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User Guide  
IN440 Micro-ATX Motherboard

[www.trimond.com](http://www.trimond.com)

## Document History

<b><i>Issue</i></b>	<b><i>Description</i></b>	<b><i>Date</i></b>
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# SAFETY AND REGULATORY NOTICES

## GENERAL

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### Battery

**This product contains a lithium battery.**

Do not use a metal or other conductive implement to remove the battery. If a short-circuit is made between its positive and negative terminals the battery may explode.

Replace a discharged battery with one of the same type; another type may explode or ignite. Follow the instructions contained in section 3 of this document to replace the battery. Dispose of a discharged battery promptly and in accordance with the battery manufacturer's recommended instructions. Do not recharge, disassemble or incinerate the discharged battery. Keep discharged batteries away from children.

### Anti-static precautions

#### **Warning**

*Static electricity can cause permanent damage to electronic components. You should be aware of this risk, and take precautions against the discharge of static electricity.*

This product is at risk from static discharge because the electronic components of the motherboard are exposed. Memory modules and replacement processors are examples of electrostatic sensitive devices (ESSDs).

All work that involves contact with the IN440 Micro-ATX Motherboard should be done in an area completely free of static electricity. We recommend using a Special Handling Area (SHA) as defined by EN 100015-1: 1992. This means that working surfaces, floor coverings and chairs must be connected to a common earth reference point, and you should wear an earthed wrist strap and anti-static clothing. It is also a good idea to use an ionizer or humidifier to remove static from the air.

Handle static-sensitive items with extreme care. Hold add-on components only by their edges, avoiding their electrical contacts. In general, do not handle static-sensitive items unnecessarily.

Keep all conductive material, and food and drink, away from your work area and the IN440 MICRO ATX Motherboard.

## LEGALITIES

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This product complies with the relevant clauses of the following European Directives (and all subsequent amendments):

**Low Voltage Directive**      **73/23/EEC**

**EMC Directive**              **89/336/EEC**

**CE Marking Directive**      **93/68/EEC**

#### **Important**

*This product, when supplied, complies with the CE Marking Directive and its strict legal requirements. Use only parts tested and approved by Mitsubishi Electric Motherboard Division.*

## STANDARDS

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### Safety

This product complies with the American Safety Standard **UL1950**.

### Electro-magnetic Compatibility (EMC)

This product complies with the following European EMC standards:

**Emissions**      **EN50022 Class B**

**Immunity**      **EN50082-1 Class B**

This product also complies with the following American EMC standard:

**FCC Class B**

### FCC Compliance Statement

Note: 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, 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 receiver.
- ◆ Connect the equipment into an outlet on a circuit different to that which the receiver is connected.
- ◆ Consult the dealer or an experienced radio/TV technician for help.

<b><i>Important</i></b>
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*You are cautioned that any change or modification to the product not expressly approved by the manufacturer could void the approvals held by this product.*

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# 1 OVERVIEW

IN440 MICRO ATX is a Pentium® II/III processor-based ATX profile motherboard.

The design of IN440 MICRO ATX is based around the following components.

- ◆ Intel Celeron™, Pentium® II or Pentium® III processor in Slot 1.
- ◆ Intel 440ZX-100 host bridge and system controller.
- ◆ Intel PIIX4e ISA bridge and peripheral and power management controller.
- ◆ SMSC 37C677 I/O Combo.
- ◆ ESS Solo 1 PCI audio controller (build option).

## Processor

The Celeron™, Pentium® II and Pentium® III processors are all based on the P6 micro-architecture and include MMX technology. Two package styles are available – cartridge (slot 1) pin-grid array (socket 370). IN440 requires the cartridge versions. All three cartridge variations are supported – SEPP (Celeron™), SECC (Pentium® II) and SECC2 (Pentium® II and Pentium® III).

## 440ZX North bridge

The 440ZX North bridge connects the processor to the SDRAM main memory, an AGP port and PCI bus interface. The device is housed in a 492-pin BGA package.

## PIIX4e ISA bridge

The PIIX4e provides the PCI to ISA bus bridge and contains the system's RTC, the IDE interfaces, the DMA and Interrupt Controllers. The PIIX4e also provides ACPI support, a SMBus controller and all the general purpose I/O ports used on the IN440 MICRO ATX motherboard. The PIIX4e device is packaged in a 324 pin BGA.

## MOTHERBOARD FEATURES

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Form factor	ATX, 9.6" wide x 7.8" deep. ATX 2.01 compliant.
Processor	Slot 1 with the VRM8.2 regulator on motherboard. Accepts Slot 1 Celeron™, Pentium® II and Pentium® III processors
Core logic	Intel 440ZX & PIIX4e
Cache	L2 cache included on processor module.
Memory – RAM	Memory sockets accept 168 pin un-buffered PC100 SDRAM modules. 66MHz Bus speed Processors can use PC66 or PC100 SDRAM modules. 100MHz Bus speed Processors can only use PC100 SDRAM modules. 2 DIMM sockets accept 64-bit modules.
Memory – Flash ROM	2Mb flash ROM. Includes BIOS, Setup-in-ROM, USB, DMI, 120MB floppy etc.
Buses	1 ISA/PCI bus master slot 2 PCI bus master slots 1 AGP 2X slot
VGA	AGP 2X slot
Audio – controller	Active speaker support only (external). Internal mono speaker and PCB mounted 'beeper'. ESS Solo 1 CODEC.
Hard Disk & CD-ROM	Dual UltraDMA33 interfaces for hard disk and CD-ROM.
Floppy Disk	720kB, 1.2MB (3-mode), 1.44MB 3½ drives, 1.2MB 5¼ drives. Support for 120MB drives via ATA port.
Parallel Port	IEEE 1284 (ECP & standard) on 25-way D-type
Serial Ports	Dual 16550s. Two 9-way D-types on rear edge of motherboard.
USB	Two ports.
Keyboard & Mouse	PS/2-style connectors.
Security	Chassis intrusion detection.
Power Management	Green and deep green via system management mode. ACPI compatible. Requires logic-controlled PSU. Standby option with wake-up on interrupt, serial port activity or button.
System Management	Hardware monitoring (Voltage, temperature and fan monitor) via optional Heceta II device.
Plug & Play	PC97 and PC98 compliant
Battery back-up	On-board lithium coin cell with 5 years typical life.
PCB	4-layer Micro-ATX form-factor. All components on top side



## **CONFIGURATION OPTIONS**

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### **Build-time**

The following items can be configured at build-time and cannot be modified by the user.

- ◆ Audio with MIDI/joystick support
- ◆ Heceta II system monitor.

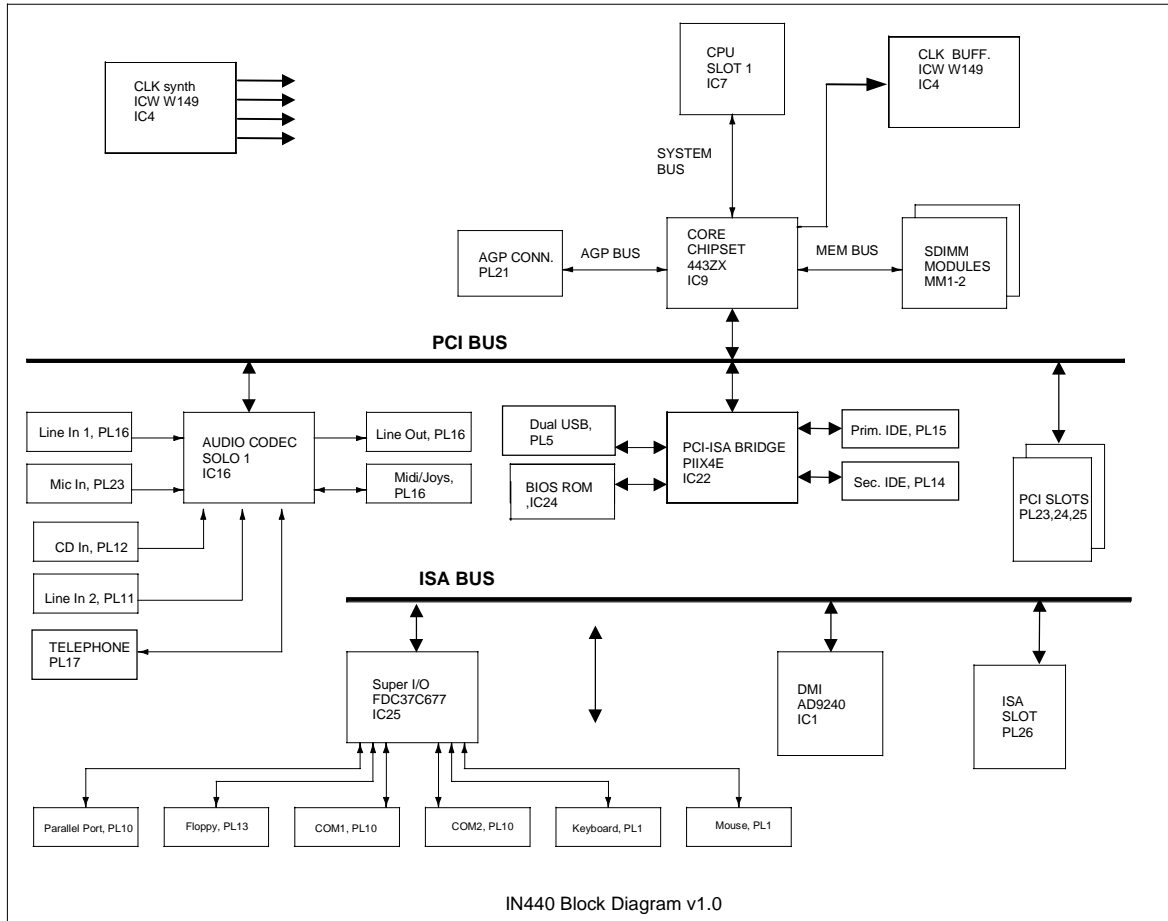
Please contact Mitsubishi Electric Motherboard Division to determine available configurations.

