Intel® LB440GX 2U Rack Server Chassis Technical Product Specification

Released version 1.0
August, 1999
245251-001

intel®

Revision History

Revision	Revision History	Date
Rev 0.xx	Initial release of the Intel® LB440GX 2U Rack Server Chassis Technical Product Specification (Part #245251-001)	03/99
Rev 0.9	Revisions	06/99
Rev 1.0	Legal and Trademark Review	8/12/99

Reference Documents

- *Intel® L440GX+ Technical Product Specification (TPS) Rev 1.0*
- *Power Supply, 300W, 5 Output, with PFC Rev 2.0*
- *Entry-Level Electronics-Bay Specification Rev 0.90*
- *ATX Specification Version 2.03*
- *SCSI Accessed Fault-Tolerant Enclosures Interface Specification*, *© Conner Peripherals and Intel Corporation, Revision 1.00, October 17, 1995*
- *SCSI Parallel Interface-2*, draft proposal revision 20a

TABLE OF CONTENTS

Figures

Tables

1 Introduction

This specification details the feature set of the Intel® LB440GX 2U rack server chassis, an ATX-form factor server chassis designed for the Intel® L440GX+ server board.

Intel® LB440GX features include:

- 2U rack mount chassis (3.46" H x 16.75" W x 28" L)
- One floppy drive
- Two 32-bit/33 MHz PCI slots on the included PCI Riser Card
- Four hot-swap hard drive bays capable of supporting two 1" and two 1.6" LVD SCSI hard drives
- Two system fans
- One 300-Watt PFC PS/2* power supply

2 Chassis

The chassis is 3.46 inches high, 16.75 inches wide, and 28 inches long. The rear I/O panel conforms to the ATX Specification version 2.03, supporting two expansion cards.

2.1 Chassis Color

The primary exterior chassis color will match Intel Color Standard 513505 (dusty beige).

2.2 Front Panel Features

The front panel is pressed SECC with four removable SCSI drive bays, two 1.6" and two 1". The front panel also allows for a floppy drive and full-size CD-ROM. The front panel contains a power button power indicator LED, and hard drive activity LED's.

2.3 Security

At the chassis level, no security option is provided (no chassis intrusion).

2.4 I/O panel

All input/output connectors are accessible on the rear of the chassis and an ATX 2.03-compatible cutout is provided for I/O shield installation. A metal I/O shield with appropriate Electromagnetic Interference (EMI) gasket is installed in the cutout in order to maintain EMI-compliance levels. The I/O cutout dimensions (measured in inches) are shown in Figure 1 below.

