Performance/AU
Motherboard
Technical Product Specification

Order Number 281802-002
May 1996

The Performance/AU motherboard may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are documented in the Performance/AU Motherboard Specification Update.

intel

Copies of documents which have an ordering number and are referenced in this document, or other Intel literature, may be obtained from:

Intel Corporation
P.O. Box 7641
Mt. Prospect, IL 60056-7641

or call in North America 1-800-879-4683, Europe 44-0-1793-431-155, France 44-0-1793-421-777,

Germany 44-0-1793-421-333, Japan (fax only) 81-0-120-478-832, other Countries 708-296-9333

Revision History

Revision Date	*Version*	*Description*
December 15, 1995	-001	First release of the Performance/AU Technical Product Specification.
May 15, 1996	-002	Second release of the Performance/AU Technical Product Specification.

Preface

This product specification applies only to standard Performance/AU motherboards, identified by part number 633784-xxx with BIOS identifier .CG0.

Changes will be published in the Performance/AU Motherboard Specification Update before being incorporated into a revision of this document.

Performance/AU Motherboard
Technical Product Summary

Table of Contents

Introduction

The Performance/AU motherboard integrates the latest advances in processor, memory, and I/O technologies into a new ATX form factor that combines performance, price, flexibility, and ease of use – making Performance/AU an ideal platform for the increasing requirements of today's and tomorrow's desktop applications.

The flexible motherboard design will accept Intel's Pentium® Pro processor at 150 MHz, 166 MHz, 180 MHz and 200 MHz. It has the scalability to accept faster Pentium Pro upgrades in the future, using the Type 8 Zero Insertion Force (ZIF) socket. The Pentium Pro processor includes an integrated second level write-back cache of either 256 KB or 512 KB. The memory subsystem supports up to 128 MB of DRAM using standard 72-pin SIMM sockets.

Intel's 82450 PCIset provides an integrated chip set for the Pentium Pro processor. The 82371 PIIX (PCI ISA/IDE accelerator) provides an integrated Bus Mastering IDE controller with two high performance IDE interfaces for up to four devices, such as hard drives or CD-ROM. The National PC87306B Ultra Super I/O controller provides the standard PC I/O functions: floppy interface, two FIFO serial ports, one EPP/ECP capable parallel port, a Real Time Clock, and keyboard controller, as well as support for an IrDA compatible infrared interface. Up to four PCI local bus slots provide a high bandwidth path for data-movement intensive functions such as graphics. Up to three ISA slots complete the I/O mix. A total of six expansion slots may be populated: one PCI and ISA slot share the same chassis I/O panel. The new ATX form factor allows for all add-in slots, both PCI and ISA, to be full length.

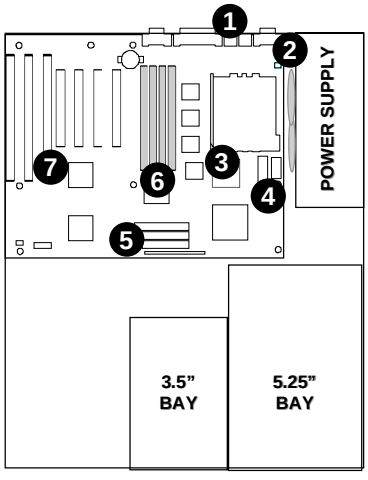
The Performance/AU complies with Version 2.0 of the PCI specification and 1.0A of the Plug and Play specification.

ATX FORM FACTOR

The ATX form factor has been defined to address four major areas of improvement required of today's predominant form factors, Baby-AT and LPX:

1) Enhance PC ease-of-use
2) Better support for current and future I/O
3) Reduce total system cost
4) Better support for future processor technology

ATX is an evolution of the popular Baby-AT form factor. By mounting the typical Baby-AT power supply on its side, it is possible to rotate the motherboard through 90 degrees in the chassis. The processor is relocated away from the expansion slots and the longer side of the board is used to host more on-board I/O connectors. Placing more I/O down on the motherboard reduces cabling inside the box, lowering cost and improving reliability and ease-of-use. A flexible I/O panel allows ATX to support all current and future I/O requirements. The ATX power supply, rather than blowing air out of the chassis as in most Baby AT platforms, blows air into the chassis and over the processor, saving the cost of a secondary fan in the system. System cost is further reduced by the higher integration of PC components onto the motherboard itself, saving material, inventory holding and assembly costs.

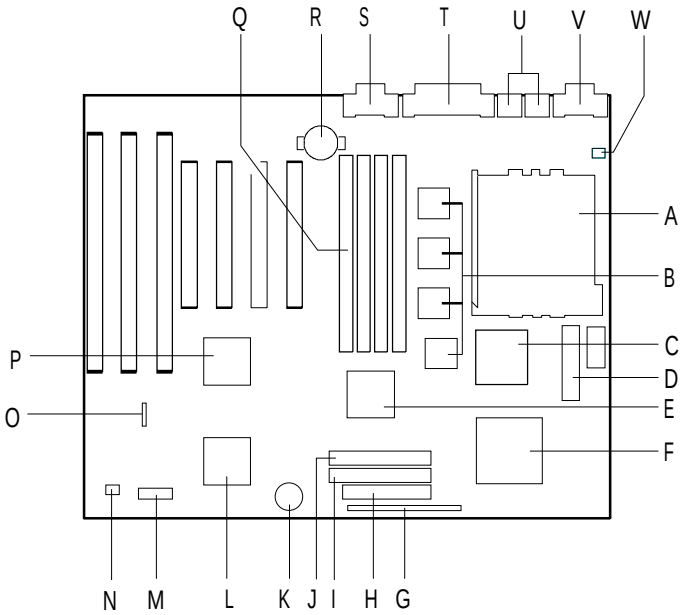


❶ Double-high expandable I/O
❷ One chassis fan
❸ Processor located near power supply
❹ One power connector
❺ Connectors close to peripheral bays
❻ Easy to access system memory
❼ Six full-length slots

Figure 1: Summary of ATX features

The Performance/AU motherboard is designed to fit into an ATX form factor chassis. All board dimensions and mounting hole locations are part of the ATX Motherboard Specification, which is available from your Intel sales representative, the Intel Applications Support BBS, or via the World Wide Web at **http://www.intel.com/pc-supp/motherbd/atx.html.**

Board Level Features



A – Type 8 Pentium Pro processor socket
B – 82451KX Memory Interface Component (MIC)
C – 82452KX Memory Data Path (MC-DP)
D – ATX-style power connector
E – 82453KX DRAM controller (MC-DC)
F – 82454KX PCI Bridge (PB)
G – Front Panel Connectors
H – Floppy Connector
I – Primary PCI IDE Connector
J – Secondary PCI IDE Connector
K – On-board Piezo speaker
L – PC87306B Super I/O Controller
M – Configuration Jumpers
N – Auxiliary Fan Connector
O – Auxiliary Hard Drive LED Connector
P – 82371FB PCI ISA/IDE Accelerator (PIIX)

Figure 2: Performance/AU Layout diagram

CPU

The Performance/AU motherboard is designed to operate with Pentium Pro processors at 150 MHz, 166 MHz, 180 MHz and 200 MHz. A patented on-board voltage regulator circuit provides the required CPU voltages from the 5 volt and 3.3 volt taps off the ATX PC power supply. The Pentium Pro processor incorporates an integrated Level 2 cache, which previously was implemented on the motherboard external to the processor. The Pentium Pro processor also has an advanced numeric coprocessor which significantly increases the speed of floating point operations, while maintaining backward compatibility with the Pentium and Intel486™DX math coprocessors and complying with ANSI/IEEE standard 754-1985. The Pentium Pro processor maintains binary compatibility with the 8086, 80286, i386™, Intel486, and Pentium processors.

PERFORMANCE UPGRADE

A Type 8 Zero Insertion Force socket, along with a programmable voltage regulator for the CPU core, provides users with a performance upgrade path to Pentium Pro OverDrive® technology. The voltage regulator programming is automatic and controlled by the Voltage ID (VID) pins of the processor.

SYSTEM MEMORY

The Performance/AU motherboard provides four 5 volt 72-pin SIMM sites for memory expansion. The sockets support 1M x 32/36 (4 MB), 2M x 32/36 (8 MB), 4M x 32/36 (16 MB), and 8M x 32/36 (32 MB) single-sided, double-sided, parity or non-parity Fast Page Mode SIMM modules. The maximum memory size, using four 8M x 36 SIMM modules, is 128 MB. Memory timing requires 60 ns fast page devices. The minimum memory size, using two 1M x 36 SIMM modules is 8 MB. Performance/AU does not support non-symmetric SIMMs, which have DRAMs with an unequal number of row and column address lines. Tin lead SIMMs are required.

The board will accept non-parity 32-bit SIMMs, but error checking and correction (ECC) capability will not be supported in that configuration. When parity SIMMs are installed, the BIOS will automatically detect them as such and enable ECC. With ECC enabled, single bit errors will be automatically detected and corrected on the fly. Double bit errors will generate an NMI interrupt.

The four sockets are arranged as Bank 0 (J15, J16) and Bank 1 (J14, J15), with each bank consisting of two sockets and providing a 64-bit wide data path. A bank must be fully populated to be functional. Bank 0 only, Bank 1 only, or both banks may be populated. Optimum performance will be achieved when both banks are populated. If both banks are populated, the same size and type of SIMMs must be used in both banks. There are no jumper settings required for the memory size or type, which is automatically detected by the system BIOS.

EXPANSION SLOTS

The ATX form-factor allows all six expansion slots on the Performance/AU motherboard to be populated with full-length add-in cards. There are three ISA bus expansion connectors and four PCI expansion connectors. One slot is shared by connectors that will accommodate either an ISA or a PCI expansion card, but not both at the same time; thus accounting for the disparity between the number of slots and connectors. All four PCI expansion slots accept PCI bus master cards, and fully support the PCI 2.0 specification.

PCI 3.3 VOLT CAPABILITIES

To maintain strict compliance with the PCI specification, the motherboard provides 3.3 volt power to the PCI slots directly from the ATX power supply. The ATX power connector definition has three pins reserved for 3.3V.

PERIPHERAL COMPONENT INTERCONNECT (PCI) CHIP SET

The Intel 82450 PCIset consists of the 82454KX PCI Bridge (PB), the 82451KX Memory Interface Component (MIC), and the two-chip 82452KX and 82543KX Memory Controller (MC). The two MC chips represent one load on the Pentium Pro system bus. One chip is the DRAM Control chip (MC-DC), and the other is the Data Path chip (MC-DP). The 82371FB PCI ISA/IDE Accelerator (PIIX) bridge, which is not part of the 82450 chip set, provides the bridge between the ISA and PCI buses.

82454KX PCI BRIDGE (PB)

The PB provides a high performance interface between the Pentium Pro processor and the PCI bus. The PB comes in a 304-pin QFP package and provides the following features:

- Synchronous Pentium Pro bus interface that supports either 50MHz, 60MHz or 66mhz external CPU clock
- Parity checking on Pentium Pro control signals
- ECC (error correcting code) protection on Pentium Pro data signals
- Synchronous PCI interface derived from the external CPU clock
- Support for multiple I/O bridges through either internal or external I/O bridge arbitration.
- Four cache line size inbound/outbound data buffers

82453KX (MC-DC) AND 82452KX (MC-DP) MEMORY CONTROLLER

The MC is the interface between the system memory and the Pentium Pro processor bus. The MC DRAM control chip (MC-DC) and the MC Data Path chip (MC-DP) work in parallel to provide a high performance memory subsystem for Pentium Pro processor platforms. The MC-DC is a 208 pin PQFP device, and the MC-DP is a 240 pin PQFP device. The MC has the following features:

- 8 or 1 deep in-order queue; four deep request queue
- Four cache line size read/write buffers

82451KX MEMORY INTERFACE COMPONENT (MIC)

There are four MIC components on the Performance/AU motherboard which provide data bus buffering and interleave control to the memory array. Controlled by the MC, the MIC devices perform all the necessary byte and word swapping required. Memory and I/O write buffers are included in these devices. The MIC devices are 144-pin QFP packages, and provide the following performance enhancing features:

- Support for 4-way interleaved conventional DRAM (not supported in Performance/AU)
- Support for 2-way interleaved conventional DRAM (supported in Performance/AU only with four SIMMs)

82371FB PCI ISA/IDE ACCELERATOR (PIIX)

The 82371FB provides the interface between the PCI and ISA buses and integrates a dual channel fast IDE interface capable of supporting up to four devices. The 82371FB integrates four 8-bit and three 16-bit DMA channels, three 8-bit timer/counters, two eight-channel interrupt controllers, PCI-to-AT interrupt mapping circuitry, NMI logic, ISA refresh address generation, and PCI/ISA bus arbitration circuitry together onto the same device. The PIIX comes in a 208-pin QFP package.

