Intel AP450GX MP Server System

Technical Product Specification

Order Number ***282966-002***

February 1997

The AP450GX MP Server System may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Characterized errata that may cause the AP450GX MP Server system's behavior to deviate from published specifications are documented in the AP450GX MP Server System Specification Update.

Revision History

Revision	Revision History	Date
-001	Initial release of the AP450GX MP Server System Technical Product Specification	10/96
-002	Second release of the AP450GX MP Server System Technical Product Specification	2/97

This product specification applies only to standard AP450GX MP Server system.

Changes to this specification will be published in the AP450GX MP Server System Specification Update before being incorporated as a revision to this document.

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or call in North America 1-800-879-4683, Europe 44-0-1793-431-155, France 44-0-1793-421-777,
Germany 44-0-1793-421-333, Japan (fax only) 81-0-120-478-832, other Countries 708-296-9333

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1. INTRODUCTION

The AP450GX MP Server System is a high reliability, high availability, high performance server system capable of supporting up to four Pentium® Pro processors and up to 2 GB of memory. An optional memory module which supports up to 4 GB of memory is also available. The system contains the AP450GX MP Server board set, redundant cooling, two hot-swap SCSI backplanes, optional redundant/hot-swappable power supplies and many built-in server management features.

This document details key chassis and system features *of* the AP450GX MP Server System. Refer to the *AP450GX MP Server System Specification Update* for the most recent specification updates on the system. The AP450GX board set features are detailed in the *AP450GX MP Server Board Set Technical Product Specification*. Refer to the *AP450GX MP Server Board Set Specification Update* for the most recent specification updates concerning the board set. The combination of these documents provides a full overview of the AP450GX MP Server System. This product specification details the following:

- Chassis
- Power system
- Chassis cooling
- Peripheral bays
- Baseboard (limited description)
- I/O and interconnects
- System configuration
- System certifications
- Environmental limits
- Reliability, availability, and serviceability

1.1 Related Documentation

Contact your Intel sales representative to obtain the following documents:

AP450GX MP Server Board Set Technical Product Specification

AP450GX MP Server Board Set Specification Update

AP450GX MP Server System Specification Update

AP450GX MP Server System Performance Brief

Installation Guide -- for the AP450GX MP Server System

Service Guide -- for the AP450GX Server System (Available only in electronic format)

Server SCSI Software User's Guide for the AIC-7800 Family of Controllers

LANDesk® Server Manager Technical Product Specification

LANDesk® Server Manager Installation and User's Guide

LANDesk® Server Control Installation and User's Guide

Server Monitor Module Technical Product Summary

1.2 Feature Summary

Table 1-1. AP450GX Feature Summary

System feature	Description
Symmetric Multi-processing support	Two expansion slots for processor modules; up to four Pentium® Pro microprocessors (two on each module). The system may include one processor module and one terminator module, or two processor modules. MPS 1.1 and 1.4 compliant with the appropriate Pentium® Pro processor extensions.
Upgradable memory	One expansion slot for a memory module, supporting up to 2GB of memory using 128MB SIMM's. An alternate memory module is available which supports up to 4GB of memory using 128MB DIMMs.
PCI bus support	Two PCI "peer" buses, each with three 32-bit PCI slots, on the system baseboard.
EISA bus support	Four dedicated EISA bus master slots on the system baseboard.
SCSI controller	Two PCI based, integrated AIC-7880 controllers; fast/wide and Fast-20 SCSI-2 support.
Hot-swap hard drives	Up to 12 Hot-swap hard drives (3.5" wide, 1.6" high SCSI-2 hard drives with the 80 pin SCA connector).
Peripheral bays	Four 5.25" half-height bays for CD-ROM, tape back-up, etc.
Video controller	Integrated ISA based CL-GD5424 super VGA controller shipped with 512KB of video memory (expandable to 1MB).
External device connectors	Onboard connectors for 2 serial ports, parallel port, PS/2-compatible keyboard and mouse, and VGA monitor.
Redundant cooling	Three dedicated chassis fans; any one can fail without degraded system cooling capabilities.
Optional redundant/hot-swappable power supplies	The system supports two or three (redundant/hot-swappable) 420W power supplies which are easily replaced.
System hardware monitoring	Chassis intrusion switches and onboard sensors for temperature, voltage, and fan failure.
Emergency management	Optional Server Monitor Module to allow remote access and emergency server control.
I^2C Bus support	I^2C bus connects all major system components together for diagnostic information.
RAID support	Optional RAID controller adapter with cache and battery back-up.

2. CHASSIS

The chassis is optimized for reliability and serviceability. It is used with the modular AP450GX MP Server board set. The main features of the chassis are:

- Built-in 3.5" diskette drive bay
- Four 5.25" half-height external peripheral bays
- Two hard drive bays, each holding six 3.5" hot-swap hard drives (a total of 12)
- LCD display
- Front panel indicator LED's
- Power and reset controls
- Customizable front bezel for customer's unique look
- Redundant cooling fans
- Redundant/hot-swappable power supplies (optional)

2.1 Chassis Features and Controls

Below is a brief description of the chassis features and controls on both the front and back of the chassis. Details of each feature are discussed later in this document.

2.1.1 Chassis Features and Controls

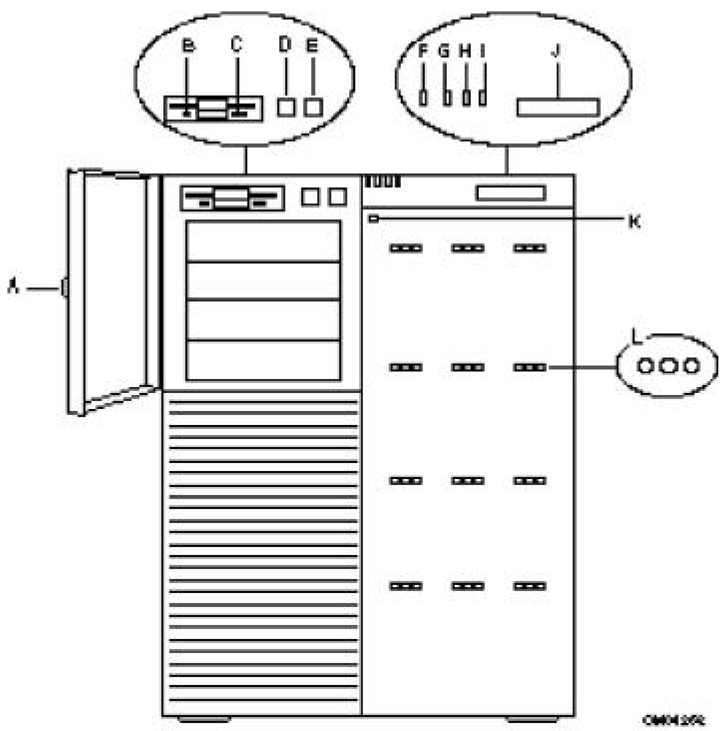


Figure 2-1. AP450GX Features & Controls (Front)

Table 2-1. Chassis Features, Front

	Chassis Feature	**Description**
A	Key lock	Secures both front external doors.
B	Activity light, 3.5” diskette drive	When lit, drive is in use.
C	Ejector button, 3.5” diskette drive	Press to eject diskette.
D	DC power switch (convex button)	Press to turn system DC power on or off. For system security, the power-off function can be disabled via the BIOS secure mode.
E	Reset switch (concave button)	Press to cause a hard reset to the system; the power-on self test (POST) will run. The Reset switch can be disabled via the BIOS secure mode.
F	Power-on LED, green	When lit, power is present in system (+5 and +12 VDC). When off, power is turned off or power source is disrupted.
G	Power-fail LED, yellow	When lit, a power supply has failed (this LED blinks when the +5.1VDC, or +12 VDC has exceeded the 240VA limit).
H	Cooling-fail LED, yellow	When lit,a fan has failed.
I	Drive-fault LED, yellow	When lit, a drive has failed (this LED will function only if a SCSI host controller that supports the SAF-TE control signals is installed in the system).
J	LCD panel	Displays information about processor type and system failures (error and diagnostic information).
K	NMI switch	Nonmaskable interrupt switch located behind closed front door (this is not an external button switch; press by using a narrow tool or pen).
L	SCSI drive status LED’s	Left to right: Drive present/power on; drive active; drive fault. Each drive has three LED’s visible above the bay from the front. See following table for status descriptions.

Table 2-2. SCSI Drive Status LED Descriptions

SCSI drive present, power on **green LED**	**SCSI drive active** **green LED**	**SCSI drive faulty**[1] **yellow LED**	**Description and action if needed**
● On	❍ Off	❍ Off	Drive is present with power.
● On	✳ Blinking	❍ Off	Drive is present with power and is being accessed.
● On	❍ Off	● On	Drive CAN be replaced. Steady yellow fault light indicates drive has a problem. Power to drive is on.
● On	❍ Off	✳ Slow blinking	Drive SHOULD NOT be replaced at this time. A slow blinking yellow fault light indicates that a drive that has just been replaced is in recovery mode (drive array being rebuilt). Power to drive is on.
❍ Off	❍ Off	❍ Off	There is no drive installed in the bay.

Notes:

1. Table assumes a SCSI host controller is installed to send the appropriate SAF-TE control signals to control the drive fault LED's.

2.1.2 Features and Controls (Back)

Figure 2-2. AP450GX Features & Controls (Back)

Table 2-3. Features and Controls (Back) Descriptions

	Chassis Feature	**Description**
A	AC input power connector	One for each power supply.
B	Power supplies (three shown)	Possible configurations, installed from bottom bay up: 2 supplies High-end system (nonredundant) 3 supplies High-end redundant system (one redundant, the supplies are hot-swappable)
C	Side cover padlock loops	One on each side at the back (0.28" diameter hole).
D	Keyboard	PS/2*-compatible 6-pin connector. Keyboard and mouse connectors are identical.
E	Mouse	PS/2-compatible 6-pin connector. Mouse and keyboard connectors are identical.
F G	COM1 and COM2	Serial port 9-pin connectors A (COM1) and B (COM2).
H	VGA	VGA* monitor 15-pin connector.
I	LPT1	LPT1 25-pin parallel port connector.
J	PCI slots	Six PCI adapter card slot locations.
K	EISA slots	Four EISA adapter card slot locations.
L	Knockouts	Available to route SCSI signals to peripheral boxes. 3 - 68-pin Wide SCSI knockouts 1 - 50-pin Narrow SCSI knockout
M	Power supply status LED's	See following table for status descriptions.

Table 2-4. Power Supply Status LED Descriptions

(PS) Power supply OK	**(I) Power supply current OK**	**Power supply LED status descriptions[1]**
On ●	● On	Power supply on and OK.
Off ❍	❍ ● Off or On	Power supply failure.
On ●	❍ Off	Current limit.
On ●	● On	Power supply disabled with the PON signal that system uses to turn on/off power supplies.

Notes:

1. See Appendix E, Erratum #4, for errata related to power supply LED status descriptions.

2.2 System Color

The primary exterior system color matches Intel Color Standard 513505 (beige). Custom OEM color matching is available for all painted exterior sheet metal components and all plastic bezel components.

2.3 Front Bezel

The front bezel is molded in four plastic pieces. The main portion of the bezel, the frame, is easily installed on the chassis and covers the left half of the chassis front. It also provides the support for the other three pieces of the bezel as well as the metal EMI door (inside the hot swap hard drive bay door), and the front panel. The other front bezel pieces are:

1) the 5.25” peripheral bay cover,
2) the peripheral bay door,
3) the hot swap hard drive bay door

All pieces can be customized for a unique OEM look. Contact your Intel sales representative for lead times and NRE required for the level of customization desired.

2.4 Security

The chassis provides a variety of system level security options. The mechanical key lock on the front panel door limits access to the reset and power switch, the hot-swap drive bays, and the removable media devices such as diskette drives, CD-ROM drives, and tape drives. Padlock loops (0.28” diameter hole) on the chassis side covers and the hard drive inner cover (SCSI drive bay EMI door) can be used to restrict access to the hot-swap hard drives and add-in cards. Cover-intrusion switches are present on the side covers and the hot-swap hard drive bay. These switches are normally open, but close when the chassis side doors or the SCSI drive bay EMI door are opened. The cover-intrusion alarm indications are transmitted to the baseboard, where server management software processes them. The intrusion alerts will also be logged in the operating system’s event log.

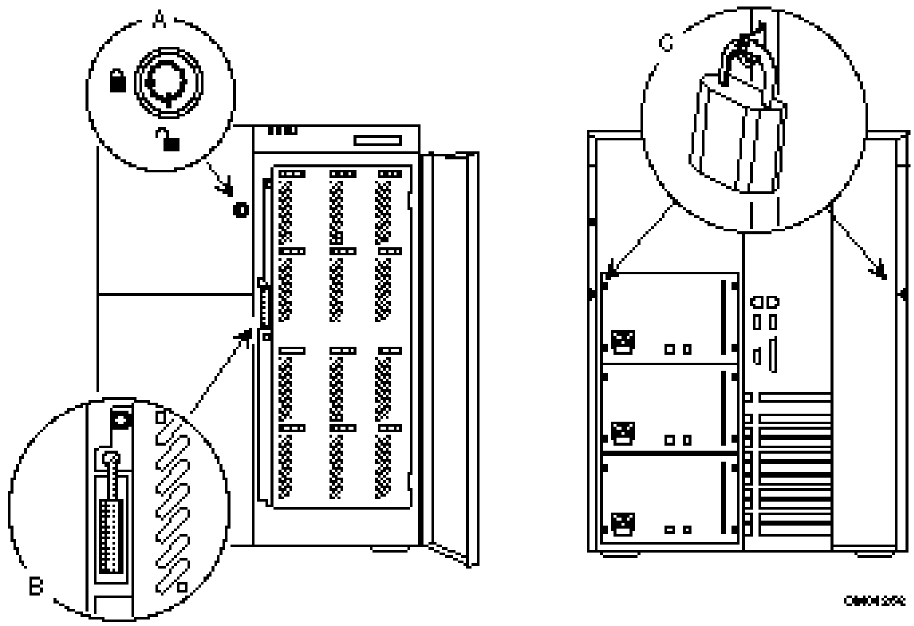


Figure 2-3. Security Features

Table 2-5.   Security Features

	Security Feature	Description
A	Front panel key lock	Lock the short front panel door to prevent access to the power and reset push-button switches. This lock also secures the right-hand hot-swap hard drive bay door.
B	Hot-swap Hard Drive/EMI door padlock loop	Secure the EMI metal door over the hot-swap drive bays by inserting a padlock (not provided) through the metal tab in the recessed slot (There is a 0.28” diameter hole in padlock loop. It will take up to a 0.75” wide padlock only).
C	Side cover padlock loops, one on each side at back	Secure each side cover to the chassis by inserting padlocks (not provided) through the metal tabs protruding through slots in the covers and door, at the back of chassis (There is a 0.28” diameter hole in padlock loop. It will take standard 1” wide padlocks with 0.25” hasp).
	Intrusion switches (not shown)	Each chassis side cover has an intrusion switch. When the covers are not in place, the switch transmits a signal to the baseboard. Intrusion can be monitored by server management software, which can take appropriate system action—such as shut down or keyboard lock. A third intrusion sensor is used to monitor intrusion into the hot-swap drive bays.

