SERVER MH4500
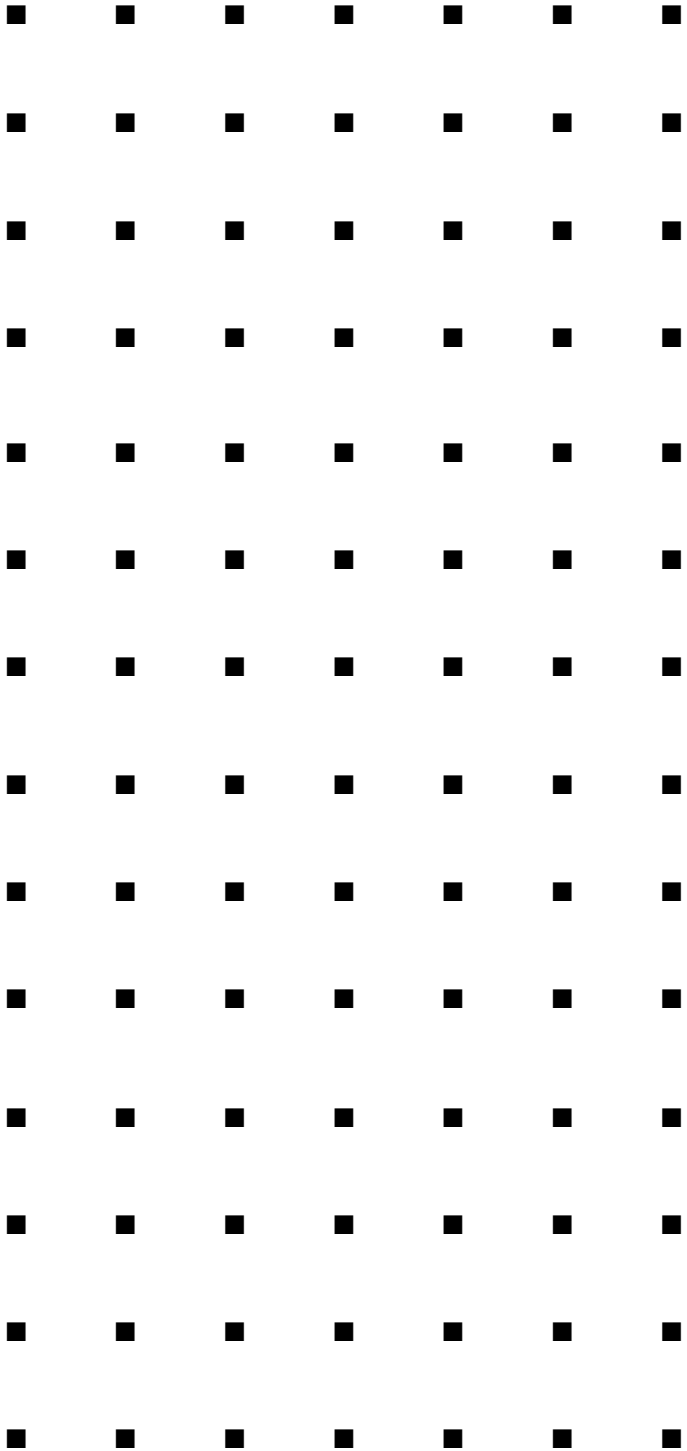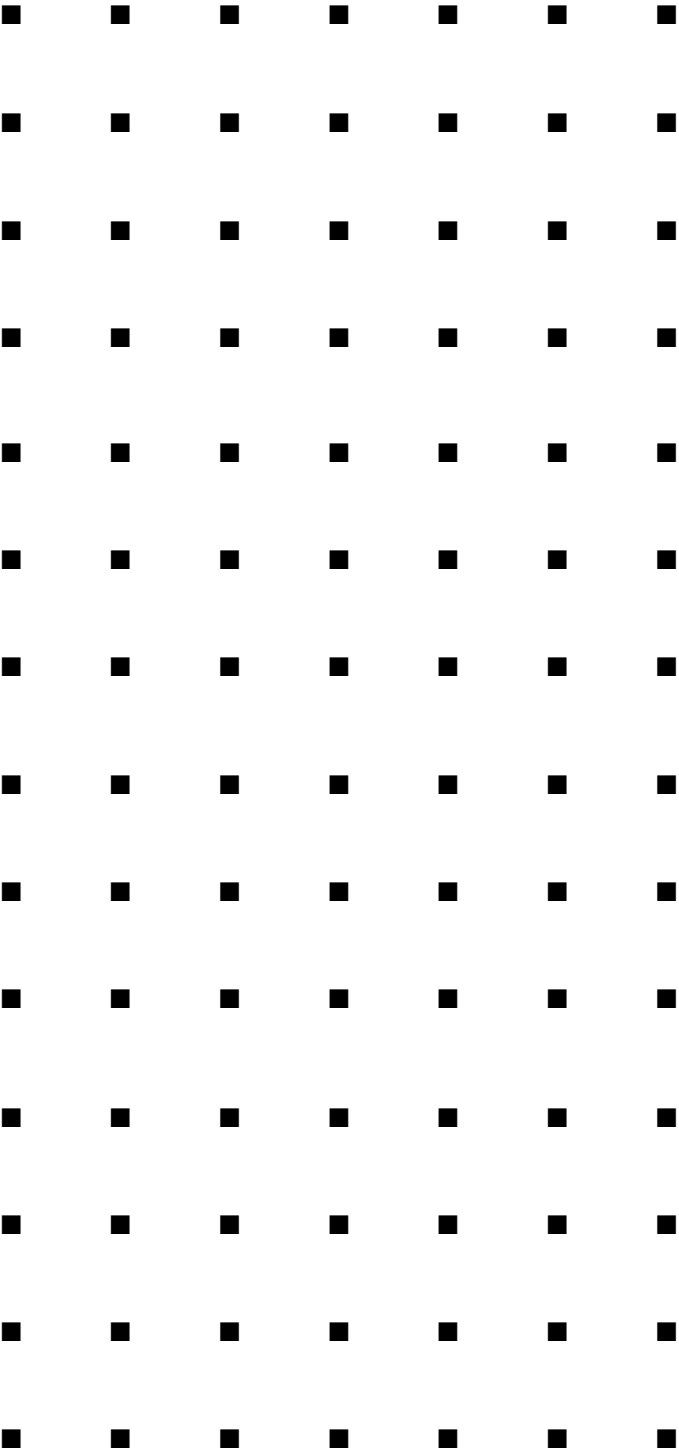
User's Guide

SERVER MH4500

User's Guide

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PN: 456-00008-003

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System Overview

- ■ System Chassis Features
- ■ System Board Features
- ■ System Security Features

The MH4500 System is a modular, multiprocessing server based on the Intel® Pentium® II Xeon™ microprocessor. The combination of compute performance, memory capacity, and integrated input/output (I/O) provides a high performance environment for many server market applications. These range from large corporations supporting remote offices to small companies looking to obtain basic connectivity capability such as file and print services, email, web access, and web site server.

As application requirements increase, you can expand your server with additional processors, memory, add-in boards, and peripheral devices (such as tape devices and hard disk drives).

The server is available in two configurations: a stand-alone pedestal system and a rack system. The pedestal system can be converted to a rack-mounted system using an optional rack mount kit. Both configurations use the same components (except there is no outer covers on the rack unit). The following figures show the pedestal system and a rack system mounted in a rack.
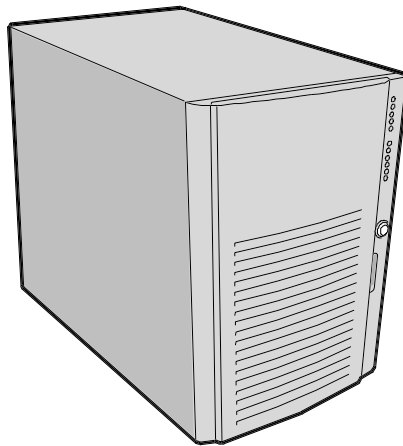
Stand-Alone Pedestal Server System
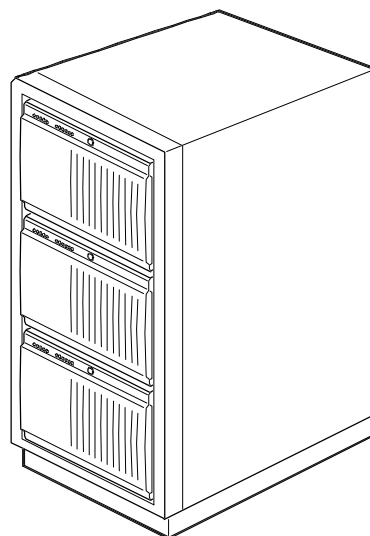
Rack Mounted Server System (three servers shown)

Your server features the following major components:

- up to four high-performance Pentium II Xeon processors, each packaged in a Single Edge Connector (S.E.C.) cartridge

- integrated 512 KB or 1 MB secondary cache integrated in the S.E.C. cartridge

- 128 MB to 4 GB of memory, using up to sixteen dual-inline memory modules (DIMMs)

- six PCI expansion slots for add-in boards (one slot shared with an ISA slot; one slot for half-length PCI boards).

- one half-length ISA expansion slot for add-in boards (shared with a PCI slot)

- onboard Cirrus Logic CL-GD5480 Super Video Graphics Array (SVGA) controller

- 2 MB of video DRAM memory

- onboard single channel enhanced IDE controller

- onboard Symbios SYM53C810AE single channel narrow SCSI controller on the PCI-A bus providing a narrow SCSI interface for 5 1/4-inch devices

- onboard Symbios SYM53C896 dual-channel wide SCSI controller on the PCI-B bus providing an ultra 2 wide SCSI interface for 3 1/2-inch devices

- 1.44MB diskette drive

- SCSI CD-ROM drive

- six SCSI hot swap hard disk drive expansion bays

- SCSI single connector attachment (SCA) compatible backplane that provides continuous fast/wide ultra 2 SCSI bus for access to all hot-swap drive bays

- three 5 1/4-inch bays for removable media devices

- PS/2-compatible mouse and keyboard ports

- VGA video port

- one Universal Serial Bus (USB) port.

System Chassis Features

The system chassis is an easy-to-expand, fabricated metal structure housing the power supplies, fans, expansion bays, system board, and supporting components. A key feature of the chassis is the "swing-out" electronics bay and subchassis modules, allowing easy access to the interior of the system.

Several major system component locations are shown in the following figure and briefly described in the following paragraphs.
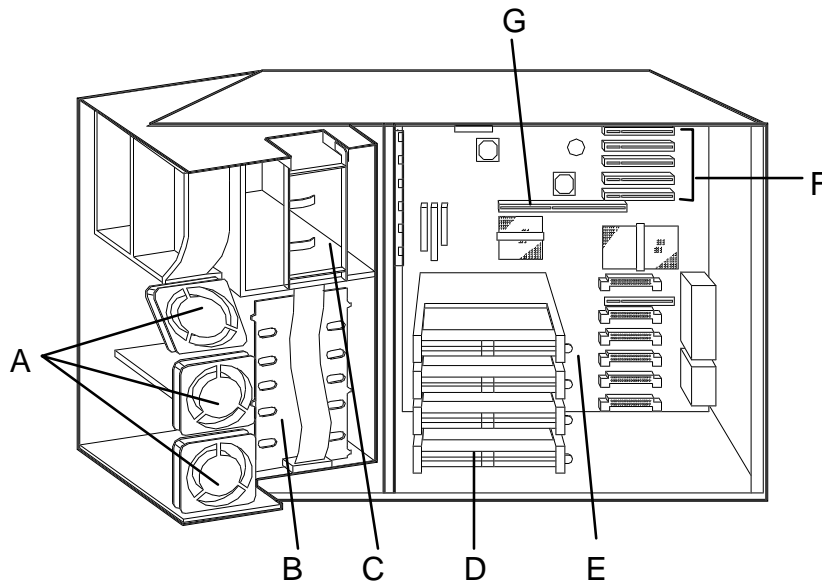
A.	Fans (8)	**E.**	System Board
B.	SCSI Backplane	**F.**	Expansion Board Connectors
C.	Removable Media Device Bays (3)	**G.**	Memory Module Connector
D.	S.E.C. Processor Bays (4)		

System Chassis

Power Supplies

Two 400 watt auto-voltage-sensing power supplies provide system power. Each operates at 115 or 230 Vac at an operating frequency of 50/60 Hz. Both supplies are designed to operate together during system operation. Both power supplies comply with existing emissions standards and provide sufficient power for a fully loaded system configuration. An optional third power supply can be added to the system as a backup unit.

System Cooling

The chassis houses eight fans for cooling and airflow.

> 📄 **Note:** To maintain proper system cooling and air flow, the chassis access cover must be installed whenever the system is running.

Peripheral Bays

The system supports a variety of standard PC AT-compatible peripheral devices. The chassis includes the following peripheral bays:

- 3 1/2-inch front panel bay for mounting the standard 3 1/2-inch diskette drive (supports 720 KB and 1.44 MB diskettes)

- three 5 /14-inch removable media device front panel bays for mounting one inch high 5 1/4-inch peripheral devices, including the standard SCSI CD ROM drive.

> ▤ **Note:** Mounting a hard drive in the 5 1/4-inch bay is not recommended due to cooling restraints and EMI requirements.

- six internal hard disk drive bays for mounting up to six, one inch high, SCSI hot-swap hard disk drives.

System Board Features

The system board features processor and memory subsystems residing on the board. The following figure shows the components on the system board. Brief descriptions of the major components follow the figure.
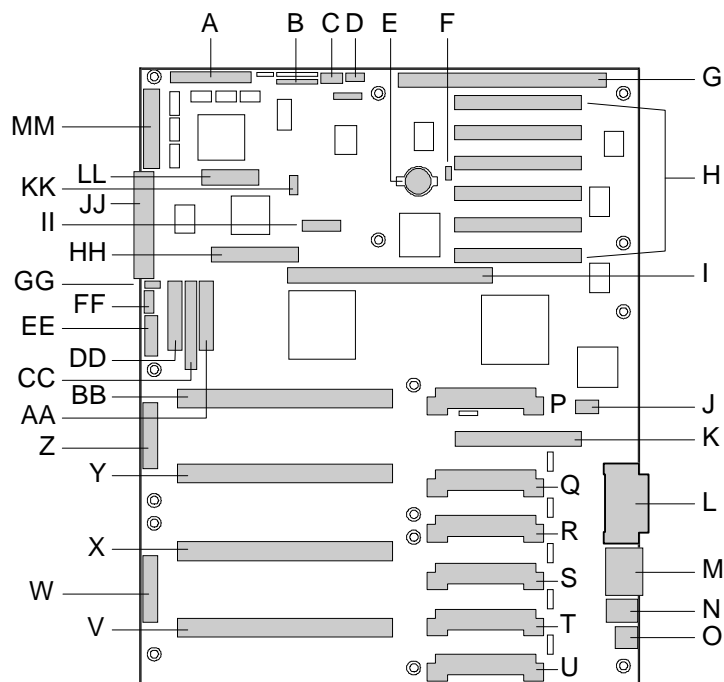
A.	Wide SCSI B Connector	U.	VRM Connector for Processor 1
B.	System Jumpers	V.	Processor 1, Slot 2 Connector
C.	Hard Drive Input LED Connector	W.	Main Power Connector
D.	System Speaker Connector	X.	Processor 2, Slot 2 Connector
E.	Lithium Battery	Y.	Processor 3, Slot 2 Connector
F.	Wake-on LAN Connector	Z.	Main Power Connector
G.	ISA Slot	AA.	Front Panel Connector
H.	PCI Slots B4, B3, B2, B1, A3, A2	BB.	Processor 4, Slot 2 Connector
I.	Memory Module Connector	CC.	IDE Connector
J.	ICMB Connector	DD.	Diskette Drive Connector
K.	PCI Slot A1	EE.	Auxiliary Power Connector
L.	Video and Parallel Port Connectors	FF.	USB Internal Header
M.	Serial Port Connector	GG.	SMBus Connector
N.	Keyboard and Mouse Connector	HH.	F16 Expansion Connector
O.	USB Connector	II.	ITP Connector
P.	VRM Connector for Processor 4	JJ.	Narrow SCSI Connector
Q.	VRM Connector for Processors 4 and 3	KK.	External IPMB Connector
R.	VRM Connector for Processor 3	LL	SMM Connector
S.	VRM Connector for Processor 2	MM.	Wide SCSI A Connector
T.	VRM Connector for Processors 2 and 1		

System Board

Pentium II Xeon Processor

The system board supports up to four Pentium II Xeon processors, each packaged in a Single Edge Contact (S.E.C.) cartridge. The cartridge includes the processor core with an integrated 16 KB primary (L1) cache; the secondary (L2) cache; a thermal plate; and a back cover. The processor implements the MMX™ technology and the processor's numeric coprocessor significantly increases the speed of floating-point operations.

The processor external interface operates at 100 MHz. The second-level cache is located on the substrate of the S.E.C. cartridge. The cache includes burst pipelined synchronous static RAM (BSRAM). The L2 cache is offered in 512 KB and 1 MB configurations, with error correcting code (ECC) that operates at half the core clock rate.

The processors are supported by one or more voltage regulator modules (VRM) on the system board, with the number of VRMs dependent on the number of processors installed.

Each S.E.C cartridge connects to the system board through a 330-pin Slot 2 edge connector. The Slot 2 connectors are arranged in a vertical stack of four on the system board. The VRM modules are located adjacent to the processors.

System Memory

System memory is mounted on a memory module that connects to the system board. The module contains sixteen 168-pin DIMM sockets arranged in four banks. Up to 4 GB of EDO DIMM memory is supported, with 32 MB being the minimum (the system ships with a minimum of 128 MB). The memory module supports a 64/72 bit four-way-interleaved pathway to main memory on the module and supports 4:1 interleaving.

System memory begins at address 0 and is continuous (flat addressing) up to the maximum amount of DRAM installed (exception: system memory is noncontiguous in the ranges defined as memory holes using configuration registers). The system supports both base (conventional) and extended memory.

The system BIOS automatically detects, sizes, and initializes the memory array, depending on the type, size, and speed of the installed DIMMs. The BIOS reports memory size and allocation to the system via configuration registers.

The memory module connects to the system board through a 242-pin connector.

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 ISA connectors.

The system board has one full-length ISA bus connector. The connector shares a chassis expansion slot with a PCI connector and supports half-length ISA boards.

ISA features include:

- bus speed up to 8.33 MHz
- 16-bit memory addressing
- Type A transfers at 5.33 MB/second
- Type B transfers at 8 MB/second
- 8- or 16-bit data transfers
- Plug and Play ready.

The system board has two 32-bit PCI bus segments: PCI-A and PCI-B. The segments provide seven PCI connectors, three on PCI-A and four on PCI-B. PCI-A supports half-length boards only and PCI-B supports full-length boards. One of the PCI-B connectors shares a chassis expansion slot with an ISA connector.

PCI features include:

- bus speed up to 33 MHz
- 32-bit memory addressing
- 5 V signaling environment
- burst transfers of up to 133 Mbps
- 8-, 16-, or 32-bit data transfers
- Plug and Play ready
- parity enabled.

Real-Time Clock/Calendar

The real-time clock provides system clock/calendar information stored in a non-volatile memory (NVRAM). The replaceable real-time clock battery 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.

IDE Controller

The system includes a single channel enhanced IDE interface controller. The controller has a primary connector located on the system board that supports a master and a slave device.

The IDE controller features:

- PIO and IDE DMA/bus master operations
- Mode 4 timings
- transfer rates up to 22 MB/second
- buffering for PCI/IDE burst transfers
- master/slave IDE mode.

SCSI Controllers

The system board contains two SCSI controllers: a narrow SCSI controller (SYM53C810AE) on the PCI-A bus, and a dual-channel wide LVD/SE (Ultra2/Ultra) SCSI controller (SYM53C896) on the PCI-B bus. The narrow controller provides support for legacy 8-bit SCSI devices in the 5 1/4-inch drive bays, including the factory installed SCSI CD-ROM drive. The wide controller drives one SCSI backplane and provides support for external expansion.

Internally, each wide channel is identical, capable of operations using either 8- or 16-bit SCSI providing 10 MB/sec (Fast-10) or 20 MB/sec (Fast-20) throughput, or 20 MB/sec (Ultra), 40 MB/sec (Ultra-wide) or 80 MB/sec (40 MHz) (Ultra-2).

The SYM53C810AE (narrow) contains a high-performance SCSI core capable of Fast 8-bit SCSI transfers in single-ended mode. It provides programmable active negation, PCI zero wait-state bursts of faster than 110 MB/sec at 33 MHz, and SCSI transfer rates from 5 to 10 MB/sec. The narrow SCSI comes in a 100-pin rectangular plastic quad flat pack (PQFP).

The Sym53C896 (wide) contains a high-performance SCSI bus interface. It supports SE mode with 8-bit (10 or 20 MB/sec) or 16-bit (20 or 40 MB/sec) transfers and LVD mode with 8-bit (40 MB/sec) or 16-bit (80 MB/sec) transfers in a 329-pin ball grid array (BGA) package.

Each controller has its own set of PCI configuration registers and SCSI I/O registers. As a PCI 2.1 bus master, the SYM53C896 supports burst data transfers on PCI up to the maximum rate of 132 MB/second using on-chip buffers.

In the hot-swap bay, the system supports up to six, one-inch high SCSI hard disk drives. Also, in the 5 1/4-inch bays, the system supports three SCSI or IDE devices (the SCSI controller itself supports more devices, but the 5 1/4-inch bay can only hold a maximum of three devices).

A wide SCSI cable provides two connectors for Ultra SCSI devices, one of which is used for the SCSI backplane. However, SCSI devices do not need to operate at the ultra transfer rate. All drives on the bus must be Ultra-2 (LVD) to run at 80 MB/sec (40 MHz). The 5, 10, and 20 MHz operations can coexist on the bus and each device interacts at its appropriate speed.

No logic, termination, or resistor loads are required to connect devices to the SCSI controller other than termination in the device at the end of the cable. The SCSI bus is terminated on the system board with active terminators that can be disabled.

Video Controller

The system has an onboard integrated Cirrus Logic CL-GD5480 64-bit high-performance SVGA subsystem that supports the following:

- BIOS compatibility with VGA, EGA, CGA, Hercules Graphics, and MDA

- 2 MB of 10 ns video random access memory (VRAM) video buffer

- 16-bit bus for high-speed display memory access

- hardware accelerated bit block transfers (BITBLT)

- display power management system

- supports 100 Hz refresh, non-interlaced at 640x480, 800x600, 1024x768, 1240x1024, and 1600x1200 resolutions

- displays up to 16 million colors at 640x480 and 800x600 resolutions, 64K colors at 1024x768 resolutions, and 256 colors at 1280x1024 resolutions.

Peripheral Controller

The advanced integrated peripheral controller supports two serial ports, one parallel port, diskette drive, PS/2-compatible keyboard and mouse, and integrated Real Time Clock (RTC). The system provides the connector interface for each port.

Serial Ports

Both serial ports are relocatable. Each serial port can be set to one of four different COM ports and can be enabled separately. When disabled, serial port interrupts are available to add-in boards.

Parallel Port

One IEEE 1284-compatible 25-pin bidirectional EPP (supporting levels 1.7 and 1.9) parallel port is provided. BIOS programming enables the parallel port and determines the port address and interrupt. When disabled, the interrupt is available to add-in boards.

External Device Connectors

The external I/O connectors provide support for a PS/2 compatible mouse and a keyboard, connector for VGA monitor, two serial port connectors, a parallel port connector, and a USB connector.

System Board Management Controller (BMC)

Server management is controlled by the System Board Management Controller (BMC). The BMC and associated circuits are powered from a 5Vdc standby voltage, which remains active when system power is switched off.

The BMC supports the Emergency Management Port (EMP) Console which allows remote server management via a modem or direct connection to a manager system. Events monitored by the manager system include over-temperature and over-voltage conditions, fan failure, or chassis intrusion.

Information on the Emergency Management Port (EMP) Console is included in Appendix C, "Emergency Management Port."

System Security Features

To help prevent unauthorized entry or use of the system, the system includes a three-position key lock/switch combination to permit selected access to the drive bays. The system also includes Server Management software that monitors the chassis intrusion microswitch.

Mechanical Locks and Monitoring

The chassis intrusion microswitch is activated whenever the system's access cover is removed (pedestal system only). When the access cover is removed, the switch transmits an alarm signal to the system board, where server management software processes the signal. The alarm system software can be programmed to respond to an intrusion by powering down the system or by locking the keyboard.

Software Locks

The BIOS Setup Utility and the System Setup Utility (SSU) provide a number of security features to prevent unauthorized or accidental access to the system. Once the security measures are enabled, access to the system is allowed only after the user enters the correct password(s). For example, the SSU allows you to:

- enable the keyboard lockout timer so that the server requires a password to reactivate the keyboard and mouse after a specified time-out period (1 to 120 minutes)

- set and enable administrator and user passwords

- set secure mode to prevent keyboard or mouse input and to prevent use of the front panel reset and power switches

■ activate a hot-key combination to enter secure mode quickly

■ disable writing to the diskette drive when secure mode is set.

Further information on the security features is contained in
Chapter 3, "Configuring Your System."

2

Setting Up Your System

- Selecting a Site
- Unpacking the System
- Getting Familiar with the System
- Installing the System
- Connecting Peripherals
- Connecting the Power Cords
- Powering on the System
- Converting to a Rack Mount Server Unit

Your system ships as a stand-alone, single server pedestal unit or as a rack unit ready to install in a rack. The pedestal system can also be converted to a rack-mounted server unit using a rack conversion kit (not supplied). You can purchase the kit from your dealer.

The information in this chapter pertains to both configurations. Where differences occur between configurations, they are noted.

Use this chapter to guide you in

- selecting a site

- unpacking the system

- becoming familiar with the system

- installing the system

- connecting peripherals

- connecting power cords

- powering on the system

- converting the system to a rack-mounted server unit.

Selecting a Site

The system operates reliably in a typical office environment. Choose a site that meets the following requirements.

- Install the system near two or more grounded, three-pronged power outlets, preferably on separate electrical circuits.

Note: For the United States and Canada, this means 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.

⚠ WARNING

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

- The site must be clean, dust-free, and well ventilated. Keep the front and rear ventilation openings free of obstructions and away from sources of heat, vibration, or physical shock.

- The site must be 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.

- Provide at least eight inches (20.32 centimeters) behind the system and three inches (eight centimeters) on each side of the system for proper cooling, airflow, and cable clearance.

- Site the system so that it is easily accessible for system maintenance and installation of system upgrades.

With the site selected, unpack and set up the system as described next.

Unpacking the System

⚠ WARNING

Your system weighs approximately 85 pounds (38.25 kg), minimum configuration. If your system contains optional boards and peripheral devices, it may weigh up to 100 pounds (45.4 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 carton(s) prior to unpacking. If the shipping carton(s) is damaged, note the damage, and if possible, photograph it for reference.

After removing the contents of the carton(s), inspect for damage. If the contents appear damaged, file a damage claim with the carrier immediately. Keep the cartons and the packing materials.

Check that you have all the parts listed on the packing slip. If any are missing, contact the dealer where you purchased the system.

Set the system where you can easily look at the front and rear. Take a few minutes and become familiar with the system's controls, indicators, and connectors (see "Getting Familiar with the System," next).

Getting Familiar with the System

Before setting up your system, you should become familiar with the system's features, such as the location of your system's front and rear panel switches, indicators, and connectors.

Front View

The following figure shows locations of controls and indicators on the front of the system. A brief description of the controls and indicators follows the figure.

> 📃**Note:** The stand-alone server unit and its controls and indicators are shown in the following front and rear view figures. All controls and indicators shown on the stand-alone unit are the same on the rack unit except for orientation, as the unit is mounted in the rack on its side.

A.	CD-ROM Drive	Standard, factory-installed CD-ROM Drive
B.	Diskette Drive	Standard, factory-installed 3 1/2-inch diskette drive.
C.	Power On/Off Button	Press to turn system DC power on or off.
D.	Sleep/Service Button	Press to put system in power saving mode or service mode.
E.	Reset Button	Press to reset system.
F.	Front Panel LEDs (starting at top)	
	Power On	When lit (green), DC power is present.
	Disk Bay Power On	When lit (green), DC power is present at hard drive bay.
	Hard Disk Activity	When lit (green), hard disk drive is in use.
	Fan Failure	When lit (yellow), a cooling fan has failed.
	Power Supply Failure	When lit (yellow), a power supply has failed.
	Six Hard Drive LEDs (labeled 0 - 5)	When lit (yellow), associated drive failed.
G.	NMI Button	Used for system troubleshooting by qualified technical personnel only.
H.	System Security Lock	Key operated lock to prevent unauthorized access to server controls.
I.	EMI Shield Lock	Latches metal EMI shield door.
J.	Internal Drive Bays	Holds up to six 1" high SCSI hot-swap hard disk drives.
K.	Metal EMI Shield	EMI shield for SCSI hard drives.
L.	5 1/4-inch Expansion Drive Bay	Holds up to three 5 1/4-inch devices, including the factory-installed CD-ROM drive.

