Intel® SC5200 5U Server Chassis Kit

Technical Product Specification

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Revision 1.4

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Enterprise Platforms and Services Marketing

Revision History

Date	Revision Number	Modifications
5/16/02	0.9	Initial draft for review.
5/29/02	1.0	Initial Release
9/13/02	1.1	Added SE7501BR2 Server information Corrected MM# for Product Code, AXX2PSMODL350 (Appendix)
12/17/02	1.2	Added KHD3RP450 Redundant Power Supply
2/10/03	1.3	Added FAN LED indicator information for SE7501HG2
6/16/03	1.4	Incorporated Specification Updates and added SATA Back Plane Information

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1. Introduction

This specification details the feature set of the Intel® Server Chassis SC5200, an entry-level server chassis designed for Intel® server board products. The SC5200 chassis series of products are low cost, time to market, and allow utilization of multiple platforms and configurations.

1.1 KHD3BASE450

KHD3BASE450 is the base SC5200 chassis, designed to address the entry market. It includes a single 450-W Power Factor Correction (PFC) non redundant power supply, and supports five non hot-swap hard drives. Two tachometer output fans, mounted in front of the server board, and two fans mounted at the rear of the chassis provide main chassis cooling. An optional hot-swap drive bay kit, product code AXX2HSDRVUG, provides an upgrade path to allow the SC5200 base chassis to support five hot-swap drives. This chassis is compatible with the Intel® Server Board SE7500CW2, SE7501CW2, SHG2, SE7502VB2 , SE7501HG2 and SE7501BR2.

1.2 KHD3RP450

KHD3RP450 is the base SC5200 chassis with a redundant 450W power supply, designed to address the entry market. It includes a single 450-W Power Factor Correction (PFC) power supply. A second 450-W module may be added to provide redundancy. Two tachometer output fans, mounted in front of the server board, and two fans mounted at the rear of the chassis provide main chassis cooling. An optional hot-swap drive bay kit, product code AXX2HSDRVUG, provides an upgrade path to allow the SC5200 base chassis to support five hot-swap drives. This chassis is compatible with the Intel® Server Board SE7501CW2, SE7505VB2, SE7501HG2 and SE7501BR2. A Rack Mount Conversio kit, ADH3RACK or ADH2RACK, is available.

1.3 KHD3HSRP650

KHD3HSRP650 contains a 650-W, 2+1 redundant power supply that features replaceable hot-swap 350-W thin power supply (TPS) modules and dual AC power cords for increased reliability and availability. The 350-W modules can be replaced without disrupting the operation of the server system. This chassis is pre-configured with two 350-W power modules and can be upgraded to a redundant power supply with an optional third 350-W module. This version of the chassis also features redundant cooling and hot-swappable fans. Two hot-swap 80-mm fans mounted at the rear, and one hot-swap 80-mm fan at the front, provide cooling for the core area (processors and memory). Two hot-swap, 92-mm fans mounted at the front provide cooling for the PCI area. A single hot-swap Small Computer Systems Interface (SCSI) hard drive bay is pre-installed in this version of the chassis, and an optional hot-swap bay drive bay kit can be installed to provide support for up to ten hot-swap SCA hard drives. This chassis is compatible with the Intel® Server Board SHG2, SE7501HG2 and SE7501BR2.

1.4 KHD3HSRP650R

KHD3HSRP650R is the rack-mountable version of the KHD3HSRP650 chassis. In addition to the features mentioned above, this version provides unpainted covers, black rack bezels, peripheral bay reorientation bracket, and slide mounting rails. The unit is re-positioned in a horizontal orientation. The reorientation bracket is provided to maintain a horizontal position for CD-ROM

and tape drives. This chassis is compatible with the Intel® Server Board SHG2 , SE7501HG2 and SE7501BR2.

1.5 AXX2HSDRVUG

The optional hot-swap SCSI hard disk drive bay, AXX2HSDRVUG, is available for all of the SC5200 chassis configurations. It supports up to five 1-inch single connector attachment (SCA) low-voltage differential SCSI (LVD) hard drives to enhance serviceability, availability, and upgradability of the system. Adapter brackets allow mounting of hard drives at the lower six 5.25-inch, half-height peripheral bays at the front of the chassis. When the hot-swap drive bay is installed, it utilizes three of the six available bay positions. For the chassis configured with a hot-swap redundant power supply, this optional hot-swap hard disk drive bay is added to the pre-installed drive bay for a total support of ten hot-swap SCSI drives.

1.6 5.25 Inch Drive Bays

An additional two 5.25-inch, half-height drive bays are available for other peripherals, such as CD-ROM and tape drives. Only two of the three spaces can be occupied by devices. The third location must remain open, retaining the vented panel installed, to provide an inlet for cooling air.

1.7 Chassis Cover

A removable access cover provides entry to the interior of the chassis. On the redundant configurations, the side cover features an access panel for hot-swap fan replacement. The rear I/O panel conforms to *Advanced Technology Extended (ATX) Specification*, Revision 2.03, and supports seven full-length expansion cards. The chassis is provided with a front panel board designed for Server Standards Infrastructure (SSI) Entry E-Bay (EEB) 3.0-compliant server boards.

This specification details the key features of the product. Reference documents listed in Appendix B provide additional product specification detail for the server boards, backplane and power supplies validated for use with this chassis. Check the compatibility section and the Configuration Guides for the server boards on the support website for more details: http://support.intel.com/support/motherboards/server/chassis/sc5200/.

Table 1 SC5200 Product Matrix

Product Code	Intel® Server Board	Hot-swap SCSI Drives Supported	Power Supply Configuration	Hot-swap Fans	Pedestal/ Rack
KHD3BASE450 *Base 450-W*	SHG2 SE7500CW2 SE7501CW2 SE7501HG2 SE7501BR2 SE7505VB2	None: Upgradeable to 5 Drives using AXX2HSDRVUG	Fixed 450-W PFC uses one power cord.	No	Pedestal
KHD3RP450 Base 450W Redundant (1+1)	SE7501CW2 SE7501HG2 SE7501BR2 SE7505VB2	None: Upgradeable to 5 SCSI Drives using AXX2HSDRVUG	Modular 450-W PFC with one 450-W power module and one blank filler, uses one power cord per module.	No	Pedestal

KHD3HSRP650 *HSRP 650-W*	SHG2 SE7501HG2 SE7501BR2	Yes – 5 (upgradeable to 10 SCSI Drives using AXX2HSDRVUG)	650-W PFC 2+1 dual line cord with two 350-W modules and one blank filler.	Yes – 5	Pedestal
KHD3HSRP650R *HSRP 650-W Rack*	SHG2 SE7501HG2 SE7501BR2	Yes – 5 (upgradeable to 10 SCSI Drives using AXX2HSDRVUG	650-W PFC 2+1 dual line cord with two 350-W modules and one blank filler.	Yes – 5	Rack

2. SC5200 Chassis

Table 2. Chassis Dimensions

Configuration	Pedestal	Rack
Height	17.5 inches	8.6 inches
Width	8.6 inches (chassis), 12.7 inches (with feet)	16.9 inches
Depth	26 inches	25 inches
Clearance Front	10 inches	N/A
Clearance Rear	5 inches	N/A
Clearance Side	3 inches (additional side clearance needed for service)	N/A

2.1 System Colors

The Intel® Server Chassis SC5200 is offered in two color configurations. The primary exterior system color (bezels and covers) will match Intel Dusty Beige (GE BR7026) for the pedestal version of the chassis. The rack version of the chassis has covers without paint and the bezel will match GE Cycoloy*-701 (Black). Front Bezel Features

The standard pedestal front bezel is a molded plastic door covering all drive bays. A key lock is provided to prevent unauthorized access to the peripheral bays. Each peripheral bay is covered with a removable electromagnetic interference (EMI) shield. A molded plastic sub-bezel is located on the face of the chassis under the front bezel. The sub-bezel houses the front panel buttons and light pipes for the front panel indicators.

Opening the exterior plastic door on the Pedestal chassis accesses the hot-swap hard drives,. An EMI shield is incorporated into the drive carrier design, eliminating the need for a separate shield or door. This adds flexibility to the bezel design by making EMI performance independent of the cosmetic plastic parts.

Customized bezels for OEM customers can be designed from the standard bezel design.

2.2 Security

A variety of chassis security options are provided at the system level.

2.2.1 Padlock Loop

A removable padlock loop on the rear of the system access cover can be used to prevent access to the microprocessors, memory, and add-in cards. A variety of lock sizes can be accommodated by the 0.270-inch diameter loop.

2.2.2 Key Lock

A two-position key lock/switch will unlock the front bezel.

2.2.3 Instrusion Switch

Intrusion switches are provided allowing server management software, such as Intel® Server Management (ISM), to detect unauthorized access to the system cover and pedestal bezel door.

Note: See the appropriate *Server Board Technical Product Specification* on the support.intel.com website for a description of BIOS and Intel® Server Management security features.

2.3 I/O Panel

All input/output (I/O) connectors are accessible on the rear of the chassis. The SSI E-bay 3.0 compliant chassis provides an ATX* 2.03-compatible cutout for I/O shield installation. Boxed server boards provide the required I/O shield for installation in the cutout. The I/O cutout dimensions are shown in *Figure 1* below for reference.

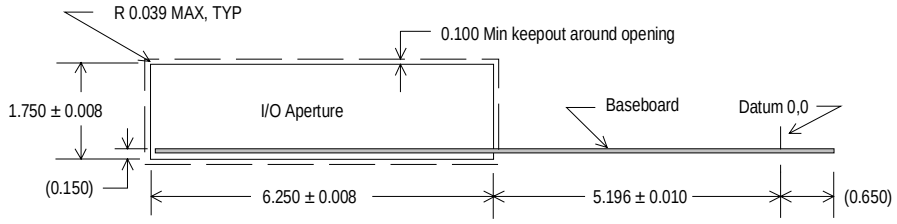


Figure 1. ATX* 2.03 I/O Aperture

2.4 Chassis Views

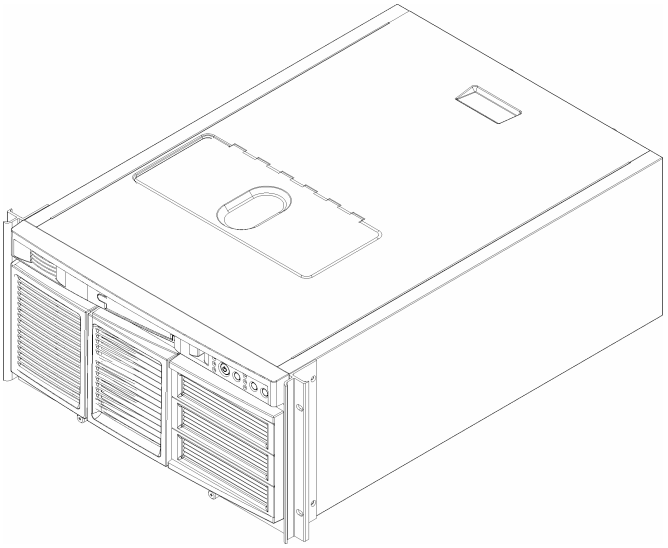


Figure 2. Rack Configuration View

(Fan access door only on redundant versions)

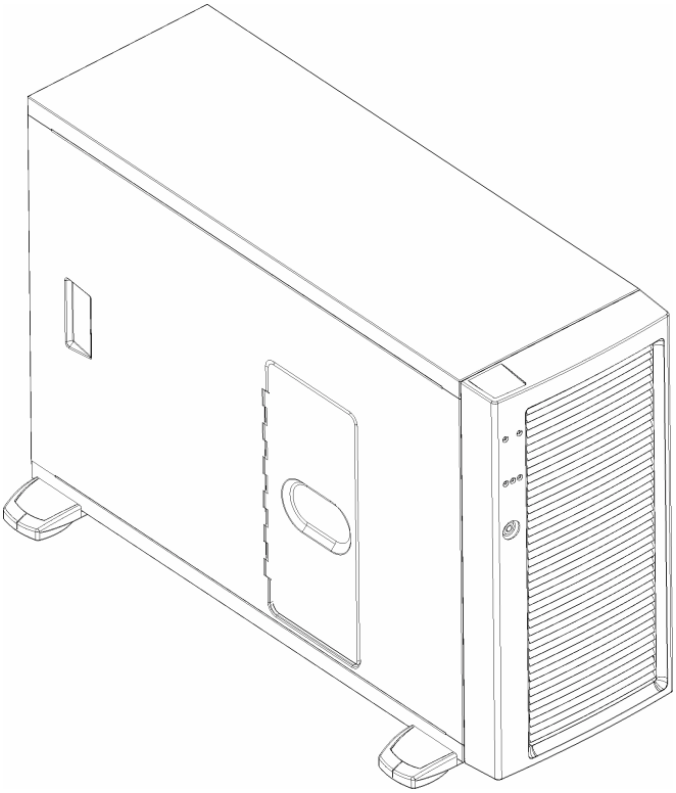


Figure 3. Front Pedestal View

(Fan access door only on redundant versions)

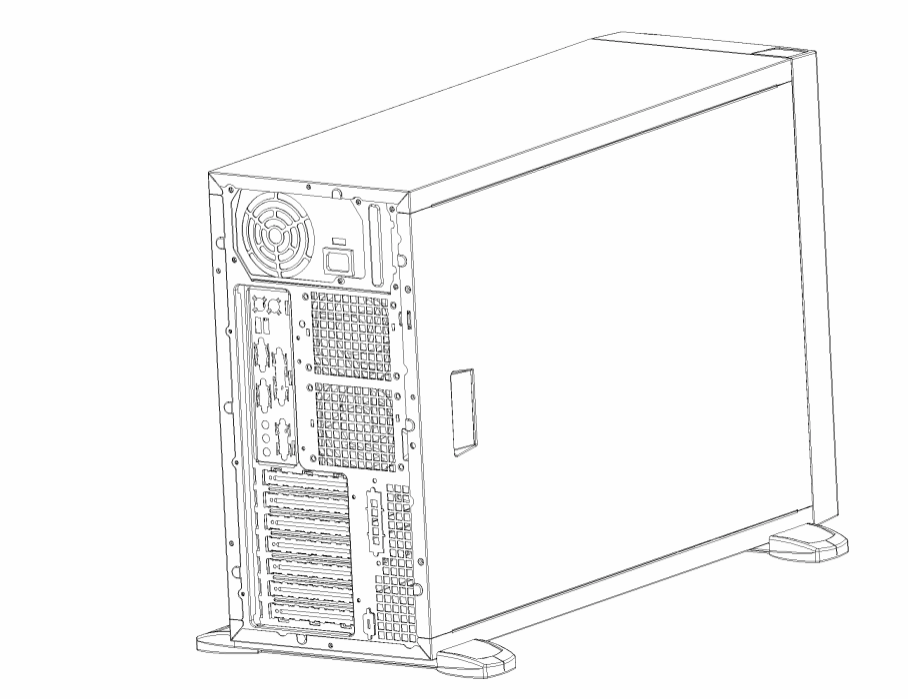


Figure 4. Rear Pedestal View (Base version)

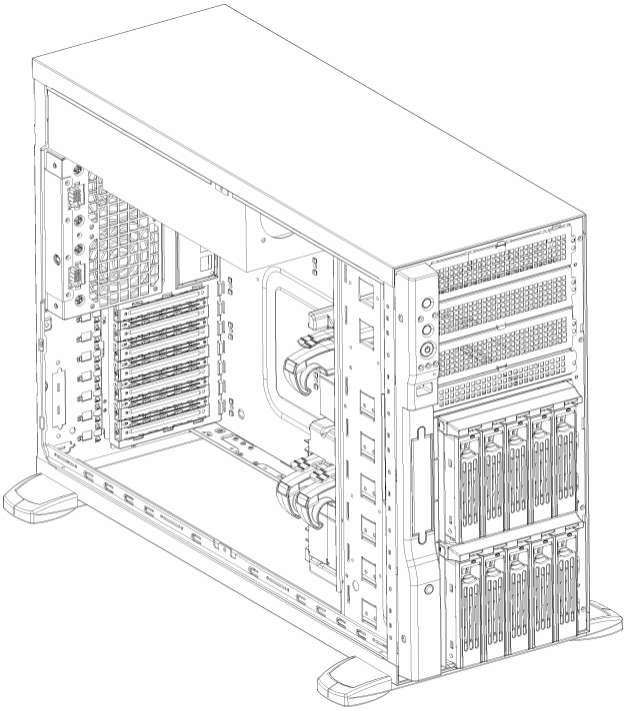


Figure 5. Front Pedestal Internal View (Redundant version)

(Shown with optional second hot-swap drive bay upgrade installed)

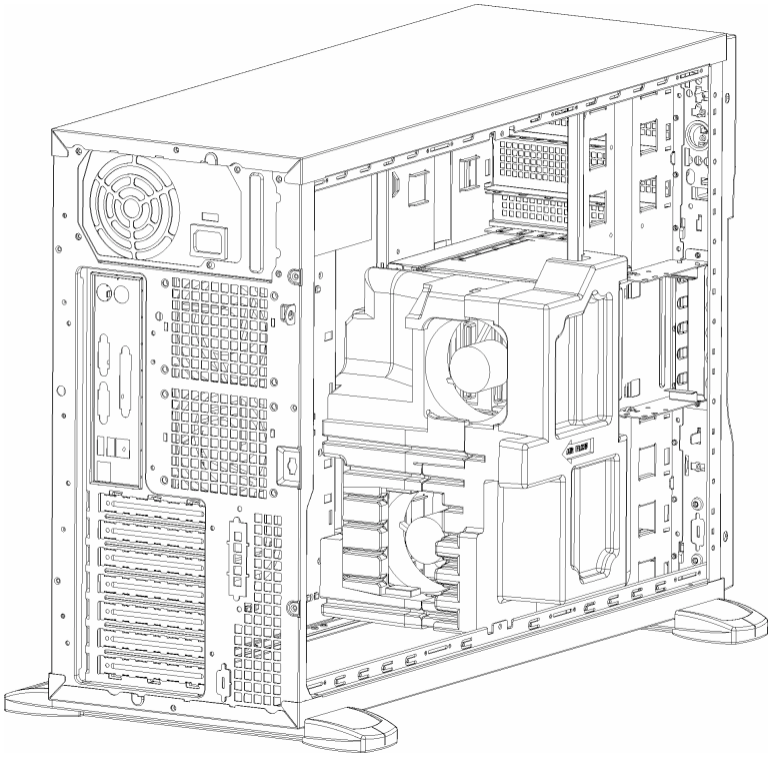


Figure 6. Rear Pedestal Internal View (Base version)

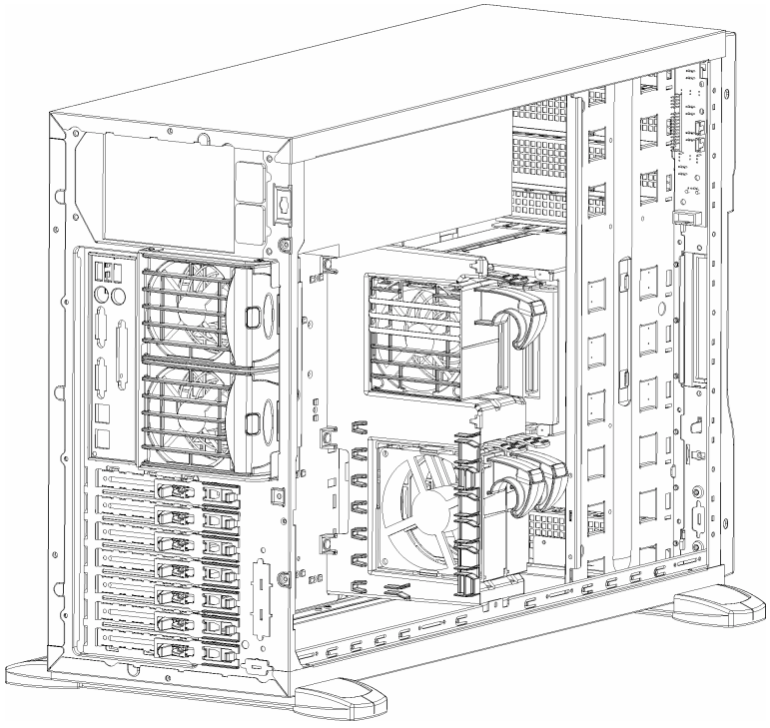


Figure 7. Rear Pedestal Internal View (Redundant version)

3. Chassis Power Subsystem

The Intel® Server Chassis SC5200 supports three different power supply solutions.

3.1 450W Entry (Non Redundant) Power Supply

The 450-W non redundant Entry Power Supply (EPS) ,KHD3BASE450, features Entry SSI (Rev. 3.0)-compliant server board connectors and is positioned as the entry power supply solution for the Intel® SHG2, SE7501HG2, SE7501BR2, SE7505VB2, SE7500CW2 and SE7501CW2 Server Boards.

3.1.1 450-W Power Supply Mechanical Outline

The mechanical outline and dimensions for the 450-W supply are an extended PS/2 form factor. The approximate dimensions are 86-mm high by 150-mm wide by 180-mm deep.

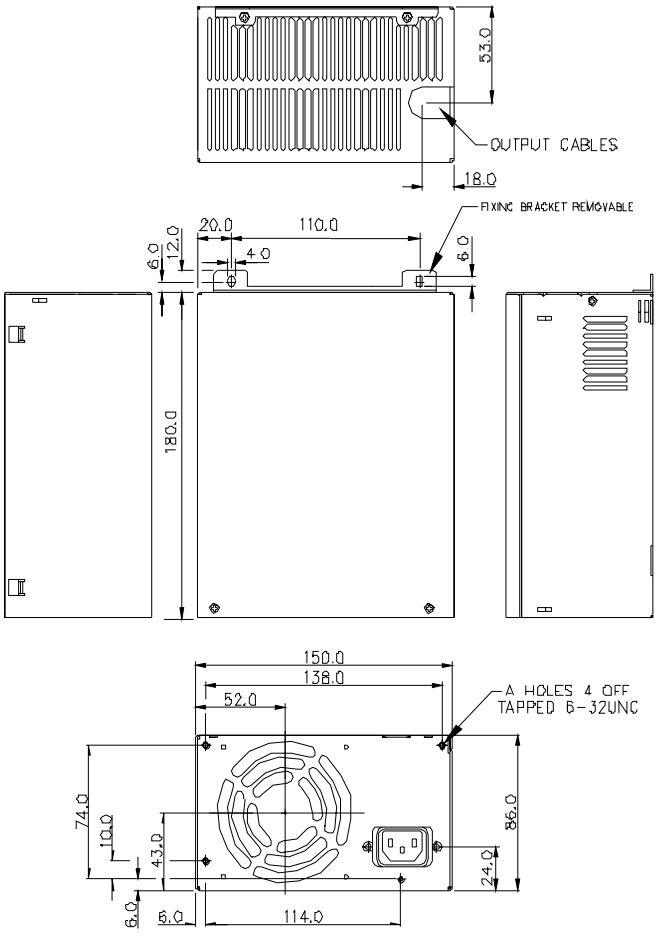


Figure 8 450W Power Supply

3.1.2 450-W Power Supply Fan Requirements

The 450-W power supply incorporates an 80-mm low acoustic noise fan to exhaust air. The sound pressure level is measured at a distance of 1.0 meter from each side of the power supply in a free field. The worst-case peak value of the measurements shall not exceed 43 dBA at 25°C inlet temperature. Redundant 450W 1+1 Power Supply

3.1.3 450-W, 1+1 Redudant Power Supply (KHD3RP450)

The 450-W, 1+1 Redudant Power Supply (KHD3RP450) features SSI (Rev. 3.0)-compliant server board connectors and is positioned as the redundant entry power supply solution for the Intel Server Board SE7505VB2, Server Board SE7501HG2, Server Board SE7501BR2 and Server Board SE7501CW2. The 450-W redudant power supply supports two removable modules inserted into a main housing (power supply cage). Each 450W module has an AC power cord receptacle. The standard configuration ships with one 450-W 1+1 module and one baffle installed for non-redundant operation. Two 450-W 1+1 modules must be installed for redundant operation. The removable hot-swap DC power modules can be replaced in the event of a failure. The system will remain in operation during a failed voltage condition and remain online during a single module replacement for maximum up time. The AC power cord must be removed before removing a hot swap module.

3.2 650W 2+1 Redundant Power Supply

The Intel® Server Board SHG2, SE7501HG2 and SE7501BR2 systems can also be configured with a 650-W, 2+1 redundant (KHD3HS650 or KHD3HS650R) power supply. The 650-W power supply features three removable modules inserted into a main housing (or cage). The main housing contains dual AC input circuits and power distribution boards. The standard configuration ships with two 350-W TPS modules and one baffle installed for non-redundant operation. Three 350-W TPS modules and both power cords must be installed for redundant operation. The removable hot-swap DC power modules can be replaced in the event of a failure. The system will remain in operation during a failed voltage condition and remain online during a single module replacement for maximum up time. Refer to the *650-W 2+1 Redundant Power Supply Cage Specification* for details.

