SE440BX
Motherboard
Product Guide

Revision History

Revision	Revision History	Date
-001	First release of the SE440BX Motherboard Product Guide.	February, 1998

If an FCC declaration of conformity marking is present on the board, the following statement applies:

FCC Declaration of Conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions related to the EMC performance of this product, contact:

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124
1-800-628-8686

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

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

Canadian Department of Communications Compliance Statement:

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numerique német pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Réglement sur le broullage radioélectrique édicté par le ministére des Communications du Canada.

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An Intel product, when used in accordance with its associated documentation, is "Year 2000 Capable" when, upon installation, it accurately stores, displays, processes, provides, and/or receives date data from, into, and between the twentieth and twenty-first centuries, including leap year calculations, provided that all other technology used in combination with said product properly exchanges date data with it.

† Third-party brands and trademarks are the property of their respective owners.

†† Wake on LAN is a trademark of IBM Corporation.

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1 Motherboard Features

This chapter gives an overview of the SE440BX motherboard, including:

- Features
- Components
- Back panel I/O connectors

The remaining chapters explain how to:

- Add or upgrade components like processors or memory
- Use the BIOS Setup program to modify the motherboard's configuration
- Upgrade the BIOS

Features Summary

- ATX form factor of 12 x 7.75 inches with seven mounting screw holes
- Support for a single Pentium® II processor
  - 66 MHz and 100 MHz host bus speeds
  - Slot 1 connector
  - Integrated 512 KB second-level cache
- Three DIMM sockets
  - Supports up to 384 MB of synchronous DRAM (SDRAM) memory
- Intel 82440BX AGPset
  - PCI/A.G.P. controller (PAC)
  - PCI ISA IDE Xcelerator (PIIX4E)
- I/O controller
- Two USB ports
- Intel/Phoenix Basic Input/Output System (BIOS)
- Single-jumper configuration
- Onboard Accelerated Graphics Port (A.G.P.) connector

Software drivers and utilities are available from Intel.

NOTE

For information about Intel motherboards, including technical product specifications, BIOS upgrades, and device drivers, see "Products" at the Intel World Wide Web site:

http://developer.intel.com/

Components

Figure 1 shows the major components on the motherboard.

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A	Wake on Ring connector	M	Power supply connector
B	Wake on LAN†† technology connector (optional)	N	Diskette drive connector
C	Fan 3 connector	O	SCSI LED connector
D	Telephony connector (optional)	P	IDE connectors
E	CD-ROM audio connector (optional)	Q	Front panel connectors
F	Auxiliary Line In connector (optional)	R	Accelerated Graphics Port (A.G.P.) connector
G	Chassis intrusion connector (optional)	S	PC/PCI connector
H	Back panel connectors	T	Battery
I	Slot 1 connector	U	Configuration jumper block
J	Fan 2 connector	V	Speaker (optional)
K	DIMM sockets	W	PCI slots
L	Fan 1 connector	X	ISA slots

Figure 1. Motherboard Components

⊜⟩ **NOTE**

Components labeled optional do not come on all SE440BX motherboards.

Back Panel I/O Connectors

Figure 2 shows the back panel I/O connectors on the motherboard.

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A	PS/2† keyboard or mouse	G	Serial Port B
B	PS/2 keyboard or mouse	H	MIDI/game Port (optional)
C	USB Port 1	I	Audio Line Out (optional)
D	USB Port 0	J	Audio Line In (optional)
E	Serial Port A	K	Audio Mic In (optional)
F	Parallel Port		
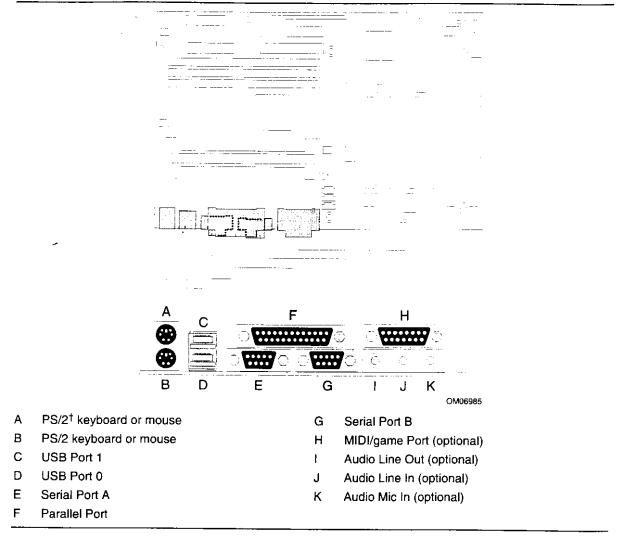
Figure 2. Back Panel I/O Connectors

Microprocessor

The motherboard supports a single Pentium II processor operating at any of the Pentium II processor speeds, voltages, and bus frequencies. Processors are not included with the SE440BX motherboard and must be purchased separately.

The processor is packaged in a Single Edge Contact (S.E.C.) cartridge. The cartridge includes the processor core, second-level cache subsystem, thermal plate, and back cover.

The processor connects to the motherboard through the Slot 1 connector, a 242-pin edge connector. When mounted in Slot 1, the processor is secured by a retention mechanism attached to the motherboard. A passive heatsink is stabilized by the heatsink support.

Microprocessor Upgrades

The motherboard can be upgraded with Pentium II processors that run at higher speeds. To upgrade the processor, use the BIOS configuration mode to change the processor speed, see Chapter 2.

Main Memory

The motherboard has three sockets for installing dual inline memory modules (DIMMs). Minimum memory size is 8 MB; maximum memory size is 384 MB. To install memory, see Chapter 2.

Second Level Cache Memory

The second-level cache is located in the S.E.C. cartridge. The cache includes synchronous pipelined burst static RAM (PBSRAM) and tag RAM. There are four PBSRAM components totaling 512 KB in size. All supported onboard memory is cacheable.

PCI Enhanced IDE Interface

The PCI enhanced IDE interface handles the exchange of information between the processor and peripheral devices like hard disks and add-in boards inside the computer. The interface supports:

- Up to four IDE devices such as hard drives
- ATAPI devices
- PIO mode 3 and PIO mode 4 devices
- Up to four PCI cards or up to two ISA cards and three PCI cards
- Logical block addressing (LBA) of hard drives larger than 528 MB and extended cylinder head sector (ECHS) translation modes
- Support for laser servo (LS-120) drives

Input/Output (I/O) Controller

The I/O controller handles the exchange of information between the processor and external devices like the mouse and keyboard or a printer that are connected to the computer. The controller features the following:

- Integrated keyboard and mouse controller
- Industry standard diskette drive controller
- One multimode bi-directional parallel port
  - Standard mode: Centronics-compatible operation
  - High speed mode: support for enhanced capabilities port (ECP) and enhanced parallel port (EPP)
- Two serial ports
- Flexible IRQ and DMA mapping for Windows† 95

Real-Time Clock

The motherboard has a time-of-day clock and 100-year calendar that will rollover to 2000 at the turn of the century. A battery on the motherboard keeps the clock current when the computer is turned off.

