Intel® Storage System SSR316MJ2

Hardware Technical Product Specification

Intel Order number C75916-001

Revision 1.0

Enterprise Platforms and Services Marketing

Revision History

Date	Revision Number	Modifications
Feb. 19, 2004	0.1	Initial draft for review
March 4, 2004	0.2	Incorporated initial team feedback
April 1, 2004	0.5	Revised draft for review
June 9, 2004	0.75	Added system memory requirements, added second Compact Flash Memory Card, removed China certs requirements and added a foot note, added feature summary table, updated Mean Time Between Failures (MTBF) table, updated spares & accessories table, updated CompactFlash section.
July 28, 2004	0.85	Final review copy prior to release (v 1.0): removed Battery Back Up (BBU) support, removed Non-Maskable Interrupt (NMI) button functionality, updated support URL links, updated MTBF numbers, clarified failed Hard Disk Drive (HDD) replacement constraint.
August 16, 2004	0.86	Corrected power supply module fan discrepancy, updated front panel text to match actual front bezel silkscreen, updated HDD LED functionality.
August 17, 2004	0.87	Updated several chassis figures, added system weight measurements.
August 24, 2004	0.88	Added 48 hour Battery Backup option to SATA HBA.
September 1, 2004	0.89	Added recommended memory upgrade note.
September 8, 2004	1.0	Added clarification of hot-swapping drives. Removed Client Server Clustering Agent and Volume Backup Agent accessories. Final version released.

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Table of Contents

List of Figures

List of Tables

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1. Feature Summary

This Technical Product Specification provides detailed information about the hardware components of the Intel® Storage System SSR316MJ2. Please refer to the *Intel® Storage System SSR316MJ2 Software User Manual* for complete feature, configuration and operation details of the Intel® Storage System SSR316MJ2 Storage Area Network (SAN) Management Software that is shipped with each Storage System.

The Intel® Storage System SSR316MJ2 includes a 3U chassis, Intel® System Board SE7501HG2, two 250 GB Serial ATA hard disk drives (with expansion for up to sixteen total drives or 4 TB of available raw storage), three Intel® SRCS16 SATA RAID controllers, 512 MB Registered DDR, ECC memory (expandable to 12 GB), dual Compact Flash® slots (ships occupied with two 256 MB Compact Flash® memory cards), dual Intel® 10/100/1000 LAN ports, and dual redundant (1+1) 700 W power supplies. Intel-based system boards and chassis have feature sets designed to support the high-density storage market. The storage system is offered in only the black color (GE701).

The Intel® System Board SE7501HG2 that is installed in the Storage System SSR316MJ2 chassis is a monolithic printed circuit board with features that were designed to support the storage system market. The architecture is based on the Intel® E7501 chipset and is capable of supporting dual Intel® Xeon™ processors with 512 Kilobyte (KB) L2 cache.

For more information on the Intel® Storage System SSR316MJ2 SAN Management Software, please refer to the *Intel® Storage System SSR316MJ2 Software User Manual* available from Intel Business Link (IBL) or your Intel sales representative.

Figure 1. Intel® Storage System SSR316MJ2

Intel® Storage System SSR316MJ2 Hardware Feature Summary

Storage Capacity	0.5 Terabytes (TB) installed, expandable to 4 TB.
Drive Bays	16 Serial Advanced Technology Attachment (SATA) Hot Pluggable
Hard Disk Drive Supported	3.5", 250 GB, Serial ATA
Processor	Dual Intel® Xeon™ processors with 512 KB L2 cache.
Memory Capacity	512 MB installed in two DIMM slots, expandable to 12 GB.
Memory Type	Synchronous Dynamic Random Access Memory (SDRAM), DDR266, Registered, ECC.
DIMM Slots	Six 184-pin DIMM sockets
Enclosure Management Controller	On-board AT89C51 micro-controller with 256 Kbexternal Static Random Access Memory (SRAM) memory
Temperature Sensor	A National Semiconductor* LM75* or equivalent temperature sensor is located on the backplane that allows drive cage temperature monitoring by enclosure management.
SAF-TE Support	The backplane firmware complies with version 1.00, rev 041497, of the SAF-TE specification.
SATA Compliance	SATA 1.5
Connectivity	Client Connectivity via Internet Protocol Small Computer System Interface (iSCSI) Dual GB Ethernet and via optional Fibre Channel Host Bus Adapter (HBA) Peripheral Component Interconnect (PCI) add-in card in slot 1
Serial Port	Management console port
Front Panel	
Buttons and Switches	Power button, Reset button, Chassis Intrusion Switch
LEDs	NIC 1 Activity, NIC 2 Activity, CF Slot 1 Activity, CF Slot 2 Activity, ID, Power
Back Panel	
I/O Connectors	1x DB15 COM1 Serial port, 2x RJ-45 Ethernet ports
Power Receptacle	2x IEC AC
Chassis	
Form Factor	3U rack-mount chassis
Height	129.54 mm, 5.1"
Width	442.6 mm, 17.425"
Depth	684.5 mm, 26.95"
Weight	As shipped (two drives): approximately 60 pounds Fully configured (sixteen drives): approximately 75 pounds Shipping container: 13 pounds
Color	Black
Rack Support	Shelf mount, compatible with four-post rack mount only.
System Cooling	
Fans	Chassis includes three 120 millimeter (mm) non-hot-swappable redundant system fans for cooling the hard drives, baseboard and

	SATA Host Bus Adapter (HBA) cards. Power supply modules each contain two 40 mm fans for cooling and run whenever AC power is applied to ensure that the modules are adequately cooled.
Power	
Configuration	700 W continuous, 1+1 redundant power supplies
Max AC input current	8.9 Amperes (A) @ 110 V, 4.5 A @ 220 V (each power supply)
Max +5V Standby output current	2.0 A (each power supply)
Max +12 V output current	58.0 A (each power supply)
Environment	
Ambient Temperature	Operating (system): 10 °C to +35 °C, with maximum change not to exceed 10 °C ; non-operating (system): -40 °C to +70 °C
Relative Humidity	Non-operating: 90% @ 35°C non-condensing
Acoustics	<55 Decibel Average (dBA) (rack-mount) in an idle state in an normal office environment (23 °C)
Electrostatic Discharge	15 KV per Intel test specification
Safety Compliance	
Argentina	IRAM
Canada	UL60950 – CSA (60950 (UL and cUL)
Europe, CE Mark	EN60950 (complies with73/23/EEC)
Germany	GS License
International	IEC60950 (CB Report and Certificate)
Nordic Countries	EMKO-TSE (74-SEC) 207/94
Russia	GOST 50377-92
United States	UL– 60950 – CSA 60950 (UL and cUL)
China	*
Electromagnetic Capability (Class A) (EMC)	
Australia/New Zealand	AS/NZS 3548 (based on CISPR 22)
Canada	ICES-003
Europe, CE Mark	EN55022; EN55024 & EN61000-3-2;-3-3 (complies with 89/336/EEC)
International	CISPR 22
Japan	VCCI
Korea	RRL, MIC 1997-41 & 1997-42
Russia	GOST 29216-91 & 50628-95
Taiwan	CNS13438
United States	FCC, Part 15
China	*

*** CCC certification is not required because Storage Systems are not on China's HS Code (International Convention on Harmonized Commodity Description and Coding System) mandatory certification list.**

1.1 System Components

A block diagram of the storage system functional components is shown below.

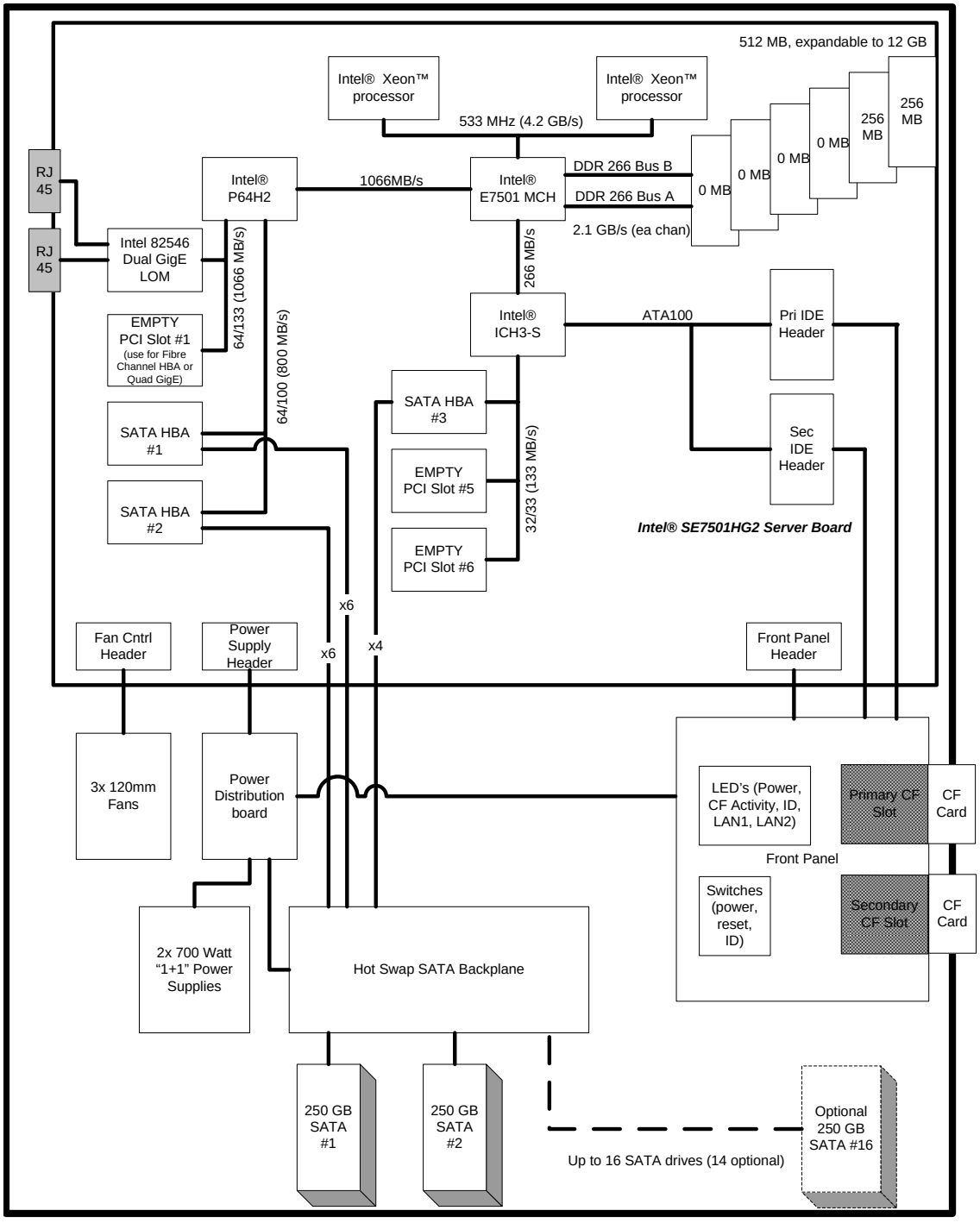


Figure 2. Intel® Storage System SSR316MJ2 Block Diagram

The components included with this storage system are diagrammed below.

