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## REGULATORY INFORMATION

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of 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. If not installed and used according to this manual, the equipment may cause harmful interference with radio and television communications. However, there is no guarantee that interference will not occur in any particular installation.

**Note:** To meet Class B emission limits, the user must observe the following requirements:

- Use only shielded I/O cables to connect this digital device with any peripheral (such as a printer, modem, monitor, etc.).
- The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

If this equipment does cause interference with radio or television reception, which you can determine by turning the equipment off and on, try to correct the interference by using one or more of the following measures:

- Move the digital device away from the affected receiver.
- Reposition (turn) the digital device with respect to the affected receiver.
- Reorient the affected receiver's antenna.
- Plug the digital device into a different AC outlet so the digital device and the receiver are on different branch circuits.
- Disconnect and remove any I/O cables that the digital device does not use. (Unterminated I/O cables are a potential source of high RF emission levels.)
- Plug the digital device into only a grounded outlet receptacle. Do not use AC adapter plugs. (Removing or cutting the line cord ground may increase RF emission levels and may also present a lethal shock hazard to the user.)
- If you need additional help, consult your dealer, manufacturer, or an experienced radio or television technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Canadian Regulatory Information - This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

VDE Manufacturer's Declaration - Hiermit wird bescheinigt, daß dieses Gerät in Übereinstimmung mit den Bestimmungen der BMPT-AmtsblVfg 243/1991 funk-entstört ist. Der vorschriftsmäßige Betrieb mancher Geräte (z. B. Meßsender) kann allerdings gewissen Einschränkungen unterliegen. Beachten Sie deshalb die Hinweise in der Bedienungsanleitung.

Dem Bundesamt für Zulassungen in der Telekommunikation wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf die Einhaltung der Bestimmungen eingeräumt.

This product complies to EN55022 Class B. To ensure continued compliance, only options that are EN55022 Class B can be added.

## Safety Notices



- **Caution:** To reduce the risk of electric shock which could cause personal injury, follow all safety notices. The symbols shown are used in your documentation and on your equipment to indicate safety hazards.
- **Warning:** Lithium batteries can be dangerous. Improper handling of lithium batteries may result in an explosion. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists.
- **Warning:** The detachable power supply cords are intended to serve as disconnect devices.
- **Warning:** This equipment uses 3-wire, grounded power cords. To prevent electrical hazards, do not remove or defeat the ground prong on the power cords. Replace a power cord if it gets damaged. Contact your dealer for an exact replacement.

In the U.S.A. and Canada, the power cord must be a UL-listed detachable power cord (in Canada, CSA-certified), type ST or SJT, 16 AWG, 3-conductor, provided with a molded-on NEMA type 5-15 P plug cap at one end and a molded-on cord connector body at the other end. The cord length must not exceed 9 feet (2.7 meters).

Outside the U.S.A. and Canada, the plug must be rated for 250 VAC, 10 amp minimum, and must display an international agency approval marking. The cord must be suitable for use in the end-user country. Consult your dealer or the local electrical authorities if you are unsure of the type of power cord to use in your country. The voltage change occurs via a switch in the power supply.

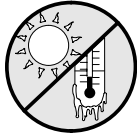
- **Warning:** Under no circumstances should the user attempt to disassemble the power supply. The power supply has no user-replaceable parts. Inside the power supply are hazardous voltages that can cause serious personal injury. A defective power supply must be returned to your dealer.

### Safety Notices for Users Outside of the U.S.A. and Canada

- **PELV (Protected Extra-Low Voltage) Integrity:** To ensure the extra-low voltage integrity of the equipment, connect only equipment with mains-protected electrically-compatible circuits to the external ports.
- **Remote Earths:** To prevent electrical shock, connect all local (individual office) computers and computer support equipment to the same electrical circuit of the building wiring. If you are unsure, check the building wiring to avoid remote earth conditions.
- **Earth Bonding:** For safe operation, only connect the equipment to a building supply that is in accordance with current wiring regulations in your country. In the U.K., those regulations are the IEE.

## Care and Handling

Use the following guidelines to properly handle and care for your system.



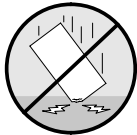
Protect the system from extremely low or high temperatures. Let the system warm (or cool) to room temperature before using it.



Keep the system away from magnetic forces.



Keep the system dry. Do not wash the system with a wet cloth or pour fluid into it.



Protect the system from being bumped or dropped.



Check the system for condensation. If condensation exists, allow it to evaporate before powering on the system.



Keep the system away from dust, sand, and dirt.



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Chapter 1  
**Introduction**

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This guide tells you how to configure and upgrade your server. Its goal is to familiarize you with your server and the tasks necessary for system configuration and upgrading.

## Organization

### **Chapter 1**

Introduction — Introduces you to the purpose and structure of this guide.

### **Chapter 2**

Features — Gives you an overview of the server and describes major system components.

### **Chapter 3**

Setup — Tells you how to select a site, unpack the system, get familiar with the system, make cable connections, and power on the system.

### **Chapter 4**

Configuring Your System — Tells you how to configure the system and provides instructions for running the System Configuration Utility (SCU), the BIOS Setup Utility and the SCSISelect Utility. This chapter also tells you how to configure function select switches and system board jumpers in order to set specific operating parameters.

### **Chapter 5**

Upgrades and Options — Provides you with instructions for upgrading your system with optional processor, memory, options cards, and peripheral devices.

### **Chapter 6**

Problem Solving — Contains helpful information for solving problems that might occur with your system.

**Appendix A**

System Cabling — Includes cabling information for the onboard SCSI controller and the RAID controller.

**Appendix B**

Memory Configurations — Defines the allowable memory configurations for your system.

**Appendix C**

Option Boards — Reserves a section of your user's guide to store add-in adapter board installation procedures.

**Appendix D**

Devices — Reserves a section of your user's guide to store add-on device installation procedures.

**Appendix E**

Network Operating Systems — Reserves a section of your user's guide to store your Network Operating System Configuration Guide.

**Glossary** — Defines the standard acronyms and technical terms used in this manual.

**Equipment Log** — Provides you with a sample equipment log for documenting the system configuration and updates.

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## Notational Conventions

The notational conventions listed below are used throughout this manual.

### F1

A letter, number, symbol, or word in CAPS represents a key on your keyboard. For example, the instruction press F1 means press the key labeled F1 on your keyboard.

### ENTER

The ENTER key is interchangeably used as RETURN and CARRIAGE RETURN.

### CTRL + ALT

Two or three key names, separated by plus sign (s), indicate multiple-key entries. For example, CTRL + ALT + DEL means hold down the CTRL and ALT keys and press the DEL key.

The special notices listed below are used throughout this manual to emphasize specific information:



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**Warning:** Warning indicates a hazard that can cause serious personal injury or death if the hazard is not avoided.

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**Caution:** Caution indicates a hazard that might cause personal injury.

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**Notice:** Notice indicates the potential to damage equipment or data is present if the user does not take the necessary precautions recommended by the Notice.

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**Note:** Notes are used to identify or amplify a point to the reader. A Note may be used to emphasize a recommended sequence of steps.



## Chapter 2

# Features

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## Overview

The server is a modular, multiprocessing server based on the Intel® Pentium® Pro chip set. The chip set incorporates a modular scaleable architecture that integrates a 64-bit bus interface with a primary and peer Peripheral Component Interconnect (PCI) bus and an Extended Industry Standard Architecture (EISA) bus. The architecture supports Symmetrical Multiprocessing (SMP) and a variety of operating systems. The chassis and system board are designed to meet the needs of the server marketplace.

The combination of computing performance, memory capacity, and integrated I/O provides a high performance environment for many applications including network servers and multi-user systems.

The server 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 a redundant power supply, 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.
- SCSI drive bays accessible from the front of the chassis.
- Hot-swap SCSI disk drive backplanes; a failed drive can be removed and a new drive installed without system power being turned off.
- High degree of SCSI disk fault tolerance and advanced disk array management features through the use of RAID (Redundant Array of Independent Disks) technology.
- Hardware monitors (temperature and voltage) and software monitors to indicate failures.
- Easy access to all parts for service.

## Expanding the Server as Needs Grow

A typical minimum system configuration could include the following:

- Board set with 64 MB memory board, system board, and two processor boards with one Pentium® Pro microprocessor.
- Diskette drive
- One SCSI hard drive
- CD-ROM drive
- Network add-in boards
- RAID controller board
- Two 330 Watt power supplies
- Two SCSI drive backplanes
- Five chassis hot swap fan modules (eight fans)
- Onboard 1 MB video memory.

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 processor board may contain up to two processors, for a configurable range of one, two, three, or four processors.
- System board has two video memory upgrade sockets (512 KB each) for an additional 1 MB of video memory.
- Memory board supports 16 DIMM devices for a minimum memory size of 64 MB; maximum is 4 GB.
- System board has four EISA slots and six PCI slots for add-in boards. The system board also has a riser board for external I/O (serial, parallel, video) interfaces.

- Chassis can hold 18 drives: 12 hot-swap bays for 3 1/2-inch ultra wide SCSI-3 hard drives; four 5 1/4-inch half-height bays for removable media drives with a CD-ROM reader already installed in one bay; and two 3 1/2-inch half-height bays with a diskette drive already installed in one bay.
- Chassis supports up to four power supplies.

### **Configuration Constraints**

Power supplies are hot-swappable and are easily removed and installed. The third or fourth power supply provides redundant power when located in the redundant power supply slot in the power cage (see Figure 2-9, Power Supply Module Features). The redundant power supply provides redundant power so that if one of the three power supplies fail, the system will continue to operate and the failed power supply can be hot swapped. That is, the failed power supply is removed and replaced without turning power off.

The system has four 5 1/4-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, the increased susceptibility to ESD, and cooling requirements, hard drives should not be installed in the 5 1/4-inch half-height bays.

## System Feature Summary

The following provides a summary of the system features:

<b>Feature</b>	<b>Description</b>
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 4 GB of memory.
Add-in board support	Rail and back panel slots support up to 10 add-in boards (four EISA and six PCI).
3 ½-inch diskette drive	3 ½-inch diskette drive is externally accessible.
One location for a 3 ½-inch removable media device	One externally accessible 3 ½-inch half-height bay is available.
Twelve locations for 3 ½-inch SCSI-2 hard drives	The hard disk drive bays can hold twelve 3 ½-inch hot-swappable ultra wide SCSI-2 hard drives. The bays are secured behind a lockable metal EMI door; drives can be swapped in or out of the system without powering it down, with a Redundant Array of Independent Disks (RAID) controller module is installed. The array of drives allows easy setup of RAID applications.
Hot swap-capable backplanes	A hot swap-capable backplane is part of each 3 ½-inch drive bay assembly for SCSI drives. The backplane is designed for wide ultra SCSI-3 devices that use the industry standard 80-pin Single Connector Attach (SCA) connector. The two backplanes consists of two rows of three drive connectors.
Four locations for 5 1/4-inch removable media devices	Three externally accessible 5 1/4-inch half-height bays are available for diskette, CD-ROM, and/or tape drives.
Power supply	From two to four 330 Watt autoranging power supplies are easily removed/installed for service. In a three or four power supply system, the fourth supply is redundant if installed in the proper slot.
Hot swap-capable cooling fans	Each power supply has two integral cooling fans. Eight more fans provide cooling for boards and drives.

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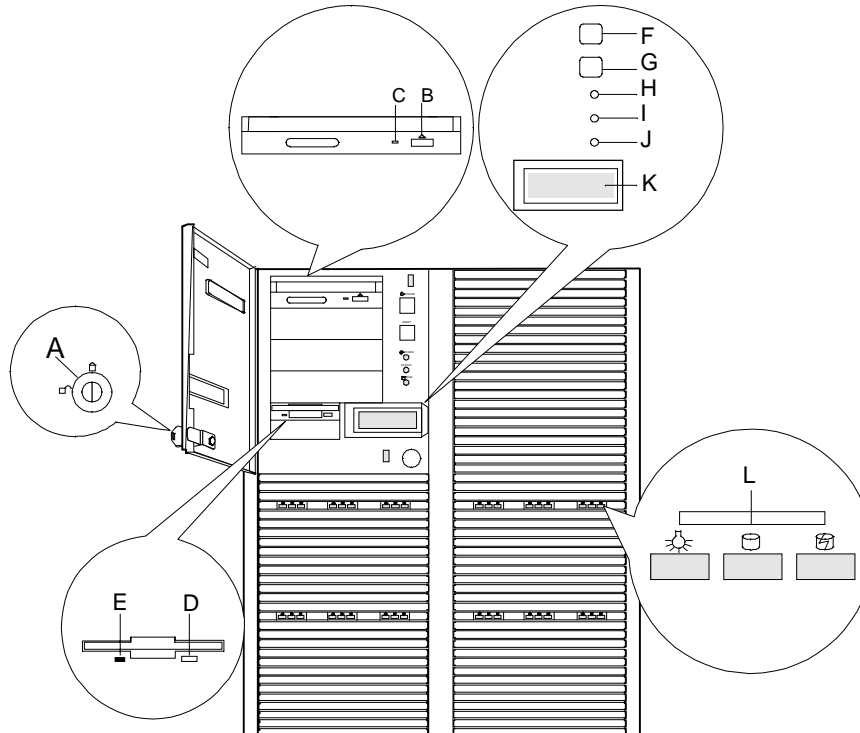
Security	<b>Mechanical:</b> Key lock at the front and up to six metal padlock loops (one at the back of the top panel cover, one across the bottom of each power supply and power supply cage). Two intrusion sensors for the hot-swap SCSI drive bay EMI doors and one power inter-lock sensor at the top front of the chassis.
Software: utilities, setup	<b>BIOS:</b> Password enable. BIOS Setup, System Configuration Utility, and SCSISelect Utility.

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## Chassis Front Features and Controls

Figure 2-1 shows the server front chassis features and controls.

Figure 2-1. Front Chassis Features And Controls



<b>A</b>	Key lock	Secures both front external doors.
<b>B</b>	Load/eject button, CD-ROM reader	Press to load CD and eject CD.
<b>C</b>	Activity light, CD-ROM reader	When lit, drive is in use.
<b>D</b>	Ejector button, 3 1/2-inch diskette drive	Press to eject diskette.
<b>E</b>	Activity light, 3 1/2-inch diskette drive	When lit, drive is in use.

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<b>F</b>	DC power switch (convex button)	Press to turn system DC power on or off.
<b>G</b>	Reset switch (concave button)	Press to cause a hard reset to the system; the power-on self test (POST) will run.
<b>H</b>	Power-on LED, green	When green, power is present in system (+5 and +12 VDC). When off, power is turned off or power source is disrupted. See Table 2-1 for a list and description of the LED system status indicators.
<b>I</b>	System status LED	When green the system is OK. See Table 2-1 for a list and description of the LED system status indicators.
<b>J</b>	Disk activity LED	When green, internal disk drives are being accessed. See Table 2-1 for a list and description of the LED system status indicators.
<b>K</b>	LCD panel	Displays information about processor type and system failures (error and diagnostic information).
<b>L</b>	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 Table 2-2 for a list of SCSI disk drive status LED indicator descriptions.

## Status LED Indicator Descriptions

Table 2-1 lists the system status LED indicators along with a description of each LED indicator. Table 2-2 lists the disk drive status LED panel indicators along with a description of each LED indicator.

**Table 2-1. System Status LED Indicators**

LED	Status	Description	Response
Power	Off	Power OFF	None required (normal)
	Green	Power ON	None required (normal)
	Amber	System power supply failure	Replace failed power supply module.
Status	Off	Power OFF	None required (normal)
	Green	No alarms	None required (normal)
	Amber	Abnormal condition (see Table 2-3).	Replace failing part.
Disk	Off	Not accessing disk drives	None required (normal)
	Amber	Internal disk drive failure	Replace disk drive
	Green	Accessing disk drives	None required (normal)

**Table 2-2. Disk Drive Status LED Panel Indicators**

LED	Status	Description	Response
Disk Drive Power	Off	Disk drive power is OFF	None required (normal)
	Green	Disk drive power is ON	None required (normal)
Disk Drive Activity	Off	Not accessing disk drives	None required (normal)
	On	Accessing disk drives	None required (normal)
Disk Drive Status	Off	No alarms	None required (normal)
	Amber	Internal disk drive failure	Replace disk drive.



**Table 2-3. System Status Abnormal Conditions**

LED (Amber)	Conditions
System Status	Unit fan alarm Memory multi-bit error (SERR) P6 bus error (SERR) Thermal sensor (from SCSI distribution board) Temperature sensor (heceta) Voltage sensor (heceta) CPU thermal trip (heceta) Chassis intrusion detection (front EMI doors) PCI PERR# (OPB/ESC detect) PCI SERR# CPU internal error WDT IOCHK

## Resetting the System

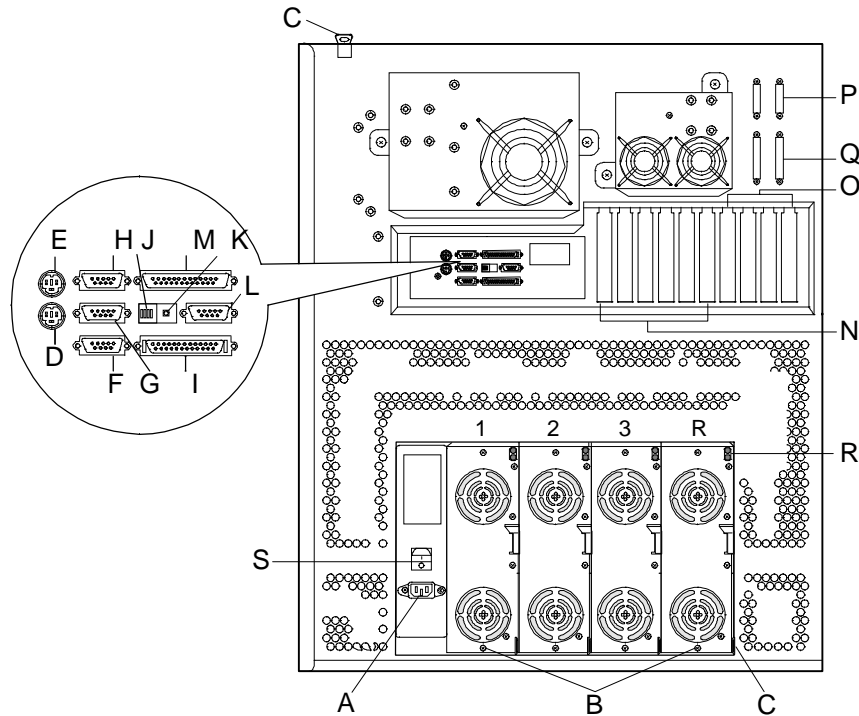
There are several ways to reset the system:

- **Reset button** - pressing this button clears system memory, restarts POST, and reloads the operating system.
- **Power on/off** - turning the power off and then on with the power button on the front of the system has the same effect as pushing the Reset button, except that power is halted to all peripherals.

## Chassis Rear Features and Controls

Figure 2-2 shows the server rear chassis features and controls.

Figure 2-2. Rear Chassis Features and Controls



- |          |                             |   |
|----------|-----------------------------|---|
| <b>A</b> | AC input power connector    | One at the left-hand side of the power supply cage that supplies AC power for all the power supplies.   |
| <b>B</b> | Power supplies (four shown) | Possible configurations, installed from left most bay:<br>2 supplies (nonredundant) positions 1 and 2<br>3 supplies (nonredundant) positions 1, 2, and 3<br>3 supplies (redundant) positions 1, 2, and R<br>4 supplies (redundant) positions 1, 2, 3, and R |
| <b>C</b> | Security padlock loops      | One at the back of the top panel cover, one on the power supply cage, and one on each power supply module.  |
| <b>D</b> | Keyboard                    | PS/2-compatible 6-pin mini-DIN connector.   |

<b>E</b>	Mouse	PS/2-compatible 6-pin mini-DIN connector.
<b>F</b>	—	Reserved
<b>G</b>	COM2	COM2 serial port 9-pin connector.
<b>H</b>	COM1	COM1 serial port 9-pin connector.
<b>I</b>	External-SCSI	Narrow-SCSI 50-pin connector
<b>J</b>	Function select switches	See <i>Configuring Switch and Jumper Settings</i> in Chapter 4 of this User's Guide.
<b>K</b>	Dump button	See <i>Configuring Switch and Jumper Settings</i> in Chapter 4 of this User's Guide.
<b>L</b>	VGA	VGA monitor 15-pin connector.
<b>M</b>	Printer	LPT1 25-pin Centronics-compatible parallel port connector.
<b>N</b>	PCI slots	Six PCI add-in board slot locations.
<b>O</b>	EISA slots	Four EISA add-in board slot locations.
<b>P</b>	Knockouts	Available to route SCSI signal cables to peripheral boxes.
<b>Q</b>	Knockouts	Available to route SCSI signal cables to peripheral boxes.
<b>R</b>	Power supply status lamps	See Table 2-4 for status descriptions.
<b>S</b>	Main line switch	Press to turn system AC power ON or OFF.

## Power Supply Status Lamp Descriptions

Table 2-4 lists the power supply status lamps.

**Table 2-4. Power Supply Status**

LED	Status	Description	Response
DC Power	Off	Power is Off	None required (normal)
	Green	Power is On	None required (normal)
Alarm	Off	No alarm	None required (normal)
	Amber	Power failure Abnormal power temperature Power FAN alarm DC-Power alarm	Replace power supply Clean air passages Replace power supply Replace power supply

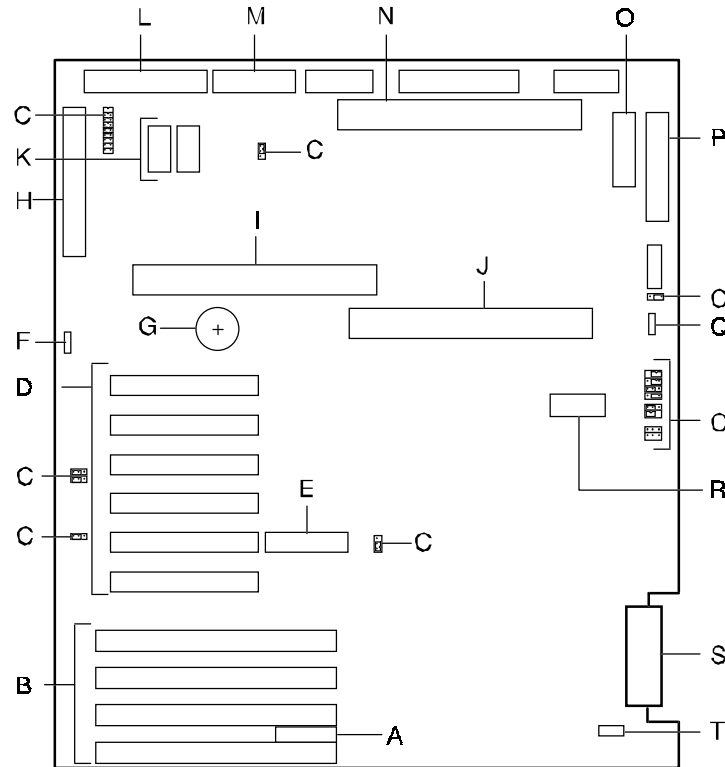
## System Board Features

The board set includes the system board, one memory board, and two processor boards. Figures 2-3, 2-4, and 2-5 show the major components on the system board, processor board, and memory board, while the following summarizes the board set features.

<b>Board set summary</b>	<b>Feature description</b>
Multiple processor support	Two processor sockets; up to two Pentium Pro microprocessors on each processor board.
Upgradable memory	Sixteen DIMM sockets on the memory board, supporting up to 4 GB memory using 256 MB DIMMs.
Add-in board support	Four dedicated EISA bus slots and six dedicated 32-bit PCI slots on the system board.
SCSI controller	Two onboard SCSI-2; ultra wide SCSI channel and narrow SCSI channel support (PCI-based).
BIOS	Flash memory-based BIOS (Basic Input/Output System ) and Setup utilities.
Video	Integrated super VGA controller ships with 1 MB of video memory. For optional 1 MB of video memory, two onboard upgrade sockets (512 KB each) are available that increases total video memory size to 2 MB.
External device connectors	Onboard connectors for two serial ports, parallel port, narrow SCSI port, PS/2-compatible keyboard and mouse, and VGA monitor.
Clock	Real-time clock/calendar (RTC).
System hardware monitoring	Detects chassis intrusion and contains sensors for temperature, voltage, and fan failure.
Configuration utilities	System Configuration Utility (SCU) and SCSISelect Utility.

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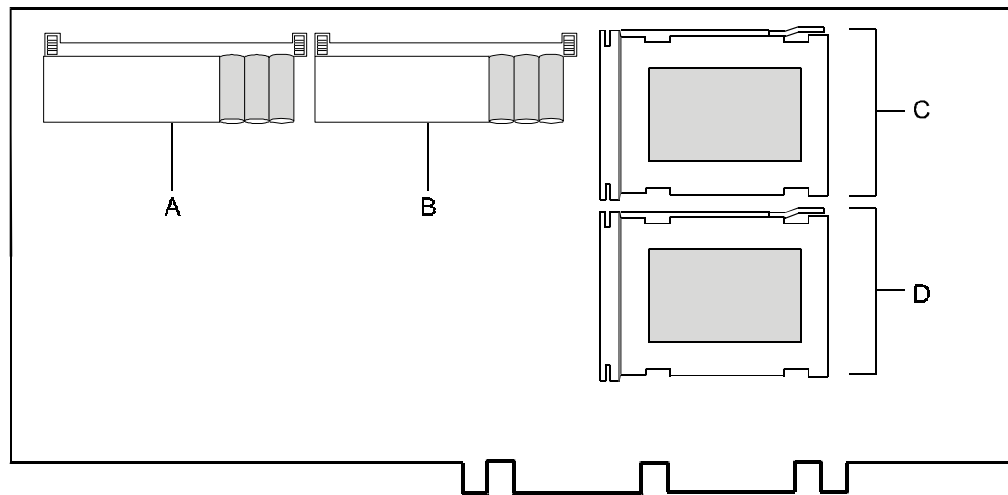
Figure 2-3. System Board Connector and Component Locations



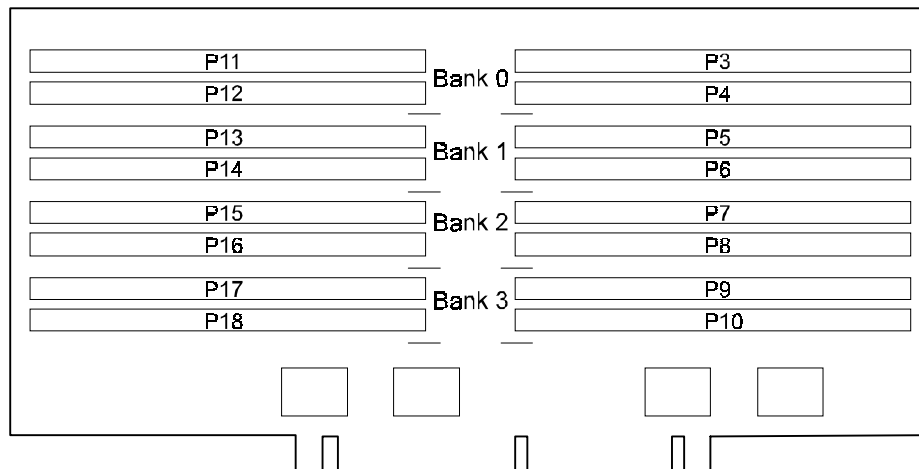
- |          |                              |
|----------|------------------------------|
| <b>A</b> | Reserved                     |
| <b>B</b> | EISA expansion slots         |
| <b>C</b> | Configuration jumpers        |
| <b>D</b> | PCI expansion slots          |
| <b>E</b> | Reserved                     |
| <b>F</b> | Fan connector (CPU Rear)     |
| <b>G</b> | Real time clock battery      |
| <b>H</b> | I/O riser board connector    |
| <b>I</b> | Processor #1 board connector |
| <b>J</b> | Processor #2 board connector |

<b>K</b>	Optional Video DRAM sockets
<b>L</b>	Narrow SCSI connector
<b>M</b>	SCSI status cable connector
<b>N</b>	Memory board connector
<b>O</b>	Diskette connector
<b>P</b>	Front panel connector
<b>Q</b>	Fan connector (CPU Front)
<b>R</b>	Non-volatile memory
<b>S</b>	Wide SCSI connector
<b>T</b>	Fan connector (Option Board).

**Figure 2-4. Processor Board Component Locations**



<b>A</b>	DC to DC converter for processor #0 or #1
<b>B</b>	DC to DC converter for processor #2 or #3
<b>C</b>	Processor #2 or #3
<b>D</b>	Processor #0 or #1

**Figure 2-5. Memory Board Component Locations**

## Processor

The system includes 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 DC to DC converters for power to each processor (Figure 2-4, A and B). The Pentium Pro processors plug into a Zero Insertion Force (ZIF) sockets on this board (Figure 2-4, C and D). Optional Pentium Pro processors enhance performance and enable symmetric multiprocessing (SMP). All processors access the same memory and I/O space and tasks can run on any CPU if your operating system (OS) supports SMP.