➧ NOTE

The recommended method of accessing the date in systems with Intel motherboards is indirectly from the Real-Time Clock (RTC) via the BIOS. The BIOS on Intel motherboards and baseboards contains a century checking and maintenance feature that checks the least two significant digits of the year stored in the RTC during each BIOS request (INT 1Ah) to read the date and, if less than 80 (i.e., 1980 is the first year supported by the PC), updates the century byte to 20. This feature enables operating systems and applications using the BIOS date/time services to reliably manipulate the year as a four-digit value.

For more information on proper date access in systems with Intel motherboards please see http://support.intel.com/support/year2000/paper.htm

Universal Serial Bus (USB) Support

The motherboard has two USB ports. You can connect two USB peripheral devices directly to the computer without an external hub. To attach more than two devices, connect an external hub to either of the built-in ports. The motherboard supports the standard universal host controller interface (UHCI) and takes advantage of standard software drivers written to be compatible with UHCI. The USB features the following:

- Support for hot swapping Plug and Play devices
- Support for self-identifying peripherals

- Support for up to 127 physical devices
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications

⊜ NOTE

Computer systems that have an unshielded cable attached to a USB port may not meet FCC Class B requirements, even if no device or a low-speed USB device is attached to the cable. Use a shielded cable that meets the requirements for a high-speed USB device.

A.G.P.

The A.G.P. is a high-performance interconnect for graphics-intensive applications, such as 3D graphics. A.G.P. is independent of the PCI bus and is intended for exclusive use with graphical display devices. A.G.P. provides these features:

- Pipelined memory read and write operations that hide memory access latency
- Demultiplexing of address and data on the bus for near 100 percent bus efficiency
- AC timing for 133 MHz data transfer rates, allowing real data throughput in excess of 500 MB/sec

BIOS

The motherboard's system BIOS is contained in a flash memory device on the motherboard. The BIOS provides the power-on self test (POST), the BIOS Setup program, and the PCI and IDE auto-configuration utilities.

The BIOS is always shadowed. Shadowing allows BIOS routines to be executed from fast 64-bit onboard DRAM instead of from the slower 8-bit flash memory device.

BIOS Upgrades

Because the BIOS is stored in a flash memory device, you can upgrade the BIOS by using a software utility on a diskette or hard disk, or over a network. For information on upgrading the BIOS, see Chapter 4.

PCI Auto Configuration

If you install a PCI add-in board in your computer, the PCI auto-configuration utility in the BIOS automatically detects and configures the resources (IRQs, DMA channels, and I/O space) for that add-in board. You do not need to run the BIOS Setup program after you install a PCI add-in board.

However, PCI add-in boards use the same IRQ resources as ISA add-in boards. If you install both a PCI and an ISA add-in board, you must specify the IRQ used by the ISA card. The PCI auto configuration program complies with version 2.1 of the PCI BIOS specification.

IDE Auto Configuration

If you install an IDE device (e.g., a hard drive) in your computer, the IDE auto-configuration utility in the BIOS automatically detects and configures the device for your computer. You do not need to run the BIOS Setup program after installing an IDE device.

ISA Plug and Play Capability

The motherboard provides auto configuration of Plug and Play ISA cards and resource management for legacy (non-Plug and Play) ISA cards when used with the ISA Configuration Utility (ICU) or a Plug and Play compatible operating system like Windows 95. To obtain the ICU, contact your computer supplier.

Security Passwords

The BIOS includes security features that restrict whether the BIOS Setup program can be accessed and who can boot the computer. A supervisor password and a user password can be set for the Setup program and for booting the computer, with the following restrictions:

- The supervisor password gives unrestricted access to view and change all the Setup options in the Setup program. This is supervisor mode.
- The user password gives restricted access to view and change Setup options in the Setup program. This is user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the Setup program gives the user restricted access to Setup.
- If both the supervisor and user passwords are set, you must enter either the supervisor password or the user password to access Setup.
- Setting a user password restricts who can boot the computer. The password prompt is displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, you can enter either password to boot the computer.

Expansion Slots

The motherboard has five expansion slots for installing add-in boards, like network cards, that expand the capabilities of your computer. The expansion slots are as follows:

- One ISA slot
- Three PCI slots
- One shared PCI/ISA slot

Power Management

The motherboard supports two types of power management — Advanced Power Management (APM) and Advanced Configuration and Power Interface (ACPI).

Advanced Power Management (APM)

APM's energy saving standby mode can be initiated in the following ways:

- Specify a time-out period in Setup
- Press the suspend/resume switch connected to the front panel sleep connector
- Use an operating system option, such as the Suspend menu item in Windows 95

In standby mode, the motherboard can reduce power consumption by spinning down hard drives, and reducing power to or turning off VESA† DPMS-compliant monitors. Power-management mode can be enabled or disabled in Setup (see Chapter 3).

While in standby mode, the system retains the ability to respond to external interrupts and service requests, such as incoming faxes or network messages. Any keyboard or mouse activity brings the system out of standby mode and immediately restores power to the monitor.

The BIOS enables APM by default; but the operating system must support an APM driver for the power-management features to work. For example, Windows 95 supports the power-management features upon detecting that APM is enabled in the BIOS.

Advanced Configuration and Power Interface (ACPI)

ACPI gives the operating system direct control over the power management and Plug and Play functions of a computer. ACPI requires an ACPI-aware operating system. ACPI features include:

- Plug and Play (including bus and device enumeration) and APM functionality normally contained in the BIOS
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video monitor, and hard disk drives
- Methods for achieving less than 30-watt system operation in the Power On Suspend sleeping state, and less than 5-watt system operation in the Suspend to Disk sleeping state
- A Soft-off feature that enables the operating system to power off the computer
- Support for multiple wake up events
- Support for a front panel power and sleep mode switch

Battery

A battery on the motherboard keeps the clock and the values in CMOS RAM current when your computer is turned off. To replace the battery, see Chapter 2.