A. Dual 700 W redundant Power supply
B. Power Distribution Board Assembly
C. SE7501HG2 System Board
D. System fans
E. Front panel board
F. Intrusion switch
G. SATA Host Bus Adapters
H. Hard drive bays
I. Backplane board
J. Dual Compact Flash module slots
K. PCI expansion slot

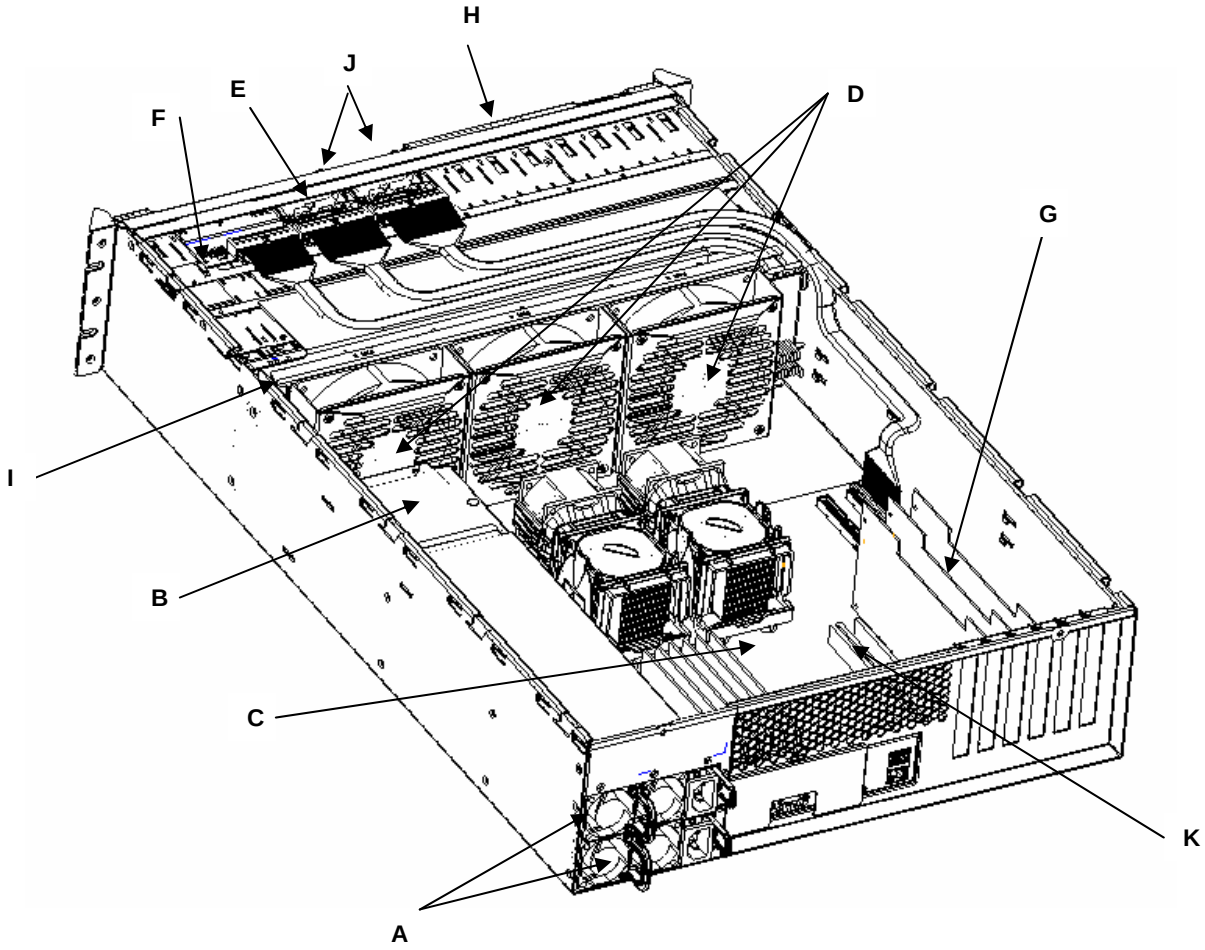


Figure 3. Intel® Storage System SSR316MJ2 System Components

1.2 System Board Feature Set

The Intel® System Board SE7501HG2 provides the following feature set, as implemented in the Storage System SSR316MJ2:

Feature	Description
Processors	Dual Socket Support for FC-mPGA2P (533 MHz 604 pin) Intel® Xeon™ processors
Memory	▪ Six 184-pin DDR SDRAM Dual Inline Memory Module (DIMM) sockets ▪ Support for up to 12 GB Registered Error Correcting Code (ECC) system memory ▪ Storage System SSR316MJ2 ships with 2 x 256 MB DIMMs (512 MB) installed – will support 2 TB of raw storage ▪ Support for single-sided or double-sided DIMMs (DDR266) o DDR266 memory supports the Intel® Pentium® 4 Processor with a 533 MHz system bus frequency. **NOTE: Intel® Storage System SSR316MJ2 memory upgrade guideline -** **Required (for functionality):** 100 MB plus 200 MB per 1 TB of raw storage installed. Example: for 16 x 250 GB drives, memory requirements = 100 MB + (200 MB x 4) = 900 MB, therefore 1 GB. **Recommended (for optimum performance):** 128 MB per 250 GB drive installed. Example: 128 MB x 16 = 2 GB.
Chipset	Intel® E7501 chipset, consisting of: ▪ Intel® E7501 Memory Controller Hub (MCH) ▪ Intel® P64H2 PCI/PCI-X 64-bit Controller Hub 2 ▪ Intel® ICH3-S I/O Controller Hub (ICH) ▪ Intel® 8 Mb (1 MB) Firmware Hub (FWH)
Peripheral Interfaces	Three separate and independent PCI buses for high through put of data: • Segment A: 32-bit, 33 MHz, 5 V, Full-length PCI (P32-A) with one embedded devices: o Three slots: 32-bit/33 MHz PCI Slot (PCI Slot 4, Slot 5 and Slot 6) ▪ **SATA HBA installed Slot 4.** ▪ **Slot 5 & 6 empty.** • Segment B: 64-bit, 100 MHz, 3.3 V, Full-length PCI (P64-B) supporting the following configuration: o Two slots: 64-bit/100 MHz PCI-X Slots (PCI-X Slot 2 and Slot 3) ▪ **SATA HBA's installed in Slot 2 & 3.** • Segment C: 64-bit, 133 MHz, 3.3 V, Full-length PCI (P64-C) supporting the following configuration: o One slot: 64-bit/133 MHz PCI-X Slots (PCI-X Slot 1) ▪ **Slot 1 should be reserved for either an optional Dual/Quad GigE card or optional Fibre Channel HBA card.** ▪ Dual channel Intel® 82546EB Gigabit Ethernet Controller on motherboard ▪ One serial port ▪ Two IDE interfaces with Ultra33, 66 and 100 Direct Memory Acess (DMA) mode (used for Compact Flash®)
LAN	Intel® 82546EB Dual 10/100/1000 Megabits per second (Mbps) Ethernet Local Area Network (LAN) Controller
Fans	Support for three system fans

Feature	Description
BIOS	AMI* BIOS with support for: ▪ Advanced Configuration and Power Interface (ACPI) ▪ 8 megabit symmetrical flash memory ▪ Support for System Management Basic Input/Output System (SMBIOS)
SSI interface support	Server System Infrastructure (SSI)-compliant connectors for SSI interface support: front panel, power connector.

Please refer to the Intel® SE7501HG2 Technical Product Specification available at http://support.intel.com for more information on the SSR316MJ2 Storage System's server board – memory compatibility and replacement.

1.3 Serial ATA (SATA) Host Bus Adapter

The Intel® Storage System SSR316MJ2 ships with three 6 port PCI to SATA Host Bus Adapters. The SATA HBA board provides the following feature set:

Feature	Description
Number of ports	6, using Silicon Image* SCL3112* controllers
Serial ATA Bus Speed	150 MHz
Serial ATA Data Transfer rate	1.5 Gbps (theotrical)
PCI Bus width and speed	64-bit, 66 MHz
PCI Data transfer rate	533 Mbps
RAID Levels	N/A – RAID card operated in pass-through mode.
SDRAM Support	64 MB ECC SDRAM
Cache function	Write-back, Write-through, Adaptive Read Ahead, Non-Read Ahead, Read Ahead, Cache I/O, Direct I/O
Hot Spare Pool	Yes
Hot Swap	Yes
Enclosure Management Support	Yes
Basic Input-Output Software (BIOS) RAID Management Tools	Yes, BIOS RAID Management Tools
Software RAID Management Tools	Yes, via Intel® Storage Control Console (SCC)
Battery Back Up option	Yes, with 48 hour minimum hold up time.

Please refer to the Intel® SRCS16 Hardware Users Guide available at http://support.intel.com for more information.

1.4 SATA Hot Swap Backplane

The SATA Hot Swap backplane board provides the following feature set:

Feature	Description
Supports up to 16 drives.	Slots provided for docking up to sixteen 1.5 Gigabits per second (Gbps) Serial ATA hot swap hard drives

Feature	Description
Enclosure Management Controller (EMCo)	The EMCo features the following: • On-board AT89C51 micro-controller with 256Kbit external SRAM memory • 3 SATA Host Controller I^2C Interfaces • SATA and SATA-II extension compatibility • Compliance with the *SATA Accessed Fault Tolerant Enclosures (SAF-TE) Specification, Version 1.00, Revision 041497*. • Supports SAF-TE commands • Hot swap support for up to 16 SATA Drives
SAF-TE Support	The backplane firmware complies with version 1.00, rev 041497, of the SAF-TE specification.
Temperature sensor	An LM75 or equivalent temperature sensor is located on the backplane that allows drive cage temperature monitoring by enclosure management.
FRU/Configuration SEEPROM	An Atmel* AT24C02* provides 2048 bits of serial EEPROM memory for storage of configuration and product FRU information.
Drive Status LEDs	The EMCo provides support for drive status LEDs that are visible at the front of each drive carrier. These LEDs indicate the following: • Activity LED – Green LED that indicates when a drive is being accessed. • Fault LED – Amber LED that has two active states: Steady-On to indicate a failed drive and Flashing-On/Off to indicate the drive(within an array) is being rebuilt.
I^2C Interface	The SAF-TE protocol is supported via out-of-band communication by three physical I^2C Interfaces. An I^2C mux implemented in a Programmable Logic Device (PLD) coordinates communication between the backplane and multiple Serial ATA controllers.
Audible Alarm	A piezo-electric buzzer on the backplane provides an audible alarm to indicate the following failures: •
2 12-pin Power Connectors	Delayed spin-up on 8 slots to reduce initial inrush current to comply with 240VA requirements.