2.5 Chassis Dimensions

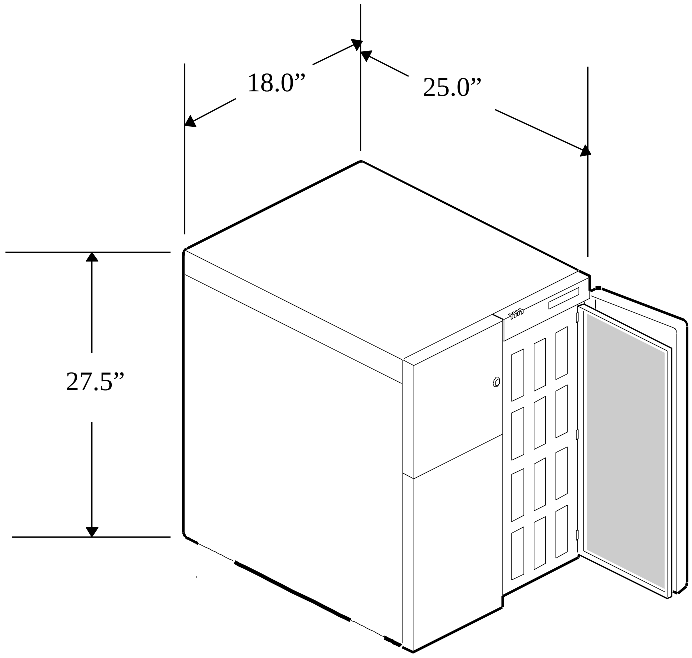


Figure 2-4. System View

Table 2-6. Chassis Dimensions

Chassis Dimension	**Measurement**
Height	27.5 inches
Width	18 inches
Depth	25 inches
Clearance Front	12 inches
Clearance Rear	5 inches
Clearance Side	3 inches (additional side clearance required for service)
Weight[1]	105 pounds (unpackaged) 146 pounds (packaged)

Notes:

1. Weight will vary with system configuration. Above values are for a standard system with the following configuration:

   1 baseboard, 1 processor module, 2 200 MHz/512 KB Pentium® Pro processors, 1 terminator module, and a 1 GB memory module with 0 MB memory.

3. SYSTEM BOARD SET

The AP450GX MP Server Board Set supports one to four identical (clock speed, stepping and L2 cache size) Pentium® Pro processors. The system is fully MPS 1.1 and 1.4 compliant with appropriate Pentium Pro processor extensions. The memory subsystem supports up to 2 GB of system memory using commodity Fast Page Mode DRAM SIMM's and up to 4 GB with an optional DIMM-based memory module.

- Pentium Pro processors supported (166 MHz/512KB or 200MHz/512KB)
- Intel 450GX PCIset
- Dual-peer PCI high-performance I/O segments
- 6 PCI slots (3 per PCI bus)
- 4 EISA slots
- PC-compatible I/O control (2 serial ports, one ECP bi-directional parallel port, PS/2 keyboard & mouse)
- Dual onboard Adaptec* AIC-7880 SCSI adapters
- Onboard IDE controller
- Onboard Cirrus* 5424 SVGA adapter (512KB video memory expandable to 1 MB)
- Optional LANDesk® Server Monitor module for emergency server management

For more details, refer to the *AP450GX MP Server Board Set Technical Product Specification* and the *AP450GX MP Server Board Set Specification Update*.

4. SYSTEM POWER

4.1 Overview

The power system is a modular design and may be configured with two or three power supplies. Each power supply has its own power cord. For systems with redundant power (three power supplies), the loss of a single power supply will not affect the operation of the system and the power supplies are hot-swappable. The failed supply can then be replaced immediately or during scheduled maintenance.

Power supplies are easily removed and installed, and are hot-swappable on three power supply configurations only. Power to the system does not need to be turned off when removing a power supply on a system with three supplies, but the AC power cord must be unplugged on the power supply that is being replaced. Power supplies that are hot-swappable have an "HS" printed on the power supply warning label. All three power supplies in the system must contain the “HS” designator for the power supplies to be hot-swappable.

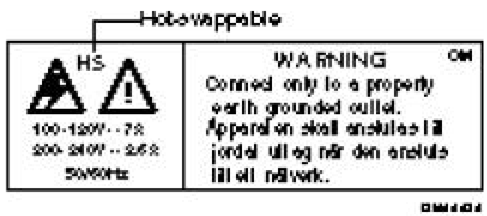


Figure 4-1. Power Supply Warning Label

WARNING

Because of chassis airflow disruption, the power supply bay may not be vacant for more than 5 minutes with system power on. Exceeding the 5-minute limit may cause damage to certain peripheral components.

Before removing and replacing a power supply on a two power supply configuration, you must turn off power to the system and unplug the AC power cord on the power supply that is being replaced. The power distribution backplane implements power sharing between the supplies with a minimal amount of active circuitry. The power distribution circuitry reports quantity and location of installed supplies through the I^2C server management bus. A failed supply results in a yellow LED being illuminated on the front. Another feature supported by the power distribution circuitry is current sensing. Current sensing shuts down the entire power system if any single output from the power distribution backplane exceeds 240 VA. Current sensing enables the system to meet the Canadian Standards Association Level 3 (CSA Safety of Component Power Supplies, C22.2 Number 234) operator accessibility requirements (a safety measure allowing untrained individuals to service a system), without costly interlocks.

Each power supply incorporates a 120mm variable speed fan with a thermistor in the power supply control circuit that controls the fan speed. The external VA rating for the system is 1400VA maximum for systems containing both two and three power supplies.

4.2 Power Supply Input Specifications

Each power supply is specified for AC inputs of 110V or 220V inputs and is auto-ranging. The exact specifications are listed in Table 4-1. The power supplies incorporate a universal power input with active power factor correction that reduces line harmonics in accordance with CE mark requirement EN6100-3-2.

Table 4-1. AC Input Voltage Specifications

Parameter	Minimum	Nominal	Maximum	Units
Vin (110)	90	100-120	132	Vrms
Vin (220)	180	200-240	264	Vrms
Vin Frequency	47	50/60	63	Hz

4.3 Power Supply Output Specifications

The following table summarizes the power supply output for each supply. Each is rated at 420W.

Table 4-2. Power Supply Output Summary (per supply)

Description	Specification
DC Power	+3.3 V @ 15 A +5.1 V @ 32 A +12 V @ 16 A -5.0 V @ 0.25 A -12 V @ 1 A 5 V Standby @ 100 mA Vbias@0.05A
AC Line Voltage (auto ranging)	100-120 Vac 200-240 Vac
AC Line Frequency	50 / 60 Hz
AC Input Current	6.4 A @ 110 Vac 3.4 A @ 210 Vac
Power Supply Efficiency	60 %

The +3.3V, +5.1V and +12V outputs are used by the baseboard, system peripherals and other boards in the chassis. Note that 5.1V is specified instead of the typical 5.0V to insure margin during high current transients. The -5V and -12V outputs are routed to the baseboard to be used by the PCI and EISA slots as needed. The 5V standby output is used by the front panel board primarily to allow remote on/off capabilities. The Vbias output is used to power the 240 VA limit circuits described later in this chapter.

4.4 Supported Configurations

The system is supported with either two or three power supplies installed. With two power supplies, the system can support a fully loaded configuration (up to four 200 MHz/512 KB Pentium® Pro processors, 12 hard drives, 10 adapter cards and 2 GB of 5V SIMM-based memory or 4 GB of 3.3V DIMM-based memory). With a third power supply, system power becomes redundant and the supplies are hot-swappable, but this does not increase the available current. When configured with two power supplies, the supplies are located in the lower two power supply bays and are not hot-swappable. The third (redundant) supply, if added, is placed in the upper power supply bay.

4.5 AC and DC Output Limits

The minimum and maximum allowable DC load conditions on each voltage are listed in Table 4-3. The numbers for a single power supply are provide for reference only. A system with only one power supply is not a supported configuration. Use Table 4.5 to help determine the power requirements of a particular system configuration.

Table 4-3. Minimum and Maximum DC Load Requirements (Amps)

	+3.3V		+5.1V[2]		+12V[2]		-5V		-12V		5V Stby	
Number of Supplies	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
1 [1]	1	15	3	32	1	16	0	0.25	0	1	0	0.1
2	2	28	6	60	2	30	0	0.25	0	1	0	0.1
3 (redundant, hot-swappable)	3	28	9	60	3	30	0	0.25	0	1	0	0.1

Notes:

1. Not a supported configuration

2. For safety reasons, any single user accessible circuit cannot exceed 240 VA. As such, the +5.1V and +12V outputs are each split into two channels. Thus not only must the total system power for +5.1V and 12V not exceed the maximum power shown in the tables above, but each channel must not exceed 240 VA. See section 8.4.5 for more details.

Maximum peak current for each voltage is listed in Table 4-4. Again, the numbers for a single power supply are provide for reference only. A system with only one power supply is not a supported configuration.

Table 4-4. Maximum Peak (AC) Current (Amps)

Number of Supplies	+3.3V	+5.1V	+12V	-5V	-12V	5V Stby
1 [1]	15	32	16	0.25	1	0.1
2	28.5	60	30	0.25	1	0.1
3 (redundant)	28.5	60	30	0.25	1	0.1

Notes:

1. Not a supported configuration

Table 4-5 shows the breakdown of power for a fully configured system. The table is provided for reference only and is not meant to provide the exact power usage in a system.

Table 4-5. AP450GX System Power Breakdown

	Maximum Power Usage (Watts)						
Component	**3.3V**	**+5.1V[3]**	**+12V[3]**	**-5V**	**-12V**	**5V Stby**	**Total[1]**
AP450GX baseboard	7W	10W	1.2W	---	---	---	18.2W
Processor Module Fab 3.x[4] (w/ 2 166 MHz/512 KB Pentium Pro processors)[2]	0.2W	1.4W	100W	---	---	---	203.2W
Processor Module Fab 4.x[5] (w/ 2 166 MHz/512 KB Pentium Pro processors)[2]	12W	1.4W	88W				---
Terminator Module	---	1W	11W	---	---	---	---
1 GB Memory Module (No memory)	3.8W	2.7W	---	---	---	---	---
1 GB Memory Module (with 1 GB memory installed)	4W	76W	---	---	---	---	80W
1 GB Memory Module (with 2 GB memory installed)	4W	53W	---	---	---	---	---
4 GB Memory Module (No memory)	4.42W	0.5W	---	---	---	---	---
4 GB Memory Module (with 4 GB memory installed)	53W	0.5W	---	---	---	---	---
1 floppy drive	---	---	6W	---	---	---	6W
12 Hot-swap SCSI Hard Drive (15W max per drive)	---	70W	110W	---	---	---	180W
3 chassis fans (at 7.8 W each)	---	---	24W	---	---	---	24W
2 SCSI backplanes (at 5 W each)	---	2@5W	---	---	---	---	10W
Front Panel	---	2W	---	---	---	0.4 W	2.4W
CD-ROM drive	---	26W	---	---	---	---	26W
6 PCI Adapters (Max = 25W per card, 10 W typical)	--	6@10W	---	---	---	---	60W
4 EISA Adapters (Max = 22.5 W per card, 10 W typical)	--	4@10W	---	---	---	---	40W
TOTAL (Watts)[1]	**11.4W**	**296.8W**	**341.2W**	**---**	**---**	**0.4W**	**649.8W**
TOTAL (Amps)[1]	**3.45A**	**58.2A**	**28.43A**	**---**	**---**	**0.08A**	**90.16A**

Notes:

1. Totals are for a system with two Fab 3.x processor modules (each with two 166 MHz/512 KB Pentium® Pro processors), one floppy drive, twelve SCSI hard drives, one CD-ROM drive, six PCI adapters, four EISA adapters, and 1GB of 5V SIMM memory.

2. Each processor is supplied power from a DC-DC converter which is ~80% efficient and converts power from +12V. Given that a 166 MHz/512 KB Pentium® Pro processor draws a maximum of 35W, the power added/subtracted from the processor module by adding/subtracting one processor would be 42W. For a 200 MHz/512 KB Pentium® Pro processor, which draws a maximum of 37.9W, the difference would be 45.5W per processor.

3. Because the +5.1V and +12V circuits are split as shown in section 8.4.5, it is possible to exceed the 240 VA limit, and not exceed the total current limit of the power sub-system. For example, if there is a limited amount of 12V on channel A (only one processor installed), but a lot of +12V on channel B (twelve 9GB hard drives and three high current drawing 5.25" peripherals), channel B might exceed the 240 VA limit, but the total +12V power used by the system could be less than the maximum of 30A. So when totaling the power consumed by your system, be sure the power of each +5.1V and +12V channel are less than the 240 VA limit. 2.

4. This processor module will only support the 166MHz/512KB Pentium Pro processor

5. This processor module will support either the 166MHz/512KB or 200/512KB Pentium Pro processor

5. SYSTEM COOLING

Redundant cooling is a standard feature of the AP450GX MP Server System. Three system fans are used to cool the baseboard and adapter card area. Failure of any one of the fans will not diminish the cooling capability of the system. System fan failures (such as a locked rotor) illuminate a yellow LED on the front panel, and pass the information to the server management software (LANDesk® Server Manager). The current version of the LANDesk software indicates a fan failure, but does not identify which fan is bad and does not indicate a power supply failure.

The system fans are fixed speed, ball-bearing type fans which receive their power from the baseboard. Each fan will assert a signal to the baseboard should they fail. The fans are easily replaceable, but the system must be powered down to replace them.

In addition to the three system fans, each power supply also contains a fan which is used to cool both the power supply and the SCSI hot-swap drive bay. Two power supply fans are sufficient to cool up to 12 hard drives (at 15 W maximum per drive).

