Intel® Server Platforms SR4850HW4 and SR4850HW4/M

Technical Product Specification

Revision History

Date	Revision Number	Modifications
May 2005	1.0	Initial release.
October 2005	1.1	Updated for Intel® Server Platform SR4850HW4/M support.
April 2006	1.2	Updated for SAS (Serial Attach SCSI) support.

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Intel order number D22226-003

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1.   Product Overview

This product specification details the features of the Intel® Server Platforms SR4850HW4 and SR4850HW4/M. Reliability, low cost, time to market, modularity, high performance, and management features are primary considerations in the design.

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M supports up to four Dual-Core Intel® Xeon® processors 7000 sequence or four 64-bit Intel® Xeon® processors MP with up to 8MB L3 cache and incorporates features that clearly differentiate it as a high availability server. Building on previous server platforms, the Intel® Server Platform SR4850HW4 and SR4850HW4/M introduces redundant memory and networking in addition to the enterprise features of hot-swap power, cooling, PCI slots, and hard disk drives. Advanced server management features are also included to remotely monitor and manage the server. Finally, the server has two optional mass storage expansion features. Throughout this specification the generic term server platform is used to indicate both or either the Intel® Server Platforms SR4850HW4 and SR4850HW4/M, unless otherwise noted.

This document is organized into eleven sections:

Section 1:   Product Overview
An overview of this document.

Section 2:   System Overview
An overview of the system hardware.

Section 3:   Server Platform Chassis and Assemblies
An overview of the chassis and major sub-assemblies.

Section 4:   Cables and Connectors
Describes the cables and connectors specific to the Intel® Server Platforms SR4850HW4 and SR4850HW4/M. Other cables and connectors are described in board-specific sections.

Section 5:   Power Supply
Describes the power supplies used in the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

Section 6:   Power Distribution Board
Describes the power distribution board used in the Intel® Server Platforms SR4850HW4 and SR6850HW4/M.

Section 7:   SCSI Backplane Board
Describes the SCSI backplane board used in the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

Section 8:   SAS Backplane Board
Describes the SAS backplane board used in the Intel® Server Platform SR4850HW4/M.

Section 9:   Front Panel I/O and Control Boards
Describes the front panel I/O board and control boards used in the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

Section 10:   SATA-to-IDE Converter Boards
Describes the SATA-to-IDE converter board used in the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

Section Error! Reference source not found.**:Regulatory Specifications**
Describes system compliance to regulatory specifications.

2.   System Overview

This section describes the features of the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

2.1   System Feature Summary

Table 1 provides a list and brief description of the Intel® Server Platform SR4850HW4 and SR4850HW4/M features, which utilizes the Intel® Board Sets SE8500HW4 and SE8501HW4 respectively.

Table 1. Intel® Server Platforms SR4850HW4 and SR4850HW4/M Feature List

Feature	Description
Compact, high-density system	Rack-mount server with a height of 4U (7 inches) and a depth of 28 inches (706mm)
Configuration flexibility	One to four 64-bit Intel® Xeon® processors MP with up to 8MB L3 cache or Dual-Core Intel® Xeon® processor 7000 sequence
	Two Ultra320* SCSI ports
	Two Gigabit Ethernet ports
	Five 1-inch hot-swap Ultra320* SCSI hard disk drives
	Seven PCI adapters (Four PCI Express* Hot-plug, one PCI-X* 133 Hot-plug, two PCI-X* 100)
	64GB Double Data Rate2 (DDR2) 400 MHz Synchronous Dynamic Random Access Memory (SDRAM), ECC Registered
	Customizable bezel
	Optional system-specific 2Gbps Fibre Channel Module
	Optional RAID On Motherboard (ROMB) with DDR2 DIMM for disk cache and optional Intel® RAID Smart Battery (RSB) for cache battery backup
	Either button or LCD front panel
	Either Intel® Management Module – Professional Edition or Intel® Management Module – Advanced Edition
Serviceability	Tool-less design features
	Front access to hot-swap hard disk drives and cooling
	Top access to hot-plug PCI slots and hot-swap memory boards
	Rear access to hot-swap power supplies
	Status and fault indicator LEDs
	Front and rear viewable System ID switches and LEDs
	Top viewable memory configuration and status LEDs
	Processor failure LEDs
	Detailed configuration label on top cover
	Color-coded parts to identify hot-swap and non-hot-swap serviceable components
Availability	Two 1470W power supplies in a redundant (1+1) configuration with separate power cords
	Four Hot-plug memory boards

Feature	Description	
Manageability	Remote management	
	Intelligent Platform Management Interface (IPMI) 2.0 compliant	
	Wired For Management (WfM) 2.0 compliant	
	Emergency Management Port (EMP) – IPMI over serial or modem	
	Extensive system sensors and monitoring	
	Remote diagnostics support via serial and LAN ports	
	Web management console	
	With Intel® Management Module - Advanced Edition:	
	▪ Dedicated Out-Of-Band management RJ-45 port (telnet, embedded web server, DNS, DHCP)	
	▪ KVM console redirection and remote viewer	
	▪ Full SNMP access	
Front panel interface	<u>Switches</u>: Power, Reset, NMI, System ID <u>Ports</u>: Video connector, Three USB 2.0	<u>LEDs</u>: Power, System ID, System status, LAN1 and LAN2 Activity, Hard drives status Optional LCD

2.2   Introduction

The platform supports sockets for up to four 64-bit Intel® Xeon® Processors MP or Dual-Core Intel® Xeon® processors 7000 sequence, and up to 64GB of memory, five hot-swap hard disk drives, seven PCI slots, two different server management modules, two different front control panels, and two optional mass storage expansions.

Figure 1 and Figure 2 show isometric views of the front and rear of the platform.
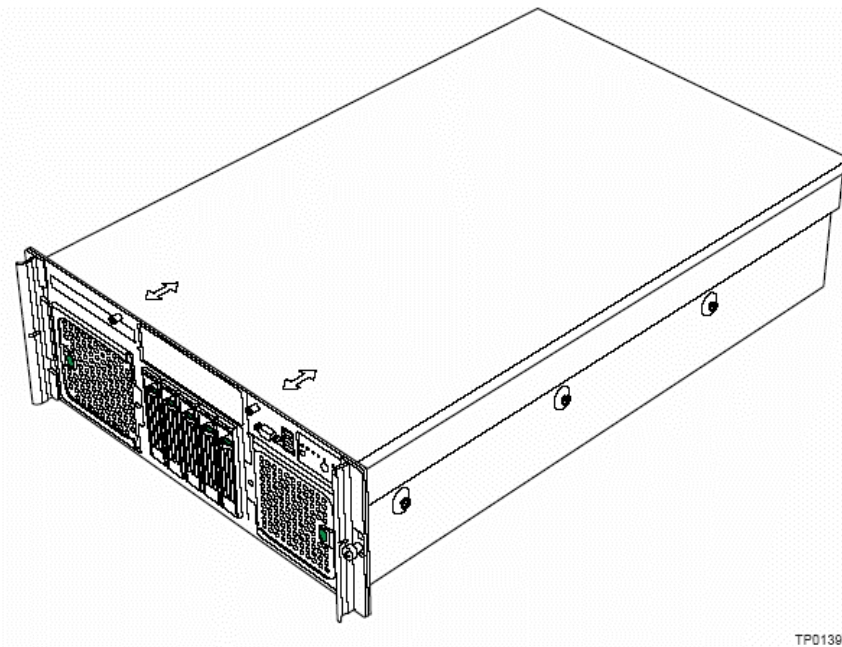
Figure 1. Server Platform, Front Bezel Removed

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M include the Intel® Server Board Sets SE8500HW4 and SE8501HW4 respectively, and each with the respective Intel® E8500 and E8501 chipset. To provide structural support, the board set mainboard attaches to a sheet metal tray which is installed at the rear of the chassis, above the power supplies.

Up to four memory boards can be installed into the either server board set. The memory boards attach perpendicular to the main board. These contain four DDR2 400HMz SDRAM DIMM slots each. With four memory boards installed, the system supports up to 64GB of memory (using 4GB DIMMs).

The hard drive bay, located at the front of platform, provides a bay for five hot-swap 1-inch Ultra320* SCSI hard disk drives. SCSI hard disk drives plug into a vertical SCSI backplane board at the rear of hard disk drive bay. One slimline (½-inch high) optical drive bay and one half-height 5¼-inch SCSI tape device bay are also located at the front of the platform.

The cooling subsystem requires two hot-swap system fan modules. Each fan module contains two fans and a status LED illuminates in the event of a fan failure. The fan modules are accessible from the front of the system and connect into the SCSI backplane board.

The front control panel provides video, USB, buttons, status LEDs, and an optional LCD, that are used for monitoring and managing the platform. The front bezel is an optional cosmetic accessory that is installed with snap-on features. The bezel can be customized to meet integrator-specific industrial design requirements, including color and imprint.
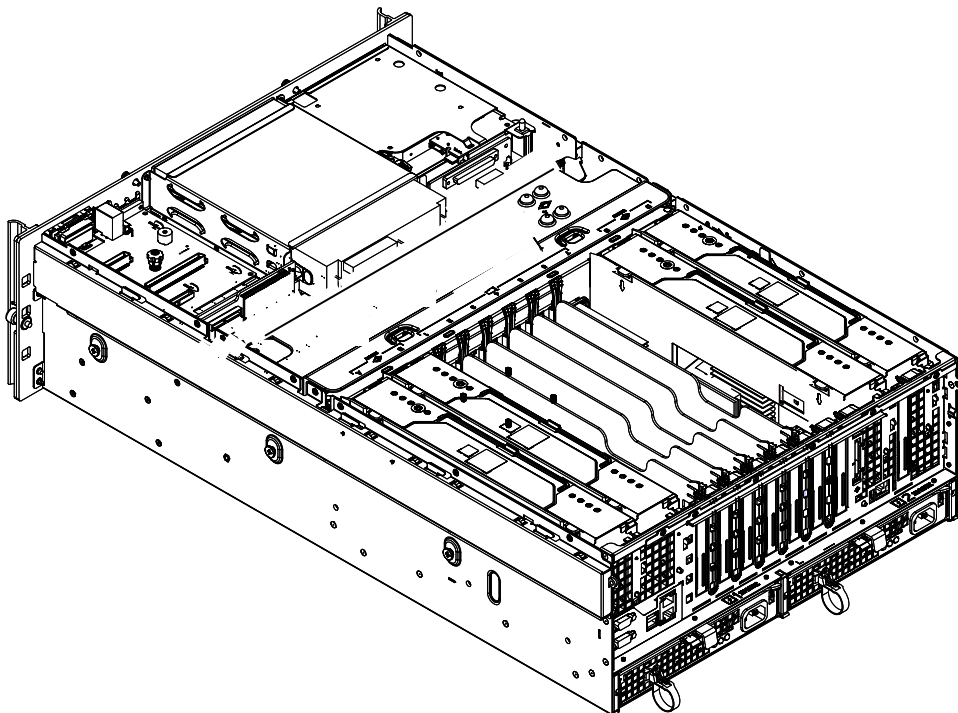
Figure 2. Server Platform, Rear View with Top Cover Removed

The power supply modules are located at the rear of the system below the Intel® Server Board Set SE8500HW4 Main board and plug directly into connectors on the horizontally oriented power distribution board. The system supports two hot-swap power supply modules in a 1+1 redundant configuration.

Upon removal of the top cover, the user has access to the processors, memory boards, PCI adapters, Intel® Management Module Board and optional mass storage features.
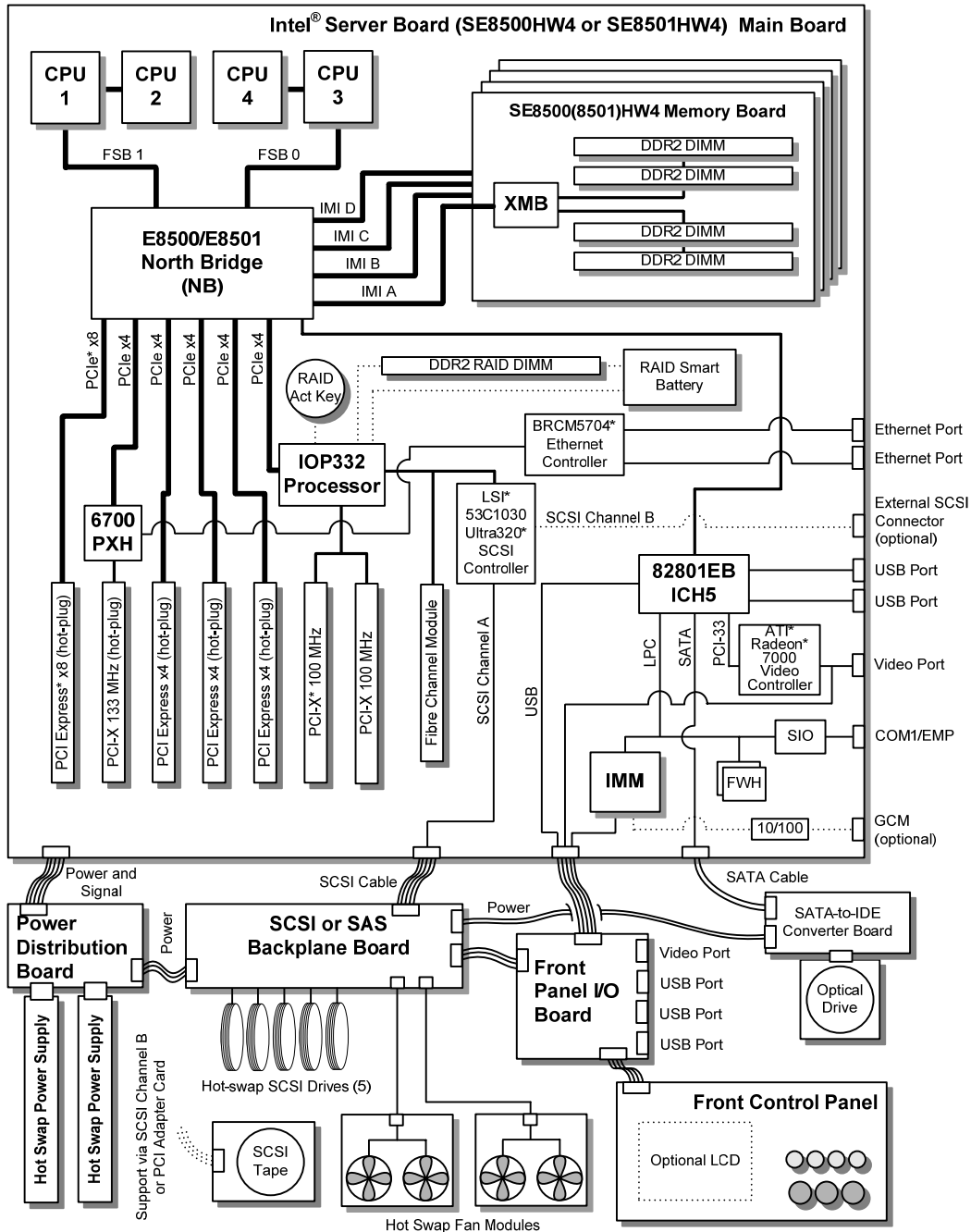
Figure 3. Intel® Server Platforms SR4850HW4 and SR4850HW4/M Chassis Block Diagram

2.3   External Chassis Features - Front

Figure 4 shows the front view of both Intel® Server Platforms SR4850HW4 and SR4850HW4/M with the bezel removed. The front provides access to the following components:

- Buttons and LEDs (with optional LCD)
- Video and USB connectors
- Hard drive bay, optical drive, SCSI tape device

2.3.1   Front View of Chassis
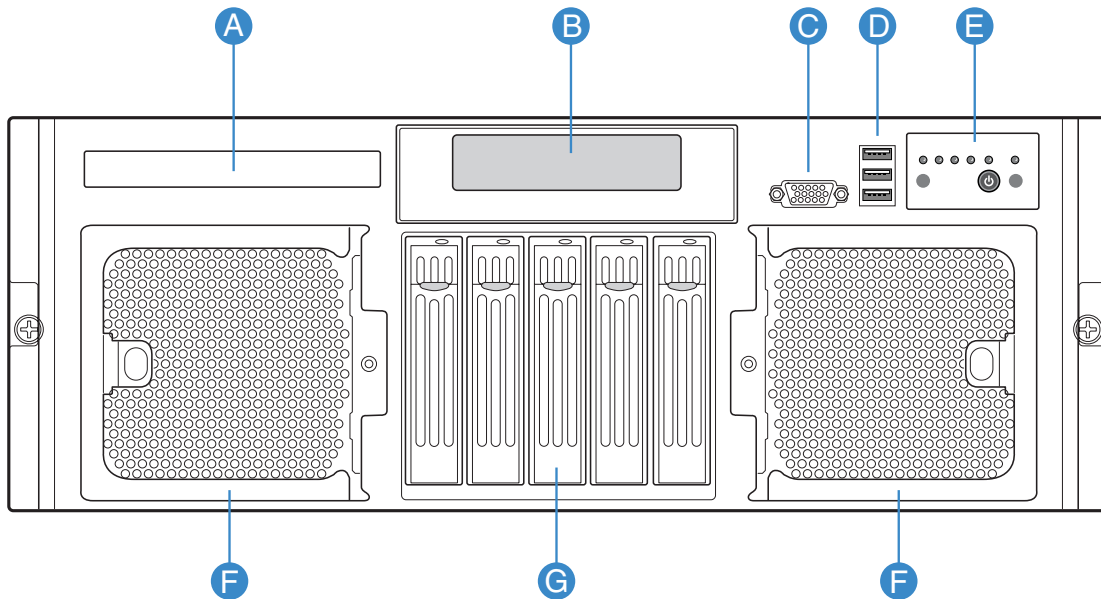
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Figure 4. Front View of the Server Platform, Bezel Removed

Item	Description
A	Optical drive bay
B	5¼ peripheral bay (half-height)
C	Video connector
D	USB 2.0 ports (three)
E	Front control panel (button control panel shown)
F	Hot-swap fan modules
G	Hot-swap SCSI hard disk drives (five)

2.3.2   Front Control Panel

The front control panel contains system control buttons and LED status indicators. It also contains one video connector, three USB 2.0 ports, NMI button, and the system speaker. The front bezel must be removed to access the front control panel switches and connectors. All LEDs are visible with the front bezel installed. See Section 9 for a description of the front panel boards.

2.3.3   Hard Disk Drive and Peripheral Device Bays

The hard disk drive and peripheral device bays can accommodate the following devices:

- Five 1-inch hot-swap Ultra320* SCSI hard disk drives
- One ½-inch optical combo drive (installed with base system)
- One half-height 5¼-inch SCSI tape device

Note: Cooling and EMI constraints do not allow installation of an IDE hard disk drive in the tape device bay.

The SCSI backplane board supports Low Voltage Differential (LVD) SCSI drives only. Single-ended (SE) devices are supported off the secondary external SCSI channel on the Intel® Server Board Set SE8501HW4 Main board. SE devices are not supported in the hot-swap hard disk drive bays in the front of the system, or validated by Intel.

The optical drive and SCSI tape device are not hot-swap devices. System power must be turned off when installing or removing these drives.

> **Note:** The 5¼-inch drive bay depth limits the physical size of the drive depth to about nine inches.

Because hard disk drives have different cooling, power, and vibration characteristics, Intel will validate specific hard disk drive types in the Server Platform SR4850HW4. See the *Intel® Server Board Set SE8501HW4 Tested Hardware and Operating System List* and the *Intel® Server Board Set SE8500HW4 Tested Hardware and Operating System* for the qualified drives.

The hard disk drive carriers supplied with the system accommodate 3½-inch x 1-inch SCSI hard disk drives. The hard disk drive is attached to the carrier with four Phillips*-head screws. The carrier is retained in the chassis by a locking handle.

The SCSI backplane board contains a dual color LED for each hard drive to display status. The LED signal is transmitted to the front of the system via a light pipe integrated in the hard drive carrier.

Due to the required cable length and bus performance, the Intel® Server Board Set SE8501HW4 Main Board contains a Serial ATA (SATA) connecter instead of a Parallel ATA (PATA) connector. The optical drive connects to the SATA-to-IDE converter board which converts the SATA signal to an IDE signal for the 1/2-inch optical drive. The optical drive is installed in a sheet metal bracket and then installed in the Intel® Server Platforms SR4850HW4 or SR4850HW4/M.

See Section 2.5.4 for a description of the SCSI backplane board. See Section 10 for descriptions of the SATA-to-IDE converter board.

2.4   External Chassis Features - Rear

Figure 5 shows the rear view of the Intel® Server Platform SR4850HW4. The user-accessible connectors, PCI slots, and power supply modules located at the rear of the system are described in the following sections.
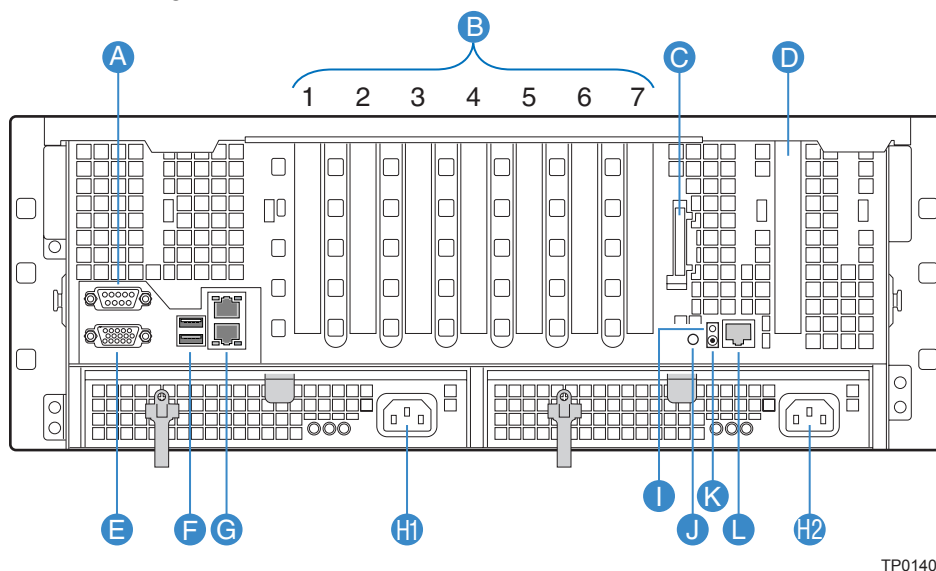
Figure 5. Rear View of the Server Platform

Item	Description	
A	Serial port connector	
B	PCI slots	
	Slot 1	PCI Express* x8 (hot-plug)
	Slot 2	PCI-X* 133MHz, 64-bit (hot-plug)
	Slot 3	PCI Express* x4 (hot-plug)
	Slot 4	PCI Express* x4 (hot-plug)
	Slot 5	PCI Express* x4 (hot-plug)
	Slot 6	PCI-X* 100MHz, 64-bit (not hot-plug)
	Slot 7	PCI-X* 100MHz, 64-bit (not hot-plug)
C	External SCSI connector	
D	Fibre Channel module slot (optional accessory)	
E	Video connector	
F	USB 2.0 ports (two)	
G	LAN ports, RJ-45 connector (LAN1 on top, LAN2 on bottom)	
H1, H2	AC input power connectors (C14, IEC-320)	
I	System ID LED (blue)	
J	System ID button	
K	DC Jack (not used)	
L	Dedicated server management port, RJ-45 connector (used with the Intel® Management Module – Advanced Edition)	

2.5   Internal Chassis Features

2.5.1   Intel® Server Board Set SE8501HW4 Main Board

The Intel® Server Board Set SE8501HW4 Main Board supports the following features:

- Four sockets for Dual-Core Intel® Xeon® processors with up to 8MB L3 cache or 64-bit Intel® Xeon® processors 7000 sequence
- Four PCI Express* x16 memory board connectors
  - Four independent memory interface buses
  - Supports hot-remove and hot-add operations
- Dual 800 MT/s Front Side Buses (FSB) for Intel® Server Board Set SE8501HW4 Main Board
- Dual 667 MT/s FSB for Intel® Server Board Set SE8500HW4 Main Board
- Intel® E8501 Chipset North Bridge (NB) with two shared 64-bit FSB interfaces configured for symmetric multiprocessing (SMP)
- Intel® E8501 Chipset eXtended Memory Bridge (XMB) for support of memory hot-plug
- Intel® 6700 PXH 64-bit Hub which acts as the bridge between the NB and PCI-X bus
- Intel® 82801EB I/O Controller Hub 5 (ICH5) which provides USB 2.0 and SATA
- Intel® IOP332 Storage I/O Processor for mass storage and PCI-X slots
- LSI Logic* 53C1030 Ultra320* SCSI Controller: provides two independent Ultra320* SCSI interfaces
- Broadcom* BRCM5704 NetXtreme* Gigabit Ethernet controller: provides two ports on the rear of the main board
  - ATI Radeon* 7000 video controller
  - 16MB embedded SDRAM
- Mirrored to both the rear and front I/O ports by default
- Advanced I/O slots including PCI Express and PCI-X and support circuits:
  - One hot-plug PCI Express x8 slot
  - Three hot-plug PCI Express x4 slots
  - One hot-plug 64-bit PCI-X 133MHzslot
  - Two 64-bit PCI-X 100MHz slots (not hot-plug)
- Buttons and LED indicators for PCI hot-plug slots
- Low-pin Count (LPC) Super I/O* enables the serial port/EMP
- USB 2.0 support
  - Two USB ports at the rear of chassis
  - Three USB ports on front of the chassis
- 4MB Flash capacity to support rolling BIOS updates
- Optional ROMB support: provides two channels of RAID 0, 1, 5, 10 or 50 (SCSI ROMB)
- Optional custom Fibre Channel module: provides two optical connectors
- Server management support via the Intel® Management Module (IMM) connector

See the *Intel® Server Board Set SE8501HW4 Technical Product Specification* for a description of this board.

2.5.2 Intel® Server Board Set SE8501HW4 Memory Board

Each memory board supports the following features:

- PCI Express* x16 card edge connector that plugs into the Intel® Server Board Set SE8501HW4 Main Board
- Intel® E8501 Chipset eXtended Memory Bridge (XMB)
  - Four DDR2 400Mhz DIMM slots for registered ECC memory
  - Support for both single-rank and dual-rank DIMMs
  - Two DDR2 400MT/s busses
  - Independent Memory Interface (IMI), a high-speed differential bus
  - LED error indicators for each DIMM and an attention LED for hot-plug events
  - LED indicator for both memory mirroring and RAID configurations
- Memory hot-plug at the card level, based on the PCI Hot-plug model
  - Field Replaceable Unit (FRU) device
  - Two temperature sensors
- Safety mechanism for instant power shut-down to the memory board when not properly removed or inserted

Memory boards labeled 667/800 support processors for both Front Side Bus speeds, 667MT/S and 800MT/S. See the *Intel® Server Board Set SE8501HW4 Technical Product Specification* for descriptions of this board.

2.5.3 Power Distribution Board

The power distribution board is located horizontally, below the Intel® Server Board Set SE8501HW4 Main Board in the middle-rear of the chassis. It has two connectors for the hot-swap power supply modules and provides 12V, standby power and server management signals to the Intel® Server Board Set SE8501HW4 Main Board and SCSI backplane board. The power distribution circuitry reports quantity, quality, and location of the installed power supplies through I^2C server management. See Section 6 for a description of this board.

2.5.4 SCSI Backplane Board

The SCSI backplane board mounts vertically in the front of the system and contains five industry-standard hot-swap Single Connector Attach 2 (SCA-2) connectors (80-pin). Ultra320* (or slower) Low Voltage Differential (LVD) SCSI hard disk drives can be installed in the system. The backplane accepts 15,000-RPM (and slower) hard disk drives. Single-Ended (SE) SCSI devices are not supported in the hot-swap hard disk drive bay.

The SCSI backplane board performs the tasks associated with hot-swapping of the hard disk drives and enclosure (chassis) monitoring and management, as specified in the *SCSI Accessed Fault-Tolerant Enclosures (SAF-TE) Specification*. The SAF-TE-specified features supported by the SCSI backplane board include, but are not limited to, the following:

- Monitoring the SCSI bus for enclosure services messages, and acting on them appropriately. Examples of such messages include:
  - Activate a drive fault indicator.
  - Power down a drive that has failed.
  - Report backplane temperature.
- SAF-TE intelligent agent, which acts as proxy for "dumb" I^2C devices (that have no bus mastering capability) during intrachassis communications.

The SCSI backplane board connects to the Intel® Server Board Set SE8501HW4 Main Board and provides power and signals to the front of the chassis. See Section 7 for a description of this board.

2.5.5 Front Panel I/O Board

The front panel I/O board mounts horizontally in the front right of the system and communicates with the SCSI backplane board and main board. The board contains a video connector, three USB ports and an NMI button. See Section 8 for a description of this board.

2.5.6 Front Panel Control Board

Two different front panel control boards are supported, the standard control panel and the Intel® Local Control Panel (LCP). Both mount vertically into the chassis and connect to the front panel I/O board via a cable. Each module houses the system operating buttons, LEDs and the Local Control Panel has an LCD. See Section 8 for a description of these boards.

2.5.7 SATA-to-IDE Converter Board

The SATA-to-IDE converter board attaches to the optical drive carrier and receives the SATA signal from the Intel® Server Board Set SE8501HW4 Main Board via a SATA cable. The board converts it to IDE signals routed to the optical drive. See Section 0 for a description of this board.

