Advanced Pentium II Motherboard

IN440EX

USER'S MANUAL

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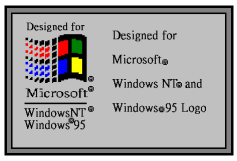

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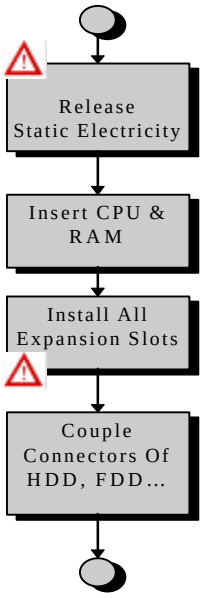
EASY INSTALLATION

The following "Easy Installation" steps are for users accustomed to the assembly of a computer system. For those individuals requiring more specific information please refer to the more detailed descriptions located within the latter chapters of this manual. Note: You must keep your power cable unplugged until the following installation steps are completed.

Getting Start:



Touch a grounded metal surface before unpacking your motherboard. For details please to release static electricity stored in your body refer to **Precaution** section in **Chapter 3.**

Install the CPU by correctly aligning the CPU with the as noted in the motherboard diagram. Once aligned, down on the CPU gently but firmly. Next, install either 3.3 volt unbuffered EDO or SDRAM into the 168 pin DIMMs. See **Sec. 3.2 & Sec. 3.3.** Slot 1 press the

After completing the above steps, install any expansion cards into the appropriate PCI, ISA or AGP slots and them tight to the chassis. See **Sec. 3.4.** screw

Plug in all cables included in the package except for power cord. Please see **Sec. 3.5.** the

Please recheck all steps to ensure no mistakes have been made and then plug in the power cord and turn on the power to enter the BIOS setup, **Chapter 4.**

CONTENTS

FEATURES: **9**

1 **11**

INTRODUCTION **11**

Overview **11**
Processor Subsystem 11
Cache Subsystem 11
Memory Subsystem 12
Data Integrity Subsystem 12
A.G.P. Interface 12
Embedded PCI Devices 13
PCI Bus Master IDE 13
PCI Add-in Cards 13
Embedded A.G.P. Devices 13
Embedded I/O Subsystem 13
System Management Subsystem 13
Advanced Configuration and Power Interface “ACPI” 13

2 **34**

FUNCTIONAL ARCHITECTURE **34**

Processor Subsystem **34**
SLOT-1 Processor Socket Pinout 34
Processor Upgrade 34
Processor Heat Sink 34

Memory Subsystem **34**
DRAM Subsystem 34
DRAM (DIMM) Sockets 35
System BIOS 35

L2 Cache Subsystem **35**
Cacheable and Non-Cacheable Regions 35

Address Maps **36**
Memory Map 36
I/O Address Map 36
Interrupt Allocation 36
DMA Channels 36

Video Subsystem **36**

FEATURES **37**
3D Accelerator 37
Video Accelerator/Video Capture 37
2D Accelerator 38
General Features 38
Video Modes 39
Video Memory 40
Video (Monitor) Connector 41
Sound Subsystem 42
Sound Features 42
Line Out Connector 42
Microphone In Connector 42
Line In Connector 42
3D Sound 43
CD-IN Connector (Audio) 43
Modem-In Connector 43

PCI/ISA Expansion Slots **43**
ISA Interface 43
ISA/PCI Expansion Slots 43
ISA Bus Speed 44
AT Bus Refresh 44

Storage Subsystem **44**
IDE Hard Disk Drive Interface 44
Floppy Disk Drive Interface 44

I/O Subsystem **45**
Serial Ports 45
Parallel Port 46
Keyboard Interface 47
Mouse Interface 47
Universal Serial Bus Connectors 48
Real-Time Clock 49
Non-volatile CMOS Memory Battery 49
IR (Infra-Red) Support 50
IRDA Header (J19) 50

Miscellaneous Connectors **50**
PC Speaker Connector 50
CPU Fan Connector 50
Hard Drive LED Connector 50
Suspend (Sleep) Connector (J27) 51
Power Button Switch (J29) 51
Green/Power-on LED Connector 51
Reset Button Connector (J30) 51

3 52

CONFIGURATION 52

Product Configuration **52**

Processor Speed Select Jumper 52
DRAM Subsystem Configurations 52

4 53

BIOS 53

The Main Menu 55
Main Menu Selection 56
Standard CMOS Setup 58
Bios Feature Setup 60
Power Management Setup 62
Load BIOS Defaults 63
Integrated Peripherals 64
Supervisor Password 65
User password 65
Save & Exit Setup 65

5 66

ELECTRICAL AND MECHANICAL SPECIFICATIONS 66

Absolute Maximum Ratings 66

Electrical 66
DC Specifications for 5V and 3.3V Signals 67

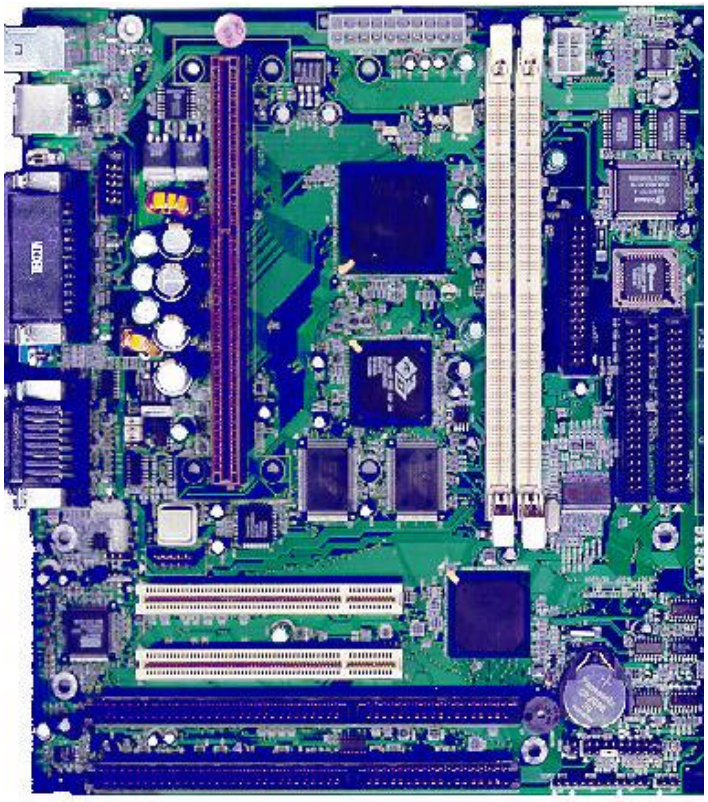
Power Supply 67
Power Supply Connectors 67
Input Power Budget 67

Mechanical 68
System Interfaces 68
User-Accessible Sockets 68
Back-Panel Interfaces 68

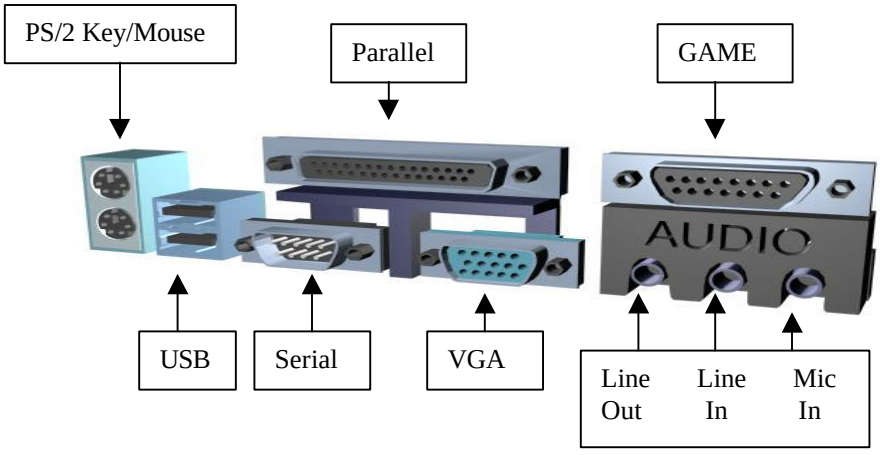
Manufacturability/Serviceability 69

Regulatory 69

Photo Of the Motherboard



Drawing of Motherboard I/O Back Plane



FEATURES:

Processor/Cache:

Processor	Intel “Deschutes”, “Klamath”, Celeron” Pentium II 233 ~ 333 MHz Operation with FSB (Front Side Bus) 66 MHz
Upgrades	Slot 1
Cache	**CPU Cartridge Integrated**; Write Back and Write Through, direct mapped organization “BSB” Cache
Size	0KB or 512KB

System Memory

Memory Size	8MB Min up to 256MB with Un-buffered SDRAM
Memory Sites	2 DIMM Sockets. SDRAM. Auto-detect w/Table Free Configuration Double Density DIMMs.
ECC/EC	Non-ECC support.
DIMM Type	8, 16, 32, 64 and 128MB. 64-bit non-ECC
Memory Speed	SDRAM 66Mhz parameter for synchronous memory.

Chipset

82440EX AGP/PCI/ISA Chipset

ISA/PCI Bus

PCI Level 2.1. 33 MHz Zero Wait State

Graphics Support

“AGP”	ATI 3D Rage Pro Turbo 2X or Rage IIC, 66MHz AGP with sidebands and pipelining 64-bit PCI Graphics Accelerator.
Video Memory	SGRAM @ 66MHz (128Kx32 or 256Kx32x2)
Memory Capacity	2MB or 4MB on the motherboard**,**

Integrated I/O

I/O Controller	Winbond W83977TF (Plug & Play Compliant) Serial Ports One 9 pin connectors for dual asynchronous serial ports. High speed 16C550 compatible serial ports.
Infrared Interface	Infrared port with FIR, IrDA and ASKIR
Parallel Port	One 25 pin supporting EPP, ECP and Centronics Interface
Hard Disk Controller	PCI Bus Mastering IDE. Native and Compatible Mode Support. IDE Transfer with Scatter Gather. “Ultra 33” Synchronous DMA. Enhanced IDE PIO mode 4 (16MB/s) Independent IDE timing. FIFOs for PCI Burst Transfers. Swap-Bay Support. Integrated 8x32-bit buffer for IDE PCI Burst Transfers
Hard Disk Connector	2 PCI IDE Connectors for 4 Drives Support
Floppy Controller	720 KB, 1.2, 1.44 and 2.88 MB support in non-FIR mode
Keyboard Port	PS/2 (Integrated in the FDC37C77X)
Mouse Port	PS/2 (Integrated in the FDC37C77X)
Real Time Clock	Integrated in the PIIX4 (DS1287 Compatible)
System Monitor	Winbond W83781D; Voltage/Temperature/Fan Speed/Chassis Intrusion

External Communication Ports

Serial Bus	Universal Serial Bus (USB), integrated with Core Logic

Integrated Sound

Sound Chip	ESS Solo –1 Business Audio
CODEC	16-bit Stereo
FM Synthesis	ESFM™ Music Synthesiser
Sound Effects	3D stereo effects

System BIOS

BIOS Type	Winbond based 2Mbit Flash
Hard Disk Driver	IDE, Auto-configuring
Plug&Play Support	Steerable DMA Channels and Interrupts. ISA Plug&Play
Special Features	PC-98 ready. Multi-Boot. PCI Add-In cardauto- config.

