NP430HX Motherboard
Technical Product Specification

Order Number 281816-001

July 1996

intel

Revision History

Revision	Revision History	Date
-001	First release of the NP430HX Technical Product Specification.	07/96

This product specification applies only to standard NP430HX motherboards with BIOS identifier 1.00.0x.DE0.

Changes to this specification will be published in the NP430HX Motherboard Specification Update (Order Number: 281828) before being incorporated into a revision of this document.

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1 Motherboard Description

1.1 Overview

The NP430HX design accepts Pentium® processors operating at 75 MHz, 90 MHz, 100 MHz, 120 MHz, 133 MHz, 150 MHz, 166 MHz, or 200 MHz. As an option, 256 KB or 512 KB of Pipeline Burst SRAM can be soldered onto the motherboard. The memory subsystem supports up to 192 MB of EDO or Fast Page DRAM. A type 7 Pentium OverDrive® socket provides upgrades to future OverDrive processors.

The NP430HX motherboard utilizes Intel's 82430HX PCIset. The 82430HX PCIset contains an integrated PCI bus mastering IDE controller with two IDE interfaces for up to four IDE devices (such as hard drives, CD-ROM readers, and so forth). The PC87306B Super I/O controller integrates the standard PC I/O functions: floppy interface, two FIFO serial ports, one EPP/ECP capable parallel port, a real-time clock, and keyboard/mouse controller. Up to three PCI local bus slots and up to three ISA slots complete the I/O mix. A total of five expansion slots may be populated with full length add-in cards: one PCI and ISA slot share the same chassis I/O panel.

1.2 Motherboard Manufacturing Options

- 256 KB or 512 KB Pipeline Burst SRAM soldered onto the motherboard for L2 cache
- Full duplex integrated audio using the Yamaha† OPL3-SA integrated CODEC/FM synthesizer
- ATI†-VT graphics subsystem with 1 or 2 MBs of 60 ns SGRAM
- 10/100 Mbps LAN
- Universal serial bus (USB) connectors
- "Soft-off," (motherboard can turn off system power through software control)
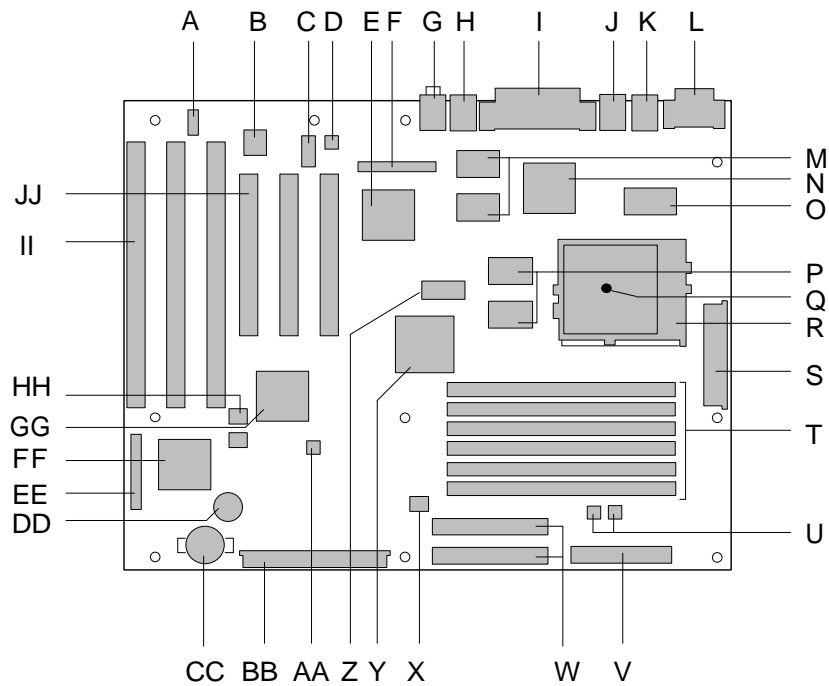
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Figure 1. Motherboard Features

A   CD-ROM audio connector

B   Optional Yamaha OPL3-SA FM synthesizer

C   Optional wavetable connector

D   Modem audio connector

E   Optional ATI 264 VT graphics controller

F   AMC connector

G   MIC in / Line out connector

H   Optional Dual stacked USB connectors

I   Parallel port/video connector

J   Optional RJ-45 Ethernet[†] connector

K   PS/2[†] Keyboard and Mouse connector

L   Serial port connectors

M   Optional SGRAM devices

N   Optional 82557 LAN controller

O   Optional 83840 device

P   PBSRAM Cache

Q   Temperature sensor (under CPU)

R   Pentium processor (socket 7)

S   Power supply connector

T   SIMM[†] sockets (6)

U   Sensor-fan connectors

V   Floppy drive connector

W   IDE connectors (2)

X   Management Extension Hardware/temperature sensor

Y   82439H Xcelerated Controller (TXC)

Z   Cache tag RAM

AA   Configuration jumper block

BB   Front panel connector

CC   Lithium battery

DD   Optional speaker

EE   Configuration jumper block

FF   PC87306B Super I/O controller

GG   82371SB PIIX3

HH   Light detector

II   ISA bus connectors (3)

JJ   PCI bus connectors (3)

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1.3 Form Factor

The motherboard fits into a standard ATX form factor chassis. Figure 2 illustrates the mechanical form factor for the motherboard. Location of the I/O connectors and mounting holes are in strict compliance with the ATX specification.
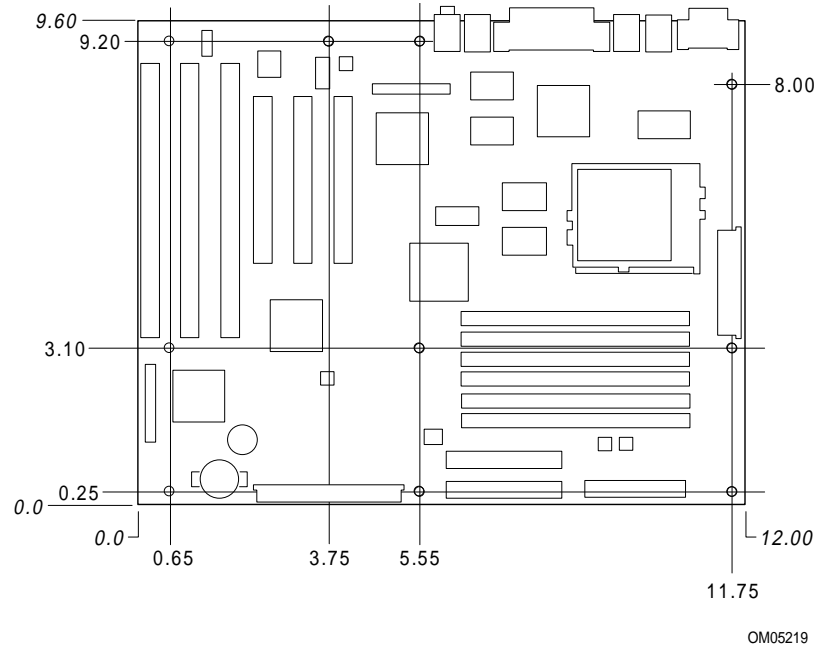
Figure 2. Motherboard Dimensions

1.4 Microprocessor

The motherboard operates with 3.5 volt Pentium processors. An onboard switching voltage regulator circuit provides the required voltage from the 5.0 volt tap of the power supply. An onboard jumper enables use of VRE specified processors. Most Pentium processors with internal clock speeds of 75, 90, 100, 120, 133, 150, 166, or 200 MHz are supported.

The Pentium processor maintains full backward compatibility with the 8086, 80286, Intel386™ and Intel486™ processors. It supports both read and write burst mode bus cycles, and includes separate 8 KB on-chip code and data caches that employ a write-back policy. The Pentium processor contains an advanced numeric coprocessor that significantly increases the speed of floating point operations, while maintaining backward compatibility with math coprocessors that comply to ANSI/IEEE standard 754-1985.

1.4.1 Microprocessor Upgrade

The motherboard provides a 321-pin Socket 7 zero insertion force (ZIF) processor socket. Socket 7 supports a processor upgrade path that includes high-performance Pentium OverDrive processors.

1.5 Memory

1.5.1   System Memory

The board has six 72-pin, tin lead SIMM sockets, arranged as three banks of two sockets. Some important considerations are:

- The board supports 70 ns fast page mode and 60 ns extended data out (EDO) SIMMs
- The board supports parity and ECC memory
- Both sockets of a bank must be used
- Both sockets of a bank must contain the same type (fast page or EDO), speed (60 or 70 ns), and size of SIMM
- You can have different types, speeds, and sizes in different banks
- Only tin lead 72-pin SIMMs can be used
- There are no jumper settings required for the memory size or type, which is automatically detected by the system BIOS

The sockets support the following SIMM sizes:

SIMM size	Configuration (without parity)	Configuration (with parity)
2 MB	512 K x 32	512 K x 36
4 MB	1 M x 32	1 M x 36
8 MB	2 M x 32	2 M x 36
16 MB	4 M x 32	4 M x 36
32 MB	8 M x 32	8 M x 36

1.5.1.1   EDO DRAM Support

The motherboard supports both fast page and extended data out (or Hyper Page) DRAM. EDO improves DRAM read performance. EDO DRAM holds the memory data valid until the next CAS# falling edge, unlike standard fast page mode DRAM which tri-states the memory data when CAS# negates to precharge for the next cycle. With EDO, the CAS# precharge overlaps the data valid time, allowing CAS# to negate earlier while still satisfying the memory data valid window time.

⟹ **NOTE**

If banks 1 and 2 are both populated, wait states will be added due to the increased loading. This will decrease performance by a small amount.

1.5.2   Second Level Cache

The Pentium processor's internal cache can be complemented by a second level (L2) cache using high-performance pipelined burst SRAMs with GWE (Global Write Enabled). A factory option on the NP430HX motherboards is an onboard 256 KB or 512 KB direct mapped write-back L2 cache implemented with two pipeline burst SRAM devices that take advantage of the Global Write Enable pin. An 8Kb x 8 external Tag SRAM provides caching support for up to 256K cache memory. A 32Kb x 8 external Tag SRAM provides caching support for up to 512K cache memory. There are no upgrade options for the second level cache. The three manufacturing options for L2 cache are:

- No cache
- 256 KB
- 512 KB

1.6   Chipset

The Intel 82430HX PCIset consists of the 82439HX Xcelerated Controller (TXC) and one 82371SB PCI ISA/IDE Xcelerator (PIIX3) bridge chip.

1.6.1   82439HX Xcelerated Controller (TXC)

The 82439HX provides all control signals necessary to drive a second level cache and the DRAM array, including multiplexed address signals. The TXC also controls system access to memory and generates snoop controls to maintain cache coherency. The TXC comes in a 324-pin BGA package and includes the following features:

- CPU interface control
- Integrated L2 write-back cache controller
  — Pipeline burst SRAM
  — 256 or 512 KB direct-mapped
- Integrated DRAM controller
  — 64 bit path to memory
  — Support for EDO and fast page DRAM
  — Parity and non-parity support, with error detection/correction for parity SIMMs
- Fully synchronous PCI bus interface
  — 25/30/33 Mhz bus speeds
  — PCI to DRAM > 100 MBs/sec
  — Up to four PCI masters in addition to the PIIX3 and IDE

1.6.2   82371SB PCI ISA/IDE Xcelerator (PIIX3)

The PIIX3 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 PIIX3 integrates seven DMA channels, one 16-bit timer/counter, two eight-channel interrupt controllers, PCI-to-AT† interrupt mapping circuitry, NMI logic, ISA refresh address generation, and PCI/ISA bus arbitration circuitry. The PIIX3 comes in a 208-pin QFP package and includes the following features:

- Interface between the PCI and ISA buses
- Universal Serial Bus controller
  — Host/hub controller
- Integrated fast IDE interface
  — Support for up to four devices
  — PIO Mode 4 transfers up to 16 MB/sec
  — Integrated 8 x 32-bit buffer for bus master PCI IDE burst transfers
  — Bus master mode
- PCI 2.1 compliant
- Enhanced fast DMA controller
- Interrupt controller and steering
- Counters/timers
- SMI interrupt logic and timer with fast on/off mode

1.6.3   Universal Serial Bus (USB) Support

The motherboard provides two USB ports. This permits connection of two USB peripheral devices directly to the system without an external hub. (Only shielded USB cable is supported.) If more devices are required, an external hub can be connected to either of the built-in ports. The NP430HX motherboard supports the standard universal host controller interface (UHCI) and takes advantage of the standard software drivers written to be compatible with UHCI. Features of the USB include:

- Self-identifying/hot plug-in peripherals
- Automatic mapping of function to driver and configuration
- Support for isochronous and asynchronous transfer types over the same set of wires
- Support for up to 127 physical devices
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications
- Error handling and fault recovery mechanisms built into protocol
- Low cost cables and connectors

1.6.4   IDE Support

The motherboard provides two independent high performance bus-mastering PCI IDE interfaces capable of supporting PIO Mode 3 and 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. Detection of IDE device transfer rate and translation mode capability is automatically determined by the system BIOS.