Table 3. System Power Summary for All Power Supplies

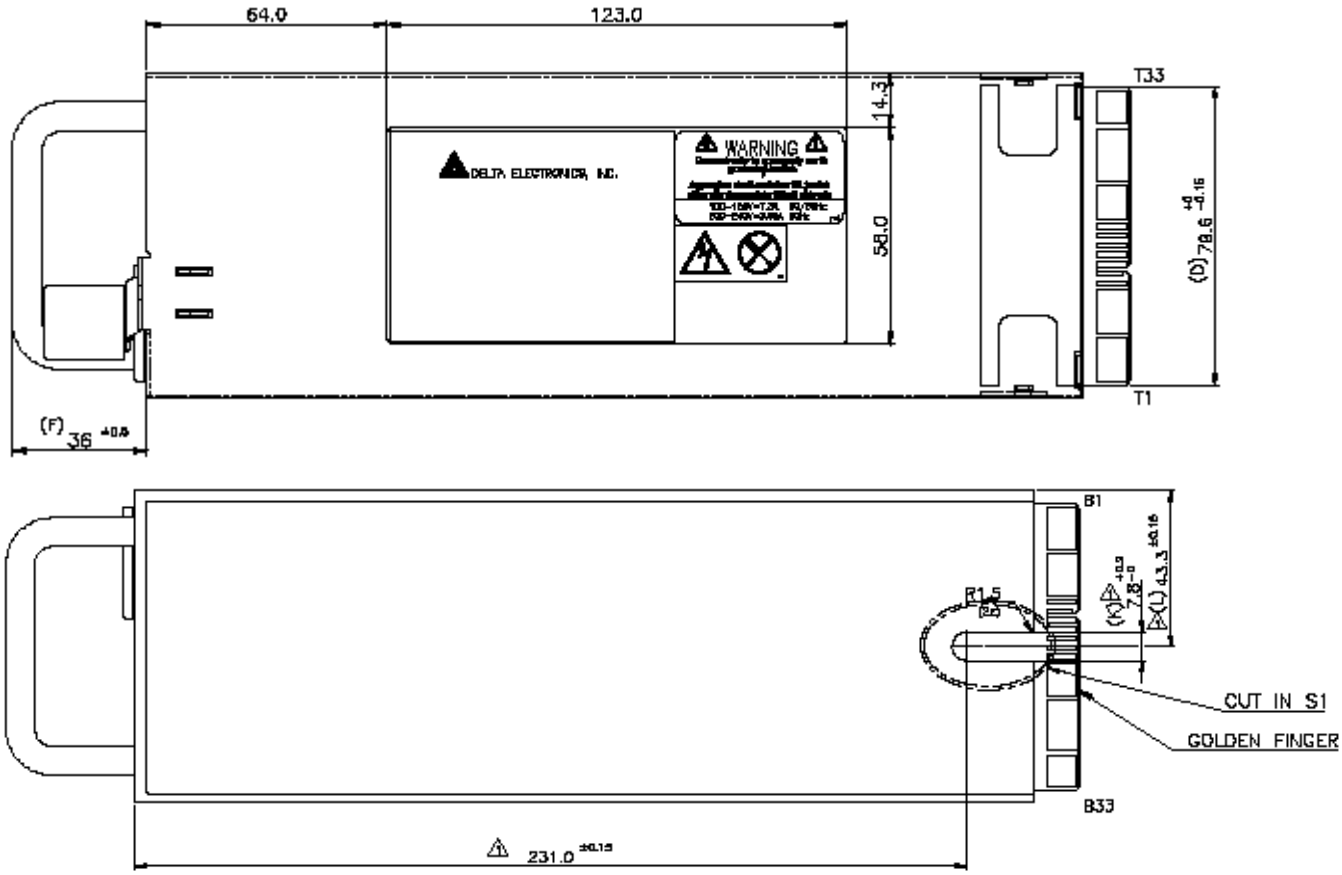
	SC5200 450-Watt Entry Power Supply Non Redundant	SC5200 650-Watt 2+1 Redundant Power Supply	SC5200 450-Watt 1+1 Redundant Power Supply
Intel Part Number	A85459-00X	A52678-00X	C20013-00X
+3.3 VDC Output	24 Amp Max	38 Amp Max	20 Amp Max
+5 VDC Output	20 Amp Max	38 Amp Max	20 Amp Max
+12 VDC Output	30 Amp Sustained 36 Amp / 12 second peak current	47.5 Amp Sustained 57 Amp / 12 second peak current	32 Amp Peak 26 Amp Sustained.
-12 VDC Output	0.5 Amp Max	0.5 Amp Max	0.3 Amp Max
+5 VDC Standby	2.0 Amp Max	2.0 Amp Max	2.0 Amp Max

Multiple +12V 240 VA Protection Circuits	Yes (2)	Yes (3)	Yes (2)
Output balancing	Total combined output power of +3.3v and +5v shall not exceed 179 W.	Total combined output power of +3.3v and +5v shall not exceed 300 W.	Total combined output power of +3.3v and +5v shall not exceed 120W
DC Power Connections	24-pin, 8-pin	24-pin, 8-pin, 5-pin SSI	24-pin, 8-pin, 5-pin SSI
AC Line Voltage	Auto-ranging for either 100-127 VAC or 200-240 VAC	Auto-ranging for either 100-127 VAC or 200-240 VAC	Auto-ranging for either 100-127 VAC or 200-240 VAC
AC Line Frequency	50/60 Hz	50/60 Hz	50/60 Hz
AC Input Current (System AC Rating)	6.0 Amp at 115 VAC 2.5 Amp at 220 VAC	8.0 Amp at 115 VAC 4.0 Amp at 220 VAC	6.56 Amp at 100 VAC 3.28 Amp at 200 VAC
Redundant Power	No	Yes	Yes
Hot-swap Power Modules	No	Three replaceable 350-W TPS Modules	Two replaceable 450 W (445W) moduels
Dual Line Cords	No	Yes	One AC Line Cord per 450 W (445W) Power Module
Redundant Fans	No	Yes	No
Replaceable Fans	No	No	No
Intended Server Boards	SHG2 SE7500CW2 SE7501CW2 SE7501BR2 SE7501HG2 SE7505VB2	SHG2 SE7501BR2 SE7501HG2	SE7505VB2 SE7501HG2 SE7501BR2 SE7501CW2

3.3 450W 1+1 Redundant Power Supply Mechanical Specifications

3.3.1 450W 1+1 Module Mechanical Drawing

Figure 9 Power Supply Enclosure Drawing



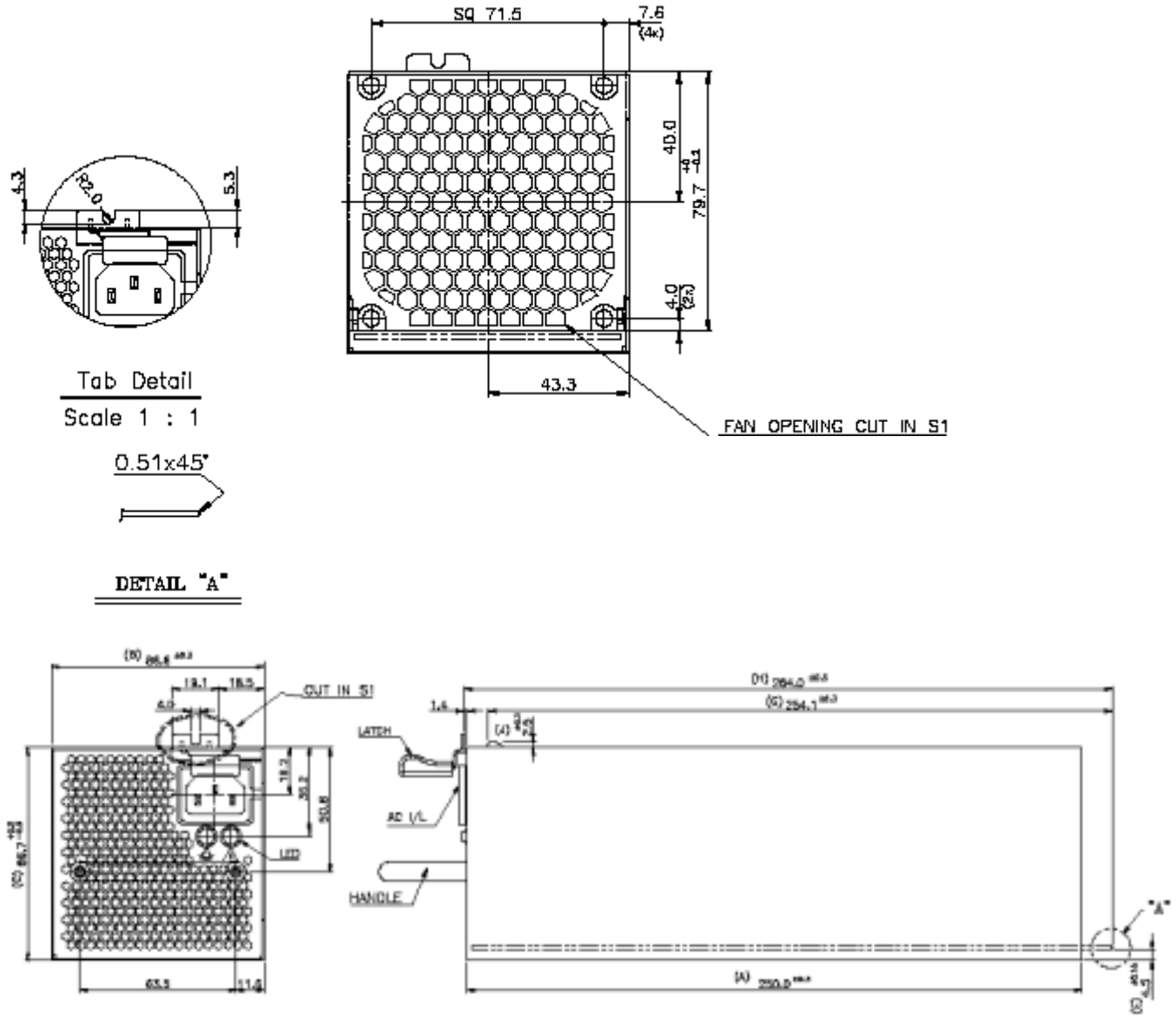
Note:

The latch shall protect the operator from any burn hazard through the use of the Intel Corporation Industrial designed plastic handle. The plastic handle shall be molded in either of the following materials:

Material	Color	Designation
GE 2800	Green	GN3058
BAYER FR2000	Green	SM G663A

3.3.2 Cage Mechanical Drawing

Figure 10 450W 1+1 Redudant Power Supply Cage Drawing



Note: All dimensions are in mm.

3.3.3 450W 1+1 Airflow and Acoustic noise

One 80mm high speed DC fan with fan speed control circuit is used for cooling.

1) When the power supply is running at 70% load (315W), the power supply must not exceed 47dB

2) When the power supply is running at max power (450W), the power supply should not exceed 50dB

3.3.4 AC Input Requirements

The power supply incorporates universal power input with active power factor correction, which shall reduce line harmonics in accordance with the EN61000-3-2 and JEIDA MITI standards. See Table 5 AC Input Rating.

3.3.5 AC Inlet Connector

The AC input connector is an *IEC 320 C-14* power inlet. This inlet is rated for 15A / 250VAC.

3.3.6 AC Input Voltage Specification

The power supply operates within all specified limits over the following input voltage range, shown in below table. The power supply shall power off if the AC input is less than 75-80Vac ranges. The power supply operates properly starting at 80-85VAC input voltages.

Table 4 AC Input Rating

PARAMETER	MIN	RATED	MAX	Max Input AC Current	Max Rated Input AC Current
Voltage (110)	90 V_{rms}	100-127 V_{rms}	140 V_{rms}	**7.3 A_{rms}** [1, 3]	**6.56A_{rms}** [4]
Voltage (220)	**180 V_{rms}**	200-240 V_{rms}	264 V_{rms}	**3.65 A_{rms}** [2, 3]	**3.28A_{rms}** [4]
Frequency	47 Hz	50/60 Hz	63 Hz		

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

3.3.7 Efficiency

The power supply shall have a **minimum** efficiency of **70%** at maximum load and over the specified AC voltage.

3.3.8 AC Line Dropout

An AC line dropout of one cycle or less (20ms min) shall not cause any tripping of control signals or protection circuits (= **20ms holdup** time requirement.

3.3.9 AC Line Fuse

The power supply has a **single line fuse**, on the Line (Hot) wire of the AC input. The line fusing shall be acceptable for all safety agency requirements.

3.3.10 AC Inrush

AC line inrush current shall not exceed **25A peak** for up to one-quarter of the AC cycle, after which, the input current should be no more than the specified maximum input current.

3.4 450W 1+1 DC Output Specification

3.4.1 Output Connector

The power supply provides card edge fingers, which mate to female connector located on the back plane. Card edge finger pin assignments are listed in *Table 5 Edge Finger Pinout*.

Table 5 Edge Finger Pinout

	Top		Bottom
1	+12V	1	+12V
2	+12V	2	+12V
3	+12V	3	+12V
4	+12V	4	+12V
5	+12V	5	+12V
6	GND	6	GND
7	GND	7	GND
8	GND	8	GND
9	GND	9	GND
10	GND	10	GND
11	+5VSB	11	+5VSB
12	Present#	12	PSKill
13	PSON#	13	PWOK
14	+12VRS	14	+12LS
15	+5VRS	15	+5LS
16	+3.3VRS	16	+3.3LS
17	Returns	17	-12V
18	+5V	18	+5V
19	+5V	19	+5V
20	+5V	20	+5V
21	+5V	21	+5V
22	GND	22	GND
23	GND	23	GND
24	GND	24	GND
25	GND	25	GND
26	GND	26	GND
27	GND	27	GND
28	+3.3V	28	+3.3V
29	+3.3V	29	+3.3V
30	+3.3V	30	+3.3V
31	+3.3V	31	+3.3V

Keying Slot

Signals that can be defined as low true or high true use the following convention: *signal*# = low true
Reserved pins are reserved for future use.

3.4.2 Grounding

The ground pins of the power supply output connector provide the power return path. The output connector ground pins are connected to safety ground (power supply enclosure).

3.4.3 Residual Voltage Immunity in Standby mode

The PS supply is immune to any residual voltage placed on its outputs (leakage voltage) up to 500mV.

3.4.4 Output Power / Currents

The following tables define two power and current ratings for this redundant 450W power supply. These were selected to cover different types of systems and configurations. The combined output power of all outputs shall not exceed the rated output power. Below are load ranges for a power supply power level.

Table 6 Load Ratings 450 Watt 1+1

Voltage	Minimum Continuous Load	Maximum Continuous Load	Peak Load	Max Continuous Power	Max Peak Power
+3.3V	**1.0 A**	**20 A**		120W (Note 2)	120W (Note 2)
+5V	**1.0 A**	**20 A**			
+12V	**1.0 A**	**26 A**	32 A peak (see note 3)	312W	384W
-12V	**0 A**	**0.3 A**		3.6W	3.6W
+5VSB	**0A**	**2.0 A**		10W	10W
Total continuous power =				**445.6W**	
Total Peak power (note 3) =					**517.6W**

1. Maximum continuous total DC output power should not exceed **445.6 Watts**.
2. Maximum combined 3.3V and 5V total output power is **120W.**
3. Peak power and peak current loading shall be supported for a minimum of **15 seconds**.

The power supply output voltages must stay within the following voltage limits when operating at **steady state and dynamic loading conditions**. These limits include the peak-peak ripple/noise specified in table 11. All outputs are measured with reference to the return remote sense signal (ReturnS). The 5V, 12V, –12V and 5VSB outputs are measured at the power supply connectors referenced to ReturnS.

Table 7 Voltage Regulation 450-Watt 1+1 Limits

PARAMETER	Tolerance	MIN	NOM	MAX	UNITS
+ 3.3V	-3%/+4.5%	+3.20	**+3.30**	+3.45	V_{rms}
+ 5V	-4%/+4%	+4.80	**+5.00**	+5.20	V_{rms}
+ 12V	-3.3%/+5%	+11.60	**+12.00**	+12.60	V_{rms}
- 12V	±10%	-13.20	**-12.00**	-10.80	V_{rms}
+ 5VSB	-4%/+5%	+4.80	**+5.00**	+5.25	V_{rms}

3.4.5 Ripple / Noise

The maximum allowed ripple/noise output of the power supply is defined in *Table 11 Ripple and Noise* below. This is measured over a bandwidth of 0Hz to 20MHz at the power supply output connectors. .

Table 11 Ripple and Noise 450-Watt 1+1

+3.3V	+5V	+12V	-12V	+5VSB
50mVp-p	60mVp-p	100mVp-p	250mVp-p	60mVp-p

3.4.6 Current Sharing

In the 1+1 parallel configuration, the +5V, +3.3V & +12V outputs shall actively current share within 10% of nominal at full load; linearly decrease to 20% of the nominal at half load. If the load sharing

is disabled by shorting the load share bus to ground, the power system will continue to operate within regulation limits for loads less than or equal to one power supply. The failure of a power supply should not effect the load sharing or output voltages of the other supplies still operating.

3.4.7 Hot Swap

A power supply may be hot swapped only if the AC power cord is unplugged. During this process the output voltages shall remain within the limits specified in Table 8. In general, a failed (off by internal latch or external control) supply may be removed, then replaced with a good power supply,

3.4.8 Timing Requirements

Timing specifications for the power supply operation are listed in Figure 11 450-Watt 1+1 Output Voltage Timing and in Figure 12 450-Watt 1+1 Turn On/Off Timing . The output voltages will rise from 10% to within regulation limits (T_{vout_rise}) within 2 to 20ms and –12V – it is allowed to rise from 0.1 to 20 ms. The +3.3V, +5V and +12V output voltages should start to rise approximately at the same time**.** All outputs rise monotonically. The +5V output will be greater than the +3.3V output during any point of the voltage rise. Refer to Figure Figure 11 450-Watt 1+1 Output Voltage Timing and *Figure 1. ATX* 2.03 I/O Aperture* for the timing specifications for the power supply being turned on and off via the AC input, with PSON held low and the PSON signal, with the AC input applied.

Figure 11 450-Watt 1+1 Output Voltage Timing

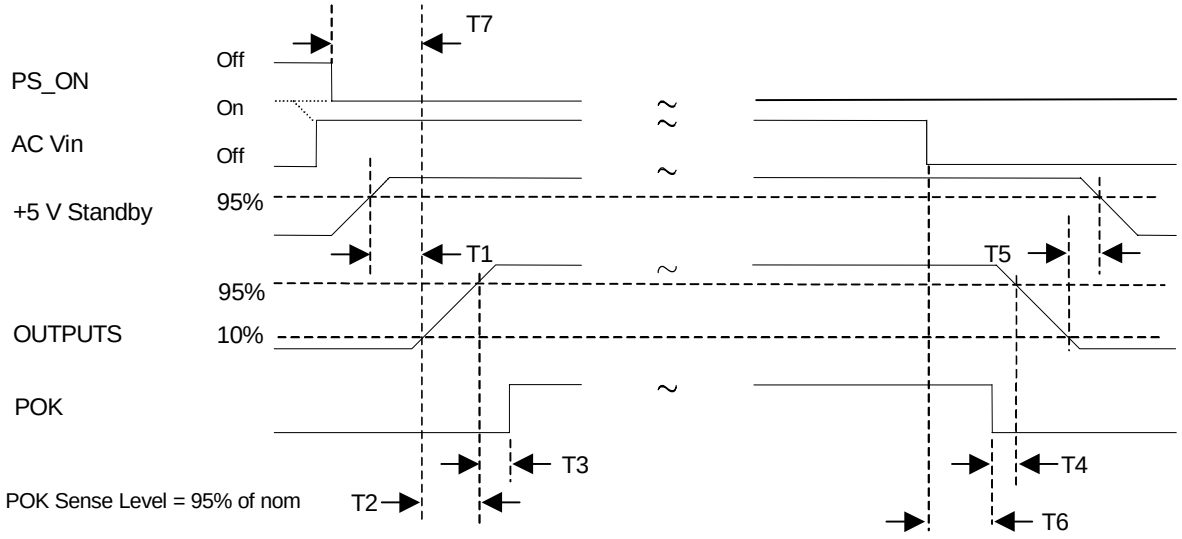


Figure 12 450-Watt 1+1 Turn On/Off Timing

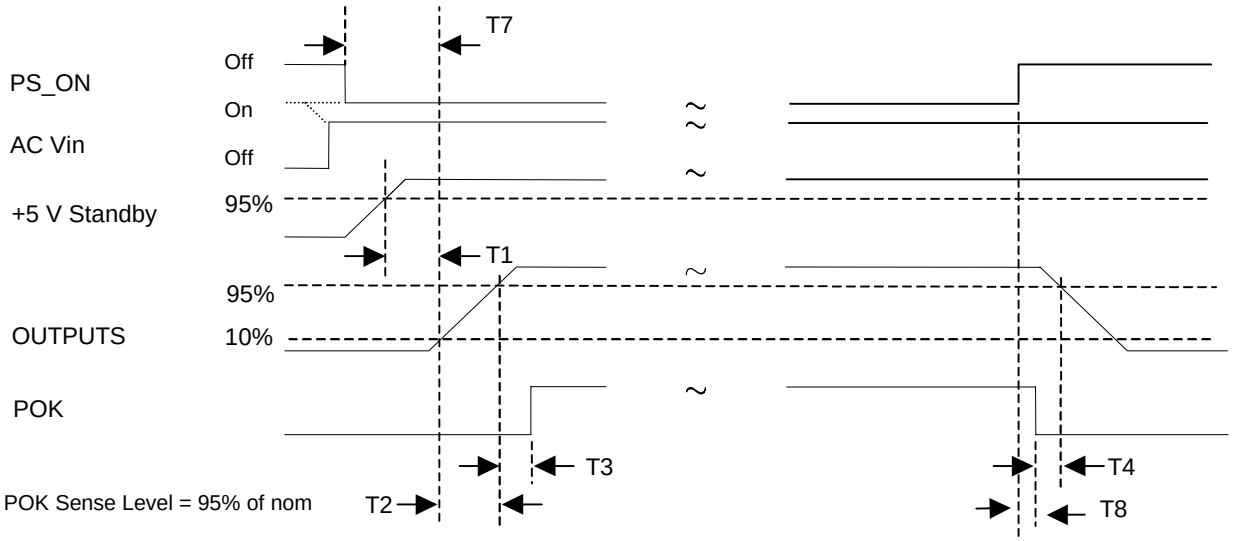


Figure 13 450Watt 1+1 Output Voltage Rise Time

ITEM	DESCRIPTION	MIN	MAX	UNITS
T_{vout_rise}	**Output voltage rise time from each main output. (T2)**	**2.0 ***	**20 ***	ms

*** The –12V output voltage rise time shall be from 0.1ms to 20.0ms**

Table 8 450Watt 1+1 Turn On/Off Timing

ITEM	DESCRIPTION	MIN	MAX	UNITS
T_{vout_holdup}	Time all output voltages stay within regulation after loss of AC. (T6 + T4)	**21**		ms
T_{pwok_holdup}	Delay from loss of AC to de-assertion of PWOK (T6)	**20**		ms
$T_{pson\_on\_delay}$	Delay from PSON# active to output voltages within regulation limits. (T2+T7)	**5**	**120**	ms
T_{pson_pwok}	Delay from PSON# reactive to PWOK being de-asserted. (T8)		**2**	ms
T_{pwok_on}	Delay from output voltages within regulation limits to PWOK asserted at turn on. (T3)	**100**	**500**	ms
T_{pwok_off}	Delay from PWOK de-asserted to output voltages (3.3V, 5V, 12V, -12V) dropping out of regulation limits. (T4)	**1**		ms
T_{sb_vout}	Delay from 5VSB being in regulation and out regulation to O/Ps being in regulation at AC turn on (T1) and off (T5).	**5**		ms

3.5 450W 1+1 Protection Circuits

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

3.5.1 Current Limit (OCP)

Current limits to prevent the +3.3V, +5V, and +12V outputs from exceeding the values are provided in *Table 9* if the current limits are exceeded the power supply shuts down and latches off. The latch is cleared by toggling the PSON# signal or by an AC power interruption. The -12V and 5VSB are also protected during over current or shorted conditions

Table 9 450Watt 1+1 Over Current Protection (OCP)

VOLTAGE	OVER CURRENT LIMIT (IOUT LIMIT)
+3.3V	110% minimum (22A); 150% maximum (30A)
+5V	110% minimum (22A); 150% maximum (30A)
+12V	130% minimum (34A); 150% maximum (39A)
5VSB	200% minimum (4A); 350% maximum (7A)

3.5.2 Over Voltage Protection (OVP)

The power supply shuts down and latches off after an over voltage condition occurs. This latch is cleared by toggling the PSON# signal or by an AC power interruption. *Table 10* contains the over voltage limits. The values are measured at the output of the power supply's connectors.

Table 10 450Watt 1+1 Over Voltage Protection (OVP) Limits

Output Voltage	MIN (V)	MAX (V)
+3.3V	**3.7**	**4.5**
+5V	**5.7**	**6.5**

+12V	**13.3**	**15**
+5VSB (no latch off)	**5.7**	**6.5**

3.5.3 Over Temperature Protection (OTP)

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.

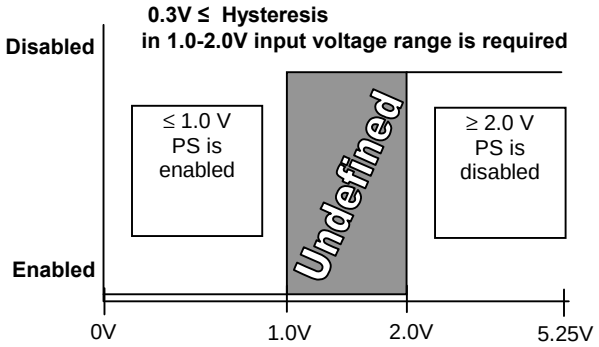
3.6 450W 1+1 Control and Indicator Functions

The PSON# signal is required to remotely turn on/off the power supply. PSON# is an active low signal that turns on the +3.3V, +5V, +12V, and -12V power rails. When this signal is not pulled low by the system, or left open, the outputs (except the +5VSB) turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply. See below table:

Table 11 PSON* Signal Functions

Signal Type	Accepts an open collector/drain input from the system. Pull-up to VSB located in power supply.	
PSON# = Low	ON	
PSON# = High or Open	OFF	
	MIN	**MAX**
Logic level low (power supply ON)	0V	1.2V
Logic level high (power supply OFF)	2.0V	5.25V
Source current, Vpson = low		1mA
Power up delay: Tpson $_{on\_delay}$	5msec	120msec
PWOK delay: T $_{pson\_pwok}$		2msec

Figure 14 PSON# Required Signal Characteristics



3.6.1 PWOK (Power OK) Output Signal

PWOK is a power OK signal and will be pulled HIGH by the power supply to indicate that all the outputs are within the regulation limits of the power supply. When any output voltage falls below regulation limits or when AC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state. See the table below.

Table 17 PWOK Signal Characteristics

Signal Type	Open collector/drain output from power supply. Pull-up to VSB located in system.	
PWOK = High	**Power OK**	
PWOK = Low	Power Not OK	
	MIN	**MAX**
Logic level low voltage, Isink=4mA	0V	0.4V
Logic level high voltage, Isource=200µA	2.4V	5.25V
Sink current, PWOK = low		4mA
PWOK delay: Tpwok $_{on}$	100ms	500ms
PWOK rise and fall time		100µsec
Power down delay: T_{pwok_off}	1ms	

3.6.2 PSKILL Signal Requirements

PKill pin allows for hot swapping of the power supply. The PS-Kill pin on the power supply is shorter than the other signal pins. When a power supply is removed from the system, the PSKill pin turns off the power supply to prevent arching of the DC output contacts.