6. SYSTEM PERIPHERAL BAYS

6.1 Overview

The AP450GX chassis has one 3.5" floppy bay, four half-height (5.25") peripheral drive bays, and two bays of six hot-swap SCSI drives, as shown in the figure below:

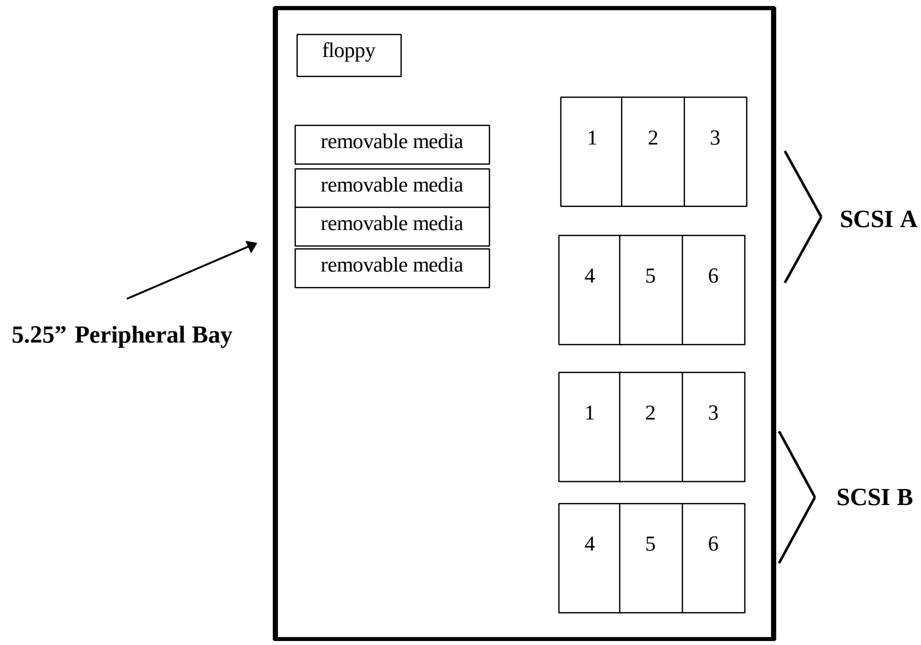


Figure 6-1. AP450GX Chassis Drive Bays

6.2 3.5” Floppy Drive Bay

The system ships from the factory with a 3.5" diskette drive installed in the floppy drive bay. Access to the drive for replacement is by removal of the system top and side covers (facing the back of the system). The drive is powered off of one of the peripheral bay power cables.

6.3 5.25” Peripheral Drive Bays

The system includes four 5.25" half-height peripheral bays. These bays accommodate peripherals with removable media (e.g. diskette drives, CD-ROM drives, or tape drives). Any two adjacent 5.25" bays are convertible to a single full-height bay. Mounting brackets for the 5.25” peripherals are included in the Country Kit. Due to power and cooling limitations, only three peripherals may be installed.

Any 5.25” peripheral is removable directly from the front of the chassis after removing the 5.25” drive bezel. The bezel is retained by snap features and is accessible when the side access cover is removed. Cosmetic cover panels are installed for all of the unused 5.25” bays.

***NOTE**: The 5.25" peripheral bays are not recommended for hard disk drives, due to several factors. These include hard disk drive generated electromagnetic interference (EMI), and increased ESD susceptibility (less hardened to ESD).*

6.4 SCSI Hot-swap Drive Bays

The chassis includes two bays that hold six 3.5" hard drives each, which are accessible from the right front bezel. A hot-swap backplane is part of each drive bay assembly. These backplanes use the industry standard 80 pin Single Connector Attach (SCA) connector to attach to the Wide SCSI II hard drives. Each backplane consists of two rows of three drive connectors each. SCSI ID numbering is set by jumpers on the SCSI backplane as shown in the section below. A SAF-TE Enclosure Processor (SEP) is located on each backplane to send and receive SAF-TE commands across the SCSI bus. The SEP is identified with SCSI ID 6.

A drive carrier is part of the hot-swap implementation. Any 3.5" peripherals up to 1.6" high can be accommodated in the carrier. The drives are mounted in the carrier with four fasteners. The carrier is retained in the chassis by a locking handle. Twelve carriers are included with every system.

These bays accept peripherals that consume up to a maximum of 15W of power and operate at a maximum temperature of 50^{o}C.

An indicator board located above each row of drives displays individual drive status. Each drive has three status LED's: for power on (green LED), activity (blinking green LED), and fault (yellow LED). A fault light on the front panel board also indicates there has been a fault on one of the hard drives. The fault lights will only operate when a SCSI host controller is installed in the system which sends the appropriate SAF-TE control signals. The onboard SCSI controllers do not send the SAF-TE signals and thus will not light the yellow fault lights.

The two SCSI backplanes cannot be connected together to form a single SCSI bus.

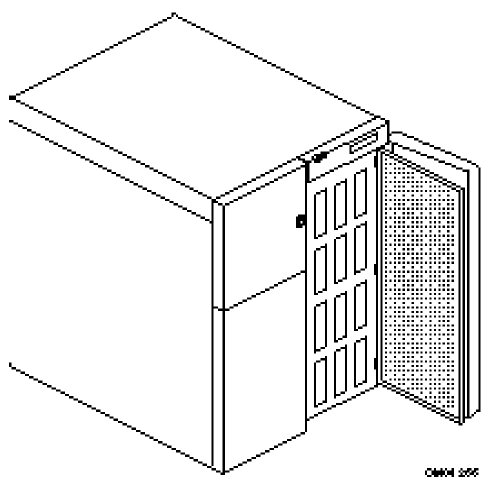


Figure 6-2. SCSI Hot-swap Drive Bay Doors Open on a AP450GX Chassis

7. SYSTEM INTERCONNECTION

This section details the connections between each of the components in the system as well as the external connections. It also includes specific information on the I^2C diagnostic bus routing. Refer to Figure 7-1 for a diagram of the system interconnections. Detailed pin outs for most of the connectors is provided in the Appendix of this document. Some of the baseboard pin outs are define in the *AP450GX MP Server Board Set Technical Product Specification.*

7.1 External Connections

7.1.1 Keyboard and Mouse Control

The keyboard and mouse connectors are PS/2 compatible. These two connectors are identical.

7.1.2 Serial Ports

The baseboard provides two RS-232C, 9-pin serial ports. The two serial port connectors are stacked, 9-pin, D-subminiature connectors. COM A is the top connector of the stacked arrangement, and COM B is the bottom. Each serial port can be enabled separately via the BIOS setup.

7.1.3 Parallel Port

The parallel port is accessed through a 25-pin D-subminiature connector. The parallel port supports ECP protocol with DMA, EPP protocol and IEEE 1284 protocol for PS/2 bi-directional compatibility.

7.1.4 Video Connector

The video port interface is a standard 15-pin, VGA-compatible connector.

7.2 Internal Connections

7.2.1 IDE Bus Interface

IDE is an 8- or 16-bit interface for intelligent disk drives that provides an interface directly to the AT bus. The IDE interface supports both programmed I/O and DMA access. An IDE Controller is on the baseboard. A second IDE Controller may be added via an adapter card.

7.2.2 Floppy Disk Interface

The AP450GX MP Server System chassis supports two sizes of floppy drives, 5.25” and 3.5”. A 3.5” drive is installed in the standard configurations.

7.2.3 Onboard SCSI Interface

The AP450GX MP Server baseboard includes two embedded PCI SCSI controllers. The SCSI controllers are compatible with the Adaptec AIC-7880 , which supports 8-bit Fast SCSI (10 MB/sec), 16-bit fast/wide SCSI (20 MB/sec), or 16-bit Fast-20 SCSI (40 MB/sec). You can switch between fast/wide SCSI mode and Fast-20 SCSI mode via the Adaptec SCSI*Select* Utility. The default mode is fast/wide SCSI. In Fast-20 mode, 8-bit narrow SCSI devices are not supported off of connector J8 of the SCSI backplane. As a PCI bus master, the SCSI controller supports a bus master burst data transfer up to the maximum rate of 133 MB/sec.

Note: In Figure 7-1, connectors with dashed lines indicate functionality is available but currently not being used. Items with dotted lines are not included in the std. product.

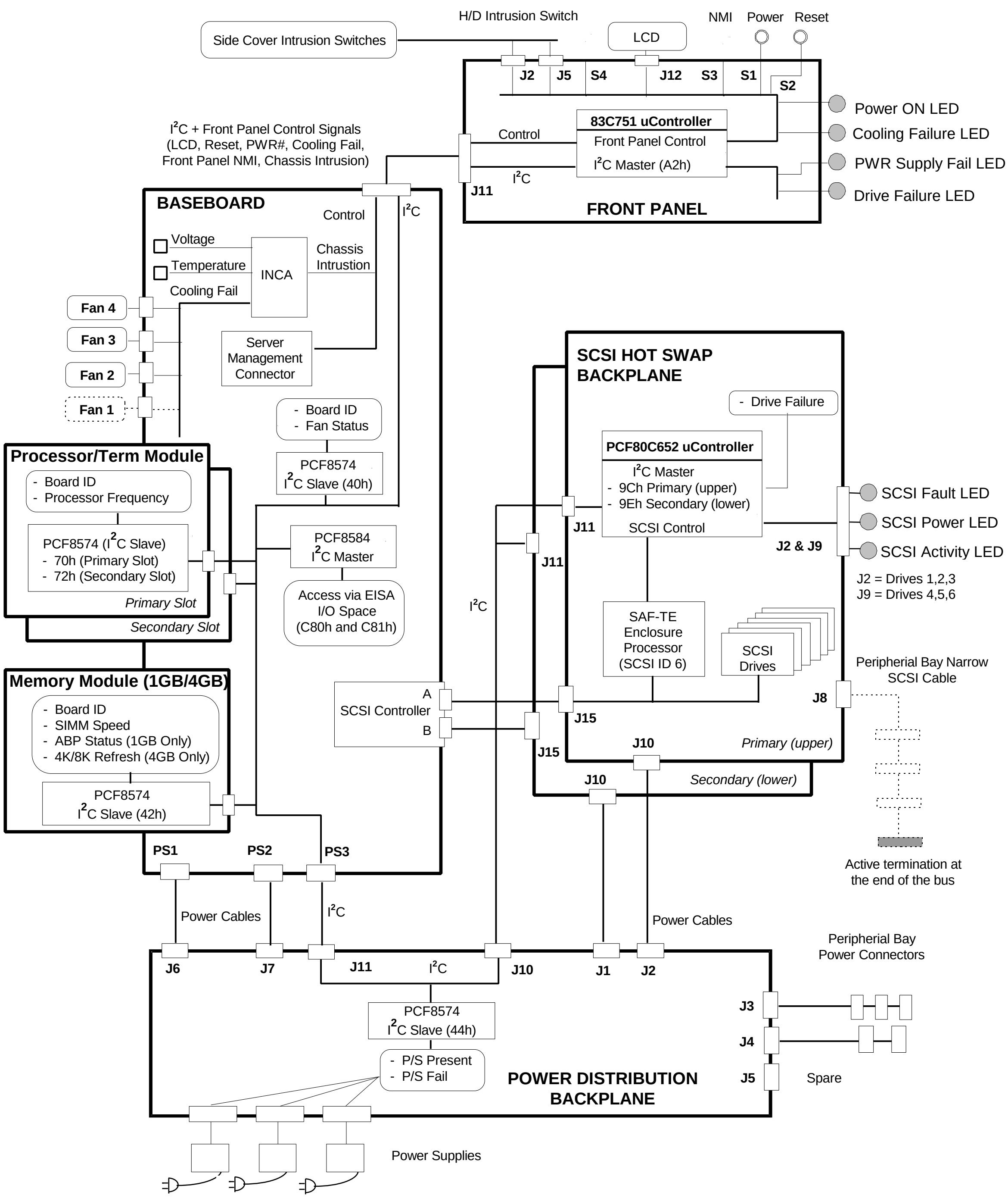


Figure 7-1. System Interconnect Diagram

8. CHASSIS ELECTRONICS

8.1 Overview

In addition to the AP450GX MP Server Board Set, the AP450GX MP Server System contains three other intelligent components. These components are the front panel, the hot-swap SCSI backplane (two per system) and the power distribution backplane (including two or three power supplies). Each of these components is described in further detail in the sections below.

8.2 Front Panel

The front panel is a microcontroller-based design which monitors chassis intrusion and provides power control, reset control and an LCD interface. It also informs users of such system abnormalities as power fail, cooling fail, and drive fault via four LED's. Figure 8-1

gives a physical view of the front panel board with emphasis on interface components.

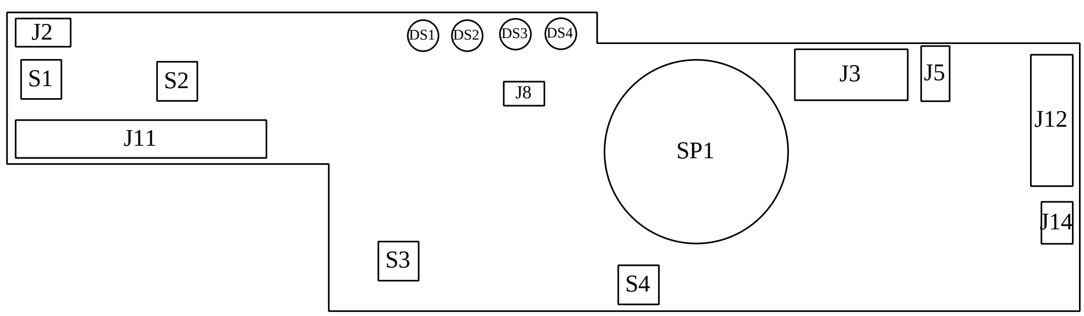


Figure 8-1. AP450GX MP Server System Front Panel Board Diagram

Switches S1 through S4 are push button, non-latching momentary contact switches. They are normally open and momentarily closed. The front panel microcontroller handles all the signal debounces.

Table 8-1. Front Panel Board Connector and Switches

Diagram Label	Description
J11	40-pin straight-head connector with housing and pin 17 removed. It provides the interface to the baseboard.
J2 and J5	3-pin right-angle latching-style connectors. They provide interfaces to the two intrusion switches mounted on the chassis side-panel doors.
J3	10-pin right-angle connector with housing. (Not used)
J12	14-pin straight-head connector with housing. It provides interface to the LCD.
J14	3-pin straight-head latching-style connector. It routes power to the LCD.
J8	2x3 straight-head non-latching connector. It houses jumpers for software configurations (factory configurable only).
S1	Power switch
S2	Reset switch

Diagram Label	Description
S3	NMI switch. Each depression of this switch generates a non-maskable interrupt to the baseboard. The switch must be released after each depression to prevent the system processor from receiving multiple non-maskable interrupts.
S4	Hard drive bay intrusion switch
SP1	Speaker
DS1	Power on LED, green
DS2	Power fail LED, yellow
DS3	Cooling fail LED, yellow
DS4	Drive fault LED, yellow

8.2.1 Power Control

The system can be powered on or off in three different ways:

- The front panel power switch
- The real-time clock
- An optional server management card

All of the power control signals go through the front panel microcontroller for decoding.