Wake on Ring

Wake on Ring enables the computer to wake from sleep or soft-off mode when a call is received on a telephony device, such as a modem, configured for operation on COM1. The first incoming call powers up the computer. A second call must be made to access the computer. To access this feature use the Wake on Ring connector. See Chapter 5 for the location and pinouts of the Wake on Ring connector.

Wake on LAN Technology (Optional)

Wake on LAN technology enables remote wakeup of the computer through a network. Wake on LAN technology requires a PCI add-in network interface card (NIC) with remote wakeup capabilities. The remote wakeup connector on the NIC must be connected to the onboard Wake on LAN technology connector. The NIC monitors network traffic at the MII interface; upon detecting a Magic Packet[†], the NIC asserts a wakeup signal that powers up the computer. To access this feature use the Wake on LAN technology connector. See Chapter 5 for the location and pinouts of the Wake on LAN technology connector.

⚠ CAUTION

For Wake on LAN, the 5-V standby line for the power supply must be capable of delivering +5 V ±5 % at 720 mA. Failure to provide adequate standby current when implementing Wake on LAN, can damage the power supply.

Hardware Monitor (Optional)

The optional hardware monitor subsystem provides low-cost instrumentation capabilities. The features of the hardware monitor subsystem include:

* Support for an optional chassis intrusion connector
* An integrated ambient temperature sensor
* Fan speed sensors that monitor the fan 1 and fan 2 connectors (see Figure 15 for the location of these connectors on the motherboard)
* Power supply voltage monitoring to detect levels above or below acceptable values

When suggested ratings for temperature, fan speed, or voltage are exceeded, an interrupt is activated. The hardware monitor component connects to the system management (SM) bus.

Audio Subsystem (Optional)

The optional audio subsystem consists of the following:

* Crystal Semiconductor CS4236B audio codec
* Crystal Semiconductor CS4611 PCI audio accelerator
* Back panel and onboard audio connectors

Crystal Semiconductor CS4236B Audio Codec

The CS4236B audio codec's features include:

- Compatibility with Sound Blaster†, Sound Blaster Pro†, and Windows Sound System
- MPU-401 compatible MIDI and joystick interfaces
- Advanced MPC3-compliant input and output mixer

Crystal Semiconductor CS4611 PCI Audio Accelerator

The CS4611's PCI bus interface enables burst mode transfers of audio data between the system bus and the device's internal DMA engine and stream processor. Other features include:

- A RAM-based Digital Signal Processor optimized for digital audio processing
- A bus mastering PCI bus interface that complies with *PCI Local Bus Specification, Revision 2.1*
- Acceleration of DirectSound†, DirectSound3D†, DirectInput†, and ActiveMovie† APIs
- General MIDI Wavetable Synthesis with Reverb and Chorus

Audio Connectors

The audio connectors include the following:

- Back panel connectors: stereo line-level output (Line Out), stereo line-level input (Line In), and Mic In
- CD audio header (black)
- Telephony (green)
- Stereo Line In (natural/white)

See Chapter 5 for the location and pinouts of the audio connectors.

Speaker (Optional)

A piezoelectric speaker is mounted on the motherboard. The speaker provides audible error code (beep code) information during the POST.

The motherboard also has a front panel connector for an offboard speaker.

2 Installing and Replacing Motherboard Components

This chapter describes the following:

- How to install and remove the motherboard
- How to install a processor
- How to prepare the motherboard for a boxed Pentium II processor
- How to install and remove memory
- How to replace the battery
- How to use the configuration jumper to set processor speed and clear passwords

Before You Begin

⚠ CAUTION

Before you install this motherboard in a chassis, see Appendix B for regulatory requirements and precautions.

- Always follow the steps in each procedure in the correct order.
- Set up a log to record information about your computer, such as model, serial numbers, installed options, and configuration information.
- Use an antistatic wrist strap and a conductive foam pad when working on the motherboard.

⚠ WARNINGS

The procedures in this chapter assume familiarity with the general terminology associated with personal computers and with the safety practices and regulatory compliance required for using and modifying electronic equipment.

Disconnect the computer from its power source and from any telecommunications links, networks, or modems before performing any of the procedures described in this chapter. Failure to disconnect power, telecommunications links, networks, or modems before you open the computer or perform any procedures can result in personal injury or equipment damage. Some circuitry on the motherboard can continue to operate even though the front panel power button is off.

⚠ CAUTION

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

How to Install and Remove the Motherboard

Refer to your chassis manual for instructions on installing and removing the motherboard. The motherboard is secured to the chassis by seven screws. Figure 3 shows the locations of the mounting screw holes.

⮑ NOTES

You will need a Phillips (#2 bit) screwdriver.

Refer to Appendix B for regulatory requirements and installation instructions and precautions.

⚠ WARNING

This procedure should be done only by qualified technical personnel. Disconnect the computer from its power source before doing the procedures described here. Failure to disconnect the power before you open the computer can result in personal injury or equipment damage.

OM07070
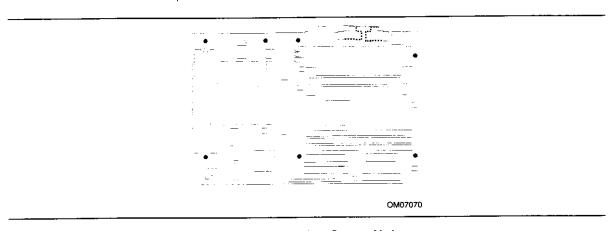
Figure 3. Mounting Screw Holes

How to Install a Processor

To install a processor, in brief you must:

1. Install the retention mechanism.

2. Install the processor.

3. Set the processor speed.

Detailed instructions follow for each of these procedures.

⮑ NOTE

If you are installing a boxed Intel Pentium II processor, see the instructions on page 23.

Install the Retention Mechanism

To install the retention mechanism, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).

2. Find the Slot 1 connector on the motherboard (see Figure 4).

OM07025

A	Retention bracket	C	Fastener retainer pins
B	Press-fit fasteners	D	Slot 1 connector
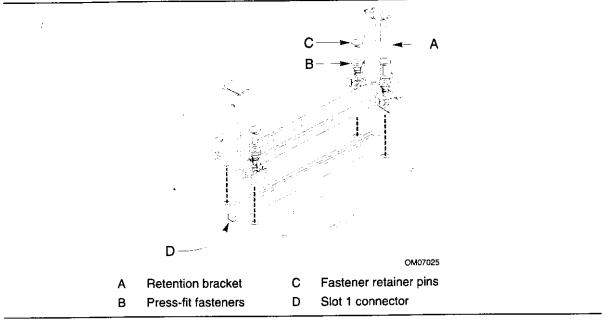
Figure 4. Installing the Processor Retention Mechanism

3. Orient the retention bracket so the tab of the Slot 1 connector matches the corresponding cutout in the retention bracket, then position the retention bracket on the motherboard.

