TC430HX Motherboard
Technical Product Specification

Order Number 281820-002
February 1997

The TC430HX motherboard may contain design defects or errors known as errata. Characterized errata that may cause the TC430HX motherboard's behavior to deviate from published specifications are documented in the TC430HX Motherboard Specification Update.

intel

Revision History

Revision	Revision History	Date
-001	First release of the TC430HX TPS	7/96
-002	Second release of the TC430HX Technical Product Specification	2/97

This product specification applies only to standard TC430HX motherboards with BIOS identifier 1.00.0x.DH0.

Changes to this specification will be published in the TC430HX Motherboard Specification Update (Order Number: 281826) before being incorporated into a revision of this document.

Contents

1 Board Description

1.1 Overview

The TC430HX motherboard supports Pentium® processors and Pentium processors with MMX™ technology. The motherboard includes a 512 KB cache implemented with pipeline burst SRAM devices soldered to the board. The memory subsystem supports up to 128 MB of DRAM using either EDO or fast page SIMM† components. A type 7 Pentium OverDrive® socket provides an upgrade path to future OverDrive processors.

The Intel 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 National 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, keyboard controller, and support for an IrDA† compatible infrared interface. To provide for the increasing number of multimedia applications, a Yamaha† OPL3-SA audio CODEC is integrated onto the motherboard. The OPL3-SA provides 16-bit stereo, Sound Blaster† Pro and Windows Sound System compatibility and full-duplex capabilities. An optional Yamaha OPL4-ML audio CODEC provides FM and wavetable synthesis.

Up to four PCI local bus slots provide a high bandwidth data path for data-movement intensive functions such as video or networking. PCI Bridge support in the BIOS allows for further expansion of the computer with PCI peripherals. Up to three ISA slots complete the I/O mix. A total of six expansion slots can be populated with full length add-in cards, since one PCI and ISA slot share the same chassis I/O panel.

A full set of software drivers and utilities are available to allow advanced operating systems such as Windows† 95 to take full advantage of the hardware capabilities. Features such as Windows 95-ready Plug and Play, Advanced Power Management (APM) with application restart, software-controlled power supply shutdown, and bi-directional audio are all provided by software available for the TC430HX.

1.2 Motherboard Manufacturing Options

- OPL4-ML wavetable audio
- Piezoelectric speaker soldered on the motherboard
- Support for universal serial bus (USB)
- S3† ViRGE or ViRGE/DX graphics controller with 2 MB of 50 ns EDO video memory

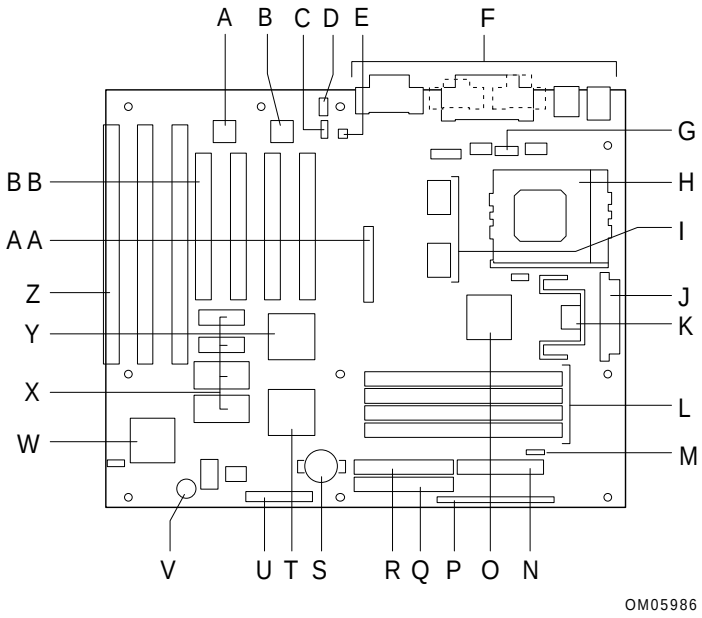

Figure 1. Board Features

A. Optional Yamaha OPL4 Wavetable upgrade
B. Yamaha OPL3 audio CODEC
C. CD ROM Audio connector
D. Optional wavetable upgrade connector
E. Telephony audio connector
F. Back panel I/O connectors
G. COM 2 serial header
H. Socket 7 Processor socket
I. 512 KB L2 cache SRAM
J. Primary power connector
K. Voltage regulator
L. SIMM sockets
M. Fan connector
N. Floppy drive connector
O. 82439HX Xcelerated Controller (TXC)
P. Front panel header
Q. Primary IDE connector
R. Secondary IDE connector
S. Battery
T. PCI/ISA IDE Xcelerator (PIIX3)
U. Configuration jumper blocks
V. Optional Piezoelectric speaker
W. I/O Controller
X. EDO graphics memory
Y. S3 graphics controller
Z. ISA expansion connectors
AA. VESA† Feature connector
BB. PCI expansion connectors

1.3 Form Factor

The motherboard fits into a standard ATX form factor chassis. Figure 2 illustrates the mechanical form factor for the TC430HX. The TC430HX ATX form factor adheres to the standard ATX guidelines. Location of the I/O connectors, and mounting holes are in strict compliance with the ATX specification.

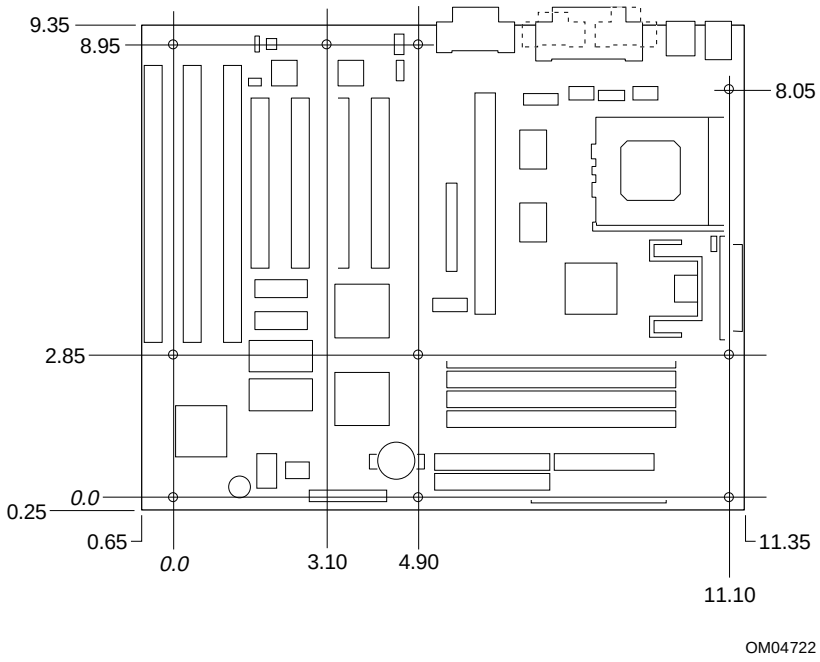

Figure 2. Board Dimensions

1.4 Microprocessor

The motherboard supports:

- Pentium processors operating at 75, 90, 100, 120, 133, 150, 166, and 200 MHz
- Pentium processors with MMX technology operating at 166 and 200 MHz

An onboard linear voltage regulator circuit provides the required voltage for the processor from the +5 V tap of the power supply.

1.4.1 Microprocessor Upgrade

The board contains a 321-pin Socket 7 ZIF processor socket that provides an upgrade path to future OverDrive processors.

1.5 Memory

1.5.1 Main Memory

The motherboard provides four 72-pin SIMM sockets that make it possible to install up to 128 MB of RAM. The sockets support 1M x 32 (4 MB), 2M x 32 (8 MB), 4M x 32 (16 MB), and 8M x 32 (32 MB) single- or double-sided modules. Minimum memory size is 8 MB and maximum memory size, using four 8M x 32 SIMM modules, is 128 MB. Memory timing requires 70 ns fast page devices or, for optimum performance, 60 ns EDO DRAM. If the maximum external microprocessor clock speed is 60 MHz or slower, 70 ns EDO DRAM can be used. Parity, ECC, and non-parity memory are all supported.

The four sockets are arranged in two banks of two sockets each. The sockets are designated Bank 0 and Bank 1. Each bank provides a 64/72-bit wide data path. Both SIMMs in a bank must be of the same memory size and type, although the different types of memory may differ between banks. It is even possible to have 70 ns Fast Page DRAM in one bank and 60 ns EDO DRAM in the other, in which case each bank is independently optimized for maximum performance. Bank 0 only, Bank 1 only, or both of the banks may be populated. There are no jumper settings required for the memory size or type, that is automatically detected by the BIOS. Use only tin lead SIMMs when adding DRAM.

1.5.1.1 EDO DRAM

Extended Data Out (or Hyper Page) 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.

