Enterprise Server Group

Intel Astor Chassis
Technical Product Specification

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The Intel Astor Chassis may contain design defects or errors known as errata. Characterized errata that may cause the Astor chassis's behavior to deviate from published specifications are documented in the Astor chassis Specification Update.

Revision History

Revision	Revision History	Date
Rev 1.0	Initial release of the Intel Astor Chassis Technical Product Specification	2/98

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1 INTRODUCTION

The Intel Astor chassis retains the dimensions of the standard Intel Columbus II chassis: approximately 19" high, 18" deep, and 8" wide, however, the Astor chassis design has an added hot-swap hard drive peripheral bay. The hot-swap bay supports up to five 1" SCA hard drives to enhance serviceability, availability, and upgradability of the system.

The Astor system hardware product specification details the deskside chassis features of low cost, time to market, and utilization for multiple platforms and multiple configurations. This chassis has user friendly features, is accessible and serviceable. A key feature of this product is the ability for the product to be customized for an unique look.

The chassis is designed to use PS/2 form factor power supplies rated up to 300 watts. Fans of various sizes (80 or 92mm) may be used as required by specific configurations.

This product specification details the key features of the product. This document references additional product specifications that provide more detail for each sub-assembly.

1.1 System Color

The primary exterior system color will match Intel Color Standard 513505.

1.2 Front Bezel Features

The standard front bezel is molded plastic with two removable 5.25" peripheral bay covers. Behind each peripheral bay cover a removable EMI shield is installed.

Hot-swap hard drives are easily accessed by opening an exterior plastic door, followed by a metal EMI door. This adds flexibility to the bezel design by making EMI performance independent of the cosmetic plastic parts.

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

1.3 Security

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

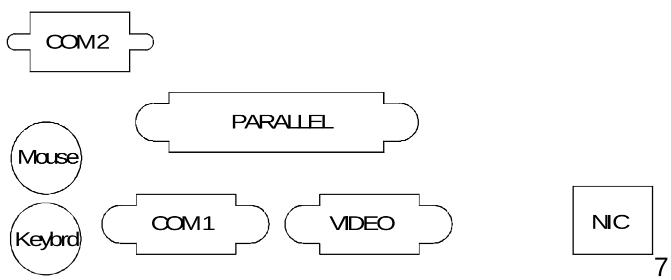
- A Padlock loop on the rear of the system side cover can be used to prevent access to the microprocessors, memory, and add-in cards. A variety of lock sizes can be accommodated by the .300 diameter loop.
- A Padlock loop on the hard drive bay EMI door provides security for the hot swap hard drives. The allotted space accommodates a MasterLock* model 120-D or equivalent lock. Dimensions: .815" H x .830" W x .430" D. Pall diameter .145"
- An alarm switch is provided for the system side cover that may be connected directly to the baseboard or to the front panel, where the user software can process alarm switch activity as desired.
- The front bezel assembly cannot be removed with the side access cover in place, preventing extraction of the 5.25" peripherals.

* See the appropriate Baseboard TPS for a description of Software and BIOS security features.

1.4 I/O panel

All input/output connectors are accessible on the rear of the chassis. A removable plate can be customized to provide a variety of connector placements. One example of the interfaces on the baseboards is mapped in Figure 1 below. The rear I/O panel conforms to ATX Specification version 2.01 and supports seven full-length expansion cards.

Figure 1: R440FX UP Server, R440LX DP Server, N440BX DP Server Style I/O Connector Map



