

# Intel® Server Chassis SR2500

# Intel® Server System SR2500AL

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| October 2007 | 1.5 | Updated Power Sub-System. Updated Table 54. |
| November 2008 | 1.6 | Add introduction of Midplane2 |

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# 1. Product Overview

The Intel® Server Chassis SR2500 is a 2U server chassis that is designed to support the Intel® Server Board S5000PAL. The server board and the chassis have features that are designed to support the high-density server market. This chapter provides a high-level overview of the chassis features. Greater detail for each major chassis component or feature is provided in the following chapters.

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

A second significant change from the previous generation is the introduction of the mid-plane circuit board. There are two options for the mid-plane circuit board: the first option provides SAS RAID support. The second option is a passive SATA/SAS mid-plane that can be used with either the SATA only connectors from the server board, or SATA/SAS connectors from an add-in card.

## 1.1 Chassis Views

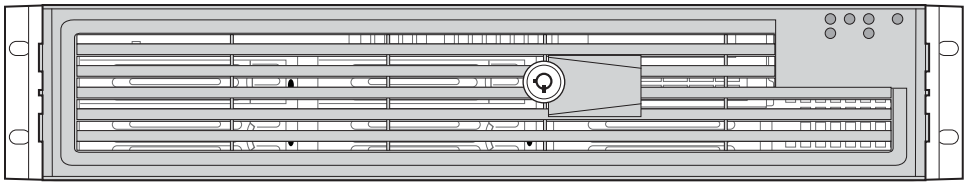



**Figure 1. Front View with Optional Bezel**

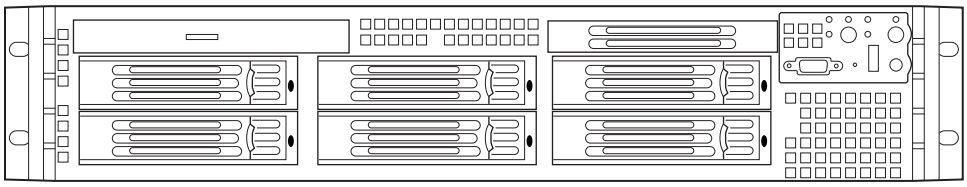



**Figure 2. Front View without Bezel (Shown with Standard Control Panel Option)**

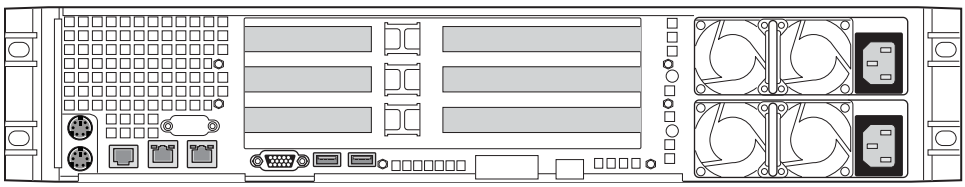



**Figure 3. Back View – (Shown with 1+1 Power Supply Configuration)**

## 1.2 Chassis Dimensions

**Table 1. Chassis Dimensions**

| | | |
|---|---|---|
| Height | 87.30 mm | 3.44” |
| Width without rails | 430 mm | 16.93” |
| Width with rails | 451.3 mm | 17.77” |
| Depth without CMA | 704.8 mm | 27.75” |
| Depth with CMA | 838.2 mm | 33.0” |
| Max. Weight | 29.5 kg | 65 lbs |

## 1.3 System Components

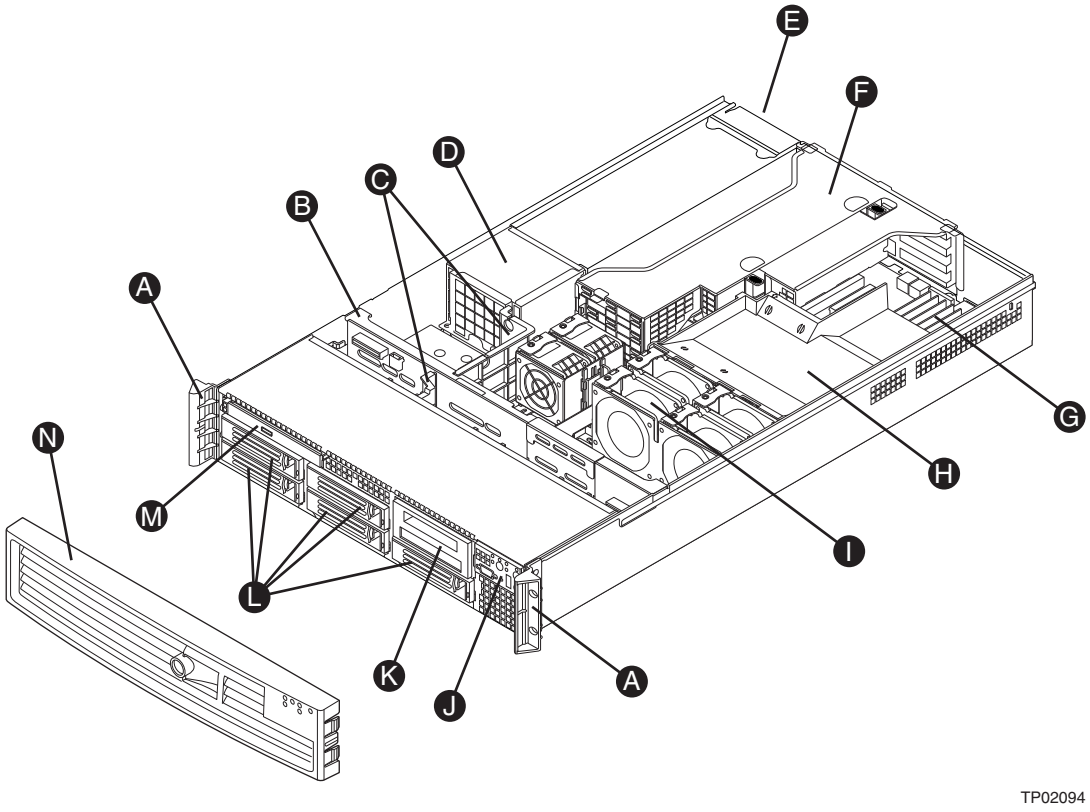



**Figure 4. Major Chassis Components**

A. Rack Handles
B. SAS/SATA Backplane
C. Air Baffles
D. Power Distribution Module
E. Power Supply Modules
F. Riser Card Assembly
G. System Memory
H. CPU Air Duct
I. System Fan Assembly
J. Standard Control Panel
K. Flex Bay – 6th HDD or Tape (Optional)
L. Hard Drive Bays
M. Slim-Line Optical Drive Bay
N. Front Bezel (Optional)

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

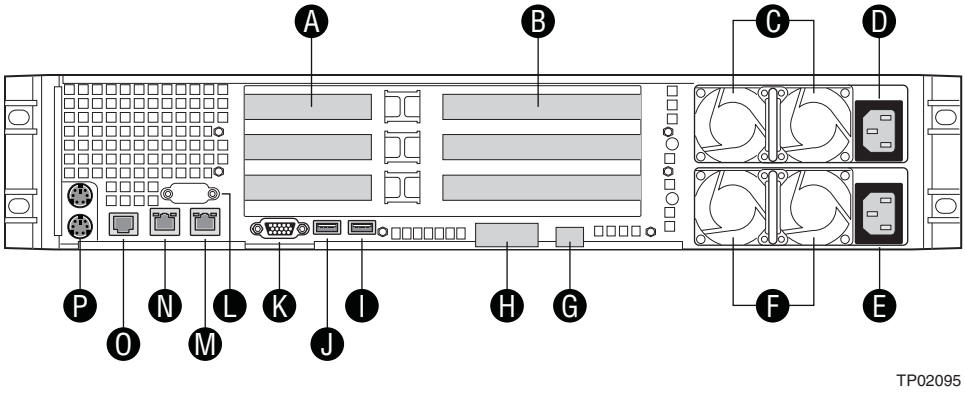



**Figure 5. Back Panel Feature Overview**

| | | | |
|---|---|---|---|
| A. | Low Profile PCIe* Add-in Card Slots | I. | USB 6 |
| B. | Full Height PCI Add-in Card Slots | J. | USB 5 |
| C. | Upper Power Supply Module | K. | Video |
| D. | Upper Power Receptacle | L. | DB-9 Serial A Connector |
| E. | Lower Power Receptacle | M. | NIC 2 |
| F. | Lower Power supply Module | N. | NIC 1 |
| G. | Intel® Remote Management Module NIC (Optional) | O. | RJ45 Serial B Connector |
| H. | Intel® I/O Expansion Module (Optional) | P. | PS2* Keyboard and Mouse Connectors |

## 1.4 System Boards

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

- Bridge Board – PCB used to route signals from the server board to the mid-plane and control panel boards.
- Mid-plane – A PCB used to determine the desired hard drive interface for the system. Two mid-plane options are available for this system:
  - Active SAS/SAS RAID – cable less solution with onboard SAS controller
  - Passive SATA – cabled to SATA ports on the server board or from add-in adapter.
- Backplane – Hot swap backplane capable of supporting both SATA and SAS hard drives.
- Riser Cards – PCI riser cards used to provide up to five add-in card slots to the system. Available riser card options for this system include:
  - Low profile, two slot PCI Express*
  - Full height, three slot PCI-X* (passive)
  - Full height, three slot PCI-X (active) with onboard PXH PCI bridge chip
  - Full height, two PCI Express slots + one PCI-X slot

- Optical Drive Interposer Card – Used to interface optical drive with 44-pin IDE cable as cabled from the server board.
- Control Panel – A PCB providing system status and control functionality features. Two control panel options are available for this system
    - Standard Control Panel
    - Intel® Local Control Panel with LCD support
- RAID Activation Keys – The system provides different RAID options depending on the mid-plane option selected. Two RAID Activation Keys are available for this system
    - Hardware RAID Activation Key – Used on the Active SAS/SAS RAID Mid-plane to enable hardware RAID support.
    - Software SATA RAID 5 Activation Key – This RAID key plugs into a connector on the server board. It is used to enable the software SATA RAID 5 functionality of the Intel® 6321ESB I/O Controller Hub SATA ports of the server board when cabled to the passive mid-plane.

## 1.5 Control Panel Options

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

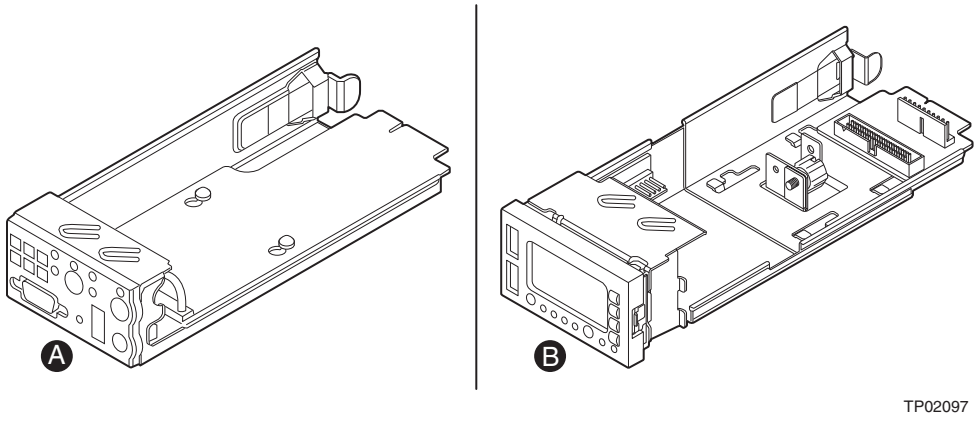



**Figure 6. Control Panel Modules**

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

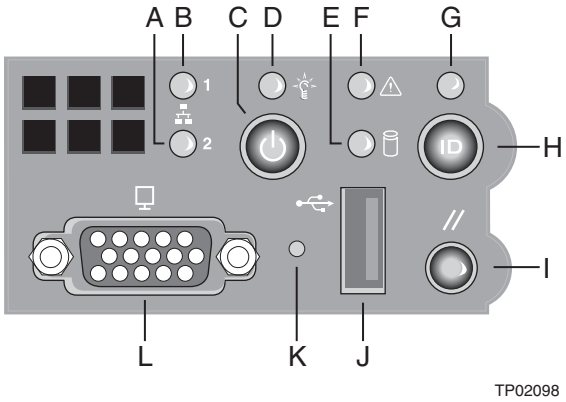



**Figure 7. Standard Control Panel Overview**

A. NIC #2 Activity LED
B. NIC #1 Activity LED
C. Power / Sleep Button
D. Power / Sleep LED
E. Hard Drive Activity LED
F. System Status LED
G. System Identification LED
H. System Identification Button
I. System Reset Button
J. USB 2.0 Connector
K. Recessed NMI Button (Tool Required)
L. Video Connector

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

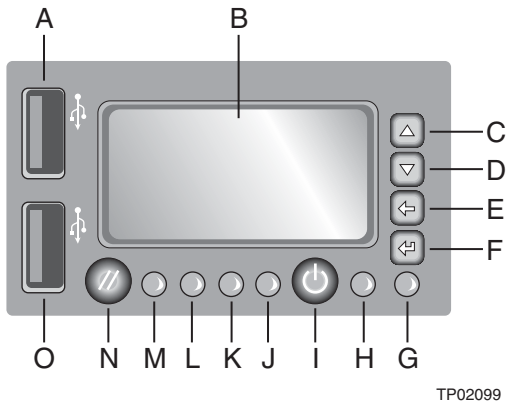



**Figure 8. LCD Control Panel Overview**

| | | | |
|---|---|---|---|
| A | USB 2.0 Port | I | Power/Sleep Button |
| B | LCD Display | J | System Status LED |
| C | Menu Control Button, Scroll up | K | NIC 2 Activity LED |
| D | Menu Control Button, Scroll down | L | NIC 1 Activity LED |
| E | Menu Control Button, Scroll left | M | Hard Disk Drive Activity LED |
| F | Menu Control Button, Enter | N | Reset Button |
| G | System Identification LED | O | USB 2.0 Port |
| H | Power/Sleep LED | | |

## 1.6 Hard Drive and Peripheral Bays

The chassis is designed to support several different hard drive and peripheral configurations. The system includes a hot swap backplane capable of supporting either SAS or SATA drives. The sixth bay (see letter “B” in the figure below) can optionally be configured to support a sixth hard drive or 3.5” tape drive.

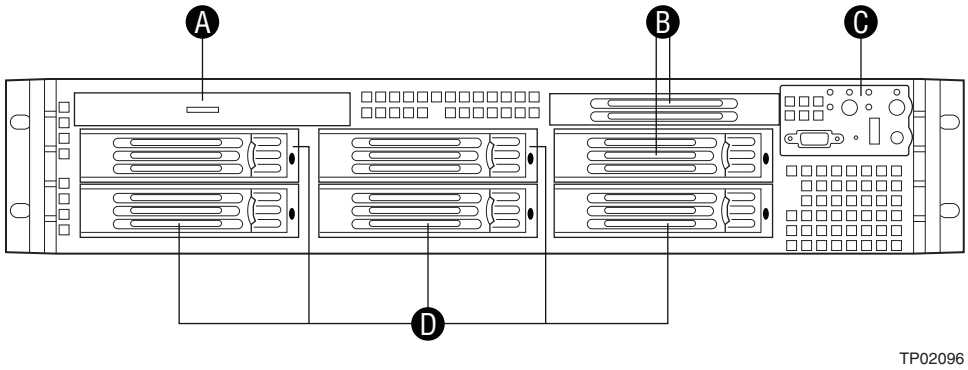



**Figure 9. Front Panel Feature Overview**

A. Slimline Optical Drive Bay
B. 6th HDD Drive or Tape Drive Bay (Optional)
C. System Control Panel
D. 3.5” Hard Drive Bays (5)

## 1.7 Power Sub-system

The power subsystem of the chassis consists of an integrated power distribution board and module enclosure which is capable of housing up to two 750 Watt power supply modules supporting 1+0 or redundant 1+1 power configurations. In a 1+1 redundant configuration, each power supply module is hot-swappable should one fail.

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

Each power supply module operates within the following voltage ranges and ratings:

| PARAMETER | MIN | RATED | MAX | Start-up Vac | Power Off Vac | Max Input AC Current | Max Rated Input AC Current |
|---|---|---|---|---|---|---|---|
| Line Voltage (110) | $90V_{rms}$ | 100-127 $V_{rms}$ | $140V_{rms}$ | 85Vac ±4Vac | 75Vac ±5Vac | 12 $A_{rms}$ [1,3] | 11.0$A_{rms}$ [4] |
| Line Voltage (220) | $180V_{rms}$ | 200-240 $V_{rms}$ | $264V_{rms}$ | - | - | 6.0 $A_{rms}$ [2,3] | 5.5$A_{rms}$ [4] |
| Frequency | 47 Hz | 50/60Hz | 63 Hz | | | | |

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

## 1.8 System Cooling

The chassis is offered with two system cooling options. The first option is a three fan solution providing sufficient airflow to maintain internal system thermal requirements when the external ambient temperature remains within specified limits. The second option is a 5+1 fan configuration. Refer to section 3.2 for details. Should a single fan failure occur, this option provides support for hot-swap fans and fan redundancy.

In addition to the system fan options, each power supply module installed provides two additional non-redundant fans which pull air from inside the chassis out the back.

## 1.9 Chassis Security

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

## 1.10 Rack and Cabinet Mounting Options

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

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

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

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

## 1.11 Front Bezel Features

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

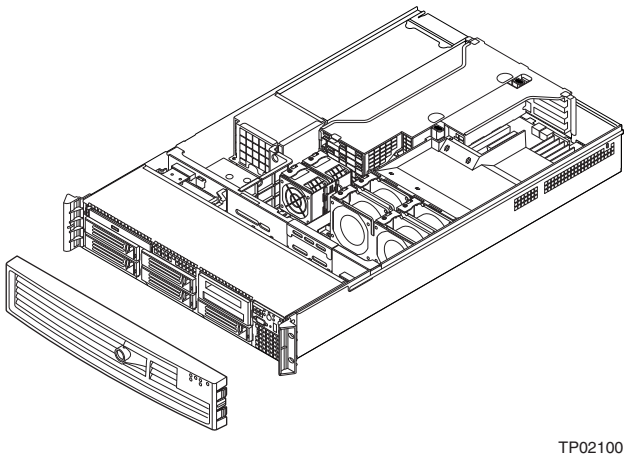



**Figure 10. Optional Front Bezel**

Separate front bezels are available to support systems that use either a standard control panel or the Intel® Local Control Panel with LCD support.

When the standard control panel is used, light pipes on the backside of the front bezel allow the system status LEDs to be monitored with the front bezel in the closed position. The front bezel lock is provided to prevent unauthorized access to hard drives, peripheral devices and the control panel.

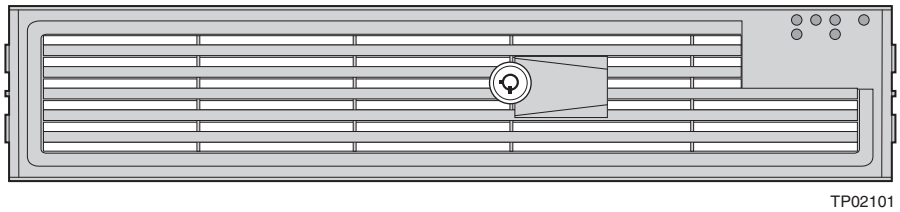



**Figure 11. Front Bezel Supporting Standard Control Panel**

When the local control panel is used, the control panel module can be adjusted to extend further out from the chassis face to allow the LCD panel to protrude from the front bezel.

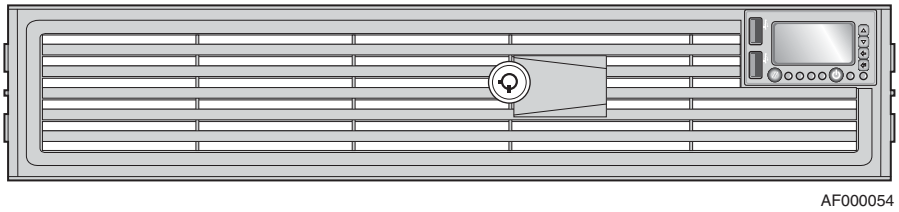



**Figure 12. Front Bezel Supporting Intel® Local Control Panel**

# 2. Power Sub-System

The power sub-system of the chassis consists of an integrated Power Distribution Module (PDM), a power module enclosure, and support for up to two 750 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 a maximum of 750 Watts of power.

This chapter provides technical details to the operation of the power supply module and power sub-system.

## 2.1 Mechanical Overview

The drawing below displays the Power Distribution Module and the power supply module enclosure assembly.

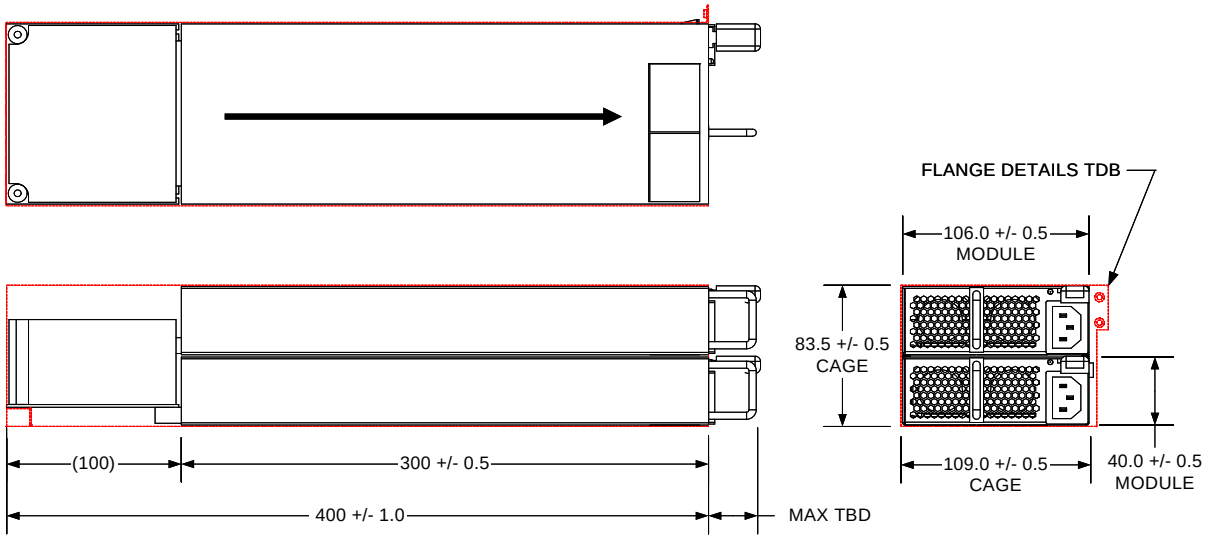



**Figure 13. Mechanical Drawing for Dual (1+1 configuration) Power Supply Enclosure with PDM**

## 2.2 Single Power Supply Module Population

In single power module configurations, server management firmware requires that the power supply module be populated in the top power module slot. The non-operating slot must have the power supply blank installed.

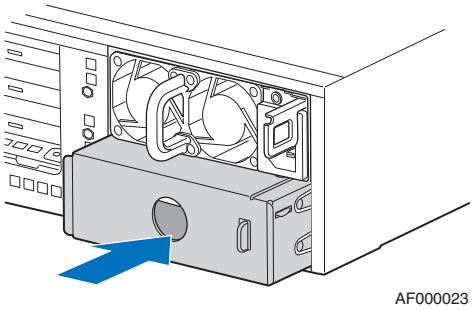



**Figure 14. Power Supply Blank**

Configuring a single power supply module in the bottom location will cause the server management firmware and BIOS to generate a system error during POST and the error will be reported to the System Event Log (SEL).