1.5.1.2 Parity/ECC DRAM

Memory error checking and correction is supported via parity or ECC SIMMs. Parity or ECC SIMMs are automatically detected. However, the user must enter Setup to configure the SIMMs for either Parity or ECC operation. Parity memory will detect single bit errors. ECC memory will detect double bit errors and correct single bit errors. Errors could be generated by a defective memory module, different speeds of memory modules, or DMA or memory conflicts.

1.5.2 Second Level Cache

The Xcelerated Controller device supports a second level (L2) cache that uses high performance synchronous pipeline burst static RAM (PBSRAM) devices.

The motherboard includes an integrated 512 KB direct-mapped write-back L2 cache implemented with two 64K x 32 PBSRAMs that take advantage of the Global Write Enable pin. An 8 KB x 8 external Tag SRAM provides caching support for up to 64 MB of main memory.

NOTE

Earlier versions of the TC430HX motherboard have a 256 KB L2 cache implemented with two 32K x 32 PBSRAMs.

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 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:

- Microprocessor interface control
- Integrated L2 write-back cache controller
  - — Pipeline burst SRAM
  - — 256 KB direct-mapped
- Integrated DRAM controller
  - — 64 bit path to memory
  - — Support for EDO and fast page DRAM
  - — Parity and non-parity support
- Fully synchronous PCI bus interface
  - — 25/30/33 MHz bus speed
  - — PCI to DRAM > 100 MB/sec
  - — Up to four PCI masters in addition to the PIIX3

1.6.2 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 together onto the same device. 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)

The motherboard features two USB ports as a factory installed option. The ports permit the direct connection of two USB peripherals without an external hub. If more devices are required, an external hub can be connected to either of the built-in ports. The motherboard fully supports the standard universal host controller interface (UHCI) and uses standard software drivers that are UHCI-compatible. Features of the USB include:

- Self-identifying "hot pluggable" 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

NOTE

Computer systems that have an unshielded cable attached to the USB port might not meet FCC Class B requirements, even if no device or a low speed (sub-channel) USB device is attached to the cable. Use shielded cable that meets the requirements for high speed (fully rated) devices.

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 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 BIOS.

Normally, programmed I/O operations require a substantial amount of microprocessor bandwidth. In multitasking operating systems like Windows 95, the microprocessor 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 I/O Controller

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

- Two NS16C550-compatible UARTs with send/receive 16 byte FIFO
- Support for an IrDA compliant Infra Red interface
- Multi-mode bi-directional parallel port
  - — Standard mode; IBM† and Centronics† compatible
  - — Enhanced Parallel Port (EPP) with BIOS/Driver support
  - — High Speed mode; Extended Capabilities Port (ECP) compatible

- Industry standard floppy controller with 16 byte data FIFO (2.88 MB floppy support)
- Integrated real-time clock accurate within ± 13 minutes/year at 25 °C and +5 V when the computer is continuously powered on
- Integrated 8042-compatible keyboard controller

By default, the 87306B interfaces are automatically configured by the BIOS during boot-up. You can also manually configure the interfaces with the BIOS Setup program. Chapter 3 describes the BIOS Setup program.

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 5.25 inch media or for 720 KB, 1.2 MB, 1.44 MB, or 2.88 MB 3.5 inch media with the BIOS Setup program. 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 and 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 that acts much like a self-healing fuse, re-establishing the connection after an over-current condition is removed. While this device eliminates the possibility of having to replace a fuse, you should still turn off the computer power before installing or removing a keyboard or mouse.

The PC87306B contains the AMI Megakey keyboard and mouse controller code that, besides providing traditional keyboard and mouse control functions, supports Power-On/Reset (POR) password protection. The POR password can be defined by the user via the Setup program. The keyboard controller also provides for the following "hot key" sequences:

- <CTRL><ALT><DEL>: Computer software reset. This sequence performs a software reset of the computer 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 computer for de-turbo mode, and <CTRL><ALT><+> sets the computer for turbo mode. Changing the Turbo mode could be prohibited by an operating system, or when the microprocessor is in Protected mode or virtual x86 mode under DOS.
- <CTRL><ALT><defined in Setup>: A power down hot-key sequence takes advantage of the SMM features of the Pentium Processor to greatly reduce the computer's power consumption while maintaining the responsiveness necessary to service external interrupts. A security hot-key sequence provides password protection to the computer.

1.7.3 Real-time clock, CMOS RAM and battery

The integrated real-time clock is DS1287 and MC146818 compatible and provides a time of day clock, 100-year calendar with alarm features. The real-time clock can be set using the BIOS Setup program. The real-time clock also supports a 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 default values using the BIOS Setup program. Also, the CMOS RAM values can be cleared to the defaults by using a configuration jumper on the board.

An external coin-cell style battery provides power to the real-time clock and CMOS memory. The battery has an estimated lifetime of three years if the computer is not plugged into the wall socket. When the computer 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 Infra-Red Support

A 6-pin interface on the front panel I/O connector is provided to allow connection to a Hewlett Packard† HSDL-1000 compatible Infra-red (IrDA) transmitter/receiver. For Consumer Ir, a Sharp GP1U58X (second sourced by Litton), Panasonic PNA4602M, ICX IRR538 and ICX model IRR638 or equivalent receiver module is required. Both modules can be connected/supported, however only one can be active at a time. Once the module is connected to the front panel I/O header, serial port 2 can be re-directed to either the IrDA or Consumer Ir module. Once configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDAs and printers using application software such as LapLink†. The IrDA specification provides for data transfers at 115 Kbps from a distance of 1 meter.

The Consumer Ir is receive only (for the motherboard) and can be used to control telephony functions and multimedia operation such as volume control, CD track change, etc.

1.7.5 Parallel port

A 25-pin D-Sub header is provided on the back panel for a multi-mode bi-directional parallel port. The Parallel port can be configured in the BIOS Setup as output only compatible mode, bi-directional mode, ECP or EPP modes. The highly flexible parallel port can also be assigned to I/O addresses 278H, 378H, or 3BCH and IRQs 5 or 7. Furthermore, a routable DMA scheme allows Plug and Play operating systems such as Windows 95 to route either DMA channels 1 or 3 to the parallel port for ECP mode. EPP BIOS support must be provided by a device driver or TSR.

1.8 Graphics Subsystem

The TC430HX motherboard is available with a factory option of an S3 ViRGE or ViRGE/DX SVGA graphics controller. Both options are supported by 2 MB of 50 ns EDO SOJ DRAM soldered to the motherboard.

1.8.1 S3 ViRGE Graphics Subsystem

The TC430HX motherboard is available with a factory option of an S3 ViRGE SVGA graphics controller with 2 MB of 50 ns EDO SOJ DRAM. The S3 ViRGE has a high performance 64-bit 2D/3D graphics engine and incorporates the S3 Streams Processor that enables the device to convert YUV formatted video data to RGB and provides acceleration for scaling the video display without compromising picture quality or frame rate. The on-chip RAMDAC/clock synthesizer is capable of output pixel data rates of 135 MHz providing non-interlaced screen resolutions of up to 1280x1024x256 colors at 75 Hz. The 64-bit S3d Engine incorporates the key Windows and other GUI accelerator functions of BitBLT, line draw and polygon fill. 3D features include flat shading, Gouraud shading and texture mapping support. Advanced texture mapping features include perspective correction, bi-linear and tri-linear filtering, MIP-mapping, and Z-buffering. These features provide the most realistic user experience for interactive 3D applications. In addition, a fast linear addressing scheme based upon DCI reduces software overhead by mapping the display memory into the microprocessor's upper memory address space and permitting direct microprocessor access to the display memory.

Table 1. S3 ViRGE Supported Resolutions

Resolution	Refresh rate (Hz)
640 x 480 x 16 colors	60
640 x 480 x 256 colors	60, 72, 75, 85
640 x 480 x 65,536 colors	60, 72, 75
640 x 480 x 16,777,216 colors (non-accelerated mode)	60, 72, 75
800 x 600 x 256	56, 60, 72, 75, 85
800 x 600 x 65,536	60, 72, 75
800 x 600 x 16,777,216 colors (non-accelerated mode)	60, 72, 75
1024 x 768 x 256	43(IL), 60, 70, 75, 85
1024 x 768 x 65,536	43(IL), 60, 70, 75
1280 x 1024 x 256	45(IL), 60, 72, 75

NOTE: IL = Interlaced
The S3 ViRGE graphics controller supports more modes than shown above. The graphics drivers provide options for additional resolutions.