2.5.8 Intel® Management Module

The Intel® Management Module (IMM) mounts onto the Intel® Server Board Set SE8501HW4 Main Board and contains the Baseboard Management Controller (BMC) that provides server management support. There are two versions of the Intel® Management Module - Professional and Intel® Management Module – Advanced Edition. The Advanced module adds more support for remote management. The Intel® Server Platforms SR4850HW4 and SR4850/M will not boot without one of these modules installed. See the *Management Module Installation and User's Guide* or the *Intel® Management Module Technical Product Specification* for a description of this part.

2.5.9 Fibre Channel Module

The Intel® Server Board Set SE8501HW4 Main Board supports the Intel® Fibre Channel Module as a mass storage expansion option. The card is based on the Qlogic* ISP2322 FC PCI-X controller and plugs into a reversed PCI Express x16 slot on the Intel® Server Board Set SE8501HW4 Main Board. See the *Intel® Fibre Channel Module Users Guide* for a description of this board.

2.5.10 RAID On Motherboard (ROMB)

The Intel® Server Board Set SE8501HW4 Main Board supports a RAID On Motherboard (ROMB) solution via the Intel® IOP332 Storage I/O Processor in conjunction with the LSI Logic* 53C1030 SCSI controller. To enable this option the Intel® RAID Activation Key and a DDR2 400MHz DIMM are required. The optional Intel® RAID Smart Battery is also available to maintain the contents of the DIMM in the event of power loss.

2.5.11 Intel® Integrated Server RAID Adapter SROMBSAS18e

The Intel® Integrated Server RAID Adapter SROMBSAS18e is an add-in SAS ROMB card available only for the SAS models of the Intel® Server Platforms SR4850HW4/M, SR6850HW4/M, SR5400RA and S5000PSL. The adapter has three modes:
- Native SAS (including SATA) mode with support for up to 120 drives via expander support.
- Intel® Integrated Server RAID providing intelligent RAID 0,1,5,10,50 (with future RAID 6 support) by the addition of the AXXRAK18E and RAM.

   Note: This card is specially hardware-keyed and restricted to PCI-Express* slot 3, 4, or 5 for operation.

The SROMBSAS18e card includes:

- Four external SAS/SATA ports (via a SFF8470 connector)
- Four internal SAS/SATA ports (via a SFF8086/7compact wide connector)
- Data throughput capabilities up to 3.0 Gbps via point to point links
- One DDRII DIMM socket capable of supporting up to 1 GB of registered ECC 400MHz SDRAM.
- An I-Button socket to hold the add in key to enable hardware Intel® Integrated Server RAID
- A buzzer to provide audible warnings.
- A battery cable header from the optional Intel® RAID Smart Battery, which provides power to the RAM cache in case of AC power failure.
- The LSI* 1068 SAS controller providing firmware, watchdog timer, and connection to both the I^2C and PCI-Express* bus.
- The Intel® IOP333 I/O controller provides offloading of RAID calculations from the CPU.
- Support for enclosure management through the I^2C bus.
- Cascaded power conversion from the PCI rail to the required voltages of the card components.

2.5.12 Power Supply Module

Two hot-swap power supply modules are installed side by side at the rear of the chassis. Each supply has its own AC input power connector and is rated at 1470W over an input range of 200-240 VAC.

The power subsystem is configured as follows:

- Two power supply modules are shipped with the system, and support a fully configured system with (1+1) power redundancy.
- If one supply is removed, the system does not have redundant power but will still run a fully configured system.

Note: Intel does not support running the Intel® Server Platforms SR4850HW4 or SR4850HW4/M with only one power supply for any period of time longer than necessary to replace a failed power supply.

One power supply module is capable of handling the maximum power requirements for a fully-configured server, which includes four processors, 64 GB of memory, seven PCI add-in cards, five hot-swap hard disk drives, an optical drive, a Fibre Channel module, ROMB options installed, and a SCSI tape device.

The default system configuration, with two power supply modules, allows the user to replace a failed power supply module without affecting the system functionality. Power supplies have three LEDs to identify failure, power good and AC OK.

The power subsystem receives AC power through two power cords. When two power supply modules and two power cords are installed, the system has (1+1) power cord redundancy and can be powered by two separate AC sources. In this configuration, the system will continue to function without interruption if one of the AC sources fails. See Section 5 for more information.

Note: The total power requirement for the server platform exceeds the 240 VA energy hazard limit that defines an operator accessible area. As a result, only qualified technical individuals should access the processor and non-hot-plug I/O areas while the system is energized. Power cords should be removed from the system before accessing non-hot-plug areas.

2.5.13 System Power Budget

Table 2 shows a summary of the system power budget. The power budget lists each major voltage rail in columns and each major subsystem of the product in rows. The worst-case power per subsystem is listed for each voltage rail. The total power per voltage rail, the power supply specification, and the margin available are shown at the bottom of the table.

Table 2. System Power Budget

Subsystem	Quantity	+3.3V	+5V	+12V (Total)	+3.3V$_{stby}$
Main Board	1	49W	27W	147W	15W
SCSI backplane board	1		2.5W	2.5W	
Front panel I/O board and front panel	1ea	2W		2W	
Processors	4			448W	
Memory	16	4W		192W	
Fans	4			115W	
Hard disk drives	5		14W	56W	
½ inch optical drive	1		1W	6W	
SCSI tape device	1		3W	7W	
PCI-X* slots	3			45W	
PCI Express* slots	4			80W	
Fibre channel module	1			15W	
System Total				**1115.5W**	**15W**
Power Subsystem Spec				1452W	16.5W
Margin				336.5W	1.5W

Notes:

1. 3.3V and 5V are derived from 12V which is the single switched output of the power supply modules. 12V column includes the 3.3V and 5V power.

2. 3.3V$_{stby}$ is the standby output of the power supply modules.

2.5.14 Cooling Subsystem

Primary cooling is generated by two fan modules, that contain two fans and an amber failure LED in each module. The modules are located at the left and right front of the chassis and connect to the SCSI backplane board for power and server management. Cooling air enters in through the front and exhausts out the rear of the chassis. The chassis has several air baffles to duct the air over critical parts, including processors, memory, and peripherals. Processor heat sinks or processor heat sink blanks, and memory boards or memory board blanks must be installed in each corresponding area to ensure proper airflow.

The system fan modules are sized to provide cooling for a fully configured system. The cooling system is designed using a worst-case analysis and appropriate fan speeds were chosen to meet acoustic and thermal requirements. Server management controls fan speed based on ambient and component temperatures. To ensure proper cooling, failed fans should be replaced within one minute.

2.6 New Platform Features

2.6.1 Advanced Memory Performance and Protection

The Intel® Server Board Set SE8501HW4 supports several new memory features that allow flexibility in performance, redundancy and the ability to upgrade. The System BIOS can be configured for maximum performance as follows:

- Where memory is up to four-way interleaved
- Maximum compatibility, where memory can be hot-added
- Memory mirroring, where two or four boards are used to keep a copy of system memory
- Memory RAID, where four boards are used in a RAID4-like mode
- Memory sparing, where a portion of each memory board is reserved for failover.

Hot-replace means the user can replace a memory board with another memory board of identical total size. This operation is supported in maximum compatibility, memory RAID and memory mirroring modes.

Hot-add means the user can add a memory board to a previously unoccupied slot. This requires operating system support and is supported in memory compatibility and memory mirroring modes.

Hot-removal means the user can remove a memory board. This operation is supported in memory RAID and memory mirroring modes.

Hot-upgrade means the user can replace an existing memory board with a memory board that contains more memory capacity. A hot-upgrade is not a unique operation, it is implemented as a hot-remove followed by a hot-add. This requires operating system support and is supported by the memory RAID mode only.

See the *Intel® Server Board Set SE8501HW4 Technical Product Specification* for more details on these new features.

2.6.2 Rolling BIOS

The Intel® Server Board SE8501HW4 Main Board supports two BIOS images to be stored in Flash. This provides a mechanism for BIOS updates without a system reboot as well as failover to an alternate image in the event of BIOS corruption. The system runs with the current BIOS until a reboot, after which time the updated BIOS is used. See the *Intel® Server Board Set SE8501HW4 Technical Product Specification* for more details on this new feature.

2.7   Server Management

The management subsystem conforms to the *IPMI v2.0 Specification*. The server management features are implemented using two micro-controllers: the Intel® Management Module that plugs into the Intel® Server Board Set SE8501HW4 Main Board, and the SCSI hot-swap controller on the SCSI backplane board. The functions of each component are summarized in the following sections.

2.7.1   Intel® Management Module (IMM)

The Intel® Management Module has a Baseboard Management Controller (BMC) micro-controller and associated circuitry. The Intel® Management Module contains flash memory that holds the operation code and the BMC configuration settings. The Intel® Management Module monitors platform management events and logs their occurrence on the onboard non-volatile System Event Log (SEL). This includes events such as over-temperature and over-voltage conditions, fan failures, etcetera. The Intel® Management Module also provides the interface to this monitored information so system management software can poll and retrieve the present status of the platform.

The Intel® Management Module also provides the interface to the non-volatile Sensor Data Record (SDR) repository. SDRs provide a set of information that system management software can use to automatically configure itself for the number and type of IPMI sensors (e.g., temperature sensors, voltage sensors, etcetera) in the system.

The following is a list of the major functions for the IMM:

- System power control
    - ACPI power control
    - ACPI sleep support
    - Minimum power off time
- System reset control
- System initialization
    - Processor temperature and voltage threshold setting
    - Fault Resilient Booting (FRB)
- Front panel user interface
    - System status (green) LED control
    - System status (amber) LED control
    - System ID LED control
    - Reset button control
    - Power button control
    - SDINT button control
- System ID Button control
- System fan management
- System management watchdog timer
- System Event Log (SEL) interface – up to 3,200 entries

- Sensor Data Record (SDR) repository interface
- SDR/SEL timestamp clock
- FRU inventory device
- Diagnostics and beep code generation
- Event message generation and reception
- Platform Event Paging and Platform Event Filtering (PEP and PEF)
- Dial page alerting
- Alert over LAN and serial/PPP
- Serial over LAN (SOL)
- Terminal Mode (TM)
- Battery monitoring
- Sensor monitoring
  - Temperature
  - Voltage
  - Fan speed
  - Processor status
  - Power supplies
- Processor Information ROM (PIROM) and Scratch Electrically Erasable Programmable ROM (SEEPROM) access
- IPMB communication interface
- Emergency Management Port (EMP) interface - IPMI messaging over Serial/Modem. This feature is also referred to as DPC (Direct Platform Control) over Serial/Modem
- Inter-Chassis Management Bus (ICMB) interface - IPMI messaging between chassis
- Additional features with Intel® Management Module - Advanced Edition installed:
  - Dedicated (Out-Of-Band) LAN interface through the Generic Communication Module (GCM) on the rear of chassis (Intel® Management Module - Advanced Edition)
  - BMC-resident SNMP support for Out-Of-Band access using third party applications such as HP* Openview*
  - Embedded web server to access system health, view the SEL and issue IPMI commands
  - Embedded Command Line Interface (using telnet server running on the BMC) to allow direct access to the BMC
  - Alerting via email
  - Keyboard, Video, Mouse (KVM) console redirection and remote viewer

See the *Intel® Management Module Technical Product Specification for* more information.

2.7.2   Hot-swap Controller

The hot-swap controller is on the SCSI backplane board. The primary function of the hot-swap controller is as follows:

- Implements the SAF-TE command set
- Controls the SCSI hard disk drive power, activity and fault LEDs
- Provides a path for management information via the SCSI bus
- Retrieves hard disk drive fault status, SCSI backplane board temperature, and fan failure information via IPMB
- Queries the status of the power distribution board by retrieving information from the Intel® Management Module via IPMB
- Controls hard disk drive power-on and power-down, facilitating hot-swapping

2.8   Reliability, Availability, Serviceability, Usability, Manageability (RASUM)

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M support the following reliability, availability, serviceability, usability and manageability (RASUM) features:

Reliability features

- Machine check architecture
- Error Checking Code (ECC) in main memory and processor caches
- ECC, parity, and protocol checking on the FSB
- Parity on the Hub Link (HL-1.5) interface
- Parity checking on PCI buses
- RAID On Motherboard (ROMB) with the Intel® RAID Smart Battery which provides battery back-up to the DDR2 400MHz DIMM for disk cache
- Voltage and temperature monitoring throughout the system

Availability features

- Hot-plug PCI Express and PCI-X
- Hot-plug memory boards
- Redundant hot-swap power supplies
- Redundant power cords
- Redundant hot-swap system fans
- Hot-swap SCSI hard drives
- Failover Ethernet ports

Serviceability features

- Tool-less installation and removal of major sub-assemblies
- Color-coded parts to identify serviceable components
  - Green: Hot-swap or hot-plug components
  - Blue: Non-hot-swap components
- System ID buttons and LEDs
- LED indicators for system health, configured options, and activity

Usability features

- Tool-less design features
- External access to hot-swap hard disk drives, power supplies, LEDs and switches
- Front and rear viewable System ID switches and LEDs
- Detailed configuration label on top cover
- Color-coded parts to identify hot-swap and non-hot-swap serviceable components

Manageability features

- Remote management via serial and LAN
- IPMI 2.0 and WfM 2.0 compliance
- Remote diagnostics via serial and LAN
- Remote management via KVM and dedicated LAN (Intel® Management Module - Advanced Edition)

All boards are connected by a server management I^2C bus to satisfy the system RASUM requirements.

2.9   Expansion Support

Table 3 summarizes the expansion support provided by the platform.

Table 3. Expansion Support

Quantity	Type
4	Dual-Core Intel® Xeon® processors 7000 sequence
7	PCI expansion bus slots
5	Single connector attachment (SCA-2) Ultra320* SCSI hard disk drive bays
1	5 1/4-inch half-height drive bay
1	External SCSI connector
16	DDR2 400HMz SDRAM registered ECC DIMM module sockets (four per memory module)
1	SCSI RAID On Motherboard (ROMB) socket, DDR2 DIMM socket and battery connector
1	Fibre Channel Module connector (with two FCAL 2GBps connectors)

2.10 Specifications

2.10.1   Environmental Specifications Summary

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M can be tested to the environmental specifications as indicated in Table 4.

Table 4. Environmental Specifications Summary

Environment	Specification	
Temperature operating	10°C to 35°C	50°F to 95°F
Temperature non-operating	-40°C to 70°C	-40°F to 158°F
Altitude	-30 to 1,500 m	-100 to 5,000 ft
Humidity non-operating	95%, non-condensing at temperatures of 25°C (77°F) to 30°C (86°F)	
Vibration non-operating	2.2 Grms, 10 minutes per axis on each of the three axes	
Shock operating	Half-sine 2 G, 11 ms pulse, 100 pulses in each direction, on each of the three axes	
Shock non-operating	Trapezoidal, 25 G, two drops on each of six faces V : 175 inches/sec on bottom face drop, 90 inches/sec on other 5 faces	
Safety	UL60 950, CSA60 950, AS/NZS 3562, GB4943-1995, EN60 950 *and* 73/23/EEC, IEC 60 950, EMKO-TSE (74-SEC) 207/94, GOST-R 50377-92	
Emissions	Certified to FCC Class A; tested to CISPR 22 Class A, EN 55022 Class A *and* 89/336/EEC, VCCI Class A, AS/NZS 3548 Class A, ICES-003 Class A, GB9254-1998, MIC Notice 1997-42 Class A, GOST-R 29216-91 Class A, BSMI CNS13438	
Immunity	Verified to comply with EN55024, CISPR 24, GB9254-1998, MIC Notice 1997-41, GOST-R 50628-95	
Electrostatic discharge	Tested to ESD levels up to 15 kilovolts (kV) air discharge and up to 8 kV contact discharge without physical damage	
Acoustic	Sound pressure: < 55 dBA at ambient temperature < 23° C measured at bystander, floor standing position Sound power: < 7.0 BA at ambient temperature < 23° C measured using the Dome Method GOST MsanPiN 001-96	

See Section **Error! Reference source not found.** for more information on environmental specifications.

2.10.2   Physical Specifications

Table 5 describes the physical specifications of the Intel® Server Platforms SR4850HW4 and SR4850HW4/M.

Table 5. Physical Specifications

Specification	Value	
Height – 4U	6.8inches	173 mm
Width	17.6inches	447 mm
Depth	27.8inches	706 mm
Front clearance	3inches	76 mm
Side clearance	1inches	25 mm
Rear clearance	6inches	152 mm
Weight (full config)	90 lbs	40 kg

Note: The system weight is an estimate for a fully configured system and will vary depending on number of peripheral devices and add-in cards, and the number of processors and DIMMs installed in the system.

3. Server Platform Chassis and Assemblies

This section provides an overview of the chassis and assembly pieces that reside within the platform. This section is divided into the following areas, with detailed specification of these items in the sections that follow:

Section 3.1:   Chassis, Rails and Top Cover

Section 3.2:   Power and Fans

Section 3.3:   Main Board Assembly

Section 3.4:   Peripherals Bay and Front Panel

Section 3.5:   Front Bezel

3.1 Chassis, Rails and Top Cover

3.1.1 Chassis

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M utilize a standard 19-inch EIA chassis that is 4U high x 28 inches deep. This chassis is designed to be rack-mounted into a 4U x 19 inches x 34inches deep space, with the extra six inches required for cable management. The chassis can be mounted into a rack with an optional rail kit and cable management arm.

The 4U height is defined by standard EIA rack units where 1U = 1.75-inches. The 28-inch depth is measured from the front mounting flange to the back of the PCI slots. This measurement does not include cables or the bezel.
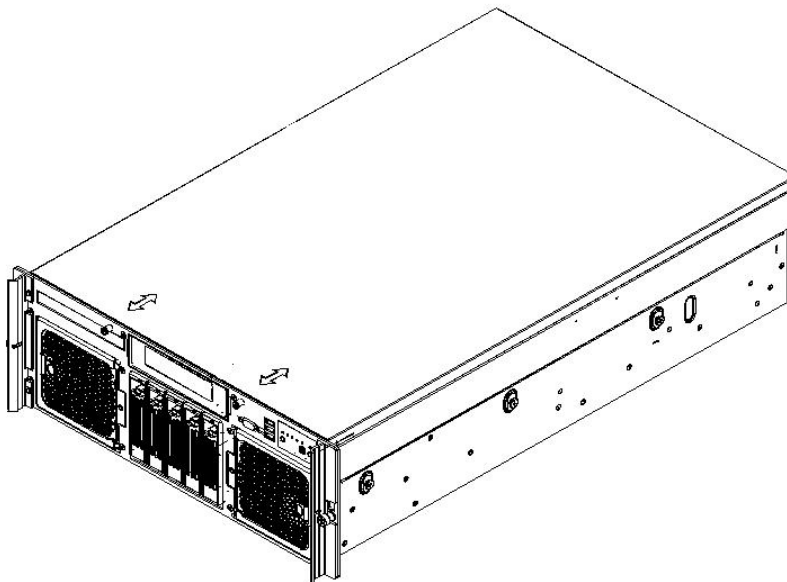
Figure 6. Server Platform

Memory Modules

PCI Adapter Slots

Slide Rail Mount Points
(both sides of chassis)
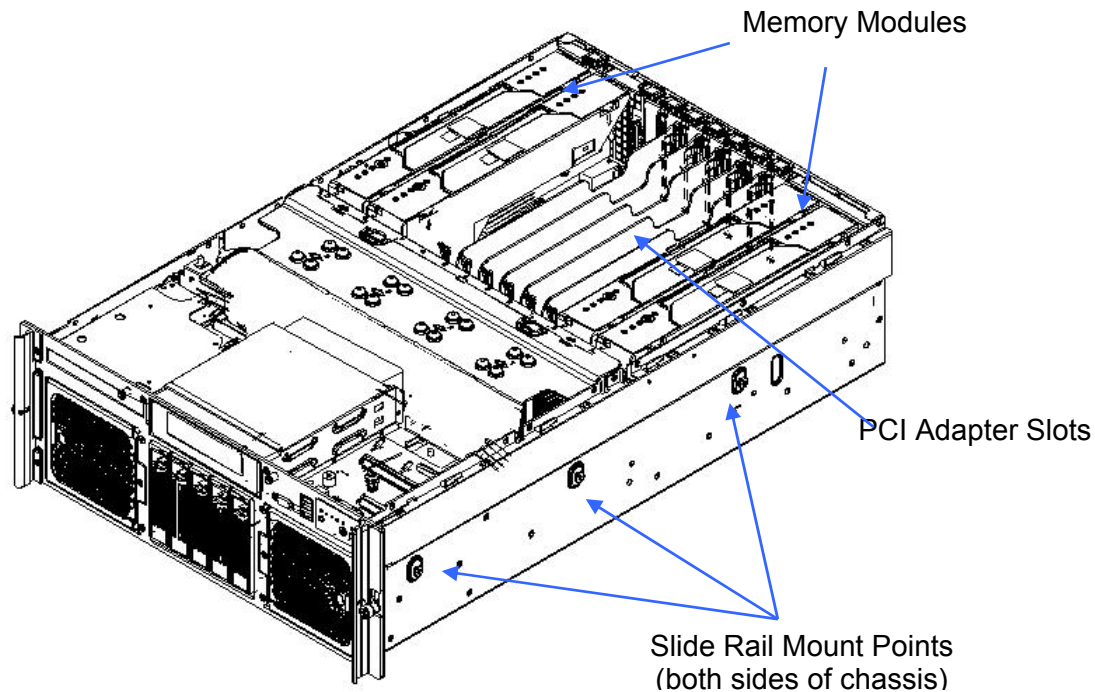
Figure 7. Server Platform, Front Bezel and Top Cover Removed

3.1.2 Slide Rails

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M accommodates slide rails to mount the chassis into a standard 19-inch rack. The slide rails attach to studs on the sides of the chassis using keyhole features on the slide rails. No loose hardware is needed. Intel produces two accessories common to enterprise servers:

- AXXRAIL3U7U, which attach to the provided mounts, or any 3U to 7U server that has mounts in these locations.
- AXXCMA3U7U, which attaches to the rail accessory to provide a cable management arm.

3.1.3 Top Cover

The top cover is a one-piece design. It attaches to the chassis with a series of slots in the sides of the chassis that align with tabs in the top cover. To install the top cover, the tabs drop into the slots and the cover slides forward. Two captive non-knurled screws on the faceplate secure the top cover in place. A tool is required to remove or install these screws. In addition, the cover has a label on the bottom side that describes system layout, jumpers and a summary of common tasks.

3.2   Power and Fans

The power bay provides space for two power supply modules and for the power distribution board. It is an integral member of the chassis structure. Each power supply in the power bay is approximately 7.75-inches (W) x 13.5-inches (D) x 1.4-inches (H). The redundant AC power inputs are external to the system.

The power distribution board distributes the power in two ways.

- A connector on the back edge of the board mates to the power supplies.
- A cable routes +12V power to the SCSI backplane board and +3.3Vstby, +12V power and signals to the Intel® Server Board Set SE8501HW4 Main Board.

The AC power is filtered with a combination 15A power plug integrated with a filter.
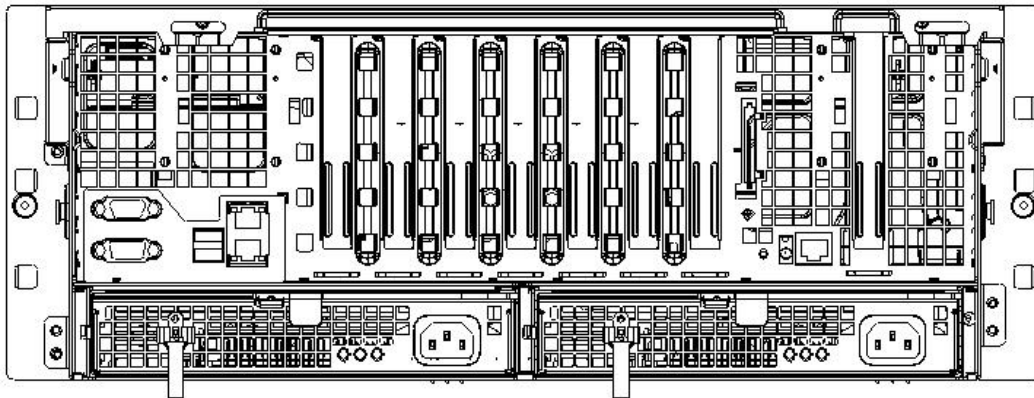
Figure 8. Rear of Platform, Power Supplies Installed Fan Subsystem

The four system fans are accessible for hot-swap operations at the front of the chassis. The fan module assembly has an integrated amber LED wired to the front of the plastic bezel. This LED lights when one of the fans is not functioning within specification. The fan connector extends from the rear of the fan assembly and mates into the SCSI backplane board.

Failure LED
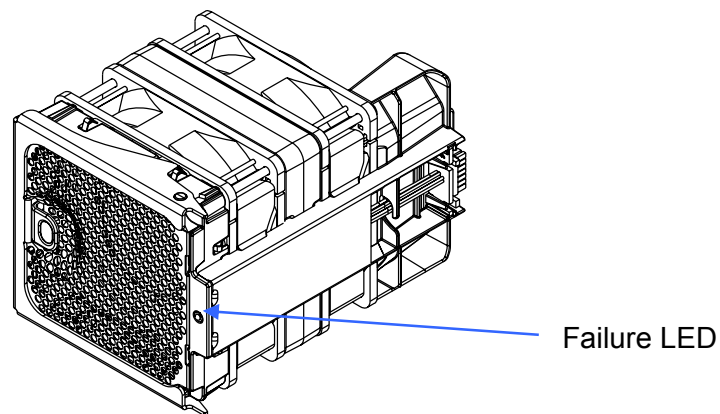
Figure 9. System Fan Module

3.3   Main Board Assembly

The Intel® Server Board Set SE8501HW4 Main Board mounts to a sheet metal tray with four metal springs from the Intel® Component Enabling Kit (CEK) and four non-captive screws. The Intel® Server Board Set SE8501HW4 Main Board Assembly is mounted in the chassis with slot and tab hooks. It is secured into the chassis by a single captive fastener.

Memory boards mount vertically on the left and right side of the board however, processors and heatsinks mount in the front.

Processors and
Heat Sinks
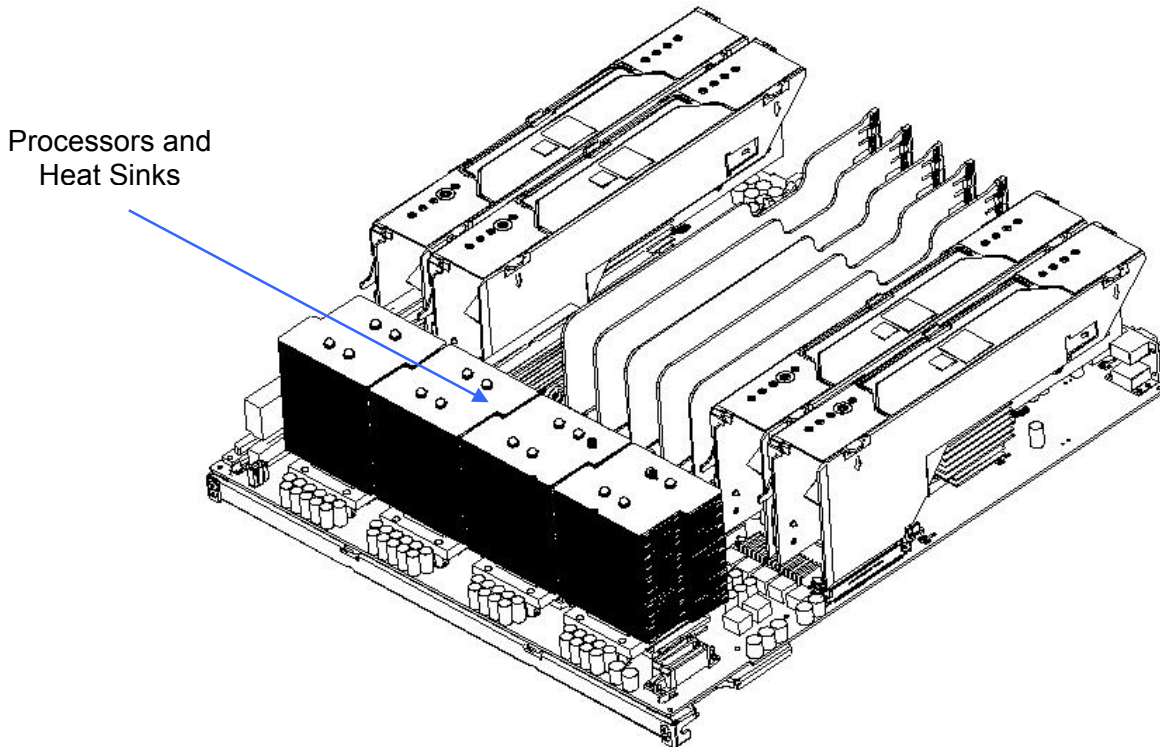
Figure 10. Main Bboard and Sheet Metal Tray, Assembly

3.4   Peripheral Bay and Front Panel

The peripheral bay is a sheet metal enclosure with features to mount the hot-swap SCSI hard disk drives, 5¼-inch device, and an optical drive. The SCSI backplane board has slots on it that slide into hooks on the peripheral bay. Two captive thumbscrews secure the SCSI backplane board and front panel I/O board to the peripheral bay.