Green Features

Power Management	APM 1.2,
Advanced Features	ACPI (Advanced Configuration and Power Interface) compliant hardware for use with **APM & PNP-BIOS APIs**

Jumpers and Front Panel Connectors

Connectors	Reset switch. Suspend/Resume Button. Speaker. HD & PWR LED. Power Button. IR. (Jumpers CPU Speed Multiplier. Password/CMOS Clear.

Headers and Rear Panel Connectors

Connectors	Video. Parallel and Serial 1 Ports. Keyboard. Mouse. Line-Out. Mic., Line-In, game/midi USB 1&2
Headers	Serial 2. CPU Fan.

Headers and Connectors

Connectors	None
Headers	Floppy. IDE 1&2. CD-Audio In. Modem Audio. Aux-In. Reset switch. Speaker. Suspend/Resume Button. HDD & Power LED. Chassis Fan.

Mechanical

Board Style	MicroATX Form Factor
Board Size/Type	9.6” x 9.0”, Four Layer Board

Expansion Slots

Description	Two PCI Expansion connectors and two ISA Expansion connectors**.**

1 Introduction

This section provides an overview for the MicroATX Pentium® II based PCI/ISA Printed Wiring Assembly (PWA) code-named "IN440EX". It describes functional blocks and their relationship. The following diagram shows the functional blocks

Overview

The IN440EX is an implementation of BCM Advanced Research for a High-Volume MicroATX motherboard featuring these subsystems:

- Intel Pentium™ II MMX Processor cartridge support through the SLOT 1 connector
- Intel 82440EX PCIset: 82443EX (“PAC” PCI A.G.P. Controller) and 82371SB (“PIIX4” PCI-ISA-IDE Xcelerator)
- Accelerated Graphics Port “AGP” connector
- PCI IDE Bus Master interface
- Embedded advanced I/O support
- System Management Logic
- Advanced multiple Audio interface
- USB (Universal Serial Bus)
- System Monitoring Hardware
- MicroATX form-factor motherboard

The targeted Operating Systems for the IN440EX are: Windows 95, Windows 98 and Windows NT.

Processor Subsystem

The IN440EX has provisions to support the following processors: Intel Pentium™ II Processor with MMX™ technology (Deschutes) operating at 333/66, 300/66, 266/66 and 233/66 MHz. The Processor speeds are selectable with a four, (4) jumper block combination for the bus-to-core frequency ratio and CPU bus speed. The bus-to-core ratio is either 2/7, 1/4, 2/9 or 1/5 yielding the bus/core frequency; 66/233, 66/266, 66/300 or 66/333 MHz respectively.

High-performance features, including pipelined 32-bit addressing, 64-bit data, 16KB/16KB Instruction/Data Write-back or Write-through 2-way set associative primary cache. 0KB/512KB Write-back direct mapped secondary cache on the CPU Cartridge using a Back-Side-Bus (BSB). Two (2) Memory DIMM for support of SDRAM.

Two onboard DC/DC converters supply the +2.5 Volts for the CPU I/O voltage and the +1.5 Volts GTL+ bus voltage (VTT). An on-board switching power converter supplies the CPU core voltage (VCORE), the switcher supports the Pentium® II Voltage-ID pins for auto-voltage programming of the switcher supply.

Cache Subsystem

The cache and control functions are part of the Pentium® II Processor. The cache SRAM interface is through the processor’s Back-Side-Bus (BSB) and is included within the CPU cartridge.

The IN440EX can accept either the Pentium® II cartridge with 512KB of second level (L2) Pipelined Burst SRAM cache. The Pentium® II second level cache supports a direct mapped organization with a write-back policy, providing all necessary snoop functions and inquire cycles. Cacheability of the entire memory space in the first level cache is supported. For the second level cache only the first 512MB of main memory is cacheable, and only main memory controlled by the PAC DRAM interface will be cached, PCI and ISA memory is not cached.

Memory Subsystem

The IN440EX DRAM controller supports a 64-bit memory data interface, optionally supporting 64-bit wide DIMM modules, without ECC/EC. The DRAM types supported are Synchronous DRAM (SDRAM). SDRAM is supported at 66 MHz using symmetrical addressing.

The IN440EX Main Memory interface provides two (2) 168-pin DIMM socket (DIMM0 and DIMM1) sites, allowing system memory from 8MB to 256MB of SDRAM.

The DIMM sockets support either single or double-sided **'Unbuffered DIMM'** modules. The installed DRAM type can be 8MB, 16MB, 32MB, 64MB or 128MB DIMMs. The DRAM Controller uses the JEDEC standard Serial Presence Detect (SPD) Mechanism to detect memory and array configurations, there is no jumper settings required for the memory size. Memory is automatically detected by the system BIOS.

Rules for Populating the DIMM memory array

- DIMM sockets can be populated in any order.
- The DRAM Timing register, which provides the DRAM speed grade control for the entire memory array, will be programmed to use the timings of the slowest DRAMs installed.

Data Integrity Subsystem

Several data integrity features are included in the system. These are 64-bit DRAM interface for EX chipset, parity generation and checking on the PCI Bus and A.G.P. (for PCI transactions).

PCI Bus.

The system implements parity generation/checking as defined by the PCI specification.

A.G.P. Bus.

For the operations on the A.G.P. interface using PCI protocol, the system supports Parity generation/checking as defined by the PCI specification.

Main Memory DRAM Protection Modes.

The system supports three modes of data protection of the DRAM array:

- Non-ECC with Byte-Wise Write Support (Default mode, in this mode there is no provision for protecting the integrity of data in the DRAM array.)

A.G.P. Interface

The A.G.P. is a high performance, component level interconnect targeted at 3D graphics applications and is based on a set of performance enhancements to PCI. The IN440EX is designed to support the A.G.P. Interface.

The A.G.P. implementation is compatible with the Accelerated Graphics Port Specification. The system supports only a synchronous A.G.P. interface coupling to the host bus frequency. The actual bandwidth will be limited by the capability of the system's memory, reaching the highest performance with fast SDRAM. The A.G.P. Interface supports PCI operations as defined by the PCI specification. Electrically, only 66MHz PCI operations are supported.

For the definition of A.G.P. Interface functionality (protocols, rules and signalling mechanisms, as well as the platform aspect of A.G.P. functionality), refer to the latest A.G.P. Interface Specification. This document focuses only on the Controller specifics of the A.G.P. interface functionality.

Embedded PCI Devices

The PCI bus contains 1 embedded PCI device: PCI bus mastering IDE interface. The arbiter within the PAC performs arbitration for PCI bus masters.

PCI Bus Master IDE

PIIX-4 provides an integrated Bus Mastering IDE controller with two high performance IDE interfaces for up to four devices, such as Hard Drives and CD-ROM.

PCI Add-in Cards

High Performance PCI I/O cards can be used in the IN440EX through the PCI connector slots. The PCI bus is specified to support 10 loads. Each embedded controller or bridge (Video, PCI to ISA Bridge) count as 1 load, each PCI expansion slot used counts as 2 loads. To support multiple PCI devices in a single slot, add an expansion board containing PCI to PCI Bridge to a secondary PCI segment.

Embedded A.G.P. Devices

The AGP bus contains 1 embedded device: The ATI 3D Rage Pro Turbo 1X Graphics Accelerator. The 3D Rage Pro is a highly integrated graphics controller, integrating the 2D, 3D and video accelerators, palette DAC and quadruple clock synthesiser.

Embedded I/O Subsystem

The Winbond Plug and Play Ultra I/O controller “W83977TF” represents the newest technology in functionality and integration. While providing the standard PC I/O requirements the Ultra I/O complies with the ISA Plug-and-Play standard version 1.0a, and provides for the recommended functionality to support Windows 95. The Ultra I/O qualifies 16-bit address to allow relocation of 480 different addresses, with 13 IRQ options and 3 DMA channels available for each logical device.

Other features of the Ultra I/O are: 8042 keyboard controller. An Infrared interface for Fast IR (FIR), IrDA and ASKIR. Floppy interface. Two serial ports with 16-byte FIFOs. One EPP/ECP supported bi-directional parallel port.

System Management Subsystem

The IN440EX support the System Monitor services using Winbond’s W83781D System Management chip. The W83781D is used to monitor Voltage, Temperature, Fan Speed and Open Case Intrusion. The combination of the System Monitor and the Wake On LAN (WOL) functionality achieves the Management Level 3.

Advanced Configuration and Power Interface “ACPI”

The IN440EX supports the ACPI specification and its key elements; The Operating System Directed Power Management (OSPM). ACPI evolves the existing collection of power management BIOS code, APM APIs, PNP BIOS APIs, and so on into a well-specified power management and configuration mechanism. It provides support for an orderly transition from existing (legacy) hardware to ACPI hardware, and it allows for both mechanisms to exist in a single machine and be used as needed. ACPI evolves the existing motherboard configuration interfaces to support these advanced architectures in a more robust, and potentially more efficient manner.

OSPM provides a new appliance interface to customers. In particular, it provides for a sleep button. This sleep button is a “soft” button, which does not turn the machine physically off but signals the OS to go into a ‘soft off’ or sleeping state. ACPI defines two types of these “soft” buttons: one for putting the machine into sleep mode and one for putting the machine into ‘soft off’ mode.

This gives the OEM two different ways to implement machines: A one or a two-button model. The button on the one-button model can be used as a power button or a sleep button as determined by user settings. The two-button model has an easily accessible sleep button and a separate power button. In either model, an override feature that forces the machine to turn off or to reset without OS consent is also needed to deal with various rare, but problematic, situations.

ACPI is neither a software nor a hardware specification, although it addresses both software and hardware and how they must behave. ACPI is actually an interface specification.

Functional Architecture

Processor Subsystem

The Pentium® II processor connects with the system through a 242-pin connector type socket on the circuit board labelled SLOT-1. The 242-pin configuration corresponds to a standard pinout that can accommodate the following processors:

Intel Pentium™ II Processor with MMX (Celeron)
Intel Pentium™ II Processor with MMX (Klamath)
Intel Pentium™ II Processor with MMX (Deschutes)

SLOT-1 Processor Socket Pinout

The 242-pin connector is provided to allow for easy configuration at the time of manufacture or as a field upgrade of the microprocessor.