Front Features and Controls

Rear View

The following figure shows the location of system controls, indicators, and connectors on the rear of the system. The rack unit is similar except that it is mounted in the rack on its side.
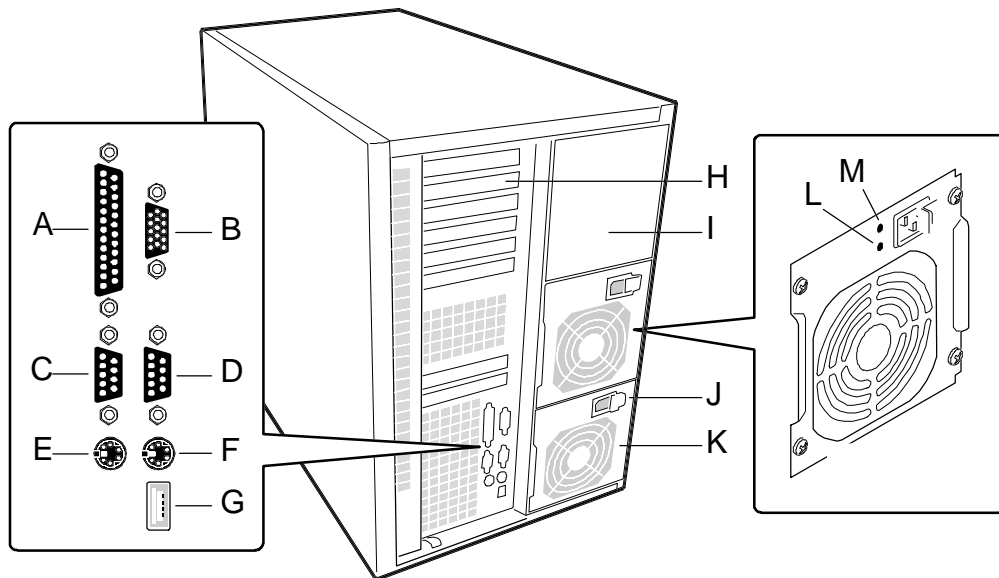
A.	Parallel Port Connector	25-pin parallel printer port connector.
B.	VGA Monitor Connector	15-pin monitor connector.
C.	Serial Port A (COM1)	9-pin serial COM1 port connector.
D.	Serial Port B (COM2)	9-pin serial COM2 port connector.
E.	Mouse Connector	6-pin PS/2-compatible mini-DIN mouse connector.
F.	Keyboard Connector	6-pin PS/2-compatible mini-DIN keyboard connector.
G.	USB Connector	Single Universal Serial Bus connector.
H.	Expansion Slots	1 shared ISA/PCI slot, 1 ISA slot, and 6 PCI slots.
I.	Power Supply Bay	Optional power supply bay for one backup power supply.
J.	AC Input Power Connector	Supplies AC power to the power supply.
K.	Power Supply Fan	Supplies cooling air to the power supply.
L.	Power Supply LED	When lit, indicates AC power is available to power supply.
M.	Power Supply Failure LED	When **not** lit, indicates power supply failure.

Rear Features and Controls

Installing the System

How you install the system depends on whether you have the stand-alone pedestal unit or the rack-mounted unit. If you have the pedestal unit, install it at your site and connect peripherals and power as explained next.

If you have the rack mounted unit, you need to install slide bars on the sides of the unit before it can be installed in a standard EIA-compatible 19-inch equipment rack. You must also install rack extension brackets and slider assemblies in the rack for the unit to mount on. See "Attaching the Outer Slide Bars to the Chassis" and Preparing the Rack" later in this chapter for procedures. Once your rack unit is in the rack, connect peripherals and power as explained next.

Connecting Peripherals

If your system normally operates without a monitor, keyboard, or mouse (for example, as a network server), you must install them to configure the system. You may remove them after running the System Setup Utility (SSU). For information on running the SSU, refer to Appendix B of this User's Guide.

Refer to the preceding figure and connect your keyboard, monitor, and mouse. Connect any external peripheral devices such as a printer by following the instructions included with the device.

⚠ CAUTION

System damage may result if the keyboard/mouse cable is connected or disconnected when power is applied to the system.

Connecting the Power Cords

The system contains two 400-watt power supplies. Each power supply is designed for automatic sensing of 115 or 230 Vac power, eliminating the need for a line voltage selector switch. The power supplies operate at a frequency of 50/60 Hz.

The system operates with both power supplies connected to power. Each power supply is separately connected to a power source with its own power cord.

Connect each power cord as follows.

1. Plug the female end of the AC power cord into its socket on the back of the power supply.

- You may need to slide the plug-lock away from the socket to allow insertion of the plug into the socket.

- To unplug the power cord, slide the lock away from the plug while carefully pulling it out of the socket. Do not pull on the cord, only the plug.

2. Plug the male end of the power cord into a wall-mounted power outlet.

- Plug the male end of the power cord into an NEMA 5-15R outlet for 100-120 Vac.

- Plug the male end of the power cord into an NEMA 6-15R outlet for 200-240 Vac.

If the power cords supplied with the system are not compatible with the AC wall outlets in your region, obtain suitable power cords that meet 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 ships with two power cords, one for each power supply. Do not attempt to modify or use the supplied AC power cords if they are not the exact type required.

Powering On the System

Power on your system as follows.

1. Make sure all external devices (monitor, keyboard, mouse) and power cords are connected.

2. Make sure both AC power supply cords are connected to the system and power outlets.

3. Power on the monitor and any other external devices.

4. Press the dc push-button power on/off switch on the front panel.

- Verify that the dc power-on LED on the front panel is lit. If it is not lit, ensure that the AC power cords are connected to functional AC power sources.

■ Verify that the AC power-on and power supply failure LEDs on the back of each power supply are lit. If the power supply failure LED is not lit, ensure that the AC power cord is connected to a functional AC power source.

⚠ WARNING

The DC push-button on/off switch on the front panel does not turn off AC power. To turn off AC power, you must unplug all power supply cords from either the power supplies or from the power sources. **Do NOT turn off AC power without first turning off DC power**.

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

⚠ CAUTION

Always allow POST to complete before powering down your system.

⚠ CAUTION

The server management logic on your system board monitors and logs system voltage changes. When powering down your system, you may experience up to five seconds delay from the time you press the push-button power on/off switch on the front panel and your system powering down. This is normal system operation and is required by the server management logic.

If you have problems powering on your system, refer to Chapter 5, "Solving Problems," in this guide.

After you have successfully powered on your system, insert the EXPRESSBUILDER CD ROM into the CD ROM drive, reboot the system, and follow the screen prompts to run EXPRESSBUILDER.

Converting to a Rack Mount Server Unit

You can convert a pedestal system to a rack mounted server unit using an optional rack installation kit available from your dealer. The kit contains the slide rails, bezel frame, and other hardware necessary for mounting the system in an EIA-compatible 19-inch equipment rack. Once you have the kit, use the following procedures to prepare the system for mounting in a rack. You should also follow any instructions that may come with the kit.

Before starting the conversion, ensure that you have all the parts necessary for the conversion (check the packing slip that comes with the rack installation kit). You should also observe and implement the following equipment rack warnings and cautions.

Equipment Rack Warnings and Cautions

Observe and implement the following equipment rack warnings and cautions before starting the conversion.

⚠ WARNING

Anchor the Equipment Rack. The equipment rack must be anchored to an unmovable support to prevent it from falling over when one or more servers are extended in front of it on slide assemblies. The anchors must be able to withstand a force of up to 113 kg (250 lbs). You must also consider the weight of any other device installed in the rack.

Main AC Power Disconnect. You are responsible for installing an AC power disconnect for the entire rack unit. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire unit, not just to the server(s).

Grounding the Rack Installation. To avoid a potential electrical shock hazard, you must include a third wire safety grounding conductor with the rack installation. If server power cords are plugged into AC outlets that are part of the rack, then you must provide proper grounding for the rack itself. If server power cords are plugged into wall AC outlets, the safety grounding conductor in each power cord provides proper grounding only for the server. You must provide additional, proper grounding for the rack and other devices installed in it.

Overcurrent Protection. The server is designed for an AC line voltage source with up to 20 amperes of overcurrent protection. If the power system for the equipment rack is installed on a branch circuit with more than 20 amperes of protection, you must provide supplemental protection for the server. If more than one server is installed in the rack, the power source for each server must be from a separate branch circuit. The overall current rating of a server configured with three power supplies is under 12 amperes.

⚠ CAUTION

Temperature. The operating temperature of the server, when installed in an equipment rack, must not go below 5 °C (41 °F) or rise above 35 °C (95 °F). Extreme fluctuations in temperature can cause a variety of problems in your server.

Ventilation. The equipment rack must provide sufficient airflow to the front of the server to maintain proper cooling. It must also include ventilation sufficient to exhaust a maximum of 4,100 Btu's per hour for the server. The rack selected and the ventilation provided must be suitable to the environment in which the server is used.

Converting the System Pedestal Unit

Converting your pedestal system to a rack mounted unit consists of:

- removing the top and side covers
- removing the bezel frame
- installing a new bezel frame
- installing handles
- attaching slide rails to the chassis
- preparing the rack.

After the system unit is converted to a rack unit, install the unit in the rack (see "Installing the Unit in the Rack" later in this chapter).

Removing the System Unit Covers

Remove the one piece system unit top and side cover as follows.

1. Power down the system, disconnect any peripheral devices, and unplug all power cords.

2. At the back of the system unit, remove and save the screw from the top cover (see the following figure).
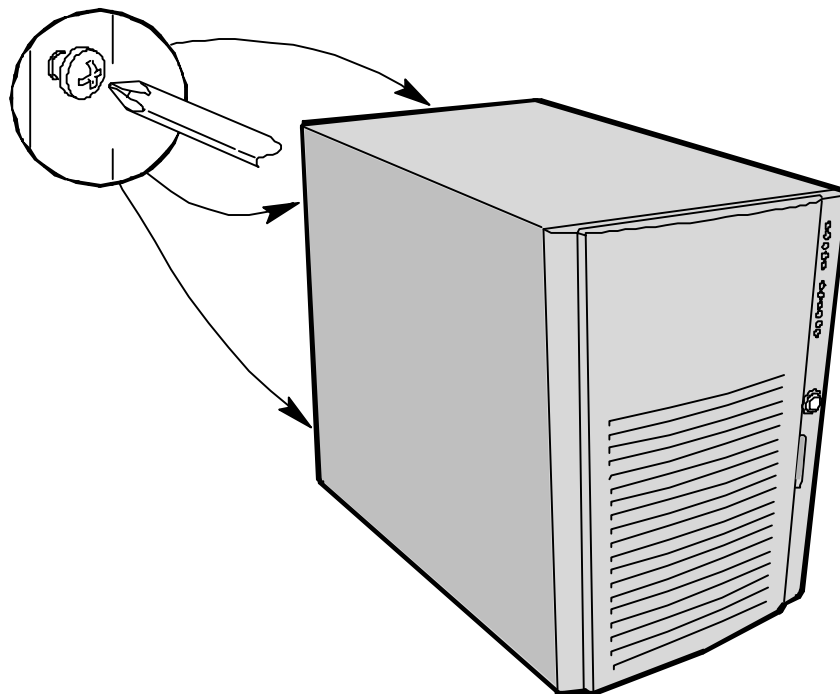
Removing the Cover Screws

3. Grasp the built-in handle on the back of the cover and, using an even pull, slide the cover back about an inch until it stops.

4. Pull the cover straight up and off the chassis. Set the cover aside.

5. Remove and save the two screws holding the access (side) panel in place.

6. Grasp the built-in handle on the back of the access panel and, using an even pull, slide the cover back about an inch until it stops.

7. Pull the cover straight away from the chassis and set aside.

Replacing the Bezel Frame

The bezel frame must be replaced with a new bezel frame containing cutouts for two chassis handles. Remove the bezel frame from the system unit and replace it with a new bezel frame as follows.

1. Open the bezel door all the way to the left (as you face the unit) and lift the door up slightly to free it from the bezel frame, then remove from the frame.

2. Remove the bezel frame by pressing its seven retaining tabs toward the center of the chassis while pulling the frame away (see the following figure).
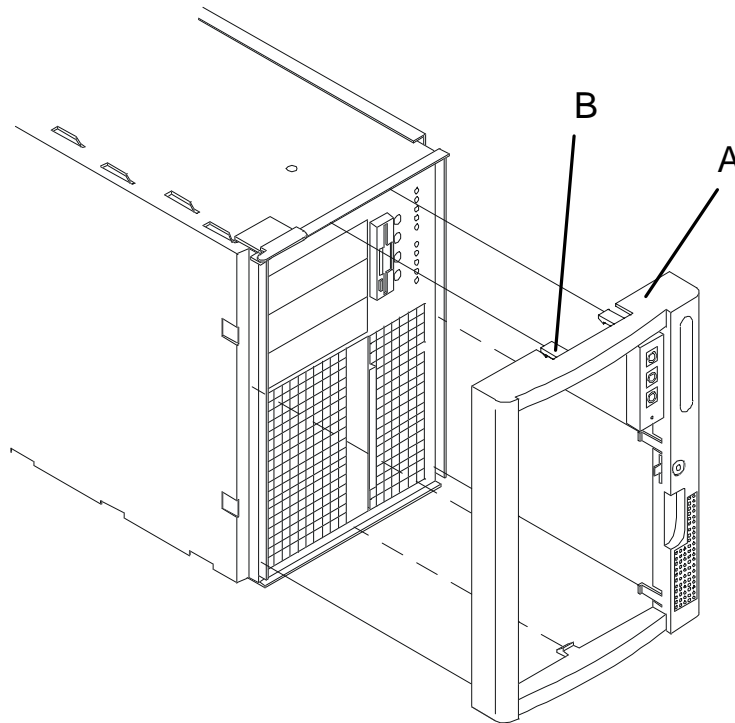
A. Bezel Frame

B. Frame Tabs (7)

Replacing the Bezel Frame

3. Install the new bezel frame by inserting the retaining tabs into their corresponding slots on the chassis.

4. Install the bezel door by inserting the door onto the hinge pins on the chassis. Shut the bezel door.

Installing the Chassis Handles

Install the two chassis handles on the chassis as follows.

⚠ WARNING

Attaching the chassis handles requires repositioning the system unit on its side. The unit weighs between 85 pounds (38 kg) and 100 pounds (45 kg), depending on configuration. To avoid injury, make sure you have someone help you to position the unit on its side.

1. Turn the system unit on its side, with the electronics bay facing up and the front of the unit facing you.

2. Locate the two rectangular cutouts in the bezel frame, one on each side, and the two threaded holes in each side of the chassis (see the following figure).

3. Attach the handles, one to a side, to the chassis. Because of the bezel frame configuration, the handles can only fit one way.

   ■ Align the two holes in the handle with the two threaded holes in the chassis.

   ■ Fasten the handle in place with two screws from the kit.

   ■ Repeat for the second handle.
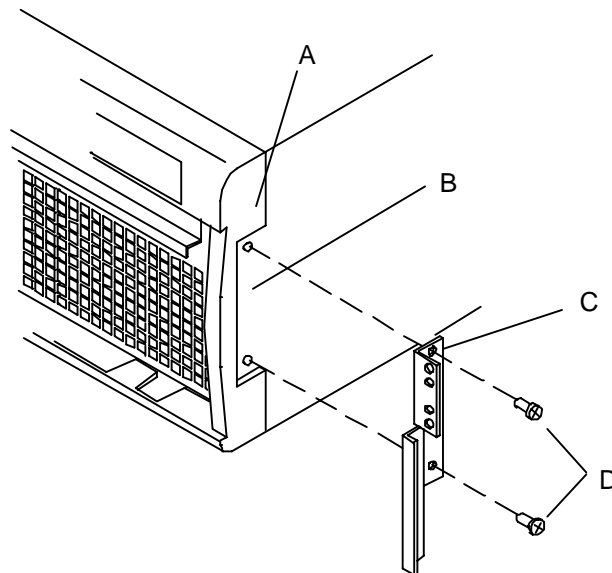
A. Bezel Frame

B. Rectangular Cutout

C. Chassis Handle

D. Screws

Attaching the Chassis Handles

Attaching the Outer Slide Bars to the Chassis

> 📑**Note:** If you have a rack unit, you must use the
> following procedure to attach the slide bars before mounting
> the unit in the rack. Observe all safety precautions,
> warnings, and cautions noted throughout this chapter.

Each slide assembly consists of a large outer bar, a center bar, and a small outer bar. The large outer bar and the center bar attach to the rack unit. The small outer bar attaches to the system chassis. As the slide assembly ships as an assembled unit, you must remove the small outer bar from the assembly before attaching to the chassis.

Remove the small outer bar from each slide assembly and attach each bar to the chassis as follows.

1. Position the slide assembly on a flat surface with the small outer bar down.

2. Fully extend the three telescoping bars until they lock in place (see the following figure).

3. While pressing down on the small outer bar safety latch (4 on the following figure), pull the small outer bar out of the assembly and set aside for installation on the chassis.

■ Release the safety latch on the center bar (5 on the figure) and collapse the large outer bar and center bar together.

■ Set the assembly aside for later installation in the rack.
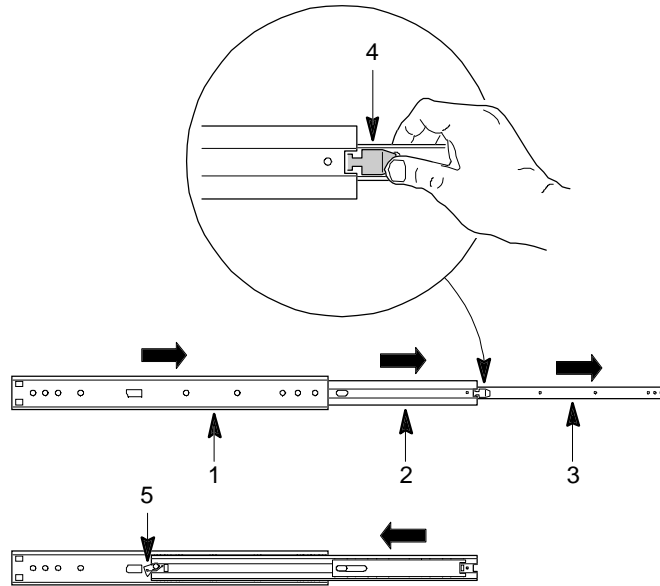
1. Large Outer Bar

2. Center Bar

3. Small Outer Bar

4. Safety Latch on Small Outer Bar

5. Safety Latch on Center Bar

Releasing the Small Outer Bar

4. Attach each small outer bar to the chassis as follows.

- Align the mounting holes in the bar to the threaded holes in the chassis (see the following figure). The right angle end of the bar goes toward the front of the chassis.

- Secure the bar to the chassis with four screws from the kit.
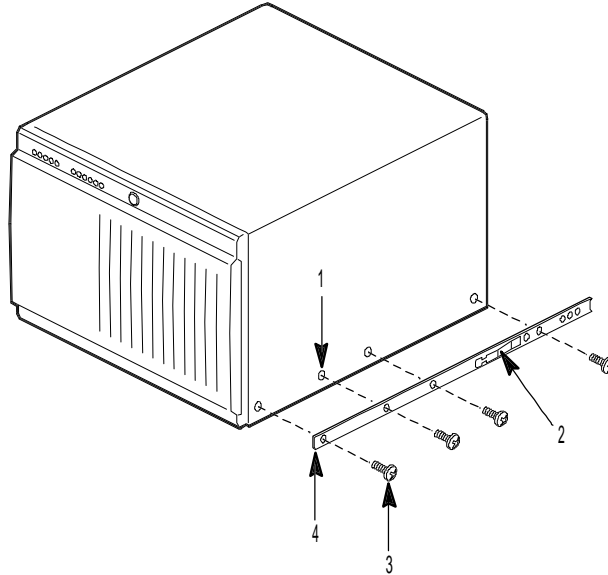
1.	Threaded Holes in Chassis
2.	Safety Latch
3.	Screw (1 of 4)
4.	Small Outer Bar (right angle end)

Attaching the Small Outer Bar to the Chassis

Preparing the Rack

⬛ **Note:** If you have a rack unit, you must use the
following procedure to prepare the rack before mounting the
unit in the rack. Observe all safety precautions, warnings,
and cautions noted throughout this chapter.

The converted system unit (or rack unit) mounts in a standard EIA-compatible
19-inch equipment rack similar to that shown in the following figure (shown
with three server units installed).
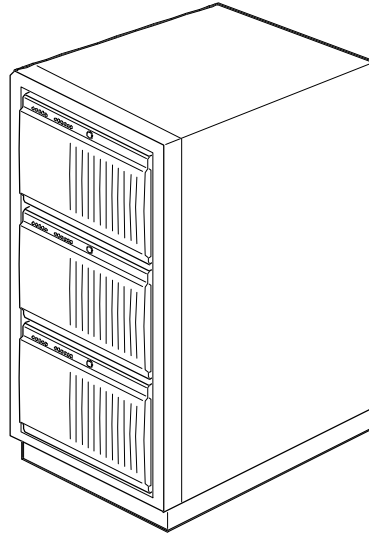
Typical Equipment Rack

Before you can mount the unit in the rack, you must install a set of rack
extension brackets and slider rails to the rack. Do this as explained in the
following paragraphs.

Installing the Rack Extension Brackets

Install the four (two to a side) rack extension brackets on the rack as follows.

1. Determine where you want to install the server unit in the rack.

■ If the rack is empty, install the server unit in the bottom most position.

■ If there are units already installed, install your unit in the next empty
space from the bottom of the rack.

2. Remove a right-angle extension bracket, two screws, and a bar nut from the
kit. The bar nut is a flat bar with four threaded holes.

3. Align the bracket behind the rack's vertical edge and behind the mounting holes in the vertical edge (see the following figure).
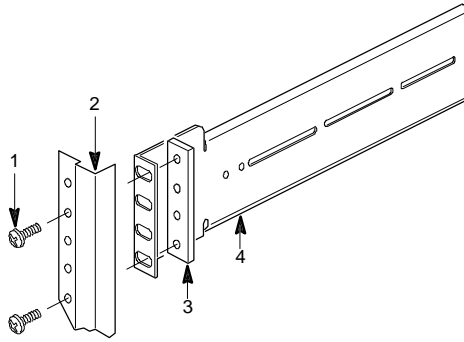
1.	Screw
2.	Rack Vertical Rail
3.	Bar Nut
4.	Right angle Extension Bracket

Installing the Extension Brackets

4. Determine where you want to attach the bracket on the rack's vertical rail.

- When determining where to attach the bracket, be sure to allow space for additional units.

- Mark, with a pencil, the bracket top and bottom hole locations on the rail.

5. Insert a screw through the marked top hole in the vertical rail and through the top hole in the extension bracket.

6. Place a bar nut over the screw and loosely thread the screw into the bar nut.

7. Insert a screw through the marked bottom hole in the vertical rail and extension bracket and loosely thread the screw into the bar nut.

8. Install the remaining three extension brackets, bar nuts, and screws.

- Before installing, carefully align each bracket in exactly the same vertical position as the first bracket.

- After installing, check that the brackets are vertically aligned and level with each other.

9. Tighten all the screws holding the brackets to the rack.

Installing the Slider Assemblies

Use the following procedure to install each slider assembly on the extension brackets in the rack. Refer to the following figure while performing the procedure.
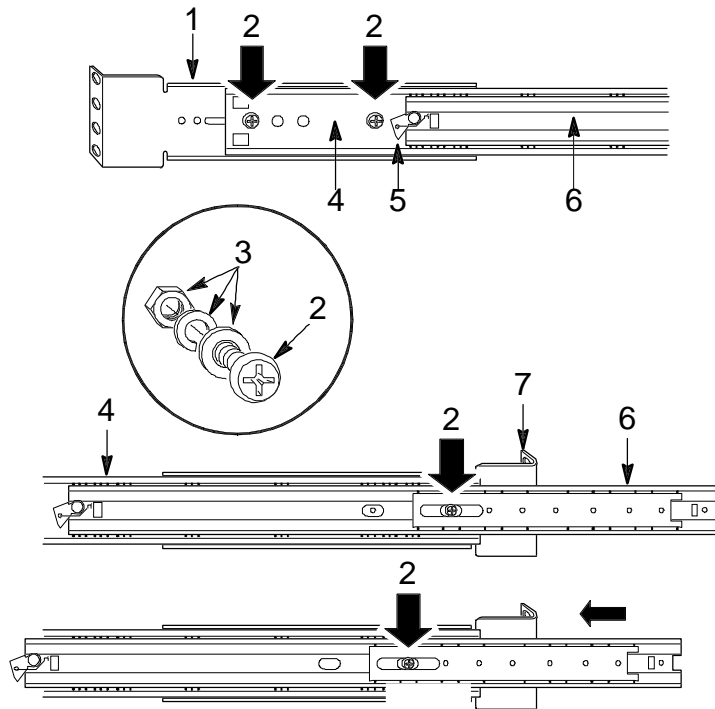
1. Back Extension Bracket

2. 8-32 Screw

3. Flat Washer, Lock Washer, and 8-32 Nut

4. Large Outer Bar

5. Safety Latch on Center Bar

6. Center Bar

7. Front Extension Bracket

Installing the Slider Assembly

1. With the safety latch (5 on the above figure) end of the slider assembly towards the back of the rack, press the flat side of the slider assembly into the U-shaped sections of the previously installed extension brackets (1 and 7).

2. Slide the slider assembly towards the front of the rack until the end of the large outer bar (4) is flush with the end of the U-shaped section of the front extension bracket (7).

3. Carefully slide the center bar (6) towards the front of the rack until the oblong hole in the bar is over the first hole in the large outer bar (4).

■ Insert a 8-32 screw through the oblong hole in the center bar, the hole in the large outer bar, and into the first hole in the front extension bracket.

■ Place a flat washer, lock washer, and a 8-32 nut on the screw and loosely tighten.

4. Carefully slide the center bar (6) towards the back of the rack until the oblong hole in the bar is over the third hole from the front of the large outer bar (4).

   ■ Insert an 8-32 screw through the oblong hole in the center bar, the hole in the large outer bar, and into the oblong slot in the front extension bracket.

   ■ Place a flat washer, lock washer, and a 8-32 nut on the screw and loosely tighten.

5. Secure the back end of the large outer bar (4) to the back extension bracket (1).

   ■ The end of the outer bar has four holes. The extension bracket has two holes and two elongated slots for fastening the bar.

   ■ Align two holes in the outer bar with a hole and slot in the bracket. Which holes/slots you use depends on the depth of the rack.

   ■ Insert an 8-32 screw through each of the two holes in the outer bar and through the hole and slot in the extension bracket.

   ■ Place a flat washer, lock washer, and a 8-32 nut on each screw and loosely tighten.

6. Check that the bars and brackets are positioned correctly in the rack.

7. Tighten all the screws holding the bars to the extension brackets and rack.

Installing the Rack Unit in the Rack

📄**Note:** If you have a rack unit, you must use the following procedure to install the unit in the rack. Observe all safety precautions, warnings, and cautions noted throughout the procedures.

Install your converted unit (or rack unit) in the rack as follows.

⚠ WARNING

Anchor The Equipment Rack. The equipment rack must be anchored to an unmovable support to prevent it from falling over when one or more servers are extended in front of it on slide assemblies. The anchors must be able to withstand a force of up to 113 kg (250 lbs). You must also consider the weight of any other device installed in the rack.

Avoid Injury. The minimum server configuration weighs 38 kg (85 lbs); the maximum configuration weighs 45 kg (100 lbs). To avoid personal injury when installing the server, have someone help you position the server in the rack.

Do not attempt to lift or move the server unit by the handles on the power supplies.

1. Pull the telescoping center bar (2 on the following figure) out of each slider assembly on the rack until it locks in place.

2. With someone helping you, use the handles on the sides of the rack unit to lift and slide the unit into the slider assemblies.

   ■ Align the small bars (1) attached to the sides of the system unit with the extended center bars (2).

   ■ Carefully slide the server unit into the extended center bars until it stops.

   ■ Press in on the safety latches (4) on the small bars and carefully slide the server unit all the way into the rack.

3. Check that the server unit slides in and out of the rack. Grasp the two handles on the sides of the unit and slowly pull the unit out and push it back in.

4. Connect all external peripherals and cables.

5. Connect the two power supply cables to the back of the server unit and to a power source.

6. Power on the server unit.
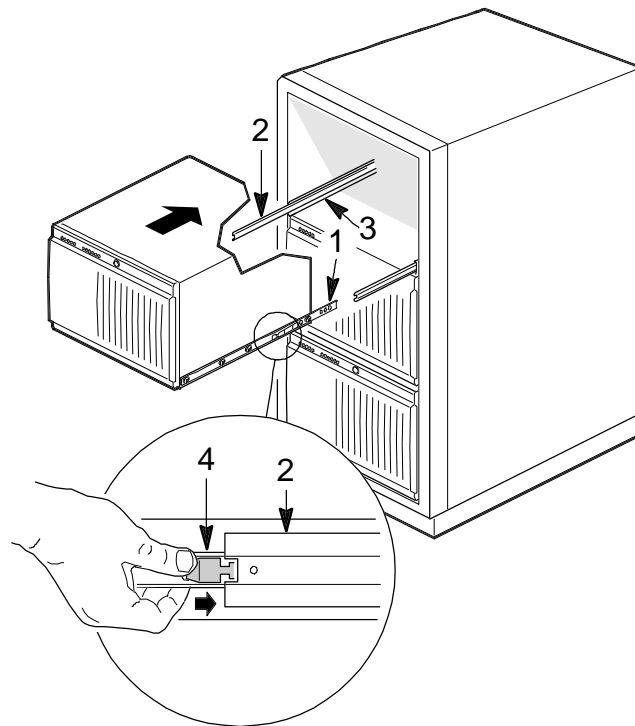
1. Small Outer Bar

2. Center Bar

3. Large Outer Bar

4. Safety Latch

Installing the Server in the Rack

3

Configuring Your System

- Using the BIOS Setup
- Using the Symbios SCSI Utility
- Using the Optional RAID Controller
- Configuring System Board Jumpers

This chapter describes the Setup utilities that you can use to change your system configuration. The utilities described in this chapter include:

■ BIOS Setup Utility

■ Symbios SCSI Utility.

The BIOS Setup Utility is used to configure the system and any option boards you may add. The BIOS Setup Utility is stored in the system FLASH memory. You do not need a diskette to run the BIOS Setup Utility.

The Symbios SCSI Utility is used to configure the SCSI controller in your system, perform a SCSI disk format, or verify disk operation on the SCSI disk drives. The utility is also used to configure any SCSI removable media devices installed in your system. You do not need a diskette to run this utility as it is accessible during system boot-up.

In addition, the following utilities are available for your use in configuring the system. Information on each utility is contained in the referenced appendix.

■ System Setup Utility (SSU) (see Appendix B, "System Setup Utility")

■ Emergency Management Port (EMP) (see Appendix C, "Emergency Management Port")

■ FRUSDR Load Utility (see Appendix C, "Emergency Management Port").

The System Setup Utility can be used to configure your system and any option boards you may add to your system. The SSU reads stored system event information. Appendix B contains information on the SSU.

The Emergency Management Port (EMP) is used for remote monitoring of the server. The FRUSDR Load Utility can be used to update the field replacement unit (FRU), sensor data record (SDR) and desktop management interface (DMI) flash components. Appendix C contains information on both utilities.