1.5 Chassis Views

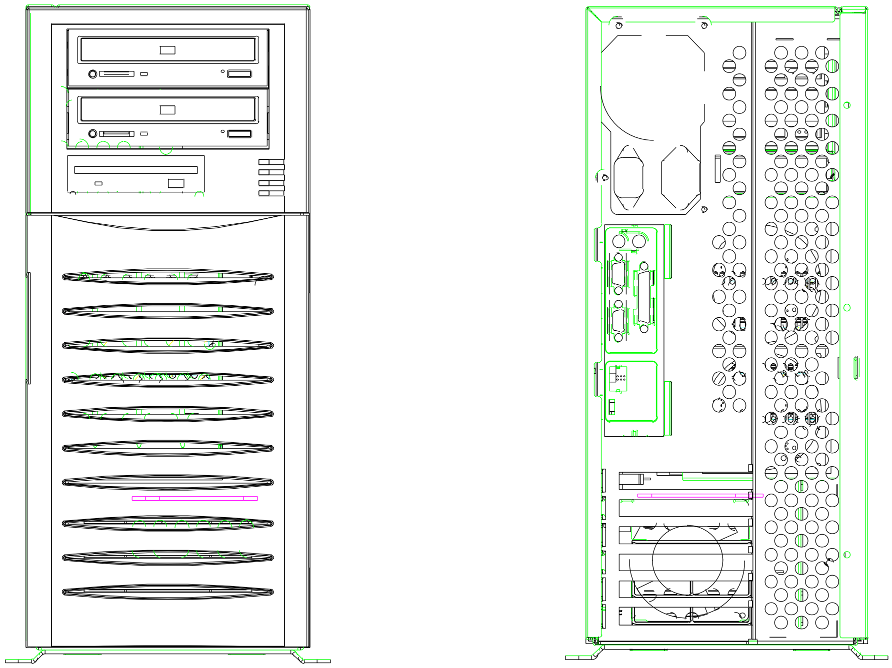


Figure 2: Front and Rear Chassis Views

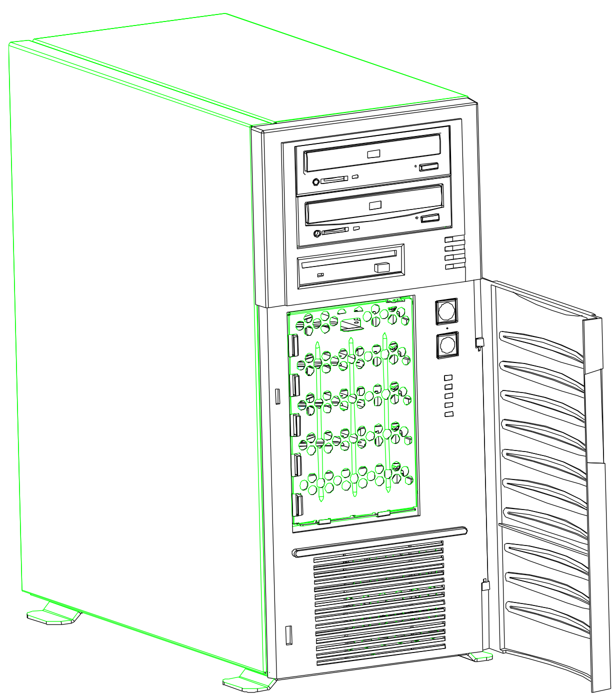


Figure 3: Front Isometric View, open Drive Access Door

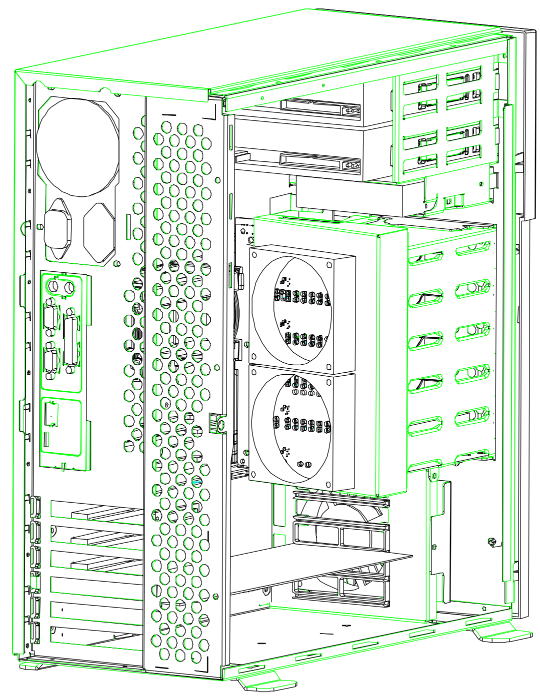


Figure 4: Rear Isometric View, open Access Cover

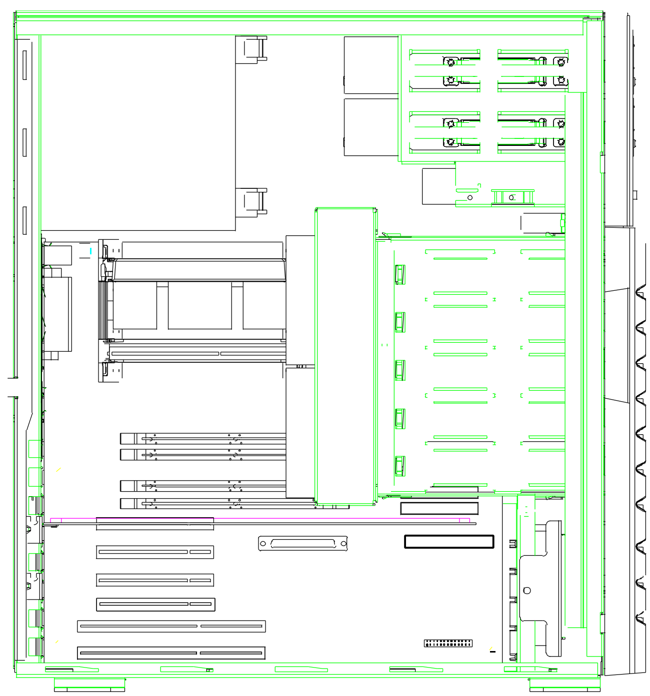


Figure 5: Side View showing N440BX DP Server baseboard

1.6 Chassis Dimensions

Table 1: System Dimensions

Height	19.3 inches
Width	8.3 inches (chassis), 10 inches (feet)
Depth	17.7 inches
Clearance Front	8.5 inches
Clearance Rear	5 inches
Clearance Side	3 inches (additional side clearance required for service)

2 SYSTEM POWER

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

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

The following table is a brief overview:

Table 2: Power Supply Output Summary

	300 Watt Supply w/PFC* 682139-XXX
+5 VDC Output	26 Amp Max
+12 VDC Output	10 Amp Sustained 13Amp/12sec peak current
-12 VDC Output	0.5 Amp Max
-5 VDC Output	0.25 Amp Max
+3.3 VDC Output	16 Amp Max
+5 VDC Standby	800 mA Max
Output balancing	Total combined output power of +3.3v and +5v shall not exceed 167 W.
AC Line Voltage	Auto-ranging for either 100-120 VAC or 200-240 VAC
AC Line Frequency	50/60 Hz
AC Input Current	4.6 Amp at 115 VAC 2.3 Amp at 220 VAC

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

2.1 Mechanical Outline

The mechanical outline and dimensions are the standard PS/2 Form factor. The approximate dimensions are 140mm high by 86mm wide by 150mm deep.

2.2 Fan Requirements

The power supply incorporates a 80mm low acoustic noise fan to exhaust air. The sound pressure level is measured at a distance of 1.0 meter from each side of the power supply in a free field. The worst case peak value of the measurements shall not exceed 38 dBA at 23°C ±2°C.

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

2.3 AC Power Line

The system is specified to operate from 100-120VAC, 200-240VAC, at 50 or 60Hz. The specified 300W PFC is autoranging. The system is tested to meet these line voltages, and has been tested (but not specified) at ±10% of the voltage ranges, and similarly ±3 Hz on the line input frequency.

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

The system is not damaged by AC surge ring wave up to 3.0kV/500A. This ring wave is a 100kHz damped oscillatory wave with a specified rise-time for the linear portion of the initial half-cycle of 0.5µsec. Additionally, the system will not be damaged by a unidirectional surge wave form of up to 1.5kV /3000A, with a 1.2µsec rise time and 50µsec duration. Further details on these wave forms can be obtained in ANSI/IEEE STD C62.45-1992.

