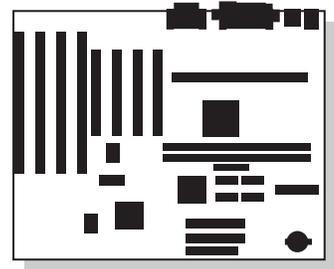


RC440BX Motherboard Product Guide



Order Number: 724183-001

Revision History

Revision	Revision History	Date
001	First release of the RC440BX Motherboard Product Guide.	September 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 numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère 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.

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1 Motherboard Features

This chapter gives an overview of the RC440BX 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

- Full ATX form factor of 12 x 9.6 inches with eleven mounting screw holes or (optionally) a microATX form factor of 9.6 x 9.6 inches with eight mounting screw holes
- Support for the following processors:
 - Intel® Pentium® II processor
 - Intel® Celeron™ processor
- Two Dual Inline Memory Module (DIMM) sockets
 - Supports up to 256 MB of synchronous DRAM (SDRAM) memory
- Intel® 82440BX AGPset
 - PCI/AGP controller (PAC)
 - PCI ISA IDE Xcelerator (PIIX4E)
- I/O controller
- Two Universal Serial Bus (USB) ports, two serial ports, one parallel port
- Intel/AMI Basic Input/Output System (BIOS)
- Single-jumper configuration
- Onboard nVidia RIVA128ZX video controller with 8MB SDRAM and VIP video connector
- Onboard Sound Blaster† AudioPCI 64V digital audio controller and AC '97 Crystal CS4297 audio codec

Software drivers and utilities are available from Intel.

⇒ NOTE

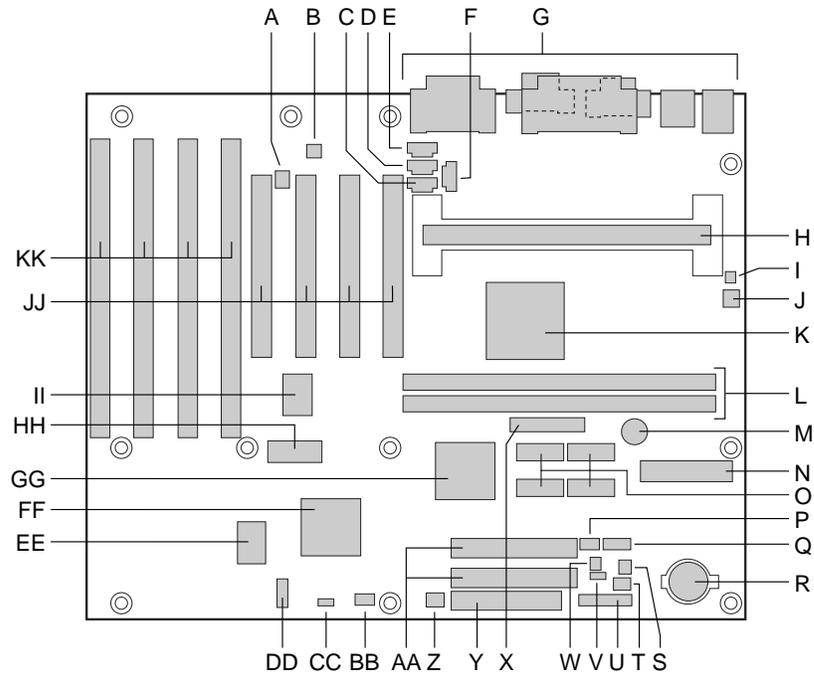
For information about Intel® motherboards, including technical product specifications, BIOS upgrades, and device drivers, see “Products” at the Intel World Wide Web site:

<http://support.intel.com/support/motherboards/desktop>

The RC440BX motherboard is available in either a microATX or a full ATX form factor. Except where noted, all figures and descriptions in this manual are based on the full ATX motherboard.

Components

Figure 1 shows the major components on the motherboard.



OM07380

- | | | | |
|---|---------------------------------------|----|---|
| A | Digital audio connector (optional) | T | Fan 1 (power supply) connector (optional) |
| B | CS4297 audio codec | U | Front panel connector |
| C | Video in connector (optional) | V | SCSI LED connector |
| D | Auxiliary line in connector | W | Wake on LAN [†] Technology connector |
| E | Telephony connector | X | VIP video connector |
| F | CD-ROM connector | Y | Diskette drive connector |
| G | Back panel connectors | Z | Fan 2 (system) connector |
| H | 242-contact slot connector | AA | IDE connectors |
| I | Chassis intrusion connector | BB | PC/PCI audio connector |
| J | Fan 3 (processor) connector | CC | Configuration jumper block |
| K | Intel [®] 82443BX PAC | DD | Serial port B connector |
| L | DIMM sockets | EE | SMC I/O controller |
| M | Speaker | FF | Intel [®] 82371EB PIIX4E |
| N | Power supply connector | GG | nVidia RIVA 128ZX Graphics controller |
| O | SDRAM graphics memory | HH | Flash memory |
| P | USB Port 0 configuration jumper block | II | Sound Blaster Audio PCI 64V audio controller |
| Q | USB front panel connector (optional) | JJ | PCI slots |
| R | Battery | KK | ISA slots |
| S | Wake on Ring connector | | |

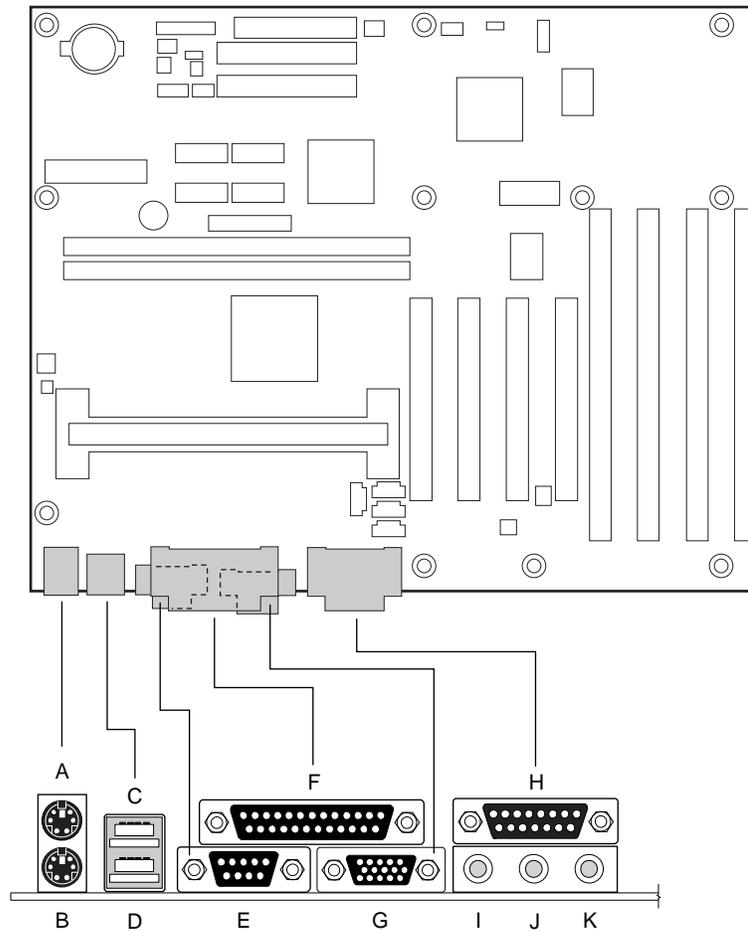
Figure 1. Motherboard Components

⇒ **NOTE**

Components labeled optional do not come on all RC440BX motherboards.

Back Panel I/O Connectors

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



OM07391

A	PS/2† keyboard or mouse	G	VGA† port
B	PS/2 keyboard or mouse	H	MIDI/Game port
C	USB port 1	I	Audio line out
D	USB port 2	J	Audio line in
E	Serial port A	K	Mic in
F	Parallel port		

Figure 2. Back Panel I/O Connectors

Microprocessor

The motherboard supports a single Pentium II processor or a single Celeron processor. Processors are not included with the RC440BX motherboard and must be purchased separately.

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

The motherboard supports the following processors:

Processor Type	Processor Speed (in MHz)	Host Bus Frequency (in MHz)	Level 2 Cache (in KB)
Pentium II processor	233	66	512
	266	66	512
	300	66	512
	333	66	512
	350	100	512
	400	100	512
	450	100	512
Celeron processor	266	66	0
	300	66	0
	300A	66	128
	333	66	128

For the latest information on processor support for the RC440BX motherboard, refer to the Intel boxed motherboard web site at:

<http://support.intel.com/support/motherboards/desktop/>

Microprocessor Upgrades

The motherboard can be upgraded with any processor at speeds specified in the section above. To upgrade the processor, see Chapter 2.

Main Memory

The motherboard has two sockets for installing DIMMs. Minimum memory size is 16 MB; maximum memory size is 256 MB. To install memory, see Chapter 2.

Second Level Cache Memory

The second level cache for the Pentium II processor 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.

The Celeron processors that include an integrated 128 KB second level cache subsystem have it implemented on the processor die. All supported onboard memory can be cached.

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 (such as CD-ROM drives)
- PIO Mode 3 and PIO Mode 4 devices
- Ultra DMA/33
- 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 Extended Capabilities Port (ECP) and Enhanced Parallel Port (EPP)
- Two serial ports
- Flexible IRQ and DMA mapping for Windows[†] 95 and Windows 98

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>

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 might 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.

Accelerated Graphics Port (AGP)

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

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

There is no AGP connector present on the motherboard, but the onboard video controller uses AGP for video operations.

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 and Windows 98. 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 seven expansion slots for installing add-in boards, such as network cards, that expand the capabilities of your computer. The expansion slots are as follows:

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

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 and Windows 98

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 and Windows 98 support 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 might 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 Serial Port A. 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 \pm 5 % at 720 mA. Failure to provide adequate standby current when implementing Wake on LAN, can damage the power supply.

Graphics Subsystem

The graphics subsystem features the nVidia RIVA128ZX graphics controller and a VIP video interface port.