1.8.2 S3 ViRGE/DX Graphics Subsystem

The optional onboard graphics subsystem uses the S3 ViRGE/DX graphics controller, with the following features:

- 64-bit graphics engine with accelerator core
- 24-bit RAMDAC/clock synthesizer
- Dual programmable clock generators
- DCI-based linear addressing scheme
- S3 Streams Processor, which enables the conversion of video data from YUV format to RGB format and accelerates display scaling while maintaining picture quality and frame rate
- 3-D graphics support including flat shading, Gouraud shading, and advanced texture mapping
- S3 Scenic Highway support for hardware MPEG

Table 2. S3 ViRGE/DX Supported Resolutions

2 MB Memory	Refresh Rate (Hz) At:				
Resolution	**4-bit Color (16 Colors)**	**8-bit Color (256 Colors)**	**15/16-bit Color (32K/64K Colors)**	**24-bit Color (16M Colors)**	**32-bit Color (16M Colors)**
640 x 480	60	60, 72, 75, 85	60, 72, 75	60, 72, 75 *	60, 72, 75
800 x 600	not supported	56, 60, 72, 75, 85	60, 72, 75	60, 72, 75 *	60, 72, 75
1024 x 768	not supported	43(IL), 60 ,70, 75, 85	43(IL), 60, 70, 75	not supported	not supported
1280 x 1024	43(IL), 45(IL), 60, 72, 75 *	45(IL), 60, 72, 75	not supported	not supported	not supported
1600 x 1200	not supported	48.5(IL)	not supported	not supported	not supported

* Non-accelerated mode only

IL = Interlaced

The S3 ViRGE/DX graphics controller supports more modes than shown above. The graphics drivers provide options for additional resolutions.

1.8.3 VESA Feature Connector

The TC430HX motherboard supports a 34-pin or 26-pin VESA feature connector for synchronizing graphics output with an external NTSC or PAL signal and a shared frame buffer interface to maximize multimedia performance, as well as the local peripheral bus that provides a bi-directional interface to a video companion device such as an MPEG/live video decoder.

The TC430HX also supports other VESA standards such as the VESA DPMS protocol to put a DPMS compliant monitor into power saving modes and the VESA Display Data Channel (DDC1) that permits transfer of monitor identification and resolution support data for ease of use.

1.8.4 Graphics Drivers and Utilities

Graphics drivers for MS-DOS† applications such as AutoCAD† and Microstation, as well as driver updates for various operating systems can be downloaded from the Intel's world wide web site (http://www.intel.com). Drivers for SCO† UNIX† are available from SCO. The following table indicates which operating systems are supported with ViRGE and ViRGE/DX graphics drivers.

Table 3. Operating Systems with ViRGE and ViRGE/DX Driver Support

Operating system	Drivers available for ViRGE?	Drivers available for ViRGE/DX?
Windows 3.x	Yes	No
Windows 95	Yes	Yes
Windows NT† 3.51	Yes	Yes
Windows NT 4.0	Yes	Yes
OS/2 2.11	No	No
OS/2 WARP	No	No

1.9 Audio Subsystem

The motherboard features a 16-bit stereo audio subsystem as a factory installed option. The audio subsystem is based upon the Yamaha YMF701 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 via selectable A-law / μlaw, and full digital control of all mixer and volume control functions.

Table 4. Audio Resource Mapping

Resource	Interrupts (Options)	DMA (Options)	I/O (Options)
Sound Blaster (SB DMA playback, DMA shared with Windows Sound System Capture)	10* (5, 7, 9) 7* (5, 9, 10)	0* (3)	220h (240h)
Windows Sound System (DMA playback)	11* (7, 9)	1* (3)	530h* (604h, E80h, F40h)
MPU-401 (IRQ shared with Sound Blaster)	10* (5, 7, 9)	0	330h* (300h, 332h, 334h)
FM Synthesizer Port			388h
Game Port			201h

* indicates default setting

1.9.1 Yamaha OPL4-ML

The Yamaha OPL4-ML wavetable is an option if the OPL3-SA is installed. The OPL4-ML is a ROM table containing live instrument sound samples. Wave synthesis results in richer and more realistic sounds then that of FM synthesis. If the OPL4-ML option is not installed, a wavetable upgrade connector header (J1F1) is installed allowing use of an ISA bus add in wavetable card.

1.9.2 Audio Drivers

Audio drivers for OS/2† 2.11, OS/2 WARP, Windows 3.x, Windows 95, Windows NT 3.51, and Windows NT 4.0 can be downloaded from the Intel world wide web site (http://www.intel.com).

1.10 Motherboard Connectors

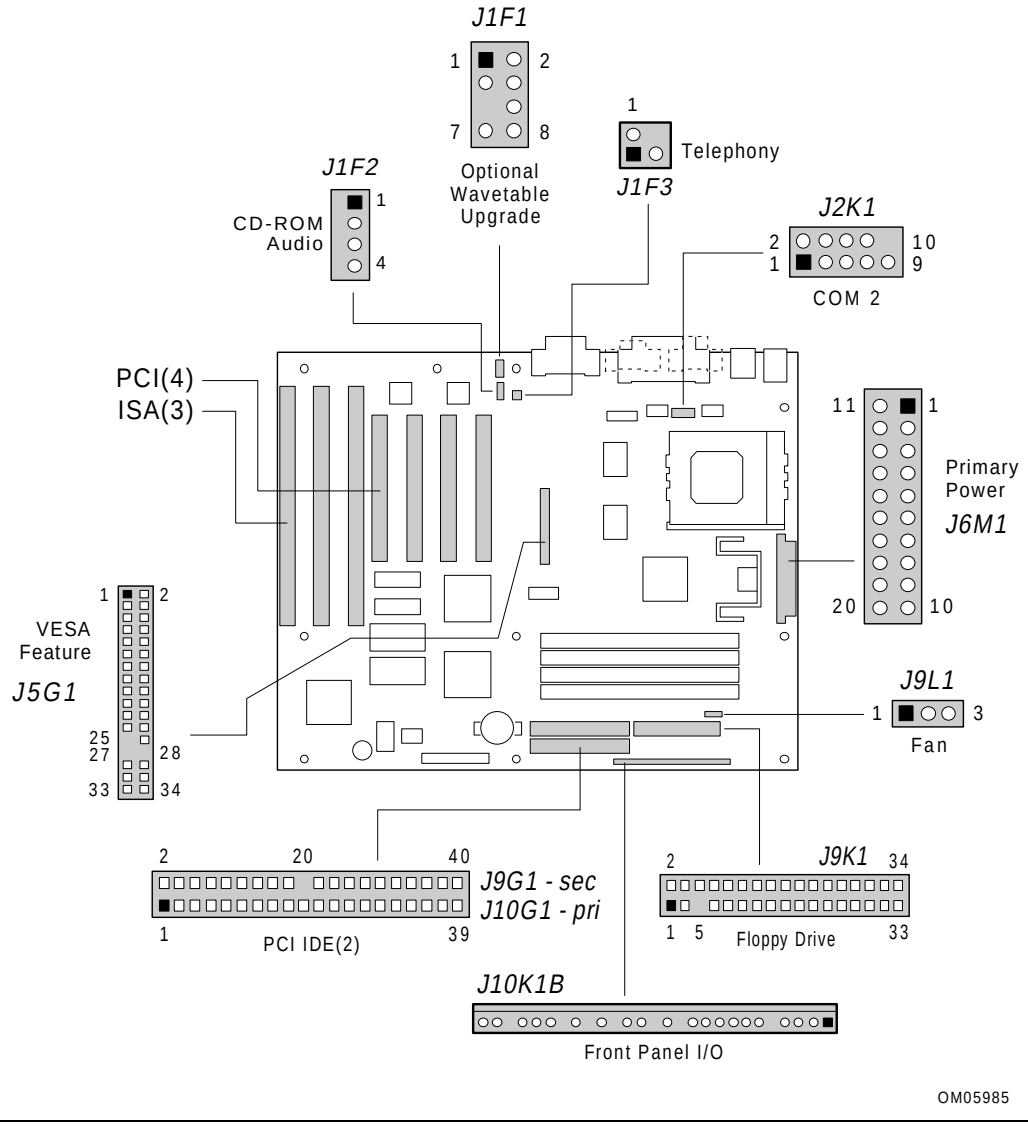

Figure 3. Motherboard Connector Locations

1.10.1 CD-ROM Audio - J1F2

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

1.10.2 Optional Wavetable Upgrade Connector - J1F1

Pin	Signal Name
1	Wave Right
2	Ground
3	Wave Left
4	Ground
5	Key
6	Ground
7	N/C
8	MIDI_OUT

1.10.3 Telephony Connector - J1F3

Pin	Signal Name
1	Ground
2	Mono Out
3	MIC In
4	Key

1.10.4 Serial Port Header (COM 2) - J2K1

Pin	Signal Name
1	DCD
2	DSR
3	Serial In# (SIN)
4	RTS
5	Serial Out# (SOUT)
6	CTS
7	DTR
8	RI
9	Ground
10	Key

1.10.5 CPU Fan Connector - J9L1

Pin	Signal Name
1	Ground
2	FANPOS (+12VDC)
3	Ground

1.10.6 Floppy Drive Connector - J9K1

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	N/C
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#
27	MSEN0	28	Write Protect#
29	Ground	30	Read Data#
31	Ground	32	Side 1 Select#
33	Ground	34	Diskette Change#

1.10.7 VESA Feature Connector - J5G1

Pin	Signal Name	Pin	Signal Name
1	Ground	2	Data 0
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	N/C	14	Data 6
15	Ground	16	Data 7
17	Ground	18	PCLK
19	Ground	20	BLANK
21	Ground	22	HSYNC
23	N/C	24	VSYNC
25	N/C	26	Ground
27	Key	28	Key
29	Ground	30	IICLK
31	N/C	32	IICDAT
33	EN2	34	EN1