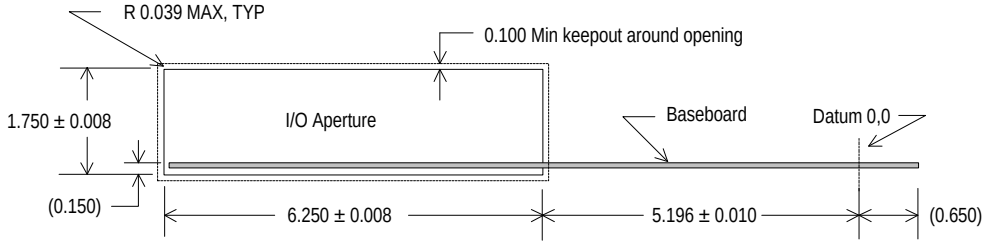


Figure 1. ATX 2.03 I/O Aperture

2.5 Chassis Views

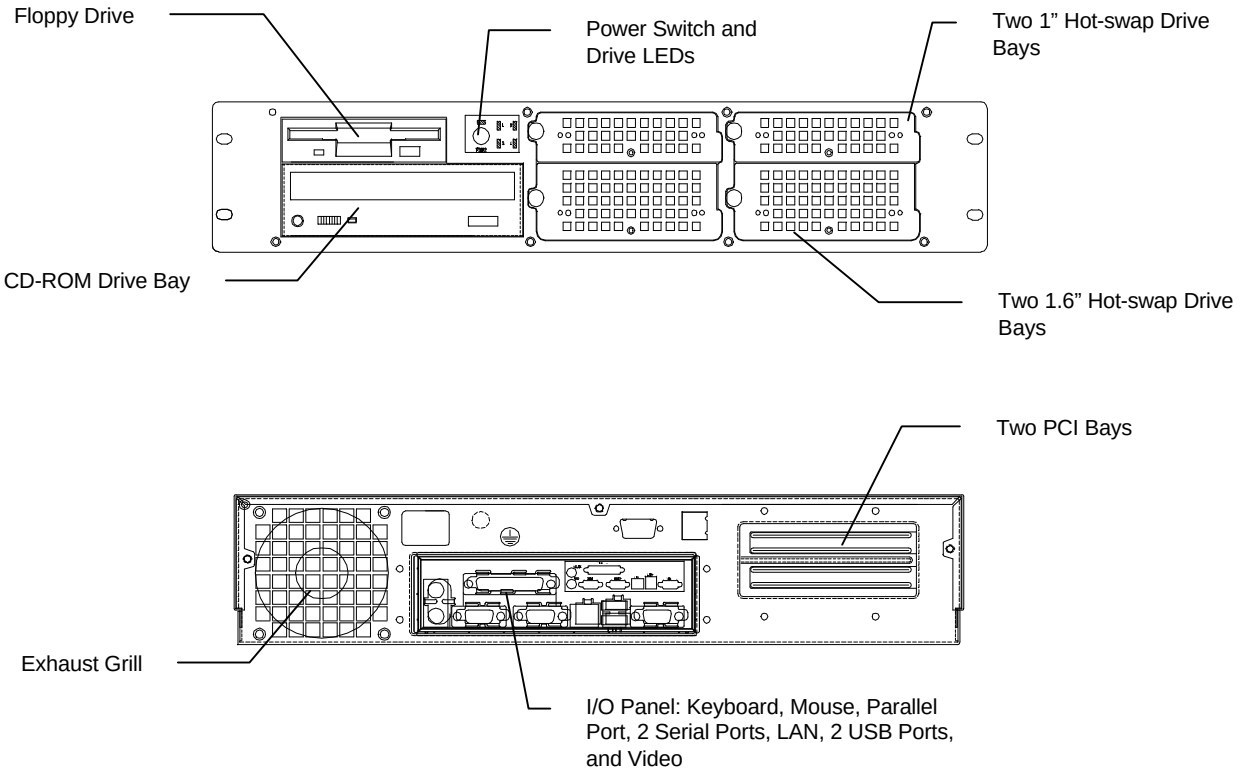


Figure 2. Front and Rear Chassis Views

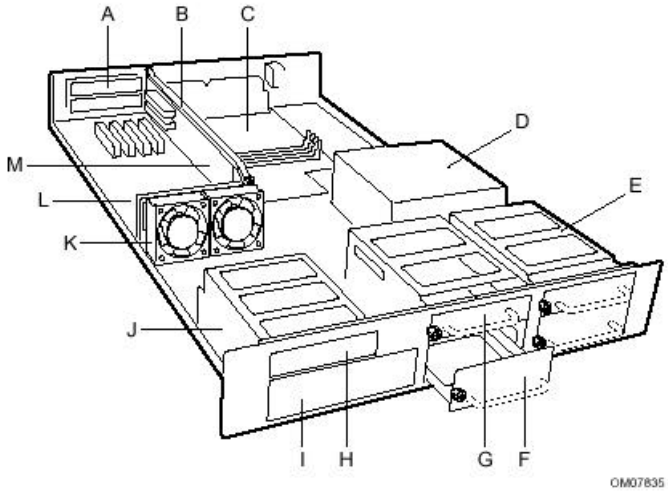


Figure 3. Major System Elements

A. Expansion slot covers	H. Floppy drive
B. PCI riser card bracket	I. Drive bay EMI cover
C. Server board	J. 5 ¼ -inch drive bay
D. Power supply	K. Fan
E. Hot-swap drive bay	L. Add-in card bracket
F. 1.6-inch hard drive carrier	M. PCI riser card
G. 1-inch hard drive carrier	

Figure 3. Isometric View without Top Cover

2.6 Chassis Dimensions

Height	2U (80 mm)
Width	16.75” (480 mm)
Depth	28” (711 mm)

Table 1. Chassis Dimensions

3 Chassis Power Subsystem

This chassis uses a single standard PS/2 form factor power supply. Variations may be chosen for future board sets to satisfy the chassis power, power distribution, thermal performance, acoustic noise and cost requirements.

The form factor was chosen to optimize the overall chassis dimensions. The typical PS/2 form factor power supply with a remote enable feature can be used. The remote enable feature permits the chassis power to be activated from a variety of sources, allowing the implementation of "Wake On LAN*" (WOL) or other remote management features. The 300-watt PFC (Power Factor Correction) power supply features a 24-pin main power connector and a 6-pin Auxiliary ATX power connector. The following table is a brief overview:

ATX 300W Non-PFC 719680-002	P/S Rating, Maximum Continuous Current
+5 VDC Output	26 Amp Max
+12 VDC Output	10 Amp Max
-12 VDC Output	0.5 Amp Max
-5 VDC Output	0.25 Amp Max
+3.3 VDC Output	16 Amp Max
+5 VDC Standby	800mA Max
Output balancing	Total combined output power of +3.3V and +5V shall not exceed 167 W.
AC Line Voltage	Autorange
AC Line Frequency	50/60 Hz
AC Input Current	4.6 Amp at 115 VAC 2.3 Amp at 220 VAC

Table 2. Power Supply Output Summary

3.1 Mechanical Outline

The mechanical outline and dimensions of the power supply adhere to the standard PS/2 Form factor. The approximate dimensions are: 140mm high x 86mm wide x 150mm deep.

3.2 Fan Requirements

The power supply incorporates an 80mm low-acoustic-noise fan to exhaust air. The sound pressure level is measured at a distance of 0.1 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.

Due to the increased output 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 will run at a reduced RPM when the system is off.