See Intel's World Wide Web site for graphics drivers:

<http://support.intel.com/support/motherboards/desktop>

nVidia RIVA128ZX Graphics Controller

The nVidia RIVA128ZX graphics controller is paired with 8 MB of SDRAM video memory and features:

- 2x AGP graphics support
- Resolutions up to 1600 x 1200 x 32 bits per pixel at 75 Hz refresh rate
- 64-bit graphics pipeline to video memory
- High-performance, 128-bit 2D/GUI/DirectDraw[†] acceleration
- Interactive, Direct3D[†] acceleration
- Video acceleration for DirectDraw/DirectVideo[†], MPEG-1, MPEG-2, and Indeo[®] video technology
- ACPI power management

VIP Video Interface Port

VIP is a standard interface between video-enabled graphics controllers and one or more video devices, such as video decoders. The VIP port features:

- Backward compatibility with the VESA Feature Connector
- RIVA 128ZX supports an ITU-CCIR-656 input stream, as available from most PCI-based DVD cards and TV decoder cards, with horizontal (HSYNC) and vertical (VSYNC) synchronization, odd and even video field, and ancillary data functions
- Support for up to four VIP slave devices
- Plug-and-play support through the graphics controller AGP interface
- Variable resolutions and scan rates and interlaced and non-interlaced video

Audio Subsystem

The audio subsystem consists of these devices:

- Sound Blaster AudioPCI 64V audio controller
- Crystal Semiconductor CS4297 stereo audio codec
- Back panel and onboard audio connectors

Sound Blaster AudioPCI 64V Audio Controller

- Interfaces to PCI bus as a Plug and Play device
- 100% DOS legacy compatible
- Access to main memory (through the PCI bus) for wavetable synthesis support – does not require a separate wavetable ROM device
- PC 98 compliant
- Connector for digital audio (optional)

Crystal Semiconductor CS4297 Stereo Audio Codec

- High performance 18-bit stereo full-duplex audio codec with up to 48 kHz sampling rate
- Connects to the Sound Blaster AudioPCI 64V using a five-wire digital interface

Audio Connectors

The audio connectors include the following:

- Back panel audio jacks: Line out, Line in, Mic in, and MIDI/Game Port
- ATAPI-style connectors: CD-ROM Audio, Line in (optional), Auxiliary line in, Telephony
- PC/PCI audio
- Digital audio (optional)

⇒ NOTE

The Line out connector, located on the back panel, is designed to power headphones or amplified speakers only. Poor audio quality may occur if passive (non-amplified) speakers are connected to this output.

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

Audio Drivers and Utilities

Audio software and utilities are available from Intel's World Wide Web site:

<http://support.intel.com/support/motherboards/desktop>

Hardware Monitor

The 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 the 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 bus (SMBus).

Speaker (Optional)

A 47 Ω inductive speaker is mounted on the motherboard. The speaker provides audible error code (beep code) information during the power-on self test (POST).

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 eleven screws. Figure 3 shows the locations of the mounting screw holes.

⇒ NOTES

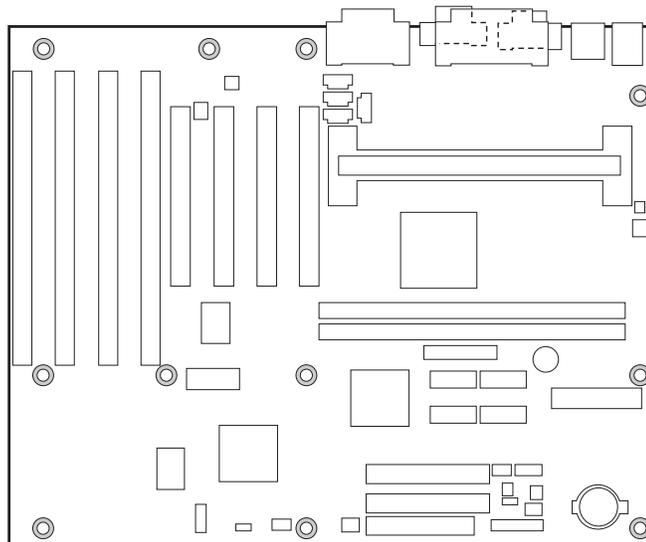
You will need a Phillips (#2 bit) screwdriver.

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.



OM07382

Figure 3. Mounting Screw Holes

How to Install a Pentium® II Processor

To install a processor, 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

Celeron processors use a different retention mechanisms. If you have a Celeron processor, see “How to Install a Celeron™ Processor” on page 25.

⇒ NOTE

If you are installing a boxed Intel Pentium II processor, see “How to Upgrade to a Boxed Pentium II Processor” on page 29.

Install the Retention Mechanism

To install the retention mechanism, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 21).
2. Find the 242-contact slot connector on the motherboard (see Figure 1 on page 10).

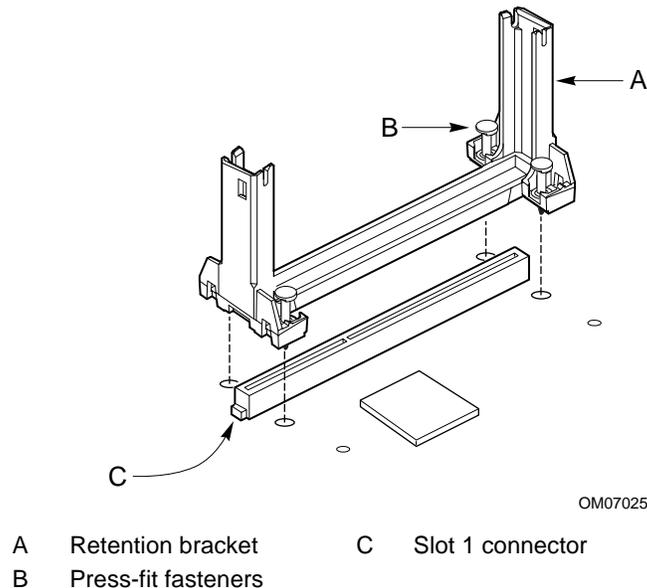


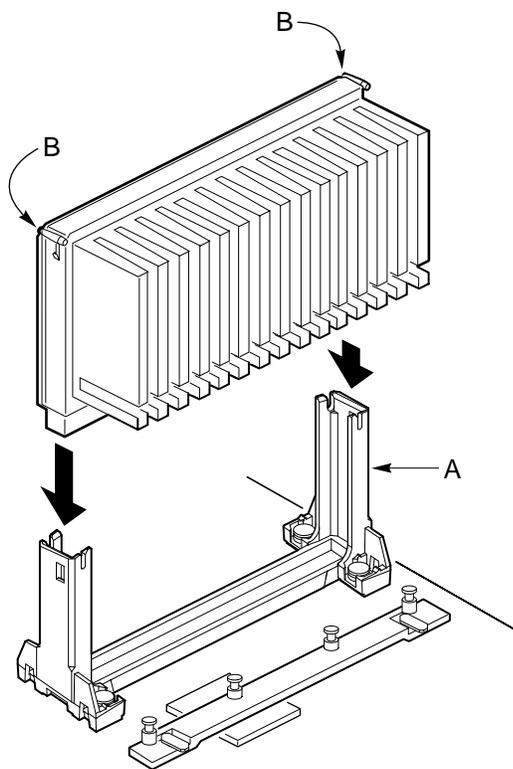
Figure 4. Installing the Processor Retention Mechanism

3. Orient the retention bracket so the tab of the 242-contact slot connector matches the corresponding cutout in the retention bracket, then position the retention bracket on the motherboard (see Figure 4).
4. Push each of the four fasteners through the motherboard mounting hole until you feel it snap into place.

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 242-contact slot connector and the latches on the processor lock into place.

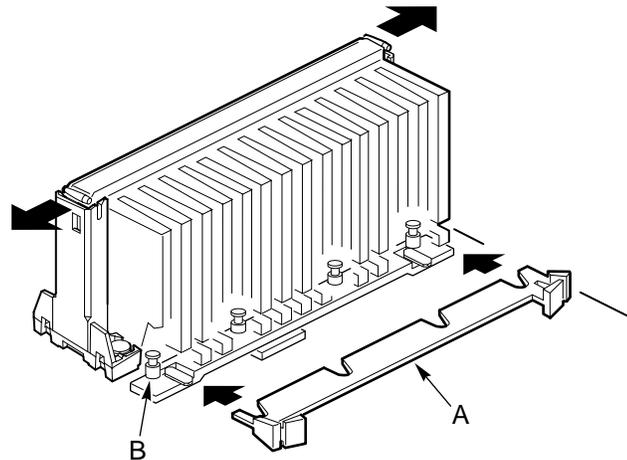


OM08232

- A Retention mechanism
- B Latches

Figure 5. Installing the Processor

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



OM08234

- A Heatsink support bar
B Retaining pins

Figure 6. Installing the Heatsink Support Top Bar

How to Install a Celeron™ Processor

To install a processor, you must:

- Install the retention mechanism.
- Install the processor.
- Set the processor speed.

Detailed instructions follow for each of these procedures.

⇒ NOTE

Pentium II processors use a different retention mechanism. If you have a Pentium II processor, see “How to Install a Pentium II Processor” on page 23.

⇒ NOTE

If you are installing a boxed Intel Pentium II processor, see “How to Upgrade to a Boxed Pentium II Processor” on page 29.

Install the Retention Mechanism

To install the retention mechanism, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 21).
2. Find the 242-contact slot connector on the motherboard (see Figure 1 on page 10).

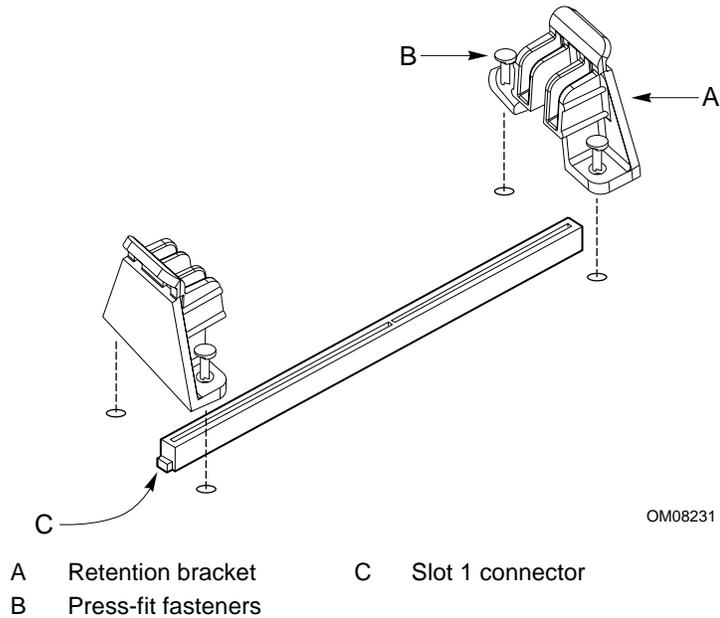


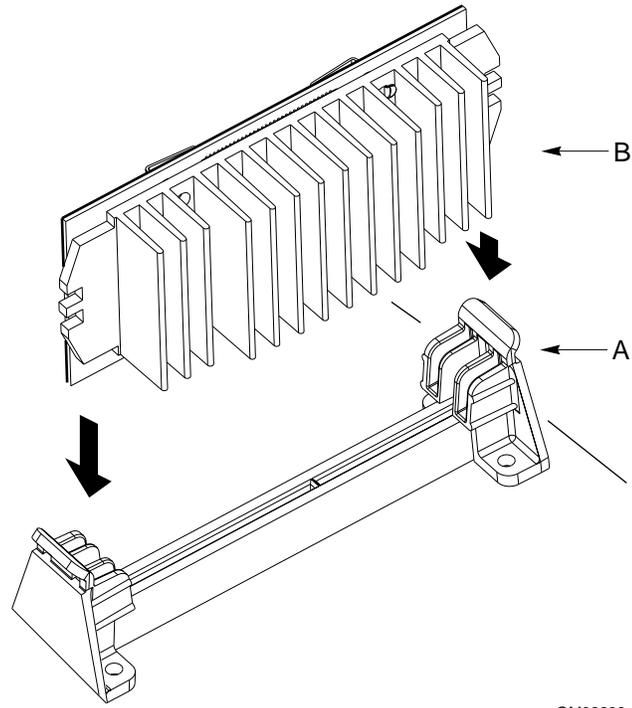
Figure 7. Installing the Processor Retention Mechanism

3. Orient the retention brackets so the sides with the slots are facing each other (see Figure 7), then position the retention brackets on the motherboard.
4. Push each of the four fasteners through the motherboard mounting hole until you feel it snap into place.