If your system is factory configured, you normally don't need to run the SSU, BIOS Setup, or Symbios SCSI Utility unless you want to change the password or security features, add certain types of option boards or devices, or upgrade your system board.

Also included in this chapter is information on setting jumpers on the system board for clearing

■ CMOS nonvolatile RAM (NVRAM)

■ System passwords.

Using the BIOS Setup Utility

The BIOS Setup Utility is used to change system configuration parameters. Note that many BIOS Setup parameters are also configurable with the SSU. However, BIOS Setup Utility parameters that are settable with the SSU are overwritten by the SSU the next time the SSU is run. The BIOS Setup Utility is resident in the system Flash memory and does not require a diskette or an operating system present to run.

You can access the BIOS Setup utility when you turn on or reboot your system. Use the following procedure to run the BIOS Setup Utility.

1. Power-on or reboot the system. The "Press <F2> to enter SETUP" message displays.

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 Bar Selections

Menu	Use
Main	Use for basic system configuration.
Advanced	Use for setting the Advanced Features available on your system.
Security	Use to set User and Supervisor Passwords and Backup and Virus-Check reminders.
Server	Use for configuring Server Management features.
Boot	Use to configure Boot Device priority.
Exit	Exits current setup.

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 Changes" 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 BIOS Setup. These keys are also listed at the bottom of the Setup Menu.

Setup Menu Keys

Key	Function in Setup Menu
F1 or Alt-H	Get Help about an item.
ESC	Exit the current menu and return to the previous menu.
Left or right arrow keys	Move between menus.

Key	Function in Setup Menu
Up or down arrow keys	Move cursor up and down. The cursor moves only to the settings that you can change.
-	Select the previous value for the field.
+	Select the next value for the field.
F9	Load default configuration values for this menu.
F10	Save configuration values and exit.
Enter	Execute command or Select submenu.

The following BIOS Setup Configuration tables show the default settings for the BIOS Setup Utility. Recommended values are bold. The tables also provide a space for you to record any changes you make to these settings.

Main Menu

The following table shows the Main Menu settings.

Main Menu

Feature	Choices	Description	Your Setting
System Time	HH:MM:SS	Sets the system time.	
System Date	MM/DD/YYYY	Sets the system date.	
Legacy Diskette A:	Disabled 360KB 1.2 MB 720KB **1.44 MB** 2.88 MB	Selects the diskette type.	
Legacy Diskette B:	**Disabled** 360KB 1.2 MB 720KB 1.44 MB 2.88 MB	Selects the diskette type.	
Hard Disk Pre-delay	**Disabled** 3, 6, 9, 12, 15, 21, or 30 seconds	Adds a delay before the first BIOS access of a hard drive. Some hard drives hang if accessed before they initialize. The delay allows the drive to initialize after power up, before being accessed.	
Primary IDE Master	Press **Enter**	Refer to "Primary IDE Master and Slave Submenu."	
Primary IDE Slave	Press **Enter**	Refer to "Primary IDE Master and Slave Submenu."	
Keyboard Features	Press **Enter**	Refer to "Keyboard Submenu."	
Processor Information	Press **Enter**	Information for all processors is	

Feature	Choices	Description	Your Setting
		described.	
Language	**English (US)** Spanish, Italian French, German, Japanese (Kanji)	Selects which language BIOS displays in.	

Primary IDE Master and Slave Submenu

The following table shows the settings for the Primary IDE Master and Slave submenu.

Primary IDE Master and Slave Submenu

Feature	Choices	Description	Your Setting
Type	**Auto** None CD-ROM IDE Removable ATAPI Removable User	Auto allows the system to attempt auto-detection of the drive type. None informs the system to ignore this drive. Allows the manual entry of some fields described below. User allows the manual entry of all fields described below.	
Cylinders	1 to 2048	Number of cylinders on drive. This field is changeable only for Type User.	
Heads	1 to 64	Number of read/write heads on drive. This field is changeable only for Type User.	
Sectors	1 to 64	Number of sectors per track. This field is changeable only for Type User.	
Maximum Capacity	N/A	Computed drive size. This field is informational only for Type User.	
Multi-Sector Transfer	**Disabled** 2, 4, 8, or 16 sectors	Determines the number of sectors per block for multi-sector transfers. This field is informational only for Type Auto.	
LBA Mode Control	**Disabled** Enabled	Enabling LBA causes logical block addressing to be used in place of cylinders, heads, and sectors. This field is informational only for Type Auto.	
32 Bit I/O	**Disabled** Enabled	Enabling allows 32 bit IDE data transfers.	
Transfer Mode	**Standard** Fast PIO 1 Fast PIO 2 Fast PIO 3 Fast PIO 4	Selects the method for moving data to and from the drive. This field is informational only for Type Auto.	

Primary IDE Master and Slave Submenu

Feature	Choices	Description	Your Setting
Ultra DMA Mode	**Disabled** Enabled	Selects the Ultra DMA Mode for moving data to and from the drive.	

Keyboard Submenu

The following table shows the settings for the Keyboard submenu.

Keyboard Submenu

Feature	Choices	Description	Your Setting
NumLock	**Auto** On Off	Selects power-on state for Num Lock.	
Key Click	**Disabled** Enabled	Enables or disables key click.	
Keyboard auto-repeat rate	**30/sec** 26.7/sec 21.8/sec 18.5/sec 13.3/sec 10/sec 6/sec 2/sec	Selects the number of times per second a key repeats while it is held down.	
Keyboard auto-repeat delay	1/4 sec **1/2 sec** 3/4 sec 1 sec	Selects delay before key repeat.	

Advanced Menu

The following table shows the Advanced Menu settings.

Advanced Menu

Feature	Choices	Description	Your Setting
Plug and Play OS	**No** Yes	Select Yes if you are booting a Plug and Play capable operating system.	
Reset Configuration Data	**No** Yes	Select Yes if you want to clear the system configuration data during next boot. System automatically resets to No in next boot.	
PCI Configuration	Press **Enter**	Refer to "PCI Configuration Submenu."	
I/O Device Configuration	Press **Enter**	Refer to "I/O Device Configuration Submenu."	

Feature	Choices	Description	Your Setting
Use Multiprocessor Specification	1.1 **1.4**	Selects version of multiprocessor specification to use. Some operating systems require version 1.1 for compatibility reasons.	
Large Disk Access Mode	**LBA** CHS	Select LBA for IDE drives.	
System Wakeup Feature	**Disabled** Enabled	If enabled, the system powers up upon receiving a "magic packet" on LAN, ring on COM2, or PME interrupt from a PCI board.	
Pause Before Boot	**Enabled** Disabled	Enables five second delay before booting operating system.	
Advanced Chipset Control	Press **Enter**	Refer to "Advanced Chipset Control Submenu."	

PCI Configuration Submenus

The following tables show the settings for the PCI Device Embedded SCSI submenu and PCI Devices submenu. The submenus should only be changed by qualified technical personnel.

⚠ CAUTION

Leave the PCI Device Embedded SCSI submenu at factory-default settings. This submenu should only be changed by qualified technical personnel.

PCI Device, Embedded SCSI Submenu

Feature	Choices	Description	Your Setting
Option ROM Scan	**Enabled** Disabled	Enables option ROM scan of the selected device. Used to enable embedded Symbios SCSI controller	
Enable Master	Enabled **Disabled**	Enabled selects the device as a PCI bus master.	
Latency Timer	Default 0020h 0040h 0060h **0080h** 00A0h 00C0h 00E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus. Caution: Do not change this setting unless you fully understand the priority of this device on the PCI bus.	
Active Termination	Disabled SCSI A On	Selects the setting of the onboard	

PCI Device, Embedded SCSI Submenu

Feature	Choices	Description	Your Setting
	SCSI B On **SCSI A & B On**	SCSI termination.	
Single-Ended Force/Auto Set	Force A and B Force B, Auto A Force A, Auto B **Auto**	If set for Force Single, the SCSI channel defaults to Single-Ended operation. Auto-Set uses hardware detection to determine single vs. double-ended operation.	

The PCI Devices submenu (see the following table) should only be changed by qualified technical personnel.

⚠ CAUTION

Leave the PCI Devices submenu at factory-default settings. This submenu should only be changed by qualified technical personnel.

PCI Devices Submenu

Feature	Choices	Description	Your Setting
Option ROM Scan	**Enabled** Disabled	Enables option ROM scan of all devices other than the onboard SCSI controllers.	
Enable Master	**Enabled** Disabled	Enabled selects all devices as a PCI bus master, other than onboard SCSI controllers.	
Latency Timer	Default 0020h 0040h 0060h **0080h** 00A0h 00C0h 00E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus. Caution: Do not change this setting unless you fully understand the priority of this device on the PCI bus.	

I/O Device Configuration Submenu

The following table shows the settings for the I/O Device Configuration submenu.

I/O Device Configuration Submenu

Feature	Choices	Description	Your Setting
COM 1:	Disabled **Enabled** Auto	Auto forces BIOS to configure the port. OS Controlled forces OS to	

I/O Device Configuration Submenu

Feature	Choices	Description	Your Setting
(Serial Port A)	OS Controlled	configure the port.	
Base I/O Address	**3F8** 2F8 3E8 2E8	Selects the base I/O address for COM port 1.	
Interrupt	IRQ 3 **IRQ 4**	Selects the IRQ for COM port 1.	
COM 2: (Serial Port B)	Disabled **Enabled** Auto OS Controlled	Auto forces BIOS to configure the port. OS Controlled forces OS to configure the port.	
Base I/O Address	3F8 **2F8** 3E8 2E8	Selects the base I/O address for COM port 2.	
Interrupt	**IRQ 3** IRQ 4	Selects the IRQ for COM port 2	
Parallel Port	Disabled **Enabled** Auto OS Controlled	Auto forces BIOS to configure the port. OS Controlled forces OS to configure the port.	
Mode	Output only Bi-directional EPP **ECP**	Selects parallel port mode.	
Base I/O Address	**378** 278	Selects the base I/O address for LPT port. Not available in ECP or EPP modes.	
Interrupt	IRQ 5 **IRQ 7**	Selects the IRQ for LPT port.	
DMA channel	**DMA 1** DMA 3	Selects the DMA for LPT port.	
Floppy disk controller	Disabled **Enabled**	Enables onboard diskette controller.	
PS/2 Mouse	**Auto** Disabled Enabled	Enables or disables onboard mouse. Disabling frees up IRQ 12. If enabled, the OS can determine whether to enable or disable mouse.	

Advanced Chipset Control Submenu

The following table lists the settings for the Advanced Chipset Control submenu.

Advanced Chipset Control Submenu

Feature	Choice	Description	Your Setting
Address Bit Permuting	Disabled **Enabled**	To be enabled, there must be a power of 2 number of rows, all rows must be the same size, and all populated rows must be adjacent and start at row 0. Two-way or four-way permuting is set automatically based on memory configuration.	
Base RAM Step	**1 MB** 1 KB Every location	Tests base memory once per MB, once per KB, or every location.	
Extended RAM Step	**1 MB** 1 KB Every location	Tests extended memory once per MB, once per KB, or every location.	
L2 Cache	**Enabled** Disabled	When enabled, secondary cache is sized and enabled. For Core Clock Frequency-to-System Bus ratios equal to two, BIOS automatically disables the L2 cache.	
ISA Expansion Aliasing	**Enabled** Disabled	When enabled, every I/O access with an address in the range x100-x3FFh, x500-x7FFh, x900-xBFF, and xD00-xFFFh is internally aliased to the range 0100-03FFh before any other address range checking is performed.	
Memory Scrubbing	Disabled **Enabled**	When enabled, BIOS automatically detects and corrects SBEs.	
Read Prefetch for PXBOA	16 **32** 64	Configures the number of Dwords that are prefetched on Memory Read Multiple commands.	
Read Prefetch for PBXOB	16 **32** 64	Configures the number of Dwords that are prefetched on Memory Read Multiple commands.	

Security Menu

The following table lists the settings for the Security Menu.

> **Note:** Enabling the Administrator Password field requires a password for entering Setup. The passwords are not case sensitive.

Security Menu

Feature	Choice	Description	Your Setting
User Password is	**Clear**	Status only; user cannot modify. Once set, this can be disabled by	

***

Security Menu

Feature	Choice	Description	Your Setting
	Set	setting it to a null string, or by clearing password jumper on system board (see "Configuring System Board Jumpers," in this chapter).	
Administrator Password is	**Clear** Set	Status only; user cannot modify. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on system board (see *Configuring System Board Jumpers*).	
Set User Password	Press **Enter**	When the **Enter** key is pressed, the user is prompted for a password; press **Esc** key to abort. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on system board (see "Configuring System Board Jumpers" later in this chapter).	
Set Administrator Password	Press **Enter**	When the <**Enter**> key is pressed, the user is prompted for a password; press **ESC** key to abort. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on system board (see "Configuring System Board Jumpers" later in this chapter).	
Password on Boot	**Disabled** Enabled	Requires password entry before boot. System will remain in secure mode until password is entered. Password on Boot takes precedence over Secure Mode Boot.	
Fixed Disk Boot Sector	**Normal** Write Protect	Write-protects boot sector on hard drive to protect against viruses.	
Secure Mode Timer	1 min 2 min 5 min 10 min 20 min 1 hr **2 hr**	Period of keyboard or PS/2 mouse inactivity specified for secure mode to activate. Password is required for secure mode to function. Cannot be enabled unless at least one password is enabled.	
Secure Mode Hot Key (Ctrl-Alt-)	[ ] [A, B, ..., Z] (0-9)	Key assigned to invoke the Quicklock feature. Cannot be enabled unless at least one password is enabled.	
Secure Mode Boot	**Disabled** Enabled	System boots in secure mode. User must enter password to unlock system. Cannot be enabled unless at least one password is enabled.	
Video Blanking	**Disabled** Enabled	Blank video when secure mode is activated. User must enter password to unlock system. Cannot	

Feature	Choice	Description	Your Setting
		be enabled unless at least one password is enabled.	
Floppy Write Protect	**Disabled** Enabled	When secure mode is activated, diskette drive is write protected. User must enter password to disable. Cannot be enabled unless at least one password is enabled.	

Server Menu

The following table lists the settings for the Server Menu.

Server Menu

Feature	Choices	Description	Your Setting
System Management	Press **Enter**	Refer to "System Management Submenu."	
Console Redirection	Press **Enter**	Refer to "Console Redirection Submenu."	
Processor Retest	Yes **No**	Select Yes to have BIOS clear all processor status and retest the processor(s) on boot-up.	
EMP Password Switch	**Disabled** Enabled	Enables or disables EMP password.	
EMP ESC Sequence	**+++** User	Escape string for the modem on EMP port. This field accepts up to 4 characters.	
EMP Hangup Line String	**ATH** User	Hangup string for the modem on EMP port. This field accepts up to 8 characters.	
Modem Init String	**AT&FS0=1S14=0& D0**	This string accepts up to 20 characters to set up the modem.	
High Modem Init String		Characters above 16 are entered here.	
EMP Access Mode	Pre-Boot Only Always Active **Disabled**	Pre-Boot: EMP enabled during power down or POST. Always Active: EMP always enabled. Disabled: EMP disabled.	
EMP Restricted Mode Access	**Disabled** Enabled	Power down, front panel NMI, Reset Control via EMP can be disabled/disabled.	
EMP Direct Connect/Modem Mode	**Direct Connect** Modem Mode	Connect directly to POST or use a modem.	

System Management Submenu

The following table lists the settings for the System Management Submenu.

System Management Submenu

Feature	Choices	Description	Your Setting
System Event Logging	Disabled **Enabled**	When enabled, system events will be logged by BIOS and BMC.	
Clear Event Log	Yes **No**	Clears the system event log (SEL) in BMC if Yes is selected.	
Assert NMI on AERR	Disabled **Enabled**	When enabled, generates a nonmaskable interrupt (NMI) on an address parity error (AERR).	
Assert NMI on BERR	Disabled **Enabled**	When enabled, generates an NMI on a bus error (BERR).	
Assert NMI on PERR	**Disabled** Enabled	When enabled, generates an NMI on a parity error (PERR). To activate, the system error (SERR) option must be enabled.	
Assert NMI on SERR	Disabled **Enabled**	When enabled, generates an NMI on SERR.	
FSB ECC Check by Chipset	Disabled **Enabled**	Enables host single and multi-bit error checking and reporting feature in the chipset.	
FSB ECC Check by Processor	Disabled **Enabled**	Enables host single and multi-bit error checking and reporting feature in the processors.	
Server Management Information	Press **Enter**	Displays system serial and part numbers and server management controller revisions.	

Console Redirection Submenu

The following table lists the settings for the Console Redirection Submenu.

Console Redirection Submenu

Feature	Choices	Description	Your Setting
COM Port Address	**Disabled** 3F8 2F8 3E8	When enabled, console redirection uses the I/O port specified. 3F8 is typically COM 1 and 2F8 is typically COM2.	
IRQ #	3 or 4 **None**	When console redirection is enabled, this displays the IRQ assigned per the address chosen in the COM Port Address field.	
Baud Rate	9600 **19.2k** 38.4k 115.2k	Communications line dependent.	
Flow Control	No Flow Control CTS/RTS XON/XOFF **CTS/RTS + CD**	Communications line dependent.	

Boot Menu

The following table lists the settings for the Boot Menu.

Boot Menu

Feature	Choices	Description	Your Setting
Floppy Check	**Disabled** Enabled	If enabled, system verifies diskette type on boot. Disabled results in a faster boot.	
BIOS Boot Spec Support	**Limited** Enabled	Enable only if the total number of hard drives is less than eight.	
Boot Device Priority	Press **Enter**.	Refer to "Boot Device Priority Submenu."	
Hard Drive	Press **Enter**.	Refer to "Hard Drive Submenu."	
Removable Devices	Press **Enter**.	Refer to "Removable Devices Submenu."	
Maximum Number of I20 drives	**1** 4	Selects maximum number of I20 drives assigned a DOS drive letter.	
Message Timeout Multiplier	**1,** 2, 8, 10, 50, 100, 1000	All timeout values are multiplied by this number.	

Boot Device Priority Submenu

The following table lists the settings for the Boot Device Priority Submenu. Use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

3-14   Configuring Your System

Boot Priority	Device	Description	Your Setting
1.	Diskette Drive	Attempts to boot from drive A.	
2.	Removable Devices	Attempts to boot from a removable media device.	
3.	Hard Drive	Attempts to boot from a hard drive device.	
4.	ATAPI CD-ROM Drive	Attempts to boot from an ATAPI CD-ROM drive.	

Hard Drive Submenu

The following table gives the settings for the Hard Drive Submenu. For options on this menu, use the up or down arrow keys to select a device, then press the **<+>** or **<->** keys to move the device higher or lower in the boot priority list.

Hard Drive Submenu

Option	Description
1. Hard Drive #1 (or actual drive string)	IDE drives have a suffix attached to the drive ID string: PM - hard drive on Primary Master Channel PS - hard drive on Primary Slave Channel SCSI CD-ROMs are displayed here because the onboard Symbios SCSI BIOS treats CD-ROMs as hard drives. SCSI removable drives also appear here.
2. Other Bootable Devices	Covers all the boot devices that are not reported to the system BIOS through the BIOS boot specification mechanism. This includes all PCI boards that are not BIOS boot compliant (legacy) as well as ISA cards that are not PnP compliant. ISA legacy cards boot first before non BIOS boot compliant PCI boards (in scan order from lowest slot to highest).

Exit Menu

You can make the following selections on the Exit Menu. Select an option using the up or down arrow keys, then press **Enter** to execute the option. Pressing **Esc** does not exit this menu. You must select one of the items from the menu or menu bar to exit.

Exit Menu

Choices	Description
Exit Saving Changes	Exits after writing all modified Setup item values to CMOS.
Exit Discarding Changes	Exits leaving CMOS unmodified.
Load Setup Defaults	Loads default values for all Setup items.
Load Custom Defaults	Loads settings from custom defaults.
Save Custom Defaults	Saves present Setup values to custom defaults.

⚠️ **CAUTION**

Verify that custom defaults are saved before exiting. Failure to do so can result in system malfunction.

Discard Changes	Reads the previous value of all Setup items from CMOS.
Save Changes	Writes all Setup item values to CMOS.

Using the Symbios SCSI Utility

The Symbios SCSI Utility detects the SCSI host adapter located on the system board. Use the utility to:

- change adapter and SCSI device default values
- check and/or change SCSI device settings that may conflict with those of other devices in the server
- perform low-level formatting or verify operations on SCSI disk drives.

Running the Symbios SCSI Utility

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

2. When this message appears on the video monitor

   Press Ctrl-C to start the Symbios SCSI Utility

   Press **Ctrl+C** to run the utility.

3. The utility starts and the Main Menu displays.

Symbios SCSI Utility Main Menu

Adapter	. Port No	IRQ Level	Status Current	Next Boot	NVRAM Found
SYM53C810	2000	11	On	On	Yes
SYM53C896	3000	11	On	On*	Yes
SYM53C896	3400	11	On	On	Yes

Change Adapter Status – Press **ENTER** to change adapter Next Boot Status.

Adapter Boot Order – Press **ENTER** to select and change boot order of each SCSI adapter.

Additional Adapter Configuration – Not used.

Display Mode-Verbose – Press **ENTER** to change display mode.

Mono/Color – Press **ENTER** to change display from black/white to color.

Language

Help

Quit

*Next Boot Status for this controller must be turned OFF if you install the optional Mylex AcceleRAID 250 Controller board in your system. Refer to "Change Adapter Status" above.

The following keys are active for all SCSI Configuration screens:

Active Keys

Key	Action
Arrows	Up and down arrows move from one parameter to another within a screen.
Enter	Displays options for a configurable parameter. Selects an option.
Esc	Moves back to previous screen or parameter or EXIT if at the Main menu.

Changing the Adapter and Device Configurations

The SCSI Configuration Utility Main Menu lists the onboard SCSI adapters and shows their current settings. The adapters control the operation of the SCSI devices in your system (hard disk drives or removable media devices).

1. Highlight an adapter and press **Enter**.

2. Select "Adapter Setup" and press **Enter**. The Adapter Setup screen displays.

Adapter Setup Screen

Description	Recommended Setting or Display Only	Your Configuration
SCAM Support	On	
Parity	On	
Host SCSI ID	7	
Scan Order	Low to High	
Removable Media Support	None	
CHS Mapping	SCSI Plug and Play Mapping	
Spinup Delay (sec)	2	
Help		
Restore Default Setup		
Exit This Menu		

3. Highlight the function you want to change and press **Enter**. You are prompted to save changes when you exit the configuration utility.

To change device configuration parameters, perform the following steps.

1. At the SCSI Configuration Utility Menu, select "Device Selections" and press **Enter**. The Devices 0 to 7 screen displays.

2. Select the SCSI device you are reconfiguring and press **Enter**.

- If you are configuring SCSI Hard Disk Drives, see the following "SCSI Hard Disk Drives" table.

- If you are configuring SCSI Removable Media Devices, see the following "SCSI Removable Media Devices" table for recommended settings.

SCSI Hard Disk Drives

Descriptions	Recommended Settings or Display Only	Your Configuration					
		0	1	2	3	4	5
Device Selections	Press **Enter** for menu. Select device and press **Enter**.						
Sync Rate	40						
Width (bits)	16						
Disconnect	On						
Read/Write I/O timeout (sec)	10						
Scan for device at boot time	Yes						
Scan for SCSI LUNS	No						
Queue Tags	On						

SCSI Removable Media Devices

Descriptions	Recommended Settings or Display Only	Your Configuration			
		Dev 0	Dev 1	Dev 2	Dev 3
Device Selections	Press **Enter** for menu. Select device and press **Enter**.				
Sync Rate	10				
Width (bits)	8				
Disconnect	On				
Read/Write I/O timeout (sec)	10				
Scan for device at boot time	Yes				
Scan for SCSI LUNS	No				
Queue Tags	On				

3. Highlight the function you want to change and press **Enter**. You are prompted to save changes when you exit the configuration utility.

> *Note:* If you wish to format a disk or verify disk media, select "Format" or "Verify" from the Device Setup menu.

Using the Optional RAID Controller

The following paragraphs provide an overview of the optional Build-to-Order RAID controllers. Included is information on the factory installed controllers and RAID configurations.

Factory Installed Controller

One of the options available for your system is the dual channel Mylex AcceleRAID 250 Controller board, which gives your system the added security of fault tolerance.

If you order a system with the RAID controller, the system is pre-configured at the factory. Refer to the "RAID Configurations" table below to determine how the RAID controller was configured at the factory. If you want to reconfigure disk arrays and logical drives, you must run the AcceleRAID 250 BIOS Configuration Utility. If you want to change the RAID level, you must run the Mylex Disk Array Controller Utilities (DACCF) software. Refer to the AcceleRAID 250 documentation included with your system for information on running the AcceleRAID 250 BIOS Configuration Utility and the DACCF Utility.

Add-on Controller

If you are adding the RAID controller to an existing system, the AcceleRAID 250 BIOS Configuration Utility allows you to configure disk arrays and logical drives in your system. Since the utility resides in the AcceleRAID 250 BIOS on the RAID controller, its operation is independent of the operating system in your server. Refer to Chapter 4 in this User's Guide for information on installing an add-in option board. Refer to Chapter 4 of the AcceleRAID 250 Installation Guide for information on running the AcceleRAID 250 BIOS Configuration Utility.

> **Note:** Next Boot Status for the first Symbios SYM53C896 controller must be turned **OFF** if you install the optional Mylex AcceleRAID™ 250 Controller board in your system. Refer to "Symbios Configuration Utility" found earlier in this chapter.
>
> Ensure a jumper is installed on JP10 of the Mylex AcceleRAID 250 Controller board. Refer to the Mylex AcceleRAID Installation Guide for the location of jumper JP10.

DACCF Configuration Utility

The DACCF utility is included with the AcceleRAID™ 250 Controller. The AcceleRAID™ 250 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 *Disk Array Controller Configuration Utilities Manual* that was shipped with the controller. Chapter 2 (*Preparing the Array)* covers array hardware preparation, configuration, and initialization. After completing the steps in Chapter 2, you can install your Network Operating System.

Factory RAID Configurations with SCSI Hard Drives

Number of Hard Drives	RAID Level Configured	Hard Drives in Array	Description
1	JBOD	1	JBOD (RAID 0) JBOD is an acronym for Just a Bunch Of Disks. Each drive can operate independently as with a common host bus adapter; or multiple drives may be spanned and seen as a single very large drive. No redundancy is provided.
2	1	2	Mirroring (RAID 1) Drives are paired and mirrored. All data is 100% duplicated on an equivalent drive (fully redundant).
3	5	3	Striping with Parity (RAID 5) Data is striped across several physical drives. Parity protection is used for data redundancy.
4	5	3 plus 1 hot spare drive	Striping with Parity (RAID 5) Data is striped across three physical drives. Parity protection is used for data redundancy. This drive is used as the "Hot Spare."
5 or more	_	_	The first four disks are as stated above. The remaining disks are not part of the array, but are ready to be configured.

Configuring System Board Jumpers

The following paragraphs contain procedures for setting system board jumpers to:

- clear the CMOS

- clear a password.

A jumper is a small plastic-encased conductor (shorting plug) that slips over two jumper pins on the jumper block.

⚠ **CAUTION**

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 following figure shows the location of the system board jumpers. The jumper configurations and default settings are given in the table immediately after the figure.
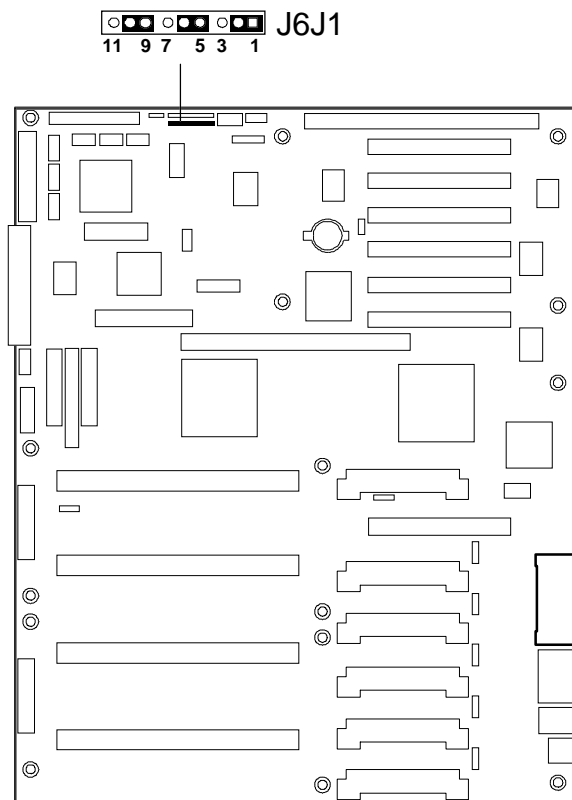
System Board Jumpers

System Board Jumper J6J1 Summary

Function	Pins (default in bold)	What it Does at System Reset
CMOS Clear	1-2, Protect CMOS	Preserves contents of NVRAM.
	2-3, Clear CMOS	Replaces contents of NVRAM with manufacturing default settings.
Password Clear	5-6, Protect	Maintains current system password.
	6-7, Clear	Clears current system password.
Recovery Boot	**9-10, Normal**	System attempts to boot using BIOS stored in flash ROM memory.
	10-11, Recovery	BIOS attempts recovery boot, loading BIOS code from diskette into the flash device. Typically used when BIOS code is corrupted.

⚠ **CAUTION**

Leave the Recovery Boot jumper at the factory default setting. This jumper should only be set by technically qualified personnel.

Moving System Board Jumpers

⚠ **CAUTION**

Before doing the following procedures, make sure your system is powered off and the two AC power cords are unplugged from the back of the chassis. Failure to disconnect power before moving the jumpers can result in personal injury and equipment damage.

Observe static precautions. Use an antistatic wrist strap.

Use this general procedure as an aid for configuring system board jumpers. See the following paragraphs for details of setting the jumpers.

1. Power off the system, disconnect any peripherals, unplug the system power cords from the system and power source, and remove the access cover (see Chapter 4, "Upgrading Your System," for access cover removal).

2. Locate the position of the jumper block on the system board (see the preceding figure and table for jumper locations and settings).