3.3 AC Power Line

The power supply is specified to operate from 100-120VAC, 200-240VAC, at 50 or 60Hz and is auto-ranging. The power supply is tested to meet these voltages, and has been tested (but not specified) in a configured system at ± 10% of the voltage ranges, and similarly ± 3Hz on the line input frequency.

The power supply, in a configured 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 50Hz).

The power supply is not damaged by AC surge ring wave up to 3.0kV/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. Additionally, the chassis will not be damaged by a unidirectional surge waveform of up to 1.5kV/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 Connector Pin Assignments

3.4.1 P1 Main Power Connector

Housing: 24-pin Molex* 39-01-2240, Contact: Molex 39-00-0038

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	+3.3VDC	Orange	13	+3.3VDC	Orange
2**	+3.3VDC +3.3V remote sense	Orange Orange	14	-12VDC	Blue
3**	COM 3.3V remote sense RTN	Black Black	15	COM	Black
4	+5VDC	Red	16	PS_ON_L	Green
5	COM	Black	17	COM	Black
6	+5VDC	Red	18	COM	Black
7	COM	Black	19	COM	Black
8	PWR OK	Gray	20	-5V	White
9	5VSB	Purple	21	+5VDC	Red
10	+12VDC	Yellow	22	+5VDC	Red
11	+12VDC	Yellow	23	+5VDC	Red
12	+3.3VDC	Orange	24	COM	Black

Table 3. 20+4-pin "Modified ATX" Power Supply Connector

- Note**: The 3.3V power and 3.3V remote sense are double crimped into a single contact at pin 2. The 3.3V remote sense return and COM are double crimped into a single contact at pin 3.

- The "Modified ATX" main power connector is configured as the standard ATX 20 (2x10) pin connector plus a 2x2 (4) pinout designed to supply additional +5VDC to the board. For connecting this into the Intel® L440GX+ server board, use the 24-pin power connector on the board.

3.4.2 P10 ATX Aux Power Connector

Housing: 6-pin Molex 90331-0010, Contact: Molex 09-50-0277

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	COM	Black	4	+3.3VDC	Orange
2	COM	Black	5	+3.3VDC	Orange
3	COM	Black	6	+5VDC	Red

Table 4. Aux ATX Power Connector

3.4.3 P2-P8, P11, P12 Peripheral Power Connector

Housing: Amp 1-480424-0, Contact: Amp 61314-1

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

Table 5. Peripheral Power Connector

3.4.4 P9 Floppy Drive Power Connector

Housing: Amp 171822-4

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

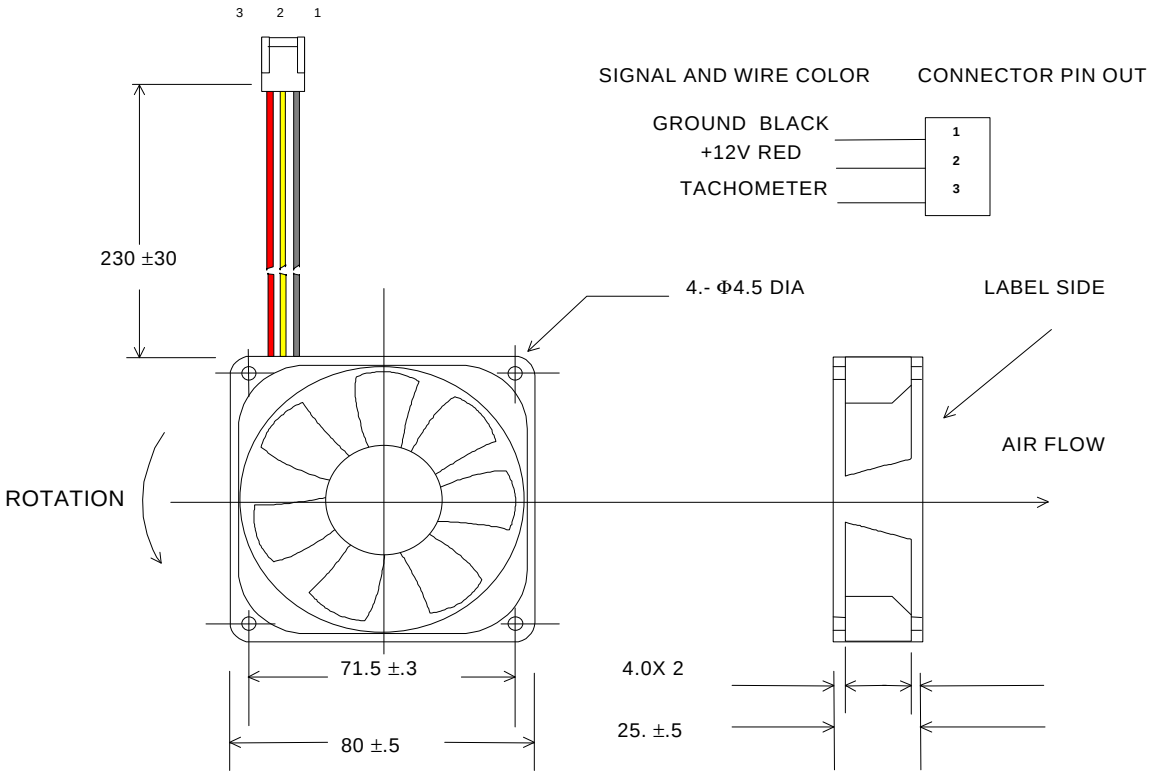
Table 6. Floppy Drive Power Connector

3.5 Power Supply/Chassis Configuration

The Intel® LB440GX 2U rack server platform can only be configured with a single power supply. For a more detailed specification on the power supply, see document 719680, the specification for the 300-Watt power supply with PFC.