Install the Processor

To install the processor, follow these steps:

1. Insert the processor in the center slot of the retention mechanism as shown in Figure 8.
2. Press down on the processor until it is firmly seated in the 242-contact slot connector and the latches on the retention mechanism lock into place.



OM08233

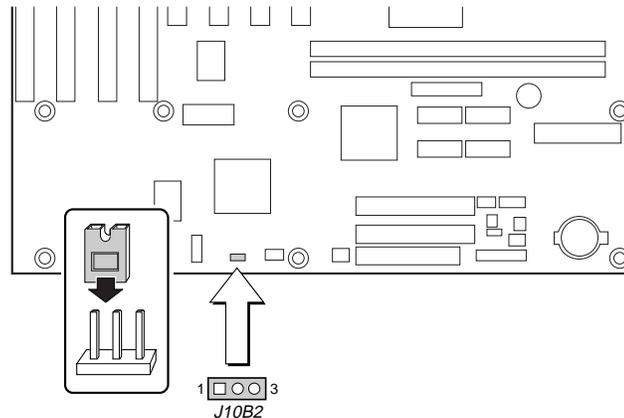
- A Retention mechanism
- B Latches

Figure 8. Installing the Processor

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



OM07383

Figure 9. Location of the Configuration Jumper Block

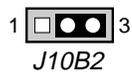


CAUTION

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 21).
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 9).
5. Place the jumper on pins 2-3 as shown below.



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.



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 by removing the existing processor:

- If you are upgrading from a Pentium II processor, see *Removing a Pentium II Processor* below.
- If you are upgrading from a Celeron processor, see “*Removing a Celeron Processor*” on page 33.

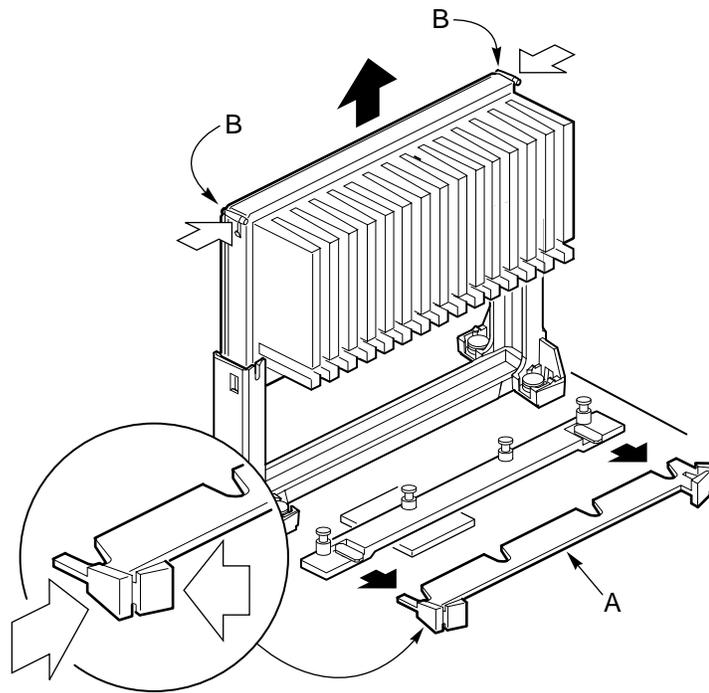
After you have removed the existing processor, see the documentation that came with the boxed Intel Pentium II processor for instructions on installing the new processor.

Removing a Pentium II Processor

To remove the installed processor, follow these steps:

1. Observe the precautions in “*Before You Begin*” (see page 21).
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*” on page 22.)
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 10. Press in on the latches to release the top bar.



- A Heatsink support top bar
- B Latches

Figure 10. Removing the Heatsink Support Top Bar and the Processor



CAUTION

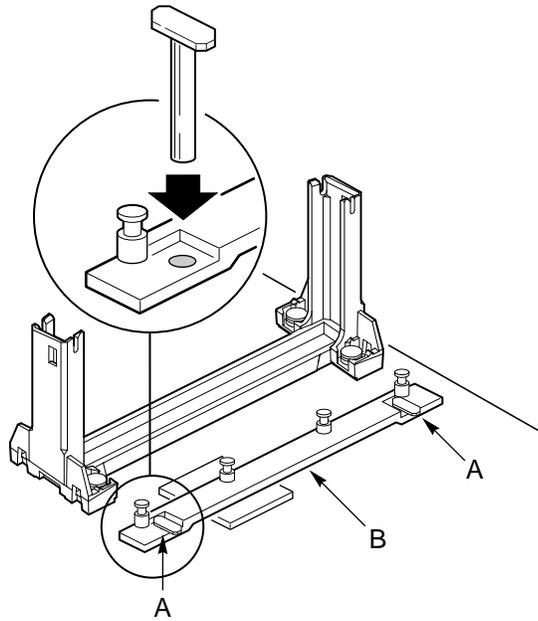
Pressing on the motherboard or components while removing the processor can cause damage. If necessary, you can safely press on the motherboard's plastic connectors to gain leverage while removing the processor.

7. Remove the processor by pressing in on the latches and pulling the processor straight up as shown in Figure 10. Place the processor aside.

⇒ **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).

8. With your fingers, remove the two retention pins from the heatsink support base as shown in Figure 11.

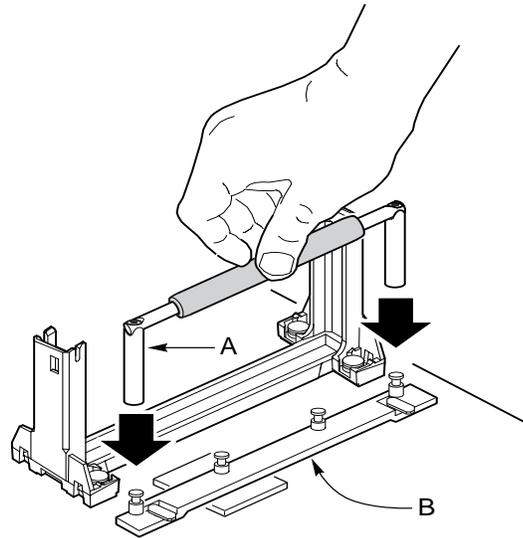


OM08240

- A Retention pins
- B Heatsink support base

Figure 11. Removing the Heatsink Support Retention Pins

9. Place the heatsink support removal tool over the two outside posts of the heatsink support base as shown in Figure 12. Make sure the tool completely engages the posts.

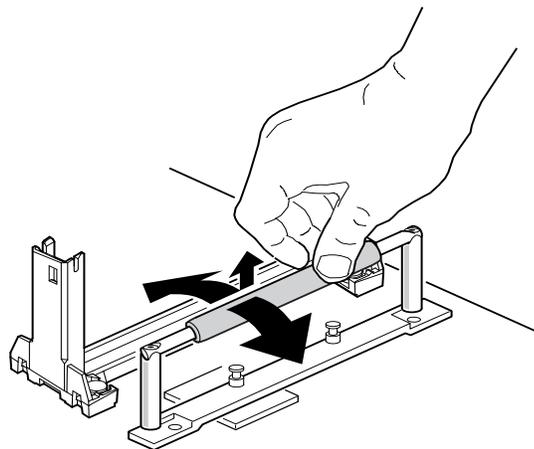


OM08241

A Heatsink support removal tool B Heatsink support base

Figure 12. Placing the Heatsink Support Base Removal Tool on the Retention Pins

10. Carefully rock the tool back and forth until the heatsink support base disengages from the holes in the motherboard (as shown in Figure 13). There is an audible click when the base disengages from the motherboard.



OM08242

Figure 13. Using the Heatsink Support Base Removal Tool

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

That completes the removal of the Pentium II processor and heatsink support base. See the documentation that came with the boxed Intel Pentium II processor for instructions on installing the new processor.

Removing a Celeron Processor

To remove the installed processor, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 21).
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” on page 22.)
5. Place the motherboard on a flat work surface and remove any components that block access to the installed processor.

⇒ NOTE

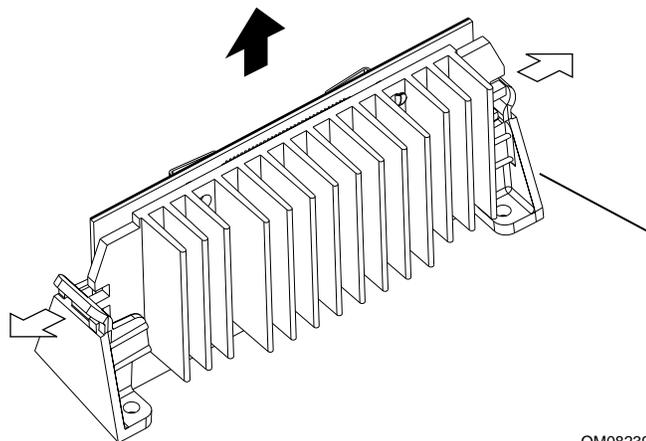
The following step is easier to accomplish with two people. While one person pulls out on the retention mechanism the second person pulls up on the processor.



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.

6. Remove the processor by pulling out on the latches at the top of the retention mechanism and pulling the processor straight up as shown in Figure 14.



OM08239

Figure 14. Removing the Celeron Processor

⇒ NOTE

To remove the processor retention mechanism from the motherboard, you need a special removal tool (P/N 000020) that is available from Napco (call 602-968-5586 for ordering information).

7. Remove the four fasteners that hold the two ends of the retention mechanism in place: insert the prongs of the removal tool under the head of the fastener and pull back on the handle of the tool to pry up the fastener.
8. Remove the two ends of the retention mechanism from the board.

That completes the removal of the Celeron processor and retention mechanism. See the documentation that came with the boxed Intel Pentium II processor for instructions on installing the new processor.

Upgrade the Processor

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

How to Install Memory

You can install from 16 MB to 256 MB of memory in the motherboard DIMM sockets. The board has DIMM sockets arranged as banks 0 and 1. 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 Capacity	DIMM Organization*	SDRAM Density	SDRAM Organization	Number of SDRAMs
16 MB	2M X 64	16 Mbit	1M X 16	8
16 MB	2M X 64	16 Mbit	2M X 8	8
16 MB	2M X 64	64 Mbit	2M X 32	2
32 MB	4M X 64	16 Mbit	2M X 8	16**
32 MB	4M X 64	64 Mbit	2M X 32	4
32 MB	4M X 64	64 Mbit	4M X 16	4
64 MB	8M X 64	64 Mbit	4M X 16	8
64 MB	8M X 64	64 Mbit	8M X 8	8
128 MB	16M X 64	64 Mbit	8M X 8	16**

* ECC DIMM organization will be X 72 and one additional component will be used on each side of DIMM.

** If number of SDRAMs is greater than nine, the DIMM will be double sided.

When adding memory, follow these guidelines:

- You can install DIMMs in either of the two 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).



