SC5000 Server Chassis Kit Technical Product Specification

April 25, 2000

Revision 4.0

ESG Server Products Division

Revision History

Revision	Date	Description
0.5	1/28/99	Preliminary Draft for Review
0.6	2/19/99	Updated Server board Information & general chassis information.
0.9	5/26/99	Review copy for release. Updated with current design implementation and added illustrations. Updated certification section.
1.0	5/28/99	Initial Release of Document.
2.0	8/13/99	Update cooling information. Updated with H840 and P820 server board information. Updated various drawings.
3.0	2/23/00	Updated for changes to support the L440GX+ Server Board.
4.0	4/25/00	Modified SC5000 Chassis specification for acoustic noise to 50 dBA in a typical office ambient temperature (65-75F).

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1 Introduction

This specification details the feature set of the SC5000 chassis, an entry-level server chassis that is designed for Intel server board products. The SC5000 chassis is a low-cost, time-to-market series of products that can be used for multiple platforms and configurations. This chassis has user-friendly features and is accessible and serviceable.

The base SC5000 chassis, product code KHBASE, is designed to support the Intel® L440GX+ server board and addresses the entry market. The base chassis includes a PS/2 form factor, 300WSSI PFC power supply, and supports up to five non hot-swap hard drives. Two 92mm tachometer output fans are mounted in front of the server board to main chassis cooling. A hot-swap drive bay kit, product code (AXXHSDRVUG), provides an upgrade path to convert the SC5000 base chassis to support hot-swap drives.

The SC5000 chassis features an optional hot-swap hard disk drive bay that supports up to five 1" SCA LVDS SCSI hard drives. The hot-swap SC5000 chassis, product code KHDHS, comes preconfigured with a five-drive hot-swap U160 SCSI hard drive bay and a 300W power supply that provides sufficient power and reliability for many users.

The hot-swap chassis enhances the serviceability, availability, and upgradability of the system. Adapter brackets allow mounting hard drives in the lower six 5.25", ½ height peripheral bays at the front of the chassis. The hot-swap drive bay utilizes three of the six available bay positions when it is installed. An additional three 5.25", ½ height drive bays are available for other peripherals, such as CD-ROM and tape drives.

The hot-swap redundant power SC5000 chassis, product code KHDHSRP, adds an optional 350W redundant power supply for increased reliability and availability. The two 350W modules can be replaced without disrupting the operation of the server system.

This specification details the key features of the SC5000 chassis product. This document references additional product specifications that provide more detail for the server boards, backplane, and power supplies validated for use with this chassis.

2 Chassis

The chassis is approximately 17.5 inches high, 26 inches deep, and 8.5 inches wide. A removable access cover provides entry to the interior of the chassis. The rear I/O panel conforms to the ATX Specification, version 2.03, and supports seven full-length expansion cards. The chassis is provided with a front panel board designed for the L440GX+ server board.

Any version of the chassis can be converted to a rack-mounted version with the option product code AHDRACK. The kit provides a replacement top cover, rack bezel, peripheral bay reorientation bracket, and slide 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.

2.1 System Color

The primary exterior system color will match Intel Color Standard 513505**.** Customized colors for OEM customers can be made available.

2.2 Front Bezel Features

The standard front bezel is molded plastic with an exterior plastic door that covers the drive bays. A key-lock is provided to prevent unauthorized access to the 5¼-inch peripheral bays. Each peripheral bay is covered with a removable 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 accesses the hot-swap hard drives, if so equipped. 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 easily designed from the standard bezel design.

2.3 Security

At the system level, a variety of security options are provided.

- 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” diameter loop.
- A two position key lock/switch will unlock the access cover.
- Alarm switches are provided for the system access cover and bezel door where Server Management Software, like Intel® Server Control (ISC), can process alarm switch activity as desired.

See the appropriate server board TPS for a description of software and BIOS security features.

2.4 I/O Panel

All input/output connectors are accessible on the rear of the chassis. The 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 2–1 below for reference.