4 Chassis Cooling

Two system fans and the power supply fan provide cooling for the processor(s), hard drives, and add-in cards. Two 80mm system fans are mounted in the middle of the chassis. All chassis fans provide a single tachometer output for RPM detection that the server board can make available for server management monitoring and alert functions. Removal of the top cover gives access to the fans, which then can be easily changed with the system powered down.



All measurements are in millimeters

Figure 4. 80mm System Fan

5 Chassis Peripheral Bays

5.1 3.5" Floppy Drive Bay

The chassis provides for the installation of a 3.5“ floppy drive above the 5.25” CD-ROM drive bay. Removal of the top cover provides access for replacement of the floppy drive.

5.2 5.25" Drive Bay

The chassis supports one half-height (1.6” high) removable media peripheral devices (typically CD-ROM). As a guideline based on cooling capabilities, the maximum recommended power per device is 17W. Thermal performance of specific devices must be verified to ensure compliance to the drive manufacturer’s specifications.

The 5.25" peripherals are removable from the front of the chassis after removal of the top cover.

5.3 LVD SCSI Hot-Swap Drive Bays

The LB440GX 2U rack server chassis supports up to four (two 1” high and two 1.6” high) 3.5" LVD Ultra-2 SCSI hard drives which are accessible from the front of the chassis. Four low-cost SECC carriers are provided with the chassis to be installed on the hard drives.

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°C.

6 Front Panel

The front panel board includes the Power On/Off button, a green Power On LED, four green hard drive activity LED's (not drive failures), which are visible through the front inlay.

A four-pin connector is provided on the front panel board for connection to the hot-swap backplane for drive activity of drives number 1 and 2.

A four-pin connector is provided on the front panel board for connection to the hot-swap backplane for drive activity of drives number 3 and 4.

A four-pin connector is provided on the front panel board for connection to the baseboard for power LED.

A two-pin connector is provided on the front panel board for connection to the baseboard for the power switch.

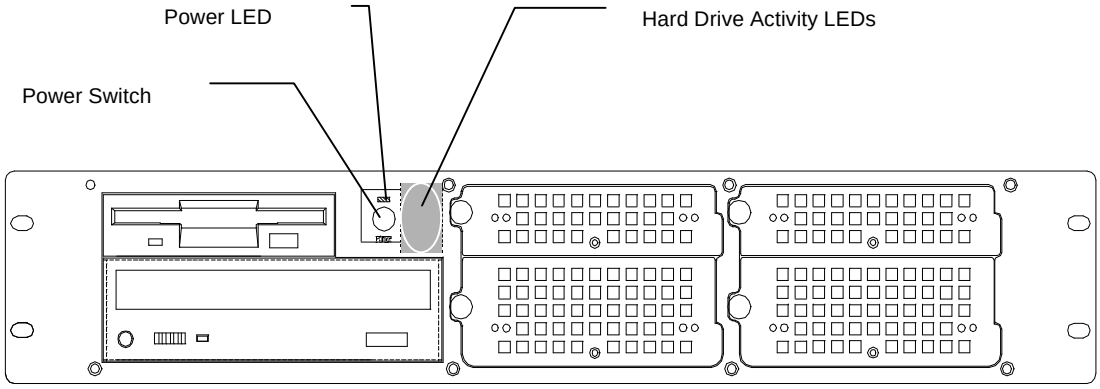


Figure 5. Front Panel and Functions

7 Hot-Swap SCSI Subsystem

The Intel® LB440GX 2U rack server chassis has two independent, identical hot-swap backplanes. Each backplane supports two Ultra2 SCSI hot-swappable drives. Two configurable switches on the back of each backplane (see Figure 11) determine the identification of each drive. The backplanes are then daisy chained with a standard 68-pin Ultra-2 SCSI cable. The hot-swap SCSI subsystem supports the following features:

- Hot-swapping of Ultra-2 SCSI drives, that allows connection of SCSI devices while the power is on.
- Full dual mode LVD operation, compliant with Fast, Ultra and Ultra-2 SCSI bus operation.

7.1 Subsystem Purpose

The Intel® LB440GX 2U rack server chassis hot-swap SCSI backplane performs the tasks associated with hot-swappable SCSI drives. The backplane design allows for:

- Four high density 68 pin connectors for four LVD Ultra-2 compatible SCSI drives
- Active termination on SCSI bus
- Per-drive power control, including automatic slot power down upon drive removal

7.2 Abstract

The Intel® LB440GX hot-swap SCSI backplane is made up of the following functional blocks:

- SCSI Bus with Ultra-2 high density LVD 68 pin drive connectors, and active terminators
- SCSI drive power control
- Configuration jumpers

7.3 Hot-Swap Backplane Board Layout

The backplanes reside in the hot-swap drive bay of the Intel® LB440GX 2U rack server chassis. Note this is a passive backplane, which means there is no firmware associated with it (no SAF-TE ASIC). As a result, server management will not be able to determine the status of each drive.