Table 18: PSKILL Signal Characteristics

Signal Type (Input Signal to Supply)	Accepts a ground input from the system. Pull-up to VSB located in the power supply.	
PSKILL = Low, PSON# = Low	ON	
PSKILL = Open, PSON# = Low or Open	OFF	
PSKILL = Low, PSON# = Open	OFF	
	MIN	**MAX**
Logic level low (power supply ON)	0V	1.0V
Logic level high (power supply OFF)	2.0V	5.25V
Source current, Vpskill = low		4mA
Delay from PSKILL=High to power supply turned off (T_{PSKill})[1]		100µsec

Tpskill is the time from the PSKill signal deasserting HIGH to the power supply's output inductor discharging.

3.6.3 PRESENT# Signal Requirements

The PRESENT# signal is used to sense the number of power supplies installed (operational or not). This signal connects to the power supply's internal output ground through a 4.7 Ohm or less resistor.

Table19: PRESENT# Signal Characteristics

Signal Type	Output from power supply that is connected to ground. Pull-up to VSB located in system.	
PRESENT# = Low	Present	
PRESENT# = High	Not Present	
	MIN	**MAX**
Logic level low voltage, Isink=4mA	0V	0.4V
Maximum pull-up voltage		5.25V
Sink current, PRESENT# = low		4mA
Sink current, PRESENT# = high		50μA

3.6.4 LED DISPLAY Indicators

Two LEDs indicate the power supply status. LED #1 is green and LED #2 is amber.

Table 12 450Watt 1+1 LED Indicators

POWER SUPPLY CONDITION	LED#1 (Power) GREEN	LED#2 (Fail) AMBER
No AC power to all PSU	**OFF**	**OFF**
No AC power to this PSU only or Power supply failure or Current limit	**OFF**	**ON**
AC present / only standby Output(s) On	**BLINK GREEN**	**OFF**
Power supply DC outputs ON and OK	**GREEN**	**OFF**

3.7 450W 1+1 Environmental Requirements

3.7.1 Temperature

Operating Ambient, normal mode (inlet air): **+10°C min / +45°C max at 10,000 feet above sea level.**
(At full load, with a maximum rate of change of 5°C/10 minutes, but no more than 10°C/hr)
Operating Ambient, stand-by mode (inlet air): **+10°C min / +45°C max at 10,000 feet above sea level.**
Non-operating Ambient: -40°C to +70°C (Maximum rate of change of 20°C/hour)

3.7.2 Humidity

Operating: 0 to 80% relative humidity (non-condensing)
Non-Operating: 0 to 95% relative humidity (non-condensing)
NOTE: 95% relative humidity is achieved with a dry bulb temp. of 55°C and a wet bulb temp. of 54°C.

3.7.3 Altitude

Operating: up **to 10,000 ft**
Non-operating: up to 35,000 ft

3.8 450W 1+1 MTBF

3.8.1 Mean Time Between Failures (MTBF)

The 450W 1+1 power supply shall have a minimum MTBF at continuous operation of 100,000 hours at 100% load and 45°C, as **calculated** by Bellcore RPP.

3.8.2 Warranty Period

Three (3) years.

3.9 450W 1+1 BACK PLANE Overview

The back plane board is designed to work with two 450W power supplies in 1+1 configuration. Each 450W power supply, supplies five output voltages and several I/O signals, which are described below. The mate connectors on the back plane are the right angle 2x31 pin connectors. The power outputs from these connectors will be combined to allow redundancy (12V, 5V, 3.3V, -12V, 5VSB).

The 240VA protection circuit will be provided for 5V and +12V outputs on the backplane. As an additional protection, a mechanical shield covering the entire back plane PCB's topside will be provided in order to keep the user from accidental contact.

Each power rail and I/O signals will be routed to the system thru a wire harness, as described below.

The I/O signals coming thru each power supply connector to the backplane are: PSON#, PWOK, Present#, PSKill. The I/O signals coming thru the backplane output wire harness to the system are:

PSON# (global), PWOK (global), PSAlert# and SMBus (I2C), as described below.

3.9.1 450W 1+1 Card Cage Mechanial Specification

Notes: All dimensions are in mm.

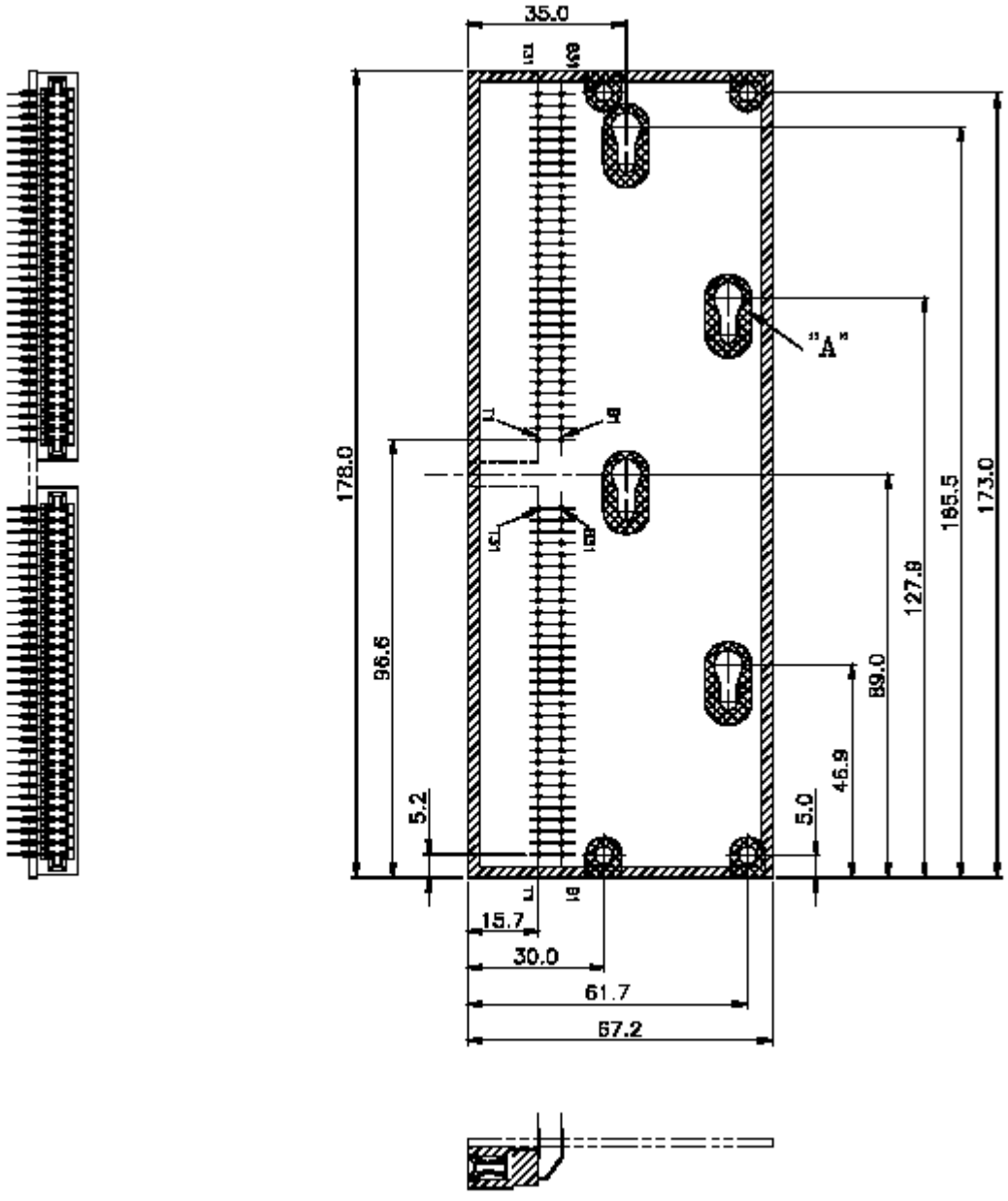
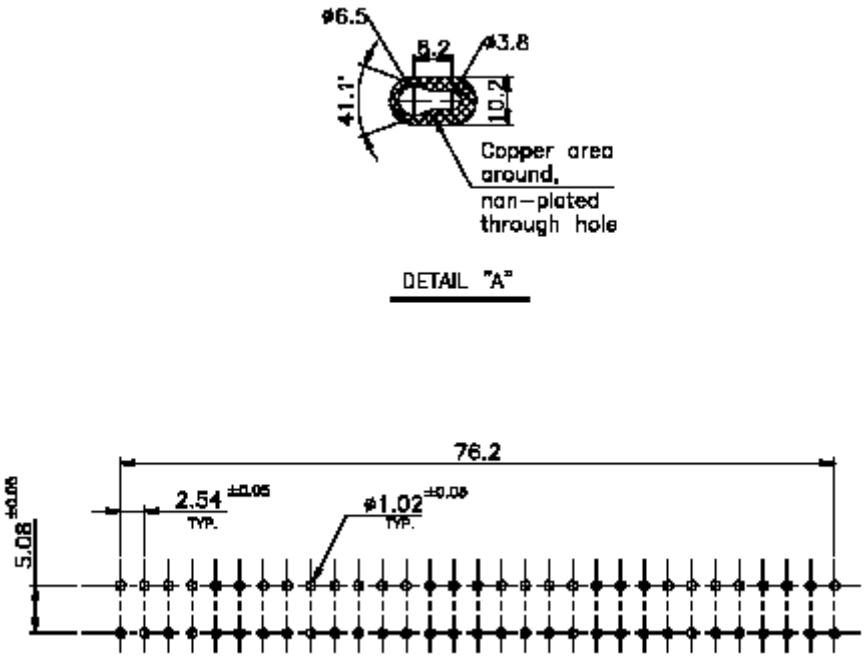


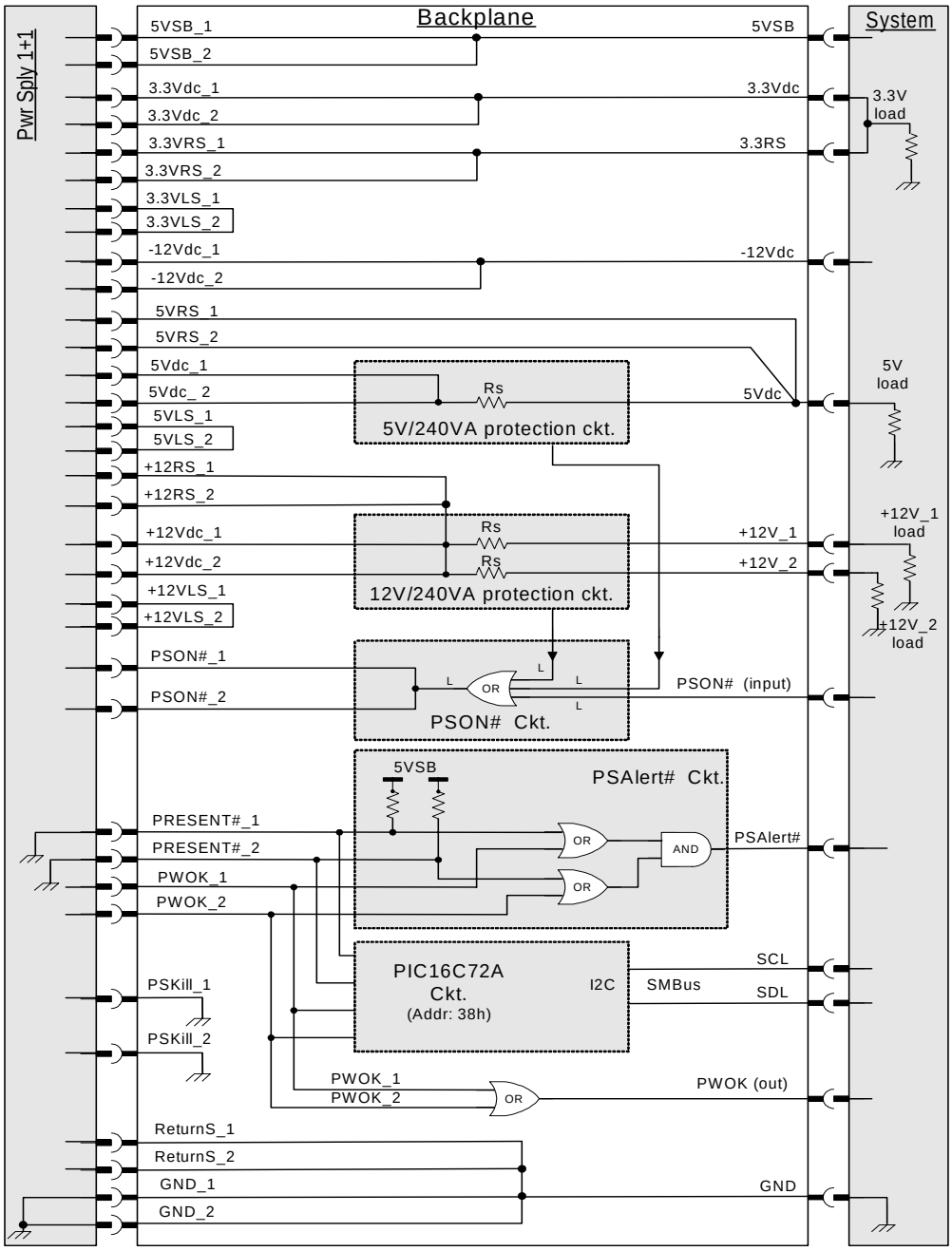
Figure 15 Input connector hole layout detail



3.10 450W 1+1 Electrical Specification

3.10.1 Backplane block schematic

Figure 16 Bckplane Block Schematic



3.10.2 Input Connectors

Each power supply output connector provides card edge fingers, which mate with the Backplane female input connector. This is a blind mating type connector that connects the power supply's

output voltages and signals. This female type connector on the backplane is the right angle **2x31 pin** type Singatron p/n: 2806-62-R-30T-P or equivalent. The connector pinout is shown below.

Table 13 Input Connector Pinout

Top Row Pin Description	PIN #	**Bottom** Row Pin Description
+12V	**1**	**+12V**
+12V	**2**	**+12V**
+12V	**3**	**+12V**
+12V	**4**	**+12V**
+12V	**5**	**+12V**
GND	**6**	**GND**
GND	**7**	**GND**
GND	**8**	**GND**
GND	**9**	**GND**
GND	**10**	**GND**
+5VSB	**11**	**+5VSB**
Present#	**12**	**PSKill**
Keying Notch		
PSON#	**13**	**PWOK**
+12VRS	**14**	**+12LS**
+5VRS	**15**	**+5LS**
+3.3VRS	**16**	**+3.3LS**
ReturnS	**17**	**-12V**
+5V	**18**	**+5V**
+5V	**19**	**+5V**
+5V	**20**	**+5V**
+5V	**21**	**+5V**
GND	**22**	**GND**
GND	**23**	**GND**
GND	**24**	**GND**
GND	**25**	**GND**
GND	**26**	**GND**
GND	**27**	**GND**
+3.3V	**28**	**+3.3V**
+3.3V	**29**	**+3.3V**
+3.3V	**30**	**+3.3V**
+3.3V	**31**	**+3.3V**

Signals that can be defined as low true or high true use the following convention: *signal*$^{\#}$ = low true
Reserved pins are reserved for future use.

3.10.3 240VA Current Limit

The power supply has 240VA current limit channels for +12V1 and 12V2 outputs and one 240VA current limit channel for +5V output to prevent the +5V, +12V1 and 12V2 outputs from exceeding the values shown in *Table 2*. If the current limits are exceeded the power supplies shall shutdown and latch off. The latch will be cleared by toggling the PSON# signal or by an AC power interruption.

Table 14 240VA Over-Current Protection Limits

240VA Channel	Continuous Load		Peak load	
	Current Limit MIN	Current Limit MAX	Peak Limit	Delay (see note)*
12V1	**18A**	**20A**	**22A Min**	**500ms-1000ms**
12V2	**18A**	**20A**	-	0
5V	**22A**	**30A**	-	0

Note: The delay means that the 12V1 OCP circuit will allow the peak load of 20-22A for **500ms min (and 1000ms max**) before it will shutdown the PS.

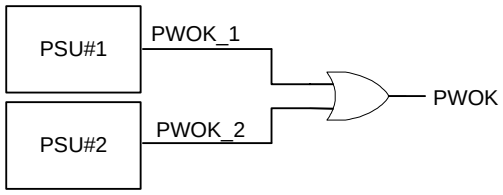
3.11 450W 1+1 Control and Indicator Functions

The following sections define the input and output signals from the power supply.
Signals that can be defined as low true use the following convention: *signal#* = low true

3.11.1 PWOK

The Backplane board shall provide the logical OR-ing of the two PWOK signals coming from each power supply to provide a single PWOK signal to the system. PWOK output is 5V TTL compatible.

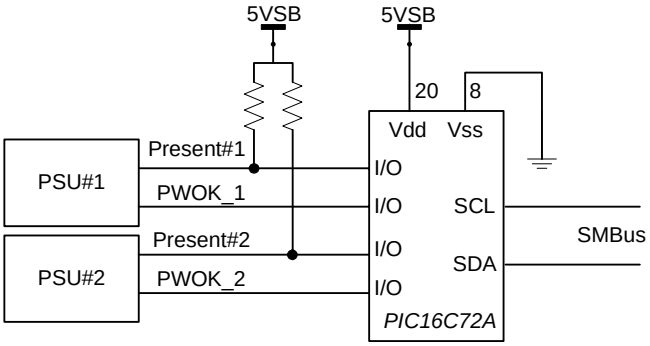
Figure 17 PWOK Circuit Function



3.11.2 SMBus (I2C)

There shall be a device on the Backplane board to monitor the PWOK and PRESENT# signals from each of the two power supplies. This device shall be a Microchip PIC16C72A micro controller or equivalent and have an address of **38h**.

Figure 18 SMBus Circuit Function



3.11.3 I2C Bus Addressing Scheme and Supply voltage:

The I2C Bus is powered from to 5VSB.

Table 15 I2C Bus Address

Hex Address R / W	Target device
38h / 39h	PIC16C72A

3.11.4 I2C Bus Command format

Read From Input Port:

Table 16 I2C Bus Command Format

1	2	3	4	5	6	7	8	9	10
S	**Slave Address**	**R**	**A**	**Data Byte 1**	**A**	**…**	**A**	**Data Byte N**	**/A**	**P**

1. Start Bit
2. Slave Address (38h)
3. Read Bit
4. ACK
5. Data Byte 1
6. ACK
7. ACK
8. Data Byte N
9. NONACK
10. Stop Bit

3.11.5 Input Port Register

This register is a read only. It reflects the incoming logic levels of the pins. Write to this register has no effect.

BIT	Name	R/W	Description

7	Reserved	Read	No use. Return 0
6	Reserved	Read	No use. Return 0
5	Reserved	Read	No use. Return 0
4	Reserved	Read	No use. Return 0
3	PWOK_2	Read	PWOK for module 2 (1=power is good, 0= otherwise)
2	PRESENT# 2	Read	PRESENT for module 2 (0=Present, 1= Not Present)
1	PWOK_1	Read	PWOK for module 1 (1=power is good, 0= otherwise)
0	PRESENT# 1	Read	PRESENT for module 1 (0=Present, 1= Not Present)

3.11.6 PSKill

The power backplane provides ground to the PSKill signal to each power supply.

3.11.7 PSAlert#

The power distribution board provides a PSAlert# signal based on PWOK and Present# signal from each power supply. This is used for boards that do not have SMBus monitoring capability to provide power supply failure status.

Table 3: Alert# Signal Characteristics

Signal Type (Active Low)	Open collector/drain output from power supply. Pull-up to VSB located in system.	
Alert# = High	OK	
Alert# = Low	Power Alert to system	
	MIN	MAX
Logic level low voltage, Isink=4 mA	0 V	0.4 V
Logic level high voltage, Isink=50 µA		5.25 V
Sink current, Alert# = low		4 mA
Sink current, Alert# = high		50 µA
Alert# rise and fall time		100 µs

The power distribution board shall provide a PSAlert# signal based on PWOK and Present# signals from each power supply. This is used for boards that do not have SMBus monitoring capability to provide power supply failure status. Below is a logic table and the needed logic to implement the PSAlert# signal.

Figure 19 PSAlert# Signal Circuit Function

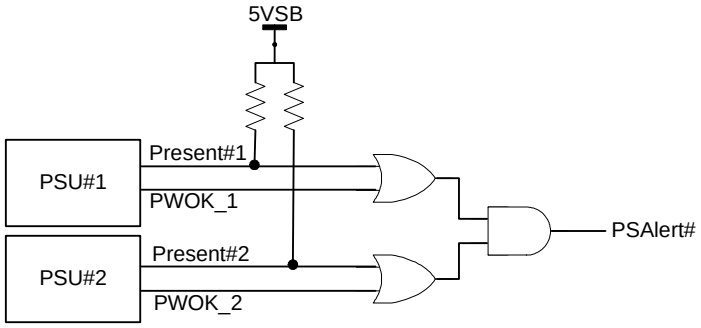


Table 17 PSAlert# Circuit Logic Table

PWOK1	Present#1	PWOK2	Present#2	PSALERT#	Comments
H	**L**	**H**	**L**	**H**	Both supplies good and ON
L	**L**	**H**	**L**	**L**	Both supplies present, PS1 failed or off
L	H	**H**	**L**	**H**	Only PS2 present, PS2 good and on
H	H	H	L	**X**	*Not a possible state*
H	**L**	L	**L**	L	Both supplies present, PS2 failed or off
L	**L**	L	**L**	L	Both present but failed or off
L	H	L	**L**	L	Only PS2 present but failed or off
H	H	L	L	X	*Not a possible state*
H	L	L	H	**H**	Only PS1 present, PS1 good and on
L	L	L	H	**L**	Only PS1 present, PS1 failed or off
L	H	L	H	X	*Not a possible state*
H	H	L	H	X	*Not a possible state*
H	L	H	H	X	*Not a possible state*
L	L	H	H	X	*Not a possible state*
L	H	H	H	X	*Not a possible state*
H	H	H	H	X	*Not a possible state*

Note: Some states are not possible since the PWOK from a power supply cannot be asserted if the power supply is not present.

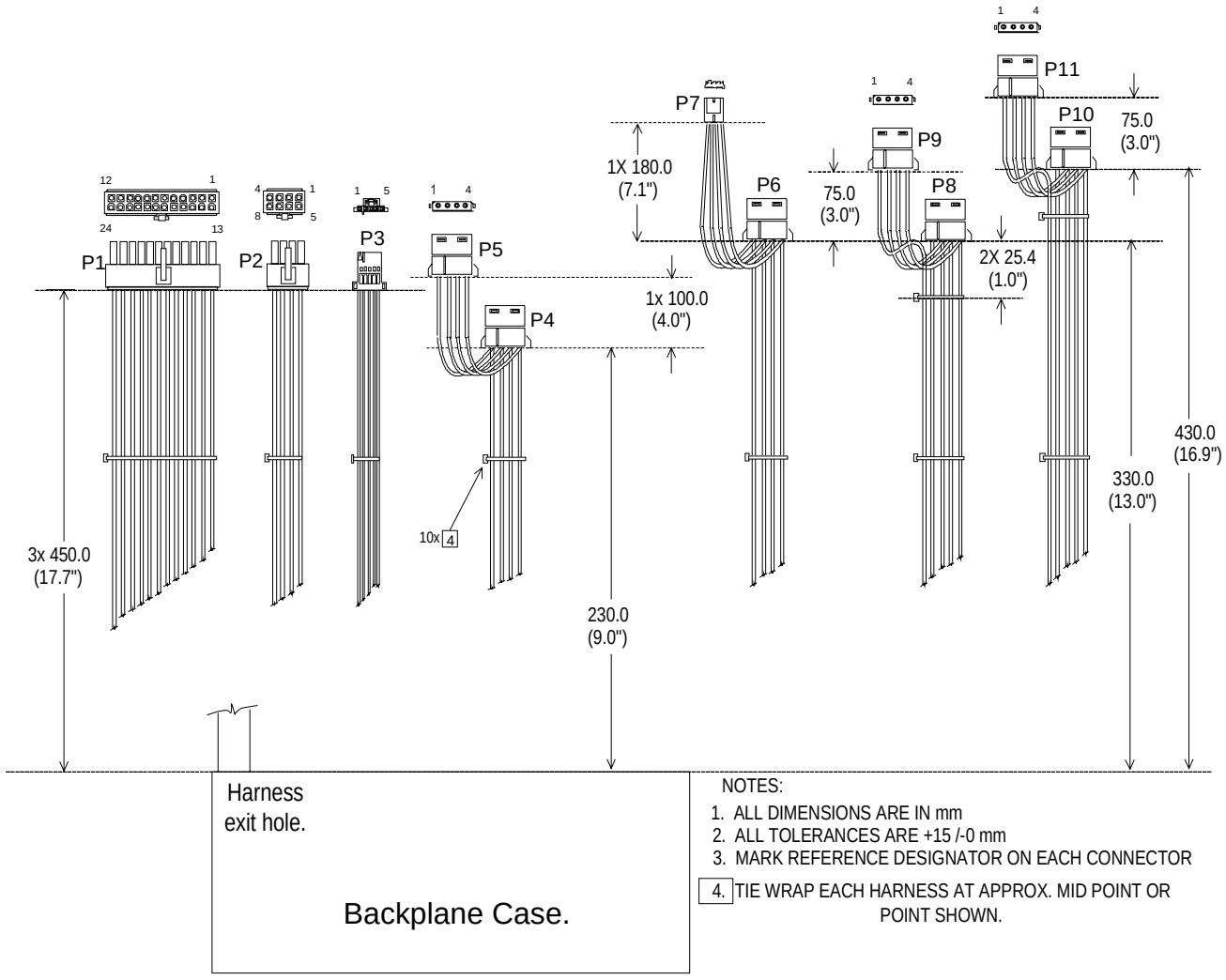
3.12 450W 1+1 Output Cable Harness

The power distribution board connects to the system via a wire harness. The harness size, connectors, and pinouts are shown below. Listed or recognized component appliance wiring material (AVLV2), CN, rated min 105°C, 300Vdc shall be used for all output wiring.