4. Push each of the four fasteners through its mounting hole in the retention bracket, and then through the motherboard mounting hole until you feel it snap into place.

5. Push a fastener retainer pin into the through hole of fastener until it is fully seated against the top of the fastener. Repeat this step for each of the four fasteners.

Install the Processor

To install the processor, follow these steps:

1. Insert the processor in the retention mechanism as shown in Figure 5.

2. Press down on the processor until it is firmly seated in the Slot 1 connector and the latches on the processor lock into place.

B

A

OM07061

A   Retention mechanism
B   Latches
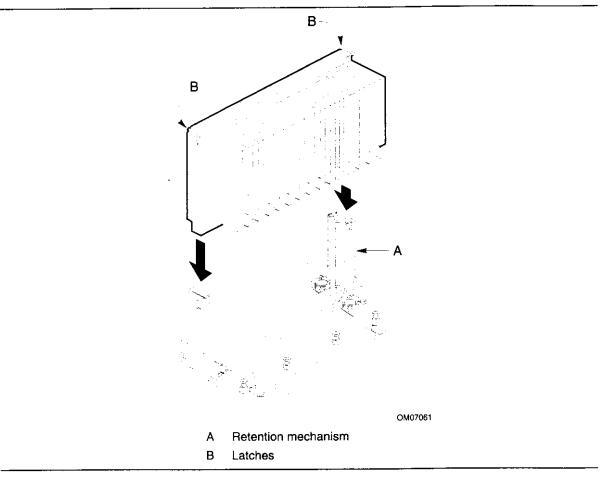
Figure 5. Installing the Processor

3. Slide the top heatsink support bar onto the retaining pins of the support's base as shown in Figure 6.

OM07060

A   Heatsink support bar
B   Retaining pins
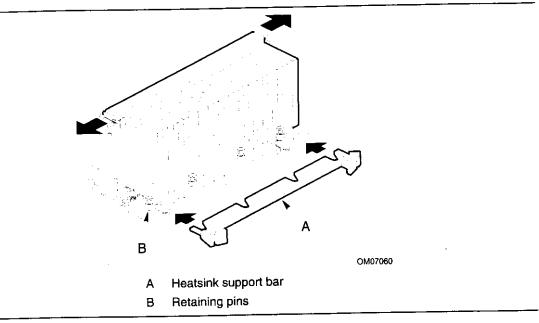
Figure 6. Installing the Heatsink Support Top Bar

How to Set the Processor Speed

Set the processor speed after you have installed or upgraded the processor. This procedure assumes that the motherboard is installed in the computer and the configuration jumper block is set to normal mode.

Figure 7 shows the location of the configuration jumper block on the motherboard. The jumper is set to normal mode at the factory.

1   3
J8A1

OM06987
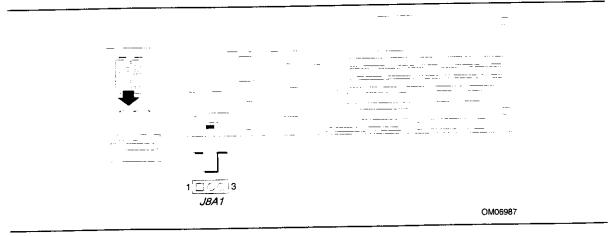
Figure 7. Location of the Configuration Jumper Block

⚠ CAUTION

To avoid bending or breaking pins, use caution when removing or installing a jumper.

To set the processor speed, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).

2. Turn off all peripheral devices connected to the computer. Turn off the computer.

3. Remove the computer cover.

4. Find the configuration jumper block (see Figure 7).

5. Place the jumper on pins 2-3 as shown below.

J8A1

1 ⬜🔘🔘 3

OM07071

6. Replace the cover, turn on the computer, and allow it to boot.

7. The computer starts the Setup program. Setup displays the Maintenance menu.

8. Use the arrow keys to select the Processor Speed feature and press <Enter>. Setup displays a popup screen with the available processor speeds.

9. Use the arrow keys to select the processor speed. For example, select 266 for a 266 MHz Pentium II processor. Press <Enter> to confirm the speed. This Maintenance menu reappears again.

10. Press <F10> to save the current values and exit Setup.

11. Turn off the computer.

12. Remove the computer cover.

13. To restore normal operation, place the jumper on pins 1-2 as shown below.

J8A1

1 🔘🔘⬜ 3

OM07072

14. Replace the cover and turn on the computer.

15. Verify the processor speed during POST.

How to Upgrade to a Boxed Pentium® II Processor

Use the instructions in this section to prepare the motherboard for a boxed Pentium II processor upgrade.

To prepare for a boxed Pentium II processor upgrade, in brief you must:

1. Remove the heatsink support top bar and the installed processor.

2. Remove the heatsink support base.

3. Upgrade the processor.

Detailed instructions follow for each of these procedures.

Remove the Installed Processor

To remove the installed processor, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).

2. Turn off all peripheral devices connected to the computer. Turn off the computer.

3. Remove the computer cover.

4. Remove the motherboard from the computer chassis. (See "How to Install and Remove the Motherboard.")

5. Place the motherboard on a flat work surface and remove any components that block access to the installed processor.

6. Remove the top bar of the heatsink support from the base as shown in Figure 8. Press in on the latches to release the top bar.

OM07059

A Heatsink support top bar
B Latches
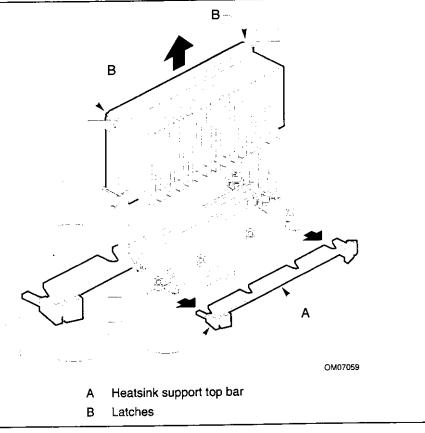
Figure 8. Removing the Heatsink Support Top Bar and the Processor

⚠ **CAUTION**

Pressing on the motherboard or components while removing the processor can cause damage. If necessary, you can safely press on the motherboard's plastic connectors to gain leverage while removing the processor.

7. Remove the processor by pressing in on the latches and pulling the processor straight up as shown in Figure 8. Place the processor aside.