Reference:	SLOT-1
Connector Type:	**Female, 242 pin Dimm**
Connector Part Number:	Molex 71796-0001 (Or equivalent)

Processor Upgrade

The Pentium™ II processor maybe removed and replaced to accommodate Kamath or "Deschutes". Changes to the VCORE (Core Voltage Selection) are automatically adjusted.

Processor Heat Sink

The IN440EX M/B provides 12V power for the cooling fan through a 3-pin header with Fan-On control and Fan Speed detection.

Memory Subsystem

DRAM Subsystem

The IN440EX has two 64-bit (168-pin) DIMM sockets (DIMM0 and DIMM1) allowing system memory from 8 MB to 256MB of main DRAM. There are no jumpers settings required for the memory size, which is automatically detected by the system BIOS.

The DIMMs are rated 66 MHz (Klamath) or 100 MHz (Deschutes) SDRAM (Synchronous DRAM). DIMM modules must be 'Unbuffered' and operate at 3.3V. All the allowable memory size configurations are described on table 2.1 (Refer to Table 3.6 in the "Configuration" section for the different combinations and sizes of DIMMs).

Table 2.2. DRAM memory configurations in Megabytes.

8	**16**	**24**	**32**	**40**	**48**
64	**72**	**80**	**96**	**128**	**136**
144	**176**	**192**	**256**		

DRAM (DIMM) Sockets

Connection to the main system DRAM can be done via two (2) DIMM connectors on the system PWA.

Reference:	DIMM0, DIMM1
Connector Type:	female, 168 pin DIMM, in-line connector
Connector Part Number:	**Berg. 91145-60024 (Or equivalent)**

System BIOS

The system and video BIOS are stored in a 2M-bit (256Kx8) Flash Memory device. The system BIOS is always shadowed and cached.

L2 Cache Subsystem

The Pentium® II processor cartridge provides an unified 0KB or 512KB second level (L2) cache to complement the level one data and instruction (L1) internal caches. The L2 cache is Direct-Mapped non-sectored, supporting the Write Back policy architecture.

Table 2.4. L2 Cache latency with Burst SRAM

Cycle Type	Clock Count
Burst Read	X-1-1-1
Burst Write (Write-back)	X-1-1-1
Single Read	X
Single Write	X
Pipelined Back-to-Back Burst Reads	X-1-1-1,1-1-1-1[1]

[1]: The back-to-back cycles do not account for CPU idle clocks between cycles

Cacheable and Non-Cacheable Regions

The system caches the following regions:

- All system memory, including 0 to 640 KB and all memory present above 1 MB up to 1GB.
- System and integrated video controller BIOS.

The system does not cache the following regions:

- The video memory block from A0000 to BFFFF.

- PCI memory space on top of main memory.
- Any access to the PCI or AT bus.

Address Maps

Memory Map

The following table describes the breakdown of the IN440EX memory areas and how they are assigned.

Table 2.5. Memory Map

LOCATION	SIZE	TO	DESCRIPTION
0FFFFFFF-FFFFFFFF	256MB	4GB	BIOS ROM
000E0000-000FFFFF	128KB	1MB	System BIOS (Shadowed in DRAM)
000C8000-000DFFFF	96KB	896KB	Expansion region (Shadowed in DRAM)
000C0000-000C7FFF	32KB	800KB	Video BIOS (Shadowed in DRAM)
000A0000-000BFFFF	128KB	768KB	Video Buffer (SMM space Non-Cacheable)
00080000-0009FFFF	128KB	640KB	Optional memory space gap (DOS Apps)
00000000-0007FFFF	512KB	512KB	DOS applications (No read/write protect) (Always cacheable)

Video Subsystem

3D RAGE PRO Graphics Controller is a highly integrated graphics controller. Incorporated within this single chip are the 2D, 3D and video accelerators, palette DAC, and quadruple clock synthesiser. This multi-function integrated controller delivers superior 3D performance, TV-quality scaled video optimized for MPEG playback, industry-leading Mach64 2D performance, and video expansion capability suited for video conferencing, cable TV viewing, and hardware MPEG decoding.

The availability of ATI BIOS, drivers, utilities, and application software developed for the entire chip family is a major strength for the 3D RAGE PRO. Being register-compatible with all other controllers in the Mach64 accelerator series means immediate compatibility with a wide range of application drivers. Since this controller is also pin-compatible with ATI's family of other mach64 integrated controllers, it provides to the OEM a low-cost upgrade path to additional features and performance.

This controller uses active power management techniques to monitor activity levels within its' self and to perform real-time power reductions such as dynamic clock control and graphics engine shutdown. Because full-speed operation can be restored without delay, these techniques do not impact performance. Major advances have been included in this chip to boost performance in the area of a new bus interface, Accelerated Graphics Port

(AGP). With AGP data the throughput between host and 3D RAGE PRO has greatly increased. The result is even faster 2D and 3D performance and enhancements to motion video support (e.g. MPEG-2 motion compensation).

FEATURES

3D Accelerator

- Complete 3D primitive support: points, lines, triangles, lists, strips and Quadrilaterals
- Triangle Setup Engine with floating point to integer parameter conversion
- 4K on-chip Texture Cache
- Destination Alpha
- Gouraud shading
- Alpha blending and alpha interpolation
- 16-bit Z buffer
- Fogging and fog interpolation
- Dithering support in 16 bpp for near 24 bpp quality
- Perspectively correct mip-mapped texture mapping hardware, supporting:
    - Palletized CI4 and CI8 texture expansion
    - Texture filtering models including tri-linear mip mapping
    - Texture lighting modes
    - Ability to use YUV format textures
    - Alpha in texture map
    - Texture maps up to 1024 x 1024
    - Non square texture maps

Software driver support for Direct 3D, QuickDraw 3D RAVE and OpenGL interfaces, as well as others.

Video Accelerator/Video Capture

- Back end scaling
- Color interpolation during scaling for improved high resolution video quality
- Integrated 768 pixel wide dual video line buffers support filtered video scaling
- 4 tap horizontal and 2 tap vertical scalers for high-quality, full-screen video playback with MPEG-2 (720x480) sources
- YUV to ROB color space conversion with support for both packed and planar YUV formats as follows:
    - YUV422, YUV410 (YUV9), YUV420 (YUV12)
    - RGB32, RGB16/15
- Built-in continuous brightness and gamma correction to correct 'dark' images
- Chroma keying for effective overlay of video on graphics
- Overlay true color video regardless of the current graphics mode
- New buffer and frame synchronization modes to reduce display tearing

- Ability to turn off graphics data access behind video, hence reducing bandwidth
- Support for CCIR 656 video standard
- Ability to capture VBI and Intercast data
- Mirror video capture to support video conference

2D Accelerator

- Hardware acceleration - Rectangle Fill, Line Draw, BitBlt, Polygon Fill,Panning/Scrolling, Bit Masking, Monochrome Expansion, Scissoring, and full ROP support
- PCI bus master support for GUI programming
- 8x8x8 SRC Brush support
- Quick engine setup with alias registers
- Improved FIFO management to memory controller
- Increased command FIFO to 128 DWORDs
- Hardware cursor up to 64x64x2
- Acceleration provided in 8/l6/24/32bpp modes. Packed pixel support (24bpp) enables true color in 1MB configurations
- Game acceleration for Microsoft's DirectDraw—Double Buffering, Virtual Sprites, Transparent Blit and Masked Blit
- Increased display FIFO to 32 DWORDs. Additional 64 entry FIFO for Bus mastering
- True 24-bit, true-color palette DAC:
    - Pixel clock rates up to 200MHz, with 230MHz option, for up to 1600x1200 screen resolution at 85Hz vertical
    - Pixel depth of 32 bit at 1600x1200 screen resolution with WRAM and external RAMDAC at 240 MHz
    - Gamma correction for true WYSIWYG
    - Full 24-bit palette

General Features

- Integrated 3D, 2D, and Video accelerators with palette DAC and quad-clock synthesiser in a single chip
- Comprehensive AGP support, including 66 MHz and 133 MHz pipeline operation with sideband addressing
- PCI revision 2.1 bus for Plug-and-Play ease of use
- Bi-endian support for compliance on a variety of processor platforms
- 128-level command FIFO assures fast response to host command transfers for maximum CPU/host bus/controller efficiency and concurrent operation
- Additional 64 entry FIFO dedicated to Bus mastering
- Programmable flat or paged memory model with enhanced host access to a linear frame buffer

- 32-bit wide read/writeable memory mapped registers with optimized organization, reduces instruction overhead and raises performance
- DDC1 and DDC2B+ Plug-and-Play monitor support
- Power management for full VESA Display Power Management Signalling(DPMS) and EPA Energy Star compliance. Also, register support for controller power reduction and DAC power down
- Built-in CRC, chip diagnostics and manufacturing SCAN to ensure quality components

Video Modes

The following video modes are supported on the system board by the ATI-3D Rage Pro Graphics and Video Controller

Table 2.9. Video Modes

Display Screen Resolution	Re-fresh Rate	Hor. Scan (kHz)	Pixel Clock (MHz)	Colors (Bits per Pixel)															
				1 MB DRAM					2 MB DRAM					4 MB DRAM					
				4	8	16	24	32	4	8	16	24	32	4	8	16	24	32
640x480	60	31.4	25.2	√	√	√	√	-	√	√	√	√	√	√	√	√	√	√
640x480	72	37.7	31.2	√	√	√	√	-	√	√	√	√	√	√	√	√	√	√
640x480	75	37.5	31.5	√	√	√	√	-	√	√	√	√	√	√	√	√	√	√
640x480	90	47.9	39.9	√	√	√	-	-	√	√	√	√	√	√	√	√	√	√
640x480	100	52.9	44.9	√	√	√	-	-	√	√	√	-	-	√	√	√	√	√
640x480	120	63.7	55.0	√	-	-	-	-	√	√	√	-	-	√	√	√	√	√
800x600	48	33.8	36.0	√	√	√	-	-	√	√	√	√	-	√	√	√	√	√
800x600	56	35.1	36.0	√	√	√	-	-	-	√	√	√	-	√	√	√	√	√
800x600	60	37.8	40.0	√	√	√	-	-	√	√	√	√	-	√	√	√	√	√
800x600	70	44.5	44.9	√	√	√	-	-	√	√	√	√	-	√	√	√	√	√
800x600	72	48.0	50.0	√	√	√	-	-	√	√	√	-	-	√	√	√	√	√
800x600	75	46.8	49.5	√	√	√	-	-	√	√	√	-	-	√	√	√	√	√
800x600	90	57.0	56.6	√	√	-	-	-	√	√	-	-	-	√	√	√	√	√
800x600	100	62.5	67.5	√	√	-	-	-	√	√	-	-	-	√	√	√	√	√
800x600	120	76.0	81.0	√	-	-	-	-	√	√	-	-	-	√	√	√	√	√
1024x768	43	35.5	44.9	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√
1024x768	60	48.3	65.0	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√
1024x768	70	56.4	75.0	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√
1024x768	72	58.2	75.0	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√
1024x768	75	60.0	78.8	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√
1024x768	90	76.2	100	-	-	-	-	-	√	√	-	-	-	√	√	√	√	√
1024x768	100	79.0	110	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1024x768	120	96.7	130	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1152x864	43	45.9	65.0	√	√	-	-	-	√	√	√	-	-	√	√	√	√	√