- To change a jumper setting, use a pair of needle-nose pliers or your fingers to remove the jumper from its current position.

- Position the jumper over the two pins for the desired setting and press it onto the pins.

- Be careful not to bend the pins.

3. Install the access cover, connect any disconnected peripherals, plug in the power cords, and power up the system.

Resetting the CMOS NVRAM

Reset the CMOS NVRAM as follows (also refer to the general procedure given above).

1. Power down the system, disconnect any peripherals, unplug the power cords from the system, and remove the access cover.

2. Move the CMOS Clear jumper from pins 1-2 to pins 2-3 (see the preceding jumper figure and table for jumper locations).

3. Connect the power cords to the system and power on the system.

Wait for POST to complete and for these messages to appear.

"NVRAM cleared by jumper"

"Press F2 to enter Setup"

This automatically reprograms CMOS and RTC to their default settings.

4. Press **F2** to enter Setup and make any changes necessary.

5. Press **F10** to save the new setup configuration and exit Setup.

6. Power off the system and unplug the power cords from the system.

7. Move the CMOS Clear jumper back to pins 1-2.

8. Replace the access cover, reconnect any peripherals, plug in the power cords, and power on the system.

9. Run the BIOS Setup Utility to check the configuration of your system.

Clearing and Changing Passwords

Use the following procedure to clear and change passwords (also refer to the general procedure given earlier).

1. Power down your system, disconnect any attached peripherals, unplug the power cords from the system, and remove the access cover.

2. Move the Password Clear jumper from pins 5-6 to pins 6-7 (see the preceding jumper figure and table for jumper locations).

3. Plug in the power cords, power on the system, and wait for POST to complete. This automatically clears the old password.

4. Power off the system and unplug the power cords from the system.

5. Move the Password Clear jumper back to pins 5-6.

6. Replace the access cover, reconnect any peripheral devices, plug in the system power cords, and power on the system.

7. To specify a new password, run the BIOS Setup Utility as described earlier in this chapter.

4

Upgrading Your System

- Observing Static Precautions
- Preparing Your System
- Maintaining the Equipment Log
- Removing the Access Panel
- Opening the Subchassis and Electronics Bay
- Upgrading the System Board
- Installing Option Boards
- Installing Hard Disk Drives
- Installing Removable Media Devices

This chapter includes procedures for

- replacing/upgrading the real-time battery, Pentium Xeon processor cartridge, and DIMM modules on the system board

- adding optional ISA and PCI boards

- installing 3 ½-inch SCSI hard drives

- installing optional 5 1/4-inch devices (tape drive, other device).

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

⚠ WARNING

The DC push button on/off switch on the front panel does not turn off system AC power. Also, +5vdc is present on the system board whenever the AC power cord is connected between the system and an AC outlet. Before performing any procedures, first power off the dc push button switch located on the front panel. Make sure your system is powered off and the AC power cord is unplugged from the system. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

⚠ CAUTION

The server management logic on the system board monitors system voltage changes. When powering down your system, you may experience a 1- to 5-second delay from the time you press the push button power on/off switch and your system powering down. This is normal system operation and is required by the server management logic.

⚠ CAUTION

Operating your system with the access cover removed can damage system components. For proper cooling and airflow, always replace the access cover before powering on.

Observing Static Precautions

An electrostatic discharge (ESD) can damage disk drives, option boards, and other components. You can provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground (any unpainted metal surface) 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.

Preparing Your System for Upgrade

Depending on the upgrade, you need one or more of the following tools:

- Phillips screwdriver (#1 bit and #2 bit)

- flat-head screwdriver

- small needle nose pliers

- pen or pencil

- ESD workstation or antistatic wrist strap (recommended).

Preparing the Equipment Log

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

Removing the Access Cover

To install options in your system, you must first remove the access cover on the right side of the system (as viewed from the front).

⚠ CAUTION

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

⚠ WARNING

Turn off your system, disconnect any external devices, and unplug the system power cords from the AC wall outlet before removing the access cover.

Remove the access cover as follows.

1. Power off the system and unplug the power cables from the AC wall outlets. If connected to a surge protector or uninterruptible power source, unplug from the AC outlet.

2. Disconnect all external devices and unplug all device cables.

3. Remove the two Phillips head screws securing the cover to the back of the chassis (see the following figure). Save the screws for reattaching the cover.

4. Grasp the built-in handle on the back of the access cover. You might also want to grasp the front handle of the access cover. The front handle is a rounded, rectangular depression in the front middle of the cover.

   Note: The access cover fits tightly to the chassis. Use two hands to remove the cover.

5. Slide the access cover toward the back of the chassis until it stops (about an inch). This unlocks the locking fingers behind the access cover.

6. Pull the access cover straight away from the chassis to disengage the locking tabs. Set the access cover aside.
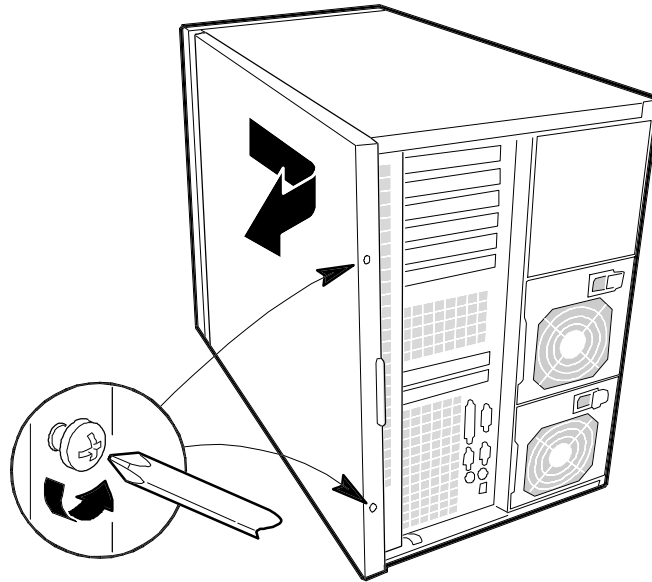
Removing/Installing the Access Cover

Installing the Access Cover

Install the access cover as follows.

1. Check that you have not left any tools or loose parts 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. Insert the metal tabs on the top and bottom of the access cover into their slots on the chassis. Slide the cover toward the front of the system, as far as it will go.

4. Secure the access cover with the two previously removed retaining screws.

5. Connect any external devices, connect all cables, and plug in the system's power cables.

Opening the Subchassis and Electronics Bay

There may be times during system upgrade that you need to open the subchassis and electronics bay. Both may be swung aside for access to components.

Open the subchassis and electronics bay as follows.

⚠ CAUTION

For proper cooling and airflow, do not operate the system with the access cover removed, the subchassis open, and the electronics bay open. Always replace the cover and close the subchassis and electronics bay before powering on the system.

⚠ WARNING

Turn off your system, disconnect any external devices, and unplug the system power cords from the AC wall outlets before removing the access cover, opening the subchassis, and opening the electronics bay.

Open the subchassis and electronics bay as follows.

1. Power off the system and unplug the power cables from the AC wall outlets. If connected to a surge protector or an uninterruptible power supply, unplug from the AC outlet.

2. Disconnect all external devices and unplug all device cables.

3. Remove the access cover as previously described.

⚠ CAUTION

All cabling to the I/O panel on the back of the system must be disconnected before opening the electronics bay. Failure to disconnect all cabling to the bay can result in serious damage to system components.

---

4. Label and disconnect all peripheral cables attached to the I/O panel on the back of the system (D in the following figure).

5. Remove the two screws on the top and bottom edges of the chassis that secure the subchassis and electronics bay (see A in the following figure).
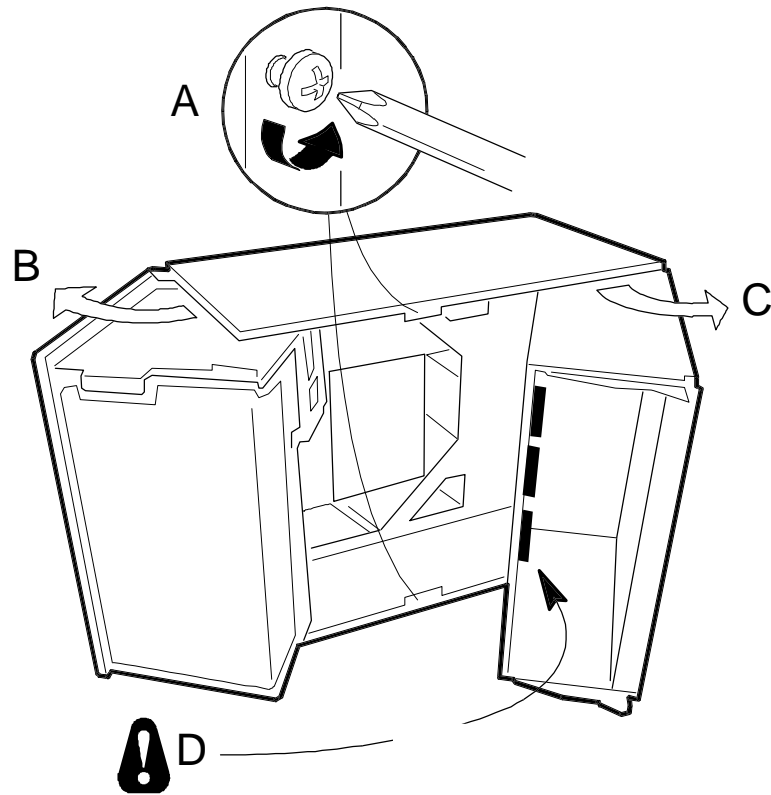
Opening the Subchassis and Electronics Bay

6. Rotate the subchassis to the left, away from the main chassis, until it stops (B in the above figure).

7. Label and disconnect all cabling to the electronics bay (D in the figure).

8. Rotate the electronics bay to the right, away from the main chassis, until it stops (C in the above figure).

Closing the Subchassis and Electronics Bay

Close the subchassis and electronics bay as follows.

1. Rotate the electronics bay to the left, towards the main chassis. Leave enough space for connecting cables.

2. Connect all the previously disconnected cables to the back of the electronics bay.

3. Close the electronics bay.

4. Rotate the subassembly to the right, towards the main chassis, as far as it goes.

5. Check for pinched wires and cables, clear as necessary.

6. Secure the subassembly and electronics bay with the two previously removed screws.

7. Connect all the previously disconnected cables to the I/O panel on the back of the chassis.

8. Install the access cover as previously described.

Upgrading the System Board

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

- replacing the real-time clock battery

- installing and removing Pentium II Xeon processor cartridges

- installing and removing DIMMs.

⚠ CAUTION

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

Replacing the Real-time Clock Battery

You may need to replace the real-time clock lithium battery as it ages. The battery (Vendor Part #CR2032) is a commodity part available through many vendors. Replace the battery as follows.

⚠ 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.

⚠ CAUTION

Observe static precautions. Use an antistatic wrist strap.

⚠ **WARNING**

If the system was running, processors and heat sinks on the board may be hot. To avoid the possibility of a burn, be careful when removing or installing components near the processor(s).

1 Power off the system, disconnect any peripherals, and unplug the power cords from the AC power source.

2. Remove the access cover as previously described.

3. Insert the tip of a small flat-bladed screwdriver under the plastic tab on the plastic retainer (A in the following figure).

4. Gently push down on the screwdriver to lift the battery (B) and retainer.

5. Remove the battery from its socket (C).
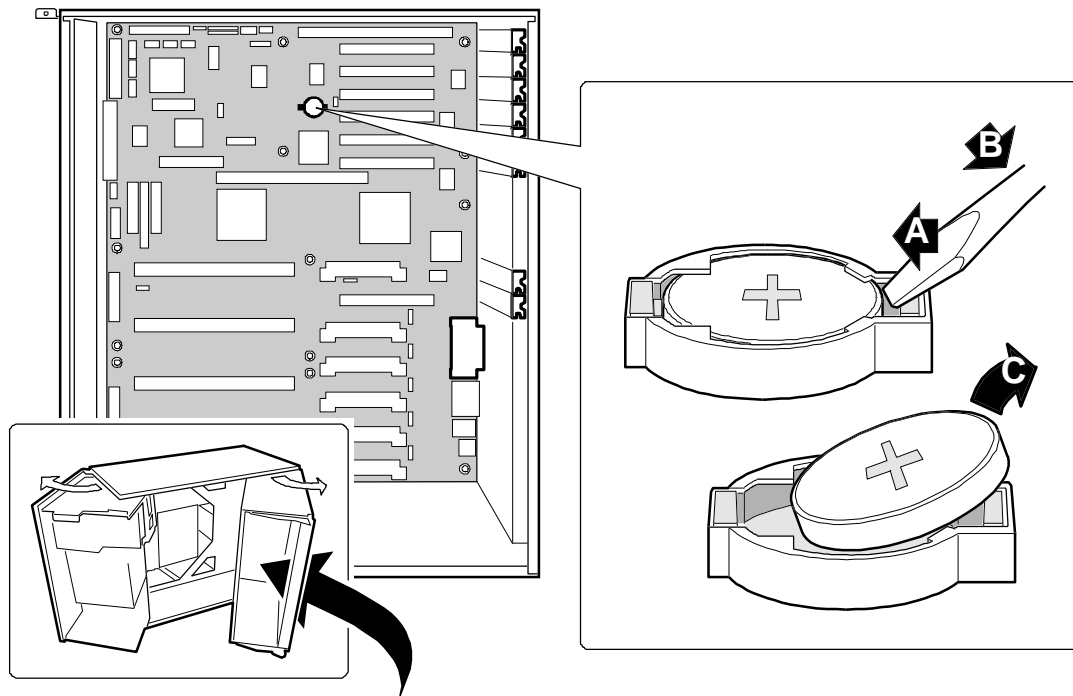
Replacing the Real-Time Clock Battery

6. Dispose of the battery according to any local ordinances.

7. Remove the new lithium battery from its package and carefully insert it in the battery socket, with the plus sign up (see above figure).

8. Reinstall the plastic retainer on the battery socket.

9. Replace the access cover, reconnect any peripherals, plug in the power supply cords, and turn on the system.

10. Run the System Setup Utility to restore the configuration settings.

Installing/Removing the Processor Cartridge

The following paragraphs provide procedures for installing and removing the Pentium II Xeon Processor Single Edge Contact (S.E.C.) cartridge. Use these procedures when upgrading or replacing your processor(s).

Each processor is packaged in a S.E.C. cartridge. The cartridge includes the processor core with an integrated 16 KB primary (L1) cache, secondary (L2) cache, heat sink, and a back cover. The processors are supported by one or more voltage regulator modules (VRM) on the system board, depending on the number of installed processors.

Each S.E.C. cartridge installs in a Slot 2 connector on the baseboard. Each slot must contain either a processor cartridge or a termination board (if there are less than four processors installed). The VRM modules are installed in a bank of VRM sockets adjacent to the processors.

> **Note:** Your system may have up to four processors. All installed processors must be matched for speed. If replacing a processor, the replacement processor must match the speed of all installed processors. If upgrading a processor, all processors must be upgraded to match.

⚠ CAUTION

Electrostatic discharge (ESD) can damage components; place them on an antistatic surface. Update the system board using an antistatic wrist strap attached to chassis ground.

⚠ WARNING

If the system was running, any processor and heat sink installed on the board is hot. To avoid the possibility of a burn, let the components cool for 10 minutes before continuing with these procedures.

Installing a Processor Cartridge

Use the following procedure to install a processor cartridge.

> **Note:** All installed processors must be matched in speed. If your system has less than four processors, and you are adding one, then you must remove the termination board in the empty Slot 2 connector. Remove a termination board the same way as a cartridge.

1. Power off the system, disconnect any attached peripherals, and unplug the system's power cords from the power sources.

2. Remove the access cover as previously described.

3. Carefully remove the foam cover from over the electronics bay.

4. Remove a new processor cartridge from its antistatic package and place it on a grounded static-free surface or conductive foam pad.

   > ◰ **Note:** All systems ship with a processor cartridge preinstalled in the bottom most slot (PROC1) on the system board. Some systems may have more, depending on how it was configured. When adding a processor cartridge, install it in the next empty slot up from the bottom slot.

5. Align the cartridge so that the heat sink (D in the following figure) faces away from the system board.

   If installing a termination board, align the board so that the white barcode label faces away from the system board.
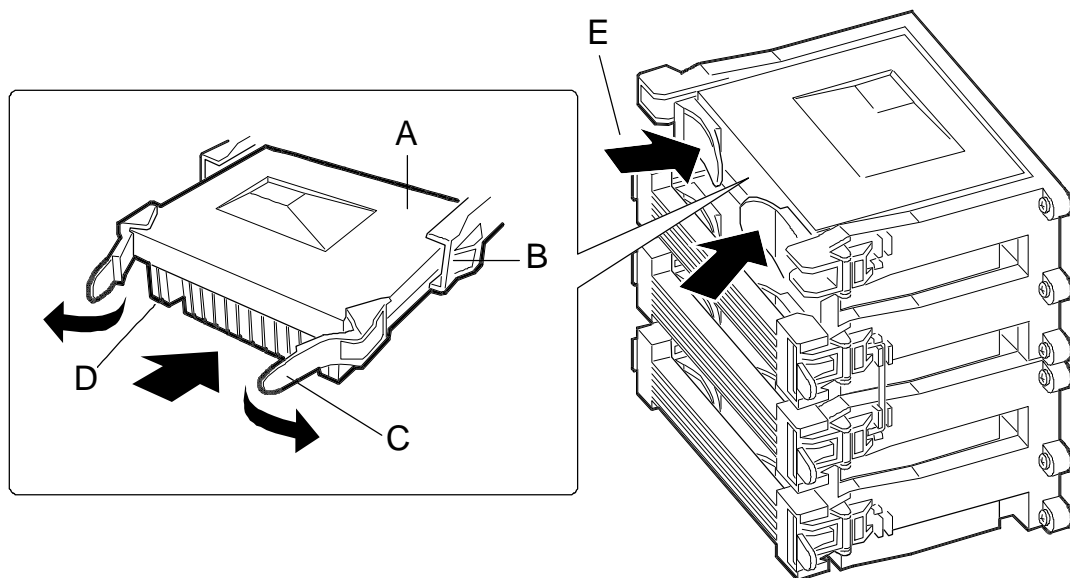
   A. S.E.C. cartridge

   B. Retention module guide rails

   C. Cartridge tabs

   D. Processor heat sink (face away from baseboard center)

   E. Push tabs inward on S.E.C. cartridge to seat processor

   Installing a Processor S.E.C. Cartridge

6. Ensure that the tabs at the top of the cartridge are completely open; i.e., pulled outward, away from the center of the cartridge (C in the preceding figure).

> 📄 **Note:** If tabs are not attached to the cartridge, see "Attaching Processor Cartridge Tabs" for procedures.

7. Insert the cartridge into the guide rails of the retention module (B in the preceding figure) and carefully push into the module until resistance is felt.

8. Close the two tabs by pushing them towards each other (E in the preceding figure) until the cartridge is fully seated.

9. Attach the retention bracket as follows.

- With the bracket in the open position (perpendicular to the front of the retention module), slide the open hinge at the left of the bracket into its slot at the left of the retention module.

- Turn the bracket to the right until it reaches the retention module. Slightly pull the tab outward and to the left to open the latch at the back of the tab.

- As you open the latch on the back of the tab, slide the right edge of the bracket onto the retention module and release the tab to lock the bracket in place.

10. Install the required VRM modules (single processor systems come with two VRM modules installed in VRM sockets 1 and 2). As you add processors, you need to install additional VRM modules.

- For processor PROC2, install a VRM module in socket 3.

- For processor PROC3, install a VRM module in sockets 4 and 5.

- For processor PROC4, install a VRM module in socket 6.

11. Reinstall the foam cover on the electronics bay.

12. Reinstall the access cover as previously described.

13. After you have installed a new processor, run the BIOS Setup Utility to configure its speed. Refer to Chapter 3, "Configuring Your System."

If your new S.E.C. processor cartridge does not have tabs installed, install them as follows.

1. Align the tab so that its triangular end (with two round pegs) points away from the center of the cartridge (see the preceding figure).

2. Slightly spread open the tab so that the two round pegs on the tab fit into two round holes at the corner of the cartridge. Use care in opening the tab to prevent breakage.

3. Repeat steps 1 and 2 for the second tab.

4. Proceed with installing the S.E.C. processor cartridge (see "Installing a Processor Cartridge," above).

Removing a Processor Cartridge

Use the following procedure to remove a processor cartridge.

1. Power off the system and remove the access cover as previously described.

2. Remove the foam cover from the electronics bay.

3. With your right thumb on the retention module bracket (A on the following figure), wrap your right index finger around tab (B).
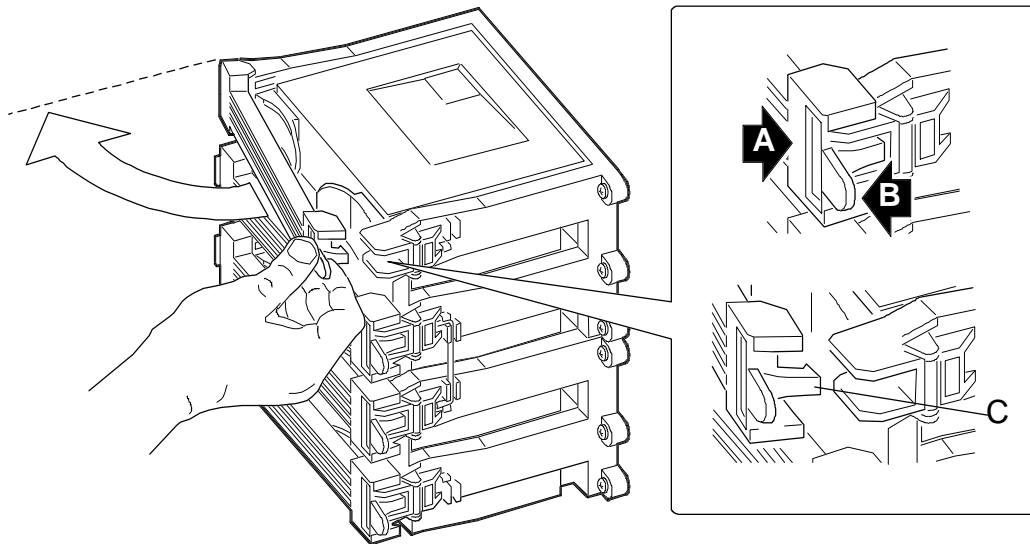
A.   Retention module bracket

B.   Bracket tab

C.   Latch

Opening the Latch

4. Use your right index finger to slightly pull the tab outward and to the left. A latch (C) releases when the tab is pulled, making it unnecessary to pull the entire bracket.

5. With the latch (C) released, rotate the bracket 90º to the left until perpendicular to the front of the retention module.

6. Grasp the bracket and move (not rotate) it to the right to disengage the bracket hinge, then remove the bracket from the cartridge.

7. Pull the two tabs (C on the following figure) on the cartridge straight away from the system board to disengage the cartridge from the system board.
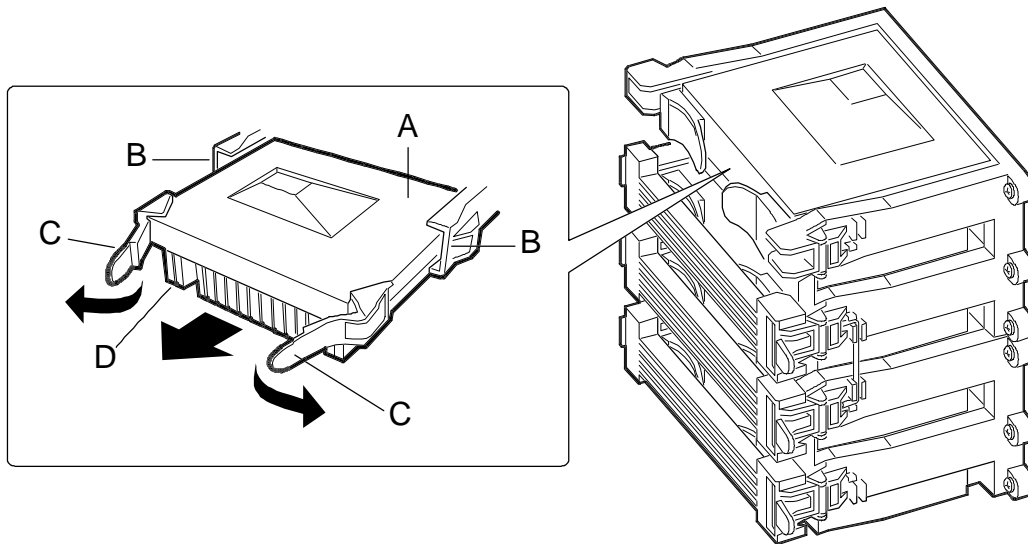
A.   S.E.C. cartridge

B.   Retention module guide rails

C.   Tabs on S.E.C. cartridge

D.   Processor heat sink

Removing the Processor

8. Pull the processor cartridge straight out of the system board and retention module. Place it on a grounded, static-free surface or conductive foam pad.

9. Put the old processor cartridge in conductive foam and store in an antistatic package.

10. Install a new processor cartridge (see "Installing a Processor Cartridge," next). If not installing a processor, install a termination board the same way as a cartridge and remove the appropriate VRM module(s).

Installing DIMM Modules

Main memory resides on a memory module that plugs into the system board. The memory module contains four banks of DIMM sockets, with each bank containing four sockets, for a total of 16 DIMM sockets. The banks are labeled A, B, C, and D. The sockets are labeled J1 through J16. The following figure shows the module and sockets.

E

J16 — D
J15 — J13
J12 — C — J10
J11 — J9
J8 — B — J6
J7 — J5
J4 — J2
J3 — A — J1

J14
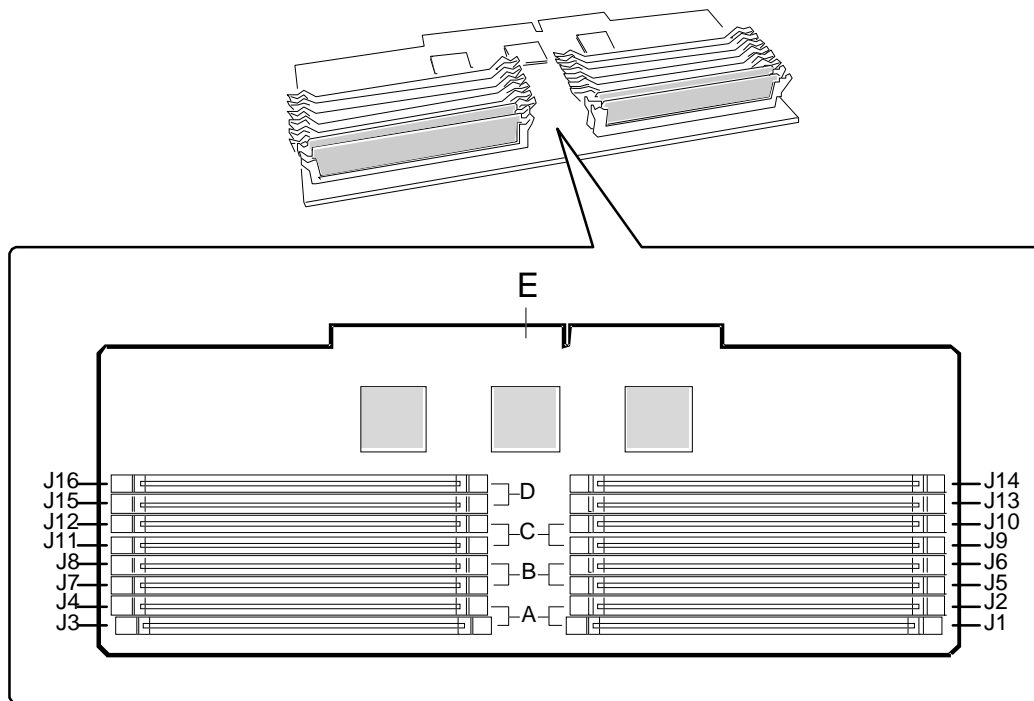
A.   Memory bank A (install first)

B.   Memory bank B (install second)

C.   Memory bank C (install third)

D.   Memory bank D (install last)

E.   Memory module connector

Memory Module

Each socket holds a single 72-bit DIMM module with 32MB, 64MB, 128MB, or 256MB of ECC memory. When all sockets are filled, the system board supports a maximum of 4 GB of memory using sixteen 256MB DIMMs.

You must install DIMMs by first filling bank A (see above figure), then fill bank B, C, and D, in that order. Each bank must be filled before going to the next bank.

Installing DIMMs requires that you first remove the memory module from the system, then add (or remove) DIMMs to the memory module as required.

Remove the module and install or remove the DIMM modules as described in the following paragraphs.

Removing the Memory Module

The memory module must first be removed from the system to install or remove DIMMs. Remove the memory module as follows.

1. Remove the access cover as previously described.

2. Remove the foam cover from the top of the electronics bay.

3. Carefully pull the memory module out of its connector on the system board (see the following figure).

4. Slide the module straight out from the system board until it clears the guide rails.

5. Place the module component-side up on a non-conductive, static-free surface.
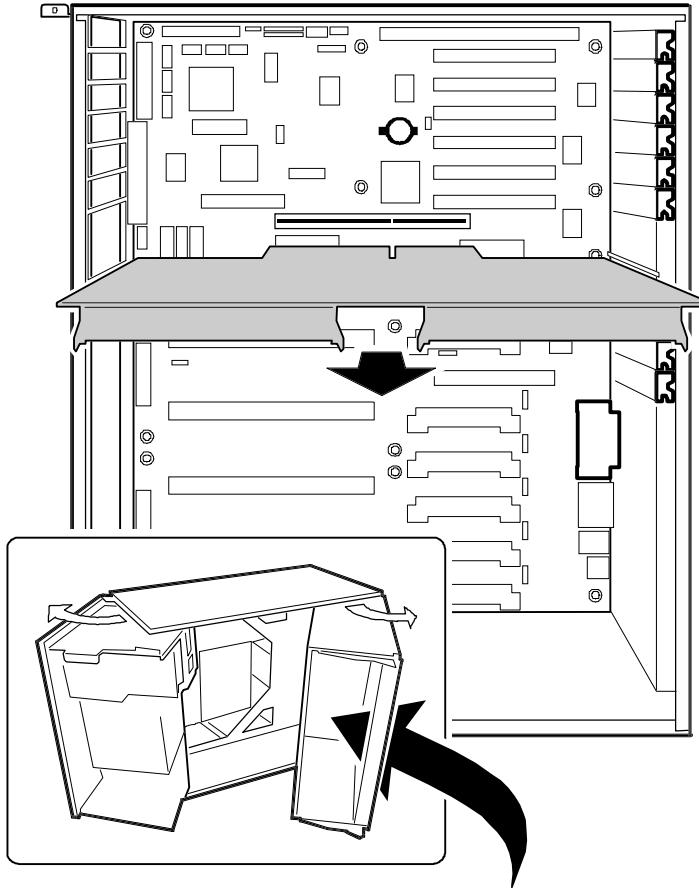
Removing the Memory Module

Installing DIMMs

Use the following procedure to install DIMMs. If you need to remove a DIMM, see "Removing DIMMs," next.