Table 18 Cable Lengths

From	**Length mm (in)**	**To connector #**	No of pins	Description
Backplane cover exit hole	**450 (17.7)**	**P1**	24	Baseboard Power Connector
Backplane cover exit hole	**450 (17.7)**	**P2**	8	Processor Power Connector
Backplane cover exit hole	**450 (17.7)**	**P3**	4	Signal Connector
Backplane cover exit hole	**230 (9.0)**	**P4**	4	Peripheral Power Connector
Extension	**100 (4.0)**	**P5**	4	Peripheral Power Connector
Backplane cover exit hole	**330 (13.0)**	**P6**	4	Peripheral Power Connector
Extension	**180 (7.1)**	**P7**	4	Floppy Power Connector
Backplane cover exit hole	**330 (13.0)**	**P8**	4	Peripheral Power Connector
Extension	**75 (3.0)**	**P9**	4	Peripheral Power Connector
Backplane cover exit hole	**430 (16.9)**	**P10**	4	Peripheral Power Connector
Extension	**75 (3.0)**	**P11**	4	Peripheral Power Connector

Figure 20 Output Harnes Mechanical Details



3.12.1 P1 Baseboard power connector

Connector housing: 24- Pin Molex Mini-Fit Jr. 39-01-2240 or equivalent
Contact: Molex 44476-1111 or equivalent

Table 19 P1 Main Power Connector

PIN	SIGNAL	18 AWG COLOR	PIN	SIGNAL	18 AWG COLOR
1	+3.3 VDC	Orange	13	+3.3 VDC	Orange
2	+3.3 VDC	Orange	14	-12 VDC	Blue
3	COM (GND)	Black	15	COM	Black
4	5 VDC* 5 VRS	Red Red	16	PS_ON#	Green
5	COM	Black	17	COM	Black
6	+5 VDC	Red	18	COM	Black
7	COM	Black	19	COM	Black
8	PWR OK	Gray	20	*Reserved (-5V in ATX)*	*N.C.*

9	5VSB	Purple	21	+5 VDC	Red
10	+12 V2	Yellow/Blue Stripe	22	+5 VDC	Red
11	+12 V2	Yellow/Blue Stripe	23	+5 VDC	Red
12	+3.3 VDC	Orange	24	COM	Black

* 5V Remote Sense Double Crimped into pin 4

3.12.2 P2 Processor Power Connector

Connector housing: 8- Pin Molex 39-01-2080 or equivalent
Contact: Molex 44476-1111 or equivalent

Table 20 P2 Processor Power Connector

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

3.12.3 P3 Signal Connector

Connector housing: 5-pin Molex 50-57-9405 or equivalent

Contacts: Molex 16-02-0088 or equivalent

Table 21 P3 Server Signal Connector

Pin	Signal	24 AWG Color
1	SMBus Clock	White/Green Stripe
2	SMBus Data	White/Yellow Stripe
3	PSAlert#	Red/White Stripe
4	Reserved (for ReturnS)	Black/White Stripe
5	3.3RS	Orange/White Stripe

3.12.4 P4-6, P8-11 Peripheral Power Connectors

Connector housing: Amp 1-480424-0 or equivalent
Contact: Amp 61314-1 or equivalent

Table 22 P4-6, P8-11 Peripheral Power Connector

Pin	Signal	18 AWG Color
1	+12 V2	Yellow/Blue Stripe
2	COM	Black
3	COM	Black
4	+5 VDC	Red

3.12.5 P7 Floppy Power Connector

Connector housing: Amp 171822-4 or equivalent

Contact: Amp 170204-1 or equivalent

Table 23: P7 Floppy Power Connector

Pin	Signal	22 AWG Color
1	+5 VDC	Red
2	COM	Black
3	COM	Black
4	+12 V2	Yellow/Blue Stripe

3.13 450W 1+1 Environmental Requirements

3.13.1 Temperature

Operating Ambient: **+10°C min / +45°C max at 10,000 feet above sea level.**

(At full load, with a maximum rate of change of 5°C/10 minutes, but no more than 10°C/hr)
Non-operating Ambient: -40°C to +70°C (Maximum rate of change of 20°C/hour)

3.13.2 Humidity

Operating: 0 to 80% relative humidity (non-condensing)
Non-Operating: 0 to 95% relative humidity (non-condensing)
NOTE: 95% relative humidity is achieved with a dry bulb temp. of 55°C and a wet bulb temp. of 54°C.

3.13.3 Altitude

Operating: up **to 10,000 ft**
Non-Operating: up to 50,000 ft

3.13.4 Mechanical Shock

The device will withstand the following imposed conditions without electrical or mechanical failure:
Non-operating Square Wave Shock: 40G, Square wave at 200in/sec (508cm/sec); on all six sides
Non-operating Half Sine Shock: Half Sine pulse for 70in/sec (178cm/sec) for 2ms; on all sides except top
Operating Half Sine Shock: Half Sine pulse for 40in/sec (102cm/sec) for 2ms; on all sides except top.

3.13.5 Random Vibration

Operating: Sinusoidal vibration, 0.5G (0-peak) acceleration. 3-200Hz, sweep at 1/2 octave/min from low to high frequency, and then from high to low. Thirty minute dwell at all resonant points, where resonance is defined as those exciting frequencies at which the device under test experiences excursions two times larger than non-resonant excursions. Plane of vibration to be along three mutually perpendicular axis.

Non-operating: Sinusoidal vibration, 1.0G (0-peak) acceleration. 3-200Hz, sweep at 1/2 octave/min from low to high frequency, and then from high to low. Thirty minute dwell at all resonant points, where resonance is defined as those exciting frequencies at which the device under test experiences excursions two times larger than non-resonant excursions.

3.13.6 Thermal Shock (Shipping)

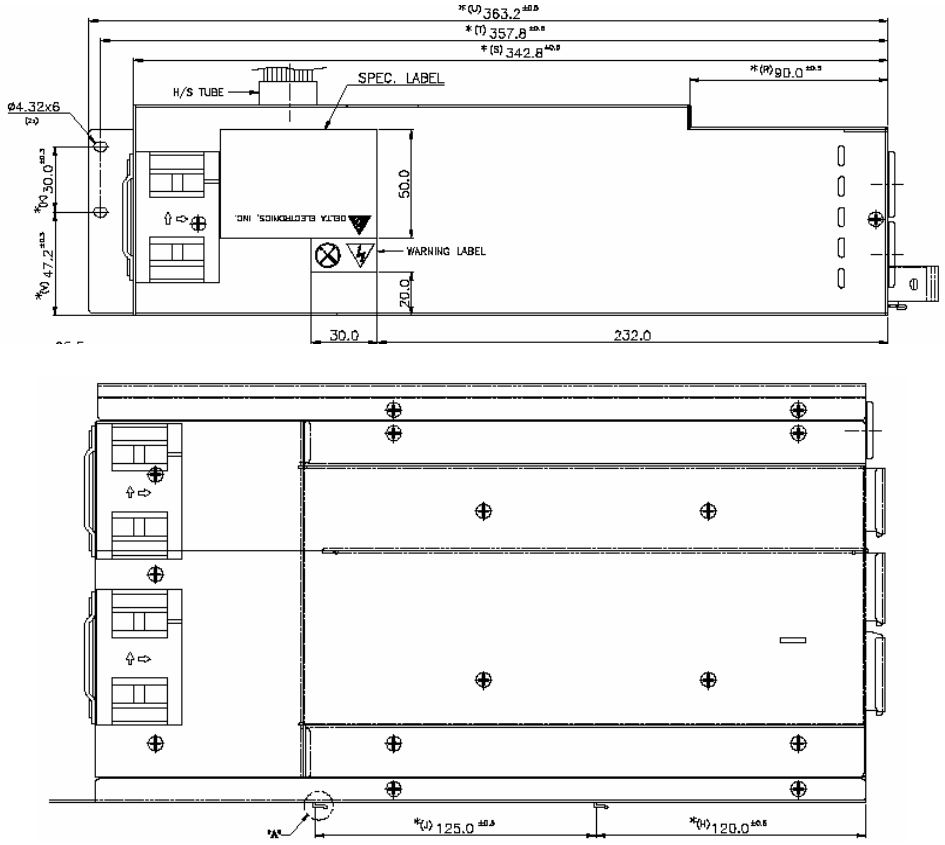
Non-operating: -40°C to +70°C, 50 cycles, 30°C/min. ≥ transition time ≥ 15°C/min., duration of exposure to temperature extremes for each half cycle shall be 30 minutes.

3.13.7 Ecological Requirements

Cadmium shall not be used in painting or plating. No brominated plastics shall be used.
No Quaternary salt electrolytic capacitors shall be used. Example of prohibited caps are: United Chemi-Con type: LXF, LXY, LXZ.

3.13.8 650-W Power Supply Mechanical Outline

The approximate 650-W 2+1 supply dimensions are 96-mm high by 184-mm wide by 343-mm deep.



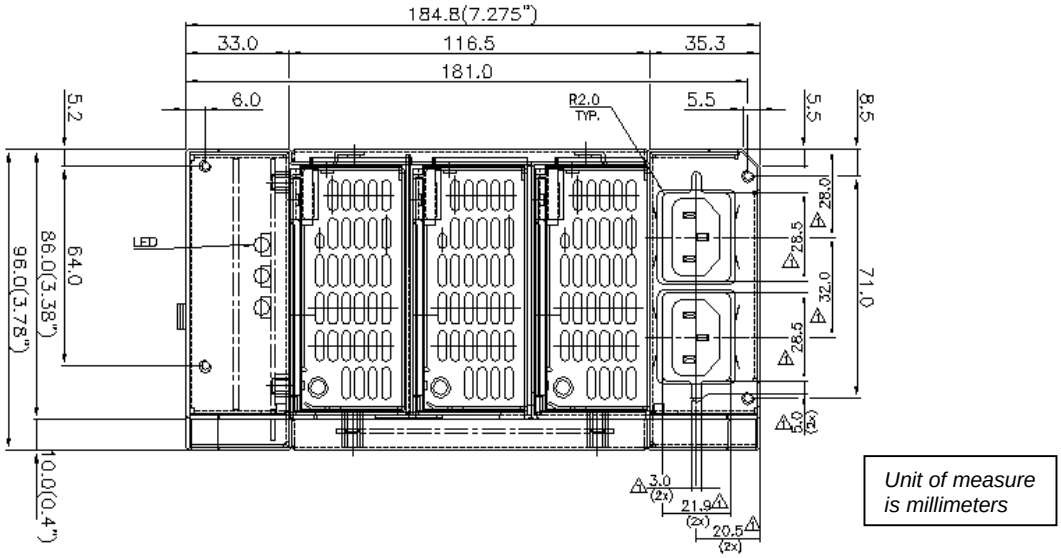


Figure 21. 650-W 2+1 Redundant Power Supply

3.13.9 Marking and Identification

Figure 22 shows AC inlet, power supply module, and LED designations on 650-W power subsystem.

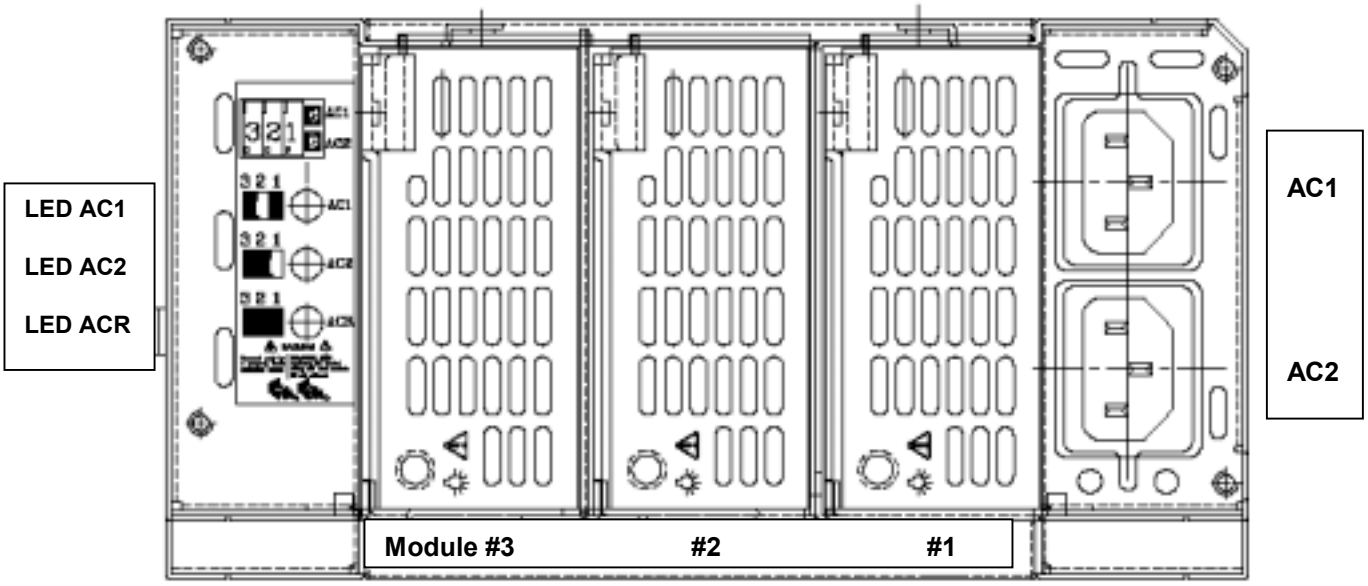


Figure 22. Power Supply Module, AC Inlet & LED Designations

3.13.10 Dual AC Inputs

The 650-W power subsystem has two AC inlets, AC1 and AC2. AC1 is connected to the inputs of TPS module #1 (PS1). AC2 shall be connected to the inputs of Module #2 (PS2). Module #3 (PS3) is connected to AC2 through normally closed transfer switch contacts. There could be a configuration where both AC inlets will be connected to the same AC source (single AC source operation).

Figure 23 illustrates how the redundant power is implemented using a transfer switch controller. The transfer switch monitors the relay operation functionality during initial AC turn on and the presence of all 3 modules.

If AC1 input fails (goes out of specified voltage range), PS2 and PS3 power modules will continue to operate taking power from the line that remains operational, AC2.

If AC2 input fails, the transfer switch will connect PS3 to AC1 so that PS1 and PS3 power modules will take power from AC1. Once AC2 recovers, PS3 will be switched into its original state.

Note: Shipping configuration (default configuration) of the SC5200 KHD3HSRP650 and KHD3HSRP650R chassis is with power supply modules installed in slots 2 and 3. A dummy (blank module) is inserted installed in slot 1. With power supply modules installed in slots 2 and 3, the AC power cord must be installed in AC2 receptacle.

Summary of supported configurations:

1. Default: Power Supplies installed in slots # 2 and #3> AC power cord installed in AC2
2. Power Supplies installed in slots #1 and #3> AC power cord installed in AC1
3. Redundant Configuration: Power Supplies installed in slots #1,#2,and #3> two AC power cords installed in AC1 and AC2 respectively.

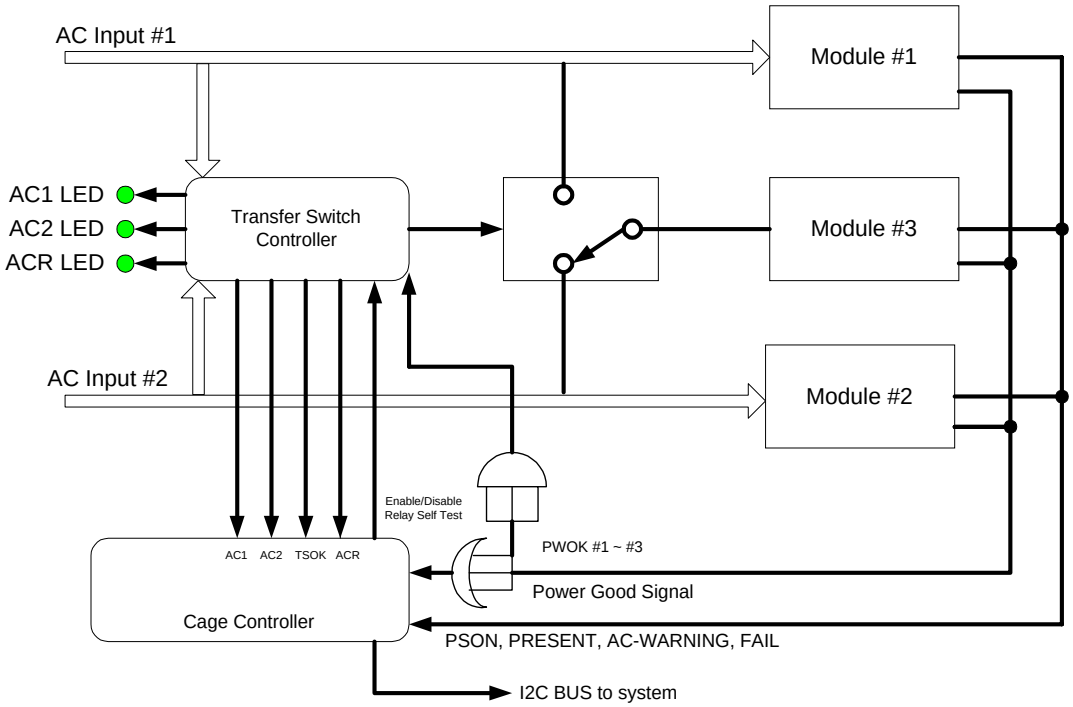


Figure 23. 650-W Power Supply Cage LED Block Diagram

3.13.11 650-W Power Supply LED Functions

Three green LEDs are positioned to the left of module #3 as shown in *Figure 23*.

- **LED AC1** indicates the availability of AC1 input voltage.
- **LED AC2** indicates the availability of AC2 input voltage.
- **LED ACR** indicates the AC redundancy status of the power subsystem depending on the following four conditions. The LED ACR is ON GREEN if all four conditions are true. Otherwise, the ACR LED is OFF.
    1. LED AC1 is green
    2. LED AC2 is green
    3. The power good signal from each of the three power modules is asserted
    4. TS-OK (transfer switch – OK) signal asserted

3.13.12 350-W TPS Module

The 350-W TPS module is redundant and hot-swappable. The module accepts AC input from an external EMI filter. The power supply docks into a power supply enclosure or cage, which contains the AC EMI filter and power distribution to the system. The supply is intended to operate with up to three modules in parallel. Refer to the *350-W TPS Power Supply Module Specification* for details.

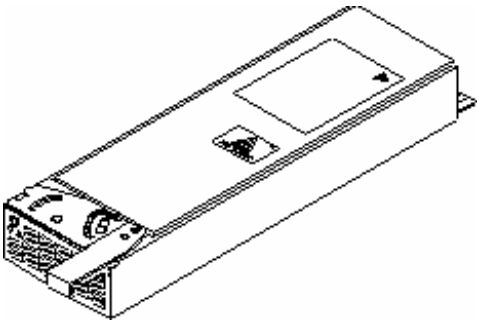


Figure 24. Replaceable 350-W Thin Power Supply Module

There is a single bi-color LED to indicate power supply status of each module. When AC is applied to the power supply module and standby voltages are available, the LED will blink GREEN. The LED turns on GREEN to indicate that all the power outputs are available. The LED turns 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. Listed below are the LED indicators for conditions of the 350-W TPS module LEDs.

Table 24. 350-W TPS Module LED Indicator

Power Supply Condition	Power Supply LED
No AC1 or AC2 power input	OFF
No AC power to this PS module only	AMBER
AC present / Only Standby Outputs On	BLINK GREEN
Power supply DC outputs ON and OK	GREEN
Power supply failure (includes over voltage, over temperature)	AMBER
Current limit	AMBER

Note: The SC5200 HSRP Chassis ships in a non-redundant, 2+0 configuration with modules #2 and #3 installed. The single power cord should be inserted in AC2 inlet to ensure that the power supply is providing 650 watts of power. If the power cord is connected to AC1, module #2 should be moved to the #1 position (*see Figure 22*). Other combinations are invalid and will degrade the power supply to 350 watts as shown in *Table 25*. Adding a second power cord will allow for any combination of two modules, but does not provide redundant operation unless the third power supply module is also added.

Table 25. Non-Redundant Power Supply Configurations

AC1	AC2	Module 1	Module 2	Module 3	Output wattage
ON		GREEN		GREEN	650 W
ON		GREEN	AMBER		350 W
ON			AMBER	GREEN	350 W
	ON		GREEN	GREEN	650 W
	ON	AMBER	GREEN		350 W
	ON	AMBER		GREEN	350 W

3.13.13 650-W Power Supply Fan Requirements

The 650-W 2+1 RPS power supply incorporates two high performance 60-mm fans to exhaust air. If a module failure is detected, the fans will enter a faster boost mode to provide additional cooling until the failing module is replaced. Under a condition where one module has failed, it is acceptable for the sound pressure level to approach 72 dBA (maximum).

The fans are redundant when 3 modules and 2 power cords are present. In this case, if a fan fails, the remaining fan will enter boost mode and maintain proper cooling. If the second fan fails, module fails, or a power cord is removed, the power supply will shut off.

3.13.14 AC Power Line

The system is specified to operate from 100-127VAC, 200-240VAC, at 50 or 60 Hz. The specified PFC power supplies are auto-ranging. The system is tested to meet these line voltages, and has been tested (but not specified) at ±10% of the voltage ranges, and similarly ±3 Hz on the line input frequency.

The system is specified to operate without error at full power supply output load, nominal input voltage, with line source interruptions not to exceed one period of the AC input power frequency (i.e., 20 milliseconds at 50 Hz).

The system is not damaged by AC surge ring wave up to 2.0kV/500A. This ring wave is a 100 kHz-damped oscillatory wave with a specified rise time for the linear portion of the initial half-cycle of 0.5µsec. Additionally, the system will not be damaged by a unidirectional surge waveform of up to 2.0kV /3000A, with a 1.2µsec rise time and 50µsec duration. Further details on these waveforms can be obtained in ANSI/IEEE STD C62.45-1992.

4. System Cooling

4.1 Fan Configuration

Two cooling solutions are employed in the Intel® SC5200 Server Chassis. The base solution consists of four fixed fans working in conjunction with the active heatsinks provided in the Intel® boxed processor kits to provide sufficient system cooling. The second redundant solution is designed for maximum up-time by providing five replaceable hot-swap fans that maintain proper system cooling, even with a single failed fan.

4.2 KHD3BASE450 (Non Redundant Base) Cooling Solution

Two 80 x 32-mm, two 80 x 25-mm system fans, and the power supply fan(s) will provide cooling for the processors, hard drives, and add-in cards. When the hot-swap drive bays are installed, one of the 80 x 32 mm system fans draws air through the rear of each bay to provide drive cooling. The 80 x 25 mm fans at the rear of the chassis assist in evacuating hot air from the system and draws air in at the upper, vented 5.25” peripheral bays. All system fans provide a signal for RPM detection that the server board can make available for server management functions. Removal of the side cover gives entry to the fans, which then can be easily changed with the system shut down.

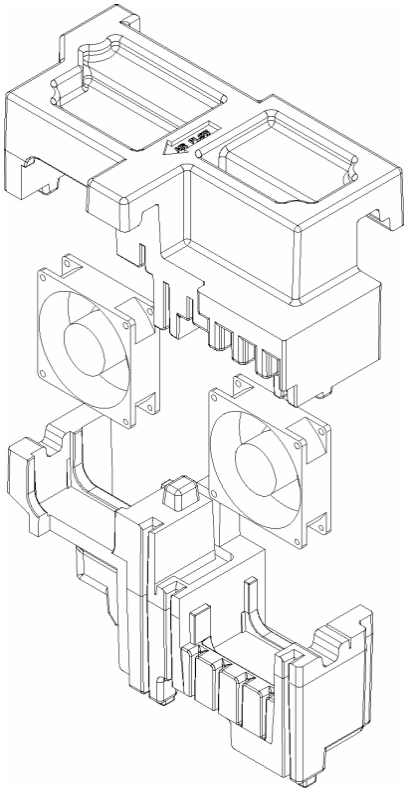


Figure 25. Close Up View of Front Fan Mounting Features

To ensure proper cooling, only processors with active heatsinks should be used unless otherwise indicated in the server board manuals. Active heatsinks incorporate a fan to provide cooling. Such a thermal solution is included with Intel® boxed processors.

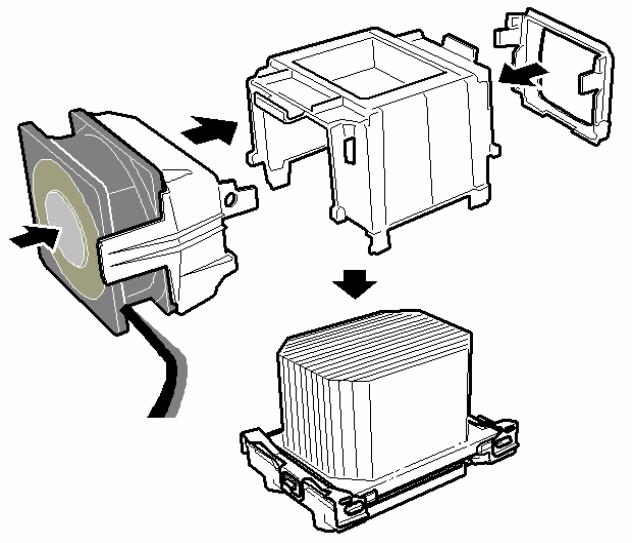


Figure 26. Processor Wind Tunnel Illustration

Air should flow through the system from front to back. The active processor cooling solution validated with this chassis is called a Processor Wind Tunnel (PWT), and is provided with the Intel® Boxed Xeon™ Processors. Proper installation places the fan portion of the PWT over the front edge of the chassis. The fans blow toward the rear of the chassis (toward I/O connectors). See illustration below. Note the direction of the fan airflow.