2.4 Power Supply/System Configuration

A system can only be configured with a single supply. For a more detailed specification on the power supplies, see document 682139, the specification for the 300 Watt Power Supply w/PFC.

Baseboards utilizing Pentium II microprocessors (N440BX DP Server and future products) use onboard DC-DC voltage converters for the processor core power requirements. These DC-DC voltage converters utilize +12V or +5V and may be onboard and/or plug-in Voltage Regulation Modules (VRMs).

3 SYSTEM COOLING

Three system fans and the power supply fan will provide cooling for the processor, hard drives, and add-in cards. All system fans provide a signal for RPM detection that the baseboard can make available for server management functions. The actual fan implemented may vary based on baseboard requirements. Removal of the side cover gives access to the fans, which then can be easily changed with the system shut down.

4 SYSTEM PERIPHERAL BAYS

4.1 3.5" Floppy Drive Bay

The system ships from the factory with a 3.5" floppy drive installed beneath the 5.25” peripheral bays. Removal of the side cover provides access for replacement of the floppy drive.

4.2 5.25" Drive Bays

The system supports two half height or one full height 5.25" removable media peripheral device (e.g. Magnetic/Optical disk, CD-ROM or tape drive), up to 9” deep. As a guideline, the maximum recommended power per device is 17W. Thermal performance of specific devices must be verified to ensure compliance to the Drive manufacturer’s specifications.

The standard 8-bit narrow SCSI cables from the on-board controller allow for two 5.25” SCSI devices to be installed in these bays. An IDE CD-ROM, IDE Tape Drive or a second floppy drive can also be installed. The 5.25" peripherals are removable directly from the front of the chassis after removal of the side cover and front bezel. Cosmetic cover panels and EMI shield panels are installed in unused 5.25" bays.

Note: These bays are not recommended for hard disk drives. Problems include hard disk drive generated EMI, increased ESD susceptibility (i.e., less hardened to ESD), and inadequate airflow for cooling.

4.3 3.5" Hot Swap Hard Drive Bays

The Astor product supports 3.5" SCA hard drives which are accessible by opening the front access doors. Five low cost plastic carriers are provided with the system to be installed on the hard drives.

The Hot swap drive bay is designed to accept 1” peripherals that consume up to 17 Watts of power. This wattage number is intended as a guideline. Thermal performance of specific hard drives must be verified to ensure compliance to the drive manufacturer’s specifications. Peripherals must be specified to operate at a maximum ambient temperature of 50^{o}C.

5 FRONT PANEL

The front panel is located in the right hand side of the front bezel. The momentary Power On/Off button, System Reset button, and tool activated NMI switch are accessed by opening the exterior hard drive access door. The front panel includes a green power on LED, a green hard drive activity LED, a green network activity LED and an amber fan failure LED, which are visible with the exterior hard drive access door closed. Five amber Hard drive fault LEDs indicate the specific drive failure, and are visible upon opening the exterior hard drive access door.

A 10-pin I2C header is provided that is cabled to the hot-swap backplane. This interface provides drive and fan status to the baseboard.

A three-pin connector is provided on the front panel for connection of a chassis intrusion alarm switch

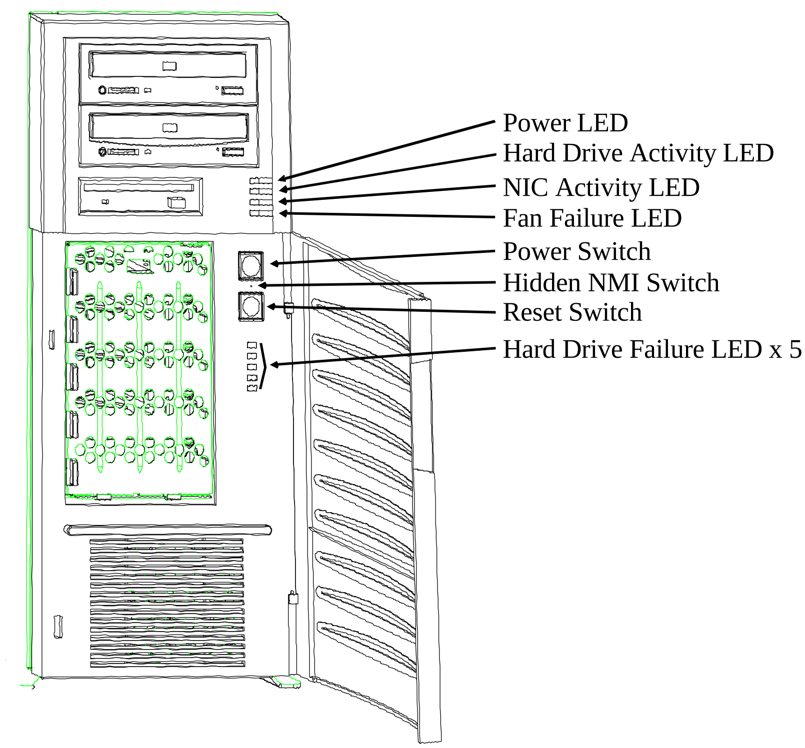


Figure 6: Front View showing Front Panel Functions

6 SYSTEM BASEBOARDS

6.1 N440BX DP Server

Baseboard Features:

- Single or Dual Slot 1 Pentium II processors of identical speed and stepping, current revision
- 440BX PCI set supporting Dual Pentium II processors
- 100 MHz System Bus
- Up to 1 GB with Dual Chip Select PC/100 SDRAM DIMMs (4 sites)
- 3 PCI Full length slots
- 1 shared full length PCI/ISA slot
- 1 Full length ISA slot
- 1x32 bit PCI bus
- Onboard PCI Dual SCSI controller, Ultra Wide and Ultra Narrow Symbios
- Onboard PCI 10/100Mb Intel 82558 Ethernet controller
- Onboard PCI SVGA graphics controller, 2MB of video memory
- keyboard, mouse ports (stacked 6 pin)
- 1-parallel port
- 2-serial ports (one 9-pin D-sub, one 10-pin header)
- USB header

7 SYSTEM INTERCONNECTION

7.1 Signal Definitions

The standard cable construction is briefly described below.