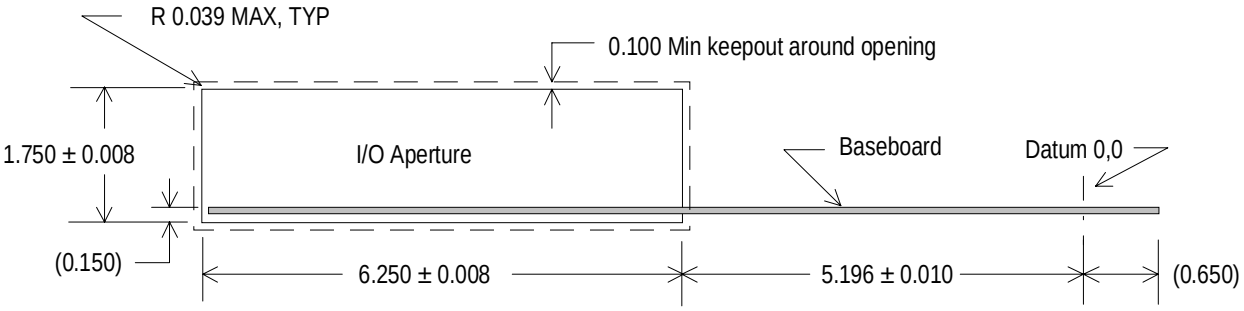

Figure 2-1: ATX 2.03 I/O Aperture

2.5 Chassis Views

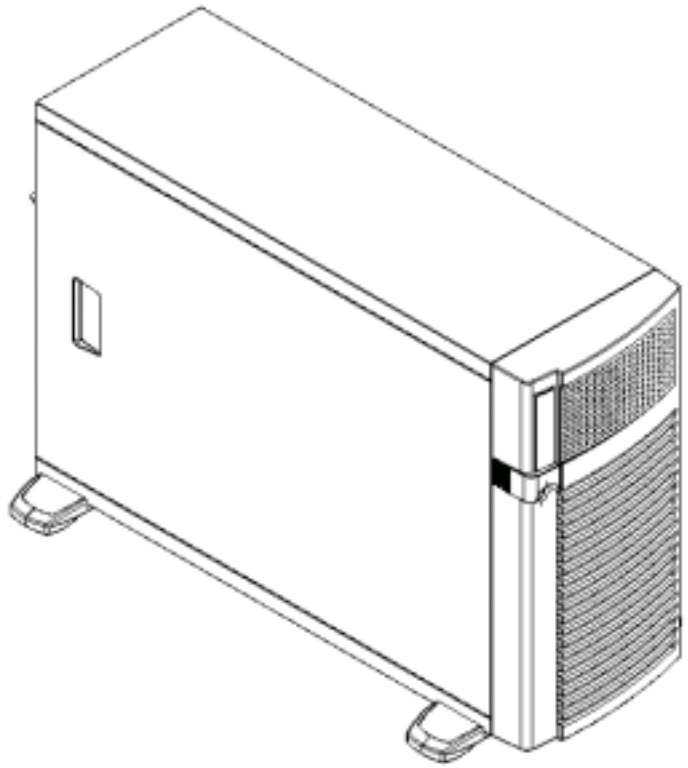

Figure 2-2: Front Isometric View

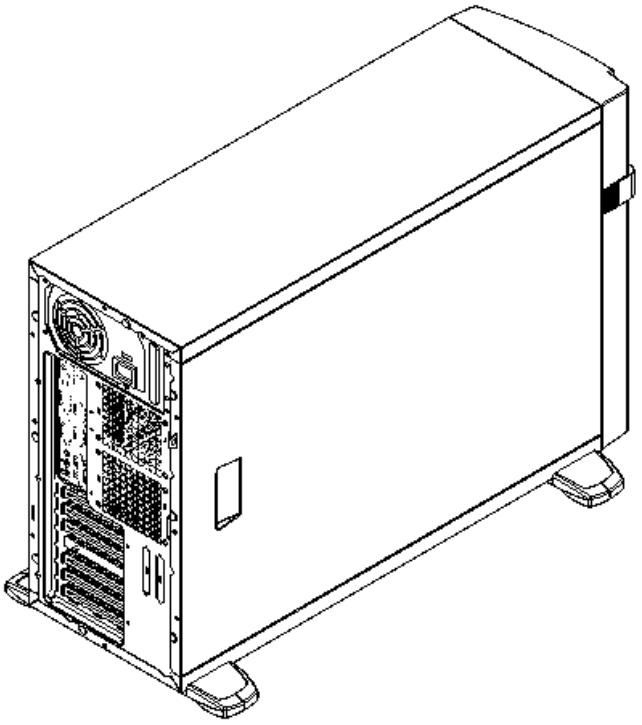

Figure 2-3: Rear Isometric View

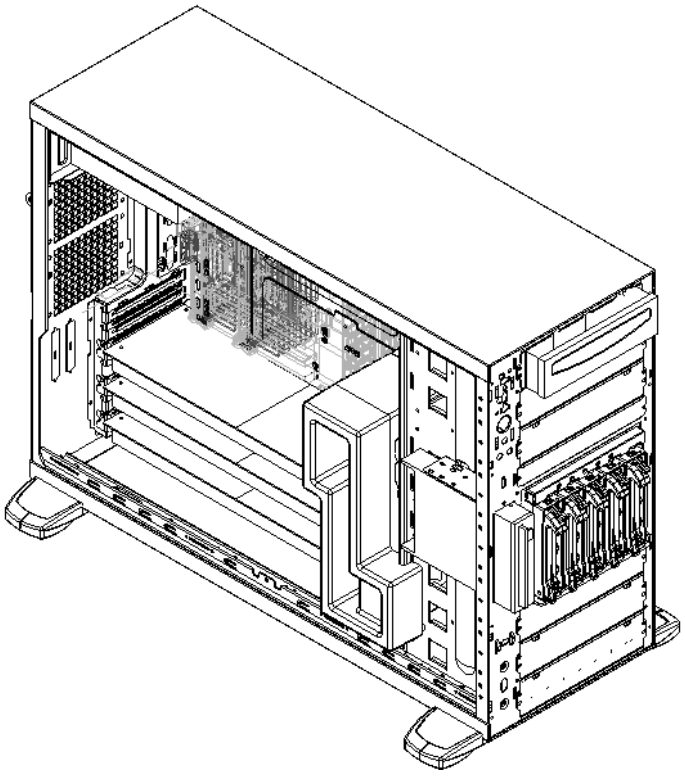

Figure 2-4: Front Isometric View, Open Access Cover and Bezels Removed

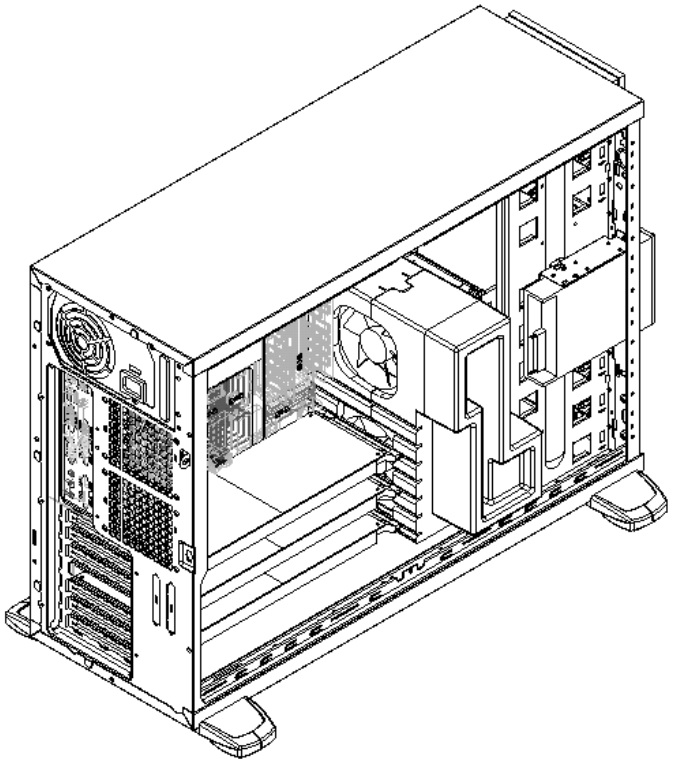

Figure 2-5: Rear Isometric View, Open Access Cover and Bezels Removed

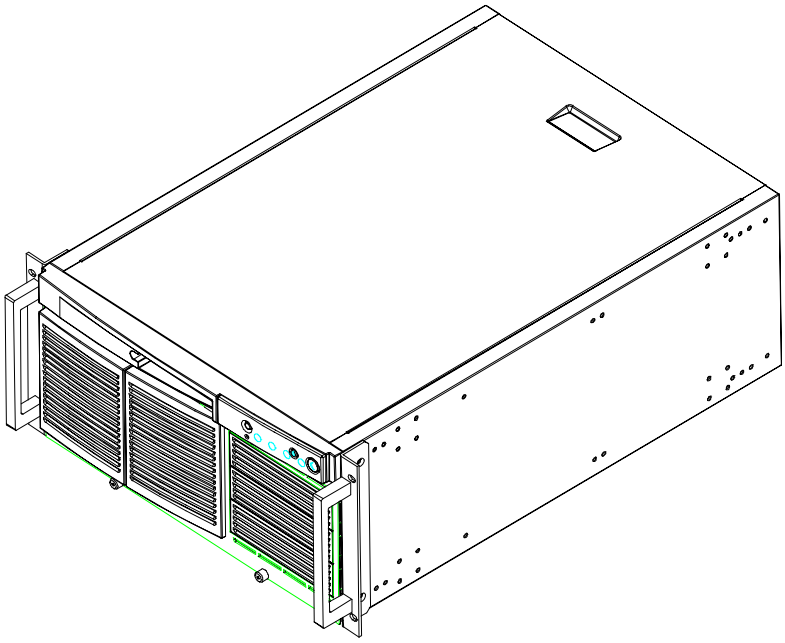

Figure 2-6: Rack Configuration View

2.6 Chassis Dimensions

Table 2-1: System Dimensions (approximate)

Configuration	Pedestal	Rack
Height	17.5 inches	8.6 inches
Width	8.6 inches (chassis), 12.7 inches (feet)	16.9 inches
Depth	26 inches	24.9 inches (chassis), 25.6 (handles)
Clearance Front	10 inches	N/A
Clearance Rear	5 inches	N/A
Clearance Side	3 inches (additional side clearance needed for service)	N/A

3 System Power

The base system utilizes a standard PS/2 form factor power supply and complies with the Entry SSI Power Supply Specification. Variations may be chosen for future board sets to satisfy the system power, power distribution, thermal performance, acoustic noise, and cost requirements.

The form factor was chosen to optimize the overall system dimensions. The typical PS/2 form factor power supply with a remote enable feature can be used. The remote enable feature permits the system power to be activated from a variety of sources, allowing the implementation of Wake-on-LAN or other remote management features. The 300-watt power supply features entry SSI-compliant server board connectors to accommodate the addition of +3.3 VDC and remote sense lines.