The following figure shows the functional blocks of the SATA Hot Swap Backplane.

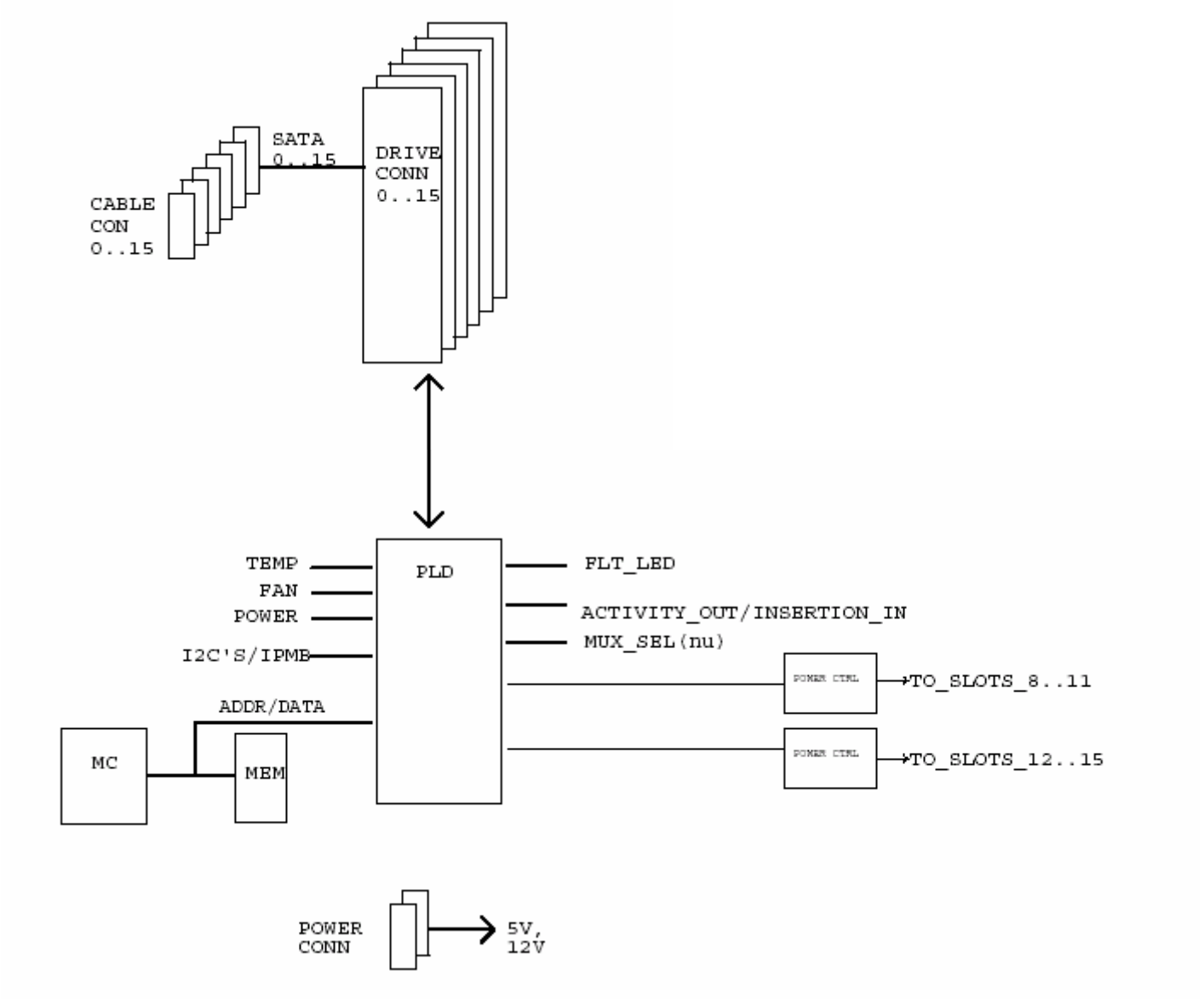


Figure 4. Intel® Storage System SSR316MJ2 SATA HSBP Block Diagram

1.5 Enclosure Management

The enclosure management controller monitors various aspects of a storage enclosure. The controller provides out-of-band SAF-TE management through the SATA Host I^2C interface.

The enclosure management controller is comprised of the following elements and supports associated features:

- Atmel* AT89C51* micro-controller
  - Implements SAF-TE command set
  - I^2C multiplex control
  - SRAM interface
  - 16 KB on-chip flash memory
  - Field updateable through SATA HBA I^2C bus
  - Very Thin Quad Flat Pack (VQFP) 44-pin package
- 256 K external SRAM memory
  - 32Kx8 organization
  - Runtime support for Micro and PLD
  - Small Outline Integrated Circuit (SOIC) (narrow 300mil) 28-pin package
- EPM3256 PLD
  - I^2C multiplexer for up to three HBA I^2C connections
  - In-circuit programmable
  - SRAM interface
  - Drive presence detect
  - Activity/Fault LED support
  - Delayed drive spin-up control
  - Thin Quad Flat Pack (TQFP) 144-pin package

The components operate from 3.3 V and an input clock frequency of 20 MHz.

1.5.1 Enclosure Management Hardware Implementation

Enclosure Management has three main hardware components, the Micro-Controller, External SRAM memory and the PLD hardware controller and a memory arbitrator.

1.5.2 SAF-TE Interface

The enclosure management controller implements SAF-TE over the Host Bus Adapter (HBA) I^2C interface. The enclosure management controller supports the following standard SAF-TE Command Set:

- Read Enclosure Configuration
- Read Enclosure Status
- Read Device Slot Status
- Read Global Flags
- Write Device Slot Status
- Perform Slot Operation

The enclosure management controller also supports the following commands:

- EEPROM update command
- Micro-Code Firmware load command

1.5.3 I^2C Serial Bus Interface

The enclosure management controller supports four independent I^2C interface ports with bus speeds of up to 400 Kbps.

The figure below provides a block diagram of I^2C bus connection implemented on the Storage System SSR316MJ2 SATA Hot Swap Backplane (HSBP).

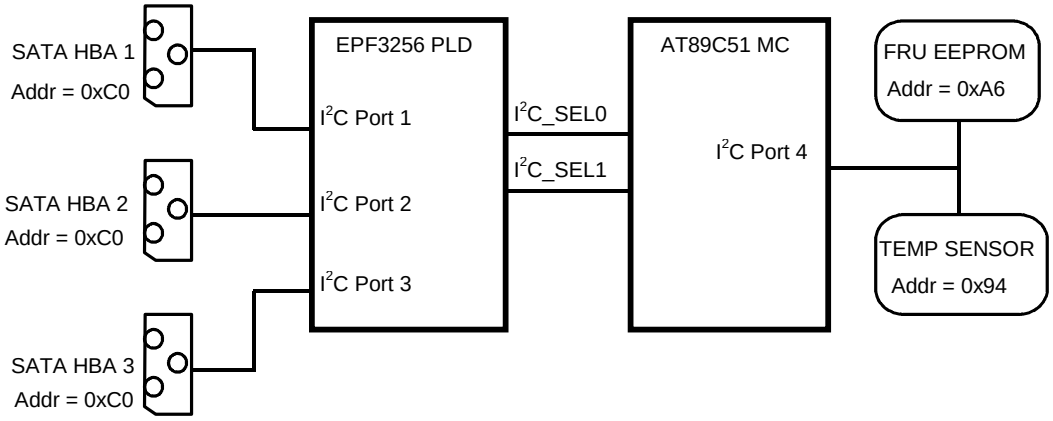


Figure 5. Intel® Storage System SSR316MJ2 SATA HSBP I^2C Bus Connection Diagram

1.5.3.1 I²C Bus Address

Table 1. I²C Bus Addressing

BUS NUMBER	I²C Address	Device type
1	C0h	SATA Controller 0 Enclosure Management Controller
1	C2h	SATA Controller 0 Activity LEDS
2	C0h	SATA Controller 1 Enclosure Management Controller
2	C2h	SATA Controller 1 Activity LEDS
3	C0h	SATA Controller 2 Enclosure Management Controller
3	C2h	SATA Controller 2 Activity LEDS
4	A6h	24C02 EEPROM I²C
4	94h	National Semiconductor* LM75* or equivalent Temp sense

1.5.4 Temperature Sensor

The Intel® Storage System SSR316MJ2 SATA HSBP provides a National Semiconductor* LM75* or equivalent temperature sensor. The host can query the LM75 at any time to read the temperature.

The temperature sensor has the I²C address of 0x94h on the Enclosure Management Controller I²C Port 4.

1.5.5 Serial EEPROM

The Intel® Storage System SSR316MJ2 SATA HSBP provides Atmel* 24C02* or equivalent serial EEPROM for storing the FRU and configuration information. The 24C02 provides 2048 bits of serial electrically erasable and programmable non-volatile memory.

The serial EEPROM has the I²C address of 0xA6h on Enclosure Management Controller Port 4.

1.5.6 Hard Disk Drive LEDs

The Intel® Storage System SSR316MJ2 SATA HSBP contains a green ACTIVITY LED and a yellow FAULT LED for each of the sixteen drive slots.

ACTIVITY LEDs are driven by the Enclosure Management Controller in response to commands sent by the SATA HBAs via I²C bus when the associated drive is being accessed.

FAULT LEDs are driven by the Enclosure Management Controller in response to commands sent by the SATA HBAs via I²C bus when an error condition, as defined by the HBA Firmware, has been detected on the associated drive.

Table 2. HDD LED Function

Activity Light States	
Drive Status	**LED Color**
Idle	Green Off
Access in Progress	Blinking Green (10Hz)
Fault Light States	
Drive Status	**LED Color**
No Fault	Amber Off
Fault	Amber On
Predictive Fail	Blinking Amber (1.5Hz)
Rebuild	Blinking Amber/Blinking Green (1.5Hz)/(10Hz)
Rebuild Interrupted	Blinking Amber (2.5Hz)
Identify Slot	Blinking Amber (2.5Hz)

1.6 SATA Drive Interface

The Intel® Storage System SSR316MJ2 SATA HSBP provides sixteen 22-pin SATA connectors for Hot Swappable drives supporting 1.5 GHz transfer rate. Sixteen standard 7-pin SATA control connectors are provided for point-to-point connection of the SATA transmit/receive differential signals between the HBAs and the HSBP.