8.2.1.1 Front Panel Power Switch

When the system is powered off, depressing the front panel power switch causes the front panel to initiate a system power-on sequence. This switch can initiate a power-on at any time and power-on in this manner is never blocked by any other system function.

When the system is powered on, depressing this switch causes the front panel to initiate a system power-off sequence. However, secure mode inhibits the power-off function of this switch. See section 8.2.3 on secure mode for more information on power inhibiting.

Release of the power switch will not affect the system power state.

8.2.1.2 real-time Clock Power Control

The baseboard real-time clock (RTC) has a power control signal routed to the baseboard interface connector (J11). This signal has two modes of operation on the front panel, level or pulse. Front panel jumper settings select the power signal mode and must match the mode used by the baseboard and BIOS.

Level mode can only be used on baseboards that supply separate power control signals for the RTC and server management card. The AP450GX MP Server baseboard uses level mode. Level mode defines the power control signal as active low. The system powers on when there is a high-to-low transition on the signal line. The power signal must be held low to maintain system power-on state. Alternatively, the system powers off when there is a low-to-high transition on the signal line. The power signal must be held high to maintain the system power-off state.

***NOTE**: The level state of the power control signal does not in itself affect the state of the system power. A low on the power control signal does not indicate the system power should be on while a high does not indicate the power is off. A transition on the signal must happen for the level state of the signal to be interpreted. This restriction is enforced because the system can be powered on by mechanisms other than the RTC (e.g. front panel power switch, server management card, etc.). When the system power is turned on by any other means, the state of the power control signal can either stay unchanged or be toggled by software control. Holding the power control signal at a specific logic level does not prevent other mechanisms from controlling the system power.*

Power control from RTC is typically used during Automatic Server Recovery (ASR) by setting an alarm in the RTC prior to power-off. It can also be used by BIOS or a utility program to power the system on or off at a predetermined time set in the RTC.

8.2.1.3 Optional Server Management Card Power Control

The server management card connection on the baseboard provides a power signal line that is routed through the baseboard to the front panel via the baseboard interface connector (J11).

When the system is powered off, power-on can be initiated by the server management card pulsing the signal low. When the system is powered on, a low pulse of the power signal will initiate a system power-off sequence. The minimum pulse width is 5 ms, and the maximum pulse width is 100 ms.

8.2.2 Power Recovery

The front panel has an EEPROM chip that records the state of the system power. If AC power is interrupted while the system is powered on, the front panel will restore the system to the power-on state when AC power is restored. This function is automatic, is independent of secure mode, and does not require intervention by an operator or the server management card. If the system is powered off and AC power is interrupted, the system will remain at power-off when AC power is restored.

8.2.3 Secure Mode

Secure mode is a user selectable feature, via the BIOS setup, to keep accidental power-off or reboot from happening via the front panel switches. When the secure mode is enabled, a signal from the baseboard disables the front panel power and reset switches. The secure mode signal is routed to the baseboard interface connector (J11). Secure mode only disables the front panel reset and power switches. It has no effect on a server management card or the baseboard RTC power control.

Removal of secure mode will not cause the system power to change state. For example, if the power switch is depressed and released while secure mode is active, the system will not power off when secure mode is later removed. However, if the front panel power switch remains depressed when secure mode is removed, power-off will occur.

8.2.4 Reset Control

A hard system reset can be initiated by depressing the front panel reset switch. The system will be held in the reset state until the switch is released.

A system reset command can also be sent via the I^2C bus. Secure mode has no effect on I^2C reset control.

8.2.5 LCD Interface

The baseboard provides status information to the LCD. The front panel board converts serial data from the baseboard to parallel data on the LCD and vice versa. In addition, the front panel provides backlight power for the LCD.

8.2.6 Front Panel Microcontroller

The front panel microcontroller provides the following functions and operates on 5V standby:

- I^2C Slave device (Address A2h)
- I^2C Bus Master (currently not used)
- Signal Debounce for all switches

- Front Panel LED Control
- Power State Control

The microcontroller operates from firmware stored inside the controller. This firmware is not field Upgradable. Currently the controller is a socketed device.

As an I^2C slave device, the microcontroller stores the power supply and hard drive failure status information. The power supply and hard drive fault lights are then asserted if a fault is detected.

The cooling fail LED is asserted if the COOL_FAIL# signal, provided by the baseboard, is asserted. The COOL_FAIL# is a logical OR of all four fan fail signals.

An EEPROM on the front panel records the power state of the system. The microcontroller accesses the front panel EEPROM to restore the correct power state when power returns after AC power has been lost. If the system power was off when AC power was lost, the system will remain off when AC power is returned. If the system power was on when AC power was lost, the microcontroller will power back on the system when AC power is returned.

8.3 Hot-swap SCSI Backplane

Each of the two SCSI backplanes supports up to six SCA style Hot-swap SCSI drives. The backplanes are identical, but perform different functions depending on how they are jumpered.

The SCSI backplane includes the following features:

- Up to six wide SCSI (16-bit) drives per board
- Single connector attachment (SCA) to simplify insertion and removal of hard disk drives
- Insertion and removal of hard drives with power on (hot-swap)
- Jumper selectable SCSI ID
- LED indicators for each drive
- Power control for each hard drive
- Onboard Wide to Narrow SCSI conversion for additional 8-bit devices (In Fast-20 mode, 8-bit narrow SCSI devices are not supported)
- Automatic cable sense termination for narrow SCSI connector
- Microcontroller to monitor activities
- I^2C bus master for server management information (Address 9Ch/9EH Primary/Secondary)
- Ease of RAID integration
- Flash memory for upgrading firmware
- Multiple hot-swap boards in a chassis

Figure 8-2 illustrates the SCSI backplane board layout, emphasizing the interface components.

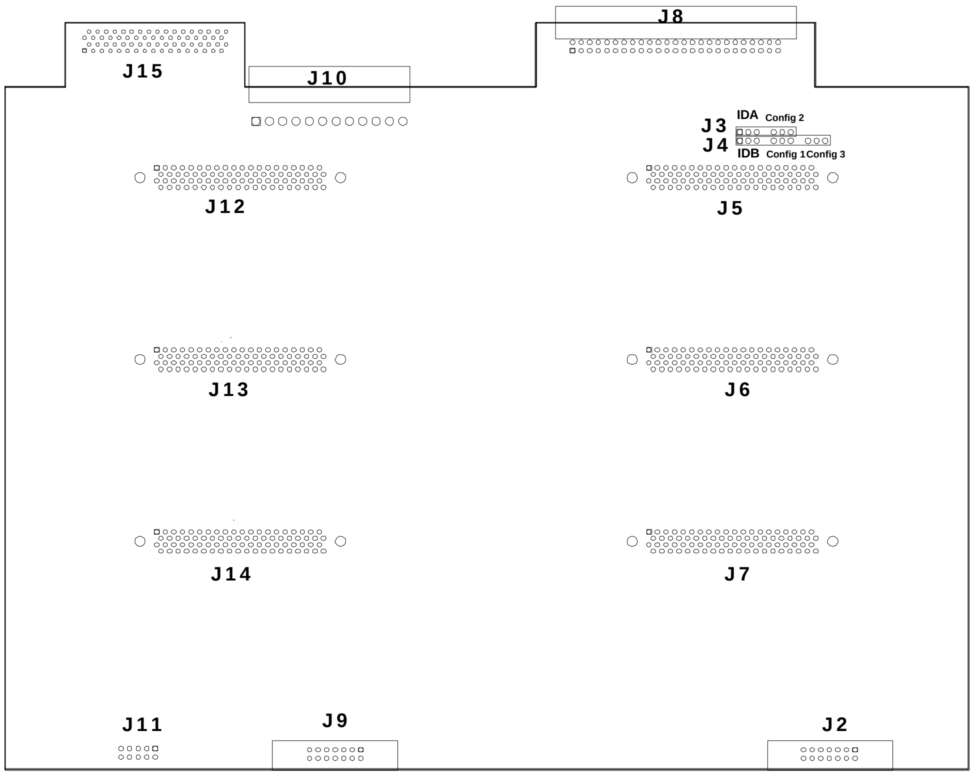


Figure 8-2. SCSI Backplane Block Diagram

8.3.1 Drive Support

The SCSI backplane supports a maximum of six 1" or 1.6" tall, Wide SCSI drives. SCSI I or II drives may be installed with either an SCA 1 or SCA 2 connector.

8.3.2 Connector Descriptions

Below are descriptions for each of the board connectors. Refer to Appendix D for pin outs.

8.3.2.1 Hot Plug Single Connector Attachment (J5, J6, J7, J12, J13, J14)

The Single Connector Attachment (SCA) drive connector is designed for 500 insertions. This is an SCA 1 connector.

A power control circuit is added to the SCA connection, to allow removing and replacing drives while power is on. A hot plugged drive will not cause electrical disturbance to adjacent drives or disrupt data integrity on the SCSI bus.

8.3.2.2 Narrow SCSI Support (J8)

One to three additional narrow SCSI drives can be controlled by the SCSI backplane. The narrow drives are attached using a standard 50 pin header ribbon cable at connector J8. No conversion for narrow SCSI is required. In Fast-20 mode, 8-bit narrow SCSI devices are not supported off of connector J8.

8.3.2.3 LED Hard Drive Indicators (J2, J9)

Each SCSI backplane drives two LED boards connected through J2 and J9. The LED boards contain three high intensity LED indicators for each hard drive. A yellow LED indicates a drive fault, a green LED indicates power, and a second green LED indicates drive activity.

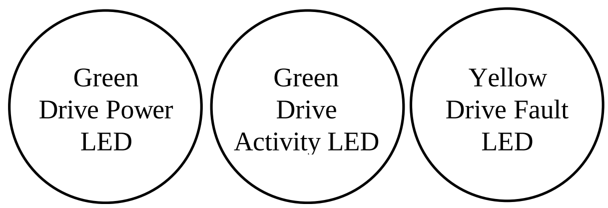


Figure 8-3. LED Drive Indicators

8.3.2.4 Power (J10)

Power to each SCSI backplane is provide from the power distribution backplane through connector J10.

8.3.2.5 Fast/Wide SCSI Connection (J15)

A 16-bit wide SCSI connection is provided with J15. In a standard configuration J15 is connected to the SCSI controllers on the system baseboard. If a SCSI adapter is installed, it may connect to the SCSI backplane via this connector.

8.3.2.6 I^2C Bus & Power Control (J11)

J11 connects both SCSI backplanes to the power distribution backplane. Power control and the I^2C bus are routed through J11.

8.3.3 SCSI Backplane Microcontroller

Each SCSI backplane has an 8-bit microcontroller (P80C652) which performs two functions. First it controls a Symbios 53C80E which functions as the SEP (SAF-TE Enclosure Processor). The SEP (SCSI ID 6) sends and receives SAF-TE commands between the backplane and a host SCSI controller, such as Intel's optional PCIRAID adapter. The SAF-TE commands allow the host adapter to communicate with the backplane via the SCSI bus and perform functions such as turning on the fault light for a faulted drive. The microcontroller also performs the function of a bus master on the internal I^2C diagnostic bus (Primary backplane only). As a bus master the microcontroller queries the power distribution backplane for faulted power supplies. It also queries itself and the other SCSI backplane for faulted hard drives. If a power supply or hard drive is faulted, the microcontroller will signal the front panel, via the I^2C bus, to light the appropriate yellow fault LED on the front panel.

The microcontroller operates from firmware stored in a flash device on the SCSI backplane. The firmware is field Upgradable via a DOS based update utility. Refer to the system *Installation Guide* for more details on the update procedure.

8.3.4 Termination

The SCSI bus runs from the baseboard or controller card, through a cable to the connector J15, through J12, J13, J14, J7, J6, and J5. The upper 9 bits (8 data bits and 1 parity bit) of the bus are then terminated. With no cable plugged in to J8, the remaining narrow SCSI bus at J8 is automatically terminated using active termination. A cable plugged into J8 (with devices on the cable) will be sensed by pin 21 on connector J8 and the termination on the Narrow portion of the SCSI bus will be deactivated. The end of the bus is now the end of the cable that is plugged in, which means the user must provide active termination at the end of the cable.

***NOTE**: A plugged in narrow cable with no SCSI devices on it will not deactivate the termination. The SCSI device on the cable is what makes pin 21 sense activity. The user must not plug in the narrow cable and leave it hanging with no SCSI devices attached to the cable. This will violate the bus specification by attachment of a huge stub.*

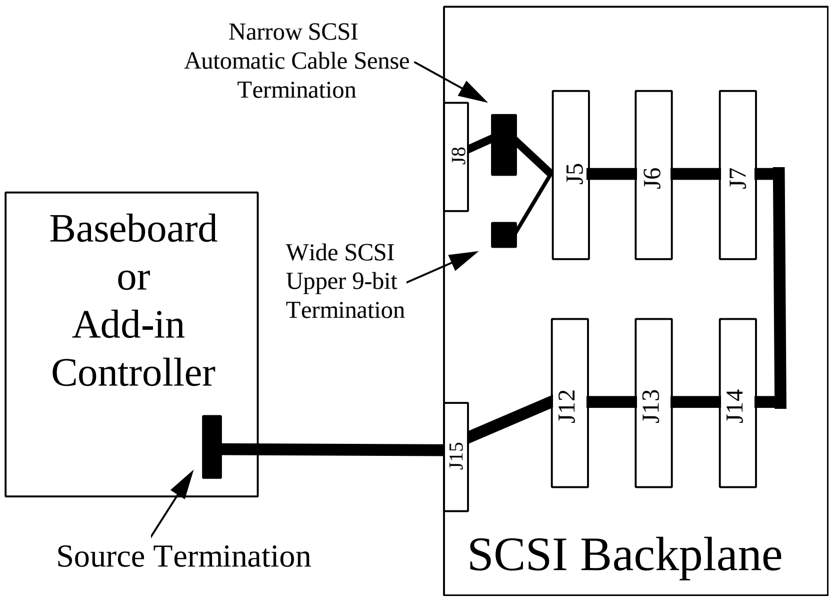


Figure 8-4. SCSI Bus And Termination

8.3.5 SCSI Backplane Jumpers

Each SCSI backplane has a jumper block which controls various configuration options. There are five different jumpers, each of which are described below.

8.3.5.1 SCSI Drive ID Jumpers (J3, J4)

The six drives on each backplane can be configured to have different SCSI ID's to allow specific IDs to be used for narrow SCSI devices like a CD-ROM or tape backup drive which may have a fixed SCSI ID. Program control must read the drive ID to correlate a drive fault message to the appropriate fault light over a drive bay. The SCSI microcontroller on the SCSI backplane is always set to SCSI ID 7. Similarly the SAF-TE Enclosure Processor (SEP) is always set to SCSI ID 6. Figure 8-5 shows the location of the jumper block on the SCSI backplane. Table 8-2 shows the ID configuration choices for each drive. Although the physical connectors are numbered Jx on the backplane, the drive locations are called HD1 through HD6 here to make it easier to describe ID jumpering for each drive (see Table 8-2).