3.4.1 Hot-Swap Hard Disk Drive Carrier

The hot-swap hard disk drive carrier is an assembly that provides guides for installing hard disk drives. The carrier has an integrated light pipe to transfer the LED indicator from the SCSI backplane board to the front of the drive carrier and an insertion/extraction mechanism. The hard drive bezel can be customized to meet integrator-specific industrial design requirements, by changing the color and imprint.
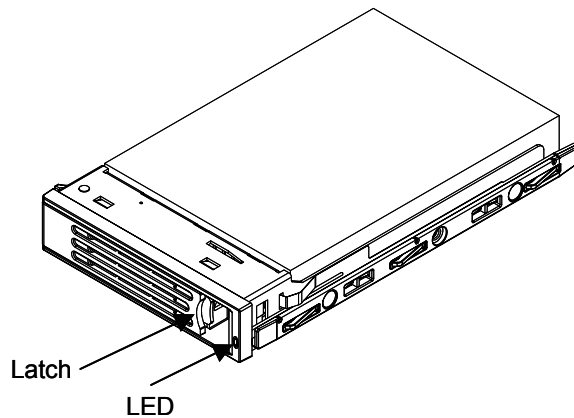
Figure 11. Hot-Swap Hard Drive Carrier

3.4.2   Optical Drive Carrier

The optical drive is installed in a sheet metal bracket. The SATA-to-IDE converter board is plugged into the IDE connector at the back of the optical device. This assembly is then installed into the chassis.
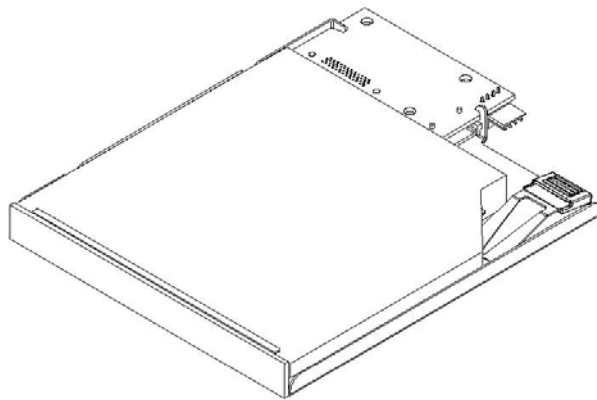
Figure 12. Optical Drive Carrier with SATA-to-IDE Converter Board

3.4.3 Front Panel

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M require a standard button control panel, providing basic functionality, or an Intel® Local Control Panel, which adds an LCD for integration with server management features. Both front panels contain on/off buttons, switches, and LED status indicators. The front panel is retained in the chassis sheet metal by two clips and connects to the front panel I/O board via a cable.

The on/off button for these server platforms will need to be pushed in or triggered to power on the server from a powered off state. From a power on state, the on/off button needs to be pushed in and held for approximately four continuous seconds. This action will force a shutdown while running a fully booted OS. Without OS control the momentary triggering of the on/off button may transition the server platform to the off state.

In the upper right of the chassis front, there is also a video connector, NMI button, and three-port USB 2.0 connector.

See Section 9 for more information on the front panel area.
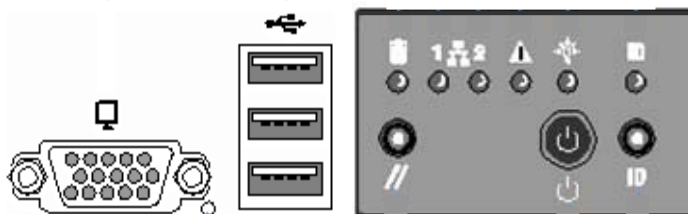
Figure 13. Front Panel with Button Control Panel
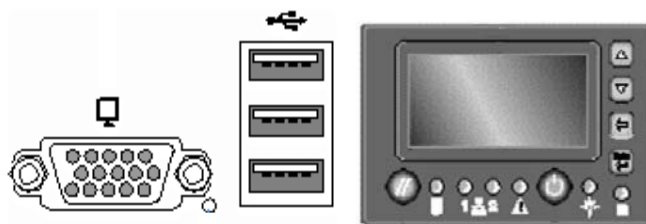
Figure 14. Front Panel with Intel® Local Control Panel

3.5   Front Bezel

The front bezel is an optional one-piece cosmetic accessory that is installed with snap-on features. The bezel can be customized to meet integrator-specific industrial design requirements, by changing the color and imprint. The bezel design allows adequate airflow to cool system components and has light pipes to allow front panel LEDs to be visible from the front of the server. Removing the bezel exposes peripherals, front panel switches and I/O connectors.

Two black plastic pull handles cover the EIA mounting flanges and enable a user to slide the chassis in and out of a rack.
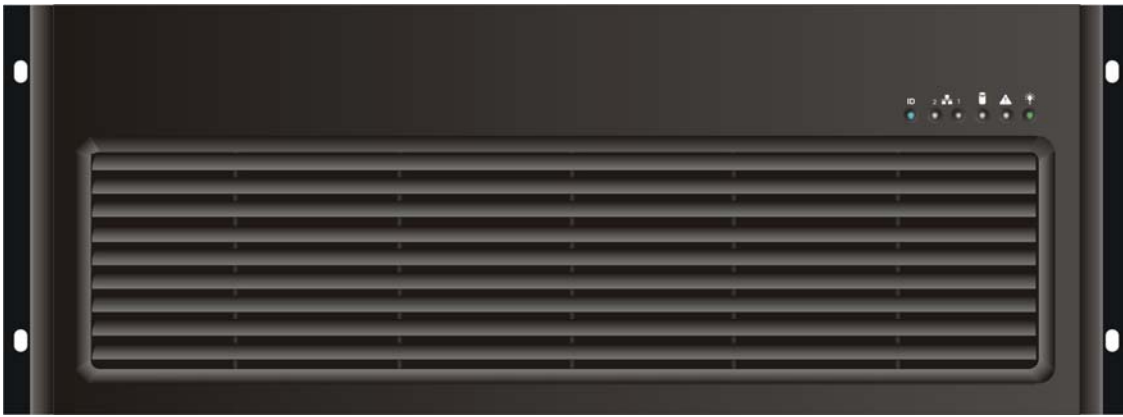
Figure 15. Front Bezel

4.   Cables and Connectors

This section describes cables and connectors specific to the Intel® Server Platforms SR4850HW4 and SR4850HW4/M. This section includes an overview diagram of the server platform interconnections, and tables that describe the signals and pinouts for user accessible connectors. Sections that follow will cover platform-specific board cables and connectors. See the *Intel® Server Board Set SE8501HW4 Technical Product Specification* for other connector signal descriptions and pinouts. This section is organized as follows:

Section 4.1:   Cable and System Interconnect Descriptions
Provides a list of the connectors and cables in the system.

Section 4.2:   User-accessible I/O Connectors
Describes the form-factor and pinout of user-accessible interconnects.

The block diagram in Figure 3 provides an overview of the cables and their relation to system boards in the platform.

4.1   Cable and System Interconnect Descriptions

Table 6 and Table 7 list cables and connectors used in the assembly of the Server Platform SR4850HW4.

Table 6. Cable Descriptions

Type	Quantity	From	To	Cable Description
Signal	1	Main board	SCSI backplane board	100-pin (multi-signal function)
Signal	1	SCSI backplane board	Front panel I/O board	34-pin (multi-signal function)
SCSI	1	Main board	SCSI backplane board	68-pin internal SCSI
SCSI	1	Main board	Rear panel	68-pin VHDCI SCSI
SATA	1	Main board	SATA-to-IDE converter board	7-pin SATA
DC Power	1	SCSI backplane board	SATA-to-IDE converter board	4-pin power (mini connector)
			SCSI tape device	4-pin power
Signal	1	Front panel I/O board	Front panel	50-pin (multi-signal function)
Switch	1	Main board	Chassis intrusion switch	3-pin switch

Table 7. Connector Descriptions

System Component	Type	Quantity	From	To	Interconnect Description
Main board	Processors	4	Main board	Processor	604-pin ZIF sockets
	PCI Express*	4	Main board	Memory board connector	164-pin Card Edge Connectors
	Memory	1	Main board	ROMB DIMM	240-pin Card Edge Connector
	PCI Express*	1	Main board	Fibre Channel Module	164-pin Card Edge Connector
	VRM	1	Main board	VRM9.1 module	62-pin Card Edge Connector
	VRM	2	Main board	VRM10.2 module	54-pin power connectors
	PCI-X*	3	Main board	PCI-X* adapters	188-pin Card Edge Connectors
	PCI Express*	4	Main board	PCI Express8 adapters	98-pin Card Edge Connectors
	Intel® Management Module	1	Main board	Intel® Management Module	120-pin connector
	ICMB	1	Main board	Internal interface	1 x 5 Header connector
	IPMB	1	Main board	Internal interface	1 x 3 Header connector
	Chassis Intrusion	1	Main board	Top cover switch	1 x 3 Header connector
	USB	1	Main board	Rear panel	1 x 4-pin double stacked USB connector
	USB	1	Main board	Internal interface	1 x 4-pin connector
	Video	1	Main board	Rear panel, monitor	15 Pin, monitor device
	COM1/EMP	1	Main board	Rear panel	9-pin Emergency Management Port (DB9)
	COM2	1	Main board	Internal interface	2 x 5-pin header
	Ethernet	1	Main board	Rear panel	Double stacked RJ45 connector ports
	SCSI	2	Main board	Internal SCSI channels	68-pin SCSI connectors
	Signal	1	Main board	SCSI backplane board	100-pin connector
	Ethernet	1	Main board	External interface	RJ45 connector port, GCM
	DC power and signal	1	Main board	RAID Smart Battery	2 x 10-pin header
	SATA signal	1	Main board	SATA-to-IDE converter board	1 x 7-pin connector (standard SATA)
	DC power	2	Main board	Power distribution board	1 x 12-pin connectors

System Component	Type	Quantity	From	To	Interconnect Description
	DC signal	1	Main board	Power distribution board	2 x 15-pin header
Memory board	Memory	1	Memory board	Main board	164-pin Card Edge Connector (x16 PCIe)
	Memory	4	Memory board	DDR2 DIMMs	240-pin Card Edge Connectors (4 per board)
SCSI backplane board	SCA2	5	SCSI backplane board	Hot-swap hard disk drive	80-pin SCA2 connectors
	SCSI	1	SCSI backplane board	Main board	68-pin SCSI connector
	Signal	1	SCSI backplane board	Main board	100-pin connector
	DC power and signal	2	SCSI backplane board	Fan module	2 x 14-pin headers
	DC power	1	SCSI backplane board	SATA-to-IDE converter board, Tape device	1 x 4-pin header
	Signal	1	SCSI backplane board	Front panel I/O board	34-pin connector
	DC power	1	SCSI backplane board	Power distribution board	1 x 12-pin connector
Front panel I/O board	Signal	1	Front panel I/O board	SCSI backplane board	34-pin header
	Video	1	Front panel I/O board	Front panel, monitor	15 Pin, monitor device
	USB	1	Front panel I/O board	Front panel	1x4-pin triple stacked USB connector
	Front panel	1	Front panel I/O board	Std Button Control Panel or Intel® Local Control Panel	50-pin header
SATA-to-IDE converter board	Signal	1	SATA-to-IDE converter board	Optical device	50-pin JAE (IDE)
	SATA	1	SATA-to-IDE converter board	Main board	1 x 7-pin connector (standard SATA)
	DC power	1	SATA-to-IDE converter board	SCSI backplane board	1 x 4-pin header (mini connector)
Fan module	DC power and signal	2	Fan module	SCSI backplane board	2 x 7-pin headers
Standard Button Control Panel or Intel® Local Control Panel	Signal	1	Standard button control panel or Intel® Local Control Panel	Front panel I/O board	50-pin header
Power distribution board	DC power and signal	2	Power distribution board	Power supply	34-blade connectors
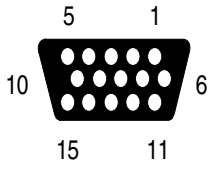
System Component	Type	Quantity	From	To	Interconnect Description
	DC power	2	Power distribution board	Main board	1 x 12-pin connectors
	Signal	1	Power distribution board	Main board	2 x 15-pin header
	DC power	1	Power distribution board	SCSI backplane board	1 x 12-pin connector
Power Supply	DC power and signal	1	Power supply	Power distribution board	34-blade connector
	AC power	1	Power supply	External interface	IEC filtered 15A receptacle

4.2   User-accessible I/O Connectors

4.2.1 Video Connectors

The Intel® Server Board Set SE8501HW4 Main Board and server platform front panel I/O board provide a video port interface with a standard VGA-compatible, 15-pin connector.
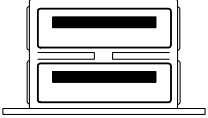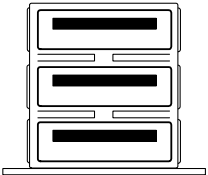
Table 8. Video Connector Pinout

Pin	Signal Name and Description	Video Connector
1	VID_R (analog color signal red)	
2	VID_G (analog color signal green)	
3	VID_B (analog color signal blue)	
4	No connection	
5	GND	
6	GND	
7	GND	
8	GND	
9	No connection	
10	GND	
11	No connection	
12	MONID1 (to support DDCx, Display Data Channel* standard)	
13	VID_HSYNC (horizontal sync)	
14	VID_VSYNC (vertical sync)	
15	MONID2 (to support DDCx, Display Data Channel standard)	

4.2.2 USB 2.0 Connectors

The Intel® Server Board Set SE8501HW4 Main Board provides a double-stacked USB port at the rear panel and one vertical USB port located in the middle of the mainboard. The server platform front panel I/O board provides three stacked USB port connectors via a USB hub controller. These built-in USB ports permit the direct connection of six USB peripherals without an external hub. If more devices are required, an external hub can be connected to any of the built-in ports.

Table 9. Dual USB Connector Pinout

Pin	Signal	USB Connectors
A1	Fused Voltage Controlled Current (VCC) (+5 V with over-current monitoring)	
A2	USBPxM (differential data line)	
A3	USBPxP (differential data line)	
A4	GND (ground)	**Dual Stacked USB Connector on Rear Panel**
B1	Fused VCC (+5 V with over-current monitoring)	
B2	USBPxM (differential data line)	
B3	USBPxP (differential data line)	
B4	GND (ground)	**Triple Stacked USB Connector on front panel**

4.2.3   Etherent Connectors

The Intel® Server Board Set SE8501HW4 Main Board provides a dual RJ-45 connector for Ethernet connection.

Table 10. Dual Ethernet Stacked Connector

Pin	Signal	Description
LED Signals		
27	DNW_LINKB10_N	Lower (Port 1) green status LED cathode signal indicating Port 1 activity
28	DNW1_ACT_N_R	Lower (Port 1) green status LED anode to 100-ohm pullup to 3.3V Standby
29	DNW_LINKB100_N	Lower (Port 1) green speed LED cathode, yellow LED anode
30	LANB1000_N_R	Lower (Port 1) yellow speed LED cathode, green LED anode
31	DNW_LINKA10_N	Upper (Port 2) green status LED cathode signal indicating Port 2 activity
32	DNW0_ACT_N_R	Upper (Port 2) green status LED anode to 100-ohm pullup to 3.3V Standby
33	DNW_LINKA100_N	Upper (Port 2) green speed LED cathode, yellow LED anode
34	LANA1000_N_R	Upper (Port 2) yellow speed LED cathode, green LED anode
Ethernet Signals		
15	DNW_MDIB_DP<0>	Port 1 transceiver 0 positive of differential pair
21	DNW_MDIB_DN<0>	Port 1 transceiver 0 negative of differential pair
23	DNW_MDIB_DP<1>	Port 1 transceiver 1 positive of differential pair
16	DNW_MDIB_DN<1>	Port 1 transceiver 1 negative of differential pair

Pin	Signal	Description
18	DNW_MDIB_DP<2>	Port 1 transceiver 2 positive of differential pair
24	DNW_MDIB_DN<2>>	Port 1 transceiver 2 negative of differential pair
26	DNW_MDIB_DP<3>	Port 1 transceiver 3 positive of differential pair
19	DNW_MDIB_DN<3>	Port 1 transceiver 3 negative of differential pair
6	DNW_MDIA_DP<0>	Port 2 transceiver 0 positive of differential pair
13	DNW_MDIA_DN<0>	Port 2 transceiver 0 negative of differential pair
11	DNW_MDIA_DP<1>	Port 2 transceiver 1 positive of differential pair
5	DNW_MDIA_DN<1>	Port 2 transceiver 1 negative of differential pair
3	DNW_MDIA_DP<2>	Port 2 transceiver 2 positive of differential pair
10	DNW_MDIA_DN<2>	Port 2 transceiver 2 negative of differential pair
8	DNW_MDIA_DP<3>	Port 2 transceiver 3 positive of differential pair
2	DNW_MDIA_DN<3>	Port 2 transceiver 3 negative of differential pair
Power Signals		
4, 7, 9, 12, 14, 17, 22, 25	+1.8V Standby	
1, 20, 35, 36, 37, 38	Chassis Ground	Ground
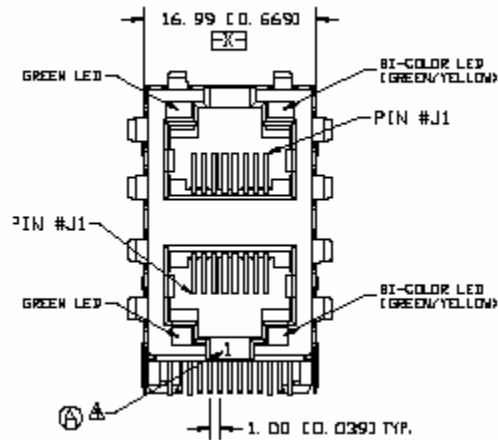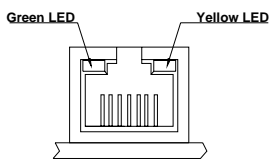
Figure 16. Dual Stacked Ethernet Connector

The main board also provides an RJ-45 connector that connects to the Intel® Management Module - Advanced Edition for out-of-band server management features. This out-of-band connector is also referred to as the Generic Communication Module (GCM), or server management Ethernet controller.
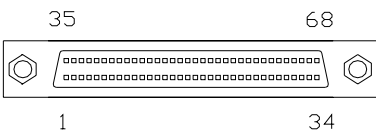
Table 11. Server Management Ethernet Connector

Pin	Signal	Description	Server Management Ethernet Connector
1	GCM_NIC_RDM		
2	GCM_NIC_RDP		
3		Magnetics Tap	
4		Magnetics Tap	
5		Magnetics Tap	
6		Magnetics Tap	
7	GCM_NIC_TDM		
8	GCM_NIC_TDP		
A1	TP_GMC_RJ45_YEL_LED_A	Yellow LED Anode	
C1	TP_GMC_RJ45_YEL_LED_C	Yellow LED Cathode	
A2	GMC_NIC_ACTLED_N	Green LED Anode	
C2	GMC_NIC_ACTLED_R_N	Green LED Cathode	

4.2.4   External 68-pin Ultra320* SCSI VHDCI Connector

As an option, either server platform can support a shielded external SCSI connection. This SCSI port is controlled by the SCSI controller component located on the Intel® Server Board Set SE8501HW4 Main Board. This interconnect is a VHDCI connector at the rear panel.

Table 12. Ultra320* SCSI VHDCI Connector Pinout

Pin	Signal Name	Ultra320* SCSI VHDCI Connector	Pin	Signal Name
1	+DB(12)		35	-DB(12)
2	+DB(13)		36	-DB(13)
3	+DB(14)		37	-DB(14)
4	+DB(15)		38	-DB(15)
5	+DB(P1)		39	-DB(P1)
6	+DB(0)		40	-DB(0)
7	+DB(1)		41	-DB(1)
8	+DB(2)		42	-DB(2)
9	+DB(3)		43	-DB(3)
10	+DB(4)		44	-DB(4)
11	+DB(5)		45	-DB(5)
12	+DB(6)		46	-DB(6)
13	+DB(7)		47	-DB(7)
14	+P_CRCA		48	+P_CRCA
15	GND		49	GND

Pin	Signal Name	Ultra320* SCSI VHDCI Connector	Pin	Signal Name
16	DIFFSENS		50	GND
17	TERMPWR		51	TERMPWR
18	TERMPWR		52	TERMPWR
19	NC		53	NC
20	GND		54	GND
21	+ATN		55	-ATN
22	GND		56	GND
23	+BSY		57	-BSY
24	+ACK		58	-ACK
25	+RST		59	-RST
26	+MSG		60	-MSG
27	+SEL		61	-SEL
28	+C/D		62	-C/D
29	+REQ		63	-REQ
30	+I/O		64	-I/O
31	+DB(8)		65	-DB(8)
32	+DB(9)		66	-DB(9)
33	+DB(10)		67	-DB(10)
34	+DB(11)		68	-DB(11)

4.2.5 Internal 68-pin SCSI Connectors

The Intel® Server Board Set SE8501HW4 Main Board has two unshielded 68-pin SCSI connectors for SCSI channel A and B.
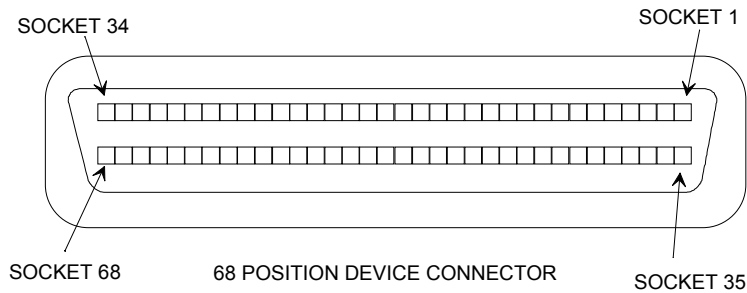
Figure 17. 68-pin SCSI Connector Non-Shielded

Table 13. 68-pin SCSI Connector Pinout

Cnnector Pin	Signal Name	Conn. Pin	Signal Name
1	SCSI(A:B)_DB_P12	35	SCSI(A:B)_DB_N12
2	SCSI(A:B)_DB_P13	36	SCSI(A:B)_DB_N13
3	SCSI(A:B)_DB_P14	37	SCSI(A:B)_DB_N14
4	SCSI(A:B)_DB_P15	38	SCSI(A:B)_DB_N15
5	SCSI(A:B)_DB_PP1	39	SCSI(A:B)_DB_NP1

Cnnector Pin	Signal Name	Conn. Pin	Signal Name
6	SCSI(A:B)_DB_P0	40	SCSI(A:B)_DB_N0
7	SCSI(A:B)_DB_P1	41	SCSI(A:B)_DB_N1
8	SCSI(A:B)_DB_P2	42	SCSI(A:B)_DB_N2
9	SCSI(A:B)_DB_P3	43	SCSI(A:B)_DB_N3
10	SCSI(A:B)_DB_P4	44	SCSI(A:B)_DB_N4
11	SCSI(A:B)_DB_P5	45	SCSI(A:B)_DB_N5
12	SCSI(A:B)_DB_P6	46	SCSI(A:B)_DB_N6
13	SCSI(A:B)_DB_P7	47	SCSI(A:B)_DB_N7
14	SCSI(A:B)_DP0_P	48	SCSI(A:B)_DP0_N
15	GND	49	GND
16	SCSI(A:B)_DIFFSENSE	50	GND
17	SCSI(A:B)_TERMPWR	51	SCSI(A:B)_TERMPWR
18	SCSI(A:B)_TERMPWR	52	SCSI(A:B)_TERMPWR
19	RESERVED (NC)	53	RESERVED
20	GND	54	GND
21	SCSI(A:B)_ATN_P	55	SCSI(A:B)_ATN_N
22	GND	56	GND
23	SCSI(A:B)_BSY_P	57	SCSI(A:B)_BSY_N
24	SCSI(A:B)_ACK_P	58	SCSI(A:B)_ACK_N
25	SCSI(A:B)_RST_P	59	SCSI(A:B)_RST_N
26	SCSI(A:B)_MSG_P	60	SCSI(A:B)_MSG_N
27	SCSI(A:B)_SEL_P	61	SCSI(A:B)_SEL_N
28	SCSI(A:B)_CD_P	62	SCSI(A:B)_CD_N
29	SCSI(A:B)_REQ_P	63	SCSI(A:B)_REQ_N
30	SCSI(A:B)_IO_P	64	SCSI(A:B)_IO_N
31	SCSI(A:B)_DB_P8	65	SCSI(A:B)_DB_N8
32	SCSI(A:B)_DB_P9	66	SCSI(A:B)_DB_N9
33	SCSI(A:B)_DB_P10	67	SCSI(A:B)_DB_N10
34	SCSI(A:B)_DB_P11	68	SCSI(A:B)_DB_N11

4.2.6 80-pin SCA2 Hard Disk Drive Connectors

Each server platform SCSI backplane board has five SCA2 connectors.
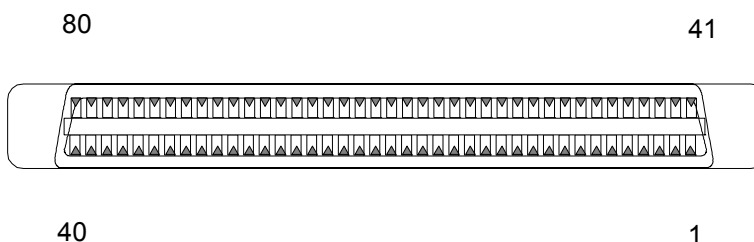
Figure 18. SCA2 80-pin SCSI Connector

Table 14. SCA2 Drive Connector Pinout

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	+12V	21	LVD_DB7_N	41	GND	61	LVD_DB7_P
2	+12V	22	LVD_DB6_N	42	GND	62	LVD_DB6_P
3	+12V	23	LVD_DB5_N	43	GND	63	LVD_DB5_P
4	+12V	24	LVD_DB4_N	44	SCSI_MATED	64	LVD_DB4_P
5	NC	25	LVD_DB3_N	45	NC	65	LVD_DB3_P
6	NC	26	LVD_DB2_N	46	DIFFSENSE	66	LVD_DB2_P
7	LVD_DB11_N	27	LVD_DB1_N	47	LVD_DB11_P	67	LVD_DB1_P
8	LVD_DB10_N	28	LVD_DB0_N	48	LVD_DB10_P	68	LVD_DB0_P
9	LVD_DB9_N	29	LVD_DBP1_N	49	LVD_DB9_P	69	LVD_DBP1_P
10	LVD_DB8_N	30	LVD_DB15_N	50	LVD_DB8_P	70	LVD_DB15_P
11	LVD_IO_N	31	LVD_DB14_N	51	LVD_IO_P	71	LVD_DB14_P
12	LVD_REQ_N	32	LVD_DB13_N	52	LVD_REQ_P	72	LVD_DB13_P
13	LVD_CD_N	33	LVD_DB12_N	53	LVD_CD_P	73	LVD_DB12_P
14	LVD_SEL_N	34	+5V	54	LVD_SEL_P	74	SCSI_MATED
15	LVD_MSG_N	35	+5V	55	LVD_MSG_P	75	GND
16	LVD_RST_N	36	+5V	56	LVD_RST_P	76	GND
17	LVD_ACK_N	37	NC	57	LVD_ACK_P	77	SCSI_ACT
18	LVD_BSY_N	38	GND	58	LVD_BSY_P	78	NC
19	LVD_ATN_N	39	SCSI_ID (0)	59	LVD_ATN_P	79	SCSI_ID(1)
20	LVD_DBP_N	40	SCSI_ID (2)	60	LVD_DBP_P	80	SCSI_ID(3)

4.2.7 AC Power Input Connectors

An IEC320 15A C14 receptacle is located on each power supply. An appropriately-sized power cord and AC main power source are required. See Section 5 for system voltage, frequency, and current draw specifications. An external AC cord retention feature is supported by the chassis but is not supplied by Intel. Refer to the *Intel® Server Product SR4850HW4 Power Cord Enabling Specification* to assist in the procurement of power cords for the platform.

4.2.8   3-pin Chassis Intrusion Connector

See the table below for 3-pin Chassis Intrusion Connector information.

Table 15. 3-pin Chassis Intrusion Connector

Pin	Signal
1	Intrusion event
2	GND
3	Intrusion button attached

4.2.9   12-pin Power Distribution Board Power Connector

Each server platform power distribution board has three power connectors, two for the Server Platform SE8501HW4 Main Board and one for the SCSI backplane board.

Table 16. Power Connector Pinout

Pins	Signal
1-6	GND
7-12	+12V

4.2.10   30-pin Power Distribution Board to Main Board Connector

See the table below for the 30-pin power distribution board to main board connector information.

Table 17. 30-pin Power Distribution Board to Main Board Connector

Pins	Signal Description
1,17,25,30	GND
6,7,10,12,14,15,24	3.3V$_{stby}$
2	PS1 present
3	PS2 AC good
4	PS Fan control
5	PS1 AC good
8	PS1 AC range
9	PS on
11	I^{2}C SCL
13	I^{2}C SDA
16	12V Sense return
18	PS 90% utilization
19	PS 74% utilization
20	PS 45% utilization
21	PS 37% utilization
22	Int alert
23	PS2 AC range
26	PS1 AC good
27	12V Sense
28	PS1 power OK
29	PS2 present

4.2.11   34-pin Front Panel I/O Board to SCSI Backplane Board Connector

See the tables below for the 34-pin front panel I/O board to SCSI backplane board connector information.

Table 18. SCSI Backplane Board Connector Signal Description

Pins	Signal Description
1,12,13,22,23,33,34	Ground
5,6,7	5V
8,27,28,29,30	$3.3V_{stby}$
2,17	Unused
3	SCSI LED activity, active low
4	SCSI fault LED, active low
9	Fan 1 tach
10	Fan 2 tach
11	Fan 3 tach
14	Fan 4 tach
15	Fan PWM
16	Backplane +5 enable
18	Backplane power good
19	PCI reset, active low
20	I^2C IPMB SCL
21	Keying Pin, unused
24	Backplane presence, active low
25	I^2C IPMB SDA
26	System power good
31	I^2C Seg2 SDA
32	I^2C Seg2 SCL

4.2.12   100-pin Main Board to Front Panel I/O Board Connector

See the tables below for the 100-pin mainboard to SCSI backplane board connector information.