The following diagram shows the layout of components and connectors on the hot-swap SCSI backplane printed circuit board.

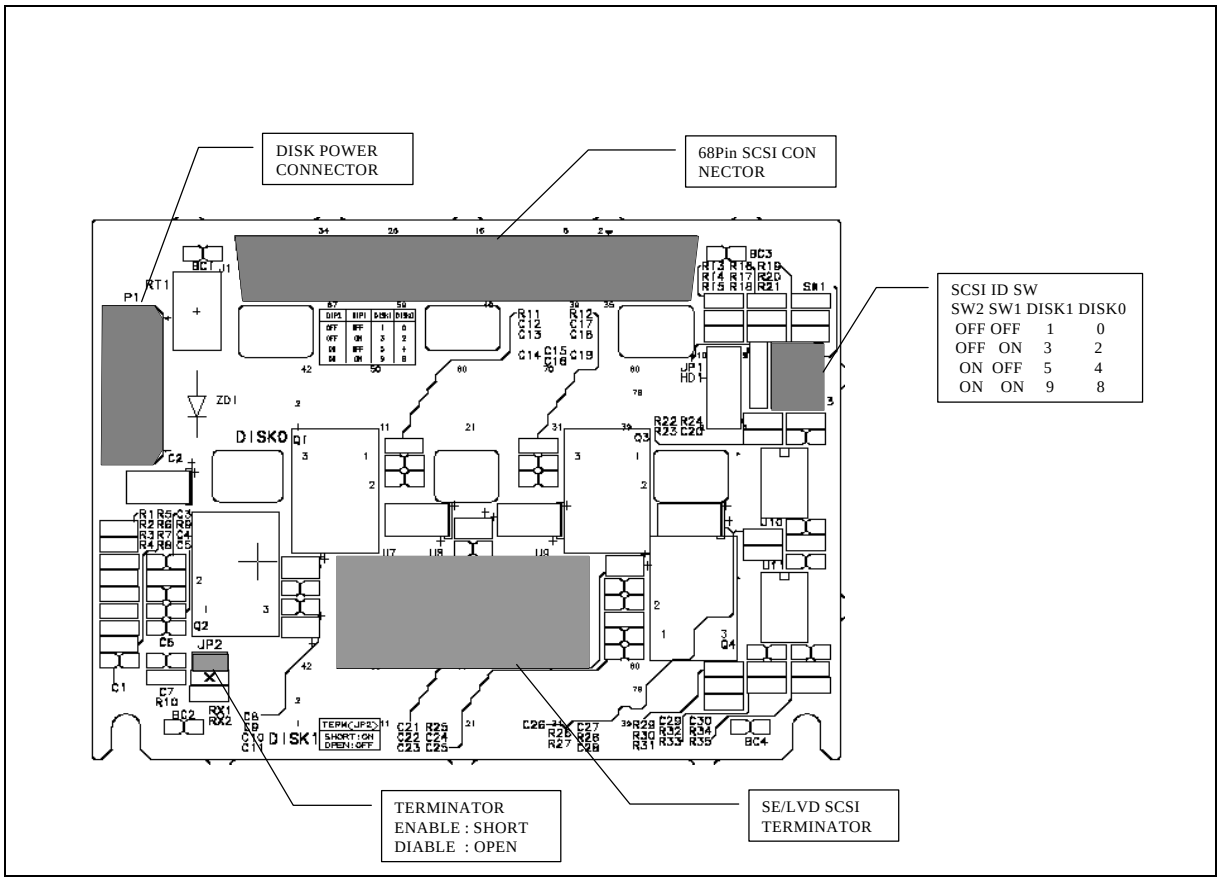


Figure 6. Functional Diagram of the Hot-Swap SCSI Backplane

7.3.1 Configuration Options

The following table lists all possible SCSI ID switch configurations of the Intel® LB440GX hot-swap SCSI backplane and the resulting SCSI ID for the position of each switch.

SW 2	SW 1	ID of Disk 1	ID of Disk 0
OFF	OFF	1	0
OFF	ON	3	2
ON	OFF	5	4
ON	ON	9	8

Table 7. HSBP Configuration Jumpers

7.4 Functional Description

This section defines the architecture of the Intel® LB440GX Hot-swap SCSI Backplane, including descriptions of functional blocks and how they operate. The following figure shows the functional blocks of the Hot-swap SCSI Backplane. An overview of each block follows.