The system can also be configured with a 350W 1+1 redundant power supply. This power supply features two removable modules inserted into a main housing. The main housing contains the AC input circuits and power distribution boards. The removable, redundant DC power modules can be replaced in the event of a failure. The system will remain in operation during a failed voltage condition and it will remain online during a module replacement for maximum up time. Both removable modules must be installed for normal operation. Refer to the 350W power supply EPS for details.

The following table is a brief system power overview:

Table 3-1: Power Supply Output Summary

	300 Watt w/PFC[1] 747566-XXX	**350 Watt w/PFC[1] 1+1 Redundant 737180-XXX**
+5 VDC Output	26 Amp Max	32 Amp Max
+12 VDC Output	10 Amp Sustained, 13Amp/12sec peak current	12 Amp Sustained, 15Amp/12sec peak current
-12 VDC Output	0.5 Amp Max	0.5 Amp Max
-5 VDC Output	0.25 Amp Max	NA
+3.3 VDC Output	16 Amp Max	28 Amp Max
+5 VDC Standby	800 mA Max	2000 mA Max
Output balancing	Total combined output power of +3.3v and +5v shall not exceed 167 W.	Total combined output power of +3.3v and +5v shall not exceed 195 W.
AC Line Voltage	Autoranging for either 100-120 VAC or 200-240 VAC	Autoranging for either 100-120 VAC or 200-240 VAC
AC Line Frequency	50/60 Hz	50/60 Hz
AC Input Current	4.6 Amp at 115 VAC2.3 Amp at 220 VAC	6 Amp at 115 VAC, 3 Amp at 220 VAC

Note:

1. This power supply incorporates Power Factor Correction (PFC).

3.1 Mechanical Outline

The mechanical outline and dimensions for the 300W supply is the standard PS/2 form factor. The approximate dimensions are 140mm high by 86mm wide by 150mm deep.

The approximate 350W 1+1 supply dimensions are 86mm high by 188mm wide by 330mm deep.