## Memory

The memory board contains sixteen 168-pin DIMM sockets (Figure 2-5). The minimum system configuration includes 64 MB (using two 32 MB DIMMs) of system memory. 16 DIMM sockets allow for system memory expansion to 4 GB (using sixteen 256 MB DIMMs). ECC generation/checking is provided for detection and correction of memory errors.

**Note:** Only use DIMMs approved for use in this server system. Call your customer service representative for information.

## **Bus Master I/O Expansion Slots**

The server's expansion capabilities meet the needs of file and application servers for high performance I/O by providing a combination of PCI local bus and EISA connectors. The system board offers six dedicated PCI slots and four dedicated EISA slots.

The system board contains four EISA bus master I/O (input/output) expansion slots (Figure 2-3, B). The EISA architecture supports 32-bit memory addressing and 16-bit or 32-bit data transfers for the CPU, DMA, and bus masters.

The system board also contains six PCI bus master I/O expansion slots (Figure 2-3, D).

## **Real-Time Clock/Calendar**

The real-time clock provides system clock/calendar information stored in a non-volatile memory (NVRAM). The real-time clock battery (Figure 2-3, G) provides power backup for the real-time clock.

## **BIOS**

A BIOS and Setup Utility are located in the Flash EPROM on the system board and include support for system setup and PCI/ISA Plug-and-Play auto-configuration.

A number of security, reliability, and management features also have been incorporated to meet vital server needs.



## Video

The onboard, integrated Cirrus Logic CL-GD5446 super VGA controller (PCI) is a high-performance SVGA subsystem that supports the following:

- BIOS compatibility with VGA, EGA, CGA, Hercules Graphics, and MDA.
- 1 MB of Video Memory expandable to 2 MB (Figure 2-3, K).
- 16-bit bus for high-speed display memory access.
- Hardware accelerated bit block transfers (BITBLT).
- Supports 72Hz refresh, non-interlaced at: 640x480, 800x600, or 1280x1024 resolutions.
- Displays of up to 16M colors at 640x480 and 800x600 resolutions, 64K colors at 1024x768 resolutions and 256 colors at 1280x1024 resolutions with the optional 2 MB video memory.

**Note:** SVGA drivers may be required to use the high-performance video modes.

## SCSI Controllers

The system board includes an embedded ultra wide SCSI-3 controller (Adaptec® AIC-7880) and a fast/narrow SCSI-2 controller (Adaptec® AIC-7860) integrated as PCI bus masters. The AIC7860 supports data paths of 8-bit (fast/narrow SCSI) at a data transfer rate of 10 MB/sec and the AIC7880 supports data paths of 16-bit (fast/wide or ultra/wide SCSI) at a data transfer rate of 20 MB/sec or 40 MB/sec. As PCI bus masters, these controllers support burst data transfer rates up to the maximum of 133 MB/sec.

On this server, a PCI RAID controller is cabled to twelve hard drives located in the SCSI hard drive bays. The AIC-7860 is cabled to four SCSI devices located in the 5 1/4-inch removable media drive bays and the riser card (containing external I/O connectors) at the rear of the system.

### **Peripheral Controller**

The advanced integrated peripheral controller supports two serial ports and one parallel port through the I/O riser board (Figure 2-3, H). The advanced integrated peripheral controller also supports the connection of two diskette drives (Figure 2-3, O).

### **External Device Connectors**

The I/O panel provides connectors for a PS/2 compatible mouse and a keyboard, connectors for VGA monitor, two serial port connectors, and a parallel port connector. It also provides a narrow SCSI external connector.

### **Keyboard and Mouse**

The keyboard/mouse controller is PS/2™-compatible.

### **Peripheral Devices**

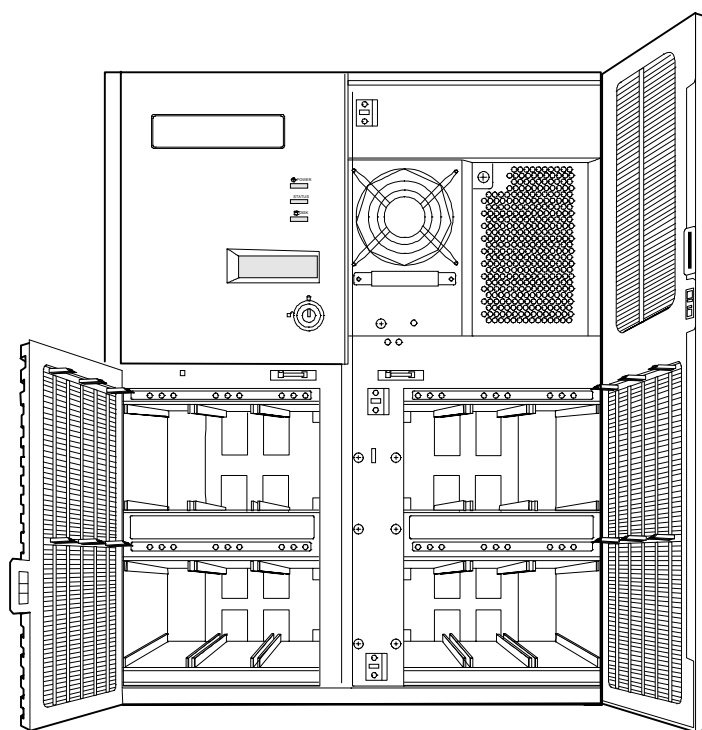
This subsection describes the SCSI-3 hard drive bays, SCSI drive hot-swap backplane, and 5 1/4-inch removable media drive bays.

## SCSI-3 Hard Drive Bays

The front bottom right-hand side and left-hand side of the system each contain a total of six bays for 3 1/2-inch SCSI-3 hard drives and a hot-swap backplane (see Figure 2-6). Each backplane supports six drives. The backplanes require an 80-pin single connector attachment (SCA) connector on the drives you install in the bays.

A drive carrier is required as part of the hot swap implementation. A 3 1/2-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.

Figure 2-6. SCSI-2 Hard Drive Bays



**Twelve bays for SCSI drives**

(EMI panel and exterior door shown open)

A fault light on the front panel board gives a general indication 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).

## **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. The backplane receives control signals from the PCI RAID ultra wide SCSI-3 controller channel.

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 backplane features are:

- 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
- SCSI management of fault LEDs.

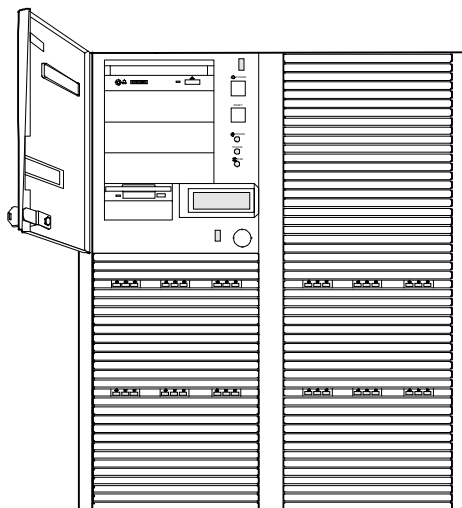
Each backplane supports SCSI drives with SCA connectors.

## Removable Media Drive Bays

On the left side of the system above the diskette drive, four 5 1/4-inch half-height bays (see Figure 2-7) are designed for peripherals with removable media (diskette, CD-ROM, tape cartridge). Any two adjacent 5 1/4-inch bays can be converted to a single full-height bay. The 5 1/4-inch drives can be removed directly from the front of the chassis after the front metal frame (bezel) is removed. The bezel is retained by two screws on top, which are accessible when the top short door is opened and the top cover is removed, and two hinge tabs on the bottom. Cosmetic filler panels and metal EMI shields are installed over all unused 5 1/4-inch bays.

On the left side of the system below the 5 1/4-inch removable media drive bays are two built-in 3 1/2-inch bays one of which contains a 3 1/2-inch diskette drive that supports both 720 KB and 1.44 MB media (see Figure 2-7).

**Figure 2-7. Removable Media Drive Bays**



**Factory-installed CD-ROM reader plus three bays for removable media drives.**

**Factory-installed 3 1/2-inch diskette drive plus second bay for removable 3 1/2-inch drive.**

(Exterior door shown open)

**Note:** The SCSI termination resistors must be installed in the last SCSI drive of the daisy chain cabling (top media bay). All other devices must have terminators removed.

## Power System

The system may be configured with two, three, or four 330 Watt power supplies. Each supply automatically switches between these input voltage ranges:

- 100-120 VAC at 50/60 Hz; 10 A maximum current
- 200-240 VAC at 50/60 Hz; 5 A maximum current
- The AC input connector is a panel mounted, IEC 320/C20 type connector.

Each supply has the following:

- Two cooling fans integral with each power supply enclosure. The fan circuitry implements fan failure detection.
- Two indicators: power and alarm.

## Number of Power Supplies in a Configuration

In a system, power is drawn equally from all supplies present (from two to three to four). In a high-access system with three or four power supplies, the power supply in the redundant position (R) gives redundancy, because the load is redistributed if one supply fails.

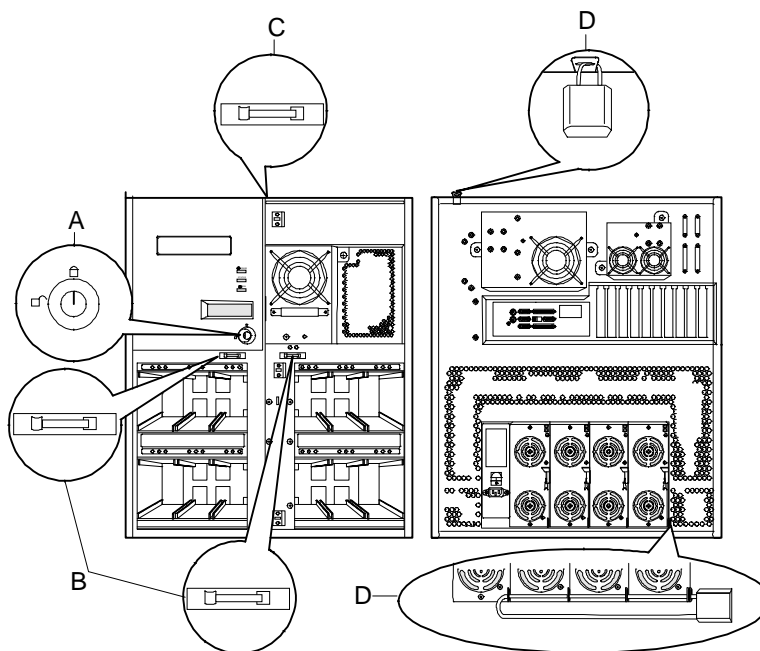
## Server Security

The following subsections describe mechanical locks and software locks via the BIOS Setup Utility.

## Mechanical Locks and Monitoring

Figure 2-8 shows the server mechanical locks and monitoring.

Figure 2-8. Mechanical Locks and Monitoring



- |          |  |   |
|----------|--|---|
| <b>A</b> | Front panel key lock                                   | The key lock secures the top front short panel door to prevent access to the power and reset switches. This lock also secures the front bottom short panel door and the front right-hand side full panel door.  |
| <b>B</b> | Location of internal intrusion alarm switches          | Two intrusion alarm switches are present on the SCSI drive bay doors. The switch opens when the drive bay door is opened. An intrusion alarm signal is transmitted to the system board, where server management software processes the signal for security. |
| <b>C</b> | Location of the internal power inter-lock alarm switch | The power inter-lock switch is present at the top of the chassis. The switch opens when the top panel cover is opened. A power inter-lock signal is transmitted to the system board controlling a power shut down to the system for safety                  |
| <b>D</b> | Padlock loop   | Secures the top panel cover cover by using a padlock (not provided). The side covers cannot be removed until the top cover has been removed. Also secures the power supplies to each other and to the power supply cage by using a padlock (not provided).  |
| -        | Environmental sensors                                  | (Not shown in figure) The system contains sensors to monitor temperature, voltage, and fan failure.   |

## Software Locks via the BIOS Setup

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

- Set and enable a supervisor password.
- Set and enable a user password.
- Enable password on boot.
- Disable writing to the diskette drive when secure mode is set.

### Using Passwords

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

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

## Hot Swap Power

The System can have up to four Hot Swappable Power Supply modules. The first, second, and third slots are basic power supply module slots, the fourth slot is a redundant power supply module slot. Each failed power supply module can be removed without turning off power. Each power supply module has two LEDs. Table 2-5 shows the Power LED Indicators and Figure 2-9 shows the power supply module features.

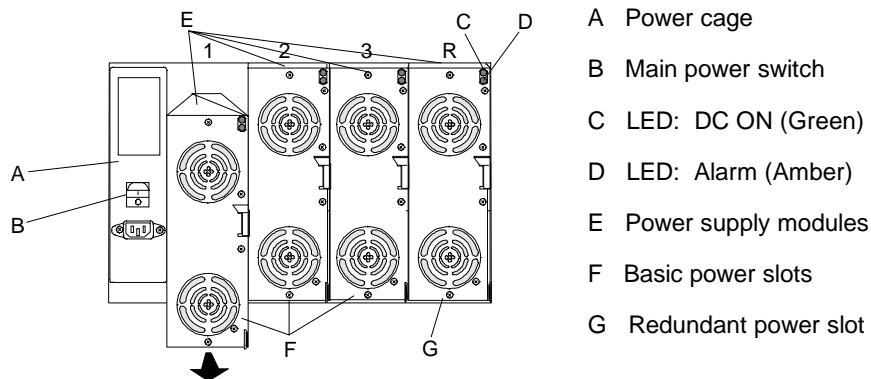
A failed power supply module is signaled by the system power on LED (green to amber), (see Figure 2-1, H), the alarm LED on the failed power supply, and by system maintenance software.



Table 2-5. Power LED Indicators

LED	Status	Description	Response
DC-Power	Off	Power is off	None required - normal
	Green	Power is on	None required - normal
Alarm	Off	No alarm	None required - normal
	Amber	Power failure	Replace Power supply
		Abnormal Power temperature	Clean air passages
		Power FAN alarm	Replace Power supply
DC-Power alarm	Replace Power supply		

Figure 2-9. Power Supply Module Features



## Hot Swap FAN

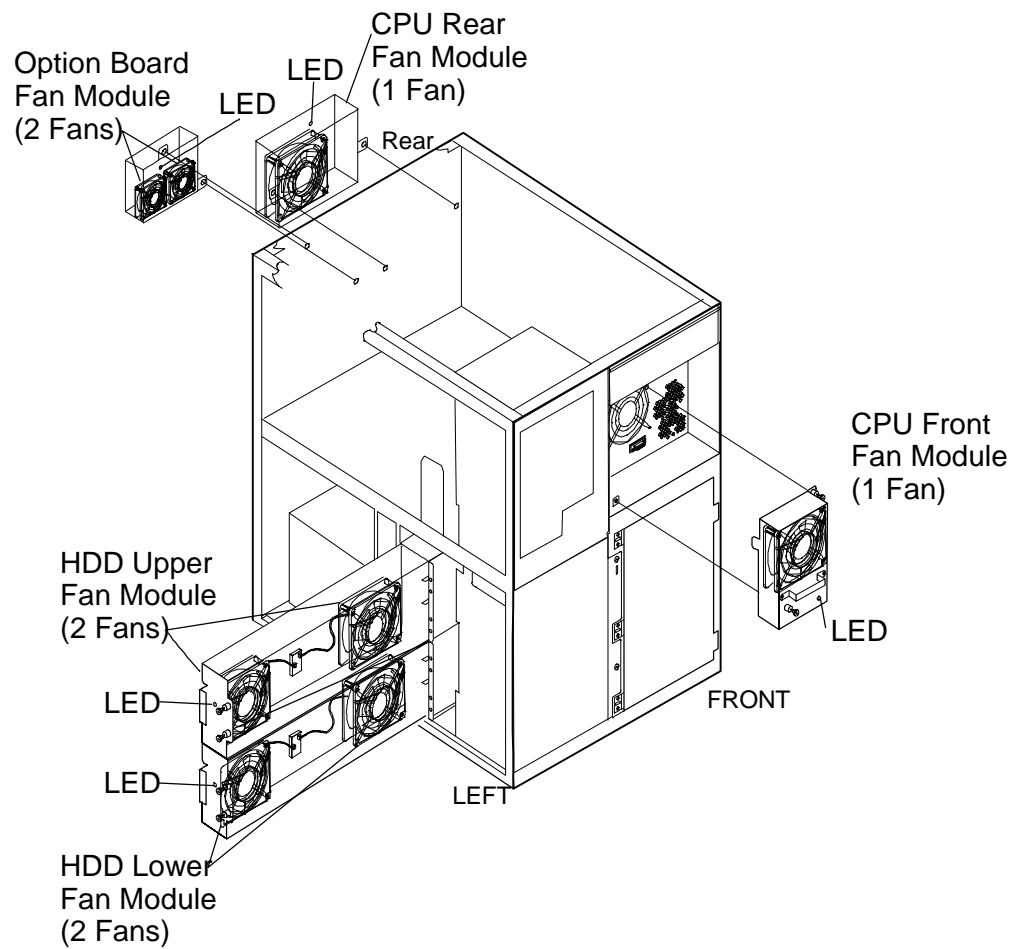
The system has five hot swappable fan modules (eight fans). The failed fan module can be easily removed or replaced without turning power off. Each fan module has a fan alarm LED and each fan is redundant in configuration. If one fan fails, its associated fan changes its rotating speed to high. Table 2-6 lists the fan redundant pairs. Figure 2-10 shows the fan features.

A failed fan is signaled by the system alarm LED (turns from green to amber) on the front of the chassis (see Figure 2-1, I) the amber LED on the failed fan boxes and by server management software.

Table 2-6. Fan Redundant Pairs

Redundant Pair	Fan Modules
1	CPU Front and CPU Rear
2	Option Board (dual fan)
3	Hard Disk Drive Upper and Hard Disk Drive Lower

Figure 2-10. Fan Features





## Chapter 3

# Setup

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## Selecting a Site

The system operates reliably in a typical office environment. Choose a site that is:

- Near grounded, three-pronged power outlets.

**Note:** For the United States and Canada, this means a NEMA 5-15R outlets for 100-120 VAC or NEMA 6-15R outlets for 200-240 VAC. For other international sites, this means three-pronged power outlets applicable for the electrical code of the region.



---

**CAUTION:** Be sure the power service connection is through a properly grounded outlet.

---

**Note:** For Denmark, the system must be connected to an AC power source rated at 16 Amps.

- Clean, dust-free, and well ventilated. Front and rear ventilating openings kept free of obstructions. Away from sources of heat, vibration or physical shock
- Isolated from strong electromagnetic fields and electrical noise produced by electrical devices (such as air conditioners, large fans, large electric motors, radio and TV transmitters, and high-frequency security devices)
- Spacious enough to provide at least five inches (13 centimeters) behind the system and three inches (eight centimeters) on each side of the system for proper cooling, airflow, and cable clearance
- **Note:** Two hard disk fan modules are located behind a small access door in the left-hand side panel (as viewed from the front of the system). You should allow 20 inches (51 centimeters) on the left-hand side of the system for easy removal of these fan modules.
- Easily accessible for system maintenance and installation of system upgrades.

## Unpacking the System



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**Caution:** Your system weighs up to 266 pounds (119.7 kg). To avoid personal injury, make sure you have someone help you lift or move the system.

---

When you receive your system, inspect the shipping containers prior to unpacking. If the shipping boxes are damaged, note the damage, and if possible, photograph it for reference. After removing the contents of the containers, keep the cartons and the packing materials. If the contents appear damaged when you unpack the boxes, file a damage claim with the carrier immediately.

## Getting Familiar with the System

Before setting up your system, refer to Chapter 2 in this User's Guide to become familiar with the system's features, such as the location of your system's security keylocks and front and rear panel switches, indicators and connectors, etc.

## Server Security

Refer to Chapter 2 of this user's guide to become familiar with the system's mechanical locks, software locks via the BIOS Setup, intrusion alarm, and power inter-lock switches.



---

## Making Connections

**Note:** If your system normally operates without a video display or keyboard (for example, as a network server), you must install a video display and keyboard to configure the system. You may remove them after running the System Configuration Utility (SCU). For information on running the SCU, refer to *Configuring Your System* in Chapter 4 of this User's Guide.

Refer to Figure 3-1 and connect your keyboard, monitor, and mouse. Connect any external peripheral devices such as a printer or modem by following the instructions included with these devices. To connect external SCSI cables, refer to *Cabling* in Appendix A of this User's Guide.

---

**Notice:** Damage to the system may result if the keyboard cable is inserted or removed when power is applied to the system.

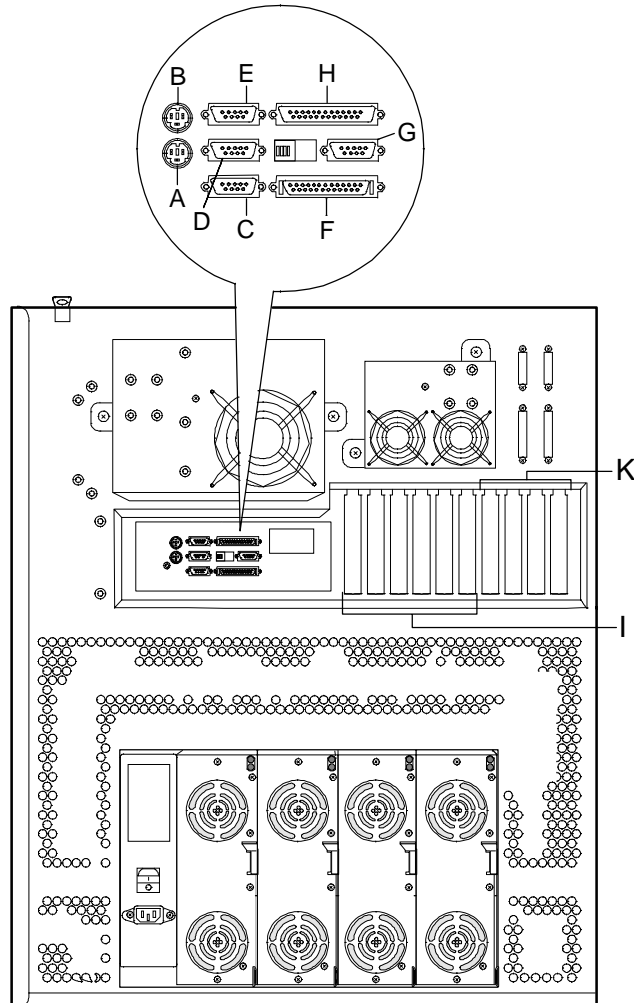
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**Caution:** Inserting a telephone line connector into a LAN board RJ-45 port may result in personal injury and equipment damage.

---

**Figure 3-1. Making Connections**

- A. Keyboard, PS/2-compatible 6-pin connector
- B. Mouse, PS/2-compatible 6-pin connector
- C. Reserved
- D. COM2, serial port 9-pin connector
- E. COM1, serial port 9-pin connector
- F. External-SCSI, 50-pin connector
- G. VGA monitor, 15-pin connector
- H. Printer, parallel port 25-pin connector
- I. PCI slots, Six PCI add-in board slots
- J. EISA slots, Four EISA add-in board slots

## Connecting the Power Cord

Plug the female end of the AC power cord into the input receptacle on the rear of the power supply cage. Plug the male end of the power cord into NEMA 5-15R outlet for 100-120 VAC or NEMA 6-15R outlet for 200-240 VAC.

If the power cord supplied with the system is not compatible with the AC wall outlet in your region, obtain a suitable power cord that meets the following criteria.


- The power cord must be rated for the available AC voltage and have a current rating that is at least 125% of the current rating of the system.
- The power cord connector that plugs into the wall outlet must be terminated in a grounding-type male plug designed for use in your region. It must have certification marks showing certification by an agency acceptable in your region.
- The power cord connector that plugs into the system must be an IEC- type CEE-22 female connector.
- The power cord must be less than 1.8 meters (6.0 feet) long.

---

**Warning:** Your system shipped with a power cord. Do not attempt to modify or use the supplied AC power cord if it is not the exact type required.

---

## Powering On Your System

1. Make sure all external devices, such as a video display, keyboard, and mouse (optional) have been connected, and the power cords are connected.
2. Power on the video display and any other external devices.
3. Press the ON/OFF button located on the rear chassis above the AC input power connector to its ON position. Refer to *Figure 2-2, Rear Chassis Features and Controls* in Chapter 2 of this User's Guide.
4.  Press the DC push-button power on/off switch on the front panel. Verify that the power-on LED is lit. If it is not lit, ensure the ac power cords are connected to a functional ac power source.

After a few seconds your system begins the internal Power-On Self Tests (POST). POST automatically checks the system board, CPU module, memory, keyboard, and most installed peripheral devices.

If you have problems powering on your system, refer to *Problem Solving* in Chapter 6 of this User's Guide.

If you have optional adapter boards or devices to install in your server, follow the procedures in the *Upgrades and Options* chapter of this User's Guide. If you are instructed to run the System Configuration Utility (SCU), you will find the SCU diskette envelope in the accessory box.

After you have successfully powered on your system, refer to the EXPRESSBUILDER User's Guide and run the Installation Checklist Utility to confirm your hardware setup is working correctly.

After you have successfully powered on your system, refer to the Network Operating System Configuration Guide for information on installing your operating system.



# Configuring Your System

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## Configuring Your System

Configuration and setup utilities are used to change your system configuration. You can configure your system, as well as option boards you may add to your system, using the System Configuration Utility (SCU) diskette delivered with your system. Also, several unique system parameters are configured using BIOS Setup which is stored in the system FLASH memory. A diskette is not needed to run BIOS Setup.

The SCSISelect Utility is used if you need to configure either of the SCSI controllers in your system or to perform a SCSI disk format or verify disk operation of these drives.

If your system has been factory configured, the SCU, BIOS Setup, or SCSISelect utilities do not need to be run unless you want to change the password or security features, add option boards or devices, or upgrade your system board.

A Utilities diskette is included with your system and contains the Event Log Utility. The Event Log Utility is used to read stored system event information.

There are some system configuration parameters that are set by jumpers. However, these parameters do not usually require change.

Finally, the EZ-SCSI utility is included with your system on diskette. This program performs MS-DOS driver installation for SCSI devices in your system and also installs basic utilities that format and manage SCSI hard disk drives. Refer to the documentation on the utility diskette for more information.

This chapter provides procedures for running the SCU, BIOS Setup, and the SCSISelect Utility. Also, a section describing the system jumper configurations is presented. Several configuration tables are provided in this chapter to record changes you make to the default system configuration.



## **System Configuration Utility (SCU)**

The System Configuration Utility is used to configure your system. The SCU can be used to configure the memory subsystem, peripheral device subsystems, and interface adapters. SCU recognizes ISA Plug-and-Play boards and PCI boards and displays their configuration. SCU also recognizes EISA boards so they can be configured using the configuration diskettes supplied with these boards. ISA (non-Plug and Play) adapter boards must be added to the SCU configuration to reserve the resources required by the ISA boards.

After you add options using the SCU, the system automatically configures and initializes them during system initialization at boot up.

The SCU must be executed every time ISA or EISA adapter boards are added, removed or relocated in the system.

The SCU stores the configuration information in the non-volatile memory on your system. When you exit the SCU the configuration information is written to non-volatile memory. The SCU also maintains the Setup configuration, which is stored in the battery-backed memory. This means that when you exit the SCU, the Setup and SCU configuration will agree with each other.

---

## Using the SCU

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**Notice:** The system can fail following improper configuration. Always save to file the Configuration Log in online Help and record the current settings before reconfiguring the system.

---

**Note:** Because of license restrictions, the SCU diskette, as supplied, is not bootable. In order to use this diskette, you must make it bootable.

1. If you are adding option boards to your system or upgrading memory, do so now using procedures found in the *Upgrades and Options* chapter of this guide.
2. Power on the system.
3. If the diskette drive is disabled, enable it using the BIOS Setup utility, explained later in this chapter. Specify the correct type of diskette drive.

**Note:** Perform Step 4 and 5 of this procedure the first time you use the SCU diskette. These steps enable the SCU diskette to be MS-DOS bootable and copies HIMEM.SYS onto the diskette.

4. Insert the SCU diskette into floppy disk drive A. At the C:\ prompt type:

```
SYS A:
```

Press ENTER. MS-DOS system files are copied onto the diskette.

5. Copy the file HIMEM.SYS from the MS-DOS directory. At the C:\ prompt type:

```
copy c:\dos\himem.sys a:
```

Your SCU diskette is now bootable and includes HIMEM.SYS. It can be used, as is, to update your system.

6. Start the SCU by rebooting the system, with the SCU diskette in Drive A. When the SCU banner is displayed, press ENTER and the System Configuration Utility Main Menu shown in Table 4-1 is displayed.

**Table 4-1. System Configuration Utility Main Menu**

<b>MENU OPTIONS</b>	<b>DESCRIPTION</b>
1. Learn about configuring your computer	Provides basic instructions on system configuration and using the Help program.
2. Configure computer	Lists automatically detected boards, and enables manually adding, moving and removing boards. Plug-and-Play and EISA boards provide their own configuration files. If you have previously defined ISA boards or their configuration files, use "Add or remove boards" for a menu to enter or change ISA board configurations. (Refer to ISA Board Configuration found later in this chapter). INSERT adds a board not detected or has not been installed. DEL removes a selected board. F7 moves a selected board to a different slot.
3. Set date	Enables viewing and changing the date that the computer uses.
4. Set time	Enables viewing and changing the time that the computer uses.
5. Maintain system configuration diskette	Enables viewing and changing Configuration (.CFG) files and System Configuration Information (SCI) files.
6. Exit from this utility	Exits from the SCU.