Normally, programmed I/O operations require a substantial amount of CPU bandwidth. In true multi-tasking operating systems like Windows[†] 95, the CPU bandwidth freed up by using bus mastering IDE can be used to complete other tasks while disk transfers are occurring. When used in conjunction with the appropriate driver for the Windows 95 environment, the IDE interface can operate as a PCI bus master capable of supporting PIO Mode 4 devices with transfer rates of up to 16 MB/sec.

1.7 Super I/O Controller (National PC87306B)

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
- Multi-mode bidirectional 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/yr
- Integrated 8042-compatible keyboard controller

By default, the 306B interfaces are automatically configured by the BIOS during boot-up. You can also manually configure the interfaces with the BIOS Setup utility.

1.7.1 Floppy Controller

The I/O controller is software compatible with the DP8473 and 82077 floppy disk controllers. You can configure the floppy interface for 360 KB or 1.2 MB 5¼ inch media or for 720 KB, 1.2 MB, 1.44 MB, or 2.88 MB 3½ inch media with the BIOS setup utility. By default, the Floppy A interface is configured for 1.44 MB and Floppy B is disabled. A Setup option makes it possible to prevent a user from being able to write to a floppy drive. A driver is required for configuring the floppy interface for 1.2 MB 3.5-inch (3-mode floppy) operation.

1.7.2 Keyboard and Mouse Interface

PS/2 keyboard/mouse connectors are located on the back panel side of the motherboard. The +5 V lines to these connectors are protected with a PolySwitch[†] circuit which acts much like a self-healing fuse, reestablishing 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 87306B contains the AMI Megakey keyboard/mouse controller code which, besides providing traditional keyboard and mouse control functions, supports Power-On/Reset (POR) password protection. The POR password can be defined using 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><+> and <CTRL><ALT><->: Turbo mode selection.
- <CTRL><ALT><->: sets the system for de-turbo mode, emulating an 23 MHz AT.
- <CTRL><ALT><+>: sets the system for turbo mode. Changing the Turbo mode may be prohibited by an operating system, or when the CPU is in Protected mode or virtual x86 mode under DOS.
- <CTRL><ALT><defined in setup>: Power down and coffee-break key sequences take advantage of the SMM capabilities of the Pentium processor to reduce the system's power consumption while maintaining the responsiveness necessary to service external interrupts.
- <CTRL><ALT><defined in setup>: Keyboard lock key sequence provides system security by blanking the screen and ignoring keyboard input until the BIOS User Password is typed. When the Keyboard lock sequence is invoked, the keyboard LEDs flash to indicate that the User Password must be entered to unlock the system. This feature will not take effect unless the User Password has been set in the BIOS setup.

1.7.3   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, 100-year calendar with alarm features. The RTC can be set using 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 BIOS Setup program. Also, the CMOS RAM values can be cleared to the system defaults by using a configuration jumper on the motherboard.

An external coin-cell style battery provides power to the RTC and CMOS memory. The battery has an estimated lifetime of three years if the system is not plugged into the wall socket. When the system is plugged in, power is supplied from the power supply's +5 V standby current to extend the life of the battery.

1.7.4   Parallel Port

A 25-pin D-Sub header is provided on the back panel for a multi-mode bidirectional parallel port. The parallel port operates in standard mode, enhanced parallel port (EPP) version 1.7 mode, with BIOS and driver support, and a high speed extended capabilities port (ECP) compatible mode. EPP mode requires a driver provided by the peripheral manufacturer to operate correctly.

1.8 Graphics Subsystem (ATI 264VT)

The mach64[†] ATI-264VT is a 208 pin, VLSI multimedia graphics and video controller that integrates a video scaler, a color space converter, a true color palette DAC, and a triple-clock synthesizer with a mach64 graphics engine. The VT with its built in video scaling, color space conversion, graphics/video keying and overlay, is optimized for superior video playback and graphics acceleration.

The VT controller consists of the major functional subsystems and interfaces described below.

1.8.1 Drawing Coprocessor

The drawing coprocessor is a fixed function CPU dedicated to draw functions. It runs concurrently with the host processor. Draw functions include rectangle fill, line draw, polygon boundary lines, and polygon fill. A sophisticated pixel data path allows monochrome-to-two-color expansion, solid color fill, screen to screen bitblts, fixed pattern fill, general pattern fill, general patterns with rotation, and host to screen data transfers. Flexible bitblt trajectories allow off-screen memory management.

Other features include context loading and context chaining, which off-loads draw engine setup from the host CPU to the draw engine. A 17-function ALU and a four-function source/destination color comparator allow a source and destination to be combined in a multitude of ways, useful for operations such as image overlaying or transparent blits. Bit masking and scissoring can protect memory regions from being written.

All internal draw engine data paths are 64 bits wide. Full drawing features are available in 1, 4, 8, 15, 16, 24, and 32 bits per pixel modes.

All draw engine registers are 32 bits wide. A 16x32 command FIFO improves throughput over the expansion bus. A 4x64 source FIFO improves memory bandwidth throughput.

1.8.2 Video Coprocessor

The video coprocessor has an optimized datapath designed for scaling, filtering, and color space conversion. A quad 192x16 SRAM line buffer has been integrated into this block to provide vertical scaling and interpolation. Graphics and video keying capabilities and a window controller allow for overlaying of the graphics and video data streams. This enables simultaneous display of 24 bits per pixel (bpp) video and 8bpp graphics.

1.8.3 Host Bus Interface

PCI 2.1 and multiplexed VLB support functions such as bus control, data flow control, address/data signal generation, signal timings, and address decoding are supported. Full 32-bit memory and I/O operations, data flow control, and byte lane swapping are enhanced by a 4x32 bit write-through FIFO available in both VGA[†] and direct memory modes.

1.8.4 Memory Controller and Interface

The memory controller subsystem arbitrates requests from the direct memory interface, VGA graphics controller, drawing coprocessor, display controller, video scalar, and hardware cursor. Requests are serviced in a manner that ensures display integrity and maximum CPU/coprocessor drawing performance.

This memory controller may be configured to support various video memory sizes: For SGRAM support, the 1 MB and 2 MB configurations are supported. A full 64-bit memory path is supported when 2 MB of SGRAM is installed.

1.8.5   Extended VGA Graphics Controller

The VGA portion of the graphics controller is fully register-compatible with VGA standards and is BIOS-compatible with VESA† super VGA drivers. The video port addresses are:

- 03B4 - 03B5 (monochrome modes)
- 03BA (monochrome modes)
- 03C0 - 03CA
- 03CC
- 03CF
- 03D4 - 03D5 (color modes)
- 03DA (color modes)

1.8.6   CRT Controller

The ATI-264VT CRTC subsystem has additional enhancements such as support for overscan, video memory up to 2 MB, and screen resolutions up to 1280 x 1024 non-interlaced.

1.8.7   Display Controller

The display controller subsystem includes a display FIFO that manages the memory interface for displayed pixel data. An enhanced attribute controller supports VGA graphics modes up to 1024 x 768 x 256 colors (at 100 Hz), VGA text modes up to 132-column on a PS/2 monitor, and accelerator display modes up to 1280 x 1024 (75Hz).

1.8.8   Palette DAC

The internal palette DAC subsystem consists of a triple 256 x 8 SRAM palette and a triple 8-bit DAC. It supports pixel clock rates up to 135 MHz, refresh rates up to 100 Hz, built in reference generation, monitor detection, direct 24-bit color, separate or composite horizontal and vertical sync signals, and optimized slew rate control for the RGB analog output for low EMI emissions.

1.8.9   Hardware Cursor

The hardware cursor logic supports a 64x64x2 memory-mapped cursor that is also XGA function compatible. The hardware cursor may be used in any display modeOptions include two solid colors, as well as "transparent" and "complement." More details on register information and programming examples are available in the *mach64 Programmer's Guide and Register Reference Guide*.

1.8.10   Video I/O Interface

This interface supports the standard VESA Feature Connector, VESA Media Channel (VMC), and a general video input decoder port. Peripherals that support either VMC or the VESA Feature Connector can be attached directly to the VT. A general video decoder port allows the attachment of some video decoder chips.

1.8.11   Resolutions Supported

Table 1.   Supported Video Resolutions

Resolution	Supported with 1 MB SGRAM?	Supported with 2 MB SGRAM?	Refresh Rate (Hz)
640 x 480 x 256 colors	Yes	Yes	100
640 x 480 x 64K colors	Yes	Yes	100
640 x 480 x 16.7M colors	Yes	Yes	100
800 x 600 x 256 colors	Yes	Yes	100
800 x 600 x 64K colors	Yes	Yes	100
800 x 600 x 16.7M colors	No	Yes	100
1024 x 768 x 256 colors	Yes	Yes	100
1024 x 768 x 64K colors	No	Yes	100
1152 x 864 x 256 colors	Yes	Yes	80
1152 x 864 x 64K colors	No	Yes	80
1280 x 1024 x 16 colors	Yes	Yes	75
1280x 1024 x 256 colors	No	Yes	75

1.8.12   Graphics Drivers and Utilities

Common graphics drivers and utilities for DOS, Windows[†] 3.1x, Windows 95, and other operating systems, as well as a variety of applications (such as AutoCAD[†]) are available for the NP430HX motherboard. Contact your vendor for a list of available drivers. The Windows 3.1x and Windows 95 drivers include the ATI WinSwitch utility that allows users to change screen resolution without rebooting Windows, and the ATI DeskTop that supports panning and scrolling across a virtual workspace of up to 2048 x 1536.

Users must install Version 2.2 or later of the ATI drivers for OS/2 in order to use 1 MB SGRAM. Drivers for SCO[†] and Interactive UNIX[†] should be obtained from the respective UNIX vendor. Although Windows 95 installs native drivers for the onboard video, these drivers are not optimized, so you should obtain and install the accelerated drivers available through your vendor.

1.9 Audio Subsystem

The NP430HX motherboard features a 16-bit stereo audio subsystem as a factory-installed option. The audio subsystem is based upon the Yamaha OPL3-SA FM synthesizer. The OPL3-SA provides all the digital audio and analog mixing functions required for recording and playing of audio on personal computers. These functions include stereo analog-to-digital and digital-to-analog converters, analog mixing, anti-aliasing and reconstruction filters, line and microphone level inputs, and digital audio compression using selectable A-law / μlaw, and full digital control of all mixer and volume control functions. The rear panel Mic/Line In function is switchable between Mic In and Line In using software.

Table 2.   NP430HX Audio Resource Mapping

Resource	Interrupts (Options)	DMA (Options)	I/O (Options)
Sound Blaster (DMA playback, DMA shared with Windows Sound System capture)	5* 7 9 10	0* 1 3	220h 240h
Windows Sound System (DMA playback)	7 9 10 11*	0 1* 3	530h 604h E80h F40h
MPU-401 (IRQ shared with Sound Blaster)			300h 330h 332h 334h
AA LIB			388h

* indicates default setting

1.10 Management Extension Hardware

The Management Extension hardware provides low-cost instrumentation capabilities designed to reduce the total cost of PC ownership. The hardware implementation is a single-chip ASIC. Features include:

- Two integrated temperature sensors, one on the ASIC, one on the board
- Two fan speed sensors
- Power supply voltage monitoring to detect levels above or below acceptable values
- Registers for storing power on self test (POST) hardware test results and error codes
- Remote reset capabilities from a remote peer or server through LANDesk® Client Manager, Version 3.0 and service layers (when available)
- Hardware compatibility with Windows NT.