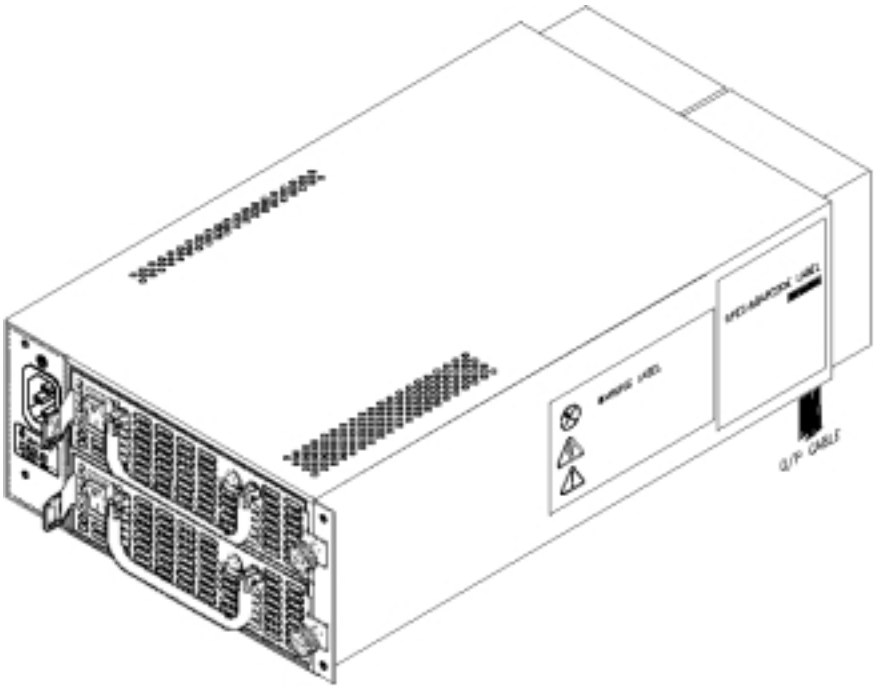

Figure 3-1: 350W 1+1 Redundant Power Supply

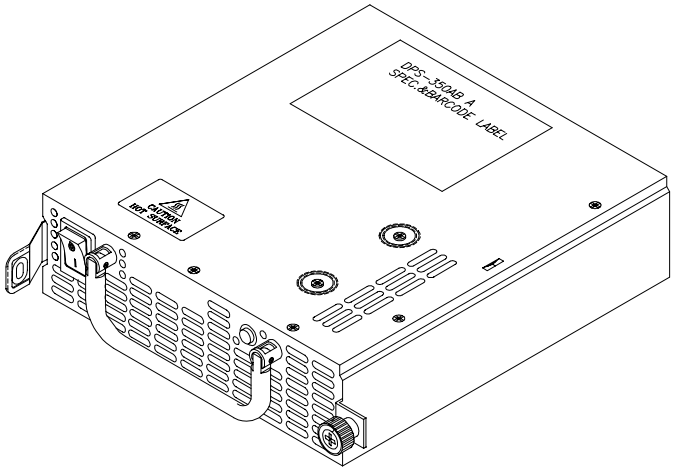

Figure 3-2: Replaceable 350W Power Supply Module

3.2 Power Supply Fan Requirements

The 300W power supply incorporates an 80mm 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 38 dBA at 23°C ±2°C.

The 350W 1+1 power supply incorporates two 80mm fans 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 45 dBA at 23°C ±2°C under normal operating conditions. If a module failure is detected, the fans will enter a faster boost mode to provide additional cooling until the failing module is replaced. During this failure mode, the above acoustical limit may be exceeded.

Due to the increased output power requirements of the 5V standby circuit, power supply thermal margins are difficult to maintain while the system is in the "off" state. For this reason, the power supply fan in the 300W and 350W power supplies will run at a reduced RPM when the system is off.

3.3 AC Power Line

The system is specified to operate from 100 - 120VAC, 200 - 240VAC, at 50 or 60Hz. The specified PFC power supplies are autoranging. The system is tested to meet these line voltages, and it 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 (IE, 20 milliseconds at 50 Hz). A reduced limit may be incorporated into the 350W 1+1 design when a module fails. The 350W 1+1 will meet this specification when operated under a normal fault-free condition. Consult the power supply EPS for more information.

The system is not damaged by AC surge ring wave up to 2.0kV/500A. This ring wave is a 100kHz damped oscillatory wave with a specified rise-time for the linear portion of the initial half-cycle of 0.5µsec. In addition, 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.

3.4 Power Supply / System Configuration

A system can only be configured with a single supply. For more detailed specifications on the power supplies, see the 300W PFC Power Supply Spec #747566, or the 350W 1+1 Redundant PFC Power Supply Spec # 737180.

Server boards utilizing Pentium® III processors (i.e. the, Intel L440GX+ server board) use onboard DC-DC voltage converters for the processor core power requirements. These DC-DC voltage converters utilize +12V or +5V and may be onboard and/or plug-in Voltage Regulation Modules (VRMs).

4 System Cooling

Two 92mm 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 bay is installed, one of these system fans draws air at the rear of this bay to provide drive cooling. All system fans provide a signal for RPM detection that the server board can make available for server management functions.

Removal of the access cover gives entry to the fans, which then can be easily changed with the system shut down. To ensure proper cooling, only processors with active heatsinks should be used. Active heatsinks incorporate a fan to provide cooling. Such a heatsink is typically installed on Intel boxed processors.

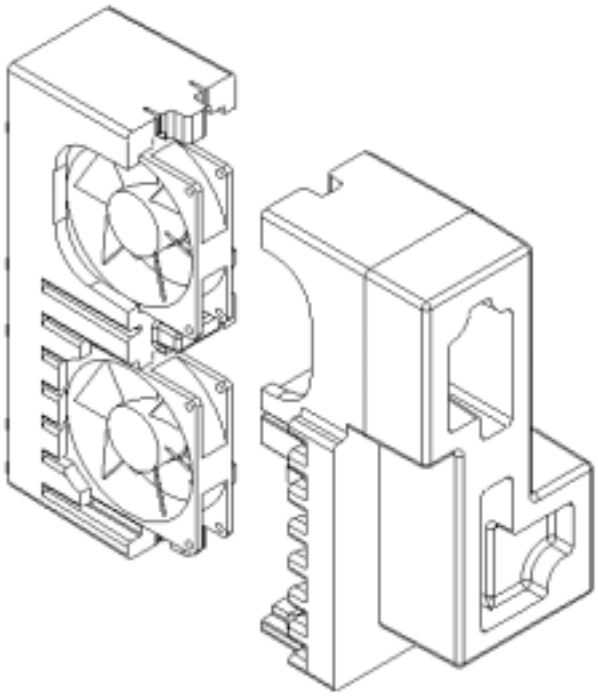

Figure 4-1: Close up view of fan mounting feature

5 System Peripheral Bays

5.1 3.5" Floppy Drive Bay

The chassis kit provides for the installation of a 3.5” floppy drive beside the 5.25” peripheral bays. Removal of the access cover provides entry for replacement of the floppy drive.