Remove the Heatsink Support Base

📩 **NOTE**

To remove the heatsink support base from the motherboard, you need a special removal tool (MID #58982) that is available from Dexter Design (call 503-648-7000 for ordering information).

To remove the heatsink support base, follow these steps:

1. With your fingers, remove the two retention pins from the heatsink support base as shown in Figure 9.

OM07024

A   Retention pins
B   Heatsink support base
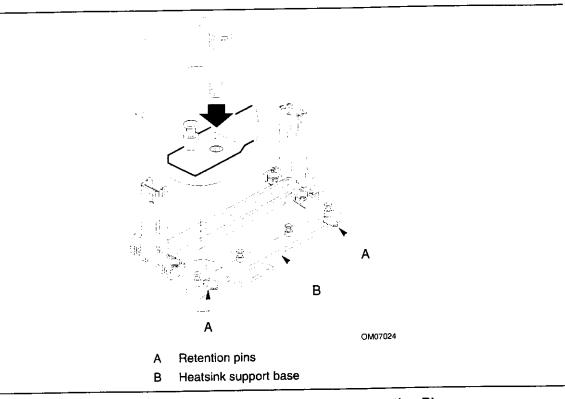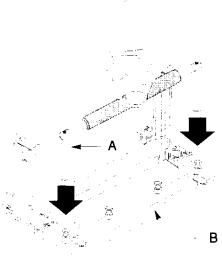
Figure 9. Removing the Heatsink Support Retention Pins
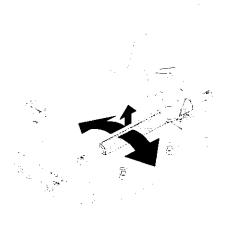
2. Place the heatsink support removal tool over the two outside posts of the heatsink support base as shown in Figure 10. Make sure the tool completely engages the posts.

OM07058

A   Heatsink support removal tool
B   Heatsink support base

Figure 10. Placing the Heatsink Support Base Removal Tool on the Retention Pins

3. Carefully rock the tool back and forth until the heatsink support base disengages from the holes in the motherboard (as shown in Figure 11). There is an audible click when the base disengages from the motherboard.

OM07057

Figure 11. Using the Heatsink Support Base Removal Tool

4. Remove the tool and the heatsink support base from the motherboard.

Upgrade the Processor

See the documentation that came with the boxed Intel Pentium II processor.

How to Install Memory

You can install from 8 MB to 384 MB of memory in the motherboard DIMM sockets. The board has DIMM sockets arranged as banks 0, 1, and 2. The motherboard supports the following memory features:

- 168-pin DIMMs with gold-plated contacts
- 66 or 100 MHz SDRAM
- Non-ECC (64-bit) and ECC (72-bit) memory
- 3.3 V memory only
- Single- or double-sided DIMMs in the following sizes:

DIMM Size	Non-ECC Configuration	ECC Configuration
8 MB	1 Mbit x 64	1 Mbit x 72
16 MB	2 Mbit x 64	2 Mbit x 72
32 MB	4 Mbit x 64	4 Mbit x 72
64 MB	8 Mbit x 64	8 Mbit x 72
128 MB	16 Mbit x 64	16 Mbit x 72

When adding memory, follow these guidelines:

- You can install DIMMs in any of the three banks.
- You can use different sizes of DIMMs in different banks.
- The BIOS detects the size and type of installed memory.
- For ECC operation to be available, all installed memory must be ECC and you must enable the ECC Configuration feature in the Setup program (see Chapter 3).

⊜ NOTE

All memory components and DIMMs used with the SE440BX motherboard must comply with the PC SDRAM specifications. These include: the PC SDRAM Specification (memory component specific), the PC Unbuffered DIMM Specification, and the PC Serial Presence Detect Specification. You can access these documents through the Internet at:

http://www.intel.com/design/pcisets/memory/

Figure 12 shows the location of the DIMM sockets.

OM07067
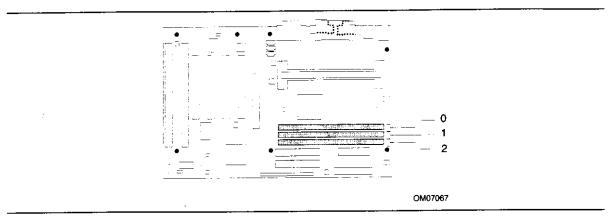
Figure 12. Location of DIMM Sockets

To install DIMMs, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover and locate the DIMM sockets.
4. Holding the DIMM by the edges, remove it from its antistatic package.
5. Make sure the clips at either end of the socket are pushed away from the socket.
6. Position the DIMM above the socket. Align the two small notches in the bottom edge of the DIMM with the keys in the socket.
7. Insert the bottom edge of the DIMM into the socket (see Figure 13).
8. When the DIMM is seated, push down on the top edge of the DIMM until the retaining clips snap into place. Make sure the clips are firmly in place.
9. Replace the computer cover.
10. If you installed a DIMM with ECC memory, turn on the computer and use the ECC Configuration feature in Setup to enable ECC (see Chapter 3).

OM07068
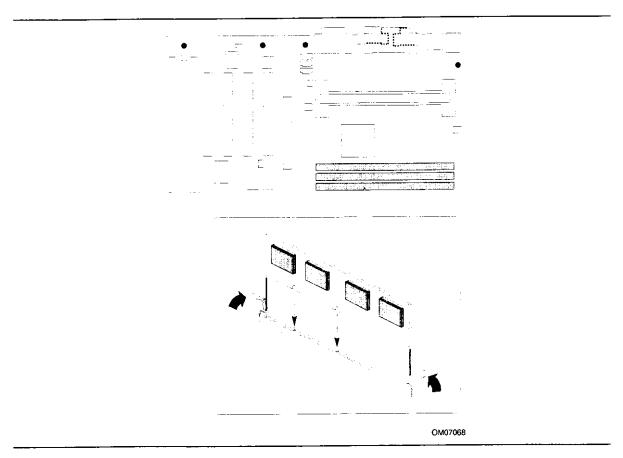
Figure 13. Installing a DIMM

How to Remove Memory

To remove a DIMM, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).

2. Turn off all peripheral devices connected to the computer. Turn off the computer.

3. Remove the computer cover.

4. Gently spread the retaining clips at each end of the socket. The DIMM pops out of the socket.

5. Hold the DIMM by the edges, lift it away from the socket, and store it in an antistatic package.

6. Reinstall and reconnect any parts you removed or disconnected to reach the DIMM sockets.

How to Replace the Battery

When your computer is turned off, a lithium battery maintains the current time-of-day clock and the values in CMOS RAM current. Figure 14 shows the location of the battery.