7. Select *Learn about configuring your computer* from the SCU Main Menu and press ENTER if you need information on system configuration. Read through the information and press the F10 key when you are done.

8. Using the ↑ and ↓ arrows highlight *Configure Computer* and press ENTER. The System Configuration Utility Menu shown in Table 4-2 displays. The keys that are active while viewing a screen are displayed on the bottom of the screen.

**Note:** Press the F1 key at any time for help and additional information on each option. To return from help, press the ESC key.

9. Select Step 1: Important System Configuration information and press ENTER to learn more about the System Configuration Utility.

10. Select Step 2 to add an ISA board to your system. Refer to "ISA Board Configuration" in this chapter.

Table 4-2. System Configuration Utility Menu

MENU OPTIONS	DESCRIPTION
Step 1. Important System configuration information.	Provides information on the System Configuration program and how it differs from ISA board configuration.
Step 2. Add and remove boards	Lists automatically detected boards, and enables manually adding, moving and removing boards. Plug-and-Play and EISA boards provide their own configuration files. This list shows all the boards and options that will be installed in your system.
Step 3. View and Edit Details	Enables viewing and changing your system configuration settings including embedded features, functionality, IRQs, and port selections. Perform Step 3 only if you need to change the system default settings.
Step 4. Examine Switches or Print Report	Enables viewing the required switch and jumper settings and allows printing of a configuration report.
Step 5. Save and Exit	Allows you to save your configuration and exits to the operating system. You can also exit without saving.

11. Select Step 3 to view your systems configuration settings. The normal (default) SCU settings are shown in Table 4-3.

## SCU Command Line Parameters

There are SCU options that can be enabled by starting the SCU from the command line with the appropriate switch listed below. To enable an option, insert the SCU diskette in drive A and type `A:SD` at the MS-DOS prompt, followed by one of these command line parameters:

- H** High resolution display. Sets the display mode to 43 lines for an EGA add-in video controller board or to 50 lines for a VGA board. The default is 25 lines for all add-in video controller boards.
- M** Monochrome display. The display screens are shown using monochrome attributes, even on a color display. The default is to display color, unless a monochrome video display is detected. Use this parameter when you have redirected the console to one of the onboard serial ports.

## SCU Configuration Settings

Table 4-3 shows the recommended settings for the SCU and provides a place for you to record any changes you make to these settings. To view and/or change SCU Configuration settings, select Step 3 under the System Configuration Utility Menu. Once you have selected step 3, you can press the F7 key to display further server specifications.

**Table 4-3. SCU Configurations**

PARAMETER	NORMAL SETTING	YOUR CONFIGURATION
<b>Flexible Disk Drives</b>		
Embedded Controller*	Primary**	
Flexible Drive A*	1.44 MB (3.5 - inch)	
Flexible Drive B*	Not Installed	
<b>Dual Serial Ports</b>		
Serial Port 1*	3F8, IRQ 4**	
Serial Port 1*	2F8, IRQ 3**	
<b>Parallel Port Configuration</b>		
Parallel Port*	378, IRQ 7**	
Parallel Port Mode*	Bi - directional mode	
<b>ESM ASIC IRQ</b>		
ESM ASIC IRQ*	IRQ13**	
<b>Mouse</b>	Enabled	
<b>SCSI ch0 - PCI SCSI Controller</b>		
PCI Function 1*	Enabled**	
<b>SCSI ch1 - PCI SCSI Controller</b>		
PCI Function 1*	Enabled**	
<b>VGA - PCI VGA Controller</b>		
PCI Function 1*	Enabled**	
<b>Standard VGA Resources</b>	Enabled**	

\* Press ENTER for Menu

\*\* Press F6 to Edit resources

---

## ISA Board Configuration

If you want to add an ISA board to your system that is not included in a .cfg file, use the following procedures to define and add the option board. It is necessary to define an ISA board to prevent other boards in the system from using the same IRQ levels, DMA channels, I/O port addresses, or memory addresses, that your ISA board uses. Standard ISA board options have .cfg files already on your SCU diskette.

You must run the SCU and add the ISA board to the configuration before installing the ISA board in the system, otherwise the resources on the ISA board may conflict with a Plug-and-Plug board in the system.

BIOS automatically assigns ISA Plug-and-Plug boards to the next available slot. If the slot displayed in Step 2: "Add or Remove Boards" is not the actual slot, it can be moved by using the F7 function key.

---

**Notice:** IRQ levels, DMA channels, I/O port addresses, and memory addresses defined using this procedure should reflect the same settings defined by supplied jumpers and/or configuration documents.

---

1. Insert the SCU diskette into drive A: and power-on the system. The system boots-up using the SCU diskette.
2. The SCU Main Menu shown in Table 4-1 is displayed. At the Startup Menu, enter choice 2, *Configure Computer*.
3. The System Configuration Utility Menu shown in Table 4-2 is displayed. Select *Step 2 Add or Remove Boards* and press ENTER.
4. The *Step 2: Add or remove boards* screen is displayed. At this screen select *Add* by pressing INSERT.
5. The *Add* screen is displayed telling you to locate the diskette that contains the .cfg file for the board. Press ENTER at this screen.

6. The *Select a Configuration (CFG) file to add* screen is displayed. At this screen select *Not Listed* by pressing F5.
7. The *Add a board without a .cfg file* screen is displayed. Read through the information and press ENTER. The *Add a board without a .cfg file* screen reappears. When the screen reappears select *Create .cfg file* and press ENTER.
8. The *Create A Board CFG File* screen is displayed. At this screen enter the board description and manufacturer and press ENTER.
9. The *New Board Setup* screen is displayed. Using the scrollable list select the resources used by the new ISA board. Table 4-4 provides a place for you to record the configuration you assign to the board.
10. Press F10 when you are finished selecting the resources used by the new ISA board.
12. The *View Current Settings* screen is displayed. Press ENTER to save the current settings.
13. The *Add confirmation* screen is displayed. Review the manufacturer's comments and press ENTER.

**Table 4-4. ISA Board Configurations**

ISA BOARD DEFINITIONS	YOUR CONFIGURATION
<b>Board Description:</b>	
<b>Manufacturer:</b>	
<b>Interrupts</b> (Select from scrollable list)	
<b>DMA Channels</b> (Select from scrollable list)	
<b>Port address</b> (Select from scrollable list)	
Start	
End	
<b>Memory address</b> (Select from scrollable list)	
Start	
Length	
<b>Slot</b> (Select from scrollable list)	

- 
14. The *Add* screen is displayed. Select the slot in which you want to install the board and press ENTER.

**Note:** If the board you add causes a conflict in the configuration, a Caution message is displayed. Press ENTER at the message. This leads you to the screens that allow you to resolve the conflict.

15. The *Step 2: Add or remove boards* screen is displayed. At this screen select *Done* by pressing F10.
16. The *Steps in configuring your computer* screen is displayed. At this screen select “Step 4: Examine switches or print report” and press ENTER.
17. The *Step 4: Examine switches or print report* screen is displayed. The boards marked with an arrow indicate that the boards in your system may have jumpers and switches that you must physically verify or that a software statement with additional information about the board is provided. Select *Done* by pressing F10.

**Note:** If the ISA board you are adding to the configuration does not have switches, jumpers, software statements or connection information, an Information message appears on screen. Press ENTER and proceed to the next step.
18. The *Steps in configuring your computer* screen is displayed. At this screen select “Step 5: Save and exit” and press ENTER.
19. The *Save and exit* screen is displayed. At this screen select “Save the configuration and restart the computer” and press ENTER.
20. The *Reboot* screen is displayed. At this screen press ENTER.
21. Now that you have reserved the system resources, you can install the ISA board.



## BIOS Setup Utility

The BIOS Setup Utility, like the SCU, is used to change system configuration parameters. This utility has some unique parameters and many parameters that are also configurable with the SCU. The utility is resident in the system FLASH memory and does not require a diskette or an operating system present to run. However, parameters set with the BIOS Setup Utility that can also be set with the SCU, will be overwritten by the SCU the next time the SCU is run.

Since the configuration information stored in the SCU overrides the configuration information stored in the BIOS Setup utility, it is strongly recommended that you only use the BIOS Setup utility for the following reasons:

- If the floppy disk drive is disabled and you want to enable the floppy disk drive to access the SCU diskette.
- To disable the floppy drive after changing the SCU to stop unauthorized SCU changes.
- To configure the system when there is no operable diskette drive.
- To correct a configuration error so the system will boot.
- To configure those features that are not in the SCU, such as security.

---

## Using the BIOS Setup Utility

You access the BIOS Setup utility when you turn on or reboot your system. To run the BIOS Setup Utility, perform the following procedure:

1. Power-on or reboot the system. BIOS displays the following:

Press <F2> to enter SETUP

2. Press **F2**. The BIOS Setup Utility starts and the Main Menu is displayed. The menu bar at the top of the Main Menu lists the following selections:

Menu	Use
Main	Use this menu for basic system configuration.
Advanced	Use this menu for setting the Advanced Features available on your system.
Security	Use this menu to set User and Supervisor Passwords and the Backup and Virus-Check reminders.
Server	Use this menu for configuring Server Features.
Exit	Exits the current menu.

Use the arrow keys to select a menu or an item on a displayed menu. Press the value keys (listed in the table below) to cycle through the allowable values for the selected field. Use the Exit menu's "Save Values" selection to save the current values on all the menus.

To display a submenu, position the cursor on a selection that has a submenu and press ENTER. Selections with submenus are preceded by an arrow.

Refer to the following table for information on the keys you use with Setup. These keys are also listed at the bottom of the Setup menu.

Key	Function in Setup Menu
F1 or Alt-H	General Help window.
ESC	Exit the current menu.
← or → arrow keys	Select a different menu.
↑ or ↓ arrow keys	Move cursor up and down. The cursor moves only to the settings that you can change.
TAB or SHIFT-TAB	Cycle cursor up and down.
HOME or END	Move cursor to top or bottom of window.
PAGE UP or PAGE DOWN	Move cursor to next or previous page.
F5 or -	Select the previous value for the field.
F6 or + or SPACE	Select the next value for the field.
F9	Load default configuration values for this menu.
F10	Load previous configuration values for this menu.
ENTER	Execute command or Select ➤ submenu.
ALT-R	Refresh the screen.

## BIOS Setup Configuration Settings

Table 4-5 shows the normal settings for the BIOS Setup Utility and provides a place for you to record any changes you make to these settings.

Table 4-5. BIOS Setup Configurations

MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
<b>MAIN MENU</b>		
<b>System Time</b> Enter current time (hour, minutes, seconds on 24 hour clock).	Current Time	
<b>System Date</b> Enter current date.	Current Date	
<b>Language</b> Use +/- to change language; indicates the language used by Setup.	English	
<b>*Diskette A:</b> Use +/- to change values; indicates the type of diskette drive installed.	1.44MB, 3 1/2"	
<b>*Diskette B:</b> Use +/- to change values; indicates the type of diskette drive installed (Not Installed in your system).	Not Installed	
<b>Video System</b>	VGA	
<b>Memory Cache</b> Press ENTER for menu.		
Memory Cache	Enabled	
Cache System BIOS Area	Write Protect	
Cache Video BIOS Area	Write Protect	
Cache Base 0 - 512K	Write Back	
Cache Base 512K - 640K	Write Back	
Cache Extended Memory Area	Write Back	
<b>*Cache Memory Regions</b>		
Cache C800-CBFF	Uncached	
Cache CC00-CFFF	Uncached	
Cache D000-D3FF	Uncached	
Cache D400-D7FF	Uncached	
Cache D800-DBFF	Uncached	
Cache DC00-DFFF	Uncached	
<b>Memory Shadow</b> Press ENTER for menu.		
System Shadow	Enabled	

\* This parameter will be overwritten by the SCU setting.

Table 4-5. BIOS Setup Configurations (Continued)

MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
<b>MAIN MENU</b>		
Video Shadow	Enabled	
*Regions with Legacy Expansion ROMs		
<b>*Boot Sequence</b> Press ENTER for menu.		
Boot Sequence	A: then C:	
SETUP Prompt	Enabled	
POST Errors	Enabled	
<b>*Numlock</b> Press ENTER for menu.		
Numlock	ON	
Key Click	Enabled	
Key Board auto-repeat rate	10/sec	
Key Board auto-repeat delay	1 sec	
<b>Base Memory:</b>	640 KB	
<b>Extended Memory:</b>	Display only	
<b>ADVANCED MENU</b>		
<b>*Integrated Peripherals</b> Press ENTER for menu.		
Serial Port 1	3F8, IRQ 4	
Serial Port 2	2F8, IRQ 3	
Parallel Port	378, IRQ 7	
Parallel Mode	Bi-directional	
Diskette Controller	Enabled	
Mouse	Enabled	
<b>Memory Reconfiguration</b> Press ENTER for menu.		
Memory Reconfiguration	Enabled	
DIMM Group #1 Status	Normal	
DIMM Group #2 Status	none	
DIMM Group #3 Status	none	
DIMM Group #4 Status	none	

\* This parameter will be overwritten by the SCU setting.

Table 4-5. BIOS Setup Configurations (Continued)

MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
<b>ADVANCED MENU</b>		
Memory Group Errors Clear	Press ENTER	
Memory Configuration Message	Enabled	
Memory Warning POST Error	Enabled	
<b>CPU Reconfiguration</b> Press ENTER for menu.		
CPU Reconfigure	Enabled	
CPU #1 Status	Normal	
CPU #2 Status	Normal	
CPU #3 Status	Normal	
CPU #4 Status	Normal	
Clear CPU Errors	Press ENTER	
CPU Error Pause	Enabled	
<b>Chipset Configuration</b> Press ENTER for menu.		
OPB-0 Traffic Priority Mode	Enabled	
OPB-1 Traffic Priority Mode	Enabled	
<b>PCI Devices</b> Press ENTER for menu.		
Default Latency Timer	No	
Latency Timer	0060 <sub>16</sub>	
PCI to EISA Bridge		
Latency Timer	0060 <sub>16</sub>	
EISA Latency Timer	007F <sub>16</sub>	
<b>Use Multiprocessor Specification</b>	1.4	
<b>CPU BIOS Update</b>	Enabled	
<b>Plug &amp; Play O/S</b>	No	
<b>Reset Configuration Data</b>	No	

Table 4-5. BIOS Setup Configurations (Continued)

MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
<b>SECURITY MENU</b>		
Supervisor Password is	Disabled	
User Password is	Disabled	
*Set Supervisor Password	Press ENTER.	
Set User Password	Press ENTER.	
**Password on boot	Disabled	
**Diskette Write	Normal	
**Diskette access	Everyone	
System backup reminder	Disabled	
Virus check reminder	Disabled	
Power Switch Mask	Unmasked	
<b>SERVER MENU</b>		
Thermal Sensor Press ENTER for menu.		
Thermal Sensor	Enabled	
Upper Limit	50°C	
Lower Limit	10°C	
ESM ASIC Interrupt	IRQ 13	
SMI	Enabled	
Event Log Initialization	Disabled	
Console Redirect Port	Disabled	

\* Enabling supervisor password requires a password for entering SETUP.

\*\* These parameters require prior setting of supervisor password.

---

## Exiting BIOS Setup

To exit Setup, select Exit from the menu bar to display the Exit Setup menu.

The following table describes the options on this menu. Note that ESC does not exit this menu. You must select one of the items from the menu or menu bar to exit this menu.

SELECTION	DESCRIPTION
<b>Save changes and Exit</b>	Stores the selections displayed in the menus in CMOS and exits the Setup program.
<b>Exit without Saving Changes</b>	Exits the program without saving any changes you have made in this session. Previous selections remain in effect.
<b>Get Default Values</b>	Displays default values for all Setup menus. Useful if BIOS detects a problem with the values stored in CMOS.
<b>Load Previous Values</b>	Reverts to previously saved values if the new values have not been saved to CMOS.
<b>Save Changes</b>	Stores the current selections without exiting the Setup program.

## Using the Utilities Diskette

The utilities diskette included with your system contains an Event Log Reader Utility.

**Note:** Because of license restrictions, the Utilities diskette, as supplied, is not bootable. In order to use this diskette, you must make it bootable.

To run the Utilities diskette, perform the following procedure:

**Note:** Perform the following procedure of this procedure the first time you use the utilities diskette. These steps enable the diskette to be MS-DOS bootable.

1. Power-on the system. The system boots up.



2. Insert the Utilities diskette into floppy disk drive A. At the C:\prompt type:

SYS A:

Press ENTER. MS-DOS system files are copied onto the diskette.

3. Reboot the system with the Utilities diskette in Drive A.

## Viewing the Event Log

The system Event Log Utility displays information on the events stored in the system log area. The information stored includes the name of the event, the date and time the event occurred and data pertinent to the event. Event data may include POST error codes that reflect hardware errors or software conflicts within the system.

**Note:** Refer to Chapter 6 *Problem Solving* for definitions on all POST error codes.

To view the Event Log, perform the following procedure:

1. Insert the bootable Utilities diskette into floppy disk drive A.
2. Power-on the system. The system boots up.
3. The System Event Log Utility starts. The System Event Log Utility screen is displayed. The following screen choices are available.

SCREEN	DESCRIPTION
<b>File</b>	Saves the Event Log and System information to a file.
<b>ElogInfo</b>	Displays Event Log information such as: date, time, and number of times the log was erased; major and minor revision level; and amount of memory used by the event log.
<b>SystemInfo</b>	Displays system information such as: system model; processor type and speed; ROM, SCSI and video BIOS version; number of EISA and PCI slots; total system memory size; and serial and parallel port configuration.
<b>Event log</b>	Displays the Event Log data.
<b>Clear Event log</b>	Not used on this platform. Use the BIOS Setup to Clear the Event Log Data.
<b>Help</b>	Description of information in this table.
<b>Exit</b>	Exits the System Event Log Utility.

To select an option from the System Event Log Utility screen, use ← and → to highlight the item and press ENTER.

To exit the menu item, press ESC.

## SCSISelect Utility

Your system board includes two integrated SCSI host controllers. An AIC7880 wide SCSI controller (not used for internally mounted devices) and an AIC7860 narrow SCSI controller providing support for internally mounted tape and CD-ROM devices as well as externally connected SCSI devices.

The integrated SCSI host controllers are configured using the SCSISelect utility. Use the SCSISelect utility to:

- Change the SCSI host adapters default values.
- Check and/or change SCSI device settings for a particular device.
- Perform low-level formatting on SCSI disk devices.
- Perform verify operations on SCSI disk devices.

## Using the SCSISelect Utility

To run the SCSISelect Utility, perform the following procedure:

1. Power-on the system. The system boots up.
2. During initialization, press CONTROL +A. The SCSISelect Utility starts. When SCSISelect detects more than one AIC-78xx host adapters, it displays a selection menu listing the bus and device number of each adapter. When the selection menu appears, select the channel you wish to configure as follows:

Bus : Device	Selected SCSI Adapter
00 : 09h	AIC7880
01 : 0Ah	AIC7860

3. Once you select the adapter, the following screen is displayed:

SCREEN	DESCRIPTION
Configure/View Host Adapter Settings	Configure host adapter and device settings.
SCSI Disk Utilities	The utility scans the SCSI bus for SCSI devices, reports a description of each device. Run these utilities <i>before</i> configuring SCSI devices.

4. If you wish to format a disk, verify disk media, or display a list of devices and their SCSI IDs, select "SCSI Disk Utilities". If you wish to configure the adapter or a device, select "Configure/View Host Adapter Settings".

## SCSISelect Configuration Settings

The following keys are active for all SCSISelect screens:

KEY	ACTION
<b>Arrows</b>	Up and down arrows move from one parameter to another within a screen.
<b>ENTER</b>	Displays options for a configurable parameter. Selects an option.
<b>ESC</b>	Moves back to previous screen or parameter or EXIT if at the Main menu.
<b>F5</b>	Switches between color and monochrome.
<b>F6</b>	Resets to host adapter defaults.

Table 4-6 shows the normal settings for the SCSISelect Utility and provides a place for you to record any changes you make to these settings.

**Table 4-6. SCSISelect Setup Configurations**

OPTION	RECOMMENDED SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
<b>SCSI Bus Interface Definitions</b>		
Host Adapter SCSI ID	7	
SCSI Parity Checking	Enabled	
Host Adapter SCSI Termination	Enabled	
<b>Additional Options</b>		
Boot Device Options	Press ENTER for menu	
Boot Target ID	0 <sup>7</sup>	
Boot LUN Number	0 <sup>8</sup>	
SCSI Device Configuration	Press ENTER for menu	
Initiate Sync Negotiation	Yes	
Maximum Sync Transfer Rate	10.0 <sup>4</sup>	
Enable Disconnection	Yes	
Initiate Wide Negotiation	Yes	
Send Start Unit Command	Yes <sup>1</sup>	
Include in BIOS Scan	Yes <sup>1</sup>	
Advanced Configuration Options	Press ENTER for menu.	
Reset SCSI Bus at IC Initialization	Enabled	

<sup>1</sup> No effect if BIOS is disabled.

<sup>2</sup> Do not remove media from a removable media drive if it is under BIOS control.

<sup>4</sup> Set to 10.0 for AIC7860 or as required for AIC7880.

<sup>7</sup> Set to 0 for AIC7880 or 5 for AIC7860.

<sup>8</sup> Option no effect if Multiple LUN Support disabled.

**Table 4-6. SCSISelect Setup Configurations (Continued)**

OPTION	RECOMMENDED SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
Host Adapter BIOS (Configuration Utility Reserves BIOS Space)	Enabled. <sup>1</sup>	
Support Removable Disks Under BIOS as Fixed Disks <sup>1,2</sup>	Boot Only <sup>1</sup>	
Extended BIOS Translation for DOS Drives > 1 GByte <sup>3</sup>	Enabled <sup>1</sup>	
Display <Ctrl-A> Messages During BIOS Initialization	Enabled <sup>1</sup>	
Multiple LUN Support	Disabled <sup>1</sup>	
BIOS Support for Bootable CD-ROM	Enabled <sup>1 6</sup>	
BIOS Support for INT 13 Extensions	Enabled <sup>1</sup>	
Support for Ultra SCSI Speed	Disabled <sup>1 5</sup>	

<sup>1</sup> No effect if BIOS is disabled.

<sup>2</sup> **Do not remove media from a removable media drive if it is under BIOS control.**

<sup>3</sup> Set to Disable if NetWare 3.12 or 4.11 Network Operating System is installed.

<sup>5</sup> **Set to Disabled for AIC7860 or as required for AIC7880.**

<sup>6</sup> **Set to Enabled for AIC7860 or as required for AIC7880.**

## Exiting SCSISelect

To exit SCSISelect, press ESC until a message prompts you to exit (if you changed any settings, you are prompted to save the changes before you exit).

---

## Configuring System Jumpers and Switches

This section describes the jumpers and switches used on the I/O riser board, processor board, and system board.

### Before You Begin

Only a qualified technical person should perform the procedures in this section.



---

**Notice:** Electrostatic discharge (ESD) can damage the system board. Modify the system board only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

---

The system jumpers enable you to set specific operating parameters for your system. A jumper is a small plastic-encased conductor (shorting plug) that slips over two jumper pins.

### Configuring I/O Riser Board Function Select Switches

This section describes how to configure and set the function select switches for specific operating parameters.



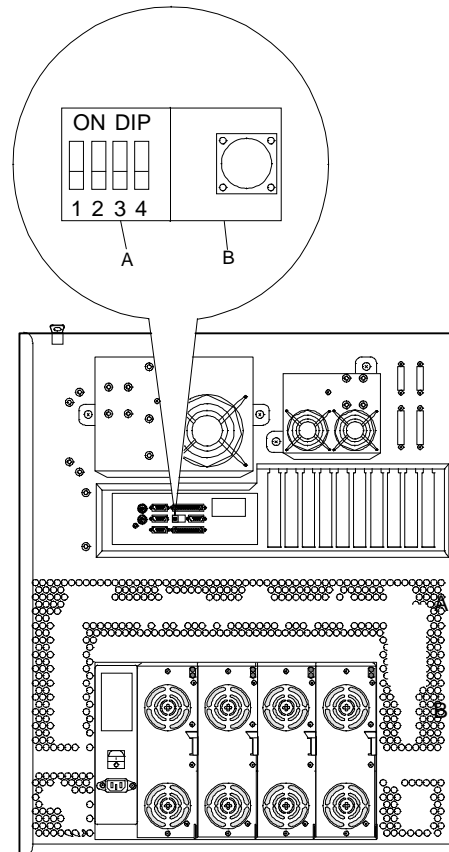
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**Caution:** Before doing the procedures in this section, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before setting switches and moving jumpers can result in personal injury and equipment damage.

---

The function select DIP switches configure the modes of your server. Figure 4-1 shows the DIP switches that consist of a block of four switches, accessible on the I/O panel that is located on the I/O riser board at the rear of the chassis.

Figure 4-1. Function Select Switches

**Function Select Switches and Dump Button**

- A Function select switches
- B Reserved

Situations that require changing switch settings include using an optional uninterruptible power supply (UPS) unit.

**Note:** The switches are set correctly at the factory for your system configuration. If your system requires a switch change, change only the switch setting for that condition. Otherwise keep the switches at their factory settings.

Table 4-7 shows the switch configurations and functions. Set the switches per Table 4-7 and the following steps.

To change a switch setting, use the following procedure.

**Note:** Power must be completely off before setting the switches, otherwise the settings will not be recognized.

1. At the front of the server, press the Power switch off.
2. At the rear of the server, press the Main Power switch off.
3. At the rear of the server, locate the Function Select DIP switch (see Figure 4-1) that you want to change.

**Table 4-7. Function Select Switch Settings**

Switch	Signal	Settings	Function
SW1	RESERVED	Off (factory setting) On	Reserved for future use.
SW2	RSTMASK	Off (factory setting) On	Reserved for future use.
SW3	ACLINK	Off (factory setting) On	Sets server for use with a local power source. Sets server for use with an optional uninterruptible power supply (UPS) unit and disables the Power button on the front of the server.
SW4	RESERVED	Off (factory setting) On	Reserved for future use.

4. Set the appropriate switch on or off, according to Table 4-7.

**Note:** If you set SW2 to On for use with an optional UPS unit, power the unit up before switching power on the server.

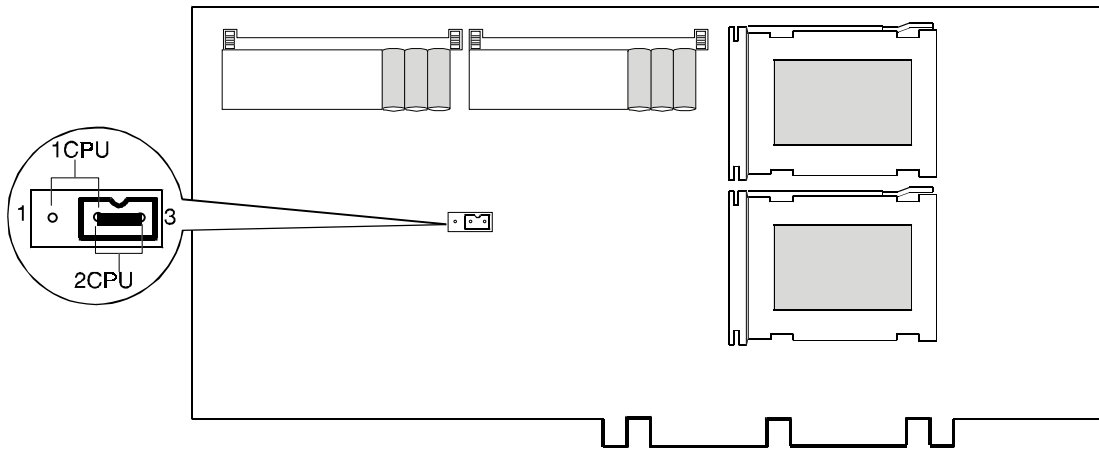
5. Press the main Power switch on.
  - If using an UPS unit, the server powers up as soon as the UPS unit is turned on (the Power button on the front of the server is disabled.)
  - If not using the UPS unit, press the Power button on the front of the server.



## Configuring Processor Board Jumper

This section describes how to configure and set the processor board jumper for the number of CPUs on the board. Figure 4-2 shows the location of the processor board jumper.