CAUTION

To be fully compliant with all applicable Intel® SDRAM memory specifications, the motherboard should be populated with DIMMs that support the Serial Presence Detect (SPD) data structure. If your memory modules do not support SPD, you will see a notification to this effect on the screen at power up. The BIOS will attempt to configure the memory controller for normal operation. However, DIMMs might not function under the determined frequency. You can access the PC Serial Presence Detect Specification at:

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

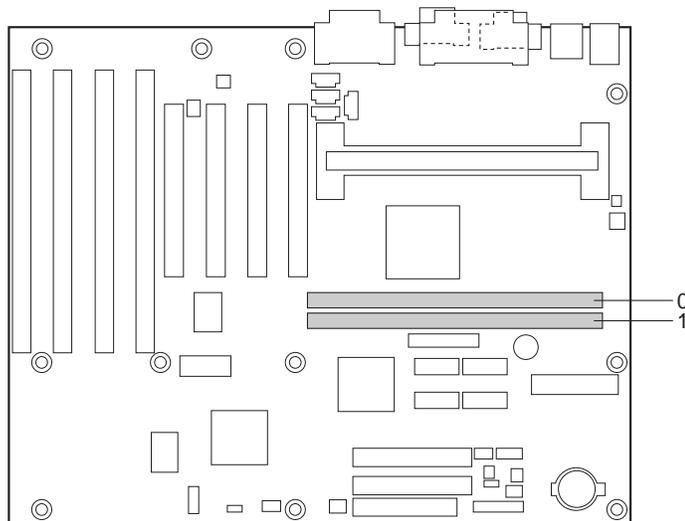


NOTE

All memory components and DIMMs used with the RC440BX motherboard must comply with the PC SDRAM specifications. These include: the PC SDRAM Specification (memory component specific), the PC100 SDRAM Component Testing Summary, the PC Unbuffered DIMM Specification, and the PC Registered DIMM Specification. You can access these documents through the Internet at:

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

Figure 15 shows the location of the DIMM sockets.

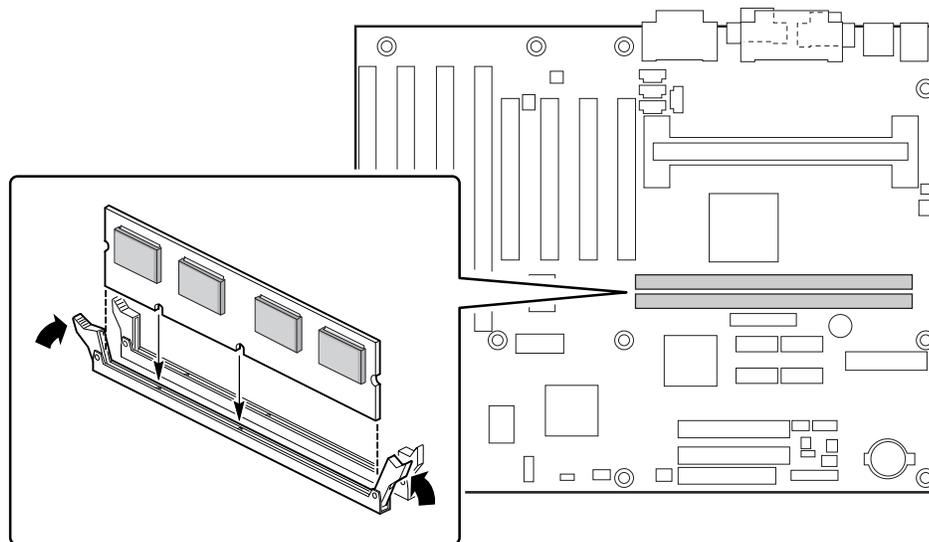


OM07386

Figure 15. Location of DIMM Sockets

To install DIMMs, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 21).
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 16).
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).



OM07387

Figure 16. Installing a DIMM

How to Remove Memory

To remove a DIMM, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 21).
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 17 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 rebut 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

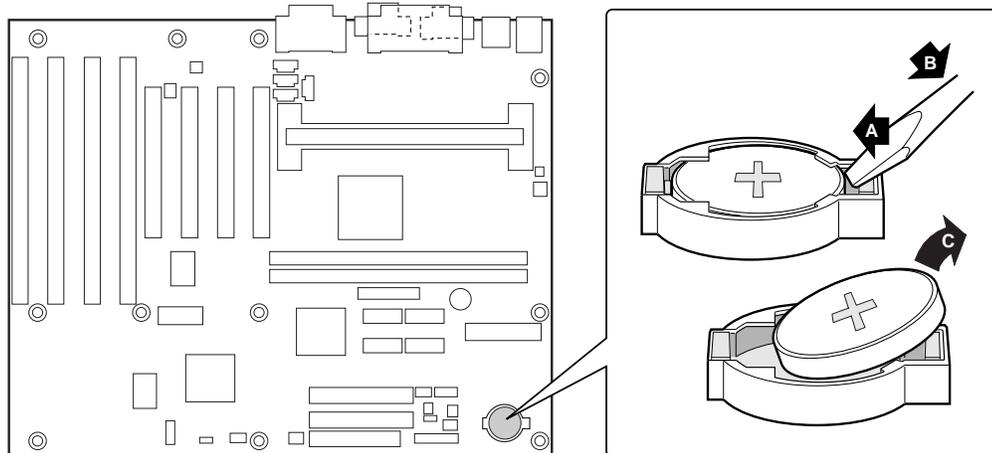
Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

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

To replace the battery, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 21).
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 17).
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.



OM07388

Figure 17. Replacing the Battery

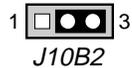
⇒ **NOTE**

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.

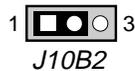
How to Clear the Passwords

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 21).
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 9).
5. Place the jumper on pins 2-3 as shown below.



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.



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 J10B2 (see Figure 9). 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 immediately press <F2> until you see the message:

Entering SETUP

⇒ NOTE

The Setup menu screens described in this section apply to RC440BX motherboards with BIOS identifier 4R4CBOXA.86A.0007.P02. Motherboards with other BIOS identifiers might have differences in one or more of the Setup menu screens.

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. See Setup Program Modes (page 41).
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.
Exit1	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. Help text appears on the right side of the screen for each selection.
<Esc>	Exits the menu.
<<-> or <->>	Selects a different menu screen.
<↑> or <↓>	Moves cursor up or down.
<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. To set the processor speed, see “How to Set the Processor Speed” on page 28. To clear the password, see “How to Clear the Passwords” on page 39”.

Table 4. Maintenance Menu

Feature	Options	Description
Processor Speed (66 MHz Host Bus)	233 266 300 333	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.
Processor Speed (100 MHz Host Bus)	350 400 450	With a host bus operating at 100 MHz, the board supports processors at the following speeds: 350, 400, and 450 MHz.
Clear All Passwords	No options	Clears the user and administrative 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 the amount of cache RAM for the processor.
Total Memory	No options	Displays the total amount of RAM on the motherboard.
Bank 0 Bank 1	No options	Displays size and type of DIMM installed in each memory bank.
Language	<ul style="list-style-type: none"> • English (US) (default) • Deutsche • Francais • Italiano • Espanol 	Selects the default language used by the BIOS.
Cache Bus ECC	<ul style="list-style-type: none"> • Disabled (default) • Enabled 	Enables or disables ECC on the cache bus.
Memory Configuration	<ul style="list-style-type: none"> • non-ECC (default) • ECC 	Enables or disables ECC.
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
Boot Settings Configuration	No options	Configures Plug and Play and the Numlock key, and resets configuration data. When selected, displays the Boot Settings Configuration submenu.
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.
Diskette Configuration	No options	When selected, displays the Floppy Options submenu.
Event Log Configuration	No options	Configures Event Logging. When selected, displays the Event Log Configuration 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.

Boot Setting Configuration Submenu

This menu is for setting Plug and Play and the Num Lock key, and for resetting configuration data.

Table 7. Boot Setting Configuration Submenu

Feature	Options	Description
Plug & Play O/S	No (default) Yes	Specifies if a Plug and Play operating system is being used. <i>No</i> lets the BIOS configure all devices. <i>Yes</i> lets the operating system configure Plug and Play devices. Not required with a Plug and Play operating system.
Reset Config Data	No (default) Yes	Clears the BIOS configuration data on the next boot.
Num Lock	On (default) Off	Specifies the power on state of the Num Lock feature on the numeric keypad of the keyboard.

Peripheral Configuration Submenu

This submenu is for the configuring the computer peripherals.

Table 8. Peripheral Configuration Submenu

Feature	Options	Description
Serial port A	<ul style="list-style-type: none"> • Disabled • Enabled • Auto (default) 	<p>Configures serial port A.</p> <p><i>Auto</i> assigns the first free COM port, normally COM1, the address 3F8h and the interrupt IRQ4.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p>
Base I/O address	<ul style="list-style-type: none"> • 3F8 (default) • 2F8 • 3E8 • 2E8 	<p>Specifies the base I/O address for serial port A, if serial port A is Enabled.</p>
Interrupt	<ul style="list-style-type: none"> • IRQ 3 • IRQ 4 (default) 	<p>Specifies the interrupt for serial port A, if serial port A is Enabled.</p>
Serial port B	<ul style="list-style-type: none"> • Disabled • Enabled • Auto (default) 	<p>Configures serial port B.</p> <p><i>Auto</i> assigns the first free COM port, normally COM2, the address 2F8h and the interrupt IRQ3.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p> <p>If either serial port address is set, that address will not appear in the list of options for the other serial port.</p> <p>If an <i>ATI mach32^t</i> or an <i>ATI mach64^t</i> 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.</p>
Mode	<ul style="list-style-type: none"> • Normal (default) • IrDA[†] SIR-A • ASK_IR 	<p>Specifies the mode for serial port B for normal (COM 2) or infrared applications. This option is not available if serial port B has been disabled.</p>
Base I/O address	<ul style="list-style-type: none"> • 3F8 • 2F8 (default) • 3E8 • 2E8 	<p>Specifies the base I/O address for serial port B, if serial port B is Enabled.</p>
Interrupt	<ul style="list-style-type: none"> • IRQ 3 (default) • IRQ 4 	<p>Specifies the interrupt for serial port B, if serial port B is Enabled.</p>
Parallel port	<ul style="list-style-type: none"> • Disabled • Enabled • Auto (default) 	<p>Configures the parallel port.</p> <p><i>Auto</i> assigns LPT1 the address 378h and the interrupt IRQ7.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p>

continued

Table 8. Peripheral Configuration Submenu (continued)

Feature	Options	Description
Mode	<ul style="list-style-type: none"> • Output Only • Bi-directional (default) • EPP • ECP 	<p>Selects the mode for the parallel port.</p> <p><i>Output Only</i> operates in AT[†]-compatible mode.</p> <p><i>Bi-directional</i> operates in bi-directional PS/2-compatible mode.</p> <p><i>EPP</i> is Extended Parallel Port mode, a high-speed bi-directional mode.</p> <p><i>ECP</i> is Enhanced Capabilities Port mode, a high-speed bi-directional mode.</p>
Base I/O address	<ul style="list-style-type: none"> • 378 (default) • 278 • 228 	Specifies the base I/O address for the parallel port, if the parallel port is Enabled.
Interrupt	<ul style="list-style-type: none"> • IRQ 5 (default) • IRQ 7 	Specifies the interrupt for the parallel port, if the parallel port is Enabled.
Audio Device	<ul style="list-style-type: none"> • Disabled • Enabled (default) 	Enables or disables the onboard audio subsystem.
Legacy USB Support	Disabled Enabled Auto (default)	Enables or disables USB legacy support.