When an out-of-range condition (temperature, fan speed, or voltage) is reached, an interrupt is activated. The Management Extension circuitry connects to the ISA bus as an 8-bit I/O mapped device.
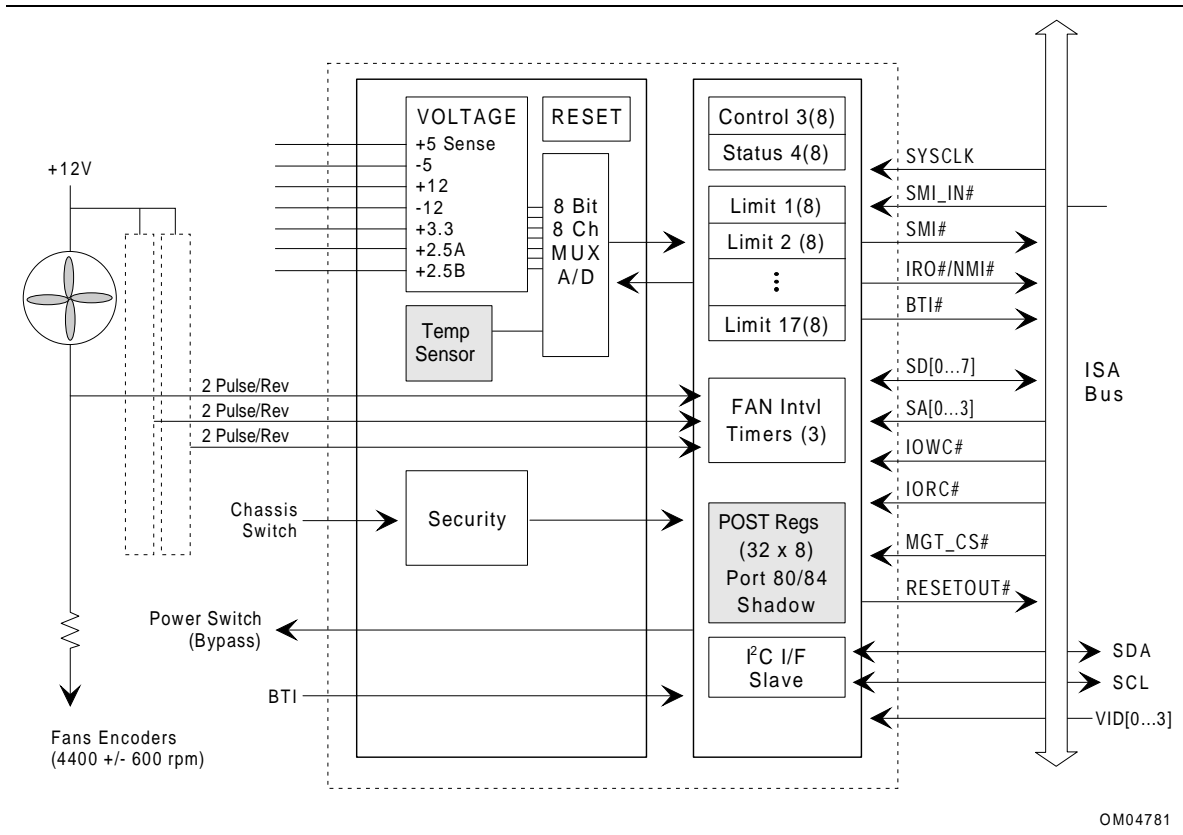
Figure 3. Block Diagram of Management Extension ASIC

1.11 Onboard Networking

1.11.1 EtherExpress™ PRO/100B PCI LAN Subsystem

The EtherExpress™ PRO/100B PCI LAN subsystem is an Ethernet LAN subsystem that provides both 10Base-T and 100Base-TX connectivity. Features include:

- 32 bit direct bus mastering on the PCI bus.
- Shared memory structure in the host memory that copies data directly to/from host memory.
- 10Base-T and 100Base-TX capability using a single RJ-45 connector.
- IEEE 802.3µ Auto-Negotiation for hardware selection of highest operating speed.
- Jumperless configuration; the LAN subsystem is totally software configurable.

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The following block diagram provides an overview of the LAN subsystem architecture.
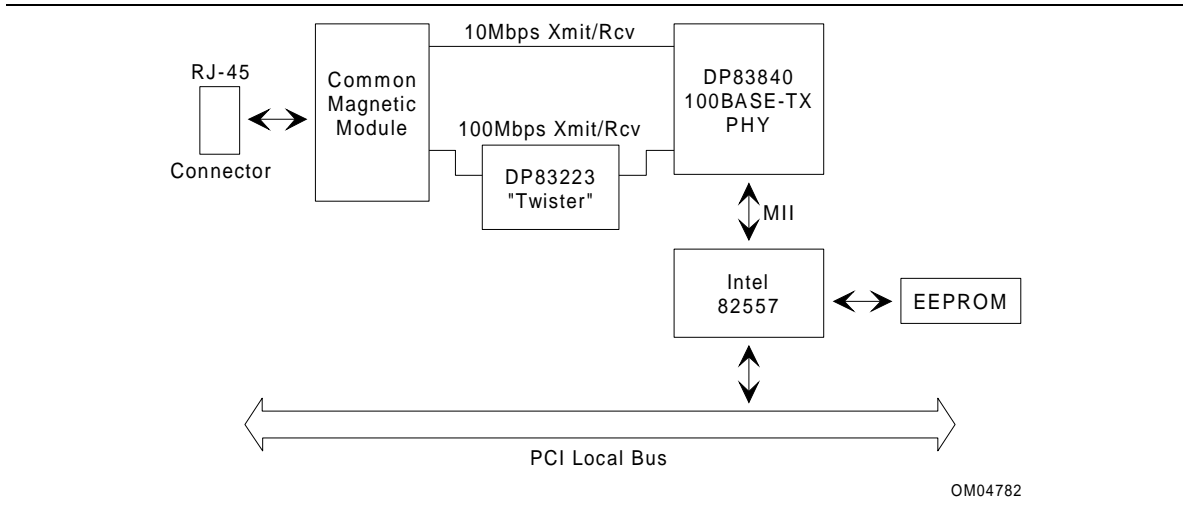
Figure 4. Functional Block Diagram of LAN subsystem

1.11.2   Intel 82557 LAN Controller

This device is the heart of the LAN subsystem and provides the following functions:

- CSMA/CD Protocol Engine
- Compatible with the PCI bus interface 2.1
- DMA engine for movement of commands, status, and network data across PCI
- Access to EEPROM
- Standard MII interface for access to IEEE 802.3μ compliant physical layer devices

1.11.3   10/100Mbps Physical Layer Interface

The physical layer interface is implemented in two devices from National Semiconductor, the DP83840 and the DP83223 (a.k.a. the "Twister"). The DP83840 provides:

- Complete functionality necessary for the 10Base-T interface; directly drives the cable when in 10Mbps mode.
- All functionality required for the 100Base-TX interface except for the NRZ to MLT3 encoding/decoding function, which is provided by the DP83223 "Twister" device.
- Complete set of MII management registers for control and status reporting.
- 802.3μ Auto-Negotiation for automatically establishing the best possible operating mode when connected to other 10Base-T or 100Base-TX devices, whether half or full-duplex capable.

1.11.4   EtherExpress PRO/100B PCI LAN Subsystem Software Description

The software provided with the EtherExpress PRO/100B PCI LAN subsystem includes setup/diagnostic software (SETUP.EXE) and a readme file viewer (README.EXE) that lists supported drivers.

1.12 Motherboard Connectors
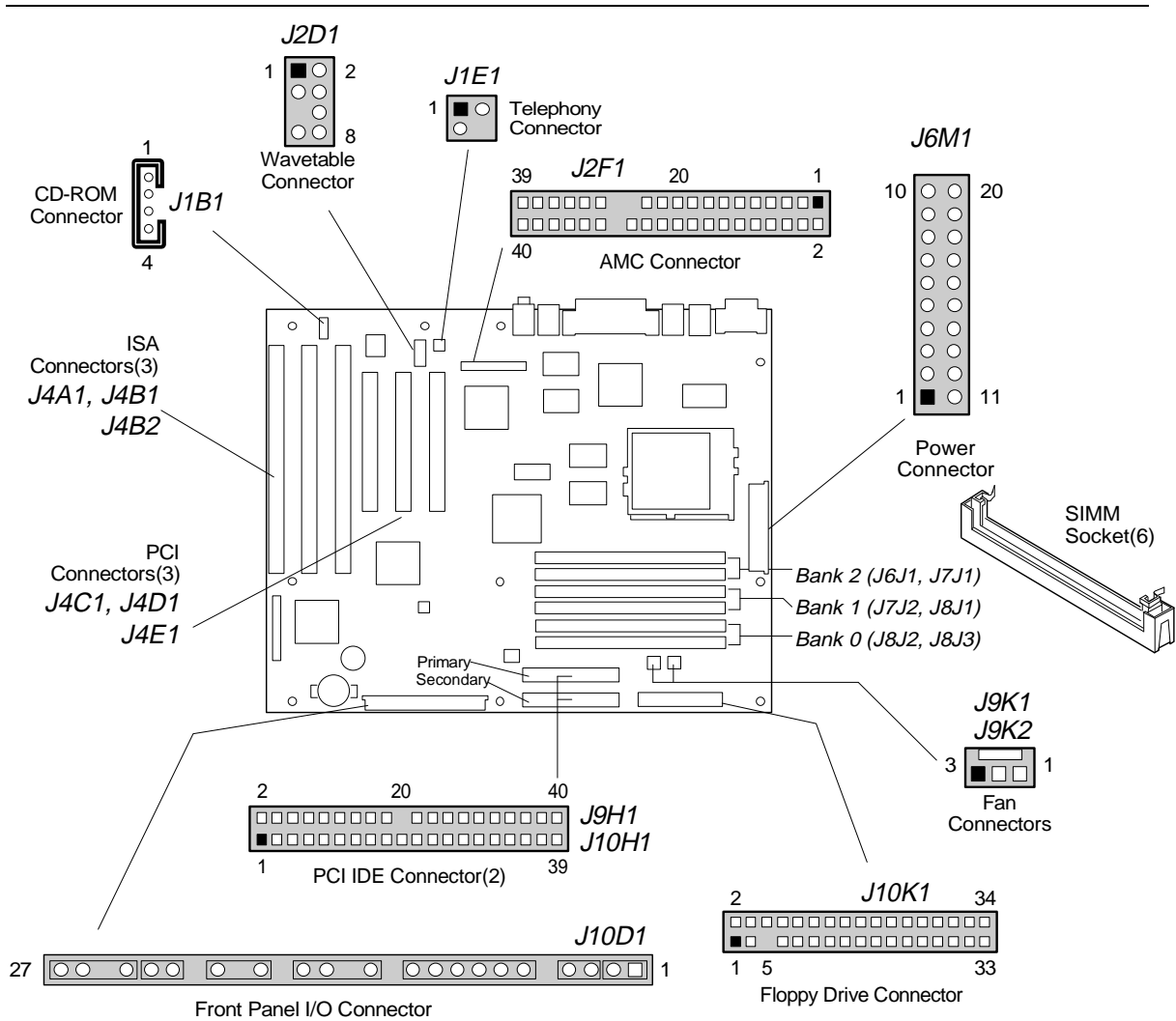
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Figure 5. Board Connectors

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1.12.1   CD Audio - J1B1

A four pin connector is provided for interfacing the audio output stream from a CD-ROM reader into the audio sub-system mixer. This connector is compatible with the typical cable that is supplied with CD-ROM readers for interfacing to audio add-in cards.

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

1.12.2   Wavetable Upgrade Connector - J2D1

With the standard audio feature (OPL3-SA) installed, an eight pin header is provided to connect to a wavetable upgrade card. The wavetable upgrade module typically is installed into a standard ISA slot with a cable routed to the connector.

Compatible wavetable upgrade cards are available from several vendors; the ICS WaveFront upgrade module and the CrystaLake Series 2000 wavetable product family add a complete General MIDI compatible music solution to the NP430HX-based system.

Pin	Signal Name
1	Wave Right
2	Ground
3	Wave Left
4	Ground
5	Key
6	Ground
7	No connect
8	MIDI_Out

1.12.3   Telephony Connector - J1E1

Pin	Signal Name
1	Ground
2	Audio Out
3	Audio In
4	Key

1.12.4   Fan Connectors - J9K1, J9K2

Pin	Signal Name
1	Ground
2	+ 12 V
3	Sense tachometer

1.12.5   ATI Hardware VESA Feature Connector/VMC - J2F1

Pin	Signal Name	Pin	Signal Name
1	Ground (VESA feature connector)	2	Data 0 (VESA feature connector)
3	Ground (")	4	Data 1 (")
5	Ground (")	6	Data 2 (")
7	Data Enable (")	8	Data 3 (")
9	Sync Enable (")	10	Data 4 (")
11	PCLK Enable (")	12	Data 5 (")
13	SDA (")	14	Data 6 (")
15	Ground (")	16	Data 7 (")
17	Ground (")	18	DCLK (")
19	Ground (")	20	BLANK (")
21	VFCSNS (")	22	HSYNC (")
23	SCL (")	24	VSYNC (")
25	Key (")	26	Ground (")
27	Key	28	Key
29	VCC	30	VSA
31	RST	32	SNRDY
33	SAD6	34	VMASK
35	No connect	36	
37	Ground	38	+12 V
39	No connect	40	No connect

1.12.6   Floppy Drive Connector - J10K1

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN
7	Ground	8	Index #
9	Ground	10	Motor Enable A #
11	Ground	12	Drive Select B #
13	Ground	14	Drive Select A #
15	Ground	16	Motor Enable B #
17	MSEN1	18	DIR #
19	Ground	20	STEP #
21	Ground	22	Write Data #
23	Ground	24	Write Gate #
25	Ground	26	Track 00 #

Floppy Drive Connector (continued)

Pin	Signal Name	Pin	Signal Name
27	MSEN0	28	Write Protect #
29	Ground	30	Read Data #
31	Ground	32	Side 1 Select #
33	Ground	34	Diskette Change #

1.12.7 PCI IDE Connectors - J9H1, J10H1

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

1.12.8   Power Supply Connector

When used with a power supply that supports remote power on/off, the motherboard can turn off the system power through software control. ("Soft-off" is a manufacturing option). The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The system BIOS turns the system power off when it receives the proper APM command from the OS. For example, Windows 95 issues this APM command when the user selects the "Shutdown the computer" option. APM must be enabled in the system BIOS and OS for the soft-off feature to work correctly.

