Intel AP450X
System Installation Guide

intel.

642976-003, released January 1997

printed on
recycled paper

Contents at a Glance

Notations and Terms

⚠ **WARNING**	**Indicates the presence of a hazard that has the potential for causing serious personal injury.**
⚠ **CAUTION**	Indicates the presence of a hazard that has the potential for causing moderate or minor personal injury. Also indicates a situation that has the potential for causing damage to the product.
⟹ **Note**	Emphasizes important or explanatory information.
<F1>	A letter, number, symbol, or word enclosed in < > represents a key on your keyboard. For example, the instruction "press <F1>" means to press the key labeled "F1" on your keyboard.
<Enter>	In this manual, <Enter> refers to a key that you press to enter a hard paragraph break or to indicate you are ready to execute a command. Different computer manuals refer to <Enter> as RETURN, <CR>, or CARRIAGE RETURN or by showing a left-facing arrow. The keycap name differs from keyboard to keyboard.
<x + y>	Two or three key names, separated by plus signs, indicate multiple-key entries. For example, <Ctrl + Shift + F8> means press and hold down the <Ctrl> and <Shift> keys and the <F8> function key.
☐ ☐ ☐	Three boxes mark the end of a chapter.

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Part 1, Hardware

Hardware Description 1

Introduction

This server system is designed for use in applications where downtime must be minimized. To this end, the server includes or has the option to include the following:

- Optional power system redundancy; in a system configured with three power supplies, the system will continue to operate with a single power supply failure.
- Self-contained power supply units that can be easily installed or removed from the back of the chassis. If the system is configured with three power supplies, the power supply can be replaced without turning the system power off.
- Small Computer System Interface (SCSI) drive bays accessible from the front of the chassis.
- Hot-docking SCSI drive backplane; a failed drive can be removed and a new drive installed without turning the system power off.
- Hardware monitors (temperature and voltage) and software monitors to indicate failures (to specifications you can set).
- Easy access to all parts for service.

Expanding the Server as Needs Grow

The typical minimum system configuration could include the following:

- Board set with 64 MB memory, one processor board with one Pentium® Pro microprocessor, and a bus termination board
- Diskette drive
- Six SCSI hard drives in a Redundant Array of Independent Disks (RAID) configuration
- IDE boot drive

- CD-ROM drive
- Three add-in boards (one SCSI and two network)
- Two 420 Watt power supplies
- Two SCSI drive backplanes
- Three chassis fans
- Onboard video memory can be expanded from standard 512 KB to optional 1 MB

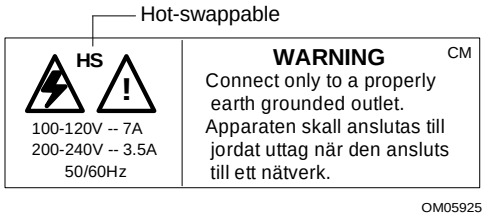
As server/client needs grow, you can expand system processor capacity, memory, drives, and the number of power supplies.

- System board has two slots for processor boards. Each board may contain one or two processors, for a configurable range from one up to a total of four processors.
- The memory board supports 16 SIMM† devices for a minimum memory size of 64 MB up to a total of 2 GB of memory. An optional 4 GB memory board is also available.
- System board has four EISA and six PCI slots for add-in boards.
- System board has onboard external I/O (serial, parallel, video) interfaces.
- Chassis can hold 18 drives: 12 hot-swap bays for 3.5-inch SCSI-2 hard drives; four 5.25-inch half-height bays for removable media drives; 3.5-inch bay with diskette drive already installed; location for a bracket for an internal 3.5-inch IDE drive above the card cage.
- Chassis supports two and three power supplies.

Configuration Constraints

Power Supplies

Power supplies are easily removed and installed, and are hot-swappable on three power supply configurations only. You do not need to turn off power to the system when removing a power supply on a system with three supplies, but you must unplug the AC power cord on the power supply that is being replacedbefore you remove it from the system. Power supplies that are hot-swappable have an "HS" printed on the 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.

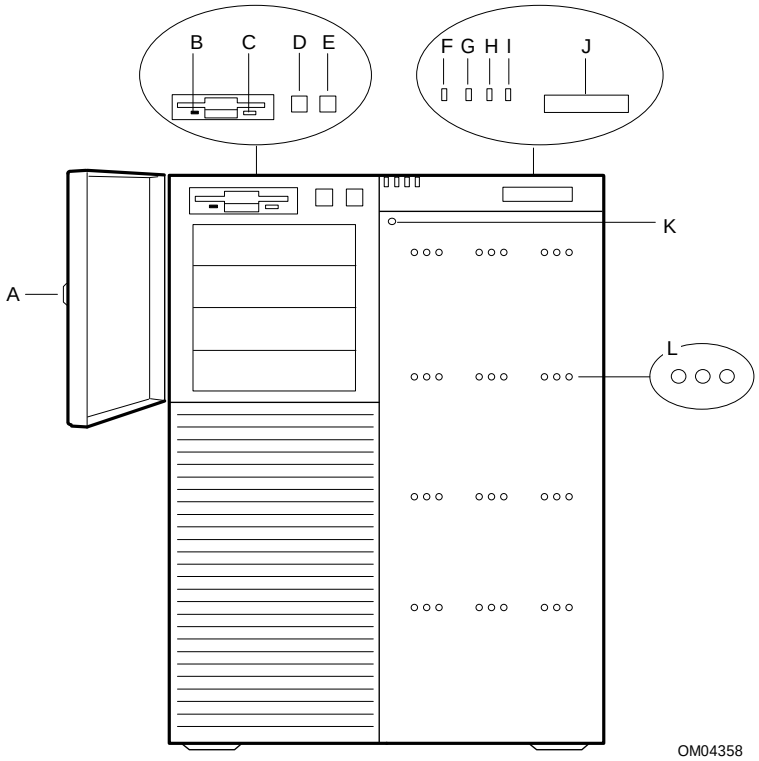
5.25-inch Half-height Bays

The system has four 5.25-inch half-height bays accessible from the front. These bays are convenient for diskette, tape, and CD-ROM drives (removable media). Because of the EMI generated by hard drives and the increased susceptibility to ESD, we do not recommend putting hard drives in the 5.25-inch half-height bays. Also, we do not recommend putting more than three devices in these bays.

System Feature Summary

Feature	Description
Modular board set	System is intended for use with a modular board set based on Pentium Pro processor technology; from one to four processors and up to 2 GB of memory. An optional 4 GB memory board is also available.
Add-in board support	Rail and back panel slots support up to 10 add-in boards.
3.5-inch diskette drive	3.5-inch diskette drive is externally accessible.
12 locations for 3.5-inch SCSI-2 hard drives	Two bays can each hold six 3.5-inch hot-swappable SCSI-2 hard drives (for a total of 12 SCSI drives). The bays are secure behind a lockable metal EMI door; drives can be swapped in or out of the system without powering it down. The array of drives allows easy setup of RAID applications.
Hot swap-capable backplane	A hot swap-capable backplane is part of each 3.5-inch drive bay assembly for SCSI drives. The backplane is designed for fast/wide and Fast-20 SCSI-2 devices that use the industry standard 80-pin Single Connector Attach (SCA) connector. Each backplane consists of two rows of three drive connectors.
Five locations for removable media drives	Four externally accessible 5.25-inch half-height bays are available for diskette, CD-ROM, and/or tape drives, and an internal location for a bracket for a 3.5-inch IDE drive is located above the card cage.
Power supply	Two or three 420 Watt autoranging power supplies are easily removed/installed for service. In a three-supply system, the third supply is redundant and the power supplies are hot-swappable.
Cooling fans	Each power supply has an integral cooling fan. Three more fans provide cooling for boards and drives.
Security	Mechanical: Key lock at the front and three metal padlock loops (door over hot-swap drive bays, 0.28" diameter hole, .075" wide padlock only, and one at the back of each side panel, 0.28" diameter hole, 1" wide padlock). Three intrusion sensors (one on each side at the back; one for the hot-swap SCSI drive bay EMI door). BIOS: Password enable; secure mode power-off disable.
Software: utilities, setup	BIOS Setup, System Configuration Utility, SCSI*Select*† Utility.
System management	Inter-Integrated Circuit interface (I^2C) for diagnostic and intra-chassis communication.

Chassis Front Features and Controls



A	Key lock	Secures both front external doors.
B	Activity light, 3.5-inch diskette drive	When lit, drive is in use.
C	Ejector button, 3.5-inch 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

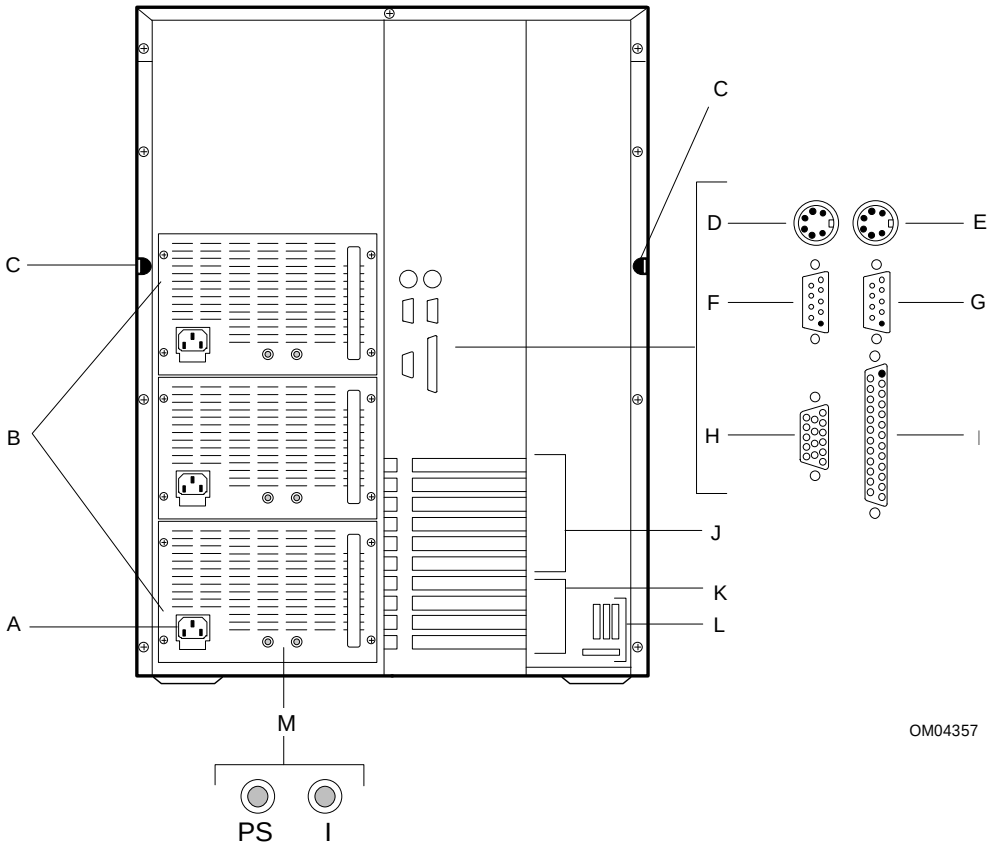
		the +5.1VDC or +12 VDC has exceeded the 240VA limit.
H	Cooling-fail LED, yellow	When lit, a fan has failed.
I	Drive-fault LED, yellow	When lit, a drive has failed (this LED will function only if a SCSI host controller that supports the SAF-TE control signals is installed in the system).
J	LCD panel	Displays 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 LEDs	Left to right: Drive present/power on; drive active; drive faulty. Each drive has three LEDs visible above the bay from the front. See following table for status descriptions.

SCSI Drive Status LED Descriptions

SCSI drive present, power on green LED	SCSI drive active green LED	SCSI drive faulty* 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.
❍ Off	❍ Off	● On	Drive CAN be replaced. Steady yellow fault light indicates drive has a problem. Power to drive is off.
● On	❍ Off	❋ Slow blinking	Drive SHOULD NOT be replaced at this time. A slowly 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.

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

Chassis Back Features and Controls



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 supply is redundant, supplies are hot-swappable)
C	Side cover padlock loops	One on each side at the back (0.28″ diameter hole, 1″ wide padlock).
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 add-in board slot locations.
K	EISA slots	Four EISA add-in board slot locations.
L	Knockouts	Available to route SCSI signals to peripheral boxes.
M	Power supply status LEDs	See following table for status descriptions.

Power Supply Status LED Descriptions

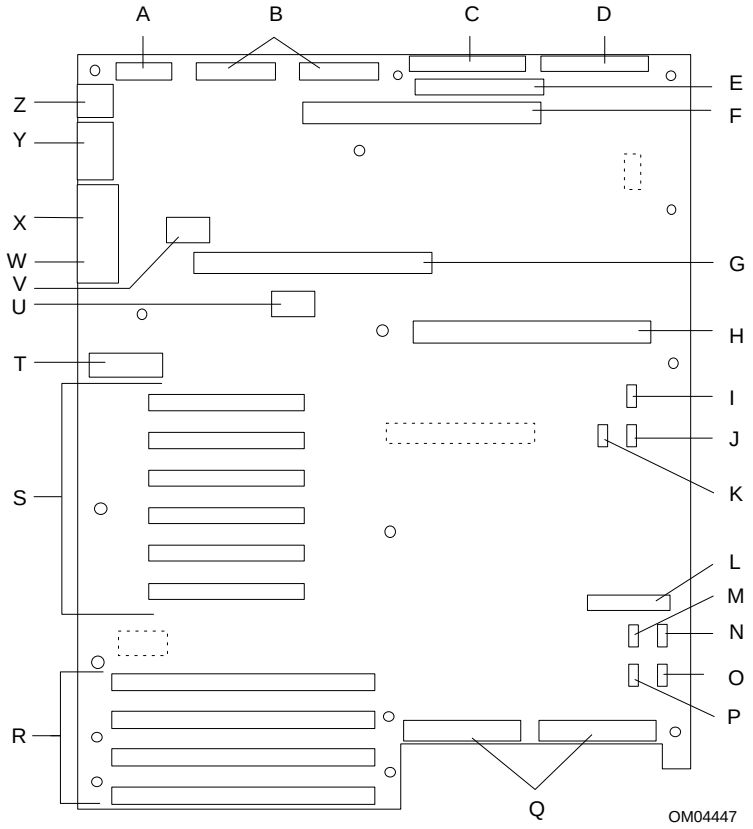
(PS) Power supply OK	(I) Power supply current OK	Power supply LED status descriptions
On ●	● On	Power supply on and OK.
Off ❍	❍ ● Off or On	Power supply failure.
On ●	❍ Off	Current limit.
On ●	● On	Power supply disabled with the PON signal that system uses to turn on/off power supplies.

System Board Set Features

The board set includes the system board, one or two processor boards, a memory board, and a bus termination board (required if only one processor board is installed). The table below summarizes the system board features.

System board summary	Feature description
Multiple processor support	Two slots for processor boards; up to four Pentium Pro microprocessors (two on each processor board). System may include one processor board and one bus termination board or two processor boards.
Upgradable memory	One slot for memory board, supporting up to 2 GB memory using 128 MB SIMMs.
Add-in board support	Four dedicated EISA bus slots on system baseboard.
	Six dedicated 32-bit PCI slots on system baseboard. Dual (peer) bus architecture.
SCSI controller	Two onboard SCSI-2; fast/wide and Fast-20 SCSI channel support (PCI-based).
IDE interface	Provides access to two IDE peripherals.
BIOS	Flash memory-based BIOS (Basic Input/Output System) and Setup utilities.
Video	Integrated super VGA controller ships with 512 KB of video memory (expandable to 1 MB).
External device connectors	Onboard connectors for two serial ports, parallel port, PS/2-compatible keyboard and mouse, and VGA monitor.
Clock	Real-time clock/calendar (RTC) chip.
System hardware monitoring	Detects chassis intrusion and contains sensors for temperature, voltage, and fan failure.
Configuration utilities	System Configuration Utility (SCU) and SCSI*Select* Utility

System Board Connector and Component Locations



A	Power control and status (PS3)
B	+5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical)
C	Diskette drive connector
D	Front panel connector
E	IDE drive connector
F	Memory board connector
G	Secondary processor board or termination board connector
H	Primary processor board connector

I	Fan 1 connector (not used)
J	Fan 2 connector (inner chassis fan)
K	Hard drive LED 1 connector (not used)
L	Connector for optional Server Management Module (SMM)
M	I^2C connector (not used)
N	Fan 3 connector (upper outer chassis fan)
O	Fan 4 connector (lower outer chassis fan)
P	Hard drive LED 2 connector (not used)
Q	SCSI bus connectors: Channel A to the right, Channel B to the left
R	EISA slots 1 - 4 for add-in boards (slot 1 toward top, 4 toward bottom)
S	PCI slots 1 - 6 for add-in boards (slot 1 toward top, 6 toward bottom: Bus 0 = slots 1 - 3; Bus 1 = slots 4 - 6)
T	Configuration switches and jumpers
U	Real-time clock
V	Video DRAM expansion socket
W	VGA monitor connector
X	Parallel port connector
Y	Serial port connectors A (COM1) and B (COM2)
Z	PS/2-compatible keyboard and mouse connectors

Three connectors are shown in the board drawing as dotted-line boxes. They are not used in this system configuration. Their functions at the factory are as follows: ITP (In-target Probe) connector, near upper right corner; test connector, near middle of board; 3.3 V PCI power connector, near lower left corner below PCI slots.

Processor

Processor boards: The system can include one or two processor boards capable of supporting up to four Pentium Pro processors (two per board). Each processor board has two processor sockets. The board contains termination circuitry required by the GTL+ signaling environment, DC to DC converters for power to each processor and termination circuitry, and logic for I^2C support and clock ratio programming. The system board has a primary connector and a secondary connector for processor boards. The two connectors have subtle differences in pinout.

Bus termination board: If only one processor board is installed, a bus termination board must be installed in the secondary connector. The termination board provides GTL+ signal termination and voltage regulation.

Memory

The memory subsystem consists of the memory chipset, the memory board connector on the system board, and the memory board itself. The system board contains the data path and data control portions of the chipset. The memory board contains the buffer devices from the chipset and sixteen 72-pin SIMM sockets for a total of up to 2 GB of system memory, using 128 MB DRAM SIMMs. SIMM sockets on the board are organized as two 72-bit wide, 1-, 2-, or 4-way interleaved banks. For example, a 4-way interleaved bank requires eight SIMMs. SIMM sockets accept 72-pin single- or double-sided SIMMs. A bank must be populated using identical pairs of SIMMs. SIMMs may vary from one bank to the other.

⇒ **Use approved SIMMs**
Only use SIMMs approved for use in this server system. Call your customer service representative for information.

Add-in Board Slots

The system board has four EISA bus slots for add-in boards. The EISA bus is an extension of the Industry Standard Architecture (ISA) bus. Because EISA is fully backward-compatible with ISA, you can install old or new ISA add-in boards in your server. The system board has six PCI (Peripheral Component Interconnect) bus slots for add-in boards. The PCI subsystem consists of two I/O bus segments, PCI Bus #0 and PCI Bus #1. PCI #0 is the primary (compatibility) bus; it connects the processor bus to a PCI/EISA bridge and three PCI connectors. PCI #1 connects the processor bus to two embedded fast/wide, Fast-20 SCSI controllers and three PCI connectors.

Video

The onboard, integrated Cirrus Logic CL-GD5424 super VGA controller (ISA) is fully compatible with these video standards: CGA†, EGA†, Hercules† Graphics, MDA†, and VGA. The standard system configuration comes with 512 KB of onboard 70 ns video memory. You can optionally expand the onboard video memory buffer size to 1 MB by adding one 40-pin 256K x 16, 70 ns fast-page DRAM. The SVGA controller supports only analog monitors (single and multiple frequency, noninterlaced) with a maximum vertical retrace noninterlaced frequency of 75 Hz.

- Supported with 512 KB memory: Pixel resolutions of 640 x 480 and 800 x 600 in 256 colors, and 1024 x 768 x 16 colors.
- Supported with 1 MB memory (optional): 132-column text modes and high resolution graphics with 1280 x 1024 x 16 colors. Depending on the environment, the controller displays up to 64,000 colors in some video resolutions.

SCSI Controllers

The system board includes two embedded fast/wide, Fast-20 SCSI-2 controllers (Adaptec† AIC-7880, compatible with Adaptec AIC-7870 in fast/wide mode), channels A and B, integrated as PCI bus masters. The controllers support data path widths of 8-bit (fast SCSI) at a data transfer rate of 10 MB/sec 16-bit (fast/wide SCSI) at a data transfer rate of 20 MB/sec and 16-bit (Fast-20) at a data transfer rate of 40MB/sec. You can switch between fast/wide SCSI mode and Fast-20 SCSI mode via the SCSI*Select* Utility. The default mode is fast/wide SCSI. See Chapter 10, "Advanced Configuration Options" for more information. As PCI bus masters, these controllers support burst data transfer rates up to the maximum of 133 MB/sec.

You can connect up to seven 8-bit narrow SCSI devices or typically up to ten 8-bit narrow and/or 16-bit fast/wide SCSI devices to each channel. Devices can be disk drives, tape drives, printers, optical media drives, and others In Fast-20 mode, 8-bit narrow SCSI devices are not supported.

Each SCSI drive backplane is configured as one SCSI bus. The backplane automatically terminates the full 16-bit-wide bus if there is no 50-pin ribbon cable connected to J8 on the backplane. If there is a cable installed at J8 to carry the bus to SCSI drives in the 5.25-inch bays (not supported in Fast-20 mode), the upper 8 bits are still automatically terminated, but the lower 8 bits must be terminated with active termination at the end of the 50-pin cable.

IDE Interface

IDE is an 8-bit or 16-bit interface for intelligent disk drives with AT† disk controller electronics onboard. The processor can transfer data from the IDE interface at a maximum transfer rate of 2.4 MB per second. This IDE implementation also supports DMA to the IDE device, which has a maximum transfer rate of 4.2 MB per second. Using DMA will significantly reduce bus use (with respect to IDE device access) and will significantly improve system performance.

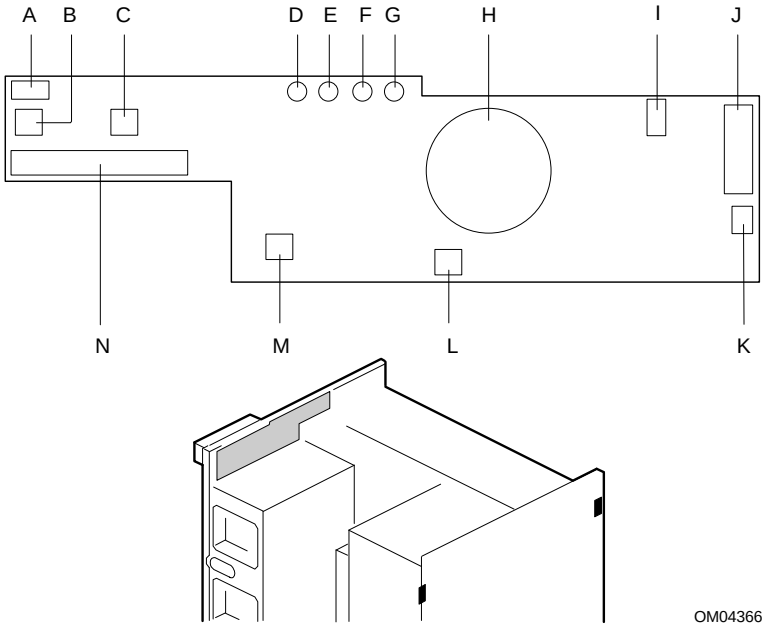
The IDE interface can be disabled. If disabled, at reset the I/O address space and interrupt IRQ14 are available for add-in boards.

Keyboard and Mouse

The keyboard/mouse controller is PS/2-compatible. The system may be locked automatically if there is no keyboard or mouse activity for a predefined length of time, if specified through the Setup utility. Once the inactivity timer has expired, the keyboard or mouse does not respond until the previously stored password in the keyboard controller is entered.

Front Panel Interface

The system front panel control board contains the power and reset switches; system speaker; LED indicators for power-on, drive fault, cooling system failure, and power system failure; an LCD character display; and the chassis intrusion alarm switch connectors. The LCD displays two lines of 16 characters each, accessible by software; the LCD can be used to display error and diagnostic information. The electrical interface is compatible with commercially available LCDs.



Front panel control board as viewed from front

Lower portion of figure shows board as installed in chassis

A Signal from intrusion switch at back edge near card cage; 3-pin right-angle latching-style connector

B Power switch

C Reset switch

D Power-on LED, green

E Power-fail LED, yellow

F Cooling-fail LED, yellow

G Drive-fault LED, yellow. This LED functions only if a SCSI host controller that supports the SAF-TE control signals is installed in the system

H Speaker

I Signal from intrusion switch at back edge near power supplies; 3-pin right-angle latching-style connector

J Signal interface to LCD; 14-pin straight-head connector

K Power to LCD; 3-pin straight-head connector latching-style connector

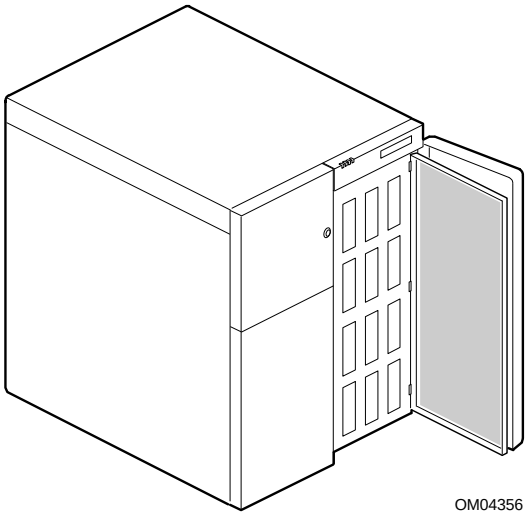
L Hard drive bay intrusion switch

M NMI switch (not a button switch; a recessed switch accessible through a small hole)

N Signal interface to system board; 40-pin straight-head connector (pin 17 removed)

Peripherals

SCSI-2 Hard Drive Bays



12 bays for SCSI drives

(EMI panel and exterior door shown open)

The right side of the system contains 12 bays for 3.5-inch SCSI-2 hard drives and two hot-swap backplanes. Each backplane supports six drives. The backplanes require an 80-pin single connector attachment (SCA) connector on the drives you install.

A drive carrier is required as part of the hot swap implementation. A 3.5-inch peripheral between 1.0 and 1.6 inches high can be accommodated in each carrier. A drive is mounted in the carrier with four fasteners, and the carrier is retained in the chassis by a locking handle. The hot-swap bays are designed to accept peripherals that consume up to 15 Watts of power and run at a maximum ambient temperature of 50°C.

A fault light on the front panel board gives the general indicator that there has been a fault on a hot-swap drive. Each drive has a set of three lights to indicate the fault or other status: power-on (green LED), activity (green LED), or fault (yellow LED). The front panel and individual drive fault LEDs functions only if a SCSI host controller that supports the SAF-TE control signals is installed in the system.

SCSI Drive Hot-swap Backplane

The SCSI backplane is an integral part of the chassis. Each backplane provides control signals for six SCSI peripheral devices. Two backplanes are used to support a total of up to 12 devices. Each backplane receives control signals from a fast/wide, Fast-20 SCSI-2 controller on the system board.

The backplane has two main functions: SCSI drive control and system data logging. Drive status is monitored to detect failing drives and to control LED indicators. The LED indicators function only if a SCSI host controller that supports the SAF-TE control signals is installed in the system. Critical event data and drive status is reported over the I^2C bus and logged for server management software to interpret.

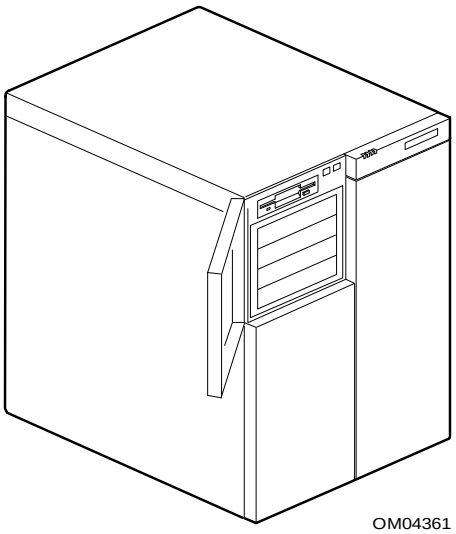
Features:

- Inserting and removing of hard drives while power is on (referred to as "hot swap")
- Simplified cable management
- SCA connectors to simplify inserting and removing hard drives
- Jumper selection for SCSI ID change
- Power control for each hard drive
- Easy RAID integration over a wide range of RAID controller products
- SCSI management of RAID fault LEDs and power supply status

Each backplane supports SCSI drives with SCA connectors. In addition, the backplane can support from one to three narrow SCSI drives. The narrow drives are attached using a standard 50-pin header cable from connector J8 on the upper backplane. The cable is routed through the center bulkhead to connect to removable media SCSI devices in the 5.25-inch drive bays (narrow SCSI devices are not supported in Fast-20 mode).

Active bus termination is needed for 5.25" narrow device cable
If you install a narrow SCSI cable, you must provide *active* SCSI bus termination at the end of the cable. You can do this either by installing a drive that includes active bus termination or by crimping a terminator device onto the end of the cable. Leaving the cable installed without active termination at the end violates the SCSI bus specification and will cause the SCSI bus to be unreliable.

Removable Media Drive Bays



Four bays for removable media drives plus factory-installed 3.5-inch diskette drive

(exterior door shown open)

On the left side of the system at the top, a built-in 3.5-inch bay contains a 3.5-inch diskette drive that supports both 720 KB and 1.44 MB media.

On the left side of the system below the diskette drive, four 5.25-inch half-height bays are designed for peripherals with removable media (diskette, CD-ROM, tape cartridge). Any two adjacent 5.25-inch bays can be converted to a single full-height bay. The 5.25-inch drives can be removed directly from the front of the chassis after the 5.25-inch plastic frame is removed. The bezel is retained by snap features and is accessible when the side panel is removed. Cosmetic filler panels and metal EMI shields are installed over all unused 5.25-inch bays.

Limited use of 5.25-inch bays
Because of several factors, we do not recommend putting hard drives in the 5.25-inch half-height bays. These factors include the EMI generated by hard drives and the increased susceptibility to ESD.

Power System

The system may be configured with two or three 420 Watt power supplies. Power supplies are hot-swappable in the three-power supply configuration. Each supply automatically switches between these input voltage ranges:

- 100-120 VAC at 50/60 Hz; 7 A maximum current
- 200-240 VAC at 50/60 Hz; 3.5 A maximum current

Each power supply provides these DC outputs: +5.1 V, +12 V, +3.3 V, -5 V, -12 V, +5.0 V standby, and Vbias. The Vbias voltage is an isolated output (+16 to +20 V) used to power the circuits on the power supply docking backplane. The +5 V standby output and the Vbias output will be present when the other outputs are disabled. All output grounds connect to the power supply chassis and to earth ground through the AC line cord.

Each supply has the following:

- Individual AC input line cord that plugs into the external side of the power supply. The AC input connector is a panel mounted, IEC 320/C20 type connector.
- An isolating device on each DC output so that the failure of one supply will not affect the operation of the others.
- Automatic recovery after an AC power failure without intervention by an operator or a server management board. If AC power is interrupted while the system is on, the system will be powered-on when AC power is restored; if interrupted while the system is off, it will remain off when AC power is restored.
- 120 mm cooling fan integral with each power supply enclosure. The fan circuitry implements variable speed fan control and fan failure detection.

Power Distribution Board

Each power supply docks into a power distribution board inside the chassis. The board provides connections for the DC power signals and status and control functions, such as server management features (quantity, location, and reporting of installed and failed supplies), through I^2C control.

Current sensing shuts down the entire power system (all supplies) if any single output from the power distribution backplane exceeds 240 VA. An overvoltage condition is sensed on the +3.3 VDC, +12 VDC, and +5.1 VDC outputs for each supply. In an overvoltage condition, the power supply shuts down and latches off until the front panel power switch is pressed off and then on again.

Number of Power Supplies in a Configuration

Power is drawn equally from all supplies present. A system with two power supplies can be fully loaded (all drive bays and add-in board slots filled). Two- and three- supply configurations use a forced current-sharing technique that ensures that the supplies will share within 10 percent at full load. In a high-access system with three power supplies, the third supply gives redundancy, because the load is redistributed if one supply fails. The power supplies are hot-swappable only in redundant configurations and if they have a hot-swappable designator on the warning label.