1. Remove the memory module as previously described.

⚠ **CAUTION**

Install DIMMs with gold-plated edge connectors in the memory module gold-plated sockets. Mixing dissimilar metals might cause memory failures and data corruption.

2. Hold the DIMM by its edges and remove from its antistatic package.

3. Align the two notches in the bottom edge of the DIMM with the keyed socket on the memory module (see the following figure).
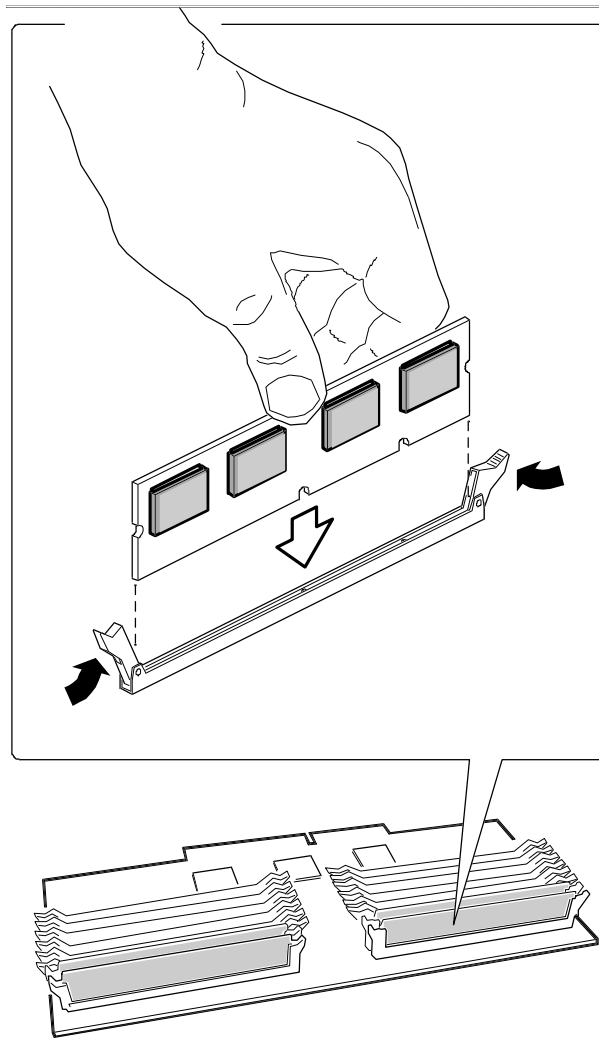
Installing the DIMM

⚠ CAUTION

Use care when inserting a DIMM. Applying too much pressure when inserting a DIMM can damage a socket or ejector lever. Apply just enough pressure on the DIMM ejector levers to lock the DIMM.

4. Carefully insert the DIMM into the socket and press down firmly on the DIMM until it is fully seated.

5. Gently push the plastic ejector levers on the socket ends to the upright position.

6. Repeat the above steps for each additional DIMM.

7. Reinstall the memory module (see "Installing the Memory Module," below).

8. Reinstall the foam cover on the electronics bay.

9. Reinstall the access cover as previously described.

10. Connect all external cables and the power cords to the system.

11. Run the SSU to configure the system and to properly attribute ECC memory (see Chapter 3, "Configuring Your System").

Removing DIMMs

Use the following procedure to remove DIMMs.

1. Remove the memory module as previously described.

2. Place the module component-side up on a non-conductive, static-free surface.

⚠ **CAUTION**

Use care when removing a DIMM. Applying too much pressure when removing a DIMM can damage a socket. Apply just enough pressure on the DIMM ejector levers to release the DIMM.

---

3. Gently press the ejector levers out and down to eject a DIMM from its socket.

4. Hold the DIMM by its edges and carefully remove it from the socket. Place the DIMM in an antistatic package.

5. If installing a new DIMM, see "Installing DIMMs," above, otherwise continue with this procedure.

6. Reinstall the memory module (see "Installing the Memory Module," next).

7. Reinstall the foam cover on the electronics bay.

8. Reinstall the access cover as previously described.

9. Connect all external cables and power cords and power up the system.

10. Run the SSU to configure the system and to set up advanced memory attributes.

Installing the Memory Module

Reinstall the memory module as follows.

1. Check that all DIMMs are firmly seated in their sockets on the memory module.

⚠ **CAUTION**

To avoid damage to the memory module, you must support
the module until it is correctly inserted and firmly seated in
its connector on the system board.

2. Hold the memory module by its edges and align it with the guide rail at the back of the electronics bay.

3. Insert the memory module through the guide rails and into the connector on the system board.

4. Firmly seat the memory module in the connector.

5. Reinstall the foam cover on the electronics bay and the access cover.

Installing Option Boards

The following paragraphs describes how to install and remove ISA and PCI option boards. The system board has one ISA bus expansion connector and seven PCI bus expansion connectors (see the following figure).

The 32-bit PCI bus is divided into PCI Segment A and PCI Segment B, each with the following connectors:

- PCI A has three expansion board connectors (PCI A1, A2, and A3)
- PCI B has four expansion board connectors (PCI B0, B1, B2, and B3).

The ISA connector accepts a half-length board only, and is shared with PCI B3 (meaning that you can install either an ISA board or a PCI board in the shared slot). PCI connector PCI A1, adjacent to the processors, accepts a half-length board only. The remaining PCI connectors accept up to full length boards.

The segmented high-performance PCI buses allow use of networking technology, such as 100 MB/second Ethernet NICs, with a minimum of effort and without concern for I/O bottlenecks. Each segmented bus offers up to 133 MB/second burst transfers.
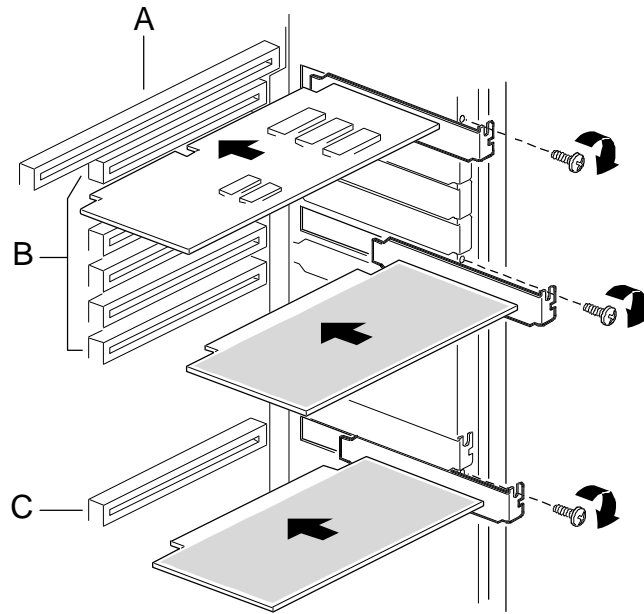
A. ISA connector (use half-length board only)

B. Six PCI connectors (top to bottom in figure)
    First four connectors: PCI B3, B2, B1, B0
    Next two connectors: PCI A3, A2

C. PCI connector A1 (use half-length board only)

Locating the PCI and ISA Slots

Installation Considerations

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

The ISA boards 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 SSU. If adding a non-Plug and Play ISA option board, run the SSU before installing the board (see Appendix B, "System Setup Utility").

Controller/Adapter Hardware Configurations

The following table lists the option boards you may add to your system that require specific installation slots.

Option Board Hardware Configurations

Option Board	IRQ	Memory Address	I/O Address	Option Slot
Mylex AcceleRAID 250 (SecuRAID 210) Controller Board	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot B2 (see PCI/ISA Slot Location illustration above)
Mylex AcceleRAID 1100 (SecuRAID 530) Controller Board				

Installing an Option Board

Install an option board as follows.

1. Power off the system, disconnect any peripherals, and unplug the AC power cords from power.

2. Remove the access cover as previously described.

3. Remove the foam cover from the electronics bay.

4. Remove an expansion slot screw and cover (see the following figure).

⚠ CAUTION
Observe static precautions. Use an antistatic wrist strap.

5. Hold the option board by its edges and remove it from its protective wrapper. Do not touch board components or connectors.

6. Set the board down on an antistatic surface.

7. Record the option board serial number in the equipment log.
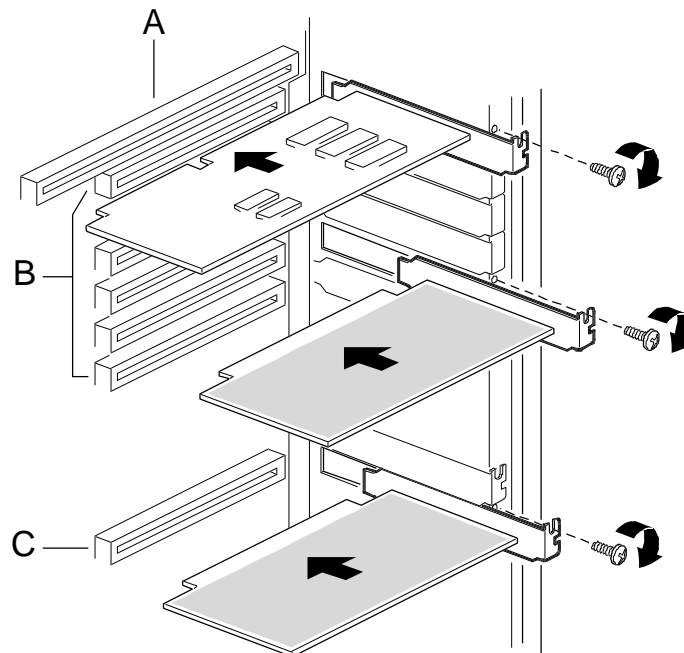
Installing an Option Board

8. Set any board jumpers or switches as described in the documentation that comes with the option board.

9. Hold the option board by its top edge or upper corners and insert it into the expansion slot until it is firmly seated. The tapered foot of the option board retaining bracket must fit into the mating slot in the expansion slot.

10. Secure the board in place, using the previously removed slot cover and screw .

11. Connect any necessary cables and peripherals to the board and system.

12. Reinstall the foam cover on the electronics bay.

13. Replace the access cover and power on the system.

Removing an Option Board

Use the following procedure to remove an option board.

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

1. Power off the system, disconnect any peripherals, unplug the power cords from their power source, and remove the access cover.

2. Remove the foam cover from the electronics bay.

3. Disconnect any cables that may be 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 pull it out of its connector. 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. If you are replacing a board, see "Installing an Option Board," otherwise continue.

7. Install an expansion slot cover over the vacant slot and secure with the previously removed screw.

8. Reinstall the filler board retaining bar and secure with the previously removed screw.

9. Replace the foam cover on the electronics bay, install the access panel, connect any peripherals, and power on the system.

Installing Hard Disk Drives

Your system supports up to six, 1-inch high, hot-swap, wide SCSI low voltage drives (LVD). The drives install in the drive bay at the front of the system (see the following figure). The drive bay is accessed by opening the front panel, unlocking the metal door (if locked), and opening the metal door.
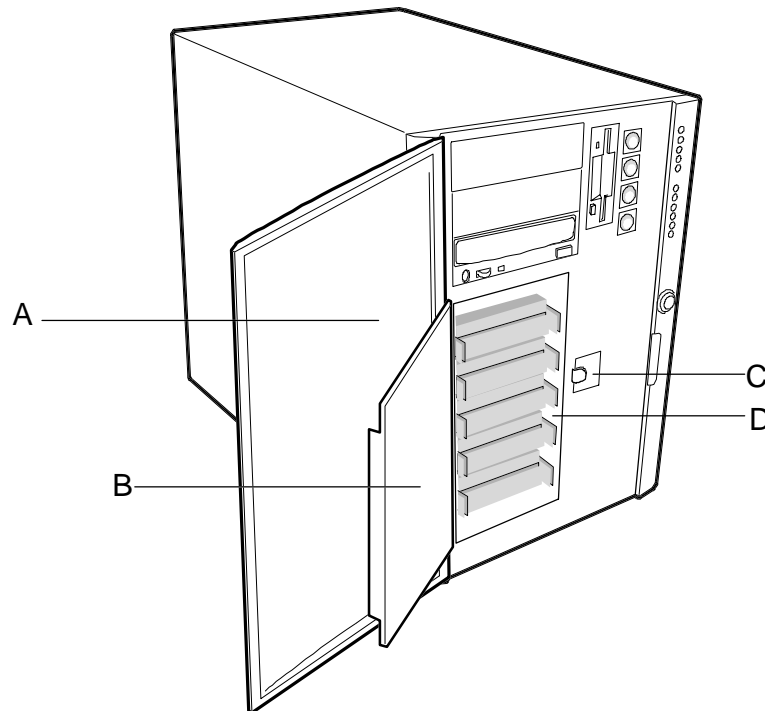
A.   Front panel

B.   Metal EMI shield door

C.   Metal door latch

D.   3 1/2-inch SCSI hard drive bay

3 1/2-Inch SCSI Hard Drive Bay Location

Each optional hard drive must be mounted in a plastic hard disk tray, and the tray and hard drive installed in the drive bay. The SCA connector on the back of the drive plugs into the system's internal SCSI backplane. The connector connects the SCSI drive power and data lines to the SCSI backplane. The backplane also acts as the termination point for all installed SCSI hard drives and sets the hard drive IDs automatically.

The following paragraphs include procedures for installing optional SCSI hard drives and for hot-swapping a failed SCSI hard drive.

Installing an Optional SCSI Hard Disk Drive

Install an optional SCSI hard disk drive as follows.

⚠ **CAUTION**

Observe static precautions. Use an antistatic wrist strap.

---

1. Turn off the system and disconnect all power cords from their power sources.

2. Remove the 3 1/2-inch hard disk drive from its protective wrapper and place the drive on an antistatic surface.

3. Record the drive model and serial number in the equipment log.

⚠ **CAUTION**

If the drive comes with drive rails, do not use them. Remove any rails already attached.

---

4. Orient the drive and carrier as shown in the following figure.
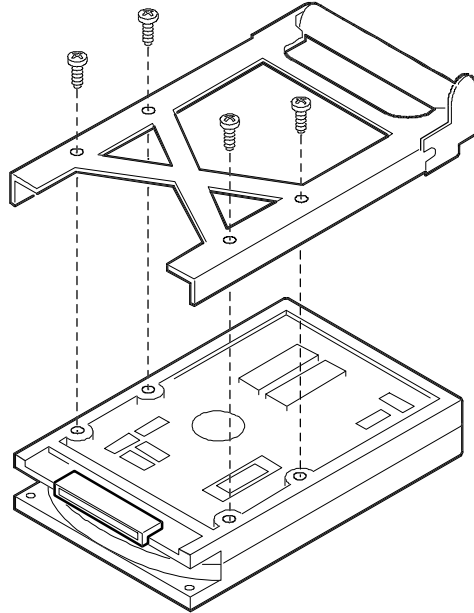
Installing the Hard Drive Carrier

5. Secure the carrier to the drive with the four supplied screws.

6. Open the front panel on the server by grasping the right edge (as you face the front) and swing the panel out.

7. Press in on the plastic latch securing the metal door and open the door.

   ■ If the door is locked with a padlock, remove it.

8. Hold the carrier by its handle, position it in front of an open slot, and start it into the guide rails.

9. Carefully push the carrier and drive part way into the bay.

10. Pull down on the carrier handle and continue pushing the carrier into the bay.

- As you push in, the two rounded notches in the handle (B in the following figure) slide onto the two round pegs inside the drive bay (A in the figure).

- When the pegs are fully seated in the notches, push the handle straight up (C in the figure) to lock.

- Press the rounded tab on the right of the carrier to the left until it clears the edge of the bay and snaps into place.
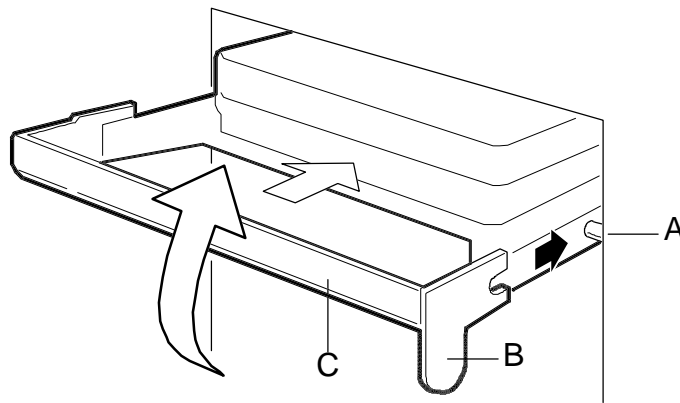
Installing an Optional SCSI Hard Drive

11. Close the metal door and secure with the plastic latch. If removed, install the padlock and lock the metal door.

12. Close the front panel.

13. Configure the system for the new SCSI hard drives (see Chapter 3, "Configuring Your System").

Hot-Swapping a SCSI Hard Disk Drive

A SCSI hard drive can be hot-swapped (removed) from the system if it fails and replaced with another SCSI hard drive, all without shutting down your system.

Hot-swap a SCSI hard disk drive as follows.

1. Open the front panel and the metal door to the hot-docking bay. If the metal door is locked with a padlock, remove it.

2. Check the bank of yellow LEDs on the front panel to determine which drive is bad.

> ✍**Note:** A failed SCSI hard drive is indicated by a continuously lit yellow LED on the front panel. The LEDs and corresponding hard drives are numbered 0 through 5, from top to bottom (for example, drive 0 is the top-most hard drive in the bay and drive 5 is the bottom-most drive in the bay).

3. Press the rounded tab on the right of the carrier towards the center of the drive (B in the following figure) while gently pulling down the carrier handle (A in the figure).
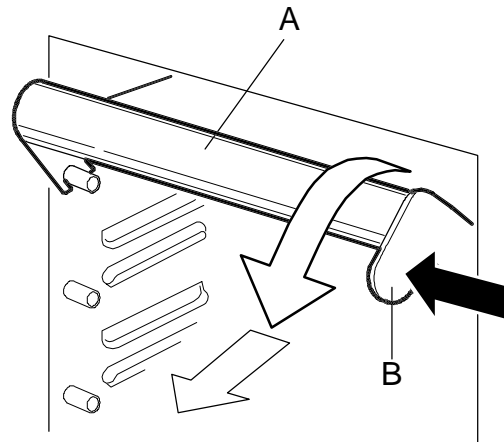
Unlocking the Carrier

4. With the handle pulled down, pull the carrier and drive out of the bay.

5. Place the carrier and drive on an antistatic surface.

6. Install a replacement carrier and SCSI hard drive as previously described.

7. Close and lock (if appropriate) the metal door, and close the front panel.

Installing Removable Media Devices

Your system supports up to three SCSI removable media devices, including the factory installed SCSI CD-ROM drive. The CD-ROM drive is shipped installed in the bottom slot, with the remaining two slots available for installation of optional devices (tape drive, other removable devices). Additional devices should be installed in the first available slot from the top.

Your system ships with a four-connector narrow SCSI cable. The SCSI CD-ROM drive is connected as the last device on the SCSI cable and is terminated. Additional single-ended SCSI removable media devices can be connected to the remaining connectors.

If you are adding or removing a SCSI removable media device, consider the following:

■ A tape drive SCSI address assignment is 2.

■ If a SCSI tape drive is connected along with the SCSI CD-ROM on the SCSI controller, SCSI termination must be removed from the tape drive.

Use the following procedures to install or remove optional 5 1/4-inch removable media devices.

Installing a 5 1/4-Inch Media Device

Install an optional 5 1/4-inch device in the removable media bay as follows.

1. Power off the system, disconnect all installed peripherals, and unplug all system power cords from their power sources.

> ⚠ **CAUTION**
>
> Only single-ended SCSI devices are supported by the narrow SCSI channel. Connecting different SCSI devices can result in electrical damage to the system board and peripherals.

> ⚠ **CAUTION**
>
> Do not install hard drives in the 5 1/4-inch device bay. The drives cannot be properly cooled in the bay. Also a hard drive generates EMI and is more susceptible to ESD in the bay.

2. Open the front panel for access to the removable media device bay.

3. Remove the EMI metal shield from the slot that you are using for the optional device.

■ Push the tab (A on the following figure) on the left side of the shield to the right to disengage it from the bay.

■ Remove the shield and save it. Reinstall the shield if you remove the device and don't replace it.
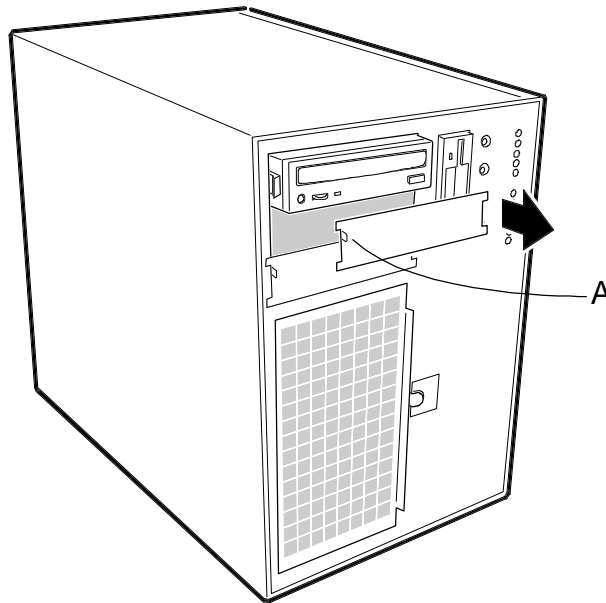
Removing the EMI Shield

⚠ CAUTION

Observe static precautions. Use an antistatic wrist strap.

4. Remove the device from its protective wrapper and place it on an antistatic surface. Record the device model and serial number in the equipment log.

5. Set any device jumpers or switches before you install the device. See the documentation that comes with the device for jumper or switch information.

   ⊟ *Note:* If the device comes with device rails, do not use them. Remove any rails already attached. Use only the rails in the accessory pack that comes with your system.

6. Remove the two rails and four mounting screws from your accessory pack and attach them to the device.

   ■ Position the device and rails as shown in the following figure.

   ■ Secure the rails to the device with the four screws.
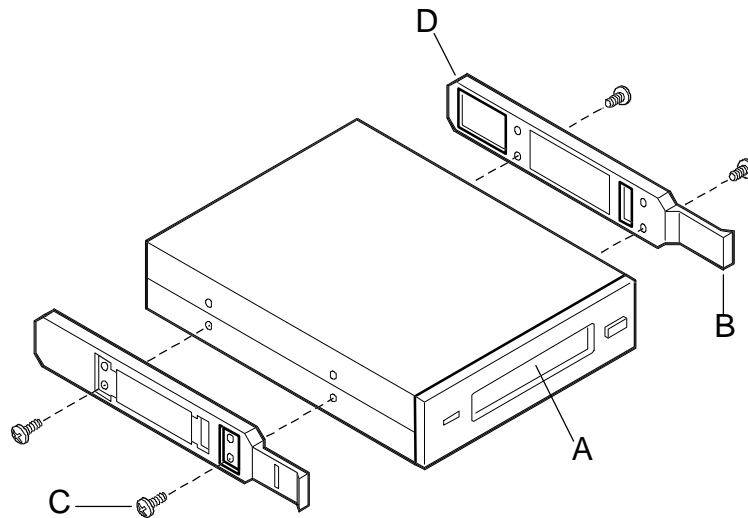
A.   Tape drive or other removable device

B.   Tab on rail

C.   Screws (4)

D.   Rails (2)

Installing the Device Rails

7. Align the device with the device slot guide rails and carefully slide the device into the slot until the device locks in place.

8. Remove the access cover and open the subchassis for access to the power and signal cables and the back of the device (see "Removing the Access Cover" and "Opening the Subchassis and Electronics Bay," described earlier in this chapter).

9. Locate a power cable and the SCSI cable, depending on the device being installed.

10. Connect the signal and power cables to the device. The connectors on the cables are keyed and can only be connected one way.

11. Check your connections, close the subchassis, install the access cover, and close the front panel.

12. Connect any external peripherals, plug in the system power cords, and turn on the system.

13. Configure the system for the new device (see Chapter 3, "Configuring Your System").

Removing a 5 1/4-Inch Media Device

Remove a 5 1/4-inch media device as follows.

1. Power off the system, disconnect any peripherals, and unplug the system power cords from their power sources.

2. Open the front panel, remove the access cover, and open the subchassis.

3. Disconnect the power cable and data cable from the back of the device you are removing.

4. At the front of the device, push in on the two latching rails while pulling the device out of its slot.

5. Set the device on an antistatic surface. Remove and save the two rails and four screws from the device.

6. Install the previously removed EMI shield over the empty slot from which you removed the device.

7. Close the subassembly, reinstall the access cover, and close the front panel.

8. Reinstall any previously disconnected peripherals, plug in the system's power cords, and turn the system on.

9. Record the device serial number in the equipment log.

5

Solving Problems

- Static Precautions
- Troubleshooting Checklists
- Additional Troubleshooting Procedures
- Specific Problems and Corrective Actions
- PCI Installation Tips
- BIOS User's Information

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

⚠ WARNING

The DC push-button on/off switch on the front panel does not turn off system AC power. Also, +5 Vdc is present on the system board whenever the AC power cords are connected between the system and an AC outlet. Before doing any procedures, make sure that your system is powered off and the power cords are unplugged from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

⚠ CAUTION

Operating your system with the access cover removed can damage system components. For proper cooling and airflow, always replace the access cover before powering on your system.

Static Precautions

An electrostatic discharge (ESD) can damage disk drives, option boards, and other components. You can provide some 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.

Troubleshooting Checklists

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

Initial System Startup

Incorrect installation or configuration usually causes problems that occur at initial system startup. Hardware failure is a less frequent cause. If you have problems during initial system startup, check the following.

- Are the system power supply cords properly connected to the system and plugged into a NEMA 5-15R outlet (100-120 Vac) or a NEMA 6-15R outlet (200-240 Vac)?

- Is AC power available at the wall outlet?

- 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 PCI/ISA option boards fully seated in their connector slots on the system board?

- Are all the SCSI hard drives fully seated in their connector slots on the backplane?

- Are all jumper settings on the system board correct? For jumper information, see Chapter 3, "Configuring Your System."

- Are all jumpers and switch settings on option boards and peripheral devices correct? To check these settings, refer to the vendor documentation and to the appendices in this guide. If applicable, ensure that there are no conflicts (for example, two option boards sharing the same interrupt).

- Are the processor(s) fully seated in their slots on the system board? Refer to Chapter 4, "Upgrading Your System," for installation procedures.

- Are all processor connectors populated with either a processor or a terminator?

- Are all DIMMs fully seated and installed correctly in the memory module? Refer to Chapter 4, "Upgrading Your System," for installation procedures.

- Are all option boards and disk drives installed correctly? See Chapter 4, "Upgrading Your System," for installation procedures.

- Are the system hard disk drives properly formatted or defined?

- Is the operating system properly loaded? Refer to the operating system documentation.

- Are all drivers properly installed?

- Are the configuration settings in BIOS Setup and the System Setup Utility (SSU) correct? For information about running these utilities, refer to Chapter 3 "Configuring Your System."

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 diskette, 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?

- If you are running the software from a CD ROM disk, is the disk scratched or dirty?

- Are the correct device drivers installed?

- Is the software correctly configured for the system?

- Are you using the software correctly?

- 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 were 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 diskette or CD ROM, try a new copy of the software.

- If you are running the software from a hard 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 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 drive. Also, the drive, drive controller, or 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 or uninteruptible power supply between the power outlet and the system power supply cords.

If the problem recurs after you have checked and corrected all of the above items, refer to "Additional Troubleshooting Procedures," next.

Additional Troubleshooting Procedures

The following paragraphs provide a more detailed approach to diagnostic testing and identification of a problem and locating its source.

Use the following troubleshooting procedures to help you identify a problem. These procedures include 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

Prepare the system for diagnostic testing as follows.

Note: 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 your monitor and keyboard are correctly connected to the system.

3. Make sure the system power supply cords are plugged into a properly grounded AC outlet and the back of the system.

4. Power up 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).

5. 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.

6. Turn on the system. If the power indicator LED does not light, refer to "Power Light Does Not Light" later in this chapter.

Monitoring POST

Each time you turn on the system, the Power-On Self-Test (POST) runs automatically and checks the system board, processor(s), memory, keyboard, and most installed peripheral devices.

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

Press **F2** to enter Setup. If you do not press **F2**, the above message remains for a few seconds and 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 and should be reported to your service representative.

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

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 is also logged to the Event Logging area.

The following table lists keys active during POST and provides a description of errors that may occur.

POST Keys and Errors

Action/Message	Description
If POST Beeps Before Video Appears	Initialization failed before video initialized. Most beep code errors are fatal; initialization cannot continue. Refer to "BIOS User's Information" at the end of this chapter.
If Monitor Displays Error	Note error; press **F1** to continue boot or **F2** to enter Setup. Refer to "BIOS User's Information" at the end of 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.

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," later in this chapter.

Specific Problems and Corrective Actions

The following paragraphs provide possible solutions for specific problems, including:

- power LED does not light

- no beep or incorrect beep pattern

- no characters appear on screen

- characters on the screen appear distorted or incorrect

- system cooling fans do not rotate

- diskette drive activity LED does not light

- hard disk drive activity LED does not light

- CD ROM drive activity LED does not light

- problems with application software

- startup prompt "Press <F2> key if you want to run Setup" does not appear on screen

- bootable CD ROM is not detected

- SSU does not boot.