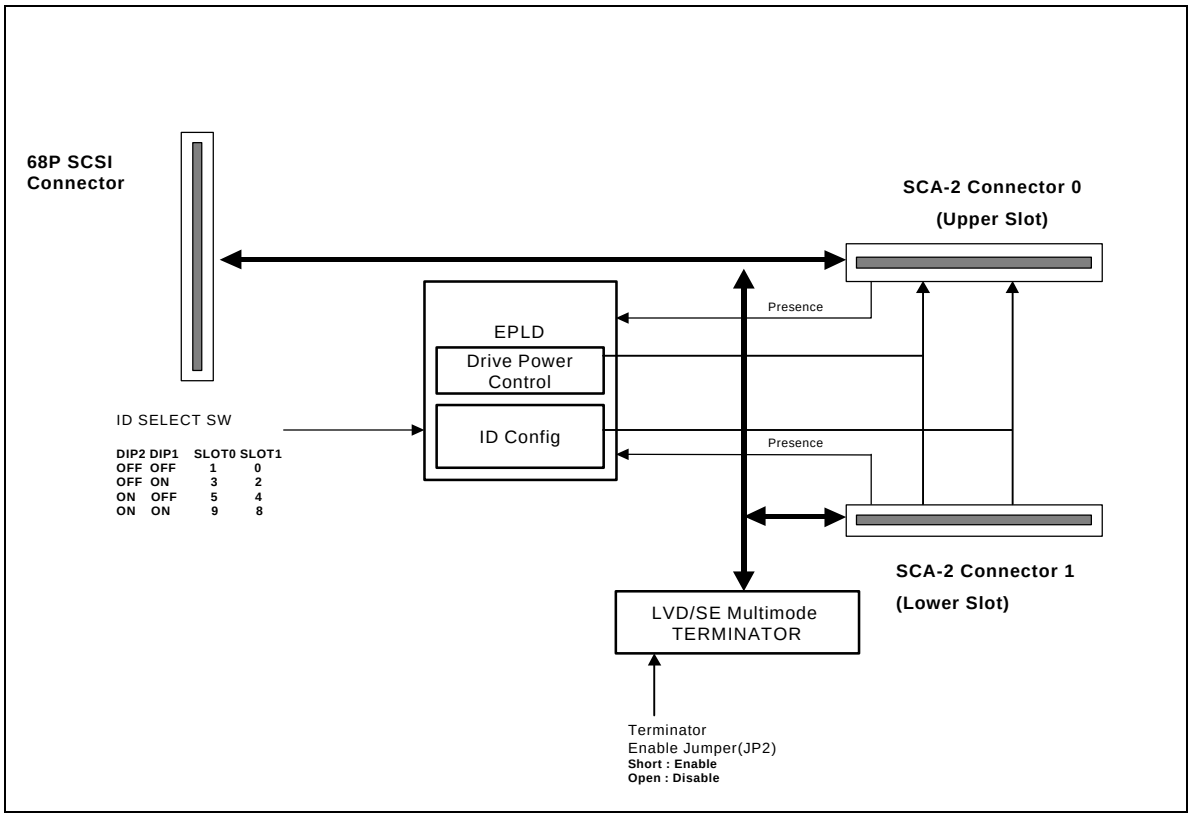


Figure 7. Hot Swap SCSI Backplane Block Diagram

7.4.1 68 pin LVD high density Hot-Swap Connectors

The Intel® LB440GX contains two hot swap backplane boards with two high-density LVD connectors on each backplane. The connectors provide power and SCSI signals using a single connector. Each SCSI drive attaches to the backplane using one of these connectors.

7.4.2 SCSI Interface

The SCSI interface on the Intel® LB440GX Hot-swap SCSI Backplane provides the required circuitry between the SCSI bus and the Adaptec controller, which contains the intelligence for the backplane. The interface consists of an Altera EPLD. After powering on, the Altera EPLD detects the presence of disks in the slots and powers them on. The SCSI ID configuration of the disks is configured on the backplanes by using two DIP-switches located on the boards. See section 7.3.1 for the SCSI ID configuration options.

8 Dual-Slot PCI Riser

The Intel® LB440GX employs a dual-slot PCI riser, which provides two full-length 32-bit/33Mhz PCI. The riser is an active riser due to the extra PCI Bus Bridge on the card. The riser resides in PCI slot number 5 of the Intel® L440GX+ server board.