1152x864	47	44.8	65.0	√	√	-	-	-	√	√	-	-	-	√	√	√	√	√
1152x864	60	54.9	80.0	√	√	-	-	-	√	√	-	-	-	√	√	√	√	-
1152x864	70	66.1	100	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1152x864	75	75.1	110	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1152x864	80	75.1	110	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1152x864	85	77.1	121.5	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1280x1024	43	50.0	80.0	√	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1280x1024	47	50.0	80.0	√	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1280x1024	60	69.3	110	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1280x1024	70	74.6	126	-	-	-	-	-	√	√	-	-	-	√	√	√	√	-
1280x1024	74	78.8	135	-	-	-	-	-	√	√	-	-	-	√	√	√	-	-
1280x1024	75	79.9	135	-	-	-	-	-	√	√	-	-	-	√	√	√	-	-

Video Memory

The system's video memory consists of SGRAM only. In it's standard configuration, the system will have two 256K/512Kx32 SGRAM chips soldered on the board to give a total of 2MB/4MB.

Table 2.10. SO-DIMM Video Memory Module Connector Pinout

Pin #	Description	Pin #	Description	Pin #	Description	Pin #	Description
1	GND	2	GND	73	MCK	74	MCK
3	VMD63	4	VMD62	75	VCC	76	VCC
5	VMD61	6	VMD60	77	NC	78	NC
7	VMD59	8	VMD58	79	GND	80	GND
9	VMD57	10	VMD56	81	VMA9	82	VMA8
11	VCC	12	VCC	83	VMA7	84	VMA6
13	VMD55	14	VMD54	85	GND	86	GND
15	VMD53	16	VMD52	87	VMA5	88	VMA4
17	VMD51	18	VMD50	89	VMA3	90	VMA2
19	VMD49	20	VMD48	91	VMA1	92	VMA0
21	GND	22	GND	93	VCC	94	VCC
23	DQM#7	24	DQM#6	95	VMD31	96	VMD30
25	DQM#5	26	DQM#4	97	VMD29	98	VMD28
27	VCC	28	VCC	99	VMD27	100	VMD26
29	VMD47	30	VMD46	101	VMD25	102	VMD24
31	VMD45	32	VMD44	103	GND	104	GND
33	VMD43	34	VMD42	105	VMD23	106	VMD22
35	VMD41	36	VMD40	107	VMD21	108	VMD20
37	GND	38	GND	109	VMD19	110	VMD18
39	VMD39	40	VMD38	111	VMD17	112	VMD16
41	VMD37	42	VMD36	113	VCC	114	VCC
43	VMD35	44	VMD34	115	DQM#3	116	DQM#2

45	VMD33	46	VMD32	117	DQM#1	118	DQM#0
47	VCC	48	VCC	119	GND	120	GND
49	NC	50	NC	121	VMD15	122	VMD14
51	NC	52	NC	123	VMD13	124	VMD12
53	NC	54	NC	125	VMD11	126	VMD10
55	GND	56	GND	127	VMD9	128	VMD8
57	DSF	58	NC	129	VCC	130	VCC
59	NC	60	NC	131	VMD7	132	VMD6
61	NC	62	NC	133	VMD5	134	VMD4
63	VCC	64	VCC	135	VMD3	136	VMD2
65	SO_CS1-	66	SO_CS0-	137	VMD1	138	VMD0
67	RAS#0	68	CAS#0	139	GND	140	GND
69	WE#	70	CKEX	141	SDA(21,22)	142	SCL (22)
71	GND	72	GND	143	VCC	144	VCC

Video (Monitor) Connector

Connection to VGA monitor is via a connector on the rear panel on the system PWA.

Reference: J8 (Video)
Connector Type: female, high density DB15S, 15-pin AT-compatible
Connector Part Number: Foxconn Dz11AA1B8 or equivalent

Table 2.11. Video Monitor Connector Pinout

PIN	Description
1	RED
2	GREEN
3	BLUE
4	N/C
5	LOGIC-GROUND
6	RED GROUND RETURN
7	GREEN GROUND RETURN
8	BLUE GROUND RETURN
9	+5V PULL-UP
10	LOGIC GROUND
11	N/C
12	DDC DAT
13	HORIZONTAL-SYNC
14	VERTICAL-SYNC
15	DDC CLK
16	LOGIC-GROUND[1]
17	LOGIC-GROUND[1]

1: Pins 16 and 17 are connector mounting holes connected to logic ground.

Sound Subsystem

The IN440EX uses the ESS Solo-1 (ES1938), which is a single chip multimedia audio system controller. It includes an integrated FM synthesiser and a Plug and Play PSI interface. The ES1938 is compatible with the Microsoft Windows Sound System standard and will run software written to the Sound Blaster and Sound Blaster Pro interfaces.

Sound Features

- Compatible with Sound Blaster™, Sound Blaster Pro™, and Windows Sound System™, PC97/PC98 and WHQL specifications.
- High-Quality ESFM™ Music Synthesiser.
- Fully Plug-and-Play PCI Compatible
- Integrated Spatializer® 3D Audio Effects Processor.
- 16-Bit Address Decode Support
- 4248 Register Compatible
- Dynamic Range (SNR) Over 80dB
- ACP1 Compliant

Line Out Connector

The audio subsystem provides external sound through a user accessible stereo jack connector (J5-1) soldered to the PWA. This jack will allow the connection of self-amplified speakers.

Reference:	J5-1 (LINE OUT)
Connector Type:	1/8 in. Audio Jack Connector
Connector Part Number:	Singatron, SJ-500C-0 (or equivalent)

Microphone In Connector

An external accessible jack connector (J5-3) is soldered to the PWA to allow the connection of a microphone for voice input.

Reference:	J5-3 (MIC IN)
Connector Type:	1/8 in. Microphone Jack Connector
Connector Part Number:	Singatron, SJ-500C-0 (or equivalent)

Line In Connector

An external accessible jack connector (J5-2) is soldered to the PWA to allow the connection of a Line-In for line input.

Reference:	J5-2 (Line-In)
Connector Type:	1/8 in. Line-In Jack Connector
Connector Part Number:	Singatron, SJ-500C-0 (or equivalent)

3D Sound

The ESS Solo-1 has integrated the 3D Audio Effects processor which uses technology from Spatializer® Audio Laboratories, Inc., and expands the sound field emitted by two speakers to create a resonant 3D sound environment.

CD-IN Connector (Audio)

Access to the CD-IN connector for audio input from CD-ROM drives.

Modem-In Connector

Access to the MODEM-IN connector for audio input and output from the phone connection.

PCI/ISA Expansion Slots

ISA Interface

The IN440EX incorporates a fully ISA (AT) bus compatible master and slave interface that is compatible with the IEEE 996 specification. The ISA interface also provides byte swap logic and I/O recovery support.

The ISA interface supports the following types of cycles:

- PCI master-initiated I/O and memory cycles to the ISA bus
- DMA compatible cycles between main memory and ISA I/O and between ISA I/O and ISA memory
- Enhanced DMA cycles between PCI memory and ISA I/O
- ISA refresh cycles initiated by either the controller or an external master
- ISA master-initiated memory cycles to PCI and ISA master-initiated I/O cycles to the controller registers

ISA/PCI Expansion Slots

The IN440EX motherboard support ISA and PCI expansion buses to implement up to two (2) ISA and two (2) PCI slots. The IN440EX will support one (1) ISA, one (1) PCI and one (1) shared ISA/PCI NLX slot.

ISA Bus Speed

Dividing the PCI clock by 4 generates the ISA system clock. The divide by 4 setting is used for 30MHz and 33MHz PCI bus speed. The frequencies supported are 7.5MHz and 8.33MHz.

AT Bus Refresh

The IN440EX system board supports *hidden* refresh cycles which allows the CPU to continue to execute unless an AT bus cycle is attempted coincident with the AT bus refresh cycle (ISA Bus refresh cycles are completely decoupled from DRAM Refresh). Transactions driven by PCI masters that target ISA or IDE resources while refresh is active are held off with wait states until the refresh is complete.

Storage Subsystem

IDE Hard Disk Drive Interface

The IN440EX provides two (2) independent high performance bus-mastering PCI IDE interfaces capable of supporting PIO Mode 3, Mode 4 and 'Ultra33' Synchronous DMA mode devices. The integrated IDE interface can control up to four IDE devices allowing for both CD-ROM and Hard Disk drives. IDE PRI & IDE SEC are the primary and secondary IDE connectors respectively. Both IDE controllers can be disabled through BIOS to allow for external disk drive controllers.

Floppy Disk Drive Interface

The IN440EX has an integrated 765B compatible floppy disk controller using the Winbond's W83977TF component. The FDC sub-section can control one (720KB, 1.2, 1.44 or 2.88MB) floppy disks or compatible tape drives. The floppy I/O address can be relocated to 480 different locations. 13 IRQ and 3 DMA channel options are available as well. Includes multiple power down modes for reduced power use.

The floppy disk interface contains 48mA drivers and Schmitt trigger inputs on the drive interface.

I/O Subsystem

The I/O Subsystem consists of a single component from Winbond. The IN440EX uses the Plug and Play Compatible Ultra I/O Controller "W83977TF", this device provides support for the ISA Plug-and-Play version 1.0a and includes the recommended functionality to support Windows 95. Through internal configuration registers, each of the W83977TF's logical device's I/O address, DMA channel and IRQ channel may be programmed. There are 480 I/O address location options, 13 IRQ options and 3 DMA channel options for each logical device.

The Ultra I/O device provides two (2) high speed UARTs compatible serial ports with send/receive 16 Byte FIFOs or one IR port, one Multi-Mode Parallel Port with ECP/EPP modes, and a Floppy/Tape Controller supporting up to 2.88MB transfer rates.

Serial Ports

The IN440EX has two (2) UARTs compatible serial ports configured as Data Terminal Equipment (DTE). The electrical characteristics are compliant with the *EIA-232-D Serial Communications Specifications*. The serial ports may be remapped above other installable serial ports or disabled through BIOS. As a minimum the first serial port (COM1) must be capable of re-mapping to COM3. The second serial port (COM2) must be able to be remapped to COM4. The serial ports I/O address can be relocated within 480 different locations. The default address for COM1, COM2, COM3 and COM4 are 3F8H, 338H, 2F8H and 238H respectively. 13 different IRQ options are available to the serial ports.