1.10.8 IDE Connectors - J10G1, J9G1

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	CSEL
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

1.10.9 ISA Connectors- J4A1, J4B1, J4B2

Pin	Signal Name	Pin	Signal Name
B1	Ground	A1	IOCHK# (IOCHCK#)
B2	RESET (RESDRV)	A2	SD7
B3	+5 V	A3	SD6
B4	IRQ9	A4	SD5
B5	-5 V	A5	SD4
B6	DRQ2	A6	SD3
B7	-12 V	A7	SD2
B8	SRDY# (NOWS#)	A8	SD1
B9	+12 V	A9	SD0
B10	Ground	A10	IOCHRDY (CHRDY)
B11	SMEMW# (SMWTC#)	A11	AEN
B12	SMEMR# (SMRDC#)	A12	SA19
B13	IOW# (IOWC#)	A13	SA18
B14	IOR# (IORC#)	A14	SA17

continued ☛

ISA Bus Connectors (continued)

Pin	Signal Name	Pin	Signal Name
B15	DACK3#	A15	SA16
B16	DRQ3	A16	SA15
B17	DACK1#	A17	SA14
B18	DRQ1	A18	SA13
B19	REFRESH#	A19	SA12
B20	BCLK	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	+5 V	A29	SA2
B30	OSC	A30	SA1
B31	Ground	A31	SA0
Key		Key	
D1	MEMCS16# (M16#)	C1	SBHE#
D2	IOCS16# (IO16#)	C2	LA23
D3	IRQ10	C3	LA22
D4	IRQ11	C4	LA21
D5	IRQ12	C5	LA20
D6	IRQ15	C6	LA19
D7	IRQ14	C7	LA18
D8	DACK0#	C8	LA17
D9	DRQ0	C9	MEMR# (MRDC#)
D10	DACK5#	C10	MEMW# (MWTC#)
D11	DRQ5	C11	SD8
D12	DACK6#	C12	SD9
D13	DRQ6	C13	SD10
D14	DACK7#	C14	SD11
D15	DRQ7	C15	SD12
D16	+5 V	C16	SD13
D17	Master16# (MASTER#)	C17	SD14
D18	Ground	C18	SD15

Note: Items in parentheses are alternate versions of signal names

1.10.10 PCI Connectors - J4C1, J4D1, J4D2, J4E1

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	+5 V (TRST#)*	B1	-12 V	A32	AD16	B32	AD17
A2	+12 V	B2	Ground (TCK)*	A33	+3.3 V	B33	C/BE2#
A3	+5 V (TMS)*	B3	Ground	A34	FRAME#	B34	Ground
A4	+5 V (TDI)*	B4	no connect (TDO)*	A35	Ground	B35	IRDY#
A5	+5 V	B5	+5 V	A36	TRDY#	B36	+3.3 V
A6	INTA#	B6	+5 V	A37	Ground	B37	DEVSEL#
A7	INTC#	B7	INTB#	A38	STOP#	B38	Ground
A8	+5 V	B8	INTD#	A39	+3.3 V	B39	LOCK#
A9	Reserved	B9	PRSNT1#	A40	SDONE	B40	PERR#
A10	+5 V (I/O)	B10	Reserved	A41	SBO#	B41	+3.3 V
A11	Reserved	B11	PRSNT2#	A42	Ground	B42	SERR#
A12	Ground	B12	Ground	A43	PAR	B43	+3.3 V
A13	Ground	B13	Ground	A44	AD15	B44	C/BE1#
A14	Reserved	B14	Reserved	A45	+3.3 V	B45	AD14
A15	RST#	B15	Ground	A46	AD13	B46	Ground
A16	+5 V (I/O)	B16	CLK	A47	AD11	B47	AD12
A17	GNT#	B17	Ground	A48	Ground	B48	AD10
A18	Ground	B18	REQ#	A49	AD09	B49	Ground
A19	Reserved	B19	+5 V (I/O)	A50	Key	B50	Key
A20	AD30	B20	AD31	A51	Key	B51	Key
A21	+3.3 V	B21	AD29	A52	C/BE0#	B52	AD08
A22	AD28	B22	Ground	A53	+3.3 V	B53	AD07
A23	AD26	B23	AD27	A54	AD06	B54	+3.3 V
A24	Ground	B24	AD25	A55	AD04	B55	AD05
A25	AD24	B25	+3.3 V	A56	Ground	B56	AD03
A26	IDSEL	B26	C/BE3#	A57	AD02	B57	Ground
A27	+3.3 V	B27	AD23	A58	AD00	B58	AD01
A28	AD22	B28	Ground	A59	+5 V (I/O)	B59	+5 V (I/O)
A29	AD20	B29	AD21	A60	REQ64C#	B60	ACK64C#
A30	Ground	B30	AD19	A61	+5 V	B61	+5 V
A31	AD18	B31	+3.3 V	A62	+5 V	B62	+5 V

* These signals (in parentheses) are optional in the PCI specification and are not implemented on this motherboard

NOTE

If the onboard video controller is installed, the shared PCI slot (J4C1) will not be populated.

1.10.11 Power Supply Connector

When used with a power supply that supports remote power on/off, the motherboard can turn off the computer power via software control. The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The BIOS will turn the computer power off when it receives the proper APM command from the OS. For example, Windows 95 will issue this APM command when the user selects "Shutdown the computer" option. APM must be enabled in the BIOS and OS in order for the soft-off feature to work correctly. If power to the computer is interrupted due to a power outage or the power cord being unplugged, when power is reapplied, the computer will return to the state it was in when the power was disconnected. If the computer was turned on when power was disconnected, the computer will turn back on when power is reapplied.

Primary Power Connector (J6M1)

Pin	Signal Name	Pin	Signal Name
1	+3.3V	11	+3.3V
2	+3.3V	12	-12V
3	Ground	13	Ground
4	+5V	14	PS-ON
5	Ground	15	Ground
6	+5V	16	Ground
7	Ground	17	Ground
8	PW-OK	18	-5V
9	+5VSB	19	+5V
10	+12V	20	+5V

1.10.12 Front Panel Connectors

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

- Speaker
- Reset
- Sleep LED
- Hard drive activity LED
- Infra-red (IrDA) connector
- Sleep/Resume
- Power on

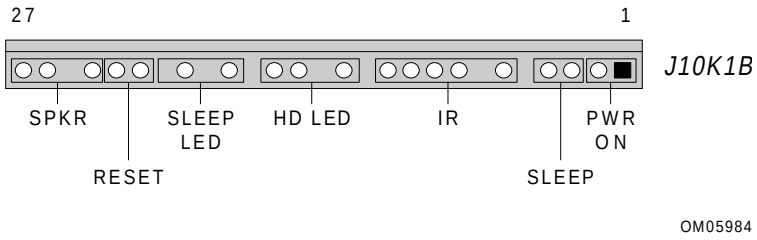

Figure 4. Front Panel I/O Connectors

Front Panel I/O Connectors (J10K1B)

Pin	Signal Name
1	Power On
2	Ground
3	SLEEP Request
4	SLEEP (+5V Pullup)
5	Key
6	+5 V
7	Key
8	IR_Rx
9	Ground
10	IR_Tx
11	CONSUMER IR
12	Key
13	HDD LED +5V Pullup
14	Key
15	HDD LED#
16	HDD LED +5V Pullup
17	Key
18	PWR LED#/ Sleep (Pullup)
19	Key
20	PWR LED +
21	Key
22	Ground
23	RESET
24	Ground
25	Key
26	SPKROUT
27	SPKRHDR

1.10.12.1 Speaker

The external speaker provides error beep code information during the Power-On Self Test, if the computer cannot use the video interface. If there are no speakers plugged into the audio output jack, the audio output is redirected to the external speaker.

1.10.12.2 Reset

This header can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the computer will hard reset and run POST.

1.10.12.3 Sleep LED

This header can be connected to an LED to provide a visual indicator for when the system power is turned on or when the system is in sleep mode. When the system is powered on, the LED will be continuously lit. When the system is in sleep mode, the LED will blink at 1 Hz.

1.10.12.4 Hard Drive Activity 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.

1.10.12.5 Infra-Red (IrDA) Connector

Serial port 2 can be configured to support an IrDA or Consumer Ir module via a front panel header connector. Once configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDAs, and printers using application software such as LapLink. The IrDA specification provides for data transfers at 115 Kbps from a distance of 1 meter. Consumer Ir is typically used for remote control of telephony and multimedia functions.

1.10.12.6 Sleep/Resume

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

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 via a keyboard hot-key sequence, or by a time-out of the 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 re-activate the computer, or "Resume", the user must press the sleep/resume button again, or use the keyboard or mouse. Mouse activity will only "wake up" the computer if a mouse driver is loaded. While the computer is in Stand-By or "sleep" mode it is fully capable of responding to and servicing external interrupts (such as an incoming fax) even though the monitor will only turn on if a user interrupt (keyboard/mouse) occurs as mentioned above.