Table 19. 100-pin Connector Pinout (Unused and Ground)

Pin Numbers	Signal Descriptions
1,3,7,10,14,20,27,42,51,52,54,58,62,65,73,77,79,82,83,85,87,89,91,93,95,100	Ground
4,6,8,12,13,15,17,19,22,24,26,29,31,33,35,37,41,44,46,48,50,53,56,59,61,66,68,70,72	Unused

Table 20. 100-pin Connector Pinout (Signals)

Pin Number	Signal Name	Signal Description
2	GND – RESISTOR	Ground through zero ohm resistor
5	GND – RESISTOR	Ground through zero ohm resistor
9	GND – RESISTOR	Ground through zero ohm resistor
11	GND – RESISTOR	Ground through zero ohm resistor
16	FAN1_TACH	Fan 1 Tachometer signal – edges per revolution
18	FAN2_TACH	Fan 2 Tachometer signal – edges per revolution
21	FAN3_TACH	Fan 3 Tachometer signal – edges per revolution
23	FAN4_TACH	Fan 4 Tachometer signal – edges per revolution
25	RESET_BTN	Front panel reset button signal
28	FAN5_TACH	Fan 5 Tachometer signal – edges per revolution
30	FAN6_TACH	Fan 6 Tachometer signal – edges per revolution
32	FAN_PWM1	Zone 1 Fan PWM control signal
34	5VSTANDBY	5Vstandby to front panel
36	BP_D2D_EN	Backplane D2D enable
38	5VSTANDBY	5Vstandby to front panel
39	ICH5_PDD8	IDE primary disk data 8
40	HD_ACT_N	SATA hard drive activity
43	BP_PWRGOOD	Backplane power good signal
45	PCI_RST_BP_N	PCI reset to backplane
47	CP_PWR_LED	Control Panel Power LED signal
49	CP_SPKR_OUT_N	Speaker signal to front panel
55	NIC1_LED	NIC 1 activity LED signal
57	ID_LED	ID LED Signal
60	CP_BTN_PWR_ON	Control panel power button signal
63	SYS_STATUS_AMB_LED	System Status amber LED signal
64	CD_PRES_N	CD drive presence signal
67	CP_ID_BUTTON_RAW	Control panel ID button signal
69	CP_BTN_NMI	Control panel NMI button
71	NIC2_LED	NIC2 activity LED signal
74	I2C_IPMB_SCL	IPMB I^{2}C bus clock

Pin Number	Signal Name	Signal Description
75	BP_PRES_N	SCSI backplane board presence signal, indicates System board interlock is achieved
76	I2C_IPMB_SDA	IPMB I^{2}C bus data
78	SYS_PWRGD4	Main board power good signal to SCSI backplane board
80	USB_FRONT_N	USB port 2 differential negative signal to front bezel
81	USB_FRONT_P	USB port 2 differential positive signal to front bezel
84	VID_RED_FRONT	Video DAC 2 RED signal
86	VID_BLUE_FRONT	Video DAC 2 BLUE signal
88	VID_GREEN_FRONT	Video DAC 2 GREEN signal
90	VID_HS_OUT_FRONT	Video DAC 2 Horizontal Synchronization signal
92	VID_VS_OUT_FRONT	Video DAC 2 Vertical synchronization signal
94	VID_DDC_OUT_SCLK_FRONT	Video monitor detection I^{2}C bus clock
96	VID_DDC_OUT_SDA_FRONT	Video monitor detection I^{2}C bus data
97	I2C_CP_SDA	Control panel I^{2}C bus data (I^{2}C segment 2)
98	SYS_STATUS_GRN_LED	System status green LED signal
99	I2C_CP_SCL	Control panel I^{2}C bus data (I^{2}C segment 2)

4.2.13   Peripheral Power Connector

Each server platform SCSI backplane board provides a standard power connector to drive both the SCSI tape device and optical drive.

Table 21. Peripheral Power Connector

Pins	Signal
1	12V
2,3	GND
4	5V

4.2.14   Fan Module Connectors

The SCSI backplane board contains two fan module power connectors and supplies the power for the fans in the system.

Table 22. Fan Power and Control (left)

Pins	Signal
1, 2, 8, 9	12V
3, 4, 10 , 11	GND
5, 12	FAN_PWM
6	FAN2_TACH
7	FAN12_PRES_L
13	FAN1_TACH
14	FAN12_AMB

Table 23. Fan Power and Control (right)

Pins	Signal
1, 2, 8, 9	12V
3, 4, 10, 11	GND
5, 12	FAN_PWM
6	FAN4_TACH
7	FAN34_PRES_L
13	FAN3_TACH
14	FAN34_AMB

4.2.15   50-pin Front Panel Control Module Connector

This connector is used between the Intel® Server Platforms SR4850HW4 and SR4850HW4/M front panel I/O board and the standard button control panel or Local Control Panel.

Table 24. Front Panel Control Module Connector Signal Description

Pin	Signal Description	Pin	Signal Description
1	+5V Standby	26	Not used
2	+5V Standby	27	LAN1 link
3	+5V	28	LAN1 activity
4	Hard drive activity,	29	GND
5	System status	30	Front panel NMI button, not used
6	Not used	31	Not used
7	System status	32	Not used
8	+5V Standby	33	Not used
9	+5V Standby	34	Not used
10	Power LED	35	Not used
11	Hard drive activity pull up	36	Not used
12	I²C IPMB SDA	37	Not used
13	GND	38	Not used
14	I²C IPMB SCL	39	Not used
15	System ID LED	40	Not used
16	Power button input, active low	41	GND
17	LAN2 link	42	Not used
18	Hard drive fault	43	GND
19	LAN2 activity	44	Not used
20	Front panel reset button, active low	45	GND
21	Not used	46	Not used
22	GND	47	GND
23	Not used	48	Not used
24	Front panel ID button, active low	49	GND
25	Not used	50	Not used

4.2.16   SATA-to-IDE Converter Board Connector

Each server platform SATA-to-IDE converter board connects to an optical IDE drive with this connector to the SATA controller.

Table 25. SATA-to-IDE Converter Board Connector

Pin	Signal	Pin	Signal
1	Audio L-Ch	2	Audio R-Ch
3	Audio GND	4	GND
5	RESET-	6	DD8
7	DD7	8	DD9
9	DD6	10	DD10
11	DD5	12	DD11
13	DD4	14	DD12
15	DD3	16	DD13
17	DD2	18	DD14
19	DD1	20	DD15
21	DD0	22	DMARQ
23	GND	24	/DIOR
25	DIOW-	26	GND
27	IORDY	28	/DMACK
29	INTRQ	30	/IOCS16
31	DA1	32	/PDIAG
33	DA0	34	DA2
35	/CS1FX	36	/CS3FX
37	/DASP	38	+5V
39	+5V	40	+5V
41	+5V	42	+5V
43	GND	44	GND
45	GND	46	GND
47	CSEL	48	GND
49	RESERVED	50	RESERVED

4.2.17   SATA-to-IDE Converter Board Power Connector

See the table below for the SATA-to-IDE converter board Power Connector information.

Table 26. SATA-to-IDE Converter Board Power Connector

Pin	Signal
1	+5 VDC
2	Ground
3	Ground
4	+12V (Not used on adapter)

4.2.18 SATA Connector

The Intel® Server Board Set SE8501HW4 Main Board has a SATA connector that is routed via a cable to the server platform SATA-to-IDE converter board.

Table 27. SATA Signal Connector

Pin	Signal
1	Ground
2	A+
3	A-
4	Ground
5	B-
6	B+
7	Ground

5.   Power Supply

This section describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M power supplies. Each server platform power supply is current sharing with auto ranging input. The Intel® Server Platforms SR4850HW4 and SR4850HW4/M power supply is approximately 7.75 inches wide, 13.5 inches deep and 1.4 inches high. Two units mount into each server with a locking latch.

The output rating of the power supply is 1470W when operated between 170VAC and 264VAC. The platform can run with a single power supply installed. For redundancy, two power supplies must be installed.

The server platform power supply is shown in Figure 19.
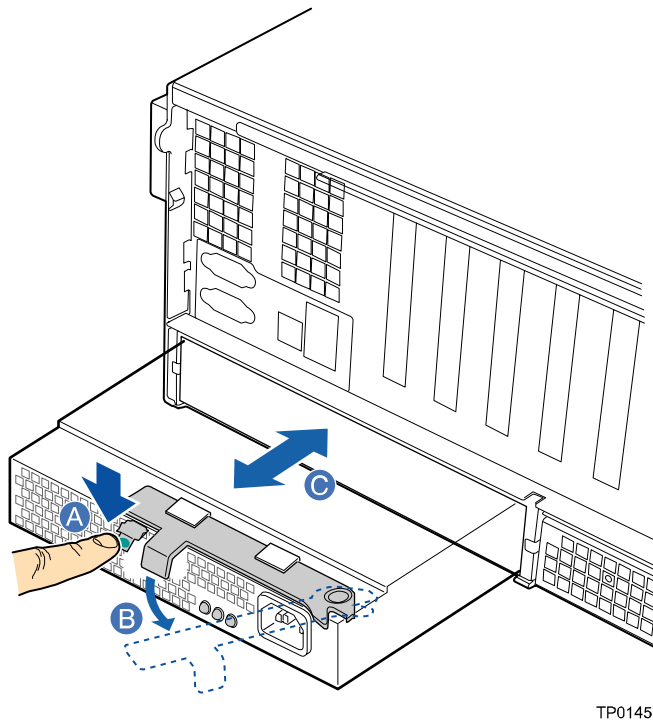
Figure 19. 1470W Power Supply

5.1   Mechanical Outline

The mechanical outline and dimensions are shown on the next page. The dimensions should be used only as a reference.
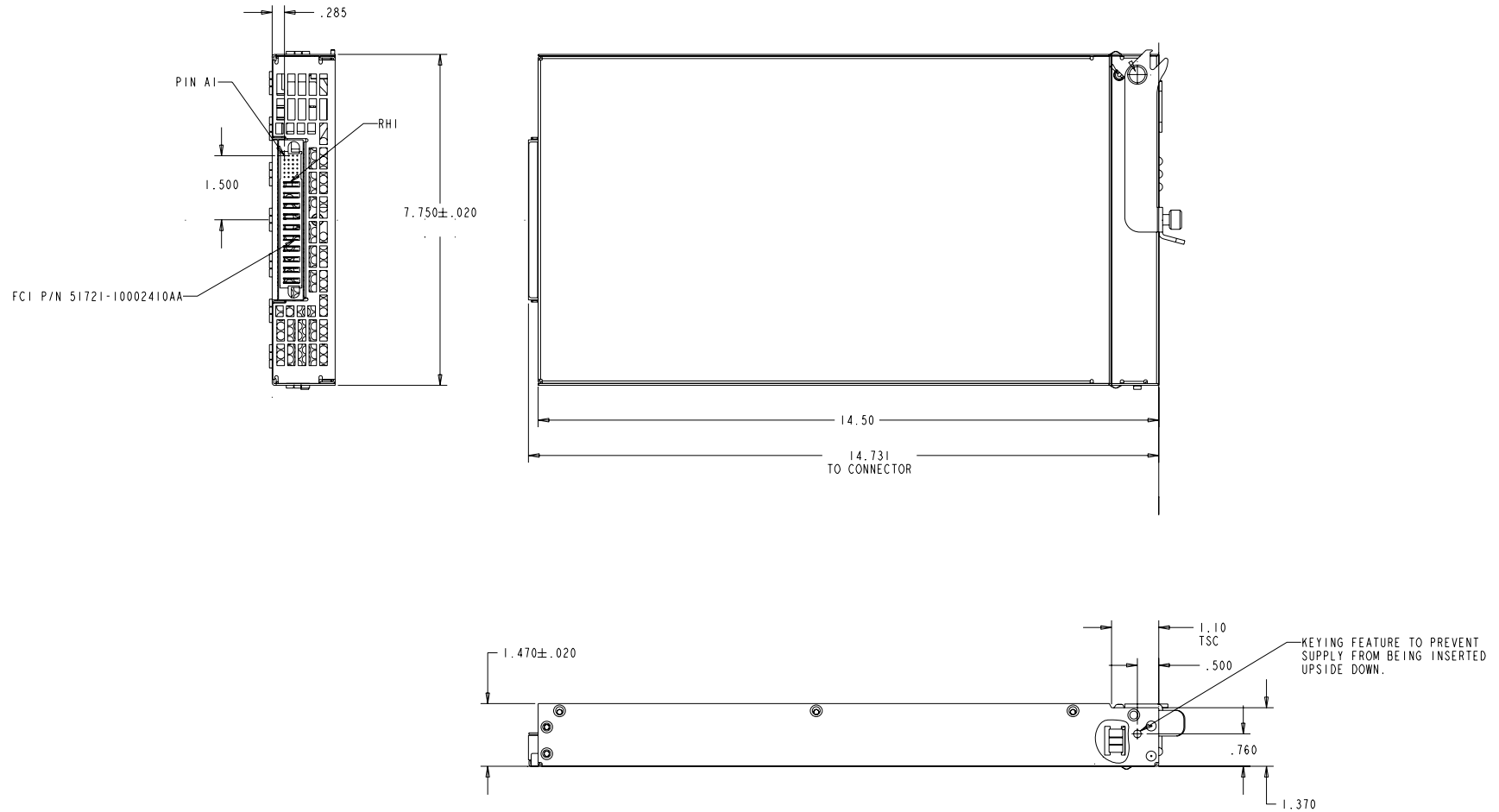
Figure 20. Power Supply Mechanical Specification

5.2   Power Supply Output Interface

5.2.1   Blade Connector

The power supply output power and control signals interface to the system power distribution board through an FCI PowerBlade* right-angle connector.

Table 28. PowerBlade-pin Assignment

P1	Pin	Signal Name	Amps per pin
FCI Powerblade* 51721-10002410AA or approved equivalent Mates to FCI 51741-10002410CC on power distribution board	PB RH1	+12V Return	26
	PB RH2	+12V Return	26
	PB RH3	+12V Return	26
	PB RH4	+12V Return	26
	PB RH5	+12V Return	26
	PB RH6	+12V	26
	PB RH7	+12V	26
	PB RH8	+12V	26
	PB RH9	+12V	26
	PB RH10	+12V	26
	A1	PS_KILL	
	A2	+12V Current Share	
	A3	Return	
	A4	+3.3V$_{stby}$	
	A5	PS A0	
	A6	+3.3V$_{stby}$	
	B1	Return	
	B2	Not Used	
	B3	Return	
	B4	+3.3V$_{stby}$	
	B5	SDA	
	B6	-PS_ON	
	C1	Return	
	C2	Not Used	
	C3	Return	
	C4	+3.3V$_{stby}$	
	C5	SCL	
	C6	VIN_GOOD	
	D1	-PS_Present	
	D2	+12V_Sense	
	D3	+12V_Rtn_Sense	
	D4	+3.3V$_{stby}$	
	D5	S_INT(Alert)	
	D6	POK	

Intel order number D22226-003

5.3   AC Input Requirement

5.3.1 AC Input Voltage Specification

The power supply operates over the range and limits shown in Table 29.

Table 29. AC Input Rating

Parameter	Minimum	Nominal	Maximum	Unit
Vin (voltage)	170	220/240	264	VACrms
Vin (frequency)	47	50/60	63	Hz
Iin (180VAC)			10.4	Arms
Iin (170VAC)			11.43	Arms
Vin (turn-on)	160		170	VACrms
Vin (turn-off)	150		160	VACrms

The main outputs of the power supply will turn off per VIN (turn-off). Any standby outputs may continue to operate at input AC voltages below VIN (turn-off).

5.3.2 Efficiency

The power supply has a minimum efficiency of 81% when operated under the maximum loading conditions of 180VAC-264VAC, and environmental conditions. The minimum efficiency is 78% when operated between 170-180VAC.

For loads less than maximum, the internal power dissipation cannot exceed 453W.

5.3.3 Input Over-Current Protection

The power supply has internal primary over-current protection. A normal-blow (fast blow), high-breaking-capacity fuse is placed in the input circuit.

5.3.4 Inrush Current

When input power is applied to the power supply, any initial current surge or spike of 10ms or less will not exceed 55A peak. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 10ms, and less than 150ms, will not exceed 25A peak.

For any conditions during turn-on, the inrush current will not open the primary input fuse or damage any other components.

5.3.5 Auto Restart

Although the power supply may power off under the conditions mentioned in Sections 5.3.3 and 5.3.4, it is capable of restarting, either automatically or under program control after the disturbance. In addition, the power supply will not be in a latched state such that any of the operator buttons/buttons do not operate correctly after the disturbance. At no time will the AC power cord have to be removed to clear an error condition.

Auto restart conditions are tested from -40% to -100% AC under-voltage conditions for time intervals ranging from 25ms to 2sec. For each time interval, all of the under-voltage conditions listed below will be tested. These tests are performed at both the lowest and highest nominal operating voltages of the power supply.

Time intervals: 25ms, 40ms, 60ms, 90ms, 130ms, 200ms, 280ms, 400ms, 600ms, 900ms, 1.3sec, and 2.0sec

Under-voltage deviation from nominal AC voltage: -40%, -50%, -60%, -70%, -80%, -90%, -100%

5.3.6 Power Factor Correction

The Power Factor Correction (PFC) is 0.97, or greater, for all specified AC input voltages with output loads greater than 90%.

The PFC is 0.75, or greater, for all specified AC input voltages with output loads greater than 50%.

5.3.7 AC Input Connector

The AC input receptacle is an IEC-320 15A rated for 250VAC minimum.

5.4 DC Output Requirements

The DC output voltages will remain within the regulation ranges shown in the Table 30 when measured at the load end of the connector.

Table 30. DC Output Voltage Regulation Limits

Output Level	Minimum (V)	Nominal (V)	Maximum (V)
+12V	11.64	12.00	12.60
+3.3V$_{stby}$	3.17	3.30	3.47

5.4.1 Hot-swap Functionality

Hot-swapping is the process of inserting and extracting a power supply from an operating power bay. During this process, the output voltages will remain within the limits specified in Table 30 and the system will continue to operate normally.

5.4.2 Output Current Rating

The combined continuous output power for all outputs will not exceed 1470W. Each output has a maximum and minimum current rating shown in Table 31.

Table 31. 1470W Load Ratings

Output Level	Minimum (A)[1]	Nominal (A)[1]	Maximum (A)[1]	Peak (A)[1]
+12V	1.0		121.0	124.0[2]
+3.3V$_{stby}$	0.0		5.0	

1. Values are at the system level. For 1+1 redundant systems the load each supply provides is based on its current-sharing accuracy.
2. Peak +12V output power not to exceed 15 seconds in duration. Maximum duty cycle is 5%.

5.4.3 Over and Under-Voltage Protection

The power supply provides latch mode over and under voltage protection as defined in the following table. A fault on any output will cause the rest of the outputs to latch off. See note 3 below the table.

Table 32. Over- and Under-voltage Limits

Output Level	Under-Voltage		Over Voltage	
	Minimum (V)	Maximum (V)	Minimum (V)	Maximum (V)
+12V	10.5	11.0	13.5	15.0
+3.3V$_{stby}$[1,2,3]	2.77	3.00	3.76	4.3

1. In standby mode, the power supply does not latch off due to an under-voltage condition.
2. In standby mode, the power supply may or may not latch off due to an over-voltage condition.
3. A fault on any output other than +3.3V$_{stby}$ will not cause the +3.3V$_{stby}$ to turn off. A fault on +3.3V Standby causes the other outputs to turn off.

5.4.4   Over-current Protection

Over-current is a fault condition defined as a 10A/s current ramp starting from full load applied to the output under test. A fault on any output causes the rest of the outputs to latch off. See note 3 below the following table.

Table 33. Over-current Protection Limits

Output Level	Minimum (A)[2,4]	Maximum (A)[2,4]
+3.3V Standby [1,3,5]	5.3	6.2
+12V	130.0	149.0

1. Output is Level III SELV and non-energy hazard complaint
2. The above current limits will be satisfied throughout the entire operating temperature range
3. A fault on any output other than +3.3V$_{stby}$ will not cause the +3.3V$_{stby}$ to turn off. A fault on +3.3V$_{stby}$ will cause the other outputs to turn off.
4. Dynamic loading must not cause a false over current when 2 supplies are in parallel.
5. The +3.3V$_{stby}$ output will not latch off. It must return to normal operation once the fault is removed. Current foldback method is preferred.

5.4.5 Short Circuit Protection

A short circuit, which is defined as an impedance of 0.1Ω, or less, applied to any output during start-up or while running will not cause any damage to the power supply (connectors, components, PCB traces, etcetera.).

When the +3.3V$_{stby}$ is shorted the output may go into "hiccup mode". When the +3.3V$_{stby}$ attempts to restart the maximum peak current from the output must be less than 8.0A. The maximum average current, taking into account the "hiccup" duty cycle, must be less than 4.0A.

5.4.6 Reset After Shutdown

If the power supply latches into a shutdown state due to a fault condition on any output, the power supply will return to normal operation only after the fault has been removed and the power supply has been power-cycled. Power cycling is defined as either:

▪ Removing AC input power, waiting for +3.3V$_{stby}$ to drop below 1.0V, then reapplying AC power. The time it takes for +3.3V$_{stby}$ to drop below 1.0V shall not exceed 15 seconds.
▪ Cycling the state of PS_ON from on to off to on. The minimum cycle time is 1ms.

5.4.7 Current Sharing

Outputs of two supplies that are connected in parallel must meet the regulation requirements of a single supply. Under normal operation with two supplies running in parallel the outputs must share the load current. If one of the supplies fails, the remaining supply must pick up the entire load without any of the outputs dropping out of regulation. A defective supply that is connected to the output voltage bus has no adverse effect on the operation of the remaining functional supply.

Table 34. Output Current Sharing

Output Level	OUTPUT SHARING
+3.3V$_{stby}$	Not required
+12V	Active

5.4.8 I^{2}C Devices

All I^{2}C devices are powered from the cathode side of the +3.3V$_{stby}$ OR'ing diode. This allows the status and FRU data to be read from a power supply that is not powered on nor has some other fault. Protection is provided so if a power supply fault occurs it does not take down the +3.3V$_{stby}$ bus.

Address locations can be determined by external settings through P1, pin A5. The 0xA1 and 0xA2 address will be wired high on the power supply. (NE1617A does not have a 0xA2 address). The alert signal from (only) the I/O port will be through P1, pin D5.

5.4.8.1   FRU Data

The power supply contains a serial EEPROM. The address is either 0xAC or 0xAE, depending on address bit 0xA0.

5.4.8.2   I/O Port Expander

The power supply contains a serial I/O port expander, Philips* PCF8575 or approved equivalent. The address is either 0x7C or 0x7E, depending on address bit 0xA0.

Table 35. I/O Port Expander Signals

Signal Name	I/O Port
-OC +12V	P0
Not Used (pull high)	P1
-UV	P2
-OV	P3
VIN_GOOD	P4
P_GOOD	P5
-PS_STATUS	P6
AC_PRFAIL	P7

Table 36. I/O Port Expander Codes

Signal Name	Normal Off	Normal On	+12V OC	AC Dropout	Low AC	No AC
-OC +12V	1	1	0	1	1	1
Not Used	1	1	1	1	1	1
-UV	1	1	1 or 0	1	1	1
-OV	1	1	1	1	1	1
VIN_GOOD	1	1	1	1 or 0	0	0
P_GOOD	0	1	0	0	0	0
-PS_STATUS	1	0	1	1	1	1
-AC_PRFAIL	1	1	1	0	1	1

Note: The No AC column refers to the status of the I/O port when only the external +3.3$_{stby}$ bus voltage is available.

5.4.8.3   Temperature Sensors

A Philips* NE1617A or equivalent temperature sensor is located near the air inlet of the supply. The address is either 0x34 or 0x9C depending on address bit 0xA0. A second sensor is near the exhaust outlet.

5.4.9 Power Supply Module LED indicators

There are three LEDs on the rear of the power supply, next to the AC input power connector.

5.4.9.1   Power Supply Fail

The amber power supply fail LED is driven by internal circuitry. It lights when a power rail has failed. The LED is not lit if the supply turns off due to PS_KILL. The LED illuminates even if the power supply is in a latched state. The only time during a fault when it does not illuminate is if the +3.3V$_{stby}$ is lost.

5.4.9.2   Power Good

The green power good LED is driven by internal circuitry. It lights whenever PWRGD is asserted.

5.4.9.3   AC OK

The green AC OK LED is driven by internal circuitry. It lights whenever VIN_GOOD is asserted.

6.   Power Distribution Board

This section describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M power distribution board and is organized as follows:

Section 6.1:   Introduction
An overview of the server platform power distribution board and board layout.

Section 6.2:   Signal Descriptions and Pinouts
Summarizes the server platform power distribution board internal signals and connector signals, and the connector signal-pin names and the signal descriptions.