### **User Configurable**

The user can configure the following items.

- ◆ Processor (Intel boxed products)
- ◆ Main memory DIMMs
- ◆ Processor speed (core/bus ratio)
- ◆ BIOS ROM write enable
- ◆ Audio enable/disable
- ◆ Hard or soft switch power supply

**BLOCK DIAGRAM**

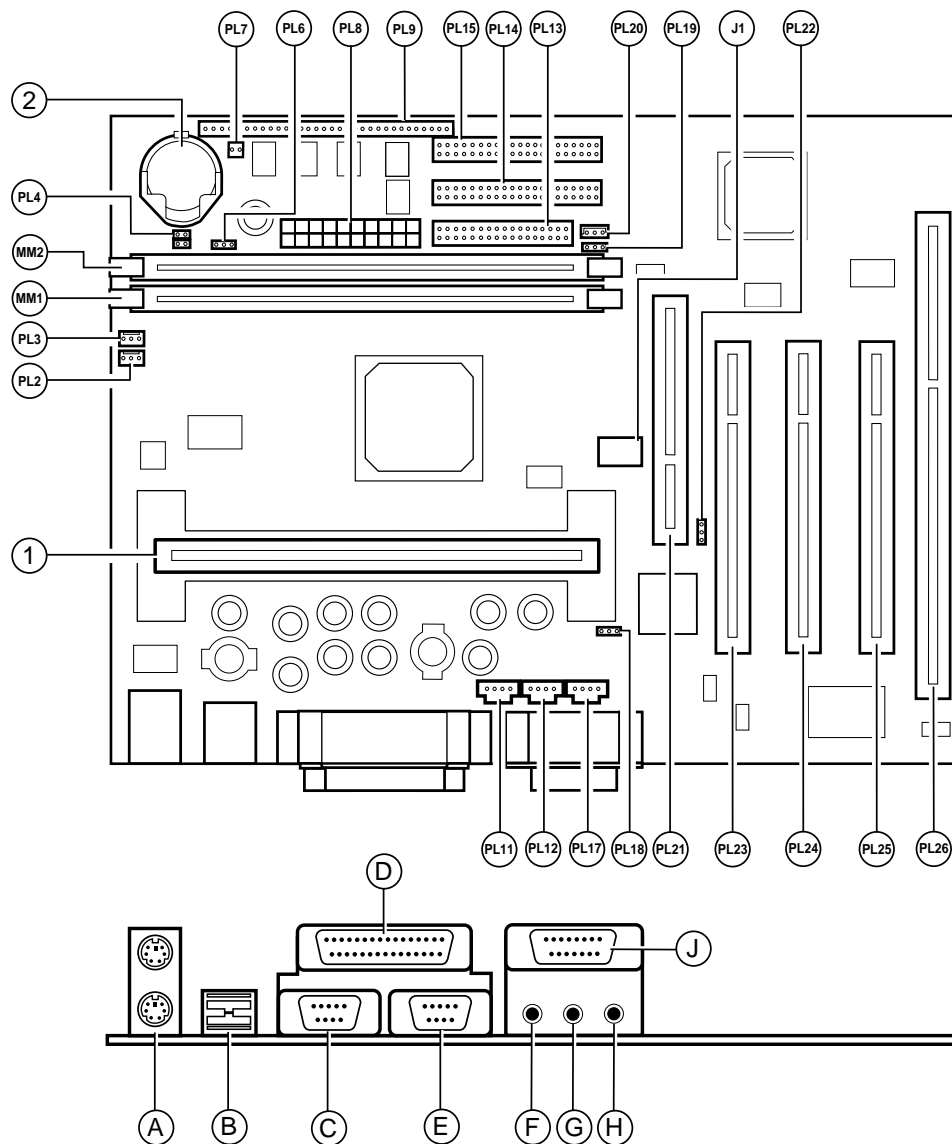


## 2 INSTALLATION GUIDE

**Warning**

Static electricity can cause permanent damage to electronic components. You should be aware of this risk, and take precautions against the discharge of static electricity.

### CONNECTOR, HEADER, SLOT IDENTIFICATION DIAGRAM

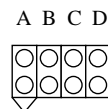


**CONNECTOR, HEADER, SLOT, IDENTIFICATION TABLE**

1	Slot 1 connector	PL13	Floppy Drive Header	PL26	ISA Connector
2	Lithium cell (CR2032)	PL14	IDE Secondary Header		
MM1 MM2	SDRAM socket	PL15	IDE Primary Header	J1	Processor Speed Jumpers
PL2	System Fan Power	PL17	ATAPI Audio LINE in (natural)	A	Keyboard/Mouse
PL3	Processor Fan Power	PL18	Audio Volume Header	B	USB (Dual)
PL4	Hard switch power supply jumper	PL19	BIOS Write Protect	C	Serial Port COM 1
PL6	Configuration memory clear jumper	PL20	Wake on LAN Header	D	Parallel Port
PL7	Intrusion Detect connector	PL21	AGP Connector	E	Serial port COM 2
PL8	Power connector	PL22	PCI Audio Disable Jumper	F	Line Output
PL9	Front Panel Connector	PL23	PCI Slot 1 Connector	G	Microphone Input
PL11	ATAPI Telephony (black)	PL24	PCI Slot 2 Connector	H	Line Input
PL12	ATAPI CD audio in (green)	PL25	PCI Slot 3 Connector	J	MIDI & Joystick

**Processor Speed Jumpers – J1 (installation guide reference J1)**

The processor operating frequency is a multiple of the bus speed, 66 or 100MHz. This jumper block sets the multiple. Note many processors have a fixed multiple and therefore the jumper setting is ignored.



X – Jumper fitted

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>Ratio</b>	<b>Speed at 66MHz</b>	<b>Speed at 100MHz</b>
X			X	3.5	233	350
X	X	X		4.0	266	400
X		X		4.5	300	450
X	X			5.0	333	500
X				5.5	366	550
	X	X	X	6.0	400	600

**PCI Audio CODEC Enable – PL22 (installation guide reference PL22)**

- 1-2 Enable audio CODEC
- 2-3 Disable audio CODEC

Motherboard Audio Enabled



Motherboard Audio Disabled



**BIOS Program Enable – PL19 (installation guide reference PL19)**

1-2	Disable BIOS updates	BIOS Updates Disabled			BIOS Updates Enabled
2-3	Enable BIOS updates				

**Clear Configuration (CMOS) Memory – PL6 (installation guide reference PL6)**

(Ensure AC is disconnected from the power supply before moving this jumper)

1-2	Normal operation	Normal Operation			Clear CMOS
2-3	Clear CMOS				

(Jumper must be returned to normal position before power-on)

**Hard switch power supply – PL4 (installation guide reference PL4)**

Link 1-2 and 3-4 when 5V standby rail is not available

## 3 UPGRADING THE MOTHERBOARD

### **Caution**

*Care must be taken in the purchase of upgrade parts to ensure both compatibility with the system and the compliance with appropriate approvals and certification, e.g. CE marking within Europe. Using non-approved parts may invalidate your warranty and system approvals.*

Upgrading the motherboard is not difficult, but if you do not feel confident about the work involved, you may wish to have your supplier or service organisation complete it for you.

### **Warning**

*Never carry out any work inside the computer with AC power applied. Turn off the computer and unplug all power cords before starting work.*

## ADDING MORE MEMORY

The motherboard has two DIMM (Dual Inline Memory Module) sockets, each of which accepts modules of up to 128 Mbytes, in any combination. The slot furthest from the processor (MM2) should be used first.

### **DIMM specification**

*The memory modules must meet the PC66 (66MHz processors) or PC100 (100MHz processors) specification.*

## Fitting and removing DIMMs

Read all of these instructions through carefully before you start work.