1.10.12.7 Power On

This header can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the computer will power up and run POST. If the system is already powered up, closing the switch will power off the system.

1.10.13 Audio Connectors

1.10.13.1 CD-ROM Audio Input

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

1.10.13.2 Wavetable Upgrade

There are two ways to provide hardware wavetable on this motherboard. The first is a manufacturing option to include the Yamaha OPL4 on the motherboard. The second is to use the 8-pin wavetable upgrade connector on the motherboard and install an ISA based wavetable upgrade card. This card fits into an ISA slot, and cables to the header such that it only uses the power pins of the ISA connector.

Compatible wavetable cards are available from several vendors. The ICS WaveFront and the CrystalLake Series 2000 wavetable product families offer general MIDI-compatible audio operation.

1.10.14 Back Panel Connectors

The back panel provides external access to PS/2 style keyboard and mouse connectors, two Universal Serial Bus (USB) connectors, one serial port connector, one parallel port connector, a VGA† connector, a MIDI/game port connector, and the external audio jacks. Figure 5 shows the location of the back panel connectors.

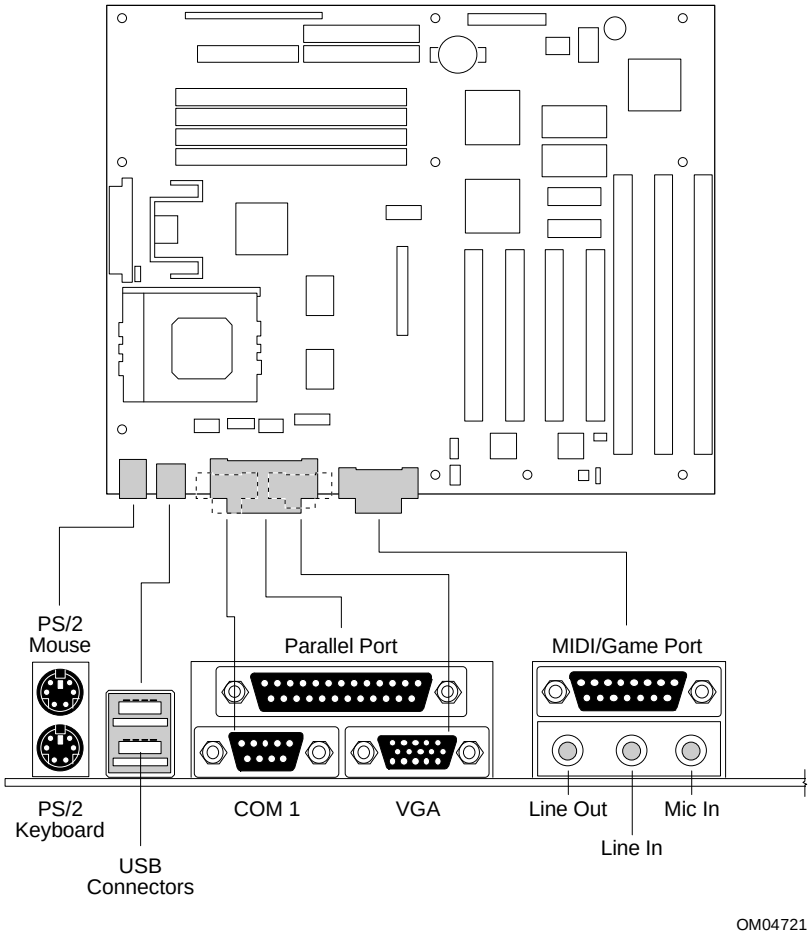

Figure 5. Back Panel Connectors

1.10.14.1 PS/2 Keyboard and Mouse Connectors

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

1.10.14.2 USB Connectors

Pin	Signal Name
1	+5 V (fused)
2	USBP0# [USBP1#] (fused)
3	USBP0 [USBP1] (fused)
4	Ground

1.10.14.3 Serial Port Connector

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

1.10.14.4 MIDI/Gameport Connector

Pin	Signal Name
1	+5V (fused)
2	JSBUTO
3	JSX1R
4	Ground
5	Ground
6	JSY1R
7	JSBUT1
8	+5V (fused)
9	+5V (fused)
10	JSBUT2
11	JSX2R
12	MIDI-OUTR
13	JSY2R
14	JSBUT3
15	MIDI-INR

1.10.14.5 Parallel Port Connector

Pin	Signal Name	Pin	Signal Name
1	Strobe#	14	Auto Feed#
2	Data bit 0	15	Fault#
3	Data bit 1	16	INIT#
4	Data bit 2	17	SLCT IN#
5	Data bit 3	18	Ground
6	Data bit 4	19	Ground
7	Data bit 5	20	Ground
8	Data bit 6	21	Ground
9	Data bit 7	22	Ground
10	ACK#	23	Ground
11	Busy	24	Ground
12	Error	25	Ground
13	Select		

1.10.14.6 Video Monitor Connector

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	DDC Data
13	Horizontal Sync
14	Vertical Sync
15	DDC Clock

1.11 Jumper Settings

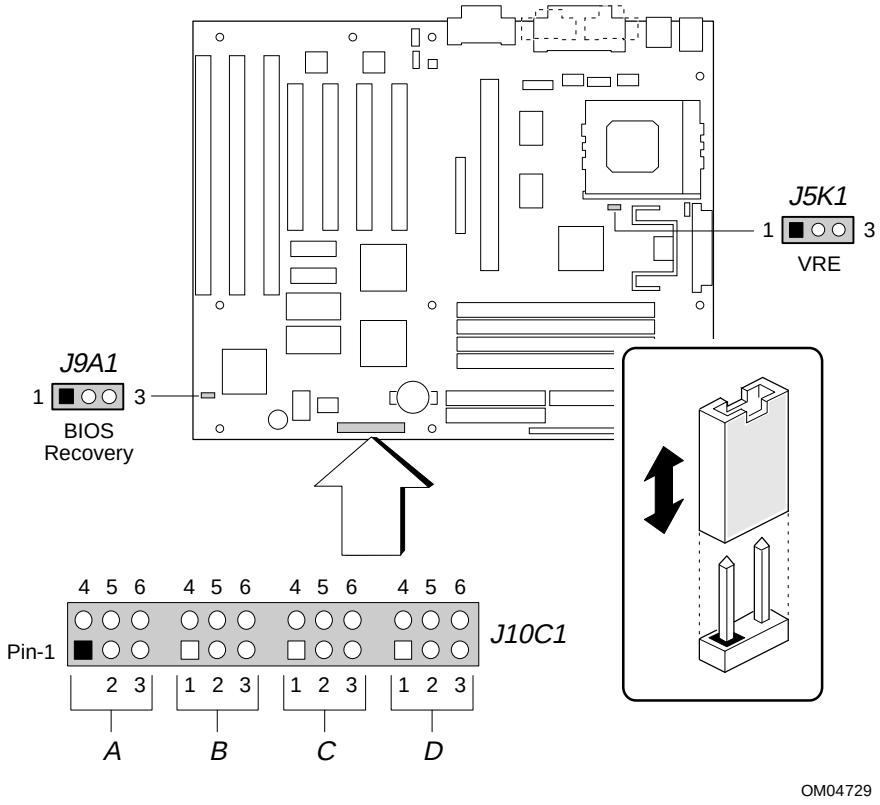

Figure 6. Jumper Locations

Table 5. Configuration Jumper Settings

Function	Jumper	Configuration
Password clear	J10C1-A	1-2 Password enabled (**Default**) 2-3 Password clear/disabled
CMOS clear	J10C1-A	4-5 Keep (**Default**) 5-6 Clear
Setup Access	J10C1-B	1-2 Access allowed (**Default**) 2-3 Access denied
Microprocessor speed ratio	J10C1-C	See Table 6
Host bus speed **(Note: These jumpers also set the PCI and ISA clock speeds.)**	J10C1-D	See Table 6
Processor voltage	J5K1	1-2 VRE enabled 2-3 Standard voltage (**Default**)
BIOS recovery	J9A1	1-2 Normal operation (**Default**) 2-3 Recovery mode

1.11.1 Microprocessor Configuration (J10C1-C, D)

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

Table 6. Microprocessor/Bus Speed Settings

Microprocessor Freq. (MHz)	Host Bus Freq. (MHz)	Jumper Settings for J10C1-C	Jumper Settings for J10C1-D	PCI Freq. (MHz)	Clock Ratio	ISA Freq. (MHz)
200	66	1-2 and 5-6	1-2 and 5-6	33	6/2	8.33
166	66	1-2 and 5-6	2-3 and 5-6	33	5/2	8.33
150	60	2-3 and 4-5	2-3 and 5-6	30	5/2	7.5
133	66	1-2 and 5-6	2-3 and 4-5	33	4/2	8.33
120	60	2-3 and 4-5	2-3 and 4-5	30	4/2	7.5
100	66	1-2 and 5-6	1-2 and 4-5	33	3/2	8.33
90	60	2-3 and 4-5	1-2 and 4-5	30	3/2	7.5
75	50	2-3 and 5-6	1-2 and 4-5	25	3/2	8.33
Reserved	-	1-2 and 4-5	-	-	-	

NOTE

There are no separate or additional jumpering requirements for Pentium processors with MMX technology.