6.1   Introduction

The server platform power distribution board provides docking connectors for the hot-swap power supply modules. It distributes power to the server platform backplane board and Intel® Server Board Set SE8501HW4 Main Board as well as power consumption information to the Intel® Server Board Set SE8501HW4 Main Board via a group of comparators. The power distribution board contains EEPROM FRU information storage but has no logic on it; it is a pass-through board. The signals shared between the two power supplies are shown in the diagram below.
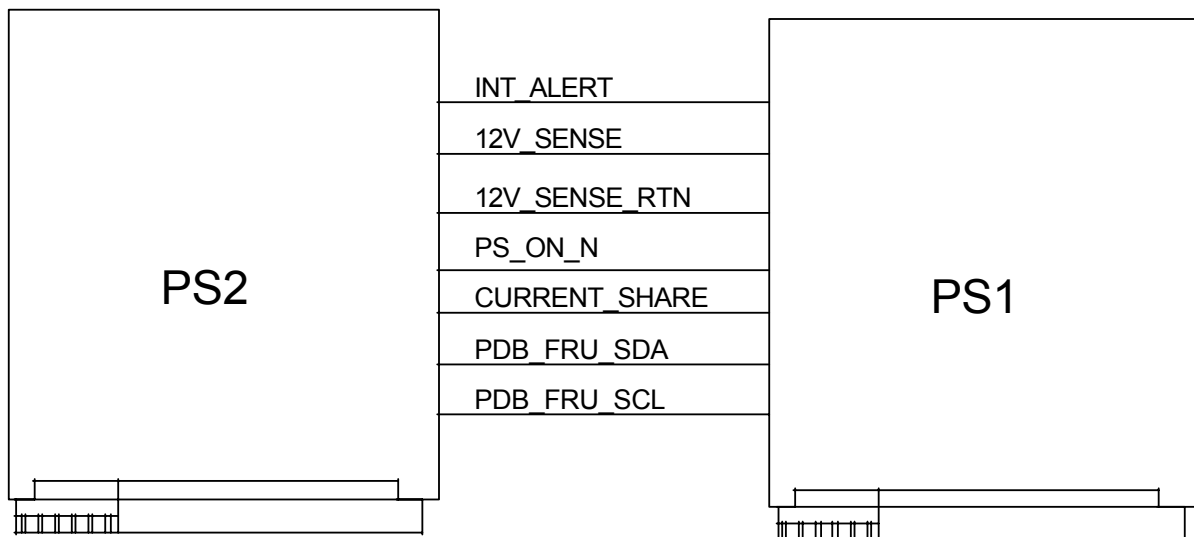
Figure 21. Power Supply Signal Sharing
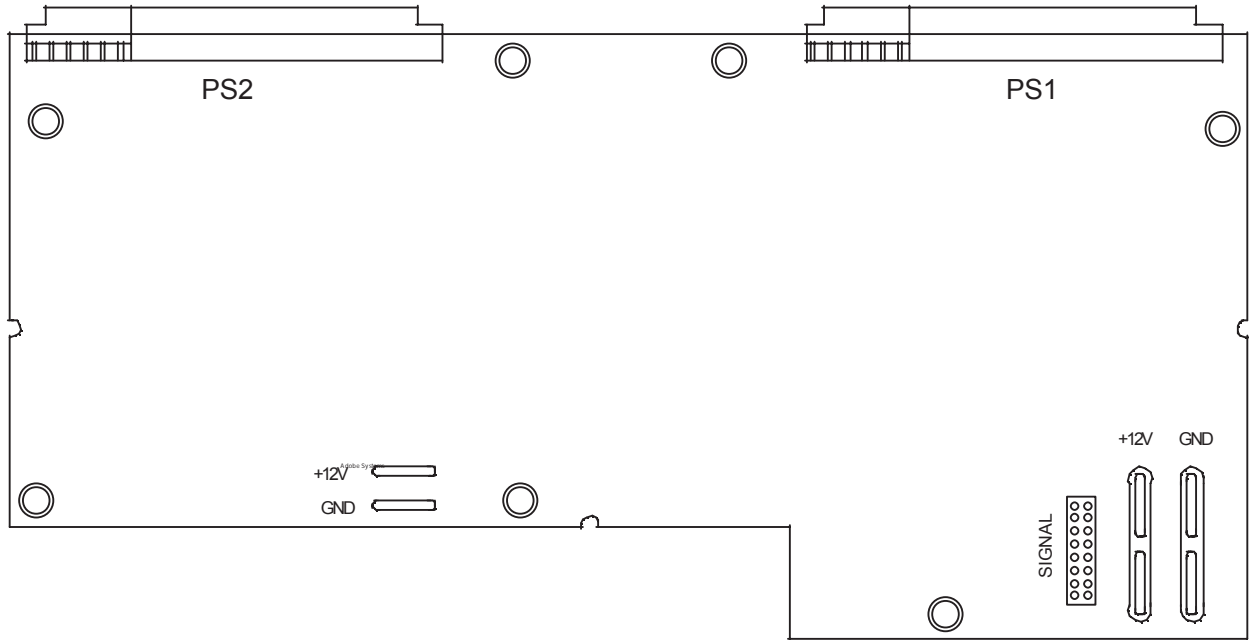
Figure 22. Power Distribution Board Layout

6.2   Signal Descriptions and Pinouts
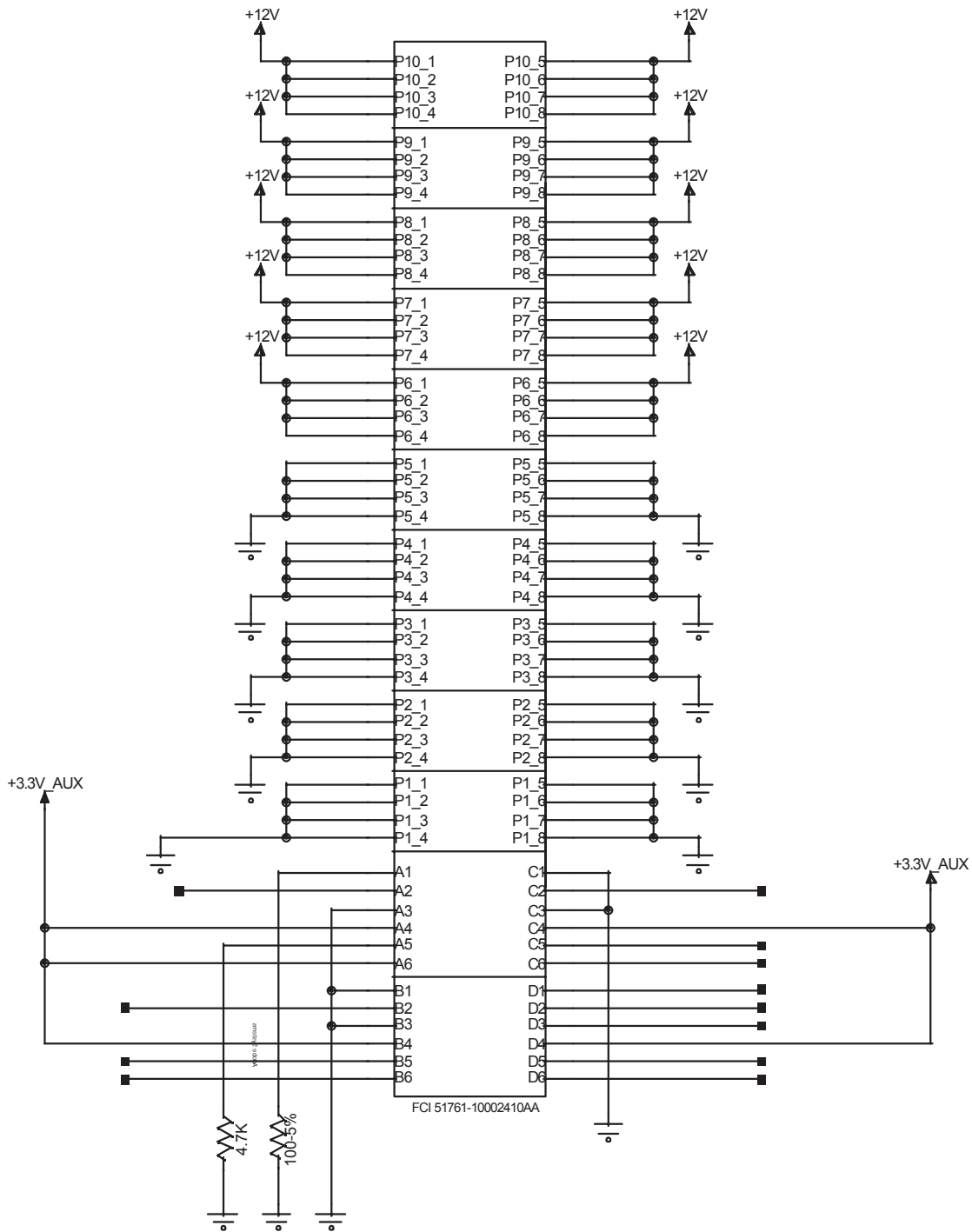
Figure 23. Power Distribution Board to Power Supply Module Docking Connector Signals
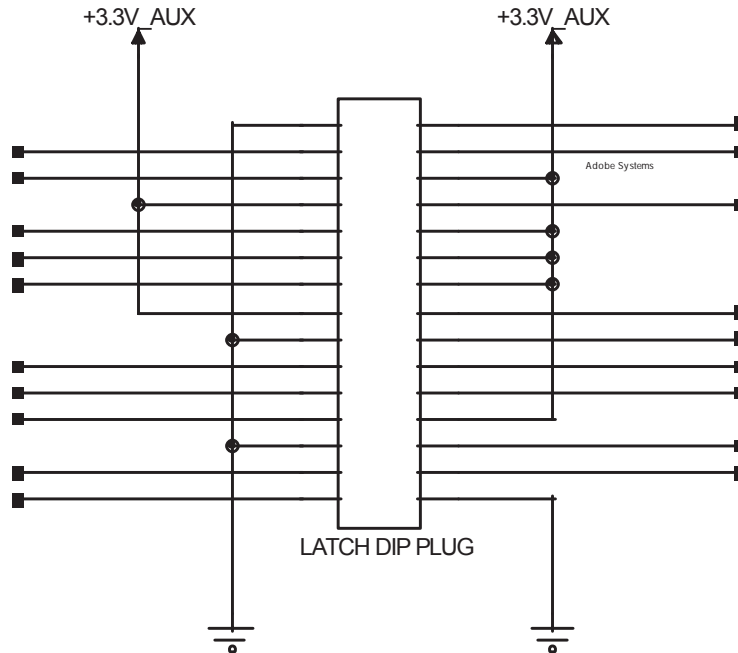
Figure 24. Main Board Connector Signals

6.2.1 Remote On/Off (-PS_ON)

The power supply DC outputs are enabled when this signal is pulled low, below 0.8V. In the low state, the input will not source more than 1mA of current. The DC outputs are disabled when the input is driven higher than 2.4V, or open circuited.

Provisions for de-bouncing are included in the –PS_ON circuitry. This prevents the power supply from oscillating on and off at startup.

6.2.2 Power Good Signal (POK or P_GOOD)

A power good signal is asserted or driven high by the power supply to indicate that all outputs are valid. If any of the outputs fails, this output is driven low.

If AC main power is lost, or if a fan has failed, this signal must be driven low at least 1ms before any of the outputs go out of regulation.

The output is an open collector/drain. It is capable of driving the output below 0.4V with a load of 4mA. The output has an internal pull-up resistor of 1KΩ between the output and +3.3V$_{stby}$. The pull-up is connected to the anode side of the +3.3V$_{stby}$ OR'ing diode.

This output also goes to I^{2}C port P5.

6.2.3 VIN_GOOD

This signal is asserted, driven high, by the power supply to indicate that the input voltage meets the minimum requirements of the input voltage range. Within 12ms after falling outside the input voltage requirements the output must be driven low.

The output is an open collector/drain. It is capable of driving the output below 0.4V with a load of 4mA. The output has an internal pull-up resistor of 1KΩ between the output and +3.3V$_{stby}$. The pull-up is connected to the anode side of the +3.3V$_{stby}$ OR'ing diode.

This output also goes to I^{2}C port P4.

7.   SCSI Backplane Board

This section describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SCSI backplane board and is organized as follows:

Section 7.1: **Introduction**
Provides an overview of the server platform SCSI backplane board.

Section 7.2: **Functional Architecture**
Describes the server platform SCSI backplane board functional blocks and architecture.

Section 7.3: **Signal Descriptions**
Summary of the server platform SCSI backplane board internal signals, connector signals, and the connector signal-pin names including the signal descriptions.

Section 7.4: **Electrical, Environmental, and Mechanical Specifications**
Specifies operational parameters and considerations, and connector pinouts.

7.1   Introduction

The server platform SCSI backplane board supports up to five hot-swap Ultra320* SCSI hard disk drives mounted into the chassis. The board provides drive status information and allows adding, removing and replacing hard disk drives without powering down the system. The following block diagram, architectural overview, and placement diagram provide an overview of the SCSI backplane board.

Intel order number D22226-003

7.1.1 Block Diagram

The block diagram divides the SCSI backplane board into physical and functional blocks. Arrows represent buses and signals. Blocks represent the physical and functional blocks.
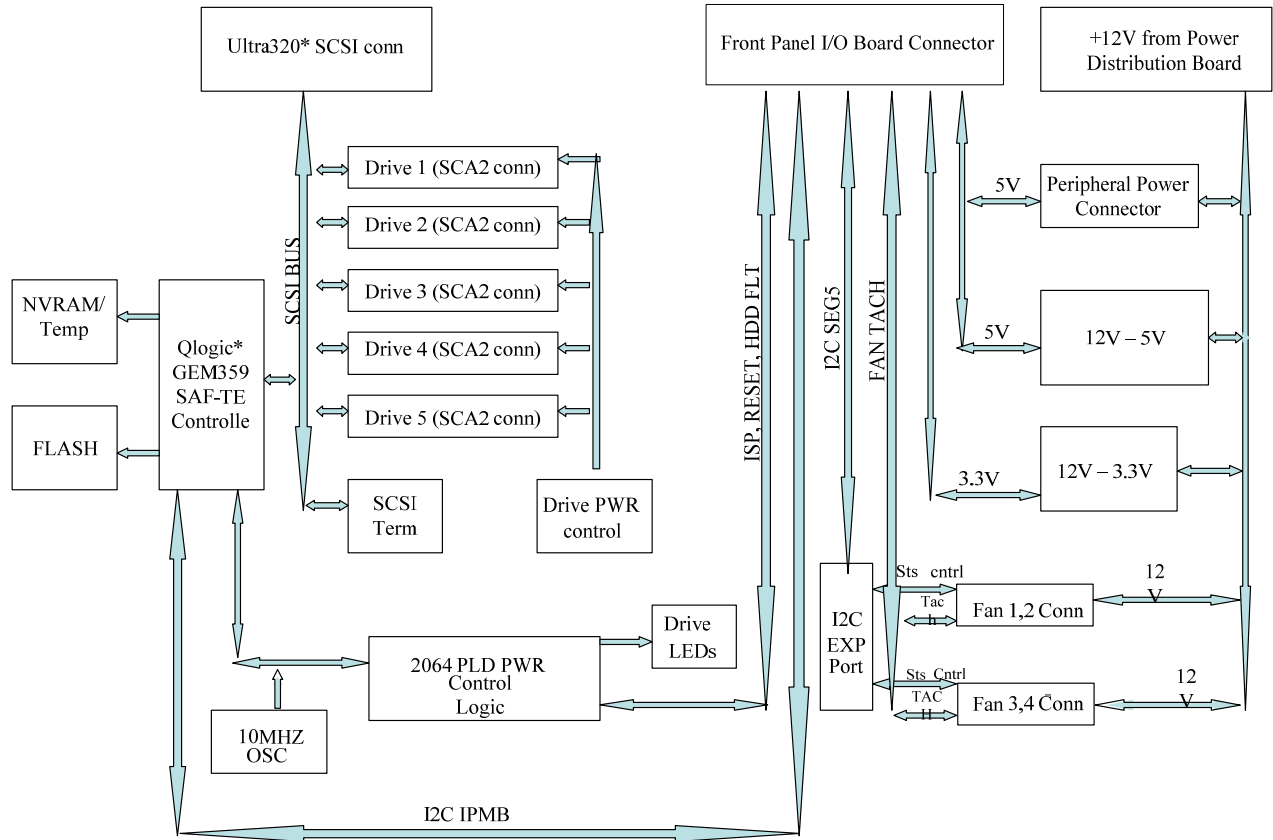
Figure 25. SCSI Backplane Board Block Diagram

7.1.2 Architectural Overview

The SCSI backplane board provides the following functions for the platform.

- Ultra320* SCSI bus passes SCSI signals between the hot-swap hard disk drives and the Intel® Server Board Set SE8501HW4 Main Board
  - A standard 68-pin SCSI connector provides connection to the Intel® Server Board Set SE8501HW4 Main Board
  - Five 80-pin SCA-2 blind-mate connectors connect to SCSI hard disk drives
- Fault tolerant enclosure management
  - SAF-TE
  - SCSI power control
  - LED control logic
- Server management
  - I^2C interface
  - I^2C Serial CMOS EEPROM (FRU)
  - Temperature sensors (primary ambient for system)
- Voltage regulators
  - 12VDC to 5VDC
  - 5VDC to 3.3VDC
- System fan control

7.1.3 Component Location

Figure 26 shows the placement of the major components and connectors on the SCSI backplane board.
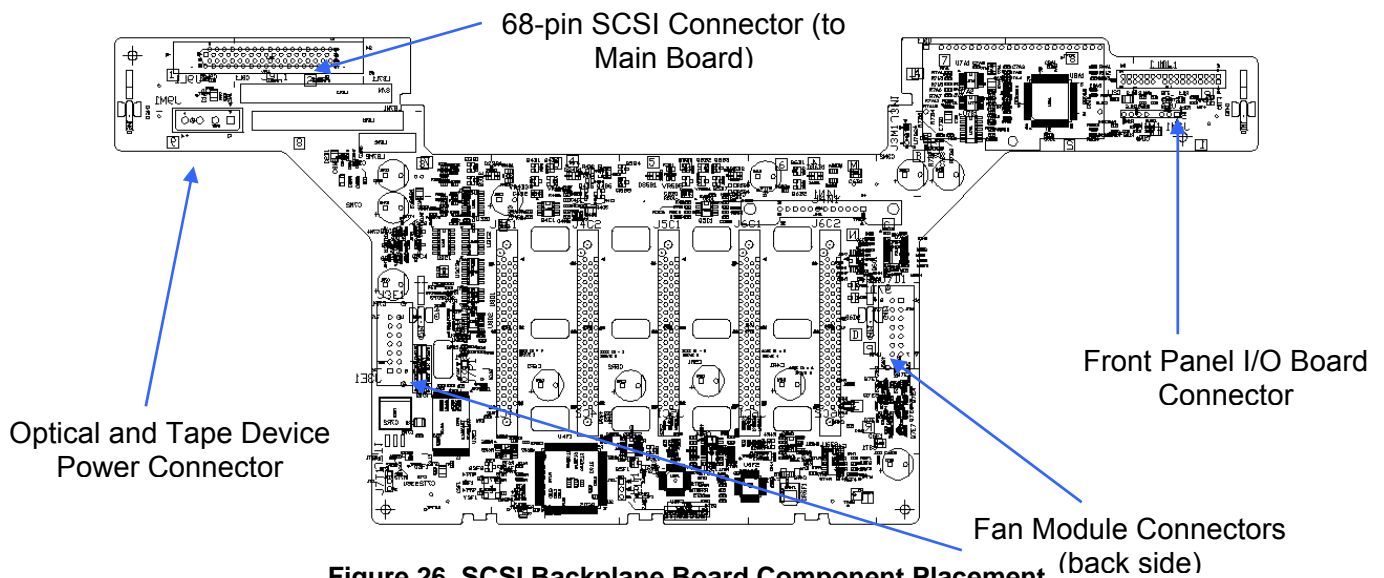
Figure 26. SCSI Backplane Board Component Placement

7.2   Functional Architecture

This section provides an architectural description of the SCSI backplane board functional blocks.

7.2.1 SCSI Buses

The SCSI backplane board passes the SCSI bus from the Intel® Server Board Set SE8501HW4 Main Board to the internal hot-swap SCSI hard disk drives. Each bus is Ultra320* SCSI low-voltage differential (LVD) capable. Single-ended (SE) drives are not supported in the hot-swap disk drive bay. Do not install an internal SE drive because the behavior of the drives is unpredictable and data corruption could result. This bus is comprised of 68 signals, operating at an 80MHz clock rate. The SCSI bus is capable of a 320MB data rate, from double transition (DT) data transfers on a two-byte wide bus. The bus attaches to the Intel® Server Board Set SE8501HW4 Main Board with a standard 68-pin SCSI connector.

- 320 MB/s = 2 byte bus * 80 MHz clock * double transitions.

Note: Drives and the SCSI controller on the Intel® Server Board Set SE8501HW4 Main Board negotiate the actual SCSI bus data rate.

7.2.2 SCSI Drive Power Control

SCSI power control is provided under control of the Programmable Logic Device (PLD). SCSI power control includes drive power switching, initial power-on charge pumping, over-current protection, system status notification, and drive status LEDs.

The system is notified when a hot-swap SCSI hard disk drive is detected. The SCSI backplane board applies power to the designated hot-swap SCSI hard disk drive and illuminates the status LED to provide visual indication of the event.

7.2.2.1   Internal SCSI Drive Power Switching

Each SCSI drive is supplied with +12V and +5V. Separate MOSFET switches are used to apply and remove +12V and +5V to each hot-swap SCSI hard disk drive.

7.2.2.2   Initial Power-on Charge Pumping

An initial current surge (up to 20A) is applied when power is first applied to a hot-swap SCSI hard disk drive. To reduce this initial current surge the SCSI backplane board charge pumps the drives for ~700µs. Charge pumping the hard disk drives keeps the average power-on current to approximately 3A.

7.2.2.3 Over-current Protection (OCP)

If either power rail for a drive exceeds 5A on 12V or 4.5A on 5V, the MOSFET switch for the out-of-spec rail is turned off. Removing power protects the MOSFET and the platform from damage if a short occurs on one of the power rails. After one-third of a second, the MOSFET is turned on to see if the short has been removed. Turning on and checking for a short every one-third of a second continues until the system instructs the SCSI backplane board to remove power or until the fault disappears.

When the MOSFET is first enabled, the over current condition is not detected during the power-up period. This no-OCP period allows the initial current surge produced by many hot-swap SCSI hard disk drives. The power-up period is short enough to prevent damage to occur to the MOSFETS or the platform.

7.2.2.4 Power Control Interlock

The power control interlock prevents drives from powering on at the same time. Since only one hot-swap SCSI hard disk drive can power on at once, the board power requirements can be kept lower. Drives power on at one-third second intervals.

7.2.2.5 System Status Notification

Hot-swap SCSI hard disk drive status information is collected by the Qlogic* GEM359 SAF-TE controller for each bus. The controller passes the information to the server management via the global I^2C bus and enclosure management information via the SCSI bus.

7.2.2.6 SCSI Status LEDs

The status LEDs give the user a visual indication of the status of each hot-swap SCSI hard disk drive. A single bi-color (amber and green) LED is present for each drive. The LEDs use a combination of color and blinking frequency to indicate multiple conditions.

The hot-swap SCSI hard disk drive status LEDs are located on the SCSI backplane board and projected out the front system by light pipes on the drive carrier. The states of the LEDs are described in Table 37.

Table 37. Hot-swap SCSI Hard Disk Drive LED Details

LED State	Description
Green on	Drive is being initialized
Green blinking	Drive is active
Amber on	Drive/slot failure
Amber slow blinking (~1Hz)	Predictive drive/slot failure or array rebuild is in process
Amber fast blinking (~2.5Hz)	Array rebuild interrupted, rebuild on empty slot, or identify slot

7.2.3 SCSI Enclosure Management

SCSI enclosure management allows the SCSI backplane board to report hot-swap SCSI hard disk drive status via the SCSI bus. This information is normally consumed by a RAID controller that supports enclosure management; the optional ROMB accessory supports this feature. The SCSI enclosure management subsystem consists of a Qlogic* GEM359 controller, flash, and PLD.
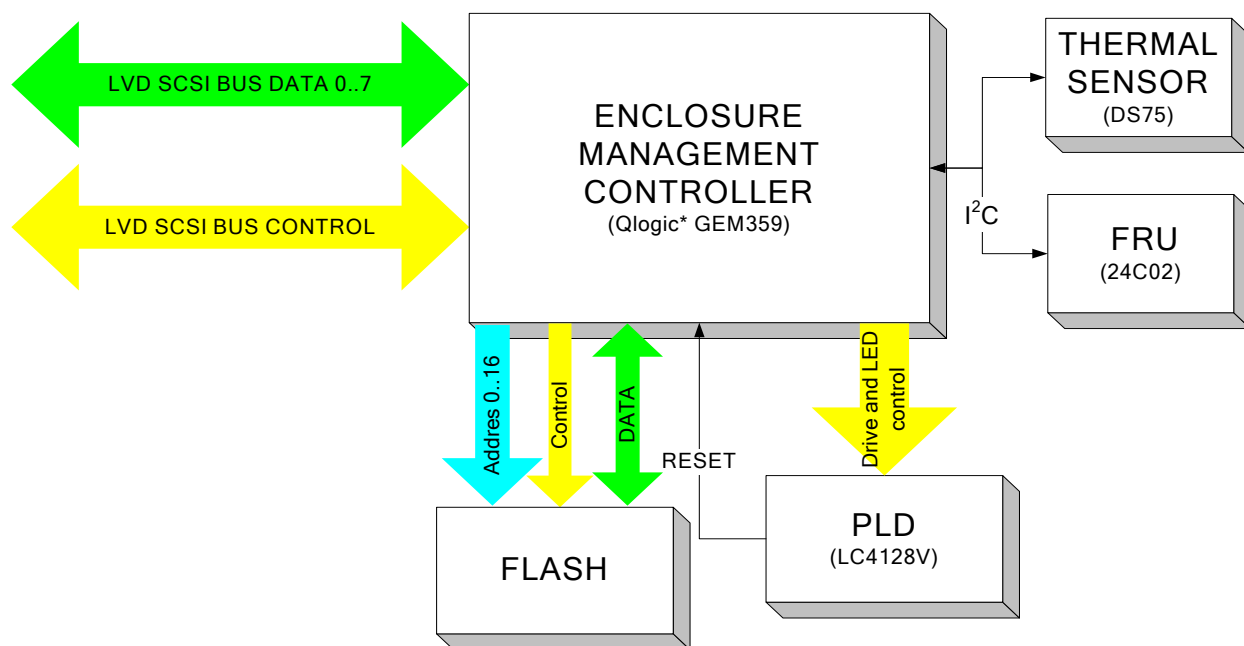
Figure 27. Enclosure Management Signal Flow Diagram

7.2.3.1   Qlogic* GEM359 Enclosure Management Controller

The GEM359 sends board and drive information to both the SCSI and IPMB bus. The GEM359 also acts on requests from both the SCSI bus and global I^2C bus. GEM359 GPIOs send LED information to the PLD.

7.2.3.2   4-Mb Flash

The GEM359 code is stored in a 4-Megabit FLASH (512K x 8). The FLASH boot block is in the top 16k of the block. The boot block is write-protected. Non-protected FLASH can be updated through the IPMB bus.

7.2.3.3   PLD

The PLD governs the SCSI power control circuit and controls the LEDs. The PLD is an In-system Programmable (ISP) with an 8-pin header connector.

7.2.4 Server Management Interface

The SCSI backplane board supports the following server management features:

- Local I²C Interface
  - Field Replaceable Unit (FRU)
  - Temperature sensor
  - Micro-controller interface (Hot-hwap Controller)
- System I²C Interface
  - Micro-controller IPMB interface
  - I²C/SM Bus (for fan monitoring)

7.2.4.1   Local I²C Bus

The Bus A local I²C bus connects the DS75 (or equivalent) thermal sensor and Atmel* AT24C02N (or equivalent) serial EEPROM (with FRU data) to the micro-controller. This thermal sensor is used by the BMC for the ambient temperature of the system.

7.2.4.2   Isolated Global I²C Bus (IPMB)

The global I²C bus connects the controllers to the system. The global I²C bus is isolated from the system until the system PWRGRD reaches the SCSI backplane board.

7.2.4.3   I²C I/O Bus

The I²C I/O bus connects the Intel® Server Board Set SE8501HW4 Main Board micro-controller to the server platform front panel I/O board and fan control.

7.2.4.4   I²C Addresses

Four I²C devices and their addresses are listed in Table 38 and Table 39. The following I²C devices can be addressed on or through the SCSI backplane board:

- Hot-swap micro-controller (HSC)
- FRU EEPROM
- Temperature sensor
- Fan controller

Table 38. I²C Local Bus Addresses

Device	Address	Bus/Location	Description
AT24C02	0xA0	Legacy I²C/SCSI backplane board	Private SCSI backplane board FRU EEPROM
DS75	0x90	Legacy I²C /SCSI backplane board	Private SCSI backplane board temperature sensor

Table 39. Global I²C Bus Addresses (IPMB Bus)

Device	Address	Bus/Location	Description
GEM359	0xC0	Legacy I²C/SCSI backplane board	Micro-controller public IPMB bus

Table 40. I²C I/O Bus Address

Device	Address	Bus/Location	Description
PCA9555	0x42	Legacy I²C/SCSI backplane board	Micro-controller public I/O bus

7.2.5   Resets

The PCI_RST_BP_N signal from the Intel® Server Board Set SE8501HW4 Main Board via the100-pin connector provides the principal reset for the logic on the SCSI backplane board. The signal resets the USB hub, the GEM359 flash chips and SCSI drive power sequencing timing in the PLD.

The PCA9555 device used to control the fans has an internal power-on reset that configures all its I/O pins as inputs.

7.2.6 Connector Interlocks

7.2.6.1   Main Board Cable Connector

The SCSI backplane board has an interlock on the 100-pin connector so the Intel® Server Board Set SE8501HW4 Main Board can detect its presence.

7.2.6.2   SCA-2 Connector

The SCSI backplane board uses an interlock to determine if a hot-swap SCSI hard disk drive is present. This interlock is defined by the SCSI_MATED# signals. Drive presence is used by enclosure management.

7.2.7 Clock Generation

The SCSI backplane board has a single, 10.0MHz, local clock. It supplies a 5V-rail clock input to the GEM359s and PLD. The clock is separately buffered by a 74LVT244.

7.2.8 Programmed Devices

Three programmed devices are on the SCSI backplane board:

- FLASH: Flash contains program code to be run by the onboard micro-controller, the HSC. Memory configuration: 512 K x 8.
- Field Replaceable Unit (FRU): The FRU is programmed at the factory. Memory Configuration: 256 x 8 serial.
- Programmable Logic Device (PLD): The PLD governs the SCSI power control circuit, controls LEDs, and provides a deglitching function for the Flash chips. The PLD is independently In-System-Programmable (ISP) with an 8-pin header connector.

7.3   Signal Descriptions

The following notations are used to describe the signal type, from the perspective of the Server Platform SR4850HW4 SCSI backplane board:

- ▪ I   Input-pin to the Server Platform SR4850HW4 SCSI backplane board
- ▪ O   Output-pin from the Server Platform SR4850HW4 SCSI backplane board
- ▪ I/O   Bi-directional (input/output) pin
- ▪ PWR   Power supply pin

The signal description also includes the type of buffer used for the particular signal:

- ▪ LVD   Low Voltage Differential SCSI
- ▪ SE   Standard Single Ended SCSI
- ▪ TTL   5V TTL signals
- ▪ CMOS   5V CMOS signals
- ▪ Analog   Typically a voltage reference or specialty power supply
- ▪ hs   This suffix is added to indicate high-speed requirements that make modifications subject to review

7.3.1 Power from the Power Distribution Board

The SCSI backplane board receives only +12V from the power distribution board through a 12-pin connector. These pins are tied together and Table 41 provides a summary of the power connector pins.

Table 41. Power Interface Signals

Signal	Type	Driver	Name and Description
+12V	I	PWR	+12 Volt supply from power distribution board

7.3.2 Front Panel Power Connector

Table 42 is a summary of the server platform front panel I/O board power connector pins.

Table 42. Front Panel I/O Board Power Interface Signals

Signal	Type	Driver	Name and Description
+3.3V$_{stby}$	I	PWR	+3.3 Volt standby supply from front panel I/O board
+3.3V	O	PWR	+3.3 Volt supply to front panel I/O board
+5V	O	PWR	+5 Volt supply to front panel I/O board

7.3.3 Front Panel I/O Board Ribbon Cable Connector

The 34-pin server platform front panel I/O board ribbon cable connector carries signals to and from the SCSI backplane board. Table 43 provides a description of the front panel I/O board ribbon cable connector. See Section 4 for pinouts.

Table 43. Front Panel I/O Board Ribbon Connector Signal Description – J1L1

	Signal	**Type**	**Driver**	**Name and Description**
Fan Ctrl	FAN1_TACH_BUFF	I		Fan1 signal.
	FAN2_TACH_BUFF	I		Fan2 signal.
	FAN3_TACH_BUFF	I		Fan3 signal.
	FAN4_TACH_BUFF	I		Fan4 signal.
	BLOWER_PWM	I		Fan power management.
Misc	BP_D2D_ENABLE	I		Used to enable on-board 12V-5V DC–to-DC converter.
	BP_PWRGOOD	O		When on-board power regulators sense power.
	PCI_RST_BP_N	O		Reset. This reset is used for all reset and power good purposes on the front panel I/O board.
LED Ctrl	SCSI_FLT_L	I		Used by the front panel I/O board to illuminate the DRIVE FAULT LED.
	SCSI_LED_ACT_L	I		Passed from the SCSI backplane board to indicate the appropriate LED activity mode of hard disk drive.
I²C	I2C_SEG2_SCL	I/O		Docking I/O serial clock. Supplies an isolated version of the global IPMB bus clock to the SCSI backplane board. The GEM micro-controller is on this bus.
	I2C_SEG2_SDA	I/O		Docking I/O serial data. Supplies an isolated version of the global IPMB bus data to the SCSI backplane board. The GEM micro-controller is on this bus.
	I2C_IPMB_SCA	I/O		Docking I/O serial data. Supplies an isolated version of the global IPMB bus data to the SCSI backplane board. The GEM micro-controller is on this bus.
	I2C_IPMB_SCL	I/O		Docking I/O serial clock. Supplies an isolated version of the global IPMB bus data to the SCSI backplane board. The GEM micro-controller is on this bus.