SCSI drive ID jumper blocks on SCSI drive backplane

(jumpers accessible from front of system after removing hard drive from the J5 connector slot)

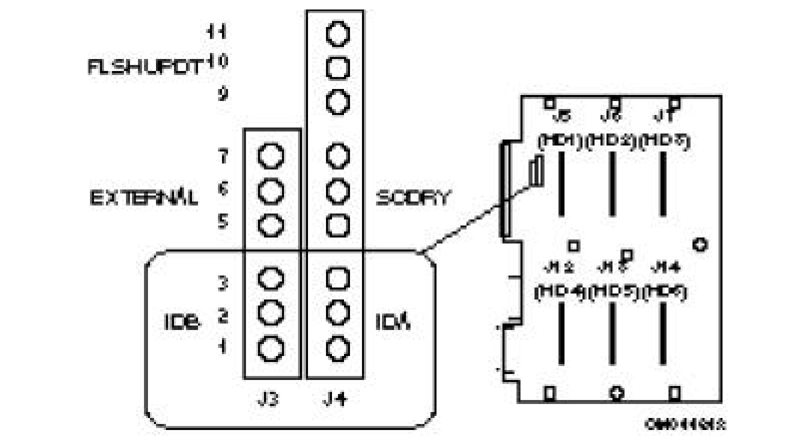


Figure 8-5. SCSI Drive ID Jumper Blocks

Table 8-2. SCSI Drive ID Jumpers

Jumper pins at		SCSI IDs for HD 1 through HD 6:					
J3	**J4**	**HD 1**	**HD 2**	**HD 3**	**HD 4**	**HD 5**	**HD 6**
1-2	1-2	0	1	10	3	4	13
1-2	2-3	0	1	2	3	4	5
2-3	2-3	8	9	2	11	12	5
2-3[1]	**1-2**[1]	**8**	**9**	**10**	**11**	**12**	**13**

Notes:

1. Factory default settings shown **in boldface.**

8.3.5.2 SCSI External Jumper (J4)

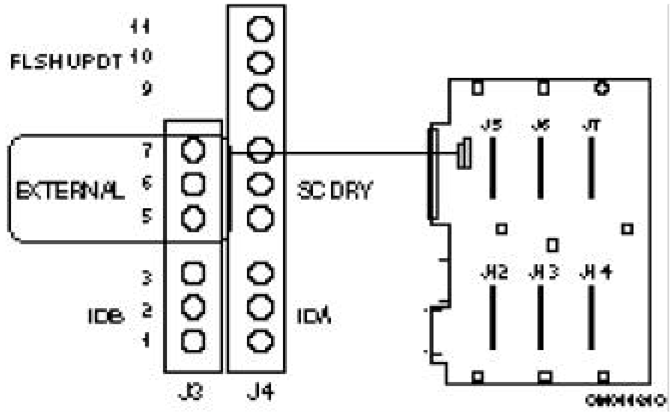


Figure 8-6. SCSI External Jumper (J4)

5-6	**Internal backplane, factory default**
6-7	External backplane,

This jumper is used to indicate if the SCSI backplane is installed in the host system/chassis (internal) or in an external chassis (for example a hard disk only chassis). In the latter case, the jumper setting could enable the backplane to assume basic enclosure services associated with the front panel. The SCSI backplane, however, is only being used in the "internal" configuration thus the external jumper setting should never be used.

8.3.5.3 SCSI Secondary Jumper (J4)

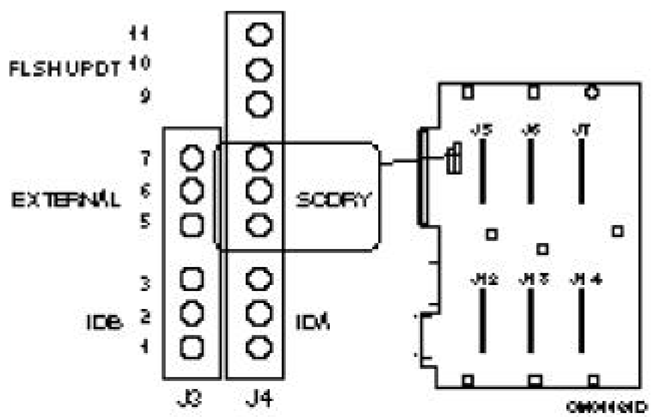


Figure 8-7. SCSI Secondary Jumper (J4)

5-6	**Primary, factory default (upper backplane)**
6-7	**Secondary, factory default (lower backplane)**

This jumper is used to define which SCSI backplane performs certain I^2C bus enclosure functions including control of the hard drive and power supply fault lights on the front panel. The upper backplane should always be jumpered as primary and the lower backplane should always be jumpered as secondary (note: factory default is to have the upper as primary and the lower as secondary). The primary backplane receives fault information from the power distribution backplane as well as the secondary backplane, combines it with its own fault information and drives the front panel fault lights when a hard drive or power supply fault is detected.

Note the drive fault indication is not supported with the onboard SCSI controllers. However, Intel's PCIRAID controller does support the hard drive fault lights. Other third party hard drive controllers may or may not support the hard drive fault lights depending on how they implement the SAF-TE command set.

8.3.5.4 SCSI Flash Update Jumper (J4)

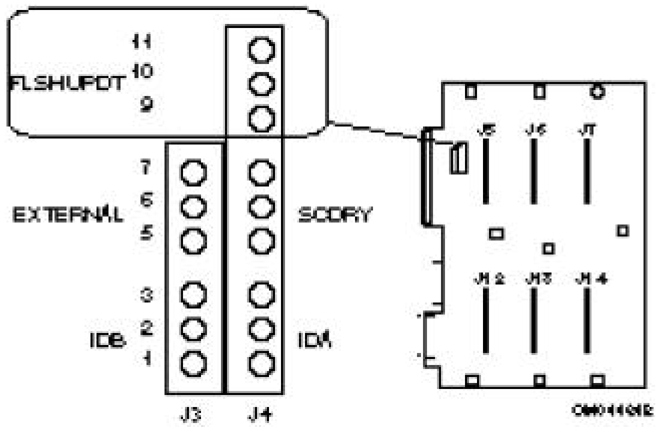


Figure 8-8. SCSI Flash Update Jumper (J4)

9-10	**Normal, factory default**
10-11	SCSI flash recovery mode

For normal operation and flash updates, the jumper should be on pins 9 and 10 at J4. To enable the SCSI flash recovery mode, the jumper should be moved to pins 10 and 11 at J4. The SCSI flash recovery mode should only be used if the SCSI backplane firmware becomes corrupted and a recovery is needed. In recovery mode, the SCSI backplane has limited functionality and all drive fault lights will be lit. For normal and recovery update procedures, see the "Updating Flash Memory" chapter in the *Installation Guide*.

8.4 Power Supply and Distribution

System power is provided by either two or three 420W power supplies. Three power supplies provide redundancy and hot-swappable capabilities. Each supply plugs into a power distribution backplane which connects together the outputs from all supplies in the system into one output for each voltage (+3.3V, +5.1V, +12V, +5Vstandby, -5V and Vbias). This current sharing allows each power supply to provide an approximately equal amount of current at each voltage. In addition, the load sharing circuit guarantees the +3.3V, +5.1V and +12V current outputs for each supply in the system will be to within 10% of each other. The failure of a power supply in a redundant configuration will not affect the load sharing or output voltages of the power supplies still operating.

The +5.1V and +12V are sensed by the 240 VA circuits and are each divided on the power distribution backplane into two channels (A and B). Channel A is routed to the baseboard and logic circuitry on the SCSI backplanes. Channel B is routed to peripheral bay components and the SCSI hard drives.

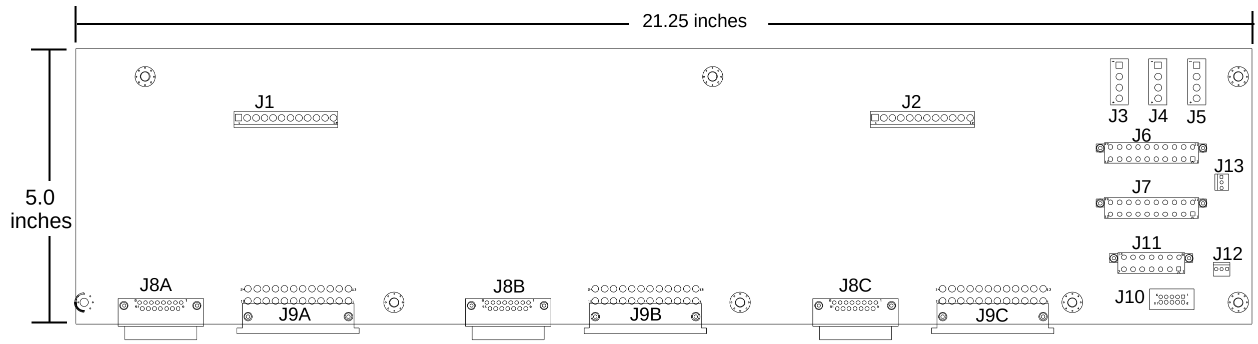


Figure 8-9. Power Supply Backplane Board Diagram

8.4.1 Connector Descriptions

Below are descriptions for each of the board connectors. Refer to Appendix D for pinouts.

8.4.1.1 SCSI Backplane Power (J1, J2)

Power to the SCSI backplanes is provided through J1 and J2. J1 goes to the lower backplane, J2 to the upper backplane.

8.4.1.2 Peripheral Bay Power (J3, J4, J5)

Power to the 5.25" peripheral bay is provided from J3, J4 and J5. Only two of these are used, the other is left unconnected. One of the two connectors used, has a cable with two four pin power drops. The other provides power to the floppy drive in addition to two more four pin power drops.

8.4.1.3 Baseboard Power (J6, J7)

Power to the baseboard is provided from J6 and J7. These two connectors are identical and the cables may plug into either PS1 or PS2 on the baseboard.

8.4.1.4 Baseboard Power Control (J11)

The power control, including remote sense signals, are provided to the baseboard through J11. The cable plugs into PS3 on the baseboard.

8.4.1.5 Power Supply Control (J8A, J8B, J8C)

Power control and status signals between each power supply and the power supply backplane is provided through the right angle connectors J8A, J8B and J8C. The mating connector on the power supply is "floating" to allow easy insertion into the power distribution backplane.

8.4.1.6 Power Supply DC Power (J9A, J9B, J9C)

DC Power from each power supply is provided to the power supply backplane through the right angle connectors J9A, J9B and J9C. The connector contacts are rated for 6 Amps each.

8.4.1.7 SCSI Backplane Power and Control (J10)

The power distribution backplane provides +5.1V, +5V standby and an I^2C bus connection, through J10. The power distribution backplane provides power supply status information via the I^2C bus.

8.4.1.8 Baseboard Power (J12, J13)

J12 and J13 are unused connectors that could provide power for additional system fans if needed.

8.4.2 Remote Sense Capabilities

Remote sensing exists on the +3.3V, +5.1V and +12V outputs. The remote sense signals for each power supply are connected together on the Power Distribution backplane and routed to the baseboard through the power control signal connector (J11/PS3). The amount of drop in each voltage for the remote sense to regulate is specified in Table 8-3. Only voltage drops exterior to the power supply are included. The loss of a remote sense connection will not cause the power supply to go into a high output voltage condition.

Table 8-3. Remote Sense Regulation Thresholds

Output Voltage	Maximum Voltage Drop
+3.3V	0.2V
+5.1V	0.3V
+12V	0.2V

8.4.3 Over Voltage Protection

An over voltage condition is sensed on the +3.3V, +5.1V and +12V outputs for each power supply. The maximum values shown are voltages measured on the power supply outputs. The power supply will shut down and latches off in an over voltage condition. To turn the power supply back on again, the AC line must be cycled off then turned back on. This is easily accomplished by removing the power cord from the back of the power supply.

Table 8-4. Over Voltage Protection Trip Values

Output Voltage	Maximum Voltage
+3.3V	4.50V
+5.1V	6.50V
+12V	15.00V

8.4.4 Over Current and Short Circuit Protection

Over current protection exists on the +3.3V, +5.1V and +12V outputs. These do not limit the outputs to under 240 VA. The set points are greater than the maximum output currents for the +3.3V and +5.1V outputs and greater than the peak current for the +12V output as listed above. The -5V and -12V outputs are sensed for a short circuit condition. For both over current and short circuit protection the power supply shuts down and latches all outputs except the +5V standby and Vbias. To turn the power supply on again the AC line must be cycled off then turned on.

8.4.5 240 VA Protection

In addition to the over current and over voltage protection circuits, additional 240 VA circuits on the power distribution board limits the available current on each of the A and B channels of the +5.1V and +12V outputs. There are actually four 240 VA circuits. One each for the +5.1V and +12V outputs on channel A and two similar circuits for channel B. Table 8-5 shows the current limit for each circuit.

Table 8-5. 240 VA Current Limits (Amps)

System Locations (Connectors)[1]	Channel	5.1V	12V
Baseboard, Front Panel and SCSI Logic (not including Hard Drives) (J6 + J7 + J10)	Channel A	42 A	18.5 A
5.25" Peripheral Bay and SCSI Hard Drives (J1 + J2 + J3 + J4 + J5)	Channel B	42 A	17 A

Notes:

1. The current limit shown is the sum of the currents in these connectors

8.4.6 Power Supply Status Indication

Each power supply has two LED's visible from the back of the system labeled PS (Power Supply OK) and I (Current OK). These LED's, along with a few other states described in the sections below will determine the status of each power supply. Table 8-6 describes the different states.

Table 8-6. Power Supply Status

Power Supply State	Shutdown Power Supply (not +5 standby or Vbias)	FAULT Signal	PGOOD Signal	PS (Power Supply OK)	I (Current OK)
Power supply operational (PON = ON)	NO	LOW	HIGH	ON	ON
Over voltage	YES	HIGH	LOW	OFF	OFF
Fan failure	YES	HIGH	LOW	OFF	OFF
Over temperature	YES	HIGH	LOW	OFF	OFF
General failure	N/A	HIGH	LOW	OFF	ON or OFF
Current limited (+5.1 V, +12 V, +3.3 V)	YES	HIGH	LOW	ON	OFF
Short circuit protection (-5 V, -12 V)	YES	HIGH	LOW	OFF	OFF
Power supply disabled (PON = OFF)	YES	LOW	LOW	ON	ON
Minimal Load	NO	LOW	HIGH	OFF	ON

Note:

1. See Appendix E, Erratum #4, for errata related to the power supply LED status description.

8.4.6.1 Power Supply Fault Signal

Each power supply provides an indicator for power supply failure (FAULT). The power supply looks at voltages across isolating FETs, load share bus levels, overvoltage conditions, fan fail, over temperature conditions, and overcurrent to assert the fault signal. This fault signal is stored in the I^2C slave device (Address 44h) on the Power Distribution backplane. If any power supply faults, the Power Supply fail LED will be lit on the front panel.