1.7 HSBP Power Control

The Intel® Storage System SSR316MJ2 SATA HSBP provides two 12-pin backplane power connectors. Each of these connectors supply 12 V and 5 V power to eight backplane drive slots. Connector JP1 supplies power to slots 0-3 at system power-on. Power to slots 4-7 is delivered from JP1 but delayed from system power-on to accommodate the additional 12 V current required while the drives are spinning-up. Similarly, JP2 provides immediate power to slots 8-11 and delayed power to slots 12-15. The delayed power is provided to stagger the drive spin-up, otherwise the additional current required during spin-up would exceed the 240 Volt-Amps (VA) agency limit.

Each of connectors JP1 and JP2 also supply 5V standby power to the backplane which is passed through to the system front panel as required for enabling the system power-on pushbutton.

1.8 Clock Interface and Distribution

The Intel® Storage System SSR316MJ2 SATA HSBP provides one clock source. A 20MHz oscillator provides the clock to the Enclosure Management Controller Micro-controller and PLD.

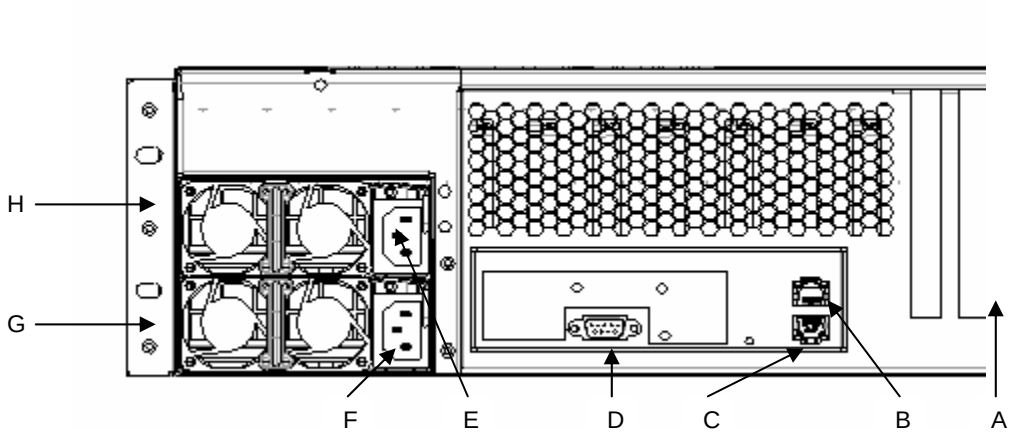
1.9 Chassis Dimensions & Weight

Table 3. Intel® Storage System SSR316MJ2 Chassis Dimensions & Weight

Height	129.54 mm	5.1”
Width	442.6 mm	17.425”
Depth	684.5 mm	26.95”
Weight		
Chassis - as shipped (2 drives)	27.2 kilogram	60 pounds
Chassis - fully configured (16 drives)	34.0 kilogram	75 pounds
Shipping container	5.9 kilogram	13 pounds

1.10 Back Panel I/O Ports and Features

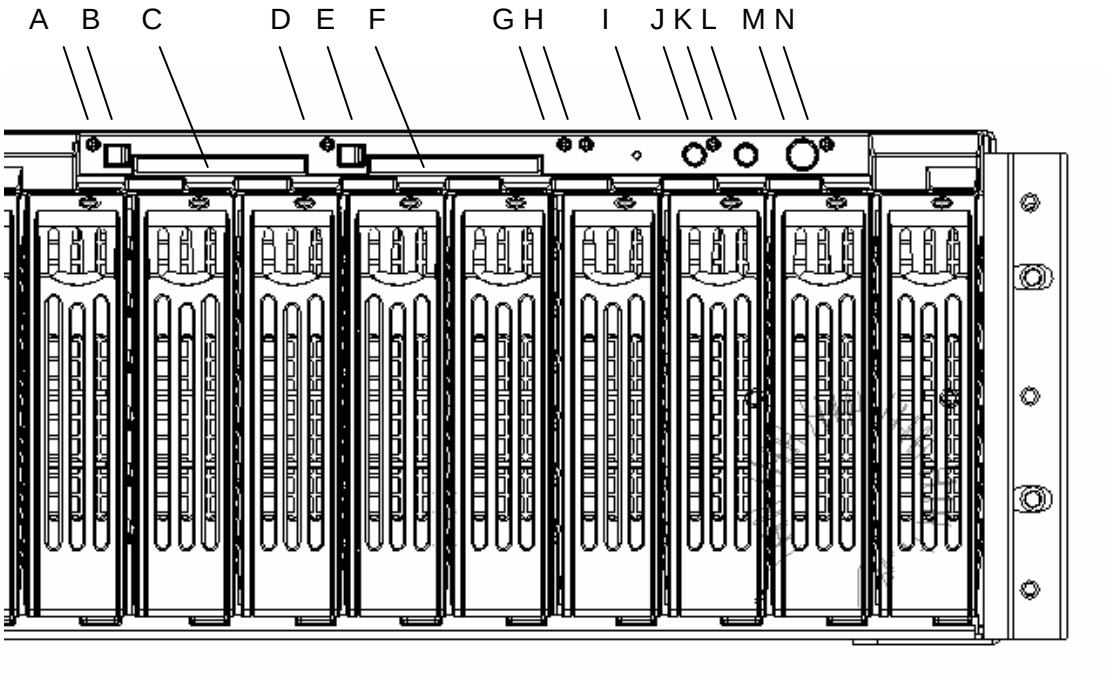
At the rear of the chassis is a serial management port and two 10/100/1000 Network Interface Card (NIC) connectors. The Input/Output (I/O) connectors are integrated to the back panel. The figure below shows the rear of the storage system.



A. PCI card area
B. RJ45 NIC 1 connector
C. RJ45 NIC 2 connector
D. COM 1
E. AC power input (primary)
F. AC power input (secondary)
G. Power supply module, secondary
H. Power supply module, primary

Figure 6. Intel® Storage System SSR316MJ2 Chassis Rear

1.11 Front Panel and HDD Bays



A. Primary Compact Flash activity LED	H. LAN 1 Activity LED
B. Primary Compact Flash Memory Card Eject Button	I. Not Used
C. Primary Compact Flash Memory Card Slot	J. ID SWITCH
D. Secondary Compact Flash activity LED	K. ID LED
E. Secondary Compact Flash Memory Card Eject Button	L. Reset Switch
F. Secondary Compact Flash Memory Card Slot	M. Power Switch
G. LAN 2 Activity LED	N. Power LED

Figure 7. Intel® Storage System SSR316MJ2 Chassis Front

1.11.1 Front Panel Controls and Indicators

The front panel controls and indicators are defined below:

Table 4. Control Button Functions

Power/Sleep button	Toggles the system power on/off. Sleep button for Advanced Configuration and Power Interface (ACPI) compatible operating systems.
Reset button	Reboots and initializes the system.

Table 5. LED Indicator Status

NIC 1 Activity LED	Continuous green light indicates a link between the system and the network to which it is connected. Blinking green light indicates network activity.
NIC 2 Activity LED	Continuous green light indicates a link between the system and the network to which it is connected. Blinking green light indicates network activity.
Power LED	Continuous green light indicates the system has power applied to it. Blinking green light (Note 1) indicates the system is sleeping. No light indicates the system does not have power applied to it (other than 5 V standby power).
Primary Compact Flash Slot Activity LED	Random blinking green light indicates Primary Compact Flash slot activity. No light indicates no Compact Flash Memory Card activity.
Secondary Compact Flash Slot Activity LED	Random blinking green light indicates Secondary Compact Flash slot activity. No light indicates no Compact Flash Memory Card activity.
ID LED	The blue system identification LED is used to help identify a system for servicing. This is especially useful when the system is installed within a high density rack or cabinet that is populated with several similar systems. The system ID LED is illuminated when the System ID button on the front panel is pressed or it can be illuminated remotely through system management software. It is powered from 5VSB to enable indication while the system is in an off state. Illuminating the ID LED on the front panel will also illuminate the rear panel ID LED.

Notes:

- The amber status takes precedence over the green status. When the amber LED is on or blinking, the green LED is off.

1.12 Fan Monitoring

The fans provided in the Storage System SSR316MJ2 contain a tachometer signal that can be monitored by the SAN management software.

1.13 Storage System Security

The storage system includes a preinstalled intrusion switch that can be monitored by SAN management software. When the cover is opened, the switch, located on the left side of the chassis transmits a signal to the Baseboard Management Controller (BMC) on the system

board. Through SAN management software, the system can be programmed to respond to an intrusion by powering down or by sending an alert.

1.14 Rack and Cabinet Mounting Options

The chassis was designed to support cabinets that are 19” (483 mm) wide by up to 36” (914 mm) deep. The chassis comes equipped with a cabinet mount kit that can be configured to support four-post cabinets.

When mounting the system into a cabinet, the front mount brackets are attached to the front of the chassis, and a set of rear support brackets are attached to the back of the cabinet. This allows the weight of the system to be as evenly distributed as possible.