1.12.8.1   Power Supply Connector - J6M1

Pin	Signal Name	Function
1	3.3 V	+3.3 V for PCI slots and 3.3 V logic
2	3.3 V	+3.3 V for PCI slots and 3.3 V logic
3	GND	Ground
4	+5 V	+5 volts Vcc
5	GND	Ground
6	+5 V	+5 volts Vcc
7	GND	Ground
8	PWRGD	Power Good
9	+5 VSB	+5 volts stand-by for real-time clock and chassis-secure circuit
10	+12 V	+12 volts
11	3.3 V	+3.3 V for PCI slots and 3.3 V logic
12	-12 V	-12 volts
13	GND	Ground
14	PS-ON*	Power Supply remote on/off control
15	GND	Ground
16	GND	Ground
17	GND	Ground
18	-5 V	-5 volts
19	+5 V	+5 volts Vcc
20	+5 V	+5 volts Vcc

* except Pentium processors, which use an onboard switching regulator

1.12.9   Front Panel Connectors

The motherboard provides header connectors to support functions typically located on the chassis bezel. Front panel features supported include:

- Speaker
- Reset switch
- Power LED
- Hard drive activity LED
- Infrared (IRDA) port
- Sleep switch
- Power switch

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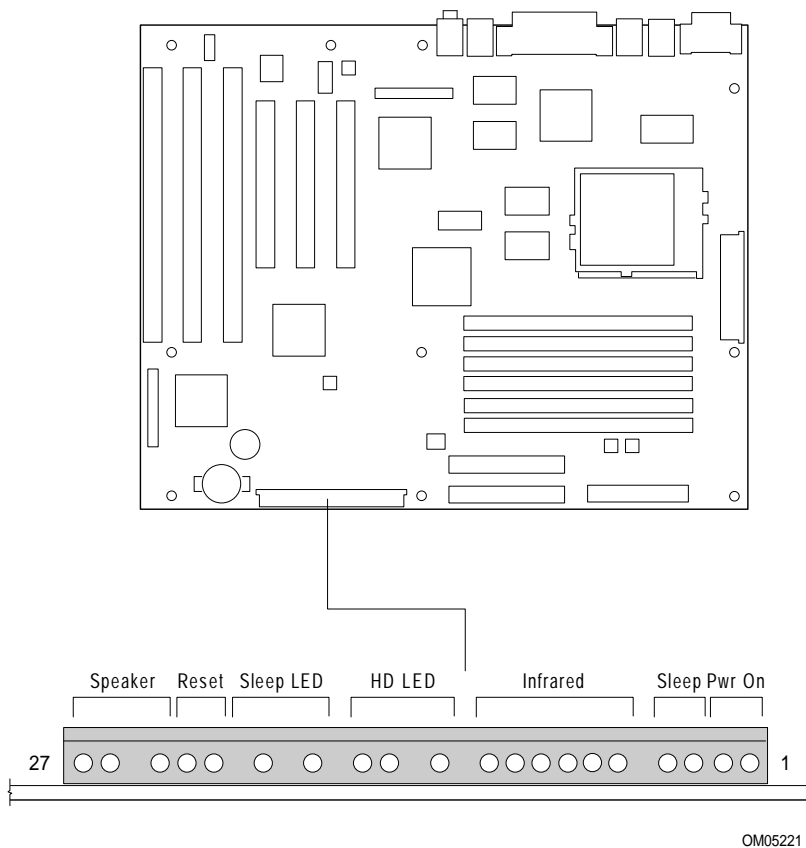
Figure 6. Front Panel I/O Connectors

1.12.9.1   Front Panel I/O Connectors

Pin	Signal Name
1	SW_ON
2	Ground
3	SLEEP
4	SLEEPPU
5	No connect
6	+5V
7	No connect
8	IRRIN
9	Ground
10	IRTX
11	CONIR
12	No connect
13	HD_PWR
14	Key
15	HDA#
16	HD_PWR
17	No connect
18	PWR_LED_DRV (Sleep LED)
19	Key
20	PWR_LED_PU (Sleep LED)
21	No connect
22	Ground
23	HW_RST
24	Ground
25	Key
26	PIEZO_IN
27	SPKRHDR

1.12.9.2   Speaker

The speaker provides error beep code information during the Power-On Self Test, if the system cannot use the video interface. As a manufacturing option, an onboard piezoelectric speaker may be present. The onboard speaker may be disabled by removing a jumper from the front panel speaker connector and connecting an offboard speaker in its place. The speaker is not connected to the audio subsystem, so it will not receive output from the audio subsystem.

1.12.9.3   Reset

This header can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the board resets and runs POST.

1.12.9.4   Sleep LED (Power LED)

This LED is on steadily when the power is on. It blinks when the computer is in sleep mode.

1.12.9.5   HD LED

This header can be connected to an LED to provide a visual indicator for when an IDE hard drive connected to the onboard IDE controller is being read or written.

1.12.9.6   Infrared connector

Serial port 2 can be configured to support an IrDA[†] module with a 6- pin header connector. After configuring the IrDA interface, 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 115 Kbps from a distance of 1 meter. Consumer IR is also supported by the same connector.

1.12.9.7   Sleep/Resume

When advanced power management (APM) is activated in the system BIOS and the operating system's APM driver is loaded, Sleep mode (Standby) can be entered in one of three ways: an optional front panel "Sleep/Resume" button, a user defined keyboard hot key, or prolonged system inactivity. The Sleep/Resume button is supported by a 2-pin header located on the front panel I/O connector. Closing the "Sleep" switch generates an SMI (System Management Interrupt) to the processor which immediately goes into System Management Mode (SMM).

The front panel "Sleep mode" switch must be a momentary two pin SPST type that is normally open. The function of the Sleep/Resume button can also be achieved with a keyboard hot-key sequence, or by a time-out of the system inactivity timer. Both the keyboard hot-key and the inactivity timer are programmable in the BIOS setup (timer is set to 10 minutes by default). To reactivate the system, or "Resume", the user must press the sleep/resume button again, or use the keyboard or PS/2 mouse. Mouse activity "wakes up" the system only if a mouse driver is loaded. While the system is in Standby or "sleep" mode it is fully capable of responding to and servicing external interrupts (such as incoming fax) even though the monitor turns on only if a user interrupt (PS/2 keyboard/mouse) occurs as mentioned above.

1.12.9.8   Pwr-On LED

When this LED is off, a momentary closure turns the computer on. When this LED is on, a momentary closure turns the computer off.

1.12.10   Back Panel Connectors

The back panel provides external access to two serial ports, PS/2 style keyboard and mouse
connectors, an RJ-45 Ethernet connector, one parallel port, a VGA connector, two USB connectors,
and external audio jacks (line out and MIC in). Figure 7 shows the location of the I/O connectors.
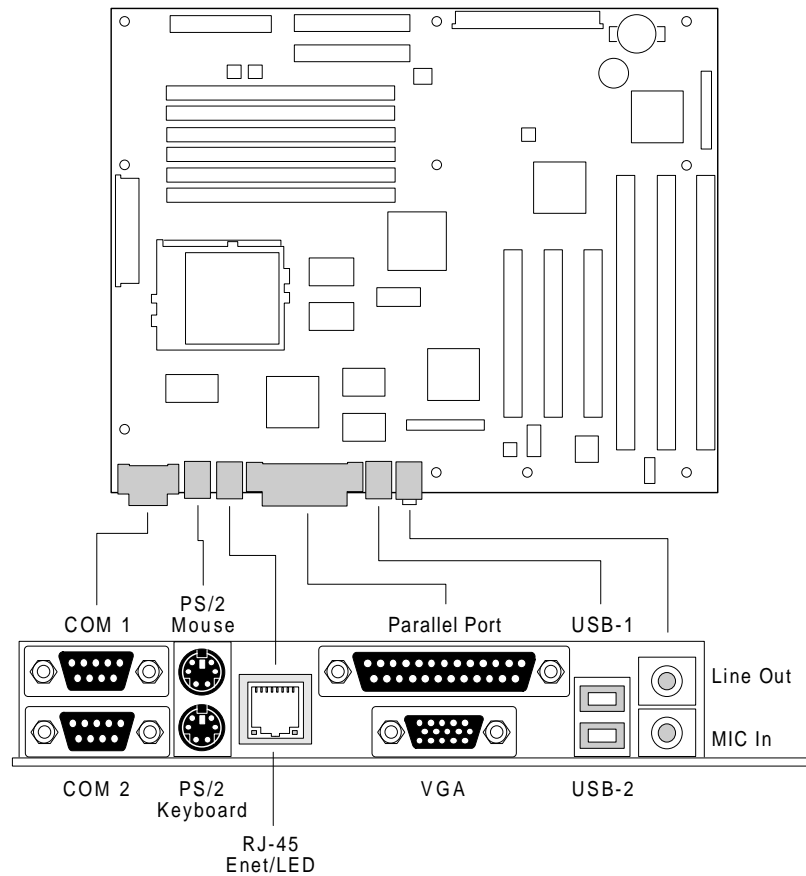
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Figure 7. Back Panel I/O Connectors

1.12.10.1   Serial Port Connectors - J1M1

Pin	Signal Name
1	DCD
2	Serial In #
3	Serial Out #
4	DTR#
5	GND
6	DSR#
7	RTS#
8	CTS#
9	RI#

1.12.10.2   PS/2 Keyboard and Mouse Connectors - J1L1

Pin	Signal Name
1	Data
2	No connect
3	Ground
4	+5 V (fused)
5	Clock
6	No connect

1.12.10.3   RJ-45 LAN Connector - J1K1

Pin	Signal Name
1	TXP
2	TXM
3	RXP
4	Bus_Term
5	Bus_Term
6	RXM
7	Bus_Term
8	Bus_Term

1.12.10.4   Parallel Port Connector - J1J1

Pin	Signal Name	Pin	Signal Name
1	Strobe#	14	Auto Feed#
2	Data bit	15	Fault#
3	Data bit	16	INIT#
4	Data bit	17	SLCT IN#
5	Data bit	18	Ground
6	Data bit	19	Ground
7	Data bit	20	Ground
8	Data bit	21	Ground
9	Data bit	22	Ground
10	ACK#	23	Ground
11	Busy	24	Ground
12	Error	25	Ground
13	Select		

1.12.10.5   Video Monitor Connector - J1J1

Pin	Signal Name
1	Red
2	Green
3	Blue
4	No connect
5	Ground
6	Ground
7	Ground
8	Ground
9	No connect
10	Ground
11	No connect
12	MONID1
13	Horizontal Sync
14	Vertical Sync
15	MONID2

1.12.10.6   USB Connectors - J1G2

Pin	Signal Name
1	Power
2	USBP0# [USBP1#]
3	USBP0 [USBP1]
4	Ground

1.12.11   Add-in Board Expansion Connectors

The motherboard contains two PCI slots, two ISA slots and one shared slot (for a PCI or ISA card). The PCI bus is fully compliant with the PCI 2.1 specification and supports up to three bus masters through the three PCI connectors.