The following table summarizes a typical entry-level system (two power supplies) and the maximum power requirements.

System parts in typical entry-level system with two power supplies	Maximum power requirement
System board set: 1 processor board with 2 Pentium Pro processors, 1 bus termination board, 256 MB memory	145 W
1 diskette drive	6 W
6 SCSI hard drives in RAID configuration, @ 15 W each	90 W
3 chassis fans @ 7.8 W each	24 W
SCSI drive backplanes	15 W
IDE boot drive	5 W
CD-ROM drive	26 W
3 add-in boards (e.g., 1 SCSI controller and 2 network), maximum 25 W but 10 W typical maximum	30 W
Total	**341 W**

Controlling Access to Power-on and Power-off

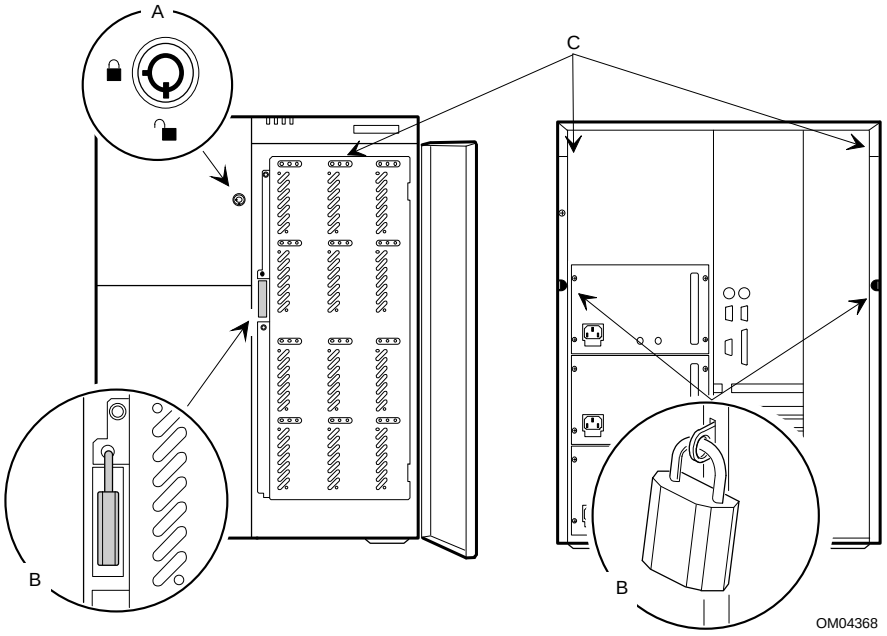
The system DC power can be turned on or off as summarized below. The different methods provide some flexibility in controlling how and by whom the system can be powered on or off.

WARNING
The DC push-button on/off switch (a convex button) on the front panel DOES NOT turn off the system AC power. To remove power from system, you must unplug the AC power cords from wall outlets or power supplies.

Power on/off by using:	Description
Front panel power on/off switch	Pressing the on/off switch is the most common form of turning system power on or off. This switch can initiate power-on at any time; power-on in this manner is never blocked by any other system function. When the system is on, pressing and releasing this switch initiates power-off. However, secure mode prevents turning off the system power by using this switch.
LANDesk® Server Monitor Module (SMM) and LANDesk Server Manager (optional hardware and software), via an alert action	This is typically used to free “hung” systems by toggling power under the control of the LANDesk Server Manager software running on a remote console. The SMM provides a power signal line that is routed through the system board to the front panel / system board interface connector. The board can power the system on or off.
Real-time clock (RTC)	RTC power control can be used by the BIOS or a utility program to power the system on or off at a predetermined time set in the RTC. Server management software can also use the RTC to automatically power off the system if an overtemperature or overvoltage condition occurs.

Server Security

Mechanical Locks and Monitoring



A	Front panel key lock	Key lock the short front panel door to prevent access to the power and reset switches. This lock also secures the right-hand door.
B	Padlock loops	Secure the EMI metal door (0.28″ diameter hole, 0.75″ wide padlock only) and the side covers (0.28″ diameter hole, 1″ wide padlock) by using padlocks (not provided). The top cover cannot be removed until the side covers have been removed.
C	Location of three internal intrusion alarm switches	Intrusion alarm switches are present on the SCSI drive bay door and at the back of the chassis. The relays close when the side doors or drive bay door are opened. An intrusion alarm signal is transmitted to the system board, where server management software processes the signal. Upon intrusion, the system shuts off or the keyboard locks.
–	Environmental sensors	(not shown in figure) The system contains sensors to monitor temperature, voltage, and fan failure.

Software Locks via the System Configuration Utility (SCU)

The SCU has software features that let you control access to one or more parts of the system:

- Enable the keyboard lockout timer so that the server requires a password to reactivate the keyboard and mouse after a specified time-out period—1 to 128 minutes.
- Set and enable an administrative password.
- Set and enable a user password.
- Set secure mode to prevent keyboard or mouse input and to prevent use of the front panel reset and power switches.
- Activate a hot-key combination to enter secure mode quickly.
- Disable writing to the diskette drive when secure mode is set.

Using Passwords

If only a user password is set and enabled: Enter this password to boot the server and run the SCU.

If both the user and administrative passwords are set and enabled: Enter either one to boot the server and enable the keyboard and mouse. Enter the administrative password to access the SCU or BIOS Setup to change the system configuration.

Secure Mode

Configure and enable the secure boot mode by using the SCU. When secure mode is in effect:

- You can boot the system, and the operating system will run, but you must enter the user password to use the keyboard or mouse.
- You cannot power-off or reset the system from the front panel switches.

Secure mode has no effect on functions enabled via the server management board or power control via the real-time clock.

Taking the system out of secure mode does not change the state of system power. That is, if you press and release the power switch while secure mode is in effect, 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.

❒ ❒ ❒

Getting Started 2

1. Check Your Shipment

After unpacking the system, verify your packing inventory papers. Make sure these accessories are present and in good condition:

- Software:
  - System Configuration Utility diskette
  - Adaptec AIC-7800 SCSI Manager and drivers
  - Diagnostics diskette
  - Video drivers diskette
  - OS drivers
  - Other diskettes and related manuals depending on your system configuration
- Hardware: several drive rails and EMI clips for 5.25-inch devices

If any part is damaged or missing, contact your customer service representative.

2. Select a Site

Requirement	Description
Near grounded, three-pronged power outlet(s)	United States and Canada: NEMA 5-15R outlet for 100-120 VAC or a NEMA 6-15R outlet for 200-240 VAC. Other international sites: three-pronged outlet applicable for the electrical code of the region. ⚠ **CAUTION** Be sure that the power service connection is through a properly grounded outlet.
Environmental quality	Clean, relatively free of excess dust, and well ventilated. Front and rear ventilating openings kept free of obstructions. Away from sources of heat. Away from sources of vibration or physical shock.
Electromagnetic fields and electrical noise	Isolated from strong electromagnetic fields and electrical noise produced by electrical devices (such as elevators, copy machines, air conditioners, large fans, large electric motors, radio and TV transmitters, and high frequency security devices).
Clearance for cooling	Provide sufficient clearance behind and around the system to ensure proper cooling and airflow. Allow a minimum of 13 centimeters (about five inches) of clearance at the back of the system and eight centimeters (about three inches) on each side.
Room for maintenance	Plan access space for system maintenance as needed. Make sure there is convenient access to disconnect the AC power cords from wall outlets or from the power supplies. Disconnecting the cords is the main way to turn off power to the server before doing maintenance or upgrade procedures. Pressing the DC push-button on/off switch on the front panel does NOT turn off system AC power.

3. Check the Power Cord(s)

WARNINGS

Do not plug in the system power cords if you will be adding internal parts (boards, memory SIMMs, removable media drives).

Do not modify or use the supplied AC power cords if they are not the exact type required. Replace them.

Make sure the supplied power cords are compatible with the AC wall outlet type in the region where the server will be installed and used. If necessary, obtain suitable power cords that meet the following requirements.

Power cord requirement	Description
Rating	Must be rated for available AC voltage and have current rating at least 125% of current rating of system.
Wall outlet connector	Must be terminated in grounding-type male plug designed for use in the region and be labeled certified by an agency acceptable in the region.
System receptacle	Must be IEC 320, Standard Sheet C13 type female connector.
Cord length and flexibility	Must be less than 4.5 meters (14.76 feet) long and must be flexible <HAR> (harmonized) cord to comply with system's safety certifications.

4. Add to the System

WARNING

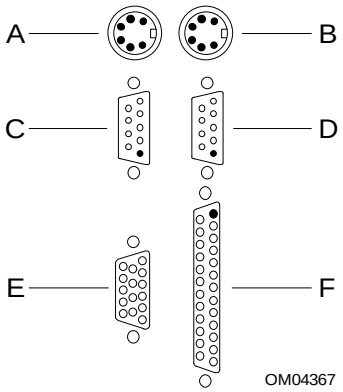
Before adding internal parts to your system, verify that the system is not plugged in. All power cords must be disconnected.

Add drives, add-in boards, and memory to your system. Make any internal changes and replace all system covers.

5. Connect External Devices

⚠ **CAUTION**
Before connecting peripheral devices, verify that the system is not plugged in. Otherwise, equipment may be damaged.

Back panel I/O connectors



A Keyboard, PS/2-compatible 6-pin connector*

B Mouse, PS/2-compatible 6-pin connector*

C COM2, serial port 9-pin connector

D COM1, serial port 9-pin connector

E VGA monitor, 15-pin connector

F LPT1 25-pin parallel port connector

* Keyboard and mouse connectors are identical.

You must install a monitor and keyboard to configure the system (see back panel connectors above). You may remove the monitor and keyboard after running the System Configuration Utility (SCU).

Connect other external peripheral devices such as a printer or modem by following instructions included with the device, using serial ports COM1 and COM2 and parallel port LPT1 on the back panel.

6. Start up the System

Connect the power cord for each power supply to the AC power receptacle on the system and to a grounded AC electrical outlet.

Turn on the monitor. Turn on system by pressing the power on/off switch.

Verify that the power LED on the front panel is lit.

After a few seconds, POST (Power-on Self Test) starts running.

❑ ❑ ❑

How to: System Integration 3

This chapter describes how to install or remove and replace user-replaceable system parts.

Tools and Supplies Needed

- Phillips screwdrivers, one with a #2 bit and one with a #1 bit.
- Standard tip screwdriver with blade thickness of 0.375- to 0.500-inch by 0.04-inch.
- IC removal tool.
- Antistatic wrist strap and conductive foam pad (recommended).
- Equipment log: as you integrate new parts into the system, add information about them to your equipment log at the back of this manual.

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should integrate and configure the system.

The only procedures that can safely be done with the system power on are installing (or hot-swapping) an SCA drive/carrier assembly in one of the SCSI hot-swap drive bays, and removing/installing (hot-swapping) a power supply in a chassis with three power supplies. For any other procedures inside the system, turn off system power and disconnect the AC power cord(s).

WARNINGS

System power on/off: The DC push-button on/off switch (a convex button) on the front panel DOES NOT turn off the system AC power. To remove power from system, you must unplug the AC power cord(s) (from wall outlet or power supply).

Hazardous conditions, power supply: Hazardous voltage, current, and energy levels are present inside the power supply. There are no user serviceable parts inside it; servicing should be done by technically qualified personnel.

Hazardous conditions, power distribution board: Hazardous energy levels are present behind the protective cover over the power distribution board. There are no user-serviceable parts; servicing should be done by technically qualified personnel.

Hazardous conditions, devices & cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cords, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

CAUTIONS

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives, or hot-swapping power supplies in a three supply configuration. However, we recommend that you do all procedures in this

chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side up on a grounded, static-free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

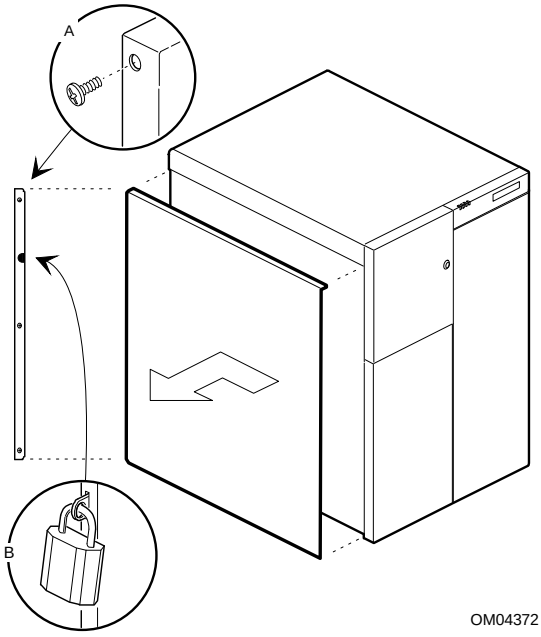
Select the correct board connectors: When working on a lab bench, be careful to select the correct connector on the system board when inserting the processor and memory boards.

Ensure complete board insertion: When installing processor or memory boards or a bus termination board, before closing the board ejector handles, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high. After closing the handles, make sure the boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted. Also ensure that add-in boards are completely and correctly seated in the system board connectors before applying power.

Internal support panel, proper cooling and airflow: To prevent damage to the system board from partially inserted memory and processor boards and to provide proper cooling and airflow, always install the internal support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

Removing Side Cover



Removing side cover

A Retaining screw (three at back)

B Padlock at back edge (if installed)

External side cover over the board area is shown; procedure is the same for both side covers. (You do not need to remove the internal board support panel if you do not need to access the processor, memory, or bus termination boards.)

CAUTIONS

For proper cooling and airflow, always replace the side covers before turning on the system; operating it with the covers removed can damage system parts.

Do not damage or displace the EMI strips mounted on the cover as you remove and install it. Replace any damaged strips, or your system may not meet EMI requirements.

Do you need to remove the internal board support panel?

This chapter describes removing the external covers. If you are adding PCI or EISA boards or removable media drives, you do not need to remove the internal panel that gives support to the system processor and memory boards. To remove the support panel, see the next chapter.

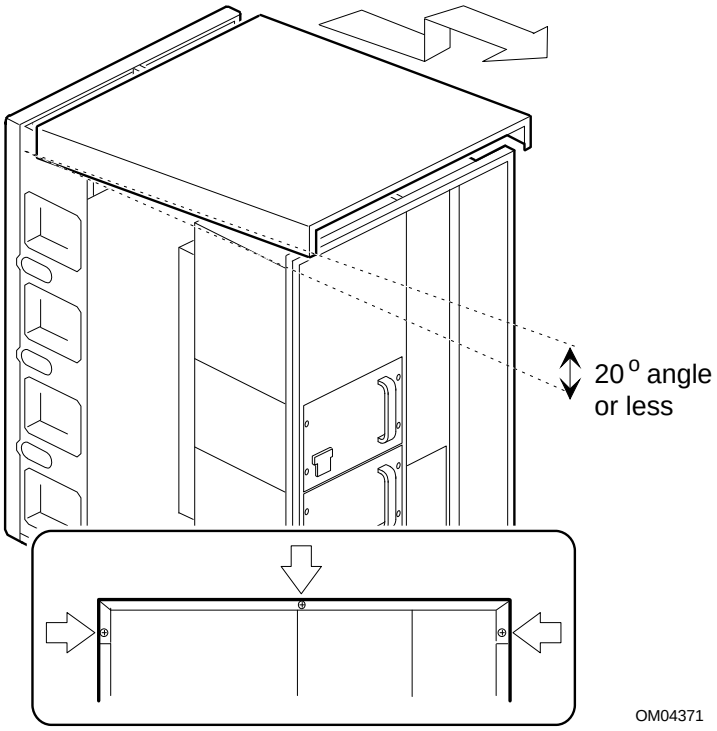
1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Unlock padlock if present, and remove it.

3. Remove three screws from the back edge of the side cover, and save to reinstall the cover.
4. Grip the two built-in handles at the back edge of the cover.
5. Slide cover toward the back about an inch until it stops.
6. Pull cover out from the system to disengage the bottom and top rows of tabs from notches in the chassis. Set cover aside.

Installing Side Cover

1. Before replacing a side cover, check that you have not left loose tools or parts inside the system. Check that cables, boards, and other components are properly installed.
2. Orient the cover so the padlock slot at the back edge fits over the loop at the back edge of the chassis. (The covers on each side are exact duplicates, but they install as a mirror image.)
3. Align the top and bottom rows of tabs on the cover with the slots in the chassis, and carefully push inward.
4. Slide the cover toward the front so the tabs firmly engage in the slots. If the cover does not slide freely all the way forward, make sure the padlock slot is correctly placed over the loop on the chassis back.
5. Attach the cover to the chassis with the three screws you removed earlier, and tighten firmly.
6. To prevent unauthorized access inside the system, insert and lock a padlock through the loop at the back (one at each side). The padlock holes are 0.28″ in diameter and will accept a standard 1″ wide padlock.

Removing Top Cover



Removing top cover

To avoid damaging EMI strips, do not lift the cover much more than the 20 degree angle implied here.

CAUTION, do not damage EMI strips
Do not damage or displace the EMI strips mounted on the cover as you remove and install it. Replace any damaged strips, or your system may not meet EMI requirements.

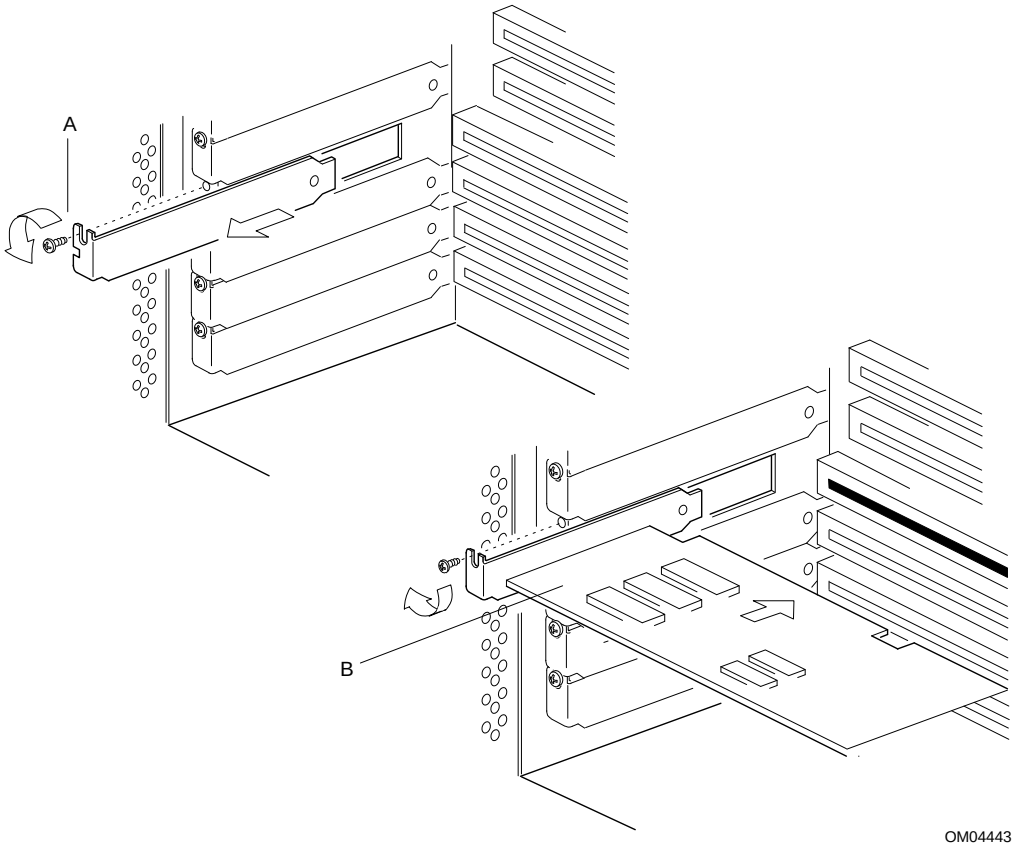
Remove side covers first
You must remove both side covers before you can remove the top cover.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers.
3. At the back, remove three retaining screws from the top cover.
4. Avoid dislodging the EMI strips as you angle the back of the cover up very slightly (to about a 20 degree angle or less), and slide the cover back and up from the chassis.

Installing Top Cover

1. Before replacing the top cover, check that you have not left loose tools or parts inside the system. Check that cables, boards, and other components are properly installed.
2. Lower the cover to about a 20 degree angle with the front edge about one inch back from the edge of the plastic bezel (front cover). The leading corners of the cover should be outside the chassis metal. Pull the cover *toward the back* slightly to make sure it is aligned evenly.
3. Carefully slide the front edge of the cover forward under the edge of the bezel.
4. Reinstall three retaining screws at the back.

Installing Add-in PCI or EISA Boards



A Expansion slot cover and screw

B Add-in board, same screw

Use any EISA add-in board or any add-in board that is compatible with an IBM† PC AT† or PC XT† system (except for an 8-bit drop card that fits only in an 8-bit PC XT connector).

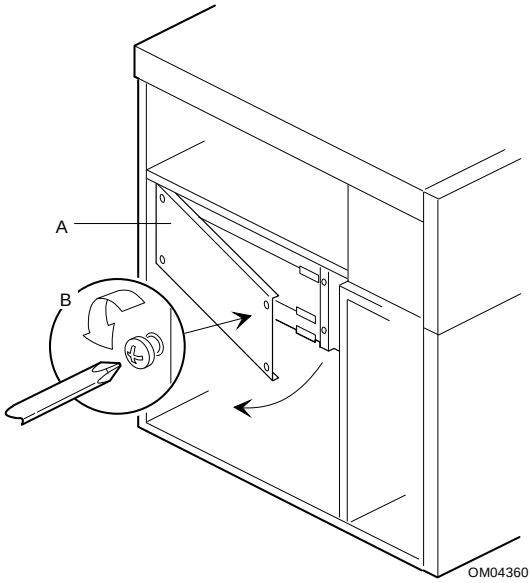
1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove and save the expansion slot screw and cover.
3. Remove add-in board from its' protective wrapper. Be careful not to touch the components or gold edge connectors. Place board component-side up on an antistatic surface.
4. Set jumpers or switches as described by the board manufacturer.
5. Hold board by its' top edge or upper corners. Firmly press it into an expansion slot on the system board. The tapered foot of the board retaining bracket must fit into the mating slot in the expansion slot frame.
6. Align the rounded notch in the retaining bracket with the threaded hole in the frame. The bracket fits the space that was occupied by the slot cover.
7. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against the screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets. Attach cables if necessary.
8. Run the System Configuration Utility (SCU) to reconfigure the system (see SCU chapter in this manual).
9. Install software according to your operating system and application software manuals. Review the README files on your software installation diskettes; they contain important information.

Removing Add-in PCI or EISA Boards

⚠ **CAUTION, make sure slot covers are installed**
Slot covers must be installed on all vacant expansion slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Disconnect any cables attached to the board you are removing.
3. Remove and save the screw from the board retaining bracket.
4. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.
5. Store board in an antistatic protective wrapper.
6. If you are not reinstalling a board in the same slot, install a slot cover over the vacant slot. The tapered foot of the cover must fit into the mating slot in the expansion slot frame.
7. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets.
8. If you remove an EISA add-in board, run the System Configuration Utility (SCU) to reconfigure the system (see SCU chapter in this manual). Running the SCU is optional for a PCI or ISA board.

Removing Board Support Panel



Removing board support panel

A Support panel

B Screws (four total)

(structural details of panel not shown here)

A separate metal panel supports the memory board. You will need to remove the panel to install SIMMs on the memory board.

⚠ **CAUTIONS**

do not remove processors

To avoid damage to the system, insertion or removal of processors should be done only by qualified technical personnel. The procedures are not described in this manual.

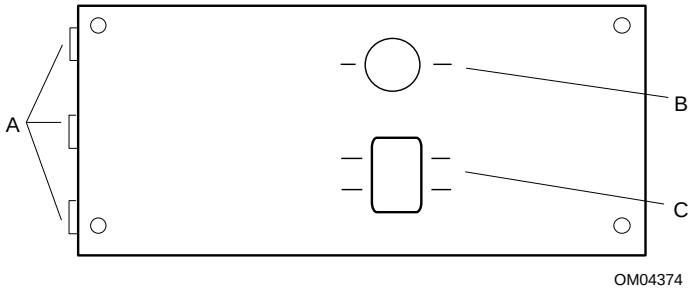
always install the internal support panel

To prevent damage to the system board from partially inserted memory and processor boards, and to provide proper cooling and airflow, always install the metal support panel before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left side panel (as viewed from front).
3. Remove four screws from the support panel and save.
4. Remove panel by pulling the back edge tabs out of three slots in the chassis. Set panel aside.

Installing Board Support Panel

1. Place the support panel in position so the three tabs are to the left. Fit the tabs in the three slots in the chassis back.
2. Swing panel closed. Check to make sure the boards in the slots behind the panel align with the scribe marks on the panel.
3. Secure internal panel with four screws.
4. Reinstall the exterior side cover.



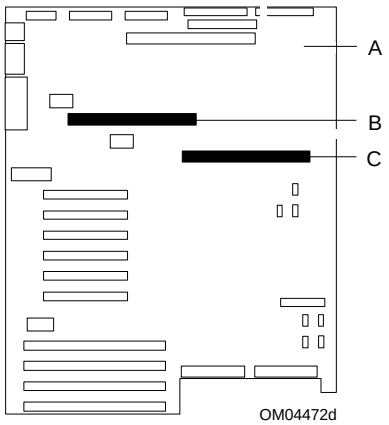
Board support panel

A Tabs to fit in slots in chassis back

B Scribe marks to check alignment of memory board

C Scribe marks to check alignment of processor boards or bus termination board

Processor Board Configuration Models



Processor board connectors on system board

A System board

B Connector for secondary processor board or bus termination board

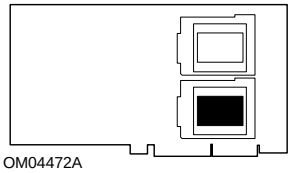
C Connector for primary processor board

The system board has a primary connector and a secondary connector for processor boards. A processor board can have one or two Pentium Pro processors installed. The table that follows shows different configuration possibilities.

Configuration Models, Processor Board and Processors

PRIMARY connector on system board

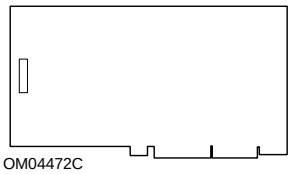
1st processor board, one processor in lower socket



OM04472A

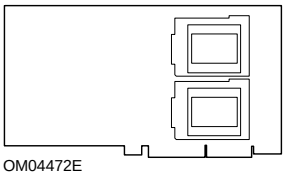
Plus one of the following in the **SECONDARY connector on system board:**

Termination board



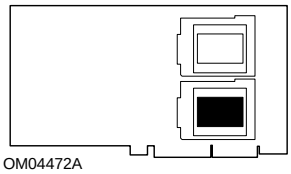
OM04472C

2nd processor board, no processors



OM04472E

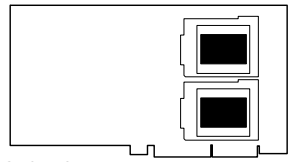
2nd processor board, one processor in lower socket



OM04472A

PRIMARY connector on system board

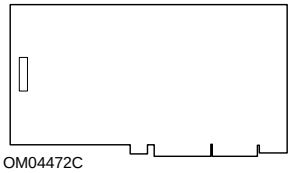
1st processor board, two processors



OM04472B

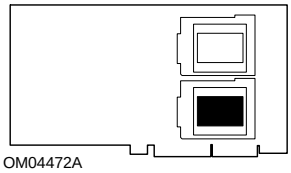
Plus one of the following in the **SECONDARY connector on system board:**

Termination board



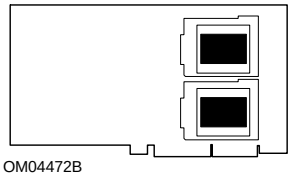
OM04472C

2nd processor board, one processor in lower socket



OM04472A

2nd processor board, two processors



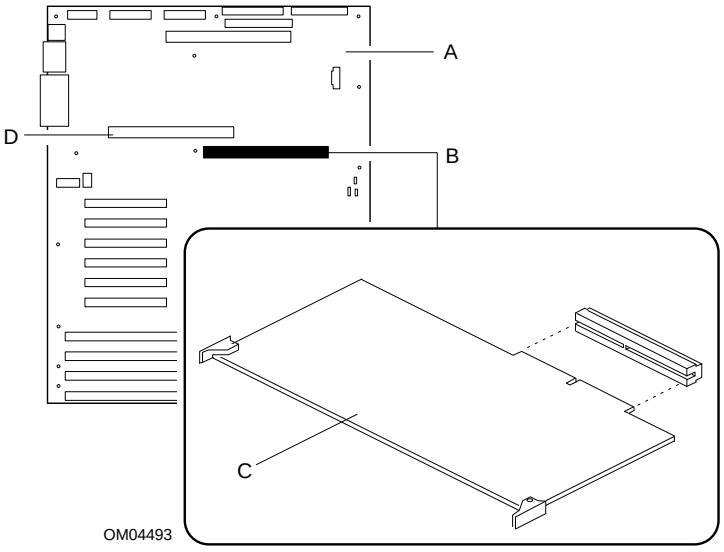
OM04472B

Removing Processor Board

WARNING
If the system has been running, any processor and heat sink already installed on the board will be hot. To avoid the possibility of a burn while removing an existing processor or installing an additional one, let the components cool for 10 minutes before continuing with the procedures described here.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Rotate the board's ejector handles outward to a 90 degree angle from the board. This eases the board free from the system board connector.
4. Holding the board by the corners where the handles are, carefully pull it out until the edge connectors are free.
5. Be careful not to touch components or gold edge connectors on the board as you remove it from the slot. Place the board component-side up on an antistatic surface.
6. Store board in an antistatic protective wrapper if you are not installing or removing a processor at this time.

Installing Processor Board



Primary processor board connector on system board

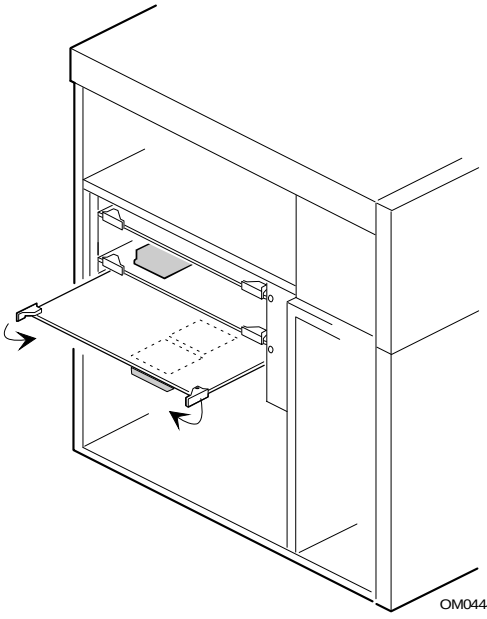
A System board

B Primary connector

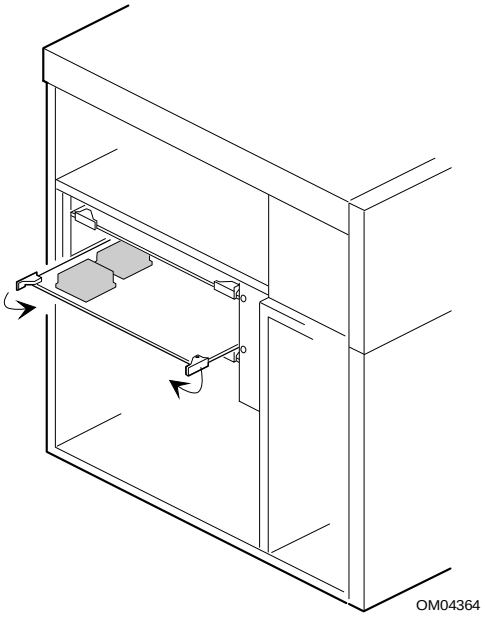
C 1st processor board (details of edge connector keying not shown)

D Secondary connector for 2nd processor board or bus termination board

1st processor board, primary connector, installed component-side down



2nd processor board, secondary connector, installed component-side up



1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the board support panel.
3. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper. Place board component-side up on an antistatic surface.
4. On the system board, locate the correct processor board connector:
   - First processor board: use primary connector. Align with the component-side down.
   - Second processor board (or bus termination board): use secondary connector. Align with the component-side up.
5. Hold the board by the corners with the ejector handles turned outward to a 90 degree angle from the board.
6. Do not press in on the board yet! Ease board into the correct slot guides until it is just touching the connector on the system board.