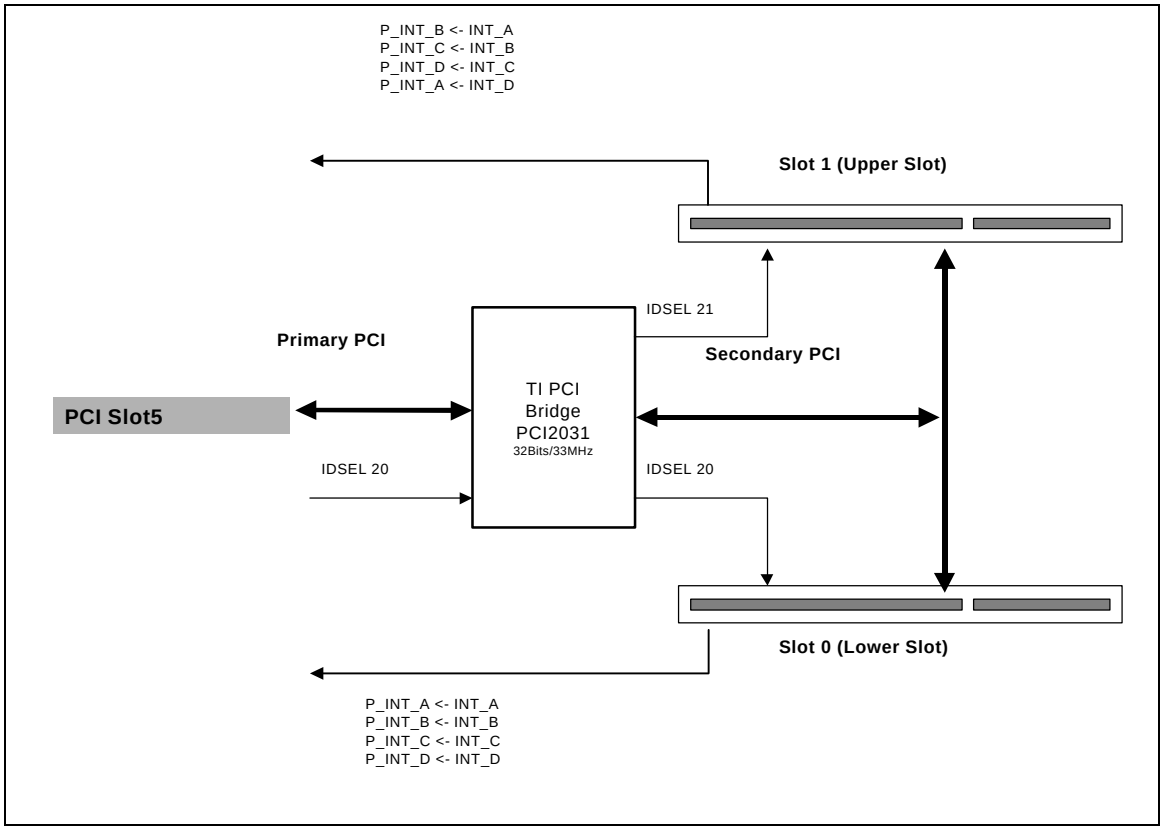


Figure 8. Active PCI Riser Block Diagram

Note: The Intel® L440GX+ baseboard provided in the Intel® LB440GX system contains 6 PCI slots and 1 ISA slot. PCI Slot 5 contains the PCI Riser Card. The other slots are inactive and should not be used. Any (up to two) PCI cards in the system should be inserted in the slots on the PCI Riser card.

9 Chassis Interconnection

9.1 Chassis Internal Cables

Front panel board to hot-swap backplanes

- A four-pin connector connect the front panel board to the second hot-swap backplane to transfer drive activities to the LED indicators of drives 3 and 4.
- A four-pin connector connects the front panel board to the first hot-swap backplane to transfer drive activities to the LED indicators of drives 1 and 2.

Front panel board to server board

- A two-pin connector cable provides Power On/Off function.
- A four-pin connector cable connects the server board to the front panel board to provide server board power status.

Server board to hot-swap backplanes

- An Ultra-2 SCSI cable (68-pin) is provided to interface from the installed server board to the two hot-swap backplanes.
- Two high-density 68-pin connectors in each backplane provide interface between the hot-swap SCSI backplane and hot-swap SCSI devices.

9.2 Connector Interfaces

Each pin is classified by type, as shown in the following table.

Type	Description
PWR	Power connection (power or ground)
I/O	Bi-directional signal
O	Output signal
I	Input signal
O/C	Open-collector output signal
O/D	Open-drain output signal

Table 8. Pin Types

9.2.1 Hot-Swap Backplane and Peripheral Power Connectors

The hot-swap backplane power connector and peripheral power connectors are a standard four-pin shrouded plastic PC power connectors with mechanical keying. Connector pinout is shown below.

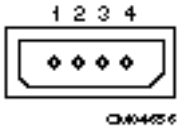


Figure 9. Peripheral power connector

Name	Pin	Description
+12V	1	+12 Volt power supply (yellow wire)
GND	2	0V Electrical ground (black wire)
GND	3	0V Electrical ground (black wire)
+5V	4	+5 Volt power supply (red wire)

Table 9. Peripheral power connectors

10 Supported Intel Server Boards

The following is a summary of the feature sets for Intel server boards supported by the Intel® LB440GX 2U rack server chassis. Please refer to the appropriate server board Technical Product Specification for greater detail.