1.12.11.1   PCI Bus Connectors

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	Vcc	B1	-12 V	A32	AD16	B32	AD17
A2	+12 V	B2	GND	A33	3.3 V	B33	C/BE2#
A3	Vcc	B3	GND	A34	FRAME#	B34	GND
A4	Vcc	B4	TD0NC	A35	GND	B35	IRDY#
A5	Vcc	B5	Vcc	A36	PTRDY#	B36	3.3 V
A6	PCIINTA3#	B6	Vcc	A37	GND	B37	DEVSEL#
A7	PCIINTC1#	B7	PCIINT4B#	A38	STOP#	B38	GND
A8	Vcc	B8	PCIINT2D#	A39	3.3 V	B39	PLOCK#
A9	GNDReserved	B9	PRSNT1C#	A40	SDONE	B40	PERR#
A10	GNDVcc	B10	Reserved	A41	SBO#	B41	3.3 V
A11	Reserved	B11	PRSNT2C#	A42	GND	B42	SERR#
A12	GND	B12	GND	A43	PAR	B43	3.3 V
A13	GND	B13	GND	A44	AD15	B44	C/BE1#
A14	Reserved	B14	Reserved	A45	3.3 V	B45	AD14
A15	PCIRST#	B15	GND	A46	AD13	B46	GND
A16	Vcc	B16	SL_3PCICLK	A47	AD11	B47	AD12
A17	PCIGNT#	B17	GND	A48	GND	B48	AD10
A18	GND	B18	PCIREQ2	A49	AD9	B49	GND
A19	Reserved	B19	Vcc	A50	KEY	B50	KEY
A20	AD30	B20	AD31	A51	KEY	B51	KEY
A21	3.3 V	B21	AD29	A52	C/BE0#	B52	AD8
A22	AD28	B22	GND	A53	3.3 V	B53	AD7
A23	AD26	B23	AD27	A54	AD6	B54	3.3 V
A24	GND	B24	AD25	A55	AD4	B55	AD5
A25	AD24	B25	3.3 V	A56	GND	B56	AD3
A26	IDSEL	B26	C/BE3#	A57	AD2	B57	GND
A27	3.3 V	B27	AD23	A58	AD0	B58	AD1
A28	AD22	B28	GND	A59	Vcc	B59	Vcc
A29	AD20	B29	AD21	A60	REQ64C#	B60	ACK64C#
A30	GND	B30	AD19	A61	Vcc	B61	Vcc
A31	AD18	B31	3.3 V	A62	Vcc	B62	Vcc

1.12.11.2 ISA Bus Connectors

Pin	Signal Name	Pin	Signal Name
B1	GND	A1	IOCHK#
B2	RSTDRV	A2	SD7
B3	Vcc	A3	SD6
B4	IRQ9	A4	SD5
B5	-5 V	A5	SD4
B6	DRQ2	A6	SD3
B7	-12 V	A7	SD2
B8	0WS#	A8	SD1
B9	+12 V	A9	SD0
B10	GND	A10	IOCHRDY
B11	SMEMW#	A11	AEN
B12	SMEMR#	A12	SA19
B13	IOW#	A13	SA18
B14	IOR#	A14	SA17
B15	DACK3#	A15	SA16
B16	DRQ3	A16	SA15
B17	DACK1#	A17	SA14
B18	DRQ1	A18	SA13
B19	REFRESH#	A19	SA12
B20	SYSCLK	A20	SA11
B21	IRQ7	A21	SA10
B22	IRQ6	A22	SA9
B23	IRQ5	A23	SA8
B24	IRQ4	A24	SA7
B25	IRQ3	A25	SA6
B26	DACK2#	A26	SA5
B27	TC	A27	SA4
B28	BALE	A28	SA3
B29	Vcc	A29	SA2
B30	OSC	A30	SA1
B31	GND	A31	SA0
KEY		KEY	
D1	MEMCS16#	C1	SBHE#
D2	IOCS16#	C2	LA23
D3	IRQ10	C3	LA22

ISA Bus Connectors (continued)

Pin	Signal Name	Pin	Signal Name
D4	IRQ11	C4	LA21
D5	IRQ12	C5	LA20
D6	IRQ15	C6	LA19
D7	IRQ14	C7	LA18
D8	DACK0#	C8	LA17
D9	DRQ0	C9	MEMR#
D10	DACK5#	C10	MEMW#
D11	DRQ5	C11	SD8
D12	DACK6#	C12	SD9
D13	DRQ6	C13	SD10
D14	DACK7#	C14	SD11
D15	DRQ7	C15	SD12
D16	Vcc	C16	SD13
D17	Master#	C17	SD14
D18	GND	C18	SD15

1.13 Jumper Settings
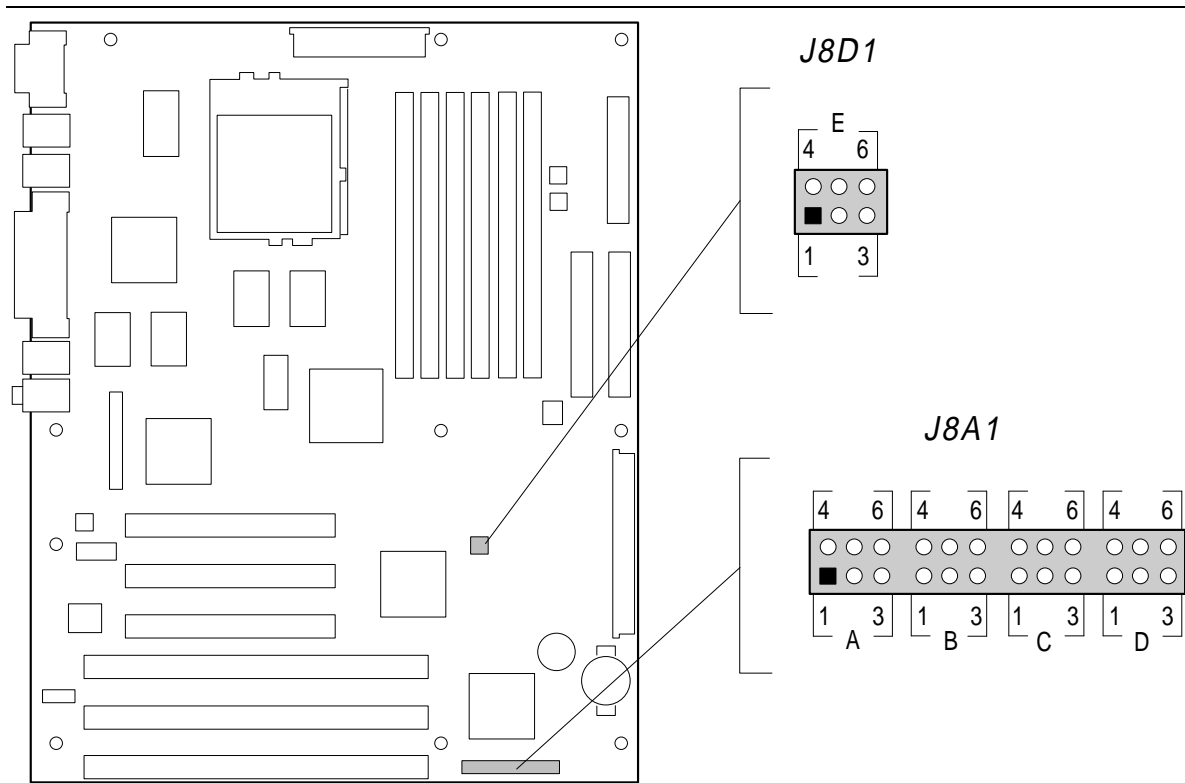
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Figure 8. Jumper Locations

Table 3.   Configuration Jumper Settings

Function	Jumper	Configuration
Password clear	J8A1-A	1-2 Password enabled (**Default**) 2-3 Password clear/disabled
CMOS clear	J8A1-A	4-5 Keep (**Default**) 5-6 Clear
BIOS Setup Access	J8A1-B	1-2 Access allowed (**Default**) 2-3 Access denied
CPU speed	J8A1-C	See Table 4
Host bus speed **(Note: These jumpers also set the PCI and ISA clock speeds.)**	J8A1-D	See Table 4
Processor voltage	J8D1-E	4-5 Standard voltage 5-6 VRE enabled (**Default**)

1.13.1 CPU Configuration (J8A1 C and D)

These jumpers allow the motherboard to be switched between different speeds of the Pentium processor. The jumpers also affect the PCI and ISA clock speeds according to the following table.

Table 4.   CPU / Bus Speed Settings

CPU Frequency	Jumper Settings for J8A1-C	Jumper Settings for J8A1-D	Host Bus Frequency	PCI Bus Frequency	ISA Bus Frequency
200 MHz	1-2 and 5-6	1-2 and 5-6	66 MHz	33 MHz	8.33 MHz
166 MHz	1-2 and 5-6	2-3 and 5-6	66 MHz	33 MHz	8.33 MHz
150 MHz	2-3 and 5-6	1-2 and 5-6	50 MHz	30 MHz	7.5 MHz
133 MHz	1-2 and 5-6	2-3 and 4-5	66 MHz	33 MHz	8.33 MHz
120 MHz	2-3 and 4-5	2-3 and 4-5	60 MHz	30 MHz	7.5 MHz
100 MHz	1-2 and 5-6	1-2 and 4-5	66 MHz	33 MHz	8.33 MHz
90 MHz	2-3 and 4-5	1-2 and 4-5	60 MHz	30 MHz	7.5 MHz
75 MHz	2-3 and 5-6	1-2 and 4-5	50 MHz	25 MHz	8.33 MHz
Reserved	1-2 and 4-5	-	-	-	-

1.13.2 Password clear (J8A1-A, Pins 1, 2, and 3)

Allows system password to be cleared by moving the jumper from pins 1-2 to pins 2-3 and turning the system on. The system should then be turned off and the jumper should be returned to the 1-2 position to restore normal operation. This procedure should only be done if the user password has been forgotten. The password function is effectively disabled if this jumper is in the 2-3 position. Default is for the password to be enabled (1-2 position).

1.13.3 Clear CMOS (J8A1-A, Pins 4, 5, and 6)

Allows CMOS settings to be reset to default values by moving the jumper from pins 4-5 to pins 5-6 and turning the system on. When the system reports that "NVRAM cleared by jumper", the system can be turned off, and the jumper should be returned to the 4-5 position to restore normal operation. Default is for this jumper to be on pins 4-5. Clearing CMOS settings also clears ESCD data.

1.13.4 BIOS Setup Access (J8A1-B, Pins 1, 2, and 3)

Allows access to BIOS Setup utility to be disabled by moving this jumper from the 1-2 position to the 2-3 position. Default is for access to setup to be enabled (1-2 position).

1.13.5 BIOS Recovery (J8D1, Pins 1, 2, and 3)

Allows for recovery in case a BIOS update fails. Move the jumper to the Recovery position (2-3 position) to perform the BIOS recovery procedure. Default is "Normal" (1-2 position).

1.13.6 CPU Voltage (J8D1, Pins 4, 5, and 6)

This jumper block changes the output of the on-board voltage regulator. Pins 4-5 should be jumpered for processors that require standard voltage regulation. Pins 5-6 should be jumpered for processors that require the VRE specification. This jumper should not be changed by the user unless changing to a new processor type. Some upgrade processors may require a different setting. Check the processor's documentation for the correct setting. (Standard = 3.135-3.6V, VRE = 3.4-3.6V). In general, the upgrade processor should be strapped to VRE, unless you are using a Pentium Overdrive processor.

1.14 Reliability

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

Motherboard: 68,534 hours calculated

1.15 Environmental

Table 5.   Motherboard Environmental Specifications

Parameter	Specification
Temperature	
Non-Operating	-40°C to +70°C
Operating	+0°C to +55°C
Vibration	
Unpackaged	5 Hz to 20 Hz: 0.01 g^2 Hz sloping up to 0.02 g^2 Hz
	20 Hz to 500 Hz: 0.02 g^2 Hz (flat)
Packaged	10 Hz to 40 Hz: 0.015 g^2 Hz (flat)
	40 Hz to 500 Hz: 0.015 g^2 Hz sloping down to 0.00015 g^2 Hz

1.16 Power Consumption

Tables 6 and 7 list the voltage and current specifications for a typical system configuration. This information is preliminary and is provided only as a guide for calculating approximate total system power usage with additional resources added.

Table 6.   DC Voltage

DC Voltage	Acceptable Tolerance
+3.3 V	±5%
+5V	±5%
+5V SB (stand by)	±5%
-5V	±5%
+12V	±5%
-12V	±5%

Table 7.   Power Usage

DC Voltage (V)	Current (RMS), APM Disabled	Current (RMS), APM Enabled
3.3	420 mA	431.6 mA
5	1.963 A	1.940 A
5 VSB	0 mA	0 mA
-5	0 mA	0 mA
12	110.1 mA	106.8 mA
-12	41.76 mA	40.24 mA

1.17 Regulatory Compliance

This printed circuit assembly meets the following safety and EMI regulations when correctly installed in a compatible host system.

1.17.1   Safety

1.17.1.1   UL 1950 - CSA 950-95, 3rd edition, 28 July 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)

1.17.1.2   CSA C22.2 No. 950-93, 2nd Edition

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (Canada)

1.17.1.3 EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)

1.17.1.4 IEC 950, 2nd edition, 1991 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)

1.17.1.5 EMKO-TSE (74-SEC) 207/94

Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark, and Finland)

1.17.2 EMI

1.17.2.1 FCC Class B

Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)

1.17.2.2 CISPR 22, 2nd Edition, 1993

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)

1.17.2.3 EN 55 022, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)

1.17.2.4 EN 50 082-1, 1992

Generic Immunity Standard. Currently compliance is determined via testing to IEC 801-2, -3 and -4. (Europe)

1.17.2.5 VCCI Class 2 (ITE)

Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)

1.17.2.6 ICES-003, Issue 2

Interference-Causing Equipment Standard, Digital Apparatus. (Canada)

1.17.3 Product Certification Markings

This printed circuit assembly has the following product certification markings:

- European CE Mark
  — Marking on the board or shipping container.

- UL Recognition Mark
  — Marking is the UL File No. E139761 on the component side of the board and the PB No. on the solder side of the board. Board material flammability is 94V-1 or -0.
- Canadian Compliance Mark
  — Marking is a small c followed by a stylized backward UR on the component side of the board.