8.4.6.2 Power Good (PGOOD & PWRGOOD) signals

Each power supply provides a power good signal to the power distribution backplane. This signal indicates that all outputs have reached operating state. The PGOOD signal is deasserted for a minimum of 250uS before any of the output voltages fall below the regulation limit. During normal power on, PGOOD will be asserted between 100mS and 1500mS after the 5.1V output reaches a minimum of 4.75V.

To indicate that all power supplies are within regulation, the PGOOD signals from each supply are OR'd together on the power distribution backplane to create a single PWRGOOD signal which is passed on to the baseboard. The PWRGOOD signal has the same timing parameters as the individual PGOOD signals described above.

8.4.6.3 Power Enable (PON) Signal

The PON signal is a control signal coming from each power supply. All three PON signals from the power supplies connect together on the Power Distribution backplane to enable or disable all three power supplies at once. The PON signal connects to the system baseboard through the power control signal connector J11. The PON signal is used by the 240 VA protection circuit to disable the power supply outputs in an over 240 VA condition.

9. SERVER MANAGEMENT

The AP450GX MP Server System provides the following server management features that allow prediction and detection of system errors. Many of the features are available via Intel's LANDesk® Server Manager (LDSM) software.

- Chassis Intrusion Alert
- Fan Fail Alert
- Power Supply Fail Alert
- Hard Drive Fail Alert
- Temperature and Voltage Monitoring
- Fault Resilient Booting
- Error Logging
- ECC Memory
- Memory Down Sizing
- I^2C diagnostic bus
- LCD Display
- Optional Emergency and Remote Management capabilities via Intel's Server Monitor Module

9.1 System Alerts

All alerts as well as the temperature and voltage monitoring listed above are monitored by LDSM. LDSM will notify the user of the alert by generating an event on the server management console. Each alert can be either turned on or off with LDSM. If turned on, the alert will generate a number of user defined events (tasks) from beeping the console and flashing an icon, to powering down the server or even sending a page (only if Intel's Server Monitor Module is installed). Refer to the LANDesk® Server Manager or LDSM manuals and the *Intel Server Monitor Module Technical Product Specification* for more details.

9.1.1 Chassis Intrusion Alert

There are three switches on the chassis, one on each side cover and one on the metal Hot-swap hard drive door, that will generate an alert if any one is opened. These alerts are passed to the INCA component on the baseboard where LDSM will detect them and indicate a breach of security on the server management console.

9.1.2 Fan Fail Alert

Each of the three system fans will assert a fail signal to the baseboard if the fan has a locked rotor. The fan fail signals are logically OR'd and passed to the INCA component on the baseboard where LDSM will detect them and indicate a system fan failure on the server management console. An indication of which fan has failed is stored in the I^2C slave device on the baseboard (Address 40h), but the current version of LDSM, does not access this device and thus does not pin-point the failed fan. However, it is easy for a user to determine which fan has a locked rotor and caused the alert.

9.1.3 Power Supply Fail Alert

Each power supply provides a signal that indicates a fault. The power supply looks at voltages across isolating FETs, load share bus levels, over-voltage conditions, fan fail, over temperature conditions, and over-current. If any is out of specification, the power supply will assert its fault signal. The fault status for all three power supplies is stored in the I^2C slave device on the Power Distribution backplane (address 44h). If any one of the power supplies indicates a fault, the Power Supply Fault LED on the front panel will be lit. The status of LED lights on the failed power supply will help determine which supply has failed, as well as the failure condition. Refer to section 8.4.6 for more details. Other than the Front Panel LED and the LED lights on the back of the power supply, there are no other indications of a power supply failure. The current version of LDSM, does not indicate a power supply failure.

In addition to the power supply fault status, a power supply present status is also stored in the I^2C slave device on the power distribution backplane. However, the current version of LDSM, does not access this I^2C device and thus does not have power supply present or fault information available to it.

9.2 Temperature and Voltage Monitoring

Voltage and temperature are both monitored by devices on the baseboard. Voltage is monitored at the pins of the INCA component (+3.3V, +5.1V and +12V), while temperature is monitored at two different places on the baseboard. One is near the processor modules, the other is near the PCI adapter slot area. All three conditions are routed to the INCA device where LDSM will monitor them.

Within LDSM, two different levels of user selectable alerts for the voltage and temperature channels can be enabled. The first is a warning alert which indicates something is beginning to go wrong, but is not deemed to be a critical event, such as the temperature in the system is beginning to rise, but is not yet out of specification. The second is a fatal alert indicating something more drastic has occurred, like the system is beyond its guaranteed operating temperature. Different events can be selected in LDSM for the different level of alert. For example a warning alert may only flash a message to the console, while a fatal alert may immediately shut down the system. Refer to the LANDesk® Server Manager or LDSM manuals for more details.

9.3 Fault Resilient Booting

To insure greater reliability and up time, the system has the ability to boot, even if the Boot Strap Processor (BSP) is faulty. This is called fault resilient booting (FRB). FRB is implemented in the following manner: If the BSP is faulty, the faulted processors is marked “bad” and eliminated from the system. The BSP responsibilities are then passed to the next processor. If this processor is also faulty, it too is eliminated from the system and the BSP responsibilities are passed on to the next processor in the system. This procedure continues until a “good” processor is found to complete system boot. If all processors in the system are deemed faulty, the system will try to boot with the last processor it marked “bad”.

A processor is deemed good by passing two tests. First the processor must pass its own BIST (Built-In-Self-Test). BIST is built into the processor. If the processors fails its own BIST, it will be deemed faulty. Second, the processor must complete its BSP responsibilities before a “watchdog timer” in the INCA component times out. The watchdog timer is set at power on and begins counting down. The BSP will turn off the timer when it completes its BSP responsibilities. If the BSP processor does not turn off the timer before it gets to zero, the processor will be deemed faulty. The timer is set for ~26 minutes, which is the theoretical maximum time it will take the processor to complete its BSP responsibilities with a fully loaded system (4GB of memory, 10 adapter cards, lots of disk etc.) This timer value is not user programmable. The BIOS will send an error message to the screen if it determines one of the processors is faulty.

It is the responsibility of the operating system to determine if processors in the system other than the BSP are faulty. This process varies with different operating systems. Both the SCU and BIOS setup will indicate if a processor has been deemed faulty.

9.4 Critical Event Logging

The system has the ability to log critical system events into a non-volatile event log. These events can then be communicated to the server console via server management software such as Intel's LANDesk® Server Manager. The critical events that are logged are listed below:

- Processor bus errors (Single Bit and Multiple Bit bus errors)
- ECC Memory Errors (Single Bit, Multiple Bit and memory parity errors)
- PCI Bus Errors (PCI Parity or PCI System errors)
- POST Errors (If Memory is resized and other POST errors)
- Environmental Errors (Voltage, Temperature or Cooling errors)

Notes:

1. Both Event Logging and the SMM (System Management Mode) should both be enabled for full critical event logging and proper responses to occur.
2. Errors will only be logged if Event Logging is turned on in the BIOS set-up.
3. Intel's LANDesk® Server Manager will still detect and report all errors, except ECC Memory Errors, even if Event Logging is turned off.
4. The BIOS will perform memory scrubbing (i.e. fix single bit errors in memory) only if the SMM is enabled.

9.5 ECC Memory

Using affordable parity SIMM's or DIMMs, the system performs single bit error correction and double-bit error detection. Single bit errors have no impact on system performance or data integrity because the errors are corrected on the fly, however if a double bit error is detected, the system will not be able to continue and will halt. Whether the shutdown is graceful or not is dependent on the ability of the operating system to handle the double bit error. If error logging is enabled, both the single bit and double bit errors will be logged in NVRAM.

9.6 Memory Downsizing

During POST (Power-On-Self-Test) the system scans memory for bad memory locations (unless the memory scan is turned off in the BIOS setup). If a bad memory location is found, memory will be reduced in size, but not configuration, until the bad location is no longer used.

9.7 I^2C Diagnostic Bus

The system has an I^2C (Inter-Integrated Circuit) bus routed in the system to facilitate diagnostic communications between all major components in the system. Refer to Figure 7-1 in chapter 7 for the exact routing within the system. There is also a separate connector on the baseboard to allow for additional I^2C connections, although I^2C connections other than those shown below are not recommended.

During POST (Power-On-Self-Test) the BIOS performs three operations from the baseboard I^2C master device:

- Read to the memory module to determine the speed of SIMM's or DIMMs installed.
- Read to both processor slots to determine the processor and bus frequency requested by each module as well as the processor steppings installed.
- Read to the baseboard to determine revision level of the baseboard.

During system runtime, the primary SCSI backplane performs three operations:

- Reads the secondary SCSI backplane to determine if a drive has faulted.
- Reads the power distribution backplane to determine if a power supply has faulted.
- Writes to the front panel to assert the power supply or hard drive fault light if a power supply or hard drive fault has occurred.

9.8 LCD Display

The LCD display has two lines with 16 characters per line and is used to display the BIOS POST codes as well as certain runtime error messages. The display can be programmed through the SCU to display anything the user wants, however the second line may be used by the BIOS to display runtime error messages.

9.9 Server Monitor Module Connector

The sever monitor module or “feature” connector on the baseboard allows Intel’s Server Monitor Module to be installed. The ISA based module enables emergency and remote management of the server. Refer to the *Intel Server Monitor Module Technical Product Specification* for more details.

10. ENVIRONMENTAL CERTIFICATIONS

10.1 Safety

The system is UL listed to UL 1950, 2nd Edition.

10.1.1 USA

The system is certified by UL(cUL) to meet the requirements of CSA C22.2 No. 950-M93. The product bears the cUL mark.

10.1.2 Canada

The system is certified by UL(cUL) to meet the requirements of CSA C22.2 No. 950-M93. The product bears the cUL mark.

10.1.3 Europe

The system is certified to meet the requirements of EN 60 950 with TUV (GS License), and IEC 950 with amendments.

10.1.4 International

The system is certified to meet the requirements of amendments and IEC 950 with amendments, EN 60 950 with amendments and Nordic deviations by NEMKO.

10.2 Electro-Magnetic Compatibility

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, EN61000-3-2, Class B and EN 50082-2. 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)

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 2 limits (CISPR 22 B Limit).

11. ENVIRONMENTAL LIMITS

Table 11-1. System Environment Summary

Parameter	Specification
Operating Temperature	+5^{o}C to +35^{o}C, derated 0.5 ^{o}C for every 1000 ft above sea level and a maximum rate of change not to exceed 10^{o}C per hour.
Non-operating Temperature	-40^{o}C to +70^{o}C
Operating Humidity	85% non-condensing at 40 ^{o}C <33 ^{o}C wetbulb (no peripherals) at 40 ^{o}C
Non-operating Humidity	95%, non-condensing @ 55^{o}C
Acoustic noise	< 55 dBA at +20^{o}C to +25^{o}C, at the bystander position (~3 ft from the system)
Random Vibration, Non-operating	7 to 28 Hz, 0.001 to 0.01 G^2 per Hz 28 to 500 Hz, 0.01 G^2 per Hz
Mechanical Shock, operating	2.0 G with 11 msec duration, 1/2 sine wave
ESD	20kV
Operating Altitude	0 to 10,000 Feet (0 to 3,050 Meters)
Non-operating Altitude	0 to 50,000 Feet (0 to 15,250 Meters)

12. RELIABILITY, SERVICEABILITY AND AVAILABILITY

12.1 MTBF

The following table lists the calculated AP450GX MP Server system hard Mean Time Between Failures (MTBF). A hard failure indicates a permanent or repeatable failure that can be readily remedied by replacing the faulty part with a good one. MTBF numbers are calculated using the Bell Core Method 1, Case 3 and associated tables.

Table 12-1. AP450GX System MTBF at 35°C

Sub Assembly Description	Total Sub Assembly MTBF (In Hours)	Total Sub Assembly Failure Rate (FITs)
Baseboard	49,033	16,314
1 Processor Module (w/1 166/512KB processor)	108,864	7,348
1 Terminator Module	188,651	4,240
1GB Memory Module	357,577	2,237
2 SCSI backplanes	132,593	12,066
Front Panel board	257,905	3,102
4 SCSI drive LED boards	2,061,856	1,552
Power Distribution Backplane	123,077	6,499
LCD	690,322	1,159
Two 420W power supplies	128,000	15,625
1.44 MB 3.5" floppy disk	81,000	2,469
Four 16MB SIMM's	862,664	3,709
AP450GX chassis	19,230,769	42
Total MTBF (hours)	**13,096**[1]	
Total Failure Rate (FITs)		**76,361**

Notes:

1. The above numbers are for a standard system at 35°C with the following configuration:

1 baseboard, 1 processor module, 2 200 MHz/512 KB Pentium Pro processors, 1 terminator module, and a 1 GB memory module with 0 MB memory.

At 25°C the MTBF for this configuration is expected to be 31,692 hours.

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. In Table 12-2 are the maximum times a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system.

Table 12-2. Maintenance Procedure Performance Times

Maintenance Procedure	Maximum Time to Perform
Remove cover	30 seconds
Remove and replace disk drive	1 minute
Remove and replace power supply	1 minute
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
Remove and replace power backplane	12 minutes
Remove and replace SCSI backplane	15 minutes
Overall MTTR (not including problem diagnosis)	15 minutes

12.2.1 Power and Status/Control Signals to SCSI Backplane

The distribution board provides power from connectors J1 and J2 to J10 on the SCSI backplane(s). The distribution board provides power status and control signals from connector J10 to J11 on the SCSI backplane(s). See pinout tables in Appendix D.

12.2.2 I^2C Input Connector, J10

The power supply backplane has a single I^2C device to detect status and presence for each power supply. The device is connected through the power control signal connectors J11 and J10 to the I^2C circuits on the system board and the SCSI hard drive backplane. The address of the device is 44h.

12.2.3 Removable Media Power Connectors, J3, J4, J5

These connectors provide power to removable media devices that are in the upper left front bays—not to the SCSI hot-swap devices in the right front bays.

Table 12-3. Removable Media Power Connectors

Pin	Description
1	+12 VDC
2 and 3	GND
4	+5.1 VDC

12.2.4 Fan Connectors, J12 and J13

Two fan connectors provide power for system fans.