7.3.4 LVD SCSI 68-pin Connector

The 68-pin LVD SCSI connector carries SCSI signals between the SCSI backplane board. The Intel® Server Board Set SE8501HW4 Main Board is unshielded. Table 44 provides a description of the LVD SCSI connector.

Table 44. LVD SCSI Connector Signal Description

Signal	**Type**	**Driver**	**Name and Description**
LVD_DB[15..0]_[P, N]	I/O	LVD hs	SCSI data bus. The data bits for the differential SCSI bus.
LVD_DBP_[P, N] LVD_DBP1_[P, N]	I/O	LVD hs	SCSI data parity. Support parity on the SCSI bus. DB_P0[P/N] supports parity for data [7..0]. DB_P1[P/N] supports parity for data [15..8].

Signal	Type	Driver	Name and Description
DIFFSENSE	I	Analog	Differential sense. The voltage level determines the operating mode of the target devices on the SCSI bus. If the voltage on the DIFFSENSE signal is from –0.35 V to +0.5 V the mode will be SE. If it is from +0.7 V to 1.9 V the mode will be LVD.
LVD_ATN_[P, N]	I/O	LVD hs	SCSI bus attention. Asserted by a SCSI device in initiator mode to alert the target that the initiator has a message to transfer.
LVD_BSY_[P, N]	I/O	LVD hs	SCSI bus busy. Indicate that the SCSI bus is being used. Can be driven by both the initiator and the target device.
LVD_ACK_[P, N]	I/O	LVD hs	SCSI bus acknowledge. Driven by an initiator, indicating an acknowledgement for a SCSI data transfer.
LVD_RST_[P, N]	I/O	LVD hs	SCSI bus reset. Indicate a SCSI bus reset condition.
LVD_MSG_[P, N]	I/O	LVD hs	SCSI bus message phase. Driven by a SCSI target to indicate it is in the Message Phase.
LVD_SEL_[P, N]	I/O	LVD hs	SCSI bus select. Used by an initiator to select a target or by a target to reselect an initiator.
LVD_CD_[P, N]	I/O	LVD hs	SCSI bus control/data phase. Driven by a target, these pins indicate that control or data information is being transferred over the SCSI bus.
LVD_REQ_[P, N]	I/O	LVD hs	SCSI bus request. Driven by a target, these pins indicate a request for a SCSI data-transfer handshake.
LVD_IO_[P, N]	I/O	LVD hs	SCSI bus I/O phase. Driven by the target, these pins control the direction of data transfer on the SCSI bus. When asserted, this signal indicates input to the initiator. When not asserted, this signal indicates output from the initiator.
GND	I/O	PWR	Ground. Provide secondary ground reference.

7.3.5 SCA2 80-pin Drive Connectors

The SCA2 connector carries power and signal between the SCSI backplane board and hot-swap SCSI hard disk drives. The LVD SCSI bus signals are driven by either the Intel® Server Board Set SE8501HW4 Main Board SCSI controller, the LVD transceiver, or the hot-swap SCSI hard disk drives. Table 45 provides a description of each signal on the SCSI connectors.

Table 45. LVD SCSI Bus Signals – J4C1, J4C2, J5C1, J6C1, J6C2

Signal	Type	Driver	Name and Description
LVD_DB[15..0]_[P, N]	I/O	LVD hs	SCSI data bus. Along with the DBP[1/0][P/N] pins they form the bi-directional SCSI data bus.
LVD_DBP_[P, N] LVD_DBP1_[P, N]	I/O	LVD hs	SCSI data parity. Support parity on the SCSI bus. DBP[P/N] supports parity for data [7..0] DBP1[P/N] supports parity for data [15..8]
DIFFSENSE	I	Analog	Differential sense. Monitor the DIFFSENSE signal from the terminator. The voltage level determines the operating mode of the target devices on the SCSI bus. If the voltage on the DIFFSENSE signal is from –0.35V to +0.5V the mode will be SE. If it is from +0.7V to 1.9V the mode will be LVD.
LVD_ATN_[P, N]	I/O	LVD hs	SCSI bus attention. Asserted by a SCSI device in initiator mode to alert the target that the initiator has a message to transfer.
LVD_BSY_[P, N]	I/O	LVD hs	SCSI bus busy. In SE mode, these pins are bi-directional and are asserted to gain use of the SCSI bus and to indicate that that SCSI bus is in use.

Signal	Type	Driver	Name and Description
LVD_ACK_[P, N]	I/O	LVD hs	SCSI bus acknowledge. Asserted by a SCSI device in initiator mode to acknowledge the target's request for a data transfer.
LVD_RST_[P, N]	I/O	LVD hs	SCSI bus reset. In SE mode, these pins are bi-directional and are asserted when all the SCSI devices attached to the SCSI bus need to be reset.
LVD_MSG_[P, N]	I/O	LVD hs	SCSI bus message phase. Asserted by a SCSI device in target mode to indicate the Message In or Message Out phase.
LVD_SEL_[P, N]	I/O	LVD hs	SCSI bus select. In SE mode, these pins are bi-directional and are asserted by the controller when attempting to select or reselect a SCSI device.
LVD_CD_[P, N]	I/O	LVD hs	SCSI bus control/data phase. Asserted or de-asserted by a SCSI device in target mode to indicate that control or data information is being transferred over the SCSI bus
LVD_REQ_[P, N]	I/O	LVD hs	SCSI bus request. Asserted by a SCSI device in target mode to indicate that the target is requesting a data transfer over the SCSI bus.
LVD_IO_[P, N]	I/O	LVD hs	SCSI bus I/O phase. Asserted by a SCSI device in target mode to indicate the direction of data movement on the SCSI bus between the target and the initiator.
SCSI_ID	O	GND/OPEN	SCSI ID. Sets internal SCSI ID depending on slot. Drive 1 has SCSI address 0. Drive 2 has SCSI address 1 and so on.
SCSI_MATED_L [1-5]	I/O	TTL	SCSI MATED. Determine if SCSI is present and has proper contact.
GND	I/O	PWR	Ground. Provide secondary ground reference.
+12V	O	PWR	+12 Volt supply. Max 1A of continuous current/6A peak current.
+5V	O	PWR	+5 Volt supply. Max 1.4A of continuous current/6A peak current.

7.3.6 Internal Logic Signals

Table 46 is a summary of the signals that route between logic on the SCSI backplane board.

Table 46. Internal Logic Signals

	Signal	Type	Driver	Name and Description
Clks	CLK_10MHz	O	CMOS	10-MHz clock that is used by the GEM359 and PLD.
GEM359 Logic Control	ADDR<16..0>	O	CMOS	Address/bus. Address bus for the FLASH.
	PROM_VPP_L	O	CMOS	FLASH PROGRAM VOLTAGE ENABLE. Driven by the GEM359 to all FLASH to be programmed.
	PROM_OE_L	O	CMOS	FLASH output enable. Driven by the GEM359 to enable the FLASH for writing data on the bus.
	PROM_CE_L	O	CMOS	FLASH output enable. Driven by the PLD to enable the FLASH.
	PROM_WE_L	I	CMOS	FLASH chip enable. Driven by the GEM359 to enable writing to the FLASH.
SCSI Power Control	KCK_5V_L [1-5]	O	Analog	5 Volt kick start. Primes 5 Volt FET to start delivering power to a drive.
	KCK_12V_L [1-5]	O	Analog	12 Volt kick start. Primes 12 Volt FET, to start delivering power to a drive.

	Signal	Type	Driver	Name and Description
	FLT_5V_L [1-5]	I	CMOS	5 Volt hot-swap fault. Indicates greater than 5A of current drawn from 5V rail.
	FLT_12V_L [1-5]	I	CMOS	12 Volt hot-swap fault. Indicates greater than 5A of current drawn from 12V rail.
	STP_5V_L[1-5]	I	Analog	5 Volt stop. Stops 5 Volt FET from delivering power to a drive.
	STP_12V_L[1-5]	I	Analog	12 Volt stop. Stops 12 Volt FET from delivering power to a drive.
	PWR_TIMER	O	Analog	Power timer. Starts one second timer for FET reset.
	TMR_DONE	I	Analog	Timer done. One second reset timer complete.
Fan Control	FAN_PRES[1-4]	I	Analog	Fan is present on system
	FAN_LED[1-4]	I	Analog	LED signal when fan was off line
	FAN_TACH[1-4]	I	Analog	Fan speed

7.4   Electrical, Environmental, and Mechanical Specifications

This section specifies the operational parameters and physical characteristics for the server platform SCSI backplane board. Further topics in this section specify normal operating conditions, mechanical specifications and connector interfaces to the board.

7.4.1   Electrical Specifications

The power budget for the SCSI backplane board and pinouts of the external interface connectors are defined in the following table.

Table 47. Electrical Specifications

Feature	Absolute Maximum Rating
Voltage of any signal with respect to ground	-0.3V to Vcc[1] to Vcc[1]+0.3V
+3.3V$_{stby}$ supply with respect to ground	-0.3V to +3.465V
+3 .3V supply with respect to ground	-0.3V to +3.465V
+5V supply with respect to ground	-0.3V to +5.25V
+12V supply with respect to ground	-0.3V to +12.6V

Note: [1]. Vcc refers to the supply voltage for the device.

7.4.1.1   Power Consumption

Table 48 shows the power consumed on each supply line for the SCSI backplane board.

Table 48. Maximum Power Consumption

Devices	Power Dissipation	Ext/Int
12V	200W	Ext
5V	100W	Int
3.3V	2W	Int
3.3V$_{stby}$	0.5W	Ext

Note: The numbers in the table are provided only to show design limits. Power consumption will vary, depending on the exact configuration.

7.4.1.2   Hot-Swap SCSI Hard Disk Drive Supplied Power

Hot-swap SCSI hard disk drives must fall within the power limits shown in Table 49. The SCSI backplane board works with drives that meet the following requirements.

Table 49. SCSI Backplane Board Power Limits per Drive

Device constraint	+5 V	+12 V
Peak start current	0.73A	1.5A
Max operating current	0.81A	1.15A
Average idle	0.68A	0.61A

7.4.1.3   Power Supply Requirements

The external and internal power supply must meet the following requirements:

- Rise time of less than 50ms (for all voltages).
- Delay of 5ms (minimum) from valid power-to-power good.

See Table 50 for voltage regulation requirements.

Table 50. DC Voltage Regulation

DC Voltage	Acceptable Tolerance
+5V	± 5%
+12V	± 5%
+3.3V	± 5%
+3.3V$_{stby}$	± 5%

8.   SAS Backplane Board

This chapter describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS backplane board. This chapter is organized into the following sections:

Section 8.1:   Introduction
Provides an overview of the SAS backplane board showing functional blocks and board layout.

Section 8.2:   Functional Architecture
Describes the SAS backplane board's functional blocks.

Section 8.3:   Signal Descriptions
Summary of the SAS backplane board's internal signals and connector signals, and the connector signal pin names and the signal descriptions. Signal mnemonics appear throughout this chapter.

Section 8.4:   Electrical, Environmental, and Mechanical Specifications
Specifies operational parameters and considerations, and connector pin-outs.

8.1   Introduction

The SAS backplane board is designed to give the end-user support for five SAS hard drives in the Intel® Server Platform SR4850HW4/M chassis. The SAS option is not available for the Intel® Server Platform SR4850HW4. The SAS design enables easy use and replacement of the SAS hard drives without powering down the system. The following block diagram, architectural overview, and placement diagram will give a general overview for how the SAS backplane board backplane works.

8.1.1   Block Diagram

The block diagram below breaks down the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS backplane board into physical and functional blocks. Arrows represent buses and signals. Blocks represent the physical and functional blocks. Figure 28 illustrates the general architecture of the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS backplane board.
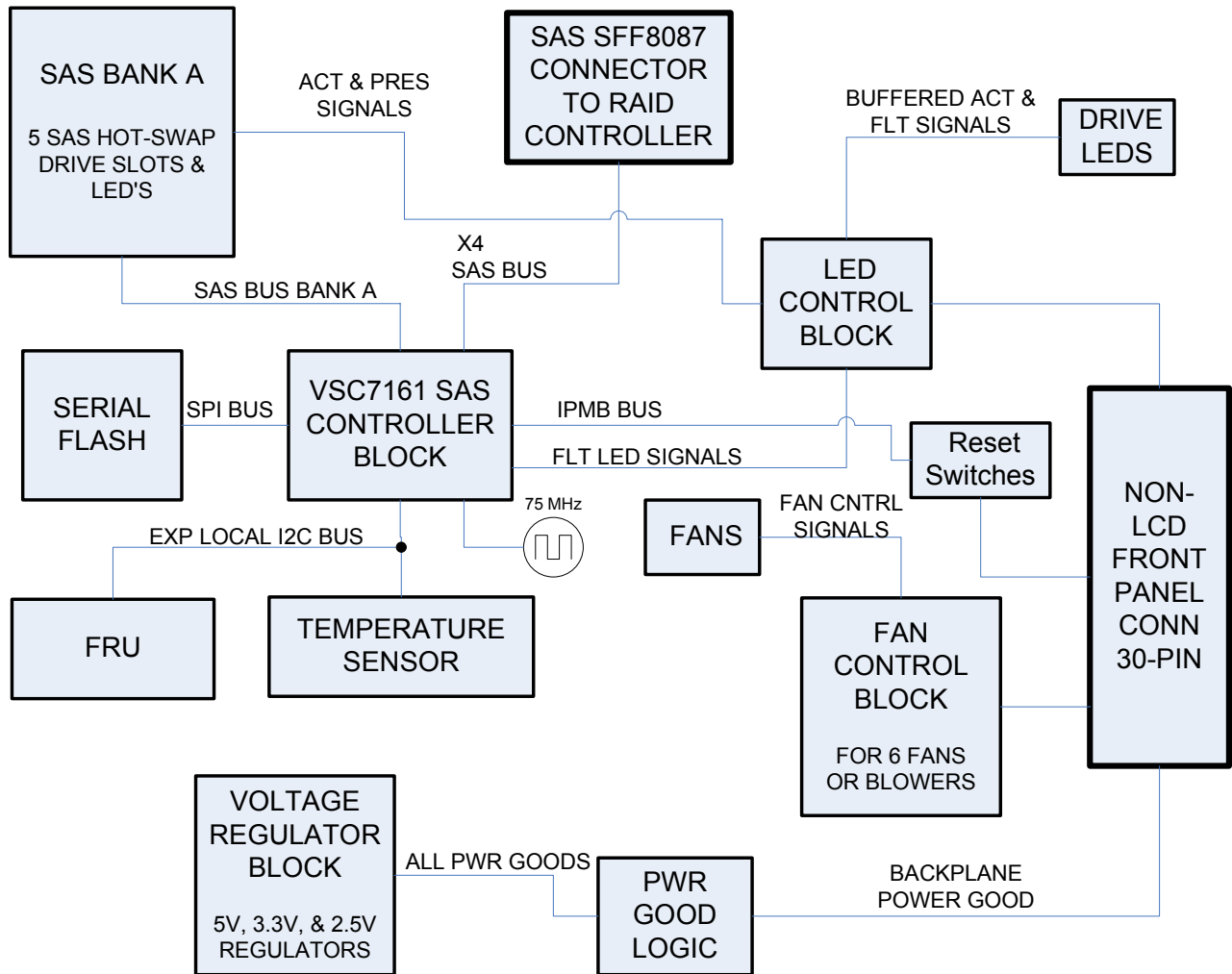
Figure 28. Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS Backplane Board Block Diagram

8.1.2   Architectural Overview

The Intel® Server Platforms SR4850HW4/M SAS backplane board provides several main functions for the system.

- 3Gbit SAS port expanders provide high-speed serial data paths from the five attached SAS hard drives to the baseboard.
  - SAS data between drives and baseboard are routed across a 4-port internal SAS cable that connects the backplane to the Intel® SASROMB18E controller card .This card is a PCI-Express* SAS RAID controller card plugged into one of the mainboard's PCI-Express* slots.
  - One SAS expander, supporting five drives, is used to control SAS traffic flow between between drives and the Intel® SASROMB18E controller card.
- Enclosure Management.
  - SAS enclosure management per SES-2
  - Fault LED control logic
- Server management I²C interface
  - Fan presence sensing & fan fault LED control
  - I²C Serial EEPROM (FRU)
  - Temperature sensors
  - Expander controller firmware update capability
- Voltage regulators
  - 12VDC to 5VDC
  - 5VDC to 3.3VDC
  - 5VDC to 2.5VDC
- System fan control for four fans
- Power connectors for DVD and tape drive bay cables

8.1.3   Board Assembly

Figure 29 and Figure 30 show the 2D view of the Intel® Server Platform SR4850HW4/M SAS backplane board top and bottom assemblies.
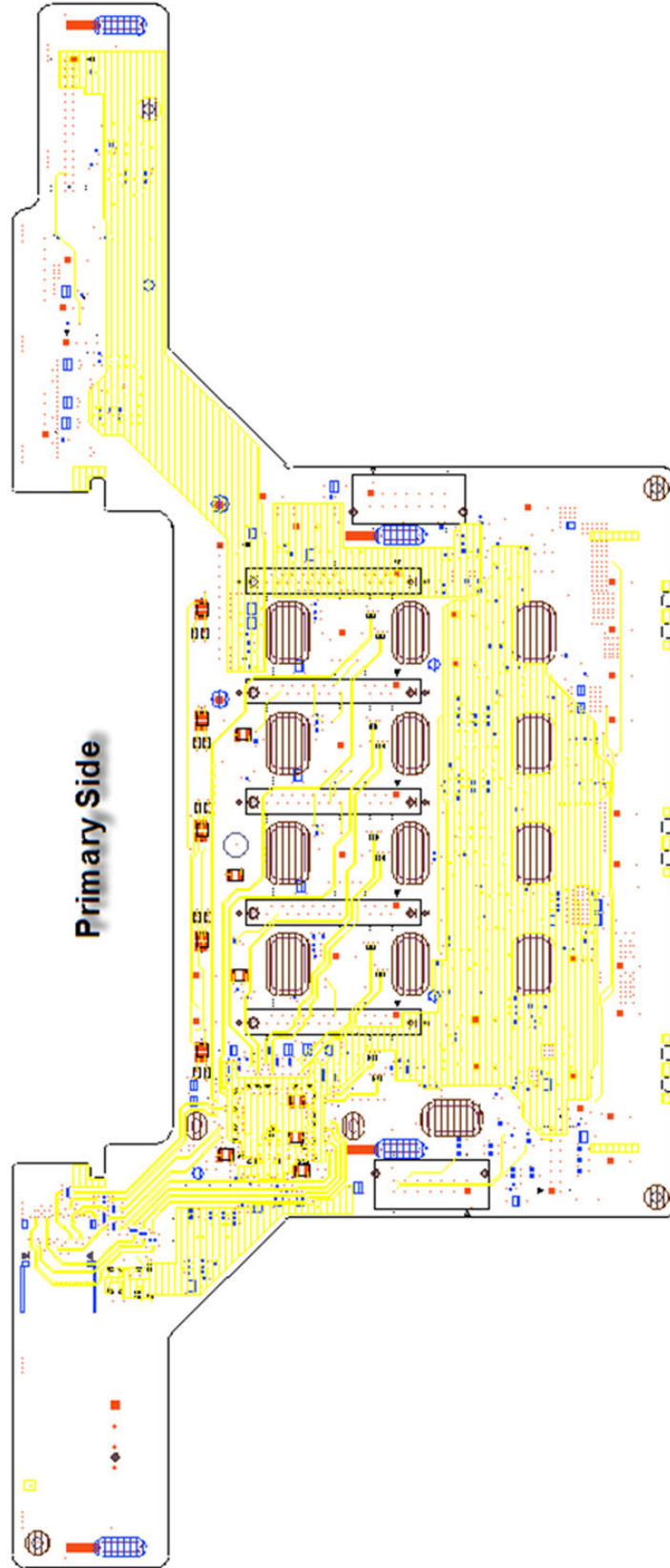
Figure 29. SAS Backplane Board Top Assembly
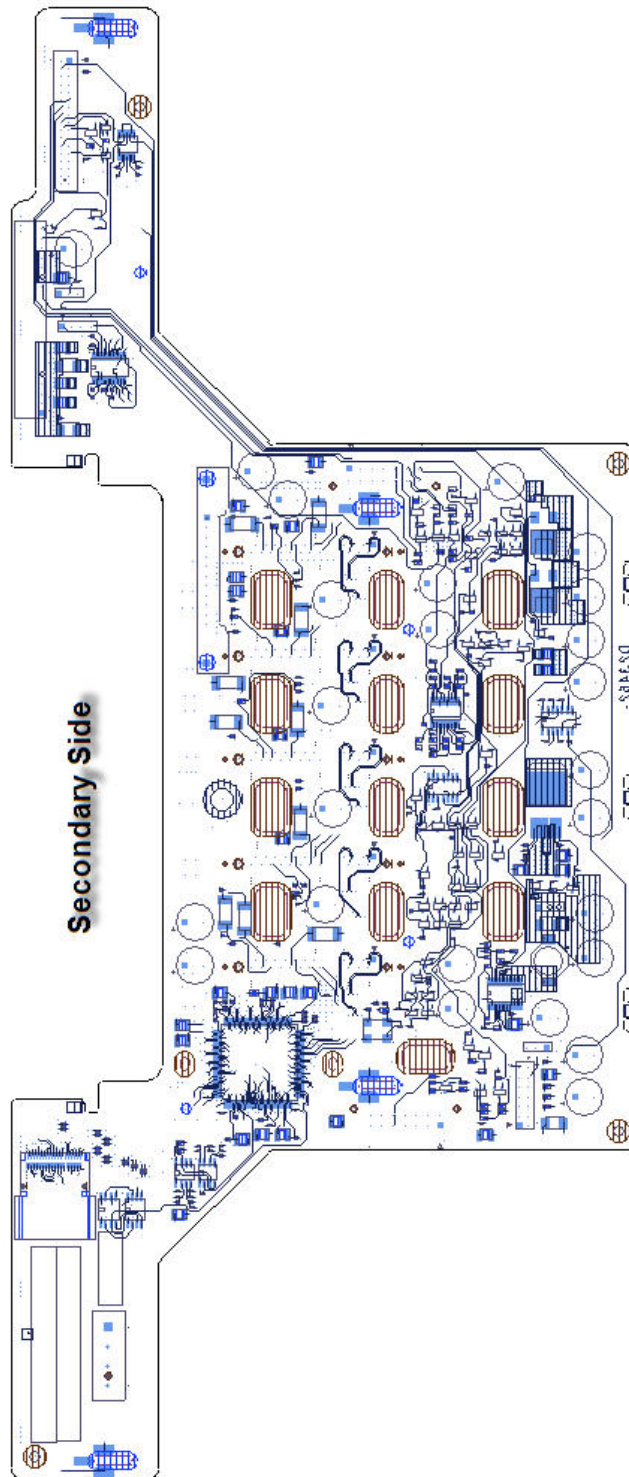
Figure 30. SAS Backplane Board Bottom Assembly

8.2   Functional Architecture

This section provides a more detailed architectural description of the Intel® Server Platform SR4850HW4/M SAS backplane board's functional blocks.

8.2.1   SAS Buses

The SAS busses are indirectly connected to the mainboard via the Intel® SASROMB18E Controller card that is plugged into the PCI-Express* slot at the mainboard. As a result, the Intel® SASROMB18E Controller provides all SAS functionality and interfacing to the Intel® Server Platform SR4850HW4/M SAS backplane board. The Intel® Server Platform SR6850HW4/M SAS backplane board uses SAS expander devices to route data to and from each of the five internal SAS drives from/to the SAS controller. Data movement between the SAS expanders on the backplane board and the SAS controller is achieved through the high-speed cable assembly that connects the Intel® SASROMB18E Controller card to the backplane board. There are a total of four separate SAS busses or lanes that are contained within the high-speed cable assembly. An SFF8087 mini connector is used to terminate each end of the cable assembly to the Intel® SASROMB18E Controller card and SAS backplane board. Each SAS lane operates in full-duplex serial mode and contains dedicated transmit and receive differential pairs for a total of eight differential pairs on the cable. As the four lanes converge on the backplane board, all four lanes are routed to the primary SAS expander. The expander, in turn, routes data to the five SAS drives that are attached to its ports.

The SAS expander consists of ten identical SAS ports, four of which are connected to the SFF8087 mini connector that route the data to/from the Intel® SASROMB18E Controller card.. Five of the ten ports are used to connect to the five hot-pluggable SAS drives with each drive having a dedicated port. The single remaining expander port is unused.

All SAS channels on the backplane board are capable of 3Gbps data transmission on both the transmit or receive paths. During system power-on and hot drive insertion, SAS rates are negotiated to operate at either 1.5Gbps or 3.0Gbps.

8.2.2   SAS Expander Functionality

The SAS backplane board expander contains an embedded 32-bit RISC processor that is used to control and monitor SAS drive functions, in addition to enclosure management functionality to satisfy SES-2 requirements. In addition, the expanders provide status and control of drive behavior such as link speed auto detection and negotiation, fault indication and error reporting. The expander uses its local I^{2}C bus to maintain direct communication to an on-board temperature sensor and EEPROM that stores FRU and SAS related data. In turn, temperature data and system FRU information are monitored and reported back to the mainboard via the IPMB bus. Firmware updates for each SAS expander and FRU updates can also be reprogrammed via the IPMB. The expander offers the ability to individually control the output voltage at each of the five attached ports and provide reprogrammable pre-emphasis to optimize on input signal quality. If a SAS drive is detected, the system will be notified. The SAS backplane board will apply power to the designated internal SAS drive. Status LEDs will provide the user with visual indicators for the internal SAS drive.

8.2.2.1   EXPANDER SPI Flash

Firmware for the Vitesse VSC7161 SAS expander is stored in an 8-Megabit (Mb) SPI FLASH memory device. The backplane board also has provisions to perform future firmware backup and revisioning by supporting a secondary SPI flash for each of the two on-board expanders. In addition, SAS related information and PHY specific configuration data can be stored in the secondary Flash location. Each FLASH can be updated via the IPMB bus.

8.2.3   SAS Drive Functionality

The Intel® Server Platform SR4850HW4/M SAS backplane board provides connections for a maximum of five SAS drives. Each drive can be inserted and removed while the system is powered-on and automatic detection and rate negotiation are performed after each insertion. The backplane board provides +5V and +12V to each drive connector and supports in-rush current limiting to 300mA during hot-swapping.

8.2.4   Power Control Interlock

The Power Control Interlock is part of the SAS specification. This prevents drives from powering on at the same time. Since only one drive can power on at once the board power requirements can be kept lower.

8.2.4.1   System Status Notification

Internal SAS drive status information is collected by the SAS expander. The information can be monitored by accessing each expander's serial port. Output drive strength and input pre-emphasis may also be controlled via the serial port. In addition, any drive data can be routed to the Server Management via the IPMB.

8.2.4.2   SAS Status LEDs

The status LEDs provide the user a visual indication of the drives' condition. There is a single bi-color (amber and green) LED for each drive. The LEDs use a combination of color and blinking frequency to indicate multiple conditions.

The hard drive status LEDs are located on the SAS backplane board and projected out the front of the carrier via light pipes. The states of the LEDs are described in Table 51.