2 Motherboard Resources

2.1 Memory Map

Table 8.   Memory Map

Address Range (Decimal)	Address Range (hex)	Size	Description
1024 K - 131072 K	100000 - C000000	191 M	Extended Memory
960 K - 1023 K	F0000 - FFFFF	64 K	Main BIOS
944 K - 959 K	EC000 - EFFFF	16 K	Boot block (available as UMB)
936 K - 943 K	EA000 - EBFFF	8 K	VPD ESCD (DMI configuration information)
932 K - 935 K	E9000 - E9FFF	4 K	Reserved for BIOS
928 K - 931 K	E8000 - E8FFF	4 K	OEM logo or Scan User Flash
896 K - 927 K	E0000 - E7FFF	32 K	POST BIOS (available as UMB / high DOS memory - open to PCI bus)
800 K - 895 K	C8000 - DFFFF	96 K	Available High DOS memory (open to ISA and PCI bus)
640 K - 799 K	A0000 - C7FFF	160 K	Onboard video memory and BIOS
639 K - 640 K	9FC00 - 9FFFF	1 K	Extended BIOS Data (moveable by QEMM†, 386MAX†)
512 K - 638 K	80000 - 9FBFF	127 K	Extended conventional
0 K - 511 K	00000 - 7FFFF	512 K	Conventional

2.2 DMA Channels

Table 9.   DMA Channels

DMA	Data Width	System Resource
0	8- or 16-bits	Audio
1	8- or 16-bits	Audio / Parallel Port
2	8- or 16-bits	Floppy
3	8- or 16-bits	Parallel Port / Audio
4		Reserved - Cascade channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

2.3 I/O Map

Table 10.   I/O Map

Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX3 - DMA 1
0020 - 0021	2 bytes	PIIX3 - Interrupt Controller 1
002E - 002F	2 bytes	Super I/O configuration registers
0040 - 0043	4 bytes	PIIX3 - counter 1
0048 - 004B	4 bytes	PIIX3 - counter 2
0060	1 byte	Keyboard Controller Byte - Reset IRQ
0061	1 byte	PIIX3 - NMI, speaker control
0064	1 byte	Keyboard Controller, CMD/STAT Byte
0070, bit 7	1 bit	PIIX3 - Enable NMI
0070, bits 6:0	7 bits	PIIX3 - Real Time Clock, Address
0071	1 byte	PIIX3 - Real Time Clock, Data
0078	1 byte	Reserved - board configuration
0079	1 byte	Reserved - board configuration
0080 - 008F	16 bytes	PIIX3 - DMA Page Register
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2
00B2 - 00B3	2 bytes	APM control
00C0 - 00DE	31 bytes	PIIX3 - DMA 2
00F0	1 byte	Reset Numeric Error
0170 - 0177	8 bytes	Secondary IDE Channel
01F0 - 01F7	8 bytes	Primary IDE Channel
0200 - 0207	8 bytes	Audio (reserved)
0220 - 022F	16 bytes	Audio (SB compatible)
0240 - 024F	16 bytes	Audio (SB compatible)
0278 - 027B	4 bytes	Parallel port 2
0290 - 0297	8 bytes	Hardware monitor ASIC: 290/94 monitors and stores post-code 295 address and content functions 296 register read/write operations
02E8 - 02EF	8 bytes	Serial port 4
02F8 - 02FF	8 bytes	Serial port 2
0300 - 0301	2 bytes	MPU - 401 (MIDI)
0330 - 0331	2 bytes	MPU - 401 (MIDI)
0332 - 0333	2 bytes	MPU - 401 (MIDI)
0334 - 0335	2 bytes	MPU - 401 (MIDI)
0376	1 byte	Sec IDE Chan Cmd Port
0377	1 byte	Floppy channel 2 command
0377, bit 7	1 bit	Floppy disk chng channel 2

Table 10.   I/O Map (continued)

Address (hex)	Size	Description
0377, bits 6:0	7 bits	Sec IDE Chan Status Port
0378 - 037F	8 bytes	Parallel port 1
0388 - 038D	6 bytes	AA LIB (FM synth)
03B4 - 03B5	2 bytes	Video (VGA)
03BA	1 byte	Video (VGA)
03BC - 03BF	4 bytes	Parallel port 3
03C0 - 03CA	11 bytes	Video (VGA)
03CC	1 byte	Video (VGA)
03CE - 03CF	2 bytes	Video (VGA)
03D4 - 03D5	2 bytes	Video (VGA)
03DA	1 byte	Video (VGA)
03E8 - 03EF	8 bytes	Serial port 3
03F0 - 03F5	6 bytes	Floppy Channel 1
03F6	1 byte	Pri IDE Chan Cmd 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 triggered
LPT + 400h	8 bytes	ECP port
0530 - 0537	8 bytes	Windows sound system
0604 - 060B	8 bytes	Windows sound system
0CF8*	4 bytes	PCI Config Address Reg.
0CF9**	1 byte	Turbo & Reset Control Reg.
0CFC-0CFF*	4 bytes	PCI Config Data Register
0E80 - 0E87	8 bytes	Windows sound system
0F40 - 0F47	8 bytes	Windows sound system
0F86 - 0F87	2 bytes	Yamaha OPL3-SA configuration
FF00 - FF07	8 bytes	IDE Bus Master Reg.
FFA0 - FFA7	8 bytes	Primary Bus Master IDE Registers
FFA8 - FFAF	8 bytes	Secondary Bus Master IDE Registers

*   DWORD access only

**   Byte access only

2.4 PCI Configuration Space Map

Table 11.   PCI Configuration Space Map

Bus Number (hex)	Dev Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82439HX (TXC)
00	07	00	Intel 82371FB (PIIX3) PCI/ISA bridge
00	07	01	Intel 82371FB (PIIX3) IDE Bus Master
00	07	02	Intel 82371FB (PIIX3) USB
00	08	00	ATI VGA Graphics
00	0C	00	Intel 82557 Ethernet Network
00	0D	00	PCI Expansion Slot: User Available
00	0E	00	PCI Expansion Slot: User Available
00	0F	00	PCI Expansion Slot: User Available

2.5 Interrupts

Table 12.   Interrupts

IRQ	System Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard buffer full
2	Reserved, Cascade interrupt from slave PIC
3	Serial Port 2*
4	Serial Port 1*
5	Audio*
6	Floppy
7	Parallel Port 1
8	Real Time Clock
9	User available
10	User available
11	Windows Sound System*
12	Onboard Mouse port if present, else user available
13	Reserved, Math coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, else user available

*   Default

3   Motherboard BIOS and Setup Utility

3.1   Introduction

The motherboard uses an Intel BIOS, which is stored in Flash EEPROM and upgraded using a floppy disk-based program. In addition to the Intel BIOS, the Flash EEPROM also contains the Setup utility, Power-On Self Tests (POST), APM 1.1, the PCI auto-configuration utility, and Windows 95 ready Plug and Play. This motherboard also supports system BIOS shadowing, allowing the BIOS to execute from 64-bit onboard write-protected DRAM.

The BIOS displays a sign-on message during POST identifying the type of BIOS and a five-digit revision code. The initial production BIOS in the motherboard will be identified as 1.00.01.DE0.

Information on BIOS functions can be found in the *IBM PS/2 and Personal Computer BIOS Technical Reference* published by IBM, and the *ISA and EISA Hi-Flex AMIBIOS Technical Reference* published by AMI. Both manuals are available at most technical bookstores.

3.2   BIOS Flash Memory Organization

The Intel 28FB200BX 2 Mbit Flash component is organized as 256K x 8. The Flash device is divided into eight areas, as described in Table 13.

Table 13.   Flash Memory Organization

System Address (Hex)	Size	Description
FFFF0000 - FFFFFFFF	64 KB	Main BIOS block
FFFEC000 - FFFEFFFF	16 KB	Boot block (available as UMB)
FFFEA000 - FFFEBFFF	8 KB	VPD ESCD (DMI configuration information)
FFFE9000 - FFFE9FFF	4 KB	Reserved for BIOS
FFFE8000 - FFFE8FFF	4 KB	OEM logo or Scan User Flash
FFFE0000 - FFFE7FFF	32 KB	Main BIOS block
FFFD0000 - FFFDFFFF	64 KB	Main BIOS block
FFFC0000 - FFFCFFFF	64 KB	Main BIOS block

3.3 BIOS Upgrades

Flash memory simplifies distributing BIOS upgrades. A new version of the BIOS can be installed from a diskette. BIOS upgrades are available to be downloaded from the World Wide Web (http://wwwcs.intel.com/oem_developer) , or Intel's FTP site (U.S.: ftp.intel.com/pub/bios; European mirror: ftp.funet.fi/pub/mirrors/ftp.initel.com/bios).

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 case 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.

3.4 PCI IDE Support

The two local bus IDE connectors with independent I/O channel support are setup up automatically by the BIOS if the user selects "Autoconfiguration" in Setup. The IDE interface supports PIO Mode 3 and Mode 4 hard drives and recognition of ATAPI CD-ROMs, tape drives, and any other ATAPI devices. The BIOS determines the capabilities of each drive and configure them to optimize capacity and performance. For the high capacity hard drives typically available today, the drive is automatically configured for Logical Block Addressing (LBA) for maximum capacity and to PIO Mode 3 or 4, depending on the capability of the drive. The user is able to override the auto-configuration options by using the manual mode setting. The ATAPI Specification Revision 2.5 recommends that an ATAPI device be configured as shown in the table below.

Table 14.   Recommendations for Configuring an ATAPI Device

	Primary Cable		Secondary Cable	
IDE Configuration	Drive 0	Drive 1	Drive 0	Drive 1
Normal, no ATAPI	ATA			
Disk and CD-ROM for enhanced IDE systems	ATA		ATAPI	
Legacy IDE System with only one cable	ATA	ATAPI		
Enhanced IDE with CD-ROM and a tape or two CD-ROMs	ATA		ATAPI	ATAPI

3.5 PCI Auto-configuration

The PCI auto-configuration utility operates in conjunction with the system Setup utility to allow the insertion and removal of PCI cards to the system without user intervention (Plug and Play). When the system is turned on after adding a PCI add-in card, the BIOS automatically configures interrupts, I/O space, and other parameters. PCI interrupts are distributed to available ISA interrupts that have been not been assigned to an ISA card, or system resources. Those interrupts left set to "available" in the BIOS setup are considered available for PCI add-in card use Which PCI interrupt is assigned to which IRQ is nondeterministic.

The PCI Auto-Configuration function complies with version 2.10 of the PCI BIOS specification. System configuration information is stored in ESCD format. The ESCD data can be cleared by setting the CMOS clear jumper to the "Clear" position. See section 1.13.3 for more information.

PCI specification 2.1 for add-in card auto-configuration is also a part of the Plug and Play BIOS. Peer-to-peer hierarchical PCI Bridge 1.0 is supported, and by using an OEM supplied option ROM or TSR, a PCI-to-PCMCIA bridge capability is possible as well.

3.6 ISA Plug and Play

The BIOS incorporates ISA Plug and Play capabilities as delivered by Plug and Play Release 1.0A (Plug and Play BIOS V. 1.0A, ESCD V. 1.03). When used in conjunction with the ISA Configuration Utility (ICU) for DOS or Windows 3.x, the system allows auto-configuration of Plug and Play ISA cards, PCI cards, and resource management for legacy ISA cards. Because the BIOS supports configuring devices across PCI bridges, release 1.41 or greater of the ICU must be used with the motherboard to properly view and change system settings. System configuration information is stored in ESCD format. The ESCD data can be cleared by setting the CMOS clear jumper to the "Clear" position. See section 1.13.3 for more information.

The BIOS also has a setup option to support the Windows 95 run time Plug and Play utilities. When this option is selected, only devices critical to booting are assigned resources by the BIOS. Device Node information is available for all devices to ensure compatibility with Windows 95.

Copies of the IAL Plug and Play specification may be obtained from the Intel BBS , or from CompuServe[†] by typing Go PlugPlay.

3.7 Advanced Power Management

The BIOS has support for Advanced Power Management (APM version 1.2). The energy saving Stand By mode can be initiated by a keyboard hot key sequence set by the user, a time-out period set by the user, or by a sleep/resume button tied to the front panel sleep connector.

When in Stand-by mode, the motherboard reduces power consumption by utilizing the Pentium processor's System Management Mode (SMM) capabilities and also spinning down hard drives and turning off VESA DPMS compliant monitors. The user may select which DPMS mode (Stand By, Suspend, or Off) is sent to the monitor in Setup. The ability to respond to external interrupts is fully maintained while in Stand-by mode allowing the system to service requests such as in-coming

faxes or network messages while unattended. Any keyboard or mouse activity brings the system out of the energy saving Stand By mode. When this occurs the monitor and IDE drives are turned back on immediately.

APM is enabled in BIOS by default, however, the system must be configured with an APM driver in order for the system power saving features to take effect. Windows 95 enables APM automatically upon detecting the presence of the APM BIOS.

3.8 Language Support

The BIOS setup screen and help messages are supported in 32 languages. There are five languages available at this time; American English, German, Italian, French, and Spanish. Translations of other languages could become available at a later date.

With a 2 Mb Flash BIOS, only two languages can be resident at a time. The default language is American English, and is always present unless another language is programmed into the BIOS using the Flash Memory Update Program (FMUP) available on the Intel BBS. American English is the only language present in the standard BIOS.