Detailed information on the PIIX is available in the Intel 82371FB data sheet.

IDE SUPPORT

The Performance/AU motherboard provides two independent high performance bus mastering PCI IDE channels capable of supporting PIO Mode 4 devices. The system BIOS supports Logical Block Addressing (LBA) and Extended Cylinder Sector Head (ECHS) translation modes as well as ATAPI (e.g.; CD-ROM) devices on both IDE interfaces. The system BIOS automatically detects the IDE device transfer rate and the translation mode capability. The BIOS also supports the ability to boot from an ATAPI CDROM drive. The CDROM must have a valid boot sector as described in the El Torrito Specification created by Phoenix Technologies.

A driver can be used to allow the IDE interface to operate as a PCI bus master, minimizing the system demands upon the processor. In true multi-tasking operating systems like Windows* NT, the CPU bandwidth freed up by using bus mastering IDE can be used to complete other tasks while disk transfers are occurring.

There are limitations when trying to use two IDE drives that have different transfer rate requirements on the same IDE channel. Only one enhanced timing mode (Mode 3 or Mode 4) can be enabled per IDE channel. If an enhanced timing mode drive (Mode 3 or Mode 4) shares the IDE channel with a Mode 0 drive, both drives will function at their optimum transfer rate. However, if a Mode 4 drive shares the channel with a Mode 3 drive, both drives will be configured for Mode 3 type transfer rates.

ATAPI devices can reside on the same channel as an ATA drive, however, advanced ATA modes are not supported for ATAPI devices since they do not use the ATA protocol.

PC87306B SUPER I/O CONTROLLER

Control for the integrated serial ports, parallel port, floppy drive, RTC and keyboard controller is incorporated into a single component, the National Semiconductor PC87306B. This component provides:

- Two NS16C550-compatible UARTs with send/receive 16 byte FIFO
  - Support for an IrDA compliant Infrared interface
- Multi-mode bi-directional parallel port
  - Standard mode; IBM and Centronics compatible
  - Enhanced Parallel Port (EPP) with BIOS/Driver support
  - High Speed mode; Extended Capabilities Port (ECP) compatible
- Industry standard floppy controller with 16 byte data FIFO (2.88 MB floppy support)
- Integrated Real Time Clock accurate within +/- 13 minutes/year
- Integrated 8042 compatible keyboard controller

The PC87306 is normally configured automatically by the BIOS, but configuration of these interfaces is also possible using the CMOS Setup utility that can be invoked during boot. See the BIOS Setup appendix for details on the specific settings.

FLOPPY CONTROLLER

The PC87306B is software compatible with the DP8473 and 82077 floppy disk controllers. The floppy interface can be configured in Setup for 360 KB or 1.2 MB 5¼" media or for 720 KB, 1.44/1.25 MB, or 2.88 MB 3½" media.

Configuring the floppy interface for 1.25 MB 3½" (3-mode floppy) requires the use of special floppy drives and a driver for the specific operating system. To support 3-mode floppy drives, the motor speed is switched between 300 and 360 rpm. This allows support of the NEC PC98 (360 rpm), and the standard PC floppy media types (300 rpm). The motor speed switch is used on Pin 2 of the floppy disk drive. Any drive that is compatible with the Pin 2 method should be supported by the Intel BIOS.

The DMFF software distribution standard of 1.77 MB from Microsoft is also supported.

KEYBOARD INTERFACE

PS/2 keyboard/mouse connectors are located on the back panel side of the motherboard. The 5V lines to these connectors are protected with a PolySwitch* circuit which acts much like a self-healing fuse, re-establishing the connection after an over-current condition is removed. While this device eliminates the possibility of having to replace a fuse, care should be taken to turn off the system power before installing or removing a keyboard or mouse. The system BIOS can automatically detect whether a keyboard or a mouse is plugged into either PS/2 style connector and configure the port accordingly.

The integrated 8042 compatible microcontroller contains the AMI Megakey keyboard/mouse controller code, which besides providing traditional keyboard and mouse control functions, also supports Power-On/Reset (POR) password

protection. The POR password can be defined by the user via the Setup program. The keyboard controller also provides for the following "hot key" sequences:

- <CTRL><ALT><DEL>: System software reset. This sequence performs a software reset of the system by jumping to the beginning of the BIOS code and running the POST operation.
- <CTRL><ALT><defined in setup>: A security hot-key sequence provides password protection to the system.Note: There are no hot key sequences for Turbo/Deturbo function. The Turbo/Deturbo status can only be set at boot time by using the CMOS Setup Utility.

REAL TIME CLOCK, CMOS RAM AND BATTERY

The integrated Real Time Clock (RTC) is DS1287 and MC146818 compatible and provides a time of day clock, and a 100-year calendar with alarm features. The RTC can be set via the BIOS Setup program. The RTC also supports 242-byte battery-backed CMOS RAM in two banks which is reserved for BIOS use. The CMOS RAM can be set to specific values or cleared to the system default values using the Setup program. Also, the CMOS RAM values can be cleared to system defaults by using a configuration jumper on the motherboard. Appendix B lists jumper configurations.

An external coin-cell style battery provides power to the RTC and CMOS memory. The battery has an estimated lifetime of three years if AC power is not provided to the power supply and is socketed for easy replacement. When the system is plugged in, power is supplied from the ATX style power supply's 5V standby current to extend the life of the battery. See Appendix A for information regarding replacement batteries.

IRDA (INFRARED) SUPPORT

A 5-pin interface on the front panel I/O connector is provided to allow connection to a Hewlett Packard HSDSL-1000 compatible Infrared (IrDA) transmitter/receiver. Once the module is connected to the front panel I/O header, serial port 2 can be redirected via on-the-fly via software to the IrDA module. When configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDAs and printers using application software such as LapLink*. The IrDA specification provides for data transfers at 115kbps from a distance of 1 meter.

MOTHERBOARD BIOS

The Performance/AU motherboard uses an Intel BIOS, which is stored in Flash EEPROM and easily upgraded using a floppy disk-based program. BIOS upgrades will be available from the Intel Applications Support electronic bulletin board service and from the Intel FTP site. In addition to the Intel BIOS, the Flash EEPROM also contains the Setup utility, Power-On Self Tests (POST), update recovery code, and the PCI auto-configuration utility. This motherboard supports system BIOS shadowing, allowing the BIOS to execute from 64-bit write-protected DRAM.

Information on generic BIOS functions can be found in the *IBM PS/2 and Personal Computer BIOS Technical Reference* published by IBM, the *ISA and EISA Hi-Flex AMIBIOS Technical Reference* or the *Programmer's Guide to the AMIBIOS, both* published by AMI. These manuals are available at most technical bookstores.

FLASH MEMORY IMPLEMENTATION

The Intel PA28F200BX 2 Mb Flash component is organized as 256K x 8 (256 KB). The code in the Flash device is compressed. At boot time, the code is decompressed and copied into shadowed DRAM. Different codes segments are dynamically paged in and out of DRAM to reduce the actual amount of system memory space required. A detailed memory map at run time is provided in Appendix C.

The write protected boot block area of the Flash device is used for BIOS recovery code.

BIOS UPGRADES

A new version of the BIOS can be installed from a diskette using the Flash Update utility. BIOS upgrades will be available as downloadable files from the Intel Applications Support BBS and Intel FTP site.

The disk-based Flash upgrade utility, FMUP.EXE, has three options for BIOS upgrades:

- The Flash BIOS can be updated from a file on a disk;
- The current BIOS code can be copied from the Flash EEPROM to a disk file as a backup in the event that an upgrade cannot be successfully completed; or
- The BIOS in the Flash device can be compared with a file to ensure the system has the correct version.

The upgrade utility ensures the upgrade BIOS extension matches the target system to prevent accidentally installing a BIOS for a different type of system. A recovery jumper is provided to allow recovery in the unlikely event of an unsuccessful BIOS upgrade. The jumper forces the ROM decode to access a 8 KB block of write protected recovery code in the Flash device.

Note: CMOS memory should always be cleared after updating the BIOS. See the BIOS Updates appendix for more details, or see the README files on the BIOS update disk.

SETUP UTILITY

The ROM-based Setup utility allows the configuration to be modified without opening the system for most basic changes. The Setup utility is accessible only during the Power-On Self Test (POST) by pressing the <F1> key after the POST memory test has begun and before boot begins. A prompt may be enabled that informs users to press the <F1> key to access Setup. A motherboard jumper can be set to prevent user access to Setup for security purposes.

PCI SUPPORT

The BIOS supports Version 2.10 of the PCI BIOS specification. Support is also provided for Version 1.0 of the PCI bridge specification. PCI-to-PCMCIA bridging can also be supported via third party expansion cards.

ISA PLUG & PLAY CAPABILITY

The BIOS incorporates ISA Plug and Play capabilities as defined by the Plug and Play Release 1.0A specification (Plug and Play BIOS Ver. 1.0A, ESCD Ver. 1.02). This allows auto-configuration of Plug and Play ISA cards, and resource management for non-plug and play (or legacy) ISA cards, when used in conjunction with Plug and Play aware operating systems (such as Windows 95), or by using the ISA Configuration Utility (ICU) for non plug and play aware operating systems (such as DOS/Windows 3.1x). System configuration information is stored in non-volatile memory in ESCD format. The ESCD data may be cleared by setting the CMOS clear jumper to ON.

Copies of the IAL Plug and Play specification may be obtained via the Intel BBS (503) 264-7999, or via CompuServe by typing Go PlugPlay.

AUTO-CONFIGURATION CAPABILITIES

The auto-configuration utility operates in conjunction with the system Setup utility to allow the insertion and removal of PCI and ISA Plug and Play cards to the system without user intervention (Plug & Play). When the system is turned on after adding a PCI or ISA Plug and Play card, the BIOS automatically configures interrupts, DMA channels, I/O space, and memory space. The user does not have to configure jumpers or worry about potential resource conflicts. Because PCI and ISA Plug and Play cards use the same interrupt resources as ISA cards, the user can specify the interrupts used by ISA add-in cards in the Setup utility. Other parameters for legacy cards can be specified using the ICU. If using Windows 95, the auto-configuration utility only initializes the devices required to boot up, Windows 95 initializes all the other devices since it's a Plug and Play aware operating system.

System configuration information is stored in ESCD format. The ESCD data may be cleared by setting the CMOS clear jumper to the ON position.

POWER MANAGEMENT CAPABILITY

Power management capability is not supported by the Performance/AU.

FLASH LOGO AREA

Performance/AU supports an 8 KB programmable Flash logo area. An OEM may use this area to display a custom logo during the boot process. The Performance/AU BIOS accesses the logo area just after completing POST. After completing the boot process, the logo code is swapped out and the memory space made available for Upper Memory Blocks. The logo utility is available for down loading from the Intel BBS.

LANGUAGE SUPPORT

BIOS error messages and Setup screens have been translated into five languages: American English, German, Italian, French, and Spanish. The FMUP utility can be used to install the various language files.