One port (COM1) is available through a connector (J4) is located on the rear panel of the system PWA. The second Serial Port (COM2) is available through a header on the PWA.

Reference:	J4 (COM1)
Connector Type:	male, 9 pin metal shell D-SUB
Connector Part Number:	Amp 1-103322-5 or equivalent

Reference:	J13 (COM2)
Connector Type:	male, 2x5, 0.100" centerline, straight
Connector Part Number:	Amp 1-103322-5 or equivalent

Table 2.17. Serial Port Connector Pinout.

PIN	DESCRIPTION
1	DATA-CARRIER-DETECT (DCD)
2	RECEIVE-DATA (RXD)
3	TRANSMIT-DATA (TXD)
4	DATA-TERMINAL-READY (DTR)
5	LOGIC-GROUND
6	DATA-SET-READY (DSR)
7	REQUEST-TO-SEND (RTS)
8	CLEAR-TO-SEND (CTS)
9	RING-INDICATOR (RI)
10	SHELL-GROUND[1]
11	SHELL-GROUND[1]

1: Pins 10 and 11 (Shell Ground) are mounting holes connected to the metal connector housing on serial port 1.

Parallel Port

The system PWA has a single, bi-directional parallel port (EPP/ECP compatible). The parallel port is capable of being disabled or remapped to either the secondary LPT address or the tertiary LPT address through BIOS if other parallel ports are installed in the system. The parallel port I/O address can be relocated within 480 different locations. Three (3) DMA channels options and 13 different IRQ options are available to the parallel port.

A connector is located on the rear panel of the system PWA for the external connection to the port. The parallel port interface contains 12mA source output drivers on the drive interface, and incorporates ChipProtect circuitry for protection against damage due to printer Power-On.

Reference: J7 (PARALLEL)
Connector Type: female, 25 pin metal shell D-SUB
Connector Part Number: AMP 750096-3 or equivalent

Table 2.18. Printer Port Connector Pinout

PIN	DESCRIPTION
1	STROBE*
2	PD0
3	PD1
4	PD2
5	PD3
6	PD4
7	PD5
8	PD6
9	PD7

10	ACKNOWLEDGE*
11	BUSY
12	PAPER-END (PE)
13	SELECT
14	AUTO-FEED*
15	ERROR*
16	INIT*
17	SELECT -IN*
18	LOGIC-GROUND
19	LOGIC-GROUND
20	LOGIC-GROUND
21	LOGIC-GROUND
22	LOGIC-GROUND
23	LOGIC-GROUND
24	LOGIC-GROUND
25	LOGIC-GROUND
26	SHELL-GROUND[1]
27	SHELL-GROUND[1]

1: Pins 26 and 27 are connector-mounting holes connected to the metal connector housing.

Keyboard Interface

The system PWA has a PS/2-compatible keyboard interface. The shielded keyboard interface connector has a PS/2-compatible pinout and is located on the rear panel on the system PWA, this connector is a dual package with the Mouse connector residing on top. To meet the requirements for UL compliance, the Vcc pin (pin 4) is connected through a fuse prior to connection to the external connector.

Reference:	J2 (KEYBOARD) bottom
Connector Type:	female, 6-pin metal shield mini-DIN
Connector Part Number:	AMP 749231-1 or equivalent

Table 2.19. Keyboard Connector Pinout

PIN	DESCRIPTION
1	KEYBOARD-DATA
2	N/C
3	LOGIC-GROUND
4	KEYBOARD-Vcc
5	KEYBOARD-CLOCK
6	N/C
7	SHELL-GROUND[1]
8	SHELL-GROUND[1]
9	SHELL-GROUND[1]

1: Pins 7-9 are, connector-mounting hole pins connected to the metal connector housing

Mouse Interface

The system PWA has a PS/2-compatible mouse interface. The shielded mouse port can be disabled through SETUP. A connector, utilizing PS/2 pinouts, is located on the rear panel on the system PWA. To meet the requirements for UL compliance the Vcc pin (pin 4) was connected through a fuse prior to connection to the external connector.

Reference: J2 (MOUSE) Top
Connector Type: female, 6-pin metal shield mini-DN
Connector Part Number: AMP 749231-1 or equivalent

Table 2.20. Mouse Connector Pinout

PIN	DESCRIPTION
1	MOUSE-DATA
2	N/C
3	LOGIC-GROUND
4	MOUSE-Vcc
5	MOUSE-CLOCK
6	N/C
7	SHELL-GROUND[1]
8	SHELL-GROUND[1]
9	SHELL-GROUND[1]

1: Pins 7-9 are connector-mounting hole pins connected to the metal connector housing.

Universal Serial Bus Connectors

The Universal Serial Bus (USB) is a communications architecture that gives a PC the ability to interconnect a variety of devices via a simple four-wire cable. The USB is actually a two-wire serial communication link that runs at 12 megabits (Mbs) per second. USB protocols can configure devices at startup or when they are plugged in at run time. These devices have been broken into five major classes:

- Monitors
- Communication devices
- Audio
- Human input
- Mass storage

More classes will be identified as the USB Standard matures.

The IN440EX is equipped with two USB Serial Ports. This permits connection of two USB peripheral devices directly to the system without an external hub. If more devices are needed, an external hub can be connected to either of the built-in ports.

Reference: J3, (USB-1) + USB2

Connector Type: USB CONN, DUAL
Connector Part Number: Molex, 87525-001 or equivalent

Table 2.21. USB-1 & 2 Connector Pinout

PIN	DESCRIPTION	COMMENT
1	VCC	Cable power
2	- Data	
3	+ Data	
4	Ground	Cable ground

Real-Time Clock

The integrated Real Time Clock (RTC) is DS12887/MC146818 compatible and provides the time of day clock, 100-year calendar with alarm features and is accurate to within 1 minute per month, it consumes less than 1 μA of standby current (Typ.). The (RTC) supports 256 bytes of battery backed Non-volatile CMOS memory in two banks of 128 bytes each, both banks being reserved for BIOS use. One bank of CMOS memory is used to maintain the clock and user-system-setting configuration parameters when the main system power is removed. The other bank (128 bytes) is lockable in 4x32 byte blocks and can be used to store and lock miscellaneous information.

The CMOS RAM can be set to specific values or cleared to the system default values using the BIOS SETUP program. Also to prevent a lock-up situation the CMOS RAM values can be cleared to the system defaults by using the CLR CMOS jumper on the PWA.

Non-volatile CMOS Memory Battery

An external coin-cell style battery provides power to the RTC and CMOS memory when system power is removed. The battery has an estimated lifetime of five to seven years and is socketed for easy replacement.

Reference: BT1
Socket Type: COIN TYPE

IR (Infra-Red) Support

The IN440EX I/O subsystem incorporates an IR interface supporting the following industry standards; Fast IR, IRDA (HP-SIR), ASK-IR. The IR header provides the necessary signal interface allowing a two-way wireless communication port using infrared as the transmission medium. The user can transfer files to/from portable devices such as laptops, PDA's and printers using application software such as LapLink. The Fast IR specification provides for data transfers at 4 Mbps from a distance of 1 meter. This implementation also provides an infrared interface supporting a standard or custom remote control device to perform wireless keyboard or mouse functions.

IRDA Header (J19)

A header is available on the IRDA header for a cable connection to the IR module.

Miscellaneous Connectors

PC Speaker Connector

A header is available on the Speaker header (J22), pin 1 and pin 4 to drive a chassis-mounted speaker if desired.

CPU Fan Connector

A 1 x 3 straight header is available on the PWA to drive the CPU mounted cooling fan and provide the system with the Fan's tachometer input.

Reference:	J18 (FAN)
Connector Type:	1 x 3 male straight 0.100
Connector Part Number:	AMCO 463-2-03 or equivalent

Table 2.24. CPU Fan Conn. Pinout

PIN	SIGNAL
1	LOGIC-GROUND
2	FAN-PWR-ON
3	FANTACH3

Hard Drive LED Connector

A header is available on the primary IDZ connector (J32) and secondary IDZ connector (J28) to power an LED on the front panel to indicate hard drive activity.

Suspend (Sleep) Connector (J27)

A header is available on the Sleep Header (J27) for connecting a momentary contact switch on the front panel, which can be used to turn the system into Sleep Mode.

Power Button Switch (J29)

A header is available on the power button header (J29) for connecting a momentary contact switch on the front panel, which can be used to turn the system power off or on.

Green/Power-on LED Connector

A header is available on the Green LED (J22, pin 2 and pin 4) for connecting to a Green LED or Power-on indicator (J23).

Reset Button Connector (J30)

A header is available on the Reset header (J30) for connecting a momentary contact switch on the front panel, which can be used to reset the system.

3

Configuration

Product Configuration

The PWA component will be produced by BCM without the microprocessor installed, it is assumed that the microprocessor will be installed during the customer's integration process. The same applies to the system memory DRAM DIMMs.

Processor Speed Select Jumper

To select the processor speed there is a jumper block of user-accessible jumpers labeled **"JP1".**

To select the processor speed install the jumper as follows:

Table 3.1. CPU Speed Selection

Klamath CPU Speed (MHz)	1-2	3-4	5-6	7-8
233	ON	OFF	ON	OFF
266	OFF	ON	ON	ON
300	OFF	ON	ON	OFF
333	OFF	OFF	ON	ON

DRAM Subsystem Configurations

The IN440EX supports 8 MB to 256MB of system RAM. The allowable memory configurations are shown below:

Table 3.2. DIMMs Configurations

DIMM0	DIMM1	Total Memory
8MB	EMPTY	8MB
8MB	8MB	16MB
16MB	EMPTY	16MB
16MB	8MB	24MB
16MB	16MB	32MB
32MB	EMPTY	32MB
32MB	8MB	40MB
32MB	16MB	48MB

32MB	32MB	64MB
64MB	EMPTY	64MB
64MB	8MB	72MB
64MB	16MB	80MB
64MB	32MB	96MB
64MB	64MB	128MB
128MB	EMPTY	128MB
128MB	8MB	136MB
128MB	16MB	144MB
128MB	32MB	176MB
128MB	64MB	192MB
128MB	128MB	256MB

For simplicity other memory configurations were not included on this table.

4

Bios

Software

This product's software is referred to as "BIOS" (Basic Input and Output Subroutine), the BIOS resides as **firmware** in a non-volatile memory device using Flash technology. This technology gives the user the ability to be able to update the BIOS and accommodate changes to features or optimizations to better the performance of the system. The user need only to load a diskette with the new BIOS firmware and follow the manufacturer instructions to update the BIOS.