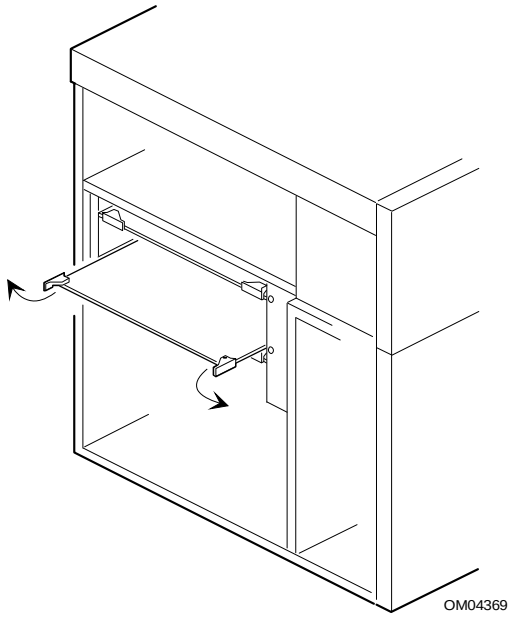
⚠ **CAUTION, before closing handles, check board connector**
Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

7. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

⚠ **CAUTION, before applying power, do one more check**
After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

8. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

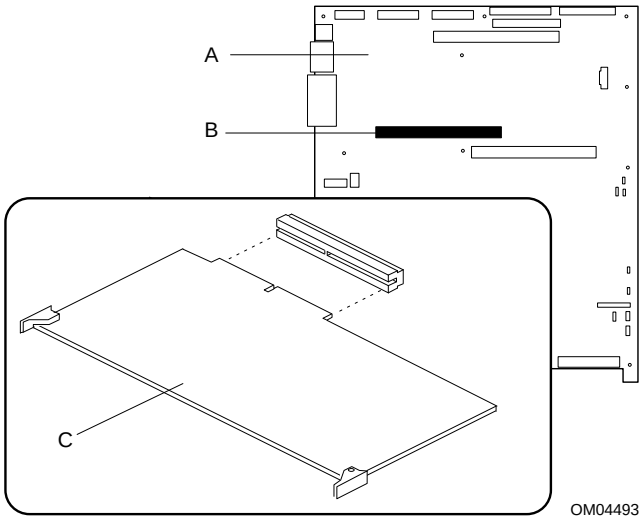
Removing Bus Termination Board



If a bus termination board is in the system, it is installed in the secondary connector. To install a second processor board, remove the bus termination board.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Rotate the board's ejector handles outward to a 90 degree angle from the board. This eases the board out of the system board connector.
4. Holding the board by the corners where the handles are, carefully pull it out until the edge connectors are free from the system board connector.
5. Be careful not to touch components or gold edge connectors on the board as you remove it from the slot and place it component-side up on an antistatic surface.
6. Store board in an antistatic protective wrapper for future use if you need to install it in this or another system.

Installing Bus Termination Board



Remove/install bus termination board

A System board

B Secondary connector

C Bus termination board (installed component-side up); details of edge connector keying not shown

why install a bus termination board
This procedure assumes you are reinstalling a termination board you removed previously, or that you are removing a second processor board and not reinstalling it.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper and place it component-side up on an antistatic surface.
3. On the system board, locate the secondary processor board connector.
4. Hold the board by the corners with the ejector handles turned outward to a 90 degree angle from the board.
5. Do not press in on the board yet! With the component-side up, ease board into the correct slot guides until it is just touching the connector on the system board.

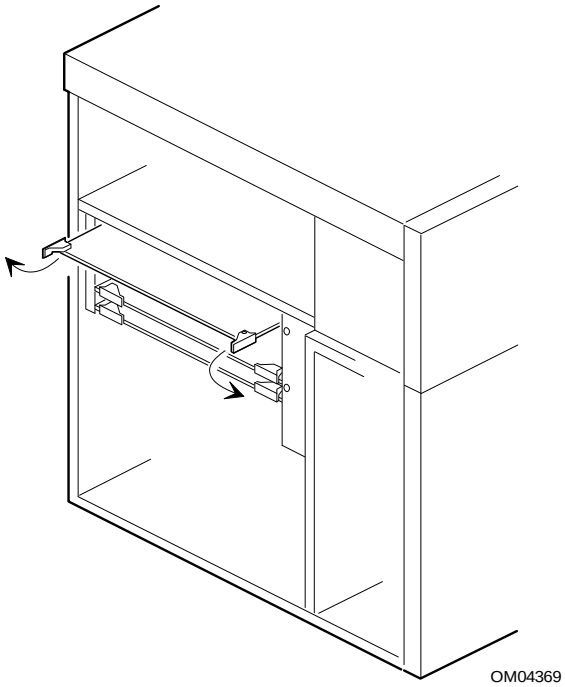
CAUTION, before closing handles, check board connector
Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

6. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

⚠ **CAUTION, before applying power, do one more check**
After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

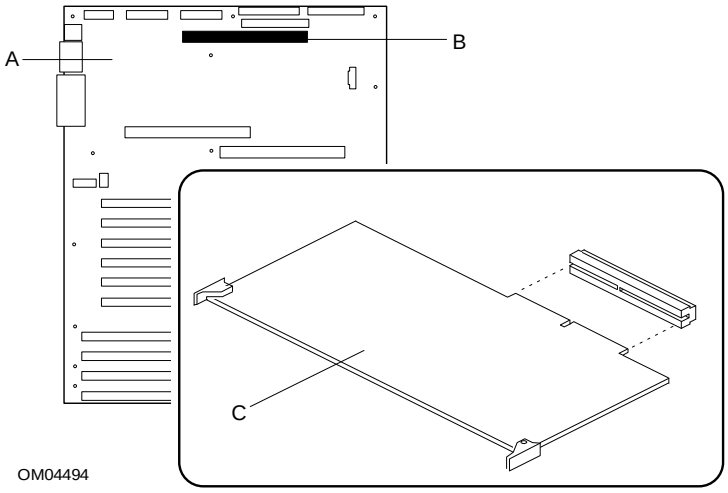
7. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

Removing Memory Board



1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Rotate the board's ejector handles outward to a 90 degree angle from the board. This eases the board free from the system board connector.
4. Holding the board by the corners where the handles are, carefully pull it out until the edge connectors are free from the system board connector.
5. Be careful not to touch components or gold edge connectors on the board as you remove it from the slot. Place the board component-side up on an antistatic surface so you can add or remove SIMMs. (If necessary, store this board in a protective wrapper until ready to modify the memory configuration.)

Installing Memory Board



Remove/install memory board

A System board

B Memory board connector

C Memory board; install with SIMM sockets facing down

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper. Place board component-side up on an antistatic surface.
3. On the system board, locate the memory board connector.
4. Hold the board by the corners with the ejector handles turned outward to a 90 degree angle from the board.
5. Do not press in on the board yet! With the SIMM sockets facing down, ease board into the correct slot guides until it is just touching the connector on the system board.

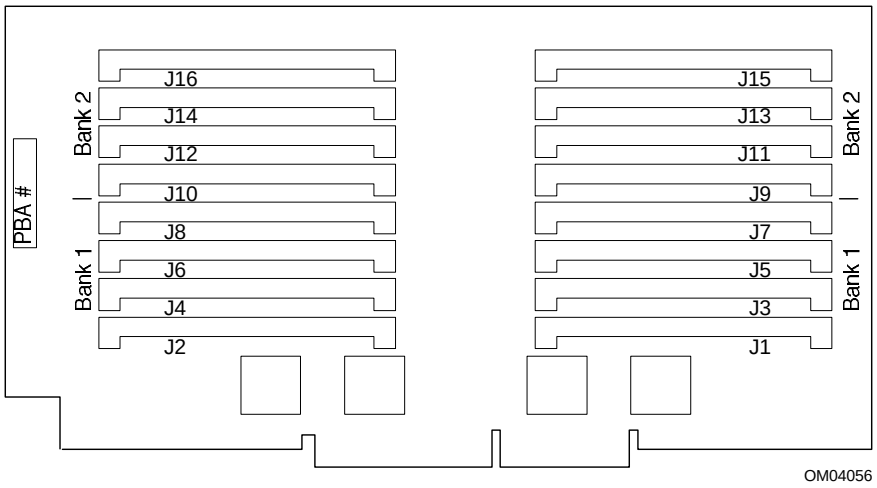
⚠ **CAUTION, before closing handles, check board connector**
Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

6. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

⚠ **CAUTION, before applying power, do one more check**
After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

7. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

Installing SIMMs on Memory Board



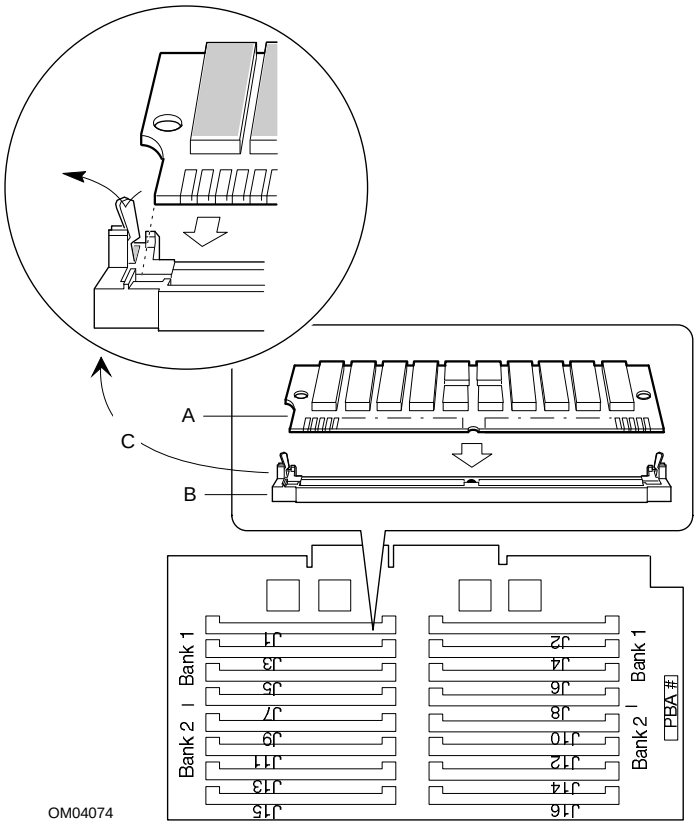
The memory board has 16 SIMM sockets, arranged in two banks. The system automatically detects system memory that is installed, so you do not need to set jumpers to specify memory size. The following table describes memory requirements and characteristics:

Memory size	**Bank installation**	**SIMM type**
Minimum standard memory configuration is 64 MB of DRAM (with four 16 MB SIMMs installed in J1, J2, J3, and J4). Maximum memory configuration is 2 GB of DRAM (with 128 MB SIMMs installed in each socket, J1 through J16).	Always begin with the bottom SIMM sites (lowest number is J1) as you fill the board sockets. All SIMMs in a bank must be identical (same size and speed). SIMMs in bank 1 may differ in size from the SIMMs in bank 2 but may not differ in speed. Number of SIMMs supported: 4, 8, or 16 only.	Use 16 MB, 64 MB, or 128 MB single-sided SIMMs or 32 MB double-sided SIMMs. Use only 36-bit, 72-pin, 60 or 70ns fast page mode SIMMs with tin-lead alloy plated edge connectors, single- or double-sided. (Single-sided refers to the addressing method, not to the physical layout of the SIMM.) Use JEDEC-compatible SIMMs. Contact customer service representative for list of approved SIMMs.

The following SIMM interleaving is supported: two-way interleaved, J1 through J4; four-way interleaved, single bank, J1 through J8; and four-way interleaved, dual bank, J1 through J16.

⚠ **CAUTION, handle SIMMs carefully**
Hold SIMMs only by their edges. Place them on an antistatic surface; do not slide them across any surface. Applying too much pressure on retaining clips can break the clips or damage the socket.

1. Place board flat with the edge connectors turned away from you, as shown in the figure. Start with the lowest numbered sockets in bank 1.
2. Orient the SIMM by checking the notch on one corner of the module. The module can be inserted in only one way.
3. Hold the SIMM at a 45 degree angle, with the top angled away from you. Press carefully into socket until the SIMM is held by the clips. When properly installed, the SIMM remains at an angle. If there is a gap between the clips and the SIMM, it is not properly installed. In this case, open the clips and remove the SIMM; then try again.



Install SIMMs

A Notch on SIMM to help orient the module to the socket (SIMM held with top angled away from you)

B Socket on memory board

C Socket clip details

This view is shown to help you orient the SIMM correctly. The memory board must be installed in the system board connector with the SIMMs facing down.

Removing SIMMs from Memory Board

1. Remove SIMMs starting from the highest numbered sockets (farthest from Bank 1).
2. Open retaining clips just enough to lift the top edge of the SIMM away from the clips.
3. Lift SIMM away from socket, and store in an antistatic package.

Fans

For cooling and airflow, the system contains three removable chassis fans to cool the boards and removable media drives. In this section, we refer to the fans as "inner" and "outer," although all three are inside the chassis. The inner and outer fan brackets are identical, but they are installed on the fans differently.

A general rule about the correct airflow direction

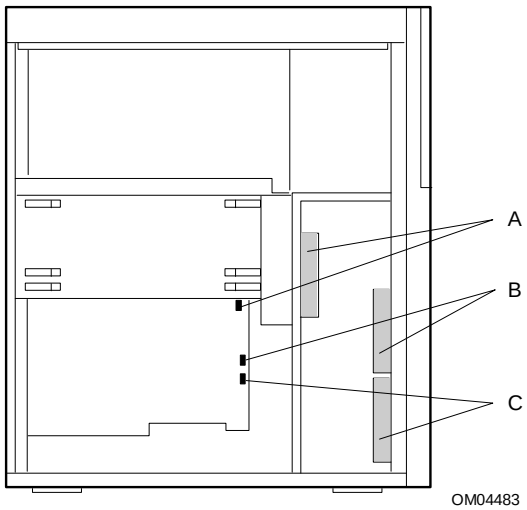
The removable fans pull air from in front of the chassis so that it flows across the boards and out the back. Thus, the fans must be oriented for the correct airflow direction. If you place each fan so the label faces the back of the chassis, this should provide the correct orientation. You can confirm this by checking the embossed arrows on the side of each fan as you place the fan in its bracket:

⇒ Arrow points horizontally toward back of chassis

⇑ Arrow points vertically up

Replacing a fan

Contact your customer service representative for information about replacing a fan. The replacement fan must provide the same failure-sensing circuitry as the fans already installed.



Locations of removable fans and their power connectors on the system board

A Inner chassis fan, fan 2 header on system board

B Outer chassis fan (upper), fan 3 header on system board

C Outer chassis fan (lower), fan 4 header on system board

(The system board has four fan connectors; only three are used to connect fans in this system configuration.)

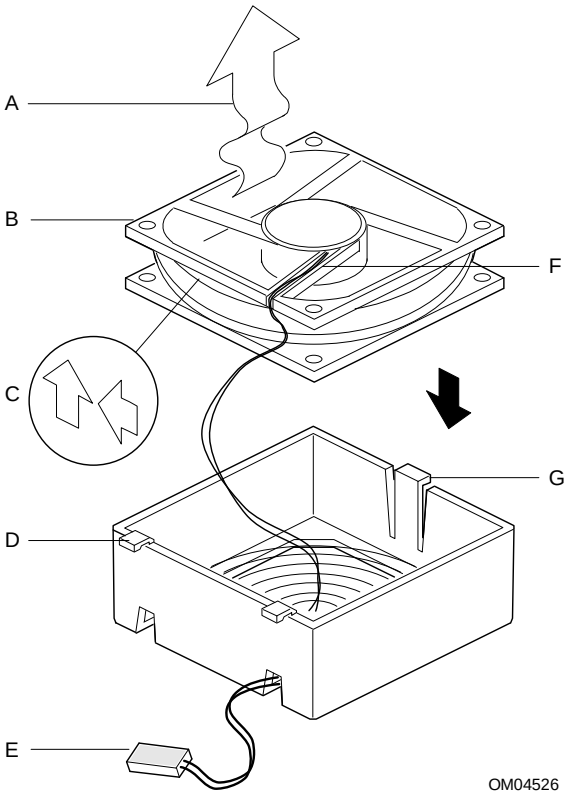
Removing Inner Chassis Fan

No screws used
The fan/bracket assembly is not held together with screws. As you remove the assembly from the chassis, do not let the parts fall.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover.
3. Disconnect the fan power cable from fan 2 header on the system board. Gently thread the cable through the grommeted hole in the vertical bulkhead.
4. Press the release tab on the near edge of the fan bracket. Rotate the assembly outward from the bulkhead until the tabs on the far edge of the bracket clear the slots in the chassis.
5. Carefully remove the assembly from the chassis, and place it on a flat surface with the label-side of the fan facing UP.
6. Lift the fan out of the bracket, pulling up the cable around the grill.

Installing Inner Chassis Fan

The orientation of the fan in the bracket is different from that of the outer chassis fan.



Routing power cable for inner chassis fan

A Wavy arrow indicates airflow direction

B Fan, label-side up

C Airflow direction arrows embossed on side of fan

D Hinge tabs on bracket

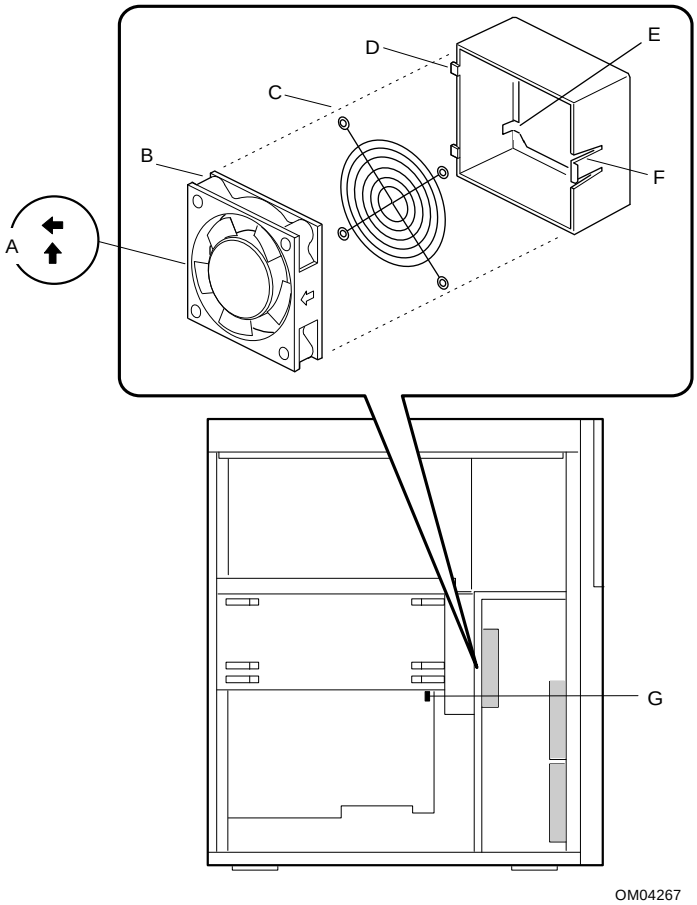
E Power cable threaded through slot in side of bracket

F Power cable wires clamped into groove on fan

G Plastic release tab on far side of bracket

1. Place the plastic bracket on a flat surface with the "open" side facing up, hinge tabs to the left and release tab to the right.
2. Place the grill inside the plastic bracket.
3. Orient the fan with the label-side UP, turned so you can read the label. Keeping the label facing up will ensure that the airflow direction is correct after you install the assembly in the chassis.
4. Secure the fan power cable wires in the groove on the fan housing.
5. With the fan label facing up, place the fan on top of the grill in the bracket. Do not pinch the power cable between fan and bracket.
6. Thread the power cable through the slot next to the hinge tabs on the bracket.

7. Hold the fan/bracket assembly together as you move it into the vertical position flat against the inner bulkhead. The label side of the fan faces the vertical bulkhead; the grill faces the front.
8. Holding the assembly with one hand, guide the hinge tabs into the chassis slots at the far edge of the fan opening. Make sure the power cable is not pinched. Rotate the assembly toward the bulkhead until the release tab snaps into place.
9. Route the power cable through the small grommeted opening in the bulkhead past the inside edge of the assembly. Connect to fan 2 connector on the system board.



Installing inner chassis fan (shown disassembled)

A Airflow direction arrows on side of fan, center label on fan facing back of chassis

B Inner chassis fan

C Protective grill

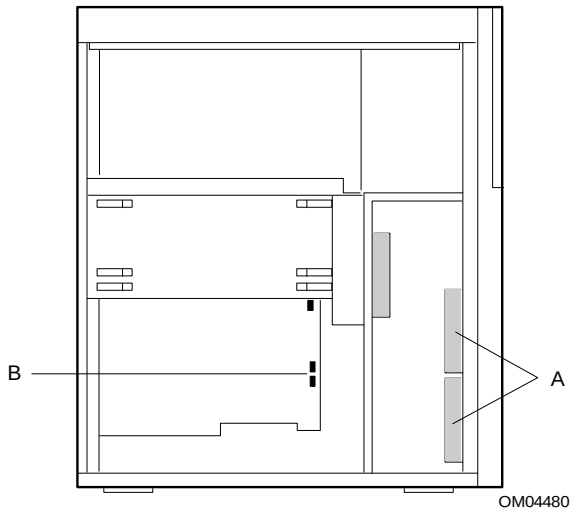
D Hinge tabs on inner edge of bracket

E Slot in bracket for routing power cable (and through grommeted hole, not shown, beyond inner edge of bracket)

F Bracket release tab

G Fan 2 header on system board

Removing Outer Chassis Fan



Location of outer chassis fans and connectors

A Upper and lower outer chassis fans

B System board: fan 3 header for upper fan and fan 4 header for lower fan

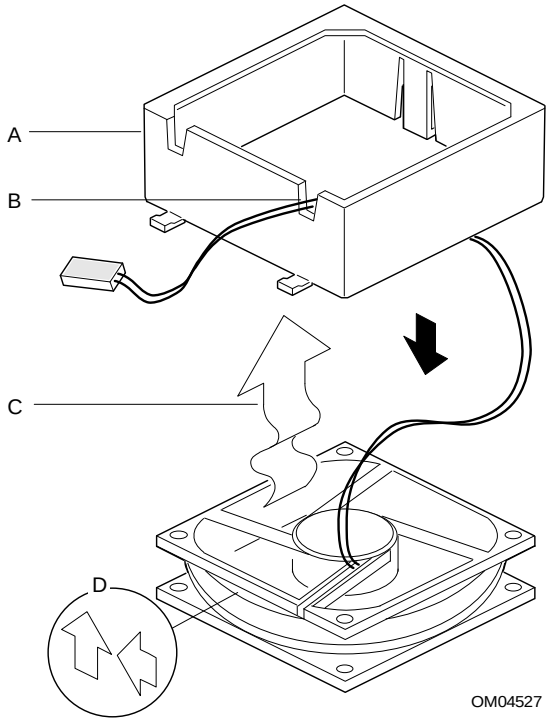
No screws used, no grill used
The fan/bracket assembly is not held together with screws. As you remove the assembly from the chassis, do not let the parts fall. The outer fan assembly does not have a separate, removable grill.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover.
3. There are two outer chassis fans, removed in the same way. Disconnect the fan power cable from its header on the system board. Carefully thread the cable back through the grommeted hole low in the vertical bulkhead.
4. Press the release tab on the near edge of the fan bracket. Rotate the assembly outward from the bulkhead until the tabs on the far edge of the bracket clear the slots in the chassis.
5. Carefully remove the assembly from the chassis, and place it on a flat surface with the label-side of the fan facing UP.
6. Release the power cable wires from the slot on the fan itself before you try to remove the fan from the bracket.
7. Lift the bracket up and away from the fan and power cable.

Installing Outer Chassis Fan

There are two outer fans. Each outer fan is placed in a bracket in the opposite direction from that of the inner chassis fan.

1. Place the fan on a flat surface with the label-side UP, turned so you can read the label. Keeping the label facing up will ensure that the airflow direction is correct after you install the assembly in the chassis.
2. Lower the plastic bracket over the fan, hinge tabs down and to the left, release tab to the right. Make sure the fan power cable is above the fan and bracket, not pinched between them.
3. Lay the power cable to the left, securing it in the groove on the fan itself. It will be in the bracket slot to the left but not fastened there.
4. Hold the fan/bracket assembly together as you lift it into a vertical position and move it into the chassis by the outer front bulkhead.
5. Holding the assembly with one hand, guide the hinge tabs into the chassis slots at the far side of the fan opening. Rotate the assembly toward the bulkhead until the release tab snaps into place.
6. Route the fan power cable through the grommeted hole low in the vertical bulkhead. Connect the fan power cables to the system board as follows:
    - Upper fan: fan 3 header
    - Lower fan: fan 4 header



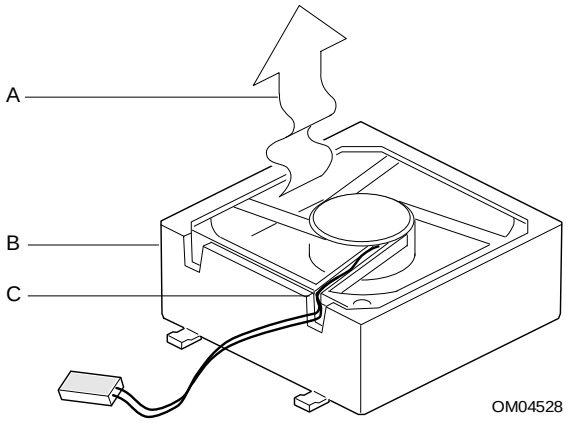
Positioning outer chassis fan and bracket assembly

A Bracket oriented as shown

B Power cable routed through slot

C Wavy arrow indicates airflow direction

D Airflow direction arrows embossed on side of fan



Completed outer chassis fan and bracket assembly

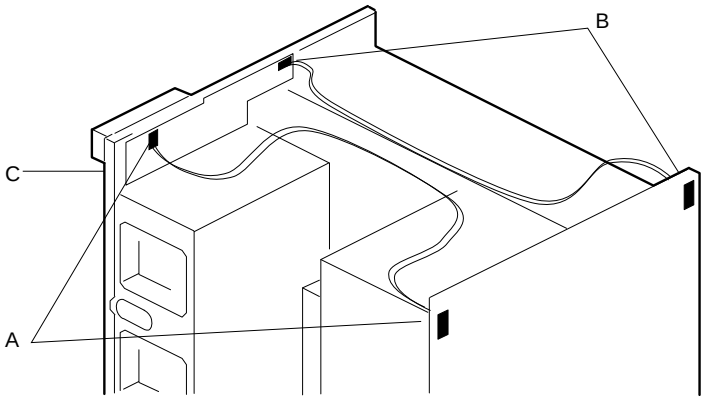
A Wavy arrow indicates airflow direction

B Fan installed in bracket (label-side still up)

C Power cable wires clamped into groove on fan

Intrusion Alarm Switch and Cable Locations

The system has three intrusion alarm switches, two located inside the upper back corners and one on the front panel behind the EMI door that covers the SCSI drive bays. The following figure shows cable routing for the back corner switches.



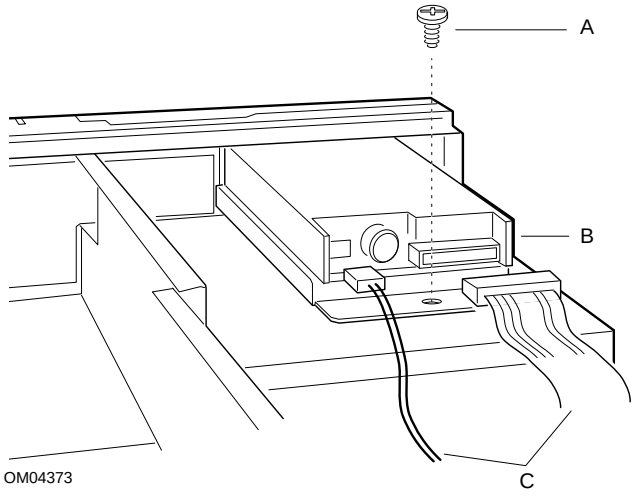
Alarm switch cable routing (connectors are on the front-facing side of the front panel control board)

A Connector J5 on front panel control board; switch located at back near power supplies

B Connector J2 on front panel control board; switch located at back above board cage area

C EMI door switch location (not shown here); direct contact, no cable

Removing 3.5-inch Diskette Drive (Upper Left Bay)

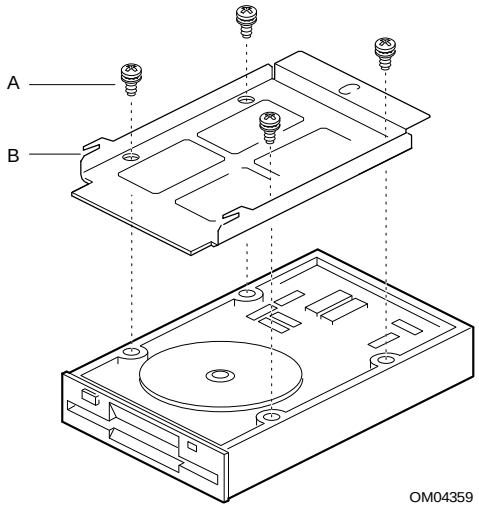


Removing diskette drive from chassis

A Chassis retaining screw

B Drive/bracket assembly

C Drive power and signal cables



Removing diskette drive from bracket

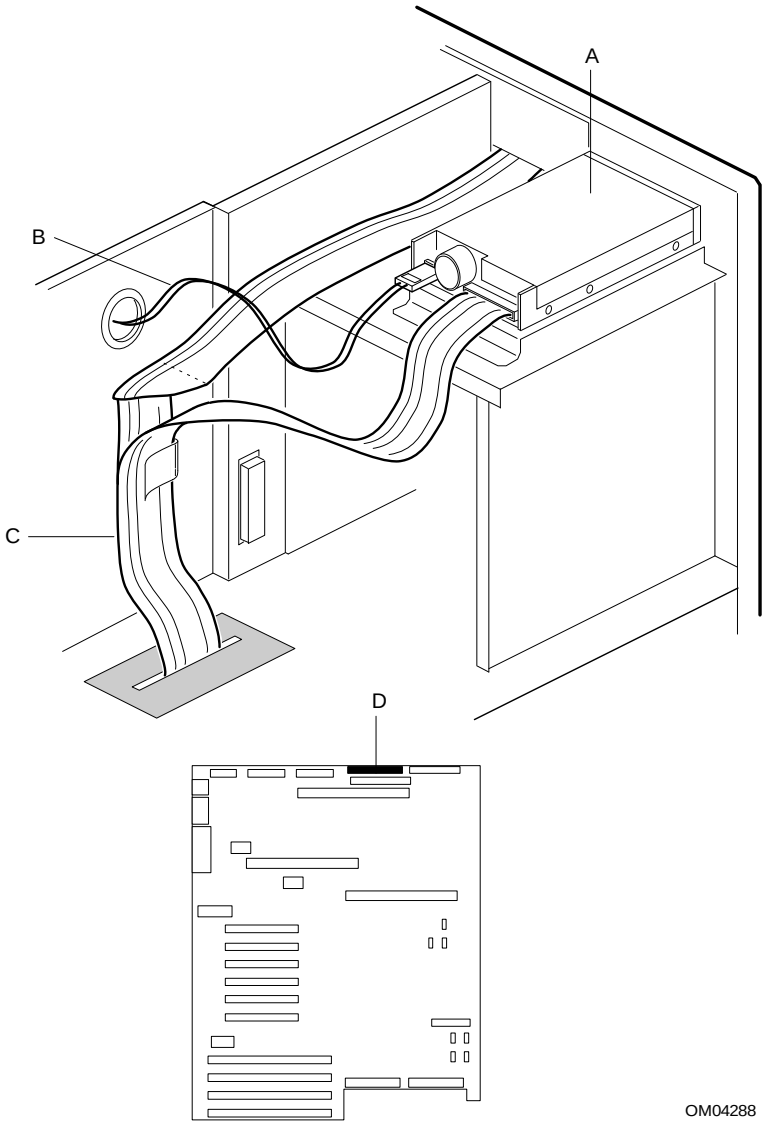
A Four bracket retaining screws

B Drive bracket

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers and the top cover.