SECURITY FEATURES

Administrative Password

If enabled, the administrative password protects all sensitive Setup options from being changed by a user unless the password is entered. If the password is forgotten, it can be cleared by turning off the system and setting the "password clear" jumper to the clear position.

User Password

The User Password feature provides security during the boot process. The user password can be set using the Setup utility, and must be entered prior to peripheral boot or keyboard/mouse operation. (If the unattended boot feature is set to enabled, the system will complete the operating system boot up process, but keyboard and mouse operation will be locked until the user password is entered. See the Security Menu section of Appendix H for more details.)

If the password is forgotten, it can be cleared by turning off the system and setting the "password clear" jumper to the clear position.

Setup Enable Jumper

A motherboard configuration jumper controls access to the BIOS Setup utility. By setting the jumper to the disable position, the user is prevented from accessing the Setup utility during the Power-On Self Test or at any other time. The message prompting the user to press <F1> to enter setup is also disabled.

FRONT PANEL CONNECTIONS (J27)

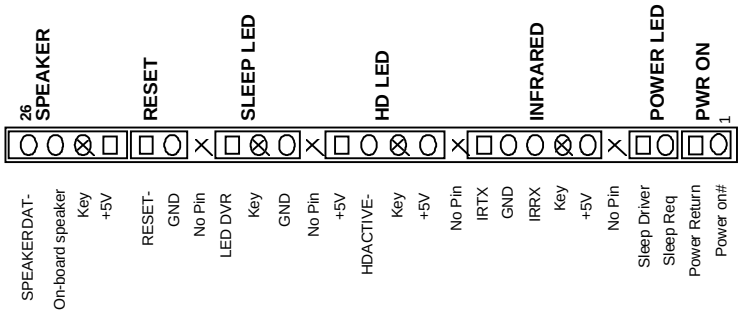


Figure 3: Front Panel I/O Connector, J27 (1 x 26 header)

The Performance/AU motherboard provides connectors to support functions typically located on the chassis bezel:

- System Speaker
- System Reset
- Power LED
- Hard Drive activity LED
- Infrared (IrDA) port
- Sleep/Resume
- Power Supply Control

SPEAKER

An on-board Piezo speaker is supported. It may be disabled by removing a jumper from the front panel header and an off-board speaker may be connected to the header instead. The external speaker provides error beep code information during the Power-On Self Test if the system cannot use the video interface. (see BIOS Error Messages appendix)

RESET

This 2-pin header can be connected to a momentary SPST type jumper that is normally open. When the jumper is closed, the system will hard reset and run POST.

POWER LED

This 3-pin header can be connected to an LED to provide a light when the system is powered on.

HD LED

This 4-pin header can be connected to an LED when an IDE hard drive is connected to the onboard IDE controller.

INFRA-RED (IRDA) CONNECTOR

Serial port 2 can be configured to support an IrDA module via a 5 pin header connector. Once configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDAs, and printers using application software such as LapLink. The IrDA specification provides for data transfers at 115kbps from a distance of 1 meter.

SLEEP CONNECTOR

This function is not supported.

REMOTE ON/OFF AND SOFT POWER SUPPORT

For power supplies that support the Remote ON/OFF feature, this 2 pin header should be connected to the system power ON/OFF switch. The power ON/OFF button should be a momentary SPST switch that is normally open. The power supply control signal (PS_ON) is supported via the primary power connector which is defined in appendix G. Traditional power supplies with mechanical ON/OFF switches that do not support remote ON/OFF or "soft-off" will bypass this circuit.

After turning the system ON by pushing the power ON/OFF button, the Performance/AU motherboard (with a power supply that supports remote power on/off) can be turned OFF from one of two sources: the front panel power ON/OFF switch or a thermal trip signal from the Pentium Pro processor. Power can be restored by pressing the power ON/OFF switch which will cycle the power back on and run POST. Shutdown of the power supply by operating systems such as Windows 95 is not supported.

MOTHERBOARD CONNECTIONS

There are connectors on-board for Floppy, IDE, and an auxiliary system fan. There are also sockets for SIMMs and a battery holder.

BACK PANEL CONNECTIONS

The back panel provides external access to PS/2-style keyboard and mouse connectors as well as two serial ports and one parallel port, which are integrated on the Performance/AU motherboard. Figure 4 shows the general locations.

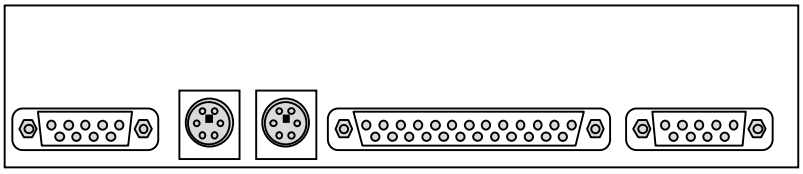


Figure 4: Back Panel Connectors

POWER CONSUMPTION

Table 2 lists the current used by system resources in a configuration which includes 16 MB of DRAM. Table 3 lists the typical power consumed by the same configuration.

CURRENT

DC Voltage	*Typical Current* (Amps)*	*Acceptable Tolerance**
+3.3V	0.9	+/-5%
+5V	6.75	+/-5%
-5V	0.01	+/-5%
+12V	1.48	+/-5%
-12V	0.08	+/-5%

Table 2. Performance/AU Current Requirements (*same configuration as below)

WATTS

System Configuration	*Typical Power**	*Sleep-mode Power**
Performance/AU motherboard, 16 MB, 150 MHz Pentium Pro proc., Teac FD235HF Floppy drive, 270 MB Maxtor* HDD, 1 GB Seagate ST31200N SCSI HDD, NCR 8100S SCSI card Diamond Viper Pro* PCI graphics card, 2x Sony* CD-ROM, Two ISA TV tuner cards, Modem/Sound card	AC: 74 W DC: 55.5 W	tbd

Table 3. Power use by System Resources (*true power measured from the wall with 65% efficient power supply)

Appendix A – User-Installable Upgrades

SYSTEM MEMORY

Table A-1 shows possible memory combinations. The Performance/AU supports only 60 ns or faster Fast Page DRAMs. Using faster-than-specified SIMMs will not improve memory performance since memory timings are fixed to support only 60 ns SIMMs. SIMMs may be installed in Bank 0 only, Bank 1 only, or both banks. All installed SIMMs must be the same size and type. Memory error checking and correction (ECC) is supported through parity SIMMs (x36). Non-parity SIMMs (x32) may be used, foregoing ECC. Also note that Performance/AU supports only symmetric SIMMs. Non-symmetric SIMMs, which have DRAMs with an unequal number of row and column address lines, are not supported.

Bank 0 (J15, J16) SIMM Type (Amount)	*Bank 1 (J13, J14) SIMM Type (Amount)*	*Total System Memory*
1M X 36 (4 MB)	Empty	8 MB
1M X 36 (4 MB)	1M X 36 (4 MB)	16 MB 2-way interleave
2M X 36(8 MB)	Empty	16 MB
2M X 36 (8 MB)	2M X 36 (8 MB)	32 MB 2-way interleave
4M X 36 (16 MB)	Empty	32 MB
4M X 36 (16 MB)	4M X 36 (16 MB)	64 MB 2-way interleave
8M X 36 (32 MB)	Empty	64 MB
8M X 36 (32 MB)	8M X 36 (32 MB)	128 MB 2-way interleave

Table A-1. Possible SIMM memory combinations. SIMMs may be (x 36) or (x 32)

WARNING: Use only tin leaded SIMMs. Do not use gold leaded SIMMs, as doing so may result in unreliable operation.

REAL TIME CLOCK BATTERY REPLACEMENT

The battery can be replaced with a Sanyo* CR2032, or equivalent, coin cell lithium battery with a 220 mAh rating.

CPU UPGRADE

A Type 8 Zero Insertion Force socket provides users with a performance upgrade path to the Pentium Pro OverDrive technology.

Appendix B – Jumper Settings

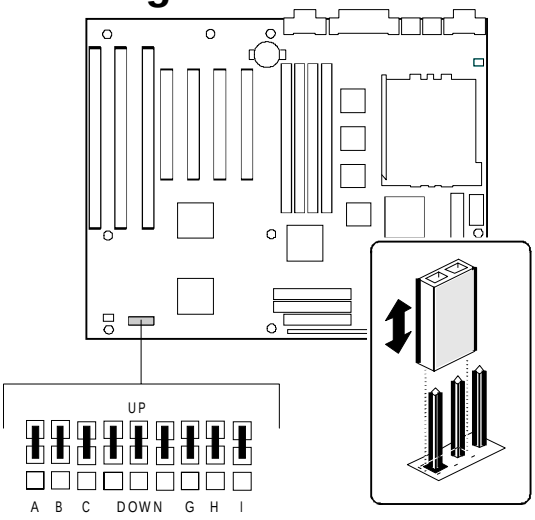


Figure B-1. Location of configuration jumpers.

PENTIUM PRO PROCESSOR SPEED - JUMPERS J25: A-D

These jumpers allow the board to be configured for different speeds of the Pentium Pro processor. The jumpers also affect the PCI and ISA clock speeds according to the following table:

Jumper A	*Jumper B*	*Jumper C*	*Jumper D*	*CPU Freq*	*Clk Freq*	*Ratio*	*PCI Freq*	*ISA Freq.*
UP	UP	UP	DOWN	200	66	3	33	8.31
DOWN	DOWN	UP	DOWN	180	60	3	30	7.51
UP	UP	DOWN	UP	166	66	5/2	33	8.31
DOWN	DOWN	DOWN	UP	150	60	5/2	30	7.51

Table B-1. CPU/System Speed settings

PASSWORD CLEAR – JUMPER J25: E

Allows system password to be cleared by moving jumper to the DOWN position and turning the system on. The system should then be turned off and the jumper returned to the default position of UP to restore normal operation. This procedure should only be done if the user password has been forgotten.

CLEAR CMOS – JUMPER J25: F

Allows CMOS settings to be reset to default values by moving jumper to the to DOWN position and turning the system on. This also will clear all Plug and Play configuration information in the ESCD area. The system should then be turned off and the jumper returned to the default position of UP to restore normal operation.

CMOS SETUP ACCESS – JUMPER J25: G

Allows access to CMOS Setup Utility to be disabled by moving jumper to the to DOWN position. Default setting is for access to Setup to be enabled with the jumper in the UP position.

FLASH BOOT BLOCK – JUMPER J25: H

Allows a recovery sequence if the system BIOS has been corrupted by moving jumper to the to DOWN position and inserting a recovery disk (see Appendix L). Default setting for the jumper is UP position.

RESERVED – JUMPER J25: I

This jumper is reserved and should remain in the UP position.

CPU VOLTAGE ID OVERRIDE – JUMPER J29

Disables the Pentium Pro processor Voltage ID detection circuitry, if installed. Forces CPU voltage to 3.1V. Default depends on the type of Pentium Pro processor installed when shipped from the factory. Check the Pentium Pro Product Specification to determine which versions of the Pentium Pro processor support voltage identification.

ONBOARD SPEAKER ENABLE – J27 PINS 25-26

A jumper located on J27 pins 25-26 enables the onboard speaker. Removing this jumper disables the onboard speaker and allows an external speaker to be connected through a standard header. Default is installed.