7.2 System Internal Cables

Intrusion Alarm cable

An open momentary switch is depressed by the side access cover. It is cabled to the baseboard by a 22AWG twisted pair, terminated with a 3-pin keyed latching connector or to the 3-pin header on the front panel.

I^2C, Front Panel to Hot-swap Backplane

A 10-pin IDC ribbon cable connects the Front Panel board to the Hot-swap backplane to transfer drive and fan status to the baseboard and LED indicators.

Baseboard to Front Panel

A 16-pin IDC connector connects the Baseboard to the Front Panel.

Baseboard to SCSI devices

Both Wide and Narrow SCSI connectors are provided on the baseboard to support a variety of configurations without the need for expensive adapter solutions. In the Astor system, the Wide SCSI channel is cabled to the hot-swap backplane, and the Narrow SCSI may be cabled to the external peripheral bay as required to support SCSI tape drives, CDROM drives, etc.

Fan Connectors

Two 3-pin connectors are mounted on the baseboard for system fans. The fan connectors are pin 1 - ground, pin 2 - tachometer signal, pin 3 - +12V. Two 3-pin connectors are mounted on the baseboard near the processor slots to provide power for fan/heatsinks. The fan/heatsink connectors are pin 1 - ground, pin 2 - +12V, pin 3 - tachometer signal.

7.3 I/O Panel Connectors

Input/Output connectors accessible at the back of the chassis can be customized by exchanging the removable I/O panel. The specific panel used will be determined by the baseboard and may include custom connectors. The following are typical panel connections:

- PS/2 keyboard connector
- PS/2 mouse connector
- Two 9-pin serial ports
- 25-pin parallel port
- 15-pin video port
- Ethernet RJ-45 connector

8 Chassis Electronics

The Hot-swap SCSI Backplane supports the following features:

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

8.1 Board Layout

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

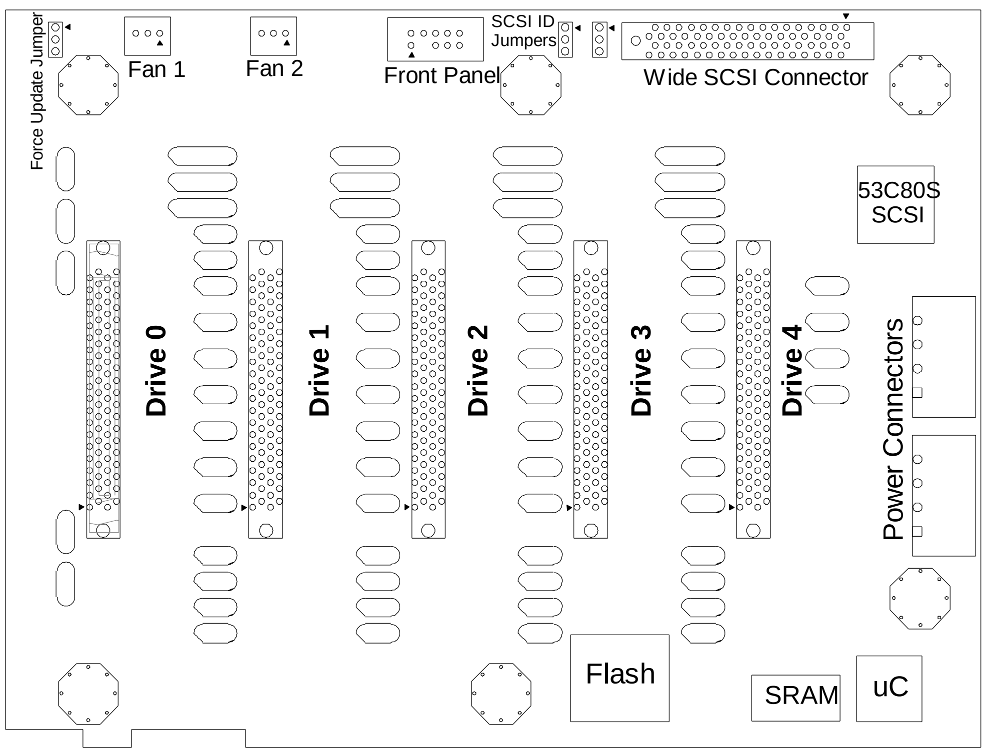


Figure 7. Astor Hot-swap SCSI Backplane Component and Connector Placement

8.2 Reference Documents

- *N440BX DP Server Technical Product Specification,* Rev. 1.0.
- *SCSI Accessed Fault-Tolerant Enclosures Interface Specification*, © Conner Peripherals and Intel Corporation, Revision 1.00, October 17, 1995
- *SCSI-3 Parallel Interface*, draft proposal revision 15a
- *SCSI-3 Fast-20*, draft proposal revision 6
- *Single Connector Attachment for Small SCSI Disk Drives.* Small Form Factor Committee, revision 3.2
- *Symbios SYM53C80E/S SCSI Protocol Controller Data Sheet*
- *The I^2C Bus and How to Use It,* January 1992, © 1992 Philips Semiconductors

SAF-TE Specifications

The Astor Hot-Swap SCSI Backplane performs the tasks associated with hot-swappable SCSI drives, and enclosure (chassis) monitoring and management, as specified in the *SAF-TE Specification*, Revision 1.00. This document assumes that you have the *SAF-TE Specification* in hand. The SAF-TE specified features supported by the Hot-swap SCSI Backplane include, but are not limited to, the following:

- Monitoring the SCSI bus for enclosure services messages, and acting on them appropriately. Examples of such messages include:
  - ⇒ Activate a drive fault indicator.
  - ⇒ Power down a drive that has failed.
  - ⇒ Report backplane temperature
- SAF-TE intelligent agent, which acts as proxy for “dumb” I^2C devices (that have no bus mastering capability) during intra-chassis communications.