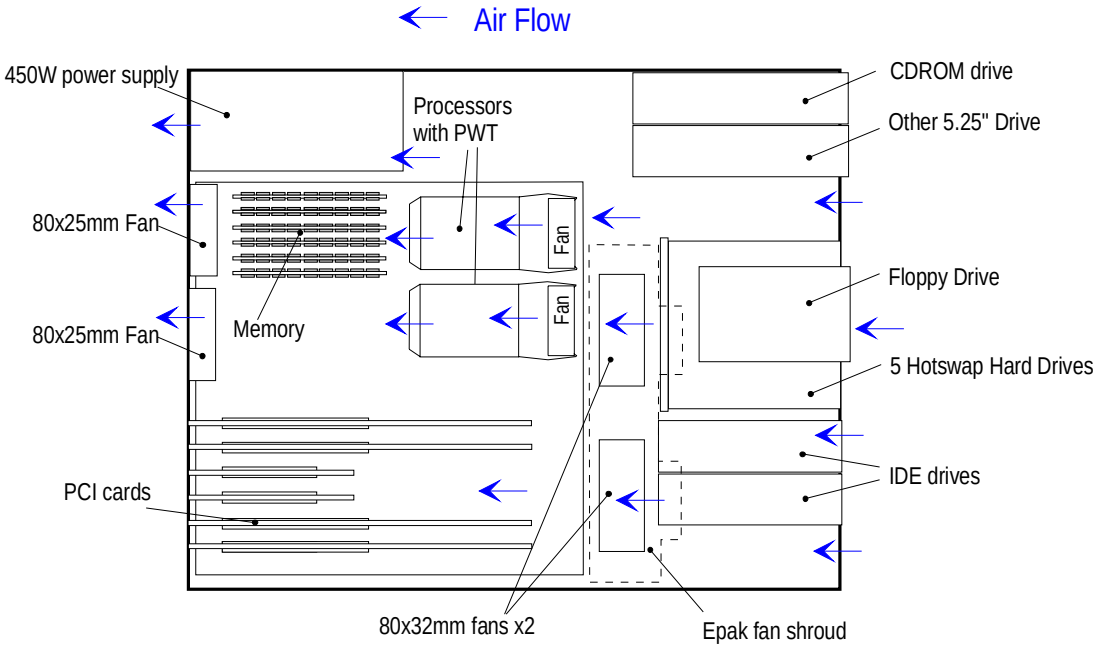


Figure 27. Base Chassis Airflow Characteristics

4.3 Redundant Cooling Solution

Three hot-swap 80 x 38 mm, two hot-swap 92 x 25 mm system fans, and the two 60 mm power supply fans provide cooling for the processors, hard drives, and add-in cards. The three 80 mm fans ensure proper cooling of the core area (processors and memory) and hot-swap drive bay. The two 92 mm fans, with help from the two rear mounted 80 mm fans, provide cooling for the PCI card area. When the optional second hot-swap drive bay is installed, the 92 mm fans provide drive cooling. Should any single fan fail, the remaining fans will increase in speed and maintain cooling until the failed unit is replaced. All system fans provide a signal for RPM detection that the server board can make available for server management functions. The two rear mounted fans are directly accessible from the back of the chassis, while the three interior system fans are accessed by opening a door on the side of the chassis. The fans can be replaced without shutting off the server, and no tools are required.

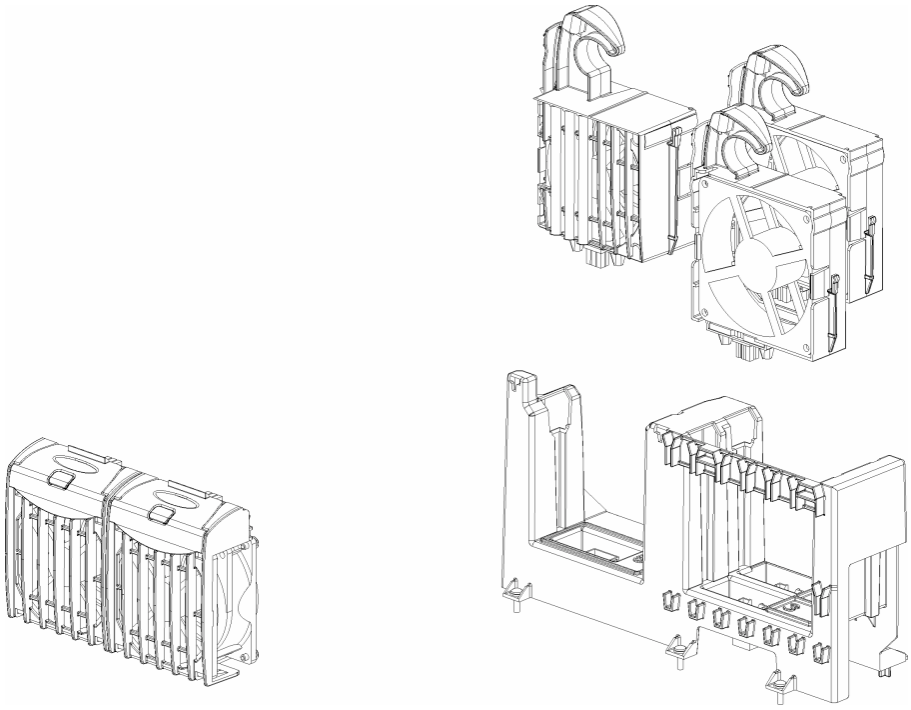


Figure 28. Close Up View of Redundant Hot-Swap Fan Assemblies

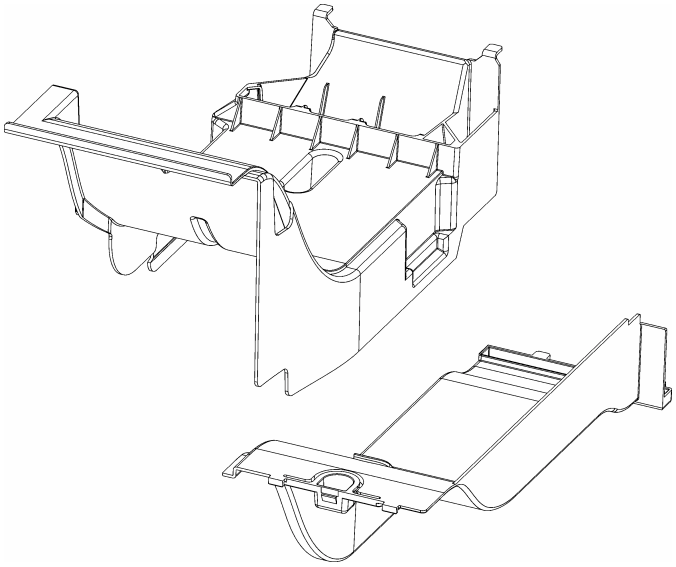


Figure 29. Processor and PCI Area Ducting

To ensure proper cooling, only processors with passive heatsinks should be used unless otherwise indicated in the server board manuals. The ducting shown in *Figure 29* is designed to work with the passive heatsink included with the Intel® Boxed Xeon™ processors.

Air flows through the system from front to back. The heatsink solution used for the HSRP version of the SC5200 chassis is provided with the Intel® Boxed Xeon™ processors. Only the retention mechanism, heatsink, clips, and thermal interface (grease) are used. The plastic PWT and fans should not be installed. Note the direction of the fan airflow.

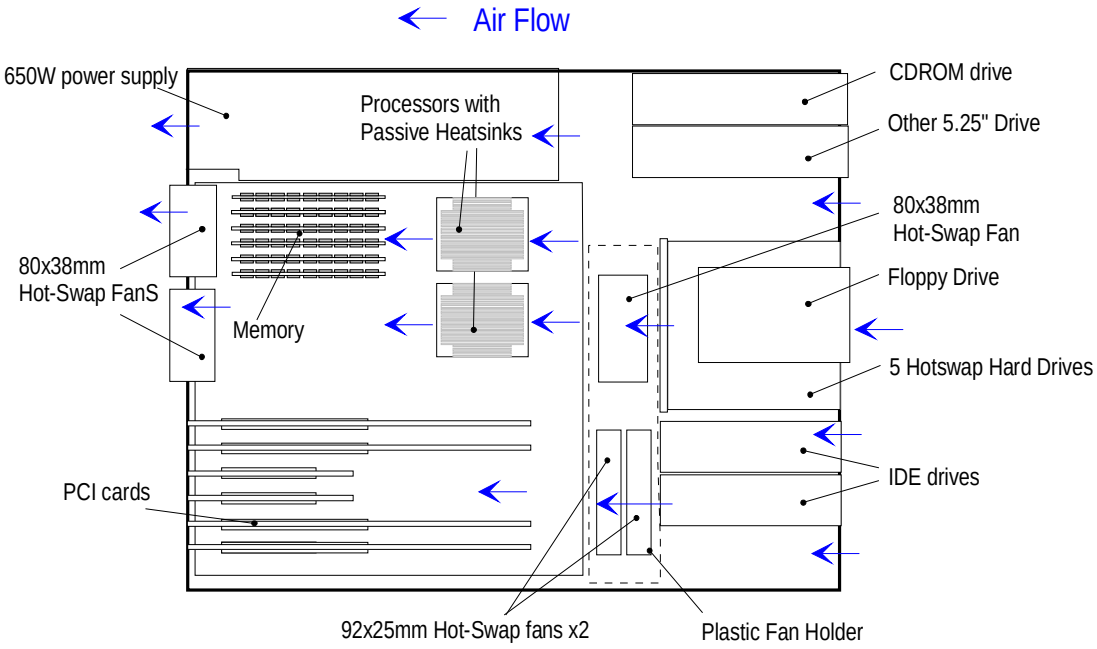


Figure 30. Redundant Chassis Airflow Characteristics

4.4 Fan Control

The fans in the Intel® Server Chassis SC5200 are designed for server boards that support fan control, such as the Intel® SHG2, SE7501HG2 and SE7501BR2 Server Boards. The front panel of the chassis has an active temperature sensor (i.e., Dallas* 1621) connected to the front panel's bus. Based on the inlet temperature measured, the server board's firmware will adjust the fan voltage. This will maintain proper system cooling of all components and peripherals, while minimizing the acoustic noise level. A fan sensor will be re-armed by the firmware if it was read as stopped (0 RPM) for one polling cycle (~30 seconds) and then started back up again. To hot swap a fan, the user should remove the failed fan, wait at least 30 seconds, and insert the replacement fan. The firmware will then re-arm the fan sensor. The correct Field Replaceable Unit (FRU)/Sensor Data Record (SDR) must be installed to ensure proper functionality of the fan control.

Some server boards may only utilize on onboard sensor to regulate fan speed between a nominal speed and high speed.

4.5 FAN Replacement LED Operation SE7501HG2

The SE7501HG2 baseboard includes replacement LEDs for FANs. The FAN replacement LEDs are lit by the BMC when a FAN Failure has been detected. In the event of a power-switch power-down or loss of AC, the status of all LEDs will be remembered and restored by the BMC when AC is restored. A corresponding OEM Sensor Data Record must be loaded to enable each FRU replacement LED. The fan failure state will persist until the cleared by the front panel reset pushbutton. If the failure condition still exists the light will come back on. There is also one additional consolidated fan failure LED on the baseboard. This is lit when any of the individual fan failure LEDs are lit.

5. System Peripheral Bays

5.1 3.5" Floppy Drive Bay

The Intel® Server Chassis SC5200 provides for the installation of a 3.5-inch floppy drive (*Figure 31*, item C) beside the 5.25-inch peripheral bays. However, another type of 3.5 inch device could be installed in this space. Removal of the access cover provides entry for replacement of the floppy drive. When a floppy drive is not installed, a snap-in EMI shield must be in place to ensure regulatory compliance. A cosmetic plastic filler is also provided to snap into the bezel.

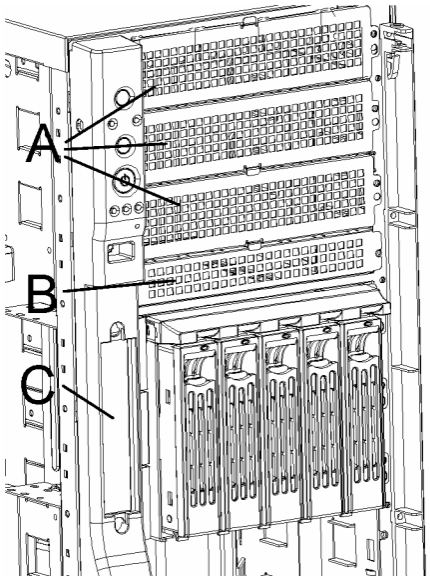


Figure 31. Drive Bay Locations

5.2 Drive Bay Locations

The SC5200 chassis supports two half height or one full-height 5.25 inch removable media peripheral device (i.e., magnetic/optical disk, CD-ROM, or tape drive). These peripherals can be up to 9 inches deep. Only the upper two of the three drive bay locations (*Figure 31*, item A) should be populated in the SC5200 chassis. The vented EMI shields in the third drive bay location and the 1-inch space below it (*Figure 31*, item B) should be retained as an air inlet for processor and memory cooling. Without this air inlet, the processors may overheat. As a guideline, the maximum recommended power per device is 18 W. Thermal performance of specific devices must be verified to ensure compliance to the manufacturer's specifications. The upper three bay locations are rotated 90 degrees (via an adapter bracket) when configured in rack mode. This allows devices (such as CDROMs) to remain in their normal operating position when the chassis is rotated to the horizontal rack position.

For the pedestal systems, an optional DLT/CDROM bracket is available as an accessory (FHD2DLTBRK). This includes a bracket to properly mount a full-height DLT type tape drive and a bracket for a slimline CDROM drive to be mounted beneath the tape drive. This allows a CDROM drive to be installed in the pedestal system when a full-height tape drive is present and still permit proper cooling.

For the rack chassis, the upper three bay locations are rotated 90 degrees via a pre-installed adapter bracket. This allows devices (such as CD-ROMs) to remain in their normal operating position when the chassis is rotated to the horizontal rack position. This configuration supports two half-height devices or one full-height device. A DLT device will mount in this reorientation bracket without the need for the optional accessory kit.

Six additional half-height 5.25-inch drive bays are provided to support installation of up to five hard drive disk devices. Five 3.5-inch to 5.25-inch hard drive adapter trays are provided in the base configurations and must be used to ensure proper cooling and Electromagnetic Compatibility

(EMC) compliance. The lowest 5.25-inch bay is covered with a ventilated EMI shield panel and should not be utilized for drives to ensure proper system cooling operation.

The 5.25-inch peripherals are removable directly from the front of the chassis after removal of the access cover (to disconnect cables) and opening front bezel (pedestal configuration only). EMI shield panels or drive trays are installed and should be retained in unused 5.25-inch bays to ensure proper cooling.

Note: Caution must be observed when approaching the maximum level of integration for these 5.25-inch drive bays. Power consumption of the devices integrated needs to be carefully considered to ensure that the power supply maximum power levels are not exceeded. Typical configurations can supply enough power for a floppy drive, a tape drive, a CD-ROM, and five SCSI hard drives. The redundant power supplies (650-W 2+1) provide enough power for up to ten hot-swap SCSI drives.

5.3 3.5-inch Hot-swap Hard Drive Bays

The backplane is an LVD/SE SCSI design, which provides support for SCSI devices, using Low Voltage Differential Signaling, as well as support for older SE SCSI devices (Ultra 160* and older). The backplane has a connector to accommodate a SAF-TE controller on an add-in card. The backplane supports five 1-inch hot-swap SCA-2 drives when mounted in the docking drive carrier. Using a “Y”-cable (AHD3HSBPYCBL), two of these backplane assemblies may be connected for ten SCSI drives from one SCSI channel (650-W redundant chassis only).

The Intel® Server Chassis SC5200 supports up to two hot-swap drive bays, each supporting five drives, for a total capacity of ten 3.5 inch-wide SCA LVDS hard drives. The 650-W power supply solution is required to be installed for full 10-drive support. The 450-W-powered systems are designed to only power five hard drives. Drives are accessible by opening the front access door on the pedestal configuration or directly from the front of the rack mount chassis. Five metal carriers are provided with each hot-swap bay to mount the hard drives. Each carrier features a plastic handle and bezel with an activity/fault indicator. When no drive is installed in a carrier, the air baffle should remain in place to ensure proper cooling of the hard drives.

Originally designed for the Intel® Server Chassis SC5100, the hot-swap drive bay is designed to accept one-inch peripherals that consume up to 18 W of power. This wattage number is intended as a guideline. Thermal performance of specific hard drives must be verified to ensure compliance to the drive manufacturer’s specifications. The compatibility list of the supported Intel® server board for the SC5200 server chassis is available on http://support.intel.com.

Further technical details of the SCSI backplane can be obtained from the *SC5100/SC5200 Low Voltage Differential (LVD)/Single Ended (SE) SCSI Backplane External Product Specification (EPS)*.

An optional hot-swap drive bay assembly (AXX2HSDRVUG) is available for the SC5200 chassis. It should be mounted in place of the middle three 5.25-inch drive trays of the base, non-redundant chassis models. For the redundant power models, the upgrade accessory should be installed in the lower three 5.25-inch drive trays to bring the total number of available hot-swap SCSI drives to ten.

Refer to the *Intel® Server Chassis SC5100/SC5200 Hot-swap Bay Upgrade Kit* for installation instructions.

5.4 SCSI Multi-Mode Termination

The multi-mode terminators provide SCSI-4 compliant termination for the backplane. These terminators provide termination in both SE modes and LVD mode. Installing a single SE drive forces all installed drives to run in the SE termination mode on the SCSI bus.

5.5 SCSI Interface

The SCSI interface on the SC5100[1] LVD/SE SCSI backplane provides the link between the SCSI bus and the microcontroller (containing the intelligence for the SC5100[1] LVD/SE SCSI backplane). This interface allows the microcontroller to respond as a SCSI target to implement the SAF-TE protocol.

Power control on the SC5100 (SC5200) LVD/SE SCSI backplane supports the following features.

- Spin-down of a drive when failure is detected and reported (using enclosure services messages) via the SCSI bus. An application or RAID controller detects a drive-related problem that indicates a data risk. In response, it removes the drive from service and sends a spin-down SCSI command to the drive. This decreases the likelihood that the drive will be damaged during removal from the hot-swap drive bay. When a new drive is inserted, the power control waits a small amount of time for the drive to be fully seated, and then applies power with a controlled power ramp.
- If the system power is on, the LVD/SE SCSI backplane immediately powers off a drive slot when it detects that a drive has been removed. This prevents possible damage to the drive when it is partially removed and re-inserted while full power is available, and disruption of the entire SCSI array from possible sags in supply voltage and resultant current spikes.

5.6 FET Short Protection

The Field Effect Transistor (FET) short protection circuit is useful to protect both 12-volt and 5-volt power control FETs located on LVD/SE SCSI backplane.

5.7 Device SCSI ID

Each device on a SCSI bus must have a unique SCSI ID. The 5 x 1.0” LVD/SE SCSI backplane device SCSI ID is dependent on whether it is configured as a primary or a secondary backplane. This configuration is defined by the logic of pin 1 on the I^2C* connector (J2A1).

Table 26. SCSI ID Assignments

Device	SCSI ID as Primary Backplane I^2C* connector (J2A1) pin1=1	SCSI ID as Secondary Backplane I^2C connector (J2A1) pin1=0
Drive 1	0x0H	0x8H
Drive 2	0x1H	0x9H
Drive 3	0x2H	0xAH

[1] The SCSI backplane board set used for the SC5200 chassis is the same as previously used in the SC5100 chassis. This board set is referred to as the SC5100 backplane board set below.

Drive 4	0x3H	0xBH
Drive 5	0x4H	0xCH
SAF-TE Controller	0x6H	0x5H

5.8 Hard Drive Activity LED

Each SCSI drive turns on a green LED when it is accessed. The LEDs are 4-terminal dual-color (yellow and green) physically located on the backplane.

Table 27. Hard Drive Activity LED

Drive	HSBP LED Activated	LED Designator	LED Color
1	1	DS5A1	Green
2	2	DS5B1	Green
3	3	DS5C1	Green
4	4	DS5D1	Green
5	5	DS5E1	Green

5.9 Hard Drive Fault LED

The hot-swap controller(HSC) is responsible for turning the drive fault LEDs on or off according to the states specified via commands received from SAF-TE and the IMB. The drive fault LEDs are yellow and indicate failure status for each drive. The LEDs are physically located on the LVD/SE SCSI backplane.

The LEDs are 4-terminal dual-color (yellow and green) physically located on the backplane.

Table 28. Hard Drive Fault LED

Drive	HSBP LED Activated	LED Designator	LED Color
1	1	DS5A1	Yellow
2	2	DS5B1	Yellow
3	3	DS5C1	Yellow
4	4	DS5D1	Yellow
5	5	DS5E1	Yellow

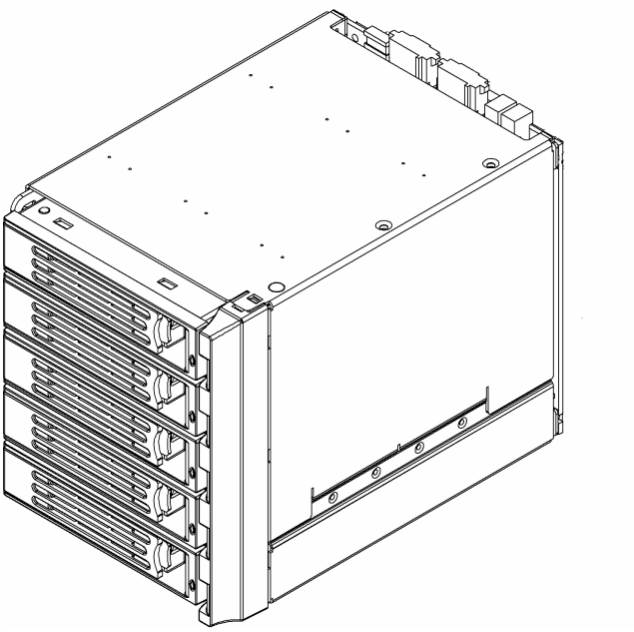


Figure 32. Hot-swap Drive Bay, Front Isometric View

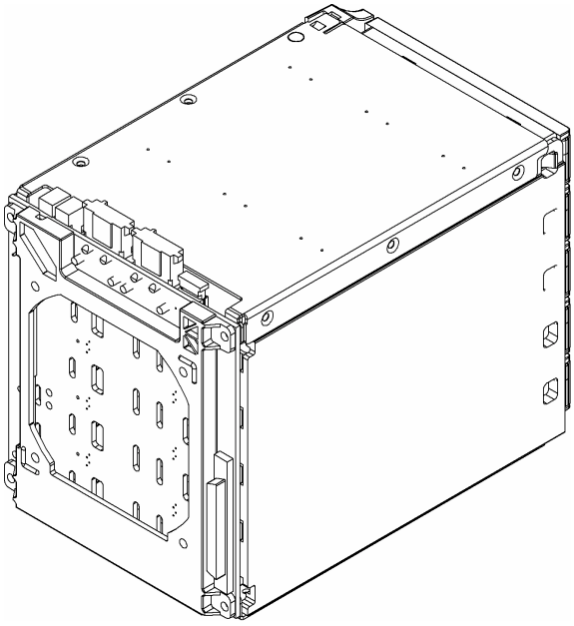


Figure 33. Hot-swap Drive Bay, Rear Isometric View

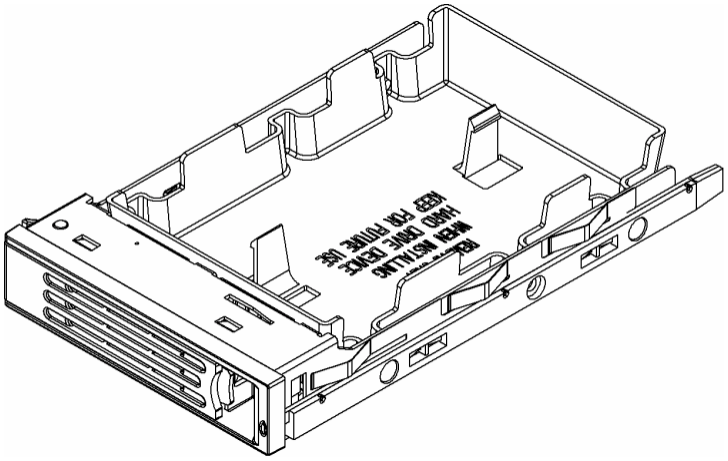


Figure 34. Drive Carrier with Air Baffle Installed

5.10 Hot-Swap Drive Bay Electronics

The hot-swap SCSI backplane board set supports the following features:

- Hot-swapping of SCSI drives, that allows connection of SCSI devices while the system power is on.
- Enclosure management and monitoring functions conforming to the *SCSI-Accessed Fault-Tolerant Enclosures Specification (SAF-TE)*, Revision 1.00.

5.10.1 SCSI HSBP Board Layout

The following diagram shows the layout of components and connectors on the hot-swap SCSI backplane printed circuit board set. This solution consists of two separate boards. The first board provides power distribution and SCSI interfacing of the drives. The second board provides the SAF-TE features and drive failure indicators.

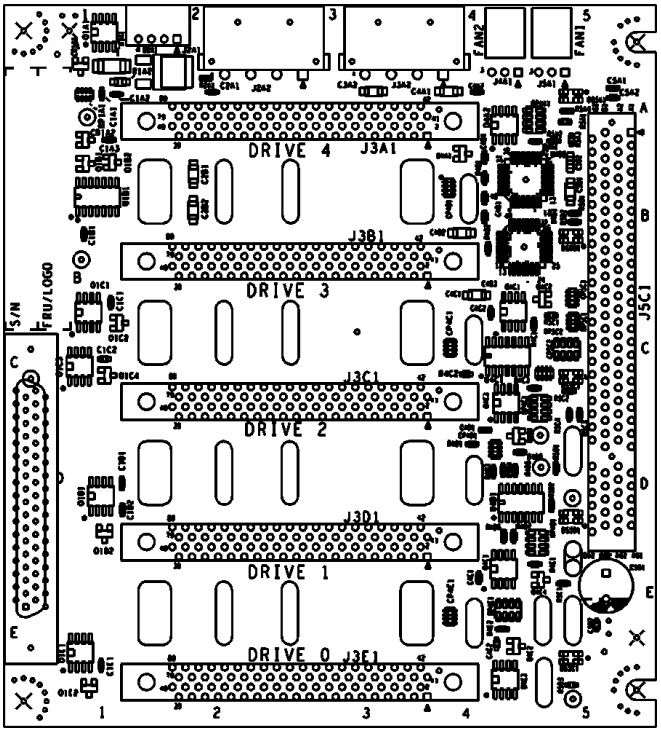


Figure 35. SC5100/SC5200 SCSI Backplane

5.10.2 SCSI Hot-Swap Backplane Specifications

The SC5100/SC5200 hot-swap SCSI backplane is an embedded application subsystem, which during normal operation does the following:

- Responds to SAF-TE messages (transmitted to the backplane via the SCSI bus).
- Monitors the temperature on the backplane, and reports a warning or critical error if outside programmed limits.
- Monitors the speed of the fans (if present), and reports a warning or critical error if outside programmed limits.