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.

- Are all power supplies plugged in? Is the power turned on to the power strip or outlet? Do you have a blown fuse or breaker?

- Is the system operating normally? If so, the power LED is probably defective or the cable from the front panel to the system board is probably loose.

- Are there other problems with the system? If so, check the items listed under "System Cooling Fan(s) Does Not Rotate."

If all the above are correct and problems persist, contact your service representative for assistance.

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 see "Messages and Beep Codes" at the end of this chapter.

No Characters Appear on Screen

Check the following.

- Is the keyboard working? Check to see if the **Num Lock** light is functioning.

- Is the monitor plugged in and turned on? Did you wait a moment or two to give the monitor time to activate from an idle or inactive state?

- Are the brightness and contrast controls on the monitor properly adjusted?

- Are the monitor switch settings correct?

- Is the monitor signal cable properly installed?

- Is the onboard video controller enabled?

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

1. Verify that the video controller board is fully seated in the system board connector.

2. Check that the monitor is plugged into the video controller board monitor port.

3. Run the SSU to disable the onboard video controller.

4. 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 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 display, the video display or video controller may have failed. Contact your service representative for assistance.

Characters are Distorted or Incorrect

Check the following.

- Are the brightness and contrast controls properly adjusted on the monitor? Refer to the documentation supplied with your monitor.

- Are the video monitor signal and power cables properly installed?

- Is the correct video monitor board installed for your operating system.

If the problem persists, the video monitor may be faulty or it may be the incorrect type. Contact your service representative for assistance.

System Cooling Fan(s) Does Not Rotate

The system has eight cooling fans. In addition, each power supply has its own cooling fan. If any of the fans are not operating properly, system components may be damaged. Check the fans periodically, as follows.

> ≣ **Note:** If a power supply fan fails, call your service representative. There are no serviceable components inside the power supply. If the power supply is opened, the manufacturer's warranty is voided.

Check the following.

- Is AC power available at the AC wall outlets?

- Are the system power cords properly connected to the system and to the AC wall outlets?

- Did you press the power on/off switch on the front panel?

- Is the fan failure indicator on the front panel lit? If so, a fan has failed and must be replaced.

- Is the power supply failure indicator on the front panel lit? If so, check the power supply failure indicator on the power supply to determine which supply failed.

- Are the power indicators on the power supplies on?

- Is the power indicator on the front panel lit?

- Is the power supply failure indicator on the power supply lit? If not, the power supply has failed.

- Is the power connector for the cooling fan(s) connected to the system board?

- 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, contact your service representative for assistance.

Diskette Drive Activity LED Does Not Light

Check the following.

- Are the diskette drive power and signal cables properly installed?

- Is the diskette drive properly configured?

- Is the diskette drive activity light always on? If so, the signal cable may be plugged in incorrectly.

If you are using the onboard diskette controller, use the Setup or SSU to make sure that the Onboard Floppy is set to Enabled. Conversely, to use an optional fixed/diskette controller, make sure that Onboard Floppy is set to Disabled. For information about running the Setup or SSU, refer to Chapter 3, "Configuring Your System," or Appendix B, "System Setup Utility."

If the problem persists, there may be a problem with the diskette 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:

- Are the power and signal cables to the drive properly installed?

- Are all relevant switches and jumpers on the hard drive and adapter board set correctly?

- Is the hard disk drive properly configured in the SSU?

- Is the individual hard drive activity indicator on the front panel lit?

- Is the disk bay power indicator on the front panel lit?

Run the SSU to make sure that the hard disk drive is configured with the correct parameters. For information about running the SSU, refer to the "Configuring Your System" chapter.

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.

> 📑 **Note:** The hard disk drive activity light on the front panel lights when either a hard disk drive, or a SCSI device controlled by the onboard SCSI host controller, is in use. This LED does not display CD-ROM activity.

CD ROM Drive Activity Light Does Not Light

Check the following.

- Is the power and signal cable to the SCSI CD ROM drive properly installed?

- Are all relevant switches and jumpers on the drive set correctly?

- Is the drive properly configured?

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 that you are using.

- Make sure all cables are installed correctly.

- Verify that the system board jumpers are set correctly. Refer to Chapter 3, "Configuring Your System," for jumper settings.

- If other software runs correctly on the system, contact your software vendor about the failing software.

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

Press F2 Key to Enter Setup: Prompt Does Not Display

If the prompt "Press **F2** key to run Setup" does not appear at system startup, then the prompt option has been disabled in the SSU. There are two ways to enable the prompt:

- Reboot the system using your SSU diskette, and go into the SSU to enable the prompt.

- Clear CMOS memory by changing a jumper, and go into the SSU to enable the prompt.

Enable F2 Prompt by Using SSU

Use the following steps to enable the **F2** prompt.

1. Insert your SSU diskette in the diskette drive. This is the diskette that is created by copying the SSU software from EXPRESSBUILDER CD ROM that comes with the system.

2. Reboot the system by pressing **Ctrl+Alt+Del** while at the DOS operating system prompt or by pressing the reset switch.

3. When the DOS Startup menu appears, select **1** or **2** to enter the SSU.

4. Select Step 3, "Change Configuration Settings." If a password menu displays, enter a user or administrator password if either is enabled, or just press **ESC** to bypass this menu prompt.

5. Select **System Board**.

6. Page down until you reach the Boot Subsystem Group. It is toward the end of the groups.

7. Find and select the option that says, "Display 'F2 for Setup' Message during POST."

8. Press **Enter** to display the option menu.

9. Select **Enable** and press **Enter**.

10. If you are finished editing the settings for the system board, press **Esc**. This takes you back to the main menu, Step 3.

11. Press **Esc** again to return to the main SSU menu.

12. Select Step 4, Save Configuration. Once you select this step, the changes are immediately saved into an INF file, a CMS file, and nonvolatile memory.

13. Press **Esc** to exit the SSU. You are prompted to reboot the system or simply exit to the command line prompt. You'll need to reboot the system to let your changes take effect, but first remove the SSU diskette drive. Press **F10** to reboot.

You should now see the **F2** prompt displayed at bootup.

Enable F2 Prompt by Changing a Jumper and Using SSU

If you do not have an SSU diskette or CD available, you can clear CMOS memory to enable the **F2** prompt. This means you must change a jumper on the system board, run the SSU, save your changes, and change the jumper back to the default setting.

> 📝 **Note:** This procedure resets *all* settings to their default settings. Clearing CMOS memory resets *all* SSU and Setup settings to their defaults, not just the CMOS CLR setting. Before proceeding, check that you have a backup paper copy of the configuration settings. Referring to the worksheets could make your reconfiguration task easier.

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

2. Turn off all connected peripherals, turn off system power, and disconnect the AC power cord.

3. Remove the access cover. Refer to Chapter 4, "Upgrading Your System," for information on removing the access cover. You do not need to remove the system board from the chassis, and you may not need to remove any add-in boards.

4. Locate the CMOS clear jumper at the edge of the system board. See Chapter 4, "Configuring Your System," for information on the location of the CMOS jumper.

5. Move the CMOS clear jumper from pins 1 and 2 and place on pins 2 and 3.

6. Reinstall the access cover for your safety, and connect the power cord to the system.

7. Power on the system. POST starts and halts displaying an "Invalid CMOS Settings" error.

8. Reboot the system, enter Setup and make any changes necessary. You need to check and possibly reset all your settings.

9. Press **F10** to save the new Setup configuration and exit Setup.

10. Turn off the system, and disconnect the power cords.

11. Remove the access cover.

12. Move the CMOS clear jumper from pins 2 and 3 back to pins 1 and 2.

13. Reinstall the access cover, and connect the power cords.

14. Turn the system on. Run BIOS Setup (press **F2**) to verify the correct settings. See Chapter 3, "Configuring Your System," for information on running BIOS Setup.

Bootable CD-ROM Is Not Detected

Check the following.

- Is the BIOS set to allow the CD ROM to be the first bootable device?

- Check your BIOS Setup (press **F2**) configuration.

Problems with the Network

The server hangs when the drivers are loaded.

- Change the PCI BIOS interrupt settings. Try the "PCI Installation Tips" below.

Diagnostics pass, but the connection fails.

- Make sure the network cable is securely attached.

- Make sure you specify the correct frame type in your NET.CFG file.

The Link LED doesn't light.

- Make sure you have loaded the network drivers.

- Check all cable connections.

- Try another port on the hub.

- Make sure you have the correct type of cable between the adapter and the hub. Some hubs require a crossover cable while others require a straight-through cable (for more information on crossover cabling, see your hub documentation).

The Activity LED doesn't light.

- Make sure you've loaded the correct network drivers.

- Network may be idle. Try accessing a server.

The controller stopped working when an add-in adapter was installed.

- Make sure the cable is connected to the port from the onboard network controller.

- Make sure your PCI BIOS is current. Try the "PCI Installation Tips" below.

- Make sure the other adapter supports shared interrupts. Also, make sure your operating system supports shared interrupts; OS/2 does not.

- Try reseating the add-in adapter.

The add-in adapter stopped working without apparent cause.

- Try reseating the adapter first; then try a different slot if necessary.

- The network driver files may be corrupt or deleted. Delete and then reinstall the drivers.

- Run the diagnostics.

PCI Installation Tips

Some common PCI tips are listed here.

- Reserve interrupts (IRQs) and/or memory addresses specifically for ISA adapters. This prevents PCI cards from trying to use the same settings ISA cards are using. Use the SSU to keep track of ISA adapter resources.

- Certain drivers may require interrupts that are not shared with other PCI drivers. The SSU can be used to adjust the interrupt numbers for PCI devices. For certain drivers, it may be necessary to alter settings so that interrupts are not shared.

BIOS User's Information

The following paragraphs describe the various screen messages 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 may also be logged to the Event Logging area.

Error and Status Messages

The "BIOS Messages" table is an alphabetic listing of error and status messages that the BIOS generates. The table also includes an explanation of each message. Many of the messages refer to the built in Setup program. For more information about Setup, see Chapter 3, "Configuring Your System."

BIOS Messages

Message	Description
nnnn Cache SRAM Passed	Where nnnn is the amount of system cache in kilobytes successfully tested.
Diskette drive A error or Diskette drive B error	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.
Entering SETUP ...	The Setup program is starting.
Extended RAM Failed at offset: nnnn*	Extended memory is not working or is not properly configured at offset nnnn.
nnnn Extended RAM passed	Where nnnn is the amount of RAM in kilobytes successfully tested.
Failing Bits: nnnn*	The hex number nnnn 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.
Fixed Disk 0 Failure or Fixed Disk 1 Failure or Fixed Disk Controller Failure*	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.
Incorrect Drive A type - run SETUP or Incorrect Drive B type - run SETUP	Type of floppy drive is not correctly identified in Setup.
Invalid NVRAM media type*	Problem with NVRAM (CMOS) access.

Keyboard controller error*	The keyboard controller test failed. You may have to replace the keyboard or controller.
Keyboard error nn	The keyboard is not working. BIOS discovered a stuck key and displays the scan code nn for the stuck key.
Monitor type does not match CMOS - Run SETUP	Monitor type is not correctly identified in Setup.
Operating system not found	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.
Parity Check 1 *nnnn** or Parity Check 2 *nnnn**	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.
Press <F1> to resume, <F2> to Setup	Displayed after any recoverable error message.
Press <F2> to enter SETUP	Optional message displayed during POST. Can be turned off in Setup.
Previous boot incomplete - Default configuration used	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.
Real time clock error*	Real time clock fails BIOS test. May require board repair.
Shadow Ram Failed at offset: *nnnn**	Shadow RAM failed at offset *nnnn* of the 64K block at which the error was detected.
nnnn Shadow RAM Passed	Where *nnnn* is the amount of shadow RAM in kilobytes successfully tested.
System battery is dead - Replace and run SETUP	The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system.
System BIOS shadowed	The system BIOS is copied to shadow RAM.
System cache error - Cache disabled*	The RAM cache failed the BIOS test and BIOS has disabled the cache.
System CMOS checksum bad - run SETUP	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.
System RAM failed at offset: *nnnn**	The system RAM failed at offset *nnnn* of the 64K block at which the error was detected.
nnnn System RAM Passed	Where *nnnn* is the amount of system RAM in kilobytes successfully tested.
System timer error*	The timer test failed. Requires repair of the system board.
UMB upper limit segment address: *nnnn*	Displays the address *nnnn* of the upper limit of the Upper Memory Blocks, indicating released segments of the BIOS which may be reclaimed by a virtual memory manager.
Video BIOS shadowed	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.

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.

The following table 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.

POST Tests

Code	Beeps	POST Routine Description
xx	1-1-1-1	There are no processors present in the system, or the processors are so incompatible that the system BIOS cannot be run (like mismatched cache voltages).
02		Verify Real Mode
04		Get CPU type
06		Initialize system hardware
08		Initialize chipset registers with initial POST values
09		Set in POST flag
0A		Initialize CPU registers
0C		Initialize cache to initial POST values
0E		Initialize I/O
0F		Initialize the local bus IDE
10		Initialize Power Management
11		Load alternate registers with initial POST values
12		Restore CPU control word during warm boot
14		Initialize keyboard controller
16	1-2-2-3	BIOS ROM checksum
18		8254 timer initialization
1A		8237 DMA controller initialization

POST Tests

Code	Beeps	POST Routine Description
1C		Reset Programmable Interrupt Controller
20	1-3-1-1	Test DRAM refresh
22	1-3-1-3	Test 8742 Keyboard Controller
24		Set ES segment register to 4 GB
28	1-3-3-1	Autosize DRAM; system BIOS stops execution here if the BIOS does not detect any usable memory DIMMs.
2A		Clear 512K base RAM
2C	1-3-4-1	RAM failure on address line xxxx; BIOS stops execution here if entire memory is bad.
2E	1-3-4-3	RAM failure on data bits xxxx* of low byte on memory bus; BIOS stops execution here if entire memory is bad.
30	1-4-1-1	RAM failure on data bits xxxx* of high byte on memory bus; BIOS stops execution here if entire memory is bad.
32		Test CPU bus-clock frequency
34		Test CMOS
35		RAM initialize alternate chipset registers.
36		Warm start shutdown.
37		Reinitialize the chipset
38		Shadow system BIOS ROM
39		Reinitialize the cache
3A		Autosize cache
3C		Configure advanced chipset registers
3D		Load alternate registers with CMOS values
40		Set Initial CPU speed
42		Initialize interrupt vectors
44		Initialize BIOS interrupts
46	2-1-2-3	Check ROM copyright notice
47		Initialize manager for PCI Option ROMs
48		Check video configuration against CMOS
49		Initialize PCI bus and devices
4A		Initialize all video adapters in system
4B		Display QuietBoot screen
4C		Shadow video BIOS ROM
4E		Display copyright notice
50		Display CPU type and speed
51		Initialize EISA board.
52		Test keyboard

5-18   Solving Problems

Code	Beeps	POST Routine Description
54		Set key click if enabled
56		Enable keyboard
58	2-2-3-1	Test for unexpected interrupts
5A		Display prompt "Press F2 to enter SETUP"
5C		Test RAM between 512 and 640K
60		Test extended memory
62		Test extended memory address lines
64		Jump to User Patch1
66		Configure advanced cache registers
68		Enable external and CPU caches
6A		Display external cache size
6C		Display shadow message
6E		Display non-disposable segments
70		Display error messages
72		Check for configuration errors
74		Test real-time clock
76		Check for keyboard errors
7A		Test for lock key on.
7C		Set up hardware interrupt vectors
7D		Intelligent system monitoring
7E		Test coprocessor if present
80		Detect and install external RS232 ports
82		Detect and install external parallel ports
85		Initialize PC-compatible PnP ISA devices
86		Reinitialize onboard I/O ports
88		Initialize BIOS Data Area
8A		Initialize Extended BIOS Data Area
8C		Initialize floppy controller
90		Initialize hard disk controller
91		Initialize local-bus hard-disk controller
92		Jump to UserPatch2
93		Build MPTABLE for multi-processor boards
94		Disable A20 address line
95		Install CD-ROM for boot

POST Tests

Code	Beeps	POST Routine Description
96		Clear hugh ES segment register
98	1-2	Search for option ROMs. One long, two short beeps on checksum failure
9A		Shadow option ROMs
9C		Set up Power Management
9E		Enable hardware interrupts
A0		Set time of day
A2		Check key lock
A4		Initialize typematic rate
A8		Erase F2 prompt
AA		Scan for F2 keystroke
AC		Enter SETUP
AE		Clear in-POST flag
B0		Check for errors
B2		POST done - prepare to boot operating system
B4	1	One short beep before boot
B5		Display MultiBoot menu
B6		Check password; password is checked before option ROM scan
B7		ACPI initialization
B8		Clear global descriptor table
BC		Clear parity checkers
BE		Clear screen (optional)
BF		Check virus and backup reminders
C0		Try to boot with INT 19
C8		Forced shutdown
C9		Flash Recovery
D0		Interrupt handler error
D2		Unknown interrupt error
D4		Pending interrupt error
D6		Initialize option ROM error
D8		Shutdown error
DA		Extended Block Move
DC		Shutdown 10 error

POST Error Codes and Messages

Whenever a recoverable error occurs during POST, BIOS displays a message on the video display screen and causes the speaker to beep as the message appears. The "POST Error Codes and Messages" table is a list of the error codes and messages written at the start of each POST test.

POST Error Codes and Messages

Code	Error message	Pause on Error
0200	Failure Fixed Disk	No
0210	Stuck Key	No
0211	Keyboard error	No
0212	Keyboard Controller Failed	Yes
0213	Keyboard locked - Unlock key switch	Yes
0220	Monitor type does not match CMOS - Run SETUP	No
0230	System RAM Failed at offset	No
0231	Shadow RAM Failed at offset	No
0232	Extended RAM Failed at offset	No
0233	Memory type mix	No
0234	Memory Ecc single	No
0235	Memory Ecc multiple	No
0250	System battery is dead - Replace and run SETUP	Yes
0251	System CMOS checksum bad - Default configuration used	No
0260	System timer error	No
0270	Real time clock error	No
0271	Check date and time settings	No
0297	ECC Memory error in base (extended) memory test in Bank xx	Yes
02B2	Incorrect Drive A type - run SETUP	No
02B3	Incorrect Drive B type - run SETUP	No
02D0	System cache error - Cache disabled	No
02F5	DMA Test Failed	Yes
02F6	Software NMI Failed	No
0401	Invalid System Configuration Data - run configuration utility	No
None	System Configuration Data Read Error	No
0403	Resource Conflict	No
0404	Resource Conflict	No

POST Error Codes and Messages

| Code	Error message	Pause on Error
0405	Expansion ROM not initialized	No
0406	Warning: IRQ not configured	No
0504	Resource Conflict	No
0505	Expansion ROM not initialized	No
0506	Warning: IRQ not configured	No
0601	Device configuration changed	No
0602	Configuration error - device disabled	No
8100	Processor 1 failed BIST	Yes
8101	Processor 2 failed BIST	Yes
8104	Processor 1 Internal Error (IERR) failure	Yes
8105	Processor 2 Internal Error (IERR) failure	Yes
8106	Processor 1 Thermal Trip failure	Yes
8107	Processor 2 Thermal Trip failure	Yes
8108	Watchdog Timer failed on last boot	Yes
810A	Processor 2 failed initialization on last boot	Yes
810B	Processor 1 failed initialization on last boot	Yes
810C	Processor 1 disabled	Yes
810D	Processor 2 disabled	Yes
810E	Processor 1 failed FRB Level 3 timer	Yes
810F	Processor 2 failed FRB Level 3 timer	Yes
8110	Server Management Interface failed to function	Yes
8120	Processor 3 failed BIST	Yes
8121	Processor 4 failed BIST	Yes
8128	Processor 3 Internal Error (IERR) failure	Yes
8129	Processor 4 Internal Error (IERR) failure	Yes
8130	Processor 3 Thermal Trip failure	Yes
8131	Processor 4 Thermal Trip failure	Yes
8138	Processor 3 failed FRB Level 3 timer	Yes
8139	Processor 4 failed FRB Level 3 timer	Yes
8140	Processor 3 disabled	Yes
8141	Processor 4 disabled	Yes
8148	Processor 2 failed initialization on last boot	Yes
8149	Processor 3 failed initialization on last boot	Yes
814A	Processor 4 failed initialization on last boot	Yes

5-22   Solving Problems

POST Error Codes and Messages

Code	Error message	Pause on Error
8150	NVRAM Cleared by Jumper	No
8151	NVRAM Checksum Error, NVRAM cleared	No
8152	NVRAM Data Invalid, NVRAM cleared	No
8153	Password cleared by jumper	No
8154	Address bit permuting prevented POST memory remapping	No
8160	Unable to apply BIOS update for Processor 4	Yes
8161	Unable to apply BIOS update for Processor 3	Yes
8162	Unable to apply BIOS update for Processor 2	Yes
8163	Unable to apply BIOS update for Processor 1	Yes
8168	Processor 1 L2 cache failed	Yes
8169	Processor 2 L2 cache failed	Yes
816A	Processor 3 L2 cache failed	Yes
816B	Processor 4 L2 cache failed	Yes
8170	BIOS does not support current stepping for Processor 4	Yes
8171	BIOS does not support current stepping for Processor 3	Yes
8172	BIOS does not support current stepping for Processor 2	Yes
8173	BIOS does not support current stepping for Processor 1	Yes
8181	Mismatch among processors detected	No
8182	L2 cache size mismatch	Yes

A
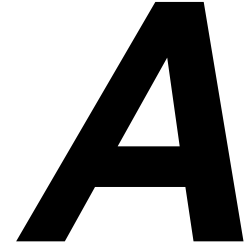
System Cabling

- Before You Begin
- Static Precautions
- Standard Configuration
- RAID Configuration

This appendix contains information on cabling configurations used in your system. The configurations include:

- standard configuration
- optional RAID configuration.

Before You Begin

Observe all cautions, warning, and static precautions while working with your system and while performing any procedures.

⚠ WARNING

The DC push button on/off switch on the front panel does not turn off system AC power. Also, +5 Vdc is present on the system board whenever the AC power supply cords are connected between the system and AC outlets. Before performing any procedures, first press off the DC push button switch located on the front panel. Make sure your system is powered off and all AC power cords are unplugged from the system. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

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 Configuration

The system's standard internal cabling includes:

- power cables
- diskette drive data cable
- SCSI data cables.

Each configuration is described in the following paragraphs.

Power Cabling

The internal power cables are connected to the system board, SCSI backplane, storage devices, and diskette drive. The power cables vary in length and provide connector sizes to accommodate a variety of supported storage devices and a flexible storage configuration. Power cables are connected to the SCSI backplane to provide power to the 3 1/2-inch SCSI hard drives in the device trays.

Diskette Drive Data Cabling

The diskette drive data cable comes attached to the system board and to the 3 1/2-inch, 1.44-MB diskette drive (see the following figure). The cable has two connectors, one connected to the system board and one connected to the diskette drive.

SCSI Cabling

Your system ships with two SCSI cables and two SCSI controllers on the system board. The cables and controllers are:

- a narrow three-connector SCSI cable and a SYM53C810AE controller on the PCI-A bus

- a wide two-connector SCSI cable and a dual-channel SYM53C896 controller on the PCI-B bus.

The narrow SCSI cable connects to the SCSI CD ROM drive (K) and the SCSI controller through a 50-pin narrow SCSI connector (G) on the system board (see the following figure). Two additional connectors are available for optional SCSI devices (J). The CD ROM drive (K) is the last device on the cable and is terminated.

The wide SCSI cable connects to the SCSI backplane (A) and the SCSI wide controller through a 68-pin wide SCSI A connector (E) on the system board (see the following figure). Termination for up to six hard disk drives (C) is provided on the SCSI distribution panel (B). A second 68-pin SCSI connector (L) is available on the system board for connecting optional SCSI devices.
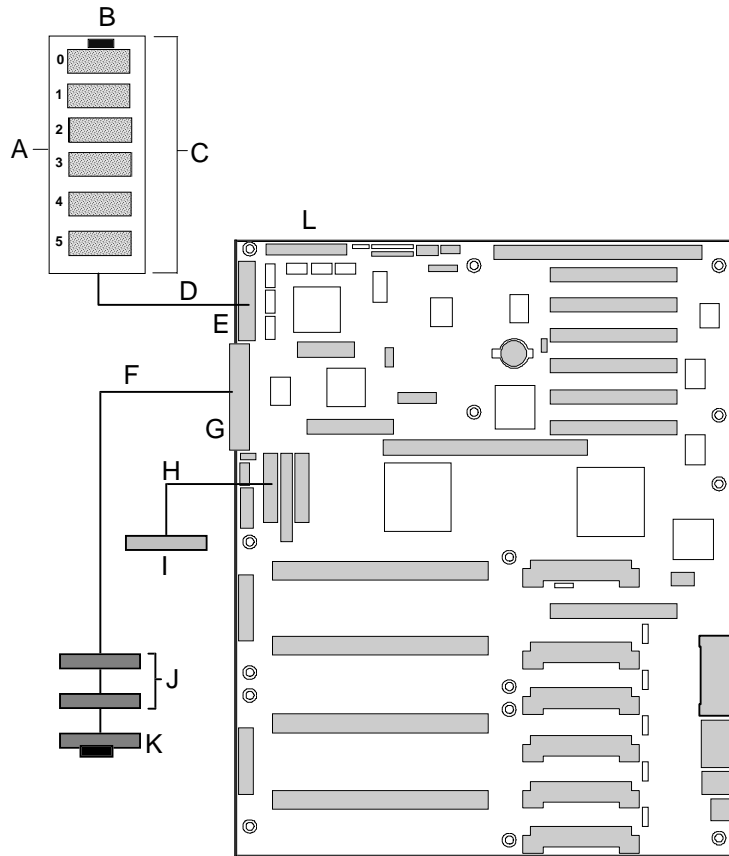
A.	SCSI Distribution Backplane	**G.**	Narrow SCSI Interface Connector
B.	SCSI Backplane Termination	**H.**	Diskette Interface Cable
C.	SCSI Hard Disk Drives	**I.**	Diskette Device
D.	Wide SCSI Interface Cable	**J.**	Removable Media SCSI Devices
E.	Wide SCSI Interface Connector	**K.**	CD ROM Drive (terminated)
F.	Narrow SCSI Interface Cable	**L.**	Wide SCSI Interface Connector

Standard Cabling Configuration

RAID Configuration

Two of the options available for your system are the Mylex AcceleRAID 250 (SecuRAID 210) or the Mylex AcceleRAID 1100 (SecuRAID 530) Controller board. These boards give your system the added security of fault tolerance. If you order a system with the RAID controller, the system is pre-cabled at the factory.

If you are adding the Mylex AcceleRAID Controller board to an existing system, you must install and configure the controller. You do not have to change any cabling in your system. Your system board recognizes the installation of the RAID controller. Refer to Chapter 4, "Upgrading Your System" for procedures to install an option board. Refer to Chapter 3, "Configuring Your System" for more information on the Mylex AcceleRAID Controller board

> 📝 **Note:** Next Boot Status for the Symbios SYM53C896 controller must be turned **OFF** if you install the optional Mylex AcceleRAID Controller board in your system. See "Symbios Configuration Utility" in Chapter 3 of this guide for information.

> 📝 **Note:** Ensure a jumper is installed on JP10 of the Mylex AcceleRAID Controller board. Refer to the Mylex AcceleRAID Installation Guide for the location of jumper JP10.

B

System Setup Utility

- Creating SSU Diskettes
- Running the SSU
- Exiting the SSU

The System Setup Utility (SSU) is a DOS-based utility that supports extended system configuration operations for onboard resources and add-in boards. It also allows you to view the system event log and to set system boot and security options. Use the SSU when you need to:

- add and remove ISA Legacy boards affecting the assignment of resources (ports, memory, IRQs, DMA)

- modify the server's boot device order or security settings

- change the server configuration resource settings

- save the server configuration

- view or clear the system event log

- view field replaceable unit (FRU) information

- view the sensor data record (SDR) table.

If you install or remove an ISA Legacy add-in board, you must run the SSU to reconfigure the server. Running the SSU is optional for a PCI add-in board

The SSU is PCI-aware, and it complies with the ISA Plug and Play specifications. The SSU works with any compliant configuration file (.CFG) supplied by the peripheral device manufacturer.

The I/O system board includes .CFG files. The .CFG file describes the characteristics of the board and the system resources that it requires. The configuration registers on PCI and ISA Plug and Play add-in boards contain the same type of information that is in a .CFG file. Some ISA boards also include a .CFG file.

The SSU uses the information provided by the .CFG files, configuration registers, NVRAM, and the information that you enter, to specify a system configuration. The SSU writes the configuration information to NVRAM memory.

The SSU stores configuration values in NVRAM memory. These values take effect when you boot the server. POST checks the values against the actual hardware configuration. If they do not agree, POST generates an error message. You must then run the SSU to specify the correct configuration before the server boots up.

The SSU always includes a checksum with the configuration data so the BIOS can detect any potential data corruption before the actual hardware configuration takes place.

Creating SSU Diskettes

SSU may be run directly from the EXPRESSBUILDER CD-ROM or from DOS-bootable diskettes. Before you can run the SSU from diskettes, you must copy the SSU from the EXPRESSBUILDER CD-ROM to a diskette.

If your diskette drive is disabled, or improperly configured, you must use the FLASH-resident BIOS Setup Utility (**F2**) to enable it so that you can use the SSU. If necessary, you can disable the drive after you exit the SSU. Information entered using the SSU overrides information entered using Setup.

1. Power on the system.

2. If the diskette drive is disabled, enable it using the BIOS Setup Utility (see Chapter 3, "Configuring Your System'). Specify the correct type of diskette drive.

3. Using the EXPRESSBUILDER CD-ROM, create the SSU diskette.

> **Note:** Ensure the diskettes do not contain any "bad blocks". Run CHKDSK or Format to check the quality of the diskettes.

Running the SSU

Use the following steps to run the SSU.

1. Power up your monitor and system.

2. Start the SSU using one of the following methods.

- **After creating the three SSU diskettes from the CD:**

  — Insert SSU diskette 1 into Drive A and reboot your server from the diskette.