Table 12-4. Fan Connectors

Pin	Description
1	GND
2	+12 VDC Channel B
3	Fan fail

APPENDIX A - SUPPORTED ENVIRONMENTS

The AP450GX MP Server System has been validated with the leading network operating systems, adapter cards and SIMM combinations. Refer to the *AP450GX Server Board Set Technical Product Specification* and the AP450GX MP Server Board Set Specification Update for more details.

APPENDIX B -- PRODUCT CODES

Contact your Intel sales representative for the current product codes, availability and pricing.

APPENDIX C -- SPARES LIST

Contact your Intel sales representative for the current spares list, availability and pricing.

APPENDIX D -- CONNECTOR PINOUTS

This appendix contains the connector pinouts for the AP450GX MP Server System. Refer to *the AP450GX Board Set Technical Product Specification* for the baseboard connectors not listed here.

D.1 SCSI Backplane Connectors

Figure D-1 shows connector locations on the SCSI drive backplane.

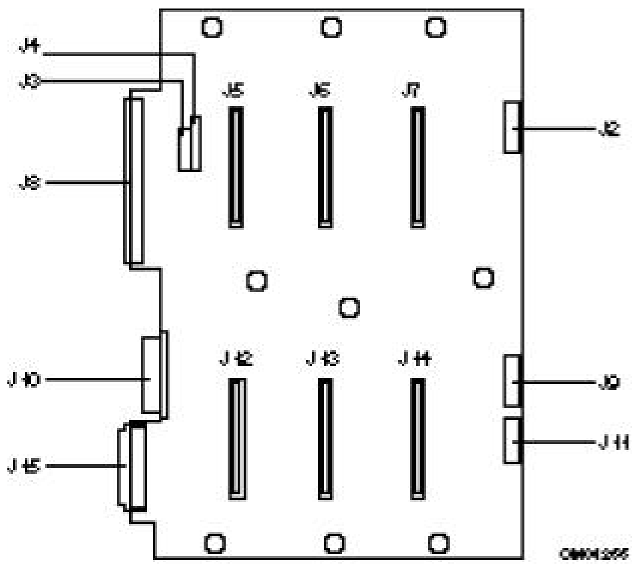


Figure D-1. SCSI Backplane Connectors

Table D-1. SCSI Backplane Connectors

J3, J4	Drive ID and configuration jumper blocks
J8	Narrow SCSI cable, output (only supported in fast/wide mode)
J10	Power and ground from power distribution board
J15	Wide SCSI cable, input from SCSI channel A or B
J2	LED connector cable for drives 1, 2, 3
J9	LED connector cable for drives 4, 5, 6
J11	I^2C bus connector (power status/control signal)
J5	Wide SCSI drive bay
J6	Wide SCSI drive bay
J7	Wide SCSI drive bay
J12	Wide SCSI drive bay
J13	Wide SCSI drive bay
J14	Wide SCSI drive bay

D.1.1 50-pin Narrow Output Connector (J8 - SCSI Backplane)

This is only supported in fast/wide mode.

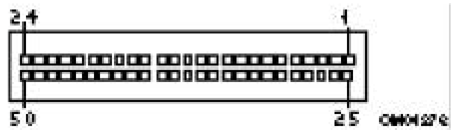


Figure D-2. Connector J8 - SCSI Backplane

Table D-2. Connector J8 - SCSI Backplane

Signal name	Connector contact	SCSI bus conductor	SCSI bus conductor	Connector contact	Signal name
GND	1	1	2	2	DB(0) #
GND	3	3	4	4	DB(1) #
GND	5	5	6	6	DB(2) #
GND	7	7	8	8	DB(3) #
GND	9	9	10	10	DB(4) #
GND	11	11	12	12	DB(5) #
GND	13	13	14	14	DB(6) #
GND	15	15	16	16	DB(7) #
GND	17	17	18	18	DB(P) #
GND	19	19	20	20	GND
GND	21	21	22	22	GND
Reserved	23	23	24	24	Reserved
Open	25	25	26	26	TERMPWR
Reserved	27	27	28	28	Reserved
GND	29	29	30	30	GND
GND	31	31	32	32	ATN #
GND	33	33	34	34	GND
GND	35	35	36	36	BSY #
GND	37	37	38	38	ACK #
GND	39	39	40	40	RST #
GND	41	41	42	42	MSG #
GND	43	43	44	44	SEL #
GND	45	45	46	46	C/D #
GND	47	47	48	48	REQ #
GND	49	49	50	50	I/O #

D.1.2 68-pin Wide Input Connector (J15 - SCSI Backplane)

This is only supported in fast/wide mode.

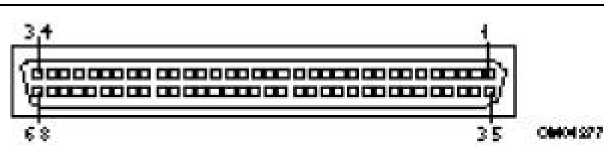


Figure D-3. Connector J15 - SCSI Backplane

Table D-3. Connector J15 - SCSI Backplane

Signal name	Connector contact	SCSI bus conductor	SCSI bus conductor	Connector contact	Signal name
GND	1	1	2	35	DB(12) #
GND	2	3	4	36	DB(13) #
GND	3	5	6	37	DB(14) #
GND	4	7	8	38	DB(15) #
GND	5	9	10	39	DB(P1) #
GND	6	11	12	40	DB(0) #
GND	7	13	14	41	DB(1) #
GND	8	15	16	42	DB(2) #
GND	9	17	18	43	DB(3) #
GND	10	19	20	44	DB(4) #
GND	11	21	22	45	DB(5) #
GND	12	23	24	46	DB(6) #
GND	13	25	26	47	DB(7) #
GND	14	27	28	48	DB(P) #
GND	15	29	30	49	GND
GND	16	31	32	50	GND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
Reserved	19	37	38	53	Reserved
GND	20	39	40	54	GND
GND	21	41	42	55	ATN #
GND	22	43	44	56	GND
GND	23	45	46	57	BSY #
GND	24	47	48	58	ACK #
GND	25	49	50	59	RST #
GND	26	51	52	60	MSG #
GND	27	53	54	61	SEL #
GND	28	55	56	62	CD #
GND	29	57	58	63	REQ #
GND	30	59	60	64	I/O #
GND	31	61	62	65	DB(8) #
GND	32	63	64	66	DB(9) #
GND	33	65	66	67	DB(10) #
GND	34	67	68	68	DB(11) #

D.1.3 Power Connector (J10 - SCSI Backplane)

Table D-4. Connector J10 - SCSI Backplane

Pin	Description
1 - 3	+12 VDC
4 - 9	GND
10 - 12	+5.1 VDC

D.1.4 Power Status/Control Signal Connector (J11 - SCSI Backplane)

The SCSI backplane receives power status and control signals at J11 from connector J10 on the power distribution board.

Table D-5. Connector J11 - SCSI Backplane

Pin	Description
1 - 3	GND
4	+5V standby
5 - 6	+5.1 VDC (Channel B)
7	Not connected
8	I^2C-SCL
9	I^2C -SDA
10	I^2C presence

D.1.5 LED Connectors (J2, J9 - SCSI Backplane)

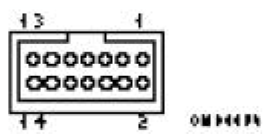


Figure D-4. Connectors J2, J9 - SCSI Backplane

The hot-swap backplane has two 14-pin cable connectors for the SCSI drive LED’s. Each cable connects to the LED’s for one row of three drives.

Table D-6. Connectors J2, J9 - SCSI Backplane

Pin	Signal
1	+5 V
2	+5 V
3	Not connected
4	DRV0PWR#/DRV3PWR#
5	DRV0ACT#/DRV3ACT#
6	DRV0FLT#/DRV3FLT#
7	DRV1PWR#/DRV4PWR#
8	DRV1ACT#/DRV4ACT#
9	DRV1FLT#/DRV3FLT#
10	DRV2PWR#/DRV5PWR#
11	DRV2ACT#/DRV5ACT#
12	DRV2FLT#/DRV5FLT#
13	Not connected
14	Not connected

D.1.6 SCA Drive Connectors (J5-J7, J12-J14 - SCSI Backplane)

Table D-7. Connectors J5-J7, J12-J14 - SCSI Backplane

Connector contact	Signal name		Connector contact	Signal name
1	12V charge		41	12V GND
2	12V		42	12V GND
3	12V		43	12V GND
4	12V		44	Mated 1
5	Reserved/ESI-1		45	EFW #
6	Reserved/ESI-2		46	DIFFSNS
7	DB(11) #		47	GND
8	DB(10) #		48	GND
9	DB(9) #		49	GND
10	DB(8) #		50	GND
11	I/O #		51	GND
12	REQ #		52	GND
13	C/D #		53	GND
14	SEL #		54	GND
15	MSG #		55	GND
16	RST #		56	GND
17	ACK #		57	GND
18	BSY #		58	GND
19	ATN #		59	GND
20	DB(P) #		60	GND
21	DB(7) #		61	GND
22	DB(6) #		62	GND
23	DB(5) #		63	GND
24	DB(4) #		64	GND
25	DB(3) #		65	GND
26	DB(2) #		66	GND
27	DB(1) #		67	GND
28	DB(0) #		68	GND
29	DB(P1) #		69	GND
30	DB(15) #		70	GND
31	DB(14) #		71	GND
32	DB(13) #		72	GND
33	DB(12) #		73	GND
34	5V		74	Mated 2
35	5V		75	5V GND
36	5V charge		76	5V GND
37	Spindle sync		77	Active LED out
38	MTRON		78	DLYD_START
39	SCSI ID (0)		79	SCSI ID (1)
40	SCSI ID (2)		80	SCSI ID (3)

D.2 Front Panel Control Board Connectors

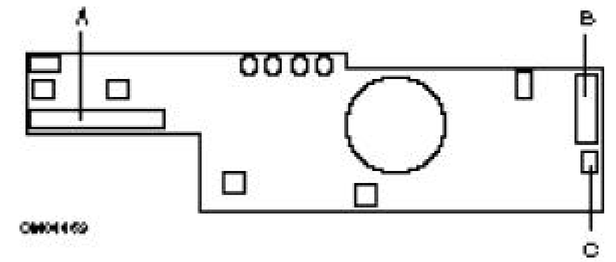


Figure D-5. Front Panel Control Board

Front panel control board

A Signal interface to system board; 40-pin straight-head connector (J3)

B Signal interface to LCD; 14-pin straight-head connector (J2)

C Backlight power to LCD; 3-pin straight-head connector latching-style connector (J7)

D.2.1 LCD Signal Interface (J2 - Front Panel)

Table D-8. Connector J2 - Front Panel

Pin	Signal	Description
1	DB6	Data bit 6
2	DB7	Data bit 7
3	DB4	Data bit 4
4	DB5	Data bit 5
5	DB2	Data bit 2
6	DB3	Data bit 3
7	DB0	Data bit 0
8	DB1	Data bit 1
9	RW	Control LCD read/write
10	EN	Enable LCD
11		LCD contrast control signal
12	RS	Select LCD register
13	GND	Ground
14	LCD-VDD	Power line to LCD

D.2.2 LCD Backlight Power (J7 - Front Panel)

Table D-9. Connector J7 - Front Panel

Pin	Description
1	Ground
2	Backlight power
3	Ground

D.2.3 System Board Signal Interface (J3 - Front Panel)

Table D-10. Connector J3 - Front Panel

Pin	Signal name	Type[1]	Function
1	SPKRDAT	In	Drives standard PC-AT speaker
2	VCC5	In	5 V power supply
3	5VSTANDBY	In	5 V power supply standby
4	PS_ON	I/O	Power supply on/off switch connection
5	FP_RESET #	Out	Active-low front panel reset switch connection
6	GND		Ground
7	FP_NMI #	Out	Connects to FP_NMI driver
8	GND		Ground
9	HD1_LED_VCC		Hard Drive 1 Activity indicator LED return
10	HD1_ LED_ACT#		Hard Drive 1 Activity indicator LED
11	HD2_LED_ACT#		Hard Drive 2 Activity indicator LED
12	HD2_LED_VCC		Hard Drive 2 Activity indicator LED return
13	KEYLOCK#		Keyboard lock signal
14	GND		Ground
15	SECURE	In	Secure mode indicator
16	VCC5	In	LCD Display controller power
17	KEY		Not connected
18	VCC5	In	5 V power supply
19	I^2C-SDA	I/O	I^2C interface data signal
20	CHASIS_SWT_RET	Out	Chassis intrusion detection switch return
21	LCD_SD	I/O	Serial I/O data to LCD controller
22	H_PWROFF#	In	Host power control (from Server Management board)
23	LCD_SCLK	In	Clock for LCD serial I/O
24	I^2C_SCL	I/O	I^2C interface clock signal
25	LCD_PCLK	In	LCD controller processor clock

Pin	Signal name	Type[1]	Function
26	GND		Ground
27	EN	In	LCD enable
28	GND		Ground
29	RW	In	LCD Read/Write strobe
30	VCC3		3.3 V power supply
31	RS	In	LCD reset
32	PWR#	In	RTC power control indication
33	LCD_GND	In	LCD display ground connection
34	GND		Ground
35	FAN_FAIL#	In	Indicates failure of at least one cooling fan
36	GND		Ground
37	I^2C_PRES		I^2C control signal
38	RESERVED		Reserved
39	Vcc		Vcc
40	RESERVED		Reserved

Notes:

1. In: driven by system board. Out: driven by front panel.

D.3 External Baseboard Connectors

D.3.1 VGA Video Port (Baseboard)

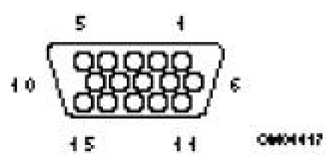


Figure D-6. VGA Video Port Connector

Table D-11. VGA Video Port Connector

Pin	Signal	Pin	Signal
1	Red	9	Not connected
2	Green	10	GND
3	Blue	11	Not connected
4	Not connected	12	Not connected
5	GND	13	HSYNC (horizontal sync)
6	GND	14	VSYNC (vertical sync)
7	GND	15	Not connected
8	GND		

D.3.2 Parallel Port Connector (Baseboard)

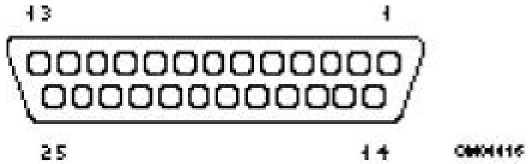


Figure D-7. Parallel Port Connector

Table D-12. Parallel Port Connector

Pin	Signal	Pin	Signal
1	Strobe #	10	ACK (acknowledge) #
2	Data bit 0	11	Busy
3	Data bit 1	12	PE (paper end)
4	Data bit 2	13	SLCT (select)
5	Data bit 3	14	AUFDXT (auto feed) #
6	Data bit 4	15	Error #
7	Data bit 5	16	INIT (initialize printer)
8	Data bit 6	17	SLCTIN (select input) #
9	Data bit 7	18–25	GND