The SC5100/SC5200 hot-swap SCSI backplane board set is made up of the following functional blocks:

- SCSI Bus with SCA drive connectors, and active LVDS terminators
- Microcontroller with program Flash and RAM
- SCSI interface that allows the microcontroller to respond as a SCSI target
- I^2C interface to server board
- SCSI drive power control

- Fault indicator support
- Support for two cooling fans (fan-tach inputs and power control)
- Temperature sensor

The hot-swap SCSI backplane board set resides in the hot-swap drive bay which is included with the SC5200 650-W redundant chassis and/or is available as an upgrade.

5.10.3 SAF-TE Board Layout

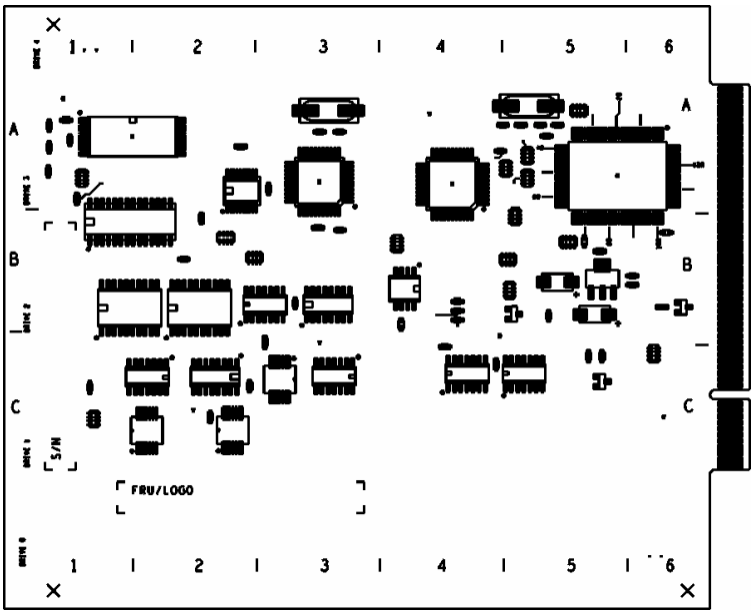


Figure 36. SC5100/SC5200 SAF-TE Board

5.11 SAF-TE Specifications

The SC5100/SC5200 hot-swap SCSI backplane board set performs the tasks associated with hot-swappable SCSI drives, enclosure (chassis) monitoring and management, as specified in the *SCSI-Accessed Fault-Tolerant Enclosures Specification (SAF-TE)*, Revision 1.0. The SAF-TE specified features supported by the hot-swap SCSI backplane 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, and report backplane temperature.

- SAF-TE intelligent agent, which acts as proxy for "dumb" I^2C devices (that have no bus mastering capability) during intra-chassis communications.

6. SATA Hardware Overview

Up to two SATA backplanes (supporting up to eight drives) can be mounted in a Server Chassis SC5200 if a SATA controller is installed. Each SATA backplane supports the connection of up to four SATA drives. When two SATA backplanes are mounted, one is designated the 'Primary SATA Backplane' and the second is designated the 'Secondary SATA Backplane'. These terms are used to be consistent with other backplanes in other server system products.

6.1 About the S-ATA Hot Swap Drive Cage Upgrade Kit

The Serial ATA (S-ATA) hot swap drive cage upgrade kit allows you to install up to four Serial ATA drives into the following Intel® Server Chassis:

Intel® Server Chassis SC5200 Base

Intel® Server Chassis SC5200 Base Redundant Power

Intel® Server Chassis SC5250-E

With this kit, you can connect directly from the Serial ATA hot swap drive cage to the Serial ATA connectors on your server board for those server boards that have integrated Serial ATA, or to a Serial ATA RAID card, such as the Intel® RAID Card SRCS14L. The RAID level that is supported depends on the Serial ATA features offered by your server board or by the Serial ATA card you install.

NOTE

Refer to your server board documentation to determine Serial ATA (S-ATA) support for your server system.

If you want to use your S-ATA drives for a RAID configuration, you may need to installation a S-ATA RAID add-in card. Refer to your server board documentation and / or your S-ATA RAID card documentation for additional installation instructions and requirements.

6.2 SATA Hot-swap Drive Bay Upgrade

Product Code ASATAHSDB. The kit includes a SATA hot-swap drive bay with mounting hardware, Four SATA cables, SATA connection ID Label and a User's Configuration Guide.

The figures demonstrates removing the fan from the standard drive bay and placing it onto the hot-swap drive bay.

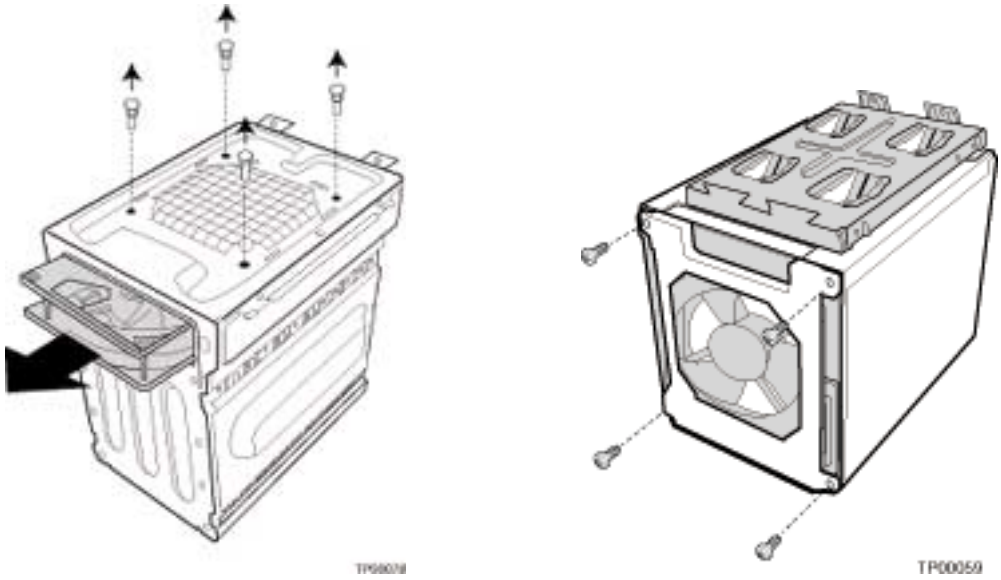


Figure 37. Replacing System Fan from IDE Drive Carrier to the SATA Drive Carrier

6.3 Kit Contents

This upgrade kit contains the following:

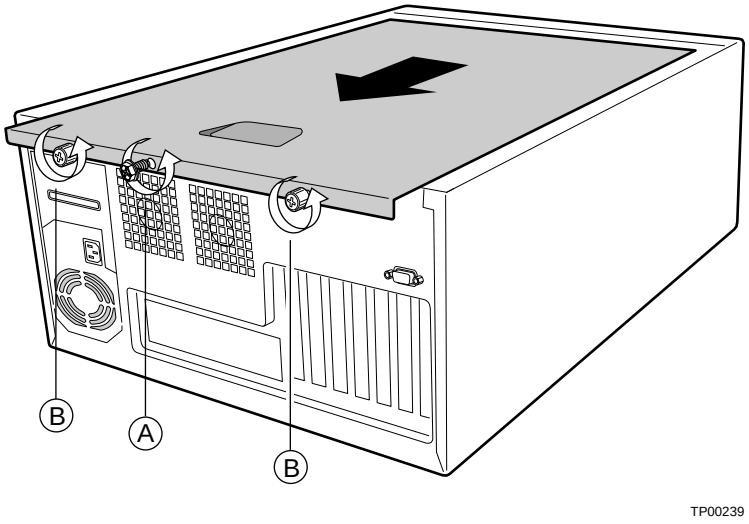
Item	Quantity
S-ATA hot swap drive cage assembly	1
Metal SC5200 drive cage brackets (pre-installed on exterior of drive cage)	2
Plastic fan bracket (pre-installed on exterior of drive cage)	1
Plastic air baffle (pre-installed in top drive bay)	1
S-ATA drive bays (pre-installed in drive cage)	4
S-ATA connection ID label	1
S-ATA cable	4
LED cable for use with the Intel® RAID Controller SRCS14L	1
This manual	1

7. SATA Upgrade Kit Installation Server Chassis SC5200 Base / SC5200 Base Redundant Power

7.1 Remove the Access Cover

When your chassis is upright (in a tower / pedestal position), and you are facing the front of it, the access cover is on the left side. Lay the chassis on its right side, so the left access cover is on the top.
If your chassis is in a rack-mounted position, the left size is already on the top.
The front bezel needs to hang over the edge of your work surface in order to fully open the front bezel door.

1. Observe all safety and ESD precautions at the beginning of this document.
2. If the shipping screw is installed, remove it. (Letter “A” in the figure below)
3. Loosen the two captive thumbscrews at the rear of the chassis. (Letter “B” in the figure below)
4. Slide the cover backward a short distance, until it stops.
5. Lift the cover upward to remove it.



**** Some chassis details shown may be different in your chassis.***

Figure 38. Removing the Access Cover

7.2 Remove the Bezel (Rack Mount Chassis)

If you have a rack-mounted server, you must remove the bezel. If you do not have a rack-mounted server, proceed to the next section.

1. Remove the handle from the right side.
2. Push up on the tab (“A” in the figure below).
3. Slide the bezel to the right and then pull it forward to remove it.

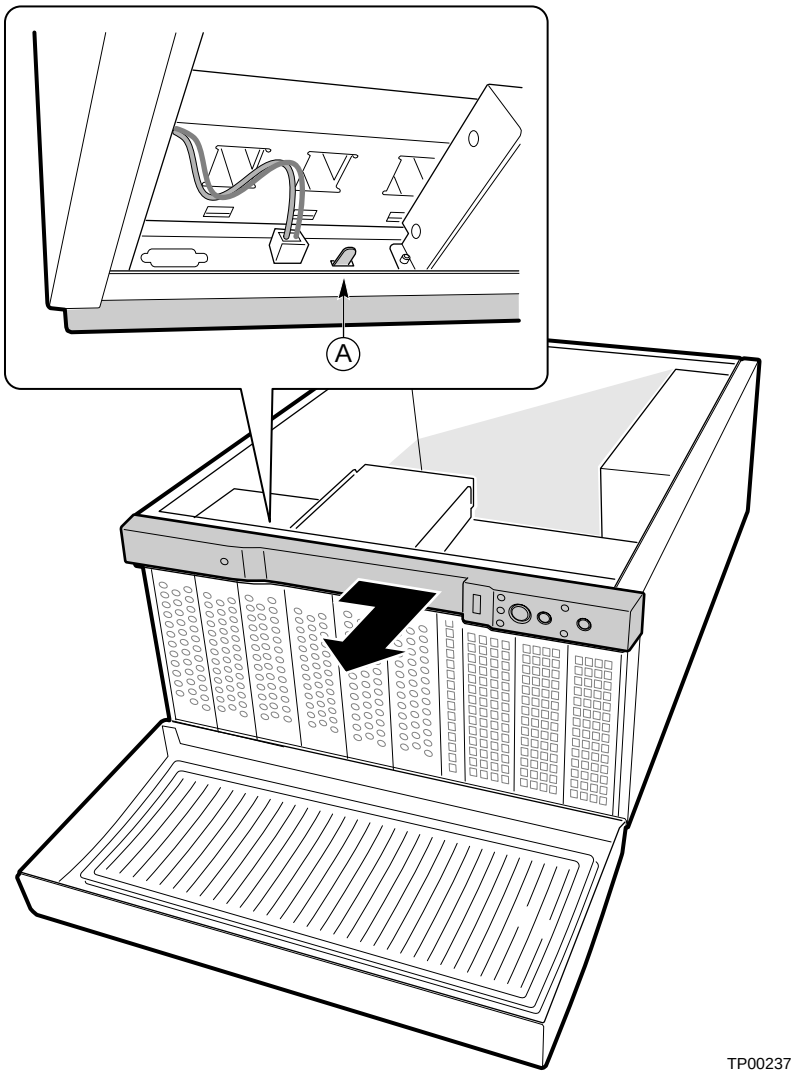


Figure 39. ***Removing the Bezel***

7.3 Remove the Top Piece of Foam Epac

The foam epac is located near the front of the chassis, over the top of the front fans. Remove the top piece of foam epac from the system fans.

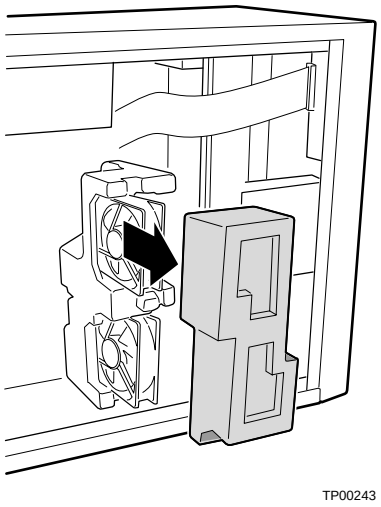


Figure 40. Removing the Top of Foam Epac

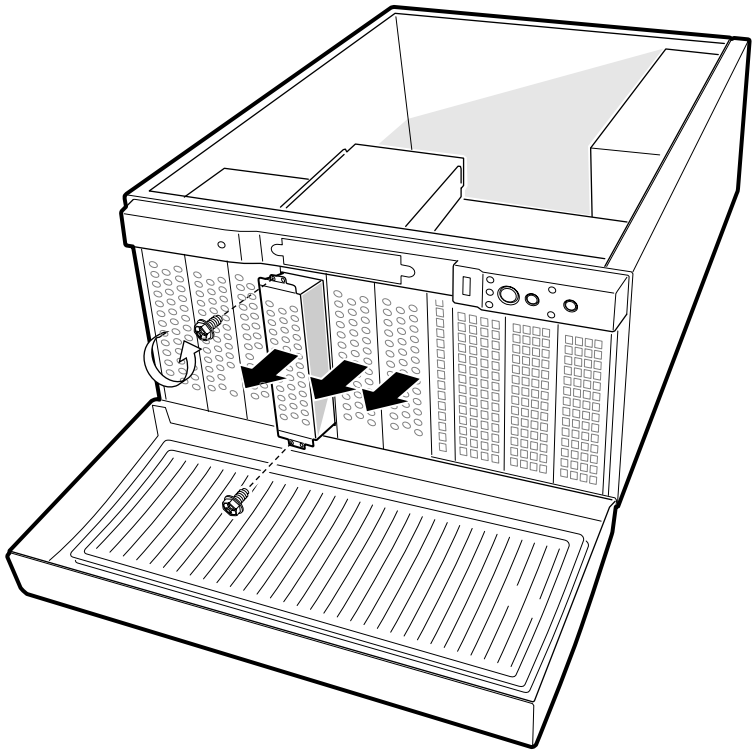
7.4 Remove Hard Drive Carriers

NOTE

Installing the S-ATA drive carrier into the location of the bottom three drive carriers is not recommended because of the thermal impact on the PCI slots.

Remove the center three drive carriers, indicated by the arrows in the figure below. Do not remove the upper 5 ¼-inch peripheral bays or the vented shield. For each drive carrier do the following:

1. If a drive is installed in the carrier, disconnect the power and data cables from it.
2. Remove and save the two screws that hold the carrier in the chassis.
3. Remove the carrier from the chassis.



TP00219

**** Some chassis details shown may different in your chassis.***

Figure 41. **Removing the Drive Carriers**

7.5 Insert S-ATA Hot Swap Cage

1. Slide the S-ATA hot swap cage into the chassis. When inserting the cage, make sure the connections on the rear of the cage point toward the right side of the chassis. As pictured below, the right side of the chassis is facing up when the chassis is lying on its side.
2. Insert and tighten the five screws that hold the cage in the chassis.

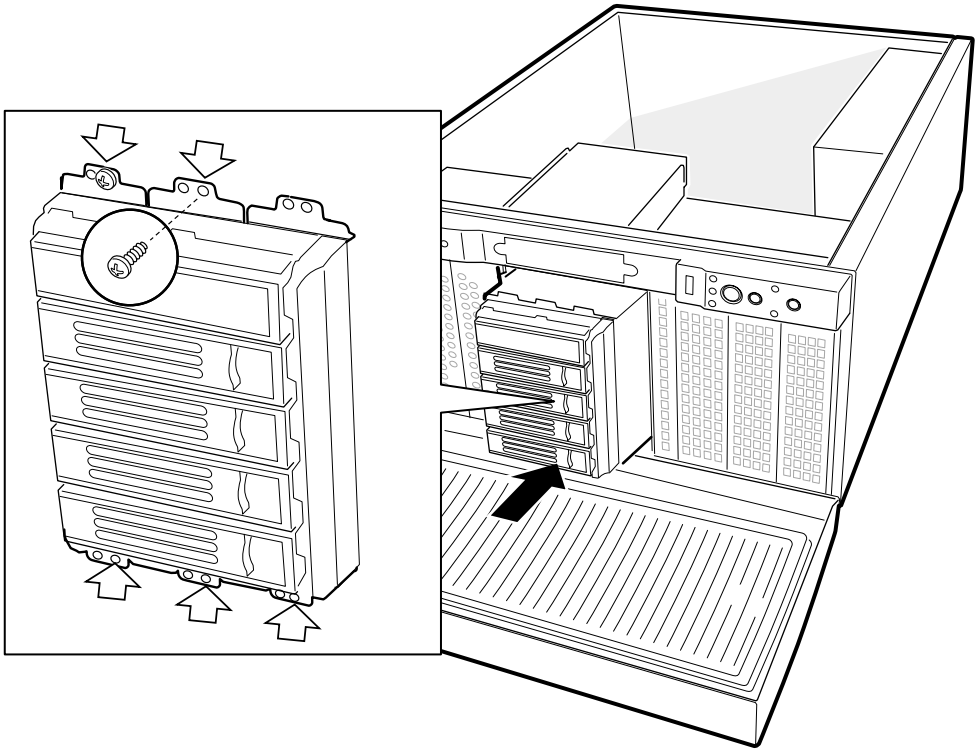


Figure 42. Inserting the S-ATA Hot Swap Drive Cage

7.6 Attach Connection ID Label

The connection ID label provides a way to identify the connections for the S-ATA Drive 0, Drive 1, Drive 2, and Drive 3. It is critical that you connect the cable on the S-ATA kit to the matching connection on your server board or S-ATA add-in card. Mixing up the connections / drive cables may result in data loss.
Attach the connection ID label to the chassis as shown. Note that when you are facing the front of the chassis, the label should appear upside down.

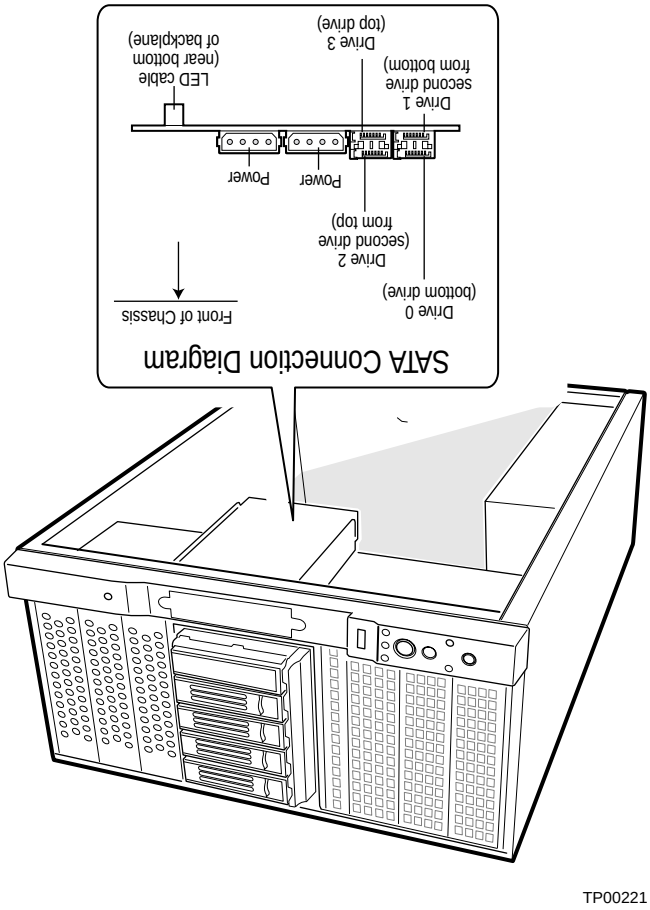


Figure 43. Attaching the Connection ID Label

7.7 Connect S-ATA Backplane Cables

1. Connect the power cables labeled P9 and P10 from the power supply to the S-ATA hot swap backplane (numbers 4 and 5 in the diagram below). Regardless of the number of drives that will be installed, both power connectors should be used. Connectors P9 and P10 should be used because these two connectors have an additional 12V wire to prevent power drops.
2. Connect each S-ATA cable to the S-ATA hot swap backplane. The connectors and associated drives are identified as follows:

Drive bay	Drive number	Connection number and drive number in figure
Bottom	Drive 0	0
Second from bottom	Drive 1	1
Second from top	Drive 2	2
Top	Drive 3	3

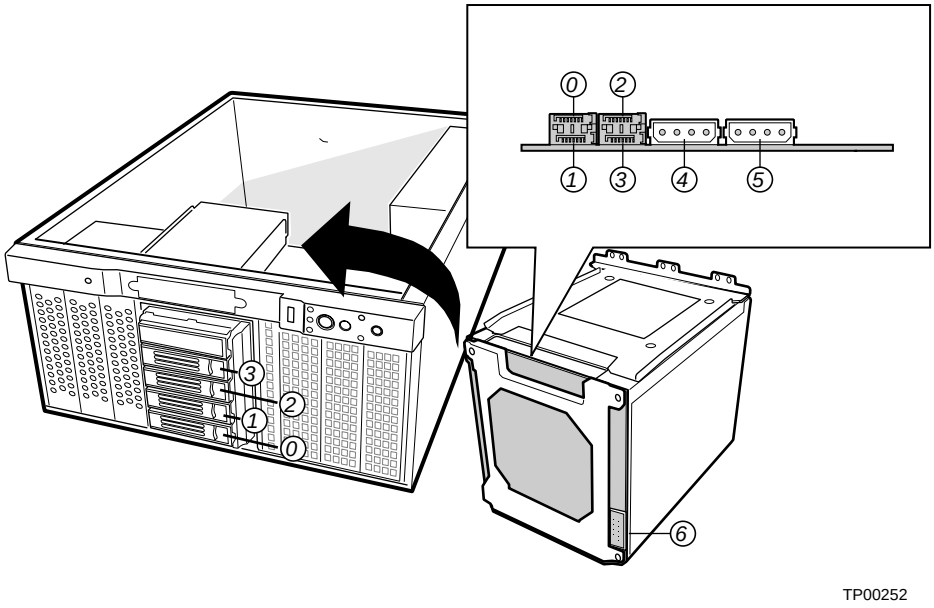


Figure 44. Attaching Cables to the S-ATA Backplane

3. Route the S-ATA cables around the front fans, as shown below.

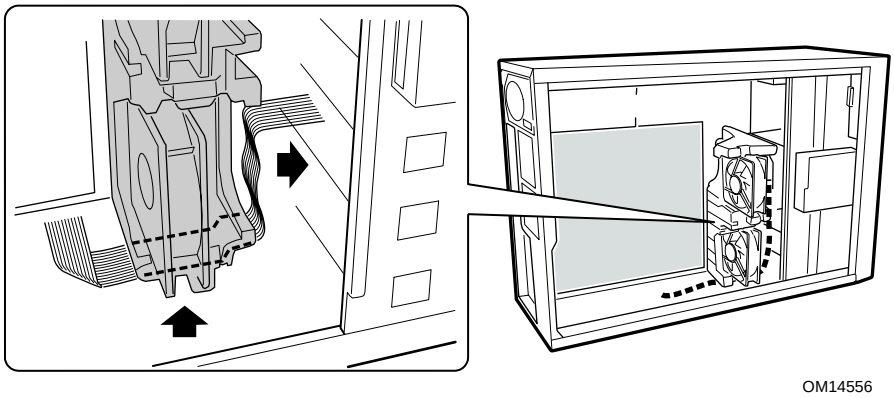


Figure 45. Routing the S-ATA Cables

4. Attach each S-ATA cable to the corresponding connection on your S-ATA RAID add-in card or to the server board. Refer to your server board documentation or to your S-ATA RAID card documentation for the location of the connectors on your server board or add-in card.

WARNING

You must connect the S-ATA drives correctly from the S-ATA backplane to your server board or to your S-ATA RAID card. If you do not connect Drive '0' on the backplane to Drive '0' on your server board or your S-ATA RAID card, Drive '1' to Drive '1' and so on, your RAID software may report incorrect information about the drive it is connected to. Data loss may occur.

5. If you are using the Intel RAID Controller SRCS14L, connect the LED cable to the S-ATA backplane. See connection number 6 in **Error! Reference source not found.**. The twisted pair side of the LED connector goes toward the back of the chassis.

7.8 Replace Upper Foam Epac

1. Make sure the fan cables are in positioned in the lower foam epac.
2. Place the upper part of the foam epac into the chassis.
3. Press the foam epac into place. You may need to push the fans back and forth to get the upper foam eapc to sit flush with the lower foam epac.