3.9 Boot Options

Booting from CD-ROM is supported in adherence to the "El Torito" bootable CD-ROM format specification developed by Phoenix Technologies and IBM. Under the *Boot Options* field in setup, *CD-ROM* is one of four possible boot devices which are defined in priority order. The default setting is for floppy to be the primary boot device and hard drive to be the secondary boot device. If CD-ROM is selected, it must be the first device. The third and fourth devices are set to *disabled* in the default configuration. The user can add also select *network* as a boot device. The network option allows booting from a network add-in card with a remote boot ROM installed.

⟹ **NOTE**

A copy of "El Torito" is available on Phoenix Web page (http://www.ptltd.com/techs/specs.html).

3.10 Flash Logo Area

The motherboard supports a 4 KB programmable Flash user area located at FFFE8000 - FFFE8FFF. An OEM may use this area to display a custom logo. The BIOS accesses the user area just after completing POST. A utility is available from Intel to assist with installing a logo into Flash for display during POST. Contact your local Intel Sales office for further information.

3.11 BIOS Setup Access Jumper

The BIOS Setup enable jumper can be set to enable or disable access to the Setup utility. Default is for access to be enabled (1-2 position). Moving the jumper to the 2-3 position disables access. See section 1.13.4 for more information.

3.12 BIOS Setup Utility

The 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. The BIOS Setup access jumper can be set to prevent user access to Setup for security purposes. See section 1.13.4 for more information

3.12.1 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 <↓> arrow keys to select items in a screen. Use the <Enter> key to select an item for modification. For certain items, pressing <Enter> brings up a subscreen. After you have selected an item, use the arrow keys to modify the setting.

Table 15.   Overview of the Setup Menu Screens

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 chipset 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 diskette drives.
IDE Device Configuration	For configuring your IDE devices.
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.
Audio Configuration	For modifying options that affect onboard audio resources.
Advanced Chipset Configuration	For modifying options that affect memory and system busses.
Power Management Configuration	For accessing and modifying Advanced Power Management (APM) options.
Plug and Play Configuration	For modifying options that affect the system's Plug and Play capabilities.

3.12.2   Main BIOS Setup Screen

This section describes the Setup options found on the main menu screen. If you select certain options from the main screen (e.g., Hard Disk), the Setup program switches to a subscreen for the selected option.

3.12.2.1   System Date

Specifies the current date. Select the month from a pop-up menu.

3.12.2.2   System Time

Specifies the current time.

3.12.2.3   Floppy Options

When selected, this pops up the Floppy Options menu.

3.12.2.4   Primary Master

Reports if an IDE device is connected to the system. When selected, this brings up the IDE Device Configuration subscreen.

3.12.2.5   Primary Slave

Reports if an IDE device is connected to the system. When selected, this brings up the IDE Device Configuration subscreen.

3.12.2.6   Secondary Master

Reports if an IDE device is connected to the system. When selected, this brings up the IDE Device Configuration subscreen.

3.12.2.7   Secondary Slave

Reports if an IDE device is connected to the system. When selected, this brings up the IDE Device Configuration subscreen.

3.12.2.8   Language

Specifies the language of the text strings used in the Setup program and the BIOS. The options are any installed languages.

3.12.2.9   Boot Options

When selected, this brings up the Boot Options subscreen.

3.12.2.10   Video Mode

Reports the video mode. There are no options.

3.12.2.11   Mouse

Reports if a mouse is installed or not. There are no options.

3.12.2.12   Base Memory

Reports the amount of base memory. There are no options.

3.12.2.13   Extended Memory

Reports the amount of extended memory. There are no options.

3.12.3   Floppy Options Subscreen

3.12.3.1   Floppy A:

Reports if a diskette drive is connected to the system. There are no options.

3.12.3.2   Floppy B:

Reports if a second diskette drive is connected to the system. There are no options.

3.12.3.3   Floppy A: Type

Specifies 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 1.44/1.25 MB, 3.5-inch.

3.12.3.4   Floppy B: Type

Specifies 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.

3.12.3.5   Floppy Access

Specifies read/write access for all attached floppy drives. The options are Read/Write and Read Only. The default is Read/Write.

3.12.4   IDE Device Configuration Subscreen

3.12.4.1   IDE Device Configuration

Used to manually configure the 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.

3.12.4.2   Number of Cylinders

If IDE Device Configuration 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.

3.12.4.3   Number of Heads

If IDE Device Configuration 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.

3.12.4.4   Number of Sectors

If IDE Device Configuration 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.

3.12.4.5   Maximum Capacity

Reports the maximum capacity of your IDE Device. It is calculated from the number of cylinders, heads, and sectors. There are no options here.

3.12.4.6   IDE Translation Mode

Specifies the IDE translation mode. The options are Standard CHS (standard cylinder head sector −less than 1024 cylinders), Logical Block, Extended CHS (extended cylinder head sector−greater than 1024 cylinders), and Auto Detected (BIOS detects IDE drive support for LBA). The default is Auto Detected.

⚠ CAUTION

Do not change this from the option selected when the hard drive was formatted. Changing the option can result in corrupted data.

3.12.4.7   Multiple Sector Setting

Sets the number of sectors transferred by an IDE drive per interrupt generated. 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 provides optimum performance for your drive.

3.12.4.8   Fast Programmed I/O Modes

Sets how fast transfers on the IDE interface occur. The options are Disabled or Auto Detected. The default is Auto Detected. If set to Disabled, transfers occur at a less-than-optimized speed. If set to Auto Detected, transfers occur at drive's maximum speed.

3.12.5   Boot Options Subscreen

This section describes the options available on the Boot Options subscreen.

3.12.5.1   First, Second, Third, Fourth Boot Device

Sets which drives the system checks to find an operating system to boot from. The following options are available:

First Boot Device: Select Disabled, Floppy, Hard Disk, CD-ROM, Network.

Second, Third, Fourth Device: Select Disabled, Floppy, Hard Disk, Network.

3.12.5.2   System Cache

Enables or disables both the primary and the secondary cache memory. The options are Enabled or Disabled. The default is Enabled.

3.12.5.3   Boot Speed

Sets 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.

3.12.5.4   Num Lock

Sets the beginning state of the Num Lock feature on your keyboard. The options are On and Off. The default is Off.

3.12.5.5   Setup Prompt

Turns on (or off) 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.

⟹ **NOTE**

This option has no effect on your ability to access the Setup program. It only toggles the prompt.

3.12.5.6   Hard Disk Pre-Delay

Adds a delay before the first access of a hard disk by the BIOS. Some hard disks hang if accessed before they have initialized themselves. This delay ensures that the hard disk has initialized after power-up, prior to being accessed.

3.12.5.7   Typematic Rate Programming

Sets the typematic rates. The options are Default and Override. The default is Default. Choosing Override enables Typematic Rate Delay and Typematic Rate.

3.12.5.8   Typematic Rate Delay

Sets 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 is not visible.

3.12.5.9   Typematic Rate

Sets 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 is not visible.

3.12.5.10   Scan User Flash Area

When enabled, allows user flash area to be scanned. Default is disabled.

3.12.5.11   Boot Virus Detection

Boot virus detection screens the BIOS and boot sectors for any known virus. Default is enabled.

3.12.6   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 switches to a subscreen for the selected option. Subscreens are described in the sections following the description of the Advanced screen options.

3.12.6.1   Processor Type

Reports the CPU type. There are no options.

3.12.6.2   Processor Speed

Reports the CPU clock speed. There are no options.

3.12.6.3   Cache Size

Reports the size of the secondary cache. There are no options. If your system contains no L2 cache, this item doesn't appear.

3.12.6.4   Peripheral Configuration

When selected, this brings up the Peripheral Configuration subscreen.

3.12.6.5   Audio Configuration

When selected, this brings up the Audio Configuration subscreen.

3.12.6.6   Advanced Chipset Configuration

When selected, this brings up the Advanced Chipset Configuration subscreen.

3.12.6.7   Power Management Configuration

When selected and enabled, this brings up the Advanced Power Management subscreen.

3.12.6.8   Plug and Play Configuration

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

3.12.6.9   Event Logging Configuration

When selected, this brings up the Event Logging Configuration subscreen.

3.12.7   Peripheral Configuration Subscreen

This section describes the screens for the peripheral configuration subscreen.

3.12.7.1   PCI IDE Interface

Enables or disables the PCI IDE hard disk interface. The first line configures the Primary PCI IDE Interface; the second line configures the Secondary PCI IDE Interface. Options are Auto Configured and Disabled. The default is Auto Configured. (If Configuration Mode is set to Auto Configured, this option cannot be modified.)

3.12.7.2   Floppy Interface

Enables or disables the diskette drive interface. The options are Enabled, Disabled, and Auto Configured. The default is Auto Configured. (If Configuration Mode is set to Auto Configured, this option cannot be modified.)

3.12.7.3   Serial Port 1 Address

Selects the address of serial port 1. The options are:

- Disabled;
- COM1, 3F8h, IRQ4;
- COM2, 2F8h, IRQ3;
- COM3, 3E8h, IRQ4;
- COM1, 3F8, IRQ3;
- COM2, 2F8, IRQ4;
- COM3, 3F8, IRQ3; and
- Auto Configured (default).

If the Configuration Mode is set to Auto Configured, the Setup program assigns the first free COM port (normally COM1, 3F8h, IRQ4) 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 Configured, this option cannot be modified.)

3.12.7.4   Serial Port 2 Address

Selects the address of serial port 2. The options are:

- Disabled;
- COM1, 3F8h, IRQ4;

- COM2, 2F8h, IRQ3;
- COM3, 3E8h, IRQ4;
- COM1, 3F8, IRQ3;
- COM2, 2F8, IRQ4;
- COM3, 3F8, IRQ3; and
- Auto Configured (default).

If the Configuration Mode is set to Auto Configured, 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 Configured, this option cannot be modified.)

⇒ **NOTE**

If either serial port address is set, the address it is set to will not appear in the options dialog box of the other serial port. If an ATI mach32† *or an ATI* mach64 *video controller is active, the COM4, 2E8h address will not appear in the options dialog box of either serial port.*

3.12.7.5 Serial Port 2 IR Mode

Makes Serial Port 2 available to infrared applications. The options are Enabled and Disabled. The default is Disabled. (If Configuration Mode is set to Auto, this option cannot be modified.)

3.12.7.6 Parallel Port Address

Selects the address and IRQ of the parallel port. The options are:

- Disabled;
- LPT1, 378h, IRQ7, DMA3;
- LPT2, 278h, IRQ7, DMA3;
- LPT1, 378h, IRQ5, DMA3;
- LPT2, 278h, IRQ5, DMA3;
- LPT1, 378h, IRQ7, DMA1;
- LPT2, 278h, IRQ7, DMA1;
- LPT1, 378h, IRQ5, DMA1;
- LPT2, 278h, IRQ5, DMA1; and
- Auto Configured (default).

The default is Auto Configured. If the Configuration Mode is set to Auto Configured, the setup program assigns LPT1, 378h, IRQ7 as the parallel port address, regardless of what is selected under the Parallel Port Address option. (If Configuration Mode is set to Auto Configured, this option cannot be modified.)

3.12.7.7   Parallel Port Mode

Selects the mode for the parallel port. The options are Compatible, Bidirectional, EPP, and ECP.
The default is Compatible. Compatible means the parallel port operates in AT-compatible mode.
Bidirectional means the parallel port operates in bidirectional PS/2-compatible mode. EPP and
ECP mean the parallel port operates high-speed, bidirectionally. This option is not affected by the
Configuration Mode field above.

3.12.7.8   USB Interface

Default is Enabled. If Disabled, the two USB ports are disabled.

3.12.7.9   Hardware Monitor Interface

Enables or disables the hardware monitor extension interface. The options are Enabled and
Disabled. The default is Enabled.

3.12.7.10   PCI LAN Interface

Enables or disables the onboard PCI LAN interface. The options are Enabled and Disabled. The
default is Enabled.

3.12.7.11   Onboard Peripheral Status Information

Six lines at the bottom of the screen display the status of various onboard peripherals: Primary PCI
IDE, Secondary PCI IDE, Floppy, Serial Port 1, Serial Port 2, and Parallel Port. If you make a
change to the configuration of any of these peripherals, the change will not appear in these status
lines until after the next restart.

3.12.8   Audio Configuration

This section describes the options available on the Audio Configuration Subscreen.

3.12.8.1   Configuration Mode

Enables you to choose between setting the audio configuration yourself or having the computer do
it automatically. The options are:

- Disabled
- Manual
- **Auto Configured (default)**

When Auto Configured is selected, the audio resources are automatically configured at power-up;
the options listed below cannot be modified. The settings displayed for those options reflect the
current hardware settings. When Manual mode is selected, you can modify the options listed
below.