Appendix C – Memory Map

Address Range (Decimal)	*Address Range (hex)*	*Size*	*Description*
1024K-131072K	100000-8000000	127M	Extended Memory
960K-1023K	F0000-FFFFF	64K	AMI System BIOS
952K-959K	EC000-EFFFF	16K	BIOS RESERVED (Currently available as UMB)
948K-951K	EA000-EBFFF	8K	ECSD (Plug and Play configuration area)
896K-947K	E0000-E9FFF	32K	BIOS RESERVED (Currently available as UMB)
800-895K	C8000-DFFFF	96K	Available HI DOS memory (open to ISA and PCI bus)
640K-799K	A0000-C7FFF	160K	Off-board video memory and BIOS
639K	9FC00-9FFFF	1K	Extended BIOS Data (moveable by QEMM, 386MAX)
512K-638K	80000-9FBFF	127K	Extended conventional
0K-511K	00000-7FFFF	512K	Conventional

Table C-1. Performance/AU Memory Map

The table above details the Performance/AU memory map at the end of the boot process. During the boot process, code is dynamically swapped in and out of memory in the E0000-FFFFF range to support POST, Autoconfigure, and Setup.

All accesses to 00000-7FFFF are always directed to on board memory (no PCI or ISA bus cycles are generated).

Accesses to 80000-9FFFF are directed to on board memory (no PCI or ISA bus cycles are generated) unless the Base Memory Size parameter in Setup is set to 512 KB (see Appendix H, Advanced Settings). In that case, accesses to this memory range will generate bus cycles.

Accesses to A0000-BFFFF are directed to on board memory and will not generate bus cycles.

The memory area from C0000-C7FFFF is assumed to be used by a VGA compatible graphics card BIOS. This area is shadowed.

The memory area from C8000-DFFFF available for use as either Upper Memory Blocks (UMB) or by expansion cards. This are is not shadowed.

Accesses to E0000-E9FFF are normally directed to on board memory. This area is currently not used by the BIOS and is available for use as UMB by memory managers. (An include parameter may be required for the memory manager to make use of this area). The autoconfigure utility may also use the area from E0000-E7FFF for PCI or Plug and Play expansion card memory. Parts of this area may be used by future versions of the BIOS to add increased functionality.

The ECSD area from EA000-EBFFF is not available for use as an Upper Memory Block (UMB) by memory managers. (An exclude parameter may be required to insure the memory manager does not use this area.) The ESCD area is used to store PCI and Plug and Play configuration information.

Accesses to EC000-EFFFF are directed to on board memory (no PCI or ISA bus cycles are generated). This area is currently not used by the BIOS and is available for use as UMB by memory managers, but is not available for use as expansion card memory. (An include parameter may be required for the memory manager to make use of this area). Parts of this area may be used by future versions of the BIOS to add increased functionality.

Accesses to F0000-FFFFF are directed to on board memory (no PCI or ISA bus cycles are generated). This area is used to shadow the system BIOS and is write protected. This area can not be used for UMBs by memory managers or for expansion card memory.

Appendix D – I/O Map

The following table lists the I/O addresses used by motherboard devices. Some devices (serial ports, parallel ports etc.) may be configured for various addresses or disabled. These I/O locations are listed in the Variable Motherboard Resources column.

Address (hex)	*Size*	*Fixed Motherboard Resources*	*Variable Motherboard Resources*
0000 - 000F	16 bytes	PIIX - DMA 1	
0020 - 0021	2 bytes	PIIX - Interrupt Controller 1	
002E - 002F	2 bytes	Ultra I/O configuration registers	
0040 - 0043	4 bytes	PIIX - Timer 1	
0060	1 byte	Keyboard Controller Data Byte	
0061	1 byte	PIIX - NMI, speaker control	
0064	1 byte	Kbd Controller, CMD/STAT	
0070, bit 7	1 bit	PIIX - Enable NMI	
0070, bits 6:0	7 bits	87C306 - Real Time Clock,	
0071	1 byte	87C306 - Real Time Clock,	
0078	1 byte	Reserved - Brd. Config.	
0079	1 byte	Reserved - Brd. Config.	
0080 - 008F	16 bytes	PIIX - DMA Page Register	
00A0 - 00A1	2 bytes	PIIX - Interrupt Controller 2	
00B2 - 00B3	2 bytes	PIIX - APM Control/Status Port	
00C0 - 00DF	32 bytes	PIIX - DMA 2	
00F0	1 byte	Reset Numeric Error	
0170 - 0177	8 bytes		Secondary IDE Channel
01F0 - 01F7	8 bytes		Primary IDE Channel
0278 - 027B	4 bytes		Parallel Port 2
027C - 027F	4 bytes		Parallel Port 2 (EPP enabled)
02E8 - 02EF	8 bytes		Serial Port 4
02F8 - 02FF	8 bytes		Serial Port 2
0376	1 byte		Sec IDE Chan Cmd Port
0377	1 byte		Sec IDE Chan Stat Port
0378 - 037F	4 bytes		Parallel Port 1
0378 - 037F	4 bytes		Parallel Port 1 (EPP enabled)
03BC - 03BF	4 bytes		Parallel Port 3
03E8 - 03EF	8 bytes		Serial Port 3
03F0 - 03F5	6 bytes		Floppy Channel 1
03F6	1 bytes		Pri IDE Chan Cmnd Port
03F7 (Write)	1 byte		Floppy Chan 1 Cmd
03F7, bit 7	1 bit		Floppy Disk Chg Chan 1
03F7, bits 6:0	7 bits		Pri IDE Chan Status Port
03F8 - 03FF	8 bytes		Serial Port 1
04D0 - 04D1	2 bytes	Edge/Level INTR Control Reg.	
0678 - -067A	3 bytes		Parallel Port 2 (ECP enabled)
0778 - -077A	3 bytes		Parallel Port 1 (ECP enabled)
0CF8 - 0CFC*	4 bytes	PCI Config Address Reg.	
0CF9	1 byte	Turbo & Reset control Reg.	
0CFC - 0CFF	4 bytes	PCI Config Data Reg	
FFA0 - FFA7	8 bytes		Primary Bus Master IDE regs
FFA8 - FFAF	8 bytes		Secondary Bus Master IDE regs

Table D-1. Performance/AU I/O Address Map (*only accessible by DWORD accesses)

I/O Port 78 is reserved for BIOS use. Port 79 is a read only port, the bit definitions are shown below in Table D-2.

Bit #	*Description*	*Bit = 1*	*Bit = 0*
0	Processor clock: J25-C		
1	Soft Off capable power supply present	No	Yes
2	On-bd Audio present	n/a	No
3	Processor clock: J25-B	Table B-2	Table B-2
4	Processor clock: J25-A	Table B-2	Table B-2
5	Setup Disable (Jumper 8)	Enable access	Disable access
6	Clear CMOS (Jumper 5)	Keep values	Clear values
7	Password Clear (Jumper 6)	Keep password	Clear password

Table D-2. Performance/AU Port 79 Definition

Note: These bit definitions are specific to the Performance/AU and may be defined differently on other Intel products.

Appendix E – PCI Configuration Space Map

The 82450 chip set uses Configuration Mechanism 1 to access PCI configuration space. The PCI Configuration Address register is a 32-bit I/O register located at CF8h, the PCI Configuration Data register is a 32-bit I/O register located at CFCh. The PCI Configuration Address register is only accessible by a DWORD access, the PCI Configuration Data register is accessible by DWORD, WORD or BYTE accesses.

ACESS TO I/O CONFIGURATION SPACE USING MECHANISM #1

1. Using a DWORD write command, output the desired I/O configuration address to I/O port CF8H

2. Using a DWORD read or write command, read or write data from the I/O port CFCH

NOTE: Any address output to CF8H is always on a 4 byte (DWORD) boundary. You can read or write any BYTE, WORD or DWORD in the four byte range by using the correct offset as follows:

DWORD @ CFCh
WORD @ CFCh or CFEh
BYTE @ CFCh, CFDh, CFEh or CFFh

CONFIGURATION ADDRESS REGISTER BIT DEFINITION

31	30 24	23 16	15 11	10 8	7 2	1	0
1	RESERVED	BUS NUMBER	DEVICE NUMBER	FUNCTION NUMBER	REGISTER NUMBER	0	0

CONFIG SPACE ENABLE FLAG (Bit 31): Always 1 to indicate I/O access is to configuration space.

RESERVED (Bits 30-24): Always 00h

BUS NUMBER (Bits 23-16): Always 00h unless a bridge card is installed in a PCI slot

DEVICE NUMBER (Bits 15-11): Used to indicate a specific PCI device. Each PCI device on the motherboard will respond only to a specific device number Each PCI slot also has a specific device number, that device number is determined by which PCI Address/Data line is connected to the slot's ID SEL pin. Table E-1 details the specific mapping information.

FUNCTION NUMBER (Bits 10-8): Used to indicate a specific function in multifunction PCI devices. The PIIX is the only multifunction device located on the motherboard. Use 00h for the basic PIIX device and 01h for the PCI IDE CONTROLLER. For a multifunction PCI add-in card, refer to the card's documentation to determine the allowable function numbers.

REGISTER NUMBER (Bits 7-2): Defines one of 64 DWORD locations for a specific PCI device.

Note that Bits 1 and 0 must always be 0h for DWORD access.

The table below lists the PCI bus and device numbers used by the motherboard. It also lists the data range that must be written to the I/O Configuration Address register to access the device.

Device	*Bus/Device/Function*	*ID Sel*	*I/O Config Address Register*
PB	00/19/0	N/A	8000 C800 - 8000 C8FC
MC	00/14/0	N/A	8000 A000 - 8000 A0FC
PIIX	00/02/0	AD18	8000 1000 - 8000 10FC
PIIX-IDE BUS MASTER	00/02/1	AD18	8000 1100 - 8000 11FC
PCI SLOT 1 (closest to ISA slots)	00/06/0	AD22	8000 3000 - 8000 30FC
PCI SLOT 2	00/09/0	AD25	8000 4800 - 8000 48FC
PCI SLOT 3	00/0C/0	AD28	8000 6000 - 8000 60FC
PCI SLOT 4 (farthest from ISA slots)	00/0E/0	AD30	8000 7000 - 8000 70FC

Table E-1. Performance/AU PCI Configuration. Space Map

Appendix F – Interrupts & DMA Channels

The following tables list the Interrupt and DMA Channel configuration options for on-board devices. The serial ports, parallel ports, and IDE controller can be configured via Setup, the ICU, or any other Plug and Play resource manager (such as the Windows 95 Device Manager). An “X” in a cell indicates a configuration option for that device.

IRQ	*Reserved Interrupts*	*Serial Port 1*	*Serial Port 2*	*Parallel Port*	*IDE*
NMI	I/O Channel Check				
0	Interval Timer				
1	Keyboard buffer full				
2	Cascade interrupt from slave PIC				
3		X	X		
4		X	X		
5				X	
6	Floppy Controller				
7				X	
8	Real Time Clock				
9					
10					
11					
12	PS/2 Mouse (if present)				
13	Math co-processor				
14					X
15					X

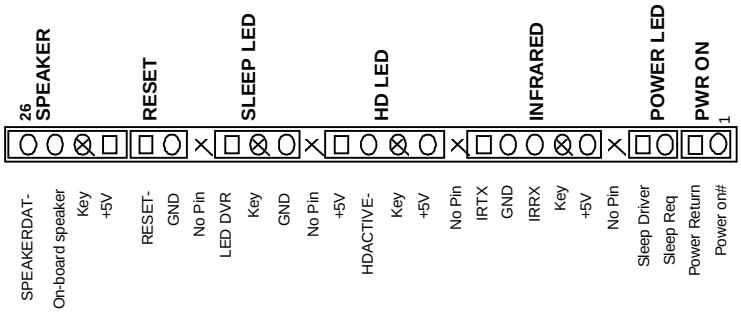
Table F-1.Performance/AU Interrupts

DMA	*Data Width*	*Reserved*	*Parallel Port*
0	8 bits		
1	8 bits		X
2	8 bits	Floppy	
3	8 bits		X
4		Cascade channel	
5	16 bits		
6	16 bits		
7	16 bits		

Table F-2. Performance/AU DMA Map

Appendix G – Connectors

FRONT PANEL CONNECTORS – (J27)