8.3 Product Abstract

The Astor Hot-Swap SCSI Backplane is an embedded application subsystem, which during normal operation does the following:

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

The Astor Hot-Swap SCSI Backplane is made up of the following functional blocks:

- SCSI Bus with SCA (Single Connector Attach) drive connectors, and active terminators
- Microcontroller with program Flash and RAM
- SCSI interface that allows the microcontroller to respond as a SCSI target
- I^2C interface to chassis
- SCSI drive power control
- Fault indicator support
- Support for two cooling fans (fan-tach inputs and power control)
- Temperature sensor
- Configuration jumpers

The Hot-Swap SCSI Backplane resides in the hot-swap drive bay of a server.

8.4 Configuration Options

The following table describes the various configuration options on the Astor Hot-Swap SCSI Backplane along with their function and intended usage.

Table 3. Configuration Options

Option	Description
Force Update	Placing this jumper in the "FORCE UPDATE" position forces external firmware update of the program code stored in Flash memory. Placing this jumper in the "NORMAL OPERATION" position allows normal operation.
SCSI ID A and B	These two jumpers determine the SCSI addresses of the drives on the backplane. See Table 3 for mapping of SCSI addresses to jumper settings.

Table 4. SCSI ID Configuration Options

ID_OPT_A	ID_OPT_B	Drive 0 ID	Drive 1 ID	Drive 2 ID	Drive 3 ID	Drive 4 ID
1-2	1-2	0	1	10	3	4
1-2	2-3	8	9	10	11	12
2-3	1-2	0	1	2	3	4
2-3	2-3	8	9	2	11	12

8.5 SCSI Bus Considerations

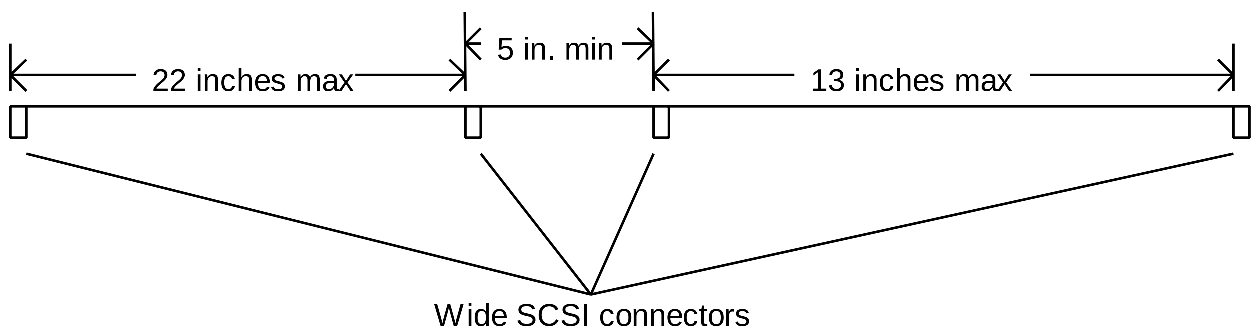
The SCSI bus, based on the SCSI-3 specification, is designed to allow any SCSI device to communicate with any other SCSI device. To that end, SCSI-3 requires that all SCSI devices be at least 0.3m (11.81") apart. Since this is a backplane, this specification is violated (drives are 1.3" apart). Therefore, certain design constraints must be placed on the backplane for the correct operation.

Only one initiator is allowed on the hot-swap SCSI bus. All SCSI devices on the backplane are targets. This arrangement eliminates communication over the SCSI bus devices when one of the devices (initiator or target) is not on the end of the bus, significantly reducing the signal reflections seen by the devices, and thereby increasing the signal quality at the receiver.

The SCSI Ultra specification requires the SCSI bus to be 59 inches (1.5m) or less in length. The backplane uses approximately 20 inches (0.51m). Therefore, the SCSI cable to the backplane must be 39 inches (0.99m) or less.

The SCSI cable must meet the following specification:

Figure 8. Astor SCSI Cable Length Specifications



The SCSI Fast-20 specification requires all SCSI devices on the bus to implement active-negation drivers. Since this requirement is new for Fast-20 SCSI, this product will require only those devices employing Fast-20 SCSI interfaces to implement active-negation drivers (non Fast-20 SCSI devices do not need to implement active-negation drivers).

8.5.1 Deviations from SAF-TE Specification

The SAF-TE specification, rev 1.00, requires the use of a "PAIR" signal. The intended use of this signal is to allow inter-backplane processor communication. This signal has not been implemented in prior designs. Therefore, this signal is deemed unnecessary and is not implemented here.