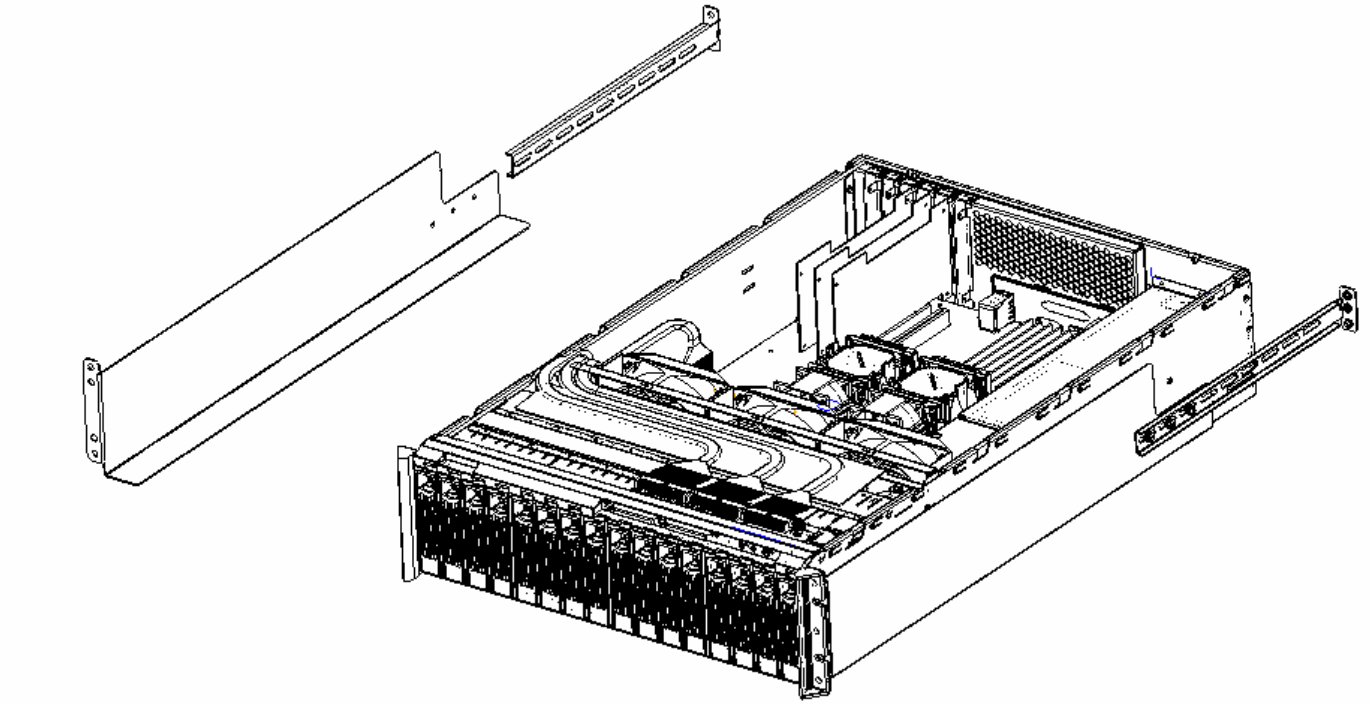


Figure 8. Intel® Storage System SSR316MJ2 Mounting

2. Power Sub-System

This section provides an overview of the Storage System SSR316MJ2 power supply sub-system.

2.1 Power Supplies

The Storage System SSR316MJ2 uses two 700 Watt (W) redundant power supply and a power distribution board assembly. The power subsystem supports the implementation of remote management features, including remote enable that permits power to be activated from a variety of sources.

- 100 - 127 V~ at 50/60 Hertz (Hz); 8.9 A maximum
- 200 - 240 V~ at 50/60 Hz; 4.5 A maximum

The system can operate with one failed module without loss of performance until the failed module is replaced. The modules can be replaced without powering down or disturbing system operation. The power supply and power distribution board assembly is designed to minimize EMI.

2.2 Power Distribution Module with 700 W Power Supply Modules

The power distribution board is a self-contained assembly that can support up to two 700 W power supply modules in a 1+1 configuration. The cage incorporates dual Alternating Current (AC) inputs with two EMI filters.

The chassis assembly provides for the power supply cage that guides the docking of the modules into the PDB, and secures them into the chassis.

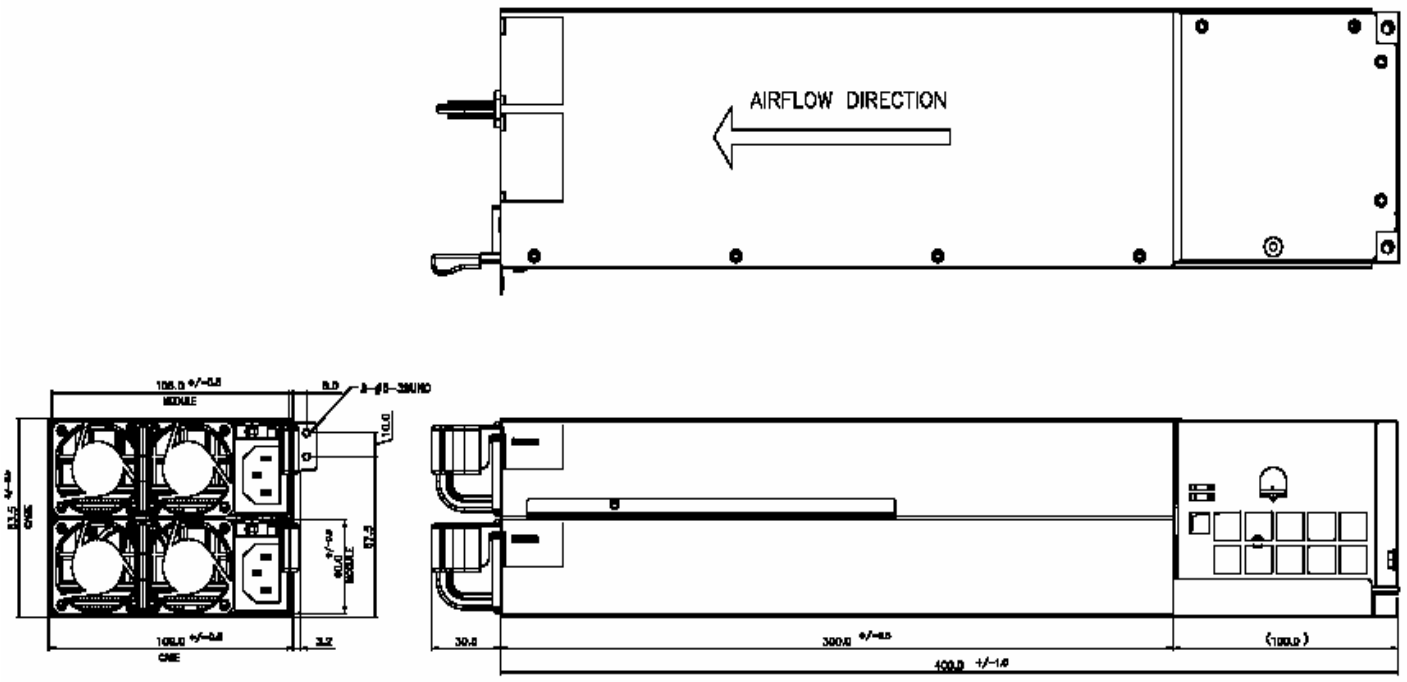


Figure 9. Intel® Storage System SSR316MJ2 Power Supply Assembly Drawing

2.2.1 Hot Swapping Power Modules

The Storage System SSR316MJ2 power supply assembly is capable of supporting hot swapping of power supply modules in a 1+1 configuration. Hot swapping a power supply module is the process of extracting and inserting a power supply module from an operating system.

2.2.2 Power Supply Module

The Storage System SSR316MJ2 power system supports two 700 W Power Supply module in a 1+1 redundant configuration. The power supply module provides two outputs; +5Vsb and +12 VDC.

The power supply module contains two fans. The module provides a handle to assist in insertion and extraction and can be inserted and extracted without the assistance of tools.

Table 6. Module Output Summary

	+12 V	5VSB
MAX	40 A	2.5 A
MIN STATIC	0 A	0 A
MIN DYNAMIC	1.5 A	0 A

2.2.2.1 Power Distribution Board Mechanical

This specification defines the Power Distribution Board (PDB) for storage system 700 W 1+1 redundant power supply. The PDB is designed to plug directly to the output connector of the PS and it contains three DC/DC power converters to produce other required voltages: +5 VDC and +12 VDC along with additional protection circuitry and a Field Replaceable Unit (FRU) Electrical Erasable Programmable Read-Only Memory (EEPROM).

The power distribution board mechanical outline and dimensions are shown in the figure below.

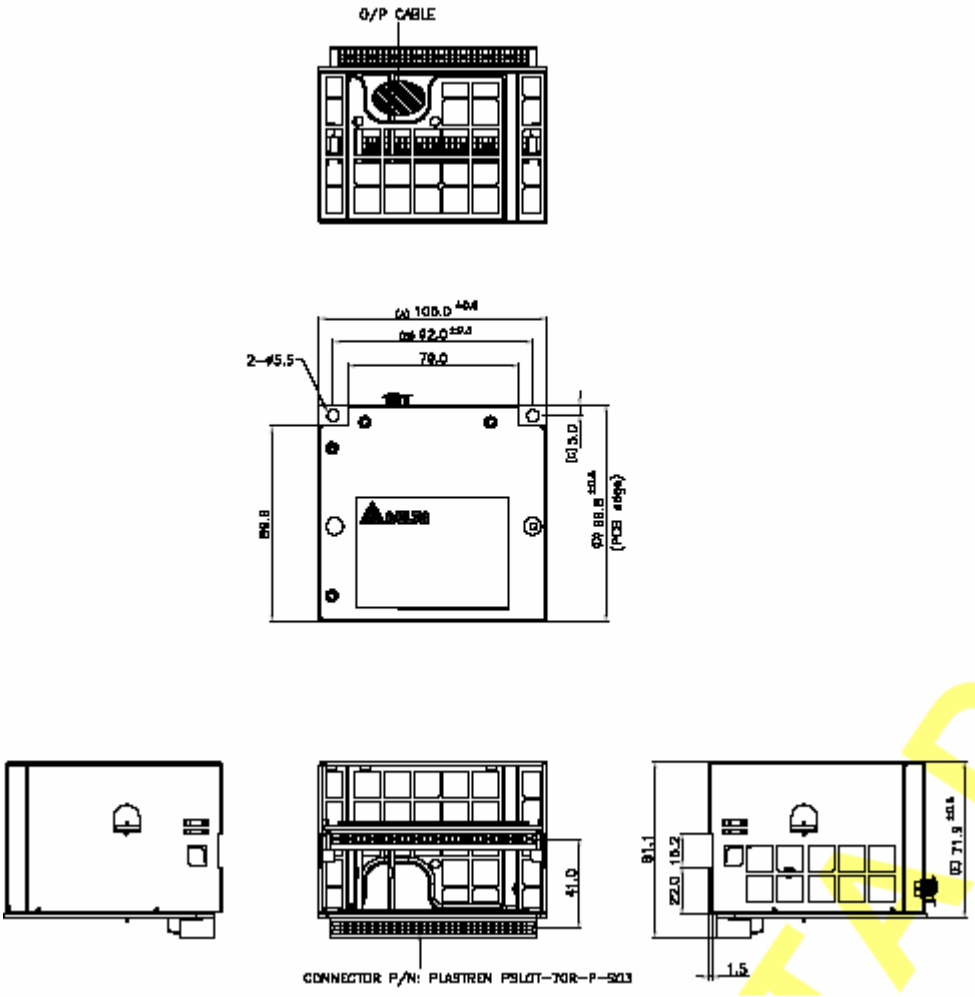


Figure 10. Outline Drawing of Power System Enclosure for Intel® Storage System SSR316MJ2

2.2.2.2 Power Supply LED Indicator

The power supply module provides a single external bi-color LED to indicate the status of the power supply. When AC is applied to the Power Supply Unit (PSU) and standby voltages are available, the LED will blink green. The LED will be solid on green to indicate that all the power outputs are available. The LED will be solid on amber to indicate that the power supply has failed, shutdown due to over current, shutdown due to over temperature, or is indicating a predictive failure. Refer to the following table for conditions of the LED.