## 2.3 Handle and Retention Mechanism

Each power supply module includes a handle for module insertion to or removal from the module enclosure. Each module has a simple retention mechanism to hold the power module in place once it is inserted. This mechanism will withstand the specified platform mechanical shock and vibration requirements. The tab on the retention mechanism is colored **green** to indicate it is a hot-swap touch point. The latch mechanism is designed to prevent insertion or removal of the module with the power cord plugged in. This will aid the hot-swapping procedure.

## 2.4 Hot-swap Support

Hot-swapping a power supply module is the process of extracting and re-inserting a power supply module from an operating power system. During this process the output voltages shall remain within specified limits. Up to two power supply modules may be on a single AC line. The power supply module can be hot-swapped by the method listed below.

Extraction: on removal, the power cord is unplugged first, and then the power module is removed. This can be done in standby mode or power-on mode.

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

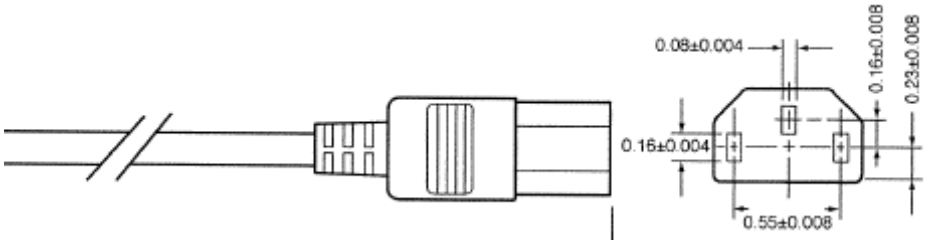
## 2.5 Airflow

Each power supply module incorporates two non-redundant 40mm fans for self cooling and partial system cooling. The fans will provide no less than **10 CFM** airflow through the power supply when installed in the system and operating at maximum fan speed. The cooling air will enter the power module from the PDB side (pre-heated air from the system).

## 2.6 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 |




## 2.7 Output Cable Harness

The power distribution board provides a cable harness providing connectors to the various system boards. The harness size, connectors, and pin outs are shown below. Listed or recognized component appliance wiring material (AVLV2), CN, rated 105°C min, 300Vdc min shall be used for all output wiring.

**Table 2. Power Harness Cable Definitions**

| Length mm | To connector # | No of pins | Description |
|---|---|---|---|
| 90, 90° angle | P1 | 2x12 | Main Power Connector |
| 115, 90° angle | P2 | 2x4 | Processor Power Connector |
| 100 | P3 | 1x5 | Server Board Signal Connector |
| 150 | P4 | 2x4 | Backplane Power Connector |
| 220 | P5 | 2x5 | Mid-plane Power Connector |

### 2.7.1 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 3. P1 Main Power Connector**

| PIN | SIGNALS | 18 AWG COLOR | PIN | SIGNAL | 18 AWG COLORS |
|---|---|---|---|---|---|
| 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 | | | |

### 2.7.2 P2 – Processor Power Connector

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

Contact: Molex 44476-1111 or equivalent

**Table 4. P2 Processor Power Connector**

| PIN | SIGNAL | 18 AWG COLORS | PIN | SIGNAL | 18 AWG COLORS |
|---|---|---|---|---|---|
| 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 |

### 2.7.3 P3 – Power Signal Connector

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

Contacts: Molex 16-02-0087 or equivalent

**Table 5. P3 Power Signal Connector**

| PIN | SIGNAL | 24 AWG COLORS |
|---|---|---|
| 1 | I2C Clock (SCL) | White/Green |
| 2 | I2C Data (SDL) | White/Yellow |
| 3 | SMBAlert# | White |
| 4 | ReturnS | Black |
| 5 | 3.3RS | White/Brown |

### 2.7.4 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 6. P4 Hot Swap Backplane Power Connector**

| PIN | SIGNAL | 18 AWG COLORS | PIN | SIGNAL | 18 AWG COLORS |
|---|---|---|---|---|---|
| 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 |

### 2.7.5 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 7. P5 Mid-plane Power Connector**

| PIN | SIGNAL | 20 AWG Colors | PIN | SIGNAL | 20 AWG Colors |
|---|---|---|---|---|---|
| 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 |

## 2.8 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.

### 2.8.1 Efficiency

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

***Table 8. Efficiency***

| Loading | 100% of maximum | 50% of maximum | 20% of maximum |
|---|---|---|---|
| Recommended Efficiency | ~80% | ~83% | ~78% |

### 2.8.2 AC Input Voltage Specification

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

***Table 9. AC Input Rating***

| PARAMETER | MIN | RATED | MAX | Start-up Vac | Power Off Vac | Max Input AC Current | Max Rated Input AC Current |
|---|---|---|---|---|---|---|---|
| Line Voltage (110) | 90$V_{rms}$ | 100-127 $V_{rms}$ | 140$V_{rms}$ | **85Vac ±4Vac** | **75Vac ±5Vac** | **12 $A_{rms}$ [1,3]** | **11.0$A_{rms}$ [4]** |
| Line Voltage (220) | 180$V_{rms}$ | 200-240 $V_{rms}$ | 264$V_{rms}$ | **-** | - | **6.0 $A_{rms}$ [2,3]** | **5.5$A_{rms}$ [4]** |
| Frequency | 47 Hz | 50/60Hz | 63 Hz | | | | |

**Notes:**
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.

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 shall power off at or below 75Vac ±5Vac. The power supply shall start up at or above 85VAC ±4Vac. Application of an input voltage below 85VAC shall not cause damage to the power supply or blow a fuse.

### 2.8.3 AC Line Dropout / Holdup

An AC line **dropout** is defined to be when the AC input drops to 0VAC at any phase of the AC line for any length of time. 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 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. Any dropout of the AC line shall not cause damage to the power supply.

**20ms Min** when tested under the following conditions: Max combined load = 525W,
**12ms Min** when tested under the following conditions: Max combined load = 750W

### 2.8.4 AC Line 5 VSB Holdup

The 5VSB output voltage should stay in regulation under its full load (static or dynamic) during an AC dropout of **70ms** min (=5VSB holdup time) whether the power supply is in ON or OFF state (PSON asserted or de-asserted).

### 2.8.5 AC Inrush

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

The power supply must meet 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 **60A peak** for up to 1 msec.

## 2.9 Protection Circuits

Protection circuits inside the PDB and the power supply shall cause the power supply's main +12V output to shut down, or shall cause a shut down of any of the three outputs on the PDB. Either of these shutdowns will 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 shall be able to reset the power supply and the PDB.

### 2.9.1 Over-Current Protection (OCP)

Each DC/DC converter output on the PDB shall have individual OCP protection circuits. The power supply and power distribution board (PS and PDB) shall shutdown and latch off after an over-current condition occurs. This latch shall be cleared by an AC power interruption. The following table provides the over-current limits. The values are measured at the PDB harness connectors. The DC/DC converters shall not be damaged from repeated power cycling in this condition. The +12V output from the power supply is divided on the PDB into four channels and each is limited to 240VA of power. There shall be current sensors and limit circuits to shut down the entire PS and PDB if the limit is exceeded. The limits are listed below.

**Table 10. Over-Current Protection Limits / 240VA Protection**

| Output Voltage | MIN OCP TRIP LIMITS | MAX OCP TRIP LIMITS |
|---|---|---|
| +3.3V | 110% min (= 26.4A min) | 150% max (= 36A max) |
| +5V | 110% min (= 33A min) | 150% max (= 45A max) |
| -12V | 125% min (= 0.625A min) | 400% max (= 2.0A max) |
| +12V1 | 112.5% min (= 18.0A min) | 20A max |
| +12V2 | 112.5% min (= 18.0A min) | 20A max |
| +12V3 | 112.5% min (= 18.0A min) | 20A max |
| +12V4 | 112.5% min (= 18.0A min) | 20A max |

### 2.9.2 Over-Voltage Protection (OVP)

Each DC/DC converter output on the PDB shall have individual OVP circuits built in and they shall be locally sensed. The PS and PDB shall shutdown and latch off after an over-voltage condition occurs. This latch shall be cleared by an AC power interruption. The following table provides the over-voltage limits. The values are measured at the PDB harness connectors. The voltage shall never exceed the maximum levels when measured at the power pins of the output harness connector during any single point of fail. The voltage shall never trip any lower than the minimum levels when measured at the power pins of the PDB connector.

**Table 11. Over-Voltage Protection (OVP) Limits**

| Output Voltage | OVP MIN (V) | OVP MAX (V) |
|---|---|---|
| +3.3V | 3.9 | 4.5 |
| +5V | 5.7 | 6.5 |
| +5VSB | 5.7 | 6.5 |
| -12V | -13.3 | -14.5 |
| +12V1/2/3/4 | 13.0 | 14.5 |

### 2.9.3 Over-Temperature Protection (OTP)

The power supply will be protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the power supply will shutdown. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically, while the 5 Vsb remains constantly on. The OTP trip level shall have a minimum of 4°C of ambient temperature hysteresis, so that the power supply will not oscillate on and off due to a temperature recovery condition. The power supply shall alert the system of the OTP condition via the power supply FAIL signal and the PWR LED.

## 2.10 DC Output Specification

### 2.10.1 Output Power / Currents

The following table defines power and current ratings for this **750W** continuous (860W pk) power supply in 1+0 or 1+1 redundant configuration. The combined output power of both outputs shall not exceed the rated output power. The power supply must meet both static and dynamic voltage regulation requirements for the minimum loading conditions. Also, the power supply shall be able to supply the listed peak currents and power for a minimum of 10 seconds. Outputs are not required to be peak loaded simultaneously.

| | +12V | +5Vsb |
|---|---|---|
| **MAX Load** | 62.0A | 3.0A |
| **MIN DYNAMIC Load** | 3.0A | 0.1A |
| **MIN STATIC Load** | 0.0A | 0.1A |
| **PEAK Load** | 70.0A(12s min) | 5.0A (0.5s min @ turn-on) |
| **Max Output Power (continuous)** | 12V x 62A = 744W max | 5V x 3A = 15W max |
| **Peak Output Power** | 12V x 70A = 840W pk | 5V x 5A = 25W pk |

### 2.10.2 Standby Output / Standby Mode

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

## 2.11 Power Supply Status LED

Each power supply module will have a single bi-color LED to indicate power supply status. The LED operation is defined below.

**Table 12. 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)<br>or<br>Power supply critical event causing a shutdown:<br>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. | **1Hz Blink AMBER** |
| AC present / Only 5VSB on (PS Off) | **1Hz Blink GREEN** |
| Output ON and OK | **GREEN** |

The LED is visible on the rear panel of each installed power supply module.

# 3. Cooling Sub-System

Several components and configuration requirements make up the cooling sub-system of the chassis. 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 54. System Environmental Limits.

Two system fan assembly options are available for this chassis. The first option 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 second option is a redundant fan solution. Three parallel sets of fans are arranged in series to provide redundant cooling in the event of a single fan failure. Each cooling option utilizes two fan types: a 60mm variable speed fan and an 80mm variable speed fan.

The chassis 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. The fans operate at the lowest speed for any given condition in order to minimize acoustics. The Baseboard Management Controller (BMC) integrated on the Intel® Server Board S5000PAL is used for the variable fan speed control function. The controller monitors selective component temperatures and the ambient temperature, as well as each fan's RPM to determine the necessary airflow. The BMC sets the fan speeds to the appropriate RPM in order to maintain proper cooling. The BMC controller will also log errors into the System Event Log (SEL) when temperature sensors exceed their safe operating ranges, or if any of the fans fail to operate at safe airflow speeds. In the event of a fan failure, the BMC will boost the remaining fans to compensate for the lost air flow. A chassis with redundant fans can continue to operate in this degraded condition while the non-redundant chassis may not. If the cooling is not sufficient under a failed fan condition, the system will eventually shutdown to protect itself from thermal damage.

## 3.1 Non-redundant Fan Module

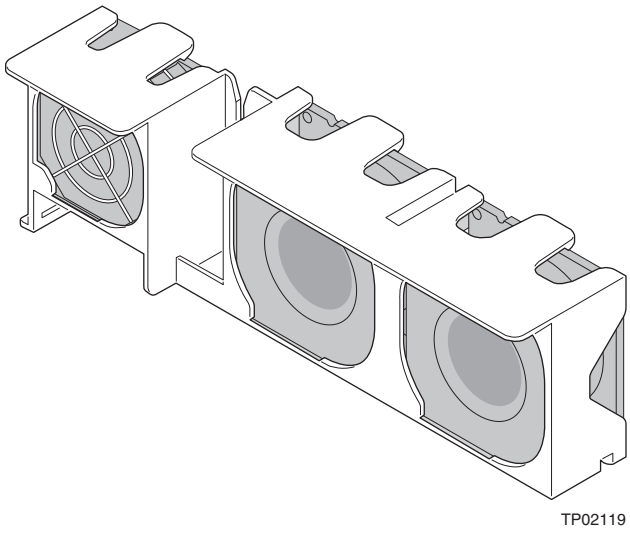



**Figure 15. Non-Redundant Fan Module**

This option provides the primary airflow for system configurations that do not require redundant cooling.

**Table 13 Nonredundant Cooling Zones**

| Fan | Cooling Zone | Description of 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 the low profile PCI cards |
| System Fan #3 | PCI | Primary cooling for hard drives 2 and 3, Full Height PCI cards, PXH and IOP80333 chipset |
| Power Supply Fans 2 fans per module | Power Supply | Primary cooling for hard drives 0 and 1, and the power supply module(s) |

The system fan module has been designed for ease of use and has support for several management features that can be utilized by the server board management system.

- The fan module houses two different fan sizes. System fans 1 and 2 use an 80mm fan, while system fan 3 uses a 60mm fan.
- Each fan is designed for tool-less insertion to or removal from the fan module housing. Note: The fans are NOT hot-swappable. The system must be turned off in order to replace a failed fan.
- Each fan within the module is capable of supporting multiple speeds. If the internal ambient temperature of the system exceeds the value programmed into the thermal sensor data record (SDR), the BMC firmware will increase the speed for all the fans within the fan module.
- Each fan connector within the module supplies a tachometer signal that allows the BMC to monitor the status of each fan. If one of the fans should fail, the remaining fans will increase their rotation and attempt to maintain the thermal requirements of the system.

- Each fan has an associated fault LED on the mid-plane located next to the fan header. In the event of a fan failure, the fault LED for the failing fan can be illuminated by system management.

**Table 14. Non-redundant Fan Connector Pin Assingment**

| 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 |
| 5 | Tachometer A | Fan RPM sensor output<br>Two pulse per revolution for the 80mm fan<br>Four pulses per revolution for the 60mm fan |
| 6 | Return | Return path to ground |
| 7 | Return | Return path to ground |
| 8 | Fan Presence | Reserved, unused by the non-redundant fan |
| 9 | LED Cathode | Loopback signal to pin 10 |
| 10 | LED Anode | Loopback signal to pin 9 |

The system fans plug into headers on the mid-plane board according to the following diagram.

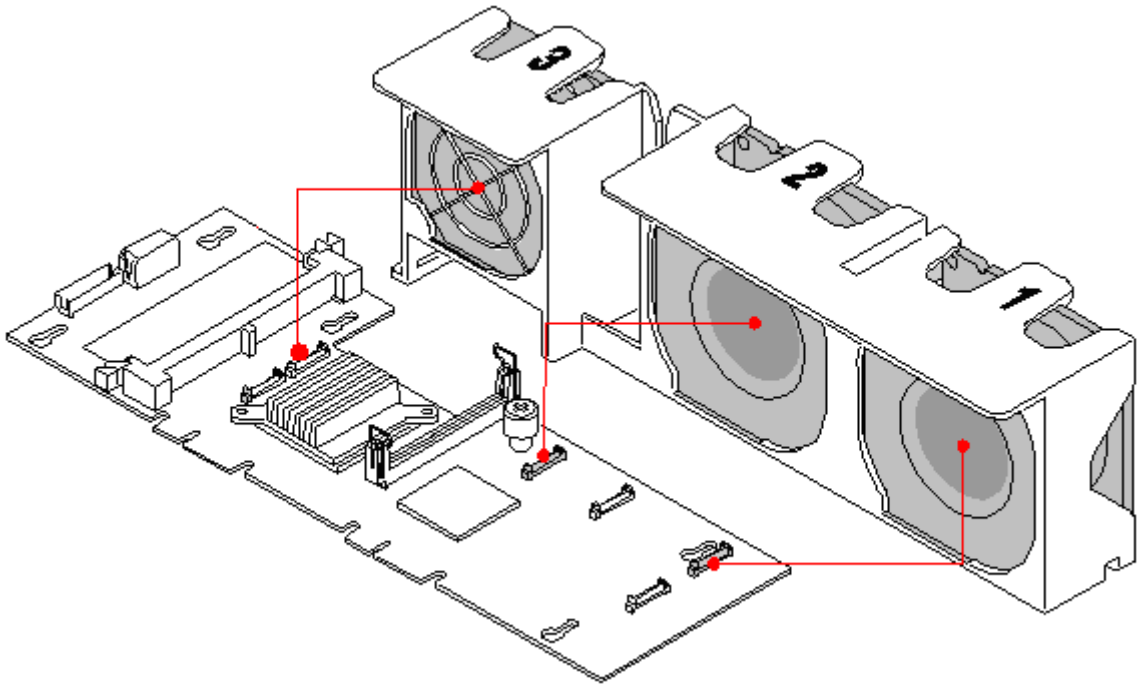



**Figure 16. Non-Redundant Fan Header Assignments on Mid-plane**

**Table 15. Nonredundant Fan Header Assignment**

| Fan ID | Mid-plane Fan Header Name |
|---|---|
| Fan #1 - CPU1 cooling | FAN_2 |
| Fan #2 - CPU2 cooling | FAN_4 |
| Fan #3 - PCI Cooling | FAN_5 |

## 3.2 Redundant System Fan Module

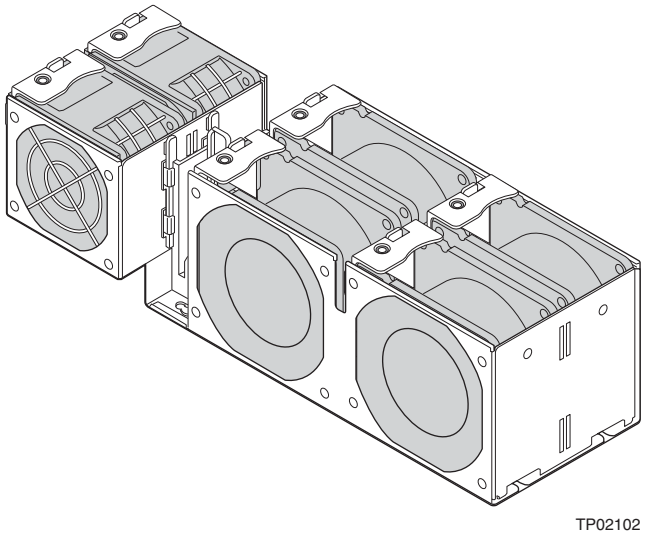



**Figure 17. Fan Module Assembly**

**Table 16 Redundant Cooling Zones**

| Fan | Cooling Zone | Description of greatest cooling influence |
|---|---|---|
| System Fan #1 & #2 | CPU1 | Primary cooling for CPU1 and memory |
| System Fan #2 & #3 | CPU2 | Primary cooling for hard drives 4 and 5, CPU2, the BNB, and the low profile PCI cards |
| System Fan #5 & #6 | PCI | Primary cooling for hard drives 2 and 3, Full Height PCI cards, PXH and IOP80333 chipset |
| Power Supply Fans 2 fans per module | Power Supply | Primary cooling for hard drives 0 and 1, and the power supply module(s) |

Each 10-pin fan connector provides power and ground, PWM control, tachometer output, a fan present detection signal, and a fault LED signal allowing it to be monitored independently by server management software. The following table provides the pin-out and description for the connectors on each fan.

**Table 17 Redundant Fan Connector Pin Assingment**

| Pin | Signal Name | Description |
|---|---|---|
| 1 | Tachometer B | Reserved, unused by redundant fan |
| 2 | PWM | Fan speed control signal |
| 3 | 12V | Power for fan |
| 4 | 12V | Power for fan |
| 5 | Tachometer A | Fan RPM sensor output<br>Two pulses per revolution for the 80mm fan<br>Four pulses per revolution for the 60mm fan |
| 6 | Return | Return path to ground |
| 7 | Return | Return path to ground |
| 8 | Fan Presence | Detection if fan is installed in system |
| 9 | LED Cathode | LED in fan |
| 10 | LED Anode | Reserved, unused by the redundant fan |

The system fans are hot-pluggable and do not have any cable connections. They mate directly to the fan module. The system fan module plugs into headers on the mid-plane board according the following diagram.

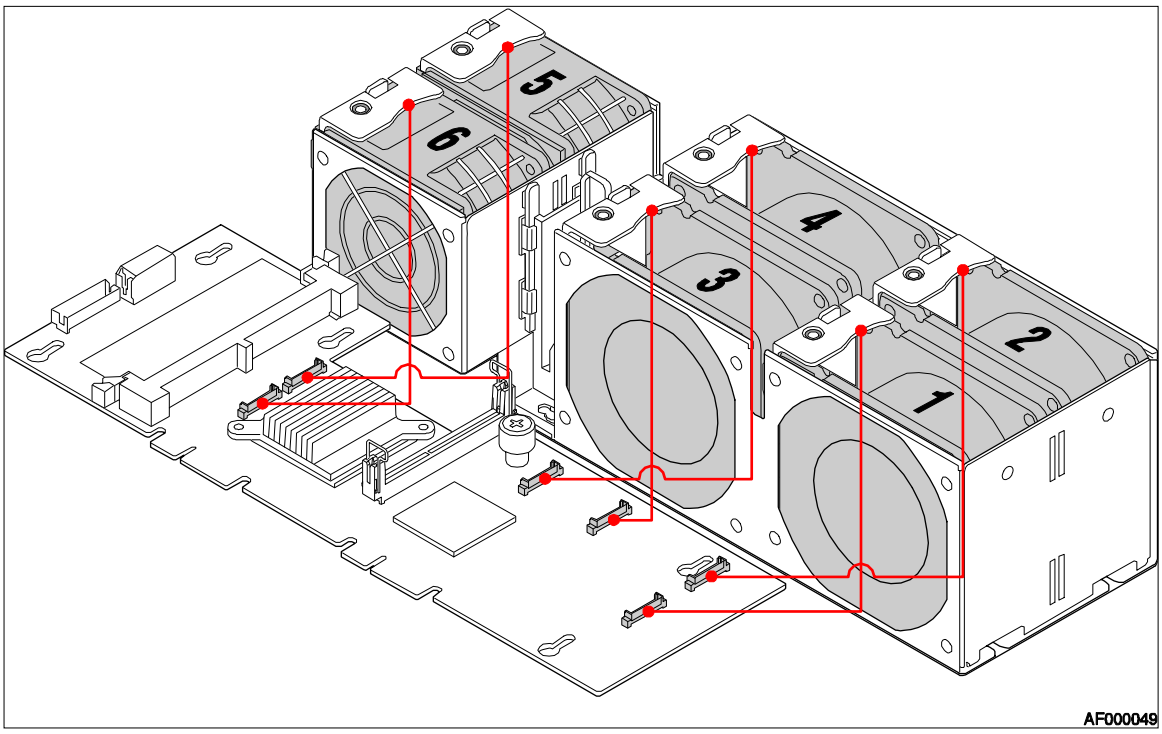



**Figure 18. Redudant Fan Header Assignments on Mid-plane**

**Table 18 Redundant Fan Header Assignment**

| Fan ID | Mid-plane Fan Header Name |
|---|---|
| Fan #1 - CPU1 Cooling | FAN_1 |
| Fan #2 - CPU1 Cooling | FAN_2 |
| Fan #3 - CPU2 Cooling | FAN_3 |
| Fan #4 - CPU2 Cooling | FAN_4 |
| Fan #5 - PCI Cooling | FAN_5 |
| Fan #6 - PCI Cooling | FAN_6 |

The system fan module has been designed for ease of use and has support for several management features that can be utilized by the server board management system.