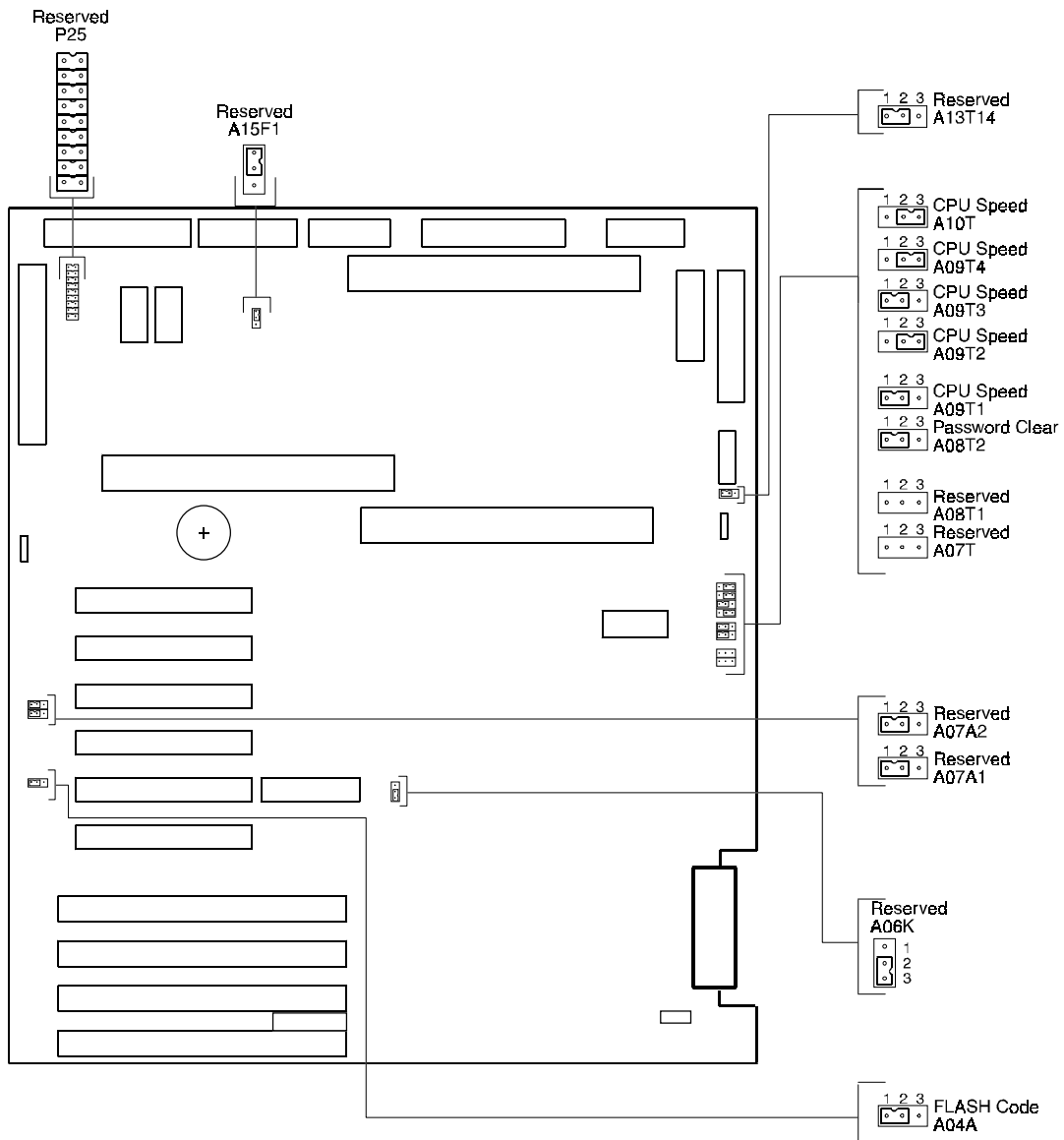
Figure 4-2. Processor Board Jumper



## Configuring System Board Jumpers

The system board jumpers enable you to set specific operating parameters for your system. Figure 4-3 shows the location of the system board jumpers. Table 4-8 lists the system board jumpers and their factory default settings.

Figure 4-3. System Board Jumpers



**Table 4-8. System Board Jumper Configurations**

Jumper	Description	Option	Setting	Factory Default	Your Setting
FLASH Code <b>A04A</b>	FLASH reprogramming power protection	BIOS not write protected; FLASH update BIOS write protected; no FLASH update	1-2 2-3	1-2	
Reserved <b>A06K</b>		Required on factory default.	1-2	1-2	1-2
Reserved <b>A07A1</b>		Required on factory default.	1-2	1-2	1-2
Reserved <b>A07A2</b>		Required on factory default.	1-2	1-2	1-2
Reserved <b>A08T</b>	All jumpers must be out.	Required on factory default	OUT	OUT	OUT
Reserved <b>A08T1</b>	All jumpers must be out.	Required on factory default	OUT	OUT	OUT
Password Clear <b>A08T2</b>	Password protection	Password protection enabled Password cleared; protection off	1-2	1-2	
CMOS Clear <b>A09T1</b>	Real-time clock CMOS protection	RTC CMOS protection enabled RTC CMOS cleared to factory defaults	1-2	1-2	
CPU Speed <b>A09T2</b>	Used with jumpers at A09T3, A09T4, and A10T to set CPU speed	Required on factory default.	2-3	2-3	2-3
CPU Speed <b>A09T3</b>	Used with jumpers at A09T2, A09T4, and A10T to set CPU speed	Required on factory default.	1-2	1-2	1-2
CPU Speed <b>A09T4</b>	Used with jumpers at A09T2, A09T3, and A10T to set CPU speed	Required on factory default.	2-3	2-3	2-3
CPU Speed <b>A10T</b>	Used with jumpers at A09T2, A09T3, and A09T4 to set CPU speed	Required on factory default.	2-3	2-3	2-3
Reserved <b>A13T14</b>		Required on factory default.	1-2	1-2	1-2
Reserved <b>A15F1</b>		Required on factory default.	2-3	2-3	2-3
Reserved <b>P25</b>	All nine jumpers must be in.	Required on factory default.	IN	IN	IN

---

## Moving System Board Jumpers



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**Caution:** Before doing the procedures in this section, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before moving the jumpers can result in personal injury and equipment damage.

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**Notice:** Observe static precautions. Use an antistatic wrist strap.

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To configure the system board options:

1. Power off the system and remove the top cover as described in Chapter 5 of this guide.
2. Check to ensure the system power cord is removed from the back of the system.
3. Locate the position of the jumpers on the system board you are changing. Refer to Figure 4-3.
4. To change a jumper setting, use a pair of needle-nose pliers or your fingers to remove the jumper from its current location. Position the jumper over the two pins for the desired setting and press it onto the pins. Be careful not to bend the pins. Refer to Table 4-8 for system board jumper settings.
5. Record changes to the system board jumpers in Table 4-8.
6. Install the system top cover and power up the system using procedures in chapter 5 of this guide.
7. Run the SCU utility to verify your reconfiguration of the system board.

## Updating the BIOS

To update the system BIOS:

1. Insert an MS-DOS bootable diskette into Drive A and power up the system.
2. At the A:\ prompt, remove the MS-DOS diskette and insert the BIOS FLASH diskette.
3. Enter PHLASH and press ENTER.
4. Monitor the BIOS update process.
5. When the *Update Process Complete* screen appears, remove the diskette and power down the system.
6. Power up the system.

If the procedure fails, perform the following steps and then retry the Update BIOS procedure.

1. Turn off the system and remove the panels as described in the *Upgrades and Options* chapter.
2. Ensure the FLASH CODE jumper A04A is set to pins 1-2 to enable updates to the BIOS (see Figure 4-3).
3. Replace the panel and power up the system with the BIOS FLASH diskette inserted in Drive A
4. The recovery process, if required, is automatic.

## Resetting the CMOS NVRAM

To reset the CMOS NVRAM:

1. Power off the system and remove the panels as described in chapter 5 of this guide.
2. Move the CMOS CLEAR jumper A09T1 to pins 2-3 (see Figure 4-3).
3. Turn the system on and wait for the POST to complete. This will automatically reprogram the CMOS NVRAM to the default settings.
4. Power off the system.
5. Move the CMOS CLEAR jumper from pins 2-3 back to pins 1-2.
6. Replace the panels and power on the system.
7. Run the SCU to configure your system.

## Clearing and Changing the Password

To clear and change the password:

1. Power off the system and remove the panels as described in the Upgrades and Options chapter.
2. Move the PASSWORD CLEAR jumper A08T2 to pins 2-3 (see Figure 4-3).
3. Power on the system and wait for POST to complete. This automatically clears the old password.
4. Power off the system.
5. Move the PASSWORD CLEAR jumper back to pins 1- 2.
6. Replace the panels and power on the system.

To specify a new password run the SCU as described earlier in this chapter.

## Configuring the RAID Controller

The DACCF utility is included with the RAID controller. This configuration utility allows you to configure your disk array before installing your network operating system. The DAC960PDU-2B-4M RAID controller supports various versions of RAID technology (referred to as RAID levels). To use any RAID level, you must configure the RAID controller using the DACCF configuration utility prior to installing your Network Operating System. For an explanation of this utility, refer to the *DACCF Utilities Installation Guide and User Manual* that was shipped with the server. Chapter 2 of the manual (*Configuration Strategies*) describes RAID technology and provides tips on making your array perform well in your specific application. Chapter 3 (*Preparing the Array*) covers array hardware preparation, configuration, and initialization. After completing the steps in chapter 3, you can install your Network Operating System.

If you want to be able to remotely (from a PC client) configure the array; increase array capacity online; or monitor statistics on disk and controller activity, you must install the Global Array Manager (GAM) option that was provided with your RAID subsystem. The GAM option includes diskettes and user documentation. Use of GAM is documented in the *Global Array Manager 2 Server Installation Guide*. Increasing array capacity is covered in the *MORE User Guide*. This user guide covers enhancements to both the Global Array manager and DACCF utilities software that implement online RAID expansion (MORE) technology.

# Upgrades and Options

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## Precautions

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

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



---

**Warning:** Before doing the procedures in this chapter, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

---

---

**Warning: 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).

---

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**Warning: 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.

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**Warning: 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.

---



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**Caution: 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 a failed fan module or power supply. 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.

---

---

**Caution: 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.

---

---

**Caution: Internal support panel, proper cooling and airflow.** To prevent damage to the system board from partially inserted processor and memory 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.

---

---

**Caution: Ensure complete board insertion.** When installing a processor or memory board, before installing the board support panel, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high. After installing the board support panel, 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 the board being inserted. Also ensure that add-in boards are completely and correctly seated in the system board connectors before applying power.

---

---

**Caution: 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.

---

Contact your sales representative or dealer for a list of approved optional peripheral devices.

## Preparing Your System for Upgrade

Have the following tools available:

- Phillips screwdriver (#1 bit and #2 bit)
- Flat-head screwdriver
- Small needle nose pliers
- Pen or pencil
- Utility knife
- ESD workstation or antistatic wrist strap (recommended)
- IC removal tool.

## Equipment Log

Use the equipment log form located at the end of this manual to record the model and serial number of your system, all installed options, and any other pertinent information specific to your system. You will need this information when configuring your system.

---

## Removing the Top Cover

**Note:** You must remove the external top cover before you can remove the side covers and to install boards in your system.



---

**Caution:** For proper cooling and airflow, do not operate the system with the top cover removed. Always replace the cover before powering on the system.

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

---

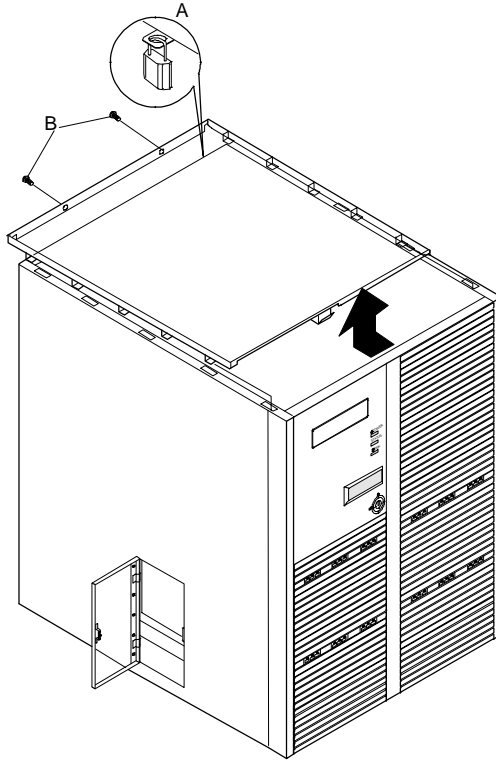
---

**Warning:** If you are removing the top cover after the system is set up, you must first power off the system and all external devices. **Unplug** the system power cord.

---

To remove the top cover:

1. Power off the system and ensure it is disconnected from the ac wall outlet.
2. Observe the safety and ESD precautions listed at the beginning of this chapter.
3. The top cover is secured from the back edge with two screws and a padlock (if used). Remove the padlock and the screws (Figure 5-1). Save the screws for reattaching the top cover.
4. Avoid dislodging the EMI strips as you slide the cover back very slightly (to about an 1-inch or until it stops.) Then pick the cover straight up from the chassis.

**Figure 5-1. System Top Cover****Removing top cover**

A Padlock at back edge (if installed)

B Retaining screws (two at back)

To avoid damaging EMI strips, do not slide the cover back much more than the 1-inch implied here.

You do not need to remove the internal board support panels, if you do not need to access the boards.

**Installing the Top Cover**

1. Before replacing the top cover, make sure no tools or loose parts have been left inside the system chassis.
2. Make sure all option boards are firmly seated in their respective slots and that all interior cables are properly connected.
3. Ensure that both side panels are installed *see Installing a Side Panel* later in this chapter.
4. Lower the cover straight down and over the top of the chassis with the front edge about 1 inch back from the edge of the front bezel (front cover). The sides of the cover should be outside the chassis metal.

5. Carefully slide the front edge of the cover forward so that its tabs firmly engage in the slots, until it stops at the edge of the front bezel. 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.
6. Reinstall the two retaining screws at the back of the chassis removed earlier, and tighten firmly.
7. To prevent unauthorized access inside the system, insert and lock a padlock through the loop at the back of the chassis.

**Note:** If your system is already set up, plug the system back in, reconnect the peripherals, and power on the peripherals and system.

## Removing a Side Panel

**Note:** The side panels do not have to be removed in order to install or remove any boards.



---

**Caution:** For proper cooling and airflow, do not operate the system with the side panels removed. Always replace the panels before powering on the system.

---

---

**Caution:** Do not damage or displace the EMI strips mounted on the inside of the panels as you remove and install them. Replace any damaged strips, or your system may not meet EMI requirements.

---

---

**Warning:** If you are removing the side panel after the system is set up, you must first power off the system and all external devices. **Unplug** the system power cord.

---

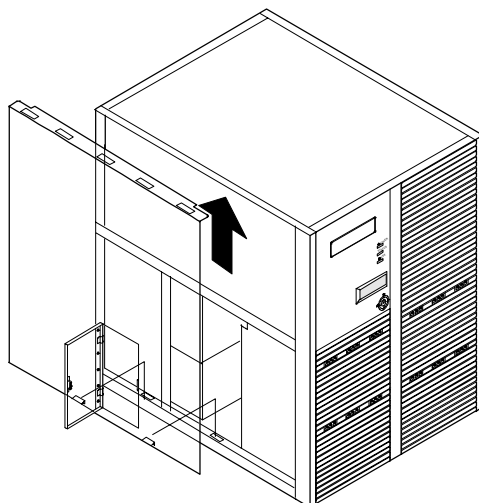
To remove a side panel:

1. Power off the system and ensure it is disconnected from the ac wall outlet.
2. Observe the safety and ESD precautions listed at the beginning of this chapter.



3. Remove the top cover, *see Removing the Top Cover*.
4. Grip the bottom of the side panel (see Figure 5-2). Slide the side panel straight up about an inch until it stops.
5. Pull the side panel out and away from the chassis. Set the panel aside.

---

**Figure 5-2. System Side Panel****System side panel**

The left external side panel of the chassis is shown; procedure is the same for both side panels

**Installing a Side Panel**

1. Before replacing the side panel, make sure no tools or loose parts have been left inside the system chassis.
2. Make sure all option boards are firmly seated in their respective slots and that all interior cables are properly connected.
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 down toward the bottom of the chassis so the tabs firmly engage in the slots.
5. Install the top cover, *see Installing the Top Cover*, earlier in this Chapter.
6. To prevent unauthorized access inside the system, insert and lock a padlock through the loop at the back of the top cover.

**Note:** If your system is already set up, plug the system back in, reconnect the peripherals, and power on the peripherals and system.

## Removing a Board Support Panel

A metal panel supports the memory board and both processor boards. To remove a processor or memory board, you must remove its board support panel.



---

**Notice:** To prevent damage to the system board from a partially inserted processor or memory board 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 the support panels in place can damage system parts.

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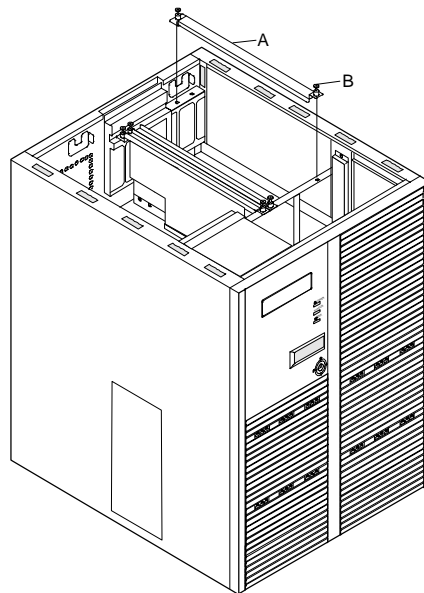
**Caution:** If the system has been running, any installed processor and heat sink on the processor board(s) will be hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

---

To remove the board support panel:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the top cover, *see Removing the Top Cover*, earlier in this Chapter.
3. Loosen the two thumb screws on the board support panel (Figure 5-3).
4. Remove the board support panel by pulling it out of the chassis. Set the board support panel aside.

**Figure 5-3. Removing Board Support Panel**



**Removing board support panel**

A Support panel

B Thumb screws (two total)

(structural details of panel not shown here)

## Installing a Board Support Panel

1. Place the board support panel in position so that the rear edge of the processor or memory board fits snug against the rubber cushion on the support panel (Figure 5-3).
2. Secure the support panel with its two thumb screws.
3. Reinstall the top cover.

## Memory Board

The following sections provide procedures for upgrading and configuring the memory board in your system. Topics covered include:

- Removing the Memory board
- Adding or removing DIMMs
- Installing the Memory board.

---

**Notice:** Electrostatic discharge (ESD) can damage add-in boards and other components; place them on an antistatic surface. Modify the memory board only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

---

### Removing the Memory 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 the processor/memory board, let the components cool for 10 minutes before continuing with the procedures described here.

---

1. Power off the system and remove the top cover as described earlier in this chapter.

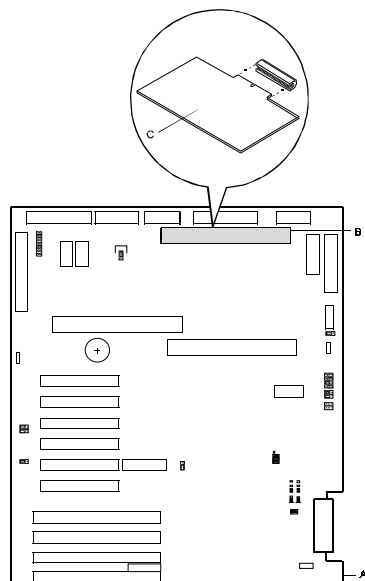
---

**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

2. Remove the memory board support panel described earlier in this chapter, *see Removing a Board Support Panel*.
3. Holding the board by its edges, carefully pull it out until the edge connectors are free (see Figure 5-4).
4. Store board in an antistatic protective wrapper if you are not installing or removing a DIMM at this time.

Figure 5-4. Memory Board

**Memory board connector on system board**

- A System board
- B Memory board connector
- C Memory board

## DIMMs

The memory board contains sixteen DIMM sockets (Figure 5-5) arranged in four banks. Each 168-pin socket can hold a single 72-bit DIMM module with 32MB, 64MB, 128MB, or 256MB of memory. When all sixteen sockets are populated, the memory board supports a maximum of 4GB of memory with 256MB DIMMs. DIMMs must be identical within a bank.

## Installing DIMMs

When properly installed, the DIMM module is oriented at an angle of 90 degrees relative to the memory board.

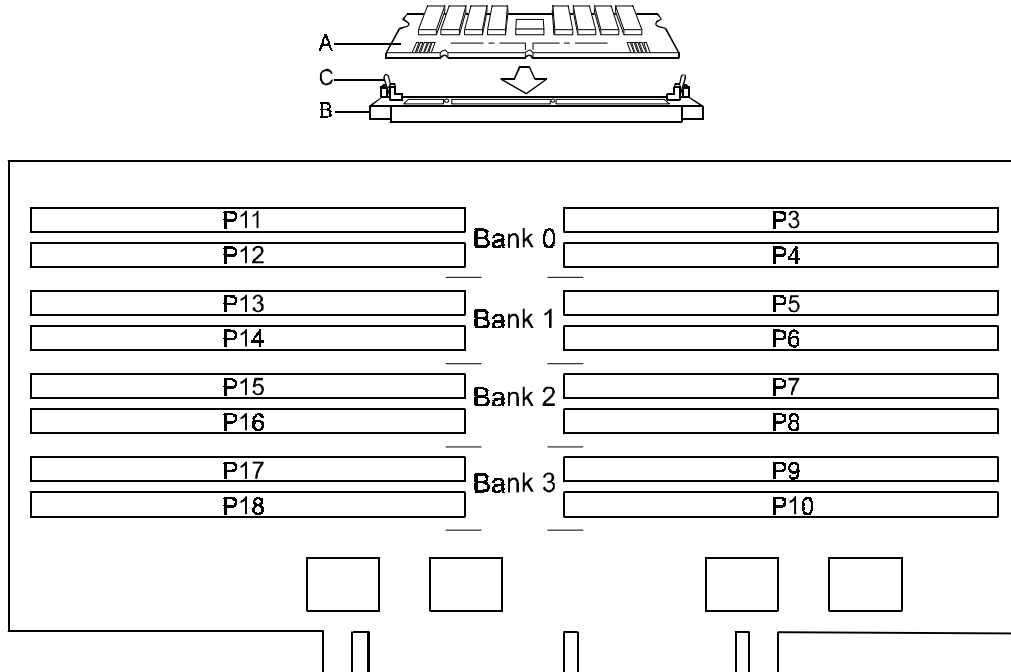
1. Remove the memory board as described earlier in this section.

---

**Notice:** Observe static precautions. Use an antistatic wrist strap. Hold DIMMs only by their edges.

---

2. Holding the DIMM module only by the edges, remove it from its antistatic package.

**Figure 5-5. Inserting Memory DIMMs**

3. DIMMs are keyed so they can only be inserted one way. Position the DIMM over the socket on the board (Figure 5-5, A and B). The notches in the bottom edge of the DIMM mates with the raised bumps in the DIMM socket.
4. Press down evenly on the DIMM until it seats correctly. The white levers on the sockets are not "tools" to aid in the insertion, only to keep the DIMM's in place and to aid in extraction. The levers should click in place once the DIMM is fully inserted.
5. Repeat the above steps to install any remaining DIMMs.
6. Install the memory board back into the system as described later in this chapter.

---

## Removing DIMMs

**Notice:** Use extreme care when removing a DIMM. Hold DIMMs only by their edges. Place them on an antistatic surface; do not slide them across any surface. Applying too much pressure can break the retaining clips or damage the socket slot. Apply only enough pressure on the retaining clips to release the DIMM.

1. Remove the memory board as described earlier in this section.
2. Remove the DIMM modules one at a time starting from the highest numbered sockets.
3. To remove each DIMM, gently spread the retaining clips (Figure 5-5, C) just enough so that you can pull the top edge of the DIMM away from the clips.
4. Carefully lift the DIMM away from the socket and store it in an antistatic package.
5. Repeat the above steps to remove the remaining DIMMs.
6. Install the memory board back into the system as described later in this chapter.

## Installing the Memory Board

This procedure assumes you are reinstalling the memory board you removed previously (see *Removing the Memory Board*).

1. Be careful not to touch components or gold edge connectors on the memory board as you remove it from its protective wrapper.
2. On the system board, locate the memory board connector (Figure 5-4, B).
3. Hold the memory board (see Figure 5-4, C) by its edges and start to insert it into the slot guides.



4. Do not press in on the board yet! Ease board into the slot guides until it is just touching the connector on the system board.



---

**Caution:** Before pressing the board firmly into the system board connector, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

---

5. Press the board carefully but firmly into the system board connector to seat the board.



---

**Caution:** Before applying power, do one more check. 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.

---

6. Replace the board support panel as described earlier in this chapter, see *Installing a Board Support Panel*.
7. Replace the top cover and turn on the power.

## Processor Board

The following sections provide procedures for upgrading and configuring the processor board in your system. Topics covered include:

- Removing the processor board
- Removing the processor board metal baffle
- Adding or removing processors
- Installing the processor board metal baffle
- Installing the processor board.

---

**Notice:** Electrostatic discharge (ESD) can damage add-in boards and other components; place them on an antistatic surface. Modify the processor board only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

---

## Removing the Processor Board



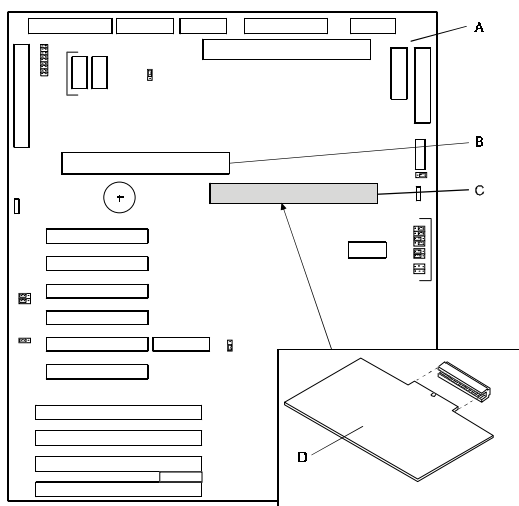
**Warning:** If the system has been running, any processor and heat sink already installed on the board will be hot. To avoid the possibility of a burn while removing the processor/memory board, let the components cool for 10 minutes before continuing with the procedures described here.

1. Power off the system and remove the top cover as described earlier in this chapter, *see Removing the Top Cover*.

**Notice:** Observe static precautions. Use an antistatic wrist strap.

2. Remove the processor board support panel described earlier in this chapter, *see Removing a Board Support Panel*.
3. Holding the board by its edges, carefully pull it out until the edge connectors are free (see Figure 5-6).
4. Store board in an antistatic protective wrapper if you are not installing or removing a processor at this time.

**Figure 5-6. Processor Board**



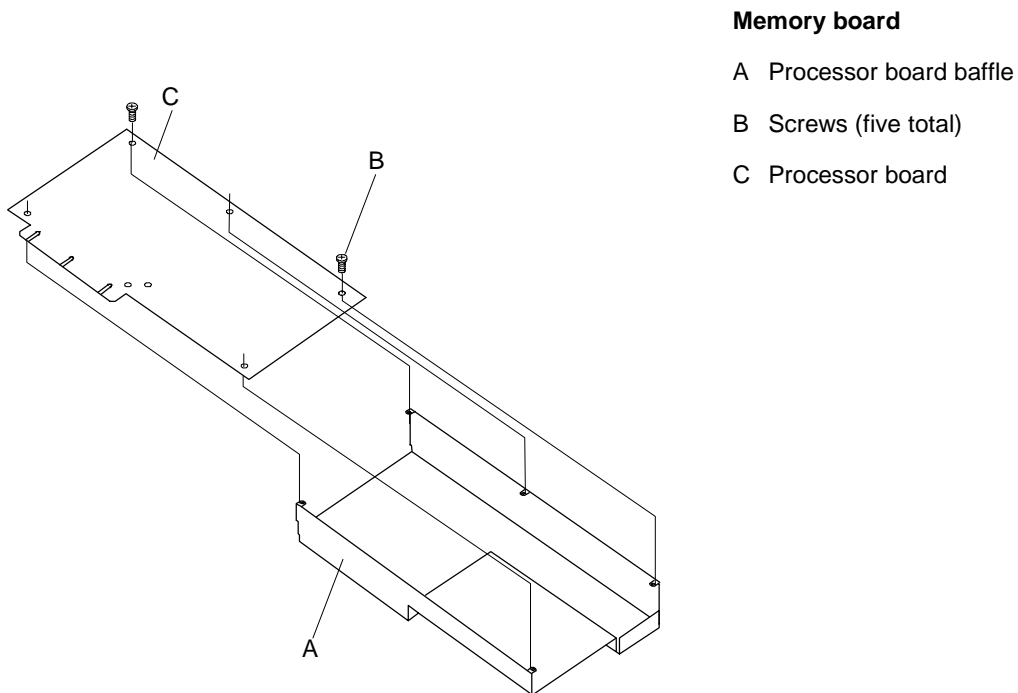
**Processor board connectors on system board**

- A System board
- B Processor #1 board connector
- C Processor #2 board connector
- D Processor board

## Removing the Processor Board Metal Baffle

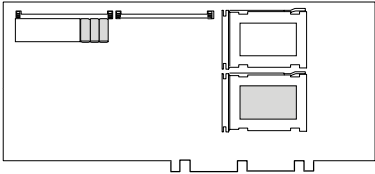
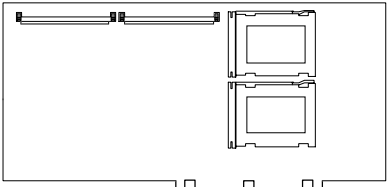
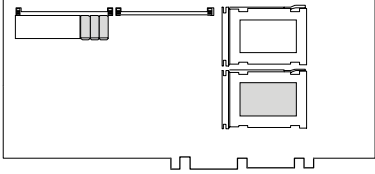
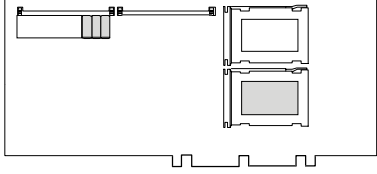
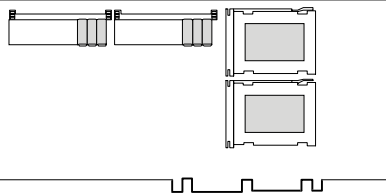
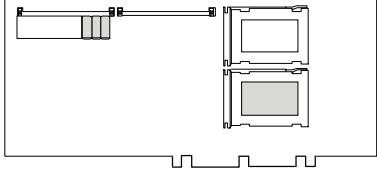
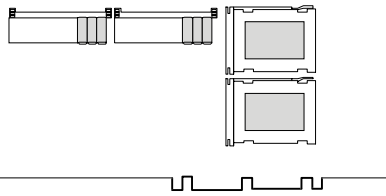
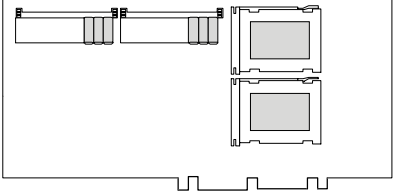
1. Remove the processor board from the system board as described earlier
2. Remove the five screws securing the metal baffle to the processor board (see Figure 5-7). Save the screws for reattaching the metal baffle.
3. Remove the metal baffle from the processor board. Set the metal baffle aside.