3. Label and disconnect the diskette drive cables.
4. Remove and save the screw that secures the drive/bracket assembly to the chassis, and lift the assembly out of the chassis.
5. Turn assembly upside down on an antistatic surface. Remove and save four screws that secure the bracket to the drive, and set bracket aside. Save screws and bracket to reinstall the same or a different 3.5-inch diskette drive.
6. Place drive on an antistatic surface. If not reinstalling the same drive, place it in a protective wrapper.

Installing 3.5-inch Diskette Drive (Upper Left Bay)



Diskette drive cable routing to system board

A DIskette drive

B Power cable

C Signal cable routed through access hole in horizontal bulkhead

D Connector on system board

1. Take the new 3.5-inch diskette drive from its protective wrapper, and place it component-side up on an antistatic surface. Record the drive model and serial numbers in your equipment log.
2. Set any jumpers or switches according to the drive manufacturer's instructions.

3. Place the drive bracket on the component-side of the drive, and align the four mounting holes.
4. Attach the bracket to the drive with four screws of the appropriate size and length (reuse the screws you removed before). Tighten the screws firmly (to 6.0 inch-pounds).
5. Put the drive/bracket assembly on the chassis. If the front door is not open, do this now to check the drive alignment in the bay opening. The drive should protrude out of the chassis only about 5/8 inch.
6. Secure the assembly to the chassis with the screw you removed earlier, and tighten it firmly (to 8.0 inch-pounds).
7. Connect cables to the diskette drive. The connectors are keyed for easier alignment. The red stripe on the signal cable indicates pin 1.
8. Reinstall the top cover and side covers.
9. Close and secure the short bay door.

Installing 5.25-inch Drives (Removable Media)

The system has four 5.25-inch half-height bays at the upper left front. These bays are intended to hold tape, CD-ROM, or other removable media drives. Narrow SCSI drives in the 5.25-inch bays receive signals through a standard 50-pin ribbon cable that must be connected to J8 on the upper SCSI backplane that is behind the 3.5-inch drive bays (narrow devices are supported in fast/wide mode only). You are limited to three devices in these bays if they are cabled to the upper SCSI drive backplane and there are already six drives in the upper six hot-swap bays.

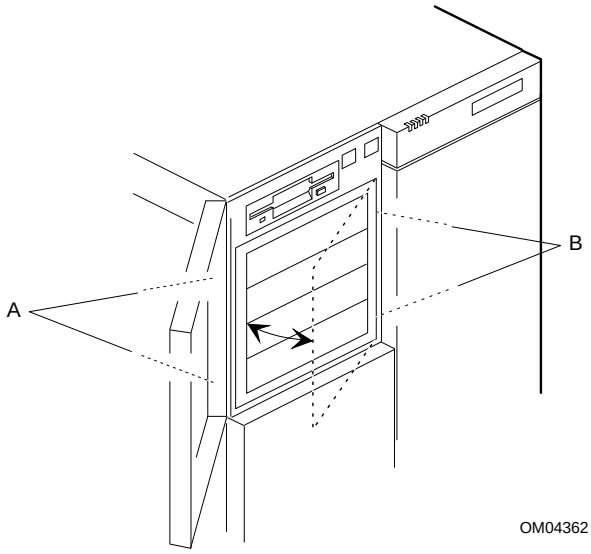
Active bus termination is needed for 5.25" device cable
If you install a narrow SCSI cable, you must provide active SCSI bus termination *at the end of the cable*. You can do this either by installing a drive that includes active bus termination or by crimping an active termination device onto the end of the cable. Leaving the cable installed without active termination at the end will violate the SCSI bus specification and will cause the SCSI bus to be unreliable.

Hard drives are not recommended in these bays
We do not recommend installing a hard disk drive in a 5.25-inch external bay, because the drive generates EMI and is more susceptible to ESD.

Save filler panels and EMI shields
System EMI integrity and cooling are both protected by having drives installed in the bays or filler panels and EMI shields covering the bays. When you install a drive, save the panel and shield to reinstall in case you should later remove the drive and not reinstall one in the same bay.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left side cover (as viewed from front).
3. Unlock and open the short bay door.
4. Each empty bay is covered with a plastic filler panel; the filler panels are in a plastic frame. To remove a panel from the frame, you must first remove the frame from the chassis. Reach from the side behind the bay, and press on two snap-in tabs.

5. Swing frame out to the right, and remove it from the chassis by disengaging the hinge tabs at the right edge of the frame.

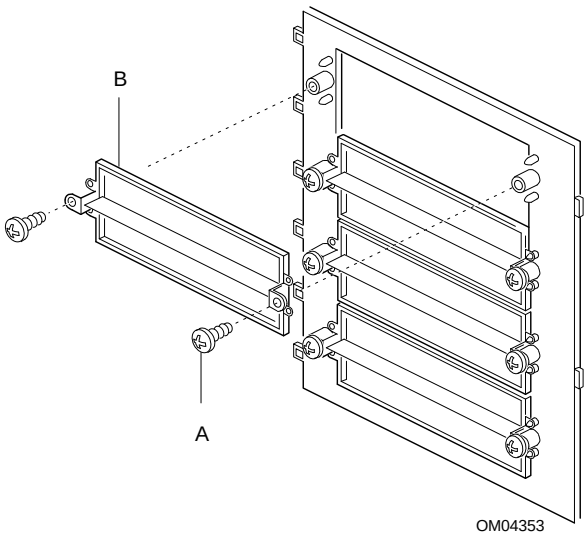


Removing plastic frame from 5.25″ drive bays

A Two snap-in tabs that secure plastic frame (inside chassis, behind the bay)

B Frame hinge tabs location (not shown)

6. Place the frame face down on a soft surface to prevent marring it.
7. Remove the screws and filler panel from the bay where you will install a drive. Save the panel and screws to reuse if you remove a drive from a bay later and do not reinstall one.

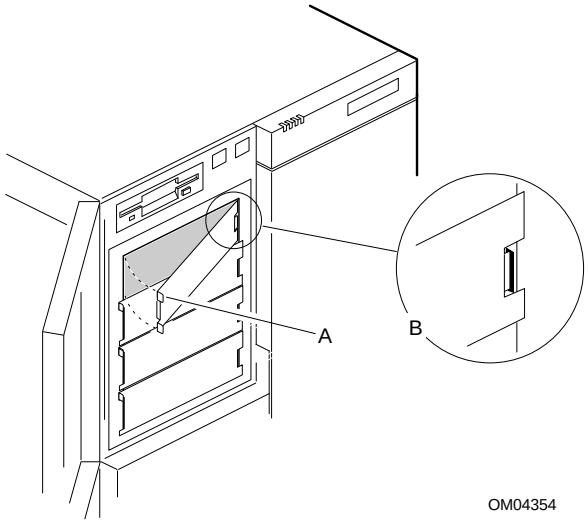


Removing filler panel from 5.25″ frame

A Screws

B Filler panel

8. To remove the metal EMI shield from the bay opening, at the left side of the shield, push the tabs slightly to the right while pulling out. Then pull the right side hinge tabs out from the chassis slot. Save the shield to reuse if you remove a drive from a bay later and do not reinstall one.



Removing EMI shield from 5.25″ drive bay

A Tab on left edge of EMI metal shield

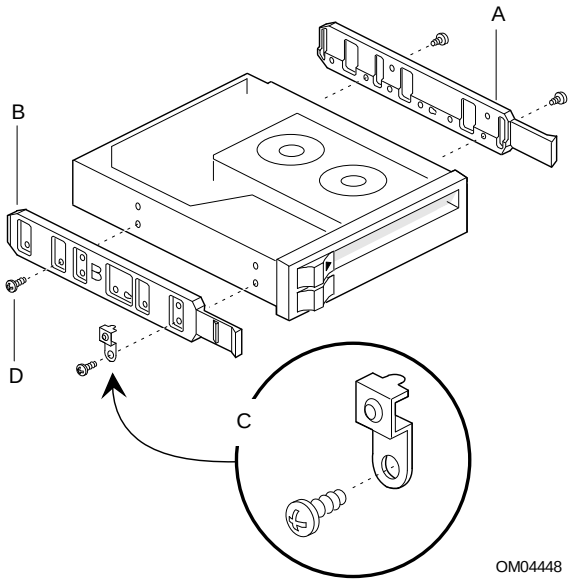
B Right side hinge tabs, detail

9. Remove drive from protective wrapper and place on an antistatic surface.

10. Record the drive model and serial numbers in your equipment log.
11. Set any jumpers and/or switches according to the drive manufacturer's instructions.
12. To attach two plastic snap-in slide rails to the drive, use two screws of the appropriate size and length (not supplied).

    Attach slide rail A to the RIGHT side of the drive.

    Attach slide rail B and an EMI/ESD grounding clip to the LEFT side of the drive. Install the grounding clip under the screw head toward the front of the drive.



Attaching slide rails and grounding clip to removable media drive

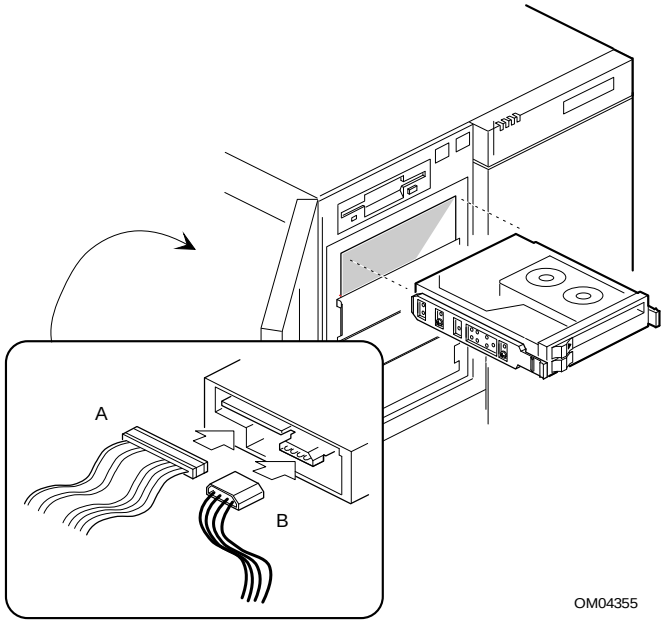
A Snap-in slide rail A (right side of drive)

B Snap-in slide rail B (left side of drive)

C Screw and grounding clip on rail B toward front of drive

D Screws (two per rail)

13. Engage the plastic slide rails in the bay guide rails. Push drive into the bay until the slide rails lock in place.



Installing 5.25″ drive in bay

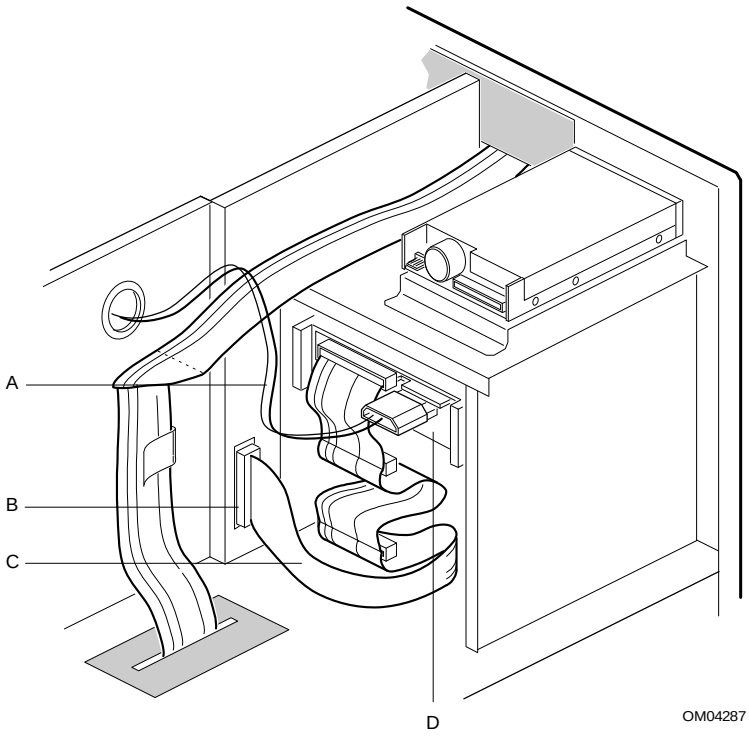
A Signal cable

B Power cable

14. Connect a power cable to the back of the drive. Power cables are provided in the chassis for removable media drives (including the diskette drive that is factory-installed). These cables are interchangeable; you can connect any one of them to any device you install in the bays. The connectors are keyed and can be inserted in only one way.

15. Connect a signal cable to the back of the drive. If a narrow SCSI cable is already connected to devices in the 5.25-inch drive bays, add your drive to the cable. Otherwise, install a standard 50-pin ribbon cable: connect to J8 on the upper SCSI backplane and to the drive (in fast/wide mode only). Refer to the note on page 3-39 for information about providing active bus termination on the 5.25-inch device cable.

16. Reinstall the filler panel frame and the side cover. Close the bay door.



Routing 5.25″ drive cables

A Power cable (example, only one shown)

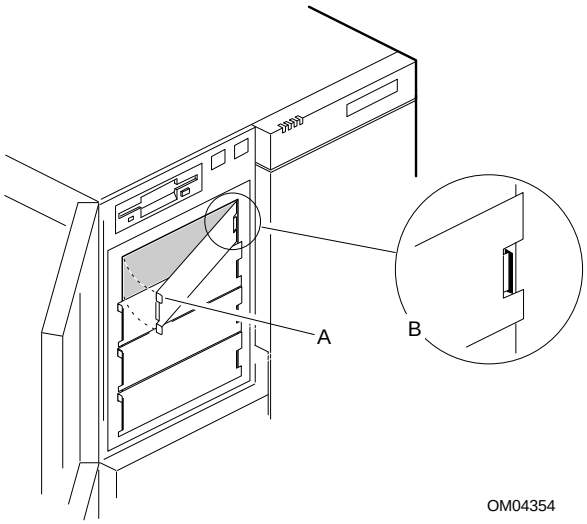
B Connector J8 on upper SCSI backplane

C Narrow SCSI cable

D Removable media drive at end of narrow SCSI cable

Removing 5.25-inch Drives (Removable Media)

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover (left as viewed from the front).
3. Disconnect the signal and power cables from the back of the drive.
4. Slide drive out the front of the bay, and place on an antistatic surface.
5. Remove and save the plastic snap-in slide rails, grounding clip, and screws.
6. Place drive in an antistatic wrapper.
7. If you are not reinstalling the same or another drive, install a metal EMI shield to cover the empty bay. On the right edge of the shield, engage the middle hinge tab in the chassis slot at the right side of the bay. The upper and lower hinge tabs should lie outside the chassis. Push in the left side of the shield until the left side tabs snap into place.

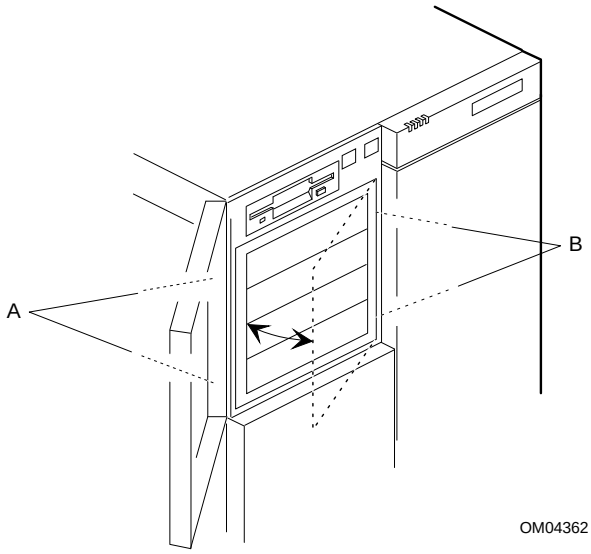


Installing EMI shield from 5.25″ drive bay

A Tab on left edge of EMI metal shield

B Detail of right side hinge tabs

8. To cover an empty bay, also install a filler panel in the bay frame. First remove the frame from the chassis. Reach from the side behind the bay, and press on two snap-in tabs. Swing frame out to the right.
9. Remove frame by disengaging the hinge tabs at the right edge of the frame.

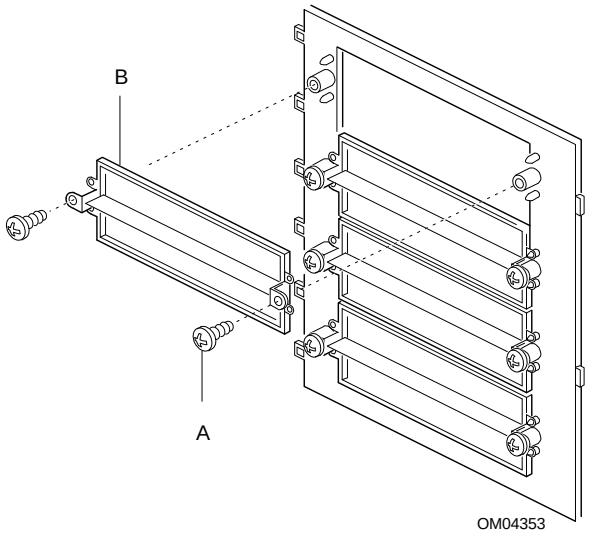


Removing plastic frame from 5.25″ drive bays

A Two snap-in tabs that secure plastic frame (inside chassis, behind the bay)

B Frame hinge tabs location (not shown)

10. Place the frame face down on a soft surface to prevent marring the front of it.
11. Use two screws to install a filler panel in the opening corresponding to the empty bay.



Adding filler panel to 5.25″ frame

A Screws

B Filler panel

12. Reinstall the filler panel frame and the side cover. Close and lock the front bay door.

Installing or Swapping a SCSI Drive in Hot-swap Bay

This procedure describes installing a new drive in or swapping out a faulty drive from one of the 12 hot-swap drive bays. The 3.5-inch SCSI drives must use the industry standard 80-pin Single Connector Attach (SCA) connector. Each drive must be installed in a carrier (supplied).

- If installing new drives, follow an installation scheme starting with the top left drive. Fill the bays left to right, across a row, and then move down a row.
- If an individual SCSI drive fault LED (yellow light) is on steadily, this indicates that the drive below it has been flagged as faulty by the SCSI host controller (supported only by SCSI host controllers that send the SAF-TE control signals only). Follow the procedure described in this section to remove the faulty drive and swap in a good one.

⚠ **CAUTION, electrostatic discharge (EDS) and protection**
ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives or hot-swapping power supplies in a three supply configuration. However, we recommend that you do all procedures in this chapter only at an ESD workstation or provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

✏ **Install or swap SCSI drives without turning off power**
This is one of the few system procedures that is safe to do with the system power left on. This is true only for the drive/carrier assemblies in the hot-swap bays, *not for drives in any other bays.*

✏ **Wait until the drive spins down**
When the SCSI drive fault LED indicates a drive fault (steady yellow light when using a SCSI host controller that sends the SAF-TE control signals), you can remove the drive and swap in a replacement at any time when the drive is not being accessed, without needing to power down the system. However, drive manufacturers caution against moving a drive that is still spinning because of possible damage to the spindles.

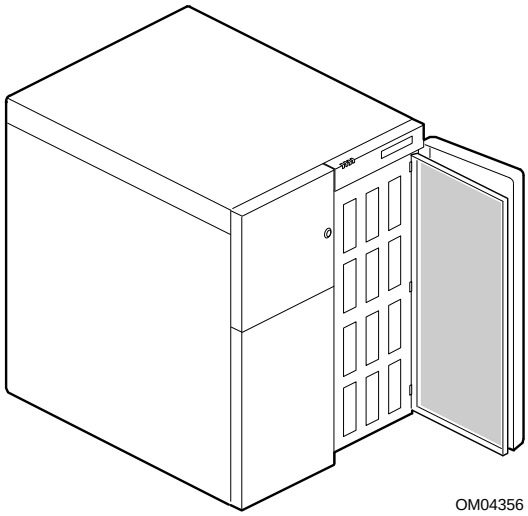
If you are swapping out a faulty SCSI drive, you can pinpoint which drive to remove by checking the status LEDs that occur in sets of three above each of the 12 drive bays.

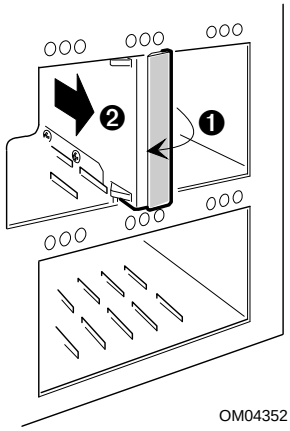
SCSI Drive Status LED Descriptions

SCSI drive present, power on green LED	SCSI drive active green LED	SCSI drive faulty* 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.
❍ Off	❍ Off	● On	Drive CAN be replaced. Steady yellow fault light indicates drive has a problem. Power to drive is off.
● On	❍ Off	✱ Slow blinking	Drive SHOULD NOT be replaced at this time. A slowly 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.

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

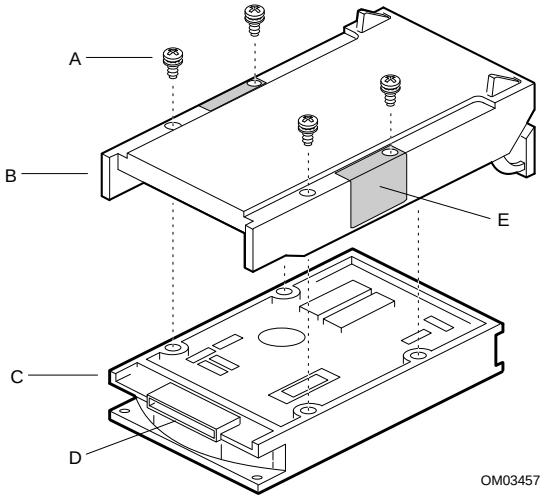
After you determine which drive has been flagged as faulty, the procedure is the same to swap a drive or to install one for the first time. The procedure begins on the next page.





1. Observe the ESD caution and the notes listed at the beginning of this section.
2. Open the right front exterior door.
3. If there is a padlock securing the EMI metal panel, unlock and remove it. Open the panel.
4. Remove the empty carrier or faulty drive from the bay. If you are installing a drive in an empty bay, grasp the plastic lever on an empty carrier, and pull lever toward you. If you are removing a faulty drive, first check the LEDs to confirm which drive to remove.
5. Remove your drive from its protective wrapper, and place on an antistatic surface.
6. Record the drive model and serial numbers in the equipment log.

7. Orient the drive so the power and signal connector is near the top surface of the drive. Place drive on the antistatic surface again.



Installing 3.5″ SCSI drive in carrier for hot-swap bays

A Four screws

B Plastic carrier

C Hard disk drive

D Drive power and signal connector

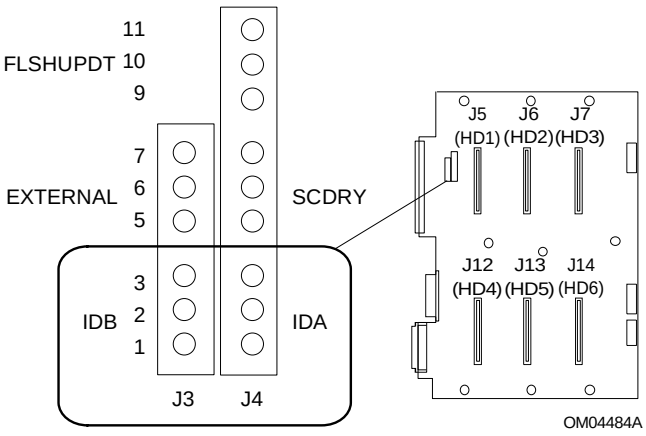
E EMI/ESD grounding clip (integral part of carrier)

8. Place the carrier on top of the drive (if swapping drives, reuse the carrier from the faulty drive). Attach carrier using four screws of appropriate size and length (screws not supplied). The carrier includes EMI/ESD grounding clips that make contact with the drive through two of the screws.
9. Align drive/carrier assembly so it engages the guide rails in the bay.
10. Gently push the assembly into the bay until the drive docks with the backplane connector.
11. Push the plastic lever to the right until it locks around the small metal posts.
12. Close the EMI metal panel, and secure with three thumbscrews.
13. To prevent unauthorized access to the bays, insert and lock a padlock through the loop at the left edge of the EMI panel.
14. Close the front exterior panel.

SCSI Backplane Configuration Jumpers

SCSI Drive ID Jumper, J3 and J4

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. The various configurations allow unused SCSI IDs to be used for narrow SCSI devices like a CD-ROM or tape backup drive (in fast/wide mode only). The figure below shows the location of the jumper block on the SCSI backplane. The table 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 below the figure).



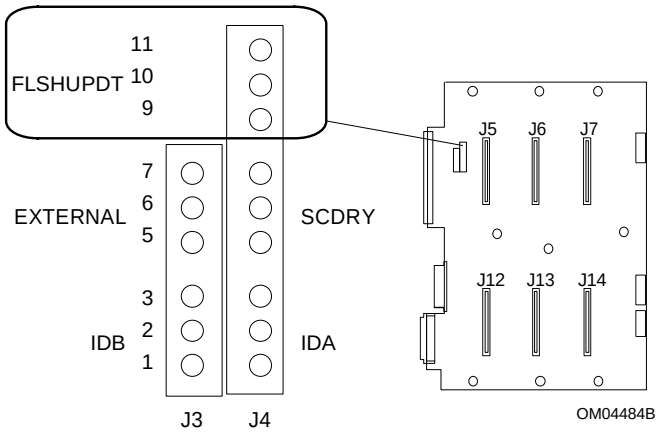
SCSI drive ID jumper blocks on SCSI drive backplane

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

Jumper pins at		To select hard drive 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*	**1-2***	**8**	**9**	**10**	**11**	**12**	**13**

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

SCSI Flash Update Jumper, J4



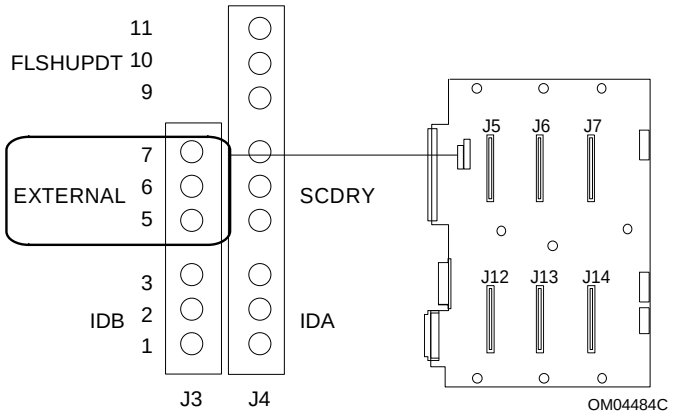
9-10 Normal, factory default

10-11 SCSI flash Recovery Mode

For normal operation and normal flash updates, the jumper should be on pins 9 and 10 at J4. To enable SCSI flash, then recovery mode, the jumper should be moved to pins 10 and 11 at J4. The SCSI recovery mode is used only if the SCSI firmware becomes corrupted and needs to be restored. In this mode, the SCSI backplane has limited functionality, and all drive fault lights will be lit to indicate the SCSI recovery jumper is set.

For the normal and recovery update procedures, see the "Updating Flash Memory" chapter in this manual.

External Backplane Jumper, J3

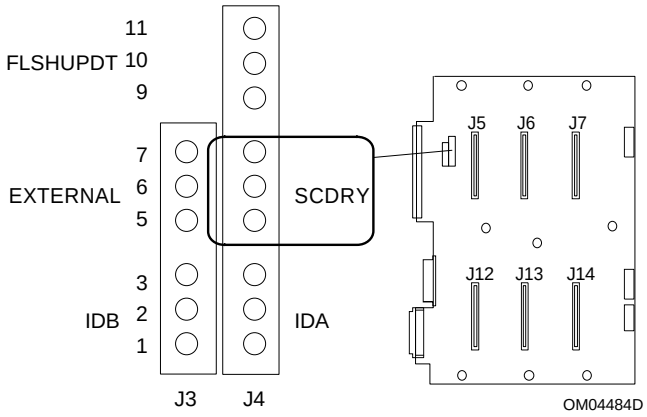


5-6 Internal backplane, factory default

6-7 External backplane

A jumper should be on pins 5 and 6 on J3 when the backplane is located in the host server chassis. A jumper should on pins 6 and 7 when the backplane is located in an external chassis (for example, a peripherals-only chassis). In the latter case, the jumper setting enables the backplane to assume basic enclosure services associated with the front panel. Such services are normally done by the system board in the host chassis.

Secondary Jumper, J4



5-6 Primary, factory default

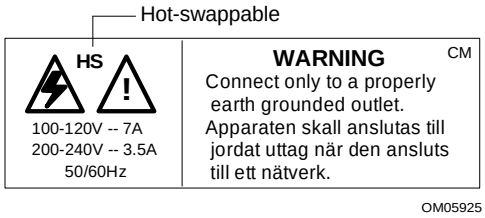
6-7 Secondary

With two SCSI backplanes in the chassis, the upper backplane is jumpered as primary so it will control the single front panel fault light and report other enclosure functions to the host system board. The second, lower backplane must be jumpered as secondary, and it reports its functions to the primary backplane.

Removing or Swapping a Power Supply

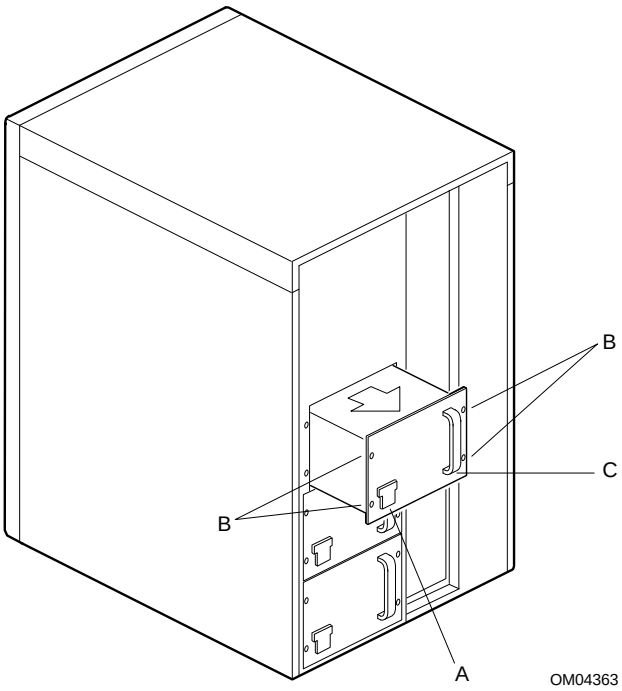
1. Observe the safety and ESD precautions listed at the beginning of this chapter.

   In a chassis with two power supplies, turn off system power at the front panel power on/off switch. In a chassis that supports three power supplies, you do not need to turn off system power because the supplies are hot-swappable, but you must unplug the AC power cord on the power supply that is being replaced before you remove it from the system. You do not need to unplug the power supplies that you are not planning to remove. Power supplies that are hot-swappable have an "HS" printed on the 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.

2. Unplug the AC power cord from the back of the power supply you plan to remove. A spring-loaded interlock at the AC receptacle prevents the supply from being removed unless the cord has been disconnected.
3. Once the cord is unplugged, remove four screws, and save to reuse.
4. Grasp the handle on the supply, and slide it out of the chassis.