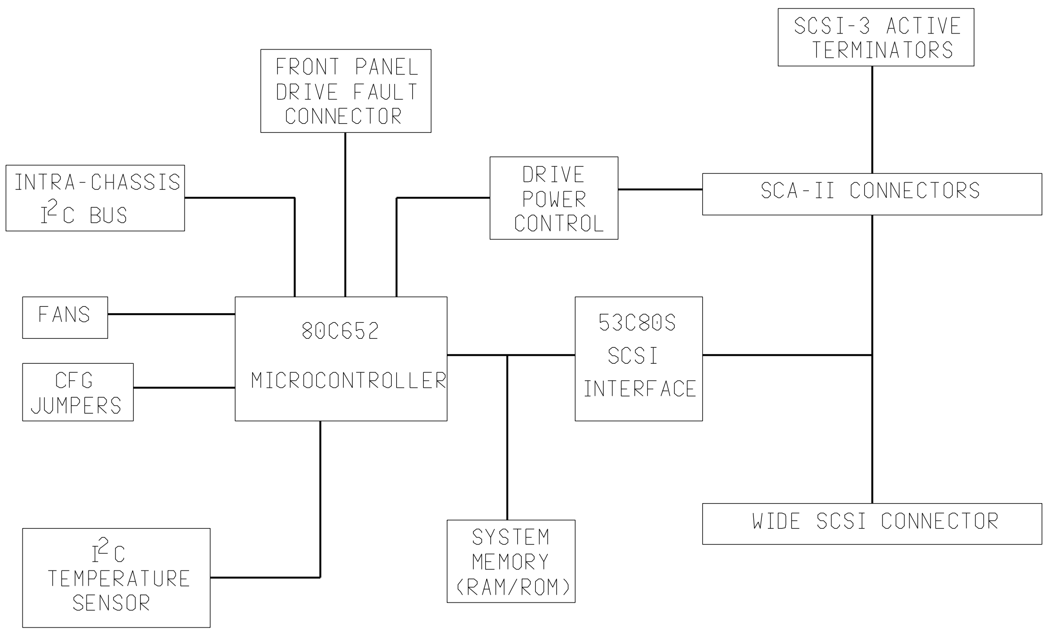
8.5.2 Miscellaneous

Per-drive power and activity indicators are somewhat common for a design such as this. In the interests of cost, these indicators are not supported or implemented.

9 Functional Description

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

Figure 9. Functional Block Diagram



9.1 Hot-Swap Connectors

The Astor Hot-swap SCSI Backplane provides five hot-swap SCA connectors, which provide power and SCSI signals using a single connector. Each SCSI drive attaches to the backplane using one of these connectors.

9.2 SCSI Interface

The SCSI interface on the Astor Hot-swap SCSI Backplane provides the required additional circuitry between the SCSI bus and the microcontroller (containing the intelligence for the Astor Hot-swap SCSI Backplane), which allows the microcontroller to respond as a SCSI target. This is implemented using the Symbios 53C80S SCSI Interface Chip.

9.3 SCSI Active Termination

The SCSI active terminators provide SCSI-3 compliant active termination for the backplane end of the SCSI bus. It is assumed that the other end of the SCSI segment is properly terminated as required by the SCSI-3 specification.

9.4 Power Control

Power control on the Astor Hot-swap SCSI Backplane supports the following features.

- Power-down of a drive when failure is detected and reported (using enclosure services messages) via the SCSI bus. This decreases the likelihood that the drive, which may be under warranty, is damaged during removal from the hot-swap drive bay. When a new drive is inserted, the power control waits a small amount of time for the drive to be fully seated, and then applies power to the drive in preparation for operation.

- If system power is on, the Hot-swap SCSI Backplane immediately powers off a drive slot when it detects that a drive has been removed. This prevents possible damage to the drive when it is partially removed and re-inserted while full power is available, and disruption of the entire SCSI array from possible sags in supply voltage and resultant current spikes.

- Hot-spare drive support, where spare drives are kept in the hot-swap bay, but are left unpowered until a drive is determined to have failed. In this case, the hot spare can be powered up and put into service automatically without requiring immediate operator intervention to replace the drive.

- The Hot-swap SCSI Backplane will automatically bypass the power control circuitry if a shorted drive is inserted or if a drive develops a short during operation. This prevents the Hot-swap SCSI Backplane from being damaged by a drive in which power and ground are shorted.

9.5 Microcontroller and Memory

The microcontroller provides the intelligence for the Hot-swap SCSI Backplane. It is an 80C652 microcontroller, with a built-in I^2C interface. The microcontroller uses an Intel FLASH EEPROM for program code storage, and RAM for program execution. During the development phase of the Hot-swap SCSI Backplane, external RAM and FLASH EEPROM is used; when the design is stable and the code is optimized, the code can be burned into internal mask ROM, eliminating the EEPROM for cost savings.

9.6 Fault LEDs

The drive fault LEDs are driven by the microcontroller, and indicate failure status for each drive. The LEDs are not physically located on the Hot-Swap SCSI backplane, but are driven from the backplane. A front panel interface connector is provided for an electrical path between the Hot-swap SCSI Backplane, drive fault LEDs, and front panel drive activity indication.

During initialization, the microcontroller flashes the LEDs for 1second as part of the POST.

9.7 Intra-chassis I²C Bus

The I^2C bus is a system-wide server management bus. It provides a way for various system components to communicate independently of the standard system interfaces (e.g., PCI bus or processor/memory bus). The I^2C bus controller is integrated into the microcontroller.

9.8 Fans

The Hot-swap SCSI Backplane supports the connection of two fans with digital tachometer outputs that can be used by the microcontroller to assess the fans' operating condition before total failure (which may result in collateral hardware damage). The fans' digital outputs are connected to inputs on the microcontroller. Microcontroller program code is responsible for monitoring the fan speed and reporting of fan condition. Power to the fans can be switched on or off from the host via the I^2C bus through the microcontroller.

9.9 Temperature Sensor

An I^2C bus temperature sensor is connected to the microcontroller on a "private" I^2C bus. Microcontroller programming implements the private I^2C connection by explicitly setting and clearing appropriate clock and data signals, to emulate an I^2C-like interface to the sensor. Temperature information is made available to other devices in the chassis using Enclosure Services messages.

9.10 Configuration Jumpers

The Hot-Swap SCSI Backplane has three configuration jumpers. See section on configuration options, for a complete description of the configuration jumpers.

10 External Interface Specifications

This chapter specifies electrical characteristics of connector pins.

10.1 Connector Interfaces

This section describes the following connector interfaces:

- Wide SCSI connector
- Power connectors
- Front Panel Interface connector

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

Table 5. Pin types

Type	Description
PWR	power connection (power or ground)
I/O	bi-directional signal
O	output signal
I	input signal
O/C	Open-collector output signal
O/D	Open-drain output signal

10.1.1 Wide SCSI connector

The Wide SCSI connector is a 0.050" spacing 68-pin, unshielded connector. Signal names are in the table below.