- The fan module houses two different fan sizes. System fans 1, 2, 3 and 4 use an 80mm fan, while system fans 5 and 6 use a 60mm fan.
- Each fan is designed for tool-less insertion to or removal from the fan module and can be hot-swapped in the event of failure.
- Each fan within the module is equipped with a failure LED. In the event of a fan failure, the failure LED on the failing fan can be illuminated by server management.
- Each fan within the module is capable of supporting multiple speeds. If the internal ambient temperature of the system exceeds the value programmed into the thermal sensor data record (SDR), the BMC firmware will increase the speed for all the fans within fan module.
- Each fan connector within the module supplies a tachometer signal that allows the BMC to monitor the status of each fan. If one of the fans should fail, the remaining fans will increase their rotation and attempt to maintain the thermal requirements of the system.

## 3.3 Air Flow Support

To control airflow within the system, the chassis 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.

### 3.3.1 Power Supply Zone

An air baffle is used to isolate the air flow of the main system board zones from the zone directly behind the power supply. As the power supply fans pull pre-heated air through the power supply from inside the chassis, the zone behind it must remain as cool as possible by drawing air from the leftmost drive bays only.

### 3.3.2 Full Height Riser Zone

The full height riser zone is the area between the power supply assembly and the full height riser card of the riser assembly. The air flow through this area is generated by system fan 3 of the fan module in a non-redundant fan configuration. In a redundant fan configuration, the air flow for this zone is provided by system fans 5 and 6. Air is drawn from the drive bay area through the fan and pushed out of the system through ventilation holes the back side of the chassis.

### 3.3.3 CPU / Memory / Low Profile PCI Zone

The CPU / memory / low profile PCI zone is the area between the low profile riser card of the riser assembly and the right chassis wall. In a non-redundant fan configuration, the air flow for this zone is generated by system fans 1 and 2 of the fan module. In a redundant fan configuration, the air flow for this zone is provided by system fans 1, 2, 3 and 4. Air is drawn from the drive bay area, through the fans, directed through the CPU air duct, and out through ventilation holes on both the back wall and rear side wall of the chassis.

The CPU air duct is used to direct air flow through the processor heat sinks for both single and dual processor configurations. For single processor configurations, a flexible air baffle is attached to the air duct as shown in the following diagram.

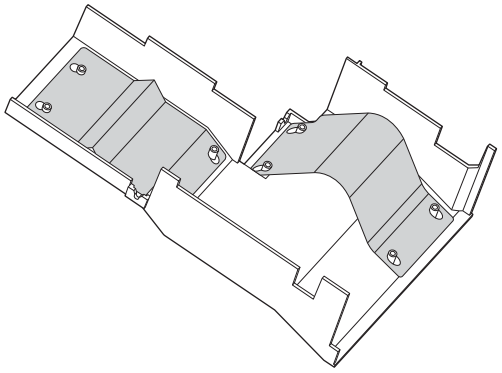



**Figure 19. CPU Air Duct with Air Baffle**

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

## 3.4 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 drive blank.

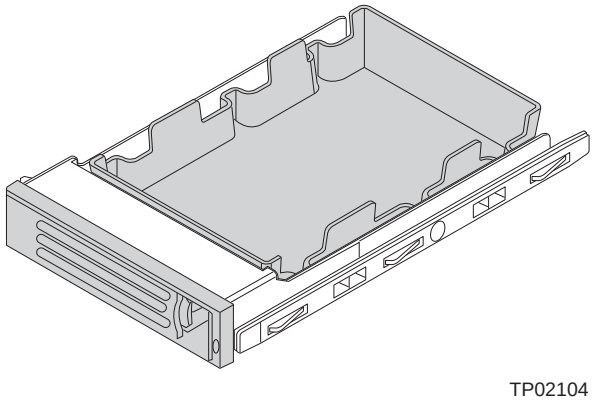
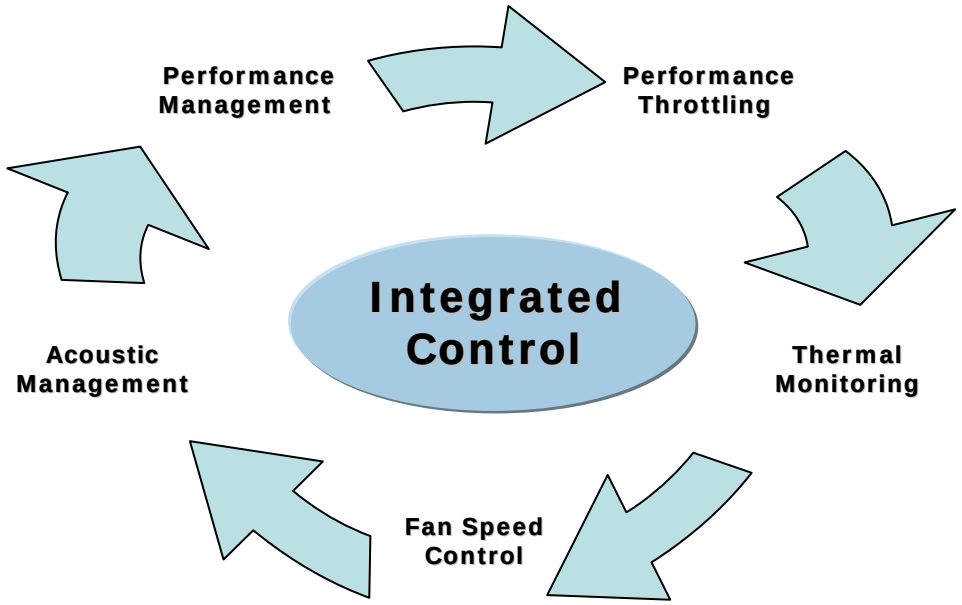



**Figure 20. Drive Blank**

# 4. Platform Control

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




## 4.1 Overview

Platform control optimizes system performance and acoustics levels through:

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

The platform components used to implement platform control include:

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

For additional details on platform control, please see the *Intel® S5000 Server Board Family Datasheet*

# 5. System Board Interconnects

The chassis incorporates several design changes from the previous generation Intel 2U server chassis, resulting in improved cable routing. System boards within the chassis include the mid-plane, bridge board, hot-swap backplane, and control panel. This chapter describes the interconnect features of each, and defines the pin-outs for each of their connectors. Functional details of each system board are described in later chapters.

## 5.1 Mid-plane

The mid-plane is new to this generation of Intel high density server platforms. Its design and use, along with that of the bridgeboard and hot-swap backplane, improve cable routing within the system. The mid-plane is the key system board of the chassis. It serves as the primary interface between the server board, hot-swap backplane, and control panel. Two mid-planes are offered for this chassis: a passive SATA/SAS, and an active SAS/SAS RAID.

The passive midplane is a simple pass through from the backplane to the SATA connectors on the baseboard or SAS/SATA connectors on an add-in card.

The following diagram shows the location for each connector found on the passive mid-plane board.

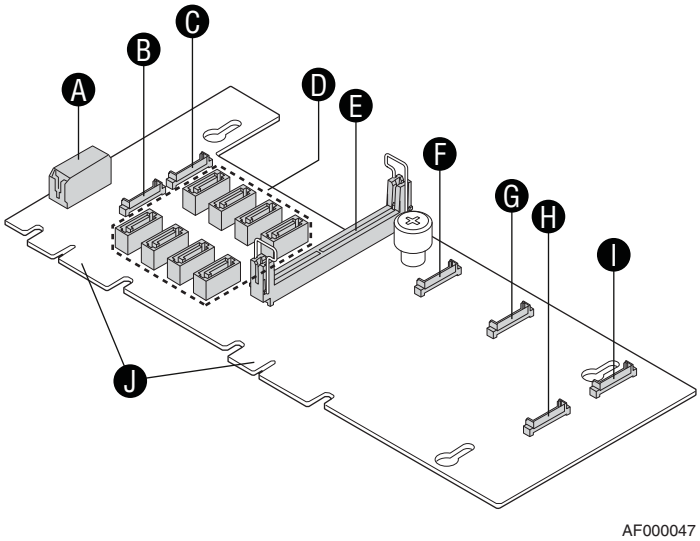



**Figure 21. Passive Mid-plane Board**

| | | | |
|---|---|---|---|
| A | Power Connector | F | Fan 4 Connector |
| B | Fan 6 Connector | G | Fan 3 Connector |
| C | Fan 5 Connector | H | Fan 1 Connector |
| D | SAS/SATA Connectors | I | Fan 2 Connector |
| E | Bridge Board Connector | J | Backplane Connector |

The chassis also supports an active SAS / SAS RAID mid-plane. This system board incorporates an LSI* LSISAS1068 SAS controller onto the board. See Chapter 5 for details describing SAS / SAS RAID support. The following diagram shows the location for each connector found on this board.

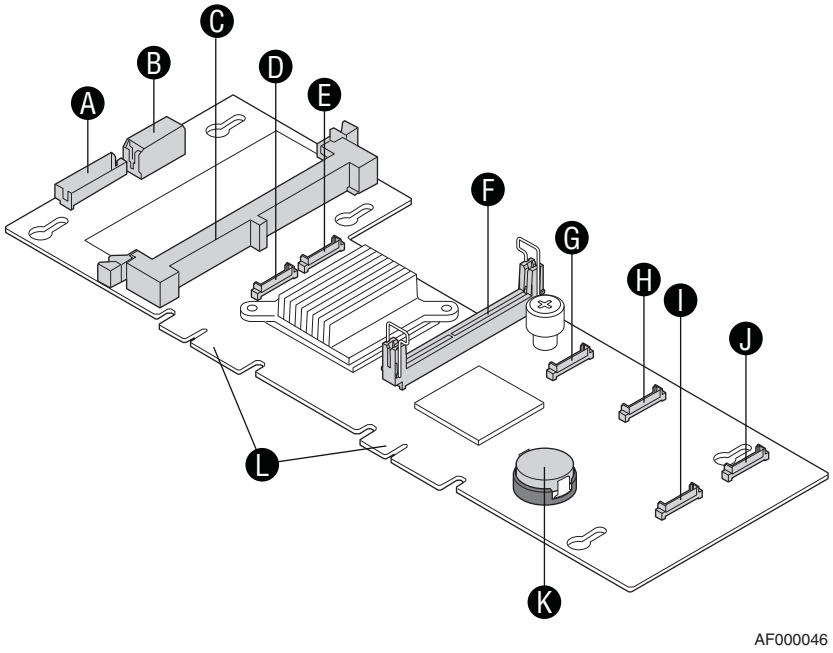



**Figure 22. SAS/SAS RAID Mid-plane Board**

| | | | |
|---|---|---|---|
| A | Optional RAID Cache Battery Backup Connection | G | Fan 4 Connector |
| B | Power Connector | H | Fan 3 Connector |
| C | Mini-DIMM Connector | I | Fan 1 Connector |
| D | Fan 6 Connector | J | Fan 2 Connector |
| E | Fan 5 Connector | K | RAID Activation Key Connector |
| F | Bridge Board Connector | L | Backplane Connector |

The following tables define the connector pin-outs for both mid-plane boards.

**Table 19. 120-pin Server Board-to-Mid-plane Bridge Board Connector Pin-out**

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| 1 | GND | 61 | SMB_SENSOR_3V3SB_CLK_BUF |
| 2 | PE1_ESB_TX_DN3 | 62 | SMB_SENSOR_3V3SB_DAT_BUF |
| 3 | PE1_ESB_TX_DP3 | 63 | FM_BRIDGE_PRSNT_N |
| 4 | GND | 64 | GND |
| 5 | PE_WAKE_N | 65 | PE1_ESB_RX_DN_C3 |
| 6 | GND | 66 | PE1_ESB_RX_DP_C3 |
| 7 | PE1_ESB_TX_DN2 | 67 | GND |
| 8 | PE1_ESB_TX_DP2 | 68 | FAN_PRSNT6_N |
| 9 | GND | 69 | GND |
| 10 | FAN_PRSNT5_N | 70 | PE1_ESB_RX_DN_C2 |
| 11 | GND | 71 | PE1_ESB_RX_DP_C2 |

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| 12 | PE1_ESB_TX_DN1 | 72 | GND |
| 13 | PE1_ESB_TX_DP1 | 73 | FAN_PRSNT4_N |
| 14 | GND | 74 | GND |
| 15 | RST_PS_PWRGD | 75 | PE1_ESB_RX_DN_C1 |
| 16 | GND | 76 | PE1_ESB_RX_DP_C1 |
| 17 | PE1_ESB_TX_DN0 | 77 | GND |
| 18 | PE1_ESB_TX_DP0 | 78 | RAID_KEY_PRES |
| 19 | GND | 79 | GND |
| 20 | FM_RAID_MODE | 80 | PE1_ESB_RX_DN_C0 |
| 21 | GND | 81 | PE1_ESB_RX_DP_C0 |
| 22 | CLK_IOP_DN | 82 | GND |
| 23 | CLK_IOP_DP | 83 | FAN_PRSNT1_N |
| 24 | GND | 84 | FAN_PRSNT3_N |
| 25 | SGPIO_DATAOUT1 | 85 | FAN_PRSNT2_N |
| 26 | SGPIO_DATAOUT0 | 86 | GND |
| 27 | SGPIO_LOAD | 87 | USB1_ESB_DP |
| 28 | SGPIO_CLOCK | 88 | USB1_ESB_DN |
| 29 | GND | 89 | GND |
| 30 | USB2_ESB_DP | 90 | USB1_ESB_OC_N |
| 31 | USB2_ESB_DN | 91 | USB0_ESB_OC_N |
| 32 | GND | 92 | GND |
| 33 | USB2_ESB_OC_N | 93 | USB0_ESB_DP |
| 34 | NIC1_LINK_LED_N | 94 | USB0_ESB_DN |
| 35 | NIC1_ACT_LED_N | 95 | GND |
| 36 | LED_STATUS_AMBER_R1 | 96 | FP_NMI_BTN_N |
| 37 | NIC2_LINK_LED_N | 97 | BMC_RST_BTN_N |
| 38 | NIC2_ACT_LED_N | 98 | FP_PWR_BTN_N |
| 39 | LED_STATUS_GREEN_BUF_R1 | 99 | FP_ID_SW_L |
| 40 | GND | 100 | GND |
| 41 | SMB_PBI_5VSB_DAT | 101 | SMB_IPMB_5VSB_DAT |
| 42 | SMB_PBI_5VSB_CLK | 102 | SMB_IPMB_5VSB_CLK |
| 43 | GND | 103 | GND |
| 44 | V_IO_HSYNC2_BUF_FP | 104 | LED_HDD_ACTIVITY_N |
| 45 | V_IO_VSYNC2_BUF_FP | 105 | LED_HDD_5V_A |
| 46 | GND | 106 | FP_PWR_LED_R_N |
| 47 | V_IO_BLUE_CONN_FP | 107 | FP_PWR_LED_3VSB |
| 48 | V_IO_GREEN_CONN_FP | 108 | FP_ID_LED_R1_N |
| 49 | V_IO_RED_CONN_FP | 109 | FM_SIO_TEMP_SENSOR |
| 50 | GND | 110 | LED_FAN3_FAULT |
| 51 | LED_FAN6_FAULT | 111 | LED_FAN2_FAULT |
| 52 | LED_FAN5_FAULT | 112 | LED_FAN1_FAULT |
| 53 | LED_FAN4_FAULT | 113 | FAN_PWM_CPU1 |
| 54 | FAN_PWM3 | 114 | GND |
| 55 | GND | 115 | FAN_PWM_CPU2 |
| 56 | PCI_FAN_TACH10 | 116 | PCI_FAN_TACH9 |
| 57 | FAN_TACH8 | 117 | FAN_TACH7 |
| 58 | FAN_TACH6 | 118 | FAN_TACH5 |
| 59 | FAN_TACH4_H7 | 119 | FAN_TACH3_H7 |
| 60 | FAN_TACH2_H7 | 120 | FAN_TACH1_H7 |

**Table 20. Mid-plane Fan Header Pin-outs**

| J2B1 - FAN_1 | | J2B3 - FAN_3 | | J7B1 - FAN_5 | |
|---|---|---|---|---|---|
| **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** |
| 1 | FAN_TACH5 | 1 | FAN_TACH7 | 1 | FAN_TACH10 |
| 2 | FAN_PWM_CPU1 | 2 | FAN_PWM_CPU2 | 2 | FAN_PWM3 |
| 3 | P12V | 3 | P12V | 3 | P12V |
| 4 | P12V | 4 | P12V | 4 | P12V |
| 5 | FAN_TACH1_H7 | 5 | FAN_TACH3_H7 | 5 | FAN_TACH9 |
| 6 | GND | 6 | GND | 6 | GND |
| 7 | GND | 7 | GND | 7 | GND |
| 8 | FAN_PRSNT1_N | 8 | FAN_PRSNT3_N | 8 | FAN_PRSNT5_N |
| 9 | LED_FAN1_FAULT | 9 | LED_FAN3_FAULT | 9 | LED_FAN5_FAULT |
| 10 | LED_FAN1 | 10 | LED_FAN3 | 10 | LED_FAN5 |

| J2B2 - FAN_2 | | J3B1 - FAN_4 | | J7B2 - FAN_6 | |
|---|---|---|---|---|---|
| **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** |
| 1 | FAN_TACH6 | 1 | FAN_TACH8 | 1 | UNUSED |
| 2 | FAN_PWM_CPU1 | 2 | FAN_PWM_CPU2 | 2 | FAN_PWM3 |
| 3 | P12V | 3 | P12V | 3 | P12V |
| 4 | P12V | 4 | P12V | 4 | P12V |
| 5 | FAN_TACH2_H7 | 5 | FAN_TACH4_H7 | 5 | FAN_TACH10 |
| 6 | GND | 6 | GND | 6 | GND |
| 7 | GND | 7 | GND | 7 | GND |
| 8 | FAN_PRSNT2_N | 8 | FAN_PRSNT4_N | 8 | FAN_PRSNT6_N |
| 9 | LED_FAN2_FAULT | 9 | LED_FAN4_FAULT | 9 | LED_FAN6_FAULT |
| 10 | LED_FAN2 | 10 | LED_FAN4 | 10 | LED_FAN6 |

**Table 21. Mid-plane Power Connector Pin-out**

| PIN | Signal Description |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | P5V |
| 4 | P3V3 |
| 5 | GND |
| 6 | P12V |
| 7 | P12V |
| 8 | P12V |
| 9 | P12V |
| 10 | P5V_STBY |

**Table 22. Mid-plane-to-Backplane Card Edge Connector #1 Pin-out**

| J7A1 - HSBP#1 I/F | | | |
|---|---|---|---|
| **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** |
| A1 | RST_PS_PWRGD | B1 | GND |
| A2 | GND | B2 | SATA0_RX_N |
| A3 | GND | B3 | SATA0_RX_P |
| A4 | SATA1_RX_N | B4 | GND |
| A5 | SATA1_RX_P | B5 | GND |
| A6 | GND | B6 | SATA0_TX_N |
| A7 | GND | B7 | SATA0_TX_P |
| A8 | SATA1_TX_P | B8 | GND |
| A9 | SATA1_TX_N | B9 | GND |
| A10 | GND | B10 | USB2_ESB_DN |
| A11 | GND | B11 | USB2_ESB_DP |
| A12 | USB2_ESB_OC_N | B12 | GND |
| A13 | GND | B13 | SATA2_RX_N |
| A14 | GND | B14 | SATA2_RX_P |
| A15 | SATA3_RX_N | B15 | GND |
| A16 | SATA3_RX_P | B16 | NC_RESERVEDB16 |
| A17 | GND | B17 | SMB_SAS_EDGE_DAT |
| A18 | GND | B18 | NC_RESERVEDB18 |
| A19 | GND | B19 | SMB_SAS_EDGE_CLK |
| A20 | SATA3_TX_P | B20 | NC_RESERVEDB20 |
| A21 | SATA3_TX_N | B21 | GND |
| A22 | GND | B22 | SATA2_TX_P |
| A23 | GND | B23 | SATA2_TX_N |
| A24 | SATA5_RX_N | B24 | GND |
| A25 | SATA5_RX_P | B25 | GND |
| A26 | GND | B26 | SATA4_RX_N |
| A27 | GND | B27 | SATA4_RX_P |
| A28 | SATA5_TX_P | B28 | GND |
| A29 | SATA5_TX_N | B29 | GND |
| A30 | GND | B30 | SATA4_TX_P |
| A31 | GND | B31 | SATA4_TX_N |
| A32 | P5V_STBY | B32 | GND |

**Table 23. Mid-plane-to-Backplane Card Edge Connector #2 Pin-out**

| J4A1 - HSBP#2 I/F | | | |
|---|---|---|---|
| **PIN** | **SIGNAL NAME** | **PIN** | **SIGNAL NAME** |
| A1 | SGPIO_DATAOUT0 | B1 | SGPIO_CLOCK |
| A2 | SGPIO_DATAOUT1 | B2 | GND |
| A3 | GND | B3 | SATA_ADDIN1_RX_N |
| A4 | GND | B4 | SATA_ADDIN1_RX_P |
| A5 | SATA_ADDIN2_RX_N | B5 | GND |
| A6 | SATA_ADDIN2_RX_P | B6 | GND |
| A7 | GND | B7 | SATA_ADDIN1_TX_N |
| A8 | GND | B8 | SATA_ADDIN1_TX_P |
| A9 | SATA_ADDIN2_TX_P | B9 | GND |
| A10 | SATA_ADDIN2_TX_N | B10 | GND |
| A11 | GND | B11 | SGPIO_LOAD |
| A12 | SMB_PBI_3VSB_DAT | B12 | SMB_IPMB_5VSB_DAT |
| A13 | SMB_PBI_3VSB_CLK | B13 | SMB_IPMB_5VSB_CLK |
| A14 | USB0_ESB_OC_N | B14 | GND |
| A15 | GND | B15 | USB1_ESB_DP |
| A16 | GND | B16 | USB1_ESB_DN |
| A17 | USB0_ESB_DP | B17 | GND |
| A18 | USB0_ESB_DN | B18 | GND |
| A19 | GND | B19 | USB1_ESB_OC_N |
| A20 | LED_NIC1_ACT_N | B20 | LED_HDD_ACTIVITY_N |
| A21 | LED_NIC1_LINK_N | B21 | LED_HDD_5V_A |
| A22 | FM_SIO_TEMP_SENSOR | B22 | FP_ID_SW_L |
| A23 | LED_NIC2_LINK_N | B23 | BMC_RST_BTN_N |
| A24 | LED_NIC2_ACT_N | B24 | FP_PWR_BTN_N |
| A25 | GND | B25 | FP_NMI_BTN_N |
| A26 | V_BLUE_CONN_FP | B26 | FP_PWR_LED_3VSB |
| A27 | V_GREEN_CONN_FP | B27 | FP_PWR_LED_R_N |
| A28 | V_RED_CONN_FP | B28 | FP_ID_LED_R1_N |
| A29 | GND | B29 | GND |
| A30 | V_HSYNC2_BUF_FP | B30 | LED_STATUS_AMBER_R1 |
| A31 | V_VSYNC2_BUF_FP | B31 | LED_STATUS_GREEN_BUF_R1 |
| A32 | GND | B32 | FP_LED |