**Figure 5-7. Removing the Processor Board Metal Baffle**



## Pentium Pro Processor

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

CPU	CPU #1 connector on system board (P11)	CPU #2 connector on system board (P12)
1	1st processor board, one processor in lower socket: 	2nd processor board, no processors: 
2	1st processor board, one processor in lower socket: 	2nd processor board, one processor in lower socket: 
3	1st processor board, two processors: 	2nd processor board, one processor in lower socket: 
4	1st processor board, two processors: 	2nd processor board, two processors: 

## Installing a Processor

Figure 5-8 illustrates the location for the optional Pentium processor in your system. When adding another processor, use the same type and speed as the processors shipped with your system. Contact your sales representative.

---

**Notice:** Installing a another processor that is of a different type than the first processor, will result in system damage. Do not touch or bend the processor's exposed pins.

---

The processor upgrade kit contains a DC to DC converter board, processor chip, and heat sink. The heat sink has a heat transfer pad on the bottom and two attached retention clips. To install the second Pentium Pro processor upgrade kit:

1. Remove the processor board as described earlier in this section.
2. Remove the processor board metal baffle as described earlier in this section.

---

**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

3. Raise the lever on the ZIF socket to the up position (Figure 5-8, A).
4. Position the processor (C) over its ZIF socket (B) so that the processor pins align with the socket holes. Note that the pins get denser as they get closer to the lever on the ZIF socket.
5. Insert the processor pins into the socket. Apply pressure equally over the top surface of the processor until it seats in the socket. The processor should easily fit, do not force the processor into the socket.
6. Push ZIF socket lever (G) down until it snaps into the locked position.



### Removing a Processor

Refer to Figure 5-8 while performing the following procedures. To remove an Pentium processor:

1. Remove the processor board as described earlier in this section.
2. Remove the processor board metal baffle as described earlier in this section.

---

**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

3. Push on the heatsink retention clips to release the clips from the tabs on the ZIF socket.
4. Raise the lever on ZIF socket to the up position (Figure 5-8, A).
5. Grasp the opposite sides of the processor, apply equal upward force on each side and rock it from side to side until it releases.
6. Place microprocessor and heatsink in an antistatic package.
7. Push the lever on the ZIF socket down until it snaps into the locked position (Figure 5-8, G).
8. Move the processor jumper (Figure 5-8, H) from the 2-3 position (2 CPU) to the 1-2 position (1 CPU) if required.
9. Reinstall the processor board metal baffle as described later in this chapter.
10. Install the processor board back into the system as described later in this chapter.

---

## Installing the Processor Board Metal Baffle

This procedure assumes you are reinstalling the processor board metal baffle you removed previously (see *Removing the Processor Board Metal Baffle*).

1. Place the processor board in position on top of the metal baffle so that their screw holes line up (see Figure 5-7).

**Note:** The shape of CPU 1 baffle is different from the shape of the CPU 2 baffle.

2. Secure the metal baffle with five screws.
3. Install the processor board back into the system board as described earlier.

## Installing the Processor Board

1. Be careful not to touch components or gold edge connectors on the processor board as you remove it from its protective wrapper. Place board component-side up on an antistatic surface. If you need to set any of the processor board configuration jumpers, refer to the *Configuring System Board Jumpers* section in the *Configuring Your System* chapter.
2. On the system board, locate the processor board connector (Figure 5-6).
3. Hold the processor board (see Figure 5-6, D) by its edges and start to insert it into the slot guides.
4. Do not press in on the board yet! Ease board into the slot guides until it is just touching the connector on the system board.



---

**Caution:** Before pressing the board firmly into the system board connector, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

---

5. Press the board carefully but firmly into the system board connector to seat the board.





---

**Caution:** Before applying power, do one more check. 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.

---

6. Replace the board support panel as described earlier in this chapter, see *Installing a Board Support Panel*.
7. Replace the top cover and turn on the power.

## Modifying the System Board

The following sections provide procedures for upgrading and configuring the system board in your system. Topics covered include:

- Installing video memory
- Replacing the non-volatile memory
- Replacing the real-time clock battery.

---

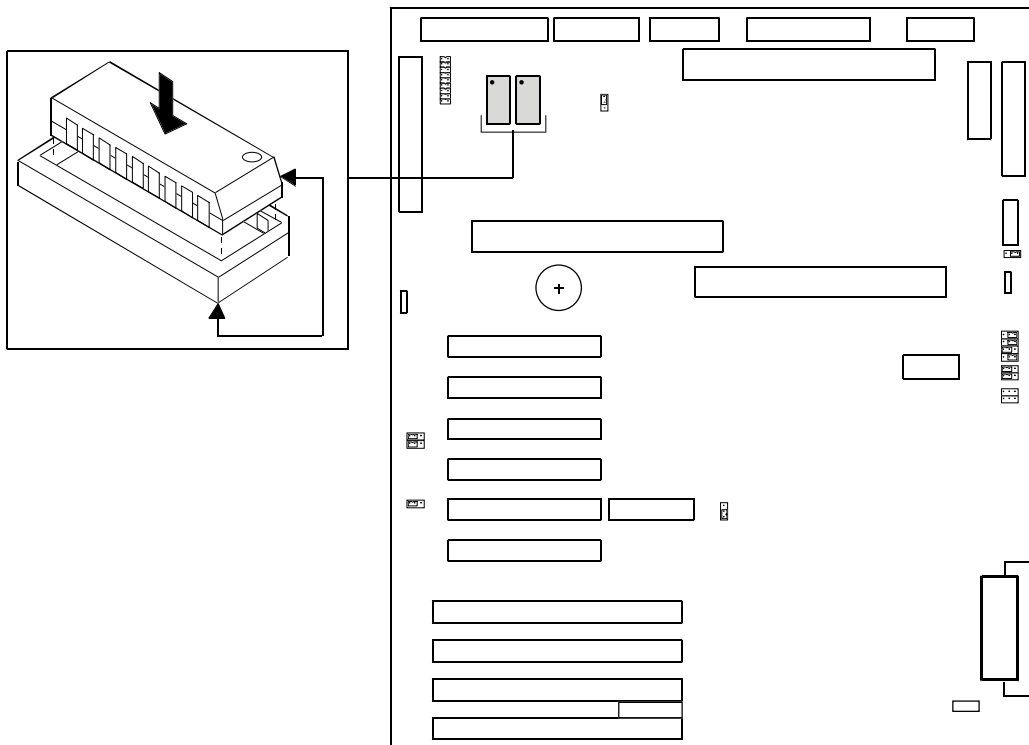
**Notice:** Electrostatic discharge (ESD) can damage add-in boards and other components; place them on an antistatic surface. Modify the baseboard only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

---

## Video Memory

The base system includes two 512K video memory modules and two sockets on the system board. If you add two additional 512K video memory modules into the sockets shown in Figure 5-9, the base video memory size is increased from 1 MB to 2 MB.

**Figure 5-9. Video Memory Location**



### Installing Video Memory

---

**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

1. If the system is on, power off the system and remove the top cover as described earlier in this chapter.
2. To gain access to the video sockets, remove the memory board, refer to *Removing the Memory Board* earlier in this chapter.
3. Align the beveled edge of the video memory module with the notched corner of the video memory socket. Refer to Figure 5-9 for the video memory socket location.
4. Press the video memory module down firmly until it is fully seated in its socket.
5. Reinstall the memory board that was removed in step 2, refer to *Installing the Memory Board* earlier in this chapter.
6. Replace the top cover and power on the system.

### Non-Volatile Memory

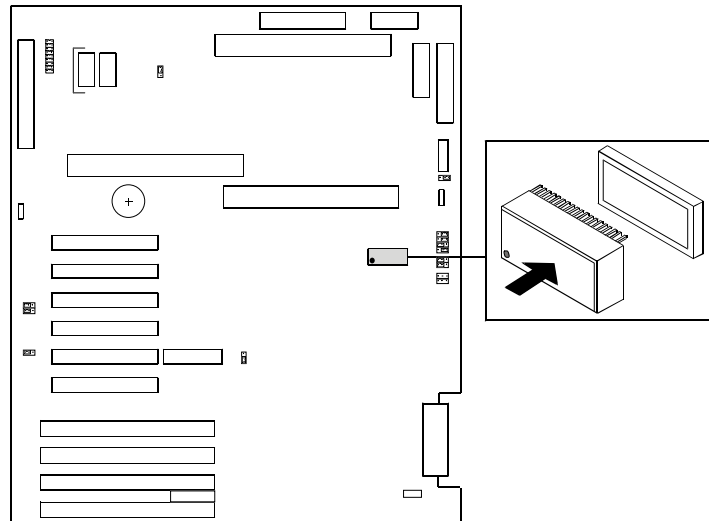
You may need to replace the non-volatile memory because of its internal integral lithium battery life span. Contact your sales representative or dealer for a list of approved devices. Its located on your system board as shown in Figure 5-10. Notice the dot on the chip. This dot will assist you in correctly positioning the chip on the system board.



---

**CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists. Do not expose the component to excessive heat or fire. Keep all batteries away from children.

---

**Figure 5-10. Non-Volatile Memory Location**

### Replacing the Non-Volatile Memory

---

**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

1. Power off the system and remove the top cover as described earlier in this chapter.
2. If the non-volatile memory is secured by a tie-wrap, remove the tie-wrap. Using an IC removal tool or a small pointed tool, gently pry up each end of the non-volatile memory and pull it straight up out of its socket (Figure 5-10).
3. Position the new chip over its socket so the dot is properly oriented. Carefully insert the chip into its socket connectors.
4. Press down on the chip until it is firmly seated in its socket.
5. Replace the top cover and turn on the system.
6. Run the BIOS SETUP and SCU to restore proper configuration settings.

## Real-time Clock Battery

You may need to replace the real-time clock (RTC) battery because of its battery life span. The battery powers the clock 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.

The battery (Vendor Part No. CR2450) is a commodity part available through many vendors. Its located on your system board as shown in Figure 5-11. Notice the plus (+) sign on the battery. This sign will assist you in correctly positioning the battery on the system board. Contact your sales representative or dealer for a list of approved devices.

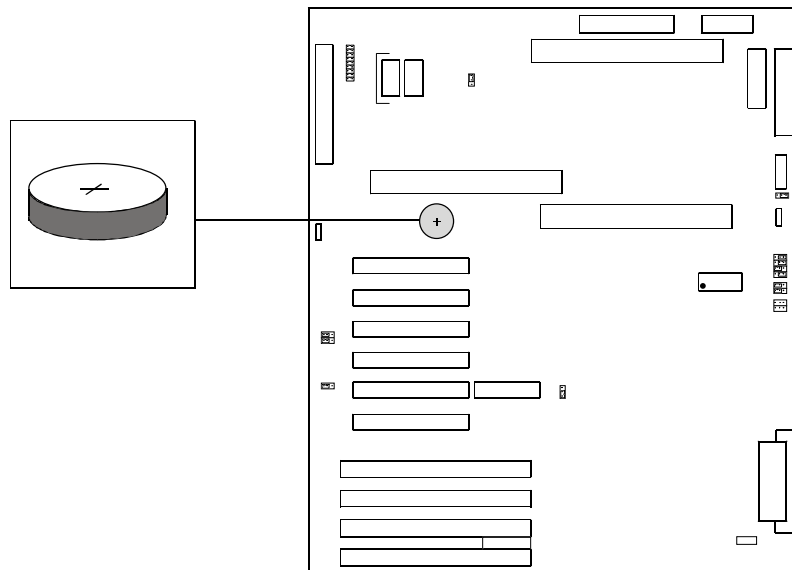


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**CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists. Do not expose the component to excessive heat or fire. Keep all batteries away from children.

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Figure 5-11. Location of the Real-Time Clock Battery



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## Replacing the Battery

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**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

1. Power off the system and remove the top cover as described earlier in this chapter.
2. To gain access to the battery, remove the processor boards, refer to *Removing the Processor Board* earlier in this chapter.
3. Using your finger nail or a small pointed tool, gently push the battery toward the left and pry the battery out of its socket. Refer to Figure 5-11 for the socket location.
4. Position the new battery over its socket so the plus (+) sign on the battery is facing up.
5. Carefully insert the left edge of the battery into the socket connector and gently push the battery into the socket.
6. Press down on the battery until it is firmly seated in its socket.
7. Reinstall the processor boards that were removed in step 2, refer to *Installing the Processor Board* earlier in this chapter.
8. Replace the top cover and turn on the system.
9. Run the BIOS Setup or SCU to restore configuration settings to the real-time-clock.

## Option Boards

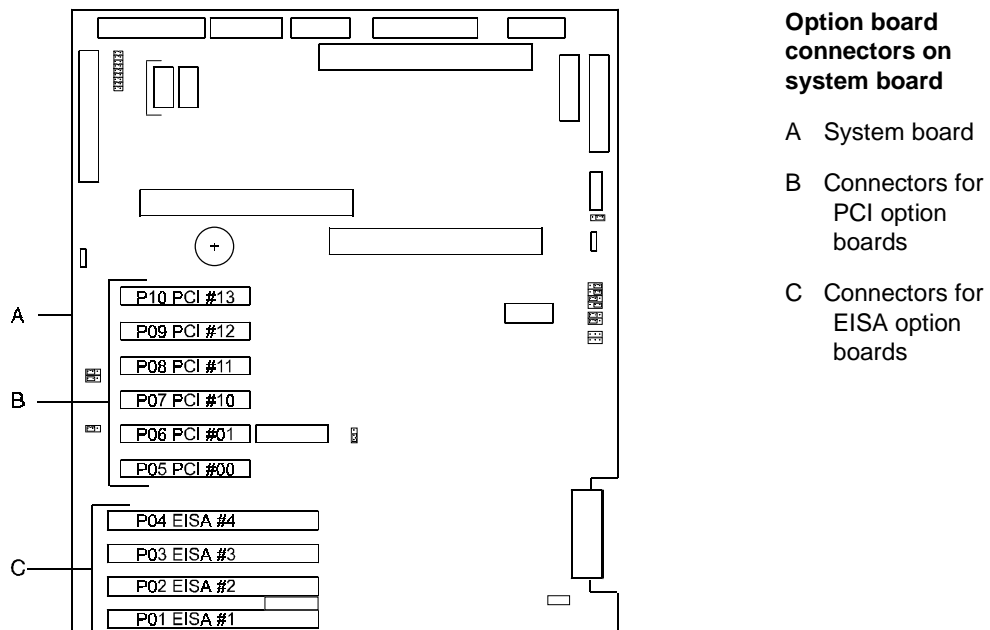
This section describes how to install and remove EISA/ISA and PCI option boards. The system board has four dedicated EISA/ISA bus master expansion slots and six dedicated PCI bus master expansion slots (see Figure 5-12).

**Note:** The top PCI slot P10 is restricted to a short PCI option board because of the CPU No.2 baffle.

The high-performance PCI local bus allows the adoption of newer networking technology, such as ATM and 100 Mb/second Ethernet NICs, with a minimum of effort and without concern for I/O bottlenecks. The PCI local bus offers up to 133 MB/second bandwidth.

This combination of PCI and EISA expansion offers continuing support for existing special function EISA add-in boards, such as X.25 Multiport Serial cards.

Figure 5-12. PCI and EISA Slot Locations



## Installation Considerations

Newer adapters, designed for Plug-and-Play systems, are automatically configured by the system without any user intervention. Older ISA and EISA adapters must be manually configured as detailed below. Once the manual configuration is complete, the Plug-and-Play adapters are configured around the manually configured adapters without causing any resource conflicts.

- **ISA Adapters** - These adapters can be Plug-and-Play. ISA adapters that are not Plug-and-Play must be manually configured following the instructions supplied with the board. The configuration is defined to the system by creating the ISA configuration file when running the SCU. For details on running the SCU, refer to Chapter 4.

**Note:** The configuration files for boards supplied with your server have already been included on the SCU diskette.

- **EISA Adapters** - Copy the configuration files (.CFG) and, if supplied, the overlay file (.OVL), to the SCU diskette. For details on running the SCU, refer to Chapter 4.

Consider the following points when installing option boards:

- Any EISA slot can be used with a bus mastering adapter.
- EISA bus priority is slot P01 - P04, slot P01 having the highest priority. See Figure 5-12 for EISA slot numbers.
- PCI bus priority is slot P05 - P10, slot P05 having the highest priority. See Figure 5-12 for PCI slot numbers.



- On system power-up and reboot, BIOS initiates a scan sequence looking for Plug-and-Play option boards installed since the last power up or reboot. The Plug-and-Play scan sequence is as follows:

First - BIOS scans for any Plug-and-Play ISA option board installed in slots P01 - P04, starting with slot P01.

Second - BIOS scans for any Plug-and-Play PCI option board installed in slots P05 - P10, starting with slot P05.

Always install option boards in the first available slot in the scan sequence. As an example, if there are ISA or EISA option boards installed in slots P01 and P02 of your system and slots P03 and P04 are vacant, install your Plug-and-Play option board into slot P03.

## **Controller/Adapter Hardware Configurations**

Table 5-1 lists option boards you may add to your system and provides information on slot location.

**Table 5-1. Option Board Hardware Configurations**

OPTION BOARD	IRQ <sup>3</sup>	MEMORY ADDRESS	I/O ADDRESS	OPTION SLOT
DigiBoard (1st)	Not Required	D0000	200	EISA Slot P01
DigiBoard (2nd)	Not Required	D0000	220	EISA Slot P02
SMC 8432BTA (1st) <sup>4</sup>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P07
SMC 8432BTA (2nd) <sup>4</sup>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P08
SMC 9332BDT (1st) <sup>4</sup>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P07
SMC 9332BDT (2nd) <sup>4</sup>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P08
Adaptec 2940UW <sup>2</sup>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P06 <sup>5</sup>
Mylex DAC960PDU <sub>2</sub>	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot P05
Onboard 7880 SCSI	Set by BIOS	Set by BIOS	Set by BIOS	N/A <sup>2</sup>
Onboard 7860 SCSI	Set by BIOS	Set by BIOS	Set by BIOS	N/A <sup>2</sup>

1. PCI slot P10 is limited to short PCI option boards because of the CPU #2 baffle.
2. For disk controllers plugged into slots and the onboard disk controllers, the sequence for BIOS scanning to determine the primary (Boot) disk controller is:

Onboard 7880 SCSI (primary PCI bus)  
 Onboard 7860 SCSI (primary PCI bus)  
 PCI slot P05 and P06 (primary PCI bus)  
 PCI slot P07 through P10 (peer PCI bus)  
 EISA slots P01 through P04.

It is recommended that the BIOS be disabled on all SCSI controllers except for the controller with the boot disk drive attached (see The SCSISelect Utilities in the Configuring Your System chapter. This saves memory address resources and provides control over the boot device independent of board slot locations.

3. Additional IRQ's can be made available as follows:
  - Disabling Comm Port 1 = IRQ4 is available
  - Disabling Comm Port 2 = IRQ3 is available
  - Disabling Parallel Port = IRQ7 is available.
4. A maximum of five LAN channels consisting of any combination of single or dual channel. Install EISA LAN card in the first available EISA slot from the bottom. Install PCI LAN card in the first available PCI slot from the bottom.
5. A maximum of two SCSI controllers may be installed. Install the first controller card in the bottom PCI slot and the second controller in the second from the bottom PCI slot.

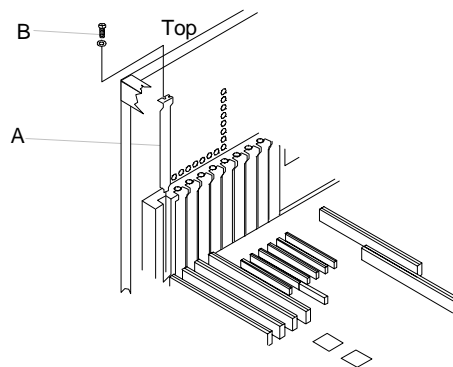
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## Installing an Option Board

**Note:** Before installing an ISA non-plug and play option board run the SCU and configure the resources required by the option board.

1. Power off the system and remove the top cover as described earlier in this chapter.
2. Observe the safety and ESD precautions at the beginning of this chapter.
3. Remove and save the expansion slot screw and cover (Figure 5-13).

**Figure 5-13. Removing the Expansion Slot Screw and Cover**



A Expansion slot cover

B Expansion slot screw

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**Notice:** Observe static precautions. Use an antistatic wrist strap.

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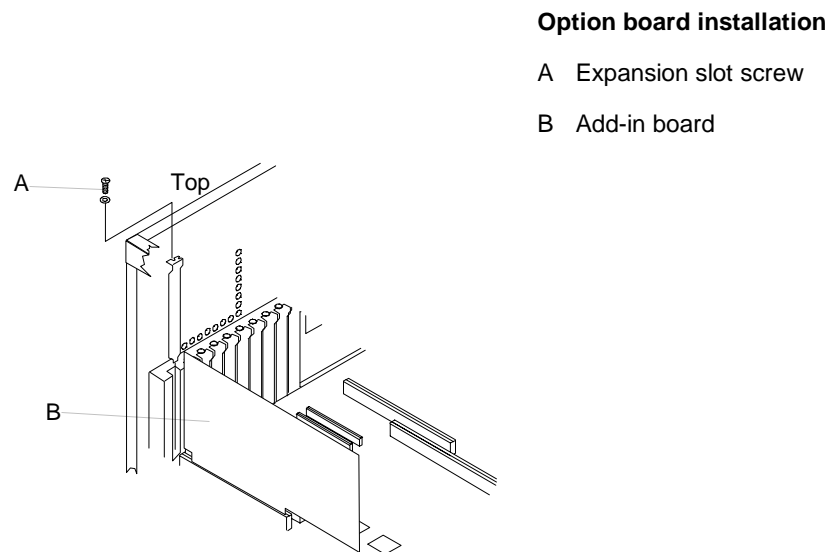
4. Remove the option board from its protective wrapper, holding the board only by the edges. Do not touch the board components or the gold connectors.

5. Record the option board serial number in the equipment log.
6. Set any board jumpers or switches as described in the documentation that comes with the option board.

**Note:** Refer to the documentation accompanying the option board for information on whether the board is to be installed in a PCI or EISA expansion slot.

7. Refer to Table 5-1 to determine the recommended option board slot assignment and configuration parameters. Refer to Figure 5-12 to determine system board slot locations.
8. Holding the board by its top edge or upper corners, firmly press the board into an expansion slot on the system board. The tapered foot of the option board retaining bracket must fit into the mating slot in the expansion slot frame (Figure 5-14).

**Figure 5-14. Installing an Option Board**



9. Align the rounded notch in the retaining bracket with the threaded hole in the expansion slot frame. The retaining bracket fits into the space that was occupied by the expansion slot cover.
10. Reinstall the screw in the threaded hole. Be sure to push the bracket slot up against the screw before you tighten it. If this is not done, the bracket may interfere with an adjacent bracket.
11. If you have installed a SCSI host adapter board, go to Appendix A for procedures on cabling these boards into the system. For all other boards, continue with step 12.
12. Connect any external cables (if they are needed) to the installed option board.
13. Replace the top cover, power on the system, and run the SCU if you have installed any EISA option boards.

## Removing an Option Board

**Note:** Expansion slot covers must be installed on all vacant slots to maintain the electromagnetic emissions characteristics of the system and to assure proper cooling of the system components.

1. Power off the system and remove the top cover as described earlier in this chapter.
2. Observe the safety and ESD precautions at the beginning of this chapter.
3. Disconnect any cables attached to the option board you are removing.
4. Remove and save the option board retaining bracket screw.
5. Hold the board at each end, and carefully rock it back and forth until the edge connectors pull free. Make sure that you do not scrape the board against other components.
6. Remove the board from the expansion slot and place it in an antistatic wrapper.
7. If you are replacing a board, go to "Installing an Option Board" earlier in this chapter, otherwise continue.
8. Install an expansion slot cover over the vacant slot using the previously removed screw.
9. Replace the top cover and power on the system.
10. If you removed an EISA/ISA option board, run the SCU to configure the system as described in the *Configuring Your System* chapter.

## Power Supply Module

The following sections provide procedures for removing and installing a power supply module.

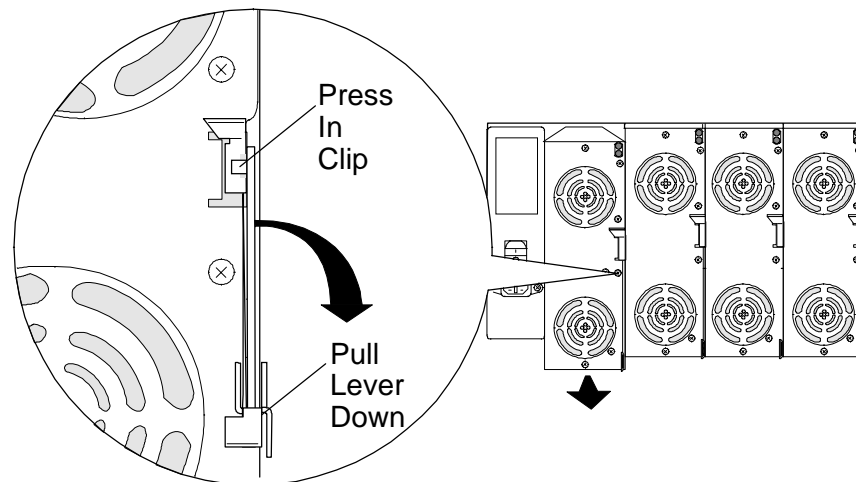
### Removing a Power Supply Module

If the amber LED on a power supply module is lit, the power supply module can be hot swapped. If the amber LED on a power supply module is not lit, it is recommended that power to the system be turned off, before removing the power supply module.

To remove a power supply module, perform the following steps (see Figure 5-15).

1. Press the locking clip on the release-handle with your thumb.
2. Pull the release-handle down with your index fingers.
3. Remove the power supply module.

**Figure 5-15. Removing a Power Supply Module**



## Installing a Power Supply Module

1. Before installing the power supply module pull the release-handle down.
2. Slide the new or replacement power supply module into the chassis until the power supply module release-handle is almost closed (upright position).
3. Push the power supply module release-handle up and in until the power supply module slides in further and locks in place.
4. If removed, connect the AC power cord to the back of the power supply cage.
5. If OFF, set the main AC power switch to its ON position. The main AC power switch is located at the top of the power supply cage.



## Installing or Swapping a Disk Drive in a Hot-swap Bay

This procedure describes installing a new drive in or swapping out a faulty drive from one of the twelve hot-swap drive bays. The 3 1/2-inch SCSI drives must use the industry standard 80-pin Single Connector Attachment (SCA) connector. Each drive must be installed in a carrier.

**Note:** To order a carrier contact your sales representative or dealer.

- If installing new drives, follow an alternating installation scheme between the two backplanes starting with the bottom left drive. Fill the bays left to right, across a row, and then move up 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. Follow the procedure described in this section to remove the faulty drive and swap in a good one.

**Note: 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 because a Redundant Array of Independent Disks (RAID) controller module is installed and only for the drive/carrier assemblies in the hot-swap bays, *not for drives in any other bays.*

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**Notice:** 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. 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.**

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**Notice:** When the SCSI drive fault LED indicates a drive fault (steady yellow light), 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 drive.

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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 six drive bays. Refer to “Status LED Indicator Descriptions” in Chapter 2.

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.