IDE Configuration

Table 9. IDE Device Configuration

Feature	Options	Description
IDE Controller	<ul style="list-style-type: none"> • Disabled • Primary • Secondary • Both (default) 	<p><i>Disabled</i>, disables the integrated IDE Controller.</p> <p><i>Primary</i>, enables only the Primary IDE Controller.</p> <p><i>Secondary</i>, enables only the Secondary IDE Controller.</p> <p><i>Both</i>, enables both IDE Controllers.</p>
Hard Disk Pre-Delay	<ul style="list-style-type: none"> • Disabled (default) • 3 seconds • 6 seconds • 9 seconds • 12 seconds • 15 seconds • 21 seconds • 30 seconds 	Selects the hard disk drive pre-delay. Causes the BIOS to insert a delay before attempting to detect IDE drives in the system.
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 10. IDE Configuration Submenus

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

Diskette Configuration Submenu

This submenu is for configuring diskette drives.

Table 11. Diskette Configuration Submenu

Feature	Options	Description
Diskette Controller	<ul style="list-style-type: none"> Disabled Enabled (default) 	Disables or enables the integrated diskette controller.
Diskette A:	<ul style="list-style-type: none"> 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.
Diskette Write Protect	Disabled (default) Enabled	Disables or enables write protect for the diskette drive(s).

Event Logging Submenu

This submenu is for configuring the DMI event logging features.

Table 12. 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 event log	No options	Enables viewing of event log.
Clear all event logs	<ul style="list-style-type: none"> No (default) Yes 	Clears the event log after rebooting.
Event Logging	<ul style="list-style-type: none"> Disabled Enabled (default) 	Enables logging of events.
ECC Event Logging	<ul style="list-style-type: none"> Disabled Enabled (default) 	Enables logging of ECC events.
Mark events as read	No options	Marks all events as read.

Video Configuration Submenu

This submenu is for configuring video features.

Table 13. Video Configuration Submenu

Feature	Options	Description
Palette Snooping	<ul style="list-style-type: none"> 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 AGP video controller.

Resource Configuration Submenu

This submenu is for configuring the memory and interrupts.

Table 14. Resource Configuration Submenu

Feature	Options	Description
Memory Reservation	<ul style="list-style-type: none"> • C800 - CBFF Available (default) Reserved • CC00- CFFF Available (default) Reserved • D000 - D3FF Available (default) Reserved • D400 - D7FF Available (default) Reserved • D800 - DBFF Available (default) Reserved • DC00 - DFFF Available (default) Reserved 	Reserves specific upper memory blocks for use by legacy ISA devices.
IRQ Reservation	IRQ3 Available (default) Reserved IRQ4 Available (default) Reserved IRQ5 Available (default) Reserved IRQ7 Available (default) Reserved IRQ10 Available (default) Reserved IRQ11 Available (default) 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 15. 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 Password	No Options	Clears the user password.
User Setup Access	<ul style="list-style-type: none"> • Limited (default) • No Access • View Only • Full 	Controls the amount of User Setup Access. <i>No Access</i> 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 16. Power Menu

Feature	Options	Description
Power Management	<ul style="list-style-type: none"> Disabled Enabled (default) 	Enables or disables the BIOS power management feature.
Inactivity Timer	<ul style="list-style-type: none"> Off 1 Minute 5 Minutes 10 Minutes 20 Minutes (default) 30 Minutes 60 Minutes 120 Minutes 	Specifies the amount of time before the computer enters standby mode.
Hard Drive	<ul style="list-style-type: none"> Disabled Enabled (default) 	Enables power management for hard disks during standby and suspend modes.
Video Power Down	Disabled Standby Suspend (default) 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 17. Boot Menu

Feature	Options	Description
Quiet Boot	<ul style="list-style-type: none"> Disabled Enabled (default) 	<i>Disabled</i> displays normal POST messages. <i>Enabled</i> displays OEM logo instead of POST messages.
Quick Boot	<ul style="list-style-type: none"> Disabled Enabled (default) 	Enables the computer to boot without running certain POST tests.
Scan User Flash Area	<ul style="list-style-type: none"> Disabled (default) Enabled 	Enables the BIOS to scan the flash memory for user binary files that are executed at boot time.
After Power Failure	<ul style="list-style-type: none"> Stays Off Last State (default) Power On 	Specifies the mode of operation if an AC/Power loss occurs. <i>Power On</i> restores power to the computer. <i>Stay Off</i> keeps the power off until the power button is pressed. <i>Last State</i> restores the previous power state before power loss occurred.

continued

Table 17. Boot Menu (continued)

Feature	Options	Description								
On Modem Ring	<ul style="list-style-type: none"> • Stay Off (default) • Power On 	Specifies how the computer responds to an incoming call on an installed modem when the power is off.								
On LAN	<ul style="list-style-type: none"> • Stay Off • Power On (default) 	Specifies how the computer responds to a LAN wakeup event when the power is off.								
On PME	<ul style="list-style-type: none"> • Stay Off (default) • Power On 	Specifies how the computer responds to a PME wakeup event when the power is off.								
First Boot Device Second Boot Device Third Boot Device Fourth Boot Device	<ul style="list-style-type: none"> • Disabled • 1st IDE-HDD • 2nd IDE-HDD • 3rd IDE-HDD • 4th IDE-HDD • Floppy • ARMD-FDD • ARMD-HDD • ATAPI CDROM • SCSI • NETWORK 	<p>Specifies the boot sequence from the available devices. To specify boot sequence, select the boot device with <↑> or <↓> and press <Enter>.</p> <p>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.</p> <p>For a typical system including a floppy drive, a hard disk drive, and a CD ROM drive, the default boot devices are:</p> <table> <tbody> <tr> <td>First Boot Device</td> <td>Floppy</td> </tr> <tr> <td>Second Boot Device</td> <td>1st IDE-HDD</td> </tr> <tr> <td>Third Boot Device</td> <td>ATAPI CDROM</td> </tr> <tr> <td>Fourth Boot Device</td> <td>Disabled</td> </tr> </tbody> </table>	First Boot Device	Floppy	Second Boot Device	1st IDE-HDD	Third Boot Device	ATAPI CDROM	Fourth Boot Device	Disabled
First Boot Device	Floppy									
Second Boot Device	1st IDE-HDD									
Third Boot Device	ATAPI CDROM									
Fourth Boot Device	Disabled									

Exit Menu

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

Table 18. 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.

4 Upgrading the BIOS

This chapter describes how to upgrade the BIOS and how to recover the BIOS if an upgrade fails.

Preparing for the Upgrade

Before you upgrade the BIOS, prepare by:

- Obtaining the BIOS upgrade file
- Recording the current BIOS settings
- Creating a bootable diskette
- Creating the BIOS upgrade diskette

Obtaining the BIOS Upgrade File

You can upgrade to a new version of the BIOS by using the BIOS upgrade file. The BIOS upgrade file is a compressed self-extracting archive that contains all the files you need to upgrade the BIOS. The BIOS upgrade file contains:

- New BIOS files
- BIOS recovery files
- Intel® Flash Memory Update Utility

You can obtain the BIOS upgrade file through your computer supplier or from the Intel World Wide Web site:

<http://support.intel.com/support/motherboards/desktop/>

⇒ NOTE

Please review the instructions distributed with the update utility before attempting a BIOS upgrade.

The Intel Flash Memory Update Utility allows you to:

- Upgrade the BIOS in flash memory.
- Update the language section of the BIOS.

Recording the Current BIOS Settings

1. Boot the computer and press <F2> when you see the message:

Press <F2> Key if you want to run SETUP

📁 NOTE

Do not skip step 2. You will need these settings to configure your computer at the end of the upgrade procedure.

2. Write down the current settings in the BIOS Setup program.

Creating a Bootable Diskette

⇒ NOTE

If your drive A is an LS-120 diskette drive, you must use a 1.44-MB diskette as the bootable BIOS upgrade diskette. The computer is unable to recover a BIOS from an LS-120 diskette.

Create a Bootable Diskette (using a DOS system to create the bootable diskette)

- Place an unformatted diskette in the diskette drive and format the diskette using the /S option.
Example: format a: /s
- Alternatively, place a formatted diskette in the diskette drive and use the "sys" command.
Example: sys a:

Create a Bootable Diskette (using a non-DOS system to create the bootable diskette)

- Double click on the file 'MK_BOOTZ.EXE' (which is located inside the self-extracting BIOS file). This will create a 'README.TXT' file.

Follow the directions in the 'README.TXT' file.

Creating the BIOS Upgrade Diskette

Obtain the BIOS upgrade file as described in “Obtaining the BIOS Upgrade File” and then:

1. Copy the BIOS upgrade file to a temporary directory on your hard disk.
2. From the C:\ prompt, change to the temporary directory.
3. To extract the file, type the name of the BIOS upgrade file, for example:

```
RCBIOS01.exe
```
4. Press <Enter>. The extracted file contains the following files:

```
LICENSE.TXT
BIOINSTR.TXT
BIOS.EXE
MK_BOOTZ.EXE
```
5. Read the LICENSE.TXT file, which contains the software license agreement, and the BIOINSTR.TXT file, which contains the instructions for the BIOS upgrade.
6. Insert the bootable diskette into drive A.
7. To extract the BIOS.EXE file to the diskette, change to the temporary directory that holds the BIOS.EXE file and type:

```
BIOS A:
```
8. Press <Enter>.
9. The diskette now holds the new BIOS files, the Intel Flash Update Utility, and the recovery files.

Upgrading the BIOS

1. Boot the computer with the BIOS upgrade diskette in drive A. Press <Enter> to go to the Main Menu. The flash memory update utility screen appears.
2. Select Update flash memory area from a file. Press <Enter>.
3. Select Update System BIOS. Press <Enter>.
4. Use the arrow keys to select the correct .bio file. Press <Enter>.
5. When the utility asks for confirmation that you want to flash the new BIOS into memory, select Continue with programming. Press <Enter>.
6. When the utility displays the message Reboot Warning, remove the diskette. Press <Enter>.
7. As the computer boots, check the BIOS identifier (version number) to make sure the upgrade was successful. If a logo appears, press <Esc> to view POST messages.
8. To enter the BIOS Setup program, press <F1> when you see the message:

Press <F1> to Run SETUP
9. For proper operation, load the BIOS Setup program defaults. To load the defaults, press <F9>.
10. To accept the defaults, press <Enter>.
11. In Setup, set the options to the settings you wrote down before beginning the BIOS upgrade.
12. To save the settings, press <F10>.
13. To accept the settings, press <Enter>.
14. Turn off the computer and reboot.