Turn off the computer and unplug all power cords. Take suitable anti-static precautions and remove the system cover. Leave the DIMM in the anti-static packaging until the last possible moment and when you do take the DIMM out of its packaging, hold it by its ends and avoid touching the metal contacts.

Follow the diagrams and simple instructions on the following pages to insert each DIMM.

### **Afterwards**

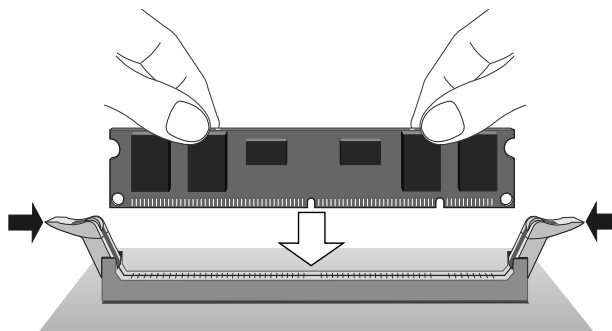
After you have fitted new modules, check that the system recognises all the memory. If not, check that you have:

- ◆ Correctly fitted the DIMMs in their slots.
- ◆ Installed DIMMs of the correct type.

It may be necessary to refit the original memory to check if there is a problem with your new modules.

## Fitting a DIMM

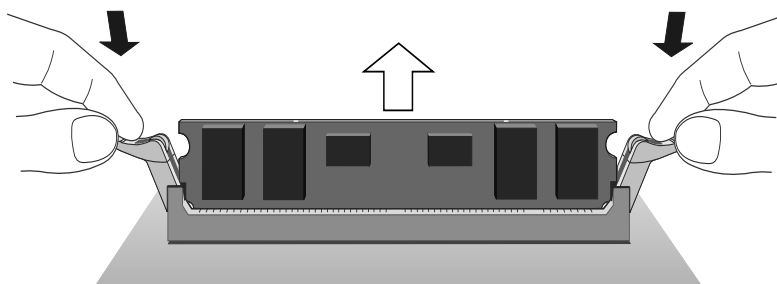
Do not use excessive force. If the module will not fit easily, remove it and start again.



*The DIMM is inserted vertically and held in place by the clips at each end.*

## Removing a DIMM

Do not use excessive force. If the module will not come free easily, check that the holding clips are clear of the module ends.



*Press the tabs on both of the socket's end clips at the same time. This releases the DIMM and lifts it partly out of the socket.*

## THE PROCESSOR ASSEMBLY

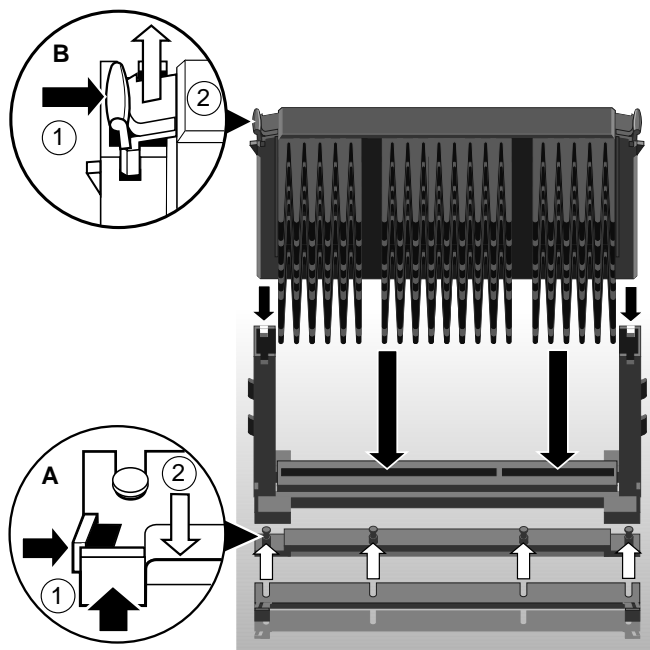
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### To remove the existing processor

1. Turn off the computer and unplug all power cords. Take suitable anti-static precautions and remove the system cover.
2. If the system was in use just before starting this procedure, the processor **may be hot**, wait until it cools.
3. If there are any expansion cards fitted that obstruct access to the processor, you may have to remove them.
4. See 'A' in the illustration. Carefully squeeze together the grips at both ends (1) of the heatsink support bracket (2) and slide it away.
  - ◇ Some designs of heatsink do not have this bracket fitted.
5. See 'B' in the illustration. Press in the clips (1) at both ends of the top of the processor body to depress the retaining pins out of the vertical supports. Then lift the processor body (2) out of the socket.

**Caution**

Handle the processor with care, by the body only. Avoid touching the connector at the bottom. Store in an antistatic container.

**To fit a new processor**

1. Take the processor out of its anti-static packaging. Hold the processor by its edges, or its heatsink and *avoid touching the edge connector*.
  - ◇ The upgrade processor and the socket are keyed to ensure that the processor is installed in the correct orientation. It will only fit into the socket one way.
2. Slide the processor into the vertical guides and down into the socket, making sure that it is correctly aligned and that you do not bend or otherwise damage the supports. **Do not use excessive force.**
3. Apply just enough pressure to overcome the resistance offered by the socket. Ensure that the retaining pins snap into the sockets on the end supports.
4. Refit the heatsink support, making sure that it is correctly and fully seated on the pins. It should snap into place.
  - ◇ This bracket may not be fitted with some heatsink designs, or may not be needed with the new processor.
5. The upgrade or overdrive processor may have its own cooling fan built into the heatsink. This will have a power lead that will need to be connected to the processor fan power (marked 'CPU FAN' (PL2) on the motherboard, see installation guide).
  - ◇ If the fan has only a two-pin connection, ensure it is connected to pins 1 and 2.
6. Now adjust the processor multiplier speed jumpers on the motherboard (see installation guide) in conjunction with the new processor's data sheet.



**Warning**

*The processor requires continuous airflow.*

7. Return to their original position any expansion cards that had been removed earlier, then refit and secure the system cover.

**REPLACING THE BATTERY FOR THE CONFIGURATION CMOS**

The computer keeps a record of its current hardware configuration in a CMOS memory chip, which is sustained by a small battery. This battery has a life of up to 5 years. If you find that you have to reconfigure the computer every time you turn it on, or the date and time seem to be dramatically incorrect, the battery is probably failing and needs to be replaced.

The battery is a 3-volt lithium type (CR2032 or equivalent) typically used in calculators, watches and other small, battery-powered electronic items.

Read carefully the following instructions before commencing work.

1. Turn off the computer and unplug all power cords.

**Warning**

***Do not** use a metal or other conductive tool to remove the battery. If a short-circuit is accidentally made between its positive and negative terminals, it may cause the battery to explode.*

2. Using a **non-conductive** tool, release the latch that holds the battery in place. The battery will pop up allowing you to lift it out of the holder.
3. Taking care not to touch the top or bottom surface of the new battery, pick up the replacement with the positive (+) terminal upwards and press the battery into the holder using a non-conductive implement.
4. Dispose of the old battery in accordance with the battery manufacturer's instructions.

When you next turn on the computer you will have to run the BIOS Setup utility to enter the hardware configuration.

## 4 ELECTRONICS

### PROCESSOR

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The IN440 MICRO ATX motherboard accepts the following Celeron™, Pentium® II and Pentium® III processors operating at a bus speed of 66 or 100MHz.

<b>Processor Speed (MHz)</b>	<b>Core/bus ratio</b>	<b>Bus speed MHz</b>
233	3.5	66
266	4.0	66
300	4.5	66
333	5.0	66
350	3.5	100
366	5.5	100
400	6.0/4.0	66/100
450	4.5	100
500	5.0	100

The processor core voltages are generated by switched-mode regulators on the motherboard to the Intel VRM8.2 specification. The design meets the 66MHz and 100MHz Slot 1 flexible motherboard recommendations and supports boxed products (processors), including a CPU fan supply.

### CORE LOGIC

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The core logic is based around the Intel 440ZX PCI AGP Controller (PAC) and the PIIX4e multi-function ISA bridge. The features of each are summarised below.

#### **440ZX Host bridge**

- ◆ Slot1 host bridge
- ◆ DRAM controller supporting SDRAM main memory
- ◆ PCI 2.1 compliant
- ◆ AGP compliant target
- ◆ Virtual PCI to PCI bridge to support AGP bus
- ◆ Packaged in a 492 Pin BGA

#### **PIIX4e Multifunction ISA Bridge**

- ◆ PCI to ISA bridge
- ◆ Dual UltraDMA33 IDE controller
- ◆ ISA system peripherals (timers, DMA etc.)
- ◆ Dual USB controller (12Mbps or 1.5Mbps)

- ◆ SMBus controller (motherboard management)
- ◆ Real-time clock
- ◆ ACPI power management logic
- ◆ Packaged in a 324 pin BGA

The two IDE interfaces are completely independent and can operate concurrently. Both can also be configured as a PCI bus master.