Removing power supply

A AC power cord receptacle

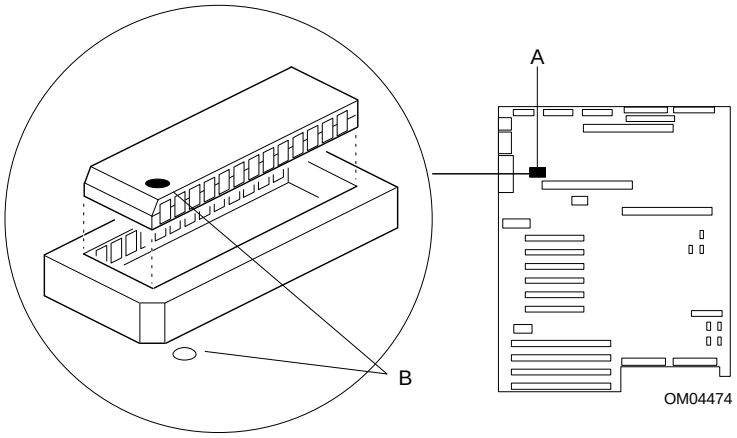
B Four screws

C Power supply handle

Installing Power Supply

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Slide the new or replacement power supply into the chassis, supporting it with the handle provided.
3. Install the four screws to secure the power supply.
4. Connect the AC cord to the back of the chassis. At the AC receptacle, a spring-loaded interlock prevents the supply from being removed once the cord has been connected.

Installing Video Memory



Install optional video DRAM

A Socket on system board

B Pin 1 location

The system board comes with 512 KB of onboard video memory. You can add optional video DRAM to increase the video memory buffer size to 1 MB. The increased size allows the controller to support 132-column text modes and high resolution graphics with 1280 x 1024 x 16 colors. To increase to 1 MB, install a 40-pin 256 K x 16, 70 ns fast-page DRAM.

DRAMs from only certain manufacturers have been tested
Contact your customer sales representative for a list of approved manufacturers and their devices.

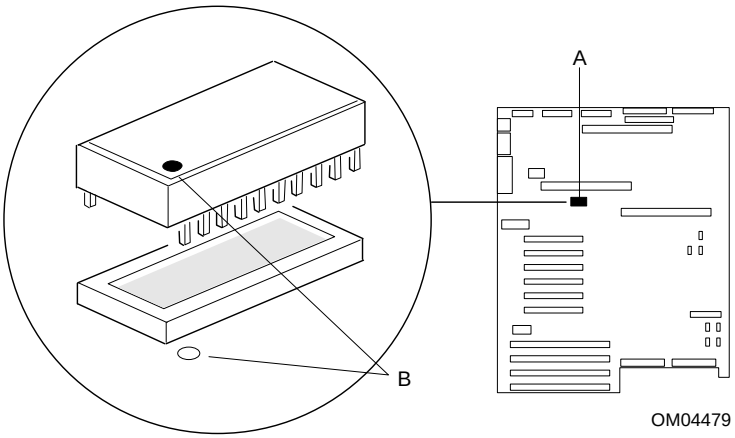
WARNING
If the system has been running, any installed processor and heat sink on the processor board(s) will be hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new DRAM from its protective package, and align the dot on the memory device with the small dot on the system board near one corner of the socket (approximate orientation shown in figure; size of dots exaggerated).
3. Press DRAM down firmly until it is fully seated in the socket.

Removing Video Memory

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Using a small, pointed tool, gently pry up each end of the video memory DRAM, and pull it straight out of the socket.
3. Place DRAM in an antistatic package.

Removing Real-Time Clock



Remove real-time clock

A Socket on system board

B Pin 1 location

You may need to replace the real-time clock (RTC) when its internal integral lithium battery reaches the end of its life span. The battery powers the clock for up to 10 years in the absence of power. When the battery starts to weaken, it loses voltage, and the system settings stored in CMOS RAM (for example, the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.

WARNING
If the system has been running, any installed processor and heat sink on the processor board(s) will be hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

The following warning and specific translations are required by specific certifying agencies to be printed immediately adjacent to the procedure for removing the real-time clock.

WARNING
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

ADVARSEL!
Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

ADVARSEL
Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

VARNING
Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS
Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Clip and remove the plastic tie-wrap holding the real-time clock securely in its socket.
3. Remove the real-time clock from its socket with an IC-removal tool.
4. If for any reason, you plan to reinstall the same RTC, place it in an antistatic bag to protect it from static electricity.
5. If you are disposing of this RTC that is powered by a lithium battery, do so according to local ordinance. Do not expose component to excessive heat or fire. Keep all batteries away from children.

Installing Real-Time Clock

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new RTC from its antistatic package, being careful not to touch the pins on the device.
3. Position the RTC so that the small dot on the top at one corner matches the small pin 1 location dot on the system board. Carefully insert the pins on the device into the socket connectors.
4. Be careful not to bend the pins as you press down on the RTC until it is firmly seated in the socket.
5. If the system will be shipped or moved, secure the RTC in its' socket with a new plastic tie-wrap.
6. Run the BIOS Setup to restore configuration settings to the RTC.

How to: System Board Configuration 4

This chapter describes how to configure the system board.

Tools and Supplies Needed

- Phillips screwdriver with a #2 bit.
- Standard tip screwdriver with .375- to .500-inch by .04-inch thick blade.
- Antistatic wrist strap and conductive foam pad (recommended).

Warnings and Cautions

These warnings and cautions apply throughout this chapter. Only a technically qualified person should configure the system board.

WARNINGS

System power on/off: The DC push-button on/off switch (a convex button) on the front panel DOES NOT turn off the system AC power. To remove power from system, you must unplug the AC power cord (from wall outlet or power supply).

Hazardous conditions, power supply: Hazardous voltage, current, and energy levels are present inside the power supply. There are no user serviceable parts inside it; servicing should be done by technically qualified personnel.

Hazardous conditions, devices & cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cord, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

⚠ **CAUTIONS**

Electrostatic discharge (ESD) & ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you do all procedures in this chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side up on a grounded, static-free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Internal support panel, proper cooling and airflow: For proper cooling and airflow, always install the internal support panel for the processor and memory boards before reinstalling the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

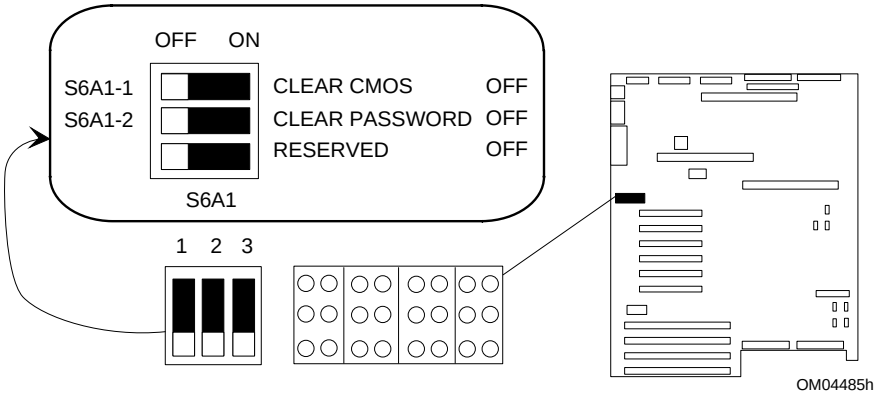
System Board Configuration

The system board has a configuration block that consists of a set of three dip switches and eight jumper blocks. All switch and jumper procedures assume that the following warning applies whenever you open the system.

WARNINGS

Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cord, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

Configuration Switches



To change setting, slide switch to desired position.

Switch	Position	Function
S6A1-1	On	Clear CMOS
	Off*	Normal operation
S6A1-2	On	Clear password
	Off*	Normal operation
S6A1-3	Off*	Reserved

* Factory default setting

CMOS Switch, S6A1-1

Switch S6A1-1 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset:

- Switch OFF: settings in CMOS and real-time clock are preserved during system reset.
- Switch ON: settings in CMOS and real-time clock are reset to factory defaults during system reset.

To clear CMOS (restore to factory default values), do these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power and disconnect the AC power cord(s).
3. Remove the card cage side panel. You do not need to remove the system board, and you probably do not need to remove any add-in boards.
4. On the system board, at switch S6A1-1, CLEAR CMOS, slide switch to ON.
5. Install side panel for your safety. Connect the power cord(s), and turn on the system.
6. Wait for POST to complete and the message "NVRAM cleared by jumper" to appear.
7. Turn off system power and disconnect the AC power cord(s).
8. Remove the side panel again.
9. At switch S6A1-1, slide switch to OFF (the original position). Setting it to OFF preserves the settings during system reset.
10. Install side panel, connect the power cord(s), and turn on the system.
11. Run BIOS Setup to verify the correct settings.

Password Switch, S6A1-2

This switch controls whether a stored password is retained or cleared during a system reset:

- Switch OFF: lets you enter and save/retain a password that is preserved even during system reset.
- Switch ON: clears the password during system reset.

To clear and enter a password, do these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. On the system board, slide switch to ON (to clear old password).
3. Turn system on and wait for POST to complete. The password will have been cleared automatically.
4. Turn system off.
5. Slide switch to OFF to resume normal operation (your settings are retained during system reset).
6. Run Setup to specify a new password. When you reboot the system, the new password will have been retained.

Configuration Jumpers

The jumper sets are arranged in pairs; that is, J6A1 has a three-pin block for BIOS Recovery and a three-pin block for Boot Block Protect. These are not numbered separately on the system board, but they are labeled with the function name. Some of the jumper blocks are reserved for future use.

⚠ **CAUTION**
A jumper is a small plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers, never the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

Procedure to Change a Jumper Setting

The short general procedure for changing a configuration setting is the same for most of the jumper functions, so we will describe it here:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Move jumper to pins specified for the desired setting.
3. Reboot the system for the change to take effect.

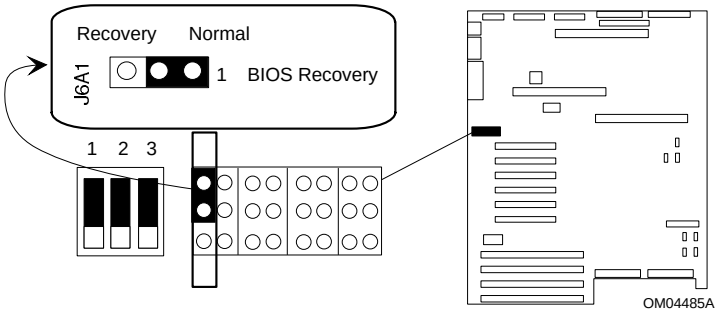
✏ **Procedures to update and recover the BIOS**
For the procedures to update the BIOS and to recover the BIOS in case of an interrupted update, see the "Updating Flash Memory" chapter in this manual.

The rest of this chapter describes each function and shows the function pin location in the jumper block on the system board.

System board configuration jumper summary (listed by block number on board)	Pins	Description
J6A1, BIOS Recovery	1-2*	Normal BIOS boot block
	2-3	Recovery BIOS boot block
J6A1, Boot Block Protect	1-2*	BIOS boot block is write-protected
	2-3	BIOS boot block is programmable
J6A4, BIOS write	1-2	Disables BIOS update of flash memory
	2-3*	Enables BIOS update of flash memory with special utility
J6A4, Floppy 0	1-2	For 1.44 MB diskette drive size or autodetection. Disables 2.88 MB size detection
	2-3*	For forced 2.88 MB diskette drive size
J6A2, Floppy 1	1-2	For 1.44 MB diskette drive size or autodetection. Disables 2.88 MB size detection
	2-3*	For forced 2.88 MB diskette drive size
J6A2, Video Sleep	1-2	Video Sleep Register resides at 03C3H
	2-3*	Video Sleep Register resides at 46E8H
J6A3, Power Control	1-2	Disables RTC power supply control
	2-3*	Enables power supply control using RTC

* Factory default setting

BIOS Recovery Jumper, J6A1



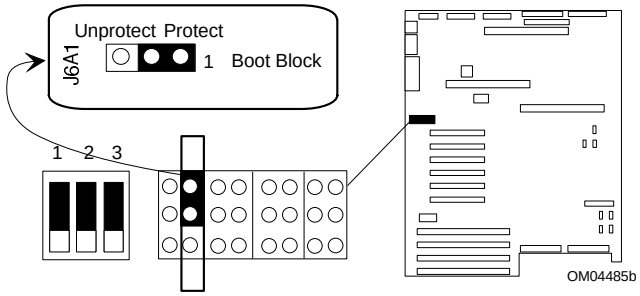
1-2 Normal BIOS boot block, factory default

2-3 Recovery BIOS boot block

This jumper enables the recovery mode for the BIOS flash memory. This mode is important because the system BIOS can be corrupted—for example, when the update procedure is aborted due to a power outage. The flash memory contains a protected area that cannot be corrupted. Code in this area is used to boot the computer from a diskette in drive A when the BIOS has been corrupted. After booting, the Flash Memory Update utility is used to automatically recover the system BIOS from the BIOS recovery files on the diskette. (For normal operation, it is important to keep the jumper on pins 1 and 2.) When the recovery procedure is run, another jumper, BIOS Write at J6A4, must also be in its default position (pins 2 and 3 jumpered).

For the recovery procedure, see the "Updating Flash Memory" chapter in this manual.

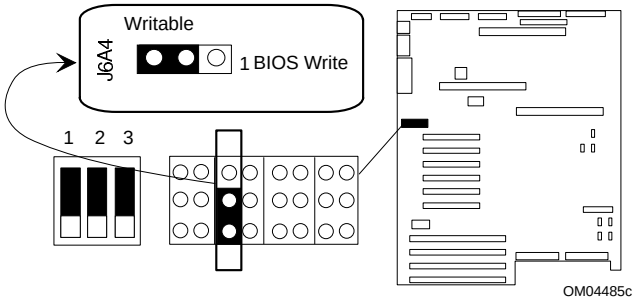
Boot Block Jumper, J6A1



1-2 BIOS boot block is write-protected, factory default

⚠ **CAUTION, leave at factory-default setting, pins 1 and 2**
Always leave the Boot Block jumper installed in the factory-default position, on pins 1 and 2, to protect the BIOS boot block from being overwritten. Do not mistake this jumper block for the ones on either side.

BIOS Write Jumper, J6A4



2-3 Enables BIOS update of flash memory with special utility, factory default

1-2 Disables BIOS update of flash memory (cannot overwrite the BIOS)

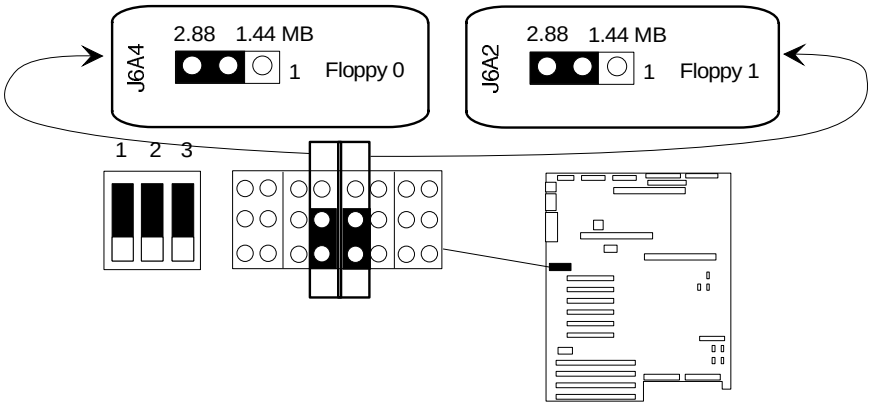
⚠ **CAUTION, updating the BIOS requires special utility**
Changing this jumper should be done only by a qualified technical person, because updating the BIOS requires a special utility.

This jumper enables updating the BIOS in flash memory with a special utility. The factory default is to leave this function enabled so that you can

update the BIOS from a bootable diskette without needing to open the system and change the jumper.

For a copy of the utility to update the BIOS, contact your customer service representative. For the normal and recovery update procedure, see the "Updating Flash Memory" chapter in this manual.

Floppy 0 Jumper at J6A4; Floppy 1 Jumper at J6A2

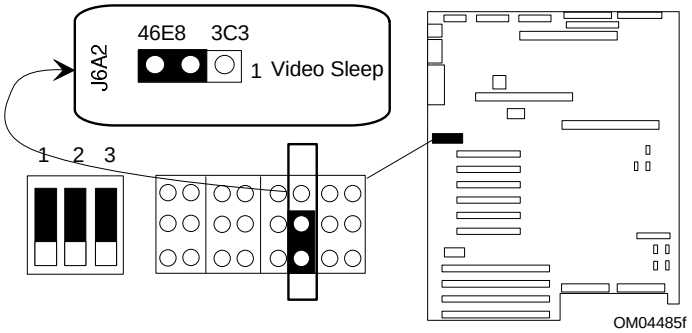


2-3 For forced 2.88 MB diskette drive size, factory default

1-2 For 1.44 MB drive size or autodetection; disables 2.88 MB size detection

The Floppy 0 and Floppy 1 functions are set at separate jumper blocks, but the descriptions are identical. These jumpers configure the floppy drive port to force 2.88 MB drive size or to support automatic size detection.

Video Sleep Jumper, J6A2



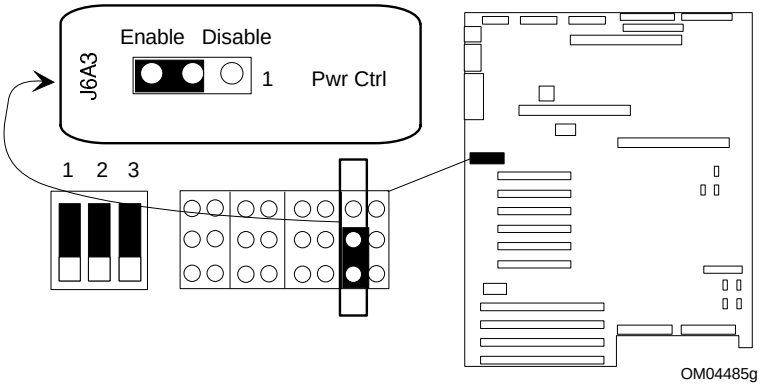
2-3 Video Sleep register resides at 46E8H, factory default

1-2 Video Sleep register resides at 03C3H

The video address jumper determines which I/O port the onboard Cirrus† Logic CL-GD5424 super VGA controller uses for its internal AT mode setup port. The starting address of the default port is 03C3H.

If there is no keyboard activity after a specified time-out period (1 to 128 minutes as specified by using the BIOS Setup), the video sleep register blanks out the monitor screen. When this happens, you must enter a password to reactivate the monitor and the keyboard.

Power Control Jumper, J6A3



2-3 Enables power supply control using the RTC, factory default

1-2 Disables RTC power supply control

This jumper (PWR CTRL) enables power supply control using the real-time clock. Power control from the RTC is typically used for Automatic Server Recovery. An alarm is set in the RTC by the BIOS or a utility program to power the system on or off at a predetermined time.

❒ ❒ ❒

Hardware Technical Reference 5

This chapter provides descriptions of the following:

- Environmental specifications
- System memory mapping
- Board interrupts
- System board connectors
- SCSI drive backplane connectors
- Front panel control board connectors
- Power supply specifications
- Power distribution board connectors
- Electromagnetic Compatibility (EMC) notices

Terms and abbreviations

The following terms and abbreviations are used in the pinout tables:

- Signal active low: In all tables in this section, a pound sign # following a signal name indicates that the signal is active in the low state.
- NC = Not connected. This also appears spelled out.
- GND = Ground.

Environmental Specifications

Chassis		Specification
Temperature	operating	+5° to +35°C (+41° to +95°F); derated 0.5°C for every 1000 ft (305 m) above sea level
	nonoperating	-40° to +70°C (-40° to +158°F)
Humidity	operating	85%, noncondensing at +40°C <33°C wetbulb (at 40°C ambient) (no peripherals)
	nonoperating	95%, noncondensing at 55°C (131°F)
Acoustic noise		Less than 55 dBA sound pressure at +20° to +25°C (+65° to +75°F) at the bystander's position
Random vibration	nonoperating	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
Electrostatic discharge (ESD)	operating	Tested to 20 KV
Safety		UL 1950 CSA 22.2 No. 950 -M93 by cUL EN 60950 by TÜV IEC 950 by TÜV EN 60950 and Nordic deviations by NEMKO
Electromagnetic emissions		Certified to FCC 47 Class B Tested, CISPR 22/85 Class B, EN 55022 Registered with VCCI Declaration of the Manufacturer or Importer: We hereby certify that this product is in compliance with EU Directive 89/336/EEC, using the EMC standards EN55022, EN61000-3-2 and EN50082-2.
Immunity		Verified to comply with EN 50082-2

System Memory Map

Address Range (hex)	Amount	Function
0000_0000H–0007_FFFFH	512 KB	Base system memory (fixed)
0008_0000H–0009_FFFFH	128 KB	Base system memory or ISA memory enabled in Setup
000A_0000H–000B_FFFFH	128 KB	ISA video buffer
000C_0000H–0007_FFFFH	160 KB	Video BIOS, AIC-7880 SCSI BIOS, other option ROMs. All these can be shadowed
000E_8000H–000F_FFFFH	96 KB	System BIOS and data areas (fixed)
0010_0000H–00EF_FFFFH	14 MB	System memory or unused
00F0_0000H–00FF_FFFFH	1 MB	System memory or EISA memory
0100_0000H–FEBF_FFFFH	4060 MB	System memory or add-in cards or unused
FEC0_0000H–FEC0_0FFFH	4 KB	I/O APIC #1
FEC0_1000H–FEC0_1FFFH	4 KB	I/O APIC #2
FEC0_2000H–FEC0_7FFFH	24 KB	Unused
FEC0_8000H–FEC0_8FFFH	4 KB	Local APIC
FEC0_9000H–FFF7_FFFFH	4939 KB	Add-in card or unused
FFF8_0000H–FFFF_FFFFH	512 KB	System BIOS (fixed)

System I/O Map

I/O address	Resource
0000–001F	DMA controller 1
0020–0021	Interrupt controller 1
0022–0023	EISA bridge configuration space access ports
0040–005F	Programmable Timer
0060–0064	Keyboard Controller
0061	NMI Status & Control Register
0070	NMI Mask (bit 7) & RTC Address (bits 6:0)
0071	Real-time Clock (RTC)
0080–0081	PCEB BIOS Timer
0080–008F	DMA Low Page Register
0092	System Control Port A (PC-AT control Port)
00A0–00BF	Interrupt Controller 2
00C0–00DF	DMA Controller 2
00F0	Clear NPX error
00F8–00FF	x87 Numeric Coprocessor
0102	Video Display Controller
0170–0177	Secondary Fixed Disk Controller (IDE)
01F0–01F7	Primary Fixed Disk Controller (IDE)
0278–027F	Parallel Port 2 (relocatable)
02E8–02EF	Serial Port 4 (relocatable)
02F8–02FF	Serial Port 2 (relocatable)
0370–0377	Secondary Floppy
0378–037F	Parallel Port 1 (relocatable)
03B4–03BA	Monochrome Display Port
03BC–03BF	Parallel Port 3
03C0–03CF	Enhanced Graphics Adapter

Continued

System I/O Map

I/O address	Resource
03D4–03DA	Color Graphics Controller
03E8–03EF	Serial Port (relocatable)
03F0–03F7	Floppy Disk Controller
03F8–03FF	Serial Port 1 (relocatable)
0400–043F	DMA Controller 1, Extended Mode Registers
0461	Extended NMI / Reset Control
0462	Software NMI
0464	Last EISA Bus master granted
0480–048F	DMA High Page Register
04C0–04CF	DMA Controller 2, High Base Register
04D0–04D1	Interrupt Controllers 1 and 2 Control Register
04D4–04D7	DMA Controller 2, Extended Mode Register
04D8–04DF	Reserved
04E0–04FF	DMA Channel Stop Registers
0C80–0C83	EISA System Identifier Registers
0C84	Board Revision Register
0CF8	PCI CONFIG_ADDRESS Register
0CFC	PCI CONFIG_DATA Register
n000–n0FF	EISA Slot n I/O Space (n = 1 to 4)
x100–x3FF	ISA I/O slot alias address
n400–n4FF	EISA Slot n I/O Space (n = 1 to 4)
x500–x7FF	ISA I/O slot alias address
n800–n8FF	EISA Slot n I/O Space (n = 1 to 4)
x900–xBFF	ISA I/O slot alias address
nC00–nCFF	EISA Slot n I/O Space (n = 1 to 4)
xD00–xFFF	ISA I/O slot alias address

EISA Slot IDs

EISA slot (hex)	Device
0	System board
1-4	EISA expansion boards

Direct Memory Access Channels

Channel	Device
0	(add-in board)
1	(add-in board)
2	Diskette drive
3	IDE hard disk drive
4	Reserved
5	(add-in board)
6	(add-in board)
7	(add-in board)

Diskette Drive Capacity Supported by BIOS

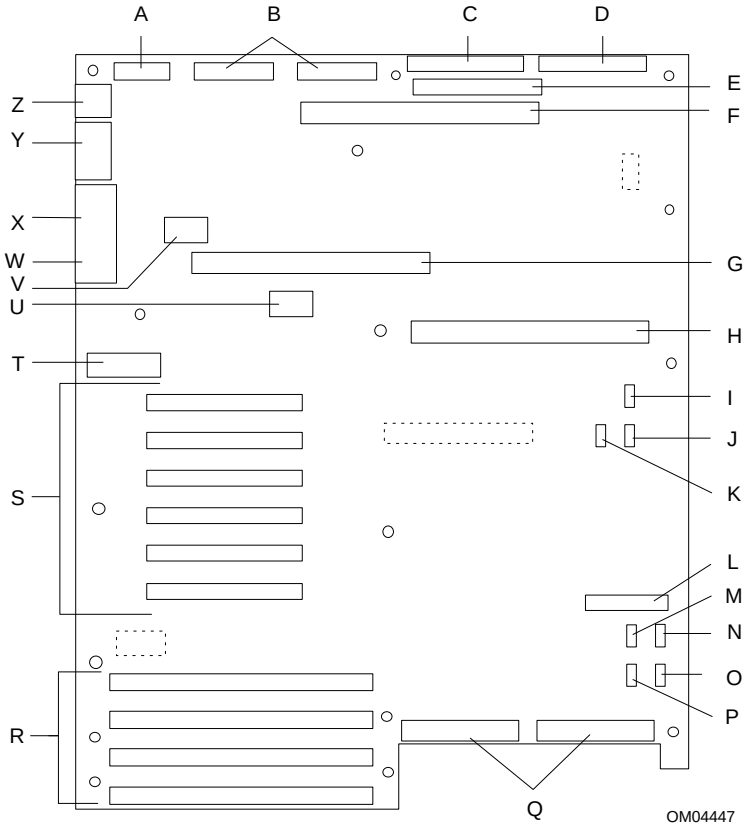
Size, inches	Capacity in KB
5.25	360 KB
5.25	600 KB
5.25	1.2 MB
3.5	720 KB
3.5	1.44 MB
3.5	2.88 MB

ISA Interrupts

IRQ	Device
NMI	Parity error
0	Interval timer
1	Keyboard buffer full
2	Reserved, cascade interrupt from slave PIC
3	Onboard serial port B (COM2) or add-in board
4	Onboard serial port A (COM1) or add-in board
5	Parallel port LPT2 or add-in board
6	Onboard diskette (floppy) controller, if enabled
7	Parallel port LPT1 or add-in board
8	Real-time clock (RTC)
9	(add-in board)
10	(add-in board)
11	(add-in board)
12	Onboard PS/2 mouse port or add-in board
13	Math coprocessor error
14	IDE hard drive controller, if enabled
15	(add-in board)

System Board Connectors

The following figure shows connector locations on the system board.



A	Power control and status connector (PS3)
B	+5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical)
C	Diskette drive connector
D	Front panel connector
E	IDE drive connector
F	Memory board connector
G	Secondary processor board or termination board connector
H	Primary processor board connector
I	Fan 1 connector (not used)
J	Fan 2 connector (inner chassis fan)

K	Hard drive LED 1 connector (not used)
L	Connector for optional Server Management Module (SMM)
M	I^2C connector (not used)
N	Fan 3 connector (upper outer chassis fan)
O	Fan 4 connector (lower outer chassis fan)
P	Hard drive LED 2 connector (not used)
Q	SCSI bus connectors: Channel A to the right, Channel B to the left
R	EISA slots 1 - 4 for add-in boards (slot 1 toward top, 4 toward bottom)
S	PCI slots 1 - 6 for add-in boards (slot 1 toward top, 6 toward bottom: Bus 0 = slots 1 - 3; Bus 1 = slots 4 - 6)
T	Configuration switches and jumpers
U	Real-time clock
V	Video DRAM expansion socket
W	VGA monitor connector
X	Parallel port connector
Y	Serial port connectors A (COM1) and B (COM2)
Z	PS/2-compatible keyboard and mouse connectors
	Three connectors are shown in the board drawing as dotted-line boxes. They are not used in this system configuration. Their functions at the factory are as follows: ITP (In-target Probe) connector, near upper right corner; test connector, near middle of board; 3.3 V PCI power connector, near lower left corner below PCI slots.

Pin information is provided for connectors that system integrators need interface information for. The system board set connector pinouts (first and second processor boards, bus termination board, memory board) are not provided.

Power Connectors PS1 and PS2, System Board

The system board receives power at PS1 and PS2 from connectors J6 and J7 on the power distribution board. PS1 and PS2 are identical; J6 and J7 are identical.

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

Power Status/Control Signal Connector PS3, System Board

The system board receives power status and control signals at PS3 from connector J11 on the power distribution board.

Pin	Signal	Pin	Signal
1	-12 VDC	8	+5 V standby
2	-5 VDC	9	GND
3	PWR ON	10	PWRGOOD
4	I2C-SDA	11	GND
5	I2C-SCL	12	I^2C PRES
6	+5V remote sense (+)	13	+3.3V remote sense (+)
7	+12V remote sense (+)	14	Ground remote sense (-)

Diskette Drive Connector, System Board

Pin	Signal	Pin	Signal
1	GND	18	Head direction
2	Density select	19	GND
3	GND	20	Step
4	Not connected	21	GND
5	Key (pin missing)	22	Write data
6	Extended density in	23	GND
7	GND	24	Write enable
8	Index	25	GND
9	GND	26	Track 0
10	Motor A on	27	GND
11	GND	28	Write protect
12	Drive B select	29	Extended density out
13	GND	30	Read data
14	Drive A select	31	GND
15	GND	32	Head select side 1
16	Motor B on	33	High density out
17	GND	34	Disk change

Front Panel Connector, System Board

Pin	Signal name	Type	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	I2C-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)

Continued

Front Panel Connector, System Board

Pin	Signal name	Type	Function
23	LCD_SCLK	In	Clock for LCD serial I/O
24	I2C_SCL	I/O	I^2C interface clock signal
25	LCD_PCLK	In	LCD controller processor clock
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	I2C_PRES		I^2C control signal
38	RESERVED		Reserved
39	Vcc		Vcc
40	RESERVED		Reserved

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

IDE Drive Connector, System Board

Pin	Signal	Pin	Signal
1	IDERST#	2	GND
3	ID7 (data bit 7)	4	ID8 (data bit 8)
5	ID6 (data bit 6)	6	ID9 (data bit 9)
7	ID5 (data bit 5)	8	ID10 (data bit 10)
9	ID4 (data bit 4)	10	ID11 (data bit 11)
11	ID3 (data bit 3)	12	ID12 (data bit 12)
13	ID2 (data bit 2)	14	ID13 (data bit 13)
15	ID1 (data bit 1)	16	ID14 (data bit 14)
17	ID0 (data bit 0)	18	ID15 (data bit 15)
19	GND	20	No connection, pin missing
21	IDEDRQ (DMA request 3)	22	GND
23	IDEIOW# (I/O write)	24	GND
25	IDEIOR# (I/O read)	26	GND
27	CHRDY (I/O channel ready)	28	SPSYNC (address latch enable)
29	IDEDAK# (DMA acknowledge 3)	30	GND
31	IDEIRQ14 (interrupt request 14)	32	IDEIO16 # (I/O channel size 16)
33	IDESA1 (address bit 1)	34	PDIAG #
35	IDESA0 (address bit 0)	36	IDESA2 (address bit 2)
37	IDECS0# (host chip select 0)	38	IDECS1# (host chip select 1)
39	IDEHDACT#/DRVPRES# disk activity/drive present)	40	GND

Fan Connectors, System Board

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

Hard Drive LED Connectors, System Board

Pin	Function
1	not connected
2	HD1_ACTIVE#
3	HD2_ACTIVE#
4	not connected

Server Management Module Connector, System Board

Pin	Signal	Type	Description
1	SMI#	Input	System management interrupt
2	I2C_CLK	Output	I^2C clock (8 MHz)
3	GND	Power	Ground
4	Reserved		No connection
5	PWROFF#	Output	Power supply off (active low)
6	I2CDATA	I/O	I^2C data signal
7	LPOK	Input	Host line power okay
8	KEYUNLK#	Input	Keyboard unlock
9	NMI	Input	Nonmaskable interrupt
10	3.3 V	Input	3.3 V power
11	RESET#	Output	Reset system board
12	GND	Power	Ground
13	GND	Power	Ground
14	Reserved		No connection
15	SECURE	Input	Host in secure mode
16	GND	Power	Ground
17	INTRUD	Input	Chassis is open
18	Reserved		No connection (reserved for future use)
19	Reserved		No connection
20	GND	Power	Ground
21	Reserved		No connection
22	Reserved		No connection
23	POWERGD		Power to system is within specification
24	Reserved		No connection
25	Reserved		No connection, pin missing
26	Reserved		No connection

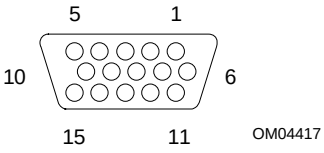
SCSI Channel A and B Connectors, System Board

See table on page 5-22.