**Table 24. Active Mid-plane SAS RAID Battery Backup Connector Pin-out**

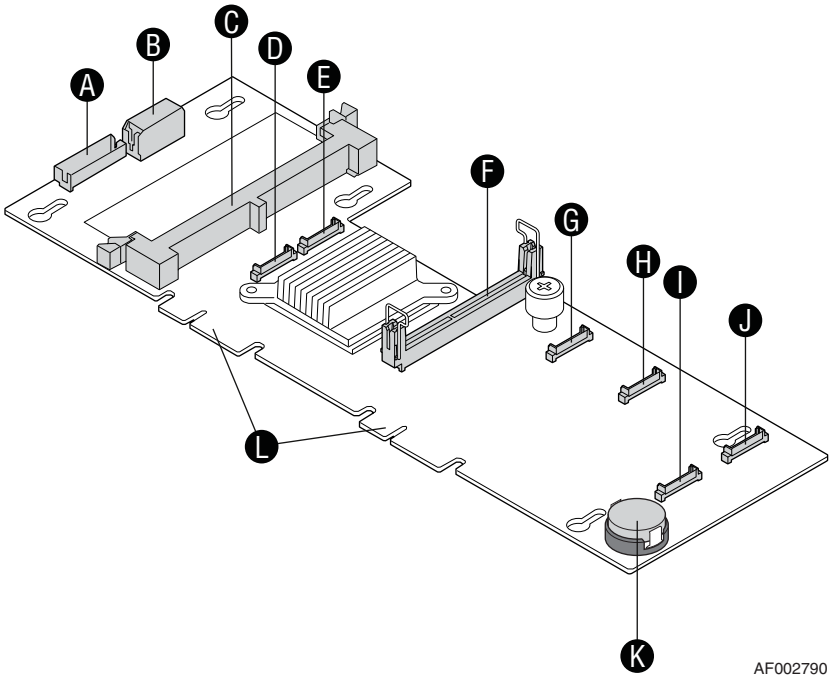
| PIN | Signal Description |
|---|---|
| 1 | P12V |
| 2 | GND |
| 3 | NC_P5V_MONITOR |
| 4 | GND |
| 5 | P1V8_VBAT_RAID |
| 6 | GND |
| 7 | PWRGD_P3V3_STBY |
| 8 | GND |
| 9 | P1V8_VBAT_RAID |
| 10 | GND |
| 11 | PX_RESET_N |
| 12 | GND |
| 13 | SMB_CLK_P3V3 |
| 14 | GND |
| 15 | SMB_DAT_P3V3 |
| 16 | BBU_PFAIL_N |
| 17 | BBU_DDR_SEL |
| 18 | BBU_BBE |
| 19 | BBU_BBSTROBE |
| 20 | BBU_BBSTATUS |

**Table 25. Passive Mid-plane SATA/SAS Connector Pin-outs**

| J5A2 - SAS_7 | | J6A1 - SAS_6 | | J5B1 - SAS_4 | | J6B1 - SAS_2 | |
|---|---|---|---|---|---|---|---|
| PIN | SIGNAL NAME | PIN | SIGNAL NAME | PIN | SIGNAL NAME | PIN | SIGNAL NAME |
| 1 | GND | 1 | GND | 1 | GND | 1 | GND |
| 2 | SATA_ADDIN1_TX_P | 2 | SATA5_TX_P | 2 | SATA3_TX_P | 2 | SATA1_TX_P |
| 3 | SATA_ADDIN1_TX_N | 3 | SATA5_TX_N | 3 | SATA3_TX_N | 3 | SATA1_TX_N |
| 4 | GND | 4 | GND | 4 | GND | 4 | GND |
| 5 | SATA_ADDIN1_RX_N | 5 | SATA5_RX_N | 5 | SATA3_RX_N | 5 | SATA1_RX_N |
| 6 | SATA_ADDIN1_RX_P | 6 | SATA5_RX_P | 6 | SATA3_RX_P | 6 | SATA1_RX_P |
| 7 | GND | 7 | GND | 7 | GND | 7 | GND |

| J5A1- SAS_8 | | J6A2 - SAS_5 | | J5B2 - SAS_3 | | J6B2 - SAS_1 | |
|---|---|---|---|---|---|---|---|
| PIN | SIGNAL NAME | PIN | SIGNAL NAME | PIN | SIGNAL NAME | PIN | SIGNAL NAME |
| 1 | GND | 1 | GND | 1 | GND | 1 | GND |
| 2 | SATA_ADDIN2_TX_P | 2 | SATA4_TX_P | 2 | SATA2_TX_P | 2 | SATA0_TX_P |
| 3 | SATA_ADDIN2_TX_N | 3 | SATA4_TX_N | 3 | SATA2_TX_N | 3 | SATA0_TX_N |
| 4 | GND | 4 | GND | 4 | GND | 4 | GND |
| 5 | SATA_ADDIN2_RX_N | 5 | SATA4_RX_N | 5 | SATA2_RX_N | 5 | SATA0_RX_N |
| 6 | SATA_ADDIN2_RX_P | 6 | SATA4_RX_P | 6 | SATA2_RX_P | 6 | SATA0_RX_P |
| 7 | GND | 7 | GND | 7 | GND | 7 | GND |

The system also supports an active SAS/SAS RAID midplane2. This system board incorporates an LSI LSISAS1078 SAS controller onto the board. The following figure shows the location for each connector found on this board.




| | | | |
|---|---|---|---|
| A. | Optional RAID Cache Battery Backup Connection | G. | Fan 4 Connector |
| B. | Power Connector | H. | Fan 3 Connector |
| C. | Mini-DIMM Connector | I. | Fan 1 Connector |
| D. | Fan 6 Connector | J. | Fan 2 Connector |
| E. | Fan 5 Connector | K. | RAID Activation Key Connector |
| F. | Bridge Board Connector | L. | Backplane Connector |

**Figure 23. Active SAS/SAS RAID Midplane 2 Board**

## 5.2 Bridge Board

The chassis utilizes a bridge board to route signals from the server board to the mid-plane board. The bridge board carries signals for three USB ports, SSI front panel control signals, video, various I2C buses, fan control signals, and a PCIe* x4 bus for SAS controller function. See Table 19. 120-pin Server Board-to-Mid-plane Bridge Board Connector Pin-out.

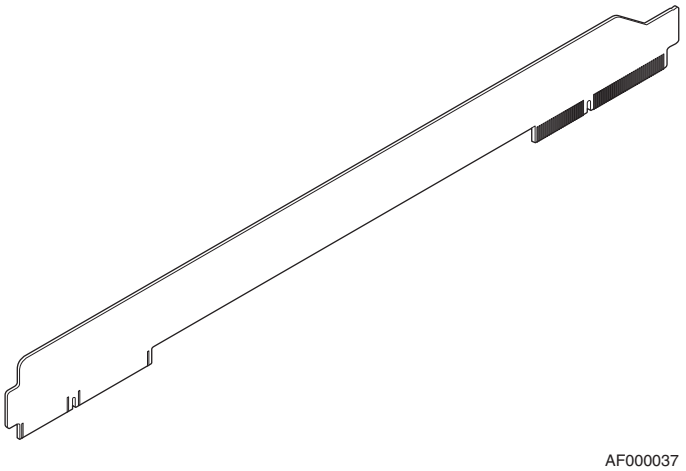



**Figure 24. Bridge Board**

## 5.3 Hot-Swap SATA/SAS Backplane

The hot swap backplane provides support for both SAS and SATA hard drives. There are no hard drive cables that connect to the backplane. All hard drive control signals are routed from the mid-plane board which plugs directly into the backplane.

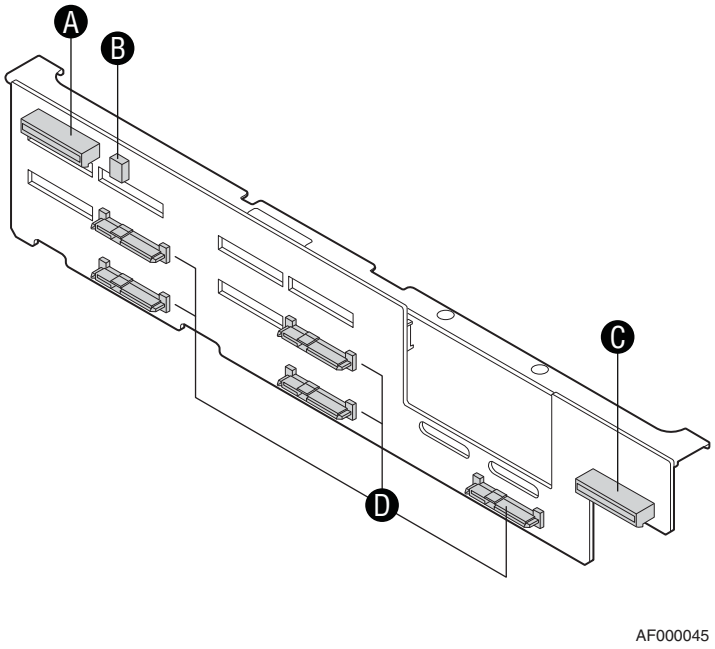



**Figure 25. Hot-Swap SAS/SATA Backplane (Front Side View)**

| | | | |
|---|---|---|---|
| A | Slimline Optical Drive Connector | C | Control Panel Connector |
| B | USB Floppy Connector | D | SAS/SATA Hot Swap Connectors |

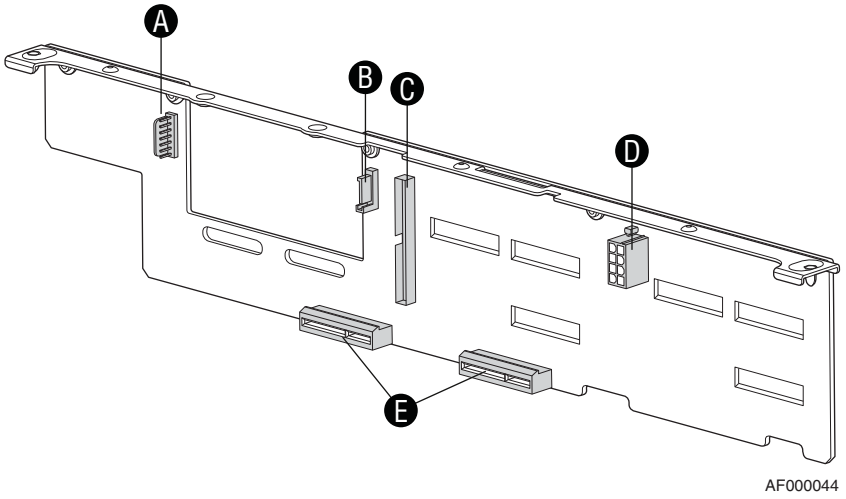



**Figure 26. Hot-Swap SAS/SATA Backplane (Back Side View)**

| | | | |
|---|---|---|---|
| A | Power Connector (for 6th Hard Drive or SATA Tape Drive) | D | Power Connector |
| B | SAS/SATA Connector (for 6th Hard Drive or SATA Tape Drive) | E | Midplane Connector |
| C | IDE Connector | | |

**Table 26. 2x4 SAS/SATA Backplane Power Connector Pin-out (J7L2)**

| Pin # | Signal Name |
|---|---|
| 1 | Ground |
| 2 | Ground |
| 3 | P5V |
| 4 | P5V |
| 5 | P12V |
| 6 | P12V |
| 7 | P5V_STBY |
| 8 | P3V3 |

**Table 27. 1x7 6th HDD / Tape Drive Option Power Connector Pin-out (J2M1)**

| Pin # | Signal Name |
|---|---|
| 1 | P12V |
| 2 | Ground |
| 3 | Ground |
| 4 | P5V |
| 5 | SASS_PRSTNT_L |
| 6 | LED_SASS_ACT_L |
| 7 | P3V3 |

**Table 28. 6th HDD Option SATA/SAS I/O Connector Pin-out (J4L1)**

| Pin # | Signal Name |
|---|---|
| 1 | Ground |
| 2 | SASS_TX_DP |
| 3 | SASS_TX_DN |
| 4 | Ground |
| 5 | SASS_RX_DN |
| 6 | SASS_RX_DP |
| 7 | Ground |

**Table 29. 2x22 Slim-Line IDE Optical Drive Connector Pin-out (J5N1)**

| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| 1 | RST_IDE_L | 23 | RIDE_DIOW_N |
| 2 | Ground | 24 | Ground |
| 3 | RIDE_DD <15..0> 7 | 25 | RIDE_DIOR_N |
| 4 | RIDE_DD <15..0> 8 | 26 | Ground |
| 5 | RIDE_DD <15..0> 6 | 27 | RIDE_DIORDY |
| 6 | RIDE_DD <15..0> 9 | 28 | IDE_ALE_H |
| 7 | RIDE_DD <15..0> 5 | 29 | RIDE_DDACK_N |
| 8 | RIDE_DD <15..0> 10 | 30 | Ground |
| 9 | RIDE_DD <15..0> 4 | 31 | IRQ_IDE |
| 10 | RIDE_DD <15..0> 11 | 32 | TP_PIDE_32 |
| 11 | RIDE_DD <15..0> 3 | 33 | RIDE_DA1 |
| 12 | RIDE_DD <15..0> 12 | 34 | IDE_PRI_CBLSNS |
| 13 | RIDE_DD <15..0> 2 | 35 | RIDE_DA0 |

| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| 14 | RIDE_DD <15..0> 13 | 36 | RIDE_DA2 |
| 15 | RIDE_DD <15..0> 1 | 37 | RIDE_DCS1_N |
| 16 | RIDE_DD <15..0> 14 | 38 | RIDE_DCS3_N |
| 17 | RIDE_DD <15..0> 0 | 39 | LED_IDE_L |
| 18 | RIDE_DD <15..0> 15 | 40 | Ground |
| 19 | Ground | 41 | Not Used |
| 20 | Not Used | 42 | Not Used |
| 21 | RIDE_DDREQ | 43 | Not Used |
| 22 | Ground | 44 | Not Used |

**Table 30. Slim-Line Optical Drive Slot Connector (J1A1)**

| Pin # | Signal Name | | | Pin # | Signal Name |
|---|---|---|---|---|---|
| A1 | RST_IDE_L | PRSNT1_N | 12V | B1 | RIDE_DD<15..0> 8 |
| A2 | Ground | 12V | 12V | B2 | Ground |
| A3 | RIDE_DD<15..0> 7 | 12V | RSVD | B3 | RIDE_DD<15..0> 9 |
| A4 | Ground | GND | GND | B4 | Ground |
| A5 | RIDE_DD<15..0> 6 | JTAG2 | SMCLK | B5 | RIDE_DD<15..0> 10 |
| A6 | Ground | JTAG3 | SMDAT | B6 | Ground |
| A7 | RIDE_DD<15..0> 5 | JTAG4 | GND | B7 | RIDE_DD<15..0> 11 |
| A8 | Ground | JTAG5 | 3_3V | B8 | Ground |
| A9 | RIDE_DD<15..0> 4 | 3_3V | JTAG1 | B9 | RIDE_DD<15..0> 12 |
| A10 | Ground | 3_3V | 3_3VAUX | B10 | Ground |
| A11 | RIDE_DD<15..0> 3 | PERST_N | WAKE_N | B11 | RIDE_DD<15..0> 13 |
| A12 | Ground | ----------KEY ---------- | | B12 | Ground |
| A13 | RIDE_DD<15..0> 2 | GND | RSVD | B13 | RIDE_DD<15..0> 14 |
| A14 | Ground | REFCLK+ | GND | B14 | Ground |
| A15 | RIDE_DD<15..0> 1 | REFCLK – | PETP0 | B15 | RIDE_DD<15..0> 15 |
| A16 | Ground | GND | PETN0 | B16 | Ground |
| A17 | RIDE_DD<15..0> 0 | PERP0 | GND | B17 | RIDE_DDREQ |
| A18 | Ground | PERN0 | PRSNT2_N | B18 | Ground |
| A19 | RIDE_DIOW_N | GND | GND | B19 | RIDE__DIOR_N |
| A20 | Ground | RSVD | PETP1 | B20 | Ground |
| A21 | RIDE_DIORDY | GND | PETN1 | B21 | RIDE_DDACK_N |
| A22 | Ground | PERP1 | GND | B22 | TP_PIDE_32 |
| A23 | IRQ_IDE | PERN1 | GND | B23 | IDE_PRI_CBLSNS |
| A24 | Ground | GND | PETP2 | B24 | Ground |
| A25 | RIDE_DA1 | GND | PETN2 | B25 | RIDE_DA2 |
| A26 | Ground | PERP2 | GND | B26 | Ground |
| A27 | RIDE_DA0 | PERN2 | GND | B27 | RIDE_DCS3_N |
| A28 | Ground | GND | PETP3 | B28 | P5V |
| A29 | RIDE_DCS1_N | GND | PETN3 | B29 | P5V |
| A30 | P5V | PERP3 | GND | B30 | P5V |
| A31 | P5V | PERN3 | RSVD | B31 | IDE_ALE_S_H |
| A32 | LED_IDE_L | GND | PRSNT2_N | B32 | Ground |
| | | RSVD | GND | | |

**Table 31. IDE Device Master/Slave Configuration Jumper (J6L1)**

| Jumper Setting | Configuration |
|---|---|
| 1-2 | IDE Master |
| 2-3 | IDE Slave |

**Table 32. I2C Connector (J6L3)**

| Pin # | Signal Description |
|---|---|
| 1 | SMB_VSC_12C_DAT0 |
| 2 | GROUND |
| 3 | SMB_VSC_12C_CLK0 |
| 4 | Not Used |

**Table 33. PCIe X4 Slot Connector from Mid-plane (J4N1)**

| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| A1 | SGPIO_DATA0 | B1 | SGPIO_CLOCK |
| A2 | SGPIO_DATA1 | B2 | Ground |
| A3 | Ground | B3 | SAS6_RX_DN |
| A4 | Ground | B4 | SAS6_RX_DP |
| A5 | SAS7_RX_DN | B5 | Ground |
| A6 | SAS7_RX_DP | B6 | Ground |
| A7 | Ground | B7 | SAS6_TX_DN |
| A8 | Ground | B8 | SAS6_TX_DP |
| A9 | SAS7_TX_DP | B9 | Ground |
| A10 | SAS7_TX_DN | B10 | Ground |
| A11 | Ground | B11 | SGPIO_LOAD |
| A12 | SMB_PB1_5VSB_DAT | B12 | SMB_IPMB_5VSB_DAT |
| A13 | SMB_PB1_5VSB_CLK | B13 | SMB_IPMB_5VSB_CLK |
| A14 | USB_OC1_N | B14 | Ground |
| A15 | Ground | B15 | USB_P2P |
| A16 | Ground | B16 | USB_P2N |
| A17 | USB_P1P | B17 | Ground |
| A18 | USB_P1N | B18 | Ground |
| A19 | Ground | B19 | USB_OC2_N |
| A20 | LED_NIC1_ACT_L | B20 | LED_HDD_ACT_R_L |
| A21 | LED_NIC1_LINK_R_L | B21 | PV_HDD_LED_3V_A |
| A22 | FP_THERM_SENSOR | B22 | FP_ID_SW_L |
| A23 | LED_NIC2_LINK_R_L | B23 | RST_FP_BTN_L |
| A24 | LED_NIC2_ACT_L | B24 | FP_PWR_BTN_L |
| A25 | Ground | B25 | FP_NMI_BTN_L |
| A26 | V_IO_BLUE_CONN_FP | B26 | FP_PWR_LED_5VSB |
| A27 | V_IO_GREEN_CONN_FP | B27 | LED_FP_PWR_R_L |
| A28 | V_IO_RED_CONN_FP | B28 | LED_FP_ID_R_L |
| A29 | Ground | B29 | Ground |
| A30 | V_IO_HSYNC_BUFF_FP_L | B30 | LED_FP_SYS_FLT1_R_L |
| A31 | V_IO_VSYNC_BUFF_FP_L | B31 | LED_FP_SYS_FLT2_R_L |
| A32 | Ground | B32 | FP_FLT_LED_5VSB |

**Table 34. PCIe* X4 Slot Connector from Mid-plane (J6N1)**

| Pin # | Signal Name | Pin # | Signal Name |
|---|---|---|---|
| A1 | RST_PWRGD_PS | B1 | Ground |
| A2 | Ground | B2 | SAS0_RX_DN |
| A3 | Ground | B3 | SAS0_RX_DP |
| A4 | SAS1_RX_DN | B4 | Ground |
| A5 | SAS1_RX_DP | B5 | Ground |
| A6 | Ground | B6 | SAS0_TX_DN |
| A7 | Ground | B7 | SAS0_TX_DP |
| A8 | SAS1_TX_DP | B8 | Ground |
| A9 | SAS1_TX_DN | B9 | Ground |
| A10 | Ground | B10 | USB_P3N |
| A11 | Ground | B11 | USB_P3P |
| A12 | USB_OC3_N | B12 | Ground |
| A13 | Ground | B13 | SAS2_RX_DN |
| A14 | Ground | B14 | SAS2_RX_DP |
| A15 | SAS3_RX_DN | B15 | Ground |
| A16 | SAS3_RX_DP | B16 | Not Used |
| A17 | Ground | B17 | SMB_SAS_3V3_SDA |
| A18 | Ground | B18 | Not Used |
| A19 | Ground | B19 | SMB_SAS_3V3_SCL |
| A20 | SAS3_TX_DP | B20 | Not Used |
| A21 | SAS3_RT_DN | B21 | Ground |
| A22 | Ground | B22 | SAS2_TX_DP |
| A23 | Ground | B23 | SAS2_TX_DN |
| A24 | SAS5_RX_DN | B24 | Ground |
| A25 | SAS5_RX_DP | B25 | Ground |
| A26 | Ground | B26 | SAS4_RX_DN |
| A27 | Ground | B27 | SAS4_RX_DP |
| A28 | SAS5_TX_DP | B28 | Ground |
| A29 | SAS5_TX_DN | B29 | Ground |
| A30 | Ground | B30 | SAS4_TX_DP |
| A31 | Ground | B31 | SAS4_TX_DN |
| A32 | P5V_STBY | B32 | Ground |

**Table 35. USB Floppy Drive Connector (J2A1)**

| Pin # | Signal Description |
|---|---|
| 1 | P5V_USB_FP_P3 |
| 2 | USB_P3N |
| 3 | USB_P3P |
| 4 | Ground |

**Table 36. Intel® Local Control Panel (LCP) Connector (J9A1)**

| Pin # | Signal Description |
|---|---|
| 1 | SMB_IPMB_5VSB_DAT |
| 2 | Ground |
| 3 | SMB_IPMB_5VSB_CLK |
| 4 | P5V_STBY_R |