- **Directly from the Server Configuration CD:**

  — Insert the configuration CD in your CD-ROM drive and reboot your server from the CD. When prompted, press **F2** to enter BIOS Setup.

  — From the Boot menu, select Boot Device Priority and select CD-ROM as your primary boot device

  — Save the settings and exit the BIOS Setup.

  — Reboot your server from the CD. The server displays a menu of options.

3. Follow the system prompts to load the SSU. When the SSU title appears on the screen, press **Enter** to continue.

4. The mouse driver loads, if available. Press **Enter** to continue.

The following message displays:

"Please wait while the Application Frame loads..."

5. When the main window of the SSU displays (see the following figure), you can customize the user interface before continuing.
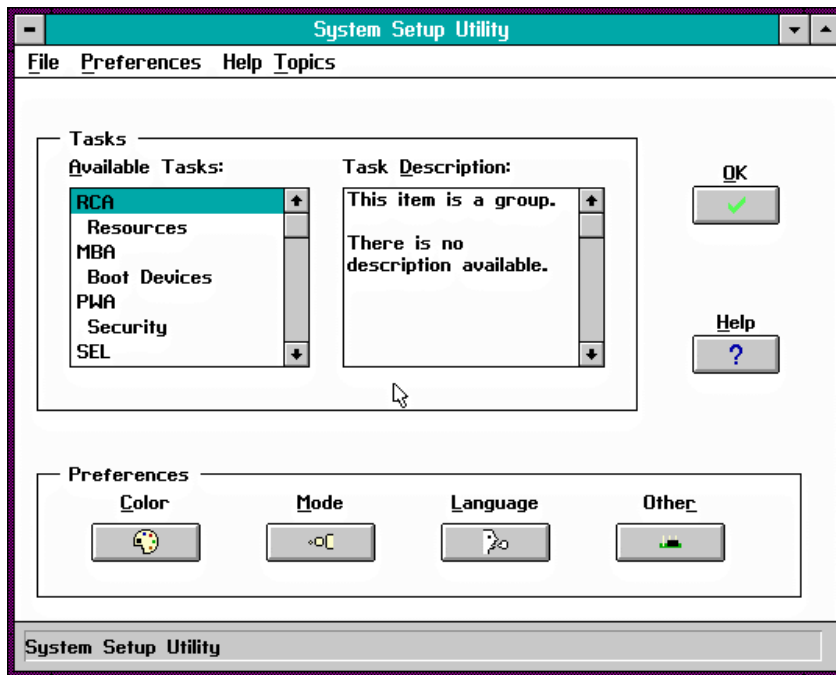
System Setup Utility Main Menu Window

Customizing the SSU

The SSU lets you customize the user interface according to your preferences. The Application Framework (AF) sets these preferences and saves them in the AF.INI file so that they take effect the next time you start the SSU. There are four user-customizable settings.

■ **Color**: lets you change the default colors associated with different items on the screen with predefined color combinations. The color changes are instantaneous.

■ **Mode**: lets you set the desired expertise level.

— novice

— intermediate

— expert.

The expert level determines which tasks are visible in the Available Tasks section and what actions each task performs. For a new mode setting to take effect, the user must exit the SSU and restart it.

■ **Language**:lets you change the strings in the SSU to strings of the appropriate language. For a new language setting to take effect, you must exit the SSU and restart it.

- **Other**: lets you enable or disable the status bar located at the bottom of the SSU menu displays. The changes are immediate.

There are three way to change the interface default values. Choose one of the following.

- Use the mouse to click on the proper button in the Preferences section of the SSU Main window.

- Use the tab and arrow keys to highlight the desired button, and press the spacebar or **Enter**.

- Access the menu bar with the mouse or hot keys (Alt + underlined letter).

📝**Note:** If you run the SSU from nonwritable media (EXPRESSBUILDER CD-ROM), customizing preferences are lost when you exit the SSU.


Launching a Task

It is possible to have many tasks open at the same time, although some tasks may require complete control to avoid possible conflicts. The tasks achieve complete control by keeping the task as the center of operation until the user closes the task window.

There are three ways to launch a task. Choose one of the following.

- In the SSU Main window (see the following figure), double-click on the task name under Available Tasks to display the main window for the selected task.

- Highlight the task name and click **OK**.

- Use the tab and arrow keys to highlight the task name, and press the spacebar or **Enter**.
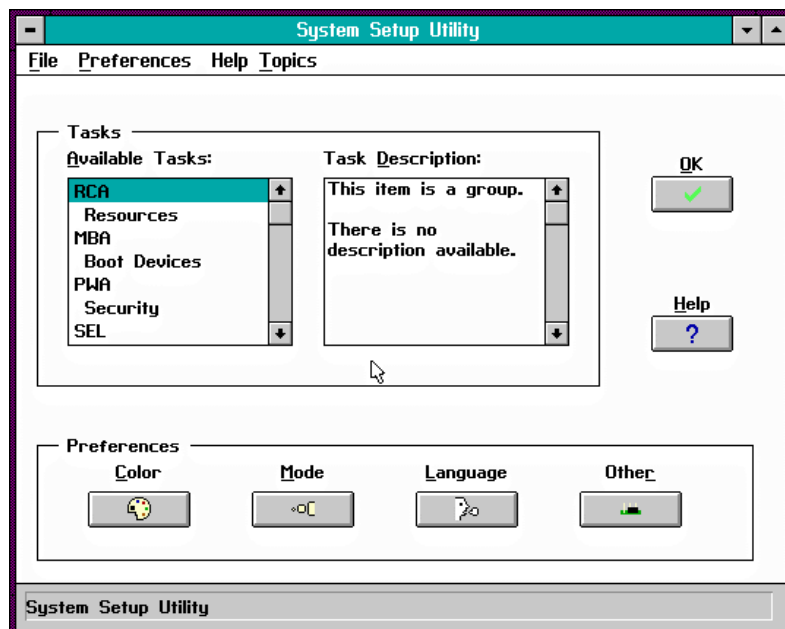
System Setup Utility Main Menu Window

Resource Configuration Add-in (RCA) Window

The RCA provides three major functions.

■ Creates representations of devices that cannot be discovered by the system (ISA cards)

■ Modifies the contents of the system by adding and removing devices

■ Modifies the resources used by devices.

You can use the RCA window to define an ISA board or add an ISA board by clicking on the appropriate button. Removing an ISA card requires that the card be highlighted in the Devices section of the screen before clicking on the button. You can add only as many ISA boards as ISA slots allow (your server has one ISA slot).

Use the following steps to define or add an ISA board.

1. From the SSU main window, launch the RCA by selecting the "Resources" task under the RCA heading in the task box. Click OK.

2. When the RCA window appears, it displays messages similar to the following:

Baseboard: System Board

PCI Card: Bus 00 dev 00 –- Host Processor Bridge

PCI Card: Bus 00 dev 0D –- Multifunction Controller

PCI Card: Bus 00 dev 0F –- Ethernet Controller

PCI Card: Bus 00 dev 12 –- SCSI Controller

PCI Card: Bus 00 dev 14 –- VGA Controller

B-6   System Setup Utility

3. To configure a device, click on it or select its name in the Devices section of the RCA window (see the following figure). Press the spacebar or **Enter**.

4. Make configuration changes and click **OK** to return to the RCA window. Repeat steps 3 and 4 to configure additional devices.

5. Save all the changes made by clicking **Save**. Saving writes your current configuration to nonvolatile storage where it's available to the system after every reboot.

6. Close the RCA window and return to the Main Menu by clicking **Close**.
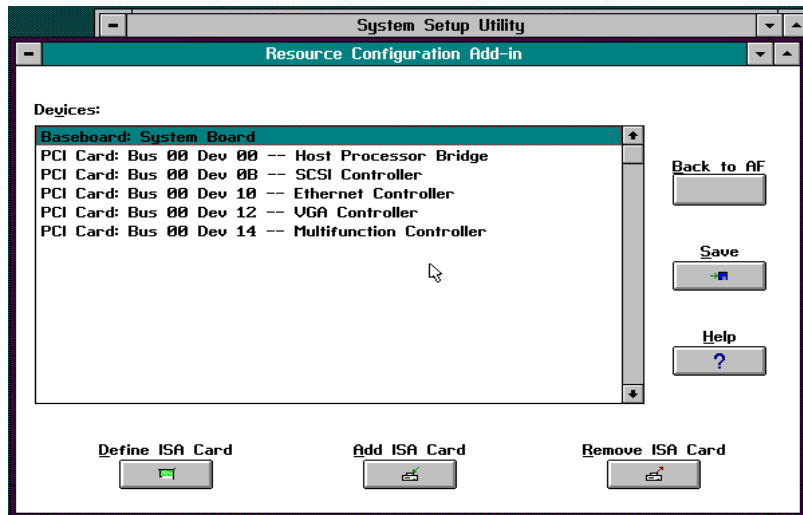
RCA Window

Defining an ISA Board

An ISA board usually comes with a vendor-created .CFG file that specifies the resources the board requires to function properly. If the .CFG file is unavailable, you must manually create it or define the board through the SSU. Defining an ISA board consists of specifying the name of the board and the resources it consumes. This allows the RCA to consider the ISA card resource requirements when the RCA tries to resolve conflicts.

1. From the SSU main window, launch the RCA by selecting the "Resources" task under the RCA heading in the task box.

2. When the RCA window appears, click Define ISA Card.

3. To add or remove ISA card resources, click the appropriate resource buttons, select the desired value, and click Add or Remove.

4. After you complete the necessary information, click Save.

5. To edit a board, click Load to retrieve the card information. After making changes, click Save.

6. To create a board, click New.

7. To remove a current definition of a board, click Delete.

8. To return to the RCA Menu, click **Close**.
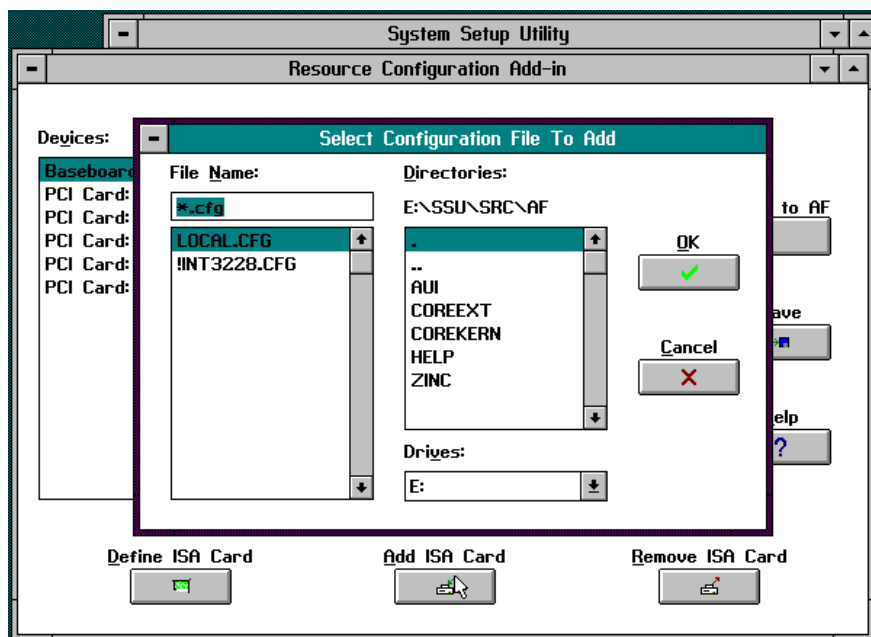
Adding and Removing ISA Boards

Adding and removing boards through the RCA provides a way for the RCA to run its conflict detection algorithms on the resources requested by the boards. This alerts you to any possible problems with that particular board in the current configuration. The following figure shows a typical RCA window.

To add an ISA board:

1. Click **Add ISA Board** in the RCA window.

2. Specify the directory for the .CFG file.

3. Select the file and click **Ok**.

To remove an ISA board:

1. Select a valid ISA board in the Devices section of the RCA window.

2. Click Remove ISA Board.

Adding and Removing ISA Boards Window

Modifying Resources

Modifying the resources of a device may be necessary to accommodate certain operating systems, applications, and drivers. It may also be necessary to modify resources to resolve a conflict.

To modify the resources associated with a device:

**1.** Highlight the device in the Devices section of the RCA window.

2. Press the spacebar or **Enter**.

The functions of the selected device along with possible choices and the resources associated with those choices displays.

To make a modification:

1. Highlight the function in the Configuration window (see the following figure).

2. Press the space bar or Enter or double-click on the entry (this updates the choice and resource lists).

3. Press the tab key to get to the Choice list, and press Enter.

4. Use the arrow keys to select a proper choice, and press Enter again.

5. If the choice allows multiple possible values for a particular resource, use the hot key to select a resource, and press the spacebar or double click on the resource.

6. Select the desired resource, and click **OK**.
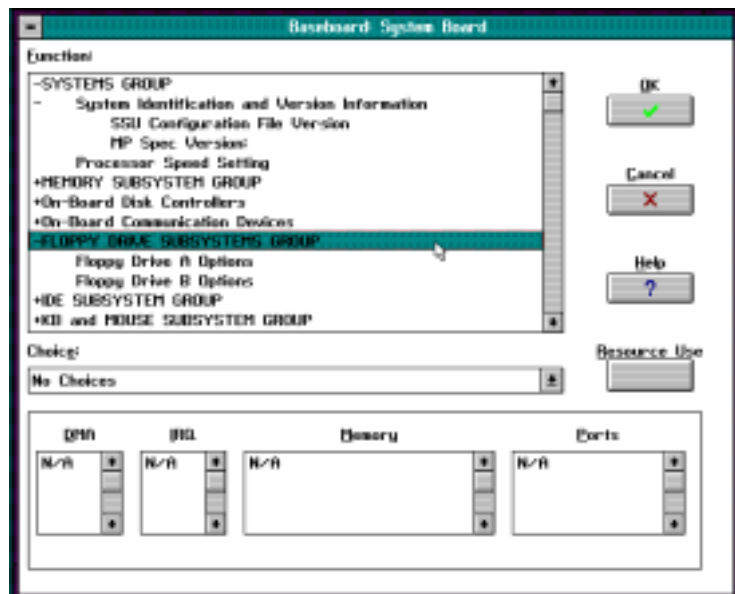
Configuration Window

Recommended Resource Settings

The following table shows the recommended RCA system board settings for a sample system and provides a place for you to record any changes you make to the settings.
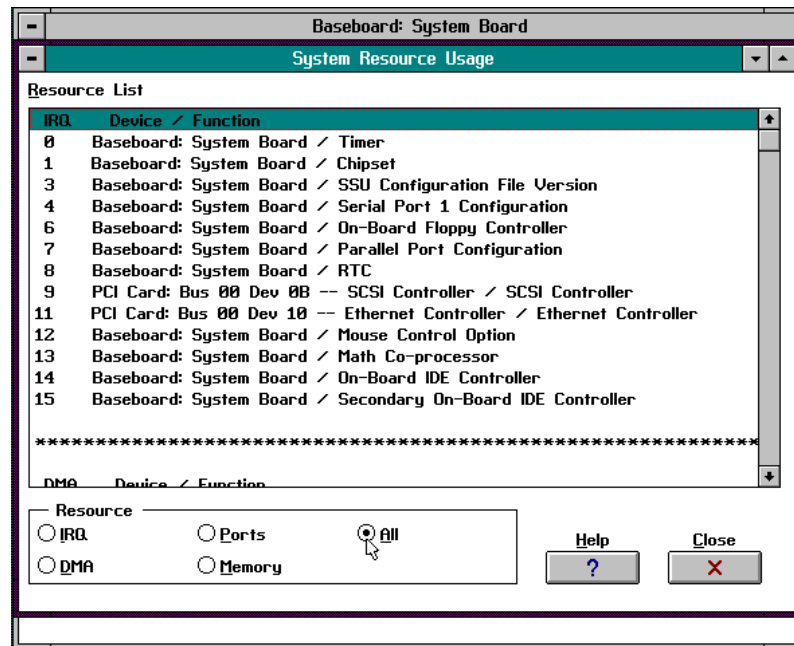
Recommended Resource Settings

System Group	Normal Setting	Your Configuration
System Identification and Version Information		
SSU Configuration File Version	Display Only	
MP Spec. Version	V 1.4	
Processor Speed Setting	3.5 X Bus Speed	
Memory Subsystem Group		
Extended Memory Options	Use BIOS Setup Utility	
On-Board Disk Controller Group		
On-board Floppy Controller	Enable	
On-board IDE Controller	Enable Primary Channel	
On-Board Communications Device Group		
Serial Port 1 Configuration	3F8h – IRQ4	
Serial Port 2 Configuration	2F8h – IRQ3	
Parallel Port Configuration	378h – IRQ7	
Parallel Port Mode	Extended Capabilities, Port DMA 1	
Floppy Drives Group		
Floppy Drive A Option	3.5 1.44/1.25 MB Drive	
Floppy Drive B Option	Disabled or not installed	
IDE Devices Group		
IDE 32-Bit I/O	Disable	
Keyboard Group		
Numlock	Off	
Key Click	Disable	
Typematic Speed	30CPS	
Typematic Delay	500 MS Delay	
SCSI ROM BIOS Group		
Embedded SCSI Devices Option	Enable	
ROM	Scan	

System Resource Usage

Clicking on the Resource Use button in the Configuration window displays the System Resource Usage window (see the following figure). This window shows what resources each device is consuming. This information is useful for choosing resources if a conflict occurs. Devices can be organized according to the resources the user wants to examine using the options in the Resource section of the screen.

```
┌─────────────────────────────────────────────────────────────────┐
│ [-]              Baseboard: System Board                          │
├─────────────────────────────────────────────────────────────────┤
│ [-]              System Resource Usage                    [▼] [▲] │
│ Resource List                                                     │
│ ┌───────────────────────────────────────────────────────────┬──┐ │
│ │ IRQ    Device / Function                                   │[▲]│ │
│ │  0     Baseboard: System Board / Timer                     │  │ │
│ │  1     Baseboard: System Board / Chipset                   │  │ │
│ │  3     Baseboard: System Board / SSU Configuration File Version│  │
│ │  4     Baseboard: System Board / Serial Port 1 Configuration│  │ │
│ │  6     Baseboard: System Board / On-Board Floppy Controller│  │ │
│ │  7     Baseboard: System Board / Parallel Port Configuration│ │ │
│ │  8     Baseboard: System Board / RTC                       │  │ │
│ │  9     PCI Card: Bus 00 Dev 0B -- SCSI Controller / SCSI Controller│
│ │ 11     PCI Card: Bus 00 Dev 10 -- Ethernet Controller / Ethernet Controller│
│ │ 12     Baseboard: System Board / Mouse Control Option      │  │ │
│ │ 13     Baseboard: System Board / Math Co-processor         │  │ │
│ │ 14     Baseboard: System Board / On-Board IDE Controller   │  │ │
│ │ 15     Baseboard: System Board / Secondary On-Board IDE Controller│
│ │                                                            │  │ │
│ │ ********************************************************** │  │ │
│ │ DMA    Device / Function                                   │[▼]│ │
│ ├───────────────────────────────────────────────────────────┴──┤ │
│ │ ┌─ Resource ──────────────────────────────┐                  │ │
│ │ │ ○ IRQ       ○ Ports      ⦿ All          │  Help    Close   │ │
│ │ │ ○ DMA       ○ Memory                     │  [ ? ]   [ ✗ ]   │ │
│ │ └─────────────────────────────────────────┘                  │ │
│ └───────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────┘
```

System Resource Usage Window

Multiboot Add-in (MBA) Window

The MBA lets you set the system boot priority. The boot priority is the order the BIOS uses to boot the operating system from various devices in your system.

Set the boot priority of your system as follows.

1. From the SSU Main Menu, launch the MBA by selecting the "Boot Devices" task under the MBA heading in the task box. Click OK.

2. When the MBA window displays, the "Boot Device Priority" window lists the current boot priority order. The "Hard Drives" window lists the hard disk drive(s) in your system. During bootup, BIOS searches the list of device types shown in the "Boot Device Priority" list, starting with the first device on the list. When BIOS gets to Hard Drives, the BIOS tries each device shown in the "Hard Drives" list, starting at the top of the list.

3. To change the priority of an entry in either list, select the entry and press + (plus) to move the device up in the list or press - (minus) to move the device down the list.

4. Click Save to save the boot priority.

5. Click **Close** to return to the Main Menu.

Password Administration (PWA) Window

The PWA configures administrator and user passwords and other security options.

1. From the SSU Main Menu, launch the PWA by selecting the "Security" task under the PWA heading in the task box.

2. Click **OK**. The Security window displays.

3. Select the Administrator and User Password buttons to change passwords.

4. Select the Options button to enable or disable security options. For an explanation of the configurable security options, press **Help**.

5. Click **Save** to save the security option changes.

6. Click **Close** to return to the Security menu.

7. Click **Close** to return to the Main menu.

System Event Log (SEL) Window

The SEL 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 5, "Solving Problems," for definitions of POST error codes

1. From the SSU Main Menu, launch the SEL by selecting the "SEL Viewer Add-in" task under the SEL heading in the task box.

2. Click **OK**. The SEL Viewer Add-in window (Event Log) displays.

The following table shows available screen choices.

<div align="center">*SEL Viewer Menus*</div>

Screen Choice	Description
File Menu	Loads, saves and clears the Event Log data. The Event Log data file is saved in either text or binary format depending on the output format selected under the Settings menu. Selecting **Exit** returns you to the SSU Main Menu.
View Menu	Views all events, events by sensor type, or events by event type. The Event Log data file is viewed in either text or binary format depending on the display format selected under the Settings menu.
Settings menu	Events are displayed and saved either in Hex codes (binary format) or as text. Select "Display Hex" to view Hex or "Display Verbose" to view text. Select "Output Binary" to save log data in Hex or "Output Text" to save log as text. **Note:** Only files saved in binary format can be viewed using the SSU SEL utility.
Help	Displays the SEL Viewer version information.

Sensor Data Record (SDR) Manager Add-In Window

The SDR Manager displays all SDR records in either Hex or text (Verbose) form. The SDR Manager window provides access to features of the add-in through menus and options. Open the SDR Manager window as follows.

1. From the SSU Main Menu, launch the SDR by selecting the "SDR Manager Add-in" task under the SDR heading in the task box.

2. Click **OK**. The SDR Manager window displays.

The following table shows available screen choices.

<div align="center">*SDR Manager Menus*</div>

Screen Choice	Description
File Menu	Opens and saves FRU data from a previously saved file. Saves SDR data to a file in binary or text format. Selecting **Exit** returns you to the SSU Main Menu.
View Menu	Views SDR information returned from the BMC, displays all records in the SDR repository, and sorts all records in the SDR repository.
Settings menu	Displays and saves SDR records either in Hex codes (binary format) or as text. Select "Display Hex" to view Hex or "Display Verbose" to view text. Select "Output Binary" to save SDR data in Hex or "Output Text" to save SDR data as text.
Help	Displays the SDR Manager version information.

Field Replaceable Unit (FRU) Manager Add-In Window

The FRU Manager displays all FRU inventory areas on the server, either in Hex or text (Verbose) form. The FRU Manager window provides access to features of the add-in through menus and options. Open the FRU Manager window as follows.

1. From the SSU Main Menu, launch the FRU Manager by selecting the "FRU Manager Add-in" task under the FRU heading in the task box.

2. Click **OK**. The FRU Manager window displays.

The following table shows available screen choices.

FRU Manager Menus

Screen Choice	Description
File Menu	Opens and saves FRU data from a previously saved file. Saves FRU data to a file in binary or text format. Selecting **Exit** returns you to the SSU Main Menu.
View Menu	Views FRU information of the selected device, displays FRU areas of all devices, and sorts FRU records by device.
Settings menu	Displays and saves FRU areas either in Hex codes (binary format) or as text. Select "Display Hex" to view Hex or "Display Verbose" to view text. Select "Output Binary" to save FRU areas in Hex or "Output Text" to save FRU areas as text.
Help	Displays the FRU Manager version information.

Exiting the SSU

Exiting the SSU causes all windows to close.

1. Exit the SSU by opening the menu bar item File in the SSU Main window.

2. Click **Exit** or highlight **Exit** and press **Enter**.

C
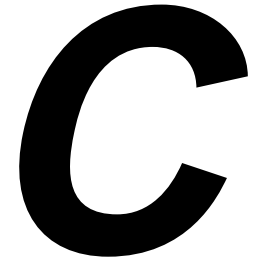
Emergency Management Port

- How the EMP Works
- EMP Requirements and Configurations
- Setting Up the Server
- Main EMP Window
- Phonebook
- Management Plug-ins
- FRU and SDR Load Utility

The Emergency Management Port (EMP) allows remote server management via a modem or direct connection. The COM2 port on your server provides an interface to Console Manager software located in a second system.
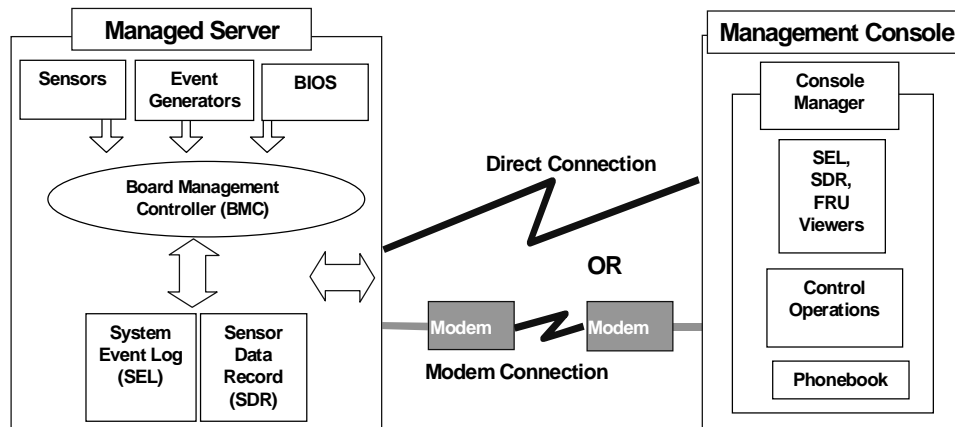
Emergency Management Port Configuration

The following server operations are available from the Console Manager:

- connecting to remote servers

- powering the server ON or OFF

- resetting the server

- SEL viewer

- SDR viewer

- FRU viewer.

The Console Manager has a Phonebook, which you use to connect to a selected server.

Referring to the above figure, the Board Management Controller (BMC) in your server monitors system management events and logs their occurrence in the System Event Log (SEL). These include events such as over-temperature and over-voltage conditions, fan failure, or chassis intrusion. To enable accurate monitoring of temperature, voltage, etc. independent of an event, the BMC also maintains Sensor Data Record (SDR) for each sensor, from which sensor information can be retrieved.

How the EMP Works

The EMP shares use of the COM 2 port with your system. When the EMP has control of the port, the port operates in command state. When the system has control of it, the port operates in redirect state. When connecting to a server, the EMP checks to determine the current COM 2 port state.

The following gives an overview of how the EMP functions in each state.

■ Command state is the default COM 2 state. In this state, the EMP communicates with the server, allowing the client to remotely reset or power the server up or down. The client can also view the server's System Event Log (SEL), Field Replaceable Unit (FRU) information, or Sensor Data Record (SDR) table.

■ In redirect state, the EMP serves as a PC ANSI terminal window for BIOS console redirection. Commands typed in this terminal window are transmitted through BIOS to the server's console, and text displayed on the server console are displayed on the EMP's terminal window. With the EMP in this state, you can remotely view boot messages, access BIOS setup, and run DOS text mode applications through the EMP's terminal window.
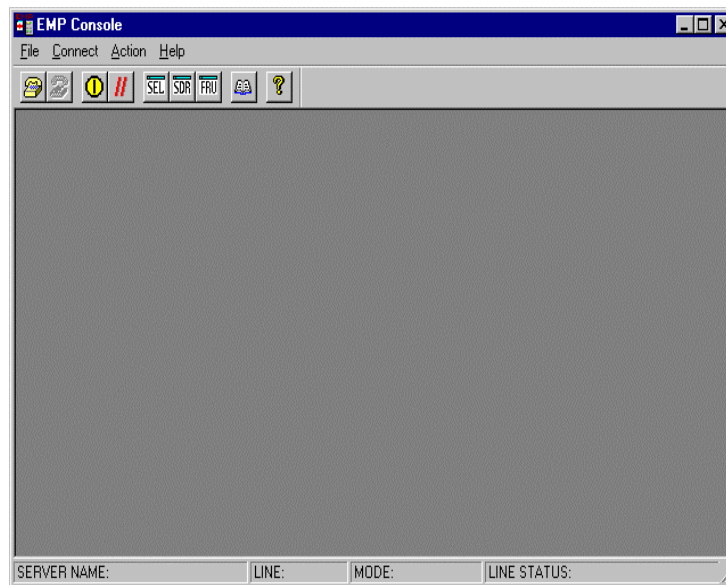
EMP in Command State

Console in Redirect State

The above figure shows the EMP window in redirect state with the terminal window. The text that appears on the server monitor displays in the redirect window.

Availability of the various EMP features is determined by two things: the EMP access mode selected during configuration in the System Management Submenu of the BIOS Server Menu, and if the server's COM 2 port is configured for console redirect in BIOS. The three EMP access modes are disabled, pre-boot, and always active.

EMP Access Modes (Server Configured for Console Redirect)

Mode	Server Powered Off	During POST	After OS boots
Disabled	Redirect window appears, but is blank	Redirect window	Redirect window
Pre-boot	EMP commands available	Redirect window*	Inactive redirect window
Always Active	EMP commands available	Redirect window*	EMP commands available

*The operation mode can be modified by selections in the post reset and post-power-up dialogs. These are server control dialogs available with the EMP.

C-4   Emergency Management Port

EMP Access Modes (Server Not Configured for Console Redirect)

Mode	Server Powered Off	During POST	After OS boots
Disabled	Redirect window appears, but is blank	Redirect window appears, but is blank	Redirect window appears, but is blank
Pre-boot	EMP commands available	EMP commands available	Redirect window appears, but is blank
Always Active	EMP commands available	EMP commands available	EMP commands available

EMP Requirements and Configurations

This section outlines the requirements and configurations necessary for using the EMP console.

Operating Systems:

- Windows 95

    — 16 MB of RAM, 32 MB recommended

    — 20 MB disk space.