Table 6 Wide SCSI signal names

Signal Name	Connector Contact Number	SCSI Bus Conductor Number	SCSI Bus Conductor Number	Connector Contact Number	Signal Name
GROUND	1	1	2	35	DB12_L
GROUND	2	3	4	36	DB13_L
GROUND	3	5	6	37	DB14_L
GROUND	4	7	8	38	DB15_L
GROUND	5	9	10	39	DBP1_L
GROUND	6	11	12	40	DB0_L
GROUND	7	13	14	41	DB1_L
GROUND	8	15	16	42	DB2_L
GROUND	9	17	18	43	DB3_L
GROUND	10	19	20	44	DB4_L
GROUND	11	21	22	45	DB5_L
GROUND	12	23	24	46	DB6_L
GROUND	13	25	26	47	DB7_L
GROUND	14	27	28	48	DBP_L
GROUND	15	29	30	49	GROUND
GROUND	16	31	32	50	GROUND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
RESERVED	19	37	38	53	RESERVED
GROUND	20	39	40	54	GROUND
GROUND	21	41	42	55	ATN_L
GROUND	22	43	44	56	GROUND
GROUND	23	45	46	57	BSY_L
GROUND	24	47	48	58	ACK_L
GROUND	25	49	50	59	RST_L
GROUND	26	51	52	60	MSG_L
GROUND	27	53	54	61	SEL_L
GROUND	28	55	56	62	C/D_L
GROUND	29	57	58	63	REQ_L
GROUND	30	59	60	64	IO_L
GROUND	31	61	62	65	DB8_L
GROUND	32	63	64	66	DB9_L
GROUND	33	65	66	67	DB10_L
GROUND	34	67	68	68	DB11_L

10.1.2 Power Connectors

The power connectors are identical to those used on standard peripherals: a 4-pin shrouded plastic connector with mechanical keying.

Figure 10. Power connector

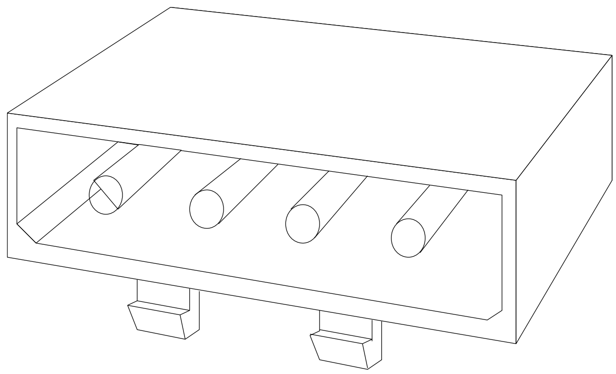


Table 7. Power Connector Signal Descriptions

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

10.1.3 Power Requirements

The Hot-swap SCSI Backplane provides power to up to five peripherals, and if not provided by the SCSI host, termination power from the +5V supply. The following table shows the required amount of power that the backplane must supply:

Table 8. Power Requirements

Voltage:	+12V	+5V
Current, no drives installed	30mA	550mA
Current, 5 drives installed	3.03A*	3.55A*
Tolerance	+5% / -4%	+5% / -4%

*Based on 0.6A per drive

Note: Tolerance is specified at the power connectors on the backplane, and not at the output from the connector on the power supply (e.g., if the wiring loss from power supply to backplane is 1%, then the tolerance at the power supply must be +6% / -3%).

10.1.4 Front Panel Interface Connector

The Front Panel Interface connector allows the Hot-swap SCSI Backplane to interface to the Front Panel. This connector and its cable provide the chassis-wide I^2C bus, and the electrical path between the drive fault indicators (LEDs) and the SCSI backplane that controls them.

The Front Panel Interface connector is a standard 0.1-inch spacing header with 0.025-inch square posts.

Figure 11. Front Panel Interface Connector

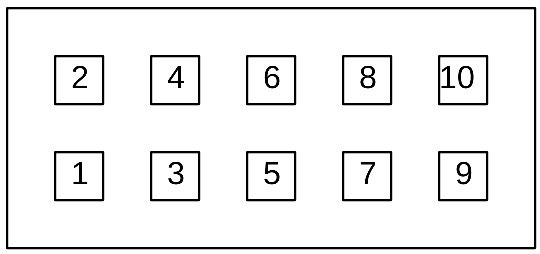


Table 9. Front Panel Interface Signal Descriptions

Name	Pin	Description	Type	V/I Char.	Load
GND	1	Electrical ground (0V)	PWR		
I2C_SDA	2	I^2C SDA (Serial Data)	I/O		
KEY	3	Pin removed for keying	N/A		
I2C_SCL	4	I^2C SCL (Serial Clock)	I/O		
PRI_SEC_L	5	Primary/Secondary backplane. The front panel connects this signal, via a resistor, to either VCC or GND, depending on which SCSI Backplane connector is used.	I	VIL = 0.8V @ .1mA	
FAULT1_L	6	Fault signal for drive 1 (logical drive 0). Active low signal	O/C	VOL = 0.4V @ 24mA	
FAULT2_L	7	Fault signal for drive 2 (logical drive 1) . Active low signal	O/C	VOL = 0.4V @ 24mA	
FAULT3_L	8	Fault signal for drive 3 (logical drive 2) . Active low signal	O/C	VOL = 0.4V @ 24mA	
FAULT4_L	9	Fault signal for drive 4 (logical drive 3) . Active low signal	O/C	VOL = 0.4V @ 24mA	
FAULT5_L	10	Fault signal for drive 5 (logical drive 4) . Active low signal	O/C	VOL = 0.4V @ 24mA	

10.1.5 Fan Connector

The Fan connector is a standard 0.1-inch spacing 3-pin header with 0.025-inch square posts. It is mechanically keyed to prevent improper insertion.