D.3.3 Serial Port Connectors 1 and 2 (Baseboard)

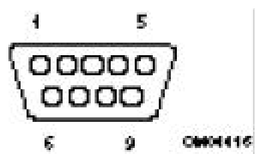


Figure D-8. Serial Port Connectors

Table D-13 Serial Port Connectors

Pin	Signal
1	DCD (data carrier detect)
2	RXD (receive data)
3	TXD (transmit data)
4	DTR (data terminal ready)
5	GND
6	DSR (data set ready)
7	RTS (request to send)
8	CTS (clear to send)
9	RI (ring indicator)

D.3.4 Keyboard and Mouse Connectors (Baseboard)

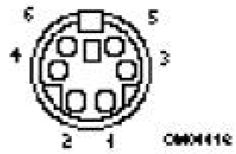


Figure D-9. Keyboard & Mouse Connectors1

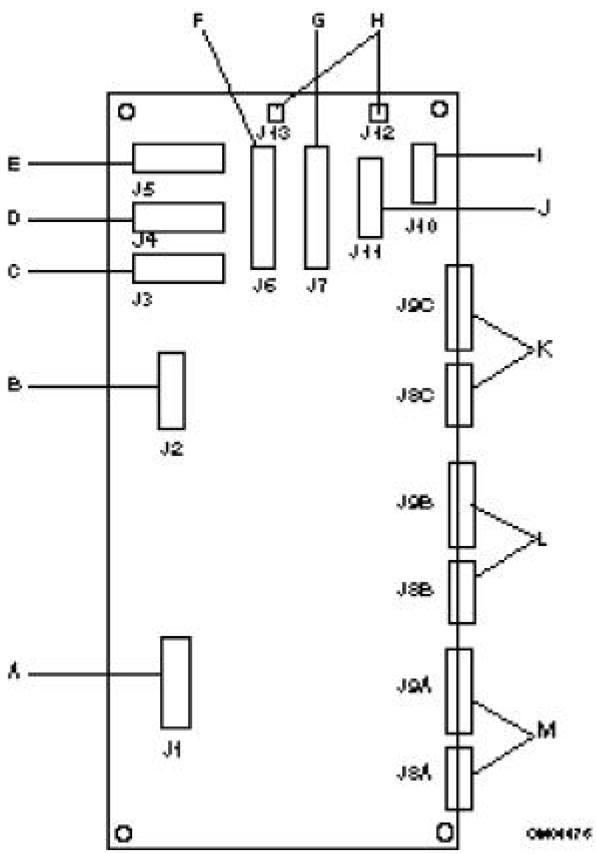
Notes:

1. These identical PS/2-compatible connectors share a common housing.

Table D-14. Keyboard and Mouse Connectors

Pin	Keyboard signal		Pin	Mouse signal
1	KEYDAT (keyboard data)		1	MSEDAT (mouse data)
2	Not connected		2	Not connected
3	GND		3	GND
4	FUSED_VCC (+5 V)		4	FUSED_VCC (+5 V)
5	KEYCLK (keyboard clock)		5	MSECLK (mouse clock)
6	Not connected		6	Not connected

D.4 Power Distribution Backplane Connectors



Power supply distribution board connectors

A J1, power to lower SCSI hard drive backplane

B J2, power to upper SCSI hard drive backplane

C J3, +5.1 VDC and +12 VDC power to removable media devices

D J4, +5.1 VDC and +12 VDC power to removable media devices

E J5, +5.1 VDC and +12 VDC power to diskette drive

F, G J6 and J7, power to PS1 and PS2 on system board

H J12 and J13, fan connectors

I J10, I^2C connector

J J11, power status/control signal to PS3 on system board

K, L, M Docking connectors for power supplies (3)

Figure D-10. Power Distribution Backplane Connectors

D.4.1 SCSI Backplane Power (J1, J2 - Power Distribution Backplane)

Table D-15. Connectors J1, J2 - Power Distribution Backplane

Pin	Description
1 - 3	+12 V
4 - 9	GND
10 - 12	+5.1 V

D.4.2 Peripheral Bay Power (J3, J4, J5 - Power Distribution Backplane)

Table D-16. Connectors J3, J4, J5 - Power Distribution Backplane

Pin	Description
1	+12 V
2 and 3	GND
4	+5.1 V

D.4.3 Baseboard Power (J6, J7 - Power Distribution Backplane)

Table D-17. Connectors J6, J7 - Power Distribution Backplane

Pin	Signal	Pin	Signal
1	+5 .1V	11	+12 V
2	GND	12	GND
3	+5.1 V	13	+12 V
4	GND	14	GND
5	+5 .1V	15	+3.3 V
6	GND	16	GND
7	+5 .1V	17	+3.3 V
8	GND	18	GND
9	+5 .1V	19	+3.3 V
10	GND	20	GND

D.4.4 Power Supply Control (J8A, J8B, J8C - Power Distribution Backplane)

Table D-18. Connectors J8A, J8B, J8C - Power Distribution Backplane

Pin	Signal	Pin	Signal
1	+5.1V (remote sense)	9	Vbias
2	+12V (remote sense)	10	+5V standby
3	+3.3V (remote sense)	11	Fault
4	GND (remote sense)	12	GND
5	+5.1 V load share	13	PGOOD
6	+12V load share	14	No Connect
7	+3.3V load share	15	No Connect
8	PON		

D.4.5 Power Supply DC Power (J9A, J9B, J9C - Power Distribution Backplane)

Table D-19. Connectors J9A, J9B, J9C - Power Distribution Backplane

Pin	Signal	Pin	Signal
1	GND	13	GND
2	GND	14	GND
3	GND	15	GND
4	GND	16	GND
5	GND	17	GND
6	GND	18	+3.3VDC
7	+3.3VDC	19	+3.3VDC
8	+12VDC	20	12VDC
9	-12VDC	21	12VDC
10	-5VDC	22	+5.1VDC
11	+5.1VDC	23	+5.1VDC
12	+5.1VDC	24	+5.1VDC

D.4.6 SCSI Backplane Power and Control (J10 - Power Distribution Backplane)

Table D-20. Connector J10 - Power Distribution Backplane

Pin	Description
1 - 3	GND
4	+5V standby
5 - 6	+5.1 VDC (Channel B)
7	Not connected
8	I^2C-SCL
9	I^2C -SDA
10	I^2C presence

D.4.7 Baseboard Power and Control (J11 - Power Distribution Backplane)

Table D-21. Connector J11 - Power Distribution Backplane

Pin	Signal	Pin	Signal
1	-12 VDC	8	+5V standby
2	-5 VDC	9	GND
3	PWR_ON	10	PWRGOOD
4	I^2C-SDA	11	GND
5	I^2C-SCL	12	I^2C_PRES
6	+5.1V remote sense (+)	13	+3.3V remote sense (+)
7	+12V remote sense (+)	14	Ground remote sense (-)

D.4.8 Auxillary Fan (J12, J13 - Power Distribution Backplane)

Table D-22. Connectors J12, J13 - Power Distribution Backplane

Pin	Function
1	GND
2	+12V
3	Fan fail sensor

APPENDIX E -- ERRATA

This appendix lists the errata which apply to the AP450GX MP Server System. Intel intends to fix some of the errata in the future, and to account for the other outstanding issues through documentation or specification changes as noted. Refer to the *AP450GX MP Server System Specification Update* (Order Number 282965) for additional specification updates concerning the AP450GX MP Server System.

E.1 Summary Table of Changes

The following table indicates the errata which apply to the AP450GX MP Server System. Intel intends to fix some of the errata in the future, and to account for the other outstanding issues through documentation or specification changes as noted. This table uses the following notations:

Codes Used in Summary Table

Fix:	This erratum is intended to be fixed in a future revision of the hardware or software associated with the AP450GX MP Server System.
Fixed:	This erratum has been previously fixed.
No Fix:	There are no plans to fix this erratum.

Table E-1. Summary Table of Changes

NO.	PLANS	ERRATA
1	Fixed	Removal of wide SCSI cable may cause strain relief to break.
2	Fixed	Edge of fan access cutout may cause damage to the fan wires.
3	Fixed	Powering off system causes incorrect signal timing.
4	No Fix	Power failure conditions may cause incorrect LED indications.
5	Fix	SAF-TE Perform Slot Operation cannot clear Identify Flag bit.
6	Fix	SAF-TE Inquiry Command receives incorrect Enclosure Unique Identification field.
7	Fixed	Power supply may exceed ripple limits under certain loads.
8	Fixed	Power supply may exceed voltage limits under certain loads.

E.2 Errata

1. Removal of Wide SCSI Cable May Cause Strain Relief to Break

Problem: It can be difficult to grasp the wide SCSI cable connector for proper removal. The tendency is to remove the cable by grasping the cable itself instead of grasping the connector. This can cause the strain relief to break.

Implication: If the strain relief breaks, the cable should still work, however the cable will then be susceptible to having a loose connection at the connector.

Workaround: Always remove the cable by grasping the connector. Do not remove the cable by pulling on the cable itself.

Status: This erratum was fixed with a new SCSI cable (PBA# 641231-002).

2. Edge of Fan Access Cutout May Cause Damage to the Fan Wires

Problem: On the internal bulkhead fan, the fan wires reside in a track running from the fan motor to the edge of the plastic fan frame. The wires in this track are exposed to the circular metal edge of the fan access cutout. There is a potential for the fan wires to rub against the metal edge and short.

Implication: The fan wires could be damaged and possibly short out by rubbing up against the circular metal edge.

Workaround: None identified.

Status: This erratum was fixed with the -012 chassis frame (PBA# 636536-012).

3. Powering Off System Causes Incorrect Signal Timing

Problem: When the power supply is turned off using power enable at any load or using AC at minimum load, the PGOOD signal goes low less than 1msec before the output voltages turn off. The worst case for the power enable turn off is 250usec at full load. The worst case for the AC turn off is 500usec at minimum loads. According to the power supply specification, the PGOOD signal is supposed to go low at least 1msec before the output voltages turn off.

Implication: This deviates from Intel's standard power supply specification. There are no known system issues related to this erratum.

Workaround: None identified.

Status: This erratum was fixed with the -011 power supply (PBA# 638179-011).

4. Power Failure Conditions May Cause Incorrect LED Indications

Problem: The "PS" LED may incorrectly turn off when any output has a solid short. If the system tries to draw more current than available from the power supplies in the system then only the "I" LED will turn off. The proper indication is both LED's off or only the "PS" LED turns off. The "I" LED may incorrectly turn off if there is a fast overvoltage condition on the +3.3V output. This will occur if the +3.3V remote sense is shorted to ground. The following table shows the difference between the expected states and the possible fault states that may occur.

	Expected State		Possible Fault State	
	"PS" LED	"I" LED	"PS" LED	"I" LED
Normal Operation	ON	ON	ON	ON
Shorted Output	ON	OFF	OFF	ON
Overvoltage on +3.3V Output	OFF	ON	ON	OFF

Implication: Incorrect power supply failure modes may be reported by the power supply LED's. This only happens for a restricted set of failure or overcurrent conditions. The "PS" LED may incorrectly turn off when any output has a solid short. If the system tries to draw more current than available from the power supplies in the system then only the "I" LED will turn off. The proper indication is both LED's off or only the "PS" LED turns off. The "I" LED will incorrectly turn off if there is a fast overvoltage condition on the +3.3V output. This will occur if the +3.3V remote sense is shorted to ground.

Workaround: None identified.

Status: There are no plans to fix this erratum.

5. SAF-TE Perform Slot Operation Cannot Clear Identify Flag Bit

Problem: As specified in the SCSI Accessed Fault-Tolerant Enclosure (SAF-TE) Interface Specification, the SAF-TE Perform Slot Operation can be used to set and clear the drive fault LED through the Identify Flag bit. When the Identify Flag bit (bit 2) within byte 2 of the Perform Slot Operation data packet is set, the drive fault LED blinks as expected. However if an attempt is made to clear the Identify Flag bit using the Perform Slot Operation, the SCSI hot-swap backplane firmware will issue a SCSI CHECK CONDITION and the bit will not be cleared.

Implication: Setting the Identify bit is a feature intended for user convenience to be used for drive identification. This does not have any adverse functional effect on the system. The fault light will continue to blink until the bit is cleared.

Workaround: Reserved bit 3 within byte 2 is unused in the current version of the SCSI hot-swap backplane firmware. Setting only bit 3 of byte 2 will cause the Identify Flag bit to be cleared.

Status: This erratum is targeted to be fixed in a future release of the SCSI hot-swap backplane firmware.

6. SAF-TE Inquiry Command Receives Incorrect Enclosure Unique Identification Field

Problem: As specified in the SCSI Accessed Fault-Tolerant Enclosure (SAF-TE) Interface Specification, in response to a SAF-TE SCSI Inquiry command, the SCSI hot-swap backplane firmware provides a unique chassis ID in the Enclosure Unique Identifier field. When the firmware writes the previous adjacent field, the Revision Level Field, it writes one too many bytes, causing the first byte of the Enclosure Unique Identifier field to be overwritten by the firmware.

Implication: The SAF-TE SCSI Inquiry command is normally used to obtain SCSI device information. The data returned for the unique chassis ID in the Enclosure Unique Identifier field will be incorrect.

Workaround: None identified.

Status: This erratum is targeted to be fixed in a future release of the SCSI hot-swap backplane firmware.

7. Power Supply May Exceed Ripple Limits Under Certain Loads

Problem: The -12V output of the power supply has 300mV of ripple under worst case conditions, with full load on the -12V and minimum load on the +12V. The maximum ripple should be 120mV (peak to peak). The 300mV ripple is caused by inadequate capacitance for the fan noise coupling to the -12V output.

Implication: This exceeds Intel standard power supply ripple specifications. While no failures related to this issue have been reported, intermittent failures could occur to circuits with -12V power.

Workaround: None identified.

Status: This erratum was fixed with the -011 power supply (PBA# 638179-011).

8. Power Supply May Exceed Voltage Limits Under Certain Loads

Problem: The -12V output of the power supply exceeds the -13.2 volt specification limit with peak load (20amps) on the +12V output and minimum load (0amps) on the -12V output.

Implication: This exceeds Intel standard power supply regulation limits for -12V. While no failures related to this issue have been reported, intermittent failures could occur to circuits with -12V power.

Workaround: None identified.

Status: This erratum was fixed with the -011 power supply (PBA# 638179-011).