## Concurrency

The major busses (processor, memory, PCI and AGP) all operate independently to achieve a high degree of concurrency. Most CPU-DRAM and AGP-DRAM transfers can occur concurrently with PCI transfers and so consume no PCI bus bandwidth.

## LEVEL 2 CACHE

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The second level cache is contained within the processor module. There is no provision for a third level cache. Cache size is determined by the type of CPU fitted, refer to your CPU manufacturer for this information.

## MEMORY

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### DIMM

There are two DIMM sockets on the motherboards that accept 168-pin un-buffered SDRAM modules to the Intel PC SDRAM un-buffered memory module specification. PC100 modules are required when using processors with a 100MHz bus. Either PC66 or PC100 modules may be used with 66MHz bus processors. All modules must support SPD (serial presence detect) to allow the BIOS to determine the memory configuration and set up the chipset optimally. These modules contain a small EEPROM that describes the module capabilities in detail - including speed, capacity and organisation. EDO modules are not supported.

- ◆ 64-bit modules.
- ◆ 2 or 4 bank organisation
- ◆ Asymmetric or symmetric memory addressing.
- ◆ Single or double-sided modules.

### BIOS

The BIOS is contained in a flash ROM device soldered directly to the motherboard and includes the code listed below. The motherboard will automatically perform a BIOS recovery operation if it detects a valid recovery disk during the boot sequence. An override jumper that prevents all writes (recovery or update) provides update protection. The BIOS ROM is accessed as a single linear region in the memory space from 4GB-128kB (0FFFE0000 - 0FFFFFFFh) and copied at the top of ISA memory (0E0000 - 0FFFFFFh).

- ◆ Core motherboard BIOS
- ◆ USB
- ◆ DMI
- ◆ Setup-in-ROM
- ◆ Intel microcode update support and code

- ◆ Power and system management code

## VIDEO

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The IN440 MICRO ATX motherboard requires a video card fitted to one of the expansion slots. This may be an ISA, PCI or AGP product. The AGP expansion slot supports 1X and 2X modes of operation (66MHz and 133MHz effective speed) and usually provides the best performance.

## AUDIO

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The optional audio subsystem is based around an ESS Solo1 PCI CODEC. When not fitted, the standard PC beep function remains.

### ESS Solo 1

- ◆ SoundBlaster™ Pro register-level compatible
- ◆ PCI bus interface
- ◆ Internal FM synthesiser
- ◆ Dual DMA support with FIFO & full duplex operation
- ◆ Programmable power management
- ◆ Joystick and MPU-401 compatible MIDI interfaces
- ◆ 5 channel input mixer

One power amplifier is used - a National Semiconductor LM4880 'Boomer' to drive the LINE-out jack socket and the optional internal speaker. The microphone input provides power to enable condenser microphones to be used.

<b>Channel</b>	
CODEC LINE	Rear line input jack socket
CODEC AUXA	Internal CD input (ATAPI connector)
CODEC AUXB	Internal auxiliary LINE input (ATAPI connector)
CODEC MIC	Rear microphone jack socket
CODEC Mono In	Internal telephony input (ATAPI connector)

The following audio connectors are supported.

- ◆ Rear 3.5mm jack microphone input with phantom power
- ◆ Rear 3.5mm jack LINE in
- ◆ Rear 3.5mm jack LINE out (also suitable for 32 ohm headphones)
- ◆ Internal CD-ROM stereo audio on 4-pin ATAPI connector
- ◆ Internal stereo LINE input on 4-pin ATAPI connector
- ◆ Internal telephony connection (mono input and output) on 4-pin ATAPI connector

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## REAL TIME CLOCK

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The real time clock is located in the PIIX4e and includes 256 bytes of battery backed RAM with two lockable ranges. The clock includes a date alarm and operates from a 32.768kHz crystal. The 3V lithium cell provides data retention for up to 5 years of normal use. Note that the battery is used only when AC power is not applied to the system (or when a standby 5V rail is not provided).

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## STANDARD I/O

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The SMSC 37C677 Super IO controller provides standard I/O. This comprises the four functions described below. It is packaged in a 100-pin PQFP and is PC98 and ACPI compliant.

### Keyboard and Mouse

The keyboard and mouse controller uses the Phoenix Multikey version 1.40 firmware. PS/2 style keyboard and mouse ports are provided on the rear panel. The ports are interchangeable.

### Floppy Disk Interface

The motherboard supports both 2-mode and 3-mode 3½" floppy disk drives.

### Serial Ports

There are two standard COM ports, which are wired to two standard 9-way D-type connectors on the rear panel. The maximum Baud rate is 115K bits per second.

### Parallel Port

This is EPP 1.7/1.9 and IEEE1284 (ECP) compliant and is compatible with a standard (output only) PC parallel port as well as a bi-directional (PS/2 style) parallel port. There is a 25-way D-type connector on the rear panel.

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## ADDITIONAL I/O

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### IDE Disk Controller

Two UltraDMA33 IDE ports are provided with the controller integrated into the PIIX4e. This allows for a maximum of four drives to be connected - two to each port. Normally the primary port would be used for hard disk drives and the secondary port for CD-ROM or DVD drives. 120MB floppy drives have IDE interfaces.

Both IDE controllers are independent and both can bus-master data into memory for improved performance. UltraDMA33 drives have a theoretical maximum transfer rate of 33MBs<sup>-1</sup>. The interfaces are also, of course, compatible with standard ATA drives.

### Universal Serial Bus (USB)

The motherboard has two USB ports at the rear with the controller integrated into the PIIX4e.

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## SECURITY

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There is chassis intrusion detection available on motherboards with the Heceta II fitted. This is capable of detecting an intrusion even when AC is disconnected (the logic is powered from the 3V lithium cell).

## MOTHERBOARD POWER

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### Processor Power

A voltage regulator conforming to the Intel VRM8.2 standard supplies power for the processor core. The motherboard automatically selects the correct processor voltage.

### Battery

An IEC-type CR2032 3V lithium coin cell and holder are fitted to the board. Note that when the motherboard is powered off but the AC remains connected (the standby rail is active) the battery is not used.

## POWER MANAGEMENT

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### Standby Switch

The motherboard supports an ACPI-compliant standby switch for use with a soft-switch power supply. The action of the switch is under a combination of hardware and software control and is summarised in the table below. The motherboard will power off regardless of the state of software if the switch is held down for more than 4 seconds.

<b>State</b>	<b>Action after switch pressed</b>
Standby (soft power off)	Machine powers up and executes POST
POST, DOS or APM O/S	Machine powers off into standby state

### Behaviour After AC-Disconnect

The 'Wake on AC connect' BIOS option and the state of the lithium cell determine the behaviour of the motherboard after an AC-disconnect. The table below describes this.

<b>Conditions</b>	<b>Action on AC Reconnect</b>
CMOS RAM cleared. This is the state of a new motherboard before assembly. This also occurs after battery removal or failure.	Motherboard waits for standby switch to be pressed.
CMOS RAM not cleared and 'Wake on AC connect' was set to 'Enabled'.	Motherboard fully powers up without intervention.
CMOS RAM not cleared and 'Wake on AC connect' was set to 'Disabled'. This is the default state. Resume events will be lost if an AC power failure occurs.	Motherboard waits for standby switch to be pressed.

### Sleep State Indication

Indication of the power state is via the power LED. When a standard LED is fitted, it is illuminated when power (main 5V) is on. Three states can be indicated by using a two-colour LED which is biased in the reverse direction to indicate a sleeping state. The table below

assumes the use of a yellow/green bi-colour LED with the green anode connected to the LED+ pin.

<b>State</b>	<b>LED Colour</b>
Power off	Off
Normal operation	Green
Sleeping	Yellow

## SYSTEM MANAGEMENT

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There are three main elements to the optional system management hardware.

- ◆ A Heceta II system monitor
- ◆ The PIIX4e power management devices 9 and 10
- ◆ Processor thermal diode ADCs

### Heceta II System Monitor

The Heceta II provides the system monitor functions as described below and is accessed via the PIIX4e SMBus interface. It provides the following functions.

- ◆ Fan monitoring. The two inputs to the Heceta II device monitor the two “fantach” signals.
- ◆ Monitoring of system +12V, +5V, +3.3V, CPU core, -12V and 2.5V power rails
- ◆ Monitoring of system temperature (actually the motherboard surface temperature)
- ◆ Monitoring of chassis intrusion (top cover)

## FAN CONTROL

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The system fan is controlled by the motherboard such that it stops rotating when the system is in ‘Suspend’ mode. As a build option, the IN440 MICRO ATX motherboard supports variable fan speed control in which the speed of the fan is raised as the temperature of the processor increases. This considerably reduces fan noise in normal operation.

The variable fan speed option can only be used with an ACPI-aware operating system (such as Windows 98) and a 100MHz-bus Pentium® II processor.

## EXPANSION SLOTS

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### Industry Standard Architecture (ISA)

One ISA slot is available which is shared with PCI slot 3.

### Peripheral Component Interconnect (PCI)

Two PCI bus master slots are available with the third shared with an ISA slot.