SPEAKER CONNECTOR

Pin	*Signal Name*
26	SPKR_DAT
25	Piezo SPKR DAT
24	Key
23	+5V

RESET CONNECTOR

Pin	*Signal Name*
22	RESET
21	Ground

POWER/SLEEP LED

Pin	*Signal Name*
19	LED_PWR
18	Key
17	Ground

HARD DRIVE LED (DISK)

Pin	*Signal Name*
15	+5V
14	HD ACTIVE
13	Key
12	+5V

INFRARED

Pin	*Signal Name*
10	IR_TX
9	Ground
8	IR_RX
7	Key
6	+5V

SLEEP/RESUME

Pin	*Signal Name*
4	Sleep Pull Up
3	Sleep Req

REMOTE ON/OFF

Pin	*Signal Name*
2	Power Return
1	Power on

EXT. HD CONTROLLER LED (J21)

Pin	*Signal Name*
1	NC
2	Drive LED input
3	Drive LED input
4	NC

FAN CONNECTORS

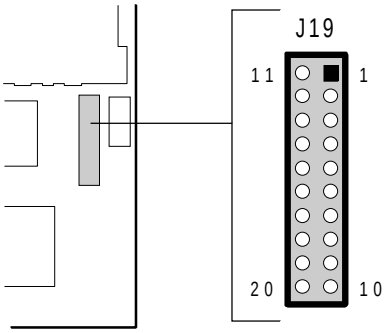
CPU FAN POWER (J17)

Pin	*Signal Name*
1	Ground
2	+12 V
3	NC

CARD SLOT FAN POWER (J24)

Fast Pin	*Slow Pin*	*Signal Name*
1	4	Ground
2	5	+12 V
3	6	Ground

POWER SUPPLY CONNECTOR



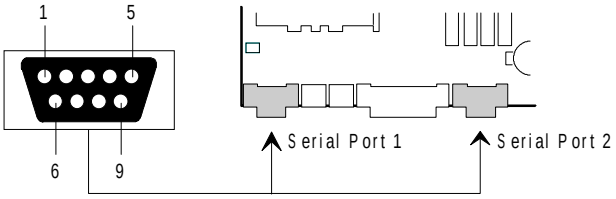
PRIMARY POWER (J19)

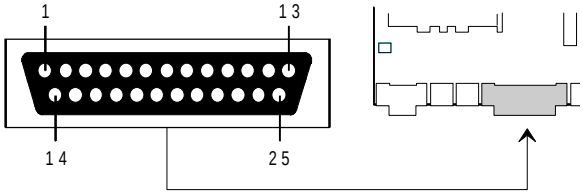
Function	*Name*	*Pin*
+ 3.3 V for PCI slots	3.3 V	11*
- 12 volts	-12 V	12
Ground	GND	13
Power Supply remote ON/OFF control	PS-ON*	14
Ground	GND	15
Ground	GND	16
Ground	GND	17
-5 volts	-5 V	18
+ 5 volts Vcc	+5 V	19
+ 5 volts Vcc	+5 V	20

Pin	*Name*	*Function*
1	3.3 V	+ 3.3 V for PCI slots
2	3.3 V	+ 3.3 V for PCI slots
3	GND	Ground
4	+5 V	+ 5 volts Vcc
5	GND	Ground
6	+5 V	+ 5 volts Vcc
7	GND	Ground
8	PWRG	Power Good
9	+5 VSB	+ 5 volts Stand By for RTC
10	+12 V	+ 12 volts

Note: Due to unused optional pins, pin 11 is labeled as pin 14 on the motherboard's silkscreen.

BACK PANEL CONNECTORS





SERIAL PORTS (J1, J5)

Pin	*Signal Name*
1	DCD
2	Serial In - (SIN)
3	Serial Out - (SOUT)
4	DTR-
5	GND
6	DSR-
7	RTS-
8	CTS-
9	RI

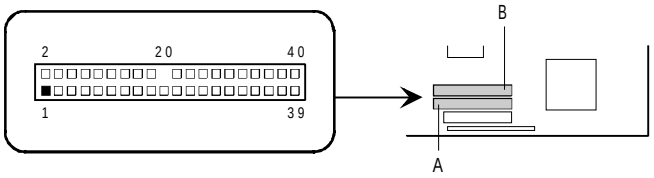
PS/2 PORTS (J3, J4)

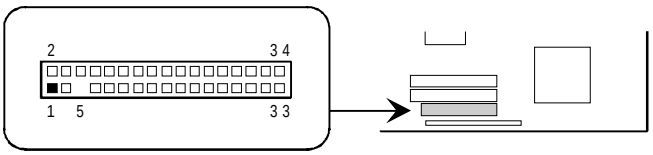
Pin	*Signal Name*
1	Data
2	No Connect
3	Ground
4	Vcc
5	Clock
6	No Connect

PARALLEL PORT (J2)

Signal Name	*Pin*	*Pin*	*Signal Name*
STROBE-	1	14	AUTO FEED-
Data Bit 0	2	15	ERROR-
Data Bit 1	3	16	INIT-
Data Bit 2	4	17	SLCT IN-
Data Bit 3	5	18	Ground
Data Bit 4	6	19	Ground
Data Bit 5	7	20	Ground
Data Bit 6	8	21	Ground
Data Bit 7	9	22	Ground
ACK-	10	23	Ground
BUSY	11	24	Ground
PE (Paper End)	12	25	Ground
SLCT	13		

INTERNAL I/O HEADERS





IDE CONNECTORS (J22, J23)

Signal Name	*Pin*	*Pin*	*Signal Name*
Reset IDE#	1	2	Ground
Host Data 7	3	4	Host Data 8
Host Data 6	5	6	Host Data 9
Host Data 5	7	8	Host Data 10
Host Data 4	9	10	Host Data 11
Host Data 3	11	12	Host Data 12
Host Data 2	13	14	Host Data 13
Host Data 1	15	16	Host Data 14
Host Data 0	17	18	Host Data 15
Ground	19	20	Key
DDRQ0 (DDRQ1)	21	22	Ground
I/O Write #	23	24	Ground
I/O Read #	25	26	Ground
IOCHRDY	27	28	SPSYNC:CSEL
DDACK0 (DDACK1)	29	30	Ground
IRQ14 (IRQ15)	31	32	IOCS16#
Addr 1	33	34	NC
Addr 0	35	36	Addr 2
Chip Select 1P (1S)	37	38	Chip Select 3P
Activity #	39	40	Ground

Note: Signals in parenthesis are for secondary IDE connector.

FLOPPY CONNECTOR (J26)

Signal Name	*Pin*	*Pin*	*Signal Name*
Ground	1	2	DENSEL
Ground	3	4	Reserved
Key	5	6	FDEDIN
Ground	7	8	Index #
Ground	9	10	Motor Enable A #
Ground	11	12	Drive Select B #
Ground	13	14	Drive Select A #
Ground	15	16	Motor Enable B #
MSEN1	17	18	DIR #
Ground	19	20	STEP #
Ground	21	22	Write Data #
Ground	23	24	Write Gate #
Ground	25	26	Track 00 #
MSEN0	27	28	Write Protect #
Ground	29	30	Read Data #
Ground	31	32	Side 1 Select #
Ground	33	34	Diskette Change #

PROBE MODE PORT (J18)

Signal Name	*Pin*	*Pin*	*Signal Name*
PROBRSET#	1	2	Ground
PMP_RST#	3	4	Ground
P6_TCKR	5	6	Ground
P6_TMS	7	8	P6_TDI
VTT_R	9	10	P6_TDO
NC	11	12	P6_TRST#
Ground	13	14	NC
Ground	15	16	P6_PREQ#
Ground	17	18	PROBPRDY#
Ground	19	20	NC
Ground	21	22	NC
Ground	23	24	NC
Ground	25	26	NC
Ground	27	28	NC
Ground	29	30	NC

EXPANSION CARD CONNECTORS

ISA CONNECTORS (J6, J7, J8)

Signal Name	*Pin*	*Pin*	*Signal Name*
GND	B1	A1	IOCHK-
RSTDRV	B2	A2	SD7
Vcc	B3	A3	SD6
IRQ9	B4	A4	SD5
-5V	B5	A5	SD4
DRQ2	B6	A6	SD3
-12V	B7	A7	SD2
0WS-	B8	A8	SD1
+12V	B9	A9	SD0
GND	B10	A10	IOCHRDY
SMEMW-	B11	A11	AEN
SMEMR-	B12	A12	SA19
IOW-	B13	A13	SA18
IOR-	B14	A14	SA17
DACK3-	B15	A15	SA16
DRQ3	B16	A16	SA15
DACK1-	B17	A17	SA14
DRQ1	B18	A18	SA13
REFRESH-	B19	A19	SA12
SYSCLK	B20	A20	SA11
IRQ7	B21	A21	SA10
IRQ6	B22	A22	SA9
IRQ5	B23	A23	SA8
IRQ4	B24	A24	SA7
IRQ3	B25	A25	SA6

Signal Name	*Pin*	*Pin*	*Signal Name*
DACK2-	B26	A26	SA5
TC	B27	A27	SA4
BALE	B28	A28	SA3
Vcc	B29	A29	SA2
OSC	B30	A30	SA1
GND	B31	A31	SA0
	KEY	KEY	
MEMCS16-	D1	C1	SBHE-
IOCS16-	D2	C2	LA23
IRQ10	D3	C3	LA22
IRQ11	D4	C4	LA21
IRQ12	D5	C5	LA20
IRQ15	D6	C6	LA19
IRQ14	D7	C7	LA18
DACK0-	D8	C8	LA17
DRQ0	D9	C9	MEMR-
DACK5-	D10	C10	MEMW-
DRQ5	D11	C11	SD8
DACK6-	D12	C12	SD9
DRQ6	D13	C13	SD10
DACK7-	D14	C14	SD11
DRQ7	D15	C15	SD12
Vcc	D16	C16	SD13
Master-	D17	C17	SD14
GND	D18	C18	SD15

PCI CONNECTORS (J9, J10, J11, J12)

Signal Name	*Pin*	*Pin*	*Signal Name*
GND	A1	B1	-12V
+12V	A2	B2	No Connect
No Connect	A3	B3	GND
No Connect	A4	B4	No Connect
Vcc	A5	B5	Vcc
PCIINT3 #	A6	B6	Vcc
PCIINT1 #	A7	B7	PCIINT2 #
Vcc	A8	B8	PCIINT4 #
Reserved	A9	B9	No Connect
Vcc	A10	B10	Reserved
Reserved	A11	B11	No Connect
GND	A12	B12	GND
GND	A13	B13	GND
Reserved	A14	B14	Reserved
SPCIRST #	A15	B15	GND
Vcc	A16	B16	PCLKE
AGNT #	A17	B17	GND
GND	A18	B18	REQA #
Reserved	A19	B19	Vcc
AD30	A20	B20	AD31
3.3V	A21	B21	AD29
AD28	A22	B22	GND
AD26	A23	B23	AD27
GND	A24	B24	AD25
AD24	A25	B25	3.3V
AD22	A26	B26	CBE3 #
3.3V	A27	B27	AD23
AD22	A28	B28	GND
AD20	A29	B29	AD21
GND	A30	B30	AD19
AD18	A31	B31	3.3V

Signal Name	*Pin*	*Pin*	*Signal Name*
AD16	A32	B32	AD17
3.3V	A33	B33	CBE2 #
FRAME #	A34	B34	GND
GND	A35	B35	IRDY #
TRDY #	A32	B32	3.3V
GND	A37	B37	DEVSEL #
STOP #	A38	B38	GND
3.3V	A39	B39	PLOCK #
SDONE	A40	B40	PERR #
SBO #	A41	B41	3.3V
GND	A42	B42	SERR #
PAR	A43	B43	3.3V
AD15	A44	B44	CBE1 #
3.3V	A45	B45	AD14
AD13	A46	B46	GND
AD11	A47	B47	AD12
GND	A48	B48	AD10
AD9	A49	B49	GND
KEY	A50	B50	KEY
KEY	A51	B51	KEY
CBEO #	A52	B52	AD8
3.3V	A53	B53	AD7
AD6	A54	B54	3.3V
AD4	A55	B55	AD5
GND	A56	B56	AD3
AD2	A57	B57	GND
AD0	A58	B58	AD1
Vcc	A59	B59	Vcc
SREQ64 #	A60	B60	SACK64 #
Vcc	A61	B61	Vcc
Vcc	A62	B62	Vcc

Appendix H – BIOS Setup

This section details the BIOS CMOS Setup Utility. The parameters described below are based on BIOS version 1.00.03.CG0; other BIOS versions may differ from the description below as new features are added.