Table 7. LED Indicators

POWER SUPPLY CONDITION	Power Supply LED
No AC power to all PSU	OFF
No AC power to this PSU only	AMBER
AC present / Only Standby Outputs On	BLINK GREEN
Power supply Direct Current (DC) outputs ON and OK	GREEN
Power supply failure (includes over voltage, over temperature)	AMBER
Voltage Regulator Module (VRM) failure (cage related)	BLINK GREEN
240VA limit (cage related)	BLINK GREEN
Current limit	AMBER

2.3 Output Power/Currents

The following table defines power and current ratings for this **700 W** continuous (810 W pk) power supply in 1+0 or 1+1 redundant configuration. The combined output power of both outputs shall not exceed the rated output power. The power supply must meet both static and dynamic voltage regulation requirements for the minimum loading conditions. Also, the power supply shall be able to supply the listed peak currents and power for a minimum of 10 seconds. Outputs are not required to be peak loaded simultaneously.

Table 8. Load Ratings

	+12 V	+5Vsb
MAX Load	**58.0 A**	**2.0 A**
MIN DYNAMIC Load	**5.0 A**	**0.1 A**
MIN STATIC Load	**1.0 A**	**0 A**
PEAK Load (10 sec min)	**67.0 A**	**2.5 A**
Max Output Power (continuous), see note 1	**12 V x 58 A = 696 W max**	**5 V x 2 A = 10 W max**
Peak Output Power (for 10s min), see note 2	**12 V x 67 A = 804 W pk**	**5 V x 2.5 A = 12.5 W pk**

Note:
1. In reality, at max load the 12 V output voltage is allowed to sag to –3%, which is 11.64 V; so the actual max power will then be: 11.64 V x 58 A = 675.12 W, and the same applies for 5VSB: 4.85 V x 2 A = 9.7 W; so total max continuous Power = 675.12 + 9.7 = 684.82 W
2. In reality, at peak load the 12 V output voltage is allowed to sag to –3%, which is 11.64 V; so the actual peak power will then be: 11.64 V x 67 A = 780 W; and the same applies to 5VSB: 4.85 V x 2.5 A = 12.125 W. The total peak power = 792 W pk.

2.4 Voltage Regulation

The power supply output voltages must stay within the following voltage limits when operating at **steady state and dynamic loading conditions**. All outputs are measured with reference to the return remote sense signal (ReturnS). The **+12 V and + 5Vsb are measured at the PDB output harness connector.**

Table 9. Voltage Regulation Limits

Output	TOLERANCE	MIN	NOM	MAX	UNITS
+ 12 V	**- 3% / +5%**	**+11.64**	**+12.00**	**+12.60**	V_{rms}
+ 5Vsb	**- 4% / +5%**	**+4.80**	**+5.00**	**+5.25**	V_{rms}

2.4.1 Dynamic Loading

The output voltages shall remain within limits specified in Table 9 for the step loading and capacitive loading specified in Table 10, below. The load transient repetition rate shall be tested between 50 Hz and 5 KHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification. The Δ step load may occur anywhere within the MIN load to the MAX load shown in Table 10.

Table 10. Transient Load Requirements

Output	Max Δ Step Load Size	Max Load Slew Rate	Test capacitive Load
+12 V	**30.0 A** (note 1)	**0.5 A/μs**	**5000 μF**
+5VSB	**1.0 A**	**0.5 A/μs**	**100 μF**

Note 1: Per Table 8, min load for Step loads on 12 V output is 5 A.

2.5 Capacitive Loading

The power supply shall be stable and meet all requirements with the following capacitive loading ranges. Min capacitive loading applies to static load only.

Table 11. Capacitive Loading Conditions

Output	MIN	MAX	Units
+12 V	**10**	**11,000**	μF
+5Vsb	**1**	**350**	μF

2.6 Protection Circuits

Protection circuits inside the power supply shall cause only the power supply's main outputs to shutdown. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF for 15 sec and a PSON# cycle HIGH for 1sec shall be able to reset the power supply.

2.6.1 Over-Current Protection (OCP)

The power supply shall have current limit to prevent the +12 V and 5Vsb outputs from exceeding the values shown below. If the current limits are exceeded the power supply shall shutdown and latch off. The latch will be cleared by toggling the PSON# signal or by an AC power interruption. The power supply shall not be damaged from repeated power cycling in this condition. 5Vsb shall be protected under over-current or shorted conditions, so that no damage can occur to the power supply.

Table 12. Over Current Protection Limits

Output Voltage	OCP Limits
+12 V	**120% min (= 70.0 A min); 140% max (= 80.0 A max)**
+5Vsb	**120% min (= 2.4 A min); 300% max (= 6.0 A max)**

2.6.2 Over Voltage Protection (OVP)

The power supply over voltage protection shall be locally sensed. The power supply shall shutdown and latch off after an over voltage condition occurs. This latch shall be cleared by toggling the PSON# signal or by an AC power interruption. Table 13 contains the over voltage limits. The values are measured at the output of the power supply's connectors. The voltage shall never exceed the maximum levels when measured at the power pins of the power supply connector during any single point of fail. The voltage shall never trip any lower than the minimum levels when measured at the power pins of the power supply connector.

Table 13. Over Voltage Protection (OVP) Limits

Output Voltage	OVP MIN (V)	OVP MAX (V)
+12 V	**13.0**	**14.0**
+5Vsb	**5.7**	**6.5**

2.6.3 Over Temperature Protection (OTP)

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

3. System Cooling

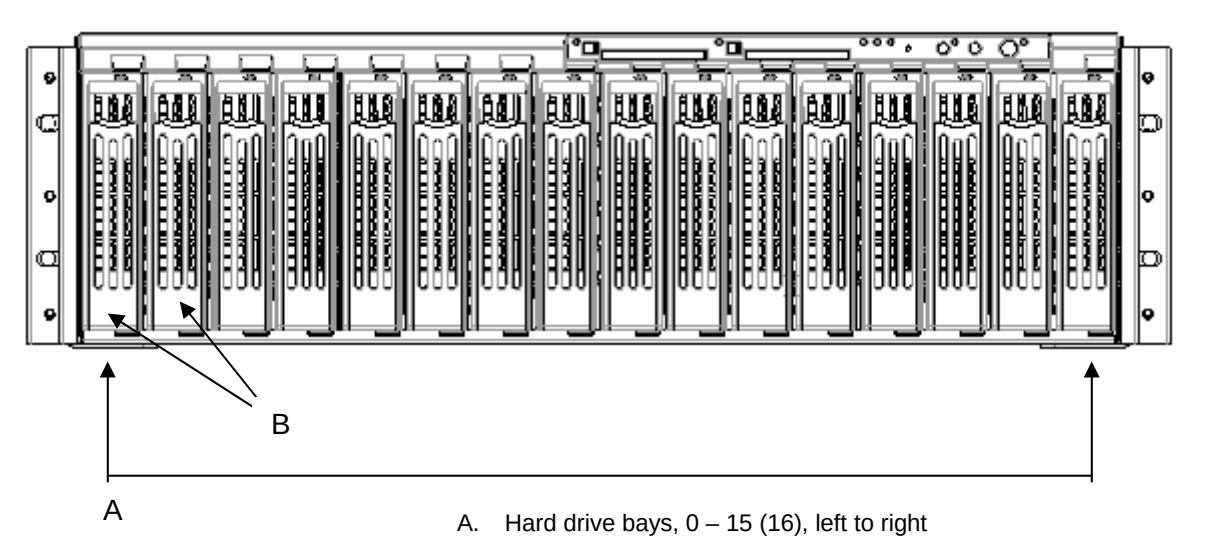
The chassis includes three 120-mm non-hot-swappable system fans for cooling the hard drives, and add-in cards. The processors are cooled by the standard Processor Wind Tunnel (PWT) cooling solution. The power supply modules each contain two 40 mm fans for cooling. These fans run whenever AC power is applied to ensure that the modules are adequately cooled.

3.1 Fan Control

Each fan within the module is capable of supporting multiple speeds. At normal room ambient of 23 degrees Celsius (C), the fans will run at slow speed for best acoustic performance. If the external temperature of the system increases, the SE7501HG2 Baseboard will increase fan speed to compensate for the increased ambient. Fans are not hot swappable. The system must be turned off before a fan can be replaced.

4. Chassis Peripheral Bays

The Storage System SSR316MJ2 chassis provides sixteen hard drive bays at the front of the chassis. All hard drive bays may be populated with a carrier-mounted 3.5” SATA hard disk drive.



A. Hard drive bays, 0 – 15 (16), left to right
B. Standard shipping configuration includes two drives mounted in carriers and fourteen empty drive carriers for expansion (drives & carriers do not ship in chassis)

Figure 11. Intel® Storage System SSR316MJ2 Chassis Peripheral Bays

4.1 Hard Disk Drive Bays

The Storage System SSR316MJ2 chassis can support up to sixteen carrier-mounted SATA, 3.5” x 1”, hard disk drives. The SATA drives may be “electrically” hot-swapped while the system power is applied, i.e., before or during POST. However, the SATA drives should NOT be hot-swapped while the SAN Management application software is configured and active. See the Intel® Storage System SSR316MJ2 Software User Manual for more information.