General

This product will have an Award Software, Inc. developed system Flash BIOS. The BIOS will have a menu driven SETUP utility. The specific features & implementation requirements are to be provided by the OEM Customer if so desired.

BIOS Setup

The SETUP Menu on your BIOS maybe slightly different than the one represented in here. Different OEMs will require certain user access to advanced functions while other OEMs may not allow the user any access at all. The exact BIOS Menu representation can be extracted from the BIOS supplied with your platform.

The Main Menu

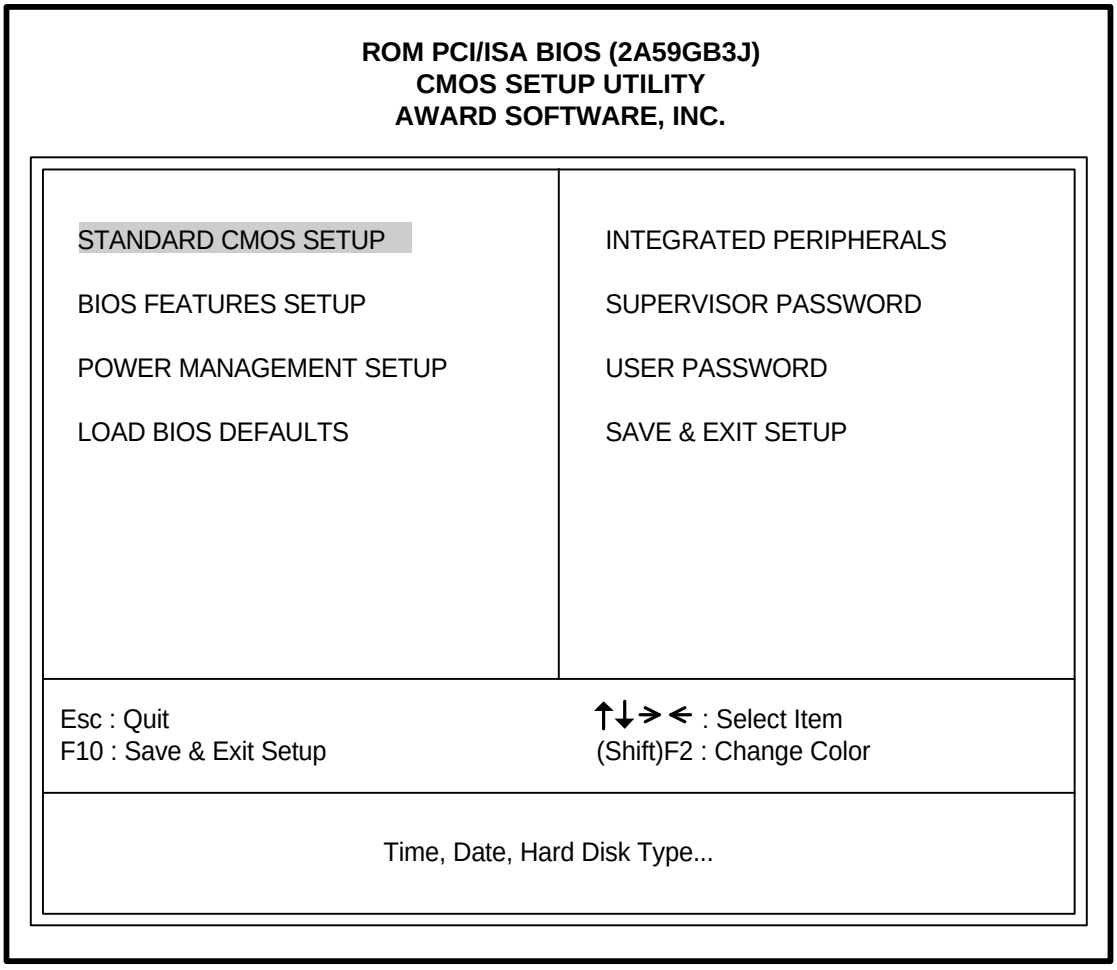
To start the Award BIOS CMOS Setup utility:

1. Turn on or reboot your system. The Award BIOS displays this message at the bottom of the screen:

   Press **DEL** to enter SETUP

2. Press the DELete Key to display the Main Menu, which looks like this:

Figure 4.1. BIOS Setup Main Menu



Main Menu Selections

The Main Menu Selections are as follows:

Table 4.1. Main Menu Selections

Standard CMOS Setup	Use this menu for basic system configuration, such as Date, Time, Hard Drive Parameters and Floppy Drive Parameters.
BIOS Features Setup	Use this menu to set certain BIOS Features available on your system's chipset.
Power Management Setup	Use this menu to configure Power-Management features.
Load BIOS Defaults	Use this to load the BIOS Defaults, except the Standard CMOS Setup
Integrated Peripherals	Use this menu to configure the Onboard peripherals, such as Serial and Parallel Ports and Hard Drive and Floppy Drive Controllers.
Supervisor Password	Setting a Supervisor Password restricts access to the BIOS Setup menus
User Password	Setting a User Password restricts access to the BIOS Setup menus or the System
Save & Exit Setup	Save all changes to CMOS and Exit the Setup Utility

Use the "←↑→↓" arrow keys to make a selection.

Standard CMOS Setup

You can make the following selections on the Standard CMOS Setup Menu.

Figure 4.1.1 Standard CMOS Setup

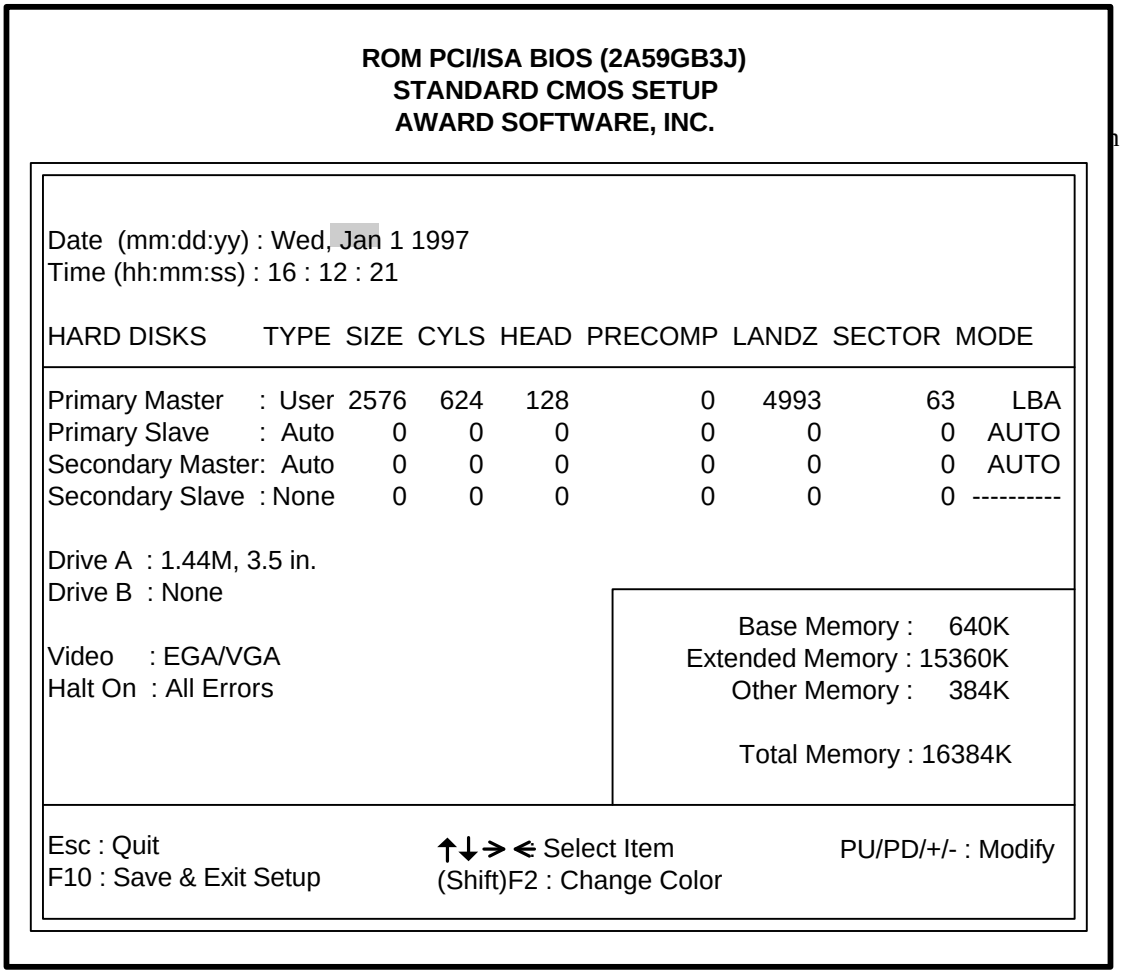


Table 4.1.1. Standard CMOS Setup

Feature	Options	Description
Date	MM/DD/YYYY	Set the system date.
Time	HH/MM/SS	Set the system time.
Primary Master TYPE Primary Slave TYPE Secondary Master TYPE Secondary Slave TYPE	Auto User None 1 - 45	'Auto' autotypes the drive at each boot. 'User' prompts the user to fill in remaining fields. 'None' indicates no drive is attached. '1 - 45' fills in all remaining fields with values for predefined disk types.
SIZE	N/A	Indicates the Size of the Hard Drive
CYLS∗	1 - 16,384	Number of Cylinders
HEAD∗	1 - 16	Number of read/write Heads
PRECOMP∗°	N/A	Obsolete
LANDZ∗°	N/A	Obsolete
SECTOR∗	1 - 63	Number of sectors per track
MODE	AUTO NORMAL LBA LARGE	'AUTO' will automatically select which mode to use. 'NORMAL' can be used for drive smaller than 514MB. 'LBA' and 'LARGE' can be used for drives larger than 514MB.
Disk A: Disk B:	360KB, 5 ¼" 1.2MB, 5 ¼" 720KB, 3 ½" 1.44M, 3 ½" 2.88MB, 3 ½" None	Select the type of floppy-disk drive installed in your system.
Video	Mono EGA/VGA CGA 40 CGA 80	Select the default video device
Halt On	No Errors All, But Keyboard All, But Diskette All, But Disk/Key All Errors	System displays the error found and 'Press F1 to continue, DEL to enter Setup', unless disabled.
Base Memory	N/A	Displays amount of conventional memory detected during bootup
Extended Memory	N/A	Displays the amount of extended memory detected during bootup
Other Memory	N/A	Displays the amount of other memory detected during bootup
Total Memory	N/A	Displays the total amount of memory detected during bootup

° IDE drives do not require setting Landing Zone and Write Precomp.

∗ These settings can only be changed when the Hard Disk Type is set to 'USER'.