The battery should last about seven years. When the battery begins to die, it loses voltage; when the voltage drops below a certain level, the Setup program settings stored in CMOS RAM (for example, the date and time) might not be accurate. Replace the battery with an equivalent one.

⚠ WARNING

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

⚠ ATTENTION

Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type recommandé par le constructeur. Mettre au rébut les batteries usagées conformément aux instructions du fabricant.

⚠ ADVARSEL!

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

⚠ ADVARSEL

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

⚠ VARNING

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

⚠ VAROITUS

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

To replace the battery, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).

2. Turn off all peripheral devices connected to the computer. Turn off the computer.

3. Remove the computer cover.

4. Locate the battery on the motherboard (see Figure 14).

5. With a medium flat-bladed screwdriver, gently pry the battery free from its socket. Note the orientation of the "+" and "-" on the battery.

6. Install the new battery in the socket, orienting the "+" and "-" correctly.

7. Replace the computer cover.

OM07069
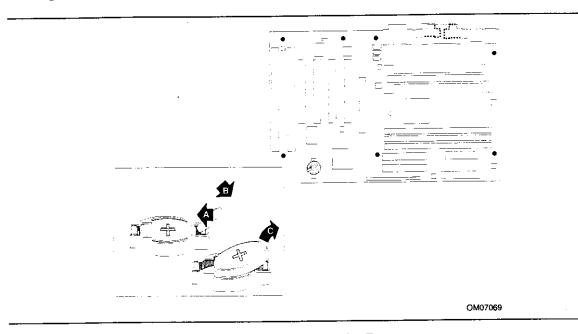
Figure 14. Replacing the Battery

⇨ **NOTE**

If your local ordinances permit, you may dispose of individual batteries as normal trash. Do not expose batteries to excessive heat or fire. Keep all batteries away from children.

How to Clear the Passwords

This procedure assumes that the motherboard is installed in the computer and the configuration jumper block is set to normal mode.

1. Observe the precautions in "Before You Begin" (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Find the configuration jumper block (see Figure 7).
5. Place the jumper on pins 2-3 as shown below.

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6. Replace the cover, turn on the computer, and allow it to boot.
7. The computer starts the Setup program. Setup displays the Maintenance menu.
8. Use the arrow keys to select Clear Passwords. Press <Enter> and Setup displays a pop-up screen requesting that you confirm clearing the password. Select Yes and press <Enter>. Setup displays the Maintenance menu again.
9. Press <F10> to save the current values and exit Setup.
10. Turn off the computer.
11. Remove the computer cover.
12. To restore normal operation, place the jumper on pins 1-2 as shown below.

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13. Replace the cover and turn on the computer.

3 Using the Setup Program

This chapter provides an overview of the Setup program. You can use the Setup program to change the configuration information and boot sequence for the computer.

⇨ **NOTE**

For reference purposes, you should write down the current Setup settings. When you make changes to the settings, update this record.

Setup Program Modes

The Setup program has three modes of operation:

- Normal mode for normal operations
- Configure mode for configuring the processor speed and clearing passwords (see Chapter 2 for how to do both tasks)
- Recovery mode for recovering the BIOS data

The Setup program operating mode is controlled by the setting of the configuration jumper block J8A1 (see Figure 7). The jumper is set to normal mode at the factory.

Table 1 shows jumper settings for the different Setup modes.

Table 1. Jumper Settings for Setup Program Modes

Mode	Jumper	Description
Normal	1-2	BIOS uses current configuration and passwords for booting.
Configure	2-3	After the POST runs, Setup starts and displays the Maintenance menu. This menu displays options for setting the processor speed and clearing passwords.
Recovery	None	BIOS recovers data from a recovery diskette. Refer to Chapter 4 for information on recovering the BIOS data during an upgrade.

Setup Menus

To enter the Setup program, turn the computer on and press <F2> when you see the message:

```
Press <F2> Key if you want to run SETUP
```

Table 2 is an overview of the menu screens in the Setup program.

Table 2.   Setup Menu Bar

Setup Menu Screen	Description
Maintenance	Specifies the processor speed and clears the Setup passwords. This menu is only available in configure mode. Refer to Section 1.15 for information about configure mode.
Main	Allocates resources for hardware components.
Advanced	Specifies advanced features available through the chipset.
Security	Specifies passwords and security features.
Power	Specifies power management features.
Boot	Specifies boot options and power supply controls.
Exit	Saves or discards changes to the Setup program options.

Function Keys

Table 3 shows the function keys available for menu screens.

Table 3.   Setup Function Keys

Setup Key	Description
<F1> or <Alt-H>	Brings up a help screen for the current item.
<Esc>	Exits the menu.
<←> or <→>	Selects a different menu screen.
<↑> or <↓>	Moves cursor up or down.
<Home> or <End>	Moves cursor to top or bottom of the window.
<PgUp> or <PgDn>	Moves cursor to top or bottom of the window.
<F5> or <->	Selects the previous value for a field.
<F6> or <+> or <Space>	Selects the next value for a field.
<F9>	Load the default configuration values for the current menu.
<F10>	Save the current values and exit Setup.
<Enter>	Executes command or selects the submenu.

Maintenance Menu

This menu is for setting the processor speed and clearing the Setup passwords. Setup only displays this menu in configure mode. See page 33 for information about setting configure mode.

Table 4.   Maintenance Menu

Feature	Options	Description
Processor Speed	• 233 • 266 • 300 • 333 • 350 • 400	Specifies the processor speed in megahertz. This setup screen will only show speeds up to and including the maximum speed of the processor installed on the motherboard. • With a host bus operating at 66 MHz, the board supports processors at the following speeds: 233, 266, 300, and 333 MHz. • With a host bus operating at 100 MHz, the board supports processors at the following speeds: 300, 350 and 400 MHz.
Clear All Passwords	No options	Clears the user and supervisor passwords.

Main Menu

This menu reports processor and memory information and is for configuring the system date and system time.

Table 5.   Main Menu

Feature	Options	Description
BIOS Version	No options	Displays the version of the BIOS.
Processor Type	No options	Displays processor type.
Processor Speed	No options	Displays processor speed.
Cache RAM	No options	Displays size of second-level cache.
System Memory	No options	Displays the total amount of RAM on the motherboard.
Memory Bank 0 Memory Bank 1 Memory Bank 2	No options	Displays size and type of DIMM installed in each memory bank.
Language	• **English (US) (default)** • Italian • Francais • Deutch • Espanol	Selects the default language used by the BIOS.
ECC Configuration	• **Non-ECC (default)** • ECC	Specifies ECC memory operation.
System Time	Hour, minute, and second	Specifies the current time.
System Date	Month, day, and year	Specifies the current date.