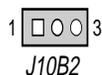
Recovering the BIOS

It is unlikely that anything will interrupt the BIOS upgrade; however, if an interruption occurs, the BIOS could be damaged. The following steps explain how to recover the BIOS if an upgrade fails. The following procedure uses recovery mode for the Setup program. See Chapter 3 for more information on Setup modes.

NOTE

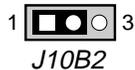
Because of the small amount of code available in the non-erasable boot block area, there is no video support. You will not see anything on the screen during this procedure. Monitor the procedure by listening to the speaker and looking at the diskette drive LED.

1. Turn off the computer, disconnect the computer's power cord, and disconnect all external peripherals.
2. Remove the computer cover and locate the configuration jumper block (J10B2) (see Figure 7).
3. Remove the jumper from all pins as shown below to set recovery mode for Setup.



4. Insert the bootable BIOS upgrade diskette into diskette drive A.
5. Replace the computer cover, connect the power cord, turn on the computer, and allow it to boot. The recovery process will take a few minutes.

6. Listen to the speaker.
 - Two beeps and the end of activity in drive A indicate successful BIOS recovery.
 - A series of continuous beeps indicates failed BIOS recovery.
7. If recovery fails, return to step 1 and repeat the recovery process.
8. If recovery is successful, turn off the computer and disconnect its power cord.
9. Remove the computer cover and continue with the following steps.
10. On the jumper block (J10B2), move the jumper back to pins 1-2 as shown below to set normal mode for Setup.



11. Leave the upgrade diskette in drive A, replace the computer cover, and connect the computer's power cord.
12. Turn on the computer and continue with the BIOS upgrade (see page 55).

Changing the BIOS Language

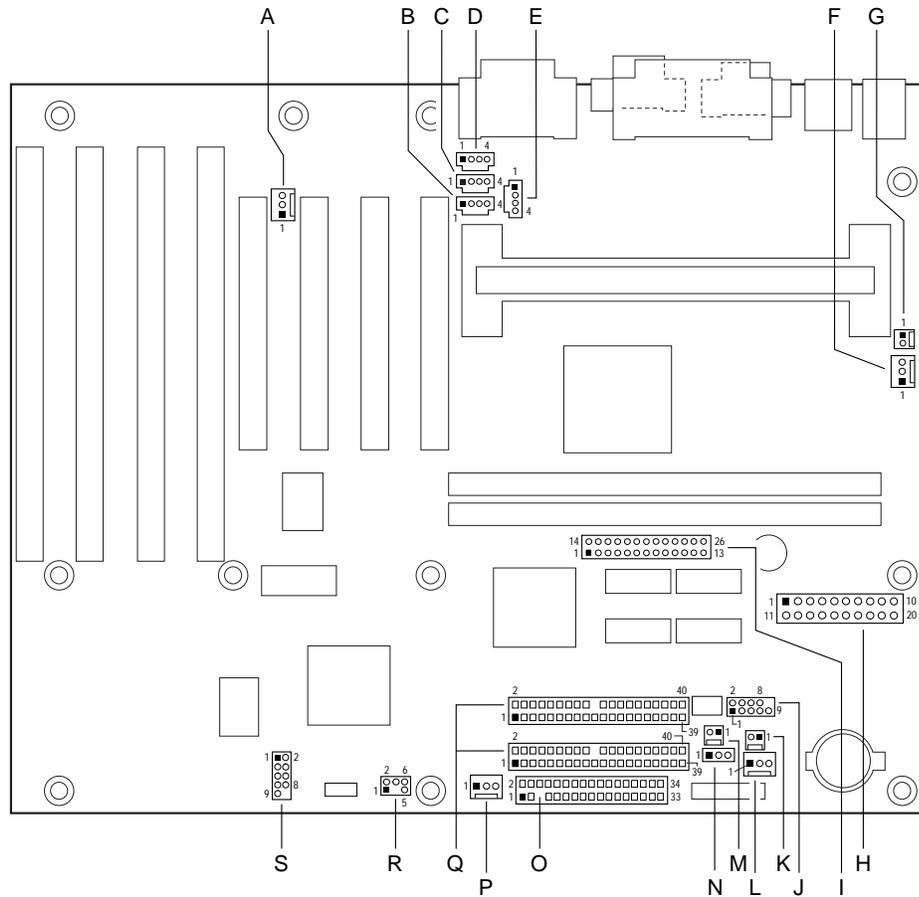
You can use the BIOS upgrade utility to change the language the BIOS uses for messages and the Setup program. Use a bootable diskette containing the Intel Flash Memory Update Utility and language files (see "Upgrading the BIOS" on page 55).

1. Boot the computer with the bootable diskette in drive A. The BIOS upgrade utility screen appears.
2. Select `Update Flash Memory From a File`.
3. Select `Update Language Set`. Press `<Enter>`.
4. Select drive A and use the arrow keys to select the correct `.lng` file. Press `<Enter>`.
5. When the utility asks for confirmation that you want to flash the new language into memory, select `Continue with Programming`. Press `<Enter>`.
6. When the utility displays the message `upgrade is complete`, remove the diskette. Press `<Enter>`.
7. The computer will reboot and the changes will take effect.

5 Technical Reference

Motherboard Connectors

Figure 15 shows the location of some of the motherboard connectors.



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- | | | | |
|---|--------------------------------------|---|----------------------------------|
| A | Digital audio connector (optional) | K | Wake on Ring connector |
| B | Video in connector (optional) | L | Fan 1 connector |
| C | Auxiliary line in connector | M | SCSI LED connector |
| D | Telephony connector | N | Wake on LAN technology connector |
| E | CD-ROM connector | O | Diskette drive connector |
| F | Fan 3 (processor) connector | P | Fan 2 (system) connector |
| G | Chassis intrusion connector | Q | IDE connectors |
| H | Power supply connector | R | PC/PCI connector |
| I | VIP video connector | S | Serial port B connector |
| J | USB front panel connector (optional) | | |

Figure 18. Motherboard Connectors

Table 19. Digital Audio Connector (Optional)

Pin	Signal Name
1	Vcc
2	SPDIF_OUT
3	Ground

Table 20. Optional Video In Connector (blue)

Pin	Signal Name
1	Video_IN-Left
2	Ground
3	Ground
4	Video_IN-Right

Table 21. Auxiliary Line In Connector (white)

Pin	Signal Name
1	Left Line In
2	Ground
3	Ground
4	Right Line In (monaural)

Table 22. Telephony Connector (green)

Pin	Signal Name
1	Audio In (monaural)
2	Ground
3	Ground
4	Mic preamp Out (to modem)

Table 23. CD-ROM Audio Connector (black)

Pin	Signal Name
1	CD_IN-Left
2	Ground
3	Ground
4	CD_IN-Right

Table 24. Processor Active Fan Connector

Pin	Signal Name
1	Ground
2	FAN_CTRL (+12 V)
3	Ground

Table 25. Chassis Intrusion Connector

Pin	Signal Name
1	Ground
2	CHS_SEC

Table 26. Power Supply Connector

Pin	Signal Name	Pin	Signal Name
1	+3.3 V	11	+3.3 V
2	+3.3 V	12	-12 V
3	Ground	13	Ground
4	+5 V	14	PS-ON# (power supply remote on/off control)
5	Ground	15	Ground
6	+5 V	16	Ground
7	Ground	17	Ground
8	PWRGD (Power Good)	18	-5 V
9	+5 VSB	19	+5 V
10	+12 V	20	+5 V

Table 27. VIP Video Connector

Pin	VESA Signal	VIP Signal	Pin	VESA Signal	VIP Signal
1	Ground	Ground	2	P0	VID[0]
3	Ground	Ground	4	P1	VID[1]
5	Ground	Ground	6	P2	VID[2]
7	EVIDEO	HAD[1]	8	P3	VID[3]
9	ESYNC	HAD[0]	10	P4	VID[4]
11	EDCLK #	HCTL	12	P5	VID[5]
13	Not connected	SCL	14	P6	VID[6]
15	Ground	Ground	16	P7	VID[7]
17	Ground	Ground	18	DCLK	PIXCLK
19	Ground	Ground	20	BLANK #	VIPCLK
21	Ground	Ground	22	HSYNC	Not connected
23	Not connected	VIRQ #	24	VSYNC	Not connected
25	Not connected	SDA	26	Ground	Ground

Table 28. USB Front Panel Connector (Optional)

Pin	Signal	Pin	Signal
1	TP_FPUSB_1	6	FNT_USBPO
2	Vcc (+5VDC)	7	Ground
3	Ground	8	FNT_USBPO#
4	TP_FPUSB_4	9	Ground
5	TP_FPUSB_5		

Table 29. Wake on Ring Connector

Pin	Signal Name
1	Ground
2	RINGA#

Table 30. Fan 1 Connector

Pin	Signal Name
1	Ground
2	FAN_CTRL (+12 V)
3	FAN_SEN*

* If the optional hardware monitor is not available, pin 3 is ground.

Table 31. SCSI LED Connector (Optional)

Pin	Signal Name
1	DRV_ACT#
2	No connect

Table 32. Wake on LAN Technology Connector

Pin	Signal Name
1	+5 VSB
2	Ground
3	WOL

Table 33. Diskette Drive Connector

Pin	Signal	Pin	Signal
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN
7	Ground	8	FDINDX# (Index)
9	Ground	10	FDM00# (Motor Enable A)
11	Ground	12	No connect
13	Ground	14	FDDS0# (Drive Select A)
15	Ground	16	No connect
17	No connect	18	FDDIR# (Stepper Motor Direction)
19	Ground	20	FDSTEP# (Step Pulse)
21	Ground	22	FDWD# (Write Data)
23	Ground	24	FDWE# (Write Enable)
25	Ground	26	FDTRK0# (Track 0)
27	No connect	28	FDWPD# (Write Protect)
29	Ground	30	FDRDATA# (Read Data)
31	Ground	32	FDHEAD# (Side 1 Select)
33	Ground	34	DSKCHG# (Diskette Change)

Table 34. Fan 2 Connector

Pin	Signal Name
1	Ground
2	FAN_CTRL (+12 V)
3	FAN_SEN*

* If the optional hardware monitor is not available, pin 3 is ground.

Table 35. PCI IDE Connectors

Pin	Signal	Pin	Signal
1	Reset IDE	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	Key
21	DDRQ0 [DDRQ1]	22	Ground

continued

Table 35. PCI IDE Connectors (continued)

Pin	Signal	Pin	Signal
23	I/O Write#	24	Ground
25	I/O Read#	26	Ground
27	IOCHRDY	28	P_ALE (Cable Select pull-up)
29	DDACK0# [DDACK1#]	30	Ground
31	IRQ 14 [IRQ 15]	32	Reserved
33	DAG1 (Address 1)	34	Reserved
35	DAG0 (Address 0)	36	DAG2Address 2
37	Chip Select 1P# [Chip Select 1S#]	38	Chip Select 3P# [Chip Select 3S#]
39	Activity#	40	Ground

NOTE: Signal names in brackets ([]) are for the secondary IDE connector.