**Accelerated Graphics Port (AGP)**

A single AGP slot is available that supports both 1X (66MHz) and 2X (133MHz) modes of operation. This is normally used for video cards.



## BUS RESOURCE UTILISATION

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### ISA DMA Channels

<b>DMA</b>	<b>Data Width</b>	<b>Usual Assignment</b>	<b>Audio</b>
0	8-bit	ISA card	option
1	8-bit	ISA card	default 8-bit
2	8-bit	Floppy disk controller	
3	8-bit	ECP parallel port	option
4	-	DMAC daisy chain	
5	16-bit	ISA card	
6	16-bit	ISA card	
7	16-bit	ISA card	

Shaded areas indicate DMA channels not normally available on the ISA bus

### ISA Interrupts

<b>IRQ</b>	<b>Usual Assignment</b>	<b>Fixed Assignment?</b>	<b>PCI</b>
IRQ0	System timer	YES	
IRQ1	Keyboard	NO	
IRQ2	IRQ8 - 15 Cascade	YES	
IRQ3	Serial port 2	NO	X
IRQ4	Serial port 1	NO	X
IRQ5	ISA/PCI bus (Audio)	NO	X
IRQ6	Floppy disk	NO	X
IRQ7	Parallel port	NO	X
IRQ8	Real time clock	NO	
IRQ9	ISA/PCI bus		X
IRQ10	ISA/PCI bus		X
IRQ11	ISA/PCI bus		X
IRQ12	PS/2 Mouse	NO	X
IRQ13	Floating point error	YES	
IRQ14	Primary hard disk	If drive connected	X
IRQ15	Secondary hard disk	NO	X

The last column indicates which ISA interrupts PCI devices can be routed to.

**PCI Interrupts**

<b>Channel</b>	<b>Device</b>
INTA#	Slots
INTB#	Slots
INTC#	Audio & Slots
INTD#	Slots

**PCI Device Selection (motherboard devices)**

<b>Bus number</b>	<b>Device number (decimal)</b>	<b>Function number</b>	<b>Address line</b>	<b>Function</b>
0	0	0	11	Host bridge
0	1	0	12	PCI to PCI bridge
0	6	0	17	PCI Audio CODEC
0	7	0	18	South bridge
0	7	1	18	IDE controller
0	7	2	18	USB controller
0	7	3	18	Power management & SMBus controllers
1	0 <sup>1</sup>	0	16	AGP video card

**PCI Arbitration**

<b>PIIX4e request level</b>	<b>Bus</b>	<b>Function</b>
0	0	PCI slot 1
1	0	PCI slot 2
2	0	PCI slot 3
3	0	PCI audio CODEC

Note that the arbiter implements a round robin scheme and thus no request level has fixed priority over another. The AGP video card does not consume any PCI bandwidth and competes for memory resource independently.

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<sup>1</sup> PCI to PCI bridges translate address lines from AD16. The host bridge translates address lines from AD11.

## 5 BIOS SETUP & POST

BIOS (pronounced “bye-oss”) stands for ‘basic input/output system’. The BIOS mediates between the computer’s hardware – the processor, memory, and so on – and its software – the operating system and your programs. The BIOS program is kept in permanent, read-only memory or ROM (although if necessary it can be upgraded by an authorised maintainer).

BIOS Setup is a helpful utility that forms part of the BIOS program. It allows you to view and alter the computer’s hardware configuration. It is also used to configure various security and power-saving options. Configuring the computer is necessary to ensure that the software you use can recognise and exploit the hardware’s capabilities.

The current configuration is kept in a special area of memory, called CMOS memory, and maintained by a battery so that the configuration is preserved even while the computer is switched off.

Whenever the computer is turned on, the BIOS power-on self-test (POST) routine tests various hardware components, including memory, and compares the actual configuration of the computer with that recorded in permanent (CMOS) memory.

A configuration discrepancy could arise if you have just installed or removed a hardware option (for example, if you have added or replaced an expansion card).

### BIOS SETUP

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To start the BIOS Setup utility:

1. Turn on or restart your computer.
2. When you see  
     **‘Press <F2> to enter setup’**  
     appear on the screen, press the F2 key.
3. If you have previously defined a Supervisor password, you are prompted for it before BIOS Setup starts.

### Control keys

Use the keys listed in the legend bar at the bottom of the BIOS Setup screen to make your selections or exit the current menu.

Sub-menus are marked by a ► pointer. To display a sub-menu, use the arrow keys to move the cursor to the sub-menu you want, then press ENTER.

Changeable fields are enclosed in square brackets. To select an item, use the arrow keys to move the cursor to the field you want. Then use the PLUS (+) and MINUS (–) keys to select a value for that field.

<b><i>Press</i></b>	<b><i>To</i></b>
<b>F1 or Alt-h</b>	View a general help topic. Press esc to close the help window.
<b>Esc</b>	Exit the current menu.
<b>Left or Right arrow</b>	Select a different menu.
<b>Up or Down arrow</b>	Select fields on the current menu.
<b>Plus (+) or F6 or Spacebar</b>	Select the next value for the current field.

<b>Press</b>	<b>To</b>
Minus (-) or <b>F5</b>	Select the previous value for the current field.
<b>Enter</b>	Make a selection from the menu bar or enter a sub-menu.
<b>Home</b> or <b>End</b>	Move the cursor to the top or bottom of the current menu.
<b>Page up</b> or <b>Page down</b>	Move the cursor to the next or previous page of the current menu.
<b>F9</b>	Restore the default settings for the fields on the current menu.
<b>F10</b>	Save the changes you've made and exit from BIOS Setup.

**Caution**

*The default BIOS settings may not be appropriate for your particular system. Make a note of the current settings before pressing F9 or using the Load Setup Defaults option of the Exit menu.*

**Getting help in BIOS Setup**

You can at any time get general help about the control keys by pressing the F1 key.

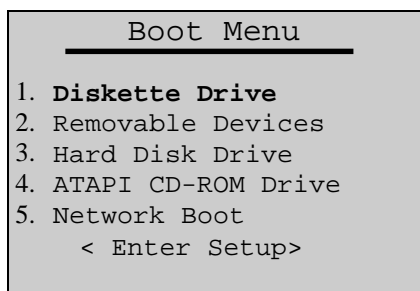
The help window on the right-hand side of each menu displays help text for the currently-selected field. It changes as you move the cursor from one field to another.

**Reserving ISA legacy resources**

To reserve interrupts and upper memory block (UMB) regions for ISA expansion cards, go to the **Advanced** menu, select **PCI Configuration**, then select **PCI/PNP ISA IRQ Resource Exclusion** or **PCI/PNP ISA UMB Region Exclusion** as required.

**MULTI-BOOT FACILITY**

Immediately after the first screen, a second screen displays various POST messages such as the memory test. While this screen is on display, a message at the bottom says: 'Press <F2> to enter setup or <ESC> to enter Boot Menu'. Even if this message is not displayed, you can press the <ESC> key and this menu will appear just before booting:



This menu can be used to temporarily use another drive or device to boot your system, for example a bootable CD-ROM, without having to enter the BIOS setup. Simply use the up and down arrows to make a selection. This change will not be permanent and the system boot will revert to the normal BIOS setting the next time you switch on your system.

## POWER-ON SELF-TEST

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### Recoverable POST errors

Whenever a recoverable (non-terminal) error occurs during POST, the BIOS displays an error message describing the problem (the most usual are described below). After some messages, you may be prompted to **Press <F1> to resume, <F2> to enter Setup** or just **Press <F2> to enter Setup**.

In general, you should respond to these errors as follows:

- ◆ Shut down the computer, wait 20 to 30 seconds, and then turn it on again to see if the problem is still reported.
- ◆ Check that all external cables are securely connected.
- ◆ Try running the BIOS Setup utility to reconfigure the system. If the computer will not BOOT after you make changes in BIOS Setup, try returning to the original settings.
- ◆ Open up the system unit and check that all internal signal and power cables are securely connected.
- ◆ If the problem persists, contact your supplier or authorised maintainer.

#### System Configuration Data updated

This message indicates that the system configuration has changed (such as an expansion card has been added) and that the configuration data has therefore been updated.

#### System Configuration Data Write Error

This message indicates that the system configuration has changed (such as an expansion card has been added) but the configuration data could not be updated. This is normally caused by the BIOS program enable jumper being in the disable position. For configuration changes to be correctly recorded the jumper must be in the enable position.

#### Invalid System Configuration Data – run configuration utility

The data describing the system configuration is incorrect and should be updated. This can be done by checking the 'Reset Configuration Data' in BIOS Setup followed by 'Save and Exit'.

#### Diskette drive A error

Drive A: is present but fails the POST diskette tests. Check that the drive is defined correctly in BIOS Setup. If necessary, open the system unit and check that the drive's signal (ribbon) cable is connected.