## Installing or Swapping a Hard Drive

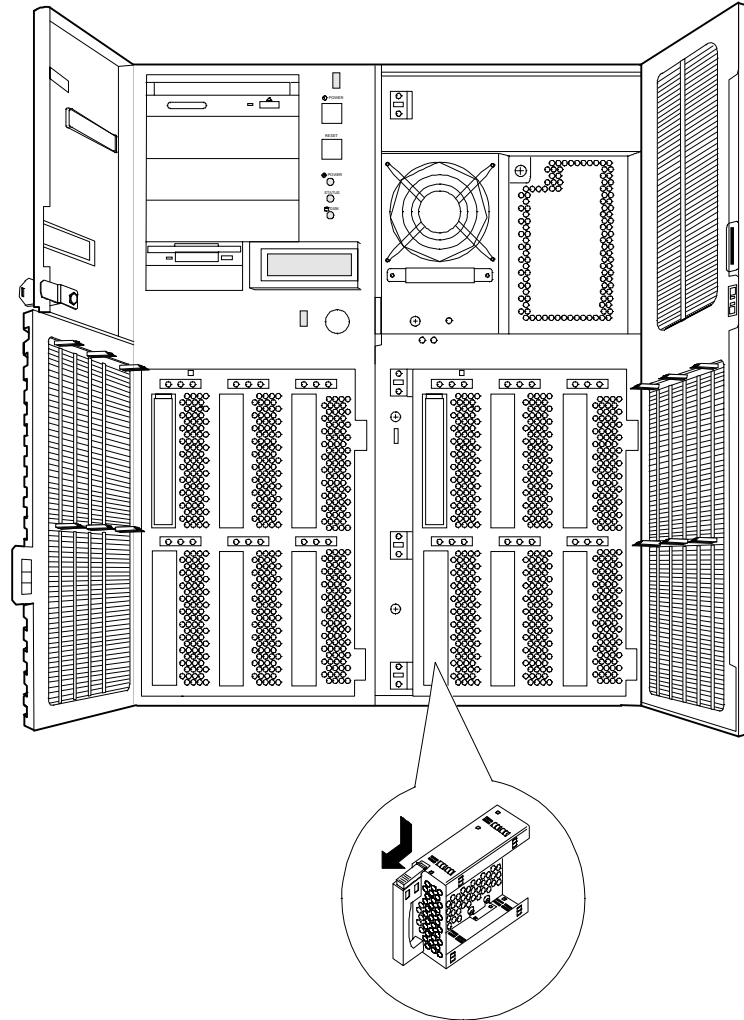
1. Observe the ESD caution and the notes listed at the beginning of this section.
2. If locked, unlock and open the upper left front exterior door.
3. Open the front right exterior door and lower left exterior door (see Figure 5-16).
4. Open the EMI metal panel by turning its two thumb lock screws counter clockwise.
5. Grasp the handle of the hard disk’s carrier and press down on its thumb-release button (see Figure 5-16).
6. If you are removing a faulty drive, check all the drive LEDs to confirm which drive to remove. Refer to “Status LED Indicator Descriptions” in Chapter 2.

---

**Notice:** Depending on the drive fault, the drive may be still spinning when you remove it. Follow the next step exactly when removing drives.

---

Figure 5-16. Disk Drive in Hot-swap Bay



7. Pull the faulty drive out of the bay far enough to disengage the drive connector from the backplane. Wait 30 seconds until the drive spins down, then remove the drive from the drive bay.

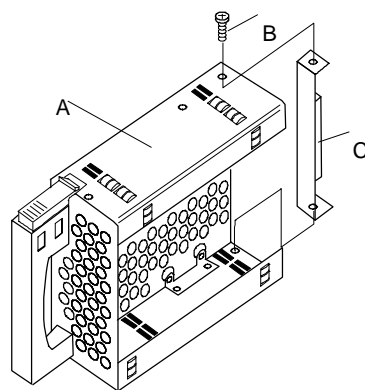
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**Notice:** Observe static precautions. Use an antistatic wrist strap.

---

8. Remove the new drive from its protective wrapper, and place on an antistatic surface.
9. Record the drive model and serial numbers in the equipment log.
10. Position the drive so its SCA connector is near the top surface of the drive. Place drive on the antistatic surface again.
11. Slide the drive into the carrier with its SCA connector facing toward the open end of the carrier if swapping drives (reuse the carrier from the faulty drive). Otherwise, the carrier's shipping bracket must be removed before installing the drive into the carrier (see Figure 5-17). To remove the shipping bracket remove the two screws securing it to the carrier and remove the shipping bracket.
12. While holding the drive in the carrier with your left hand, align the drive's screw holes with the carrier's screw holes and insert the four screws of appropriate size and length (see Figure 5-18).
13. Align drive/carrier assembly so it engages the guide rails in the bay.
14. Gently push the assembly into the bay until the drive docks with the backplane connector and locks in place.

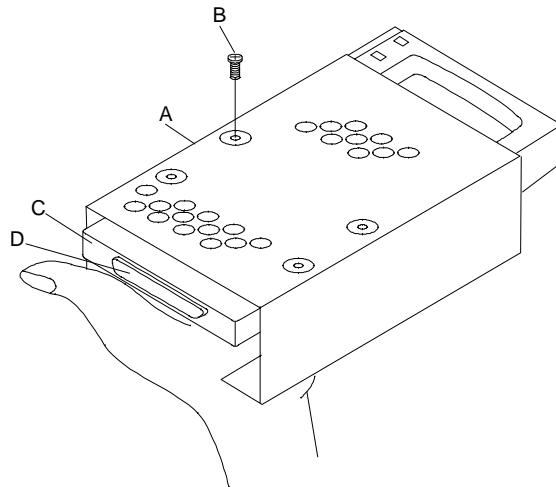
**Figure 5-17. Removing the Carrier's Shipping Bracket**



**Removing the carrier's shipping bracket**

- A Carrier
- B Two screws
- C Shipping bracket

**Figure 5-18. Installing Hard Disk in Carrier**



**Installing 3 1/2inch hard disk drive in carrier for hot-swap bays**

- A Carrier
- B Four screws
- C Hard disk drive
- D SCA connector

15. Close the EMI metal panels, and secure with the two thumbscrews.

16. Close the front exterior panels.

## Removable Media Devices and Diskette Drives

A CD-ROM reader is always mounted in bay A. SCSI removable media devices can be installed in peripheral bays B, C, and D. SCSI devices should be installed in the first available bay from the top (bay A). Figure 5-19 illustrates the recommended removable media configuration. These bays are intended to hold tape, CD-ROM, or other removable media drives. Narrow SCSI drives in the 5 1/4-inch bays receive control signals from a fast/narrow SCSI-2 controller on the system board.

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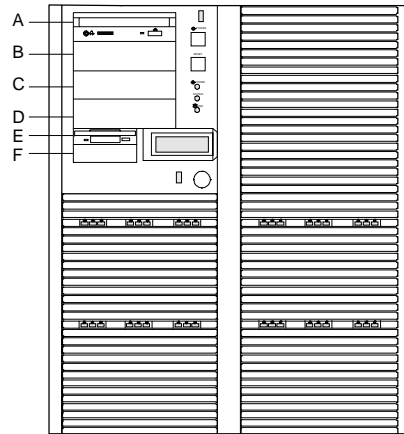
**Notice:** The SCSI termination resistors must be installed in the last SCSI drive of the daisy chain cabling (top media bay A). All other devices must have terminators removed.

---

Hard disk drives cannot be installed in a 5 1/4-inch external bay because the drive generates EMI, is more susceptible to ESD, and would not have sufficient cooling.

A 1.44 MB diskette drive is always mounted in bay E. A second 3 1/2-inch device can be installed in bay F.

Figure 5-19. Removable Media and Diskette Device Bays



#### Removable Media and Diskette Device Bays

- A CD-ROM reader
- B 5 1/4-inch expansion bay
- C 5 1/4-inch expansion bay
- D 5 1/4-inch expansion bay
- E 1.44 MB diskette
- F 3 1/2-inch expansion device bay

<p><b>Bay A</b>          CD-ROM (SCSI address 5), always installed.          Device must have the internal SCSI terminators <b>installed</b>.</p>
<p><b>BAY B</b>          Second CD-ROM (SCSI address X).          QIC Tape (SCSI address 2).          DAT Tape (SCSI address 6).          Device must have the internal SCSI terminators <b>removed</b>.</p>
<p><b>Bay C</b>          Third CD-ROM.          QIC Tape (SCSI address 2 or address 6 if no DAT).          DAT Tape (SCSI address 6 or address 2 if no QIC).          Device must have the internal SCSI terminators <b>removed</b>.          1.44 MB Diskette drive option.</p>
<p><b>Bay D</b>          QIC Tape (SCSI address 2 or address 6 if no DAT).          DAT Tape (SCSI address 6 or address 2 if no QIC).          Device must have the internal SCSI terminators <b>removed</b>.          1.44 MB Diskette drive option.</p>
<p><b>Bay E</b>          1.44 MB diskette drive (always installed).</p>
<p><b>Bay F</b>          Second 3 1/2-inch device.</p>

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## Installing a 5 1/4-Inch Device or 3 1/2-Inch Diskette Drive



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**Caution:** CD-ROM devices contain a laser system and are classified as ©CLASS 1 LASER PRODUCTS. To use these devices properly, thoroughly read the documentation provided by the CD-ROM manufacturer, and keep the documentation for future reference. In case of any trouble with a CD-ROM, please contact your nearest service representative. To prevent direct exposure to the laser beam, do not try to open the enclosure.

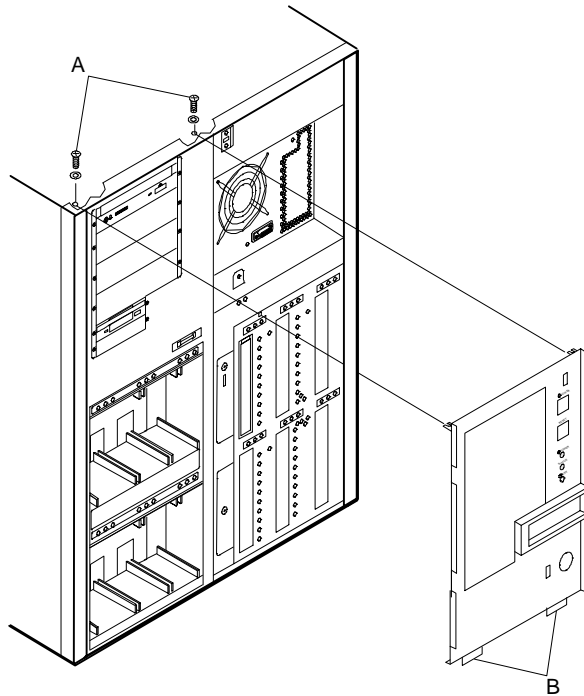
Use of controls or adjustments or performance of procedures other than those specified in the CD-ROM manufacturer's documentation may result in hazardous radiation exposure.

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**Note:** If you are replacing a diskette drive in Bay E or installing a diskette drive in bay F, use the internal diskette drive cables provided with the system. If you are installing a SCSI device in bays B, C, and D, you must use the internal SCSI cables. Contact your sales representative or dealer for a list of approved optional peripheral devices.

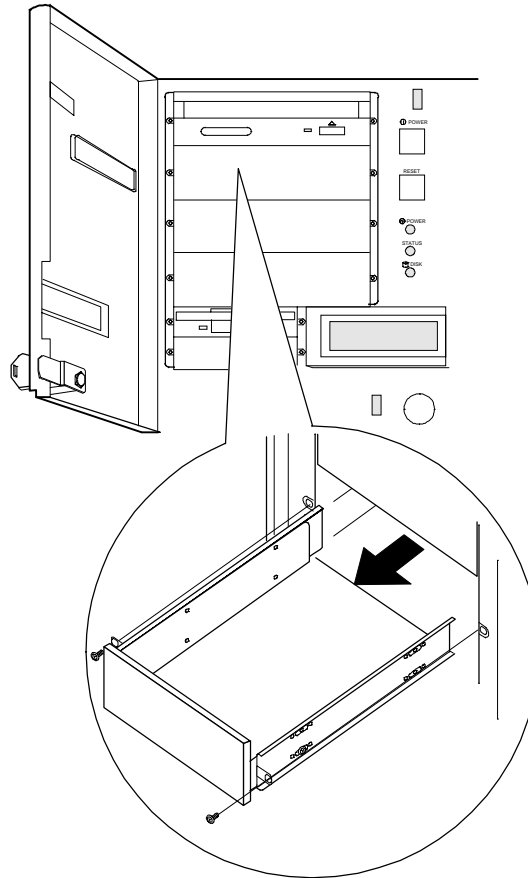
1. Power off the system and remove the top cover described earlier in this chapter.
2. Observe the safety and ESD precautions listed at the beginning of this chapter.
3. Unlock and open the top left exterior door.
4. Each empty media or diskette drive bay has a blank panel tray. To remove a blank panel tray from the chassis, you must first remove the device bay frame from the front of the chassis. To remove the frame, first remove the two screws located on the top of the frame (Figure 5-20).
5. Carefully remove the device bay frame from the chassis by pulling its top slightly out away from the chassis and then up and out of the hinge tabs at the bottom edge of the frame.



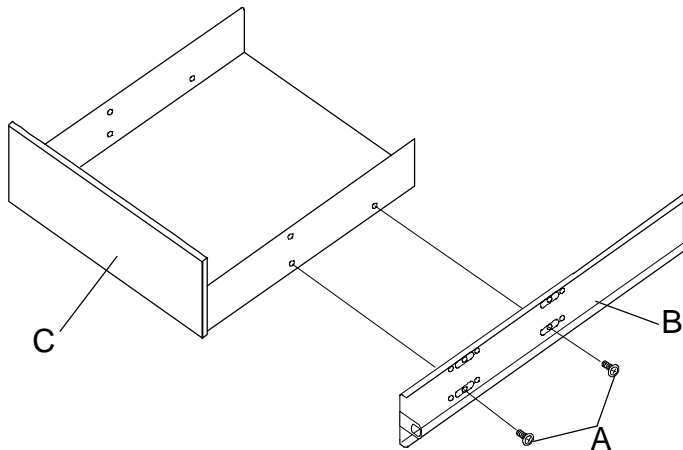
**Figure 5-20. Removing Device Bay Frame****Removing device bay frame from the media and diskette drive bays**

- A Two screws that secure the device bay frame to the front of the chassis
- B Two frame hinge tabs that hold the device bay frame to the chassis

6. Place the frame face down on a soft surface to prevent marring it.
7. From the bay where you want to install a drive, remove the two drive rail locking screws that secure the blank panel tray to the bay and slide the tray out of the bay (Figure 5-21).
8. Remove the two screws securing each side rail to the blank panel tray (Figure 5-22).

**Figure 5-21. Removing Blank Panel Tray**

9. Save the blank panel tray and screws to reuse if you remove a drive from a bay later and do not reinstall one.
10. Remove the device from its protective wrapper and place it on an antistatic surface. Record the drive model and serial number in the equipment log.

**Figure 5-22. Removing Side Rails with Locking Tabs****Removing side rails with locking tabs from a blank panel tray**

- A Screws
- B Side rails
- C Blank panel tray

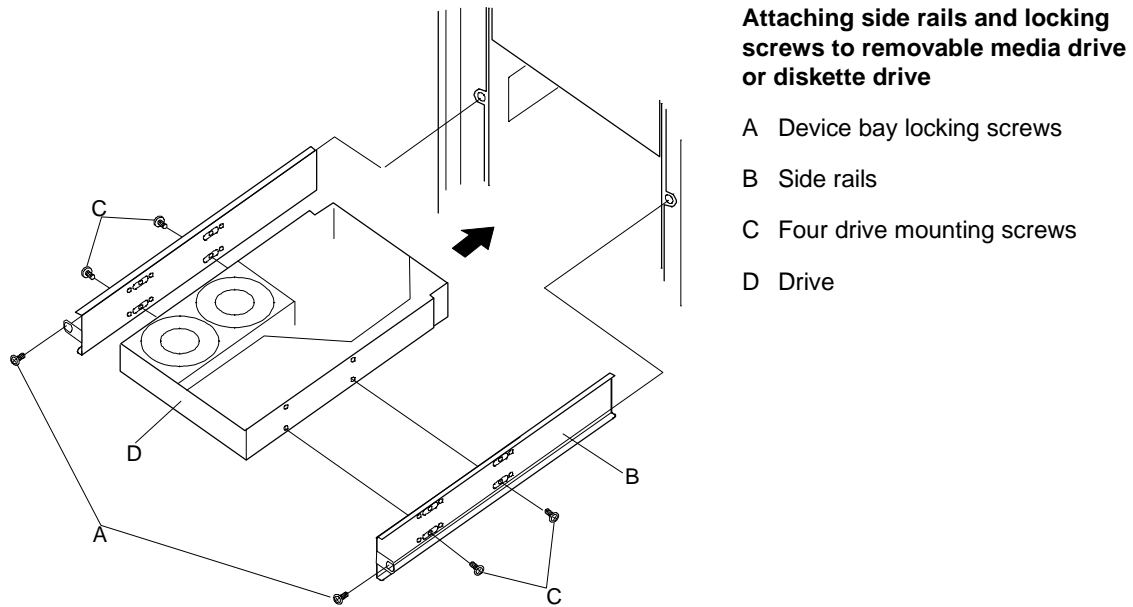
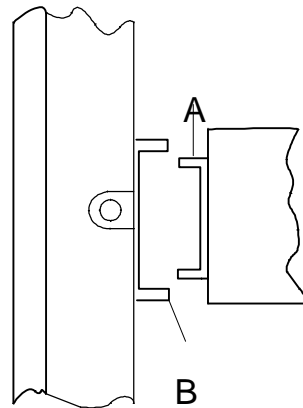
11. Set any device jumpers or switches on the device. Refer to the installation procedures that came with the device.

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**Notice:** SCSI termination resistors for the 5 1/4-inch devices must be installed in the last SCSI device of the daisy chain cabling (top media bay A). All other 5 1/4-inch devices must have terminators removed.

---

12. Using the four screws supplied with the drive, reinstall the side rails just removed from the blank panel tray (Figure 5-23, A). Attach the rails to each side of the device (C) by using only the bottom screw holes, as shown. The rails for each side of the device are identical.
13. Insert the device side bay rails into the bay guide rails (see Figure 5-24). Ensure that the device side rails (see Figure 5-24, A) are inside the bay guide rails exactly as shown in Figure 5-24, B.
14. Push the drive into the bay (see Figure 5-21, C).
15. Reinstall the two drive rail locking screws.

**Figure 5-23. Attaching Side Rails and Locking Screws to a Device****Figure 5-24. Engaging the Device Side Rails to the Bay Guide Rails**

16. Connect a power cable to the back of the drive (see Figure 5-25).

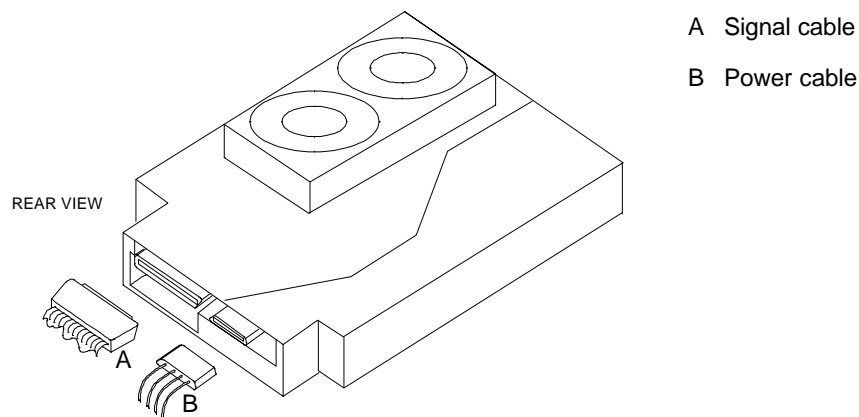
**Note:** For 5 1/4-inch devices power cables are provided in the chassis for removable 5 1/4-inch media drives (including the CD-ROM that is factory-installed). These power cables are interchangeable for 5 1/4-inch devices only; you can connect any one of them to any device you install in the 5 1/4-inch media bays. The connectors are keyed and can be inserted in only one way.

For 3 1/2-inch diskette drives power cables are provided in the chassis (including the diskette drive that is factory-installed). The connectors are keyed and can be inserted in only one way.

17. Connect the ribbon data cable (Figure 5-25) to the device; the connector is keyed and can be inserted only one way.

**Note:** For the 5 1/4-inch media devices be certain that you are using the 50-pin SCSI data cable. This cable comes from the system board to the removable media bays and ends at the CD-ROM reader in bay A. Do not confuse this cable with the 34-pin diskette drive cable which begins on the system board and ends at the diskette drive in bay E.

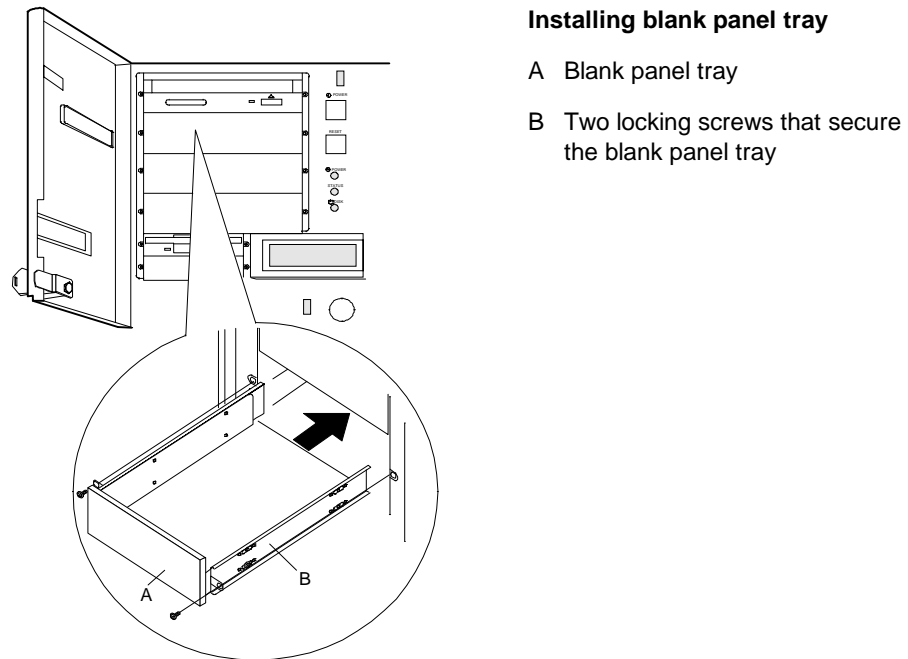
**Figure 5-25. Installing Device Cables**



18. Reinstall the drive bay frame, top cover, and power on the system. It may be necessary to run the SCU as described in the *Configuring Your System* chapter.

### **Removing a 5 1/4-Inch Device or 3 1/2-Inch Diskette Drive**

1. Power off the system and remove the top cover as described earlier in this chapter.
2. Observe the safety and ESD precautions listed at the beginning of this chapter.
3. Remove the device bay frame, refer to *Installing a 5 1/4-Inch Device or 3 1/2-Inch Diskette Drive* as described earlier in this chapter.
4. Disconnect the signal and power cables from the back of the drive that you want to remove.
5. Remove the drive rail locking screws and slide the drive out the front of the bay, and place it on an antistatic surface.
6. Remove and save the side rails and locking screws.
7. Place drive in an antistatic wrapper.
8. To cover an empty bay, install a blank panel tray in the bay.(Figure 5-26).
9. Attached the side rails and locking screws just saved to a reusable blank panel tray previously removed.
10. Engage the blank panel tray side rails into the bay guide rails (see Figure 5-24). Ensure that the blank panel tray side rails (see Figure 5-24, A) are inside the bay guide rails (see Figure 5-24, B).

**Figure 5-26. Adding Blank Panel Tray**

11. Push the blank panel tray into the bay (Figure 5-24).
12. Replace the side rail locking screws.
13. Reinstall the device bay frame, the top cover, and power on the system.
14. Power on the system and remove the drive serial number from the equipment log. It may be necessary to run the SCU as described in the *Configuring Your System* chapter.

## Swapping Out a Fan Module

This procedure describes swapping out a faulty fan module from one of the five hot-swap fan bays.

The system has five hot swappable fan modules housing a total of eight fans (a single fan in two modules and two fans in three modules). The failed fan module can be easily removed or replaced without turning power off. Each fan module has a fan alarm LED and each fan is redundant in configuration. If one fan fails, its associated fan changes its rotating speed to high. Figure 5-27 shows removing fans from the front of the chassis and Figure 5-28 shows removing fans from the rear of the chassis.

**Note:** To order a new fan module contact your sales representative or dealer.

If the system status LED indicator on the front of the system unit is amber (abnormal condition), it can be indicating a faulty fan condition. Each fan module alarm LED (lite steadily) can then be checked to pinpoint which fan module is faulty and needs to be removed. Follow the procedure described in this section to remove the faulty fan module and swap in a good one.

**Note: Swapping Fan Modules without turning off power.** This is one of the few system procedures that is safe to do with the system power left on.

1. If the fan module being removed is located in the front or on the left-hand side of the system unit (as viewed from the front) continue, otherwise go to step 4.
2. To remove the front fan module open the right front exterior door. Go to step 4.
3. To remove one of the left-hand side fan modules open the fan access door and continue.
4. Loosen the two thumb screws that secure the fan module to the chassis.



5. Grasp the fan module's handle (if equipped) or two thumb screws and pull the fan module out of the chassis.
6. Remove the new fan module from its shipping container.
7. Slide the new fan module into the fan bay until it docks with its connector.
8. Tighten the two thumb screws that secure the fan module to the chassis.

**Figure 5-27. Removing the Front Fan modules**

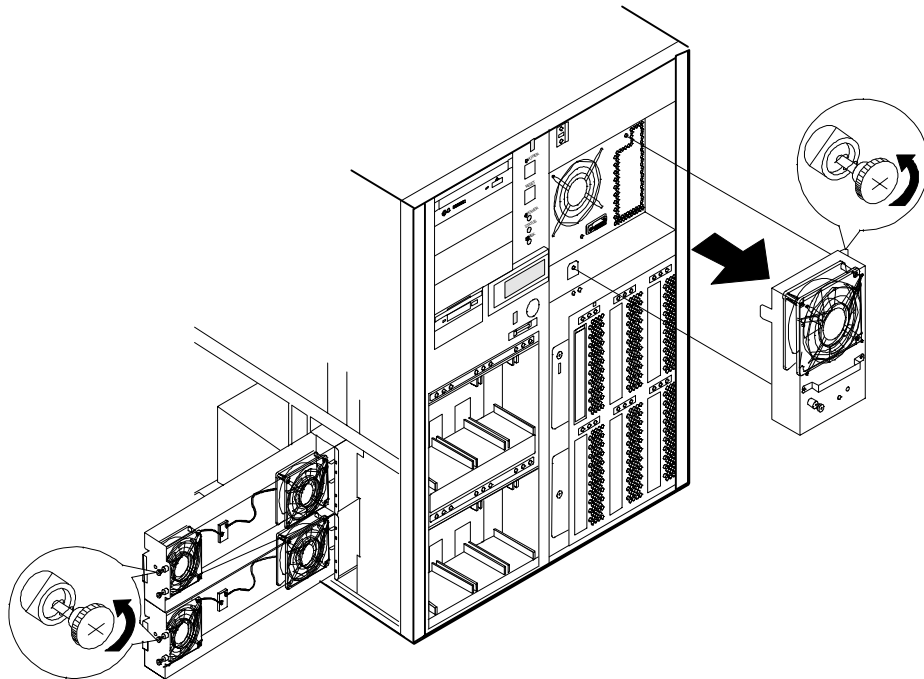
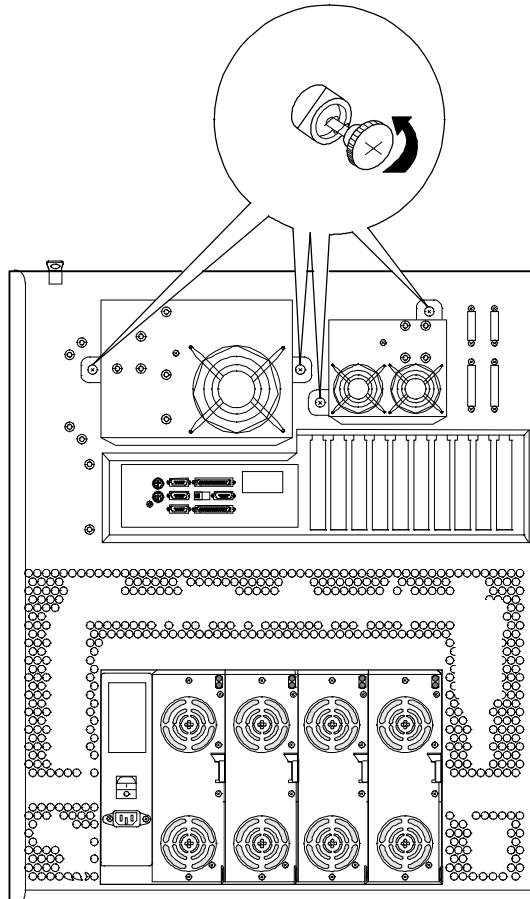


Figure 5-28. Removing the Rear Fan modules



Chapter 6  
**Problem Solving**

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This chapter helps you identify and solve problems that may occur during system installation or while using your system. The first section of this chapter tells you how to reset your system in the event of problems. The next few sections provide troubleshooting checklists and procedural steps that help you isolate specific system problems. The last section includes BIOS and system and disk status user information.