**Table 37. Control Panel Slot Connector (J9B1)**

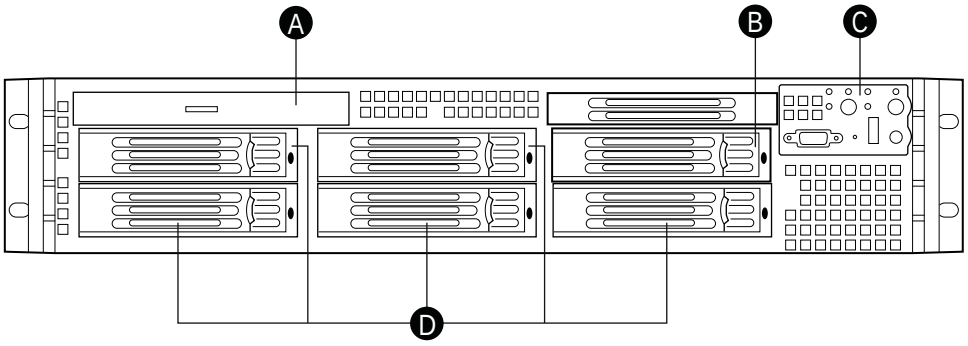
| Pin # | Signal Name | | | Pin # | Signal Name |
|---|---|---|---|---|---|
| A1 | Ground | PRSNT1_N | 12V | B1 | FP_THERM_SENSOR |
| A2 | V_IO_VSYNC_BUFF_FP_L | 12V | 12V | B2 | P5V |
| A3 | Ground | 12V | RSVD | B3 | P5V |
| A4 | V_IO_HSYNC_BUFF_FP_L | GND | GND | B4 | P5V |
| A5 | Ground | JTAG2 | SMCLK | B5 | V_VIDEO_IN_USE |
| A6 | V_IO_BLUE_BUFF_FP_L | JTAG3 | SMDAT | B6 | Ground |
| A7 | Ground | JTAG4 | GND | B7 | P5V_STBY |
| A8 | V_IO_GREEN_BUFF_FP_L | JTAG5 | 3_3V | B8 | Ground |
| A9 | Ground | 3_3V | JTAG1 | B9 | FP_FLT_LED_5VSB |
| A10 | V_IO_RED_BUFF_FP_L | 3_3V | 3_3VAUX | B10 | Ground |
| A11 | Ground | PERST_N | WAKE_N | B11 | LED_FP_SYS_FLT1_R_L |
| A12 | Ground | ---------- KEY ---------- | | B12 | FP_ID_SW_L |
| A13 | RST_FP_BTN_L | GND | RSVD | B13 | LED_FP_ID_R_L |
| A14 | Ground | REFCLK + | GND | B14 | SMB_IPMB_5VSB_DAT |
| A15 | FP_CHASSIS_INTRU | REFCLK – | PETP0 | B15 | SMB_IPMB_5VSB_CLK |
| A16 | Ground | GND | PETN0 | B16 | Ground |
| A17 | SMB_PB1_5VSB_DAT | PERP0 | GND | B17 | LED_NIC1_ACT_L |
| A18 | SMB_PB1_5VSB_CLK | PERN0 | PRSNT2_N | B18 | LED_NIC1_LINK_R_L |
| A19 | Ground | GND | GND | B19 | FP_PWR_BTN_L |
| A20 | FP_NMI_BTN_L | RSVD | PETP1 | B20 | FP_PWR_LED_5VSB |
| A21 | Ground | GND | PETN1 | B21 | PV_HDD_LED_3V_A |
| A22 | USB_P1P | PERP1 | GND | B22 | Ground |
| A23 | USB_P1N | PERN1 | GND | B23 | Ground |
| A24 | Ground | GND | PETP2 | B24 | LED_NIC2_ACT_L |
| A25 | Ground | GND | PETN2 | B25 | LED_NIC2_LINK_R_L |
| A26 | P5V_USB_P1 | PERP2 | GND | B26 | LED_HDD_FLT_R_L |
| A27 | P5V_USB_P2 | PERN2 | GND | B27 | LED_HDD_ACT_RR_L |
| A28 | Ground | GND | PETP3 | B28 | LED_FP_PWR_R_L |
| A29 | Ground | GND | PETN3 | B29 | LED_FP_SYS_FLT2_R_L |
| A30 | USB_P2P | PERP3 | GND | B30 | Ground |
| A31 | USB_P2N | PERN3 | RSVD | B31 | Ground |
| A32 | Ground | GND | PRSNT2_N | B32 | RST_PWRGD_PS |
| | | RSVD | GND | | |

**Table 38. SAS/SATA Hard Drive Connector Pin-outs (J2C3, J2B1, J4C1, J4B1, J7C1)**

| Pin# | Signal Description |
|---|---|
| SI | Ground |
| S2 | SAS#_TX_DP (# = 0…4) |
| S3 | SAS#_TX_DN (# = 0…4) |
| S4 | Ground |
| S5 | SAS#_RX_DN (# = 0…4) |
| S6 | SAS#_RX_DP (# = 0…4) |
| S7 | Ground |
| S8 | Not Used |
| S9 | Not Used |
| S10 | Not Used |
| S11 | Not Used |
| S12 | Not Used |
| S13 | Not Used |
| S14 | Not Used |
| P1 | Not Used |
| P2 | Not Used |
| P3 | Not Used |
| P4 | Ground |
| P5 | Ground |
| P6 | P3V3 |
| P7 | P5V |
| P8 | P5V |
| P9 | P5V |
| P10 | Ground |
| P11 | LED_SAS#_ACT_L (# = 0…4) |
| P12 | Ground |
| P13 | P12V |
| P14 | P12V |
| P15 | P12V |
| PTH0 | Ground |
| PTY1 | Ground |

# 6. Peripheral and Hard Drive Sub-System

The chassis can be configured to support several different hard drive and peripheral configurations. The peripheral/hard drive sub-system consists of a drive bay, supporting a slimline optical drive, hard drives, and flex bay; a mid-plane; and hot-swap backplane. This chapter describes the details for each sub-system component.




A. Slimline IDE Optical Drive Bay
B. Optional 6th HDD Drive or Tape Drive Bay
C. System Control Panel
D. 3.5” Hard Drive Bays x5

**Figure 27. Optional 6th Hard Drive (Front View)**

## 6.1 Slimline Drive Bay

The chassis provides a slim-line drive bay that is designed to support a single slim-line IDE optical drive or USB Floppy Drive. A list of supported drives can be found in the Intel® Server Board S5000PAL/S5000XAL Tested Hardware and OS List. Either drive type is mounted to a tool-less tray which allows for easy installation into and removal from the chassis. Once inserted into the chassis, the assembly locks into place. It is not hot-swappable. For removal, the system must be powered down, the chassis top cover removed and the locking latch disengaged.

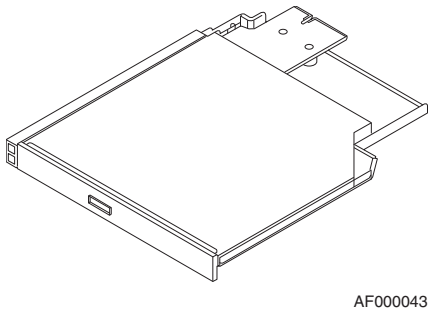



**Figure 28. Slim-Line Optical Drive Assembly**

The IDE Optical drive assembly includes an interposer board which plugs into the back of the optical drive. The interposer board is a card-edge type card that eliminates the need for cable connections. As the drive assembly is inserted into the drive bay, the edge connector is blind mated to a slot connector on the backplane.

The interposer board has two connectors. The first connector is the industry standard 50-pin IDE interface used by all slim-line optical devices. The second connector is the card edge used to connect directly to the hot-swap backplane board.

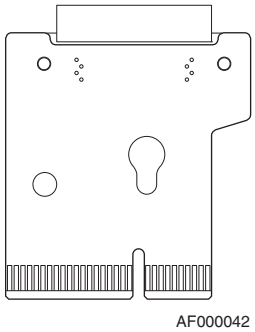



**Figure 29. 50-pin Connector to Slimline Optical Device**

**Table 39. J1L1 50-pin Connector to Slimline Optical Device**

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| 1 | TP_LCH | 26 | GND |
| 2 | TP_RCH | 27 | IDE_SIORDY |
| 3 | TP_GND | 28 | IDE_SDDACK_L |
| 4 | GND | 29 | IRQ_IDE_S |
| 5 | RST_IDE_S_L | 30 | IDEIO16_L |
| 6 | IDE_SDD8 | 31 | IDE_SDA1 |
| 7 | IDE_SDD7 | 32 | IDE_CBL_DET_S |
| 8 | IDE_SDD9 | 33 | IDE_SDA0 |
| 9 | IDE_SDD6 | 34 | IDE_SDA2 |
| 10 | IDE_SDD10 | 35 | IDE_SDCS0_L |
| 11 | IDE_SDD5 | 36 | IDE_SDCS1_L |
| 12 | IDE_SDD11 | 37 | IDE_SEC_HD_ACT_L |
| 13 | IDE_SDD4 | 38 | P5V |
| 14 | IDE_SDD12 | 39 | P5V |
| 15 | IDE_SDD3 | 40 | P5V |
| 16 | IDE_SDD13 | 41 | P5V |
| 17 | IDE_SDD2 | 42 | P5V |
| 18 | IDE_SDD14 | 43 | GND |
| 19 | IDE_SDD1 | 44 | GND |
| 20 | IDE_SDD15 | 45 | GND |
| 21 | IDE_SDD0 | 46 | GND |
| 22 | IDE_SDDREQ | 47 | IDEP_ALE_H |
| 23 | GND | 48 | GND |
| 24 | IDE_SDIOR_L | 49 | UNUSED |
| 25 | IDE_SDIOW_L | 50 | UNUSED |

The USB floppy drive assembly includes a USB cable which plugs into the back of the USB floppy drive and is then routed to the backplane's 4-pin USB connector J2A1 (See Table 35. USB Floppy Drive Connector (J2A1).

**Note:** The optional internal USB floppy drive accessory kit (product order code – AXXUSBFLOPPY) includes a slim-line USB floppy drive, a USB cable, and mounting hardware to install the drive into either the slim-line drive bay or one of the hard drive bays.

## 6.2 Hard Drive Bays

The chassis can be configured to support up to 6[1] hot-swap 3.5" x1" SAS or SATA hard disk drives. Hard drives are mounted to hot-swap drive trays for easy insertion to or extraction from the drive bay.

### 6.2.1 Hot-swap Drive Trays

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

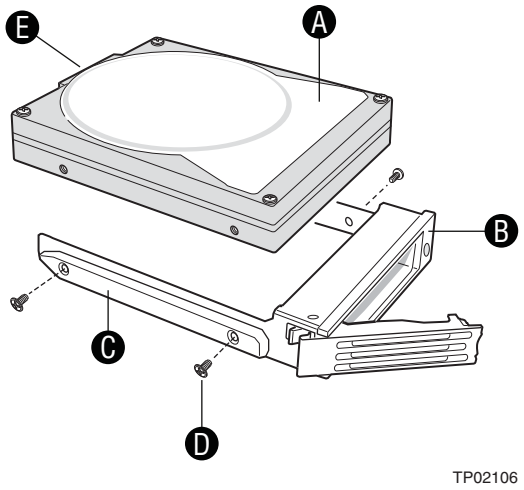



**Figure 30. Hard Drive Tray Assembly**

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

[1] Default 5 Hard Drives + one optional 6Th Hard Drive using Flex Bay

## 6.3 Optional Tape Drive or 6th Hard Drive Flex Bay

For system configurations that require either a Tape Drive or a 6th hard disk drive, a dual purpose drive bay is provided. By default this drive bay is covered by two face plates as shown in the following diagram. The drive bay is located next to the control panel.

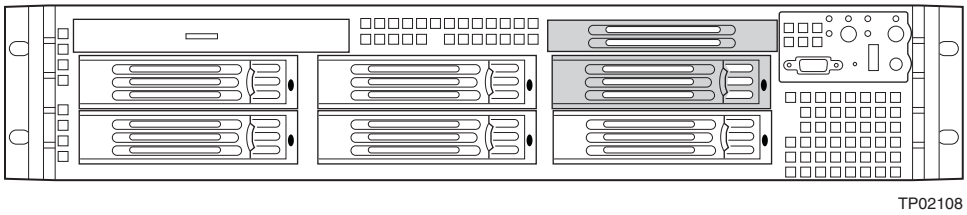



**Figure 31. Optional 6th Hard Drive (Front View)**

To configure a 6th hard drive, the lower face plate is removed and the 6th hard drive accessory kit is installed (product order code – ASR2500SIXDRV). This kit includes a backplane board insert, power cable, and drive carrier.

To install a 3.5” tape drive, both face plates are removed and the optional tape drive kit is installed (product order codes – ASR2500SATAPE or ADRTAPEKIT). Both tape drive kits include tape drive mounting tray and necessary cables.

**Note**: To remove the tape drive tray from the chassis, a spring latch located inside the chassis on the back right side of the carrier must be released to allow the drive tray to slide free. Do not attempt to pull out the drive tray without first releasing the spring latch. Doing so may damage the plastic faceplate.

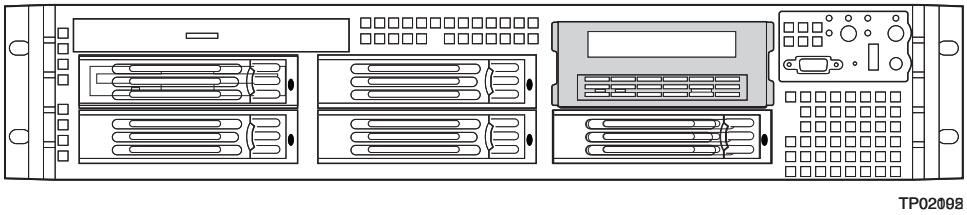



**Figure 32. Optional Tape Drive (Front View)**

## 6.4 Mid-plane Options

New to this generation of high density server platform is the concept of the mid-plane. The mid-plane is the interconnect between the server board and both the hot-swap backplane and control panel. It is also used to determine which hard drive technology is to be supported. Two different Mid-plane options are available for this platform 1) a passive mid-plane capable of supporting SATA ports from the server board or SAS using ports from an add-in card; 2) an active SAS / SAS RAID mid-plane. This section will describe the hard drive interface support of each of the mid-plane boards.

### 6.4.1 Passive Mid-plane

The passive mid-plane is used as an interconnect, routing drive control signals from either the on-board SATA ports of the baseboard or SAS/SATA ports from an add-in card to the hot-swap backplane. The hard drive controller signals are cabled to the mid-plane which then routes the signals to the hot-swap backplane through two edge connectors that plug directly into it. See Table 22. Mid-plane-to-Backplane Card Edge Connector #1 Pin-out and Table 23. Mid-plane-to-Backplane Card Edge Connector #2 Pin-out.

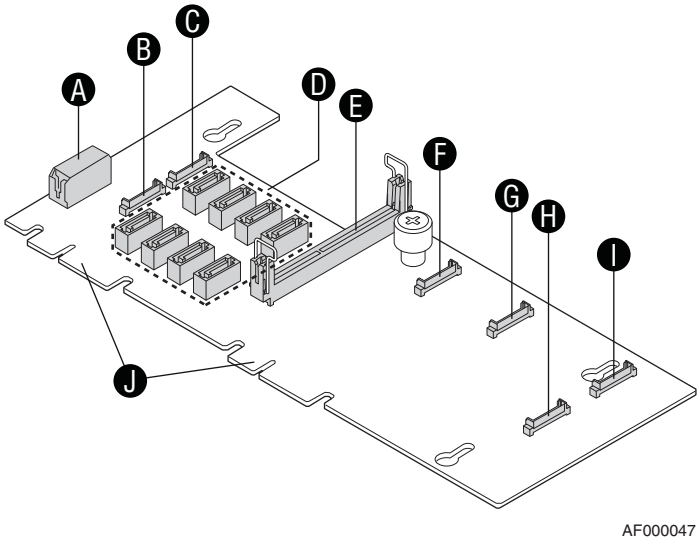



**Figure 33. Passive Mid-plane Board**

| | | | |
|---|---|---|---|
| A | Power Connector | F | Fan 4 Connector |
| B | Fan 6 Connector | G | Fan 3 Connector |
| C | Fan 5 Connector | H | Fan 1 Connector |
| D | SAS/SATA Connectors | I | Fan 2 Connector |
| E | Bridge Board Connector | J | Backplane Connector |

### 6.4.2 Active Mid-plane with SAS /SAS RAID Support

The active mid-plane is used to provide SAS / SAS RAID support. It has integrated on to it an Intel IOP80333 IO processor and an LSI* LSLSAS1068 3Gb/s SAS controller. Together they provide support for up to six SAS drives in this chassis. By default, this mid-plane option provides software RAID levels 0, 1, and 10 utilizing Intel® Embedded RAID Technology II. With the installation of optional RAID enablement devices, the mid-plane can support hardware RAID levels 0, 1, 5, 10, and 50. The mid-plane attaches to the hot-swap backplane by two card edge connectors which eliminates the need for any hard drive cables. The following sub-sections describe the board level SAS / SAS RAID functionality.

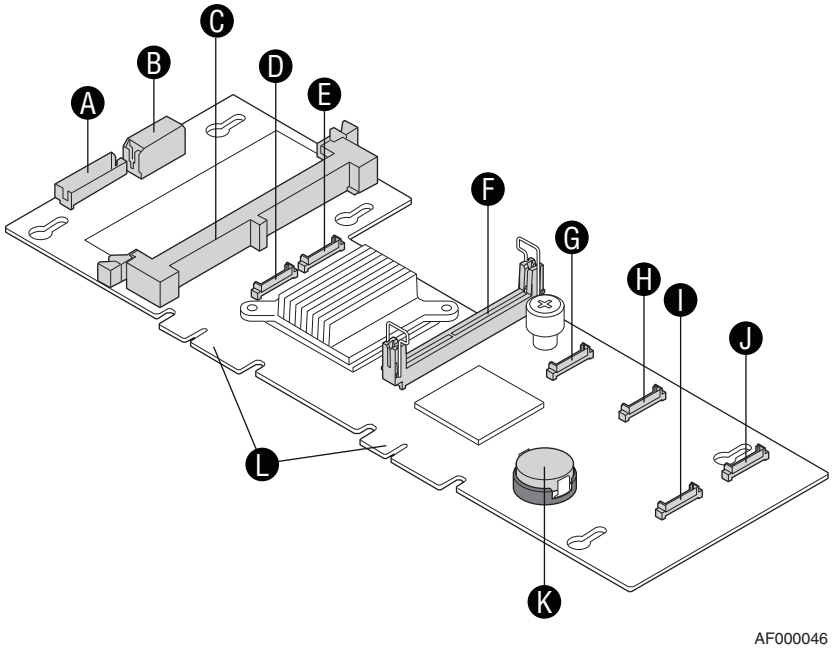
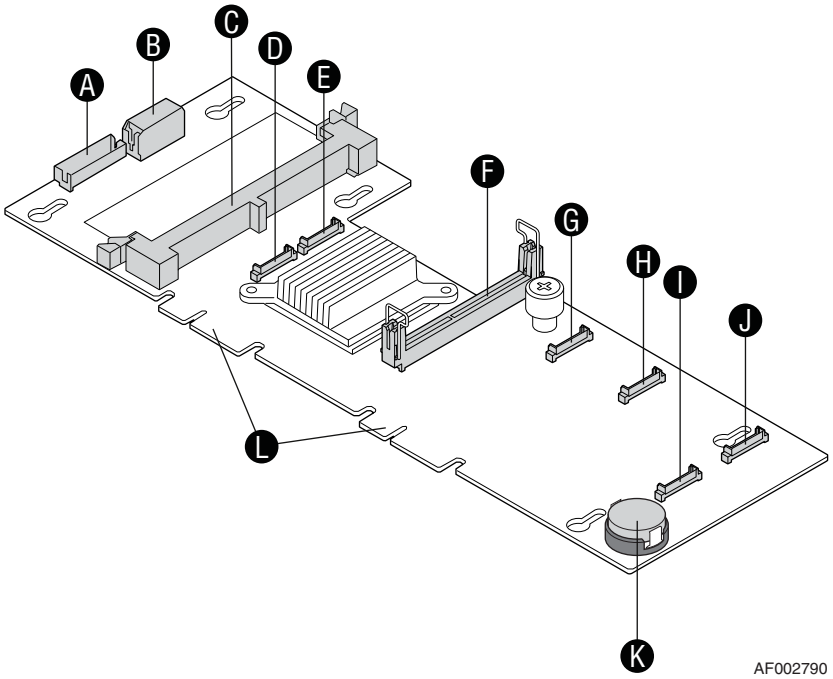



**Figure 34. Active Mid-plane with SAS / SAS RAID Support**

| | | | |
|---|---|---|---|
| A | RAID Battery Backup Unit Connector | G | Fan 4 Connector |
| B | Power Connector | H | Fan 3 Connector |
| C | Mini-DIMM Connector | I | Fan 1 Connector |
| D | Fan 6 Connector | J | Fan 2 Connector |
| E | Fan 5 Connector | K | RAID Activation Key Connector |
| F | Bridge Board Connector | L | Backplane Connector |

### 6.4.3 Active Midplane2 with SAS/SAS RAID Support

The active midplane2 is used to provide SAS/SAS RAID support. It has an integrated LSI LSISAS1078 3 Gb/s RAID On-a-Chip (ROC) device. It provides support for up to eight SAS drives in this system. By default, this midplane2 option provides software RAID levels 0, 1, and 10 and utilizes Intel® Embedded RAID Technology II. With the installation of optional RAID enablement devices, the midplane2 can support hardware RAID levels 0, 1, 5, 6, 10, 50 and 60. The midplane2 attaches to the hot-swap backplane by two card edge connectors, which eliminates the need for any hard drive cables. The following sub-sections describe the board level SAS/SAS RAID functionality.




| | | | |
|---|---|---|---|
| A. | RAID Battery Backup Unit Connector | G. | Fan 4 Connector |
| B. | Power Connector | H. | Fan 3 Connector |
| C. | Mini-DIMM Connector | I. | Fan 1 Connector |
| D. | Fan 6 Connector | J. | Fan 2 Connector |
| E. | Fan 5 Connector | K. | RAID Activation Key Connector |
| F. | Bridge Board Connector | L. | Backplane Connector |

**Figure 35. Active Midplane2 with SAS/SAS RAID Support**

### 6.4.3.1 Architectural Overview

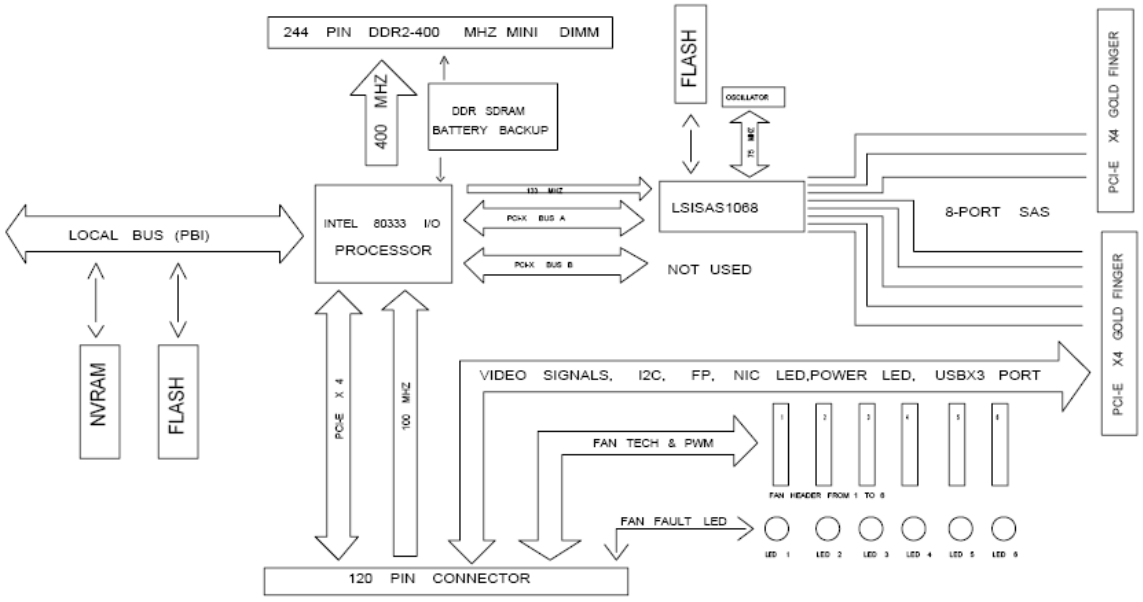



**Figure 36. Architecture Overview**

### 6.4.3.2 x4 PCIe* Card Edge Interfaces

Two x4 PCIe* card edges are used to connect the active mid-plane to the hot-swap backplane. See Table 22. Mid-plane-to-Backplane Card Edge Connector #1 Pin-out and Table 23. Mid-plane-to-Backplane Card Edge Connector #2 Pin-out for details. The use of card edge connectors to the back plane eliminates all hard drive cabling.

### 6.4.3.3 IOP80333 IO processor

The Intel 80333 IO processor is a multi-function device that integrates the Intel Xscale® core with intelligent peripherals and two PCIe* to PCI-X* bridges. It will be connected to the server board's x4 PCIe lane and serve as bridge for PCI-X 133MHz secondary bus. The IOP80333 also includes fully functional RAID support.