Table 36. PC/PCI Connector (Optional)

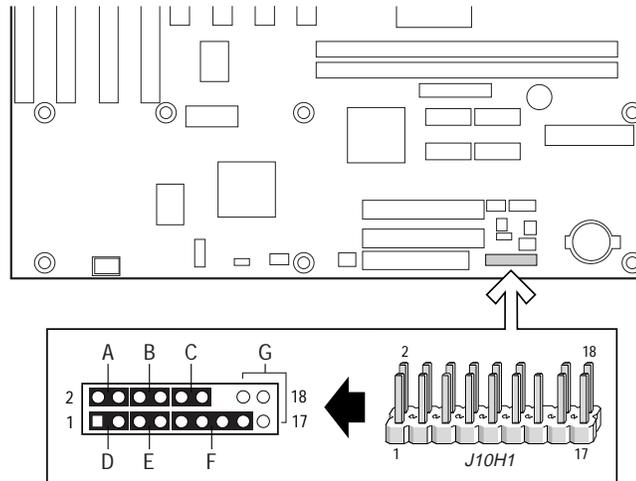
Pin	Signal Name	Pin	Signal Name
1	P_PCIGNTA#	2	Ground
3	No connect	4	P_PCIREQA#
5	Ground	6	SER_IRQ

Table 37. Serial Port B Connector

Pin	Signal	Pin	Signal
1	DCD—Data Carrier Detect	2	DSR—Data Set Ready
3	SIN #—Serial Data In	4	RTS—Request to Send
5	SOUT #—Serial Data Out	6	CTS—Clear to Send
7	DTR—Data Terminal Ready	8	RI—Ring Indicator
9	Ground		

Front Panel Connectors

The motherboard has connectors for controls and indicators typically located on the front panel of the computer.



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Figure 19. Front Panel Connectors

Table 38. Front Panel I/O Connector

Pin	Signal	In/Out	Description	Pin	Signal	In/Out	Description
1	HD_PWR	Out	Hard disk LED pull-up (330 Ω) to +5 V	2	HDR_BLNK_GRN	Out	Front panel green LED
3	HAD#	Out	Hard disk active LED	4	HDR_BLNK_YEL	Out	Front panel yellow LED
5	GND		Ground	6	FPBUT_IN	In	Front panel On/Off button
7	FP_RESET#	In	Front panel Reset button	8	GND		Ground
9	+5 V	Out	IR Power	10	FPSLP#	In	Front panel Sleep button
11	IRRX	In	IrDA serial input	12	GND		Ground
13	GND		Ground	14	(pin removed)		Not connected
15	IRTX	Out	IrDA serial output	16	+5 V	Out	Power
17	N/C		Not connected	18	N/C		Not connected

Pins 1 and 3 can be connected to an LED to provide a visual indicator that data is being read from or written to a hard drive. For the LED to function properly, an IDE drive must be connected to the onboard hard drive controller.

Pins 2 and 4 can be connected either a single or dual colored LED that will light when the computer is powered on. Table 39 and Table 40 show the possible states for these LEDs.

Table 39. Power LED (Single-colored)

LED State	Description
Off	Off
Steady Green	Running
Blinking Green	Running or message waiting (Note)

Note: To utilize the message waiting function, an OnNow / Instantly Available aware message capturing software application must be invoked.

Table 40. Power LED (Dual-colored)

LED State	Description
Off	Off
Steady Green	Running
Blinking Green	Running or message waiting (Note)
Steady Yellow	Sleeping
Blinking Yellow	Sleeping or message waiting (Note)

Note: To utilize the message waiting function, an OnNow / Instantly Available aware message capturing software application must be invoked.

Pins 6 and 8 can be connected to a front panel power switch. The switch must pull the SW_ON# pin to ground for at least 50 ms to signal the power supply to switch on or off. (The time requirement is due to internal debounce circuitry on the motherboard.) At least two seconds must pass before the power supply will recognize another on/off signal.

Pins 5 and 7 can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the motherboard resets and runs the POST.

Pins 10 and 12 can be connected to a momentary SPST type switch that is normally open. When the switch is pressed and the power is on, the motherboard will toggle in or out of the sleep state.

Pins 11, and 13 - 16 can be connected to an IrDA module. After the IrDA interface is configured, files can be transferred to or from portable devices such as laptops, PDAs, and printers using application software.

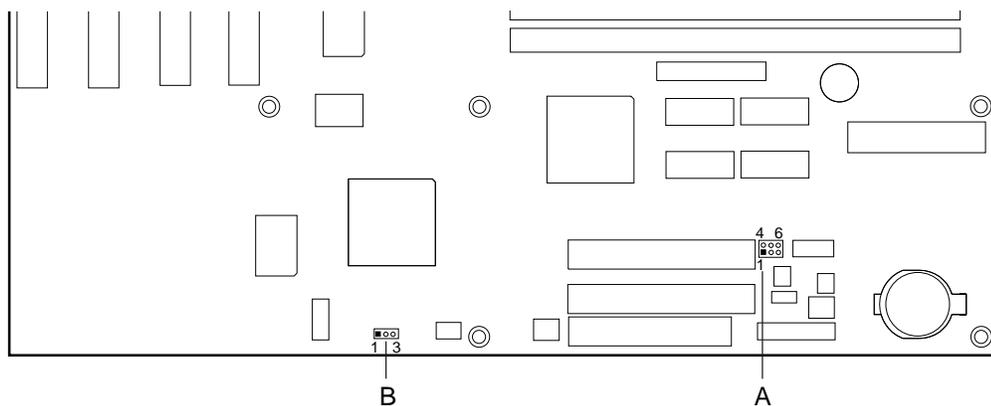
Jumper Blocks

The motherboard has two jumper blocks. Figure 20 shows the location of the motherboard's jumper blocks.



CAUTION

Do not move the jumper with the power on. Always turn off the power and unplug the power cord from the computer before changing the jumper.



OM08414A

- A USB Port 0 configuration jumper block
- B BIOS setup configuration jumper block

Figure 20. Location of the Jumper Blocks

USB Port 0 Configuration Jumper Block

This 6-pin jumper block enables configuration of USB Port 0. Table 41 describes the jumper settings for configuring USB Port 0.

Table 41. USB Port 0 Configuration Jumper Settings

Jumper	Configuration
2-3 and 5-6	USB Port 0 signals are routed to the back panel.
1-2 and 4-5	USB Port 0 signals are routed for a front panel USB connector.
None	USB Port 0 is disconnected from either location.

BIOS Setup Configuration Jumper Block

This 3-pin jumper block enables all motherboard configuration to be done in BIOS Setup. Table 42 describes the jumper settings for normal, configure, and recovery modes.

Table 42. BIOS Setup Configuration Jumper Settings

Function	Jumper	Configuration
Normal	1-2	The BIOS uses current configuration information and passwords for booting.
Configure	2-3	After the POST runs, Setup runs automatically. The maintenance menu is displayed.
Recovery	none	The BIOS attempts to recover the BIOS configuration. A recovery diskette is required.

Motherboard Resources

Memory Map

Table 43. Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 262144 K	100000 - 10000000	255 MB	Extended Memory
960 K - 1024 K	F0000 - FFFFF	64 KB	Runtime BIOS
896 K - 960 K	E0000 - EFFFF	64 KB	Reserved
800 K - 896 K	C8000 - DFFFF	96 KB	Available high DOS memory (open to ISA and PCI bus)
640 K - 800 K	A0000 - C7FFF	160 KB	Video memory and BIOS
639 K - 640 K	9FC00 - 9FFFF	1 KB	Extended BIOS data (movable by memory manager software)
512 K - 639 K	80000 - 9FBFF	127 KB	Extended conventional memory
0 K - 512 K	00000 - 7FFFF	512 K	Conventional memory

DMA Channels

Table 44. DMA Channels

DMA Channel Number	Data Width	System Resource
0	8- or 16-bits	Audio
1	8- or 16-bits	Audio/parallel port
2	8- or 16-bits	Diskette drive
3	8- or 16-bits	Parallel port (for ECP)/audio
4		Reserved - cascade channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

I/O Map

Table 45. I/O Map

Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX4E - DMA 1
0020 - 0021	2 bytes	PIIX4E - interrupt controller 1
0040 - 0043	4 bytes	PIIX4E - counter/timer 1
0048 - 004B	4 bytes	PIIX4E - counter/timer 2
0060	1 byte	Keyboard controller byte - reset IRQ
0061	1 byte	PIIX4E - NMI, speaker control
0064	1 byte	Keyboard controller, CMD/STAT byte
0070, bit 7	1 bit	PIIX4E - enable NMI
0070, bits 6:0	7 bits	PIIX4E - real time clock, address
0071	1 byte	PIIX4E - real time clock, data
0070 -0071	2 bytes	CMOS Bank 0
0072 - 0073	2 bytes	CMOS Bank 1
0080 - 008F	16 bytes	PIIX4E - DMA page registers
00A0 - 00A1	2 bytes	PIIX4E - interrupt controller 2
00B2 - 00B3	2 bytes	APM control
00C0 - 00DE	31 bytes	PIIX4E - DMA 2
00F0	1 byte	Reset numeric error
0170 - 0177	8 bytes	Secondary IDE channel
01F0 - 01F7	8 bytes	Primary IDE channel
0200 - 0207	8 bytes	Audio / game port
0220 - 022F	16 bytes	Audio (Sound Blaster Pro [†] compatible)
0240 - 024F	16 bytes	Audio (Sound Blaster Pro compatible)
0228 - 022F	8 bytes	LPT3
0240 - 024F	16 bytes	Audio (Sound Blaster compatible)

continued

Table 45. I/O Map (continued)

Address (hex)	Size	Description
0278 - 027F	8 bytes	LPT2
0228 - 022F	8 bytes	LPT3
02E8 - 02EF	8 bytes	COM4/video (8514A)
02F8 - 02FF	8 bytes	COM2
0330 - 033F	8 bytes	MPU-401 (MIDI)
0376	1 byte	Secondary IDE channel command port
0377	1 byte	Floppy channel 2 command
0377, bit 7	1 bit	Floppy disk change, channel 2
0377, bits 6:0	7 bits	Secondary IDE channel status port
0378 - 037F	8 bytes	LPT 1
0388- 038B	6 bytes	AdLib [†] (FM synthesizer)
03B4 - 03B5	2 bytes	Video (VGA)
03BA	1 byte	Video (VGA)
03C0 - 03CA	2 bytes	Video (VGA)
03CC	1 byte	Video (VGA)
03CE - 03CF	2 bytes	Video (VGA)
03D4 - 03D5	2 bytes	Video (VGA)
03DA	1 byte	Video (VGA)
03E8 - 03EF	8 bytes	COM3
03F0 - 03F5	6 bytes	Diskette Channel 1
03F6	1 byte	Primary IDE channel command port
03F7 (Write)	1 byte	Diskette channel 1 command
03F7, bit 7	1 bit	Diskette disk change channel 1
03F7, bits 6:0	7 bits	Primary IDE channel status port
03F8 - 03FF	8 bytes	COM1
04D0 - 04D1	2 bytes	Edge/level triggered PIC
0530 - 0537	8 bytes	Windows Sound System
LPTn + 400h	8 bytes	ECP port, LPTn base address + 400h
0CF8 - 0CFB*	4 bytes	PCI configuration address register
0CF9**	1 byte	Turbo and reset control register
0CFC - 0CFF	4 bytes	PCI configuration data register
EF00 - EF3F	64 bytes	Windows Sound System
FFA0 - FFA7	8 bytes	Primary bus master IDE registers
FFA8 - FFAF	8 bytes	Secondary bus master IDE registers