5.2 5.25" Drive Bays

The system supports three half-height or one full-height and one half-height 5.25” removable media peripheral device (e.g. Magnetic/Optical disk, CD-ROM or tape drive), up to 9” deep in the upper 3 bays. As a guideline, the maximum recommended power per device is 17W. Thermal performance of specific devices must be verified to ensure compliance to the manufacturer’s specifications. These upper three bay locations rotate 90 degrees when upgraded with the rack kit. This allows devices (such as CD-ROMs) to remain in their normal operating position when the chassis is rotated to the horizontal rack position.

Six additional half-height 5.25” drive bays are provided to support installation of up to five hard drive devices. Five 3.5” to 5.25” hard drive adapter trays are provided in the base configuration and must be used to ensure proper cooling and EMC compliance. The lowest 5.25” bay is covered with a ventilated EMI shield panel and should not be utilized for drives to ensure proper system cooling operation. A single optional hot-swap drive bay assembly may be mounted in place of the middle three 5.25” drive trays. This bay can hold up to five 1” SCSI hard drives.

The 5.25" peripherals are removable directly from the front of the chassis after removal of the side cover and opening front bezel. EMI shield panels are installed in unused 5.25" bays.

Note: Caution must be observed when approaching the maximum level of integration for these 5.25” 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, five SCSI hard drives and a single IDE hard drive.

5.3 3.5" Hot-swap Hard Drive Bays

The SC5000 chassis supports up to five 3.5" SCA LVDS hard drives and are accessible by opening the front access door. Five metal carriers are provided with the system to mount the hard drives. When no drive is installed in a carrier, an air baffle is installed to ensure proper cooling of the hard drives.

The hot-swap drive bay is designed to accept 1” peripherals that consume up to 14 Watts 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. Peripherals must be specified to operate at a maximum ambient temperature of 50^{o}C.

Further details of the SCSI Backplane can be obtained from the *SC5000 SCSI Backplane EPS*.