### 6.4.3.4 LSI* LSISAS1068 SAS Controller

The LSI* LSISAS1068 controller resides on the Channel A PCI-X bus of the IOP80333 supporting transfer rates of up to 3GB/s. It includes an Address Translation Unit (ATU) supporting transactions between PCI address space and 80333 address space. Address translation for the ATU is controlled through programmable registers accessible from both the PCI interface and the Intel Xscale® core. The LSISAS1068 controller includes its own Flash ROM and NVSRAM to support SAS only software RAID. Software RAID Levels supported include 0, 1, and 10.

#### 6.4.3.5 Optional Hardware RAID Support

The active mid-plane supports options to provide full hardware RAID support. Options required to enable hardware RAID support include an Intel® RAID Activation Key (product order code - AXXRAK18E) and installation of a Mini-DIMM for Intel RAID Cache support. To protect from data loss during an unexpected power loss event, an Intel® RAID Smart Battery Backup module (AXXRSBBU3) is also supported. Hardware RAID levels supported include 0, 1, 5, 10, and 50.

##### *6.4.3.5.1 Intel® RAID Activation Key*

The Intel® RAID Activation Key enables the full intelligent SAS Hardware RAID solution engineered around the Intel® 80333 I/O Processor @ 500MHz. The activation key plugs directly in to a connector (J1A10) on the mid-plane board. With no RAID activation key installed, only SAS Software RAID levels 0, 1, and 10 are supported.

##### *6.4.3.5.2 Intel RAID Cache support*

To further enable support for hardware RAID, the active mid-plane provides a 244-pin mini-DIMM connector (J8C1), supporting a single registered ECC non-parity DDR2-400 MHz Mini-DIMM to provide Intel RAID cache. Mini-DIMM capacities supported range from 128MB to 1GB.

Note: See the *Intel® Server Board S5000PAL Tested Memory List* for a list of Intel validated mini-DIMMs.

##### *6.4.3.5.3 Intel® RAID Smart Battery Backup Module*

With an Intel® RAID Smart Battery Backup module installed, data loss is prevented when data is still present in the RAID Cache Module and power is unexpectedly lost. Depending on the cache module capacity used, the battery backup unit can provide 48 to 72 hours of battery backup power to allow data stored in the RAID cache to be processed. A 2x10 connector (J9A2) is used to attach the battery backup unit to the mid-plane. See Table 24. Active Mid-plane SAS RAID Battery Backup Connector Pin-out for details.

## 6.5 Hot-Swap SAS/SATA Backplane

The chassis supports a multifunctional SAS/SATA backplane with the following features:

- Vitesse* VSC410 enclosure management controller
    - External non-volatile Flash ROM
    - Four $I^2C$ interfaces
    - Compliance with SCSI Accessed Fault Tolerant Enclosures (SAF-TE) specification
    - Compliance with Intelligent Platform Management Interface (IPMI)
- Five SAS/SATA compatible hot-swap hard drive connectors
- Designed to support an optional 6th hard drive, or power for an optional tape drive.
- Hard Drive Status and Fault LEDs for each hard drive connector

- Card edge connectors for most interconnects, including:
    - Mid-plane
    - Control Panel
    - Slim-line IDE Optical Drive
- Temperature Sensor
- FRU EEPROM
- One 2x4-pin Power Connector

### 6.5.1 SAS/SATA Backplane Layout

The hot-swap backplane installs on the back side of the hot-swap drive bay inside the chassis. Alignment features on the chassis and backplane assembly make for easy tool-less installation. The following diagram shows the layout of components and connectors found on the board.

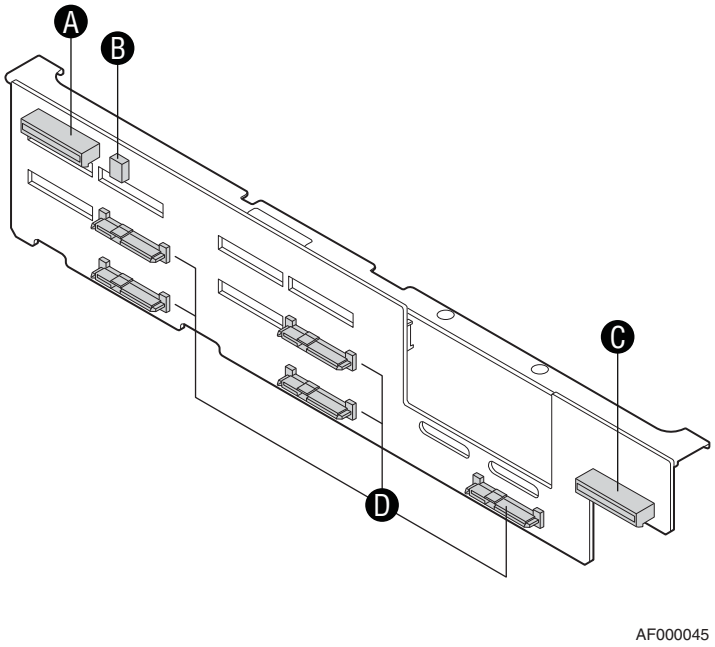



**Figure 37. Hot-swap SAS/SATA Backplane (Front Side View)**

| | | | |
|---|---|---|---|
| A | Slim-line Optical Drive Connector | C | Control Panel Connector |
| B | Slim-line USB Floppy Connector | D | SAS/SATA Hot Swap Connectors |

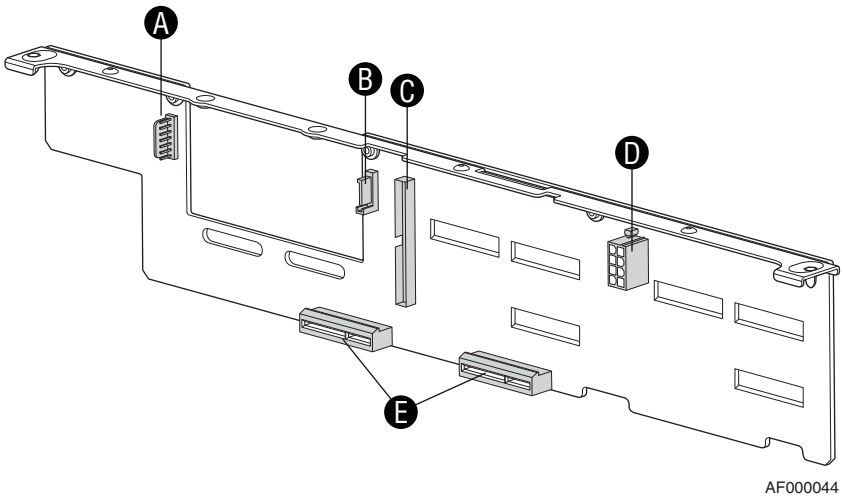



**Figure 38. Hot-swap SAS/SATA Backplane (Back Side View)**

| | | | |
|---|---|---|---|
| A | Power Connector (for 6th Hard Drive or Tape Drive) | D | Power Connector |
| B | SAS/SATA Connector (for 6th Hard Drive or SATA Tape Drive) | E | Midplane Connectors |
| C | IDE Connector | | |

**Notes:** To prevent the backplane from flexing when installing or removing hard drives from the drive bay, make sure the mid-plane is securely fastened and the system top cover is in place.

Make sure all system boards, peripherals, and cables are detached from the backplane before removing the backplane from the system. Failure to detach components from the backplane before removal may result in component damage.

### 6.5.2 SAS/SATA Backplane Functional Architecture

The figure below shows the functional blocks of the SAS/SATA backplane.

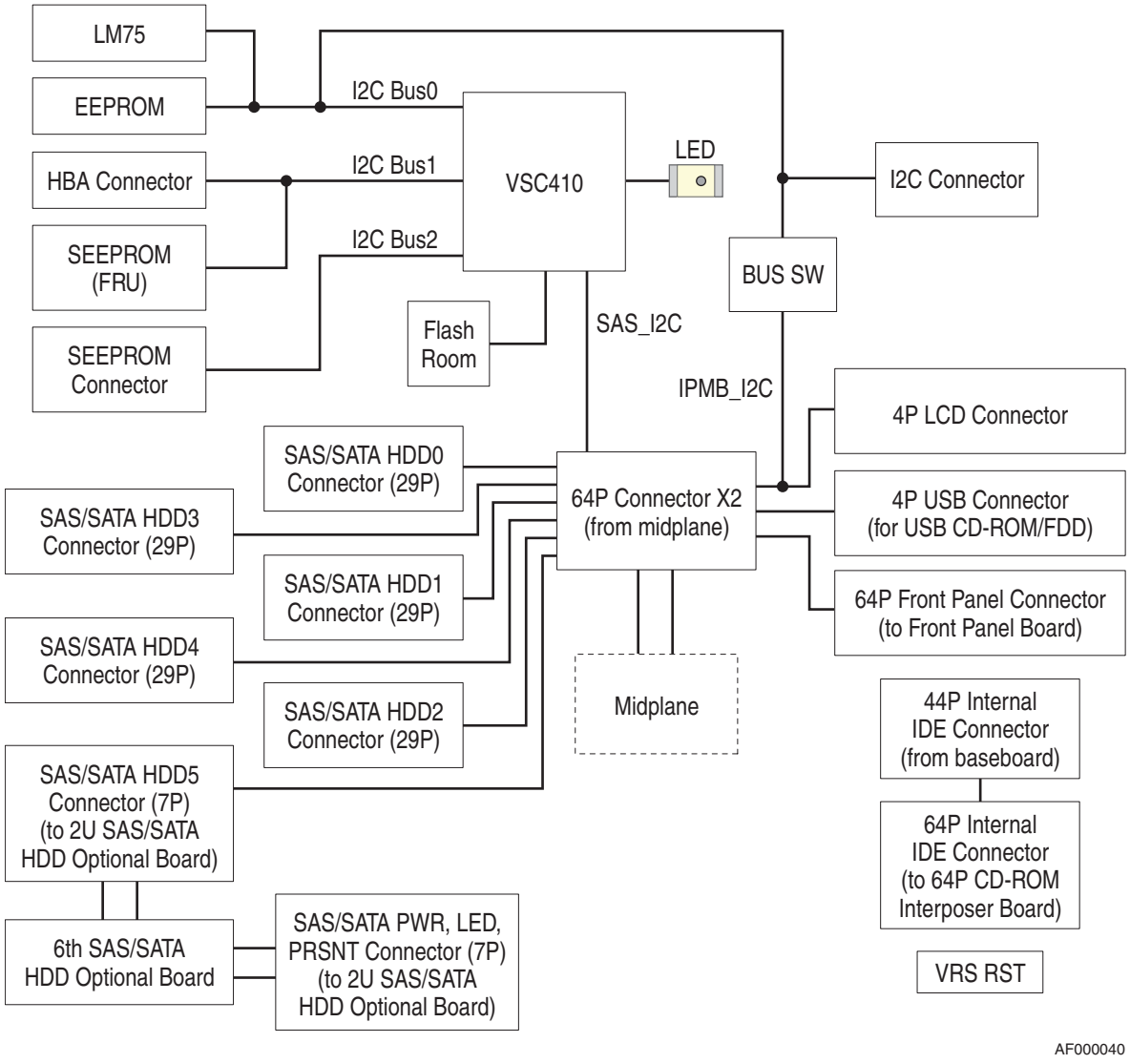



**Figure 39. SAS/SATA Backplane Functional Block Diagram**

#### 6.5.2.1 Enclosure Management Controller

The backplane utilizes the features of the Vitesse* VSC410 to implement several enclosure management functions. The chip provides in-band SAF-TE and SES management and utilizes the four $I^2C$ interfaces listed below.

1. I2C bus 0 is connected to an EEPROM which stores configuration and FRU data
2. I2C bus 1 is connected to an LM75 temperature sensor
3. I2C bus 2 is connected to an IPMB bus from the server board.
4. I2C bus 3 is connected to the LSISAS1068 SAS controller.

#### 6.5.2.2 Hard Drive Activity and Fault LEDs

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

**Table 40. Hard Drive LED Function Definitions**

| Status LED | Definition |
|---|---|
| GREEN | HDD Activity |
| AMBER | HDD Fail |

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

**Table 41. 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 |

#### 6.5.2.3 Optional 6th Hard Drive

The backplane is capable of supporting a 6th hot-swap SAS/SATA hard drive with the addition of an optionally installed backplane add-in board. The 6th drive add-in board assembly consists of a PCB with power and interface connectors, and a mounting bracket allowing for the add-in card to slide into a fitted cut out on the existing backplane.

# 7. Standard Control Panel

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

The control panel assembly comes pre-assembled and is modular in design. The control panel assembly module slides into a slot on the front of the chassis and is blind mated with a slot connector on the backplane. It is not hot-swappable.

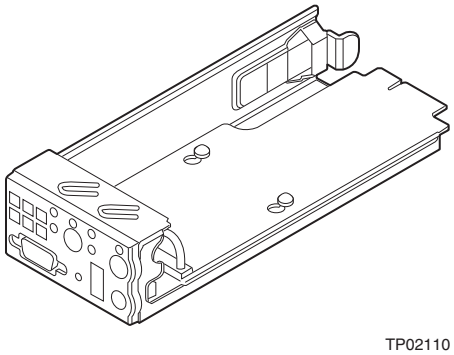



**Figure 40. Standard Control Panel Assembly Module**

## 7.1 Control Panel Buttons

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

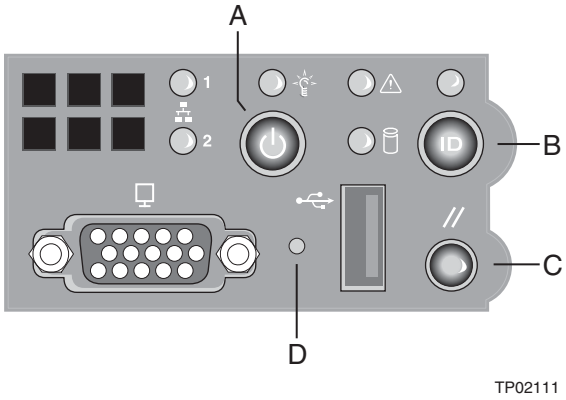



**Figure 41. Control Panel Buttons**

**Table 42. Control Button and Intrusion Switch Functions**

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

## 7.2 Control Panel LED Indicators

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

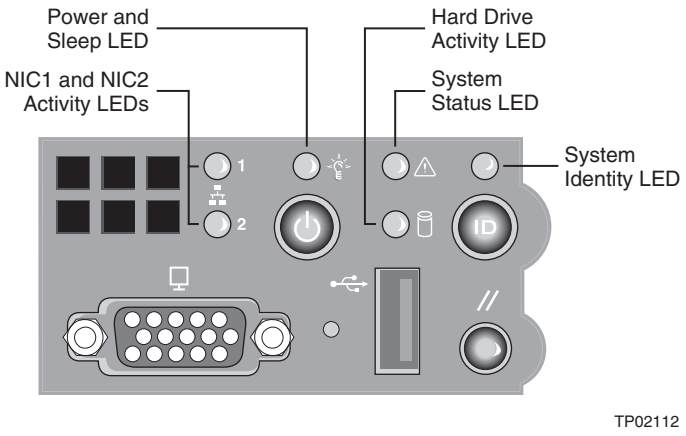



**Figure 42. Control Panel LEDs**

The following table identifies each LED and describes their functionality.

**Table 43. Control Panel LED Functions**

| LED | Color | State | Description |
|---|---|---|---|
| NIC1 / NIC2 Activity | Green | On | NIC Link |
| | Green | Blink | NIC Activity |
| Power / Sleep (on standby power) | Green | On | Legacy power on / ACPI S0 state |
| | | Blink [1,4] | Sleep / ACPI S1 state |
| | Off | Off | Power Off / ACPI S4 or S5 state |
| System Status (on standby power) | Green/Amber | Alternating Blink | Pre DC Power On – 15-20 second BMC Initialization |
| | Green | On | Running / normal operation |
| | | Blink [1,2] | Degraded |
| | Amber | On | Critical or non-recoverable condition. |
| | | Blink [1,2] | Non-critical condition. |
| | Off | Off | POST / system stop. |
| Disk Activity | Green | Random blink | Provides an indicator for disk activity. |
| | Off | Off [3] | No hard disk activity |
| System Identification | Blue | On | Identify active via command or button. |
| | Off | Off | No Identification. |

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

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

### 7.2.1 Power / Sleep LED

**Table 44. 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.

### 7.2.2 System Status LED

**Table 45. 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<br>Unable to use all of the installed memory (more than one DIMM installed).<br>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.<br>In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2).<br>Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems.<br>PCIe* link errors<br>CPU failure / disabled – if there are two processors and one of them fails<br>Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system<br>Non-critical threshold crossed – Temperature and voltage |
| Amber | Blink | Non-critical | Non-fatal alarm – system is likely to fail<br>Critical voltage threshold crossed<br>VRD hot asserted<br>Minimum number of fans to cool the system not present or failed<br>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<br>DIMM failure when there is one DIMM present, no good memory present<br>Run-time memory uncorrectable error in non-redundant mode<br>IERR signal asserted<br>Processor 1 missing<br>Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed)<br>No power good – power fault<br>Processor configuration error (for instance, processor stepping mismatch) |

#### 7.2.2.1 System Status LED – BMC Initialization

When AC power is first applied to the system and 5V-STBY is present, the BMC controller on the server board requires 15-20 seconds to initialize. During this time, the system status LED will blink, alternating between amber and green, and the power button functionality of the control panel is disabled, preventing the server from powering up. Once BMC initialization has completed, the status LED will stop blinking and the power button functionality is restored and can be used to turn on the Server.

### 7.2.3 Drive Activity LED

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

### 7.2.4 System Identification LED

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

The blue system ID LED can be illuminated using either of two mechanisms.

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

- By issuing the appropriate hex IPMI chassis identify value, the ID LED will either blink blue for 15 seconds and turn off or will blink indefinitely until the appropriate hex IPMI chassis identify value is issued to turn it off.

## 7.3 Control Panel Connectors

The control panel has two external I/O connectors:

- One USB port
- One VGA video port

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

**Table 46. External USB Connectors (J1B1)**

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

Table 47. Video Connector (J1A1)

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

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

## 7.4 Internal Control Panel Interconnect

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

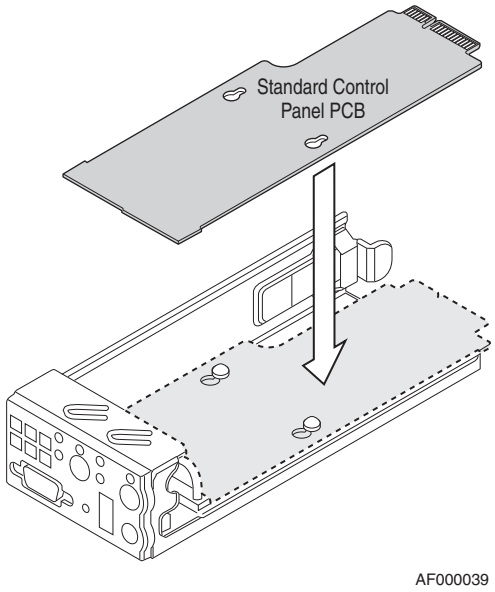



**Figure 43. Standard Control Panel PCB**

The following table defines the pin-out for the 64-pin edge connector.

**Table 48. 64-pin Control Panel Connector (J6B1)**

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| A1 | GND | B1 | 1_WIRE_BUS |
| A2 | VGA_VSYNC_FP_L | B2 | P5V |
| A3 | GND | B3 | P5V |
| A4 | VGA_HSYNC_FP_L | B4 | P5V |
| A5 | GND | B5 | VGA_INUSE_L |
| A6 | VGA_BLUE_FP | B6 | GND |
| A7 | GND | B7 | P5V_STBY |
| A8 | VGA_GREEN_FP | B8 | GND |
| A9 | GND | B9 | FAULT_LED_5VSB |
| A10 | VGA_RED_FP | B10 | GND |
| A11 | GND | B11 | FP_SYS_FLT_LED1_R_L |
| A12 | GND | B12 | FP_ID_SW_L |
| A13 | FP_RST_BTN_L | B13 | FP_ID_LED_R_L |
| A14 | GND | B14 | NC_IPMB_5VSB_SDA |
| A15 | NC_FP_CHASSIS_L | B15 | NC_IPMB_5VSB_SCL |
| A16 | GND | B16 | GND |
| A17 | BP_I2C_5V_SDA | B17 | NIC1_ACT_LED_L |
| A18 | BP_I2C_5V_SCL | B18 | NIC1_LINK_LED_R_L |
| A19 | GND | B19 | FP_PWR_BTN_L |
| A20 | FP_NMI_BTN_L | B20 | PWR_LED_5VSB |
| A21 | GND | B21 | HDD_LED_P3V3_A |
| A22 | USB_DP2_FP | B22 | GND |
| A23 | USB_DN2_FP | B23 | GND |
| A24 | GND | B24 | NIC2_ACT_LED_L |
| A25 | GND | B25 | NIC2_LINK_LED_R_L |
| A26 | PWR_FP_USB2 | B26 | HDD_FAULT_LED_R_L |
| A27 | PWR_FP_USB3 | B27 | HDD_LED_ACT_R_L |
| A28 | GND | B28 | FP_PWR_LED_R_L |
| A29 | GND | B29 | FP_SYS_FLT_LED2_R_L |
| A30 | USB_DP3_FP | B30 | GND |
| A31 | USB_DN3_FP | B31 | GND |
| A32 | GND | B32 | NC_RST_P6_PWRGOOD |

# 8. Intel® Local Control Panel

The Intel® Local Control Panel utilizes a combination of control buttons, LEDs, and LCD display to provide system accessibility, monitoring, and control functions. The pre-assembled module slides into a slot on the front of the chassis where a card edge connector is blind mated to a matching slot edge connector on the backplane eliminating any cable attachments. The Intel® Local Control Panel module is designed so that it can be adjusted for use with or without an outer front bezel.

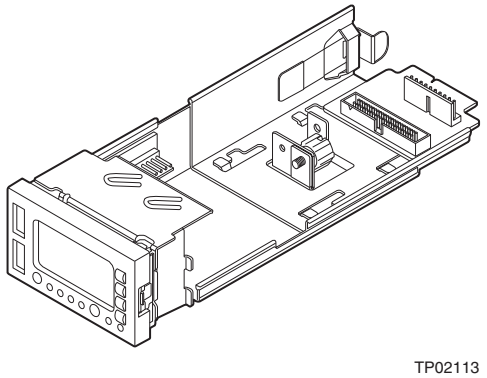



**Figure 44. Intel® Local Control Panel Assembly Module**

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

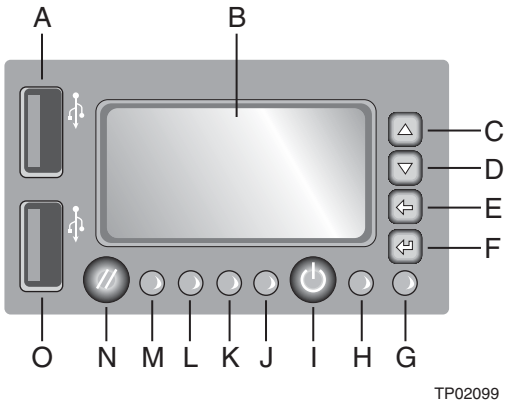



**Figure 45. Intel® Local Control Panel Overview**

| | | | |
|---|---|---|---|
| A | LCD Display | I | System Status LED |
| B | LCD Menu Control Button – Up | J | NIC 2 Activity LED |
| C | LCD Menu Control Button – Down | K | NIC 1 Activity LED |
| D | LCD Menu Control Button – Previous Option | L | Hard Drive Activity LED |
| E | LCD Menu Control Button – Previous Page | M | System Reset Button |
| F | ID LED | N | USB 2.0 Port |
| G | Power LED | O | NMI Button (Tool Required) |
| H | System Power Button | P | USB 2.0 Port |

## 8.1 LED Functionality

The following table identifies each LED and describes their functionality.