PCI Connectors, System Board

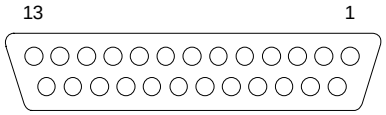
The system board PCI connectors adhere to the requirements in the PCI Specification 2.0.

VGA Video Port, System Board



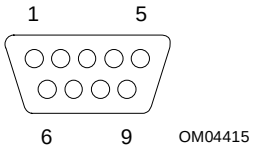
Pin	Signal	Pin	Signal
1	Red	9	Not connected
2	Green	10	GND
3	Blue	11	Not connected
4	Not connected	12	Not connected
5	GND	13	HSYNC (horizontal sync)
6	GND	14	VSYNC (vertical sync)
7	GND	15	Not connected
8	GND		

Parallel Port Connector, System Board



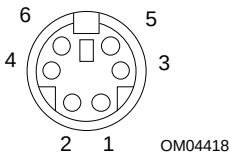
Pin	Signal	Pin	Signal
1	Strobe #	10	ACK (acknowledge) #
2	Data bit 0	11	Busy
3	Data bit 1	12	PE (paper end)
4	Data bit 2	13	SLCT (select)
5	Data bit 3	14	AUFDXT (auto feed) #
6	Data bit 4	15	Error #
7	Data bit 5	16	INIT (initialize printer)
8	Data bit 6	17	SLCTIN (select input) #
9	Data bit 7	18–25	GND

Serial Port Connectors A (COM1), B (COM2), System Board



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	RIA (ring indicator)

Keyboard and Mouse Connectors, System Board

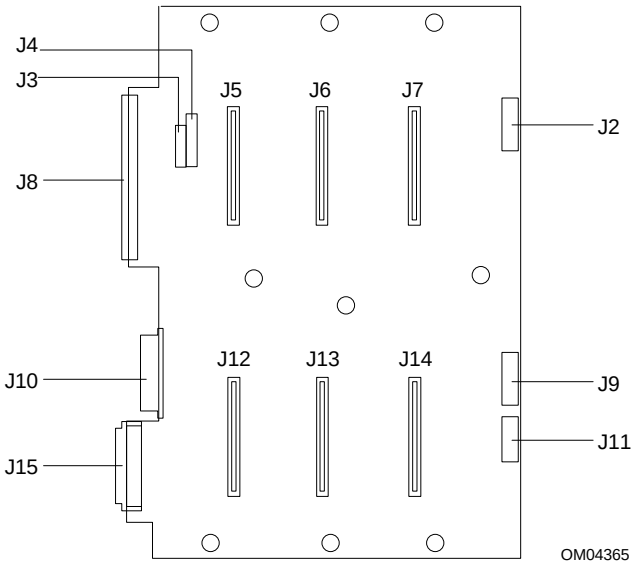


Pin	Keyboard signal
1	KEYDAT (keyboard data)
2	Not connected
3	GND
4	FUSED_VCC (+5 V)
5	KEYCLK (keyboard clock)
6	Not connected

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

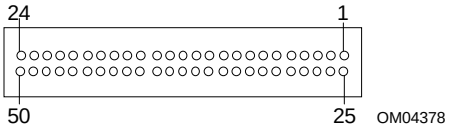
SCSI Backplane Connectors

The following figure shows connector locations on the SCSI drive backplane.



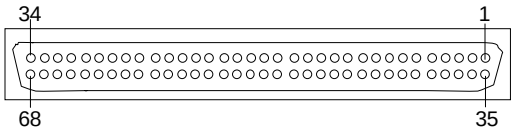
J3, J4	Drive ID and configuration jumper blocks
J8	Narrow SCSI cable, output (fast/wide mode only)
J10	Power and ground from power distribution board
J15	Wide SCSI cable, input from SCSI channel A or B
J2	LED connector cable for drives 1, 2, 3
J9	LED connector cable for drives 4, 5, 6
J11	I^2C bus connector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

50-pin Narrow Output 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 #

68-pin Wide Input 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) #

Power Connector, J10, SCSI Backplane

The SCSI backplane receives power at J10 from connectors J1 and J2 on the power distribution board.

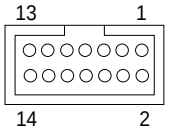
Pin	Description
1 - 3	+12 VDC
4 - 9	GND
10 - 12	+5.1 VDC

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.

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

LED Connectors, J2 and J9, SCSI Backplane



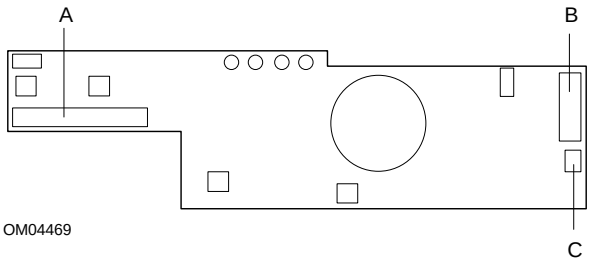
The hot-swap backplane has two 14-pin cable connectors for the SCSI drive LEDs. Each cable connects to the LEDs for one row of three drives. The drive fault signals are only present in a system that includes a SCSI host controller that supports the SAF-TE control signals.

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

SCA Drive 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)

Front Panel Control Board Connectors



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)

LCD Signal Interface, 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

LCD Backlight Power, J7, Front Panel

Pin	Description
1	Ground
2	Backlight power
3	Ground

System Board Signal Interface, J3, Front Panel

See Front Panel Connector table on page 5-12.

Power Supply Specifications

Description	Specification
DC power	+3.3 V @ 15 A +5.1 V @ 32 A +12 V @ 16 A -5 V @ 0.25 A -12 V @ 1 A 5 V standby @ 100 mA
AC line voltage (autoranging)	100-120 VAC 200-240 VAC
AC line frequency	50 / 60 Hz
AC input current	7.0 A @ 100-120 VAC 3.5 A @ 200-240 VAC

Current Sharing Maximum Output per Voltage

Maximum peak current for each voltage is listed in the table below. A system with one power supply is not a supported configuration. The numbers for a single power supply are provided for reference only.

Number of supplies	+3.3V	+5.1V	+12V	-5V	-12V	5V standby
1*	15 A	32 A	16 A	0.25 A	1 A	0.1 A
2	28.5 A	60A	30 A	0.25 A	1 A	0.1 A
3 (redundant)	28.5 A	60A	30 A	0.25 A	1 A	0.1 A

* Not a supported configuration

Maximum and Minimum VDC Output Load Rating, Each Supply

	+5.1	+12	+12 peak	+3.3	-12	-5	+5 V stand-by	Vbias (+16 V to +20 VDC)
Max	32 A	16 A	20 A	15 A	1 A	0.25 A	100 mA	50 mA
Min	3 A	1 A	–	1 A	0 A	0 A	0 A	0 A

VDC Load Range, System-wide

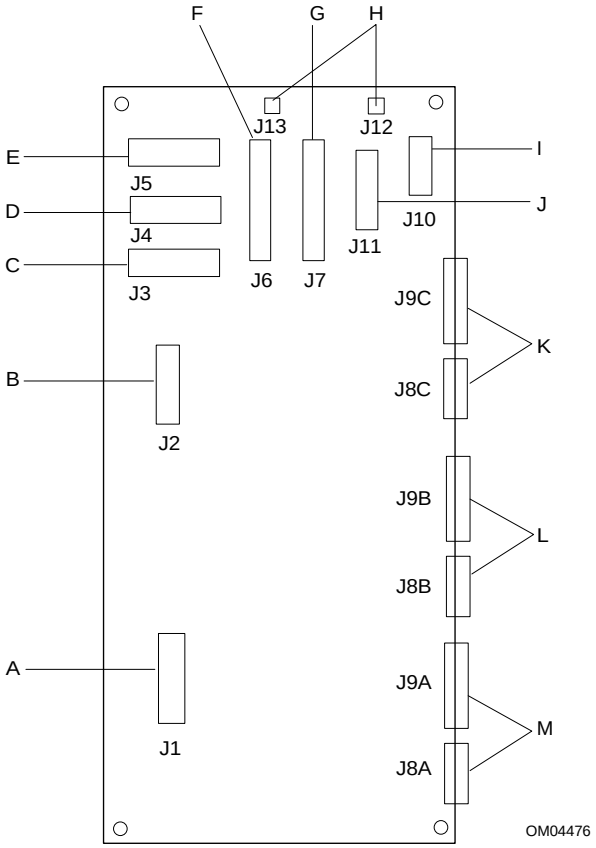
The minimum and maximum allowable DC load conditions on each voltage are listed below. A system with one power supply is not a supported configuration. The numbers for a single power supply are provided for reference only.

Number of Supplies		+3.3V	+5.1 V	+12V	-5V	-12V	5V Standby
1*	Min	1 A	3 A	1 A	0 A	0 A	0 A
	Max	15 A	32 A	16 A	0.25 A	1 A	0.1 A
2	Min	2 A	6 A	2 A	0 A	0 A	0 A
	Max	28 A	60 A	30 A	0.25 A	1 A	0.1 A
3	Min	3 A	9 A	3 A	0 A	0 A	0 A
(redundant)	Max	28 A	60 A	30 A	0.25 A	1 A	0.1 A

* Not a supported configuration

⚠ **CAUTION, user-accessible circuit cannot exceed 240 VA**
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. The total system power for +5.1V and 12V must not exceed the maximum power shown in the tables above, and each channel must not exceed 240 VA.

Power Distribution Board



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)

Power and Status/Control Signals to System Board

The distribution board provides power from connectors J6 and J7 to PS1 and PS2 on the system board. PS1 and PS2 on the system board are identical; J6 and J7 on the distribution board are identical. The distribution board provides power status and control signals from connector J11 to PS3 on the system board. See pinout tables on page 5-10.

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 on page 5-23.

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.

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.

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

Fan Connectors, J12 and J13

Two fan connectors provide power for system fans.

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

Declaration of the Manufacturer or Importer

We hereby certify that this product is in compliance with EU Directive 89/336/EEC, using the EMC standards EN55022, EN61000-3-2, and EN50082-2.

Electromagnetic Compatibility (EMC) Notices

EMC Notices, USA

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

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

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

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

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

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

EMC Notices, International

この装置は、第二種情報装置（住宅地域又はその隣接した地域において使用されるべき情報装置）で住宅地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）基準に適合しております。
しかし、本装置をラジオ、テレビジョン受信機に近接してご使用になると、受信障害の原因となることがあります。
取扱説明書に従って正しい取り扱いをして下さい。

(English translation of the notice above) This equipment is in the Class 2 category (information equipment to be used in a residential area or an area adjacent thereto) and conforms to the standards set by the Voluntary Control Council For Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential area.
When used near a radio or TV receiver, it may become the cause of radio interference.
Read the instructions for correct handling.

This equipment has been tested for radio frequency emissions and has been verified to meet CISPR 22 Class B.

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

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

□ □ □

Part 2, Software

Software Description 6

This section of the manual tells how to use the software utilities to configure your server and peripherals and to update the BIOS.

Utility	Short reference	How shipped
Power-on Self Test	POST	Resident on system.
System Configuration utility	SCU	Provided on diskette.
BIOS Setup utility	Setup	Provided in flash memory. Use only under the circumstances listed in the Setup Utility chapter.
SCSI*Select* utility	(none)	Resident on system.
Flash memory update utility	FMUP	Provided on diskette.

The software includes these features:

- System security: select secure mode options to limit access to the hardware.
- Critical event logging: use server monitoring software to monitor hardware conditions and log events.

Terms and Conventions

In this manual, default settings for options are printed **in bold**.

On your screen, user-selectable options display in black. Parameters that appear only for your Information display in blue.

Language Support

BIOS prompts are displayed in English as the factory default. To select a different display language, use Setup. On the Setup main menu, select the Language option, and step through the language choices until you see the one you want. After you select a language, the Setup menus will immediately display in that language. Any screen messages controlled by the BIOS—error messages, the BIOS sign-on, log-on information about devices present—will also display in the selected language. However, sign-on information from other vendors will continue to display in English.

Although the preferred way to specify a language is by using Setup, there is also a Language Support option in the SCU—Peripheral Configuration menu. However, any change you make by using the SCU does not show an immediately visible result. The SCU menu screens continue to display in English no matter which language is selected, and you will need to exit the SCU and enter Setup to see whether the language change took effect (which it should have automatically).

Critical Event Logging and Server Management

Critical events are events that normally result in the system being shut down to prevent catastrophic side-effects from propagating to other parts of the system. Using the SCU, you can enable a feature that causes the BIOS to log critical and informational events to nonvolatile flash memory. The following events are considered critical and are logged:

- Multibit ECC and parity errors in the memory subsystem.
- A system management interrupt (SMI) will be generated on events that normally generate a Nonmaskable-Interrupt (NMI) (including I/O channel check, EISA bus time-outs, EISA watchdog timer expiration, EISA-software generated NMI, and PCI SERR and PERR events).
- If the OS device driver is using a watchdog timer to detect software or hardware failures, and that timer happens to expire, an Asynchronous System Reset (ASR) will be generated, which is equivalent to a hard reset, except that the limit registers are not reset. As the system reboots, POST detects this event and logs it.
- POST logs the failure of a processor during POST.
- Errors detected during POST.
- System monitor limit threshold exceeded events.

The chipset is programmed to generate an SERR if parity or ECC errors are observed in the memory subsystem. An interrupt is generated if a single bit correctable error is observed in the memory subsystem. When these errors are detected, the SMI routines will log the error or event in a manner that is transparent to the OS. The SMI routines will then cause an NMI to be generated for certain events, so that the operating system can respond appropriately.

In the SCU, use the System Management Options menu to enable the features and set options.

Autodetection of Video Adapters

The BIOS looks for video adapters in the following order (preference is always given to offboard devices): ISA or EISA, PCI, then system board. The onboard (or offboard) video BIOS will be shadowed starting at address C0000h, and it will be initialized before memory tests begin in POST.

Autodetection of Memory

The BIOS is capable of detecting, sizing, and testing any amount of RAM, up to the physical maximum. The BIOS is capable of reporting up to 64,043,328 bytes (64M-64K) via Int 15h, AX=88h, or INT 15h, function E801h, which can report up to 4096 MB. INT 15h, function E820h, supports reporting of the system memory regions.

Power-on Self Test (POST) 7

Testing the System at Power-on

Each time you turn on the server, the power-on self-test (POST) checks the system board, processor module(s), memory module, keyboard, and most installed peripheral devices.

During the memory test, POST displays the amount of memory that it is able to access and test. Depending on the amount of memory installed on the memory module, it may take several minutes to complete the memory test.

You will see screen prompts and messages similar to the following:

```
Press F1 key if you want to run SETUP

Keyboard.....Detected
Mouse........Detected
```

If you do not press <F1>, the above message remains for about 15 seconds, the boot process continues, and the server beeps once.

During POST, the BIOS displays on the LCD the BIOS revision number, current POST countdown value, POST error codes, and the sizes of base and extended memory.

Just before the OS is booted, the BIOS can display one of the following:

- The default message, consisting of the processor type and speed, number of processors, and POST error codes
- Your custom message string, which can be 32 characters long, displayed as two lines of 16 characters each

After POST completes, the server beeps once.

If the server halts before video is available, it sounds a beep code indicating a fatal system error that requires immediate attention. Write down the audible beep code (number of beeps and sequence); this information is useful to your service representative.

Resource Allocation Sequence

In the following sequence, the BIOS scans for devices, initializes them, and allocates resources:

1. ISA devices. If detected, an ISA device will be initialized and given resource priority over other devices of the same type installed in the system.
2. EISA devices. If detected, the devices will be initialized according to the parameters set up in the SCU.
3. Off board PCI devices.
4. Onboard devices. If there are no devices off board, the BIOS allocates resources according to the parameters set up in the SCU. Onboard SCSI devices are scanned before PCI slots 5 and 6.

System Configuration Utility (SCU) 8

The system configuration utility (SCU) is the main tool to configure the system or to check or change the configuration. Most system settings can be entered from either the SCU or Setup, but the SCU provides conflict resolution as well as access to information about ISA, ISA Plug-N-Play, EISA, and PCI adapters.

System must have a diskette drive
Your system must have a diskette drive present and enabled to use the SCU, because it is provided on a diskette. If a drive is present but is disabled or improperly configured, use the BIOS Setup utility to enable or configure the diskette drive. Then make a bootable SCU diskette and use the SCU to configure the system.

When to Run the SCU

...when you first set up and configure your system
...if you get a configuration error message at power-on
...each time you add, remove, or move an EISA or ISA add-in board
each time you add or remove a Plug-N-Play or PCI add-in board
...each time you add or remove memory

Where the SCU Gets Information

Information comes from	Description
Configuration (.CFG) *or* overlay (.OVL) files	For the system board, we provide these files. For EISA and some ISA add-in boards, each comes with a diskette that contains a .CFG file (and an optional .OVL file) supplied by the device manufacturer. The file describes the board's characteristics and the system resources it requires.
Configuration registers	The configuration registers on PCI and Plug-N-Play add-in boards contain the same type of information that an EISA .CFG file does. The SCU is PCI and Plug-N-Play aware, and it complies with the EISA Specification (version 3.12) and ISA Plug-N-Play Specification (version 1.1).
Your option selections	The SCU stores your information by modifying ISA CMOS and EISA nonvolatile RAM (NVRAM). It stores most of the values in the battery-maintained memory of the real-time clock (RTC); it stores the rest of the values in flash memory.

Checking the Configuration at Power-on

At power-on or rebooting, the BIOS POST routines and the Plug-N-Play Auto Configuration Manager check and configure the hardware. POST checks the values that have been stored against the actual hardware configuration; if the values do not agree, you will get an error message. You must then run the SCU to correct the configuration before the system boots.

How to Use the SCU

First make a bootable diskette, and copy the file HIMEM.SYS onto it.

1. Turn on your video display monitor and system.
2. There are three ways to start and run the SCU:
   - From diskette: insert the System Configuration Disk in drive A, and then press the reset button or type <Ctrl+Alt+Del> to reboot the system.

- From a DOS directory that you have copied onto your hard drive, type SCU. Press <Enter>. If you use this method, you need to load HIMEM.SYS into the AUTOEXEC.BAT and CONFIG.SYS files.
- From diskette in drive A: change to drive A and type SCU at the MS-DOS† prompt. Press <Enter>.

Whether or not you can use the second and third ways depends on how much main memory is used by drivers you have loaded on the system.

The SCU has four major configuration menus and several submenus. From the main menu, select "Step 1: About System Configuration" for information about setting up your computer.

To navigate the screens	Press key	or use mouse
Change between major menus	← or →	
From main menu, press up or down arrow to highlight an item	↑ or ↓	Point to item
Select an item	<Enter>	Double-click left button
Get help	<F1>	Point to help on toolbar
Enter numbers and symbols	numeric keypad keys	
To change options	Enter Administrator password if this is enabled	

To run the SCU faster on a DOS-based system

To run the SCU faster on a DOS-based system, copy to a directory on your hard drive, and run it from there. The SCU may not run properly unless HIMEM.SYS is loaded and there is approximately 600 KB of conventional system memory available.

Configuring the System

There are six steps to configure your system. These steps are accessed from the main menu:

- Step 1: About System Configuration
- Step 2: Add and Remove Boards
- Step 3: Change Configuration Settings
- Step 4: Save Configuration
- Step 5: View Switch/Jumper Settings
- Step 6: Exit

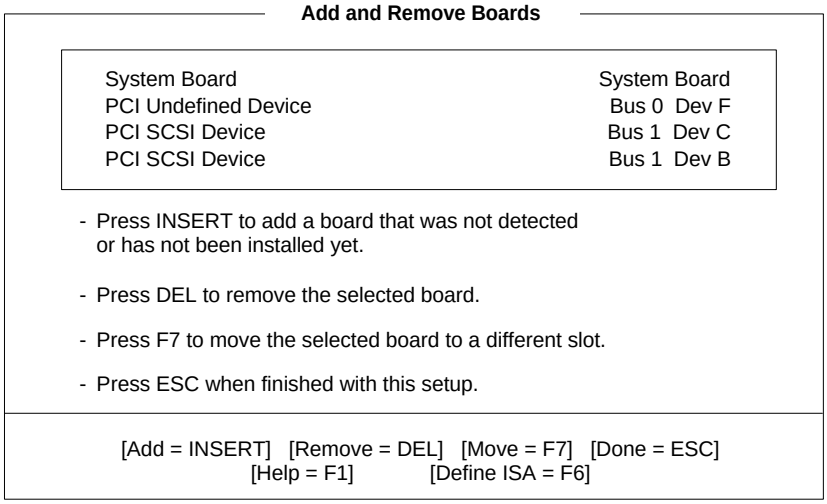
The SCU has three major menus and multiple submenus. Follow the screen prompts to move between the major menus, display submenus, and make selections.

About System Configuration

This step provides basic information for configuring expansion devices. More experienced users can skip this step.

Add and Remove Boards

Use this step to add, delete, or move boards. Most boards are automatically detected and added by the SCU once you enter this step. However, if the SCU did not detect a board, you can add a board manually.



OM04253

To add a board:

1. Press Insert.
2. From the Select the Board to Add dialog box, select the board's .CFG file and press Enter.

To delete an existing board:

1. Use the arrow keys to select the board that you want to delete.
2. Press Delete.
3. Confirm that you want to delete the board.

To move a board from one slot to another:

1. Use the arrow keys to select the board that you want to move.
2. Press F7.

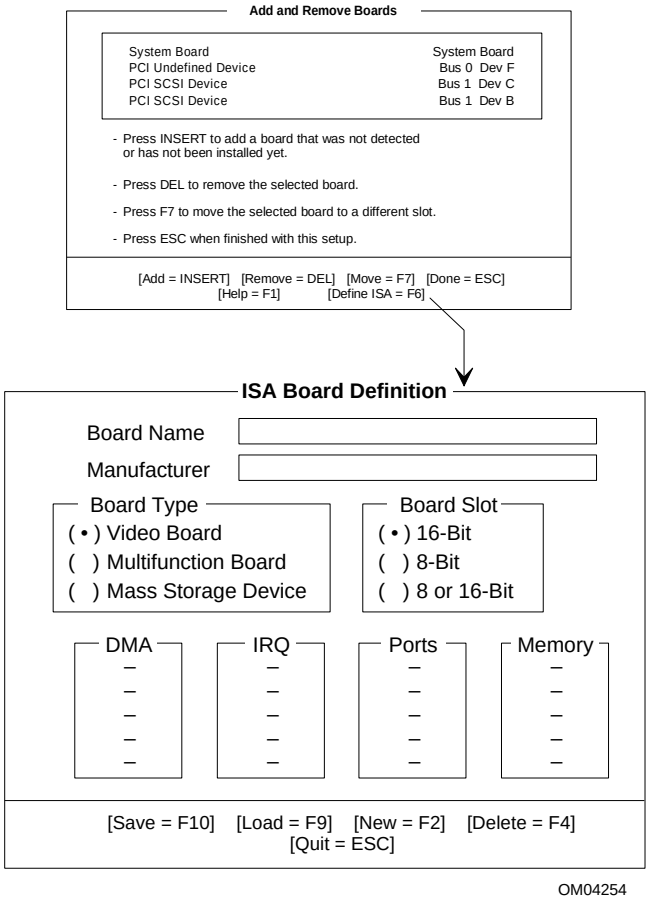
If you add, move, or remove boards
Manually verify the resource settings of these adapters, and any other adapters that are not locked, before saving your configuration.

To define an ISA board:

Press F6 to display the ISA Board Definition dialog box. Refer to the section below for details.

Define an ISA Board

To define an ISA board that has no .CFG file, press F6 while viewing the Add and Remove Boards screen. The ISA Board Definition dialog box will appear. It is necessary to define a board to prevent other boards in the system from using the same IRQ levels, DMA channels, I/O addresses, or memory addresses as that of the ISA board.



OM04254

To define an ISA board:

1. In the Board Name box, type a description of the board.
2. In the Manufacturer box, type the name of the board manufacturer.
3. From the Board Type box, choose the type of board.

4. From the Board Slot box, choose the type of slot.
5. In the DMA box, define up to four DMA channels.
6. In the IRQ box, define up to seven IRQ levels.
7. In the Ports box, define up to eight ranges of I/O ports.
8. In the Memory box, define up to eight memory address ranges.
9. Press F10 to save the ISA board definition.

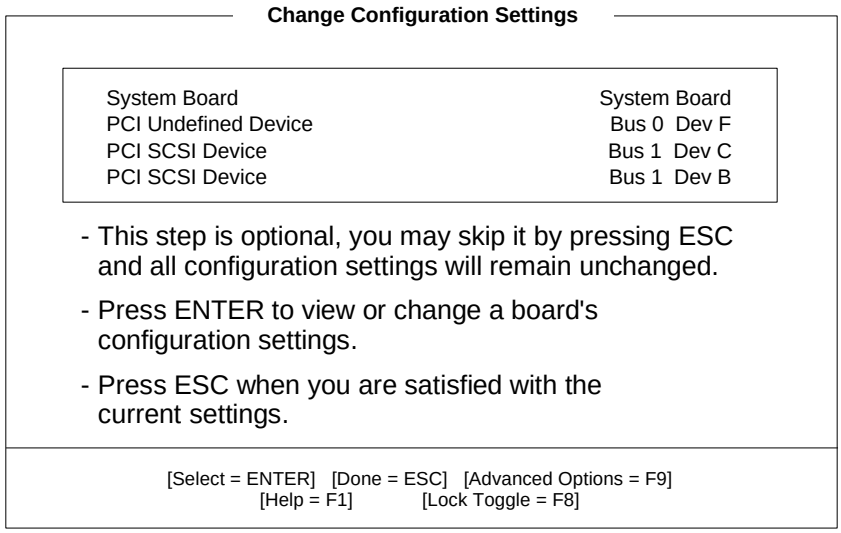
You can load an existing ISA board in order to modify the board definition.

To load an existing ISA board: Press F9.

To delete an ISA board: Press F9, and confirm that you intend to delete the ISA definition.

Change Configuration Settings

Use this step to view or change the configuration settings for any board in the system. You can verify that the system board and adapter board resources are set properly.



OM04256

To view or change the settings for a board:

1. Use the arrow keys to select the board.
2. Press Enter.
3. When you are satisfied with the current settings, press ESC to return to the Main Menu.

Advanced Options

The Advanced Options menu is intended for advanced users. These are the options available:

Use this option	To see this
Global resource map	A list of allocated resources (DMA, IRQ, ports, and memory)
Board details	Detailed information for individual boards
System details	Information on the entire system and the current configuration
Physical board ID map	IDs of boards present in the system

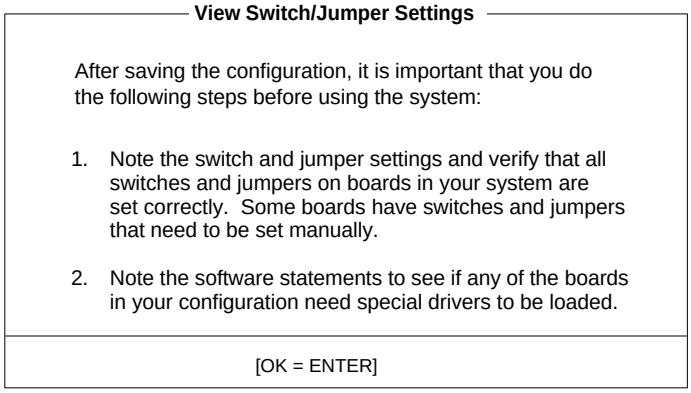
To view the Advanced Options menu: from the Change Configuration Settings dialog box, press F9.

Save Configuration

This step saves the configuration settings to nonvolatile RAM as well as to a backup file (.CMS file). You must save your settings once they have been configured.

View Switch/Jumper Settings

Use this step to view manufacturer's instructions about setting dip switches and jumpers, and how to run utilities to ensure correct configuration of each adapter.



OM04255

Exit

This step exits to the operating system. If any configuration settings were changed, you will be prompted to restart your system to see the changes.

About the Options

The rest of this chapter lists SCU groups as they display on screen after you select System Board from the Change Configuration Settings screen. These are the groups: Systems Group, Peripheral Configuration Group, LCD Display, Management Subsystem, and System Management.

After each group, some of the option choices are described. Not all of them are described because (a) a few are not user-selectable but are displayed for your information, and (b) many of the option choices are relatively self-explanatory.

Systems Group

System Identification and Version Information		
System Identification String	N/A	Display only
Config and Overlay Version	N/A	Display only
BIOS Version String	N/A	Display only
MP Spec. Version	**1.1**/1.4	
System Processor Modules		
Display Processor Type(s) and Speed based on position	N/A	Display only
System Processor Status		
Processor Status for each processor	**No Failures Detected**/ Failures Detected	The status automatically changes to *Failures Detected* if the BIOS detects a processor failure. Unless there is only one processor in the system, a failed processor remains disabled in next boots until you use the SCU to change the status to *No Failures Detected*.
System Performance		
Power-On Speed	**Fast** / Slow	BIOS programs the SLOW timer before boot.
Secondary IOAPIC control	Enable / **Disable**	
Memory Subsystem		
Base Memory Option	512 / **640** KB	
Shadowing ISA ROMs Options	MENU	Shadowing at C0000, C4000, C8000, CC000, D0000, D4000, D8000, DC000, E0000, E4000
Extended Memory Options (Cache, 1 MB ISA Hole)	MENU	Cache mode **enable**/disable ISA hole enable/**disable**

ROM Shadowing

All onboard adapter ROM (stored in compressed form in the system flash ROM) and PCI adapter ROM will be shadowed into RAM in the ISA-compatible ROM adapter memory space between C0000h to E7FFFh. Any BIOS found on ISA or EISA devices that can be shadowed will be shadowed into adapter memory space in the same range after initialization. ISA cards that require memory-mapped read/write accessibility should be located into the 15M-16M ISA space, or the 512KB-640KB space, which may be enabled individually via the SCU. Shadowing for ISA devices can be disabled for various regions via the SCU. A PCI BIOS is always shadowed.