1.11.2 Password Clear (J10C1-A, Pins 1, 2, and 3)

Allows both passwords to be cleared by moving the jumper from pins 1-2 to pins 2-3 and turning the computer on. The computer 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 or administrative 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).

1.11.3 Clear CMOS (J10C1-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 computer on. When the computer reports that “NVRAM cleared by jumper”, the computer 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.

1.11.4 Setup Access (J10C1-B, Pins 1, 2, and 3)

Allows access to Setup program 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).

1.11.5 Microprocessor Voltage (J5K1)

This jumper block changes the output of the on-board voltage regulator. Pins 1-2 should be jumpered for processors that require the VRE specification. Pins 2-3 should be jumpered for processors that require standard voltage regulation. Some upgrade processors might require a different setting. Check the processor's documentation for the correct setting. Refer to the *Pentium Processor Specification Update* to determine the voltage requirements for the processor you are using.

1.12 Reliability

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

TC430HX Motherboard 84,538 Hours

1.13 Environmental

Table 7. Board Environmental Specifications

Parameter	Specification		
Temperature			
Non-Operating	-40 °C to +70 °C		
Operating	+0 °C to +55 °C		
DC Voltage			
+5 V	±5 %		
-5 V	±5 %		
+12 V	±5 %		
-12 V	±5 %		
+3.3 V	±5 %		
Shock			
Unpackaged	50 G trapezoidal waveform		
	Velocity change of 170 inches/second		
Packaged	Half sine 2 millisecond		
	Product (Weight)	**Free fall (height in inches)**	**Velocity (Change - inches/second)**
	<20 lbs	36	167
	21-40 lbs	30	152
	41-80 lbs	24	136
	81-100 lbs	18	118
Vibration			
Unpackaged	5 Hz to 20 Hz : 0.01g² Hz sloping up to 0.02 g² Hz		
	20 Hz to 500 Hz : 0.02g² Hz (flat)		
Packaged	10 Hz to 40 Hz : 0.015g² Hz (flat)		
	40 Hz to 500 Hz : 0.015g² Hz sloping down to 0.00015 g² Hz		

1.14 Power Consumption

Table 8 lists the wattage and current specifications for a hypothetical computer configured with the motherboard and the following components: a 133 MHz Pentium processor, 16 MB RAM, 256 KB cache, 2 MB graphics memory, 3.5-inch floppy drive, 1 GB hard drive, and a 4X CD ROM drive. This information is preliminary and is provided only as a guide for calculating **approximate** total computer power usage with additional resources added.

Table 8. Power Usage

Static Windows 95 Desktop		DC (amps)				
	AC (watts)	+3.3 V	+5 V	-5 V	+12 V	-12 V
APM disabled in BIOS						
Off	41	0.56	3.43	0.01	0.07	0.03
Enabled APM Mode						
Standard	41	0.56	3.43	0.01	0.07	0.03
Advanced only	29	0.35	1.57	0.01	0.07	0.03
with Video Suspend, Standby or Sleep	27	0.35	1.32	0.01	0.07	0.03
Advanced with Video Sleep and IDE Drive powered down	24	0.35	1.27	0.01	0.07	0.03

1.15 Regulatory Compliance

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

1.15.1 Safety

1.15.1.1 UL 1950 - CSA 950-95, 3rd edition, Dated 07-28-95

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

1.15.1.2 CSA C22.2 No. 950-93, 3rd Edition

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

1.15.1.3 EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2 & 3)

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

1.15.1.4 IEC 950, 2nd edition, 1991 (with Amendments 1, 2 & 3)

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

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

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

1.15.2 EMI

1.15.2.1 FCC Class B

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

1.15.2.2 CISPR 22, 2nd Edition, 1993

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

1.15.2.3 EN 55 022, 1995

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

1.15.2.4 EN 50 082-1 (1992)

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

1.15.2.5 VCCI Class 2 (ITE)

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

1.15.2.6 ICES-003, Issue 2

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

1.15.3 Product Certification Markings

This printed circuit assembly has the following product certification markings:

- European CE Marking: Consists of a marking on the board and shipping container.
- UL Recognition Mark: Consists of 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: Consists of small c followed by a stylized backward UR on component side of board.

2 Board Resources

2.1 Memory Map

Table 9. Memory Map

Address Range (Decimal)	Address Range (hex)	Size	Description
1024K-131072K	100000-8000000	127 M	Extended Memory
960K-1023K	F0000-FFFFF	64 K	Main BIOS
944K-959K	EC000-EFFFF	16 K	Reserved for system BIOS during boot
936K-943K	EA000-EBFFF	8 K	ESCD (Plug and Play configuration area)
928K-935K	E8000-E9FFF	8 K	OEM logo
896K-927K	E0000-E7FFF	32 K	BIOS reserved
800-895K	C8000-DFFFF	96 K	Available high DOS memory (open to ISA and PCI bus)
640K-799K	A0000-C7FFF	160 K	Off-board video memory and BIOS
639K	9FC00-9FFFF	1 K	Extended BIOS Data (moveable by QEMM†, 386MAX†)
512K-638K	80000-9FBFF	127 K	Extended conventional
0K-511K	00000-7FFFF	512 K	Conventional

2.2 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
0040 - 0043	4 bytes	PIIX3 - Timer 1
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	Board Configuration

continued ☛

Table 10. I/O Map (continued)

Address (hex)	Size	Description
0080 - 008F	16 bytes	PIIX3 - DMA Page Register
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2
00B2	1 byte	APM control port
00B3	1 byte	APM status port
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	Gameport Joystick
0220 - 022F	16 bytes	Sound Blaster / OPL3-SA base port
0270 - 0273	4 bytes	I/O read port for Plug and Play
0278 - 027B	4 bytes	LPT2
02E8 - 02EF	8 bytes	COM4
02F8 - 02FF	8 bytes	COM2
0330 - 0331	2 bytes	Audio - MPU-401
0376	1 byte	Secondary IDE Channel Command Port
0377	1 byte	Secondary IDE Channel Status Port
0378 - 037F	8 bytes	LPT1
0388 - 038B	4 bytes	Audio - FM Synthesizer
03B0 - 03BB	12 bytes	S3 ViRGE or ViRGE/DX
03BC - 03BF	4 bytes	LPT3
03C0 - 03DF	32 bytes	S3 ViRGE or ViRGE/DX
03E8 - 03EF	8 bytes	COM3
03F0 - 03F5	6 bytes	Floppy Channel 1
03F6	1 byte	Primary IDE Channel Command Port
03F7 (Write)	1 byte	Floppy Channel 1 Command
03F7, bit 7	1 bit	Floppy Disk Change Channel 1
03F7, bits 6:0	7 bits	Primary IDE Channel Status Port
03F8 - 03FF	8 bytes	COM1
04D0 - 04D1	2 bytes	Edge/level triggered
LPT + 400h	8 bytes	ECP port, LPT + 400h
0530-0537	8 bytes	Windows Sound System base port
0CF8 - 0CFB	4 bytes	PCI Configuration Address Register
0CF9	1 byte	Turbo & Reset Control Register
0CFC-0CFF*	4 bytes	PCI Configuration Data Register
FF00 - FF07	8 bytes	IDE Bus Master Register
FFA0 - FFA7	8 bytes	Primary Bus Master IDE Registers
FFA8 - FFAF	8 bytes	Secondary Bus Master IDE Registers
FF80 - FF9F*	32 bytes	PCI Universal Serial Bus

* Only by DWORD accesses.

2.2.1 Port 79h Definition

Table 11. Port 79h Bit Definitions

Bit	Description	Bit = 1	Bit = 0
7	Password	Keep / enable function	Clear
6	CMOS values	Keep	Clear
5	Setup access	Enabled	Disabled
4 and 3	Host bus frequency	10 = 66 MHz 01 = 60 MHz 00 = 50 MHz	
2	Onboard audio present?	Yes	No
1	Soft-off capable power supply present?	No	Yes
0	Reserved	N/A	N/A

2.3 Soft-off Control

The board design supports Soft-off control via the SMM code in the BIOS. The CS1 pin of the I/O controller is connected to the Soft-off control line in the power supply circuit. The registers in the I/O controller that set the I/O address and control of the CS1 pin are not setup until the SMM code is activated.