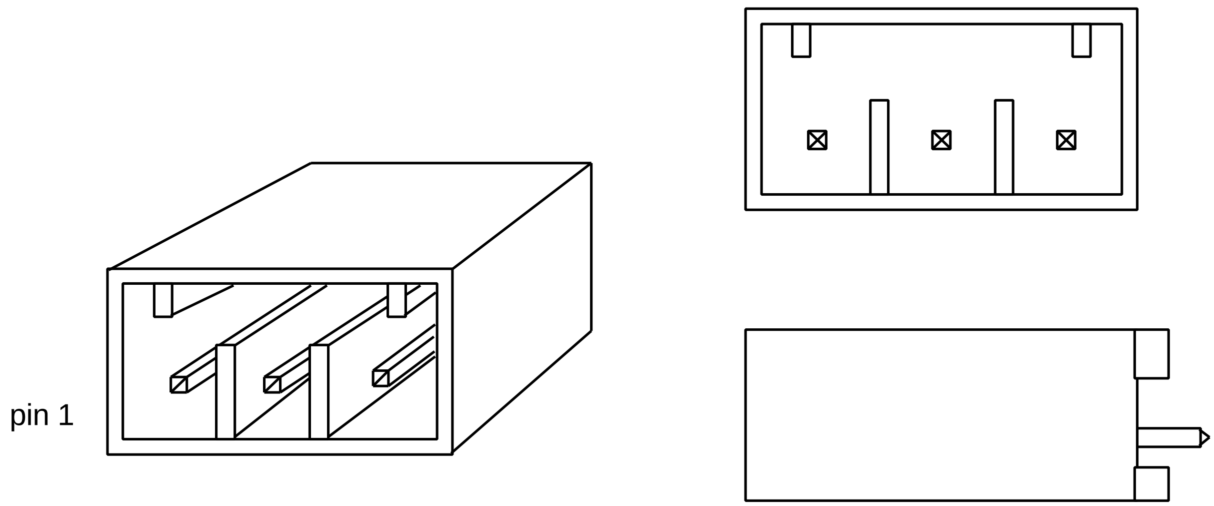


Figure 12. Fan Connector

Table 10. Fan Signal Descriptions

Name	Pin	Description	Type	V/I Char.	Load
GND	1	Electrical ground (0V)	PWR		
SPEED	2	Fan Speed input	I/O	VIL = 0.4V @ 10uA VIH = 2.4V @ 10uA	10k pull-up to 5V
+12V	3	12V power	PWR		

11 SYSTEM CONFIGURATION

11.1 Standard Configuration

Baseboard	N440BX DP Server	Future Baseboard
Processor	1 or 2 Pentium II	TBD
Std Bezel	Yes	TBD
3.5" Floppy	1	TBD
CD-ROM	optional	TBD
3.5” Peripheral bay	Five 1” drive hot-swap bay	TBD
Standard Cable Set	1	TBD
Power Supply	300 Watt	TBD
System Fans	3ea 92mm	TBD

Table 11: Standard Configurations

12 CERTIFICATION

The Astor systems have been designed and tested to meet the standards and regulation listed below.

12.1 Safety

USA

The system is UL listed to UL 1950, 3rd Edition.

Canada

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

Europe

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

International

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

12.2 Electro-Magnetic Compatibility

USA

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

Canada

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

Europe

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

IEC 801-2 ESD Susceptibility (level 2 contact discharge, level 3 air discharge)

IEC 801-3 Radiated Immunity (level 2)

IEC 801-4 Electrical fast transient (level 2)

International

The system is compliant with CISPR 22 class B

Japan

The system is registered with VCCI and complies with VCCI Class 2 limits (CISPR 22 B Limit).

13 ENVIRONMENTAL LIMITS

13.1 System Office Environment

Parameter	Limits
Operating Temperature	+5^{o}C to +35^{o}C with the maximum rate of change not to exceed 10^{o}C per hour.
Non-Operating Temperature	-40^{o}C to +70^{o}C
Non-Operating Humidity	95%, non-condensing @ 30^{o}C
Acoustic noise	< 45 dBA at typical office ambient temperature (65-75F)
Operating Shock	No errors with a half sine wave shock of 2G (with 11 millisecond duration).
Package Shock	operational after a 30 inch free fall, although cosmetic damage may be present
ESD	20kV per Intel Environmental test specification

Table 12: System Office Environment Summary

13.2 System Environmental Testing

The system will be tested per the Environmental Standards Handbook, Intel Doc.#662394-02. These tests shall include:

Temperature Operating and Non-Operating

Humidity Non-Operating

Shock Packaged and Unpackaged

Vibration Packaged and Unpackaged

AC Voltage, Freq. & Source Interrupt

AC Surge

Acoustics

ESD

EMC Radiated Investigation

14 RELIABILITY, SERVICEABILITY AND AVAILABILITY

14.1 MTBF

The system MTBF as shipped from the factory has been calculated at 20,222 hrs. Calculated MTBF at maximum configuration has been calculated at 13,998 hours. The sub-assembly MTBF numbers are shown below.

N440 BX DP Server calculated for 50C and percentage usage.

Item	Percentage usage	MTBF HRs
Baseboard	100	108,686
SCSI Backplane	100	459,083
Front panel board	100	3,533,251
Hitachi CD-ROM	5	500,000
Hard Drive	100	300,000
PRO 100 B	100	580,540
Power supply	100	50,333
1.44MB 3.5" FDU	1	405,000
32 MB DIMM	100	1,698,303
FAN	100	384,246

14.2 Serviceability

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

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

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

Remove cover	1	minute
Remove and replace hard disk drive	1	minute
Remove and replace 5 ¼ peripheral device	5	minutes
Remove and replace power supply	5	minutes
Remove and replace drive cage fan	2	minutes
Remove and replace card cage fan	5	minutes
Remove and replace expansionboard	5	minutes
Remove and replace front panel board	5	minutes
Remove and replace baseboard (with no expansion boards)	10	minutes
Overall MTTR	20	minutes