Peripheral Configuration Group

Onboard Disk Controllers		
Onboard Floppy Controller	**Enable /** Disable	
Onboard IDE Controller	**Enable /** Disable	
Onboard Communications Devices		
Serial Port 1 Configuration	Serial port 1 Address and IRQ	
Serial Port 2 Configuration	Serial Port 2 Address and IRQ	
Parallel Port Configuration	Parallel Port Address and IRQ	
Parallel Port Mode	Parallel Port Mode	
Parallel Port DMA	Valid only with ECP mode	
Floppy Subsystem Group		
Floppy drive A Options	Size and capacity	The system automatically detects diskette drive type and size.
Floppy drive B Options	Size and capacity	
IDE Subsystem Group		
ISA IDE DMA Transfers	**Auto Configured /** Disable	
IDE Configuration	MENU	
Multi-sector transfer selection	**Auto Configured /** 4 Sector / 8 Sector / Disable	
Translation Mode	Standard CHS / Logical Block Addressing / Extended CHS / **Auto Configured**	
Fast Programmed I/O modes	**Auto Configured** / Disable	

Language Support Group		
Language Support options	Languages supported	
KB/Mouse Subsystem Group		
NumLock Options	On at Boot/ **Off at Boot**	
Typematic Speed	**Auto** / Slow / Medium / Fast	
Mouse Control option	Auto detected	
Console Redirection		
COM port for redirection	**Disable** / COM 1/COM 2	
Baud rate	2400/ 9600/ 19.2k/ **115.2k**	
Hardware Flow Control	**None** / CTS/RTS / CTS/RTS & Xoff/Xon	
Terminal Type	**ANSI**	Display only
Security Subsystem		
Administrative Password	Enable / **Disable**	Enabled is implied by entering a password.
User Password	Enable / **Disable**	Enabled is implied by entering a password.
Hot-Key Option	Enable / **Disable**	
Lockout Timer	1 through 127 min. / **10 min.**	
Secure Boot Mode	Enable / **Disable**	
Video Blanking	Enable / Disable	
Floppy Writes	Enable / **Disable**	

Boot Subsystem Group	
First Boot Drive	Boot Disabled / **Boot Floppy** / Boot Hard Disk / Boot IDE CD-ROM Floppy Image / Boot IDE CD-ROM Hard Drive Image / Boot Network
Second Boot Drive	Boot Disabled / Boot Floppy / **Boot Hard Disk** / Boot Network
Third Boot Drive	**Boot Disabled** / Boot Floppy / Boot Hard Disk / Boot Network
Fourth Boot Drive	**Boot Disabled** / Boot Floppy / Boot Hard Disk
Display “<F1> for Setup” message during POST	**Enable** / Disable
Require user interaction on POST errors	Enable / **Disable**

SCSI ROM BIOS Options Group		
SCSI A ROM BIOS scan	**Enable**/Disable	SCSI A is fully configured, but the ROM scan is skipped if this is disabled.
SCSI B ROM BIOS scan	**Enable**/Disable	SCSI B is fully configured, but the ROM scan is skipped if this is disabled.

Language Support Group

BIOS prompts are displayed in English as the factory default. To select a different display language, the preferred way is to use Setup. However, the SCU also includes a Language Support option in the Peripheral Configuration menu. Select the Language Support option and step through the language choices until you see the one you want. After you select a language, the Setup menus and other BIOS information will display in that language. However, any change you make by using the SCU does not show an immediately visible result. The SCU menu screens continue to display in English no matter which language is selected, and you will need to exit the

SCU and enter Setup to see whether the language change took effect (which it should have automatically). The available language choices are listed in the option menu. When more language files become available, they can be flashed into the system BIOS by using FMUP.

Updating the BIOS overwrites language files
Although you do not have to update the BIOS to select a different display language, a system BIOS update does overwrite language files. Thus, if you have created a custom language file, you must flash it into the BIOS again after updating the BIOS.

Automatic Detection and Enabling of IDE Hard Drives

During POST, if an IDE controller is detected, the BIOS does the following:

- Determines the types of IDE drives attached
- Sets the drive parameters for the best performance
- Maps each device into memory and I/O space
- Assigns IRQs and DMA channels as needed so that there are no conflicts

If you choose parameters for your drive that are different from the drive's native parameters, your definitions will be programmed into the drive controller.

Security

The BIOS includes security features to prevent unauthorized access to or tampering with the system. Once the security features are enabled, access is allowed only after the correct password has been entered.

Boot Subsystem Group

Besides the sequence that you specify on the menu in the Boot Subsystem Group, the boot device sequence is also affected by whether the system is in secure mode or not.

System is NOT in secure mode:	• Boots from diskette drive A:, or if no diskette is present, boots from hard disk C:. • Boots from hard disk C:, or if no bootable OS is present on C:, boots from diskette drive A:. • Boots from hard disk C: only. • Boots from diskette A: only.
System IS in secure mode:	• Boots from hard disk C: if present. After booting, system remains in secure mode. Even if the power cycles off and on for an unattended system, it still comes up in secure mode. • Boots from a diskette ONLY if the correct password is entered. Without the password, the system will not boot from diskette. Once a password is entered, the system is no longer in secure mode.

Onboard SCSI devices are scanned before PCI slots 5 and 6.

LCD Subsystem Group

LCD Display String	**Enable** / Disable	
LC Display String Before OS Boot	**MENU**	Default
	(user-defined string or default)	"N x PID Speed System Ready " where N is the number of processor PID is the processor ID string Speed is what the processor is running in MHz

LCD

In a system with an LC display panel, you can choose to have the panel display informative messages. If the system supports server control monitoring software and features, the LCD can display status messages about the monitoring process.

If you do not want to display messages, use the SCU to disable the LCD option.

During POST, the BIOS displays on the LCD the BIOS revision number, current POST countdown value, POST error codes, and the sizes of base and extended memory.

LCD Display String Before Boot

Just before the OS is booted, the BIOS can display (a) the default message, consisting of the processor type and speed, number of processors, and POST error codes, or (b) your custom message string. This string can be 32 characters long, displayed as two lines of 16 characters each. To return to the default string, enter a blank message.

Management Subsystem

Temperature/Voltage Limit Control	MENU
A to D Channel Enable switch	MENU
Speaker Options	**Enable** / Disable
Scan user FLASH area	Enable / **Disable**

The options in the Management Subsystem group are used to

- Set up system board voltage and temperature scanning by determining the appropriate thresholds
- Scan a particular A/D channel
- Scan the flash memory area for binaries that extend or alter critical event logging

System Management Options

System Management Mode	Enable / **Disable**	
SMM Time Stamp Source	**Post capture** / Real time Clock	
Event Logging	Enable / **Disable**	Controls onboard event logging
Reserve VGA resources	**Reserve VGA memory** / Disable onboard video	

If event logging is enabled, the BIOS can log critical and informational events to nonvolatile flash memory. Critical events are those that normally result in the system being shut down to prevent catastrophic side-effects from propagating to other parts of the system:

- Operating system outside of the range of set temperature and voltage limits
- Multibit and parity errors in the memory subsystem
- Most errors that normally generate a Nonmaskable Interrupt (NMI) (including I/O channel check, EISA bus time-out, EISA fail-safe timer expiration, software generated NMI, and PCI SERR and PERR events)

When these errors are detected, the system management interrupt (SMI) routines will log the error or event (transparently to the OS) and will then cause an NMI to be generated for certain fatal events (for example, certain NMIs and uncorrectable ECC errors).

If the OS device driver is using the watchdog timer to detect software or hardware failures, and that timer happens to expire, an Asynchronous System Reset (ASR) will be generated. This is equivalent to a hard reset, except that the limit registers are not reset. POST will detect this event as the system reboots and will log the event to the logging area. Failure of a processor during POST will also be logged in flash memory during POST.

Worksheets for SCU Settings

Record your SCU settings on the worksheets, especially if your settings differ from the defaults. If the default values ever need to be restored to CMOS (after a CMOS-clear, for example), you would need to run the SCU again; referring to the worksheets could make your reconfiguration task easier.

Circle your options or write in the values.

System Group Worksheet

System Identification and Version Information	
System Identification String	N/A
Config and Overlay Version	N/A
BIOS Version String	N/A
MP Spec. Version	1.1/1.4
System Processor Module	
Display Processor Type(s) and Speed based on position	N/A
System Processor Status	
Processor Status, 1st processor, module 1	No Failure Detected / Failure Detected
Processor Status, 2nd processor, module 1	No Failure Detected / Failure Detected
Processor Status, 3rd processor, module 2	No Failure Detected / Failure Detected
Processor Status, 4th processor, module 2	No Failure Detected / Failure Detected
System Performance	
Power-On Speed	Fast / Slow
Secondary IOAPIC control	Enable / Disable
Memory Subsystem	
Base Memory Option	512 / 640 KB
Shadowing ISA ROMs Option	MENU
Extended Memory Options	MENU

Peripheral Configuration Worksheet

Onboard Disk Controllers		
Onboard Floppy Controller	Enable / Disable	
Onboard IDE Controller	Enable / Disable	
On-board Communications Devices		
Serial Port 1 Configuration	(Serial port 1 Address and IRQ)	
Serial Port 2 Configuration	(Serial Port 2 Address and IRQ)	
Parallel Port Configuration	(Parallel Port Address and IRQ)	
Parallel Port Mode	(Parallel port Mode)	
Parallel Port DMA	(Valid only with ECP mode)	
Floppy Subsystem Group		
Floppy drive A Options		(Size and capacity)
Floppy drive B Options		(Size and capacity)
IDE Subsystem Group		
ISA IDE DMA Transfers	Auto Configured / Disable	
IDE Configuration - Primary Master	MENU	
Multi-sector transfer selection	Auto Configured / 4 Sector / 8 Sector / Disable	
Translation Mode	Standard CHS / Logical Block Addressing / Extended CHS / Auto Configured	
Fast Programmed I/O modes	Auto Configured / Disable	
IDE Configuration - Primary Slave	MENU	
Multi-sector transfer selection	Auto Configured / 4 Sector / 8 Sector / Disable	
Translation Mode	Standard CHS / Logical Block Addressing / Extended CHS / Auto Configured	
Fast Programmed I/O modes	Auto Configured / Disable	
IDE Configuration - Secondary Master	MENU	
Multi-sector transfer selection	Auto Configured / 4 Sector / 8 Sector / Disable	
Translation Mode	Standard CHS / Logical Block Addressing / Extended CHS / Auto Configured	
Fast Programmed I/O modes	Auto Configured / Disable	

Continued

Peripheral Configuration Worksheet

IDE Configuration - Secondary Slave	MENU
Multi-sector transfer selection	Auto Configured / 4 Sector / 8 Sector / Disable
Translation Mode	Standard CHS / Logical Block Addressing / Extended CHS / Auto Configured
Fast Programmed I/O modes	Auto Configured / Disable
Language Support Group	
Language Support options	
KB/Mouse Subsystem Group	
NumLock Options	On at Boot / Off at Boot
Typematic Speed	Slow / Medium / Fast
Mouse Control option	Auto detected
Console Redirection	
COM port for redirection	Disable / COM 1/ COM 2
Serial Port baud rate	2400/ 9600/ 19.2k/ 115.2k
Hardware Flow Control	None / CTS/RTS / CTS/RTS & Xoff/Xon
Terminal Type	ANSI
Security Subsystems	
Administrative Password	Enable / Disable
User Password	Enable / Disable
Hot-Key Option	Enable / Disable
Lockout Timer	1 through 127 min. / 10 min.
Secure Boot Mode	Enable / Disable
Video Blanking	Enable / Disable
Floppy Writes	Enable / Disable
Boot Subsystem Group	
Boot Sequence Control	Boot Disabled / Boot Floppy / Boot Hard Disk / Boot IDE CD-ROM Floppy Image / Boot IDE CD-ROM Hard Drive Image / Boot Network
Display “<F1> for Setup” message during POST	Enable / disable
Require user interaction on POST errors	Enable / disable
Onboard SCSI Subsystem	
SCSI A ROM BIOS scan	Enable/Disable
SCSI B ROM BIOS scan	Enable/Disable

LCD Display Worksheet

LCD display string	Enable / Disable	
LC Display String Before OS Boot	MENU	(user-defined string or default)

System Management Options Worksheet

System Management Mode	Enable / Disable
SMM time stamp Source	Post capture / Real time Clock
Event Logging	Enable / Disable
Reserve VGA Resources	Reserve VGA memory / Disable onboard video

Management Subsystem Worksheet

A to D Channel Enable switch	MENU
Speaker Options	Enable / Disable
Scan user FLASH area	Enable / Disable
Temperature/Voltage Limit Control	MENU
+5 V Upper Warning Level	0.02 - 5.4 V in 0.02 V steps
+5 V Lower Warning Level	0.02 - 5.4 V in 0.02 V steps
+5 V Upper Critical Level	0.02 - 5.4 V in 0.02 V steps
+5 V Lower Critical Level	0.02 - 5.4 V in 0.02 V steps
+12 V Upper Warning Level	0.1 - 14.9 V in 0.1 V steps
+12 V Lower Warning Level	0.1 - 14.9 V in 0.1 V steps
+12 V Upper Critical Level	0.1 - 14.9 V in 0.1 V steps
+12 V Lower Critical Level	0.1 - 14.9 V in 0.1 V steps
+3.3 V Upper Warning Level	0.02 - 3.74 V in 0.02 V steps
+3.3 V Lower Warning Level	0.02 - 3.74 V in 0.02 V steps
+3.3 V Upper Critical Level	0.02 - 3.74 V in 0.02 V steps
+3.3 V Lower Critical Level	0.02 - 3.74 V in 0.02 V steps
-12 V Upper Warning Level	-16.7 to -5.9V in .1V steps
-12 V Lower Warning Level	-16.7 to -5.9V in .1V steps
-12 V Upper Critical Level	-16.7 to -5.9V in .1V steps
-12 V Lower Critical Level	-16.7 to -5.9V in .1V steps
Temperature Probe #1 Upper Warning Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #1 Lower Warning Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #1 Upper Critical Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #1 Lower Critical Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #2 Upper Warning Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #2 Lower Warning Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #2 Upper Critical Level	0 °C to 200 °C in 2 °C steps
Temperature Probe #2 Lower Critical Level	0 °C to 200 °C in 2 °C steps

Setup Utility 9

This chapter describes the BIOS Setup options. The Setup utility stores configuration values in flash memory and in the battery-backed memory of the real-time clock (RTC). Values you enter in Setup are overwritten when you run the SCU.

For a number of options, the settings are made by using the SCU, not Setup. The values are simply displayed in the Setup screens. To see the descriptions of such options, refer to the SCU chapter.

Setup has four major menus and several submenus. To move between the major menus, use the ← → keys. To display the submenus, press <Enter> when the prompt is displayed beside an option name.

When you see this on the screen:	What it means
On screen, an option is grayed out. In the tables in this chapter, the phrase "Display only" appears in the "Choice" column.	You cannot change or configure the option through Setup. You must use (1) a different Setup screen or (2) the SCU. In some cases, the option may be auto-configured or auto-detected.
On screen, the phrase <Press Enter> appears next to the option, and, in the tables here, in the "Default/next menu" column.	Press <Enter> to display a submenu (either a separate full-screen menu or a small pop-up menu with one or several choices).

When to Run Setup

... if you get a boot-time prompt that says to do so.

... if you need to enable or properly configure your diskette drive.

... if you do not have access to a diskette drive.

Much of the system configuration is done through the SCU, not Setup. Because the SCU is provided on diskette, a diskette drive needs to be connected and enabled. After configuring the system, you may prefer to secure it against casual or unauthorized access by someone using diskettes. Therefore, you can

- run Setup to enable the diskette drive
- then use Setup or the SCU to configure the system
- run Setup again to disable the diskette drive for security

Main Menu

Option	Default	Choices
System Date	Month xx, 1995	Default is current date.
System Time	xx:xx:xx	Default is random.
Floppy Options	Press Enter	
Primary IDE Master	Press Enter	Display menu.
Primary IDE Slave	Press Enter	Display menu.
Secondary IDE Master	Press Enter	Display menu.
Secondary IDE Slave	Press Enter	Display menu.
Language	English (US)	Display menu. Default is English.
Boot Options	Press Enter	Display boot option menu.
Video Mode	EGA / VGA	Display only. Go to SCU to select.
Mouse	Installed	Display only. Go to SCU to select.
Base Memory	640KB	Display only. Go to SCU to select.
Extended Memory	32678KB	Display only. Go to SCU to select.

System Date and System Time—to change, type in the correct date and time and press <Enter>.

Floppy Options—displays a menu that lists the type of diskette drive connected. If one is not connected, you will see the word "Disabled."

⇒ **You can use Floppy Options menu to limit access to drive**
Use this menu to specify whether access to the diskette drive is Read/Write or Read Only.

Primary IDE Master—a separate menu screen appears for EACH of the IDE devices. For each IDE drive, if the system has already been configured, you will see the name of the device or the phrase "Not installed."

Language—step through the language choices available for the BIOS prompts. If you change the default (English), you will not see any change until you exit the SCU and enter Setup. Only the BIOS prompts and menus appear in the selected language. The SCU screens remain in English.

Boot Options—a separate menu screen appears.

Video Mode—displays the mode selected in the SCU.

Mouse—displays the mode selected in the SCU.

Memory—displays the amount of base and extended memory detected.

The most stable system will be achieved if you use the recommended default settings, although you are free to try other options. Keep the settings for the primary and secondary IDE masters and slaves.

Main Menu: IDE Device

Each IDE device, primary or secondary, master or slave, has a separate menu screen. To display each, select the item from the main menu and press <Enter>.

Option	Default	Choices*
IDE Device Configuration	Auto Configured	**Auto Configured** User Definable
Number of Cylinders	1057	If autoconfigured, display only.
Number of Heads	16	If autoconfigured, display only.
Number of Sectors	63	If autoconfigured, display only.
Maximum Capacity	520 MB	If autoconfigured, display only.
IDE Translation Mode	Auto Detected	Standard CHS addressing Extended CHS Logical block **Auto Detected**
Multiple Sector Setting	Auto Detected	**Auto Detected** 4 Sectors per block 8 Sectors per block Disabled
Fast Programmed I/O Modes	Auto Detected	**Auto Detected** Disabled

* Choices shown in **bold** are factory default

IDE Device Configuration—when Auto Configured, the BIOS automatically senses and configures any IDE drives in the system. The User Definable option lets you specify the IDE drive parameters.

Number of Cylinders—if Auto Configured, the value is display-only.

Number of Heads—if Auto Configured, the value is display-only.

Number of Sectors—if Auto Configured, the value is display-only.

Maximum Capacity—if Auto Configured, the value is display-only.

IDE Translation Mode—select the translation mode for the IDE hard disk:

Standard CHS addressing: cylinder count of 1024 or less

Extended CHS: cylinder count greater than 1024

Logical block: if supported by disk

Auto Detected: selects proper method based on information from the hard disk

Multiple Sector Setting—set IDE programmed I/O cycles so that multiple sectors are transferred with a single interrupt.

Fast Programmed I/O Modes—the BIOS queries an IDE hard disk connected to the PCI IDE bus and uses the fastest PIO protocol supported by the hard disk/controller pair. Can be disabled.

Main Menu: Boot Options

Option	Default	Choices*
First Boot Device	{Name of device}	**Floppy**/Disabled/Hard Disk/CD-ROM/Network
Second Boot Device	{Name of device}	**Hard Disk**/Disabled/Floppy/Network
Third Boot Device	{Name of device}	**Disabled**/Floppy/Hard Disk/Network
Fourth Boot Device	{Name of device}	Network/**Disabled**/Floppy/Hard Disk
CD-ROM Image Type	Floppy	Floppy/Hard Disk
System Cache	Enabled	Enabled/Disabled
Boot Speed	Turbo	Turbo/Deturbo
Num Lock	Off	Off/On
Setup Prompt	Enabled	Enabled/Disabled
Typematic Rate Programming	Default	Default/Override

* Choices shown in **bold** are factory default

Boot Devices—selects the order in which the system checks drives to find an operating system to boot from.

CD-ROM Image Type—selects either Floppy or Hard Disk for the type.

System Cache—when system cache is enabled, the cache controllers in all Pentium Pro processors are initialized consistently (a) among all such processors in a multiprocessor system and also (b) between the Pentium Pro processors and the chipset. When system cache is disabled, system performance will decrease significantly.

Boot Speed—selects processor speed. When set to Deturbo, system performance will decrease significantly.

Num Lock—sets the initial state of the Num Lock keyboard feature when the system boots. When set to Off, the numeric keypad is not locked on at boot-time.

Setup Prompt—enables/disables the screen prompt to enter Setup utility.

Typematic Rate Programming—when set to Default, the Rate Delay = 250 ms, and the Rate = 15 characters per second. When set to Override, the Rate Delay and Rate can be reprogrammed.

Advanced Menu

On the Advanced menu, the type and speed of processor(s) are displayed (not selected). The Advanced menu leads to three separate configuration menus: Peripheral, Advanced Chipset, and Plug and Play. Press <Enter> to display each in turn.

Option			Default	Choices
Slot 1:	Processor 1	Type	Pentium Pro processor	
	Processor 1	Speed	166 MHz	
	Processor 2	Type	Pentium Pro processor	
	Processor 2	Speed	166 MHz	
Slot 2:	Processor 1	Type	Absent	
	Processor 1	Speed	Absent	
	Processor 2	Type	Absent	
	Processor 2	Speed	Absent	
		Cache Size	512K	
	Peripheral Configuration		Press Enter	Go to Peripheral Configuration.
	Advanced Chipset Configuration		Press Enter	Go to Advanced Chipset Configuration.
	Plug and Play Configuration		Press Enter	Go to Plug and Play Configuration.

Peripheral Configuration

Option	Default	Choices
Configuration Mode	Auto	Auto / Manual:
Standard IDE Interface	Enabled	Enabled/Disabled
Floppy Interface	Enabled	Enabled/Disabled
Serial Port 1 Address	COM1, 3F8h	Disabled/COM1, 3F8h/COM3, 3E8h/COM4, 2E8h
Serial Port 2 Address	COM2, 2F8h	Disabled/COM2, 2F8h/COM3, 3E8h/COM4, 2E8h
Parallel Port Address	LPT1, 378h	Disabled/LPT3, 3BCh/LPT1, 378h/:LPT2, 278h
Parallel Port Mode	ISA Compatible	ISA Compatible/PS/2 Compatible/EPP Compatible/ECP Compatible
Parallel Port ECP-DMA	Disabled	Disabled/DMA 3/DMA 5/ DMA 6
Serial Port 1 IRQ	IRQ4	
Serial Port 2 IRQ	IRQ3	
Parallel Port IRQ	IRQ7	
Onboard SCSI-A ROM Scan	Enable	Enable/Disable
Onboard SCSI-B ROM Scan	Enable	Enable/Disable
Console Redirection	Disable	Disable/Port 1/Port 2

Configuration Mode—when set to Auto, system peripherals are automatically configured during power up. When set to Manual, system peripherals must be explicitly confirmed.

Standard IDE Interface—enables or disables the onboard standard IDE hard disk controller.

Floppy Interface—enables or disables the onboard floppy disk controller.

Serial Port 1 Address—enables the onboard serial port and configures the COM number and I/O address.

Serial Port 2 Address—enables the onboard serial port and configures the COM number and I/O address.

Parallel Port Address—enables the onboard parallel port and configures the LPT number and I/O address.

Parallel Port Mode—compatible mode is the AT-spec output only mode. Extended mode sets the port to the extended capabilities mode.

Onboard SCSI-A ROM Scan—SCSI device gets all other resources including IRQ and memory, even if the ROM scan is disabled.

Onboard SCSI-B ROM Scan—SCSI device gets all other resources including IRQ and memory, even if the ROM scan is disabled.

Console Redirection—enables the console redirection to a serial port.

Advanced Chipset Configuration

Option	Default	Choices
Base Memory Size	640KB	512KB / 640KB
VGA Buffer Attributes	Uncacheable	Uncacheable / USWC
SMM	Disable	Enable / Disable
MPS version	1.1	1.1/1.4
Second I/O APIC	Disable	Enable / Disable
Cache Mode	Write Back	Write Back / Write Through
IOQ Depth	Auto Configure	Auto Configure / 1 / 8
Outbound Posting	Disable	Enable/Disable
PCI Line Prefetch	Enable	Enable/Disable
Addr Bit Permuting	Disable	Enable/Disable
Fast String	Disable	Enable/Disable
Bus Performance	Auto Configure	Auto Configure / Low / 82450A / 82450B
BINIT Mode	Enable	Enable / Disable
AERR Mode	Enable	Enable / Disable
BERR Mode	Enable	Enable / Disable
EERR Mode	Disable	Enable / Disable
MERR Mode	Enable	Enable / Disable
PERR Mode	Disable	Enable / Disable

Base Memory Size—use to set the amount of system board base memory.

VGA Buffer Attributes—select Uncacheable Speculative Write Combined (USWC) to allow the processor to perform speculative combining while writing to the VGA frame buffer. Select Uncacheable for adapters that do not support USWC mode.

SMM—enable system management mode, including event logging and ECC memory support.

MPS Version—choose a multiprocessing specification version number for the BIOS to use when building the MPS table. Select 1.4 for Windows NT†, and select 1.1 for all other operating systems.

Second I/O APIC—If disabled, the BIOS does not report the second I/O APIC in the MPS tables. The operating system will not be able to use it. Enable this feature only if the operating system is capable of supporting the second I/O APIC.

Cache Mode—set the processor's L1 and L2 caches to use either write back or write through mode.

IOQ Depth—configure the In-order Queue to support either 1 or 8 outstanding pipelined transactions on the host (processor) bus.

Outbound Posting—enable the posting of writes to the PCI bus from the host (processor) bus.

PCI Line Prefetch—enable the prefetching of up to three additional cache lines in response to PCI Line Read and PCI Read Multiple commands.

Address Bit Permuting—when enabled, the memory controller will swap the high order row selection bits with some low order bits when computing the effective address. In some applications this can increase performance by decreasing the precharge penalties when accessing system memory.

Bus Performance—this setting turns on and off certain performance features in the chipset based on the revision level of the hardware. The Auto Configuration setting allows the BIOS to detect your hardware and set the appropriate level. Although you can override this and hard-code the system to a given level, overriding may cause the system to become unstable.

BINIT Mode—if enabled, the host (processor) bus will attempt to reinitialize in response to a noncorrectable error. Disabling this will prevent the system from trying to recover from the noncorrectable error.

AERR Mode—enable the detection of Address Parity Errors on the host (processor) bus.

BERR Mode—BERR is used to signal any error condition on the host (processor) bus that will not impact the future reliability of the bus. If enabled, the operating system error handler will attempt to correct the error. If disabled, then the BERR will be ignored.

EERR Mode—enable the reporting of EISA bus time-out errors.

MERR Mode—enable ECC error correction on the host (processor) bus.

PERR Mode—enable the detection of PCI bus protocol violations.

Plug and Play Configuration

Latency Timer (PCI Clocks)	Ensures that a PCI card can access the PCI bus within the specified number of PCI clocks.

Security Menu

Option	Default	Choices
Set User Password	Press Enter	
Set Administrative Password	Press Enter	
Unattended Start	Disabled	Disabled/enabled
Security Hot Key (CTRL-ALT-)		
Keyboard Inactivity Timer	10	0 - 10 - 128
Video Blanking	Disabled	Disabled/enabled
Floppy Writes	Disabled	Disabled/enabled
Reset and Power Switch Locking	Enabled	Disabled/enabled

If you enter a user password, the following items will appear:

```
User password is enabled.

Administrative password is disabled.
```

Set User Password—user password controls access to the system at boot. The password can be up to seven characters.

Set Administrative Password—administrative password controls access to the Setup utility and the SCU. The password can be up to seven characters.

Unattended Start—if feature is enabled, the system can boot before a password is required. The keyboard and mouse remain locked until the user password is entered.

Security Hot Key—secure the system immediately, rather than wait for the inactivity time-out period, use a hot-key combination that you set through the SCU or Setup.

Keyboard Inactivity Timer—specify a keyboard/mouse inactivity time-out period of 1 to 128 minutes (in 1-minute increments). If the timer is enabled,

and no keyboard or mouse action occurs for the specified period, keyboard and mouse input will be inhibited.

Video Blanking—if feature is enabled, the monitor display will go blank after the specified inactivity time-out period occurs.

Floppy Writes—if feature is enabled, the diskette drive will be write-protected after the specified inactivity time-out period occurs.

Reset and Power Switch Locking—if feature is enabled, the power switch and reset button will be locked when the system is in secure mode.

Exit Menu

Exit saving changes	Save Setup information to CMOS and exit the utility.
Exit discarding changes	Exit the utility without saving the Setup information to CMOS.
Load Setup defaults	Default Setup values are loaded and displayed by the utility.
Discard changes	Discard the changes made in the current Setup session but do not exit the utility.

SCSI*Select* Utility 10

The SCSI*Select* utility detects the number of SCSI AIC-78xx host adapters in your system. Use the utility to start, format, and verify SCSI drives or to explicitly configure the SCSI host adapter to settings other than defaults.

The utility is menu-driven. Follow the screen prompts and information about moving around through the menus and selecting options.

To Start Up SCSI*Select*

1. Turn on or reboot the system. During boot-up, the following prompt is displayed at the time the SCSI BIOS is loaded:

   `<<< Press <CTRL><A> for SCSISelect™ Utility! >>>`

   To enter the SCSI*Select* utility, press <Ctrl-A> when you see the prompt.

2. When the utility appears, choose the bus:device that you want to configure; each bus accepts up to 15 devices.

Main Menu

Feature	Option	Comment
Bus:Device	01:0Bh	Select this option to configure the SCSI devices on SCSI Channel A.
	01:0Ch	Select this option to configure the SCSI devices on SCSI Channel B.

Bus:Device

Feature	Option	Comment
Bus:Device 01:XXh	Configure/View Host Adapter Settings	See Configuration Menu.
	SCSI Disk Utilities	See SCSI Disk Utilities Menu.

Configuration Menu

Feature	Option*	Comment
SCSI Bus Interface Definitions		
Host Adapter SCSI ID	0–**7**–15	
SCSI Parity Checking	**Enabled** Disabled	
Host Adapter SCSI Termination	**Automatic** Low ON/High ON Low OFF/High OFF Low OFF/High ON	
Additional Options		
Boot Device Options	Press <Enter>	
Boot Target ID	**0**–15	The default boot device is at SCSI ID 0 with logical unit number (LUN) 0. To specify a different boot device, choose a different SCSI ID (0 through 7 on 8-bit adapters, 0 through 15 on 16-bit adapters).
Boot LUN Number	**0**–7	If the boot device has multiple logical units, you must also specify the boot LUN. It can be 0 through 7 (on 8-bit or 16-bit adapters). If you disable Multiple LUN Support in the Advanced Configuration menu, specifying a number here has no effect.
Advanced Configuration Options	Press <Enter>	See Advanced Configuration Options Menu.
SCSI Device Configuration	Press <Enter>	See SCSI Device Configuration Menu.

* Options shown in **bold** are factory default.

Advanced Configuration Options

Feature	Option*	Comment
Reset SCSI Bus at IC Initialization	**Enabled** Disabled	
Host Adapter BIOS (Configuration Utility Reserves BIOS Space)	**Enabled** Disabled	No effect if BIOS is disabled.
Support Removable Disks Under BIOS as Fixed Disks	**Boot Only** All Disks Disabled	⚠ **CAUTION** Do not remove media from a removable media drive if drive is under BIOS control. No effect if BIOS is disabled.
Extended BIOS Translation for DOS Drives > 1 GByte	**Enabled** Disabled	No effect if BIOS is disabled.
Display (Ctrl-A) Message During BIOS Initialization	**Enabled** Disabled	
Multiple LUN Support	Enabled **Disabled**	LUN = logical unit number.
BIOS Support for Bootable CD-ROM	**Enabled** Disabled	When enabled, the system can boot from a CD-ROM.
BIOS Support for Int13 Extensions	**Enabled** Disabled	Required for bootable CD-ROMs.
Support for *Ultra*SCSI Speed**	Enabled **Disabled**	The option displays only if the BIOS is configured to support *Ultra*SCSI speeds.

* Options shown in **bold** are factory default.

** This option is referred to as Fast-20 SCSI in earlier chapters of this manual. Narrow SCSI devices are not supported off of connector J8, on the SCSI Backplane when this option is enabled.

SCSI Device Configuration Menu

SCSI Device ID	0–15 Option*	Comment
Initiate Sync Negotiation	**yes** no	
Maximum Sync Transfer Rate	**20.0** 8.0 6.7 5.0	
Enable Disconnection	**yes** no	
Initiate Wide Negotiation	**yes** no	
Send Start Unit Command	**yes** no	No effect if BIOS is disabled. Needs to be YES for hot-swap drives.

* Options shown in **bold** are factory default

Updating Flash Memory 11

This chapter describes updating flash memory for two different pieces of firmware:

- System BIOS: update or recover system BIOS by using the Flash Memory Update Utility (FMUP)
- SCSI hot-swap backplane firmware: update or recover the backplane firmware by using the SCSI hot-swap backplane update utility (HSUPDAT)

Normal update procedures do not require that you open up the chassis to change any jumper or switch configurations.

However, occasionally the normal update procedure fails or is interrupted, and in such a case you will need to run the appropriate recovery procedure. Recovery involves making configuration changes on the affected board (system board for BIOS; SCSI hot-swap backplane for SCSI firmware).

⚠ **CAUTION**
A jumper is a small plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers, never the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

✏ **Make sure you have a backup copy**
It is always a good idea to have a backup copy of your system before installing any new software.