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	S3 Video
00	0D	00	PCI Expansion Slot 1 - J4E1
00	0E	00	PCI Expansion Slot 2 - J4D2
00	0F	00	PCI Expansion Slot 3 - J4D1
00	10	00	PCI Expansion Slot 4 - J4C1

2.5 DMA Channels

Table 12. DMA Channels

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

2.6 Interrupts

Table 13. Interrupts

IRQ	Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard buffer full
2	Reserved, Cascade interrupt from slave PIC
3	COM2
4	COM1
5	Sound Blaster/MPU/User available
6	Floppy
7	LPT1
8	Real-time Clock
9	User available
10	Universal Serial Bus
11	Windows Sound System/ User available
12	Onboard Mouse Port if present, else user available
13	Reserved, Math coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, else user available

3 Motherboard BIOS and Setup Program

3.1 Introduction

The board 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 program, Power-On Self Tests (POST), APM 1.2, the PCI auto-configuration utility, and Windows 95 ready Plug and Play. This board also supports BIOS shadowing, allowing the BIOS to execute from 64-bit on-board 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 board will be identified as 1.00.01.DH0.

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 PA28FB200BX 2Mbit Flash component is organized as 256K x 8 (256 KB). Flash memory is visible at memory addresses FFFC0000 - FFFFFFFFh. The Flash device is divided into seven areas, as described in the table below.

Table 14. Flash Memory Organization

System Address		FLASH Memory Area
FFFF0000h	FFFFFFFFh	64 KB Main BIOS (reserved for BIOS)
FFFEC000h	FFFEFFFFh	16 KB Boot Block (not Flash erasable)
FFFEA000h	FFFEBFFFh	8 KB ESCD area (Plug and Play data storage area)
FFFE8000h	FFFE9FFFh	8 KB OEM logo area
FFFE0000h	FFFE7FFFh	32 KB (reserved for BIOS)
FFFD0000h	FFFDFFFFh	64 KB (reserved for BIOS)
FFFC0000h	FFFCFFFFh	64 KB (reserved for BIOS)

3.3 BIOS Upgrades

Flash memory simplifies BIOS upgrades. A new version of the BIOS can be installed from a diskette. BIOS upgrades are available to be down loaded from the secure section on the Intel bulletin board, or Intel's FTP site.

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

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

The upgrade utility ensures the upgrade BIOS extension matches the target computer to prevent accidentally installing a BIOS for a different type of computer.

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 will determine the capabilities of each drive and configure them to optimize capacity and performance. For the high capacity hard drives typically available today, the drive will be automatically be configured for Logical Block Addressing (LBA) for maximum capacity and to PIO Mode 3 or 4, depending on the capability of the drive. Mixing IDE drives, on the same cable, that offer different transfer modes is supported. Each drive's mode is supported independently. The user is able to override the auto-configuration options by using the manual mode setting.

3.5 PCI Auto-configuration

The PCI auto-configuration utility operates in conjunction with the Setup program to allow the insertion and removal of PCI cards to the computer without user intervention (Plug and Play). When the computer 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 other resource. Those interrupts left set to "available" in the Setup will be considered free for PCI add-in card use. It is nondeterministic as to which PCI interrupt will be assigned to which ISA IRQ.

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

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 BIOS 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 board to properly view and change BIOS settings. Computer configuration information is stored in ESCD format. The ESCD data can be cleared by setting the CMOS clear jumper to the Clear position.

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 can be obtained via the Intel BBS, or via 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 board 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 can 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 computer to service requests such as in-coming faxes or network messages while unattended. Any keyboard or mouse activity brings the computer 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 computer must be configured with an APM driver in order for the power saving features to take effect. Windows 95 will enable 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 5 languages translated at this time for use; American English, German, Italian, French, and Spanish. Translations of other languages will available at a later date.

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

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 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 the Phoenix Web page (http://www.ptltd.com/techs/specs.html).

3.10 Flash Logo Area

The motherboard supports an 8 KB programmable flash user area located at E8000-E9FFF. An OEM can 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 or authorized distributor for further information.

3.11 CMOS Setup Access Jumper

A motherboard configuration jumper (J10C1-B, pins 1-3) controls access to the BIOS Setup program. By setting the jumper to the disable position, the user is prevented from accessing the Setup program during the Power-On Self Test or at any other time. The message prompting the user to press <F1> to enter Setup is also disabled.

3.12 BIOS Setup program

The Setup program allows the configuration to be modified without opening the computer for most basic changes. The Setup program 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 can be enabled that informs users to press the <F1> key to access Setup. A jumper setting (J10C1-B, pins 1-3) on the motherboard can be set to prevent user access to Setup for security purposes.

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 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> will bring 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 computer.
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 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	Modify options that affect the audio subsystem.
Advanced Chipset Configuration	For modifying options that affect memory and 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 (such as Floppy Options), 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 IDE Master

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

3.12.2.5 Primary IDE Slave

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

3.12.2.6 Secondary IDE Master

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

3.12.2.7 Secondary IDE Slave

Reports if an IDE device is connected to the computer. 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.

3.12.2.14 BIOS Version

Reports the version number of the BIOS. 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 computer. There are no options.

3.12.3.2 Floppy B:

Reports if a second diskette drive is connected to the computer. 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 (**default**)
- 2.88 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 (**default**)
- 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

3.12.3.5 Floppy Access

Specifies read/write access for all attached floppy drives. The options are:

- Read/Write (**default**)
- Read Only

3.12.4 IDE Device Configuration Subscreen

3.12.4.1 IDE Device Configuration

Used to manually configure the hard drive or have the BIOS auto configure it. The options are:

- Auto Configured (**default**)
- User Definable
- Disabled

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)
- Auto Detected (BIOS detects IDE drive support for LBA) (**default**)

⚠ 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
- Auto Detected (**default**)

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
- Auto Detected (**default**)

If set to Disabled, transfers occur at a less than optimized speed. If set to Auto Detected, transfers occur at the 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 Boot Device

Sets which drive the computer checks first to find a bootable operating system. The options are:

- Disabled
- Floppy (**default**)
- Hard Disk
- CD-ROM
- Network

3.12.5.2 Second Boot Device

Sets which drive the computer checks second to find a bootable operating system. The options are:

- Disabled
- Floppy
- Hard Disk (**default**)
- Network

3.12.5.3 Third Boot Device

Sets which drive the computer checks third to find a bootable operating system. The options are:

- Disabled (**default**)
- Floppy
- Hard Disk
- Network

3.12.5.4 Fourth Boot Device

Sets which drive the computer checks fourth to find a bootable operating system. The options are:

- Disabled (**default**)
- Floppy
- Hard Disk
- Network

3.12.5.5 System Cache

Enables or disables both the primary and the secondary cache memory. The options are:

- Disabled
- Enabled (**default**)

3.12.5.6 Boot Speed

Sets the system's boot speed. The options are:

- Deturbo
- Turbo (**default**)

If Turbo is selected, boot-up occurs at full speed. If Deturbo is selected, the board operates at a slower speed.

3.12.5.7 Num Lock

Sets the beginning state of the Num Lock feature on your keyboard. The options are:

- Off (**default**)
- On

3.12.5.8 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:

- Disabled
- Enabled (**default**)

NOTE

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

3.12.5.9 Hard Disk Pre-Delay

Sets the hard disk drive pre-delay. When enabled, this option causes the BIOS to wait the specified time before it accesses the first hard drive. If your system contains a hard drive and you don't see the drive type displayed during boot-up, but the drive type is displayed following a warm boot (<Ctrl><Alt><Del>), the hard drive may need more time before it is able to communicate with the controller. Setting a pre-delay provides additional time for the hard drive to initialize. The options are:

- Disabled (**default**)
- 3 seconds
- 6 seconds
- 9 seconds
- 12 seconds
- 15 seconds
- 21 seconds
- 30 seconds

3.12.5.10 Typematic Rate Programming

Sets the typematic rates. The options are:

- Default (**default**)
- Override

Choosing Override enables Typematic Rate Delay and Typematic Rate.

3.12.5.11 Typematic Rate Delay

Sets how long (in milliseconds) it takes for the key-repeat function to start when you hold down a key on the keyboard. The options are:

- 250 msec (**default**)
- 500 msec
- 750 msec
- 1000 msec

If Typematic Rate Programming is set to Default, this option is not available.

3.12.5.12 Typematic Rate

Sets the speed (in characters per second) 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 char/sec (**default**)
- 8 char/sec
- 10 char/sec
- 12 char/sec
- 15 char/sec
- 20 char/sec
- 24 char/sec
- 30 char/sec

If Typematic Rate Programming is set to Default, this option is not available.

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 microprocessor type. There are no options.

3.12.6.2 Processor Speed

Reports the microprocessor 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 computer contains no L2 cache, this item will not 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. If no audio components are included on the motherboard, this field will not appear.

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.

3.12.7 Peripheral Configuration Subscreen

This section describes the screens for the peripheral configuration subscreen.