**Table 49. Control Panel LED Functions**

| LED | Color | State | Description |
|---|---|---|---|
| NIC1 / NIC2 Activity | Green | On | NIC Link |
| | Green | Blink | NIC Activity |
| Power / Sleep (on standby power) | Green | On | Legacy power on / ACPI S0 state |
| | | Blink [1,4] | Sleep / ACPI S1 state |
| | Off | Off | Power Off / ACPI S4 or S5 state |
| System Status (on standby power) | Green/Amber | Alternating Blink | Pre DC Power On – 15-20 second BMC Initialization |
| | Green | On | Running / normal operation |
| | | Blink [1,2] | Degraded |
| | Amber | On | Critical or non-recoverable condition. |
| | | Blink [1,2] | Non-critical condition. |
| | Off | Off | POST / system stop. |
| Disk Activity | Green | Random blink | Provides an indicator for disk activity. |
| | Off | Off [3] | No hard disk activity |
| System Identification | Blue | On | Identify active via command or button. |
| | Off | Off | No Identification. |

**Notes:**

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

The current limiting resistors for the power LED, the system fault LED, and the NIC LEDs are located on the Intel® Server Board S5000PAL.

### 8.1.1 Power / Sleep LED

**Table 50. 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.

### 8.1.2 System Status LED

**Table 51. 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<br>Unable to use all of the installed memory (more than one DIMM installed).<br>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.<br>In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2).<br>Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems.<br>PCIe link errors<br>CPU failure / disabled – if there are two processors and one of them fails<br>Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system<br>Non-critical threshold crossed – Temperature and voltage |
| Amber | Blink | Non-critical | Non-fatal alarm – system is likely to fail<br>Critical voltage threshold crossed<br>VRD hot asserted<br>Minimum number of fans to cool the system not present or failed<br>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<br>DIMM failure when there is one DIMM present, no good memory present<br>Run-time memory uncorrectable error in non-redundant mode<br>IERR signal asserted<br>Processor 1 missing<br>Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed)<br>No power good – power fault<br>Processor configuration error (for instance, processor stepping mismatch) |

#### 8.1.2.1 System Status LED – BMC Initialization

When AC power is first applied to the system and 5V-STBY is present, the BMC controller on the server board requires 15-20 seconds to initialize. During this time, the system status LED will blink, alternating between amber and green, and the power button functionality of the control panel is disabled, preventing the server from powering up. Once BMC initialization has completed, the status LED will stop blinking and the power button functionality is restored and can be used to turn on the server.

### 8.1.3 Drive Activity LED

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

### 8.1.4 System Identification LED

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

The blue system ID LED can be illuminated using either of two mechanisms.

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

- By issuing the appropriate hex IPMI chassis identify value, the ID LED will either blink blue for 15 seconds and turn off or will blink indefinitely until the appropriate hex IPMI chassis identify value is issued to turn it off.

## 8.2 Intel® Local Control Panel Interconnects

The Intel® Local Control Panel module includes the control panel interface board and an interposer board. Connectors on the control panel interface board are cabled to matching connectors on the interposer board. When the pre-assembled control panel module is installed into the chassis, a card edge connector on the interposer card is blind mated with a slot edge connector on the backplane. This section will define the pin-out for each connector and header found on both the control panel interface board and interposer board.

- A 64-pin card edge connector on the interposer board is used to route signals to/from the backplane to the control panel interface board. The backplane is used as a conduit for communication to the server board.
- Signals from the card edge connector are routed to control panel interface board through matching 50-pin connectors on the interposer board and control panel interface board. The 50-pin connectors are attached using a small 50-pin flat cable.
- USB signals from the card edge connector are routed to the control panel interface board through matching 10-pin connectors on the interposer board and control panel interface board. The 10-pin connectors are attached using a small 10-pin round cable.
- A 4-pin IPMI header (not used).
- A 4-pin NMI/Temp Sensor header.

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

**Table 52. 50-pin Control Panel Connector**

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| A1 | GND | B1 | 1_WIRE_BUS |
| A2 | VGA_VSYNC_FP_L | B2 | P5V |
| A3 | GND | B3 | P5V |
| A4 | VGA_HSYNC_FP_L | B4 | P5V |
| A5 | GND | B5 | VGA_INUSE_L |
| A6 | VGA_BLUE_FP | B6 | GND |
| A7 | GND | B7 | P5V_STBY |
| A8 | VGA_GREEN_FP | B8 | GND |
| A9 | GND | B9 | FAULT_LED_5VSB |
| A10 | VGA_RED_FP | B10 | GND |
| A11 | GND | B11 | FP_SYS_FLT_LED1_R_L |
| A12 | GND | B12 | FP_ID_SW_L |
| A13 | FP_RST_BTN_L | B13 | FP_ID_LED_R_L |
| A14 | GND | B14 | NC_IPMB_5VSB_SDA |
| A15 | NC_FP_CHASSIS_L | B15 | NC_IPMB_5VSB_SCL |
| A16 | GND | B16 | GND |
| A17 | BP_I2C_5V_SDA | B17 | NIC1_ACT_LED_L |
| A18 | BP_I2C_5V_SCL | B18 | NIC1_LINK_LED_R_L |
| A19 | GND | B19 | FP_PWR_BTN_L |
| A20 | FP_NMI_BTN_L | B20 | PWR_LED_5VSB |
| A21 | GND | B21 | HDD_LED_P3V3_A |
| A22 | USB_DP2_FP | B22 | GND |
| A23 | USB_DN2_FP | B23 | GND |
| A24 | GND | B24 | NIC2_ACT_LED_L |
| A25 | GND | B25 | NIC2_LINK_LED_R_L |

| PIN | SIGNAL NAME | PIN | SIGNAL NAME |
|---|---|---|---|
| A26 | PWR_FP_USB2 | B26 | HDD_FAULT_LED_R_L |
| A27 | PWR_FP_USB3 | B27 | HDD_LED_ACT_R_L |
| A28 | GND | B28 | FP_PWR_LED_R_L |
| A29 | GND | B29 | FP_SYS_FLT_LED2_R_L |
| A30 | USB_DP3_FP | B30 | GND |
| A31 | USB_DN3_FP | B31 | GND |
| A32 | GND | B32 | NC_RST_P6_PWRGOOD |

**Table 53. Internal USB Header**

| Pin # | Description |
|---|---|
| 1 | PWR_FP_USB2 |
| 2 | PWR_FP_USB3 |
| 3 | USB_DP2_FP |
| 4 | USB_DN2_FP |
| 5 | USB_DP3_FP |
| 6 | USB_DN3_FP |
| 7 | GND |
| 8 | GND |
| 9 | TP_USB0_P9 |
| 10 | TP_USB0_P10 |

# 9. PCI Riser Cards and Assembly

The chassis supports different riser card options depending on the add-in card configuration desired. The riser assembly for the chassis is tool-less. Stand-offs on the bracket allow the riser cards to slide onto the assembly where a latching mechanism than holds each riser in place. Holding down the latch releases the risers for easy removal.

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

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

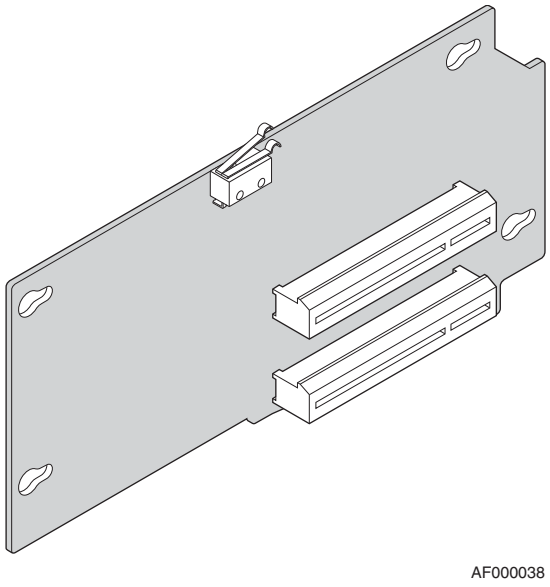



**Figure 46. Low Profile PCIe* Riser**

## 9.1 Riser Card Options

The Intel® Server Board S5000PAL has two riser slots capable of supporting riser cards for both 1U and 2U system configurations. Because of board placement resulting in different pin orientations, and expanded technology support associated with the full-height riser, the riser slots are not the same and require different riser cards.

The low profile riser slot (J5B1) utilizes a 98-pin connector. It is capable of supporting up to two low profile PCIe* add-in cards. The x8 PCIe bus can support bus speeds of up to 20Gb/S. The following table provides the supported bus throughput for the given riser card used and the number of add-in cards installed.

| Low Profile Riser | 1 add-in card | 2 add-in cards |
|---|---|---|
| 2U | X4 | X4 |

**Note:** There are no population rules for installing a single low profile add-in card in the 2U low profile riser card; a single add in card can be installed in either PCI Express* slot. While each slot can accommodate a x8 card, each slot will only support x4 bus speeds.

The full height riser slot (J4F1) implements Intel® Adaptive Slot Technology. This 280-pin connector is capable of supporting riser cards that meet either the PCI-X* or PCI Express* technology specifications. The following tables show the maximum bus speed supported with different add-in card populations.

| Full Height Riser PCI-X "Passive" (Product Order Code – ADRPCIXRIS) | 1 add-in card | 2 add-in cards | 3 add-in cards |
|---|---|---|---|
| 2U – 3 add-in card slots | Up to 100MHz in top PCI slot | Up to 100MHz using top and middle slots | 66MHz |

**Note:** For the 2U PCI-X* (passive) riser card, add-in cards should be installed starting with the top slot first, followed by the middle, and then the bottom. Any add-in card populated in the bottom PCI slot will cause the bus to operate at 66MHz.

| Full Height Riser PCI-X "Active" (Product Order Code – ADRACTRIS) | 1 add-in card | 2 add-in cards | 3 add-in cards |
|---|---|---|---|
| 2U | Up to 133MHz | Up to 133MHz | Up to 133MHz |

**Note:** Each PCI slot on the 2U PCI-X* (active) riser card operates on an independent PCI bus. Using an add-in card that operates below 133MHz will not affect the bus speed of the other PCI slots.

| Full Height Riser PCI Express* (Product Order Code – ASR2500FHR) | 1 add-in card | 2 add-in cards | 3 add-in cards |
|---|---|---|---|
| 2U – 3 add-in card slots | Single PCIe* x4 in top slot or x8 in middle slot<br>Or<br>PCI-X* – Up to 133MHz in bottom slot | Single PCIe – x4 in either slot or x8 in middle slot and PCI-X – Up to 133MHz<br>Or<br>Dual PCIe – x4 | Dual PCIe – x4<br>And<br>PCI-X – Up to 133MHz |

## 9.2 PCI Riser Card Mechanical Drawings

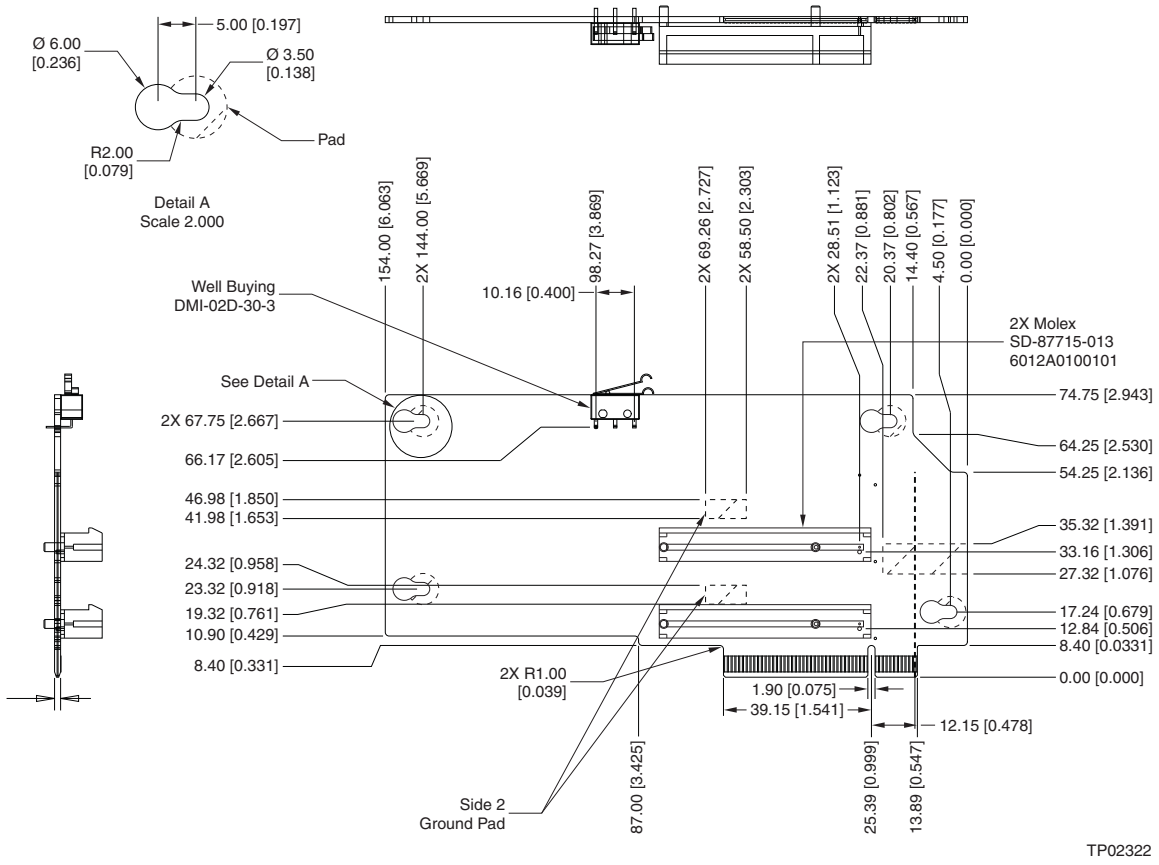
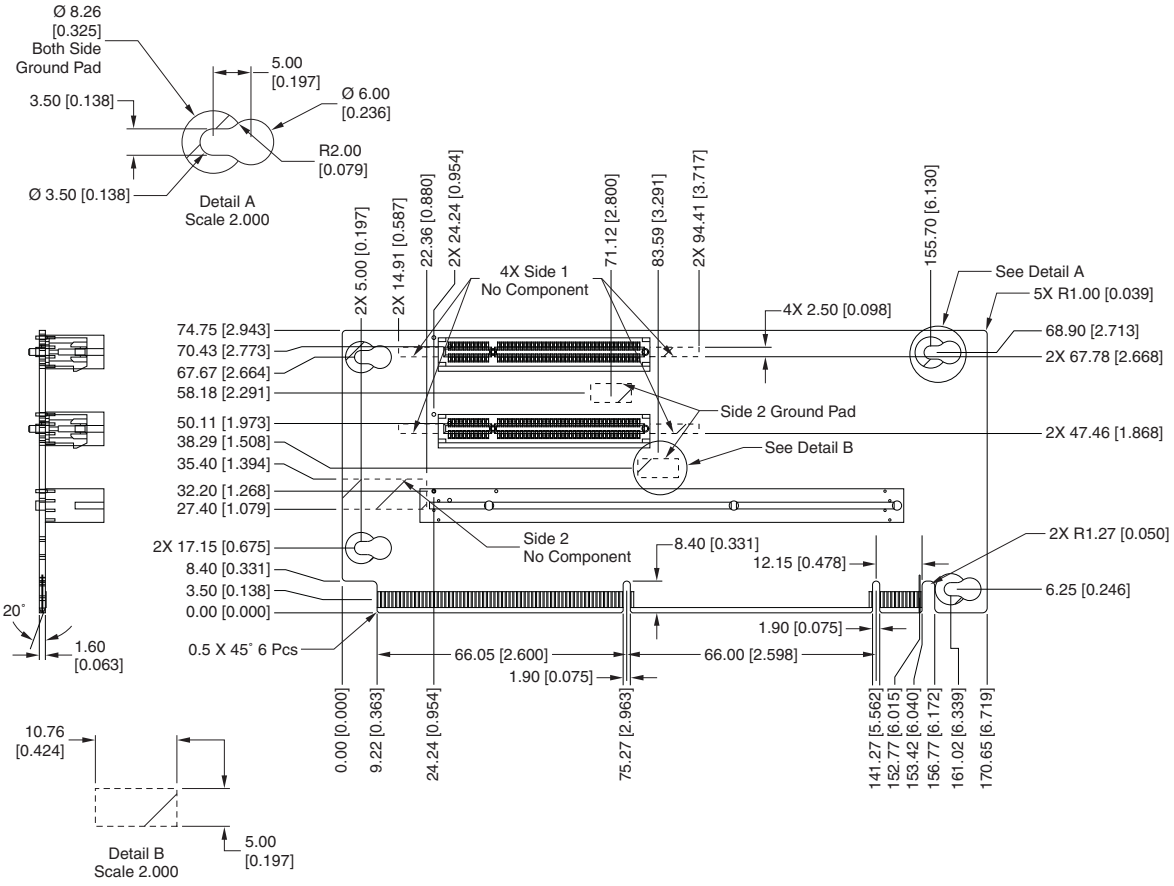


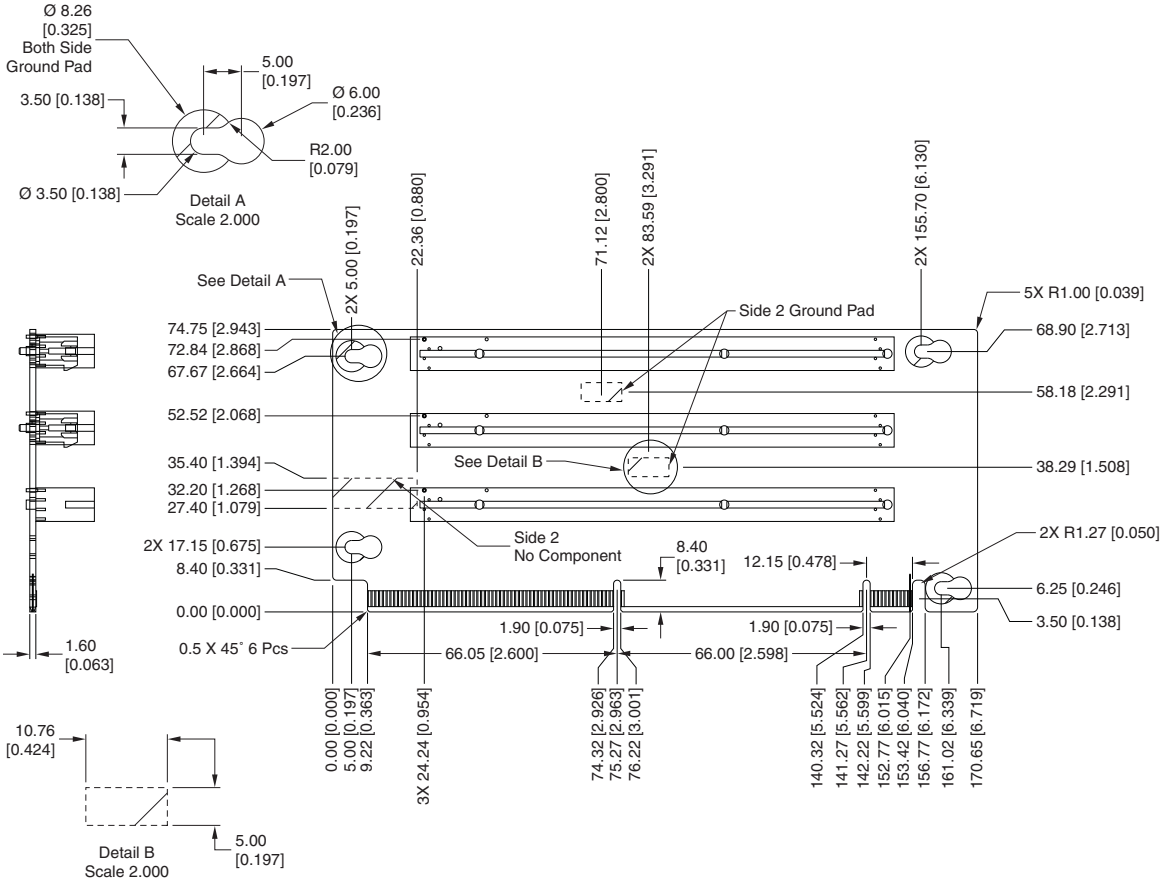

**Figure 47. Low Profile Passive PCI Express* Riser Card**




Notes:
1. PCB tolerance:
   A: 62 mil (1.58 mm) ± 7 mil
   B: 93 mil (2.36 mm) ± 9 mil
   C: 98 mil (2.49 mm) ± 9 mil
2. If there is needed:
   sheet 1: Board profile and mounting hole
   2: Pin location
   3: Constrain area on both sides
3. No indicated radii should be 2.00 mm

TP02320

**Figure 48. Full Height PCI Express* Riser Card**




Notes:
1. PCB tolerance:
   A: 62 mil (1.58 mm) ± 7 mil
   B: 93 mil (2.36 mm) ± 9 mil
   C: 98 mil (2.49 mm) ± 9 mil
2. If there is needed:
   sheet 1: Board profile and mounting hole
   2: Pin location
   3: Constrain area on both sides
3. No indicated radii should be 2.00 mm

TP02321

**Figure 49. Full Height Passive PCI-X* Riser Card**

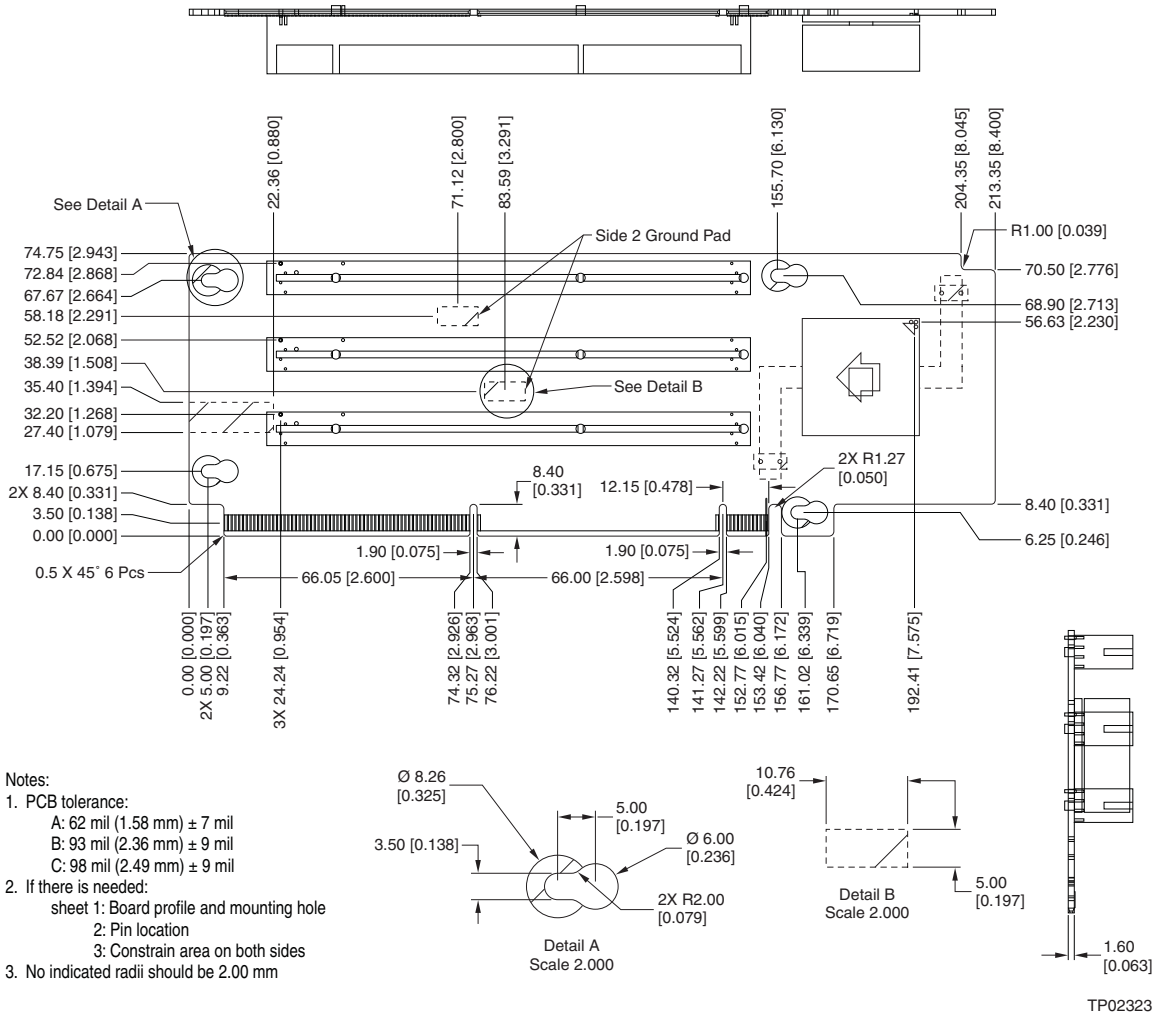



**Figure 50. Full Height Active PCI-X* Riser Card**

# 10. Supported Intel® Server Boards

The chassis is mechanically and functionally designed to support the Intel® Server Board S5000PAL and Intel® Server Board S5000XAL. The following sections provide an overview of the server board feature sets. The Technical Product Specification for the server board should be referenced for more detailed information.