System BIOS

The system BIOS is stored in nonvolatile memory (NVRAM) in a flash EPROM device. You can easily update the BIOS without replacing the device. This section describes two procedures:

- Update the BIOS, normal procedure
- Recover the BIOS when an interruption has occurred during an update

A BIOS update always updates Setup, the onboard Video BIOS, and the SCSI BIOS. Language files will be overwritten by a BIOS update. If a custom language file has been created for your system, you must flash in your custom file again after updating the BIOS. The user binary area is untouched by a system BIOS update.

When running FMUP in interactive mode, you can do the following:

- Save: Take a mirror image copy of a given flash area and copy it to a file or files on hard disk or diskette.
- Update: Take a file or files from hard disk or diskette and update them in the system's flash device.
- Verify: Compare an existing flash area against a file or files on hard disk or diskette to verify that the versions are the same and insure that the system has the correct BIOS version.

⟹ **Exit Windows and disable EMM386 before using FMUP**
FMUP must be run without the presence of a 386 control program (such as Windows† or EMM386). FMUP uses the processor's flat model mode to update the flash part.

Contents of BIOS Update

A new BIOS is contained in .BIx files. The number of files is determined by the size of the BIOS area in the flash part. The system BIOS files are named as follows:

xxxxxxxx.BIO
xxxxxxxx.BI1
xxxxxxxx.BI2
....

Filename restrictions

The first eight letters of the filename can be anything but cannot be renamed. Each file contains a link to the next file in the sequence. FMUP does a link check before updating to ensure that the FMUP process will be successful.

The first file in the list can be renamed to any filename but all subsequent filenames must remain unchanged.

User Flash Block

One 8 KB user block is available for general use, and FMUP can update this area with user-supplied code or data. This area may optionally be scanned for adapter BIOS signatures during POST, and any BIOS found there will be initialized in the same manner as any other adapter BIOS. To enable or disable this scanning process, use an option in the SCU and in Setup. Some system resources (e.g., RAM, CMOS) may be required by the scanned BIOSes.

To accommodate a range of uses, the user flash area will allow user programs to be called at various points in the BIOS execution.

A custom BIOS placed in flash must be recognizable to the system BIOS so it can execute the code, and to applications (i.e., DOS memory managers) so that they will be protected after DOS boots.

Description, BIOS Recovery Mode

Recovery mode is a noninteractive mode in which you can boot the system board if the main system BIOS won't come up. This can happen in the case of a corrupt .BIx image or an unsuccessful BIOS update—for example, when the update procedure is aborted due to a power outage. The flash memory contains a protected area that cannot be corrupted. Code in this area is used to boot the computer from drive A: when the BIOS has been corrupted.

The recovery code boots MS-DOS from drive A and executes the special AUTOEXEC.BAT file released with the BIOS version. The batch file invokes FMUP, which updates flash memory with the BIOS from the diskette. The process takes two to four minutes.

System BIOS, Normal Update Procedure

1. Get a BIOS update from your customer sales representative or dealer, and copy the file to a bootable MS-DOS diskette. You do not need to remove add-in boards for a normal BIOS update.
2. Insert the update diskette in drive A.
3. Reboot the system. The update process starts automatically following system boot. Follow the displayed prompts, including a final reboot.

Updating the BIOS does not clear CMOS. If you need to clear CMOS and reset nonvolatile memory to the factory defaults, refer to Chapter 4, section "CMOS S6A1-1."

System BIOS, Recovery Procedure

Requirements:

- At least 4 MB of RAM installed.
- Drive A: must be a 3.5-inch 1.44 MB diskette drive.
- On the system board, the configuration jumper at J6A4 must be in the default position (pins 2 and 3, BIOS Write **enabled**).

The recovery operation automatically updates only the main system BIOS. Video is not initialized, and the keyboard is disabled. Because there is no screen display, you will need to listen for these audible status signals:

Audible Beeps	Description
1	Signals beginning of recovery process; process takes 2 to 4 minutes.
2	Signals successful completion, no errors.
4	System could not boot from the diskette. Diskette may not be bootable.
Continuous series of low beeps (like a buzz)	Any or all of these causes: The wrong BIOS recovery files are being used. Configuration switch allowing BIOS Recovery mode is in wrong position. Configuration switch allowing BIOS Write to flash memory is in wrong position. One or more system BIOS FMUP files is corrupt or missing.

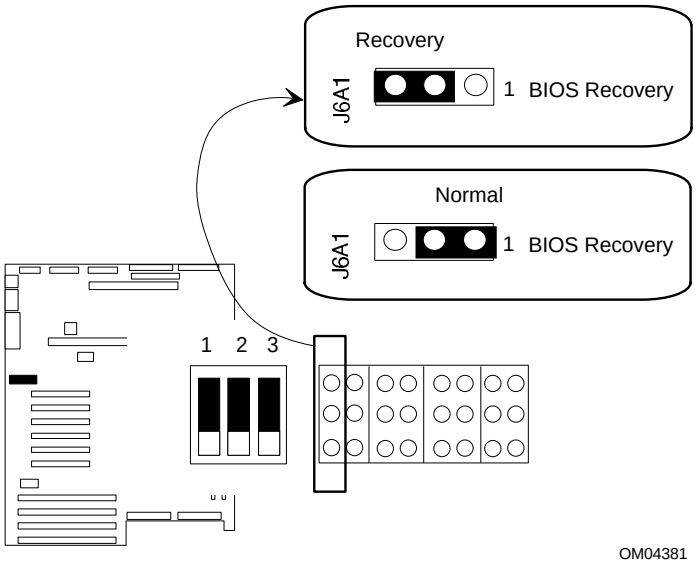
WARNING

If the system has been running, any processor and heat sink installed on the processor board will be hot. The system board configuration switches are immediately adjacent to a processor board connector. To avoid the possibility of a burn while accessing a configuration switch, let the components cool for 10 minutes before continuing with the procedures described here.

Before beginning recovery procedure

If you have mapped the BIOS of an add-in board to any part of the E0000H address range, you must either map it to another area before beginning a recovery procedure or physically remove the board from the system.

1. Observe the safety and ESD precautions described in Chapters 3 and 4.
2. If you have not already done so, create a bootable MS-DOS diskette, and copy the BIOS update to the diskette.
3. Turn off the system, and unplug the power cord(s).
4. Open the system. On the system board, move the BIOS Recovery jumper from pins 1 and 2 **to pins 2 and 3**.



5. Insert the Flash Memory Update diskette in drive A. Turn the system on. You will hear a single initial beep that is part of the typical system boot-up process.
6. Then you will hear another single beep that indicates the recovery process is beginning. The process takes two to four minutes. While in the recovery mode, there is no screen display on the monitor, and the keyboard is disabled as the system automatically recovers the BIOS.
7. You will hear two beeps when the process is successfully completed. (If the process is not successful, you will hear a different beep pattern; refer to the table on page 11-4.)
8. Make sure the diskette drive activity light is OFF. Turn off the system.
9. At J6A1, remove the BIOS Recovery jumper from pins 2 and 3, and place it back on pins 1 and 2.
10. Remove the FMUP diskette from drive A.
11. Close the system, plug in the power cord(s), and turn on the system. Check the BIOS version number against what you intended to flash in.

CMOS is not cleared when you update the BIOS. After doing the recovery procedure, clear CMOS (see procedure in Chapter 4, section "CMOS Switch S6A1-1"). Also, you will need to flash in again any additional languages that were present before updating.

SCSI Hot-swap Backplane Firmware

The SCSI backplane firmware is stored in nonvolatile memory on the backplane. You can easily update the firmware without replacing the memory device. This section describes two procedures:

- Update the backplane firmware, normal procedure
- Recover the firmware when an interruption has occurred during an update

Command line format:

HSUPDAT <switches> [Source File]

where

HSUPDAT — is the name of the utility.

<switches> — are not case-sensitive; are defined as:

-b: source file is in binary. The utility defaults to Intel Hex 86 format if the -b switch is not specified.

-p1, -p2: specifies the hot-swap backplane to be updated. -p1 indicates primary controller; -p2 indicates secondary controller. Default (no -pX switch specified) is to program both.

[Source File] — is the name of the source file to be used for the update. If not specified, the utility just prints the status and version information about the processors.

SCSI Backplane, Normal Update Procedure

1. Get an update from your customer sales representative or dealer, and copy the file to a bootable MS-DOS diskette. You do not need to remove drives or boards for a normal update.
2. Insert the update diskette in drive A.
3. Reboot the system. Follow the displayed prompts.
4. Fromdrive A, run the HSUPDAT utility. Enter command:

`HSUPDAT`	to retrieve and display the version information for the firmware on both backplanes
`HSUPDAT xxxxxxxx.hex`	to update the firmware on both backplanes
or	
`HSUPDAT -p1 xxxxxxxx.hex`	to update the primary backplane firmware (top SCSI backplane)
or	
`HSUPDAT -p2 xxxxxxxx.hex`	to update the secondary backplane firmware (bottom SCSI backplane)

5. Verify that the correct version is now installed. Enter command:

`HSUPDAT`	to retrieve and display the version information for the firmware on both backplanes

Two sets of version information will be displayed, one for the Operating Code and one for the FLASH Loader. The Operating Code version should match that of the .hex file. The 'FLASH Loader' code is permanent and does not get updated.

Displaying version information
If for some reason the FLSHUPDT jumper is in the update recovery position described in the next section, the Operating Code version may not be able to be retrieved. However, for a normal flash update, the default position of the jumper should allow the version information to be displayed.

6. When the update process is completed, remove the diskette from drive A and power-cycle the system.

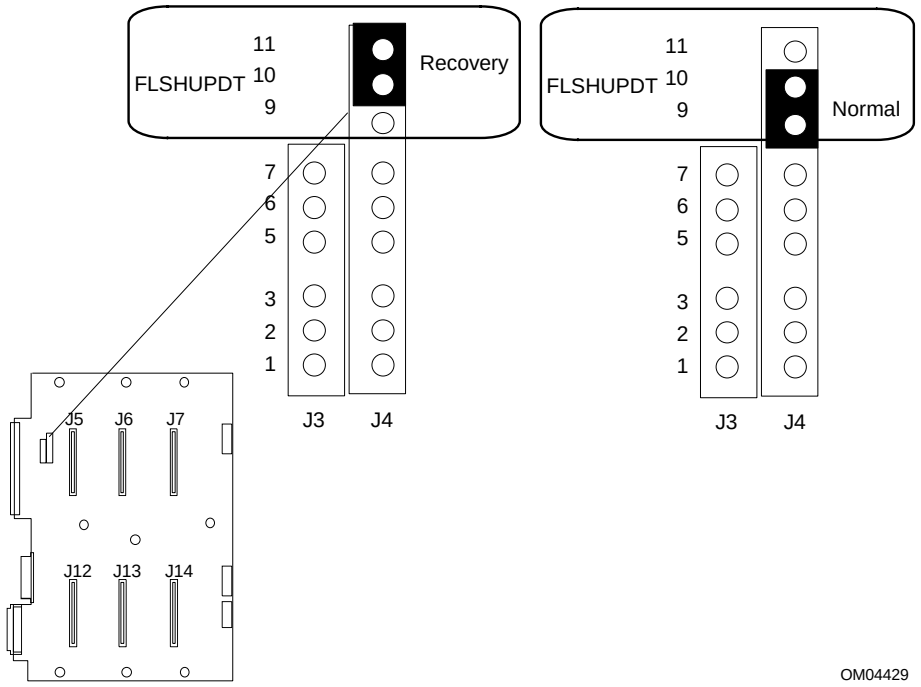
SCSI Backplane, Recovery Procedure

Once a firmware update has begun, it must be completed. The transfer immediately overwrites existing data. If an update is prematurely terminated, the normal operation mode of the backplane processor will most likely not work correctly. A partial update may prevent entry into firmware transfer mode. In this situation a SCSI flash recovery procedure must be done to update the SCSI firmware.

Recovery Procedure Requirements:

- Pen light
- Needlenosed pliers

1. Observe the safety and ESD precautions described in Chapters 3 and 4.
2. If you have not already done so, create a bootable MS-DOS diskette, and copy the update to the diskette.
3. Turn off the system, and unplug the power cord(s).
4. Open the right front exterior door and the metal EMI panel.
5. Remove SCSI hard drive 1 from the upper left drive bay of the backplane you need to do the recovery on. For more space to work, you may also want to remove hard drive 2.
6. Using a pen light and looking through the front of the empty drive bay, locate the configuration jumper block on the backplane. At J4 move the FLSHUPDT jumper from pins 9 and 10 **to pins 10 and 11**. If you need to do a recovery on both backplanes, move the jumper on both backplanes to the pin 10 and 11 position.



10-11 SCSI flash update recovery

9-10 Normal, factory default

7. Reinstall the hard drive(s).
8. Insert the update diskette in drive A.
9. Plug in the power cord(s), and turn on the system. Follow the displayed prompts.
10. Copy HSUPDAT.exe and the data files (xxxxxxxx.hex) to a hard drive.
11. From the hard drive, run the HSUPDAT utility. Enter command:

HSUPDAT	to retrieve and display the version information for the firmware on both backplanes; only the FLASH Loader version information may be displayed

`HSUPDAT xxxxxxxx.hex`	to update the firmware on both backplanes
or	
`HSUPDAT -p1 xxxxxxxx.hex`	to update the primary backplane firmware (top SCSI backplane)
or	
`HSUPDAT -p2 xxxxxxxx.hex`	to update the secondary backplane firmware (bottom SCSI backplane)

12. Turn off the system, and unplug the power cord(s).
13. Remove the diskette from drive A.
14. Remove SCSI hard drive 1 from the upper left bay.
15. At J4, move the FLSHUPDT jumper from pins 10 and 11 **back to pins 9 and 10** (on both SCSI backplanes if they were both updated).
16. Reinstall the hard drive(s).
17. Plug in the power cord(s), and turn on the system.

Part 3, Administering the System

System Security 12

Protecting Your System

The BIOS provides a number of security features to prevent unauthorized or accidental access to the system. Once the security measures are enabled, access to the system is allowed only after the user enters the correct password(s). The table below lists the features, describes what protection each offers, and tells how to enable or disable a feature.

✏ **How to enable most of the features**
In general, to enable or set the features listed here, you must run the **SCU** and go to the **Peripheral Configuration Group**, **Security Subsystem** menu. If you have to use a different menu or use the Setup utility, we have noted that in the table.

Feature	Description
Enter secure mode immediately with hot-keys	To secure the system immediately, rather than wait for the inactivity time-out period, use a hot-key combination that you set through the SCU or Setup.
Inactivity timer: keyboard, mouse, blank video, diskette write-protect	You can specify a keyboard/mouse inactivity time-out period of 1 to 128 minutes (in 1-minute increments). If the timer is enabled, and no keyboard or mouse action occurs for the specified period, keyboard and mouse input will be inhibited. In addition, if you have enabled these security features through Setup or the SCU, the monitor display will go blank, and the diskette drive (if enabled) will be write-protected. To resume activity, enter the password.
Lock the reset button and power switch	The power switch and reset button will be disabled when the system is in secure mode.

Continued

Feature	Description
Disable writing to diskette	If the system is in secure mode, it will not boot from or write to a diskette unless a password is entered. To set this feature, use the SCU Peripheral Configuration Group, **Security Subsystem** group. To write-protect diskette access whether the system is in secure mode or not, use the Setup main menu, **Floppy Options**, and specify Floppy Access as read only.
Specify the boot sequence	Boot sequence depends on whether the system is in secure mode or not. When system is NOT in secure mode: • Boots from diskette A:, or if no diskette is present, boots from hard disk C:. • Boots from hard disk C:, or if no bootable OS is present on C:, boots from diskette A:. • Boots from hard disk C: only. • Boots from diskette A: only. When system IS in secure mode: • Boots from hard disk C: if present. After booting, system remains in secure mode. Even if the power cycles off and on for an unattended system, it still comes up in secure mode. • Boots from a diskette ONLY if the correct password is entered. Without the password, the system will not boot from diskette. Once a password is entered, the system is no longer in secure mode.
Control access to using the SCU: set administrative password	To control access to setting or changing the system configuration, set an administrative password and enable it through Setup or the SCU. If both the administrative and user passwords are enabled, either can be used to boot the system or enable the keyboard and/or mouse, but only the administrative password will allow Setup and the SCU to be changed. To disable a password, change it to a null string.

Continued

Feature	Description
Control access to the system other than SCU: set user password	To control access to using the system, set a user password and enable it through Setup or the SCU. To disable a password, change it to a null string.
Put the system into secure boot mode	Setting passwords enables the secure mode. When this mode is enabled, the system can boot and run the OS, but no mouse or keyboard input is accepted until you enter the user password. In secure boot mode, if a diskette is detected in drive A at boot time, the system will prompt for a password. When the password is entered, the system will boot from the diskette, and the system will no longer be in secure mode. If there is no diskette in drive A, the system will boot from drive C and will be in the secure mode automatically. All of the secure mode features that are enabled will go into effect at boot time.
Boot without keyboard	The BIOS will boot whether a keyboard is installed or not. POST automatically detects the presence of a keyboard, and the keyboard is tested if present. There is no entry in the SCU to enable or disable a keyboard.

❒ ❒ ❒

Solving Problems 13

Codes and Error Messages

The system BIOS displays error messages on the video screen. At power-on, before the video adapter has been initialized, beep codes will be used to inform the user of errors. POST error codes will be logged in NV-RAM, as well as the Extended BIOS Data area (EBDA), and displayed on the LC display.

The BIOS will display POST error codes both on the LCD panel and the console monitor.

When you turn on the system, POST displays messages that will provide information about the system. If a failure occurs, POST uses beep codes that indicate errors in hardware, software, or firmware. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message appears.

- POST beep codes
- POST codes
- POST error messages

Critical Event Logging

This information is provided to help in developing drivers and applications that need to access the logs of critical events.

Terms and Conventions

CP = checkpoint code as seen by a "port-80h" card

POST Beep Codes

At power-on, before the video adapter has been initialized, the BIOS indicates failures by using audible beep codes. A given code consists of a series of individual beeps, each equal in length. The table below describes the error condition associated with each code and the corresponding POST checkpoint code as seen by a "port-80h" card.

Beep Count	Port 80 Codes	Error Condition
1	71h	Refresh failure
2	72h	Parity cannot be reset
3	73h	First 64 KB memory failure
4	74h	Timer not operational
5	75h	Processor failure
6	76h	8042 Gate A20 is off (v_mode)
7	77h	Exception interrupt error
8	78h	Display memory R/W error
9	79h	ROM checksum error
10	7Ah	Shutdown reg. R/W error
11	7Bh	I^2C Error

POST Codes and Countdown Codes

At power-on, after the video adapter has been initialized, the BIOS indicates the current testing phase by sending a 2-digit hex code to I/O location 80h. If a port-80h board is installed, it will display this 2-digit code on a pair of hex display LEDs. The current countdown code will also be displayed on the LCD panel, once the panel is initialized.

Recovery Port-80 Codes and Countdown Codes Displayed

During BIOS recovery, the diskette in drive A is booted, and a BIOS image is automatically installed.

Port 80 Code	Countdown Code	Reason
02h		Disable internal cache
08h		Disable DMA controller #1, #2, disable interrupt controller #1, #2, reset video display
13h		Initialize all chipset registers (Enable LCD display here)
15h	900	Initialize system timer
1Bh	800	Real mode base 64 KB test
20h	700	16 KB base RAM test
23h	650	Setup interrupt vectors
40h	600	Test memory in virtual mode
65h	500	Initialize 8237 DMA controller
67h	400	8259 interrupt controller test
80h	300	Unmask diskette, keyboard and timer interrupts
88h	200	Floppy unit initialization
A0h	100	Cache enable
00h	000	Boot OS

Standard Port-80 Codes and Countdown Codes Displayed

Port 80 Code	Countdown Code	Reason
D0h		Early MP Initialization
D1h		Power On Initialization
D2h		Disable NMI
D3h		Reset video controller
D4h		Enter real mode
D5h		Checksum the 8 KB loader BIOS
D6h		Loader BIOS checksum good
D7h	900	Check if Keyboard Controller (KBC) buffers are free
D8h		Issue BAT (basic assurance test) command to KBC
D9h		Read BAT results
DAh		Check if keyboard controller passed BAT
DBh	820	Keyboard Initialization Passed
DDh		Disable keyboard and auxiliary devices
DFh		Disable both DMA controllers
E0h	780	Preliminary initialization of PICs
E1h		Enter real big mode and initialize chipset, size memory
E2h		Initialize timer 2 for speaker
E3h	760	Initialize timer channel 0 for system timer
E4h		Clear any pending parity errors
E6h	740	Test RAM from 0-640 KB
E7h		Test and initialize 2 MB memory
E8h		RAM failure, remap memory partitions and test again

Continued

Port 80	Countdown

Code	Code	Reason
E9h		RAM test complete, passed. Clear parity errors
EAh	730	Set up stack at 30:100, enable cache and shadow BIOS
EBh		Initialize code dispatcher
ECh		Make F000h DRAM R/W Enabled
EDh		Dispatch POST
23h	700	Initializations before setting up vector table
24h		Setup interrupt vector table
0Dh		Check CMOS clear jumper
0Eh	690	Check validity of CMOS
0Fh		Force CMOS defaults if required
10h		CMOS initialization complete
25h		Nothing
28h		Set monochrome mode
29h		Set color display
2ah		Clear parity status if any, initialize warm reset flag
2bh		Video autoconfiguration and initialization
F0h		EISA Slot Initialization
F1h		Enable extended NMI sources
F2h		Test extended NMI sources
2ch	580	Conventional video option ROM search
2dh		Scan user flash
2eh	570	Initialize monochrome display if no other video present
2fh	560	Test buffer memory for monochrome
30h		Check vertical and horizontal retrace

Continued

Port 80	Countdown

Code	Code	Reason
31h		Test for color display memory if no external video BIOS found
32h		Check vertical retrace
34h		Sign on message
36h		Initialize Messaging Services and clear screen
37h	500	Custom sign on display
80h	370	Keyboard/mouse port check
81h		Keyboard controller initialization and testing
83h		Check if keyboard is locked
F5h	330	Initialize mouse
39h		Keyboard, mouse and other signons
3bh		Prepare for memory test
43h	290	Decide memory size from chipset
4Fh		Disable cache, test memory and display memory size on screen
52h		Initialize for the other processors in MP system, reset DMA controller
61h	250	DMA register tests
62h		DMA test OK
65h		Initialize 8237 DMA controller
66h		Clear DMA write request register and mask set/reset register
67h	220	8259 Interrupt controller test
F4h		Enable extended NMI sources
8Ch	140	Initialize remaining Plug-N-Play devices (i.e., other than video), initialize IPL, initialize IDE controller

Continued

Port 80 Code	Countdown Code	Reason

8Fh	130	Floppy Initialization
92h		Set printer, RS-232 time-out
96h		Optional ROM scan and initialize above C800h
97h	080	Scan User flash and conventional option ROM scan
98h		Scan User flash area
9Ah		Clear soft reset flag, complete MP Table
9Dh	070	Timer data area initialization
A0h		Printer setup
A1h		RS-232 setup
A2h		Check for stuck key
ABh		Before NPX test and initialization
ACh	060	NPX test and initialization
ADh		Update coprocessor information in CMOS and recalculate checksum
Aeh		Set typematic rate
AFh	050	Keyboard read ID command
B0h		Wait for READ ID response
A3h		Display POST errors
A6h		Before Setup
A7h	030	Call Setup if required, prompt for password if enabled
B1h		Enable Cache for boot
B3h		Setup display mode set
B4H		Jump to pre-OS code
BBh	020	Initialize SMI code, prepare for boot
00h	000	Execute BOOT

POST Error Codes and Messages

The BIOS indicates errors as follows:

- By writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area
- By displaying a POST Error Code and message on the screen.

Number	Error message
0002	Primary Boot Device Not Found
0010	Cache Memory Failure, Do Not Enable Cache
0015	Primary Output Device Not Found
0016	Primary Input Device Not Found
0041	EISA ID Mismatch for Slot
0042	ISA Config contains invalid info
0043	EISA Invalid Configuration for Slot
0044	EISA config NOT ASSURED!
0045	EISA Expansion Board Not Ready in Slot
0047	EISA CMOS Configuration Not Set
0048	EISA CMOS Checksum Failure
0049	EISA NVRAM Invalid
0050	PnP Memory Conflict
0051	PnP 32 bit Memory Conflict
0052	PnP IRQ Conflict
0053	PnP DMA Conflict
0054	PnP Error Log is Full
0055	Bad PnP Serial ID Checksum
0056	Bad PnP Resource Data Checksum
0060	Keyboard Is Locked ... Please Unlock It

Continued

Number	Error message
0070	CMOS Time & Date Not Set
0080	Option ROM has bad checksum
0081	Custom Binary Checksum Failure
0083	Shadow of PCI ROM Failed
0084	Shadow of EISA ROM Failed
0085	Shadow of ISA ROM Failed
0131	Floppy Drive A:
0132	Floppy Drive B:
0135	Floppy Disk Controller Failure
0140	Shadow of System BIOS Failed
0162	Unable to apply BIOS Update for Slot 1 Processor #1
0163	Unable to apply BIOS Update for Slot 1 Processor #2
0164	Unable to apply BIOS Update for Slot 2 Processor #1
0165	Unable to apply BIOS Update for Slot 2 Processor #2
0166	BIOS does not support current stepping of Slot 1 Processor #1
0167	BIOS does not support current stepping of Slot 1 Processor #2
0168	BIOS does not support current stepping of Slot 2 Processor #1
0169	BIOS does not support current stepping of Slot 2 Processor #2
0170	Disable CPU slot #
0171	CPU Failure - Slot 1, CPU # 1
0172	CPU Failure - Slot 1, CPU # 2
0173	CPU Failure - Slot 2, CPU # 1

Continued

Number	Error message
0174	CPU Failure - Slot 2, CPU # 2
0175	CPU modules are incompatible
0176	Previous CPU Failure - Slot 1, CPU # 1
0177	Previous CPU Failure - Slot 1, CPU # 2
0178	Previous CPU Failure - Slot 2, CPU # 1
0179	Previous CPU Failure - Slot 2, CPU # 2
0180	Attempting to boot with failed CPU
0181	BSP switched, system may not be in uniprocessor mode
0191	CMOS Battery Failed
0195	CMOS System Options Not Set
0198	CMOS Checksum Invalid
0200	Invalid voltage jumper for processor in Slot 1 Processor #1
0201	Invalid voltage jumper for processor in Slot 1 Processor #2
0202	Invalid voltage jumper for processor in Slot 2 Processor #1
0203	Invalid voltage jumper for processor in Slot 2 Processor #2
0204	CPU Removed - Slot 1, CPU #1
0205	CPU Removed - Slot 1, CPU #2
0206	CPU Removed - Slot 2, CPU #1
0207	CPU Removed - Slot 2, CPU #2
0208	CPU not responding - Slot Slot 1, CPU #1
0209	CPU not responding - Slot Slot 1, CPU #2
0210	CPU not responding - Slot Slot 2, CPU #1

Continued

Number	Error message
0211	CPU not responding - Slot Slot 2, CPU #2
0220	Fan Failure Slot 1 Processor #1
0221	Fan Failure Slot 1 Processor #2
0222	Fan Failure Slot 2 Processor #1
0223	Fan Failure Slot 2 Processor #2
0230	Invalid processor for module in Slot 1 Processor #1
0231	Invalid processor for module in Slot 1 Processor #2
0232	Invalid processor for module in Slot 2 Processor #1
0233	Invalid processor for module in Slot 2 Processor #2
0289	System Memory Size Mismatch
0295	Address Line Short Detected
0297	Memory Size Decreased
0299	ECC Error Correction failure
0301	ECC Single bit correction failed, Correction Disabled
0302	ECC Double bit Error
0303	ECC SIMMs incompatible
0304	Invalid memory configuration. Caused by either memory failures during POST or invalid combination of SIMM sizes.
0305	PCI-to-PCI bridge found, IO Queue Depth set to 1, setup value overriden
0309	ECC Memory Failure
0310	ECC Memory Size Changed, Bank #1 (2GB memory module)
0311	ECC Memory Size Changed, Bank #2 (2GB memory module)

Continued

Number	Error message
0312	ECC Memory Size Changed, Bank #3 (2GB memory module)
0313	ECC Memory Size Changed, Bank #4 (2GB memory module)
0314	ECC Memory Size Changed, Bank #0 (4GB memory module)
0315	ECC Memory Size Changed, Bank #1 (4GB memory module)
0316	ECC Memory Size Changed, Bank #2 (4GB memory module)
0317	ECC Memory Size Changed, Bank #3 (4GB memory module)
0320	Adding/removing PCI adapters has changed available memory.
0322	An error has caused the memory resizing to fail, insufficient memory to continue.
0370	Keyboard Controller Error
0373	Keyboard Stuck Key Detected
0375	Keyboard and Mouse Swapped
0380	ECC SIMM failure, Board in slot 1 SIMM #
0392	ECC SIMM failure, Board in slot 2 SIMM #
0430	Timer Channel 2 Failure
0440	Gate-A20 Failure
0441	Unexpected Interrupt in Protected Mode
0445	Master Interrupt Controller Error
0446	Slave Interrupt Controller Error
0450	Master DMA Controller Error

Continued

Number	Error message
0451	Slave DMA Controller Error
0452	DMA Controller Error
0460	Fail-safe Timer NMI Failure
0461	Software Port NMI Failure
0465	Bus Time-out NMI in Slot
0467	Expansion Board NMI in Slot
0510	PCI Parity Error
0511	PCI System Error
0710	System Board Device Resource Conflict
0711	Static Device Resource Conflict
0780	PCI Segment 1 memory request exceeds 998Mb
0781	PCI Segment 1 I/O requests exceeds 12K
0782	PCI I/O request exceeds amount available
0783	PCI memory request exceeds amount available
0784	Illegal bus for memory request below 1Mb
0785	Memory request below 1Mb exceeds 1Mb
0800	PCI I/O Port Conflict
0801	PCI Memory Conflict
0802	PCI IRQ Conflict
0803	PCI Error Log is Full
0804	PCI ROM not found, May Be OK For This Card
0805	Insufficient Memory to Shadow PCI ROM
0806	Memory Allocation Failure for Second PCI Segment
0809	PCI Error Log is Full

Continued

Number	Error message
0810	Floppy Disk Controller Resource Conflict
0811	Primary IDE Controller Resource Conflict
0812	Secondary IDE Controller Resource Conflict
0815	Parallel Port Resource Conflict
0816	Serial Port 1 Resource Conflict
0817	Serial Port 2 Resource Conflict
0900	NVRAM Checksum Error, NVRAM Cleared
0903	NVRAM Data Invalid, NVRAM Cleared
0905	NVRAM Cleared By Jumper
0906	Password Cleared By Jumper
0982	I/O Expansion Board NMI in Slot
0984	Expansion Board Disabled in Slot
0985	Fail-safe Timer NMI
0986	System Reset caused by Watchdog Timer
0987	Bus Time-out NMI in Slot

Equipment Log 14

This chapter consists of a blank equipment log. Use this equipment log to record pertinent information about your server. You will need some of this information when you run the System Configuration Utility (SCU).

Record the model and serial numbers of the server and the system board. They are on the back panel of the server and along the left side of the system board near the expansion slots.

Record the model and serial numbers of the system components, dates of component removal or replacement, and the vendor's name. Be sure to record the same information for any components added to the system, such as hard disk drives, add-in boards, or printers.

The location of serial numbers on add-in boards, hard disk drives, and external equipment, such as video displays or printers, varies from one manufacturer to another.

Component	Manufacturer Name and Model Number	Serial Number	Date Installed
System			
System Board			
Video Display			
Keyboard			
Mouse			
Floppy Disk Drive A			
Floppy Disk Drive B			
Tape Drive			
CD-ROM Drive			
Hard Disk Drive 1			
Hard Disk Drive 2			
Hard Disk Drive 3			
Hard Disk Drive 4			
Hard Disk Drive 5			

Component	Manufacturer Name and Model Number	Serial Number	Date Installed
Hard Disk Drive 6			
Hard Disk Drive 7			
Hard Disk Drive 8			
Hard Disk Drive 9			
Hard Disk Drive 10			
Hard Disk Drive 11			
Hard Disk Drive 12			
Processor Board			
Memory Board			
VGA/EGA Adapter Board			
SCSI Host Adapter Controller Board 1			
SCSI Host Adapter Controller Board 2			
RAID Controller Board			

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