OVERVIEW OF THE SETUP MENU SCREENS

The Setup program initially displays the Main menu screen. In each screen there are options for modifying the system configuration. Select a menu screen by pressing the left <←> or right <→> arrow keys. Use the up <↑> or down <↓> keys to select items in a screen. Use <Enter> to select an item for modification. For certain items, pressing <Enter> will bring up a subscreen. After you have selected an item, use the arrow keys to modify the setting.

Setup Menu Screen	*Description*
Main	For setting up and modifying some of the basic options of a PC, such as time, date, diskette drives, hard drives.
Advanced	For modifying the more advanced features of a PC, such as peripheral configuration and advanced chip set configuration.
Security	For specifying passwords that can be used to limit access to the system.
Exit	For saving or discarding changes.

Setup Subscreen	*Description*
Floppy Options	For configuring your floppy disk drives.
Primary IDE Master	For configuring your Primary IDE Master drive.
Primary IDE Slave	For configuring your Primary IDE Slave drive.
Secondary IDE Master	For configuring your Secondary IDE Master drive.
Secondary IDE Slave	For configuring your Secondary IDE Slave drive.
Boot Options	For modifying options that affect the system boot up, such as the boot sequence.
Peripheral Configuration	For modifying options that affect the serial ports, the parallel port, and the disk drive interfaces.
Advanced Chip set Configuration	For modifying options that affect memory and system busses.
Plug and Play Configuration	For modifying options that affect the system's plug and play capabilities.

OVERVIEW OF THE SETUP KEYS

Setup Key	*Description*
<F1>	Pressing the <F1> key brings up a help screen for the currently selected item.
<Esc>	Pressing the <Esc> key takes you back to the previous screen. Pressing it in the Main, Advanced, Security, or Exit screen allows you to Exit Discarding Changes (see later in this chapter).
<Enter>	Pressing the <Enter> key selects the current item or option.
<↑>	Pressing the up <↑> key changes the selection to the previous item or option.
<↓>	Pressing the down <↓> key changes the selection the to the next item or option.
<←> <→>	Pressing the left <←> or right <→> keys in the Main, Advanced, Security, or Exit menu screens changes the menu screen. Pressing either key in a subscreen does nothing.
<F5>	Pressing the <F5> key allows you to Load Setup Defaults (see later in this chapter).
<F6>	Pressing the <F6> key allows you to Discard Changes (see later in this chapter).
<F10>	Pressing the <F10> key allows you to Exit Saving Changes (see later in this chapter).

MAIN SCREEN

This section describes the Setup options found on the main menu screen. If you select certain options from the main screen (e.g., Floppy options), the Setup program will switch to a subscreen for the selected option. Subscreens are described in the sections following the description of the main screen options.

System Date

When selected, this brings up a dialog box that allows you to specify the current date.

System Time

When selected, this brings up a dialog box that allows you to specify the current time.

Floppy Options

When selected, this brings up the Floppy Options subscreen.

Primary IDE Master

This reports if a primary master IDE hard disk is connected to the system. When selected, this brings up the Hard Disk Configuration subscreen.

Primary IDE Slave

This reports if a primary slave IDE hard disk is connected to the system. When selected, this brings up the Hard Disk Configuration subscreen.

Secondary IDE Master

This reports if a secondary master IDE hard disk is connected to the system. When selected, this brings up the Hard Disk Configuration subscreen.

Secondary IDE Slave

This reports if a secondary slave IDE hard disk is connected to the system. When selected, this brings up the Hard Disk Configuration subscreen.

Language

This reports the current language of the text strings used in the Setup program and the BIOS. There are no options. The language of the text strings can be changed by using the Flash Memory Update utility.

Boot Options

When selected, this brings up the Boot Options screen.

Video Mode

This reports the video mode. There are no options.

Mouse

This reports if a PS/2 style mouse is installed or not. There are no options.

Base Memory

This reports the amount of base memory. There are no options.

Extended Memory

This reports the amount of extended memory. There are no options.

FLOPPY OPTIONS SUBSCREEN

Floppy A: Type

When selected, this brings up a dialog box that allows you to specify the physical size and capacity of the diskette drive. The options are Disabled; 360 KB, 5.25-inch; 1.2 MB, 5.25-inch; 720 KB, 3.5-inch; 1.44/1.25 MB, 3.5-inch; 2.88 MB, 3.5-inch. The default is 1.44 MB, 3.5-inch.

Floppy B: Type

When selected, this brings up a dialog box that allows you to specify the physical size and capacity of the diskette drive. The options are Disabled, 360 KB, 5.25-inch; 1.2 MB, 5.25-inch; 720 KB, 3.5-inch; 1.44/1.25 MB, 3.5-inch; 2.88 MB, 3.5-inch. The default is Disabled.

PRIMARY IDE MASTER SUBSCREEN

IDE Device Configuration

When selected, this brings up a dialog box that allows you to manually configure your hard drive or have the system auto configure it. The options are Auto Configured, User Definable and Disabled. The default is Auto Configured. If you select User Definable then the Number of Cylinders, Number of Heads, and Number of Sectors items can be modified.

Number of Cylinders

If Hard Disk Type is set to User Definable, you must type the correct number of cylinders for your hard disk. If Hard Disk Type is set to Auto Configured, this reports the number of cylinders for your hard disk and cannot be modified.

Number of Heads

If Hard Disk Type is set to User Definable, you must type the correct number of heads for your hard disk. If Hard Disk Type is set to Auto Configured, this reports the number of heads for your hard disk and cannot be modified.

Number of Sectors

If Hard Disk Type is set to User Definable, you must type the correct number of sectors for your hard disk. If Hard Disk Type is set to Auto Configured, this reports the number of sectors for your hard disk and cannot be modified.

Maximum Capacity

This reports the maximum capacity of your hard disk. It is calculated from the number of cylinders, heads, and sectors. There are no options.

IDE Translation Mode

When selected, this brings up a dialog box that allows you to specify the IDE translation mode. The options are Standard CHS (standard cylinder head sector — less than 528MB total drive size), Logical Block Addressing (LBA), Extended CHS (extended cylinder head sector), and Auto Detected (BIOS detects IDE drive support for LBA). The default is Auto-detected.

Some operating systems do not support LBA and/or ECHS translation modes. In these cases, this parameter should be set to CHS. Check the documentation for your specific operating system to see if it supports these extended modes. (DOS/Windows 3.X and Windows 95 both support LBA and ECHS modes).

Also, if an IDE drive has previously been FDISKed and formatted on another system, you must ensure both systems are set for the same translation mode. Data corruption or erratic operation may result if different modes are used.

Multiple Sector Setting

When selected, this brings up a dialog box that allows you to set the IDE programmed I/O cycles so that multiple sectors are transferred in a single block. The options are Disabled, 4 Sectors/Block, 8 Sectors/Block, or Auto Detected. The default is Auto Detected. Check the specifications for your hard disk drive to determine which setting will provide the optimum performance for your drive.

Fast Programmed I/O Modes

When selected, this brings up a dialog box that allows you to set how fast transfers on the PCI IDE interface occur. The options are Disabled or Auto Detected. The default is Auto Detected. If set to Disabled, transfers occur at an un-optimized speed. If set to Auto Detected, transfers occur at the maximum speed of the drive or controller (Mode 4).

PRIMARY IDE SLAVE SUBSCREEN

Please refer to “PRIMARY IDE MASTER SUBSCREEN” section described above.

SECONDARY IDE MASTER SUBSCREEN

Please refer to “PRIMARY IDE MASTER SUBSCREEN” section described above.

SECONDARY IDE SLAVE SUBSCREEN

Please refer to “PRIMARY IDE MASTER SUBSCREEN” section described above.

BOOT OPTIONS SUBSCREEN

First Boot Device

When selected, this brings up a dialog box that allows you to set which device the system checks first to find an operating system to boot from. The options available are: Disabled, Floppy, Hard Disk, CD-ROM, and Network. The default is Floppy.

Second Boot Device

When selected, this brings up a dialog box that allows you to set which device the system checks second to find an operating system to boot from. The options available are: Disabled, Floppy, Hard Disk, CD-ROM, and Network. The default is Hard Disk.

Third Boot Device

When selected, this brings up a dialog box that allows you to set which device the system checks third to find an operating system to boot from. The options available are: Disabled, Floppy, Hard Disk, CD-ROM, and Network. The default is Disabled.

Fourth Boot Device

When selected, this brings up a dialog box that allows you to set which device the system checks fourth to find an operating system to boot from. The options available are: Disabled, Floppy, Hard Disk, CD-ROM, and Network. The default is Disabled.

System Cache

When selected, this brings up a dialog box that allows you to enable or disable both the primary and secondary cache memory. The options are Enabled or Disabled. The default is Enabled.

Boot Speed

When selected, this brings up a dialog box that allows you to set the system's boot speed. The options are Deturbo and Turbo. The default is Turbo. If Turbo is selected, boot-up occurs at full speed. If Deturbo is selected, the board operates at a slower speed (approximately equivalent to 25 MHz PC-AT). Selecting the Deturbo option is equivalent to disabling the system cache. The BIOS does not use the deturbo register in the 82450 chip set.

Num Lock

When selected, this brings up a dialog box that allows you to set the beginning state of the Num Lock feature on your keyboard. The options are On and Off. The default is Off.

Setup Prompt

When selected, this brings up a dialog box that allows you to turn on the "Press <F1> Key if you want to run Setup" prompt during the power-up sequence. The options are Enabled and Disabled. The default is Enabled.

Typematic Rate Programming

When selected, this brings up a dialog box that allows you to set the typematic rates. The options are Default and Override. The default is Default. Choosing Override will enable display of the Typematic Rate Delay and Typematic Rate parameters described below.

Typematic Rate Delay

When selected, this brings up a dialog box that allows you to set how long it takes for the key-repeat function to start when you hold down a key on the keyboard. The options are 250, 500, 750, and 1000 millisecond delays. The default is 250. If Typematic Rate Programming is set to Default, this option will not be visible.

Typematic Rate

When selected, this brings up a dialog box that allows you to set the speed at which characters repeat when you hold down a key on the keyboard. The higher the number, the faster the characters repeat. The options are 6, 8, 10, 12, 15, 20, 24, and 30 characters per second. The default is 6. If Typematic Rate Programming is set to Default, this option will not be visible.

ADVANCED SCREEN

This section describes the Setup options found on the Advanced menu screen. If you select certain options from the Advanced screen (e.g. Peripheral Configuration), the Setup program will switch to a subscreen for the selected option. Subscreens are described in the sections following the description of the Advanced screen options.

Processor Type

This reports the CPU type. There are no options.

Processor Speed

This reports the clock speed of the CPU. There are no options.

Cache Size

This reports the size of the secondary cache. There are no options. If no secondary cache is installed, this field will not be displayed.

Peripheral Configuration

When selected, this brings up the Peripheral Configuration subscreen.

Advanced Chip set Configuration

When selected, this brings up the Advanced Chip set Configuration subscreen.

Plug and Play Configuration

When selected, this brings up the Plug and Play Configuration subscreen.