## 10.1 Intel® Server Board S5000PAL / S5000XAL Feature Set

The Intel® Server Board S5000PAL and Intel® Server Board S5000XAL are monolithic printed circuit boards with features that were designed to support the high-density 1U and 2U server markets.

| Feature | Description |
|---|---|
| Processors | 771-pin LGA sockets supporting 1 or 2 Dual-Core Intel® Xeon® processors 5000 sequence, with system bus speeds of 667 MHz, 1066 MHz, or 1333 MHz |
| Memory | 8 Keyed DIMM slots supporting fully buffered DIMM technology (FBDIMM) memory. 240-pin DDR2-533 and DDR2-677 FBDIMMs must be used. |
| Chipset | Intel® 5000 Chipset Family which includes the following components:<br>Intel® 5000P Memory Controller Hub or Intel® 5000X Memory Controller Hub<br>Intel® 6321ESB I/O Controller Hub[1]<br>Note: Intel will only make available an OEM SKU of this server board using the Intel® 5000X Memory Controller Hub. |
| On-board Connectors/Headers | External connections:<br>▪ Stacked PS/2* ports for keyboard and mouse<br>▪ RJ45 Serial B port<br>▪ Two RJ45 NIC connectors for 10/100/1000 Mb connections<br>▪ Two USB 2.0 ports<br>▪ Video Connector<br>Internal connectors/headers:<br>▪ One USB port header, capable of providing two USB 2.0 ports<br>▪ One DH10 Serial A header<br>▪ Six SATA ports via the ESB-2 and integrated SW RAID 0/1/10 support<br>▪ One 44pin (power + I/O) ATA/100 connector for optical drive support<br>▪ One Intel® Remote Management Module (Intel® RMM) connector (Intel® RMM use is optional)<br>▪ One Intel® I/O Expansion Module Connector supporting:<br>▪ Dual GB NIC Intel® I/O Expansion Module (Optional)<br>▪ External SAS Intel® I/O Expansion Module (Optional)<br>▪ Infiniband* I/O Expansion Module (Optional)<br>▪ SSI-compliant 24-pin control panel header<br>▪ SSI-compliant 24-pin main power connector, supporting the ATX-12V standard on the first 20 pins<br>▪ 8-Pin +12V Processor Power Connector |
| Add-in PCI, PCI-X*, PCI Express* Cards | ▪ One low profile riser slot supporting 1U or 2U PCIe* riser cards<br>▪ One full height riser slot supporting 1U or 2U PCI-X* and PCIe* riser cards |
| On-board Video | ATI* ES1000 video controller with 16MB DDR SDRAM |
| On-board Hard Drive Controller | ▪ Six ESB-2 SATA ports.<br>▪ Intel® Embedded Server RAID Technology II with SW RAID levels 0/1/10.<br>▪ Optional support for SW RAID 5 with activation key.[2] |
| LAN | Two 10/100/1000 Intel® 82563EB PHYs supporting Intel® I/O Acceleration Technology |
| System Fans | Six 4-pin Fan Headers supporting two processor fans, and four system fans |
| System Management | Support for Intel® System Management Software |

[1] For the remainder of this document, the Intel® 6321ESB I/O Controller Hub may be refferred to as ESB-2.

[2] Onboard SATA SW RAID 5 support provided as a post-launch product feature.

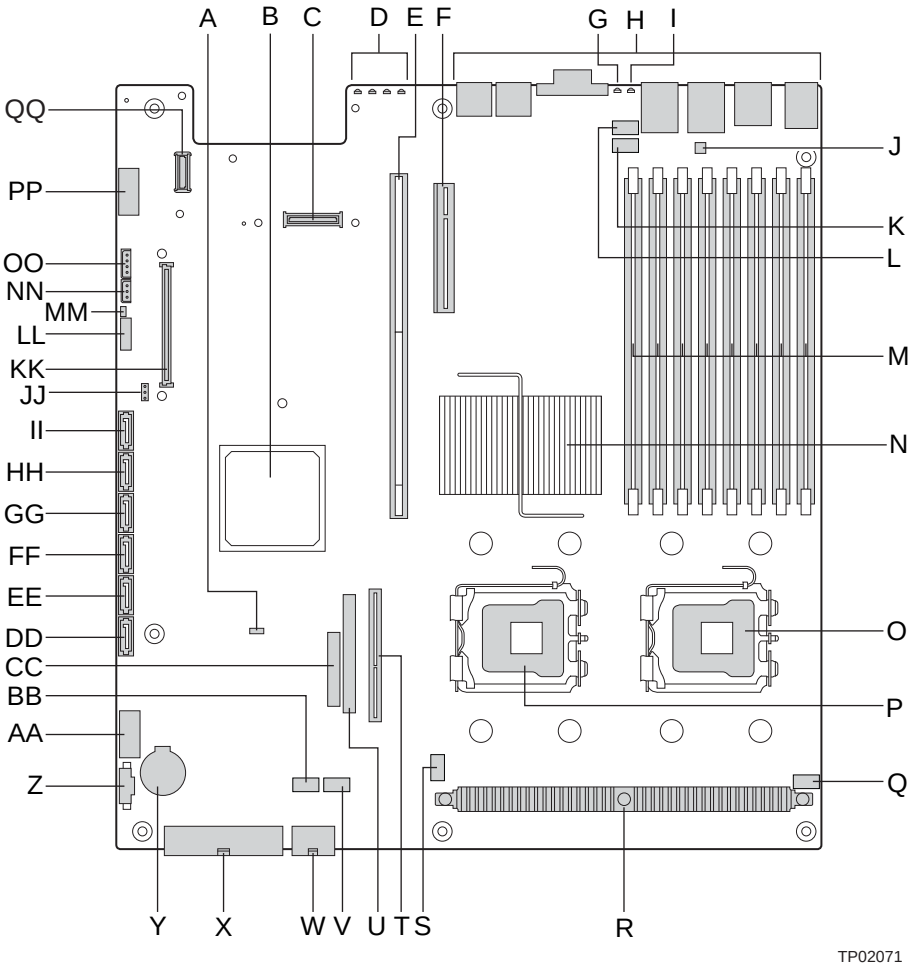



**Figure 51. Intel® Server Board S5000PAL**

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

**Figure 52. Intel® Server Board S5000PAL Components**

### 10.1.1 Processor Support

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

For additional information on processor compatibility and a list of supported processors, please see the Intel® Server Board S5000PAL/S5000XAL Technical Product Specification (TPS).

# 11. Environmental and Regulatory Specifications

## 11.1 System Level Environmental Limits

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

**Table 54. 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 @ 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 | 3264 BTU/hour |

## 11.2 Serviceability and Availability

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

The desired Mean Time To Repair (MTTR) of the system is 30 minutes including diagnosis of the system problem. To meet this goal, the system enclosure and hardware have been designed to minimize the MTTR.

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

| Activity | Time Estimate |
|---|---|
| Remove cover | 1 min |
| Remove and replace hard disk drive | 5 min |
| Remove and replace power supply module | 1 min |
| Remove and replace system fan (non-hot swappable) | 7 min |
| Remove and replace system fan (hot swappable) | 1 min |
| Remove and replace backplane board | 12 min |
| Remove and replace midplane board | 10 min |
| Remove and replace control panel module | 2 min |
| Remove and replace server board | 15 min |

## 11.3 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.**

## 11.4 Product Regulatory Compliance

The server chassis product, when correctly integrated per this guide, complies with the following safety and electromagnetic compatibility (EMC) regulations.
**Intended Application** – This product was evaluated as Information Technology Equipment (ITE), which may be installed in offices, schools, computer rooms, and similar commercial type locations. The suitability of this product for other product categories and environments (such as: medical, industrial, telecommunications, NEBS, residential, alarm systems, test equipment, etc.), other than an ITE application, may require further evaluation.

### Notifications to Users on Product Regulatory Compliance and Maintaining Compliance

To ensure regulatory compliance, you must adhere to the assembly instructions in this guide to ensure and maintain compliance with existing product certifications and approvals. Use only the described, regulated components specified in this guide. Use of other products / components will void the UL listing and other regulatory approvals of the product and will most likely result in noncompliance with product regulations in the region(s) in which the product is sold.
To help ensure EMC compliance with your local regional rules and regulations, before computer integration, make sure that the chassis, power supply, and other modules have passed EMC testing using a server board with a microprocessor from the same family (or higher) and operating at the same (or higher) speed as the microprocessor used on this server board. The final configuration of your end system product may require additional EMC compliance testing. For more information please contact your local Intel Representative. This is an FCC Class A device and its use is intended for a commercial type market place.

## 11.5 Use of Specified Regulated Components

To maintain the UL listing and compliance to other regulatory certifications and/or declarations, the following regulated components must be used and conditions adhered to. Interchanging or use of other component will void the UL listing and other product certifications and approvals. Updated product information for configurations can be found on the Intel Server Builder Web site at the following URL:
http://channel.intel.com/go/serverbuilder
If you do not have access to Intel's Web address, please contact your local Intel representative.

**Server chassis** (base chassis is provided with power supply and fans)—UL listed.

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

**Add-in boards**—must have a printed wiring board flammability rating of minimum UL94V-1. Add-in boards containing external power connectors and/or lithium batteries must be UL recognized or UL listed. Any add-in board containing modem telecommunication circuitry must be UL listed. In addition, the modem must have the appropriate telecommunications, safety, and EMC approvals for the region in which it is sold.

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

The following table references Server Chassis Compliance and markings that may appear on the product. Markings below are typical markings however, may vary or be different based on how certification is obtained.

Note: Certifications Emissions requirements are to Class A

**Table 55. Product Safety & Electromagnetic (EMC) Compliance**

| Compliance Regional Description | Compliance Reference | Compliance Reference Marking Example |
|---|---|---|
| Australia / New Zealand | AS/NZS 3548 (Emissions) |  N232 |
| Argentina | IRAM Certification (Safety) |  |
| Belarus | Belarus Certification | None Required |
| Canada / USA | CSA 60950 – UL 60950 (Safety) |  |
| | Industry Canada ICES-003 (Emissions) | CANADA ICES-003 CLASS A<br>CANADA NMB-003 CLASSE A |
| | FCC<br>CFR 47, Part 15 (Emissions) | 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 interference receive, including interference that may cause undesired operation. |
| China | CNCA – CB4943 (Safety)<br>GB 9254 (Emissions)<br>GB17625 (Harmonics) |  |
| CENELEC Europe | Low Voltage Directive 93/68/EEC;<br>EMC Directive 89/336/EEC<br>EN55022 (Emissions)<br>EN55024 (Immunity)<br>EN61000-3-2 (Harmonics)<br>EN61000-3-3 (Voltage Flicker)<br>CE Declaration of Conformity |  |
| Germany | GS Certification – EN60950 |  |
| International | CB Certification – IEC60950<br>CISPR 22 / CISPR 24 | None Required |
| Japan | VCCI Certification | 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 |
| Korea | RRL Certification<br>MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) |  인증번호: CPU-Model Name (A) |
| Russia | GOST-R Certification<br>GOST R 29216-91 (Emissions)<br>GOST R 50628-95 (Immunity) |  |

| Compliance Regional Description | Compliance Reference | Compliance Reference Marking Example |
|---|---|---|
| Ukraine | Ukraine Certification | None Required |
| Taiwan | BSMI CNS13438 |  R33025 |
| | | 警告使用者：<br>這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策 |

## 11.6 Electromagnetic Compatibility Notices

### 11.6.1 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.

### 11.6.2 FCC Verification Statement

Product Type: SR2500; S5000PAL

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124-6497

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

### 11.6.3 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.

### 11.6.4 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.

### 11.6.5 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.

### 11.6.6 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。

### 11.6.7 RRL (Korea)

Following is the RRL certification information for Korea.




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

**English translation of the notice above:**

1. Type of Equipment (Model Name): On 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

### 11.6.8 CNCA (CCC-China)

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

声明

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

## 11.7 Product Ecology Compliance

Intel has a system in place to restrict the use of banned substances in accordance with world wide product ecology regulatory requirements. The following is Intel's product ecology compliance criteria.

| Compliance Regional Description | Compliance Reference | Compliance Reference Marking Example |
|---|---|---|
| California | California Code of Regulations, Title 22, Division 4.5; Chapter 33: Best Management Practices for Perchlorate Materials. | Special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate This notice is required by California Code of Regulations, Title 22, Division 4.5; Chapter 33: Best Management Practices for Perchlorate Materials. This product / part includes a battery which contains Perchlorate material. |
| China | **China RoHS** Administrative Measures on the Control of Pollution Caused by Electronic Information Products" (EIP) #39. Referred to as China RoHS. Mark requires to be applied to retail products only. Mark used is the Environmental Friendly Use Period (EFUP). Number represents years. |  |
| | **China Recycling (GB18455-2001)** Mark requires to be applied to be retail product only. Marking applied to bulk packaging and single packages. Not applied to internal packaging such as plastics, foams, etc. |  |
| Intel Internal Specification | All materials, parts and subassemblies must not contain restricted materials as defined in Intel's ***Environmental Product Content Specification*** of Suppliers and Outsourced Manufacturers – http://supplier.intel.com/ehs/environmental.htm | None Required |
| Europe | **Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC** – Mark applied to system level products only. |  |
| | **European Directive 2002/95/EC** - Restriction of Hazardous Substances (RoHS) Threshold limits and banned substances are noted below. Quantity limit of 0.1% by mass (1000 PPM) for: Lead, Mercury, Hexavalent Chromium, Polybrominated Biphenyls Diphenyl Ethers (PBB/PBDE) Quantity limit of 0.01% by mass (100 PPM) for: Cadmium | None Required |

| Compliance Regional Description | Compliance Reference | Compliance Reference Marking Example |
|---|---|---|
| Germany | **German Green Dot**<br>Applied to Retail Packaging Only for Boxed Boards |  |
| Intel Internal Specification | All materials, parts and subassemblies must not contain restricted materials as defined in Intel's ***Environmental Product Content Specification*** of Suppliers and Outsourced Manufacturers – http://supplier.intel.com/ehs/environmental.htm | None Required |
| International | **ISO11469** - Plastic parts weighing >25gm are intended to be marked with per ISO11469. | >PC/ABS< |
| | Recycling Markings – Fiberboard (FB) and Cardboard (CB) are marked with international recycling marks. Applied to outer bulk packaging and single package. |    |
| Japan | **Japan Recycling**<br>Applied to Retail Packaging Only for Boxed Boards |     |

## 11.8 Other Markings

| Compliance Description | Compliance Reference | Compliance Reference Marking Example |
|---|---|---|
| Stand-by Power | 60950 Safety Requirement<br>Applied to product is stand-by power switch is used. |  |
| Multiple Power Cords | 60950 Safety Requirement<br>Applied to product if more than one power cord is used. | English:<br>This unit has more than one power supply cord. To reduce the risk of electrical shock, disconnect (2) two power supply cords before servicing. |
| | | Simplified Chinese:<br>注意：<br>本设备包括多条电源系统电缆。为避免遭受电击，在进行维修之前应断开两（2）条电源系统电缆。 |
| | | Traditional Chinese:<br>注意：<br>本設備包括多條電源系統電纜。爲避免遭受電擊，在進行維修之前應斷開兩（2）條電源系統電纜。 |
| | | German:<br>Dieses Geräte hat mehr als ein Stromkabel. Um eine Gefahr des elektrischen Schlages zu verringern trennen sie beide (2) Stromkabeln bevor Instandhaltung. |
| Ground Connection | 60950 Deviation for Nordic Countries | Line1 :<br>"WARNING:"<br>Swedish on line2:<br>"Apparaten skall anslutas till jordat uttag, när den ansluts till ett nätverk."<br>Finnish on line 3:<br>"Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan."<br>English on line 4:<br>"Connect only to a properly earth grounded outlet." |
| Country of Origin | Logistic Requirements<br>Applied to products to indicate where product was made. | Made in XXXX |

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# Appendix A: Chassis Integration and Usage Tips

This appendix provides a list of useful information that is unique to the Intel® Server Chassis SR2500 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 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 Chassis SR2500.
- The Mid-plane board must be removed from the system before removal of the Backplane.
- In order to remove or replace the Mid-plane board, the fan cage must first be removed.
- 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 56: 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 | |

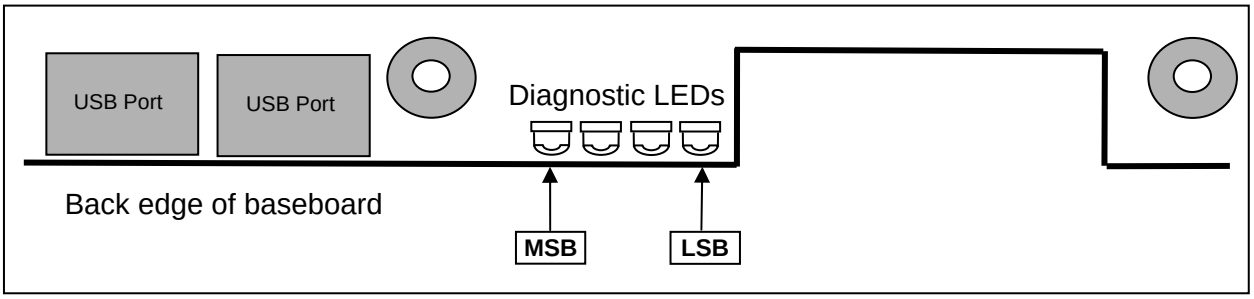



**Figure 53. Diagnostic LED Placement Diagram**

**Table 57. 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) |
| 0x23h | OFF | OFF | A | G | Detecting presence of memory |
| 0x24h | OFF | G | R | OFF | Programming timing parameters in the memory controller |
| 0x25h | OFF | G | R | G | Configuring memory parameters in the memory controller |
| 0x26h | OFF | G | A | OFF | Optimizing memory controller settings |
| 0x27h | OFF | G | A | G | Initializing memory, such as ECC init |
| 0x28h | G | OFF | R | OFF | Testing memory |
| **PCI Bus** | | | | | |
| 0x50h | OFF | R | OFF | R | Enumerating PCI busses |
| 0x51h | OFF | R | OFF | A | Allocating resources to PCI busses |
| 0x52h | OFF | R | G | R | Hot Plug PCI controller initialization |
| 0x53h | OFF | R | G | A | Reserved for PCI bus |
| 0x54h | OFF | A | OFF | R | Reserved for PCI bus |
| 0x55h | OFF | A | OFF | A | Reserved for PCI bus |
| 0x56h | OFF | A | G | R | Reserved for PCI bus |
| 0x57h | OFF | A | G | A | Reserved for PCI bus |
| **USB** | | | | | |
| 0x58h | G | R | OFF | R | Resetting USB bus |
| 0x59h | G | R | OFF | A | Reserved for USB devices |
| **ATA / ATAPI / SATA** | | | | | |
| 0x5Ah | G | R | G | R | Resetting PATA / SATA bus and all devices |
| 0x5Bh | G | R | G | A | Reserved for ATA |
| **SMBUS** | | | | | |
| 0x5Ch | G | A | OFF | R | Resetting SMBUS |
| 0x5Dh | G | A | OFF | A | Reserved for SMBUS |
| **Local Console** | | | | | |
| 0x70h | OFF | R | R | R | Resetting the video controller (VGA) |
| 0x71h | OFF | R | R | A | Disabling the video controller (VGA) |
| 0x72h | OFF | R | A | R | Enabling the video controller (VGA) |
| **Remote Console** | | | | | |
| 0x78h | G | R | R | R | Resetting the console controller |
| 0x79h | G | R | R | A | Disabling the console controller |
| 0x7Ah | G | R | A | R | Enabling the console controller |
| **Keyboard (PS2 or USB)** | | | | | |
| 0x90h | R | OFF | OFF | R | Resetting the keyboard |
| 0x91h | R | OFF | OFF | A | Disabling the keyboard |

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

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

# Appendix C: POST Error Beep Codes

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

**Table 58. 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 59. Each digit in the code is represented by a sequence of beeps whose count is equal to the digit.

**Table 59. BMC Beep Codes**

| Code | Reason for Beep | Associated Sensors | Supported? |
|---|---|---|---|
| 1-5-2-1 | CPU: Empty slot / population error – Processor slot 1 is not populated. | CPU Population Error | Yes |
| 1-5-2-2 | CPU: No processors (terminators only) | N/A | No |
| 1-5-2-3 | CPU: Configuration error (e.g., VID mismatch) | N/A | No |
| 1-5-2-4 | CPU: Configuration error (e.g., BSEL mismatch) | N/A | No |
| 1-5-4-2 | Power fault: DC power unexpectedly lost (power good dropout) | Power Unit – power unit failure offset | Yes |
| 1-5-4-3 | Chipset control failure | N/A | No |
| 1-5-4-4 | Power control fault | Power Unit – soft power control failure offset | Yes |

# *Glossary*

| Word / Acronym | Definition |
|---|---|
| ACA | Australian Communication Authority |
| ANSI | American National Standards Institute |
| BMC | Baseboard Management Controller |
| CMOS | Complementary Metal Oxide Silicon |
| D2D | DC-to-DC |
| EMP | Emergency Management Port |
| FP | Front Panel |
| FRB | Fault Resilient Boot |
| FRU | Field Replaceable Unit |
| LCD | Liquid Crystal Display |
| LPC | Low-Pin Count |
| MTBF | Mean Time Between Failure |
| MTTR | Mean Time to Repair |
| OTP | Over-temperature Protection |
| OVP | Over-voltage Protection |
| PFC | Power Factor Correction |
| PSU | Power Supply Unit |
| RI | Ring Indicate |
| SCA | Single Connector Attachment |
| SDR | Sensor Data Record |
| SE | Single-Ended |
| UART | Universal Asynchronous Receiver Transmitter |
| USB | Universal Serial Bus |
| VCCI | Voluntary Control Council for Interference |

# *Reference Documents*

See the following documents for additional information:

- Intel® Server Board S5000PAL Technical Product Specification
- Intel® 5000 Series Chipsets Server Board Family Datasheet
- Intel® Server Chassis SR2500 Power Distribution Board for 750W Power Supply Specification
- Intel® Server Chassis SR2500 750 Watt AC Power Supply Module Specification
- Intel® Server Board S5000PAL/S5000XAL Tested Hardware and OS List