## Resetting the System

There are two ways to reset the system:

### **Reset button**

Pushing the reset button clears the system memory, restarts the POST, and reloads the operating system.

### **Power off/on**

Turning the power off and then on with the push-button switch on the front panel has the same effect as pushing the reset button, except that power is halted to all peripherals.

## Troubleshooting Checklists

The following subsections provide troubleshooting checklists for problems that occur at initial system startup, when you run new application software, and after the system hardware and software have been running correctly.

### Initial System Startup

Problems that occur at initial system startup are usually caused by incorrect installation or configuration. Hardware failure is a less frequent cause. If you have problems during initial system startup, check the following:

- Is the system power cord properly connected to the system and plugged into a NEMA 5-15R outlet (100-120 V ac) or a NEMA 6-15R outlet (200-240 V ac)?
- Is AC available at the wall outlet?
- Is the main power switch located on the left-hand side of the power supply cage at the rear of the system in the ON position?
- Is the power on/off push-button switch on the front panel in the ON position (power on LED should be lit)?
- Are all cables correctly connected and secured?
- Are all the EISA/PCI/ISA option boards fully seated in their connector slots on the system board?
- Are all jumper settings on the system board correct? For jumper information, see the *Configuring Your System* chapter.
- Are all jumper and switch settings on option boards and peripheral devices correct? To check these settings, see the respective appendices. If applicable, ensure that there are no conflicts; for example, two option boards sharing the same interrupt.

- Are all DIMMs fully seated and installed correctly? Refer to the *Upgrades and Options* chapter for installation instructions.
- Are all option boards and disk drives installed correctly? Refer to the *Upgrades and Options* chapter.
- If the system has a hard disk drive, is it properly formatted or defined?
- Is the operating system properly loaded? Refer to the operating system documentation.
- Are all drivers properly installed? For information about installing drivers, refer to your network operating system configuration guide.
- Are the configuration settings in Setup and the System Configuration Utility (SCU) correct? For information about running these utilities, refer to the *Configuring Your System* chapter.

If the above items are all correct, but the problem reoccurs, refer to *Additional Troubleshooting Procedures* in this chapter.



## Running New Application Software

Problems that occur when you run new application software are usually related to the software. Faulty equipment is much less likely, especially if other software runs correctly. If you have problems while running new application software, check the following:

- Does the system meet the minimum hardware requirements for the software? Refer to the software documentation.
- Is the software an authorized copy? Unauthorized copies often do not work. Obtain an authorized copy of the software.
- If you are running the software from a floppy disk, is it a good copy?
- If you are running the software from a hard disk drive, is the software correctly installed? Were all necessary procedures followed and files installed?
- Are the correct device drivers installed?
- Is the software correctly configured for the system?
- Are you using the software correctly?
- Try a different copy of the software to see if the problem is with the copy you are using.
- If other software runs correctly on the system, contact your vendor about the failing software.

If the problems persist with the software, contact the software vendor's customer service representative.

## After System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. However, many situations that are easy to correct can also cause such problems. If you have problems after the system has been running correctly, check the following:

- If you are running the software from a floppy disk, try a new copy of the software.
- If you are running the software from a hard disk drive, try running it from a floppy. If the software runs correctly, there may be a problem with the copy on the hard disk. Reinstall the software on the hard disk drive and try running it again. Make sure all the necessary files are installed.
- If the problem recurs, you may need to reformat the hard disk drive. The drive, the drive controller, or the system board may be defective.
- If the problems are intermittent, there may be a loose cable, dirt in the keyboard (if keyboard input is incorrect), a marginal power supply, or other random component failures.
- If you suspect that a transient voltage spike, power outage, or brownout might have occurred, reload the software and try running it again. Symptoms of voltage spikes include a flickering video display, unexpected system reboots, and the system not responding to user commands.

**Note:** Voltage spikes can corrupt or destroy data files on the drive. If you are experiencing voltage spikes on the power line, install a surge suppresser between the power outlet and the system power cord.

If the problem recurs after you have checked and corrected all of the above items, refer to *Additional Troubleshooting Procedures* in this chapter.

## Additional Troubleshooting Procedures

This section provides a more detailed approach to diagnostic testing and identification of a problem and locating its source.

### Error Checking

Each time you turn on the system, the POST runs automatically and checks the system board, CPU module, memory, keyboard, and most installed peripheral devices.

If POST finds an error, it displays an error message and, in case there is a problem with the display, puts out a series of long and short beeps. One short beep means the system passed POST. Refer to the *BIOS User's Information* section in this chapter for a list of items to check for each error code and for an explanation of the error beep codes.

### Troubleshooting Guide

Use the following troubleshooting procedures to help you identify a problem. These general procedures lead you through the following:

- Preparing the system for diagnostic testing
- Monitoring POST while it is running
- Verifying proper operation of key system LEDs
- Confirming loading of the operating system.

### Preparing the System for Diagnostic Testing

To prepare the system for diagnostic testing, perform the following:

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**Notice:** Before disconnecting any peripheral cables from the system, turn off the system and any external peripheral devices. Failure to do so can cause permanent damage to the system and/or the peripheral devices.

---

1. Turn off the system and all external peripheral devices. Disconnect all devices from the system except the keyboard and video monitor.
2. Make sure the system power cord is plugged into a properly grounded AC outlet.
3. Make sure your video display monitor and keyboard are correctly connected to the system. Turn on the video monitor. Set its brightness and contrast controls to at least two-thirds of their maximum ranges (refer to the documentation supplied with your video display monitor).
4. If the operating system normally loads from the hard disk drive, make sure there is no diskette in drive A. Otherwise, place a diskette containing the operating system files in drive A.
5. Turn on the system. If the power indicator LED does not light, refer to *Power Light Does Not Light* found later in this chapter.

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## Monitoring POST while it is running

Each time you turn on the system, the power-on self-test (POST) runs automatically and checks the system board, CPU, memory, 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, it may take several minutes to complete the memory test. When the memory test completes, the following is displayed:

Press <F2> to enter SETUP

If you do not press <F2>, the above message remains for a few seconds and the boot process continues.

When this message appears:

Press <Ctrl><A> for SCSISelect™ Utility!

Press <Ctrl+A> if you have installed SCSI devices in your system. When the utility appears, follow the instructions on your monitor to configure the SCSI host adapter settings and run the SCSI disk utilities. See Chapter 4, *Configuring Your System*.

If you choose not to run the SCSISelect Utility, the boot process continues.

If POST finds an error, it displays an error message and, in case there is a problem with the display, puts out a series of long and short beeps. Write down any beep code emitted. This information is useful to your service representative.

Refer to the *BIOS User's Information* section in this chapter for a list of items to check for each error code and for an explanation of the error beep codes.

Table 6-1 lists keys active during POST and provides a description of errors that may occur.

**Table 6-1. POST Keys and Errors**

ACTION/MESSAGE	DESCRIPTION
To Abort Memory Test	Press ctrl+alt+s during the memory test.
If POST Beeps Before Video Appears	Initialization failed before video initialized. Most beep code errors are fatal; initialization cannot continue. Refer to the section <i>BIOS User's Information</i> in this chapter.
If Monitor Displays Error	Note error; press F1 to continue boot or F2 to enter Setup. Refer to the section <i>BIOS User's Information</i> in this chapter.
To Enter Setup	Setup changes specific options, then writes to CMOS, NVRAM. Press F2 during initialization to run Setup. If you do not press F2, the boot process continues.
Enter BOOT Diskette	If prompted, insert the boot diskette.

The BIOS indicates errors by writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area, and by displaying a message on the screen, which is sometimes preceded by the POST Error Code. The error code will also be logged to the Event Logging area.

Report any error code to your service representative.

### Verifying Proper Operation of Key System Indicators

As POST determines the system configuration, it tests for the presence of each mass storage device installed in the system. As each device is checked, its activity indicator should turn on briefly. Check for the following:

- Does the diskette drive activity indicator turn on briefly. If not, refer to *Diskette Drive Activity Indicator Does Not Light* in this chapter.
- If a second diskette drive is installed, does its activity indicator turn on briefly. If not, refer to *Diskette Drive Activity Indicator Does Not Light* in this chapter.
- If there is a hard disk drive or SCSI devices installed in the system, does the hard disk drive activity indicator turn on briefly. If not, refer to *Hard Disk Drive Activity Indicator Does Not Light* in this chapter.

### Confirming Loading of the Operating System

Once the system boots up, the operating system prompt appears on the screen. The prompt varies according to the operating system. If the operating system prompt does not appear, refer to *Problems With Application Software* found later in this chapter.

### Specific Problems and Corrective Actions

This section provides possible solutions for the following specific problems:

- Power LED does not light
- System cooling fans do not rotate
- No characters appear on screen
- Characters on the screen appear distorted or incorrect
- No beep or incorrect beep pattern
- Floppy disk drive access LED does not light
- Hard disk drive access LED does not light
- The SCU does not boot
- Problems with application software.

Try the solutions in the order given. If you cannot correct the problem, contact your service representative for assistance.

## Power LED Does Not Light

Check the following:

- Is the system operating normally? If so, the power LED is probably defective.
- Are there other problems with the system? If so, check the items listed under System Cooling Fans Do Not Rotate.

## System Cooling Fans Do Not Rotate

**Note:** The system has five hot-swap cooling fan modules. In addition, there are two cooling fans that are an integral part of each power supply. There are no serviceable components inside the power supply. If the power supply is opened, the manufacturer's warranty is voided. Two of the hot-swap fan modules are accessible from the rear of the system. A single hot-swap fan module is accessible from the front of the system and two dual hot-swap cooling fan modules are accessible via the fan compartment door located on the left-hand side of the system (refer to the *Upgrades and Options* chapter 5 in this guide.)

Check the following:

- Is AC power available at the wall outlet?
- Is the system power cord properly connected to the system and the AC wall outlet?
- Is the power connector for the cooling fan connected to the system board?
- Is the front panel power on indicator lit?
- Is the cable from the front panel board connected to the system board?

If the switches and connections are correct and the power outlet is functioning, the power supply has probably failed. Contact your service representative for assistance.



## No Characters Appear On Screen

Check the following:

- Is the riser card fully seated in the system board connector? The riser card is the small card that the mouse and keyboard plug into.
- Is the keyboard working?
- Is the video display plugged in and turned on?
- Are the brightness and contrast controls properly adjusted?
- Are the video display switch settings correct?
- Is the video display signal cable properly installed?

If you are using an option video controller board, perform the following:

1. Verify that the video controller board is fully seated in the system board connector.
2. Run the SCU to disable the onboard video controller.
3. Reboot the system for changes to take effect.

If there are still no characters on the screen after you reboot the system, contact your service representative or authorized dealer for assistance.

POST emits one long beep and two short beeps pattern to indicate a possible problem with the video display controller. If you do not receive a beep pattern and characters do not appear, the video display or video controller may have failed. Contact your service representative or authorized dealer for assistance.

## **Characters are Distorted or Incorrect**

Check the following:

- Are the brightness and contrast controls properly adjusted on the video display? Refer to the documentation supplied with your video display.
- Are the video display signal and power cables properly installed?
- Is the SCU configuration set up correctly for the type of monitor you have attached to the system?
- If the problem persists, the video display may be faulty or it may be the incorrect type. Contact your service representative for assistance.

## **Incorrect Or No Beep Code**

Check the following:

- Is the speaker enabled?
- Is the speaker cable connected to the system board?

If the system operates normally, but there was no beep, the speaker may be defective, contact your service representative for assistance.

Record the beep code emitted by POST and refer to the Error Messages section, for information about beep pattern error messages.

## Floppy Disk Drive Activity LED Does Not Light

Check the following:

- Are the floppy disk drive power and signal cables properly installed?
- Are all relevant switches and jumpers on the floppy disk drive set correctly?
- Is the floppy disk drive properly configured in Setup?

If you are using the onboard floppy disk controller, use Setup or the SCU to make sure that Onboard Floppy is set to Enabled. Conversely, to use an optional fixed/floppy disk controller, make sure that Onboard Floppy is set to Disabled. For information about running Setup or the SCU, refer to the *Configuring Your System* chapter.

If the problem persists, there may be a problem with the floppy disk drive, system board, or drive signal cable. Contact your service representative for assistance.

## Hard Disk Drive Activity LED Does Not Light

If you have installed one or more hard disk drives in your system, check the following:

- Is the disk controller board fully seated in the system board connector?
- Is the disk drive seated properly?
- Are the jumpers on the system board set correctly?
- Is the hard disk activity LED cable connector plugged into the RAID controller board, if present?

If you received error messages, refer to the *Error Messages* section for information about error messages.

If the problem persists, there may be a problem with the hard disk drive, the optional controller board, system board, drive signal cable, or LED connector. Contact your service representative for assistance.

## Problems with Application Software

If you have problems with application software, perform the following:

- Verify that the software is properly configured for the system. Refer to the software installation and operation documentation for instructions on setting up and using the software.
- Verify a different copy of the software to see if the problem is with the copy you are using.
- Make sure all cables are installed correctly.
- Verify that the system board jumpers are set correctly. Refer to the *Configuring Your System* chapter for jumper settings.
- If other software runs correctly on the system, contact your vendor about the failing software.

If the problem persists, contact the software vendor's customer service representative for assistance.

## BIOS User's Information

This section describes the various screen messages and beep codes of the system BIOS. The BIOS indicates errors by writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area, and by displaying a message on the screen, which is sometimes preceded by the POST Error Code. The error code will also be logged to the Event Logging area.

### Error and Status Messages

Table 6-2 is an alphabetic list of error and status messages that BIOS generates and an explanation of each message. Many of the messages refer to the built in Setup program. For more information about Setup, refer to the *Configuring Your System* chapter.

Table 6-2. BIOS Messages

MESSAGE	DESCRIPTION
<b>nnnn Cache SRAM Passed</b>	Where <i>nnnn</i> is the amount of system cache in kilobytes successfully tested.
<b>CPU Type not supported</b>	The CPU installed is not the correct stepping and is not supported.
<b>Diskette drive A error</b> or <b>Diskette drive B error</b>	Diskette Drive is present but fails the BIOS POST diskette tests. Check to see that the drive is defined with the proper diskette type in Setup and that the diskette drive is correctly attached.
<b>Entering SETUP ...</b>	The Setup program is starting.
<b>Extended RAM Failed at offset: nnnn*</b>	Extended memory is not working or is not properly configured at offset <i>nnnn</i> .
<b>nnnn Extended RAM passed</b>	Where <i>nnnn</i> is the amount of RAM in kilobytes successfully tested.
<b>Failing Bits: nnnn*</b>	The hex number <i>nnnn</i> is a map of the bits at the RAM address (in System, Extended, or Shadow memory) which failed the memory test. Each 1 (one) in the map indicates a failed bit.
<b>Fixed Disk 0 Failure</b> or <b>Fixed Disk 1 Failure</b> or <b>Fixed Disk Controller Failure*</b>	Fixed disk is not working or not properly configured. Check to see if the fixed disk is attached properly. Run Setup to be sure the fixed disk type is correctly identified.
<b>Incorrect Drive A type - run SETUP</b> or <b>Incorrect Drive B type - run SETUP</b>	Type of floppy drive is not correctly identified in Setup.
<b>Invalid NVRAM media type*</b>	Problem with NVRAM (CMOS) access.
<b>Keyboard controller error*</b>	The keyboard controller test failed. You may have to replace the keyboard or controller.
<b>Keyboard error nn</b>	The keyboard is not working. BIOS discovered a stuck key and displays the scan code <i>nn</i> for the stuck key.
<b>Keyboard locked - Unlock key switch</b>	Unlock the system to proceed.
<b>Monitor type does not match CMOS - Run SETUP</b>	Monitor type is not correctly identified in Setup.
<b>Operating system not found</b>	The operating system cannot be located on either drive A: or drive C:. Enter Setup and see if the fixed disk and floppy are properly identified.
<b>Parity Check 1 nnnn*</b> or <b>Parity Check 2 nnnn*</b>	A parity error was found in the system bus (Parity Check 1) or the I/O bus (Parity Check 2). BIOS attempts to locate and display the address on the screen. If it cannot locate the address, it displays ????.

\* If your system displays this message, write down the message and notify your customer representative. If your system fails after you made changes in the BIOS Setup menus, you may be able to correct the problem by entering Setup and restoring the original values.

Table 6-2. BIOS Messages (Continued)

MESSAGE	DESCRIPTION
<b>Press &lt;F1&gt; to resume, &lt;F2&gt; to Setup</b>	Displayed after any recoverable error message.
<b>Press &lt;F2&gt; to enter SETUP</b>	Optional message displayed during POST. Can be turned off in Setup.
<b>Previous boot incomplete - Default configuration used</b>	Previous POST did not successfully complete. POST loads default values and offers to run Setup. If the failure was caused by incorrect values and they are not corrected, the next boot will likely fail. On systems with control of wait states, improper Setup settings can also terminate POST and cause this error on the next boot. Run Setup and verify that the wait-state configuration is correct. This error is cleared the next time the system is booted.
<b>Real time clock error*</b>	Real time clock fails BIOS test. May require board repair.
<b>Shadow Ram Failed at offset: <i>nnnn</i>*</b>	Shadow RAM failed at offset <i>nnnn</i> of the 64K block at which the error was detected.
<b><i>nnnn</i> Shadow RAM Passed</b>	Where <i>nnnn</i> is the amount of shadow RAM in kilobytes successfully tested.
<b>System battery is dead - Replace and run SETUP</b>	The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system.
<b>System BIOS shadowed</b>	The system BIOS is copied to shadow RAM.
<b>System cache error - Cache disabled*</b>	The RAM cache failed the BIOS test and BIOS has disabled the cache.
<b>System CMOS checksum bad - run SETUP</b>	The system CMOS has been corrupted or incorrectly modified, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the default values or making your own selections.
<b>System RAM failed at offset: <i>nnnn</i>*</b>	The system RAM failed at offset <i>nnnn</i> of the 64K block at which the error was detected.
<b><i>nnnn</i> System RAM Passed</b>	Where <i>nnnn</i> is the amount of system RAM in kilobytes successfully tested.
<b>System timer error*</b>	The timer test failed. Requires repair of the system board.
<b>UMB upper limit segment address: <i>nnnn</i></b>	Displays the address <i>nnnn</i> of the upper limit of the Upper Memory Blocks, indicating released segments of the BIOS which may be reclaimed by a virtual memory manager.
<b>Video BIOS shadowed</b>	The video BIOS is successfully copied to shadow RAM.

\* If your system displays this message, write down the message and notify your customer representative. If your system fails after you made changes in the BIOS Setup menus, you may be able to correct the problem by entering Setup and restoring the original values.



## Messages and Beep Codes

Whenever a recoverable error occurs during POST, BIOS displays a message on the video display screen and causes the speaker to beep twice as the message appears. BIOS also issues a beep code (one long tone followed by two short tones) during POST if the video configuration fails or if an external ROM module does not checksum to zero.

At the beginning of each POST test routine, the BIOS outputs the test point error code to I/O address 80h. If the BIOS detects a terminal error condition, it halts POST after issuing a terminal error beep code signifying the test point code and attempting to display the test point error code on the upper left corner of the display screen. BIOS derives the beep code from the test point error code as follows:

1. The 8-bit hexadecimal error code is broken down to four 2-bit groups.
2. Each group is made one-based by adding one.
3. Short beeps are generated for the number in each group.

For example, a test point error code of 16 is indicated by a 1-2-2-3 beep code (a single beep, a burst of two beeps, a burst of two beeps, and a burst of three beeps). In addition, BIOS writes a value of 16 on the upper left corner of the display screen and to I/O port 80h to enable debugging tools to identify the area of failure.

Table 6-3 is a list of the test point error codes written at the start of each POST test and the beep codes issued for terminal errors.

**Table 6-3. POST Tests**

<b>Code</b>	<b>Beeps</b>	<b>POST Routine Description</b>
02	1-1-1-3	Verify Real Mode
04	1-1-2-1	Get CPU type
06	1-1-2-3	Initialize system hardware
08	1-1-3-1	Initialize chipset registers with initial POST values
09	1-1-3-2	Set in POST flag
0A	1-1-3-3	Initialize CPU registers
0C	1-1-4-1	Initialize cache to initial POST values
0E	1-1-4-3	Initialize I/O
10	1-2-1-1	Initialize Power Management
11	1-2-1-2	Load alternate registers with initial POST values
12	1-2-1-3	Restore CPU control word during warm boot
14	1-2-2-1	Initialize keyboard controller
16	1-2-2-3	BIOS ROM checksum
18	1-2-3-1	8254 timer initialization
1A	1-2-3-3	8237 DMA controller initialization
1C	1-2-4-1	Reset Programmable Interrupt Controller
20	1-3-1-1	Test DRAM refresh
22	1-3-1-3	Test 8742 Keyboard Controller
24	1-3-2-1	Set ES segment register to 4 GB
28	1-3-3-1	Autosize DRAM
2A	1-3-3-3	Clear 512K base RAM
2C	1-3-4-1	RAM failure on address line xxxx*
2E	1-3-4-3	RAM failure on data bits xxxx* of low byte on memory bus
30	1-4-1-1	RAM failure on data bits xxxx* of high byte on memory bus
32	1-4-1-3	Test CPU bus-clock frequency
34	1-4-2-1	Test CMOS RAM
37	1-4-2-4	Reinitialize the chipset (MB only)
38	1-4-3-1	Shadow system BIOS ROM
39	1-4-3-2	Reinitialize the cache (MB only)
3A	1-4-3-3	Autosize cache
3C	1-4-4-1	Configure advanced chipset registers
3D	1-4-4-2	Load alternate registers with CMOS values

\* If the BIOS detects error 2C, 2E, or 30 (base 512K RAM error), it displays an additional word-bitmap (xxxx) indicating the address line or bits that failed. For example, "2C 0002" means data bits 12 and 5 (bits and 5 set) have failed in the lower 16 bits.

**Table 6-3. POST Tests (continued)**

<b>Code</b>	<b>Beeps</b>	<b>POST Routine Description</b>
40	2-1-1-1	Set Initial CPU speed
42	1-1-1-3	Initialize interrupt vectors
44	2-1-2-1	Initialize BIOS interrupts
46	2-1-2-3	Check ROM copyright notice
47	2-1-2-4	Initialize manager for PCI Option ROMs
48	2-1-3-1	Check video configuration against CMOS
49	2-1-3-2	Initialize PCI bus and devices
4A	2-1-3-3	Initialize all video adapters in system
4C	2-1-4-1	Shadow video BIOS ROM
4E	2-1-4-3	Display copyright notice
50	2-2-1-1	Display CPU type and speed
52	2-2-1-3	Test keyboard
54	2-2-2-1	Set key click if enabled
56	2-2-2-3	Enable keyboard
58	2-2-3-1	Test for unexpected interrupts
5A	2-2-3-3	Display prompt "Press F2 to enter SETUP"
5C	2-2-4-1	Test RAM between 512 and 640K
60	2-3-1-1	Test extended memory
62	2-3-1-3	Test extended memory address lines
64	2-3-2-1	Jump to User Patch1
66	2-3-2-3	Configure advanced cache registers
68	2-3-3-1	Enable external and CPU caches
6A	2-3-3-3	Display external cache size
6C	2-3-4-1	Display shadow message
6E	2-3-4-3	Display non-disposable segments
70	2-4-1-1	Display error messages
72	2-4-1-3	Check for configuration errors
74	2-4-2-1	Test real-time clock
76	2-4-2-3	Check for keyboard errors
7C	2-4-4-1	Set up hardware interrupt vectors
7E	2-4-4-3	Test coprocessor if present
80	3-1-1-1	Disable onboard I/O ports
82	3-1-1-3	Detect and install external RS232 ports
84	3-1-2-1	Detect and install external parallel ports
86	3-1-2-3	Reinitialize onboard I/O ports

**Table 6-3. POST Tests (continued)**

<b>Code</b>	<b>Beeps</b>	<b>POST Routine Description</b>
88	3-1-3-1	Initialize BIOS Data Area
8A	3-1-3-3	Initialize Extended BIOS Data Area
8C	3-1-4-1	Initialize floppy controller
90	3-2-1-1	Initialize hard disk drives
91	3-2-1-2	Initialize local-bus hard-disk controller
92	3-2-1-3	Jump to UserPatch2
94	3-2-2-1	Disable A20 address line
96	3-2-2-3	Clear huge ES segment register
98	3-2-3-1	Search for option ROMs. One long, two short beeps on checksum failure
9A	3-2-3-3	Shadow option ROMs
9C	3-2-4-1	Set up Power Management
9E	3-2-4-3	Enable hardware interrupts
A0	3-3-1-1	Set time of day
A2	3-3-1-3	Check key lock
A8	3-3-3-1	Erase F2 prompt
AA	3-3-3-3	Scan for F2 keystroke
AC	3-3-4-1	Enter SETUP
AE	3-3-4-3	Clear in-POST flag
B0	3-4-1-1	Check for errors
B2	3-4-1-3	POST done - prepare to boot operating system
B4	3-4-2-1	One short beep before boot
B6	3-4-2-3	Check password (optional)
B8	3-4-3-1	Clear global descriptor table
BC	3-4-4-1	Clear parity checkers
BE	3-4-4-3	Clear screen (optional)
BF	3-4-4-4	Check virus and backup reminders
C0	4-1-1-1	Try to boot with INT 19
D0	4-2-1-1	Interrupt handler error
D2	4-2-1-3	Unknown interrupt error
D4	4-2-2-1	Pending interrupt error
D6	4-2-2-3	Initialize option ROM error
D8	4-2-3-1	Shutdown error
DA	4-2-3-3	Extended Block Move
DC	4-2-4-1	Shutdown 10 error
DE	4-2-4-3	Keyboard Controller Failure

**Table 6-3. POST Tests (continued)**

<b>Code</b>	<b>Beeps</b>	<b>POST Routine Description</b>
<b>The following are for boot block in FLASH ROM</b>		
E2	4-3-1-3	Initialize the chipset
E3	4-3-1-4	Initialize refresh counter
E4	4-3-2-1	Check for Forced Flash
E5	4-3-2-2	Check HW status of ROM
E6	4-3-2-3	BIOS ROM is OK
E7	4-3-2-4	Do a complete RAM test
E8	4-3-3-1	Do OEM initialization
E9	4-3-3-2	Initialize interrupt controller
EA	4-3-3-3	Read in the bootstrap code
EB	4-3-3-4	Initialize all vectors
EC	4-3-4-1	Boot the Flash program
ED	4-3-4-2	Initialize the boot device
EE	4-3-4-3	Boot code was read OK

## System and Disk Status LED User's Information

This section lists and describes the various system and disk status LED indicators and provides a user response for the various status conditions.

Once your server is up and running, you can monitor server operation through the system status LED panel indicators and the SCSI device status LED panel indicators. See Table 6-4 and Table 6-5 for a list and description of the LED indicators and Table 6-6 for a list of the system status abnormal conditions.

If any problems persist, contact your service representative for assistance.

**Table 6-4. System Status LED Indicators**

LED	Status	Description	Response
Power Status	Off	Power OFF	None required (normal)
	Green	Power ON	None required (normal)
	Amber	System power supply failure	Replace failed power supply module.
System Status	Off	Power OFF	None required (normal)
	Green	No alarms	None required (normal)
	Amber	Abnormal condition (see Table 6-6).	Replace failing part.
Disk Status	Off	Not accessing disk drives	None required (normal)
	Amber	Internal disk drive failure	Replace disk drive
	Green	Accessing disk drives	None required (normal)

**Table 6-5. Disk Drive Status LED Panel Indicators**

LED	Status	Description	Response
Disk Drive Power	Off	Disk drive power is OFF	None required (normal)
	Green	Disk drive power is ON	None required (normal)
Disk Drive Activity	Off	Not accessing disk drives	None required (normal)
	On	Accessing disk drives	None required (normal)
Disk Drive Status	Off	No alarms	None required (normal)
	Amber	Internal disk drive failure	Replace disk drive.

**Table 6-6. System Status Abnormal Conditions**

<b>LED (Amber)</b>	<b>Conditions</b>
System Status	Unit fan alarm Memory multi-bit error (SERR) P6 bus error SERR) Thermal sensor (from SCSI distribution board) Temperature (heceta) Voltage (heceta) CPU thermal trip (heceta) Chassis intrusion (front cover) PCI PERR# (OPB/ESC detect) PCI SERR# CPU internal error WDT IOCHK





Appendix A  
**System Cabling**

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**Contents**

Before You Begin ..... 1  
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This appendix contains information and procedures on cabling configurations used in your system.

## Before You Begin



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**Warning:** The DC push-button on/off switch on the front panel does not turn off the system AC power. Before doing the procedures in this chapter, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

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## Static Precautions

An electrostatic discharge (ESD) can damage disk drives, option boards, and other components. You can provide ESD protection by wearing an antistatic wrist strap attached to chassis ground when handling system components.