PERIPHERAL CONFIGURATION SUBSCREEN

Configuration Mode

When selected, this brings up a dialog box that allows you to set the peripheral configuration yourself, or have the system do it. The options are Auto and Manual. The default is Auto.

When Auto is selected, the system peripherals are automatically configured during power up. The options below for the PCI/IDE Interfaces, Floppy Interface, Serial Port 1 and Serial Port 2 Addresses, Serial Port2 IR mode, and the Parallel Port Address can not be modified. The settings displayed for those options reflect the current state of the hardware.

If Manual is selected, the options for the PCI IDE Interfaces, Floppy Interface, Serial Port 1 and Serial Port 2 Addresses, Serial Port2 IR mode, and Parallel Port Address can be explicitly configured.

PCI IDE Interface

When selected, this brings up a dialog box that allows you to enable the PCI IDE hard disk interface. The options are Enabled and Disabled. The default is Enabled. (If Configuration Mode is set to Auto, this option cannot be modified.)

Floppy Interface

When selected, this brings up a dialog box that allows you to enable the diskette drive interface. The options are Enabled and Disabled. The default is Enabled. (If Configuration Mode is set to Auto, this option cannot be modified.)

Serial Port 1 Address

When selected, this brings up a dialog box that allows you to select the address of the serial port. The options are Disabled; COM1, 3F8h, IRQ4; COM2, 2F8h, IRQ3; COM3, 3E8h, IRQ4; and COM4, 2E8h, IRQ3. (All options may not be listed if the BIOS detects another serial port.) The default is COM1, 3F8h, IRQ4. If the Configuration Mode is set to Auto, the Setup program assigns the first free COM port (normally COM1, 3F8h) as the serial port 1 address, regardless of what is selected under the Serial Port 1 Address option. (If Configuration Mode is set to Auto, this option cannot be modified.)

Serial Port 2 Address

When selected, this brings up a dialog box that allows you to select the address of the serial port. The options are Disabled; COM1, 3F8h, IRQ4; COM2, 2F8h, IRQ3; COM3, 3E8h, IRQ4; and COM4, 2E8h, IRQ3. (All options may not be listed if the BIOS detects another serial port.) The default is COM2, 2F8h, IRQ3. If the Configuration Mode is set to Auto, the Setup program assigns the first free COM port (normally COM2, 2F8h) as the serial port 2 address, regardless of what is selected under the Serial Port 2 Address option. (If Configuration Mode is set to Auto, this option cannot be modified.)

Serial Port 2 IR Mode

When selected, this dedicates Serial Port 2 for infrared applications. Serial Port 2 also can be enabled with software from application programs. The default is Disabled. This option is only available when the Configuration Mode is set to Manual.

Parallel Port Address

When selected, this brings up a dialog box that allows you to select the address of the parallel port. The options depend on the setting of the Parallel Port Mode parameter (see below). If the Parallel Port Mode is set to Compatible or Bi-Directional, the options are: Disabled; LPT3, 3BCh, IRQ 7; LPT1, 378h, IRQ 7; LPT2, 278h, IRQ 7; LPT1, 378h, IRQ 5; LPT3, 3BCh, IRQ5; and LPT2, 278h, IRQ5. If the Parallel Port Mode is set to ECP, the options are: Disabled; LPT1, 378h, IRQ 7, DMA 3; LPT2, 278h, IRQ 7, DMA 3; LPT1, 378h, IRQ 5, DMA 3; and LPT2, 278h, IRQ5, DMA 3. If the Parallel Port Mode is set to EPP, the options are: Disabled; LPT1, 378h, IRQ 7; LPT2, 278h, IRQ 7; LPT1, 378h, IRQ 5; and LPT2, 278h, IRQ5. The default is LPT1, 378h, IRQ 7. If the Configuration Mode is set to Auto, the setup program assigns LPT1, 378h as the parallel port address, regardless of what is selected under the Parallel Port Address option. (If Configuration Mode is set to Auto, this option cannot be modified.)

Parallel Port Mode

When selected, this brings up a dialog box that allows you to select the mode for the parallel port. The options are Compatible, Bi-directional, ECP or EPP. The default is Compatible, which means the parallel port will operate in AT-compatible output mode. Bi-directional means the parallel port will be set for 8-bit bi-directional. When set to ECP, the port will be configured to support the Enhanced Capabilities Port standard. When set to EPP, the parallel port will be configured for the Extended Parallel Port standard.

ADVANCED CHIP SET CONFIGURATION SUBSCREEN

Base Memory Size

When selected, brings up a dialog box that allows you to set the size of the base memory. The options are 512 KB and 640 KB. The default is 640 KB. *Note: If ISA LFB Size is set to 1 MB, Base Memory cannot be set to 512 KB.*

ISA LFB Size

When selected, this brings up a dialog box that allows you to access memory on the ISA bus instead of motherboard DRAM in the address range from 15-16 MB. The options are Disabled, 1, 2 or 4 MB. The default is Disabled. If this is set to 1, 2, or 4 MB, then the ISA LFB Base Address field will appear.

ISA LFB Base Address

This reports the base address of the LFB. There are no options. This field will not appear if the ISA LFB Size is set to Disabled.

Video Palette Snoop

When selected, this brings up a dialog box that allows you to control the ability of a PCI graphics card to “snoop” write cycles to an ISA graphics card’s color pallet registers. The options are Enabled and Disabled. The default is Disabled. *Note: Some video capture or TV tuner add-in boards may require this feature to be enabled. Depending on graphics card hardware limitations, this item may not appear*.

Latency Timer (PCI Clocks)

When selected, this brings up a dialog box that allows you to control the time an agent on the PCI bus can hold the bus after another agent has requested the bus. The valid numbers are between 0 and 255. The default is 66.

ECC Support

Reports if ECC is enabled. ECC is automatically enabled if 36-bit (parity) SIMMs are installed. There are no options.

PLUG AND PLAY CONFIGURATION SUBSCREEN

Configuration Mode

When selected, this brings up a dialog box that allows you to set how the BIOS gets information about ISA cards that do not have plug and play capabilities. The options are “Use Setup Utility” and “Use ICU” (ISA Configuration Utility). The default is “Use Setup Utility”.

If “Use ICU” is selected, the assumption is some type of Plug and Play configuration utility, rather than the system BIOS, will be used to initialize the system peripherals.

If “Use Setup Utility” is selected, the system peripherals are fully configured by the system BIOS and not the operating system. "Boot With PnP OS" will not be visible in this case.

Boot With PnP OS

When selected, this brings up a dialog box that allows you to specify how the Plug and Play devices are configured. The options are Disabled, Other, and Windows95™. The default is Windows95™.

If set to Disabled, the system peripherals are fully configured by the system BIOS and not the operating system, just like in “Use Setup Utility”.

If the user selects Windows* 95, it is expected that the user is running Windows* 95. Resources are assigned in such a way that Windows* 95 may easily reconfigure them to resolve the potential conflicts. Following is the order in which the devices are allocated resources:

Motherboard fixed - Basic Static ISA Legacy devices such as Keyboard, Video, RTC, etc.

PnP Add in Cards - ISA PnP Devices like some audio solutions, and PnP adapters

Dynamic Motherboard Devices - Relocatable Devices such Comm, and LPT ports

PCI Devices - includes both PCI expansion cards and on-board PCI devices such as the IDE controller.

If the user selects Other, only a few devices are enabled by the system BIOS, and they are: an input device, an output device, and an IPL. The input device will usually be the keyboard, the output device is usually the video, and IPL is the first boot device found. The order at which each set of devices are initialized is as follows:

Motherboard fixed - Basic Static ISA Legacy devices such as Keyboard, Video, RTC, etc.

PnP Add in Cards - ISA PnP Devices like some audio solutions, and PnP adapters

PCI Devices - includes both PCI expansion cards and on-board PCI devices such as the IDE controller.

Dynamic Motherboard Devices - Relocatable Devices such Comm, and LPT ports

ISA Shared Memory Size

When selected, this brings up a dialog box that allows you to specify a range of memory addresses that will be directed to the ISA bus rather than on-board memory. The options are Disabled, 16 KB, 32 KB, 48 KB, 64 KB, 80 KB and 96 KB. The default is Disabled. If this is set to Disabled, "ISA Shared Memory Base Address", below, will not be visible.

This field should be set to *Enabled* only when a non Plug and Play ISA card (legacy card) is used that requires non-ROM memory space. LAN cards that have on-board memory buffers are one example of this, video capture cards that have video buffer memory are another.

By default, allocation of upper memory is as follows: Memory from C0000-C7FFF is automatically shadowed. (This memory range is typically reserved for Video BIOS.) Memory from C8000-DFFFFh is initially unshadowed. The BIOS will scan this range for any ISA expansion card BIOSes that may be present and note the location and size. The BIOS will then autoconfigure the PCI and Plug and Play devices, shadowing the ROM requirements (other than video) into the area above E0000h until that area is full. It will then assign additional PCI and Plug and Play expansion cards to the area between C8000h and DFFFFh. If an ISA legacy card has non-ROM memory requirements, the autoconfigure routine may write into an area that is needed by the ISA expansion card. The ***ISA Shared Memory Size*** parameter is used to signify to the autoconfigure routine that this block of memory is reserved and should not be shadowed. (Shadowing is a technique which copies a block of memory from an add in card’s ROM to the same address in system DRAM memory to allow faster access to the code and achieve higher performance.)

ISA Shared Memory Base Address

When selected, this brings up a dialog box that allows you to set the base address for the ISA Shared Memory. The options are C8000h, CC000h, D0000h, D4000h, and D8000h. The default is C8000h. This setting may affect the ISA Shared Memory Size item. The value entered in the ISA Shared Memory Size item cannot extend into the E0000h address. For example, if a size of 64K was selected, options D4000h, and D8000h will not be available.

IRQ 3, 4, 5, 7, 9, 10, 11, 12

When selected, this brings up a dialog box that allows you to set the status of specific IRQs. The options are Available and Used By ISA Card. The default is Available. The auto-configuration code looks here to see if these interrupts are available. If an interrupt is available, the auto-configuration code can assign the interrupt to be used by PCI or Plug and Play devices. If your system contains an ISA agent that uses one of these interrupts, select Used By ISA Card for that particular interrupt.

Some of these interrupts may not be displayed if they already have been assigned to other peripherals, such as IRQ 3 and IRQ 4, which are normally used by the serial ports, and IRQ 12 for the mouse port.

Note: If PCI add-in cards are used, all but one IRQ can be set to Used By ISA Card; one must remain available in order for PCI cards which use interrupts to function correctly.

Note: IRQ 14 and IRQ 15 will not show up as user available. If the on-bd IDE controller is not used, these interrupts are available for use by ISA cards, even though they do not show up in the list above. These interrupts can not be used for PCI cards.

SECURITY SCREEN

The objectives of the BIOS security system are to:

1. Keep unwanted individuals from accessing the computer.
2. Limit the fields that can be accessed in the CMOS Setup Utility program.
3. Allow the computer to boot while unattended and still be secure.
4. Set up a hot key to invoke the security system immediately.

The security system is implemented using two passwords in tandem, a **User Password** and an **Administrative Password**. The level of security available is dependent on whether one or both passwords are set and which password is used to enter the system. It is assumed that if the **Administrative Password** is used, it is controlled by a central corporate information services or security organization and that the **Administrative Password** and **User Password** will have been set prior to the end user receiving the system.