10.1 Intel® L440GX+ DP Server Board

- Support for Single or Dual Pentium® II processors of identical speed and stepping, current revision
- Designed around the Intel® 440GX AGPSet, PIIX4e, I/O APIC devices for full MPS 1.4 compliance.
- 100MHz System Bus (Front Side Bus)
- Support for up to 2 GB 100MHz "PC/100" compliant registered or 1GB of unbuffered ECC or Non-ECC SDRAM DIMMs (4 sites)
- Dual Peer PCI buses providing 6 PCI slots.
- Adaptec* AIC-7896 Dual function PCI SCSI controller providing Ultra2 (LVDS) wide and Ultra wide SCSI channels. Support for Adaptec ARO-1130U2 RAID*Port** "zero channel" RAID controller.
- Intel® 82559 PCI 10/100Mbit Ethernet controller with integrated physical layer. Onboard RJ-45 Network connector.
- Cirrus Logic* GD5480 PCI SVGA graphics controller, 2MB of Synchronous Graphics memory (SGRAM)
- PCI IDE controller (in PIIX4E) providing dual independent Ultra DMA/33 IDE interfaces, each able to support 2 IDE drives.
- Compatibility I/O device integrating floppy, dual serial and parallel ports, all connectors provided.
- Universal Serial Bus (USB) support with two USB connectors.
- Integration of server management features, including thermal, voltage, fan, and chassis monitoring into one controller. Emergency Management Port (EMP) feature. Introducing Platform Event Paging (PEP) Feature enabling remote notification of significant server management events.
- Flash BIOS support for all of the above.

11 Regulatory Information

11.1 Regulatory Compliance

11.1.1 Safety Standards

UL 1950 - CSA 950-95, 3rd Edition, July 28, 1995
The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada). This product has been evaluated and complies with UL1950 – CSA 950-95 3rd Edition. However, if a UL1950 2nd Edition modem telecommunications add-in card is used, the system will be deemed to comply with UL 1950 2nd Edition/CSA950-93.

EN 60 950, 2nd Edition, 1992
The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)

IEC 950, 2nd edition, 1991
The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)

EMKO-TSE (74-SEC) 207/94
Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark, and Finland)

11.1.2 EMC Regulations

FCC Class B
Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)

CISPR 22, 2nd Edition, 1993, Amendment 1, 1995
Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)

EN 55 022, 1995
Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)

EN 50 082-1, 1992
Generic Immunity Standard. Currently, compliance is determined via testing to IEC 801-2, -3 and -4. (Europe)

VCCI Class B (ITE)
Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)

ICES-003, Issue 2
Interference Causing Equipment Standard, Digital Apparatus. (Canada)

Australian Communication Authority (ACA)
Australian C-tick mark, limits and methods of measurement radio interference characteristics of information technology equipment to ASNZS 3548 (Australian requirements based on CISPR 22 requirements).

New Zealand Ministry of Commerce
Australian C-tick mark, limits and methods of measurement radio interference characteristics of information technology equipment to ASNZS 3548 (New Zealand requirements based on CISPR 22 requirements). New Zealand authorities accept ACA C-Tick Compliance Mark.

11.1.3 Regulatory Compliance Markings

This product is provided with the following Product Certification Markings.

- UL, cUL Listing Marks
- CE Mark and CE Declaration of Conformity
- The CE marking on this product indicates that it is in compliance with the European community's EMC (89/336/EEC) and low voltage directives (73/23/EEC)
- NEMKO Mark
- German GS Mark
- FCC, Class B Markings (Declaration of Conformity)
- ICES-003 (Canada Compliance Marking)
- C-Tick Mark (Australia Compliance Marking)

11.2 Electromagnetic Compatibility Notice (USA)

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

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

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

Only peripherals (computer input/output devices, terminals, printers, etc.) that comply with FCC Class 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.

⟹ **NOTE**

If a Class A device is installed within this system, then the system is to be considered a Class A system. In this configuration, operation of this equipment in a residential area is likely to cause harmful interference.

11.2.1 FCC Declaration of Conformity

Product Type: BAR2

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

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

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe B 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 B limits for radio noise emissions from digital apparatus set out in the interference causing equipment standard entitled "Digital Apparatus," ICES-003 of the Canadian Department of Communications.

11.3 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Ｂ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

(English translation of the notice above) This is a Class B 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.

When used near a radio or TV receiver, it may become the cause of radio interference.
Read the instructions for correct handling.
This equipment has been tested for radio frequency emissions and has been verified to meet CISPR 22 Class B.

12 Environmental Limits

12.1 System Office Environment

Parameter	Limits
Operating Temperature	+5°C to +35°C with the maximum rate of change not to exceed 10°C per hour.
Non-Operating Temperature	-40°C to +70°C
Non-Operating Humidity	95%, non-condensing @ 30°C
Acoustic noise	< 45 dBA in an idle state at 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	20kV per Intel Environmental test specification

Table 10. System Office Environment Summary

12.2 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 and Unpackaged Shock

Packaged and Unpackaged Vibration

AC Voltage, Freq. & Source Interrupt

AC Surge

Acoustics

ESD

EMC Radiated Investigation

13 Reliability, Serviceability, and Availability

13.1 Mean-Time-Between-Failure (MTBF)

MTBF data was being collected at the time of the generation of this specification. It will be provided in a future revision of this specification or a Specification Update.

13.2 Serviceability

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

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

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

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 rear drive bay fans	3 minutes
Remove and replace front system fan	5 minutes
Remove and replace expansion board	5 minutes
Remove and replace front panel board	5 minutes
Remove and replace baseboard (with no expansion boards)	10 minutes
Overall MTTR	20 minutes