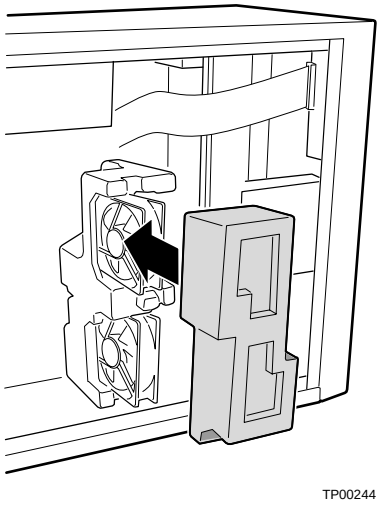


Figure 46. Installing the Upper Foam Epac

7.9 Install Bezel (Rack Mount Chassis)

If you previously removed the bezel, install it as follows.

1. Position the bezel. Make sure the plastic tabs ("A" in the figure below) are aligned with their holes.
2. Slide the bezel to the left.

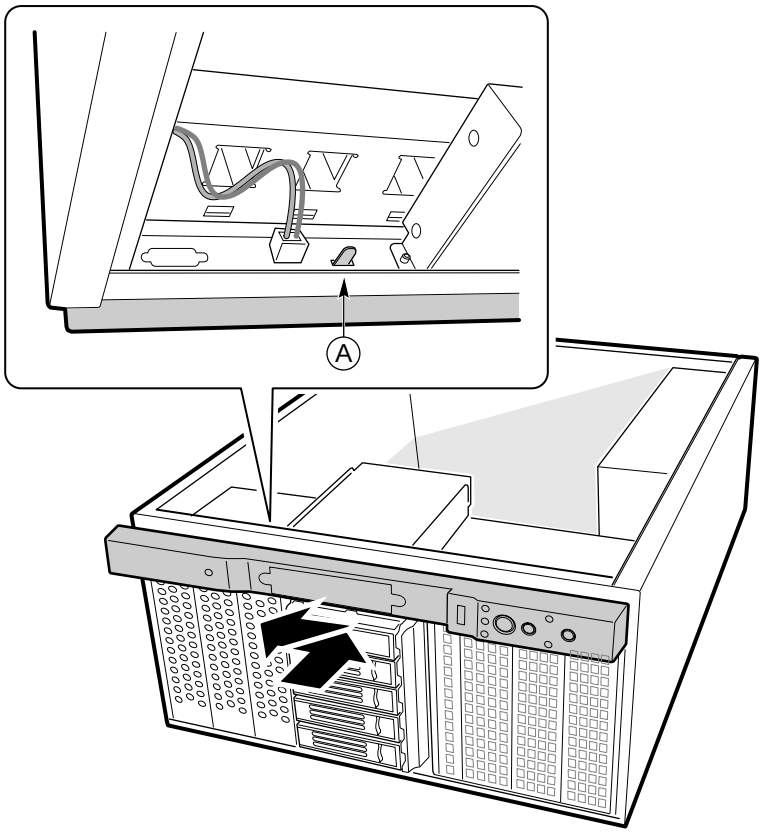


Figure 47. Installing the Bezel

7.10 Replace Access Cover

1. Place the cover so the tabs go into the slots on the server. The cover should be flush against the chassis.
2. Slid the cover forward until it stops.
3. Tighten the two captive screws into the rear of the chassis.

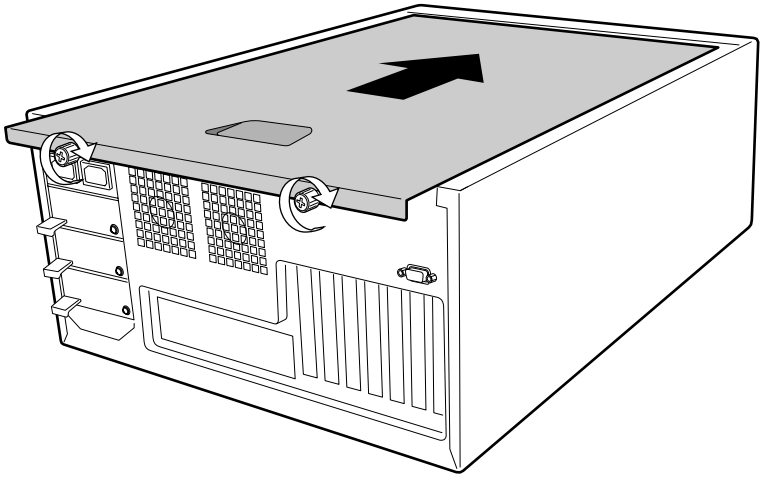


Figure 48. Installing the Access Cover

7.11 Update BIOS

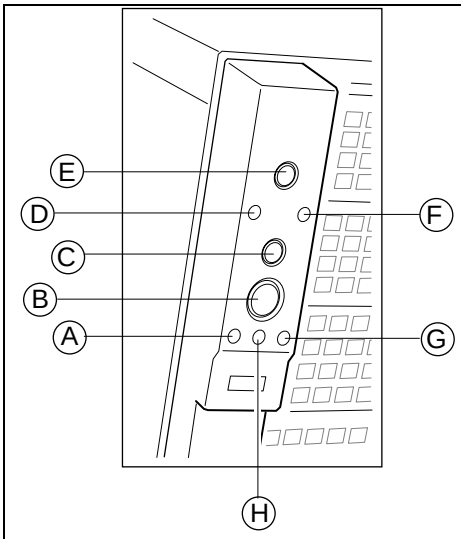
You may need to update the system BIOS for proper operation. See your server board documentation for information and instructions.

8. Front Panel

The front panel is located in the front corner of the chassis and remains unchanged from the SC5100 server chassis. For the pedestal configuration, an exterior door allows full access to the front panel features. The front panel features the control buttons and LED indicators listed in *Figure 49*. Not shown (in the figure below) is a tool-activated Non-maskable Interrupt (NMI) switch located below the Status LED. The LEDs are visible with the pedestal exterior access door closed. The blue ID LED and ID toggle switch featured in the rack mount SC5200 chassis is used to indicate which particular chassis among several in a rack configuration is being serviced. There is a second blue ID LED mounted on the baseboard and visible from the rear of the chassis, which mimics the front ID LED.

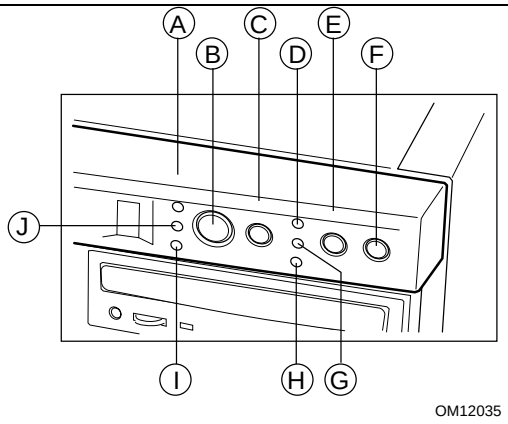
A 34-pin Entry Ebay SSI (rev 3.0) front panel header is located on the back of the front panel. This allows for a 34-pin ribbon cable connection for use with SSI rev 3.0-compliant server boards, or a 24-pin ribbon connection for use with first generation SSI server boards.

When the hot-swap drive bay is installed, a bi-color hard drive LED is located on each drive carrier (five total) to indicate specific drive failure or activity. For pedestal systems, these LEDs are visible upon opening the front bezel door.



A. Hard drive activity LED (bi-color)
B. Power button
C. Sleep button
D. NIC1 activity LED (green)
E. Reset button
F. NIC2 activity LED (green)
G. Status LED (bi-color)
H. Power/Sleep LED (green)

Figure *49*-1. Pedestal Controls and Indicators



A. Hard drive activity LED (bi-color)
B. Power button
C. Sleep button
D. NIC1 activity LED (green)
E. Reset button
F. ID toggle switch
G. ID LED (blue)
H. NIC2 activity LED (green)
I. Status LED (bi-color)
J. Power/ Sleep LED (green)

Figure *49*-2. Rack Controls and Indicators

Figure 49. Front Panel Controls and Indicators

Table 29. Front Panel LED Functions

LED Name	Color	Condition	Description
Power/Sleep LED	Green	ON	Power on
	Green	BLINK	Standby/Sleep (S1)
		OFF	Power off or Sleep (S4)
Status LED	Green	ON	System ready
Note: Non-Redundant Power Configuration	Green	BLINK	Processor or memory disabled
Note: Redundant Power Configuration	Green	BLINK	Processor disabled, memory disabled, or loss of redundant power.
	Amber	ON	Critical temperature or voltage fault; CPU/Terminator missing
	Amber	BLINK	Power fault; Fan fault; Non-critical temperature or voltage fault
		OFF	Fatal error during POST
Hard drive activity	Green	BLINK	Hard drive activity
	Amber	ON	Fault
		OFF	No activity
NIC1 activity	Green	ON	Linked
	Green	BLINK	LAN activity
		OFF	Disconnected
NIC2 activity	Green	ON	Linked
	Green	BLINK	LAN activity
		OFF	Disconnected
ID LED	Blue	ON	Server identification; Toggled by ID button or software
		OFF	Server identification; Toggled by ID button or software

Further details of the front panel functions supported refer to the individual server board specifications.

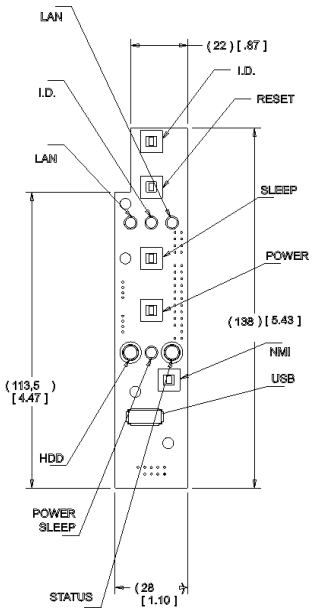


Figure 50. Front Panel, Showing Basic Layout

9. System Interconnection

9.1 Signal Definitions

The standard cable construction is briefly described following. The pin-out on the connectors referred to in this section is defined in the respective server board Technical Product Specificarion (TPS).

9.2 Interconnect Diagram

The figure below depicts cables that may be found in a fully integrated SC5200 system. Not all the cables shown below are provided with the system chassis or server board products.

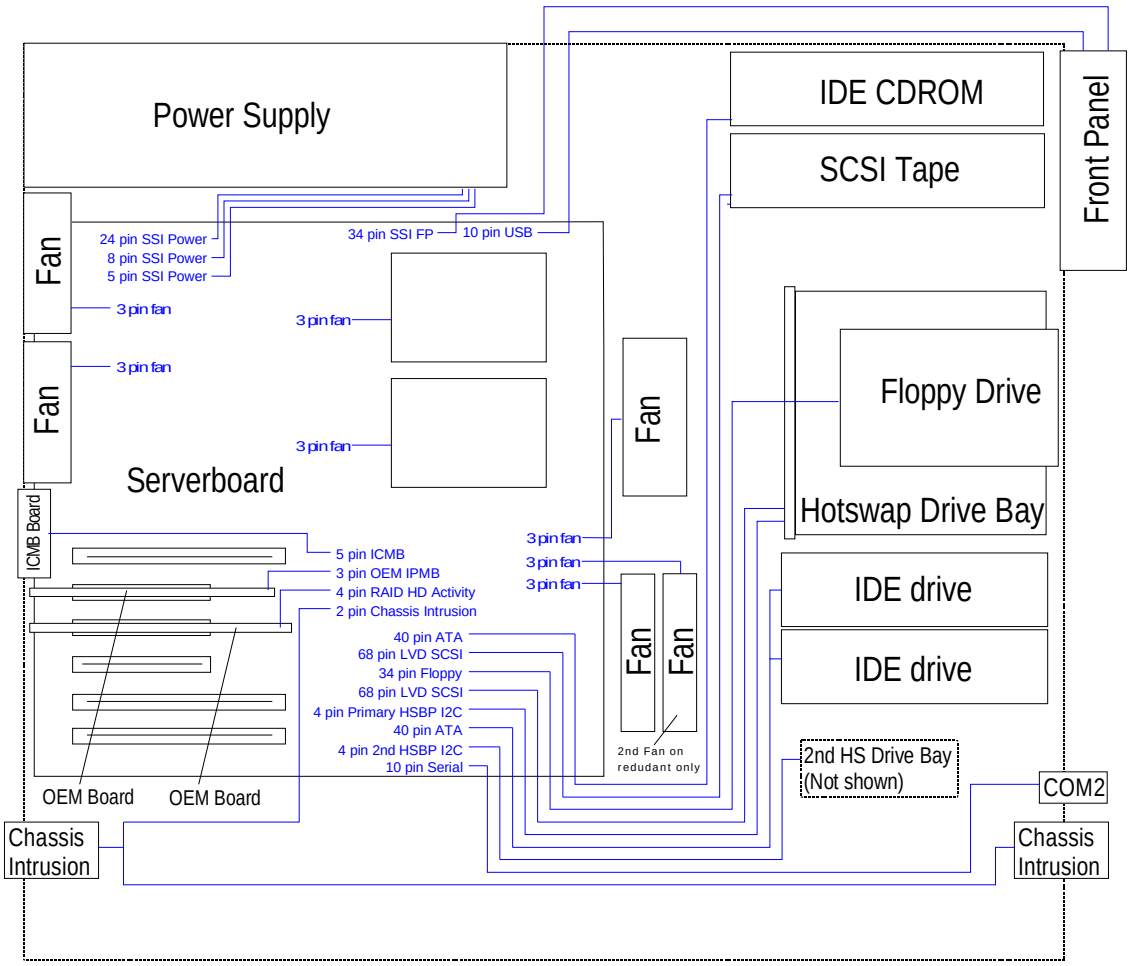


Figure 51. Chassis Interconnect Diagram

Note: Actual server board connections will vary by product. Consult the server board TPS for details. Cabled COM2 is normally routed to the rear of the chassis with front mounting as an option for rack version. Two hot-swap drive bays can be installed on the chassis with the 650-W 2+1 redundant power supply chassis. No hot-swap drive bays are shipped with the 450-W power supply chassis. Install hot-swap drive upgrade kit

(AXX2HSDRVUG). ICMB board kit is a separate option (AXX2ICMBKIT). Both power supplies have the 24-pin SSI and 8-pin power connectors, and the 650-W also has the 5-pin connector.

9.3 Chassis Internal Cables

The following cables are provided as part of the chassis kit:

9.3.1 Intrusion Alarm Switch cable

The intrusion alarm cable consists of two switches in a series which are normally open and are depressed by the access cover and front bezel. It is cabled to the server board by 22AWG twisted-pair wire terminated at a 2-pin connector.

9.3.2 Front Panel cable

A 34-conductor ribbon cable with 34-pin IDC* connectors links the front panel and SSI Revision 2.0-compliant server board (e.g., SHG2). Some boards may employ a 24-pin ribbon cable that does not fully support all the features of the front panel.

9.3.3 USB cable

A 10-conductor USB cable with 10-pin connectors is used for connecting the front panel- mounted USB connector to the server board

9.3.4 Fan Connectors

The installed system fans provide 3-pin connectors designed to mate with SSI (ATX*)-compatible fan headers. Hot-swap fans employ chassis-mounted adapter cables to provide a standard 3-pin connector for the server board.

The following cables are also provided as part of the HSRP chassis kit:

9.3.5 SCSI cable

A 68-conductor twisted-pair SCSI cable is provided to interface from the server board to the hot-swap backplane (HSBP).

9.3.6 I^2C cable

A 4-pin cable connects the server board to the HBSP to communicate server management information, such as drive and fan status to the server board. Note that the server management features will vary by server board.

9.4 Server Board Internal Cables

Depending on the specific server board support of these features, some or all of the following cables may not be included as part of the boxed board kit:

9.4.1 IDE cable

One or two 40-pin, 80-conductor DMA33/66/100 IDE cable.

9.4.2 SCSI cable

One 68-pin, 68-conductor twisted-pair wide SCSI cable with terminator. Cable supports connection of up to four SCSI drives to the server board.

9.4.3 Floppy cable

One 34-conductor cable featuring two 34-pin IDC connectors (2x17) floppy cable.

9.4.4 Serial cable

One 8-conductor cable terminated in a 2x5 header at one end and a 9-pin panel mount Dsub connector on the other.

9.5 Accessory Cables

9.5.1 ICMB Interface Card cable

One 5-pin ICMB cable connects the server board to the ICMB interface card mounted on the chassis rear panel or add-in card slot (included in the ICMB Interface Card Kit (AXX2ICMBKIT)

9.5.2 External SCSI Cable

One 68-pin SCSI cable connects the server board or add-in SCSI card to the panel which mounts to the back of the chassis (see *Figure 56*). (AXXEXTSCSICBL)

9.5.3 SCSI Y-Cable

A 68-conductor twisted-pair SCSI cable is provided to interface from the server board to two HSBPs. The server board uses the middle connector with an HSBP connected on each end. The server board or SCSI card utilized must support disabling termination on the board, as both backplanes will provide proper termination (see *Figure 55*). (AHD3HSBPYCBL)

9.6 I/O Panel Connectors

The server chassis SC5200 provides an ATX 2.03 and SSI E-bay 3.0 -compliant I/O aperture for the backside I/O. The specific panel used will be provided in the boxed server board kit. The following are typical panel connections:

- PS/2 keyboard connector
- PS/2 mouse connector
- 9-pin serial port(s)
- 25-pin parallel port
- USB port(s)
- 15-pin video port
- Ethernet RJ-45 connector(s)

10. System-Compatible Server Boards

10.1 Intel® Server Board SE7505VB2

Dual Intel® Xeon™ processors

Intel® E7505 Chipset

8GB DDR 266 (4DIMMs) w/Intel® x4 Single Device Data Correction

Triple peer PCI

2*PCI-X 64bit/100MHz, 1*64bit/66MHz, 2*32bit/33MHz

AGP 3.0 (8X) Slot with Pro50 support

Dual Intel Ethernet (Gigabit & 10/100)

Integrated PCI graphics (8MB)

Integrated Serial ATA (2 port)

SCSI - single channel U320 (optional accessory)

Server monitoring and control (LDCM)

USB 2.0 support (up to 4 ports)

SSI Entry Electronics Bay 3.0 (12x13”)

10.2 Intel® Server Board SHG2

Major features of the server board SHG2 include the following:

- Dual Intel® Xeon™ processor support.
- Embedded VRMs
- ServerWorks* Grand Champion LE chipset.
- Support for six DDR200 or DDR266-registered ECC SDRAM DIMMs.
- 32-bit, 33-MHz, 5V keyed PCI segment with three expansion connectors and two embedded devices.
    - One PCI NIC—Intel® 82550PM Fast Ethernet Controller.
    - 3D/2D graphics accelerator —ATI Rage XL* 8 MB SDRAM Video Controller.

- 64-bit, 100-MHz, 3.3V PCI-X segment with two expansion connectors and one embedded device.
    - One PCI-X network interface controller—Intel® 82544GC Gbit Ethernet Controller
- 64-bit, 133-MHz, 3.3V PCI-X segment with one expansion connector and one embedded device.
    - Dual Channel Ultra160 SCSI controller—Adaptec* 7899W SCSI controller.
- X-bus segment with one embedded device.
    - 8-Mbit Flash device for system BIOS.
- LPC bus segment with two embedded devices.
    - Super I/O* controller chip providing all PC-compatible I/O (floppy, parallel, serial, keyboard, mouse).
    - Sahalee Baseboard Management Controller (BMC) providing monitoring, alerting, and logging of critical system information obtained from embedded sensors on the baseboard.
- Four Universal Serial Bus (USB) ports.
- Two IDE connectors, supporting two ATA* 33/66/100-compatible devices.
- IPMI 1.5-compliant Intel® Server Management v5.1 intelligent hardware and firmware
- Intelligent Chassis Management Bus (ICMB) support via paddle card accessory
- Supports SMBus
- SHG2 has following connectors and switches: Serial x 2, Parallel, USB x 4, keyboard, mouse, video, IPMB x 2, ICMB x 1, Ultra 160* -wide SCSI x 2, IDE x 2, LAN x 2 (one 100/10Base-T, one 1Gbit) x 1, Dump (NMI) switch, DC on/off switch, Sleep switch, Reset switch, and ID switch (rack).

10.3 Intel® Server Board SE7500CW2

Major features of the server board SE7500CW2 include the following:

- Dual Intel® Xeon™ processors using the Socket* 603/604 FCPGA2 package.
- 400 MHz front side bus
- Intel® E7500 server chipset
  - Memory Controller Hub (MCH) memory controller
  - P64H2 64-bit I/O Hub
  - ICH3-S I/O controller
  - Firmware Hub (FWH)
- Support for up to four DDR200 or DDR266-compliant ECC DDR DIMMs, providing up to 4 GB of memory.
- Three separate and independent PCI buses:
  - Segment A: 32-bit, 33 MHz, 5 V (P32-A) with four embedded devices:
    - 2D/3D graphics controller: ATI Rage XL Video Controller with 8 MB of SDRAM
    - Two Intel® 10/100 82550PM Fast Ethernet Controllers
    - ATA-100 controller: Promise Technology* PDC20267
    - 2 PCI I/O riser slot capable of supporting full length PCI add-in cards
  - Segment B: PCI-X 64-bit, 100 MHz, 3.3 V, (P64-B) supporting the following configuration:
    - Two PCI slots capable of supporting full length PCI add-in cards
    - Segment C: PCI-X 64-bit, 133 MHz, 3.3 V (P64-C) supporting the following device:
    - One PCI slot capable of supporting full length PCI add-in cards
  - Segment C: PCI-X 64-bit, 133 MHz, 3.3 V (P64-C) supporting the following device:
    - One PCI slot capable of supporting full length PCI add-in cards
- Low Pin Count (LPC) bus segment with two embedded devices:
  - Super I/O controller chip providing all PC-compatible I/O (floppy, serial, keyboard, mouse) as well as integrated hardware monitoring via a Winbond* 83627HF hardware monitor
  - Flash ROM device for system BIOS: Intel® 8Mbit N82802AC flash ROM.
- Three external USB ports with an additional internal header providing one optional USB ports for front panel support.
- Two IDE connectors, supporting up to four ATA-100 compatible devices
- Support for up to four system fans and two processor fans.
- SSI-compliant connectors for SSI interface support: front panel and power connectors.
- SE7500CW2 has the following connectors and switches: Serial x 2, Parallel, USB x 4, keyboard, mouse, video, IDE x 2, ATA RAID x 2, LAN x 2 (100/10Base-T) x 1, DC On/Off switch, Sleep switch, and Reset switch.

10.4 Intel® Server Board SE7501CW2

Major features of the server board SE7501CW2 include the following:

- Dual Intel® Xeon™ processors using the Socket* 603/604 FCPGA2 package.
- 533 MHz front side bus
- Intel® E7501 server chipset
  - Memory Controller Hub (MCH) memory controller
  - P64H2 64-bit I/O Hub
  - ICH3-S I/O controller
  - Firmware Hub (FWH)
- Support for up to four DDR266-compliant ECC DDR (4) DIMMs, providing up to 4 GB of memory.
- Three separate and independent PCI buses:
  - Segment A: 32-bit, 33 MHz, 5 V (P32-A) with four embedded devices:
    - 2D/3D graphics controller: ATI Rage XL Video Controller with 8 MB of SDRAM
    - Two Intel® 10/100 82550PM Fast Ethernet Controllers
    - ATA-100 controller: Promise Technology* PDC20267
    - 2 PCI I/O riser slot capable of supporting full length PCI add-in cards
  - Segment B: PCI-X 64-bit, 100 MHz, 3.3 V, (P64-B) supporting the following configuration:
    - Two PCI slots capable of supporting full length PCI add-in cards
    - Segment C: PCI-X 64-bit, 133 MHz, 3.3 V (P64-C) supporting the following device:
    - One PCI slot capable of supporting full length PCI add-in cards
  - Segment C: PCI-X 64-bit, 133 MHz, 3.3 V (P64-C) supporting the following device:
    - One PCI slot capable of supporting full length PCI add-in cards
- Low Pin Count (LPC) bus segment with two embedded devices:
  - Super I/O controller chip providing all PC-compatible I/O (floppy, serial, keyboard, mouse) as well as integrated hardware monitoring via a Winbond* 83627HF hardware monitor
  - Flash ROM device for system BIOS: Intel® 8Mbit N82802AC flash ROM.
- Three external USB ports with an additional internal header providing one optional USB ports for front panel support.
- Two IDE connectors, supporting up to four ATA-100 compatible devices
- Support for up to four system fans and two processor fans.
- SSI-compliant connectors for SSI interface support: front panel and power connectors.

SE7501CW2 has the following connectors and switches: Serial x 2, Parallel, USB x 4, keyboard, mouse, video, IDE x 2, ATA RAID x 2, LAN x 2 (100/10Base-T) x 1, DC On/Off switch, Sleep switch, and Reset switch.

10.5 Intel® Server board SE7501BR2

Major features of the server board SE7501BR2 include support for the following:

- Dual Intel® Xeon™ processors with 512KB L2 cache

- 533 MHz front side bus
- Embedded VRMs.
- Intel® E7501 chipset
  - Memory Controller Hub (MCH) memory controller
  - P64H2 64-bit I/O Hub
  - ICH3-S I/O controller
- Support for four DDR266 registered ECC SDRAM DIMMs, providing up to 8 GB of memory.
- Three separate and independent PCI buses:
  - Segment A: PCI 32-bit, 33 MHz, 5 V (P32-A) with two full-length/full-height expansion slots and three embedded devices:
    - ATI* 3D/2D Rage XL Graphics Accelerator Video Controller.
    - Intel® 10/100 82550PM Ethernet Controller.
    - Intel® Gigabit 82540EM Ethernet Controller.
  - Segment B: PCI-X 64-bit, 100 MHz, 3.3 V, (P64-B) with with two full-length/full-height expansion slots and one embedded device:
    - Adaptec* AIC-7901 single-channel Ultra320 SCSI controller
  - Segment C: PCI-X 64-bit, 100 MHz, 3.3 V, (P64-B) with with two full-length/full-height expansion slots. This segment may operate as PCI-X 64-bit, 133 MHz when only one slot is used.
- LPC bus segment with two embedded devices:
  - Super I/O controller chip providing all PC-compatible I/O (floppy, parallel, serial, keyboard, mouse) – National Semiconductor* PC87417.
  - Sahalee BMC providing monitoring, alerting, and logging of critical system information obtained from embedded sensors on baseboard.
- Two IDE connectors, supporting up to four ATA 33/66/100-compatible devices.
- Five USB ports.
- Support for up to six system fans and two processor fans.
- IPMI 1.5-compliant Intel Server Management v5.2 intelligent hardware and firmware.
- ICMB support via paddle card accessory.
- Supports SMBus.
- SE7501BR2 has the following connectors and switches: Serial x 2, Parallel, USB x 4, keyboard, mouse, video, IPMB, ICMB, Ultra 320-wide SCSI x 1, IDE x 2, LAN x 2 (one 10/100, one 1Gbit), Dump (NMI) switch, DC on/off switch, Sleep switch, Reset switch, and ID switch (rack).