Table 51. SAS Hard Drive LED Details

LED State	Description
Green on	The hard drive is configured and ready for access.
Green blinking	The hard drive is active.
Amber on	Hard drive/slot failure.
Amber slow blinking (~1Hz)	A predictive hard drive/slot failure or rebuild in process
Amber fast blinking (~2.5Hz)	Hard drive rebuild interrupted, rebuild on empty slot, or identify slot

8.2.5   SAS Enclosure Management

SAS Enclosure Management allows the SAS backplane board to report SAS drive status and backplane temperature readings. A SAS RAID controller will interface with Enclosure Management. The SAS Enclosure Management subsystem consists of the one SAS expander, and associated SPI Flash and EEPROM memory devices.
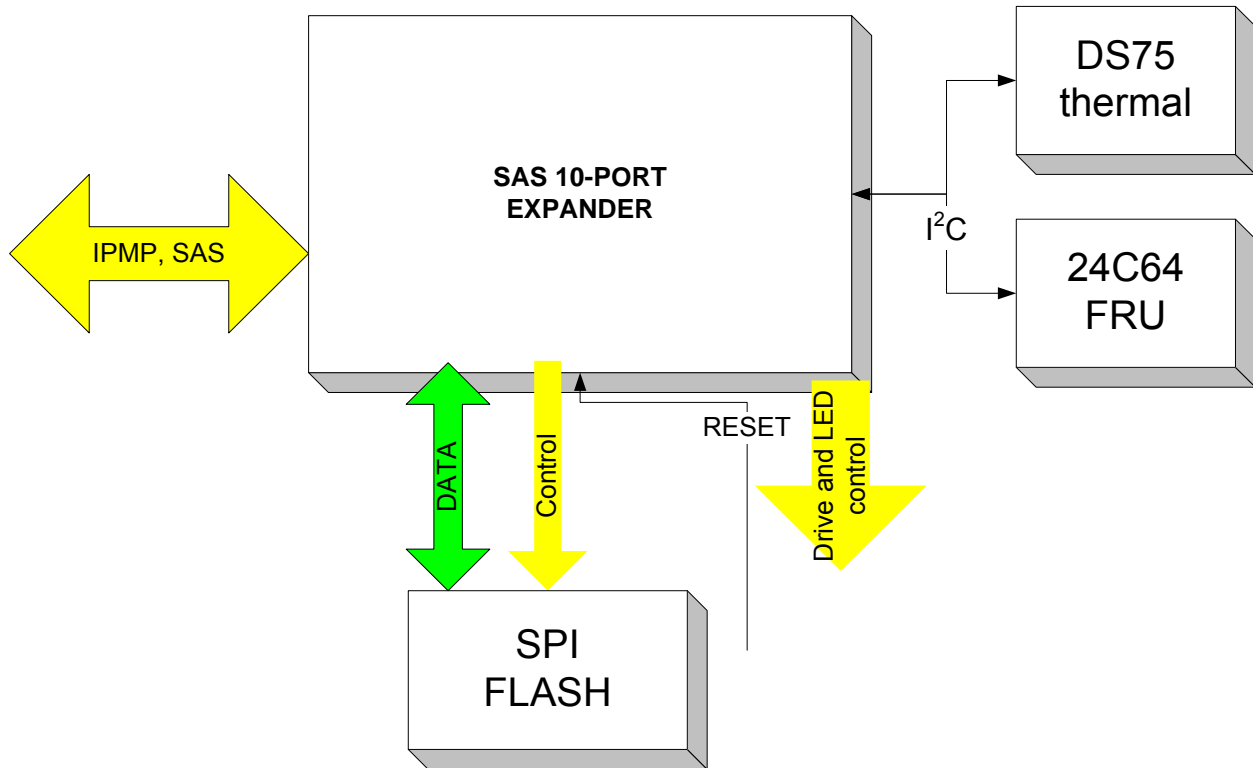
Figure 31. Enclosure Management Signal Flow Diagram

8.2.6   Server Management Interface

The backplane board will support the following Server Management features:

Local I^{2}C Interface
- SAS backplane Field Replaceable Unit (FRU).
- SAS backplane temperature sensor
  - One temperature sensor is attached to the local I^{2}C bus expander.
- Micro-controller interface

System I^{2}C Interface
- Micro-controller IPMB interface.

8.2.6.1 Local I²C Bus

The Bus A local I²C bus connects the DS75 (or equivalent) thermal sensor and Atmel AT24C64N (or equivalent) serial EEPROM (with FRU data) to the Bus A controller Isolated Global I²C Bus (IPMB).

8.2.6.2 Isolated Global I²C Bus (IPMB)

The global I²C bus connects the on-board SAS expanders to the server mainboard. The bus is isolated from the expanders until PCI_RST_BP_N signal from the mainboard is deasserted.

The IPMB bus also goes to the front panel control connector for use with an LCD display.

8.2.6.3 I²C I/O Bus

The I2C_SEG2 bus connects the system server management controller to the PCA9555 device used for fan sensing and LED control. The bus address list is in Table 52.

8.2.6.4 I²C Addresses

Four I²C devices and their addresses are listed in Table 52 through Table 54. There are seven I²C devices that can be addressed on the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS backplane board.

- Hot Swap Micro Controllers
- Intel® Server Platform SR4850HW4/M SAS backplane FRU EEPROM
- Intel® Server Platform SR4850HW4/M SAS backplane temperature sensors

Table 52. I²C Local Bus Addresses

Device	Address	Bus	Description
AT24C64	0xA0	Expander local bus	Private SAS backplane FRU EEPROM on the Bus A local bus. (Bus B local bus also supports an identical device.)
DS75	0x90	Expander local bus	Private SAS backplane temperature sensor for each expander

Table 53. Global I²C Bus Addresses (IPMB Bus)

Device	Address	Bus	Description
Bus A Expander	0xC0	IPMB system interface	Micro controller public IPMB bus

Table 54. I²C IO Bus Addresses

Device	Address	Bus	Description
PCA9555	0x42	I2C_CP bus	Micro controller public IO bus

8.2.7   Resets

The principal reset for logic on the SAS backplane board is supplied by the PCI_RST_BP_N signal from the mainboard via the front panel connector. The signal resets the SAS expander.

The PCA9555 device being used to control the fans has an internal power-on reset that configures all its I/O pins as inputs.

8.2.8   Clock Generation

The SAS backplane board requires a single clock frequency in order to support SAS. An independent 75MHZ HCMOS oscillator is used to drive the SAS expander Programmed Devices

There are three programmed devices on the SAS Backplane.

8.2.8.1   FLASH Memory

The SAS expander uses two flash memory devices, a primary and secondary. The primary flash memory devices contain program code to be run by each onboard expander. The secondary flash devices can be used to perform program code backup and store additional SAS information.

- Memory configuration: 64Mb SPI

8.2.8.2   Field Replaceable Unit (FRU)

The FRU is a serial EEPROM programmed at ATE.

Memory Configuration: 512Kb serial

8.3   Signal Descriptions

The following notations are used to describe the signal type, from the perspective of the Intel® Server Platform SR4850HW4/M SAS backplane board:

I	Input pin to the SAS backplane board
O	Output pin from the SAS backplane board
I/O	Bi-directional (input/output) pin
PWR	Power Supply pin

The signal description also includes the type of buffer used for the particular signal:

LVD	Low Voltage Differential
TTL	5V TTL signals
CMOS	5V CMOS signals
3.3V CMOS	3.3V CMOS signals
Analog	Typically a voltage reference or specialty power supply
hs	This suffix is added to indicate high speed requirements that would make any modifications subject to detailed review

8.3.1   Power Bay Connector

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M SAS backplane board receives only +12V from the power distribution board thru a 12-pin connector. Table 55 is a summary of power connector pins, including the signal mnemonic, the name, and a brief description.

Table 55. Power Bay Interface Signals – J4N1

Signal	Type	Driver	Name and Descrpition
+12V	PWR	PWR	+12 Volt supply from power bay.
GND	PWR	PWR	Ground

8.3.2   Front Panel Control Ribbon Cable Connector

The 34-pin Front Panel Control Ribbon Cable Connector interconnects signals between the Intel® Server Platform SR4850HW4/M SAS backplane board and front panel control board. Table 56 provides a description of the front panel control ribbon cable connector.

Table 56. Front Panel Control Ribbon Connector Signal Description – J1L1

	Type	Type	Name and Desription
Fan Ctrl	FAN1_TACH_BUFF	I	Fan1 signal
	FAN2_TACH_BUFF	I	Fan2 signal
	FAN3_TACH_BUFF	I	Fan3 signal
	FAN4_TACH_BUFF	I	Fan4 signal
	BLOWER_PWM	I	Fan Power Management
Power	BP_D2D_ENABLE	I	Used to enable on-board 12V-5V DC–to-DC converter
	BP_PWRGOOD	O	When on-board power regulators sense power.
	PCI_RST_BP_N	O	**Reset.** This reset is used for all reset and power good purposes on the front panel.
LED Ctrl	SAS_FLT_L	I	This signal is used by the front panel to illuminate the DRIVE FAULT LED
	SAS_LED_ACT_L	I	This signal is passed from the SAS backplane board to indicate the appropriate LED Activity Mode of Hard disk.
I²C	I²C_SEG2_SCL	I/O	**Docking I/O Serial Clock.** This pin supplies an isolated version of the global IPMB Bus clock to the SAS backplane board. The GEM microcontroller is on this bus.
	I²C_SEG2_SDA	I/O	**Docking I/O Serial Data.** This pin supplies an isolated version of the global IPMB Bus data to the SAS backplane board. The GEM Microcontroller is on this bus.
	I²C_IPMB_SCA	I/O	**Docking I/O Serial Data.** This pin supplies an isolated version of the global IPMB Bus data to the SAS backplane board. The GEM Microcontroller is on this bus
	I²C_IPMB_SCL	I/O	**Docking I/O Serial Clock.** This pin supplies an isolated version of the global IPMB Bus data to the SAS backplane board. The GEM Microcontroller is on this bus

8.3.3   SAS 36-pin Connector

The SAS mini 4i 36-pin SFF8087 connector is used to carry four lanes of SAS signals to/from the SAS RAID controller card. Table 57 provides a description of the mini 4i SAS Connector.

Table 57. SFF8087 SAS Connector Signal Description – J8L1

Signal	Type	Driver	Name and Description
HBA_EXPD0_PHY9_RX[P, N]	I	LVD hs	**SAS RX DATA.** Expander Lane0 RX data
HBA_EXPD0_PHY9_TX[P, N]	O	LVD hs	**SAS TX DATA.** Expander Lane0 TX data
HBA_EXPD0_PHY8_RX[P, N]	I	LVD hs	**SAS RX DATA.** Expander Lane1 RX data
HBA_EXPD0_PHY8_TX[P, N]	O	LVD hs	**SAS TX DATA.** Expander Lane1 TX data
HBA_EXPD1_PHY0_RX[P, N]	I	LVD hs	**SAS RX DATA.** Expander Lane2 RX data
HBA_EXPD1_PHY0_TX[P, N]	O	LVD hs	**SAS TX DATA.** Expander Lane2 TX data
HBA_EXPD1_PHY1_RX[P, N]	I	LVD hs	**SAS RX DATA.** Expander Lane3 RX data
HBA_EXPD1_PHY1_TX[P, N]	O	LVD hs	**SAS TX DATA.** Expander Lane3 TX data
GND	PWR	PWR	**Ground**

8.3.4   SAS Drive 22-pin Connectors

The 4u SAS backplane board implements an extended height 22-pin SATA connector in order to accommodate the limited reach of the mating SAS drives. The backplane board provides five identical drive connectors. The SAS drives mate directly to the 22-pin connector. Table 58 provides a description of each signal on the SAS drive connectors.

Table 58. LVD SCSI Bus Signals – J4D1, J4D2, J5D1, J6D1, J6D2

Signal	Tyrpe	Driver	Name and Desription
DRV[A,B] [0..4]_RX_[P, N]	I	LVD hs	**SAS RX DATA.** RX differential data from the drives
DRV[A,B] [0..4]_TX_[P, N]	O	LVD hs	**SAS TX DATA.** TX differential data to the drives
HD[A,B] [0..4]_PRESENT_L	I	TTL	**SAS DRIVE DETECT.** Active low presense detect
HD[A,B] [0..4]_ACT_LED_L	O	TTL	**SAS ACTIVITY DETECT.** Active low readiness indicator. Low-to-high transition to indicate activity
GND	PWR	PWR	**Ground.**
P12V	PWR	PWR	**+12 Volt supply.** Max 1 amp of continuous current. Max 4 amps peak current.
P5V	PWR	PWR	**+5 Volt supply.** Max 1.4 amps of continuous current. Max 4 amps peak current.

8.3.5   Fan Signals

There are two fan power connectors on the SAS backplane board. The connectors will control and supply the power for four fans in the system.

Table 59. Fan Power and Control J3E1

J6G1 12 pins	Type	Signal
1, 2, 8, 9	O	12V
3,4, 10, 11	O	GND
13	I	FAN1_TACH
6	I	FAN2_TACH
5	O	FAN_PWM
14	I/O	FAN12_AMB
7	I/O	FAN12_PRES_L

Table 60. Fan power and control J7D1

J6G1 12 pins	Type	Signal
1, 2, 8, 9	O	12V
3,4, 10, 11	O	GND
13	I	FAN3_TACH
6	I	FAN4_TACH
5	O	FAN_PWM
14	I/O	FAN34_AMB
7	I/O	FAN34_PRES_L

Each fan has an integral amber LED whose cathode is grounded, providing a small current to a transistor which drives the FAN [10..1]_PRES signal. This signal is read by server management through U5R2, the PCA9555 I²C Port. Server management can also use U5R2 to turn on a FAN [10..1]_LED signal. FET drivers then boost the current through the LED to make it bright.

The FAN_PWM signal from the Baseboard controls the fan speed. The FAN [4..1]_TACH signal is shaped by an FET buffer and driven to the Baseboard through the front panel as FAN[4..1]_TACH_BUFF for determination of fan speed.

8.3.6   Internal Logic Signals

Table 61 is a summary of the signals that route between logic devices on the SAS backplane board.

Table 61. Internal Logic Signals

	Signal	Type	Driver	Name and Desription
Clks	CLK_75MHZ_EXPD0	O	CMOS	**75-MHz Clock.** Expander0 75MHZ clock
	CLK_75MHZ_EXPD1	O	CMOS	**75-MHz Clock.** Expander1 75MHZ clock
Expander Memory Control	EXPD0_SDO	I/O	CMOS	**SPI DATA.** Expander0 FLASH data
	EXPD0_SCK	O	CMOS	**SPI CLOCK.** Expander0 FLASH clock
	EXPD0_SCSPN	O	CMOS	**SPI CHIP SELECT.** Expander0 FLASH select
	EXPD0_WP0_N	O	CMOS	**SPI WRITE PROTECT.** Active low Expander0 FLASH write protect
	EXPD1_SDO	I/O	CMOS	**SPI DATA.** Expander1 FLASH data
	EXPD1_SCK	O	CMOS	**SPI CLOCK.** Expander1 FLASH clock
	EXPD1_SCSPN	O	CMOS	**SPI CHIP SELECT.** Expander1 FLASH select
	EXPD1_WP0_N	O	CMOS	**SPI WRITE PROTECT.** Active low Expander1 FLASH write protect
	EXPD0_SCSSN	O	CMOS	**SPI CHIP SELECT.** Expander0 secondary FLASH select
	EXPD0_WP1_N	O	CMOS	**SPI WRITE PROTECT.** Active low Expander0 secondary FLASH write protect
	EXPD1_SCSSN	O	CMOS	**SPI CHIP SELECT.** Expander1 secondary FLASH select
	EXPD1_WP1_N	O	CMOS	**SPI WRITE PROTECT.** Active low Expander1 secondary FLASH write protect
	EXPD1_SCSPN	O	CMOS	**SPI CHIP SELECT.** Expander1 FLASH select
	EXPD1_WP0_N	O	CMOS	**SPI WRITE PROTECT.** Active low Expander1 FLASH write protect
Fan Control	FAN[4..1]_PRES	I	TTL	**Fan** is present on system
	FAN[4..1]_LED	I	CMOS	**LED** signal from Baseboard when fan is off line
	FAN[4..1]_TACH	I	Analog	**Fan** is installed

8.4   Electrical, Environmental, and Mechanical Specifications

This section specifies the operational parameters and physical characteristics for the SAS backplane board.

Further topics in this section specify normal operating conditions for the Intel® Server Platform SR4850HW4/M SAS backplane board, and mechanical specifications for the module and connector interfaces to the board.

8.4.1   Electrical Specifications

The power budget for the SAS backplane board and pin-outs of the external interface connectors are defined here.

Table 62. Electrical Specifications

Feature	Absolute Maximum Rating
Voltage of any signal with respect to ground	-0.3 V to Vcc[1] to Vcc[1]+0.3 V
+2.5 Volt supply with respect to ground	-0.25 V to +2.75 V
+3.3 Volt standby supply with respect to ground	-0.3 V to +3.465 V
+3 .3Volt supply with respect to ground	-0.3 V to +3.465 V
+5 Volt supply with respect to ground	-0.3 V to +5.25 V
+12 Volt supply with respect to ground	-0.3 V to +12.6 V

Note: 1. Vcc means supply voltage for the device.

Power Consumption Table 63 shows the power consumed on each supply line for the SAS backplane board. Since P5V, P2V5 and P3V3 are derived from the input 12V supply, the power dissipation on the 12V rail will also include the power dissipation from the other three rails. The P5V rail includes power provided to the hard drives, DVD player, and optional tape drive. The P12V rail also includes power to the four fans, one optional tape drive, and SAS drives.

Table 63. Maximum Power Consumption

Device	Power Dissipation
12 V	290 W
5 V	40W
3.3 V	3W
2.5 V	5.2
3.3 V Standby	0.5W

Note: Table 63 is provided only to show design limits. Actual power consumption will vary depending on the exact configuration.

8.4.1.1   SAS Drive Supplied Power

The SAS drives installed in the system must fall within power limits shown in Table 64. The Backplane is designed to work with the Fujitsu MAU3XXXRC SAS drives, however drives that meet the following requirements can be used.

Table 64. SAS Backplane Power Limits per Drive

Device Constraint	+5 V	+12 V
Peak Start Current	0.73 amps	3.0 amps
Max Operating Current	1.0 amps	1.0 amps
Average Idle	0.45 amps	0.75 amps

8.4.1.2   Power Supply Requirements

The external and internal power supply must meet the following requirements:

- Rise time of less than 50 msec (for all voltages).
- Delay of 5 msec (minimum) from valid power-to-power good.
- See Table 65 for voltage regulation requirements.

Table 65. DC Voltage Regulation

DC Voltage	Acceptable Tolerance
+5 V	± 5%
+12 V	± 5%
+3.3 V	± 5%
+3.3 V standby	± 5%
+2.5 V	± 5%

8.4.1.3   Power Bay Connector Pin-out

The power bay connector delivers power from the power cage to the backplane board.

Table 66. Power Bay Connector Pin-out – J4N1

Pins	Signal
1 thru 6	GND
7 thru 12	+12V

8.4.2   DVD Power Connector

The DVD Power Connector provides power to the DVD disk drive. Other signals for the drive connect directly with the baseboard.

Table 67. DVD Power Connector – J9M1

Pins	Signal
1	+5V
2	GND

8.4.2.1   SAS Connector Pin-outs

The internal SAS SFF8087 connector is a shielded 36-pin connector.

Table 68. 36-Pin SAS 4i Internal Connector Pin-out – J8L1T

Signal Name	Connector Pin	Connector Pin	Signal Name
GND	A1	B1	GND
RX0_P	A2	B2	TX0_P
RX0_N	A3	B3	TX0_N
GND	A4	B4	GND
RX1_P	A5	B5	TX1_P
RX1_N	A6	B6	TX1_N
GND	A7	B7	GND
NC	A8	B8	NC
NC	A9	B9	NC
GND	A10	B10	GND
GND	A11	B11	GND
GND	A12	B12	GND
RX2_P	A13	B13	TX2_P
RX2_N	A14	B14	TX2_N
GND	A15	B15	GND
RX3_P	A16	B16	TX3_P
RX3_N	A17	B17	TX3_N
GND	A18	B18	GND
GND	A1	B1	GND
RX0_P	A2	B2	TX0_P
RX0_N	A3	B3	TX0_N
GND	A4	B4	GND
RX1_P	A5	B5	TX1_P
RX1_N	A6	B6	TX1_N
GND	A7	B7	GND
NC	A8	B8	NC
NC	A9	B9	NC
GND	A10	B10	GND
GND	A11	B11	GND
GND	A12	B12	GND

Signal Name	Connector Pin	Connector Pin	Signal Name
RX2_P	A13	B13	TX2_P
RX2_N	A14	B14	TX2_N
GND	A15	B15	GND
RX3_P	A16	B16	TX3_P
RX3_N	A17	B17	TX3_N
GND	A18	B18	GND

Table 69. SAS Drive Connector Pin-out – J4D1, J4D2, J5D1, J6D1, J6D2

Pin	Signal	Pin	Signal
S1	GND	P1	NC
S2	RXP	P2	NC
S3	RXN	P3	NC
S4	GND	P4	GND
S5	TXN	P5	GND
S6	TXP	P6	PRESENT_N
S7	GND	P7	+5V
		P8	+5V
		P9	+5V
		P10	+5V
		P11	ACT_N
		P12	+12V
		P13	+12V
		P14	+12V
		P15	+12V

8.4.2.2   Front Panel Connector Pin-outs

Table 70. SAS Drive Connector Pin-out – J1L1

Pin	Signal	Pin	Signal
2	NC	1	GND
4	SCSI_FLT_L	3	SCSI_LED_ACT_L
6	+5V	5	+5V
8	+3.3V	7	+5V
10	FAN2_TACH_BUFF	9	FAN1_TACH_BUFF
12	GND	11	FAN3_TACH_BUFF
14	FAN4_TACH_BUFF	13	GND
16	BP_D2D_ENABLE	15	BLOWER_PWM
18	BP_PWRGOOD	17	TP_IPMB_RST
20	I2C_IPMB_SCL_SB	19	PCI_RST_BP_N
22	GND	21	KEY
24	BP_PRES_N	23	GND
26	TP_SYS_PWGOOD	25	I2C_IPMB_SDA_SB

Pin	Signal	Pin	Signal
28	+3.3V_STBY	27	+3.3V_STBY
30	+3.3V_STBY	29	+3.3V_STBY
32	I2C_SEG2_SCL	31	I2C_SEG2_SDA
34	GND	33	GND

8.4.3   Cooling requirements

The SAS backplane board cooling requirements have not been determined at this point in time. The cooling requirements of the SAS drives that will be docked into the SAS backplane board will be much more significant than those associated with the power dissipation of the SAS backplane board components themselves.

8.4.4   Mechanical Specifications

Figure 32 shows the mechanical specifications and the connector positions for the SAS backplane board. The board outline dimensions are 15.150" x 6.430". The board thickness is 0.093" +.008/-.005". All dimensions are in inches.
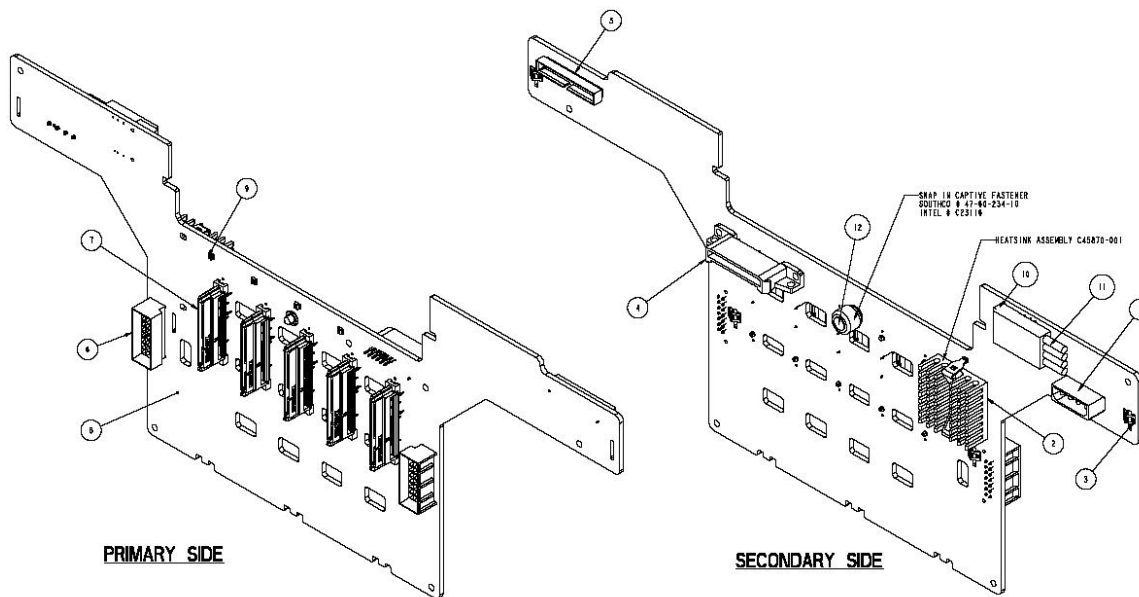

Figure 32. Mechanical Drawing

9.   Front Panel I/O and Control Boards

This section describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M front panel I/O board and is organized as follows:

Section 9.1:   Introduction
Provides an overview of the front panel I/O board, showing functional blocks and board layout.

Section 9.2:   Functional Architecture
Describes the front panel I/O board functional blocks.

Section 9.3:   Signal Descriptions
Summary of the internal and connector signals, and the connector signal-pin names and descriptions. Signal mnemonics appear throughout this section.

Section 9.4:   Electrical, Environmental, and Mechanical Specifications
Specifies operational parameters and considerations, and connector pinouts.

Section 9.5:   Front Panel Control Module
Describes the two different front panel control modules available in the Intel® Server Platforms SR4850HW4 and SR4850HW/M.

9.1   Introduction

The server platform front panel I/O board provides access to the video and USB interfaces. It also interfaces to the front panel control module that contains the front control panel buttons, LEDs and optional LCD window. Circuitry on the front panel I/O board consists of video filters, USB filters, USB port power bulk capacitors with fusing, and a piezoelectric speaker.

9.1.1 Block Diagram

The following block diagram divides the front panel I/O board into physical and functional blocks. Arrows represent buses and signals. Blocks represent the physical and functional circuits. Figure 33 illustrates the general architecture of the front panel.
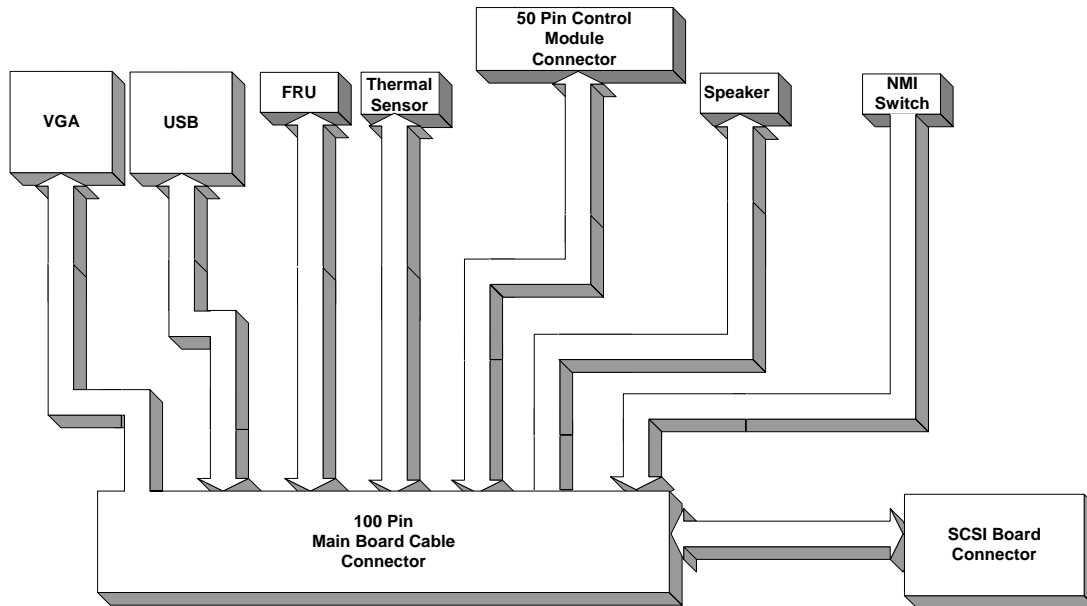
Figure 33. Front Panel I/O Board Block Diagram

9.2 Architectural Overview

The front panel I/O board provides three main functions for the platform. The first function is to provide filtered video and USB signals to the front panel connector. The second is to provide a speaker. The third is to provide a system NMI button.