#### System/Extended/Shadow RAM failed at offset: xxxx Failing bits: yyyy

System, extended or shadow memory is not working, or not configured properly, at offset xxxx. The hexadecimal number yyyy is a map of the bits at the address that failed the memory test. Each "1" in the map represents a failed bit.

#### Fixed disk X failure or Fixed disk controller failure

A fixed (hard) disk drive is not working or not configured properly. Check that the drive is defined correctly in BIOS Setup. If necessary, open the system unit and check that the drive's signal (ribbon) cable is connected.

#### Incorrect drive A type - run SETUP

The diskette drive is not correctly specified in BIOS Setup.

#### Invalid NVRAM media type

Problem with NVRAM (non-volatile random-access memory).

**Keyboard error [nn] or Keyboard controller error**

There is a problem with the keyboard or (less likely) the standard I/O controller on the motherboard. If POST discovers a stuck key it displays its scan code.

**Operating system not found**

An operating system cannot be located either on a system diskette or on a hard disk. Start BIOS Setup and check that the diskette and/or hard disk drives are specified correctly.

**Parity check 1 xxxx or Parity check 2 xxxx**

Parity error found on the system (1) or I/O (2) bus. The BIOS attempts to locate and display the address xxxx. If it cannot locate the address, it displays "????".

**Previous boot incomplete - default configuration used**

The previous POST did not complete successfully. POST loads default values and offers to start BIOS Setup. If the failure was caused by incorrect values and they are not corrected, the next boot will likely fail too.

**Real-time clock error**

Enter BIOS Setup and check the System Time and System Date settings on the Main menu.

**System battery is dead - replace and run Setup**

Replace the configuration battery as instructed in the previous chapter, then use BIOS Setup to reconfigure the system.

**System cache error - cache disabled**

The RAM cache failed POST and BIOS disabled it.

**System CMOS checksum bad - run Setup**

System CMOS has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run BIOS Setup and reconfigure the system either by getting the default values or by making your own selections.

**Terminal POST errors and beep codes**

There are several POST routines that shut down the computer if they fail. If possible, the BIOS sounds a sequence of beeps to identify the point at which POST failed. The most usual errors are listed below.

The BIOS also issues one long tone followed by two short tones if the video system is faulty or if an external ROM module fails.

Turn off the computer for 30 seconds and then try again. If the fault persists, make a note of the error code (if any) and call your supplier or authorised maintainer.

<b>Beeps</b>	<b>Test which failed</b>
1-2-2-3	BIOS ROM checksum
1-3-1-1	DRAM refresh.
1-3-1-3	8742 keyboard controller
1-3-4-1	RAM failure on address line.
1-3-4-3	RAM failure on data bits of low byte of memory bus.
1-4-1-1	RAM failure on data bits of high byte of memory bus.
2-1-2-3	Check ROM copyright notice
2-2-3-1	Test for unexpected interrupts
1-2	Video configuration failure, or option ROM checksum failure. (One long, two short beeps.)

The BIOS also issues Port 80h codes that can be displayed using a suitable diagnostic card. The codes can be used to determine the failure.

<b>Code</b>	<b>POST Routine Description</b>
02h	Verify Real Mode
03h	Disable Non-Maskable Interrupt (NMI)
04h	Get CPU type
06h	Initialise system hardware
08h	Initialise chipset with initial POST values
09h	Set IN POST flag
0Ah	Initialise CPU registers
0Bh	Enable CPU cache
0Ch	Initialise caches to initial POST values
0Eh	Initialise I/ O component
0Fh	Initialise the local bus IDE
10h	Initialise Power Management
11h	Load alternate registers with initial POST values
12h	Restore CPU control word during warm boot
13h	Initialise PCI Bus Mastering devices
14h	Initialise keyboard controller
16h	BIOS ROM checksum
17h	Initialise cache before memory autosize
18h	8254 timer initialisation
1Ah	8237 DMA controller initialisation
1Ch	Reset Programmable Interrupt Controller
20h	Test DRAM refresh
22h	Test 8742 Keyboard Controller
24h	Set ES segment register to 4 GB
26h	Enable A20 line
28h	Autosize DRAM
29h	Initialise POST Memory Manager
2Ah	Clear 512 KB base RAM
2Ch	RAM failure on address line
2Eh	RAM failure on data bits of low byte of memory bus
2Fh	Enable cache before system BIOS shadow
30h	RAM failure on data bits of high byte of memory bus
32h	Test CPU bus- clock frequency
33h	Initialise Phoenix Dispatch Manager
34h	Test CMOS RAM
35h	Initialise alternate chipset registers.

<b>Code</b>	<b>POST Routine Description</b>
36h	Warm start shut down
37h	Reinitialise the chipset (MB only)
38h	Shadow system BIOS ROM
39h	Reinitialise the cache (MB only)
3Ah	Autosize cache
3Ch	Advanced configuration of chipset registers
3Dh	Load alternate registers with CMOS values
42h	Initialise interrupt vectors
44h	Initialise BIOS interrupts
45h	POST device initialisation
46h	Check ROM copyright notice
48h	Check video configuration against CMOS
49h	Initialise PCI bus and devices
4Ah	Initialise all video adapters in system
4Bh	Display QuietBoot screen
4Ch	Shadow video BIOS ROM
4Eh	Display BIOS copyright notice
50h	Display CPU type and speed
51h	Initialise EISA board
52h	Test keyboard
54h	Set key click if enabled
56h	Enable keyboard
58h	Test for unexpected interrupts
59h	Initialise POST display service
5Ah	Display prompt "Press F2 to enter SETUP"
5Bh	Disable CPU cache
5Ch	Test RAM between 512 and 640 KB
5Eh	Base address
60h	Test extended memory
62h	Test extended memory address lines
64h	Jump to UserPatch1
66h	Configure advanced cache registers
67h	Initialise Multi Processor APIC
68h	Enable external and CPU caches
69h	Setup System Management Mode (SMM) area
6Ah	Display external L2 cache size
6Bh	Customise defaults
6Ch	Display shadow- area message
6Eh	Display possible high address for UMB recovery



<b>Code</b>	<b>POST Routine Description</b>
70h	Display error messages
72h	Check for configuration errors
74h	Test real- time clock
76h	Check for keyboard errors
77h	SMBus init devices
78h	Initialise system monitor and check for intrusion
79h	PCI audio init
7Ah	Test for key lock on
7Ch	Set up hardware interrupt vectors
7Eh	Initialise coprocessor if present
80h	Disable onboard Super I/ O ports and IRQs
81h	Late POST device initialisation
82h	Detect and install external RS232 ports
83h	Configure non- MCD IDE controllers
84h	Detect and install external parallel ports
85h	Initialise PC- compatible PnP ISA devices
86h	Re- initialise onboard I/ O ports.
87h	Configure Motheboard Configurable Devices
88h	Initialise BIOS Data Area
89h	Enable Non- Maskable Interrupts (NMIs)
8Ah	Initialise Extended BIOS Data Area
8Bh	Test and initialise PS/ 2 mouse
8Ch	Initialise floppy controller
8Eh	Autotype
8Fh	Determine number of ATA drives
90h	Initialise hard- disk controllers
91h	Initialise local- bus hard- disk controllers
92h	Jump to UserPatch2
93h	Build MPTABLE for multi- processor boards
95h	Install CD ROM for boot
96h	Clear huge ES segment register
97h	Fixup Multi Processor table
98h	Search for option ROMs. One long two short beeps on checksum failure
99h	Check for SMART Drive
9Ah	Shadow option ROMs
9Ch	Set up Power Management
9Dh	Security init
9Eh	Enable hardware interrupts
9Fh	Determine number of ATA and SCSI drives

<b>Code</b>	<b>POST Routine Description</b>
A0h	Set time of day
A2h	Check key lock
A4h	Initialise typematic rate
A8h	Erase F2 prompt
AAh	Scan for F2 key stroke
ACh	Enter SETUP
A Eh	Clear IN POST flag
B0h	Check for errors
B1h	ROMPilot unload
B2h	POST done - prepare to boot operating system
B4h	One short beep before boot
B5h	Terminate QuietBoot
B6h	Check password (optional)
B7h	ACPI initialisation
B8h	Clear global descriptor table
B9h	Clean up all graphics
BAh	Initialise DMI parameters
BBh	Initialise PnP Option ROMs
BCh	Clear parity checkers
BDh	Display MultiBoot menu
BEh	Clear screen (optional)
BFh	Check virus and backup reminders
C0h	Try to boot with INT 19
C1h	Initialise POST Error Manager (PEM)
C2h	Initialise error logging
C3h	Initialise error display function
C4h	Initialise system error handler
C5h	Dual cmos init
C6h	Dock init
C7h	Dock init late
C8h	Force recovery check
C9h	Extended checksum check of bios
D2h	Unknown\unexpected interrupt
E0h	Initialise the chipset
E1h	Initialise the bridge
E2h	Initialise the CPU
E3h	Initialise system timer
E4h	Initialise system I/ O
E5h	Check force recovery boot

<b>Code</b>	<b>POST Routine Description</b>
E6h	Checksum BIOS ROM
E7h	Go to BIOS
E8h	Initialise Multi Processor
E9h	Set Huge Segment
EAh	Initialilze OEM special code
EBh	Initialise PIC and DMA
ECh	Initialise Memory type
EDh	Initialise Memory size
EEh	Shadow Boot Block
EFh	System memory test
F0h	Initialise interrupt vectors
F1h	Initialise Run Time Clock
F2h	Initialise video
F3h	Initialise beeper
F4h	Initialise boot
F5h	Clear Huge segment
F6h	Boot to Mini DOS
F7h	Boot to Full DOS

The following codes are produced during the BIOS recovery sequence.