Advanced Menu

This menu is for setting advanced features that are available through the chipset.

Table 6. Advanced Menu

Feature	Options	Description
Plug & Play O/S	• **No (default)** • Yes	Specifies if a Plug and Play operating system is being used. *No* lets the BIOS configure all devices. *Yes* lets the operating system configure Plug and Play devices. Not required with a Plug and Play operating system.
Reset Configuration Data	• **No (default)** • Yes	Clears the BIOS configuration data on the next boot.
Numlock	• **Auto (default)** • On • Off	Specifies the power on state of the Num Lock feature on the numeric keypad of the keyboard.
Peripheral Configuration	No options	Configures peripheral ports and devices. When selected, displays the Peripheral Configuration submenu.
IDE Configuration	No options	Specifies type of connected IDE device.
Floppy Configuration	No options	When selected, displays the Floppy Options submenu.
DMI Events Logging	No options	Configures DMI Events Logging. When selected, displays the DMI Events Logging submenu.
Video Configuration	No options	Configures video features. When selected, displays the Video Configuration submenu.
Resource Configuration	No options	Configures memory blocks and IRQs for legacy ISA devices. When selected, displays the Resource Configuration submenu.

Peripheral Configuration Submenu

This submenu is for the configuring the computer peripherals.

Table 7.   Peripheral Configuration Submenu

Feature	Options	Description
Serial port A	• Disabled • Enabled • **Auto (default)**	Configures serial port A. *Auto* assigns the first free COM port, normally COM1, the address 3F8h and the interrupt IRQ4. An * (asterisk) displayed next to an address indicates a conflict with another device.
Base I/O address	• 3F8 • 2F8 • 3E8 • 2E8	Specifies the base I/O address for serial port A.
Interrupt	• IRQ 3 • **IRQ 4 (default)**	Specifies the interrupt for serial port A.
Serial port B	• Disabled • Enabled • **Auto (default)**	Configures serial port B. *Auto* assigns the first free COM port, normally COM2, the address 2F8h and the interrupt IRQ3. An * (asterisk) displayed next to an address indicates a conflict with another device. If either serial port address is set, that address will not appear in the list of options for the other serial port. If an *ATI mach32*† or an *ATI mach64*† video controller is active as an add-in card, the COM4, 2E8h address will not appear in the list of options for either serial port.
Mode	• **Normal (default)** • IrDA† • ASK-IR	Specifies the mode for serial port B for normal (COM 2) or infrared applications.
Base I/O address	• 3F8 • **2F8 (default)** • 3E8 • 2E8	Specifies the base I/O address for serial port B.
Interrupt	• **IRQ 3 (default)** • IRQ 4	Specifies the interrupt for serial port B.

Table 7.   Peripheral Configuration Submenu (continued)

Feature	Options	Description
Parallel port	• Disabled • Enabled • **Auto (default)**	Configures the parallel port. *Auto* assigns LPT1 the address 378h and the interrupt IRQ7. An * (asterisk) displayed next to an address indicates a conflict with another device.
Mode	• Output Only • **Bi-directional (default)** • EPP • ECP	Selects the mode for the parallel port. *Output Only* operates in AT†-compatible mode. *Bi-directional* operates in bi-directional PS/2-compatible mode. *EPP* is Extended Parallel Port mode, a high-speed bi-directional mode. *ECP* is Enhanced Capabilities Port mode, a high-speed bi-directional mode.
Base I/O address	• 378 • 278 • 228	Specifies the base I/O address for the parallel port.
Interrupt	• IRQ 5 • IRQ 7	Specifies the interrupt for the parallel port.
Audio	• Disabled • **Enabled (default)**	Enables or disables the onboard audio subsystem.
Legacy USB Support	• **Disabled (default)** • Enabled	Enables or disables USB legacy support. (See section 3.1.13 for more information.)

IDE Configuration

Table 8.   IDE Configuration

Feature	Options	Description
IDE Controller	• Disabled • Primary • Secondary • **Both (default)**	Specifies the integrated IDE controller. *Primary* enables only the Primary IDE Controller. *Secondary* enables only the Secondary IDE Controller. *Both* enables both IDE controllers.
Hard Disk Pre-Delay	• **Disabled (default)** • 3 Seconds • 6 Seconds • 9 Seconds • 12 Seconds • 15 Seconds • 21 Seconds • 30 Seconds	Specifies the hard disk drive pre-delay.
Primary IDE Master	No options	Reports type of connected IDE device. When selected, displays the Primary IDE Master submenu.
Primary IDE Slave	No options	Reports type of connected IDE device. When selected, displays the Primary IDE Slave submenu.
Secondary IDE Master	No options	Reports type of connected IDE device. When selected, displays the Secondary IDE Master submenu.
Secondary IDE Slave	No options	Reports type of connected IDE device. When selected, displays the Secondary IDE Slave submenu.

IDE Configuration Submenus

This submenu is for configuring IDE devices, including:

- Primary IDE master
- Primary IDE slave
- Secondary IDE master
- Secondary IDE slave

Table 9.   IDE Configuration Submenus

Feature	Options	Description
Type	• None • ATAPI Removable • Other ATAPI • CD-ROM • User • IDE Removable • **Auto (default)**	Specifies the IDE configuration mode for IDE devices. *User* allows the cylinders, heads, and sectors fields to be changed. *Auto* automatically fills in the values for the cylinders, heads, and sectors fields.
Maximum Capacity	No options	Reports the maximum capacity for the hard disk.
Multi-Sector Transfers	• **Disabled (default)** • 2 Sectors • 4 Sectors • 8 Sectors • 16 Sectors	Specifies number of sectors per block for transfers from the hard drive to memory. Check the hard drive's specifications for optimum setting.
LBA Mode Control	• Disabled • **Enabled (default)**	Enables or disables the LBA mode control.
Transfer Mode	• **Standard (default)** • Fast PIO 1 • Fast PIO 2 • Fast PIO 3 • Fast PIO 4 • FPIO 3 / DMA 1 • FPIO 4 / DMA 2	Specifies the method for moving data to/from the drive.
Ultra DMA	• **Disabled (default)** • Mode 0 • Mode 1 • Mode 2	Specifies the Ultra DMA mode for the drive.

Floppy Options

This submenu is for configuring floppy drives.