Functional blocks are as follows:

- USB Hub
- USB ports
  - External front control panel connector for three USB 2.0 ports
  - Filtering for the USB signals
  - Bulk capacitance and fused power for USB ports
- Video connector
  - External front control panel 15-pin VGA connector
  - Required safety fusing and EMI filtering
- Speaker
  - Audible beep-code and alarm speaker
- NMI button

9.2.1 Component Location

The following figure shows the placement of the major components and connectors on the front panel I/O board. Figure 34 provides a three-dimensional view of the board.
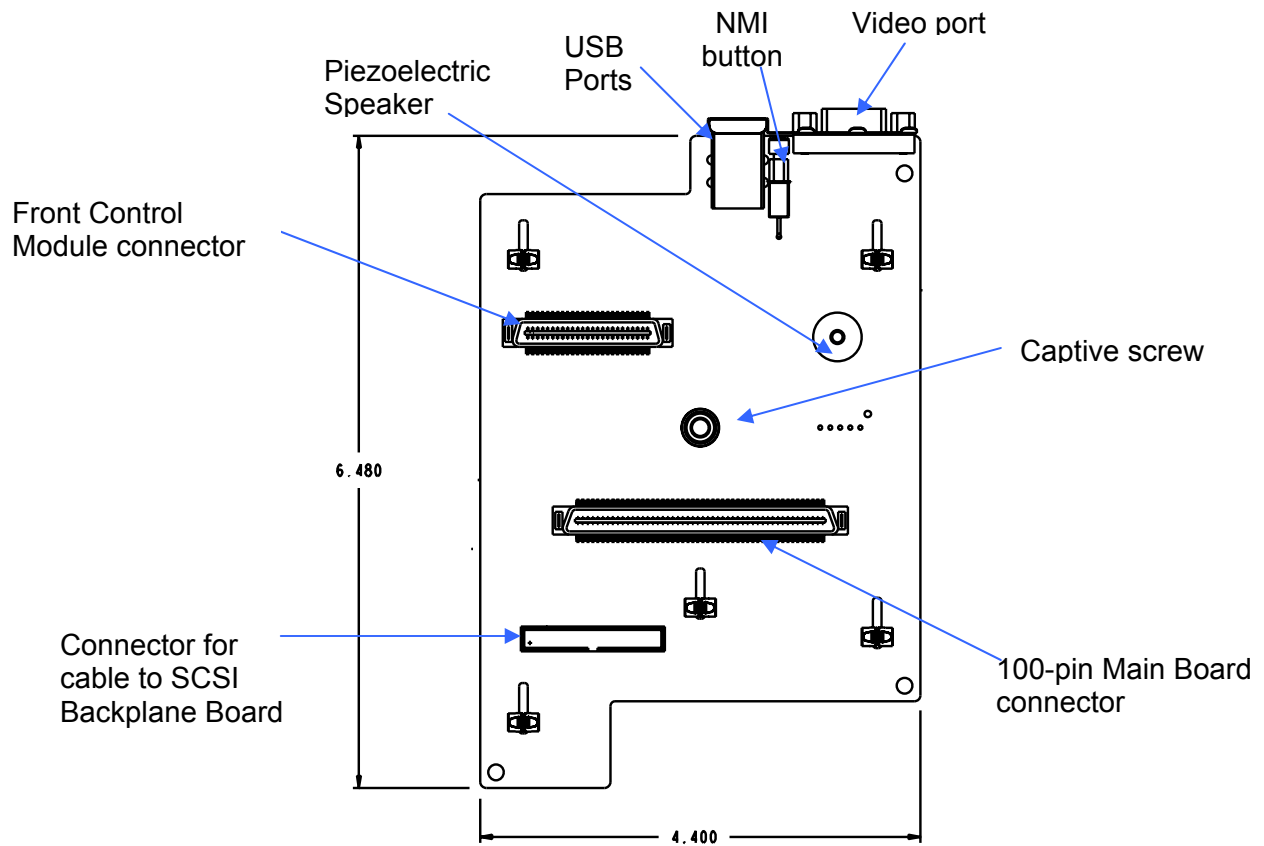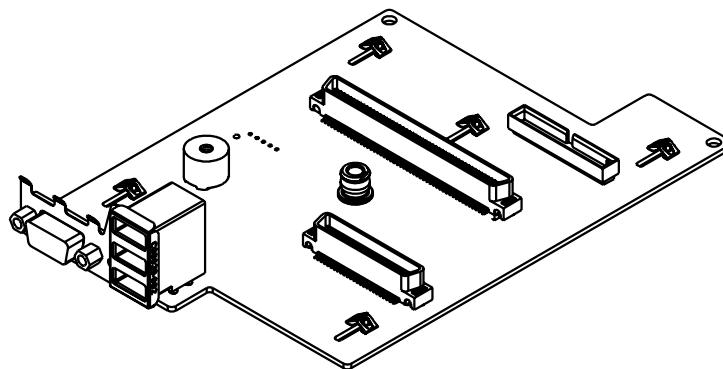

Figure 34. Front Panel I/O Board Placement Diagram

Figure 35. Front Panel I/O Board

9.3   Functional Architecture

This section provides an architectural description of the Intel® Server Platforms SR4850HW4 and SR4850HW4/M front panel I/O board functional blocks.

9.3.1 VGA

The front panel I/O board passes the VGA video signals from Intel® Server Board Set SE8501HW4 Main Board connector to the front panel I/O board.

Using the default operating system video driver options, the VGA signal is mirrored between the rear panel and the front panel of the platform. This design consideration was made to facilitate user debug of an operating system hard failure. When the system is in a failure state, a portable monitor can be attached to the front of the system to determine root cause. Since this is an enterprise server, Intel is not validating the video driver configured with the front panel I/O board VGA connector in a non-mirrored, extended desktop, state.

9.3.2 USB

The front panel I/O board has an SMSC* USB20H04 controller, high-speed USB 2.0 hub, that drives three USB ports on the front of the system. This controller is accessible through I^{2}C bus address 0x5A.

9.3.3 NMI Button

The front panel I/O board has a recessed NMI button; this signal is routed to the 30-pin Server Platform SR4850HW4 SCSI backplane board connector.

9.3.4 50-pin Control Panel Connector

The following input functions are routed to the Intel® Server Board Set SE8501HW4 Main Board: reset, power and system ID. The following LEDs are activated through the connector: hard drive status, LAN1 and LAN2 activity, system status, power and system ID.

9.3.5 100-pin Main Board and SCSI Backplane Board Connectors

The front panel I/O board passes signals from the 100-pin Intel® Server Board Set SE8501HW4 Main Board connector to the server platform SCSI backplane board via the 340pin connector.

9.4   Signal Descriptions

The following notations are used to describe the signal type, from the perspective of the server platform front panel I/O board:

- I   Input-pin to the front panel I/O board
- O   Output-pin from the front panel I/O board
- I/O   Bi-directional (input/output) pin
- PWR   Power supply pin

The signal description also includes the type of buffer used for the particular signal:

- TTL   5V TTL signals
- CMOS   5V CMOS signals
- 3.3V CMOS   3.3V CMOS signals
- Analog   Typically a voltage reference or specialty power supply
- hs   High-speed requirements that would make modifications subject to review

9.4.1 USB Connector

Table 71 provides a summary of power connector pins, including the signal mnemonic, the name, and a brief description.

Table 71. USB Connector

Signal		Type	Driver	Name and Description
USB port 1(J6K1)	USB_FB_OC1			Connector, TOP
	USB_P1_CONN_M	I/O		
	USB_P1_CONN_P	I/O		
	USB_P1_CABLE_GND			
USB port 2(J5K1)	USB_FB_OC2			Connector, CENTER
	USB_P2_CONN_M	I/O		
	USB_P2_CONN_P	I/O		
	USB_P2_CABLE_GND			
USB port 3(J6K1)	USB_FB_OC3			Connector, BOTTOM
	USB_P3_CONN_M	I/O		
	USB_P3_CONN_P	I/O		
	USB_P3_CABLE_GND			

9.4.2 Front Panel VGA Connector

The front panel I/O board provides a video port interface with a standard VGA-compatible, 15-pin connector. Onboard video is supplied by the ATI* Radeon* 7000 component, with 16MB of on-chip memory. The signal is mirrored between the front panel I/O board and the rear panel of the Intel® Server Board Set SE8501HW4 Main Board. See Section 4 for pinouts.

Table 72. VGA Connector Signal Description

	Signal	Type
RGB VGA	RED	O
	GREEN	O
	BLUE	O
	HSYNC	O
	VSYNC	O
I²C	VID_SCL	O
	VID_SDA	I/O
	V_PRES_L	I
	VIDPWR	O

9.5 Electrical, Environmental, and Mechanical Specifications

This section specifies the board-level operational parameters and physical characteristics for the front panel I/O board. Further topics in this section specify normal operating conditions for the front panel, mechanical specifications, and connector interfaces to the board.

9.5.1 Electrical Specifications

The power budget for the front panel I/O board are defined in Table 73.

Table 73. Electrical Specifications

Feature	Absolute Maximum Rating
Voltage of any signal with respect to ground	-0.3V to Vcc[1] to Vcc[1]+0.3V
+5V supply with respect to ground	-0.3V to +5.25V

Note: 1. Vcc means supply voltage for the device.

9.5.1.1   Power Consumption

The front panel I/O board consumes no power. The +5 volt power consumption is for the three USB ports and is shown in Table 74.

Note: The numbers in the table are provided only to show design limits. Power consumption will vary depending on the exact configuration.

Table 74. Maximum Power Consumption

Devices	Power Dissipation
+5V	1.5W

9.5.1.2   Power Supply Requirements

The power supply must meet the following requirements:

- Rise time of less than 50ms (for all voltages).
- Delay of 5ms (minimum) from valid power-to-power good.
- See the following table for voltage regulation requirements.

Table 75. DC Voltage Regulation

DC Voltage	Acceptable Tolerance
+5V	± 5%

9.5.2   Cooling Requirements

The front panel I/O board does not dissipate significant heat. Cooling is not required to maintain ambient temperatures.

9.6   Front Panel Control Module

The Intel® Server Platforms SR4850HW4 and SR4850HW4/M support either the standard Button Control Panel, providing basic functionality, or the Intel® Local Control Panel, which adds an LCD and additional server management features. Both front panels contain switches and LED status indicators. Both front panels are retained in the chassis sheet metal by two clips and connect to the front panel I/O board via a 30-pin flat cable.

9.6.1 Button Control Panel

Standard Button Control Panel features are shown in Figure 36. Please refer to the *Intel® Button Control Panel Technical Product Specification* for more information.
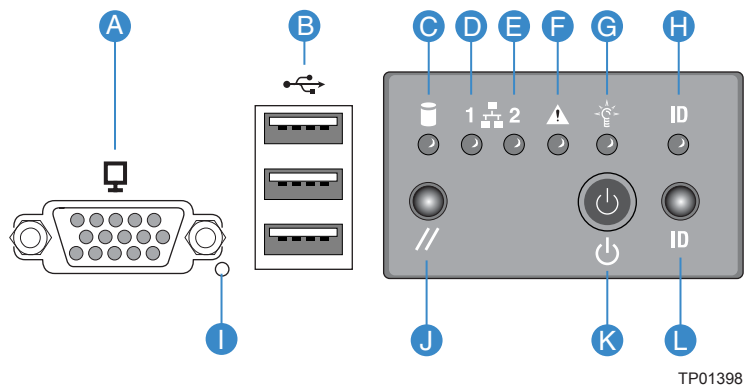

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Figure 36. Button Control Panel Features

Item	Feature	Description		
A	Video Display Connector	Part of the I/O panel, not part of the Button Control Panel		
B	USB Connectors	Part of the I/O panel, not part of the Button Control Panel		
C	Hard drive activity LED (green/amber)	Indicates hard drive activity and fault status.		
		LED	State	Description
		Green, On		A hard drive is being initialized.
		Green, blinking		A hard drive is active.
		Amber, On		Hard drive/slot failure.
		Amber, Slow blinking (~1Hz)		A predictive hard drive/slot failure or rebuild in process.
		Amber, Fast blinking (~2.5Hz)		Hard drive rebuild interrupted or rebuild on empty slot.
D, E	LAN1, LAN2 Status LEDs (green)	Indicates LAN activity status.		
		LED	State	Description
		Off	Idle	
		On	Inactive	No access
		Blinking	Active	Access
F	System Status/Fault LED (green/amber)	Indicates system status.		
		LED	State	Description
		Off	Not ready	AC Power Off, POST error
		Green, On	Ready	System booted and ready
		Green, blinking	Degraded	Processor or DIMM disabled
		Amber, on	Critical Alarm	Critical Power Supply, Blower, Voltage, or Temperature failure.

Item	Feature	Description		
		Amber, blinking	Non-Critical Alarm	Redundant Power Supply or Blower failure. Non-Critical Blower, Voltage, and Temperature failure.
G	System Power LED (green)	Indicates system power status.		
		LED	State	ACPI
		Off	Power off	No
		On	Power on	No
		Off	S5	Yes
		Blinking	S1	Yes
		On	S0	Yes
H	System ID LED (Blue)	Identifies the system via server management or locally.		
		Off	Not active	
		On	Active via switch	Cannot be turned off by Server Management
		Blinking	Active via Server Management	Cannot be turned off by switch
I	Recessed NMI button	Asserts NMI, used to enable OS dumps.		
J	System Reset button	Press to reset the system.		
K	System Power button	Press to turn the system power on or off.		
L	System ID button	Press to turn the system ID LED on or off.		

9.6.2 Intel® Local Control Panel

Local Control Panel features are shown in Figure 37 and described in **Error! Reference source not found.**. See the *Intel® Local Control Panel Technical Product Specification* for more information.
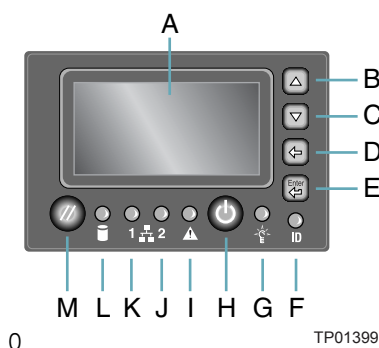

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Figure 37. Intel® Local Control Panel Features

Item	Feature	Description
A	LCD	Display of text
B	Scroll up button	Press to scroll up on the LCD
C	Scroll down button	Press to scroll down on the LCD
D	Back button	Press to move to the previous LCD screen
E	Select button	Press to enter a command or select an option on the LCD

Item	Feature	Description		
F	System ID LED (Blue)	Helps identify the system via server management or locally		
		Off	Not active	
		On	Active via switch	Cannot be turned off by Server Management
		Blinking	Active via Server Management	Cannot be turned off by switch
G	System Power LED (green)	Indicates system power status.		
		Off	Power off	ACPI: No
		On	Power on	ACPI: No
		Off	S4 / S5	ACPI: Yes
		Blinking	S1	ACPI: Yes
		On	S0	Yes
H	System Power button	Toggles system power		
I	System Status/Fault LED (green/amber)	Indicates system status		
		Off	Not ready	AC power off, POST error
		Green, on	Ready	System booted and ready
		Green, blinking	Degraded	Processor or DIMM disabled
		Amber, on	Critical Alarm	Critical power supply, blower, voltage, or temperature failure
		Amber, blinking	Non-Critical Alarm	Redundant power supply or blower failure. Non-critical blower, voltage, or temperature failure.
J, K	LAN1, LAN2 Status LEDs (green)	Indicates LAN activity status		
		Off	Idle	
		On	Inactive	No access
		Blinking	Active	Access
L	Hard Drive Status LED (green/amber)	Indicates hard drive activity and fault status.		
		Green	On	A hard drive is being initialized
		Green	Blinking	A hard drive is active
		Amber	On	Hard drive/slot failure
		Amber	Slow blinking (~1 Hz)	A predictive hard drive/slot failure or rebuild in process
		Amber	Fast blinking (~2.5 Hz)	Hard drive rebuild interrupted or rebuild on empty slot
M	System Reset button	Resets the system		

9.6.3 System ID Buttons and LEDs

The system contains two system ID buttons and two blue system ID LEDs. The LEDs are used to easily identify a platform. It is useful when several platforms are racked or installed near each other and a specific system needs to be serviced. One button/LED pair is located on the front control panel and a second button/LED pair is located at the rear of the platform.

The system ID LEDs can be turned on and off either by the system ID buttons or remotely through server management software. If the LEDs are activated by the system LED button, they must be turned off with the button; they cannot be turned off remotely through software. If the LEDs are activated through software, they must be turned off through software, not by pressing the system LED button.

Table 76. System ID LED Details

LED State	Description
Off	System ID inactive.
On	System ID active via button.
Blinking	System ID active via remote command.

10. SATA-to-IDE Converter Board

This section describes the Intel® Server Platforms SR4850HW4 and SR4850HW4/M SATA-to-IDE converter board to support an optical drive. This board connects a JAE slim-line peripheral 50-pin Slim-line Form Factor (SFF) IDE connector on an optical drive to a 7-position SATA signal connector. The power for the optical drive and the converter board is delivered through a 4-pin mini-power connector. The SATA-to-IDE converter board can be removed when a SATA optical device has been qualified for the system.

Please refer to the *Tested Hardware Operating System List (THOL)* for more information on the specific optical drives Intel has validated in the platform. DVD-ROM drives will be qualified for the platform, but since this is an enterprise server, DVD video playback will not be validated.

10.1 Mechanical Outlines

The following figures show mechanical outline drawings of the SATA-to-IDE converter board and an optical drive.
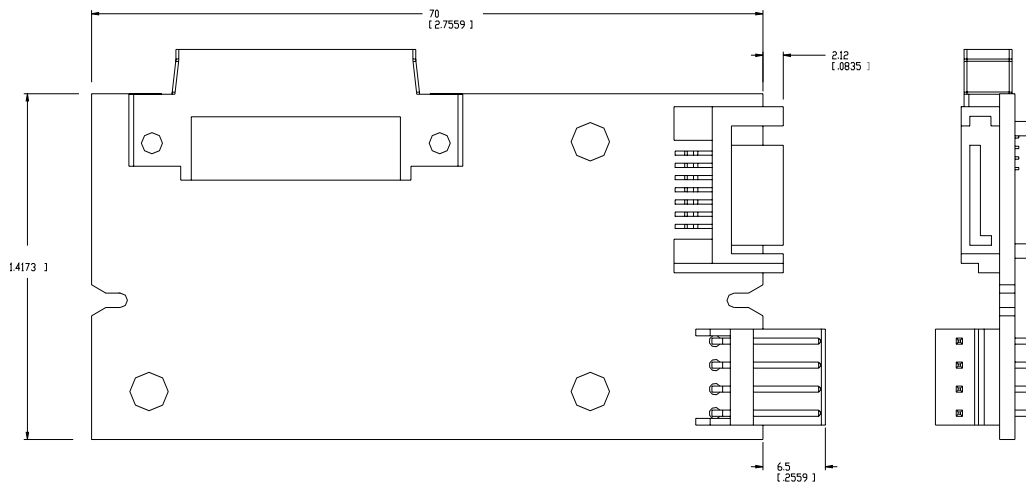

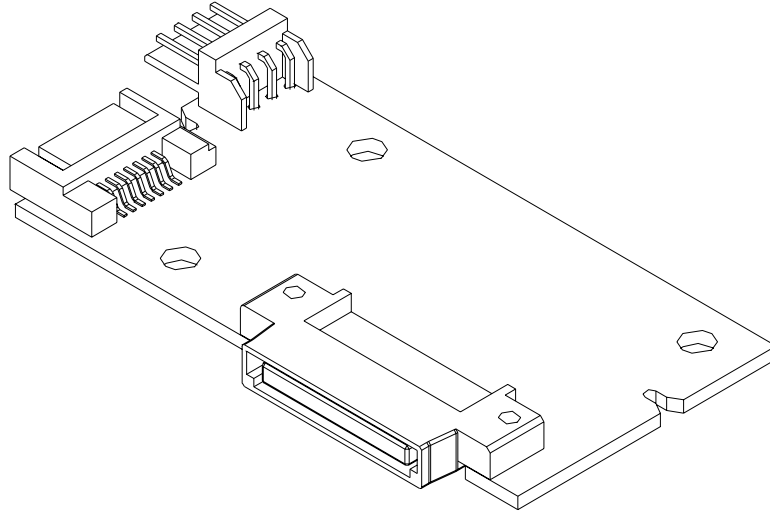**Figure 38. SATA-to-IDE Converter Board Mechanical Outline**

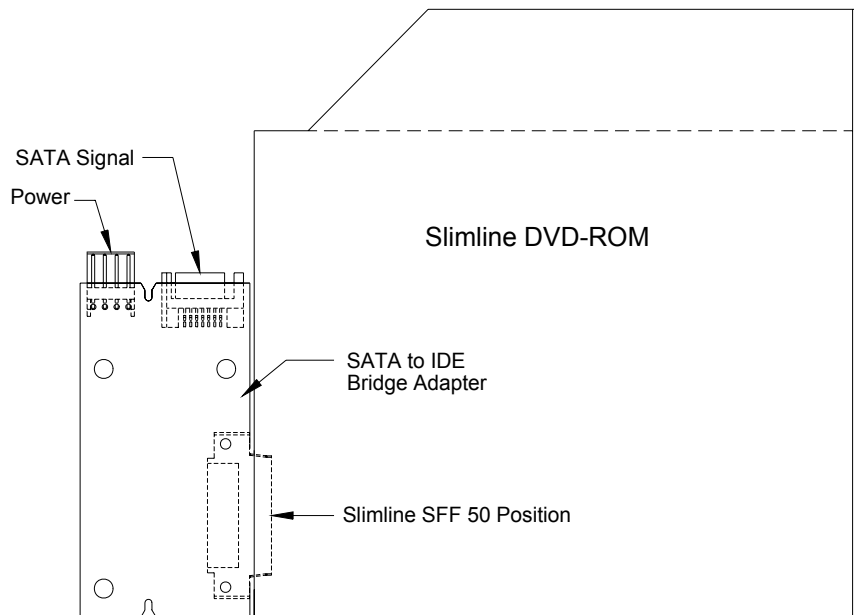**Figure 39. SATA-to-IDE Converter Board**

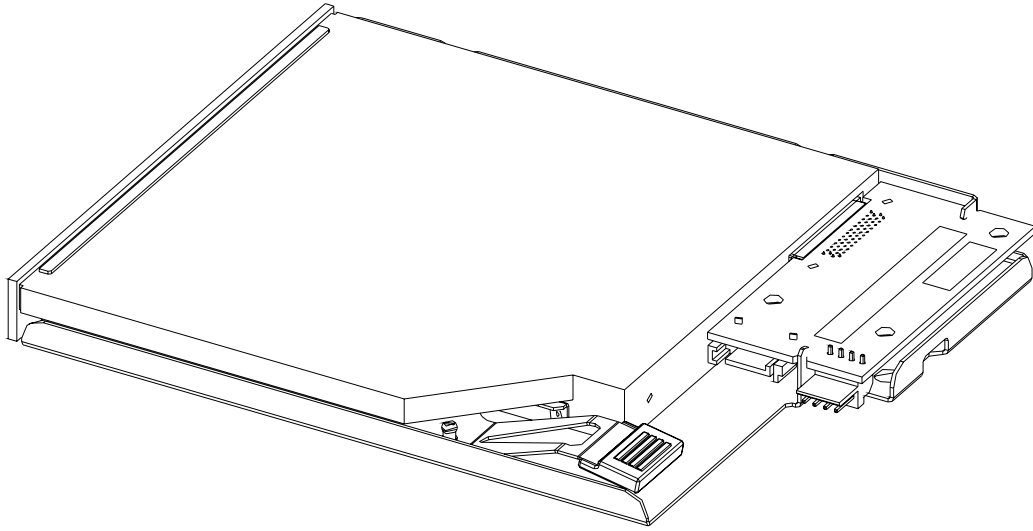**Figure 40. SATA-to-IDE Converter Board with Attached Optical Drive**

Figure 41. SATA-to-IDE Converter Board with Attached Optical Drive

11. Regulatory and Certification Information

⚠ WARNING

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. Integration of it into a Class B chassis does not result in a Class B device.

11.1 Product Regulatory Compliance

The Server Chassis product, when correctly integrated per this 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.

11.1.1   Product Safety Compliance

UL60950 – CSA 60950(USA / Canada)

EN60950 (Europe)

IEC60950 (International)

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

GS License (Germany)

GOST R 50377-92 - License (Russia)

Belarus License (Belarus)

Ukraine License (Ukraine)

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

IRAM Certification (Argentina)

GB4943- CNCA Certification (China)

11.1.2   Product EMC Compliance – Class A Compliance

Note: <u>Legally</u> the product is required to comply with Class A emission requirements as it is intended for a commercial type market place. Intel targets 10db margin to Class A Limits

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

CISPR 22 – Emissions (International)

EN55022 - Emissions (Europe)

EN55024 - Immunity (Europe)

EN61000-3-2 - Harmonics (Europe)

EN61000-3-3 - Voltage Flicker (Europe)

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

VCCI Emissions (Japan)

AS/NZS 3548 Emissions (Australia / New Zealand)

BSMI CNS13438 Emissions (Taiwan)

GOST R 29216-91 Emissions (Russia)

GOST R 50628-95 Immunity (Russia)

Belarus License (Belarus)

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

GB 9254 - CNCA Certification (China)

GB 17625 - (Harmonics) CNCA Certification (China)

11.1.3   Certifications / Registrations / Declarations

UL Certification (US/Canada)

CE Declaration of Conformity (CENELEC Europe)

FCC/ICES-003 Class A Attestation (USA/Canada)

VCCI Certification (Japan)

C-Tick Declaration of Conformity (Australia)

MED Declaration of Conformity (New Zealand)

BSMI Certification (Taiwan)

GOST R Certification / License (Russia)

Belarus Certification / License (Belarus)

RRL Certification (Korea)

IRAM Certification (Argentina)

CNCA Certification (China)

Ecology Declaration (International)

11.1.4   RoHS

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

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

Threshold limits and banned substances are noted below.

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

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

   - Cadmium

11.2 Product Regulatory Compliance Markings

The Intel Server Chassis product bears the following regulatory marks.

Regulatory Compliance	Region	Marking
cULus Listing Marks	USA/Canada	
GS Mark	Germany	
CE Mark	Europe	
FCC Marking (Class A)	USA	This device complies with Part 15 of the FCC Rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. Manufactured by Intel Corporation
EMC Marking (Class A)	Canada	CANADA ICES-003 CLASS A CANADA NMB-003 CLASSE A
C-Tick Mark	Australia / New Zealand	 N232
VCCI Marking (Class A)	Japan	この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。VCCI-A
BSMI Certification Number & Class A Warning	Taiwan	 R33025 警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策
GOST R Marking	Russia	
RRL MIC Mark	Korea	 인증번호: CPU−*Model Name* (A)

Regulatory Compliance	Region	Marking
China Compulsory Certification Mark	China	

11.3 Electromagnetic Compatibility Notices

11.3.1   FCC Verification Statement (USA)

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

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

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

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

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

11.3.2   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.

11.3.3   Europe (CE Declaration of Conformity)

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

11.3.4   VCCI (Japan)

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

English translation of the notice above:

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

11.3.5   BSMI (Taiwan)

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

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

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11.3.6　　　RRL (Korea)

Following is the RRL certification information for Korea.

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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

11.3.7　　　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。

11.4 Regulated Specified Components

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

Updated product information for configurations can be found on the Intel Server Builder Web site at the following URL:
http://channel.intel.com/go/serverbuilder
If you do not have access to Intel's Web address, please contact your local Intel representative.

- **Server Chassis** (base chassis is provided with power supply and fans)　 UL listed.
- **Server board**　 you must use an Intel server board—UL recognized.
- **Add-in boards**　 must have a printed wiring board flammability rating of minimum UL94V-1. Add-in boards containing external power connectors and/or lithium batteries must be UL recognized or UL listed. Any add-in board containing modem telecommunication circuitry must be UL listed. In addition, the modem must have the appropriate telecommunications, safety, and EMC approvals for the region in which it is sold.
- **Peripheral Storage Devices** - must be UL recognized or UL listed accessory and TUV or VDE licensed. Maximum power rating of any one device is 19 watts. Total server configuration is not to exceed the maximum loading conditions of the power supply.

Glossary

This appendix contains important terms used in the preceding sections. Acronyms are then entered in their respective place, with non-acronyms following.

Word / Acronym	Definition
ACPI	Advanced configuration and power interface
BIOS	Basic Input / Output System
BMC	Baseboard management controller
CE	Community European
CISPR	International Special Committee on Radio Interference
CMOS	Complementary metal-oxide semiconductor
CSA	Canadian Standards Organization
DB	Data bus
dBA	Decibel acoustic
DDR-II	Double data rate
DIMM	Dual in-Line memory module
DMA	Direct memory access
ECC	Error checking and correcting
EEPROM	Electrically erasable programmable ROM
EMI	Electromagnetic interference
EMP	Emergency Management Port
EPS	External Product Specification
ESD	Electro static discharge
FCC	Federal Communications Commission
FRB	Fault resilient booting
FRU	Field replaceable unit
FSB	Front side bus
FWH	Firmware hub
GND	Ground
GUI	Graphical user interface
HDD	Hard disk drive
HL	Hub-link
HSC	Hot-swap controller
I/O	Input / Output
ICMB	Intelligent Chassis Management Bus
IDE	Integrated device electronics
IEC	International Electrotechnical Commission
IMB	Intelligent management bus
IPMB	Intelligent platform management bus
IPMI	Intelligent platform management interface
ISP	In-system programmable
ITE	Information technology equipment
ITP	In-target probe
JTAG	Joint Test Action Group

Word / Acronym	Definition
LAN	Local area network
LED	Light emitting diode
LPC	Low-pin count
LVDS	Low voltage differential SCSI
NIC	Network interface card
OEM	Original equipment manufacturer
OS	Operating system
OTP	Over-temperature protection
PCI	Peripheral component interconnect
PDB	Power distribution board
PEF	Platform event filtering
PEP	Platform event paging
PFC	Power factor correction
PIROM	Processor information ROM
PLD	Programmable logic device
PWM	Pulse width modulator
RAID	Redundant array of independent disks
RAS	Reliability, availability, and serviceability
RPM	Revolutions per minute
SAF-TE	SCSI accessed fault-tolerant enclosure
SCA	Single connector attachment
SCL	Serial clock
SCSI	Small computer systems interface
SDA	Serial data
SDINT	System diagnostic interrupt
SDR	Sensor data record
SDRAM	Synchronous dynamic RAM
SE	Single-ended
SEEPROM	Serial dlectrically erasable programmable read-only memory
SEL	System event log
SMP	Symmetric multiprocessing
TTL	Transistor-transistor logic
USB	Universal serial bus
UV	Under-voltage
VAC	Alternating current (AC) voltage
VCC	Voltage controlled current
VCCI	Voluntary Control Council for Interference by Information Technology Equipment
VGA	Video graphics array
VID	Voltage ID
VRM	Voltage regulator module
VSB	Voltage standby
WfM	Wired for management

Reference Documents

See the following documents for additional information:

- *Intel® Server Board Set SE8501HW4 Technical Product Specification*

- *Intel® Server Board Set SE8500HW4 Technical Product Specification*

- *Intel® Server Platform SR6850HW4 Power Cord Enabling Specification*

- *Intel® Server Platform SR4850HW4 Power Cord Enabling Specification*

- *SCSI Accessed Fault-Tolerant Enclosures Interface Specification (SAF-TE)*

- *Intel® Server Board SE8501HW4 Tested Hardware and Operating System List (THOL)*

- *Intel® Server Board SE8500HW4 Tested Hardware and Operating System List (THOL)*

- *Intel® Local Control Panel Technical Product Specification*

- *Intel® Button Control Panel Technical Product Specification*

- *Intel® Management Module Installation and User's Guide*

- *IPMI Specification, Version 2.0*