To meet each of the objectives above, the following procedures are recommended:

1. End user sets/resets **User Password** and sets the **Unattended Start** parameter to Disabled. User will be prompted for a password, and must enter the correct password before the boot process is allowed to complete or before the user is allowed to enter Setup.
2. The **Administrative Password** is set prior to end user receiving system; no action required by end user. No password is required to complete the boot process, the user will be prompted for the correct password before being allowed to enter Setup.
3. End user sets **User Password** then *Enables* **Unattended Start**. If **User Password** had previously been set, user *Enables* **Unattended Start**. System will complete the boot process and start the operating system. The user must enter the correct **User Password** (not the **Administrative Password**) before input will be accepted from either the mouse or keyboard. The password does not need to be followed by a carriage return. The user will not be prompted for a password, however the keyboard LEDs (Num Lock, Caps Lock, and Scroll Lock) will blink indicating the system is in secure mode. The user is prompted for the password before being allowed to enter Setup.
4. End user sets **User Password** then *Enables* **Security Hot Key**. If **User Password** had previously been set, user *Enables* **Security Hot Key**. The user can place the system in to secure mode at any time by typing the specified keystroke combination (<CTL> <ALT> <user specified>). Once the system is in secure mode, the user will need to enter the correct **User Password** (not the **Administrative Password**) before input will be accepted from either the mouse or the keyboard. The password does not need to be followed by a carriage return. The user will not be prompted for a password, however the keyboard LEDs (Num Lock, Caps Lock, and Scroll Lock) will blink indicating the system is in secure mode.

Password in Effect	*Password Needed at Boot?*	*Password Needed to Access Setup?*	*Able To Access All Setup Fields?*	*Able To Set Unattended Start?*	*Able To Set Security Hot Key?*
User only	Yes	Yes	Yes	Yes	Yes
Administrative only	No	Yes	Yes	No	No
Both -- User password used	Yes	Yes	No	Yes	Yes
Both -- Admin password used	Yes	Yes	Yes	Yes	Yes
No password enabled	No	No	Yes	No	No

SECURITY SCREEN OPTIONS

User Password is

This reports if there is a User password set. There are no options.

Administrative Password is

This reports if there is an Administrative password set. There are no options.

Set User Password

When selected, this brings up a dialog box that allows you to set the User password.

Set Administrative Password

When selected, this brings up a dialog box that allows you to set the Administrative password.

Unattended Start

When selected, this brings up a dialog box that allows you to control when the security password is requested. The options are Enabled and Disabled. The default is Disabled. The User password must be enabled before you can enable this option. If Enabled is selected, the system will boot, but the keyboard will be locked until the **User** password is entered.

Security Hot Key (CTRL-ALT-)

This allows you to set a hot key that, when pressed, will lock the keyboard until the User password is entered.

EXIT SCREEN

Exit Saving Changes

When selected, this allows you to save the change to CMOS and exit the Setup program. You can also press the <F10> key anywhere in the Setup program to do this.

Exit Discarding Changes

When selected, this allows you to exit the Setup program without saving any changes. This means that any changes made while in the Setup program will be discarded and **NOT SAVED**. Pressing the <Esc> key in any of the four main screens will do this.

Load Setup Defaults

When selected, this allows you to reset all of the setup options to their defaults. You can also press the <F5> key anywhere in the Setup program to do this. This selection loads the default values from the ROM table.

Discard Changes

When selected, this allows you to discard any changes you made during the current Setup session without exiting the program. You can also press the <F6> key anywhere in the Setup program to do this. This selection loads the CMOS values that were present when the system was turned on.

Appendix I – PCI Configuration Error Messages

The following PCI messages are displayed as a group with bus, device and function information.

```
<'NVRAM Checksum Error, NVRAM Cleared'>, \ ; String
<'System Board Device Resource Conflict'>, \ ; String
<'Primary Output Device Not Found'>, \ ; String
<'Primary Input Device Not Found'>, \ ; String
<'Primary Boot Device Not Found'>, \ ; String
<'NVRAM Cleared By Jumper'>, \ ; String
<'NVRAM Data Invalid, NVRAM Cleared'>, \ ; String
<'Static Device Resource Conflict'>, \ ; String
```

The following messages chain together to give a message such as:

```
"PCI I/O Port Conflict: Bus: 00, Device 0D, Function: 01".
```

If and when more than 15 PCI conflict errors are detected, the log full message is displayed.

```
<'PCI I/O Port Conflict:'>, \ ; String
<'PCI Memory Conflict: '>, \ ; String
<'PCI IRQ Conflict: '>, \ ; String
<' Bus '>, \ ; String
<', Device '>, \ ; String
<', Function '>, \ ; String
<'PCI Error Log is Full.'>, \ ; String
<'Floppy Disk Controller Resource Conflict '>, \ ; Text
<'Primary IDE Controller Resource Conflict '>, \ ; Text
<'Secondary IDE Controller Resource Conflict '>, \ ; Text
<'Parallel Port Resource Conflict '>, \ ; Text
<'Serial Port 1 Resource Conflict '>, \ ; Text
<'Serial Port 2 Resource Conflict '>, \ ; Text
```

Appendix J – BIOS Error messages and Beep Codes

Errors can occur during POST (Power On Self Test) which is performed every time the system is powered on. Fatal errors, which prevent the system from continuing the boot process, are communicated through a series of audible beeps. Other errors are displayed in the following format:

ERROR *Message Line 1*

ERROR *Message Line 2*

For most displayed error messages, there is only one message. If a second message appears, it is "RUN Setup". If this message occurs, press <F1> to run the Setup utility.

BEEP CODES

Beeps	*Error Message*	*Description*
1 long, 2 short	No video card found	Applies only to motherboards with no on-bd video.
1 long, 3 short	No Monitor connected	Applies only to motherboards with on-bd video present.
1 long, x short	Video related failure	Other video beep codes may exist and are tied to specific video BIOS implementations. Contact the vendor for details should the need arise.
1	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
2	Parity Error	Parity error in the first 64 KB of memory.
3	Base 64 KB Memory Failure	Memory failure in the first 64 KB.
4	Timer Not Operational	Memory failure in the first 64 KB of memory, or Timer 1 on the motherboard is not functioning.
5	Processor Error	The CPU on the motherboard generated an error.
6	8042 - Gate A20 Failure	The keyboard controller (8042) may be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The CPU generated an exception interrupt.
8	Display Memory Read/Write Error	System video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum Error	ROM checksum value does not match the value encoded in BIOS.
10	CMOS Shutdown Reg Rd/Wrt Error	The shutdown register for CMOS RAM failed.
11	Cache Error / External Cache Bad	The external cache is faulty.

ERROR MESSAGES

Error Message	*Explanation*
8042 Gate - A20 Error	Gate A20 on the keyboard controller (8042) is not working. Replace the 8042.
Address Line Short!	Error in the address decoding circuitry on the motherboard.
Cache Memory Bad, Do Not Enable Cache!	Cache memory is defective. Replace it.
CH-2 Timer Error	Most AT systems include two timers. There is an error in timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	After CMOS RAM values are saved, a checksum value is generated for error checking. The previous value is different from the current value. Run AMIBIOS Setup.
CMOS System Options Not Set	The values stored in CMOS RAM are either corrupt or nonexistent. Run Setup.
CMOS Display Type Mismatch	The video type in CMOS RAM does not match the type detected by the BIOS. Run AMIBIOS Setup.
CMOS Memory Size Mismatch	The amount of memory on the motherboard is different than the amount in CMOS RAM. Run Setup.
CMOS Time and Date Not Set	Run Standard CMOS Setup to set the date and time in CMOS RAM.
Diskette Boot Failure	The boot disk in floppy drive A: is corrupt. It cannot be used to boot the system. Use another boot disk and follow the screen instructions.
Display Switch Not Proper	The display jumper is not implemented on this product, this error will not occur.
DMA Error	Error in the DMA controller.
DMA #1 Error	Error in the first DMA channel.
DMA #2 Error	Error in the second DMA channel.
FDD Controller Failure	The BIOS cannot communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	The BIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR #1 Error	Interrupt channel 1 failed POST.
INTR #2 Error	Interrupt channel 2 failed POST.

ERROR MESSAGES (CONT.)

Invalid Boot Diskette	The BIOS can read the disk in floppy drive A:, but cannot boot the system. Use another boot disk.
Keyboard Is Locked...Unlock It	The keyboard lock on the system is engaged. The system must be unlocked to continue.
Keyboard Error	There is a timing problem with the keyboard. Set the *Keyboard* option in Standard CMOS Setup to *Not Installed* to skip the keyboard POST routines.
KB/Interface Error	There is an error in the keyboard connector.
Off Board Parity Error	Parity error in memory installed in an expansion slot. The format is: OFF BOARD PARITY ERROR ADDR (HEX) = (XXXX) *XXXX* is the hex address where the error occurred.
On Board Parity Error	Parity error in motherboard memory. The format is: OFF BOARD PARITY ERROR ADDR (HEX) = (XXXX) *XXXX* is the hex address where the error occurred.
Parity Error ????	Parity error in system memory at an unknown address.

ISA NMI MESSAGES

Memory Parity Error at *xxxxx*	Memory failed. If the memory location can be determined, it is displayed as *xxxxx*. If not, the message is *Memory Parity Error ????.*
I/O Card Parity Error at *xxxxx*	An expansion card failed. If the address can be determined, it is displayed as *xxxxx*. If not, the message is *I/O Card Parity Error ????*.
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

Appendix K – BIOS Updates

The Performance/AU incorporates the AMIBIOS in a Flash memory component. Flash BIOS allows easy upgrades without the need to replace an EPROM. The upgrade utility fits on a floppy diskette and provides the capability to save, verify, and update the system BIOS. The upgrade utility also provides the capability to install alternate languages for BIOS messages and the Setup utility. The upgrade utility can be run from a hard drive or a network drive, but no memory managers can be installed during upgrades.

The latest upgrade utility and BIOS are available from your service provider or from the Intel bulletin board.

USING THE UPGRADE UTILITY

If the utility is obtained from the BBS, UNZIP the archive and copy the files to a bootable MS-DOS 3.3, 4.01, 5.0, or 6.x diskette. Reboot the system with the upgrade diskette in the bootable floppy drive and follow the menu-driven program.

Prior to starting the update, the user must make a note of the current Setup parameters. After the update completes, CMOS memory should be reset to default values by entering Setup and hitting the <F5> key. The user may then re-enter his original values. CMOS memory must be reset to default values because the mapping of the parameters to specific CMOS memory locations may change from one version of BIOS to the next. If CMOS is not reset, erratic operation can occur.

RECOVERY PROCESS

In the unlikely event that a Flash upgrade is interrupted catastrophically, it is possible the BIOS may be left in an unusable state. Recovering from this condition requires the following steps (be sure a power supply and speaker have been attached to the board, and a floppy drive is connected as drive A:):

1. Change Flash Recovery jumper to the recovery mode position.
2. Install the bootable upgrade diskette into drive A: and reboot the system.
3. Because of the small amount of code available in the non-erasable boot block area, no video is available to direct the procedure. The procedure can be monitored by listening to the speaker and looking at the floppy drive LED. When the system beeps and the floppy drive LED is lit, the system is copying the recovery code into the Flash device. As soon as the drive LED goes off, the recovery is complete.
5. Turn the system off.
6. Change the Flash Recovery jumper back to the default position.
7. Leave the upgrade floppy in drive A: and turn the system on.
8. Continue with the original upgrade.

Appendix L – Environmental Standards

Parameter	*Condition*	*Specification*
Temperature	Non-Operating	-40°C to +70°C
	Operating	+0°C to +55°C (min. airflow of 200 LFM)
Voltage	Operating	
	+5	+/- 5%
	-5	+/- 5%
	+12	+/- 5%
	-12	+/- 5%
	+3.3	+/- 5%
Shock	Non-Operating	
	Unpackaged	Trapezoidal, 50.0G, 11ms
	Packaged	Half sine, 2ms, 36" simulated free fall height
Vibration	Unpackaged	5 Hz - 500 Hz, 3.1 gRMS random
	Packaged	10 Hz - 500 Hz, 1.0 gRMS random

Table L-1. Environmental standards

Appendix M – Reliability Data

The Mean-Time-Between-Failures (MTBF) data is calculated from predicted data @ 55C.

Performance/AU motherboard (includes two 2Mx36 SIMMs)	63,049 Hours