NOTE:

1) **All drives must be populated in order, from left to right, in drive bay 0 thru drive bay 15.**

2) **Once a particular RAID configuration is applied to the present drives, if the drives are removed from the system for any reason, they will need to be re-installed in the exact same drive bays they were removed from. Please use the HDD labels provided in your Storage System SSR316MJ2 shipping container to number the drives 0 thru 15 prior to removal.**

3) **If a failed drive needs replacing, it must be replaced with the exact same manufacturer, model, and size.**

4) **For more information on configuring supported RAID levels, refer to the *Intel® Storage System SSR316MJ2 Software User Manual* available from Intel Business Link (IBL) or your Intel sales representative.**

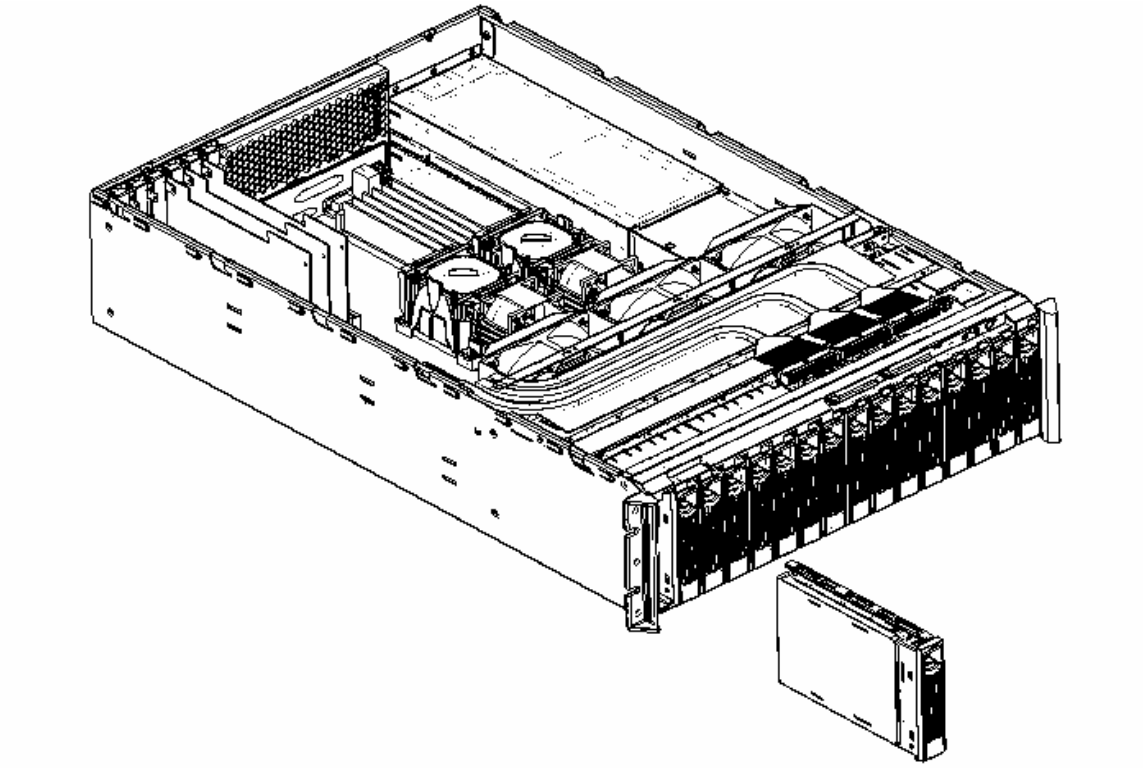


Figure 12. Intel® Storage System SSR316MJ2 Hard Disk Drive Bays

4.1.1 Hard Disk Drive Carrier

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

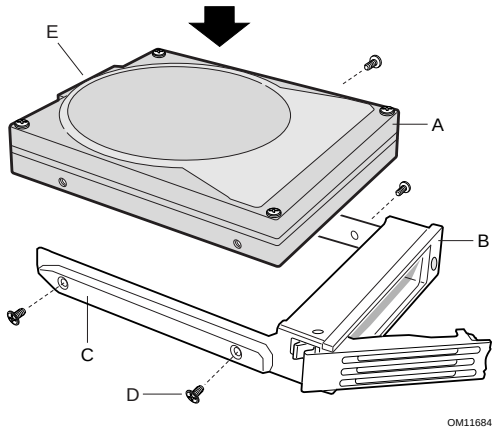


Figure 13. Intel® Storage System SSR316MJ2 Hard Drive Carrier Assembly

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

4.2 Compact Flash* Slots

The front panel assembly provides two Compact Flash* slots that are accessible through openings in the front bezel. An ejector button and access pull tab allows for easy removal of a Compact Flash* device. The Storage System SSR316MJ2 ships with dual 256 MB Compact Flash* Memory cards.

NOTE:

1) **The Compact Flash* memory cards contain the Storage System SSR316MJ2 SAN Management software, and should never be removed from the Compact Flash* slots while the system is operational.**

2) **For more information on how to upgrade the Storage System SSR316MJ2 SAN Management Software, please refer to the *Intel® Storage System SSR316MJ2 Software User Manual* available from Intel Business Link (IBL) or your Intel sales representative.**

WARNING – The Compact Flash* memory cards should not be removed with power applied.

4.2.1 Compatibility

The two Compact Flash* slots are compatible with:

- CF Type I form factor.
- PC Card AT Attachment (ATA) specification 7.0.
- True IDE mode.
- All Programmed Input/Output (PIO) modes.
- +5 V operation.
- Minimum 10,000 insertions

5. System Interconnection

5.1 Signal Definitions

The connector pinouts referred to in this section are defined in the *Intel® Server Board SE7501HG2 Technical Product Specification*.

5.2 Chassis Internal Cables and Connector

The following cables and connectors are provided:

- Front panel cable
  A 34-conductor ribbon cable with 34-pin Internet Database Connector (IDC) connectors links the front panel and SSI Entry-Level Electronics Bay (EEB) Revision 3.0-compliant System Board.
- Compact Flash* cables: two 40-pin, 80-conductor DMA33/66/100 Integrated Drive Electronics (IDE) cables.
- HDD SATA cables: sixteen 7-pin, 7-conductor twisted-pair length 270 mm and 360 mm

Sixteen Serial ATA (SATA) cables ship with the base storage system. These cables support the two installed SATA hard drives, as well as the additional fourteen expansion drives.

5.3 I/O Panel Connectors

The Storage System SSR316MJ2 provides an aperture for the rear I/O ports. The following are the I/O ports available:

- Two RJ-45 LAN connectors
- One 9-pin serial port

5.4 SSR316MJ2 SATA HSBP Connectors

5.4.1 22-pin SATA Connector

The following table defines the pin-outs of the 22-pin SATA Drive Connectors, JP1-JP16.

Table 14. 22-pin SATA Connector Pin-out

Connector Contact Number	Signal Name	Description
1	S1	GND
2	S2	RX+
3	S3	RX-
4	S4	GND
5	S5	TX-
6	S6	TX+
7	S7	GND
8	P1	3.3 V - NC
9	P2	3.3 V - NC
10	P3	3.3 V Precharge - NC
11	P4	GND
12	P5	GND
13	P6	GND
14	P7	5 V Precharge
15	P8	5 V
16	P9	5 V
17	P10	GND
18	P11	NC
19	P12	GND
20	P13	12 V Precharge
21	P14	12 V
22	P15	12 V
G1	P16	Connector GND
G2	P17	Connector GND
G3	P18	Connector GND

5.4.2 7-pin SATA Connector

The following table defines the pin-outs of the 7-pin SATA Control Connector, JP17-JP32.

Table 15. 7-pin SATA Connector Pin-out

Connector Contact Number	Signal Name
1	GND
2	RX+
3	RX-
4	GND
5	TX-
6	TX+
7	GND

5.4.3 Power Connector

The following table defines the pin-outs of the 4-pin Power Connectors JP1 and JP2.

Table 16. Power Connector Pin-out

JP1			
Pin	**Signal**	**Pin**	**Signal**
1	Ground	7	P0_12V
2	Ground	8	P0_12V
3	Ground	9	P0_12V
4	Ground	10	P0_VCC
5	Ground	11	P0_VCC
6	Ground	12	5VSB
JP2			
Pin	**Signal**	**Pin**	**Signal**
1	Ground	7	P1_12V
2	Ground	8	P1_12V
3	Ground	9	P1_12V
4	Ground	10	P1_VCC
5	Ground	11	P1_VCC
6	Ground	12	5VSB

5.4.4 Front Panel Power Connector

The following table defines the pin-outs of the 4-pin Front Panel power connector.

Table 17. Front Panel Power Connector

Pin	Signal Name	Description
1	P0_12V	12 V from JP1
2	Ground	
3	Ground	
4	P0_VCC	5 V from JP1

5.4.5 SATA Host I^2C Header

The following table defines the pin-outs of the 3-pin SATA Host I^2C Headers JP4, JP6, JP7.

Table 18. SATA Host I^2C Header Pin-out

JP4 Pin	Signal Name	Description
1	SDA1	Port1 Data
2	GND	
3	SCL1	Port1 Clock
JP6		
1	SDA2	Port2 Data
2	GND	
3	SCL2	Port2 Clock
JP7		
1	SDA3	Port3 Data
2	GND	
3	SCL3	Port3 Clock

5.4.6 Jumper Block Headers

The SSR316MJ2 SATA HSBP has two jumper blocks that provide three user selectable jumper options.

5.4.6.1 HBA Configuration Jumper

This jumper header provides selection of two system configuration: two or three HBAs. These jumpers map the backplane drive slots to the HBA SATA channels. The jumpers are used only to select system operation with either three 6 channel HBAs (present) or two 8 channel HBAs (future).

The following table defines the pin definitions for the HBA configuration jumper J34.

Table 19. HBA Configuration Jumpers

Pin	Signal Name	Pin	Signal Name	Description
1	CFG2	2	Ground	Spare
3	CFG1	4	Ground	Spare
5	CFG0	6	Ground	Installed – 3 controller layout None Installed – 2 controller layout

5.4.6.2 Buzzer Mute Jumper

This jumper header allows disabling the audible alert from the backplane buzzer.

The following table defines the pin definitions for the Buzzer Mute jumper header J37.

Jumper Positions: No jumper installed (default) = Buzzer enabled, Jumper installed = Buzzer muted.

Table 20. Force Update Jumper Pin Definitions

Pin	Signal Name	Description
1	MUTE	Mute signal to Micro-Ctrlr
2	Ground	Ground

6. Regulatory Information

Product Regulation Requirements

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.