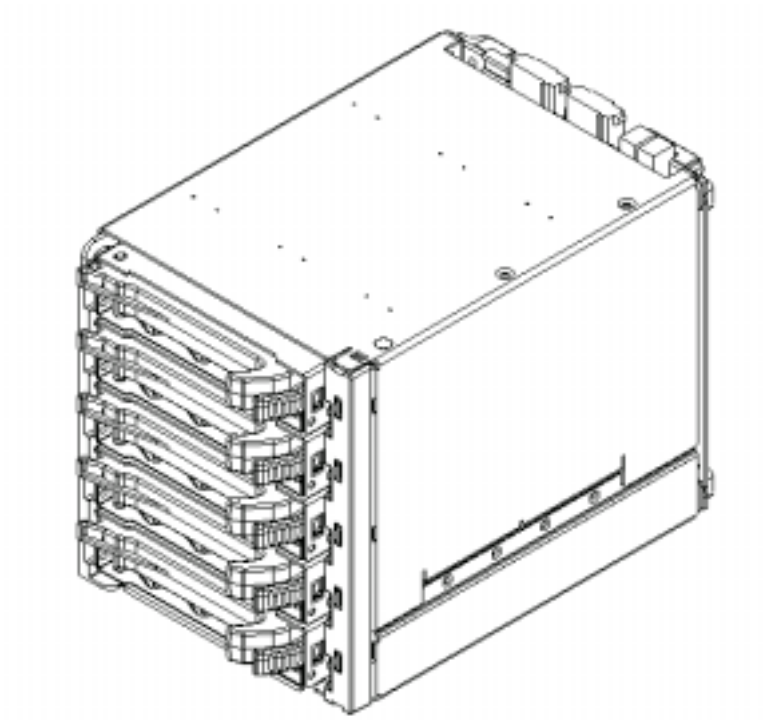

Figure 5-1: Hot-swap Drive Bay, Front Isometric View

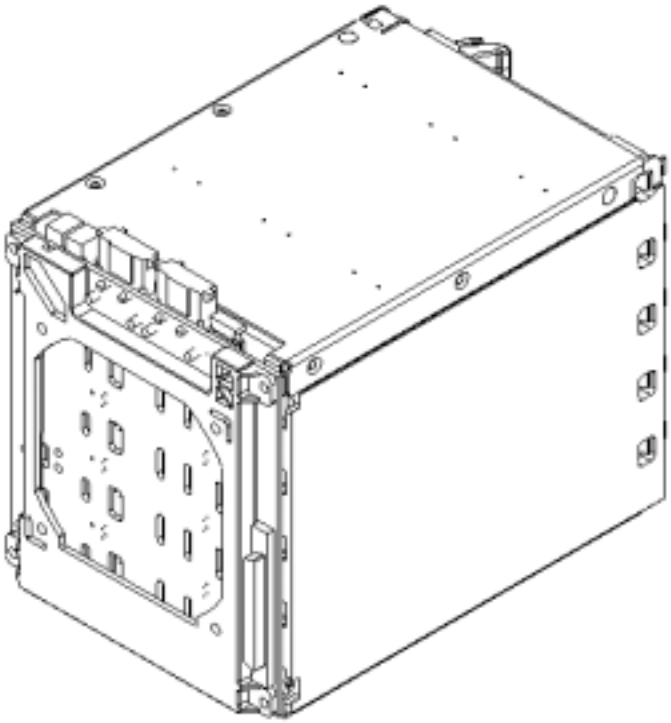

Figure 5-2: Hot-swap Drive Bay, Rear Isometric View

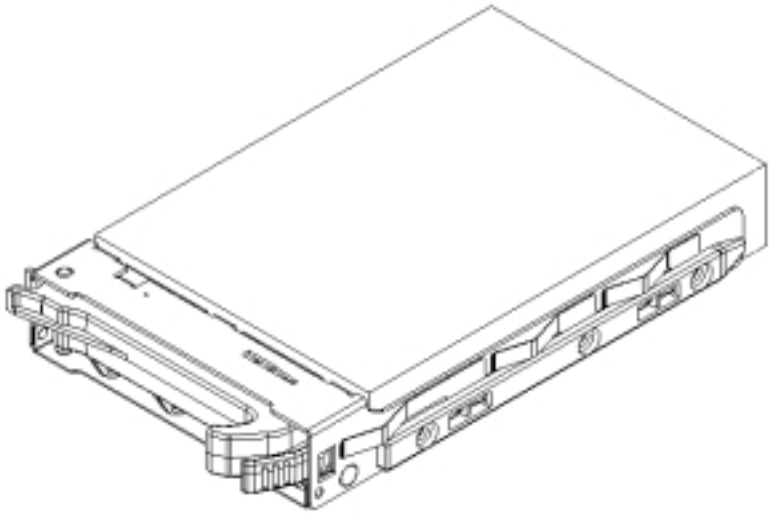

Figure 5-3: Hot-swap Drive Carrier with Drive Installed

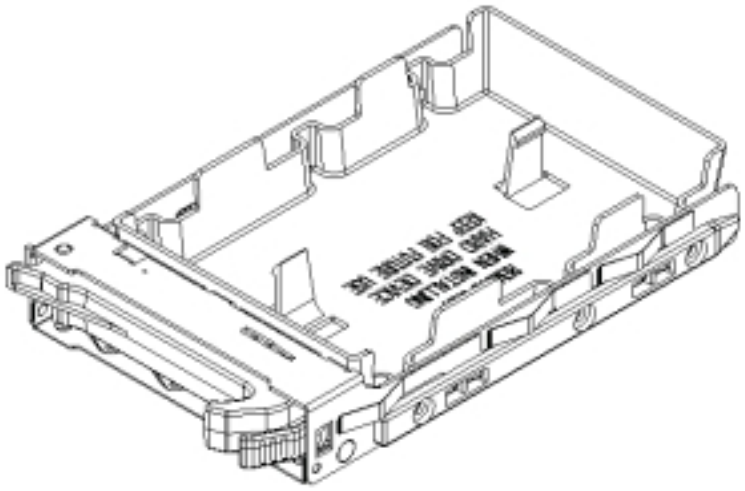

Figure 5-4: Drive Carrier with Air Baffle Installed

6 Front Panel

The front panel is located at the left side of the front of the chassis. Opening the exterior access door allows access to the momentary Power On/Off button, System Reset button, ACPI Sleep Switch and tool-activated NMI switch. The front panel includes a green power on LED, a green hard drive activity LED, a green network activity LED and an amber general system fault LED, which are visible with the exterior access door closed.

A 16-pin ribbon cable interfaces the board to the front panel connector on the L440GX+ board. A 2-pin twisted pair lead connects the sleep switch to the ATX stake pin location on the L440GX+ server board.

When the hot-swap drive bay is installed, five bi-color hard drive LEDs located on the drive bay indicate specific drive failure or activity, and are visible upon opening the front bezel door. A 4-pin I^2C cable interfaces the front panel to the hot-swap drive bay.

Further details of the front panel can be obtained from the Front Panel TPS.

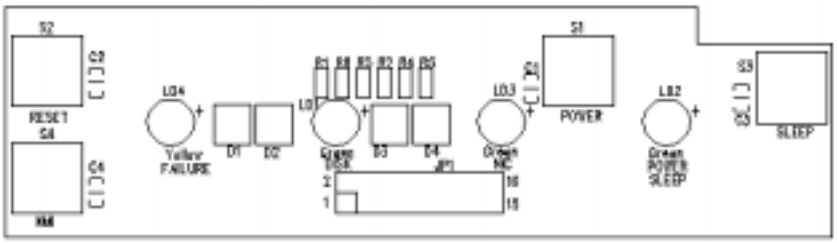

Figure 6-1: Front Panel, Showing Basic Layout

7 System Server Boards

7.1 Intel L440GX+ DP Server Board

Major features of the L440GX+ Server Board include:

- Volume server platform based on the Intel® Pentium® II and Intel Pentium III Processor. On the L440GX+, these processors operate with a 100MHz 242-contact slot connectors.
- Using dual processors, the system is fully MPS (Multi-Processor Specification) 1.4 compliant (with appropriate Pentium II and Pentium III extensions). In addition, support is provided for multi-processor operating systems that may not be fully MPS 1.4 compliant.
- System design based on Intel 440GX AGPset, PIIX4e, and I/O APIC devices
- 100Mhz main memory interface supporting up to 2GB of PC/100-compliant commodity SDRAM DIMMs. (ECC and Non-ECC)
- PCI I/O system, compliant with revision 2.1 of the PCI specification.
- Integrated Adaptec* 7896 PCI dual-port SCSI controller providing separate Ultra2 and Ultra wide SCSI channels.
- Integrated Intel EtherExpress™ PRO100+ 10/100Mbit PCI Ethernet controller with integrated physical layer (Intel 82559).
- Cirrus Logic* GD5480 High performance 2D PCI video controller with 2MB of SGRAM onboard
- PCI IDE controller (in PIIX4e) providing dual independent Ultra DMA/33 IDE interfaces, each able to support two IDE drives.
- Four PCI 33MHz, 5 Volt, 32-bit expansion slots
- Two PCI 33/66 MHz, 32-bit, “Universal” expansion slots
- One ISA expansion slot, (Not shared)
- 0-channel RAID expansion slot – specific support for Adaptec* 1130U2 RAIDPort III Raid card only
- Compatibility I/O device integrating floppy, serial and parallel ports.
- Integration of server management features, including thermal, voltage, fan, and chassis monitoring into one controller.
- Dual Universal Serial Bus (USB) ports.
- Emergency Management Port (EMP).
- Platform Event Paging (PEP)
- Flash BIOS support for all of the above.