<b>Code</b>	<b>POST Routine Description</b>
14h	Read file
16h	Erase sector
17h	Program sector
18h	Verify sector
E0h	Memory allocation error
E1h	File not found
E2h	Path not found
E3h	No handles available
E4h	Access denied
E5h	Invalid access code
E6h	Undefined file open error
E7h	Access denied on file read
E8h	Invalid handle
E9h	Undefined file read error
EAh	File close failure
EBh	Chip ID failure
ECh	Sector erase failure
EDh	Sector protect failure
EEh	Sector program failure
EFh	Sector verify error
88h	Video not found
FFh	Incorrect parameters

## 6 ELECTRICAL

### POWER REQUIREMENTS

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The motherboard power requirements are heavily dependent on system configuration and the software being used. The table below can be used as a guide to the likely power supply requirements. They are measured using a 400MHz Intel Pentium® II Processor, 2 memory modules and an AGP video card running stress test software designed to yield worst case results. They should not, however, be regarded as maximum values.

<b>Supply</b>	<b>+5V standby</b>	<b>+5V</b>	<b>+3.3V</b>	<b>+12V</b>	<b>-12V</b>	<b>-5V</b>
Voltage Tolerance	± 5%	± 5%	± 4%	± 5%	± 10%	± 10%
Maximum Current (in above configuration)	50mA	5A	1.3A	300mA	30mA	0mA

Note that these figures do not cover cards plugged into the slots.

Note: For PCI 2.2 & PC99 compliance the +3.3 Volt standby rail is derived from the +5V standby output. Ensure the PSU used can supply the current required by the PCI cards when operating in standby.

**When operating this motherboard with a power supply that does not provide a +5V standby output, the PL4 jumpers must be fitted.**

#### **Advisory**

*Mitsubishi has found that some power supplies generate damaging voltages on their main outputs when their +5V standby output is over-loaded.*

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### PCB

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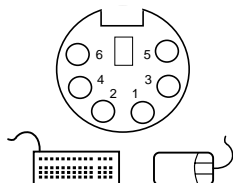
The PCB is a four-layer design measuring W7.8" x L9.6". It is ATX 2.01 compliant. The inner power planes are arranged so that the ground plane is nearest the top component layer.

The PCB has a UL flammability rating of 94V-0.

## 7 CONNECTOR ASSIGNMENTS

### Keyboard and Mouse (PS/2 Mini-DIN)

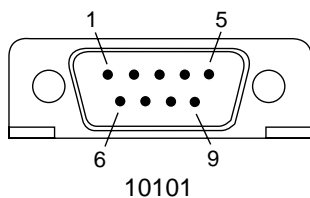
(Installation guide references A)



<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	CLK	I/O	Data clock
2	VCC	O	+5V Power
3	GND	-	Signal ground
4	NC	-	No connect
5	DATA	I/O	Serial data
6	NC	-	No connect

### Serial Port 1 and Serial Port 2 (9 way D-type)

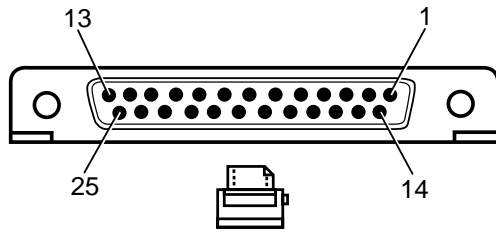
(Installation guide references C and E)



<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	DCD	I	Data Carrier Detect
2	RXD	I	Receive Data
3	TXD	O	Transmit Data
4	DTR	O	Data Terminal Ready
5	GND	I	Signal ground
6	DSR	I	Data Set Ready
7	RTS	O	Request to Send
8	CTS	I	Clear to Send
9	RI	I	Ring Indicate

**Parallel Port (25 way D-type)**

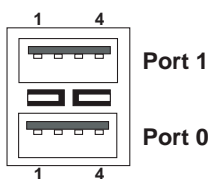
(Installation guide reference D)



<b>Pin</b>	<b>Standard mode</b>	<b>ECP mode</b>	<b>Direction</b>
1	STB#	STB#	
2	DATA0	DATA0	I/O
3	DATA1	DATA1	I/O
4	DATA2	DATA2	I/O
5	DATA3	DATA3	I/O
6	DATA4	DATA4	I/O
7	DATA5	DATA5	I/O
8	DATA6	DATA6	I/O
9	DATA7	DATA7	I/O
10	ACK#	ACK#	I
11	BUSY	BUSY	I
12	PE	PE	I
13	SLCT	SLCT	I
14	AFD#	AFD#	O
15	ERR#	ERR#	I
16	INIT#	INIT#	O
17	SLIN#	SLIN#	O
18	GND	GND	-
19	GND	GND	-
20	GND	GND	-
21	GND	GND	-
22	GND	GND	-
23	GND	GND	-
24	GND	GND	-
25	GND	GND	-

### USB Ports 0 and 1

(Installation guide reference B)



<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	VCC	O	+5V Power
2	DATA-	I/O	Differential Serial Data -
3	DATA+	I/O	Differential Serial Data +
4	GND	-	Signal ground

### Line Input and Output (3.5mm stereo jack)

(Installation guide references H and F)

<b>Pin</b>	<b>Signal</b>
Sleeve	GND
Tip	Left channel
Ring	Right channel

### Microphone Input (3.5mm stereo jack)

(Installation guide reference G)

<b>Pin</b>	<b>Signal</b>
Sleeve	GND
Tip	Mono input
Ring	Electret bias voltage

### Processor and System Fan (3 way header with locking ramp)

(Installation guide reference PL3, PL2)

<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	GND	-	Signal ground
2	+12V Power	O	DC fan drive voltage
3	FAN_TACH#	I	Tacho sense from fan



**Internal CD audio (4 way green ATAPI header)**

(Installation guide reference PL12)

<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	LEFT	I	Left audio input
2	GND	-	Signal ground
3	GND	-	Signal ground
4	RIGHT	I	Right audio input

**Internal LINE in (4 way natural colour ATAPI header)**

(Installation guide reference PL11)

<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	LEFT	I	Left audio input
2	GND	-	Signal ground
3	GND	-	Signal ground
4	RIGHT	I	Right audio input

**Internal telephony (4 way black ATAPI header)**

(Installation guide reference PL17)

<b>Pin</b>	<b>Signal</b>	<b>Direction</b>	<b>Description</b>
1	Input	I	Input from MODEM
2	GND	-	Signal ground
3	GND	-	Signal ground
4	MIC	O	Microphone output to MODEM

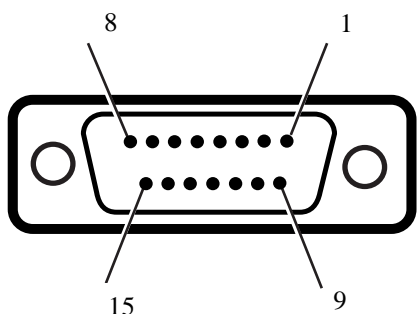
**Chassis Intrusion Switch (2 pin single row 0.1" header)**

(Installation guide references PL7)

<b>Pin</b>	<b>Signal</b>
1	Switch input. Switch should be open when chassis is closed.
2	GND

**MIDI/Joystick (15 way D-Type)**

(Installation guide reference J)



(Installation guide reference J)

<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>
1	FUSED +5V POWER	2	JAB1
3	JACX	4	GND
5	GND	6	JACY
7	JAB2	8	FUSED +5V POWER
9	FUSED +5V POWER	10	JBB1
11	JBCX	12	MIDI OUT
13	JBCY	14	JBB2
15	MIDI IN		

**Floppy Disk (34 way dual row 0.1" header)**

(Installation guide reference PL13)

<b><i>Pin</i></b>	<b><i>Signal</i></b>	<b><i>Pin</i></b>	<b><i>Signal</i></b>
1	GND	2	MODE
3	GND	4	DENSEL#
5	Key	6	DS3#
7	GND	8	INDEX#
9	GND	10	DS0#
11	GND	12	DS2#
13	GND	14	MOTOR#
15	GND	16	DIR
17	GND	18	STEP#
19	GND	20	WRDATA#
21	GND	22	WE#
23	GND	24	TRK0#
25	GND	26	WP#
27	GND	28	JBB2
29	GND	30	RDDATA
31	GND	32	HDSEL
33	GND	34	DSKCHG#