3.12.8.2   SB Base Port Address

Selects the Sound Blaster base port address. The options are:

- Disabled
- 220h (default)
- 240h

3.12.8.3   WSS Base Port Address

Selects the Windows sound system base port address. The options are:

- Disabled
- 530h (default)
- E80h
- F40h
- 604h

3.12.8.4   MPU-401 Base Port Address

Selects the MPU-401 base port address. The options are:

- Disabled
- 330h (default)
- 332h
- 334h
- 300h

3.12.8.5   WSS Interrupt

Selects the Windows sound system interrupt. The options are:

- Disabled (default)
- IRQ7
- IRQ9
- IRQ10
- IRQ11

3.12.8.6   SB Play / MPU-401 Interrupt

Selects the Sound Blaster playback / MPU-401 interrupt. The options are:

- Disabled (default)
- IRQ5
- IRQ7
- IRQ9
- IRQ10

3.12.8.7   WSS Play DMA

Selects the Windows sound system playback DMA channel. The options are:

- Disabled
- Channel 0 (default)
- Channel 1
- Channel 3

3.12.8.8   SB Play / WSS Capture DMA

Selects the Sound Blaster playback / Windows sound system record DMA channel. The options are:

- Disabled
- Channel 1 (default)

If WSS Play DMA is not disabled, the following are the valid configurations between WSS Play DMA and SB Play / WSS Capture DMA:

WSS Play DMA	SB Play / WSS Capture DMA
Disabled	Disabled
Channel 0	Disabled
Channel 1	Disabled
Channel 3	Disabled
Disabled	Channel 1
Channel 0	Channel 1
Channel 1	Channel 0
Channel 3	Channel 0

If WSS Play DMA is disabled, SB Play / WSS Capture DMA has these options:

- Disabled
- Channel 0
- Channel 1
- Channel 3

3.12.9   Advanced Chipset Configuration Subscreen

This section describes the options available on the Advanced Chipset Configuration Subscreen. It shows the type of memory installed, and in what banks.

3.12.9.1   Base Memory Size

Sets the size of the base memory. The options are 512 KB and 640 KB. The default is 640 KB.

3.12.9.2   ISA LFB Size

Sets the size of the linear frame buffer. The options are Disabled, 1 MB, 2MB, and 4MB. The default is Disabled. When the LFB size is set to 1 MB, 2MB, or 4MB, the ISA LFB Base Address field is set to 15 MB, 14 MB, or 12 MB, respectively.

3.12.9.3   ISA LFB Base Address

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.

3.12.9.4   Video Palette Snoop

Controls the ability of a primary PCI graphics controller to share a common palette with an ISA add-in video card. The options are Enabled and Disabled. The default is Disabled.

3.12.9.5   Latency Timer (PCI Clocks)

Sets the length of time an agent on the PCI bus can hold the bus when another agent has requested the bus. Valid numbers are between 0 and 256. The default is 66.

3.12.10   Power Management Configuration Subscreen

This section describes the options available on the Power Management Subscreen.

3.12.10.1   Advanced Power Management

Enables or disables the Advanced Power Management (APM) support in your system's BIOS. The options are Enabled and Disabled. The default is Enabled. Power Management works only with APM-capable operating systems to manage power consumption in your system. If Advanced Power Management is set to Disabled, none of the fields in the Advanced Power Management subscreen will be visible.

3.12.10.2   IDE Drive Power Down

Sets any IDE drives to spin down when the system goes into power managed mode. The options are Enabled and Disabled. The default is Enabled.

3.12.10.3   VESA Video Power Down

Sets the command issued to your graphics card when the system goes into power managed mode. The options are Disabled, Standby, Suspend, and Sleep. The default is Sleep.

3.12.10.4   Inactivity Timer

Sets how long the system must be inactive before it enters power managed mode. Enter the number of minutes. The range is 0 to 255 minutes. The default is 10 minutes.

3.12.10.5   Hot Key

Sets the hot key that, when pressed while holding down the <Ctrl> and <Alt> keys, causes the system to enter power managed mode. All alphabetic keys are valid.

3.12.11   Plug and Play Configuration Subscreen

This section describes the options found on the Plug and Play configuration subscreen.

3.12.11.1   Configuration Mode

Sets how the BIOS gets information about ISA cards that do not have Plug and Play capabilities. The options are Use BIOS Setup and Use PnP OS. The default is Use PnP OS.

If Use ICU is selected, the BIOS relies on run-time software to ensure that there are no conflicts between ISA boards with Plug and Play capabilities and those without. Only Boot With PnP OS will be visible.

3.12.11.2   Boot with PnP OS

Enables the PC to boot with an operating system capable of managing Plug and Play add-in cards. The options are Disabled, Other PnP OS, and Windows 95. The default is Windows 95.

3.12.11.3   ISA Shared Memory Size

Enables you to specify a range of memory addresses directed to the ISA bus rather than onboard 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, the ISA Shared Memory Base Address (described below) will not be visible.

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

Shadowing is a technique that copies a block of memory from an add-in card's ROM to the same address in system DRAM memory. This provides faster access and achieves higher performance.

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 scans this range for any ISA expansion card BIOSes that may be present and notes their location and size. The BIOS then autoconfigures 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 then assigns 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 signifies the autoconfigure routine that this block of memory is reserved and should not be shadowed.

3.12.11.4   ISA Shared Memory Base Address

Sets the base address for the ISA Shared Memory. The options are C8000h, CC000h, D0000h, D4000h, D8000h, and DC000h. The default is C8000h. This setting could affect the ISA Shared Memory Size item. The value entered in the ISA Shared Memory Size item cannot extend to the E0000h address. For example, if a size of 64K was selected, options D4000h, D8000h, and DC000h will not be available.

3.12.11.5   IRQ 3, 4, 5, 7, 9, 10, 11, 12, 14, 15

Sets the status of the IRQ. The options are Available and Used By ISA Card. The default is Available. The PCI auto-configuration code looks here to see if these interrupts are available for use by a PCI add-in board. If an interrupt is available, the PCI auto-configuration code can assign the interrupt to be used by the system. If your system contains an ISA agent that uses one of these interrupts, select Used By ISA Card for that interrupt.

⇒ **NOTE**

IRQ 3, 4, 5, and 7 may not be available in this option, depending on the setting chosen for the COM1, COM2 and parallel ports in the Peripheral Configuration Subscreen.

IRQ 14 and 15 will not show up as user available. If the onboard IDE controller is not used, these interrupts will be available to ISA cards. These interrupts can not be used for PCI cards.

3.12.12   Event Logging Configuration

This section describes the options available in the Event Logging Configuration subscreen.

3.12.12.1   Event Log Capacity

This information field tells whether or not the log is full.

3.12.12.2   Event Log Count Granularity

This field determines the multiple of errors that cause an entry to be made in the event log. For example, if the Event Log Count Granularity is 10, then an entry is made in the event log on the 1st, 11th, 21st, etc., occurrence of an error of a particular type within the time specified by the Event Time Granularity value. Event Log Count Granularity is a one-byte parameter with possible values 0 through 255 and a default of 10.

3.12.12.3   Event Time Granularity

Event Time Granularity determines the maximum amount of time that the system will wait before making another event log entry upon occurrence of an event after the maximum number of counts for that event type has been exceeded. Event Time Granularity is a one-byte parameter with possible values 0 through 255 and a default of 30.

3.12.12.4   Event Log Control

This field allows users to enable or disable event logging (values: All Events Enabled or All Events Disabled), or to enable event logging with ECC errors excluded from the event log (value: ECC Events Disabled). The default is All Events Enabled.

3.12.12.5   Clear Event Log

This field sets a flag that clears the event log on the next pass through POST (value: On Next Boot) or keeps the event log (value:Keep). The default is Keep.

3.12.12.6   Mark Existing Events as Read

This field marks all events already in the log as having been read (value:Mark) or not read (value:Do Not Mark). The default is Do Not Mark.

3.12.12.7   Event Log Subscreens

The bottom of the Event Log screen includes several information fields that display information about the date and time of the last event of a specific type, as well as a count of how many events of that type are logged. Selecting a field and pressing Enter brings up a subscreen that shows information specific to that event type. Event types for which subscreens are availalbe include:

- Single Bit ECC Events
- Multi-Bit ECC Events
- Pre-Boot Events
- Logging Disabled Certain Events
- System Limit Exceeded Events
- Boot Virus Detection Events

3.12.13   Security Screen

This section describes the two access modes that can be set using the options found on the Security screen, and then describes the Security screen options themselves.

3.12.13.1   Administrative and User Access Modes

The options on the Security screen menu make it possible to restrict access to the Setup program by enabling you to set passwords for two different access modes: Administrative mode and User mode.

In general, Administrative mode has full access to the Setup options, whereas User mode has restricted access to the options. Thus, by setting separate Administrative and User passwords, a system administrator can limit who can change critical Setup values. The actual limitations depend on whether either the Administrative or User passwords or both are set. (See the table below for a description of how the passwords actually work together.)

To limit access to who can boot the system, set the User password. This is the password that the system asks for before booting. If only the Administrative password is set, the system boots up without asking for a password. If both passwords are set, you can enter either password to boot the system.

The following table shows the effects of setting the Administrative and User passwords. (The table is for reference only, and is not shown on the Security screen.) In the table, the statement "Can change a limited number of options" means you can change the system date and time, the power management hot key, the User password, the security hot key, and unattended start.

Table 16.   Administrative and User Password Functions

Password Set	Administrative mode can . . .	User mode can . . .	Password Required During Boot Process
Neither	Can change all options*	Can change all options*	None
Administrative only	Can change all options	Can change a limited number of options	None
User only	N/A	Can change all options	User
Both	Can change all options	Can change a limited number of options	Administrative or User

*   If no password is set, any user can change all Setup options.

3.12.14   Security Screen Options

3.12.14.1   User Password is

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

3.12.14.2   Administrative Password is

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

3.12.14.3   Set User Password

Sets the User password. The password can be up to seven alphanumeric characters.

3.12.14.4   Set Administrative Password

Sets the Administrative password. The password can be up to seven alphanumeric characters.

3.12.14.5   Unattended Start

Controls 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 boots, but the keyboard will be locked until the User password is entered.

3.12.14.6   Security Hot Key (CTRL-ALT-)

Sets a hot key that, when pressed, locks the keyboard until the User password is entered. The Keyboard LEDs flash to indicate that the keyboard is locked. When you enter the User password, you do not have to press the <Enter> key.

3.12.15   Exit Screen

This section describes the different ways to exit and save or not save changes made in the Setup program.

3.12.15.1   Exit Saving Changes

Saves the changes to CMOS RAM and exits the Setup program. You can also press the <F10> key anywhere in the Setup program to do this.

3.12.15.2   Exit Discarding Changes

Exits the Setup program without saving any changes. This means that any changes made while in the Setup program are discarded and NOT SAVED. Pressing the <Esc> key in any of the four main screens will do this.

3.12.15.3   Load Setup Defaults

Resets 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 Setup values from the ROM table.

3.12.15.4   Discard Changes

Discards 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 RAM values that were present when the system was turned on.

4 Error Messages and Beep Codes

4.1 BIOS Beep Codes

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
2	Parity Error	A parity error has occured in system 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 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	The 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 Register Rd/Wrt Error	The shutdown register for CMOS RAM failed.

4.2 PCI Configuration Error Messages

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

Message	Explanation
Bad PnP Serial ID Checksum	The Serial ID checksum of a Plug and Play card was invalid.
Floppy Disk Controller Resource Conflict	The floppy disk controller has requested a resource that is already in use.
NVRAM Checksum Error, NVRAM Cleared	The ESCD data was reinitialized because of an NVRAM checksum error. Try rerunning the ICU.
NVRAM Cleared By Jumper	The "Clear CMOS" jumper has been moved to the "Clear" position and CMOS RAM has been cleared.
NVRAM Data Invalid, NVRAM Cleared	Invalid entry in the ESCD.
Parallel Port Resource Conflict	The parallel port has requested a resource that is already in use.
PCI Error Log is Full	This message is displayed when more than 15 PCI conflict errors are detected. No additional PCI errors can be logged.
PCI I/O Port Conflict	Two devices requested the same resource, resulting in a conflict.
PCI IRQ Conflict	Two devices requested the same resource, resulting in a conflict.
PCI Memory Conflict	Two devices requested the same resource, resulting in a conflict.
Primary Boot Device Not Found	The designated primary boot device (hard disk drive, diskette drive, or CD-ROM drive) could not be found.
Primary IDE Controller Resource Conflict	The primary IDE controller has requested a resource that is already in use.
Primary Input Device Not Found	The designated primary input device (keyboard, mouse, or other, if input is redirected) could not be found.
Secondary IDE Controller Resource Conflict	The secondary IDE controller has requested a resource that is already in use.
Serial Port 1 Resource Conflict	Serial port 1 has requested a resource that is already in use.
Serial Port 2 Resource Conflict	Serial port 2 has requested a resource that is already in use.
Static Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
System Board Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.

4.3 BIOS Error Messages

Error Message	Explanation
8042 Gate - A20 Error	Gate A20 on the keyboard controller is not working.
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 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 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 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.
Invalid Boot Diskette	The BIOS can read the disk in floppy drive A:, but cannot boot the system. Use another boot disk.

BIOS Error Messages (continued)

Error Message	Explanation
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 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 is not supported on this product, this error will not occur.
Parity Error ????	Parity error in system memory at an unknown address.

4.4 ISA NMI Messages

ISA NMI Message	Explanation
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.