See the *Intel L440GX+ DP Server Board TPS* for more detail.

7.2 Additional Server Boards

The L440GX+ server board will be enhanced in the future, and compatibility with the SC5000 chassis family will be maintained. Future server boards will also be targeted for the SC5000 chassis family.

8 System Interconnection

8.1 Signal Definitions

The standard cable construction is briefly described below. The pin-out on the connectors referred to in this section is defined in the respective server board TPS.

8.2 System Internal Cables

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

- **Intrusion Alarm Switch Cable**
  The Intrusion Alarm cable is two normally open momentary switches in series that 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.
- **Server Board to Front Panel Cable**
  A 16-pin IDC connector connects the server board to the front panel for the SC5000 product via a 16-conductor ribbon cable. A two pin twisted pair cable routes the front panel sleep switch to the ATX stake pin header.
- **SCSI, Server Board to SCSI Hot-swap Backplane Cable (when HSBP is installed)**
  A 68-conductor U160 SCSI cable is provided to interface from the server board to the hot-swap backplane (HSBP).
- **I^2C, Server Board to SCSI Hot-swap Backplane Cable (when HSBP is installed)**
  A 4-pin cable connects the front panel board to the Hot-swap backplane to communicate server management information, such as drive and fan status to the server board.
- **Fan Connectors**
  The installed system fans provide three-pin connects designed to mate with SSI (ATX) compatible fan headers. The connector pin outs are shown in the figure below.

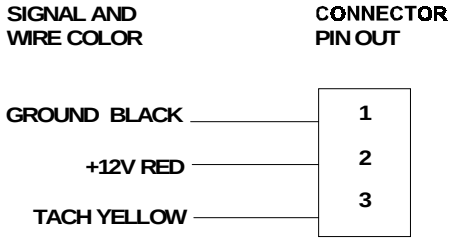

Table 8-1. Fan pin-out

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

- One Standard 40-pin IDE cable or 80-pin DMA66 IDE cable
- One Standard 68-pin SCSI cable (flat ribbon or twisted pair).
- One Standard Floppy 34-pin floppy cable.

8.3 I/O Panel Connectors

The chassis provides an ATX 2.03 compliant I/O Aperture for backside I/O. The specific panel used will be provided in the boxed server board kit. The following are typical panel connections:

- One PS/2 keyboard connector
- One PS/2 mouse connector
- Two 9-pin serial ports
- One 25-pin parallel port
- Two USB ports
- One 15-pin video port (if applicable)
- One Ethernet RJ-45 connector (if applicable)

9 Chassis 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.

9.1 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.