**Primary and Secondary IDE Disk (40 way dual row 0.1" header)**

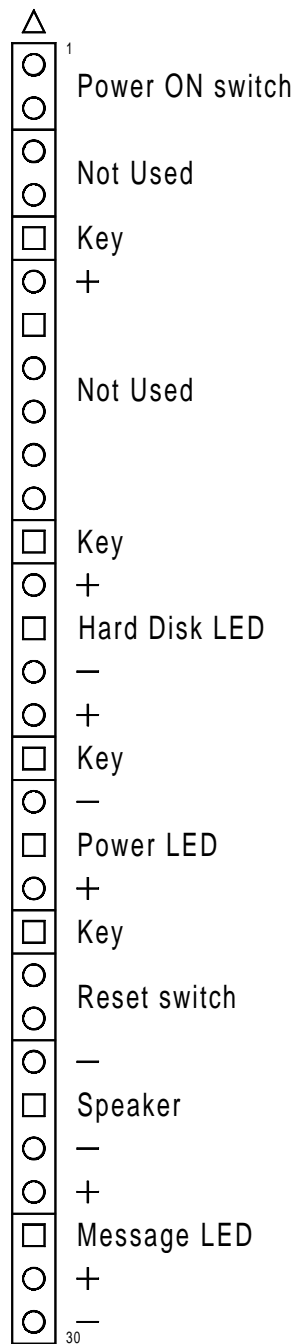
(Installation guide reference PL15 and PL14)

<b><i>Pin</i></b>	<b><i>Signal</i></b>	<b><i>Pin</i></b>	<b><i>Signal</i></b>
1	RESET#	2	GND
3	DATA7	4	DATA8
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	Key
21	DMAREQ	22	GND
23	IOW#	24	GND
25	IOR#	26	GND
27	IORDY	28	SPS_CSL
29	DMACK#	30	GND
31	INTRQ	32	IOCS16#
33	A1	34	PDIAG#
33	A0	36	A2
33	CS1FX#	38	CS3FX#
33	DASP#	40	GND

**Front panel connectors (single row 0.1" header)**

(Installation guide reference PL9)

<b>Pin</b>	<b>Signal</b>
1	Power switch. (momentary)
2	GND
3	Not used
4	Not used
5	Key (pin missing)
6	Not Used
7	Key (pin missing)
8	Not Used
9	GND
10	Not Used
11	Not used
12	Key (pin missing)
13	Hard disk activity LED +
14	Key (pin missing)
15	GND
16	Hard disk activity LED +
17	Key (pin missing)
18	Power LED -
19	Key (pin missing)
20	Power LED +
21	Key (pin missing)
22	Reset switch
23	GND
24	GND
25	Key (pin missing)
26	GND
27	Internal speaker drive
28	Key (pin missing)
29	Message LED +
30	Message LED -



## 8 GLOSSARY

**Accelerated Graphics Port (AGP).** A bus specification that enables 3-D graphics to display quickly. The interface uses the computer's main memory for refreshing the monitor image and to support the processing required for 3-D image display. When not being used for accelerated graphics, main memory is restored to use by the operating system or other applications.

**ACPI (Advanced Configuration & Power Interface).** ACPI defines a flexible and abstract hardware interface that provides a standard way to integrate power management features throughout a computer system, including hardware, operating system, and application software. In addition, ACPI provides a generic system event mechanism for Plug and Play (q.v.) and an operating-system-independent interface for configuration control. Windows 98 is an example of an ACPI-aware operating system.

**ATAPI (Advanced Technology Attachment Packet Interface).** An interface for removable-media drives. ATAPI is part of the Enhanced Integrated Drive Electronics (EIDE) interface, also known as ATA-2.

**ATX.** ATX is an industry-wide open specification for motherboard layout and placement. ATX improves motherboard design by allowing space for more full-length expansion cards. A double-height aperture is specified for the rear of the chassis, allowing a greater variety of peripheral ports. ATX-based computers are also easier to cool.

**codec (coder/decoder).** In this context, an audio signal analogue-to-digital, digital-to-analogue coder/decoder.

**DIMM (Dual In-line Memory Module).** A DIMM is a circuit board containing memory chips which plugs into a computer's motherboard by a row of contacts on the DIMM's lower edge.

**DMA (Direct Memory Access).** A way of moving data between devices without using the processor core logic to do it.

**DMI (Desktop Management Interface).** DMI is an industry-standard interface for keeping track of and monitoring the status of components in a network of computers.

**EIDE (Enhanced Integrated Drive Electronics).** A standard electronic interface for mass storage drives. EIDE's enhancements to the earlier IDE interface made it possible to address hard disks larger than 528 Mbytes. EIDE also provides faster access to the hard drive, support for Direct Memory Access (DMA), and support for removable-media drives (see *ATAPI*).

**ECC (Error Checking & Correcting).** A method of detecting — and where possible correcting automatically — errors in data that is being read or transmitted (in this context, to or from memory).

**EPP/ECP (Enhanced Parallel Port/Extended Capability Port).** EPP/ECP is a standard signalling method for bi-directional parallel communication between a computer and peripheral devices, that offers the potential for much higher rates of data transfer than the original parallel signalling methods. EPP is for non-printer peripherals. ECP is for printers and scanners. EPP/ECP are part of IEEE Standard 1284.

**IDE (Integrated Drive Electronics).** A standard electronic interface for mass storage limited to 528 Mbytes.

**ISA (Industry Standard Architecture).** ISA is a standard bus architecture associated with the original IBM AT motherboard. Although superseded technologically, many expansion cards continue to use it.

**logic-controlled Power Supply Unit (PSU).** Also known as a "soft-switch" PSU. A PSU that is controlled by a combination of firmware/software and which is capable of supplying current to a +5 V standby rail. Such a PSU facilitates sophisticated power-saving modes, and features such as

**Wake-on-LAN (q.v.).** The system's Power button is connected to the motherboard rather than providing a direct mechanical coupling to the PSU itself. See also *ACPI*.

**OLGA.** See *SECC2*.

**PC66, PC100.** Specifications from Intel for SDRAM (see below) designed to operate at 66 MHz and 100 MHz respectively.

**PCI (Peripheral Component Interconnect).** PCI is an interconnection system between a microprocessor and attached devices, including motherboard devices and expansion cards. Originally designed by Intel as a local bus, PCI is now relatively independent of microprocessor design.

**PLGA.** See *SECC2*.

**Plug and Play (PnP).** Plug and Play is both a design philosophy and a set of computer architecture specifications. The aim of PnP is to design intelligence into the computer to handle installation and configuration tasks without user intervention. The system itself determines the optimal configuration, and applications automatically adjust to take full advantage of the new configuration. PnP requires a PnP-aware BIOS, operating system and devices (which can include expansion cards and motherboard devices). The more recent ACPI specification (q.v.) extends the functionality of PnP-aware operating systems.

**Riv screws™.** A proprietary fastening that combines the speed of placement of a rivet with the ease of removal of a screw. Requires special tools to insert and remove.

**RTC (Real Time Clock).** Clock to keep time. It is battery backed to keep time when the main motherboard power is removed.

**SDRAM (Synchronous Dynamic Random Access Memory).** A generic name for various kinds of memory that are synchronised with the clock speed for which the processor is optimised. This tends to increase the number of instructions that the processor can perform in a given time. The speed of SDRAM is rated in MHz rather than in nanoseconds.

**SECC (Single Edge Contact Cartridge).** Packaging used for original Pentium® II processors. The substrate is entirely enclosed in a plastic cover with thermal plate. Gradually superseded by SECC2 packaging.

**SECC2.** Packaging used for later Pentium® II and Pentium® III processors. Has a plastic cover on one side only. The Pentium® II SECC2 package has two variants: PLGA (Plastic Land Grid Array) and the more recent OLGA (Organic Land Grid Array).

**SEPP (Single Edge Processor Package).** Packaging used for Celeron™ processors.

**SMbus.** A two way serial communication bus for connecting integrated circuits.

**UltraDMA/33.** A protocol for transferring data between a hard disk drive and the computer's memory. The Ultra DMA/33 protocol transfers data in burst mode at a rate of 33.3 megabytes per second, twice as fast as the previous Direct Memory Access (DMA) interface.

**Universal Retention Mechanism (URM).** A plastic support for Intel processors in Slot 1 connectors. Supports SECC, SECC2 and SEPP packaging.

**USB (Universal Serial Bus).** An interface/device standard for computer peripherals. With USB, a new device can be attached without having to turn off the computer. USB supports a data speed of 12 megabits per second, and can also supply DC power to certain devices.

**Wake-On-LAN.** Provides the capability to remotely power-on a networked computer simply by sending it a Wake-On-LAN packet. Wake-on-LAN support must be provided by the motherboard, BIOS, network adapter, operating system and client software, plus a logic-controlled PSU capable of delivering at least 720 mA on the +5 V standby rail.