6.1.1 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)
China*

6.1.2 Product EMC Compliance – Class A Compliance

Note: Legally 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)
China*

6.1.3 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)
Ecology Declaration (International)
China*

6.1.4 Component Regulation Requirement Need to Support System Level Certifications

1. Component Power Supplies must have the following certifications:
   a) UL, cUL
   b) German Bauart
   c) China*
   d) Ctick DOC
   e) BSMI DOC
   f) RRL License
   g) CE DOC
   h) CB Report (including all national deviations)
2. All peripheral devices, such as CD ROMS, Disk drives, Tape drives shall have the following certifications: UL or CSA NRTL, CSA or cUL, and TUV or VDE and SEMKO or NEMKO or DEMKO or FIMKO, CE, and FCC.
3. All Fans shall have the minimum certifications: UL and TUV or VDE
4. All current limiting devices shall have UL and TUV or VDE certifications and shall be suitable rated for the application where the device in its application complies with IEC60950.
5. All lithium batteries shall be UL recognized and battery circuits are to have suitable reverse bias current protection for the application it is used in.
6. All printed wiring boards shall be rated UL94V-0 and be sourced from a UL approved printed wiring board manufacturer
7. All connectors shall be UL recognized and have a UL flame rating of UL94V-0
8. All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80 V.
9. All plastics used must be made of a UL recognized material, and have the appropriate flame ratings mandated by IEC60950 per system level requirements. All plastics parts shall be manufactured by an UL approved fabricator and the parts shall be marked with the appropriate UL traceability markings. Markings to include:
   - Plastic Fabricators name and/or UL Fabricator ID
   - Material Name (for example GE, C2800)
   - Date Code
13. Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.
14. The product must be marked with the correct regulatory markings to support the certifications that are specified

15. Product documentation shall incorporate all safety required information to conform to certifiers and regulators and the certifications issued for the product.

6.1.5 Product Ecology Requirements

16. All materials, parts and subassemblies must not contain restricted materials as defined in Intel's Environmental Product Content Specification of Suppliers and Outsourced Manufacturers – http://supplier.intel.com/ehs/environmental.htm
17. All plastic parts shall not use brominated flame retardant or any other halogenated retardants that are not accepted by environmental programs such as Blue Angels, Nordic White Swan, and Swedish TCO.
18. All plastic parts that weigh >25gm shall be marked with the ISO11469 requirements for recycling. Example >PC/ABS<
19. Packaging materials may not contain more than 100 ppm (total) of lead, cadmium, chromium or mercury.
20. If sold as a retail product, packaging materials must be marked with applicable recycling logos for Europe (green dot) and Japan (Eco-marks).
21. Product documentation shall incorporate all safety required information to conform to certifiers and regulators and the certifications issued for the product.
22. All cords and cables shall contain < 100 ppm of cadmium.

NOTE:

1) * CCC certification is not required because Storage Systems are not on China's HS Code (International Convention on Harmonized Commodity Description and Coding System) mandatory certification list.

7. Environmental Limits

7.1 System Office Environment

Table 21. Intel® Storage System SSR316MJ2 System Office Environment Summary

Parameter	Limits
Operating Temperature	10 ^{o}C to +35 ^{o}C with the maximum rate of change not to exceed 10 ^{o}C per hour.
Non-Operating Temperature	-40 ^{o}C to +70 ^{o}C
Non-Operating Humidity	95%, non-condensing at 35 ^{o}C
Acoustic noise	59 dBA (Rackmount) in an idle state at typical office ambient temperature. (23 ± ^{o}C)
Operating Shock	No errors with a half sine wave shock of 2 Giga (1.024 x 10^{9}) (G) (with 11 millisecond duration)
Package Shock	Operational after a 30 inch free fall, although cosmetic damage may be present (chassis weight 30 lbs)
Electrostatic Discharge (ESD)	±15 Kilovolt (KV) per Intel® Environmental test specification
System Cooling Requirement in British Thermal Units (BTU) per Hour	1676 BTU/hour

7.2 System Environmental Testing

The system has been tested per the *Intel® Environmental Standards Handbook*, Intel document number 662394-03. These tests include:

- Temperature Operating and Non-Operating
- Humidity Non-Operating
- Packaged and Unpackaged Shock
- Packaged and Unpackaged Vibration
- AC Voltage, Frequency and Source Interrupt
- AC Surge
- Acoustics
- ESD
- EMC Radiated Investigation

7.3 Regulatory Requirements

The following table summarizes environmental limits, both operating and non-operating.

Table 22. Intel® Storage System SSR316MJ2 Operating and Non-Operating Environmental Limits

Temperature	**Specification**
Non-operating	-40 °C to 70 °C
Operating Temperature	10 °C to 35 °C
Thermal Map	Must not exceed maximum Integrated Circuit (IC) junction temperature as specified in the component data sheets (CPDs).
Thermal Shock	**Specification**
Non-operating	-40 °C to 70 °C
Humidity	**Specification**
Non-operating	92% Relative Humidity (RH) at +50 °C
Vibration	**Specification**
Non-Operating:	Random input, 0.01 g2/Hz at 5 Hz, sloping to 0.02 g2/Hz at 20 Hz, and maintaining 0.02 g2/Hz from 20 Hz to 500 Hz.
Shock	**Specification**
Non-operating	50 G, 11 millisecond (msec)
ESD	**Specification**
Operating	Indirect (radiated) only. Test to 15 KV with limited errors and to 20 K with no damage.
EMI	**Specification**
Operating	Required to meet EMI emission requirements, tested as part of system.

8. Serviceability and Availability

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

The desired Mean Time To Repair (MTTR) of the system is 40 minutes, including diagnosis of the system problem. To meet this goal, the system enclosure and hardware have been designed to minimize the MTTR.

Below are the maximum times that a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system, and with the system powered down and unplugged.

- Remove top cover 0.5 minutes
- Remove and replace a hard disk drive 0.5 minutes
- Remove and replace power supply 5 minutes
- Remove and replace 120 mm fans 3 minutes
- Remove and replace SATA add-in cards 5 minutes
- Remove and replace front panel board 5 minutes
- Remove and replace baseboard 10 minutes
- Remove and replace backplane 10 minutes

9. Calculated MTBF

The Mean Time Between Failures (MTBF) for the Storage System SSR316MJ2 is calculated at 18,135 hours operating at 35 degrees C. The following table shows the MTBF numbers for individual components within the chassis.

Table 23. Intel® Storage System SSR316MJ2 Component MTBF Numbers

Subassembly (System in 35 °C ambient air)	MTBF (hours)
System Board (SE7501HG2)	92,345
700 W Power Supply	100,000
Power Distribution board	100,000
120 mm Cooling Fans (No redundancy)	708,724
Compact Flash® memory card and bay	6,944,444
Hot Swap SATA Backplane	441,696
Front Panel board	1,492,537
SATA Six Channel Host Bus Adapter	550,503
250 GB SATA HDD	500,000

Appendix A: Spares and Accessories

Upgrade and Accessory Parts

Table 24. Intel® Storage System SSR316MJ2 Upgrade and Accessory Parts

Product Code	MM #	Qty.	Description
FMJCABLES	862951	1	**Cable Kit** (1 ea 6" bundle SATA cables type A + 1 ea 6" bundle SATA cables type B + 1 ea 4" bundle SATA cables type C+ 2 ea IDE Cable + 1 ea front panel cable)
FMJFRTPANEL	863017	1	**Front Panel Board** (front panel board assembly including light pipes and CF reader)
FMJBACKPLANE	862952	1	**Hot Swap Backplane Board** (back plane board, SATA Cables and sheet metal bracket)
FMJBEZEL	862953	1	**Bezel** (Bezel and three screws)
FMJPS700W	862987	1	**700 W Power Supply**
FMJPDB	862987	1	**Power Distribution Module**
FMJFAN	863042	1	**120 mm fan** (fan assembly = 120mm fan + snap rivet + bracket)
AMJSWSC	864204	1	**Scalability Package** (configure multiple Storage System SSR316MJ2's together)
AMJSWSN	864205	1	**Configurable Snapshot Package** (customize and configure the snapshot)
AMJSWRM	864206	1	**Remote Data Protection Package** (allows remote async copies of system data)

Glossary

Word / Acronym	Definition
A	Ampere
AC	Alternating Current
ACA	Australian Communication Authority
ACPI	Advanced Configuration and Power Interface
ANSI	American National Standards Institute
ATA	AT Attachment
BMC	Baseboard Management Controller
BTU	British Thermal Units
C	Celsius
CF	Compact Flash®
CMOS	Complementary Metal Oxide Silicon
CPD	Component Data Sheet
D2D	DC-to-DC
dBA	Decibel Average
DDR	Double Data Rate
DIMM	Dual Inline Memory Module
DMA	Direct Memory Access
ECC	Error Correcting Code
EEB	Entry-Level Electronics Bay
EEPROM	Electrical Erasable Programmable Read-Only Memory
EMC	Electro Magnetic Compatibility
EMP	Emergency Management Port
ESD	Electrostatic Discharge
FC	Fibre Channel
FP	Front Panel
FRB	Fault Resilient Boot
FRU	Field Replaceable Unit
FW	Firmware
FWH	Firmware Hub
G	Giga (1.024×10^9)
GB	Gigabyte
Gbps	Gigabits per Second
GHz	Gigahertz
HBA	Host Bus Adapter
HDD	Hard Disk Drive
HSBP	Hot Swap Backplane
Hz	Hertz
IBL	Intel Business Link
IC	Integrated Circuit
ICH	I/O Controller Hub
IDC	Internet Database Connector
IDE	Integrated Drive Electronics
I/O	Input/Output
Word / Acronym	**Definition**

iSCSI	Internet Protocol Small Computer System Interface
ITE	Information Technology Equipment
K	Kilo (1.024×10^3)
KB	Kilobyte
KV	Kilovolt
KHz	Kilohertz
LAN	Local Area Network
LED	Light-Emitting Diode
LPC	Low-Pin Count
MB	Megabyte
Mbps	Megabits per second
MCH	Memory Controller Hub
MHz	Megahertz
mm	Millimeter
msec	Millisecond
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
NIC	Network Interface Card
OTP	Over-Temperature Protection
OVP	Over-Voltage Protection
PCI	Peripheral Component Interconnect
PDB	Power Distribution Board
PFC	Power Factor Correction
PIO	Programmed Input/Output
PLD	Programmable Logic Device
PSU	Power Supply Unit
PWT	Processor Wind Tunnel
RAID	Redundant Array of Inexpensive Disks
RH	Relative Humidity
RI	Ring Indicate
SAN	Storage Area Network
SATA	Serial AT Attachment
SCA	Single Connector Attachment
SCC	Storage Control Console
SDR	Sensor Data Record
SDRAM	Synchronous Dynamic Random Access Memory
SE	Single-Ended
SMBIOS	System Management Basic Input/Output System
SOIC	Small Outline Integrated Circuit
SRAM	Static Random Access Memory
SSI	Server System Infrastructure
TQFP	Thin Quad Flat Pack
TB	Terabyte
UART	Universal Asynchronous Receiver Transmitter

μF	Micro Farad (1 x 10^{-6} Farads)
Word / Acronym	**Definition**
μS	Micro Second (1 x 10^{-6} Second)
USB	Universal Serial Bus
V	Volt
VA	Volt-Amp
VCCI	Voluntary Control Council for Interference
VQFP	Very Thin Quad Flat Pack
VRM	Voltage Regulator Module
W	Watt