* DWORD access only

** Byte access only

PCI Configuration Space Map

Table 46. PCI Configuration Space Map

Bus Number (hex)	Device Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82443BX (PAC)
00	01	00	Intel 82443BX PCI/AGP bridge
00	07	00	Intel 82371EB (PIIX4E) PCI/ISA bridge
00	07	01	Intel 82371EB (PIIX4E) IDE bus master
00	07	02	Intel 82371EB (PIIX4E) USB
00	07	03	Intel 82371EB (PIIX4E) power management
00	0C	00	PCI audio controller (Sound Blaster AudioPCI 64V)
00	0D	00	PCI expansion slot 1 (J4D1)
00	0E	00	PCI expansion slot 2 (J4C1)
00	0F	00	PCI expansion slot 3 (J4B1)
00	10	00	PCI expansion slot 4 (J4A1)
01	00	00	nVidia RIVA 128ZX Graphics controller

Interrupts

Table 47. Interrupts

IRQ	System Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard Buffer Full
2	Reserved, Cascade Interrupt From Slave PIC
3	COM2*
4	COM1*
5	LPT2 (Plug and Play option) / Audio / User available
6	Diskette Drive
7	LPT1*
8	Real Time Clock
9	Reserved for PIIX4E system management bus
10	User available
11	Windows Sound System* / User available
12	Onboard Mouse Port (if present, else user available)
13	Reserved, Math Coprocessor
14	Primary IDE (if present, else user available)
15	Secondary IDE (if present, else user available)

* Default, but can be changed to another IRQ

A Error Messages

BIOS Beep Codes

One long beep followed by several short beeps indicates a video problem.

Table 48. Beep Codes

Beeps	Port 80h Code	Explanation
1-2-2-3	16h	BIOS ROM checksum
1-3-1-1	20h	Test DRAM refresh
1-3-1-3	22h	Test Keyboard Controller
1-3-3-1	28h	Autosize DRAM
1-3-3-2	29h	Initialize POST Memory Manager
1-3-3-3	2Ah	Clear 512 KB base RAM
1-3-4-1	2Ch	RAM failure on address line xxxx
1-3-4-3	2Eh	RAM failure on data bits xxxx of low byte of memory bus
1-4-1-1	30h	RAM failure on data bits xxxx of high byte of memory bus
2-1-2-2	45h	POST device initialization
2-1-2-3	46h	Check ROM copyright notice
2-2-3-1	58h	Test for unexpected interrupts
2-2-4-1	5Ch	Test RAM between 512 and 640 KB
1-2	98h	Search for option ROMs. One long, two short beeps on checksum failure

BIOS Error Messages

Table 49. BIOS Error Messages

Error Message	Explanation
Diskette drive A error	Drive A is present but fails the POST diskette tests. Check that the drive is defined with the proper diskette type in Setup and that the diskette drive is installed correctly.
Extended RAM Failed at offset: <i>nnnn</i>	Extended memory not working or not configured properly at offset <i>nnnn</i> .
Failing Bits: <i>nnnn</i>	The hexadecimal number <i>nnnn</i> is a map of the bits at the RAM address (System, Extended, or Shadow memory) that failed the memory test. Each 1 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 configured properly. Check to see if fixed disk is installed properly. Run Setup to be sure the fixed-disk type is correctly identified.

continued

Table 49. BIOS Error Messages (continued)

Error Message	Explanation
Incorrect Drive A type - run SETUP	Type of diskette drive for drive A not correctly identified in Setup.
Invalid NVRAM media type	Problem with NVRAM (CMOS) access.
Keyboard controller error	The keyboard controller failed test. Try replacing the keyboard.
Keyboard error	Keyboard not working.
Keyboard error nn	BIOS discovered a stuck key and displayed the scan code nn for the stuck key.
Keyboard locked - Unlock key switch	Unlock the system to proceed.
Monitor type does not match CMOS - Run SETUP	Monitor type not correctly identified in Setup.
Operating system not found	Operating system cannot be located on either drive A or drive C. Enter Setup and see if fixed disk and drive A are properly identified.
Parity Check 1	Parity error found in the system bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays ????.
Parity Check 2	Parity error found in the I/O bus. BIOS attempts to locate the address and display it 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 <F1> to start the boot process or <F2> to enter Setup and change any settings.
Real time clock error	Real-time clock fails BIOS test. might require motherboard repair.
Shadow RAM Failed at offset: <i>nnnn</i>	Shadow RAM failed at offset <i>nnnn</i> of the 64 KB block at which the error was detected.
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 cache error - Cache disabled	RAM cache failed the BIOS test. BIOS disabled the cache.
System CMOS checksum bad - run SETUP	System CMOS RAM has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the default values and/or making your own selections.
System RAM Failed at offset: <i>nnnn</i>	System RAM failed at offset <i>nnnn</i> of the 64 KB block at which the error was detected.
System timer error	The timer test failed. Requires repair of system motherboard.

nnnn = hexadecimal number

B Regulatory and Integration Information

This appendix contains:

- Safety standards, electromagnetic compatibility regulations, and product certification markings for this motherboard
- Instructions and precautions for integrators who are installing this motherboard in a chassis

Regulatory Compliance

This motherboard complies with the following safety and EMC regulations when correctly installed in a compatible host system.

Table 50. Safety Regulations

Regulation	Title
UL 1950/CSA950, 3 rd edition, Dated 07-28-95	Bi-National Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)
EN 60950, 2 nd Edition, 1992 (with Amendments 1, 2, 3, and 4)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Community)
IEC 950, 2 nd edition, 1991 (with Amendments 1, 2, 3, and 4)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)
EMKO-TSE (74-SEC) 207/94	Summary of Nordic deviations to EN 60950. (Norway, Sweden, Denmark, and Finland)

Table 51. EMC Regulations

Regulation	Title
FCC Class B	Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)
CISPR 22, 2 nd Edition, 1993 (Class B)	Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)
VCCI Class B (ITE)	Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)
EN55022 (1994) (Class B)	Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)
EN50082-1 (1992)	Generic Immunity Standard; Currently compliance is determined via testing to IEC 801-2, -3, and -4. (Europe)
ICES-003 (1997)	Interference-Causing Equipment Standard, Digital Apparatus, Class B (Including CRC c.1374) (Canada)

Product Certification Markings

This printed circuit assembly has the following product certification markings

- UL Joint Recognition Mark: Consists of a small c, followed by a stylized backward UR, and followed by a small US. (Component side)
- Manufacturer's recognition mark: Consists of a unique UL recognized manufacturer's logo, along with a flammability rating (94V-0). (Solder side)
- UL File Number for motherboards: E139761 (Component side)
- PB Part Number: Intel bare circuit board part number. 717320-002 (Solder side)
- Battery "+ Side Up" marking: located on the component side of the board in close proximity to the battery holder.
- FCC Logo/Declaration: (Solder side)
- CE Mark: (Component side). The CE mark should also be on the shipping container.
- Note: ACA Mark (C-Tick): Consists of a stylized letter c with a tick mark and the number N-232. This mark is not required on motherboards. Box versions must include this mark on the container only.

Installation Precautions

When you install and test the motherboard, observe all warnings and cautions in the installation instructions.

To avoid injury, be careful of:

- Sharp pins on connectors
- Sharp pins on printed circuit assemblies
- Rough edges and sharp corners on the chassis
- Hot components (like processors, voltage regulators, and heat sinks)
- Damage to wires that could cause a short circuit

Observe all warnings and cautions that instruct you to refer computer servicing to qualified technical personnel.



WARNING

Do not open the power supply. Risk of electric shock and burns from high voltage and rapid overheating. Refer servicing of the power supply to qualified technical personnel.

Installation Instructions



CAUTION

Follow these guidelines to meet safety and regulatory requirements when installing this board assembly.

Read and adhere to all of these instructions and the instructions supplied with the host computer and associated modules. If the instructions for the host computer are inconsistent with these

instructions or the instructions for associated modules, contact the supplier's technical support to find out how you can ensure that your computer meets safety and regulatory requirements. If you do not follow these instructions and the instructions provided by host computer and module suppliers, you increase safety risk and the possibility of noncompliance with regional laws and regulations.

Ensure Electromagnetic Compatibility (EMC)

Before computer integration, make sure that the power supply and other modules have passed EMC testing using a motherboard with a microprocessor from the same family and operating at the same (or higher) speed as the microprocessor on this motherboard.

In the installation instructions for the host chassis, power supply, and other modules pay close attention to the following:

- Certifications
- External I/O cable shielding and filtering
- Mounting, grounding, and bonding requirements
- Keying connectors when mismatching of connectors could be hazardous

If the power supply and other modules have not passed applicable EMC testing before integration, EMC testing must be conducted on a representative sample of the newly completed computer.

Ensure Host Computer and Accessory Module Certifications

Make sure that the host computer, any added subassembly, such as a board or drive assembly, and internal or external wiring, are certified for the region(s) where the end-product will be used. Marks on the product are proof of certification. Certification marks are as follows:

In Europe

The CE marking signifies compliance with all relevant European requirements. If the host computer does not bear the CE marking, obtain a supplier's Declaration of Conformity to the appropriate standards required by the European EMC Directive and Low Voltage Directive. Other directives, such as the Machinery and Telecommunications Directives, might also apply depending on the type of product. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. All Intel motherboards now have PTCs on all external ports that provide DC power externally.

In the United States

A certification mark by a Nationally Recognized Testing Laboratory (NRTL) such as UL, CSA, or ETL signifies compliance with safety requirements. External wiring must be UL Listed and suitable for the intended use. Internal wiring must be UL Listed or Recognized and rated for applicable voltages and temperatures. The FCC mark (Class A for commercial or industrial only or Class B for residential) signifies compliance with electromagnetic interference requirements.

In Canada

A nationally recognized certification mark such as CSA or cUL signifies compliance with safety requirements. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate

protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. All Intel motherboards now have PTCs on all external ports that provide DC power externally.

Prevent Power Supply Overload

Unless the power supply has inherent overcurrent protection, do not overload the power supply output. To avoid overloading the power supply, make sure that the calculated total current load of all the modules within the computer is less than the output current rating of the power supply. If you do not do this, the power supply could overheat, catch fire, or damage the insulation that separates hazardous AC line circuitry from low-voltage user accessible circuitry. If the load drawn by a module cannot be determined by the markings and instructions supplied with the module, contact the module supplier's technical support.

Place Battery Marking on the Computer

There is insufficient space on this motherboard to provide instructions for replacing and disposing of the battery. The following warning must be placed permanently and legibly on the host computer as near as possible to the battery.



WARNING

Danger of explosion if battery is incorrectly replaced.

Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Use Only for Intended Applications

This product was evaluated for use in computers that will be installed in offices, homes, schools, computer rooms, and similar locations. The suitability of this product for other applications, (such as medical, industrial, alarm systems, and test equipment) might require further evaluation.