Electronic devices can be easily damaged by static electricity. To prevent damage, keep them in their protective packaging when they are not installed in your system.

## Standard SCSI Bus Configuration

Your system is cabled using one on-board SCSI controller and one PCI SCSI RAID controller expansion card. The on-board Adaptec 7860 narrow SCSI controller is used to control up to four removable media peripherals (CD-ROM and tape drives). The two channel PCI RAID controller expansion card is used to control twelve additional hard disk drives. A 3 1/2-inch diskette drive is installed in all systems and interfaces separately to the system board. Figure A-1 is a diagram of the standard SCSI cabling and Figure A-2 illustrates the internal cable routing for this configuration.

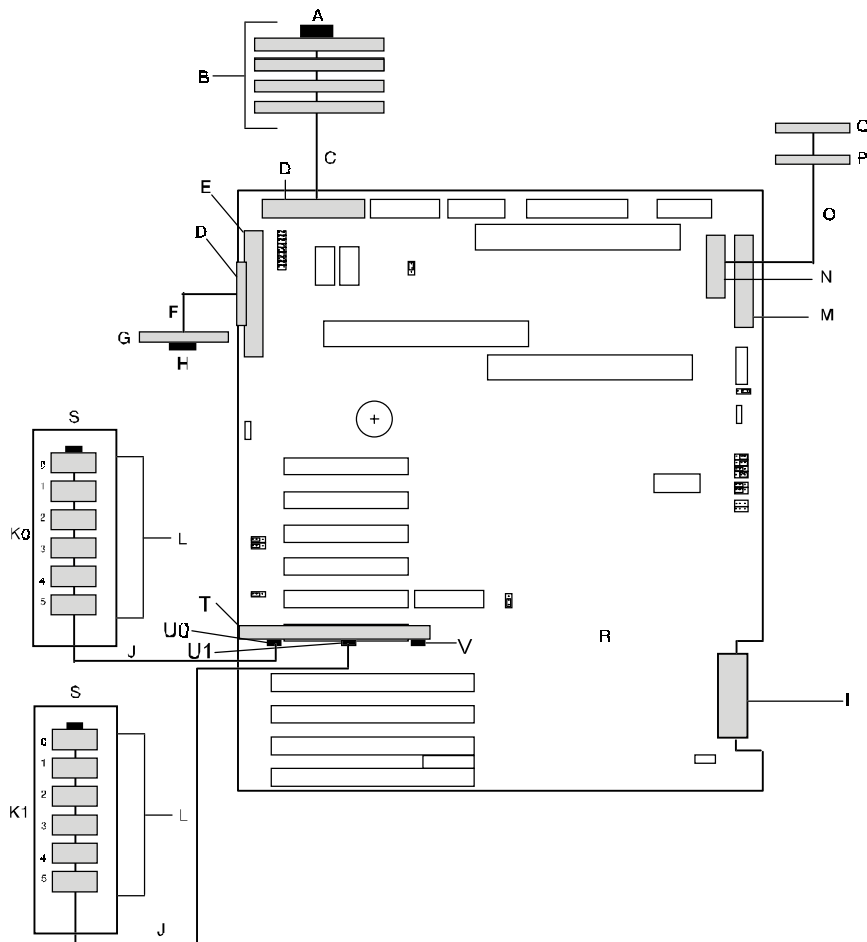
The narrow SCSI interface cable is connected to the SCSI connector on the top edge of the system board (see Figure A-1, D). This cable connects to the rear of the SCSI removable media peripherals (if present). The last drive on the daisy chain cable must have its internal SCSI terminators installed.

The ultra wide SCSI interface cables for channel 0 and channel 1 are connected to the SCSI connectors on the PCI RAID Controller (see Figure A-1, U0 and U1). These cables connect to the SCSI distribution panels (see Figure A-1, K0 and K1) at the rear of the hard disk drives. Termination for the hard disk drives is provided on the SCSI distribution panels.

The onboard narrow SCSI controller also includes a connector located at the rear of the system for connecting external SCSI devices. Three important rules must be followed if you connect external narrow SCSI devices:

- A maximum of seven narrow SCSI devices may be connected to the onboard SCSI controller. For example if four SCSI devices in the system cabinet are connected to the SCSI bus, only three external narrow SCSI devices can be connected.
- The maximum cable length for all narrow devices connected to the controller is 1 meter (39 inches).
- The last external narrow SCSI device must be terminated. Active termination is recommended.

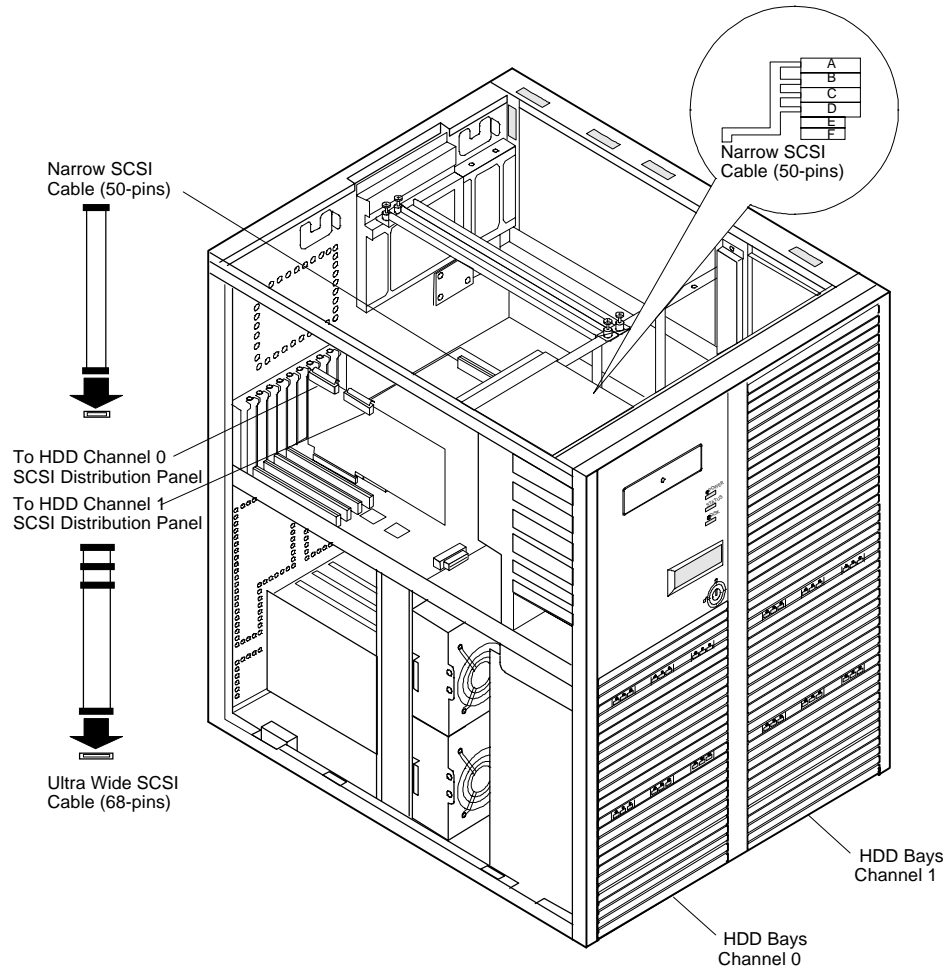
Figure A-1. Standard System Cable Configuration



- A—Device internal SCSI termination resistors
- B—Narrow SCSI devices in upper peripheral bays
- C—Narrow SCSI interface cable
- D—Narrow SCSI connector (50 pin)
- E—I/O riser board
- F—External narrow SCSI cable
- G—External narrow SCSI device
- H—SCSI terminator
- I—Ultra wide SCSI connector (68 pin) (not used)
- J—Ultra wide SCSI interface cable
- K0—SCSI distribution panel for channel 0
- K1—SCSI distribution panel for channel 1

L—Ultra wide SCSI Hard disk drives in internal bays  
M—Front panel connector  
N—Diskette drive connector  
O—Diskette interface cable  
P—2nd 3 1/2-inch device (optional)  
Q—3 1/2-inch diskette drive  
R—System board  
S—SCSI distribution panel terminator  
T— DAC960PDU-2B-4M RAID controller in PCI slot #00 (P05)  
U0—RAID channel 0 cable connector  
U1—RAID channel 1 cable connector  
V—Activity cable connector (not used)

Figure A-2. Standard SCSI Bus Cable Routing







# Memory Configurations

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## Memory DIMM Configurations

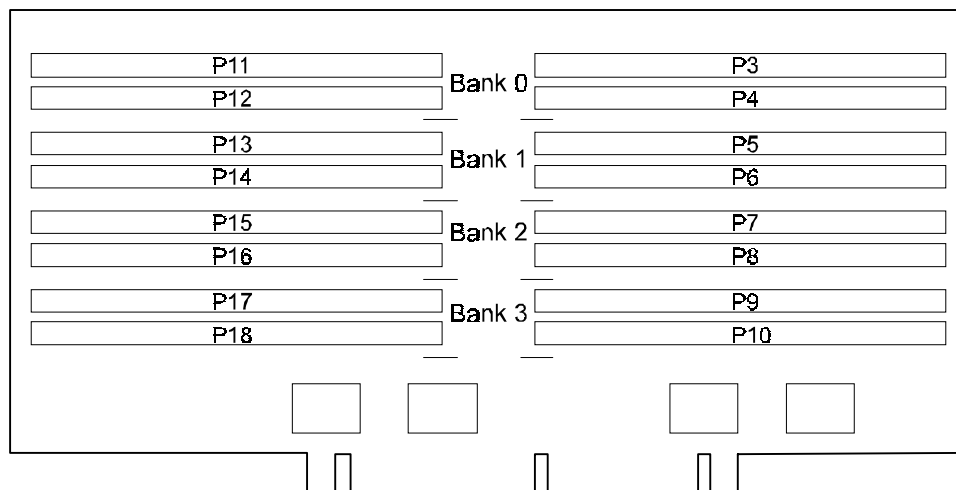
The memory board contains sixteen 168-pin DIMM sockets for a total of up to 4 GB of system memory, using 256MB DIMMs. See Figure B-1. DIMM sockets on the board are organized as four 72-bit wide, 2-, or 4-way interleaved banks. For example, a 4-way interleaved bank requires four DIMMs. DIMM sockets accept 168-pin single- or double-sided DIMMs. A bank must be populated using identical DIMMs. DIMMs may vary in size from one bank to the other, but all DIMMs must be the same speed. Timing requires 60 ns fast page devices.

A memory DIMM upgrade kit consists of 2 or 4 identical (of the same size and type) DIMMs defined as:

- 2 x 32MB DIMMs = 64MB
- 4 x 32MB DIMMs = 128MB
- 4 x 64MB DIMMs = 256MB
- 4 x 128MB DIMMs = 512MB
- 4 x 256MB DIMMs = 1GB.

The 2 x 32MB DIMMs upgrade kit is used only for servers that were originally shipped with 64MB (two 32MB DIMMs) of memory.

Figure B-1. System Board DIMM Sockets



The following table describes memory requirements and characteristics:

Bank installation	DIMM type
<p>Always begin with the top DIMM sites (P3 and P11) as you fill the sockets.</p> <p>All DIMMs in a bank must be identical size.</p> <p>DIMMs may differ in size from bank to bank.</p> <p>Number of DIMMs supported: 2, 4, 8, 12, or 16.</p>	<p>Use only 72-bit, 168-pin, fast page mode DIMMs with gold plated edge connectors, single- or double-sided.</p> <p>Use JEDEC-compatible DIMMs. Contact customer service representative for list of approved DIMMs.</p>

Table B-1 lists the distribution of DIMMs for system memory configurations that maximize socket availability, other combinations are possible.

**Table B-1. Memory Configurations**

Total Memory	Interleave Type	Bank #0	Bank #1	Bank #2	Bank #3
64MB	two-way	2 x 32MB (P3 + P11)			
128MB	four-way	4 x 32MB (P3, P11, P4 + P12)			
256MB	four-way	4 x 64MB (P3, P11, P4 + P12)			
256MB	four-way	4 x 32MB (P3, P11, P4 + P12)	4 x 32MB (P5, P13, P6 + P14)		
384MB	four-way	4 x 64MB (P3, P11, P4 + P12)	4 x 32MB (P5, P13, P6 + P14)		
512MB	four-way	4 x 128MB (P3, P11, P4 + P12)			
512MB	four-way	4 x 64MB (P3, P11, P4 + P12)	4 x 64MB (P5, P13, P6 + P14)		
640MB	four-way	4 x 128MB (P3, P11, P4 + P12)	4 x 32MB (P5, P13, P6 + P14)		
768MB	four-way	4 x 128MB (P3, P11, P4 + P12)	4 x 64MB (P5, P13, P6 + P14)		
1024MB	four-way	4 x 256MB (P3, P11, P4 + P12)			
1024MB	four-way	4 x 128MB (P3, P11, P4 + P12)	4 x 128MB (P5, P13, P6 + P14)		

**Table B-1. Memory Configurations (Continued)**

Total Memory	Interleave Type	Bank #0	Bank #1	Bank #2	Bank #3
1152MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 32MB (P5, P13, P6 + P14)		
1280MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 64MB (P5, P13, P6 + P14)		
1536MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 128MB (P5, P13, P6 + P14)		
2048MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)		
2176MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 32MB (P7, P15, P8 + P16)	
2304MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 64MB (P7, P15, P8 + P16)	
2560MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 128MB (P7, P15, P8 + P16)	
3072MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 256MB (P7, P15, P8 + P16)	
3200MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 256MB (P7, P15, P8 + P16)	4 x 32MB (P9, P17, P10 + P18)
3328MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 256MB (P7, P15, P8 + P16)	4 x 64MB (P9, P17, P10 + P18)
3584MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 256MB (P7, P15, P8 + P16)	4 x 128MB (P9, P17, P10 + P18)
4096MB	four-way	4 x 256MB (P3, P11, P4 + P12)	4 x 256MB (P5, P13, P6 + P14)	4 x 256MB (P7, P15, P8 + P16)	4 x 256MB (P9, P17, P10 + P18)



Appendix C  
**Option Boards**

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## **Introduction**

Use this section of your user's guide for storing controller/adaptor installation procedures that accompany option boards you purchase after your server is installed.



Appendix D  
**Devices**

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## **Introduction**

Use this section of your user's guide for storing device installation procedures that accompany add-on peripheral devices you purchase after your server is installed.

# Network Operating Systems

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## **Introduction**

Use this section of your user's guide for storing your Network Operating System Configuration Guide.

# Equipment Log

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Use this equipment log form to record pertinent information about your system. You will need some of this information to run the System Configuration Utility. Be sure to update the equipment log when you add options.

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

Record the model and serial numbers of the unit and system baseboard. The model and serial numbers of the system unit are recorded on a label attached to the rear of the unit. The serial number of the baseboard is located along the left side of the board, near the PCI expansion slot covers.

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. Literature accompanying these products should illustrate or describe the location of model and serial numbers.



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**Equipment Log**

<b>Component</b>	<b>Manufacturer Name and Model</b>	<b>Serial Number (if available)</b>	<b>Date Installed</b>
Server			
Baseboard			
2nd CPU			
3rd CPU			
4th CPU			
DIMMs			
Video Mem. DRAM			
Diskette Drive A			
Diskette Drive B			
Tape Drive 1			
Tape Drive 2			
Tape Drive 3			
Tape Drive 4			
CD-ROM Drive 1			
CD-ROM Drive 2			
CD-ROM Drive 3			
CD-ROM Drive 4			
Hard Disk Drive 1			
Hard Disk Drive 2			
Hard Disk Drive 3			
Hard Disk Drive 4			
Hard Disk Drive 5			
Hard Disk Drive 6			
Hard Disk Drive 7			

(continued)

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**Equipment Log (continued)**

<b>Component</b>	<b>Manufacturer Name and Model</b>	<b>Serial Number (if available)</b>	<b>Date Installed</b>
Hard Disk Drive 8			
Hard Disk Drive 9			
Hard Disk Drive 10			
Hard Disk Drive 11			
Hard Disk Drive 12			
Optional SCSI Controller			
Optional RAID Controller			
DigiBoard 1			
DigiBoard 2			
Network Controller 1			
Network Controller 2			
Monitor			
Keyboard			
Mouse			
External SCSI Peripherals			



# Glossary

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## A

- AC** (Alternating Current) The type of current available in wall outlets. All computers must convert alternating current to direct current to operate. See also DC.
- address** A label, name, or number that identifies a location in computer memory.
- ASCII** (American Standard Code for Information Interchange) A standard number assigned to each of the alphanumeric characters and keyboard control code keys to enable the transfer of information between different types of computers and peripherals.

## B

- backplane slot** A connector on the backplane board in desktop computers and expansion boxes that allows you to install circuit cards.
- backup** A copy of data for safe-keeping. The data is copied from computer memory or disk to a floppy disk, magnetic tape, or other media.
- backup battery** The battery in your computer that maintains the real-time clock and the configuration information when the computer's power is removed.
- base memory** An area of memory between 0 and 640 kilobytes.
- baud rate** The speed with which data is transmitted during serial communication. The computer's operating system and software program must be configured for the same baud rate as the communication device, such as a serial printer. See also bps.
- BIOS** (Basic Input/Output System) A program stored in flash EPROM or ROM that controls the keyboard, disk drives, video monitor, and other devices. See also flash EPROM, EPROM, and ROM.
- bit** Derived from BInary digiT, a bit is the smallest unit of information a computer handles. See also byte.
- boot** The process of loading the operating system into memory.
- bps** (bits per second) The number of bits transferred in one second during serial communication, such as modem transmission.
- byte** A group of eight bits.

**C**

<b>cache memory</b>	A very fast, limited portion of RAM set aside for temporary storage of data for direct access by the microprocessor.
<b>CD-ROM drive</b>	(Compact Disk ROM drive) A type of mass storage device that reads information from a compact disk.
<b>Centronics port</b>	An industry standard parallel port. See also parallel port.
<b>CGA</b>	(Color Graphics Adapter) A type of video display system that provides low-resolution text and graphics on TTL monochrome and color monitors.
<b>CMOS</b>	(Complimentary Metal-Oxide Semiconductor) A type of low-power integrated circuit used in computers. See also TTL.
<b>COM1 or COM2</b>	The name you can assign a serial port to set or change its address. See also serial port.
<b>command</b>	An instruction that directs the computer to perform a particular operation.
<b>configuration</b>	The way in which a computer is set up to operate. Some configurable options include CPU speed, serial port designation, and memory allocation.
<b>coprocessor</b>	See math coprocessor.
<b>CPU</b>	(Central Processing Unit) See microprocessor.
<b>CRT</b>	(Cathode-Ray Tube) The type of video display used in monitors for desktop computers.

**D**

<b>DC</b>	(Direct Current) The type of current available in the rechargeable battery packs used in portable computers. See also AC.
<b>default</b>	The factory setting your computer uses unless you instruct it otherwise. For example, when powering up, the computer will boot from the default drive.
<b>density</b>	The capacity of information (bytes) that can be packed onto a storage device, such as a floppy disk.
<b>device driver</b>	A software program that a computer must use to recognize and operate certain hardware, such as a mouse or a video monitor.
<b>disk drive</b>	A device that stores data on a hard or floppy disk. A floppy disk drive requires a floppy disk to be inserted; a hard disk drive has a permanently encased hard disk.

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<b>DOS</b>	(Disk Operating System) See operating system.
<b>DRAM</b>	(Dynamic RAM) See RAM.
<b>E</b>	
<b>ECC</b>	(Error Checking and Correction) A method of detecting and correcting errors.
<b>EEPROM</b>	(Electrically Erasable Programmable Read-Only Memory) A type of memory device that stores password and configuration information.
<b>EGA</b>	(Enhanced Graphics Adapter) A type of video display system that provides medium-resolution text and graphics on TTL monochrome, color, and enhanced color monitors.
<b>EISA</b>	(Extended Industry Standard Architecture) An industry standard for computers and circuit cards that transfer 32 bits of data at a time.
<b>EMI</b>	(Electromagnetic Interference).
<b>EMS</b>	(Expanded Memory Specification) A method of accessing memory beyond the 640K limit of DOS by exchanging data in and out of main memory at high speeds. Some software requires EMS to operate.
<b>EPROM</b>	(Erasable Programmable Read-Only Memory) A type of memory device that is usually used to store system BIOS code. This code can be erased with ultraviolet light, but is not lost when the computer is powered off. See also flash EPROM and ROM.
<b>ESD</b>	(Electrostatic Discharge).
<b>expanded memory</b>	See EMS.
<b>expansion slot</b>	See backplane slot.
<b>extended memory</b>	The protected memory above 1M that is directly accessible by the microprocessor through certain utilities and operating systems. This memory is used in computers with 80286, 80386, and 80486 microprocessors.
<b>F</b>	
<b>flash EPROM</b>	A type of memory device that is usually used to store system BIOS code. This code can be replaced with updated code from a floppy disk, but is not lost when the computer is powered off. See also EPROM and ROM.
<b>floppy disk drive</b>	See disk drive.
<b>format</b>	The process used to organize a hard or floppy disk into sectors so it can accept data. Formatting destroys all previous data on the disk.

---

**G**

**(Gigabyte)** 1,073,741,824 bytes. See also byte.

**H**

**hard disk drive** See disk drive.

**hardware** The physical parts of your computer, including the keyboard, monitor, disk drives, cables, and circuit cards.

**I**

**IC** (Integrated Circuit) An electronic device that contains miniaturized circuitry.

**(ISA Configuration Utility)** The program that you use to change the configuration of some ISA desktop computers. This program also contains information about the hardware in the computer.

**IDE** (Integrated Drive Electronics) A type of hard disk drive with the control circuitry located inside the disk drive rather than on a drive controller card.

**interface.** A connection between the computer and a peripheral device that enables them to exchange data. See also parallel port and serial port.

**ISA** (Industry Standard Architecture) An industry standard for computers and circuit cards that transfer 16 bits of data at a time.

**J**

**jumper** A small electrical connector used for configuration on some computer hardware.

**K**

**(Kilobyte)** 1,024 bytes. See also byte.

**L**

**LAN** (Local Area Network) A group of computers linked together within a limited area to exchange information.

**LCD** (Liquid Crystal Display) The type of video display used in portable computers.

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**LED** (Light-Emitting Diode) A small electronic device that glows when current flows through it.

**LPT1 or LPT2** The name you can assign a parallel port to specify its address. See also parallel port.

## **M**

**(Megabyte)** 1,048,576 bytes. See also byte.

**math coprocessor** An IC that works with the microprocessor to speed up mathematical calculations.

**memory** The circuitry in your computer that stores data and programs. See also EMS, extended memory, RAM, and ROM.

**microprocessor** The integrated circuit that processes data and controls the basic functions of the computer.

**modem** A device used to exchange information with other computers over telephone or data lines.

**module** A circuit board that plugs into a dedicated connector on the system board in your computer.

**mouse** A small input device that you guide on a flat surface to control the cursor movement and operation of the computer when using certain software programs.

## **N**

**NVRAM** (Nonvolatile RAM) A type of RAM that retains its contents even after the computer is powered off. This memory stores EISA configuration information. See also RAM and SRAM.

## **O**

**operating system** A set of programs that provides the interface between other software programs and the computer.

## **P**

**parallel port** The connector on the back of your computer that allows the transfer of data between the computer and a parallel device, such as a parallel printer.

**partition** The process of dividing the storage space on a hard disk into separate areas so that the operating system treats them as separate disk drives.

<b>password</b>	A security feature that prevents an unauthorized user from operating your computer. See also EEPROM.
<b>PCI</b>	Peripheral Component Interconnect. PCI is a high-performance peripherals I/O bus supporting data transfers of up to 132MB per second.
<b>Pentium</b>	A type of microprocessor, with a built-in math coprocessor, cache memory, and memory and bus controllers, that processes and communicates 32 bits of data at a time. This microprocessor also contains power management capabilities.
<b>peripheral</b>	A device connected to and controlled by the computer, such as an external disk drive or a printer.
<b>pixel</b>	The smallest element that is visible on a video display. The resolution of a video display system is measured in pixels.
<b>POST</b>	Power-On-Self-Test.
<b>R</b>	
<b>RAM</b>	(Random-Access Memory) A temporary storage area for data and programs. This type of memory must be periodically refreshed to maintain valid data, and is lost when the computer is powered off. See also NVRAM and SRAM.
<b>real-time clock</b>	The IC in your computer that maintains the time and date.
<b>ROM</b>	(Read-Only Memory) A type of memory device that usually is used to store system BIOS code. This code cannot be altered and is not lost when the computer is powered off. See also BIOS, EPROM, and flash EPROM.
<b>RS-232C port</b>	An industry standard serial port. See also serial port.
<b>S</b>	
<b>save</b>	To store information on a floppy disk, hard disk, magnetic tape, or some other permanent storage device.
<b>SCU</b>	(System Configuration Utility) The program that you use to change the configuration of your system. This program also contains information about the hardware in your system.
<b>SCSI</b>	(Small Computer System Interface) An industry standard interface that provides high-speed access to tape drives, hard disk drives, and other peripheral devices.
<b>serial communication</b>	Information sent sequentially, one bit at a time.

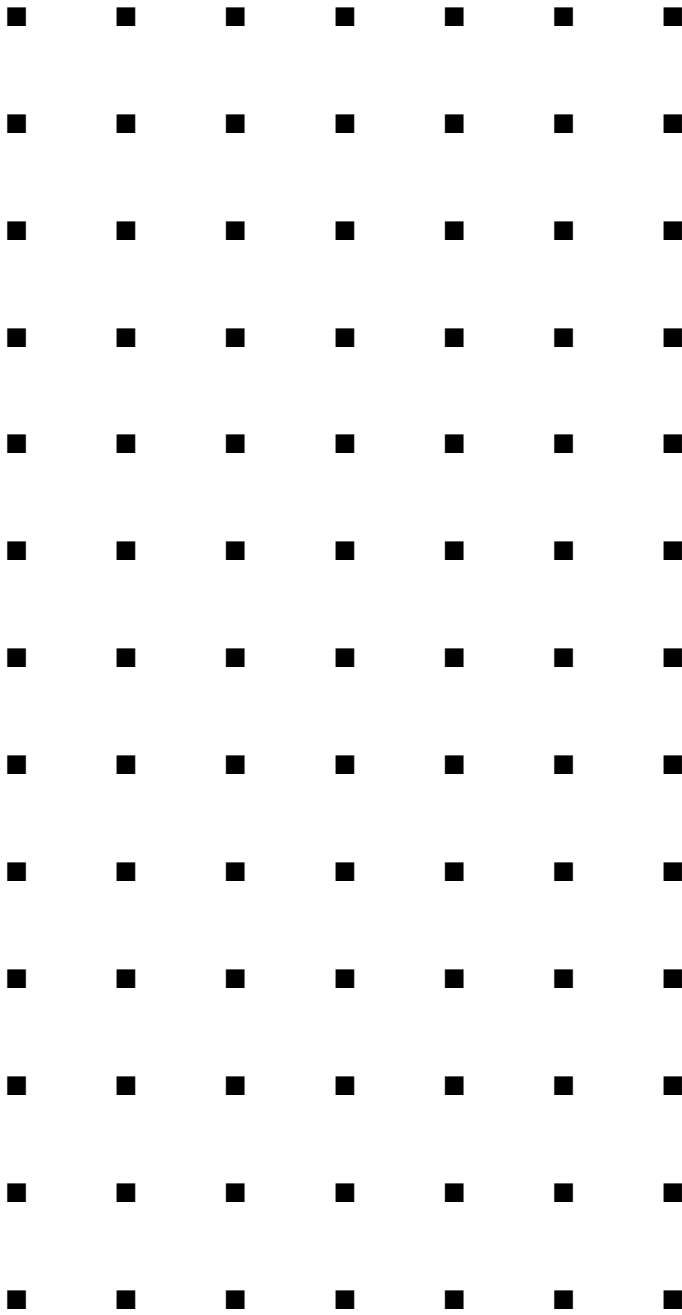
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<b>serial port</b>	The connector on the back of your computer that allows the transfer of data between the computer and a serial device, such as a mouse, a modem, or a serial printer.
<b>Setup program</b>	The program that you use to change the configuration of some ISA desktop and notebook computers. This program also contains information about the hardware in the computer.
<b>SMP</b>	(Symmetrical Multiprocessing).
<b>software</b>	Programs with specific functions, such as word processing, data base management, communications, and operating system.
<b>SRAM</b>	(Static RAM) A temporary storage area for data and programs. This type of memory does not need to be refreshed, but it is lost when the computer is powered off. See also NVRAM and RAM.
<b>SVGA</b>	(Super VGA) A type of video display system that provides very high-resolution text and graphics on analog color monitors.
<b>system board</b>	The main circuit board in your computer. It contains most of the connectors and ports.
<b>T</b>	
<b>tape drive</b>	A type of storage device using magnetic tape.
<b>TTL</b>	(Transistor-Transistor Logic) A type of integrated circuit used in computers. See also CMOS.
<b>V</b>	
<b>VGA</b>	(Video Graphics Array) A type of video display system that provides high-resolution text and graphics on analog color monitors.









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