- Windows NT

    — Windows NT 4.0 or later

    — 24 MB of RAM, 32 MB recommended

    — 20 MB disk space.

Client Configuration: The EMP supports all COM ports on the client system, along with any Windows NT/95 compatible modem.

Server Configuration: The EMP requires the server's COM 2 port to be connected to an external modem or directly connected to a serial cable.

Direct Connect Configuration: A null modem serial cable is required. Connect one end of the cable into the COM 2 port of the server and the other into a port on the client machine.

Modem Configuration: On the client, the EMP console uses the Windows Application Program Interface (API) to determine if a modem is connected and available. The EMP console does not configure the modem; it should be preconfigured through Windows.

For modem support, the server must use a Hayes compatible 14400 bps modem. The modem must be on the NT Hardware Compatibility List provided by Microsoft. The server modem must be set in auto-answer mode for the EMP to be able to connect to it.

Setting Up the Server for the EMP

To use the EMP, you must configure the server's BIOS with specific settings. These settings take place in two submenus of the BIOS Server menu: System Management Submenu and Console Redirect Submenu. (Refer to Chapter 3, "Configuring Your System," for BIOS Setup information.) The following shows what settings must be configured to use the EMP.

System Management Submenu

All EMP related settings occur from the System Management Submenu of the Server main menu. Change only the items below; all other default settings should remain the same.

EMP Password: Anytime you attempt to initiate a connection, a prompt for the user password appears. If you never set up the EMP password, anyone can access the EMP by clicking **OK** at the password prompt.

In the EMP Password area of the System Management Submenu, type in a password of up to eight alphanumeric characters. If a beep is heard, the password was not accepted and a different password must be entered.

EMP Access Modes: Choose either Disabled, Pre-boot, or Always Active, depending on the type of EMP access needed. The tables above show what is available with a given setting.

EMP Restricted Mode Access: Set Restricted Mode to either enabled or disabled as needed. If in enabled mode, this means that the EMP's server control options (Power On/Off and Reset) are not available. In disabled mode, these same server control options are available.

EMP Direct Connect/Modem Mode: Select Direct Connect if a null modem serial cable directly connects the server's COM 2 port to the EMP client machine. If they are connected via a modem, select Modem Mode.

Console Redirection Submenu

These settings in the Console Redirection Submenu of the Server menu must be set exactly as noted to be able to use the EMP.

COM Port Address: Select 2F8. This is the COM 2 port that must be used by the EMP. The IRQ# setting automatically populates with the correct number based on the COM Port Address choice.

Baud Rate: Select appropriate speed.

Console Type: Choose PC ANSI.

Flow Control: Choose CTS/RTS + CD.

Main EMP Window

The main EMP window provides a graphical user interface (GUI) to access server control operations and to launch the management plug-ins. At the top of the GUI is the menu and tool bar. These provide the options to initiate plug-ins and other support features. A status bar at the bottom displays connection information like server name, line status, and mode.

Toolbar

The tool bar buttons of the EMP main window combine server control and management plug-in options available from the Connect and Action menus as follows.

	Generates the Connect dialog to allow connection to a selected server.
	Disconnects from the currently connected server.
	Generates the Power On/Off dialog.
	Generates the Reset dialog.
	Launches the SEL viewer.
	Launches the SDR viewer.
	Launches the FRU viewer.
	Opens the phonebook.
	Opens online help.

Status Bar

The status bar displays at the bottom of the current window. It contains the following status information.

- **Server Name:** the name of the server (stored in the Phonebook) connected to.

- **Line:** the type of line connection (direct or modem).

- **Mode:** either Redirect of EMP, depending on whether the EMP has control of the COM 2 port.

- **Line Status:** gives status information on the server connection. For example, if a server is connected, the status bar says "Connected." Otherwise, the line is blank.

EMP Console Main Menu

The EMP Console Main menu has the following menus.

- **File**

    — **Exit** - Exits the EMP.

- **Connect**

    — **Disconnect** - disconnects the server connection.

    — [Re]Connect - raises the connect dialog.

    — A list of the five most recent connections - can click on one of the five servers most recently connected to. A connection to the selected server is initiated.

- **Action**

    — **Power On/Off** - powers the server on or off with post-power-up options.

    — **Reset** - resets the server with post-reset options.

    — **SEL Viewer** - opens the SEL viewer.

    — **SDR Viewer** - opens the SDR viewer.

    — **FRU Viewer** - opens the FRU viewer.

    — **Phonebook** - opens the phonebook dialog.

- **Help** - provides version information and help topics for the EMP.

Server Control Operations

Three server control operations are available from the menu or toolbar of the main EMP window: remote server connection, powering the server on and off, and resetting the server. The server console mode can also be switched between EMP active and BIOS redirect modes through post-power-up and reset options.

Connect to Remote Server

When you select [Re]Connect from the Connect menu, the Connect dialog (see the following figure) allows you to connect to a selected server. If the client machine is already connected to a server, initiating connection generates a warning message. It lets you know that the existing connection will be terminated if you continue trying to initiate the new connection. You are prompted to enter the EMP password whenever a connection is attempted.
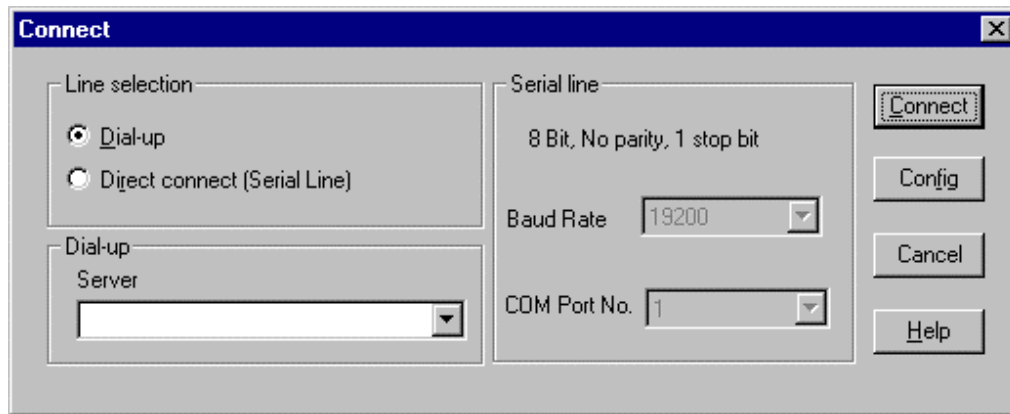
Connect Dialog

Options available in the dialog include the following.

- **Line Selection** - you can specify whether to use a direct connection or dial-up modem connection to the server.

    — **Dial-up** - connects to a selected server with a modem.

    — **Direct connect (Serial Line)** - connects to the selected server directly using a null modem serial cable.

- **Server** - you can select or enter a server name from a dropdown edit list box of available servers. A server must be selected when the line selection is Dial-up.

- **Serial Line** - must be filled out when the line selection is set to Direct connect (Serial Line).

    — **Baud Rate** - must be 19200 for EMP to connect properly.

    — **COM Port No.** - sets the COM Port number to which the null modem serial cable is connected.

- **Connect** - initiates connection to the connected server. When this button is clicked, you are prompted for the EMP password.

- **Config** - displays the Phonebook dialog.

- **Cancel** - exits the Connect dialog without any action taken.

- **Help** - displays dialog level help information.

Power On/Off

Selecting Power On/Off from the Action menu allows you to power the server on or off, with post-power-up options. It generates the Power on/off dialog screen (see the following figure).
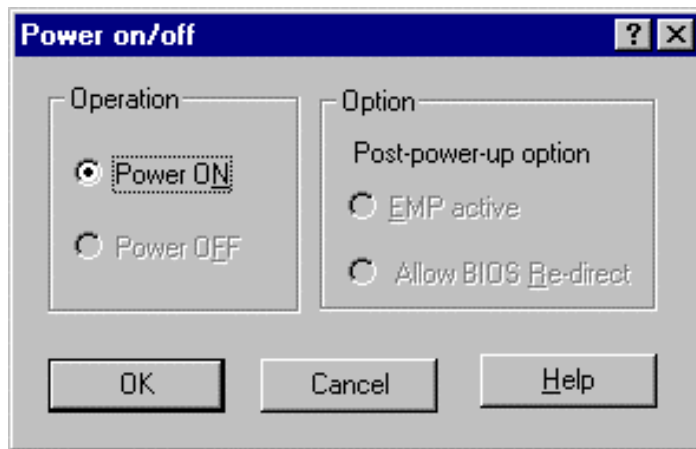
Power On/Off Dialog

Options available in the dialog include the following.

- **Power ON** - powers on the server.

- **Power OFF** - powers off the server. This option is not allowed if the server is configured in RESTRICTED mode for EMP operations.

- **Post-power-up option** - sets the mode selection of the server to EMP active or BIOS redirection. The setting is available after the next power-up. The default selection is EMP active.

- **Cancel** - exits the dialog without any action taken.

- **Help** - displays dialog level help information.

Reset

Selecting Reset from the Action menu generates the Reset dialog screen (see the following figure) so that you can remotely reset the server with post-reset options.
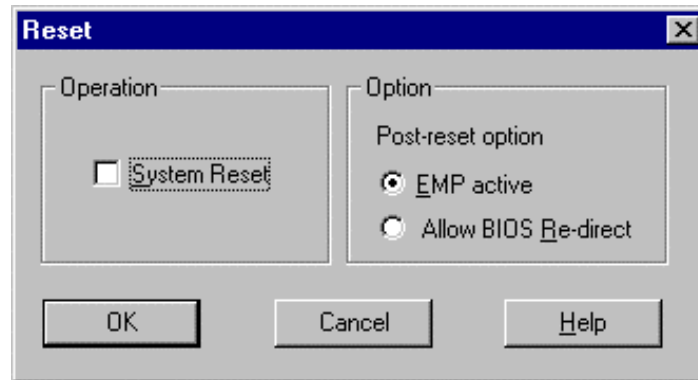
Reset Dialog

Options available in the dialog screen include the following.

- **System Reset** - resets the server with the selected POST-reset options. This operation is not allowed if the server is configured in RESTRICTED mode for EMP operations.

- **Option Group** - sets the POST-reset option that is effective after reset. The options are EMP active or BIOS redirection. The default selection is EMP active.

- **Cancel** - exits the dialog without any action taken.

- **Help** - displays dialog level help information.

Phonebook

The EMP provides a Phonebook support plug-in. The Phonebook stores names and numbers of servers in a list that can be updated by adding, modifying, or deleting entries. The Phonebook can be opened from the Main menu and tool bars, or launched from the Connect dialog by clicking the Config button. The following figure shows the Phonebook dialog screen.
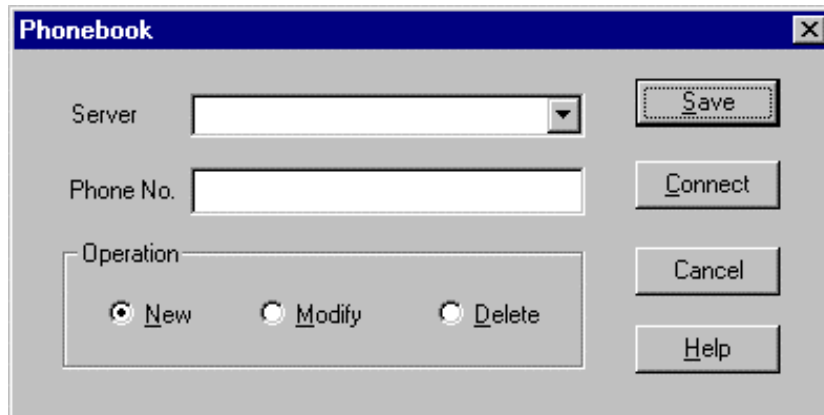
Phonebook Dialog

Options available in the dialog include the following.

- **Server** - a dropdown list of server names previously stored in the Phonebook. If **New** is selected in the Operation area, this area is cleared.

- **Phone No.** - the number of the selected server. If **New** is selected in the Operation area, this area is cleared.

- **Operation**

  — **New** - lets you make a new entry in the phonebook. Selecting this option clears the Server and Phone No. fields. Click **Save** to add the entry to the phonebook.

  — **Modify** - lets you edit an existing entry. You select an existing entry from the Server dropdown edit box and modifies the existing phone number before selecting this option. Click **Save** to store this entry in the phonebook.

  — **Delete** - lets you delete an entry from the phonebook. You must first select an existing server from the Server dropdown edit box before selecting this option. Click **Save** to delete the entry.

- **Save** - saves a new or modified Phonebook entry or deletes an entry if **Delete** was selected.

- **Connect** - raises the Connect dialog with the server from the Phonebook's Server dropdown edit box already populating the Connect dialog's Server dropdown edit box.

- **Cancel** - exits the dialog without any action taken.

- **Help** - displays dialog level help information.

Management Plug-ins

The following management plug-ins are available:

- SEL Viewer

- SDR Viewer

- FRU Viewer.

Each is briefly described in the following paragraphs.

SEL Viewer

The SEL viewer provides access to the System Event Log on the server. It can display records in either hexadecimal or text (verbose) form. Options available through the SEL viewer are:

- view the SEL from a file

- save the SEL to a file

- view SEL summary info

- view all SEL entries

- view SEL info by event type

- view SEL info by sensor type

- set SEL display mode to either Hex or verbose mode

- set the SEL output file format to either text or binary format

- close the SEL viewer

- exit the EMP.

SEL Viewer Menu Options

The following menu options are found on the SEL viewer menu bar:

- **File**

  - **Open** - you can view SEL data from a previously saved file if it was stored in binary format. Selecting the Open menu item allows you to specify a filename under which the data is found. The default filename is "SELLOG.DAT." If the file cannot be opened, the program displays an error message.

— **Close** - you can close the SEL viewer.

— **Save As** - dumps the SEL data to a file in either binary raw or verbose text format. The binary file may be retrieved later. Selecting this option lets you specify a filename to which the data is saved. The default filename is "SELLOG.DAT." If there is no data, an error message is displayed.

— **Exit** - exits the EMP.

■ **Connect**

■ **View**

— **SEL Information** - displays SEL summary information as returned by the server.

— **All Events** - displays all events in the SEL.

— **By Sensor Type** - shows all events in the SEL generated by a specific sensor type such as voltage, temperature, etc.

— **By Event** - displays all the events in the SEL of a particular type; for example, by memory or threshold. A pop-up menu lets you select the event type to display. This pop-up menu displays all the event types that may be generated by the particular hardware.

■ **Settings** - you can change several operating parameters for the SEL viewer. This menu displays the following suboptions:

— **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying SEL records.

— **Output Text/Binary** - determines whether SEL data is saved to the file in binary format or verbose format.

■ **Window** - gives options for displaying currently open windows.

■ **Help** - provides version information for the SEL viewer and provides help topics on the EMP.

SDR Viewer

The SDR viewer lets you view the Sensor Data Records retrieved from the SDR repository. Options available through the SDR viewer are:

■ view all SDR records

■ view SDR entries by SDR type

■ view SDR summary info

■ set SDR display mode to either Hex or verbose mode

■ close the SDR viewer

■ exit the EMP.

The following menu options are on the SDR viewer menu bar:

- **File**

    — **Close** - closes the SDR viewer.

    — **Exit** - exits the EMP.

- **View**

    — **Display all Records** - displays all records from the SDR repository.

    — **SDR Type** - displays the records of a particular SDR type. You select an SDR type from a pop-up menu that displays all the SDR types available for the given hardware.

    — **SDR Info** - displays the SDR summary information as returned by the server.

- **Settings** - lets you change operating parameters for the SDR viewer. This menu displays the following suboption:

    — **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying SDR records.

- **Window** - gives options for displaying currently open windows.

- **Help** - provides version information for the SDR viewer and provides help topics on the EMP.

FRU Viewer

The FRU viewer allows you to view the server's FRU (Field Replaceable Units) data from the server's baseboard FRU information area. Options available with the SDR viewer are:

- view all FRU records

- view FRU summary info

- set FRU display mode to either Hex or verbose mode

- close the FRU viewer

- exit the EMP console.

FRU Viewer Menu Options

The following menu options are on the FRU viewer menu bar:

- **File**

    — **Close** - closes the FRU viewer.

— **Exit** - exits the EMP console.

■ **View**

— **Display all Records** - displays all FRU data, which consists of chassis, board, and product information.

— **FRU Info** - displays the FRU summary information as returned by the server.

■ **Settings** - lets you change operating parameters for the FRU viewer. This menu displays the following suboption:

— **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying FRU records.

■ **Window** - gives options for displaying currently open windows.

■ **Help** - provides version information for the FRU viewer and provides help topics on the EMP console.

FRU and SDR Load Utility

The Field Replacement Unit (FRU) and Sensor Data Record (SDR) load utility is a DOS-based program used to update the server management subsystem's product level FRU, SDR, and the Desktop Management Interface (DMI) nonvolatile storage components (EEPROMs). The utility:

■ discovers the product configuration based on instructions in a master configuration file

■ displays the FRU information

■ updates the EEPROM associated with the Baseboard Management Controller (BMC) that holds the SDR and FRU area

■ updates the DMI FRU area located in the BIOS nonvolatile storage device

■ generically handles FRU devices that might not be associated with the BMC.

When to Run the FRUSDR Load Utility

You should run the FRUSDR load utility each time you upgrade or replace the hardware in your server, excluding add-in boards, hard drives, and RAM. For example, if you replace an array of fans, you need to run the utility. It programs the sensors that need to be monitored for server management.

Because the utility must be reloaded to properly initialize the sensors after programming, turn the server off and remove the AC power cords from the server. Wait approximately 30 seconds, then reconnect the power cords and turn on the server.

What You Need to Do

You can run the utility directly from the configuration software CD or from diskettes you create from the CD.

If you choose to run the FRUSDR Load Utility from a diskette, you must copy the utility from the CD and follow the instructions in the included README.TXT file.

If your diskette drive is disabled or improperly configured, you must use BIOS Setup to enable it. If necessary, you can disable the drive after you are done with the FRUSDR utility.

How You Use the FRUSDR Load Utility

The utility

- is compatible with ROM-DOS Ver. 6.22, MS-DOS Ver. 6.22, and later versions

- accepts CFG, SDR, and FRU load files (the executable file for the utility is frusdr.exe)

- requires the following supporting files

  — one or more .FRU files describing the system's field replaceable units

  — a .cfg file describing the system configuration

  — an .sdr file describing the sensors in the system

Command Line Format

The basic command line format is

    frusdr [-?] [-h] [-d {dmi, fru, sdr}] [-cfg filename.cfg] [-fru filename.fru]

The commands and command descriptions are given in the following table.

Command Line Format

Command	Description
frusdr	Utility name
-? or -h	Displays usage information
-d {dmi, fru, sdr}	Displays requested area only
-cfg filename.cfg	Uses custom .CFG file
-p	Pause between blocks of data
-v	Verbose, display any additional details

Parsing the Command Line

The FRUSDR load utility allows only one command line function at a time. A command line function can consist of two parameters. For example,

> -cfg filename.cfg.

Invalid parameters cause an error message and exit the program. You can use either a slash (/) or a minus sign (-) to specify command line options. The -p and -v flags can be used in conjunction with any of the other options.

Displaying Usage Information

When the utility is run with the -? or -h command line flags, the following message is displayed when the verbose flag -v is added to the help command:

FRU & SDR Load Utility Version 2.1 Revision R.1.1

Usage	frusdr	
	-? or -h	Displays usage information
	-d {dmi,fru,sdr}	Only displays requested area.
	-cfg filename.cfg	Uses custom CFG file.
	-p	Pause between blocks of data.
	-v	Verbose, display any additional details.

This utility must be run from a system executing DOS. Running in a Window's DOS box is insufficient and causes incorrect results. Programming the BMC FRU area clears the SDR table; therefore the SDR table must be reprogrammed. Upon completing the programming of the FRU and SDR areas, the server should be rebooted. DOS users may alternatively use a '/' instead of the '-'.

The following information displays if the -v option is included in the command line.

The /D FRU command may be followed with up to 16 device addresses. These device addresses are used to view up to 16 different FRU areas, instead of the default of displaying the BMC FRU. The arguments following the "-d FRU" are in the same order and value as the NVS_TYPE, NVS_LUN, DEV_BUS and DEV_ADDRESS which are found in the FRU file header in each FRU file. The LUN address is optional. If the LUN address is used, it must start with an 'L'.

> Usage: FRUSDR -d fru (device) [lun] (bus) (addr) (addr2) (etc)
> Example: FRUSDR /D FRU IMBDEVICE L00 00 C0 C2

The configuration file may be used to load multiple FRU and SDR files. In the configuration file, you may define which FRU and SDR areas are to be programmed. Additionally, you may request information from the user or ask the user to choose which areas to program.

Displaying a Given Area

When the utility is run with the -d DMI, -d FRU, or **-**d SDR command line flag, the indicated area is displayed. Each area represents one sensor for each instrumented device in the server. If the given display function fails because of an inability to parse the data present or a hardware failure, the utility displays an error message and exits.

Displaying DMI Area

Each DMI area displayed is headed with the DMI area designated name. In each area, each field has a field name header followed by the field in ASCII or as a number.

Example:

To display the DMI area, type **frusdr -d dmi** and press <Enter>.

Displaying FRU Area

The FRU area is displayed in ASCII format when the field is ASCII or as a number when the field is a number. Each FRU area displayed is headed with the FRU area designated name. Each field has a field name header followed by the field in ASCII or as a number. The board, chassis, and product FRU areas end with an END OF FIELDS CODE that indicates there are no more data in the area. The internal use area is displayed in hex format, 16 bytes per line.

Example:

To display the FRU area, type **frusdr -d fru** and press <Enter>.

Displaying SDR Area

The SDR nonvolatile storage area is displayed in the following hex format. The data are separated by a sensor record number X header, where X is the number of that sensor record in the SDR area. The next line after the header is the sensor record data in hex format delineated by spaces. Each line holds up to 16 bytes. The data on each line are followed by the same data in ASCII format; nonprintable characters (ch < 32 || ch > 126) are substituted by a period (.).

Example:

To display the SDR area, type **frusdr -d sdr** and press <Enter>.

Using Specified CFG File

The utility can be run with the command line parameter of **-**cfg filename.cfg. The filename can be any DOS-accepted, eight-character filename string. The utility loads the specified CFG file and uses the entries in that file to probe the hardware and to select the proper SDRs to load into nonvolatile storage.

Displaying Utility Title and Version

The utility displays its title:

Configuration File

The configuration file is in ASCII text. The utility executes commands formed by the strings present in the configuration file. These commands cause the utility to run tasks needed to load the proper SDRs into the nonvolatile storage of the BMC and possibly generic FRU devices. Some of the commands may be interactive and require you to make a choice.

Prompting for Product Level FRU Information

Through the use of a configuration file, the utility might prompt you for FRU information.

Filtering Records From the SDR File

The MASTER.SDR file has all the possible SDRs for the system. These records might need to be filtered based on the current product configuration. The configuration file directs the filtering of the SDRs.

Updating the SDR Nonvolatile Storage Area

After the utility validates the header area of the supplied SDR file, it updates the SDR repository area. Before programming, the utility clears the SDR repository area. The utility filters all tagged SDRs depending on the product configuration set in the configuration file. Nontagged SDRs are automatically programmed. The utility also copies all written SDRs to the SDR.TMP file; it contains an image of what was loaded. The TMP file is also useful for debugging the server.

Updating FRU Nonvolatile Storage Area

After the configuration is determined, the utility updates the FRU nonvolatile storage area. First it verifies the common header area and checksum from the specified FRU file. The internal use area is read out of the specified .FRU file and is programmed into the nonvolatile storage. The chassis area is read out of the specified .FRU file. Finally, it reads the product area out of the specified FRU file, then the area is programmed into the FRU nonvolatile storage. All areas are also written to the FRU.TMP file.

Updating DMI FRU Nonvolatile Storage Area

After programming the BMC FRU area, the utility programs chassis, board, and product FRU information to the DMI fields, if the DMI flag follows each FRUAREA command in the configuration file.

Cleaning Up and Exiting

If an update was successfully performed, the utility displays a single message and then exits.

If the utility fails, it immediately exits with an error message and exit code.

Glossary

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.

BMC

(Baseboard Management Controller) Contains all of the server management functions. One major function of the BMC is to monitor system management events and log their occurrence in the System Event Log (SEL).

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.

bus

An electronic circuit within a computer used for transmitting data or electrical power from one device to another.

byte

A group of eight bits.

C

cache memory

A very fast, limited portion of RAM set aside for temporary storage of data for direct access by the microprocessor.

CD-ROM drive

(Compact Disk ROM drive) A type of mass storage device that reads information from a compact disk.

Centronics port

An industry standard parallel port. See also parallel port.

CGA

(Color Graphics Adapter) A type of video display system that provides low-resolution text and graphics on TTL monochrome and color monitors.

clock

Electronic timer used to synchronize computer operations.

CMOS

(Complimentary Metal-Oxide Semiconductor) A type of low-power integrated circuit used in computers. See also TTL.

cold boot

Process of starting up the computer by turning on the power. If power is already on, the process means to turn off the computer and turn it on again. A cold boot reinitializes all devices.

COM1 or COM2
The name you can assign a serial port to set or change its address. See also serial port.

command
An instruction that directs the computer to perform a particular operation.

configuration
The way in which a computer is set up to operate. Some configurable options include CPU speed, serial port designation, and memory allocation.

coprocessor
See math coprocessor.

CPU
(Central Processing Unit) See microprocessor.

CRT
(Cathode-Ray Tube) The type of video display used in monitors for desktop computers.

D

DC
(Direct Current) The type of current available in the rechargeable battery packs used in portable computers. See also AC.

default
The factory setting your computer uses unless you instruct it otherwise. For example, when powering up, the computer will boot from the default drive.

density
The capacity of information (bytes) that can be packed onto a storage device, such as a floppy disk.

device driver
A software program that a computer must use to recognize and operate certain hardware, such as a mouse or a video monitor.

disk drive
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.

DOS
(Disk Operating System) See operating system.

DRAM
(Dynamic RAM) See RAM.

E

ECC

(Error Checking and Correction) A method of detecting and correcting errors.

EEPROM

(Electrically Erasable Programmable Read-Only Memory) A type of memory device that stores password and configuration information.

EGA

(Enhanced Graphics Adapter) A type of video display system that provides medium-resolution text and graphics on TTL monochrome, color, and enhanced color monitors.

EMP

The Emergency Management Port (EMP) Console provides an interface to the Emergency Management Port (EMP) called the Console Manager. This interface allows remote server management via a modem or direct connection.

EMS

(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.

EPROM

(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.

expanded memory

See EMS.

expansion slot

See backplane slot.

extended memory

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.

F

flash EPROM

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.

floppy disk drive

See disk drive.

---

format

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.

hertz

(Hz) A unit of frequency equal to one cycle per second.

hot key

Combination of two or three keys (such as Ctrl-Alt-D) that you press
simultaneously for a particular function.

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.

input/output

(I/O) The process of transferring data between the computer and external devices.

interface

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

interrupt

A special control signal from an I/O device that diverts the attention of the
microprocessor from the program to a special address.

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.

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.

LVD

Super-fast Ultra2 SCSI Low Voltage Differential (LVD) Parallel SCSI Interface. A new SCSI interface that provides greater I/O bandwidth, device connectivity, data reliability, and longer cable lengths for Ultra2 SCSI hard disk drives.

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.

password

A security feature that prevents an unauthorized user from operating your computer. See also EEPROM.

PCI

Peripheral Component Interconnect. PCI is a high-performance peripherals I/O bus supporting data transfers of up to 132MB per second.

Pentium
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.

peripheral
A device connected to and controlled by the computer, such as an external disk drive or a printer.

pixel
The smallest element that is visible on a video display. The resolution of a video display system is measured in pixels.

PnP
(Plug-n-Play) Plug-and-play is the ability to plug a device into a computer and have the computer recognize that the device is there. The user doesn't have to tell the computer.

POST
Power-On-Self-Test.

R

RAM
(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.

real-time clock
The IC in your computer that maintains the time and date.

ROM
(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.

RS-232C port
An industry standard serial port. See also serial port.

S

save
To store information on a floppy disk, hard disk, magnetic tape, or some other permanent storage device.

SCSI
(Small Computer System Interface) An industry standard interface that provides high-speed access to tape drives, hard disk drives, and other peripheral devices.

SEL

(System Event Log) A record of system management events. 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.

serial communication

Information sent sequentially, one bit at a time.

serial port

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.

Setup program

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.

software

Programs with specific functions, such as word processing, data base management, communications, and operating system.

SRAM

(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.

SSU

(System Setup Utility) The program that you use to change the configuration of your system. This program also contains information about the hardware in your system and is used to read the System Event Log.

SVGA

(Super VGA) A type of video display system that provides very high-resolution text and graphics on analog color monitors.

system board

The main circuit board in your computer. It contains most of the connectors and ports.

T

tape drive

A type of storage device using magnetic tape.

TTL

(Transistor-Transistor Logic) A type of integrated circuit used in computers. See also CMOS.

V

VGA
(Video Graphics Array) A type of video display system that provides high-resolution text and graphics on analog color monitors.

volatile memory
Storage media that loses its data when system power is turned off. Standard memory and memory that you add to the Versa are volatile memory. See nonvolatile memory.

W

warm boot
Process of resetting the computer without turning off the power through keyboard input (pressing **Ctrl**, **Alt**, and **Del** keys simultaneously) or the reset button. The system returns to an initial or arbitrarily selected condition.

write
To record or store information to a storage device.

Equipment Log

Use this equipment log form to record pertinent information about your system. You will need some of this information to run the System Setup 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 system board 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.

Equipment Log

Component	Manufacturer Name and Model	Serial Number (if available)	Date Installed
Server			
System Board			
DIMMs			
Modem			
Diskette Drive A			
Tape Drive 1			
Tape Drive 2			
CD-ROM Drive 1			
Hard Disk Drive 1			
Hard Disk Drive 2			
Hard Disk Drive 3			
Hard Disk Drive 4			
Hard Disk Drive 5			
Hard Disk Drive 6			
Optional RAID Controller			
Network Controller 1			
Network Controller 2			
Monitor			
Keyboard			
Mouse			
External Peripherals			

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