WARNING: Incorrect settings can cause your system to malfunction.

BIOS Features Setup

You can make the following selections on the BIOS Features Setup Menu.

Figure 4.1.2 BIOS Features Setup

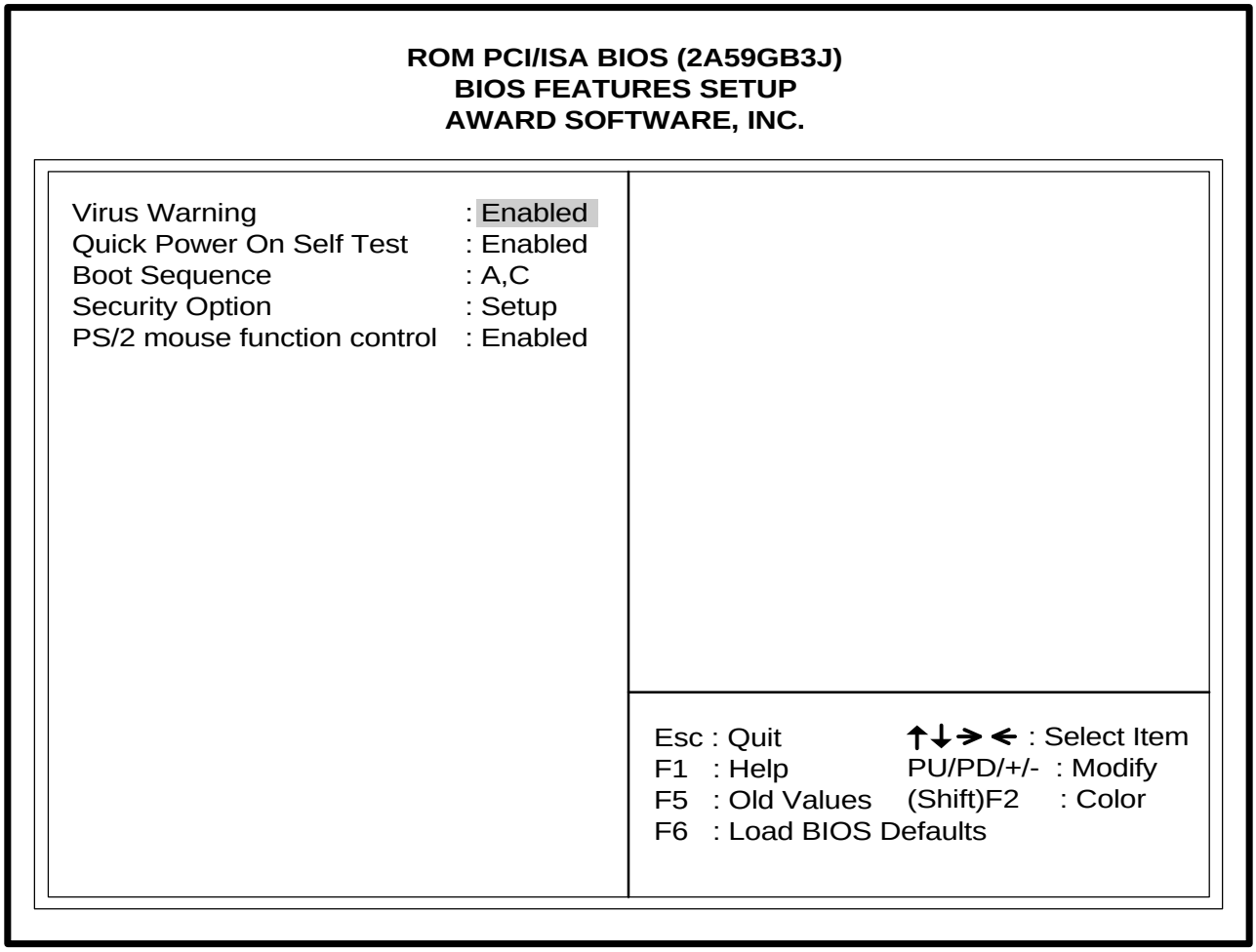


Table 4.1.2 BIOS Features Setup

Feature	Options	Description
Virus Warning	Enabled Disabled	If ‘Enabled’, a warning message will appear on the screen when any attempt is made to write to the boot-sector of the Hard Disk Drive.
Quick Power On Self Test	Enabled Disabled	If ‘Enabled’, the system will shorten or skip certain checks during the Power On Self Test (POST). The system will boot more quickly.
Boot Sequence	A,C C,A C,CDROM,A CDROM,C,A C only	The BIOS attempts to load the Operating System from the disk drives in the sequence selected here.
Security Option	Setup System	When ‘Setup’ is selected, the system will neither boot nor allow access to the CMOS Setup, without entering the correct password. When ‘System’ is selected, the system will boot, but access to the CMOS Setup is restricted by password.
PS/2 Mouse Function Control	Enabled Disabled	Enables or Disables the on-board PS/2 Mouse functionality.

Power Management Setup

Selecting "Power Management Setup" from the Main Menu displays a menu like the one shown here.

Figure 4.1.3 Power Management Setup

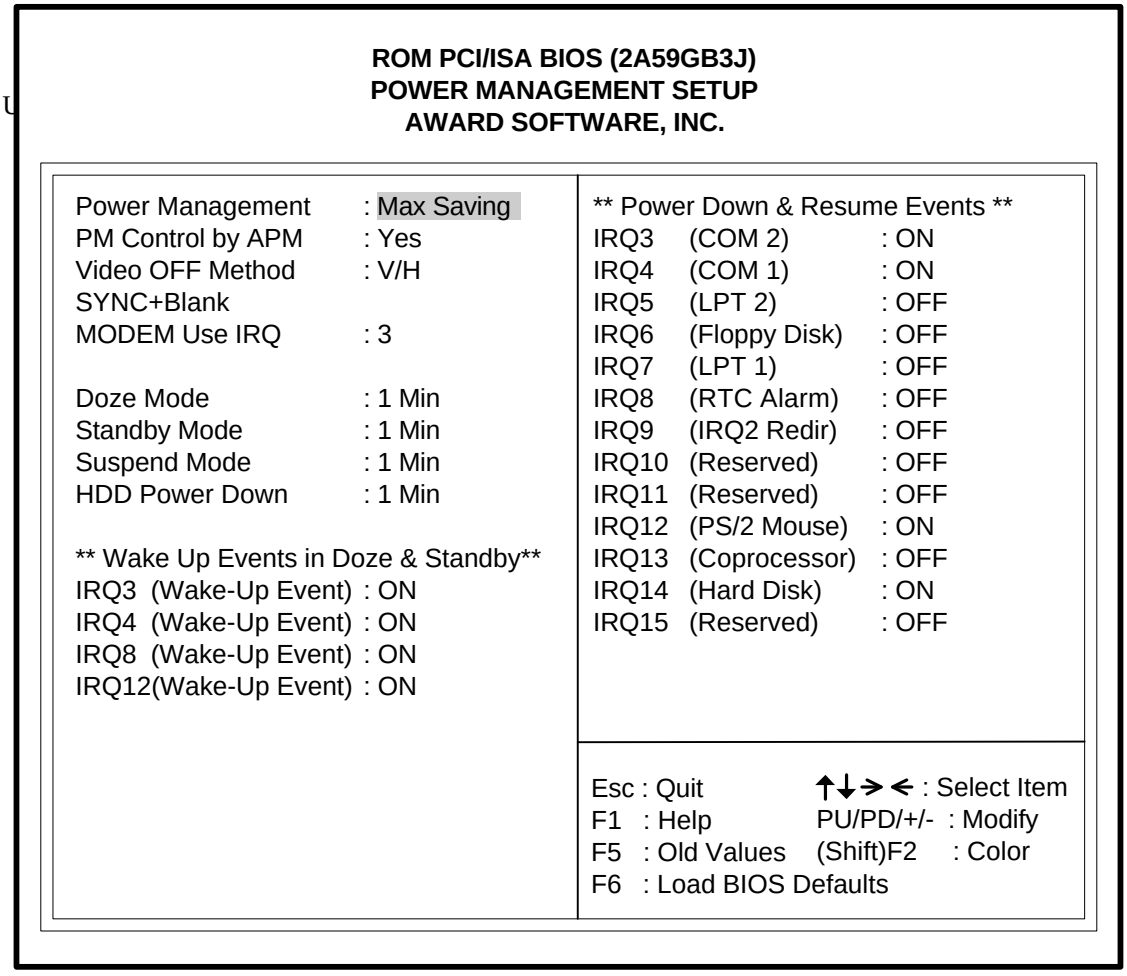


Table 4.1.3 Power Menu Selections

Feature	Options	Description
Power Management Mode	Disable Min Saving User Define Max Saving	'Max' and 'Min' set power-management options with pre-defined values. Select 'User Define' to make your own selections from the following fields. Disabled turns off all power management.
PM Control by APM	Yes No	When 'Yes' is selected the Power Management features are controlled by an advanced operating system such as Windows95®. When 'No' is selected, the BIOS will control power management.
Video Off Method	Blank Screen V/H SYNC+Blank DPMS	When 'Blank Screen' is selected, the system will only blank the screen when going into power saving mode. When 'V/H Sync+Blank' is selected, the system will also turn off the V-SYNC and H-SYNC signals. 'DPMS' mode can only be used by video card that adhere to the DPMS Standard.
Modem Use IRQ	NA, 3, 4, 5, 7, 9, 10, 11	Enter the Interrupt that is used by the modem, if one is installed. Select 'NA' if no modem is installed
Doze Mode Standby Mode Suspend Mode	Disable 1 min 2 min 4 min 6 min 8 min 10 min 20 min 30 min 40 min 1 Hour	Time of inactivity required to enter the next consecutive power saving mode. These selections are only available when the above Power Management feature is set to 'User Define'
HDD Power Down	Disable 1 - 15 Min	Time without any disk access, before the hard drive goes into standby mode (i.e. motor turns off).
Wake Up events in Doze and Standby IRQ 3, 4, 8, 12	OFF ON	When the system is in Doze or Standby mode, accessing the enabled IRQ turns the system back to full power mode.
Power Down and Resume Events IRQ 3 - 15	OFF ON	Any activity on the enabled IRQ will reset the Power Management Timers to 0. If the system is in Power Saving Mode, accessing the enabled IRQ turns the system back to full power

Load BIOS Defaults

This feature allows the CMOS Settings to be reset to the original default values. The values in the Standard CMOS Setup Menu, such as date, time and disk drive parameters are unaffected.

Integrated Peripherals

Selecting "Integrated Peripherals" from the Main Menu displays a menu like the one shown here.