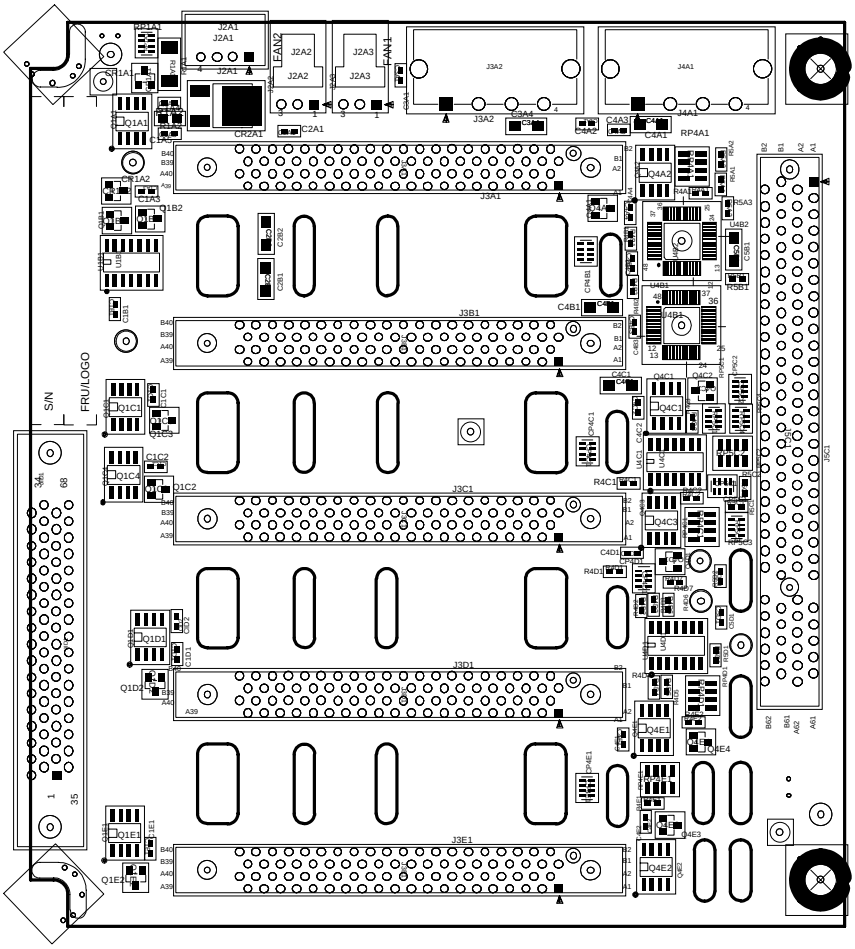

Figure 9-1: SC5000 SCSI Backplane

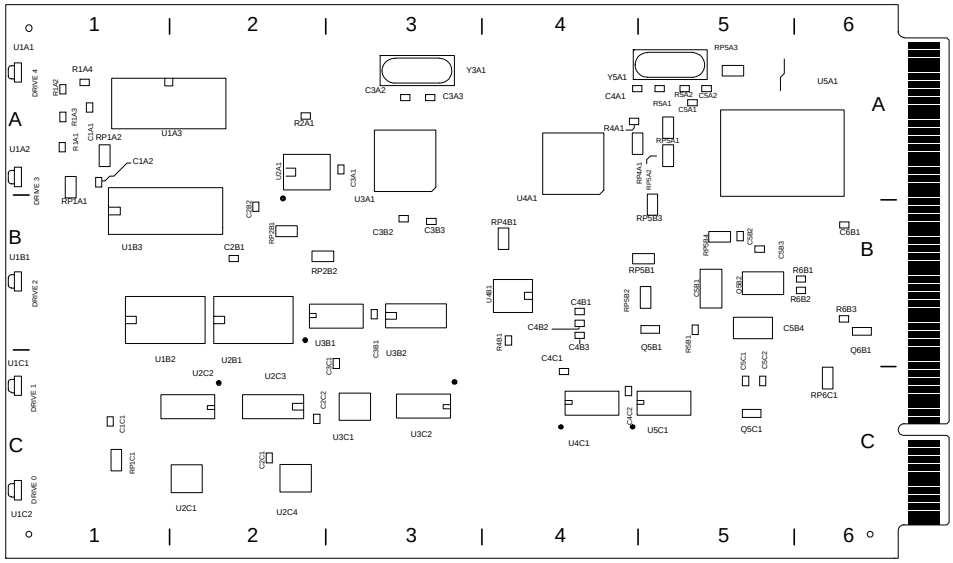

Figure 9-2: SC5000 SAF-TE Board

9.2 SAF-TE Specifications

The SC5000 Hot-Swap SCSI Backplane Board Set performs the tasks associated with hot-swappable SCSI drives, enclosure (chassis) monitoring and management, as specified in the SAF-TE Specification, Revision 1.00. 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 the 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” I2C devices (that have no bus mastering capability) during intra-chassis communications.

9.3 Product Abstract

The SC5000 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 SC5000 Hot-Swap SCSI Backplane Board set is made up of the following functional blocks:

- SCSI Bus with SCA (Single Connector Attach) drive connectors, and active LVDS terminators.
- Microcontroller with program Flash and RAM
- SCSI interface that allows the microcontroller to respond as a SCSI target
- I2C interface to Server board
- SCSI drive power control
- Fault indicator support
- Support for two cooling fans (fan-tach inputs and power control)
- Temperature sensor
- Configuration Jumpers

The Hot-Swap SCSI Backplane Board set resides in the hot-swap drive bay of the SC5000 chassis.

10 Certification

The SC5000 chassis has been designed and tested to meet the standards and regulation listed below when configured with the Intel server boards specified.

10.1 Safety

10.1.1 USA

The system is UL listed to UL 1950 – CSA 950-95, 3rd Edition (UL and cUL).

10.1.2 Canada

The system is certified by UL(cUL) to meet the requirements of CSA C22.2 No. 950-M95. The product will bear the cUL mark.

10.1.3 Europe

The system is certified to meet the requirements of EN60 950 2nd Edition with amendments by ERG (GS License). It also complies with the UE Low Voltage Directive (73/23/EEC).

10.1.4 International

The system is certified by NEMKO to meet the requirements EN60 950 with amendments and Nordic deviations, and IEC 60950 with amendments.

10.2 Electro-Magnetic Compatibility (EMC)

10.2.1 USA

The system is certified to FCC CFR 47 Part 15, Class B

10.2.2 Canada

The system complies with the Limits for Radio Noise Emissions for Class B Digital Apparatus as required by Industry Canada (IC).

10.2.3 Europe

The system complies with the EU EMC directive (89/336/EEC) via EN 55022, Class B and EN 50082-1. The product will carry the CE mark. The system is tested to the following immunity standards and maintains normal performance within these specification limits:

- IEC 801-2: ESD Susceptibility (level 2 contact discharge, level 3 air discharge)
- IEC 801-3: Radiated Immunity (level 2)
- IEC 801-4: Electrical fast transient (level 2)
- IEC 61000-3-2: Harmonics

10.2.4 International

The system is compliant with CISPR 22 class B

10.2.5 Japan

The system is registered with VCCI and complies with VCCI Class B limits (CISPR 22 B Limit).

11 Environmental Limits

11.1 System Office Environment

Table 11-1: 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	50 dBA in a typical office ambient temperature (65-75F)
Operating Shock	No errors with a half sine wave shock of 2G (with 11-millisecond duration).
Package Shock	Operational after a 24 inch free fall, although cosmetic damage may be present
ESD	15kV per Intel Environmental test specification

11.2 System Environmental Testing

The system will be tested per the Environmental Standards Handbook, Intel Doc.#662394-03. These tests shall include:

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

12 Reliability, Serviceability, and Availability

12.1 MTBF

The MTBF of a typical SC5000 system using an Intel L440GX+ server board is similar to previous L440GX+ systems such as the Astor2/L440GX+. Calculated MTBF at maximum configuration has been calculated at 55,702 hours at 35°C. The subassembly MTBF numbers from the Astor2/L440GX+ are shown below.

Item	Percentage usage	MTBF HRs
Server board	100	96,311
SCSI Backplane	100	314,618
Front panel board	100	2,852,904
Hitachi CD ROM	5	100,000
Hard Drive	100	N/A
PRO 100 B	100	464,382
Power supply	100	Unknown
1.44MB 3.5" FDU	1	81,000
32 MB DIMM	100	1,358,496
FAN	100	Unknown

Note:

Calculated for 50C and percentage usage.

12.2 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.

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.

Task	Time to complete
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)	10 minutes
Overall MTTR	20 minutes

Appendix 1: Reference Documents

- L440GX+ DP Server Board TPS
- SC5000 Front Panel TPS
- SC5000 Hot-swap Backplane EPS
- 300W PFC Power Supply Spec #747566
- 350W 1+1 Redundant PFC Power Supply Spec # 737180
- Environmental Standards Handbook, #662394-03
- SAF-TE Specification, Revision 1.00
- SSI Entry-Level Electronics-Bay Specification, Version 1.0

Appendix 2: Upgradability

- HSBP Upgrade – Product Code AXXHSDRVUG
- Rack Kit – Product Code AHDRACK

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