10.6 Intel® Server Board SE7501HG2

The server board SE7501HG2 supports the following feature set:

- Dual Intel® Xeon™ processors in FC-PGA2P package using Socket 604
- 533 MHz Front Side Bus
- Intel® E7501 chipset
  - E7501 Memory Controller Hub
  - P64H2 PCI/PCI-X 64-bit PCI/PCI-X Controller Hub2

  - ICH3-S I/O Controller Hub

- Support for six DDR266 compliant registered ECC DDR DIMMs providing up to 12 GB of memory.
- Three separate and independent PCI buses:
  - Segment A: 32-bit, 33 MHz, 5 V, Full-length PCI (P32-A) with one embedded devices:
    - Three slots: 32-bit/33MHz PCI Slot (PCI Slot 4, Slot 5 and Slot 6)
    - 2D/3D graphics controller: ATI RAGE* XL Video Controller with 8 MB of SDRAM
  - Segment B: 64-bit, 100 MHz, 3.3 V, Full-length PCI (P64-B) supporting the following configuration:
    - Two slots: 64-bit/100MHz PCI-X[2] Slots (PCI-X Slot 2 and Slot 3)
    - Dual-channel Adaptec* AIC-7902 wide Ultra-320 SCSI Controller
    - Dual-channel Adaptec* HostRAID support
    - Zero Channel RAID (ZCR) support. Also known as modular M-ROMB (Slot2)
  - Segment C: 64-bit, 133 MHz, 3.3 V, Full-length PCI (P64-C) supporting the following configuration:
    - One slot: 64-bit/133MHz PCI-X[2] Slots (PCI-X Slot 1)
    - Dual –channel Intel® 82546EB Gigabit Ethernet Controller
- LPC (Low Pin Count) bus segment with two embedded devices:
  - Baseboard Management Controller (BMC) providing monitoring, alerting, and logging of critical system information obtained from embedded sensors on server board
- Super I/O controller chip providing all PC-compatible I/O (floppy, serial, parallel, keyboard, mouse) X-Bus segment with one embedded device:
  - Flash ROM device for system BIOS: Intel® 32 megabit 28F320C3 Flash ROM
- Three external Universal Serial Bus (USB) ports on the rear of the board with an additional internal header that provides one optional USB port for front panel.
- Two serial ports: One serial port on the rear of the board and one internal header is also available providing an optional Serial B port.
- Two IDE connectors, supporting up to four ATA-100 compatible devices
- Six hot swappable multi-speed system fans and two single-speed CPU fans
- Multiple server management headers providing on-board interconnects to the board's server management features
- SSI-EEB3.0 compliant board form factor, the board size is 12 inch by 13 inch
- SSI-compliant connectors for SSI interface support the 34-pin front panel, floppy, ATA-100 and power connectors

[2] The BIOS is responsible for setting the mode (PCI or PCI-X) and bus speed for the two segments provided by the P64H2. The actual bus mode/speed will be determined by the least capable card installed on that bus.

11. Product Regulatory Compliance

The SC5200 chassis is designed and tested to meet the standards and regulation listed below when configured with the Intel® server boards specified.

11.1 Product Safety Compliance

The SC5200 complies with the following safety requirements:

- UL 1950 – CSA 950 (US/Canada).
- EN 60 950 (European Union).
- IEC 60 950 (International).
- CE – Low Voltage Directive (73/23/EEC) (European Limits).
- EMKO-TSE (74-SEC) 207/94 (Nordics).

11.2 Product EMC Compliance

The system has been tested and verified to comply with the following EMC regulations when configured with the Intel server boards specified. For information on compatible server boards, refer to Intel's Server Builder website (http://www.intel.com/go/serverbuilder) or contact your local Intel representative.

- FCC (Class A Verification) – Radiated and Conducted Emissions (USA).
- ICES-003 (Class A) – Radiated and Conducted Emissions (Canada).
- CISPR 22, 3rd Edition (Class A) – Radiated and Conducted Emissions (International).
- EN45022 (Class A) – Radiated and Conducted Emissions (European Union).
- EN45024 (Immunity) (European Union).
- EN6100-3-2 & -3 (Power Harmonics & Fluctuation and Flicker).
- CE – EMC Directive (89/33/EEC) (European Union).
- VCCI (Class A) – Radiated and Conducted Emissions (Japan).
- RRL (Class A) – Radiated and Conducted Emissions (Korea).
- BSMI (Class A) – Radiated and Conducted Emissions (Taiwan).

11.3 Product Regulatory Compliance Markings

This product is provided with the following Product Certification Markings.

- UL / cUL Listing Mark.
- CE Mark.
- German GS Mark.
- Russian GOST Mark.

- FCC, Class A Verification Marking.
- ICES-003 (Canada EMC Compliance Marking).
- VCCI, Class A Mark.
- Australian C-Tick Mark.
- Taiwan BSMI Certification Number and Class A Warning.

11.4 Electromagnetic Compatibility Notices

11.4.1 USA

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

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

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

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

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

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

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

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

11.4.2 FCC Verification Statement

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

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

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

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

11.4.3 ICES-003 (Canada)

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

English translation of the notice above:

"This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Canadian Department of Communications."

11.4.4 Europe (CE Declaration of Conformity)

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

11.4.5 Japan EMC Compatibility

Electromagnetic Compatibility Notices (International).

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

English translation of the notice above:

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

11.4.6 BSMI (Taiwan)

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

警告使用者：

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

12. Environmental Limits

12.1 System Office Environment

Table 30. System Office Environment Summary

Parameter	Limits
Operating Temperature	+5^{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 @ 30^{o}C
Acoustic noise	55 dBA in a typical office ambient temperature (18-25C)
Operating Shock	No errors with a half sine wave shock of 2G (with 11-millisecond duration).
Package Shock	Operational after a free fall, 18 – 24 inch depending on the weight.
ESD	15kV per *Intel Environmental Test Specification*

12.2 System Environmental Testing

The system will be tested per the *Environmental Standards Handbook*, Intel Doc.#662394-05. These tests shall include:

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

13. Reliability, Serviceability, and Availability

13.1 MTBF

Calculated Mean Time Between Failures (MTBF) at maximum configuration at 35°C.

Table 31. MTBF Calculations

Item	Percentage usage	MTBF HRs
Baseboard	100	TBD
Front panel board (typical)	100	3,566,515
Processor	100	TBD
SATA Back Plane	100	2,024,479
SCSI dist BD	100	314,618
Hard Drive	100	NA
PRO 100 B	100	1,680,930
IDE CD-ROM (typical)	25	500,000
Power supply (typical)	100	150,000
1.44MB 3.5" FDU (typical)	5	405,000
32 Meg DIMM (typical)	100	283,051
FAN (typical)	100	96,062

13.2 Serviceability

The system is designed for service by qualified technical personnel only.

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

The following are the maximum times that a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system.

Table 32. Maximum Maintenance Procedure Times

Remove cover	1	minute
Remove and replace hard disk drive	1	minute
Remove and replace 5 ¼ peripheral device	5	minutes
Remove and replace power supply	5	minutes
Remove and replace drive cage fan	2	minutes
Remove and replace expansion board	5	minutes
Remove and replace front panel board	5	minutes
Remove and replace server board (with no expansion boards)	15	minutes
Overall MTTR	20	minutes

14. Upgradeability

Listed below are accessory kits available for the SC5200 chassis. Illustrations are provided to indicate some of the kit contents. Not all parts for each kit are shown and the actual part may differ in appearance.

14.1 DLT Tape Drive and Slimline CDROM Mounting Brackets

Product Code FHD2DLTBRK. Contains DLT tape drive mounting rails (can be used for proper mounting of other full-height peripherals), slim-line CDROM adapter bracket with integrated cooling grill (for proper processor cooling), and 4-pin power adapter cable.

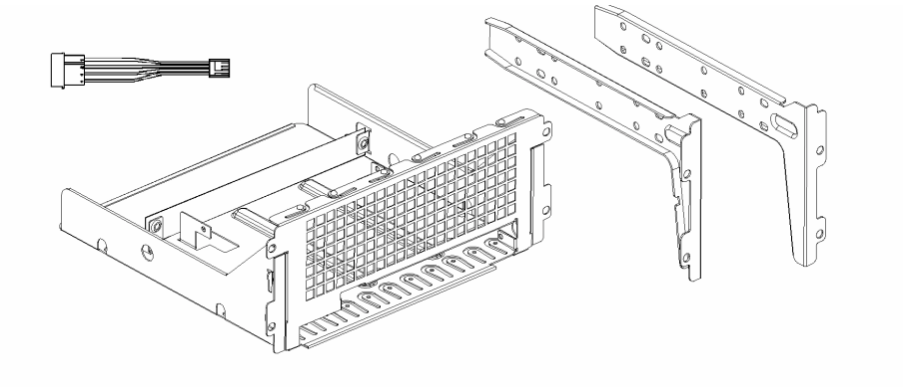


Figure 52. DLT Tape Drive and Slimline CDROM Mounting Brackets

14.2 ICMB Interface card with brackets and cable

Product Code AXX2ICMBKIT. This kit includes an interface board, adapter brackets for rear panel mounting or PCI card slot mounting, and cable for connecting a server board to external ICMB devices.

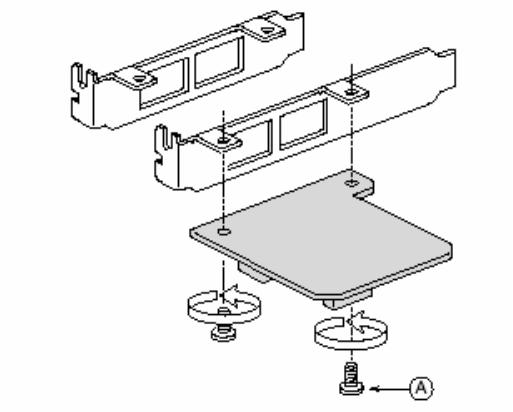


Figure 53. ICMB Interface Card

14.3 Hot-swap Drive Bay Upgrade

Product Code AXX2HSDRVUG. The kit includes a hot-swap drive bay with mounting hardware, 68-pin LVD SCSI cable for data transfer, and 4-pin I^2C cable for server management communication.

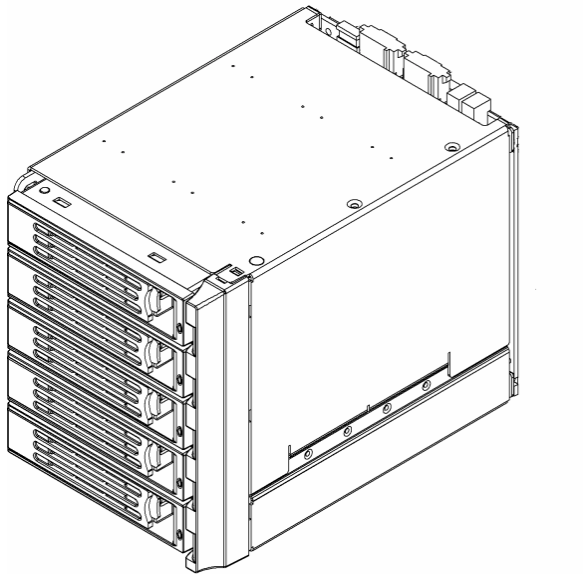


Figure 54. Hot-swap Drive Bay Upgrade

14.4 SCSI Y-Adapter Cable

Product Code AHD3HSBPYCBL. This 10-pack kit includes a Y-Cable that splits a single SCSI channel from a server board or add-in card, for connection to two 5-drive SCSI Backplanes (see AHD3HSDRVUG).

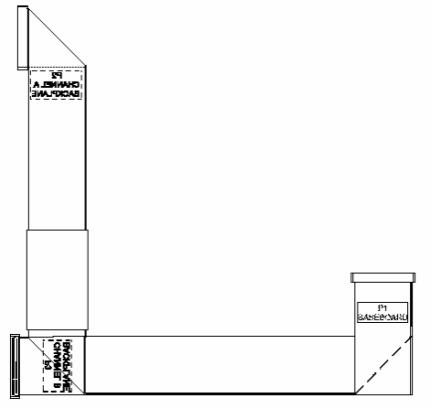


Figure 55. SCSI Y-Adapter Cable

14.5 External SCSI Adapter Cable

Product Code AXXEXTSCSICBL. This 68-pin LVD SCSI cable allows an internal SCSI connection from the motherboard to be routed to the ICMB/SCSI knockout at the rear of the chassis.

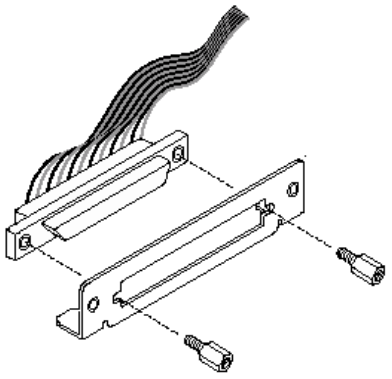


Figure 56. External SCSI Adapter Cable Detail

14.6 350-W TPS Power Module

Product Code AXX2PSMODL350. This accessory provides a single 350-W TPS module and power cord to upgrade RPS power supplies to redundant mode. It is also used as a replacement module.

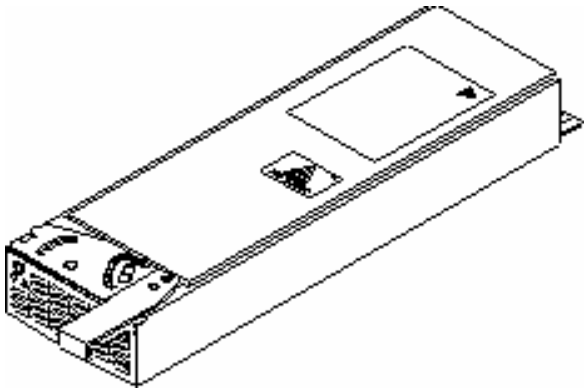


Figure 57. 350-W TPS Power Module

14.7 450-W Base Redundant Power (BRP) Power Module

Product Code FHD3BRPS450W (MM# 851831). This accessory provides a single 450-W power supply module to upgrade BRP power supplies to redundant mode. It is also used as a replacement module.

Figure 58. 450-W BRP Power Module

14.8 Rack Conversion Kit(s)

Product Code AHD3RACK or AHD2RACK

Kit includes all parts needed to convert a pedestal chassis into the rack version. Contents include rack bezel parts, 5.25-inch reorientation bracket, unpainted side covers, handles, mounting rails, and hardware kit.

Note: ADH3RACK kit includes all sheet metal covers to support both KHD3HSRP650 and KHD3BASE450 or KHD3RP450 Chassis KDK's. ADH2HRACK will support the KHD3BASE450 and KHD3RP450 Chassis KDK's.

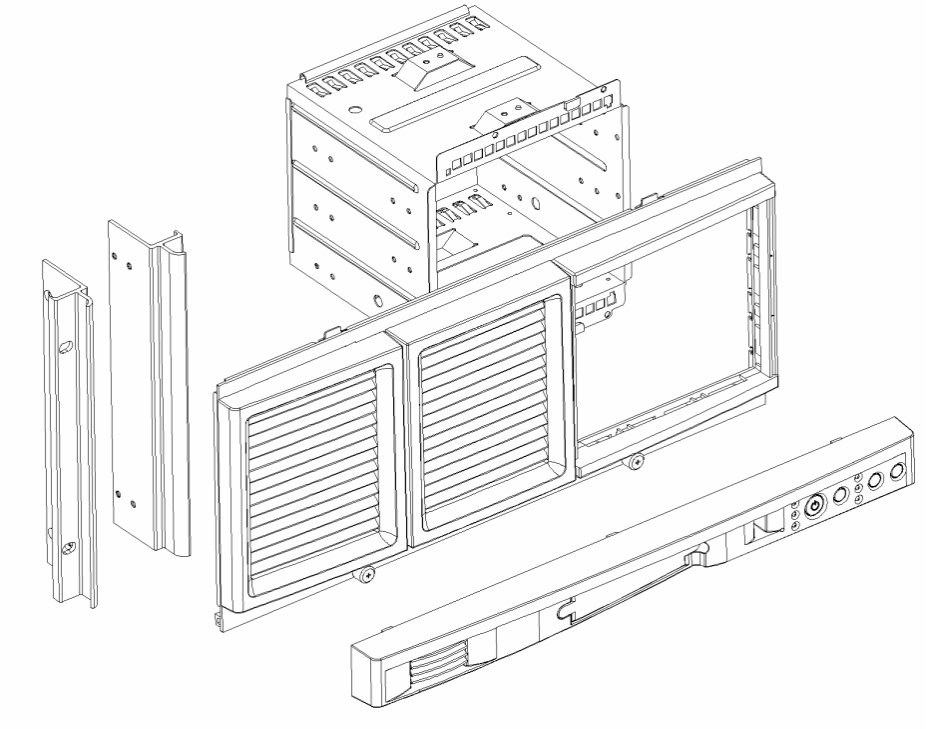


Figure 59. Rack Conversion Kit

Appendix A: Chassis Spares & Accessories

Upgrade and Accessory Parts

Product Code	MM #	UPC	Qty.	Description
AXX2PSMODL350	841602	7 35858 14629 6	1	350W Power Supply Module Upgrade or Spare
FHD3BRPS450W	851831	7 35858 1 59687	1	450W BRP Power Supply Module Upgrade or Spare for SC5200 KHD3RP450 Base Redundant Chassis KDK.
AXX2HSDRVUG	835948	7 35858 14630 2	1	Hot-Swap Drive Upgrade Kit – Upgrade Base Chassis to 5 drives or HSRP to 10 drives
AHD3HSBPYCBL	848239	7 35858 15645 5	10	New SCSI Y-cable to work with SC5200 HSRP. Permits cabling two back planes to one SCSI/RAID channel.
AXXEXTSCSICBL	830656	7 35858 13953 3	1	External SCSI Cable Accessory. For use with SCSI Knock-out on rear of chassis.
AXX2ICMBKIT	836017	7 35858 14653 1	1	ICMB Board Assembly
FHD2DLTBRK	836423	7 35858 14669 2	5 Sets	DLT mounting bracket, includes slim-line CD ROM mounting bracket and connector board
AHD2RACK	835849	7 35858 14670 8	1	Rack Kit- Use to convert Pedestal Chassis to a 5U rack chassis. Includes rails, rack mounting hardware, and rack bezel in black. Will work with SC5100 or SC5200 Base Chassis. Use AHD3RACK for HSRP Chassis.
AHD3RACK	845727	7 35858 15426 0	1	Rack upgrade kit with new SC5200 Hot-swap fan access side cover. Backwards compatible with Hudson II (includes both side covers)
ASATAHSDB	853276	7 35858 16062 9	1	SATA Hot Swap Upgrade Kit- Upgrade Base Chassis

Replacement and Spare Parts

AHG2IO	844599	7 35858 15299 0	50	I/O Shield and Gasket for Intel® SHG2, SE7500CW2, and SE7501BR2 Server Boards
FHDLVDSCBL	823391	7 35858 12705 9	10	SCSI Wide, LVDS Cable. Note: Use FHD3SCSICBL for HSRP SKU.
FHD3SCSICBL	847537	7 35858 15475 8	10	New SCSI cable to work with SC5200 HSRP. Connects baseboard to SCSI backplane (non-terminated).

FHDEYE2C	823392	7 35858 12720 2	10	I^2C Cable
FXX2HSBRD	836033	7 35858 14654 8	1	Hot-Swap Backplane Board
FXX2SAFTE	836027	7 35858 14655 5	1	SAF-TE Board
FHDSHRD	823387	7 35858 12712 7	10	HSBP Fan Shroud
FXX2DRVCARBLK	835853	7 35858 14621 0	10	Hot-Swap Drive Carrier, 1 inch, black
FHD2FPBRD	835851	7 35858 14622 7	1	Front Panel Board & Cable
FHD3BASEFANS	844703	7 35858 15303 4	1	Base SKU fan spare kit: one each 80x25 mm and 80x32 mm
FHD3HSFANS	844702	7 35858 15302 7	1	Hot swap fan spare kit: (1) 92 mm and (2) 80 mm, includes carriers/connectors
FHD2EPAC	835950	7 35858 14632 6	1 Set	EPAC Set for SC5200 Base chassis (without hot swap fans)
FHD3HSDUCT	844704	7 35858 15305 8	1	Plastic duct and fan holder/harness for HSRP SKU
FHD3PS450	844924	7 35858 15351 5	1	Non-Redundant 450W Power Supply for SC5200 Base Chassis
FHD3BRPS450W	851831	7 35858 1 59687	1	450W BRP Power Supply Module Upgrade or Spare for SC5200 KHD3RP450 Base Redundant Chassis KDK.
FHD2PSCAGE2P1	836424	7 35858 14668 5	1	650W 2+1 Power Supply Cage – Dual Line Cord for SC5200 HSRP Chassis
FHD3BRPDB	852234	7 35858 1 59654	1	Power Distribution Board (Cage) for SC5200 Base Redundant (KHD3RP450) Chassis KDK
AXX2PSMODL350	841602	7 35858 14629 6	1	350W Power Supply Module Upgrade or Spare
FHD3HSSIDE	844701	7 35858 15306 5	5	Side cover with fan access door for HSRP Chassis
FHDSDE	823386	7 35858 12706 6	5 Sets	Right and Left Side Panels - Painted
FHDTP	823385	7 35858 12707 3	10	Top Panel - Painted
FHDBTTM	823372	7 35858 12708 0	10	Bottom Panel- Painted
FHDFEET	823396	7 35858 12709 7	10	Pedestal Foot (Beige)
FHDPKG	823390	7 35858 12713 4	1	Packaging
FHD2HWKT	836557	7 35858 14707 1	1	Hardware Kit – Screws
FHD3SPRS	844685	7 35858 15304 1	1	SC5200 Channel Spares Kit
FSATAHSDBBRD	853278	007358-581 16062 9	1	SATA Back Plane Board

Glossary

Term	Definition
AC	Alternating Current
ACPI	Advanced Configuration and Power Interface.
ATX	Advanced technology extended (motherboard type).
BKM	Best Known Method – a document, created by an Intel organization, that details the proper or customary steps used to perform a specific task (e.g., operating system installation).
BMC	Baseboard Management Controller – Provides monitoring, alerting, and logging of critical system information obtained from embedded sensors on the baseboard.
BRP	Base Redundant Power
DC	Direct Current
DDR	Double Data Rate
DIMM	Dual Inline Memory Module
DLT	Digital Linear Tape
ECC	Error Correcting Code
EEB	Entry E-Bay
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electromagnetic compatibility
EMI	Electromagnetic Interference
EPS	Entry Power Supply; External Product Specification
EPG	Enterprise Products Group – a division of Intel Corporation.
ESD	Electrostatic Discharge
FET	Field Effect Transistor
FRU	Field Replaceable Unit
FWH	Firmware Hub
HCT	Hardware Compatibility Test
HSBP	Hot-Swap Backplane
HSC	Hot-Swap Controller
Hz	Hertz (1 cycle/second)
I^2C	Inter-integrated circuit bus
ICMB	Intelligent Chassis Management Bus
IDE	Integrated Drive Electronics
I/O	Input / Output
IP	Internet protocol
IPMI	Intelligent Platform Management Interface
ISM	Intel® Server Management
LAN	Local Area Network
LED	Light Emitting Diode
LPC	Low Pin Count
LVDS	Low-voltage differential SCSI
MTBF	Mean Time Between Failures

Term	Definition
MTTR	Mean Time to Repair
NMI	Non-maskable Interrupt
OEM	Original Equipment Manufacturer
OS	Operating System
PCI	Peripheral Component Interconnect
PFC	Power Factor Correction
RPM	Revolutions Per Minute
RPS	Redundant Power Supply
PWT	Processor Wind Tunnel – Active cooling device included with the Intel® Boxed Xeon™ Processors
SAF-TE	SCSI Accessed Fault –Tolerant Enclosure
SCA	Single connector attachment.
SCSI	Small Computer Systems Interface.
SDR	Sensor Data Record
SKU	Stock Keeping Unit
SMBus	A subset of the I^2C bus/protocol, developed by Intel.
SSI	Server System Infrastructure – Organization which defines and promotes specifications for the server market
TBD	To Be Documented – Used when item being described has not yet been designed or formalized.
TPS	Thin Power Supply; Technical Product Specification
USB	Universal Serial Bus
VCCI	Voluntary Control Council for Interference
VRAM	Video Random Access Memory
VRM	Voltage Regulation Module
WFM	Wired for Management
WOL	Wake-on-LAN

Reference Documents

Refer to the following documents for additional information:

- *Intel® SC5200 Base Server Chassis Subassembly Product Guide, #A86510*
- *Intel® SC5200 Hot-Swap, Redundant Power Pedestal and Rack Server Chassis Subassembly Product Guide, #A83713*
- *Intel® SC5100 and SC5200 Server Chassis Hot Swap Bay Upgrade Kit, #A58844*
- *Intel® SC5100 and SC5200 DLT Tape and Slim-line CD ROM Installation Guide, #A58846*
- *Intel® SC5100 and SC5200 Rack Kit Installation Guide, #A58842*
- *Intel® SC5100 and SC5200 ICMB Card Installation Guide, #A58841*
- *Intel® SC5100 and SC5200 External SCSI Cable Install Guide, #A27198*
- *SCSI Accessed Fault-Tolerant Enclosures Specification,* Revision 1.00
  The SAF-TE Specification is available via email @ SAF.TE@connor.com
- *SSI Entry-Level Electronics–Bay Specification,* Version 3.0
- Advance Technology Extended (ATX) Specification, Revision 2.03
  http://www.ssiforum.org/docs/entry_elecbay_spec_v3_0.pdf
- *ANSI/IEEE STD C62.45-1992*
  http://standards.ieee.org/reading/ieee/std_public/description/surge/C62.45-1992_desc.html

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