Figure 4.1.4 Integrated Peripherals Menu

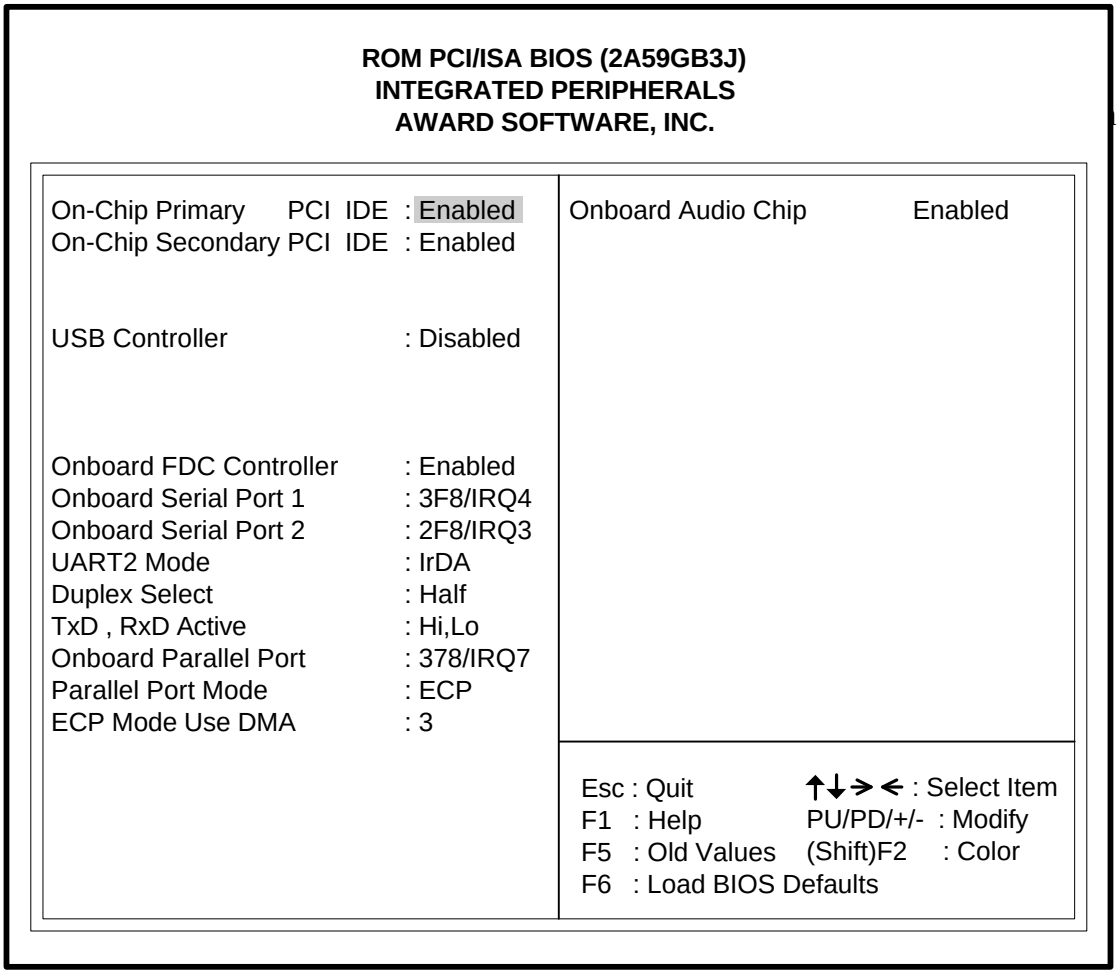


Table 4.1.4 Integrated Peripherals Selections

Feature	Options	Description
On-Chip Primary & Secondary PCI IDE	Enabled Disabled	Enable or Disable the corresponding on-board IDE adapter.
USB Controller	Enabled Disabled	Enable or Disable the on-board Universal Serial Bus (USB) controller
Onboard FDC Controller	Enabled Disabled	Enable or Disable the on-board Floppy Disk Drive controller
Onboard Serial Port 1	Disabled 3F8/IRQ4 2F8/IRQ3 3E8/IRQ4 2E8/IRQ3 Auto	Disable or Enable the first onboard serial port. 3F8 through 2E8 correspond to Com1 through Com4 assignments respectively.
Onboard Serial Port 2	Disabled 3F8/IRQ4 2F8/IRQ3 3E8/IRQ4 2E8/IRQ3 Auto	Disable or Enable the second onboard serial port. 3F8 through 2E8 correspond to Com1 through Com4 assignments respectively.
UART2 Mode	Standard IrDA ASK-IR	Select mode for the second serial port. 'Standard' is used for normal serial communications. 'IrDA' is used for Infra-Red communications at a rate of up to 115 kBaud. ASK-IR is used for Infra-Red communication at up to 19.2kBaud.
Duplex Select	Half Full	Select 'Half' or 'Full' duplex to match the specification of the IR capable peripheral that is being used.
TxD, RxD Active	Lo,Lo Hi,Hi Hi,Lo Lo,Hi	Sets the transmit and receive active level, i.e. 'Hi,Lo' means that the transmit output is active high (+V) and the receive input is active low (Logic Ground)
Onboard Parallel Port	Disabled 3BC/IRQ7 378/IRQ7 278/IRQ5	Disable or Enable the Parallel Port. 3BC, 378, 278 correspond to printer ports LPT3, LPT2, LPT1 respectively.
Parallel Port Mode	Normal EPP1.7+SPP ECP+EPP1.7 SPP EPP1.9+SPP ECP ECP+EPP1.9	'Normal' can be selected when the port is used for printer only. The Enhanced Parallel Port (EPP) protocol is meant to be used with peripherals such as CD ROM and Tape Backup. The Extended Capabilities Port (ECP) protocol is meant to be used with multi-function peripherals, such as a Fax/Printer/Modem device.
ECP Mode used DMA	1, 3	Select the Dynamic Memory Address (DMA) channel to be used by the parallel port. Only available when ECP mode is selected.
Onboard Audio Chip	Enabled Disabled	Enable or Disable the audio chip on the motherboard.

Supervisor Password

Select a supervisor password to prevent access to the CMOS Setup Utility program without entering the proper password. If the security option in the BIOS Features Setup is set to 'System', a password must also be entered before the system will boot.

User Password

Select a user password to prevent access to the CMOS Setup Utility program without entering the proper password. If the security option in the BIOS Features Setup is set to 'System', a password must also be entered before the system will boot. If a supervisor password is also set up the CMOS Setup Utility program will be unavailable unless the supervisor password is entered.

Save & Exit Setup

This feature allows the changes to be made to the CMOS setup to be saved. The system will resume booting after a successful save.

5

Electrical and Mechanical Specifications

This section specifies Electrical parameters for the IN440EX motherboard and describes its Mechanical characteristics.

Absolute Maximum Ratings

Stresses beyond those shown in the following table may cause permanent damage to the system (provided for stress testing only).

Table 5.1. Absolute Maximum Ratings

Operating Temperature	0°C to + 55°C
Storage Temperature	-55°C to + 150°C
Voltage on any Signal with Respect to VSS	-0.3 to Vcc +0.3 V
Supply Voltage with Respect to VSS (5v)	-0.3 to +5.5 V
Supply Voltage with Respect to VSS (3.3V)	-0.3 to +4.0 V

The topics in this section specify the normal operating conditions for the IN440EX motherboard. Exposure to absolute maximum rating conditions for extended periods may affect the system reliability.

Electrical

IN440EX DC specifications are summarized here, for motherboard signaling environment, power connectors and 5V power budget. Refer to PCI Local Bus Specification Rev. 2.1, and ISA Bus Specification for PCI and ISA DC and AC electrical specifications. Refer also to the documentation for ASIC devices used on the IN440EX motherboard.

DC Specifications for 5V and 3.3V Signals

The following tables, show the required DC specifications for 5V and 3.3V CPU bus signalling environment.

Table 5.2. 5 Volt DC Specifications

Symbol	Parameter	Condition	Min	Max	Units
Vcc	Supply Voltage		4.75	5.25	V
Vih	Input High Voltage		2.2	5.25	V
Vil	Input Low Voltage		0.3	0.8	V
Voh	Output High Voltage	Ioh, max Vcc, min	2.4		V
Vol	Ouput Low Voltage	Iol, max Vcc, min		0.4	V

Table 5.3. 3.3 Volt DC Specifications

Symbol	Parameter	Condition	Min	Max	Units
Vcc3	Supply Voltage		3.168	3.432	V
Vih	Input High Voltage		2.2	3.432	V
Vil	Input Low Voltage		-0.3	0.8	V
Voh	Output High Voltage		2.4		V
Vol	Ouput Low Voltage			0.4	V

Power Supply

Power Supply Connectors

The input power is supplied via the ATX power supply. The ATX power supply incorporates the power supply connector (J17) on the system PWA.

Input Power Budget

The +5V current available reflects the rating of the power connector. The Power itself may deliver more so the system integrator must be sure that the total load does not exceed the system power supply or board power connector rating, whichever is less. The rating of the ISA slots is 4.5A per slot. The ISA specification recommends supporting an average of 3.0A per slot. The average current consumption may not exceed 3A per slot. The system integrator must also guarantee that worst-case power consumption does not exceed the maximum allowed by the motherboard power connector.

Table 5.5. IN440EX Motherboard Power Budget

Voltage		Current Load(A)	
Input	**Tolerance**	**Minimum**	**Maximum**
-12V	+/-5%	0	0.1 amp
-5V	+/-5%	0	0.1 amp
+5V	+/-5%	1	9 amp
+12V	+/-5%	0.2	0.8 amp
3.3	+/-4%	1.5	5 amp

Mechanical

System Interfaces

User-Accessible Sockets

The following user accessible sockets are located on the top of the system PWA:

Table 5.9. Accessible Sockets

U22 (BIOS)	System and Video BIOS PROM (During development only)
MICROPROCESSOR UPGRADE	SLOT 1 processor socket
DIMM0, DIMM1	DIMM sockets

Back-Panel Interfaces

The following interface connections are located on the rear panel of the system PWA:

Table 5.11. Back-Panel Interfaces

J2 (bottom)	Keyboard connector
J2 (top)	PS/2 Mouse connector
J3	Universal Serial Bus connector 1
J1	SVGA Connector
J4	COM 1 port connector
J5-3	Mic-In
J5-1	Line-Out
J5-2	Line-In
J5-1	Game/MIDI port
J7	Parallel port connector

Manufacturability/Serviceability

IN440EX is designed to be both easy to manufacture and service. The items specifically related to the system PWA are:

- Connector location & labeling
- Jumper location & labeling
- PWA bar code label (part number and revision)
- Flash BIOS
- DIMM sockets labeling & location
- Video memory upgrade DRAM sockets & labeling location

Regulatory

BCM will supply information and resource to assist in the IN440EX product qualification testing for compliance with the regulatory agency approvals.