Table 10. Floppy Options

Feature	Options	Description
Floppy Disk Controller	• Enabled (default) • Disabled	Disables or enables the integrated floppy disk controller.
Diskette A:	• Disabled • 360 KB, 5¼" • 1.2 MB, 5¼" • 720 KB, 3½" • 1.44/1.25 MB, 3½" (default) • 2.88 MB, 3½"	Specifies the capacity and physical size of diskette drive A.
Floppy Write Protect	• Disabled (default) • Enabled	Disables or enables write protect for the diskette drive(s).

DMI Event Logging

This submenu is for configuring the DMI event logging features.

Table 11. DMI Event Logging Submenu

Feature	Options	Description
Event log capacity	No options	Indicates if there is space available in the event log.
Event log validity	No options	Indicates if the contents of the event log are valid.
View DMI event log	No options	Enables viewing of DMI event log.
Clear all DMI event logs	• No (default) • Yes	Clears the DMI event log after rebooting.
Event Logging	• Disabled • Enabled (default)	Enables logging of DMI events.
ECC Event Logging	• Disabled (default) • Enabled	Enables logging of ECC events.
Mark DMI events as read	No options	Marks all DMI events as read.

Video Configuration Submenu

This submenu is for configuring video features.

Table 12. Video Configuration Submenu

Feature	Options	Description
Palette Snooping	• Disabled (default) • Enabled	Controls the ability of a primary PCI graphics controller to share a common palette with an ISA add-in video card.
AGP Aperture Size	• 64 MB (default) • 256 MB	Specifies the aperture size for the A.G.P. video controller.

Resource Configuration Submenu

This submenu is for configuring the memory and interrupts.

Table 13.   Resource Configuration Submenu

Feature	Options		Description
Memory Reservation	• C800 - CBFF • CC00 - CFFF • D000 - D3FF • D400 - D7FF • D800 - DBFF • DC00 - DFFF • Memory hole	**Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Disabled (default)** I Conventional I Extended	Reserves specific upper memory blocks for use by legacy ISA devices. Memory hole frees address space in RAM for a legacy ISA board.
IRQ Reservation	• IRQ3 • IRQ4 • IRQ5 • IRQ7 • IRQ10 • IRQ11	**Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved **Available (default)** I Reserved	Reserves specific IRQs for use by legacy ISA devices. An * (asterisk) displayed next to an IRQ indicates an IRQ conflict.

Security Menu

This menu is for setting passwords and security features.

Table 14.   Security Menu

Feature	Options	Description
User Password Is	No options	Reports if there is a user password set.
Supervisor Password Is	No options	Reports if there is a supervisor password set.
Set User Password	Password can be up to seven alphanumeric characters.	Specifies the user password.
Set Supervisor Password	Password can be up to seven alphanumeric characters.	Specifies the supervisor password.
Clear User	No Options	Clears the user password.
User Setup Access	• Disabled • **Enabled (default)**	Enables or disables User Setup Access. *Disabled* prevents the user from accessing Setup.
Unattended Start	• **Disabled (default)** • Enabled	Enables the unattended start feature. When enabled, the computer boots, but the keyboard is locked. The user must enter a password to unlock the computer or boot from a floppy diskette.

Power Menu

This menu is for setting power management features.

Table 15. Power Menu

Feature	Options	Description
Power Management	• Disabled • **Enabled (default)**	Enables or disables the BIOS power management feature.
Inactivity Timer	• **Off (default)** • 1 Minute • 5 Minutes • 10 Minutes • 20 Minutes • 30 Minutes • 60 Minutes • 120 Minutes	Specifies the amount of time before the computer enters standby mode.
Hard Drive	• Disabled • **Enabled (default)**	Enables power management for hard disks during standby and suspend modes.
VESA Video Power Down	• Disabled • **Standby (default)** • Suspend • Sleep	Specifies power management for video during standby and suspend modes.

Boot Menu

This menu is for setting the boot features and the boot sequence.

Table 16. Boot Menu

Feature	Options	Description
Quick Boot Mode	• Disabled • **Enabled (default)**	Enables the computer to boot without running certain POST tests.
Scan User Flash Area	• **Disabled (default)** • Enabled	Enables the BIOS to scan the flash memory for user binary files that are executed at boot time.
After Power Failure	• **Power On (default)** • Stay Off • Last State	Specifies the mode of operation if an AC/Power loss occurs. *Power On* restores power to the computer. *Stay Off* keeps the power off until the power button is pressed. *Last State* restores the previous power state before power loss occurred.
On Modem Ring	• Stay Off • **Power On (default)**	Specifies how the computer responds to an incoming call on an installed modem when the power is off.
On LAN	• Stay Off • **Power On (default)**	Specifies how the computer responds to a LAN wakeup event when the power is off.
On PME	• **Stay Off (default)** • Power On	Specifies how the computer responds to a PME wakeup event when the power is off.

Table 16.   Boot Menu (continued)

Feature	Options	Description
First Boot Device Second Boot Device Third Boot Device Fourth Boot Device	• Removable devices • Hard Drive • ATAPI CD-ROM Drive • Network Boot	Specifies the boot sequence from the available devices. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each boot device in the order listed. Changing the order of the devices changes the drive lettering.
Hard Drive	No options	Lists available hard drives. When selected, displays the Hard Drive submenu.
Removable Devices	No options	Lists available removable devices. When selected, displays the Removable Devices submenu.

Hard Drive Submenu

This submenu is for configuring the boot sequence for hard drives.

Table 17.   Hard Drive Submenu

Options	Description
• Bootable Add in Card	Specifies the boot sequence for the hard drives attached to the computer. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.

Removable Devices Submenu

This submenu is for configuring the boot sequence for removable devices.

Table 18. Removable Devices Submenu

Options	Description
• Legacy Floppy Drives	Specifies the boot sequence for the removable devices attached to the computer. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.

Exit Menu

This menu is for exiting the Setup program, saving changes, and loading and saving defaults.

Table 19. Exit Menu

Feature	Description
Exit Saving Changes	Exits and saves the changes in CMOS RAM.
Exit Discarding Changes	Exits without saving any changes made in Setup.
Load Setup Defaults	Loads the factory default values for all the Setup options.
Load Custom Defaults	Loads the custom defaults for Setup options.
Save Custom Defaults	Saves the current values as custom defaults. Normally, the BIOS reads the Setup values from flash memory. If this memory is corrupted, the BIOS reads the custom defaults. If no custom defaults are set, the BIOS reads the factory defaults.
Discard Changes	Discards changes without exiting Setup. The option values present when the computer was turned on are used.