3.12.7.1 Primary PCI IDE Interface

Disables or automatically configures the primary PCI IDE hard disk interface. The options are:

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

3.12.7.2 Secondary PCI IDE Interface

Disables or automatically configures the secondary PCI IDE hard disk interface. The options are:

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

3.12.7.3 Floppy Interface

Disables or automatically configures the diskette drive interface. The options are:

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

3.12.7.4 Serial Port 1 Interface

Selects the logical COM port, I/O address and interrupt for Serial Port 1. The options that are displayed can vary, depending on whether you choose Windows 95 in the "PnP OS" screen (see Section 3.12.11.2). The options appear in the following format:

- Disabled
- <COMx>, <I/O address>, <IRQx>
- Auto Configured (Setup assigns the first free COM port, normally COM1, 3F8h, IRQ4) **(default)**

3.12.7.5 Serial Port 2 Interface

Selects the logical COM port, I/O address and interrupt for Serial Port 2. The options that are displayed can vary, depending on whether you choose Windows 95 in the "PnP OS" screen (see Section 3.12.11.2). The options appear in the following format:

- Disabled
- <COMx>, <I/O address>, <IRQx>
- Auto Configured (Setup assigns the first free COM port, normally COM2, 2F8h, IRQ3) **(default)**

NOTE

If you specifically set either serial port address, that address will not appear in the list of options for the other serial port.

3.12.7.6 Serial Port 2 IR Mode

Makes Serial Port 2 available to infrared applications. The options are:

- Disabled (**default**)
- Enabled

If the Serial Port 2 Interface is set to Auto Configured, this option cannot be modified.

3.12.7.7 Parallel Port Interface

Selects the logical printer port, I/O address, interrupt, and DMA channel (if applicable) of the parallel port. The options that are displayed can vary, depending on the Parallel Port Mode you choose (see Section 3.12.7.8) and whether you choose Windows 95 in the "PnP OS" screen (see Section 3.12.11.2). The options appear in the following format:

- Disabled
- <LPTx>, <I/O address>, <IRQx>, <DMA x>
- Auto Configured (Setup assigns LPT1, 378h, IRQ7) **(default)**

3.12.7.8 Parallel Port Type

Selects the operating mode for the parallel port. The options are:

- Compatible (**default**)
- Bi-directional
- ECP
- EPP

Compatible means the parallel port operates in AT-compatible mode. Bi-directional means the parallel port operates in bidirectional PS/2-compatible mode. ECP and EPP mean the parallel port operates high-speed, bidirectionally. This option is not affected by the Configuration Mode field above.

3.12.7.9 USB Interface

Selects the mode for the USB ports. The options are:

- Disabled
- Enabled (**default**)

3.12.7.10 Primary IDE Status

Displays the current status of the Primary IDE Interface from the selectable setting above. This is an informational field and cannot be changed.

3.12.7.11 Secondary IDE Status

Displays the current status of the Secondary IDE Interface from the selectable setting above. This is an informational field and cannot be changed.

3.12.7.12 Floppy Status

Reports the current status of the floppy drive from the selectable setting above. There are no options.

3.12.7.13 Serial Port 1 Status

Reports the current status of serial port 1 from the selectable setting above. There are no options.

3.12.7.14 Serial Port 2 Status

Reports the current status of serial port 2 from the selectable setting above. There are no options.

3.12.7.15 Parallel Port Status

Reports the current status of the parallel port from the selectable setting above. There are no options.

3.12.8 Audio Configuration Subscreen

This section describes the options available on the Audio Configuration Subscreen. If no audio components are included on the motherboard, this subscreen will not appear.

3.12.8.1 Audio Configuration Mode

Used to manually configure the audio options, or have the BIOS auto configure them. The options are:

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

When Auto or Disabled is selected, the SB Port Base, WSS Port Base, MPU Port Base, WSS Interrupt, SB/MPU Interrupt, WSS Play DMA, and SB Play/WSS Capture DMA fields cannot be modified.

3.12.8.2 SB Port Base

Sets the Sound Blaster compatible device base address. The options are:

- Disabled
- 220h (**default**)
- 240h

3.12.8.3 WSS Port Base

Sets the Windows Sound System base address. The options are:

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

3.12.8.4 MPU Port Base

Sets the MPU base address. The options are:

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

3.12.8.5 WSS Interrupt

Sets the Windows Sound System interrupt. The options are:

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

3.12.8.6 SB/MPU Interrupt

Sets the SB and MPU interrupt. The options are:

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

3.12.8.7 WSS Play DMA

Sets the WSS playback DMA channel. The options are:

- Disabled
- Channel 0 (**default**)

3.12.8.8 SB Play/WSS Capture DMA

Sets the SB playback and WSS Capture DMA channel. The options are:

- Disabled
- Channel 1 (**default**)

3.12.8.9 Game Port

Enables you to choose between setting the game port configuration yourself, or having the BIOS do it. The options are:

- Disabled
- Enabled
- Auto (**default**)

3.12.8.10 Game Port Status

Reports the game port I/O address. There are no options.

3.12.8.11 FM Synthesizer Port Status

Reports the FM synthesizer port I/O address. There are no options.

3.12.9 Advanced Chipset Configuration Subscreen

This section describes the options available on the Advanced Chipset Configuration Subscreen.

3.12.9.1 Base Memory Size

Sets the size of the base memory. The options are:

- 512 KB
- 640 KB (**default**)

3.12.9.2 ISA LFB Size

Sets the size of the linear frame buffer. The options are:

- Disabled (**default**)
- 1 MB
- 2 MB
- 4 MB

If this is set to 1 MB, 2 MB, or 4 MB, the ISA LFB Base Address field will appear.

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:

- Disabled (**default**)
- Enabled

3.12.9.5 Latency Timer (PCI Clocks)

Sets the length of time (measured in the number of PCI clock cycles) that an agent on the PCI bus can hold the bus when another agent has requested the bus. The clock choices include every eighth value between 16 and 128 clocks. The options are:

- Auto Configured (**default**)
- 16
- 24
- 32

…

- 128

3.12.9.6 Memory Error Detection

Sets the type of error detection or correction. This field appears if either ECC or Parity system memory is detected. Parity and ECC memory can be configured to run either as Parity or ECC (parity memory can be configured to run in ECC mode). The options are:

- Disabled **(default)**
- ECC
- Parity

3.12.9.7 Bank 0

Reports the type of memory found in the first bank (bank 0). There are no options.

3.12.9.8 Bank 1

Reports the type of memory found in the second bank (bank 1). There are no options.

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 the BIOS. The options are:

- Disabled
- Enabled (**default**)

Power Management will only work with APM-capable operating systems to manage power consumption in your computer. 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 computer goes into power managed mode. The options are:

- Disabled
- Enabled (**default**)

3.12.10.3 VESA Video Power Down

Sets the command issued to your graphics card when the computer goes into power managed mode. The options are:

- Disabled
- Standby
- Suspend
- Sleep (**default**)

3.12.10.4 Inactivity Timer (Minutes)

Sets how long the computer 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 computer 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 (displays options for reserving resources for ISA legacy devices)
- Use PnP OS (displays a choice of OSs as listed in the following section) **(default)**

3.12.11.2 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
- Windows 95 (**default**)

3.12.11.3 ISA Shared Memory Size

Enables you to “unshadow” a block of the upper memory area. The options are:

- Disabled (**default**)
- 16 KB
- 32 KB
- 48 KB
- 64 KB
- 80 KB
- 96 KB

If this is set to Disabled, the ISA Shared Memory Base Address (described below) will not be visible.

Shadowing is a technique that copies a block of memory from an add-in card’s ROM to the same address in main memory. This provides faster access and achieves higher performance. By default, all upper memory is shadowed.

3.12.11.4 ISA Shared Memory Base Address

Sets the base address for the ISA Shared Memory. The options are:

- C8000h (**default**)
- CC000h
- D0000h
- D4000h
- D8000h
- DC000h

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 (**default**)
- Used By ISA Card

The PCI auto-configuration code looks here to see if these interrupts are available for use by a PCI add-in card. If an interrupt is available, the PCI auto-configuration code can assign the interrupt to be used by the computer. If your computer 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 might 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 on-board 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 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.

3.12.12.1 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 computer, set the User password. This is the password that the BIOS asks for before booting. If only the Administrative password is set, the computer boots up without asking for a password. If both passwords are set, you can enter either password to boot the computer.

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 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.

3.12.13 Security Screen Options

3.12.13.1 User Password

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

3.12.13.2 Administrative Password

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

3.12.13.3 Enter Password

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

3.12.13.4 Set Administrative Password

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

3.12.13.5 Unattended Start

Controls when the security password is requested. The options are:

- Enabled
- Disabled (**default**)

The User password must be enabled before you can enable this option. If Enabled is selected, the computer boots, but the keyboard will be locked until the User password is entered.

3.12.13.6 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.

3.12.14 Exit Screen

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

3.12.14.1 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.

3.12.14.2 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.

3.12.14.3 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.

3.12.14.4 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 computer 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.
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 microprocessor on the motherboard generated an error.
6	Gate A20 Failure	The keyboard controller might be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The microprocessor generated an exception interrupt.
8	Display Memory Read/Write Error	The 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.

continued ☛

PCI Configuration Error Messages (continued)

Message	Explanation
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
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.
CH-2 Timer Error	There is an error in timer 2.
CMOS Battery State Low	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 computer. Use another boot disk and follow the screen instructions.
DMA Error	Error in the DMA controller.

continued ☛

BIOS Error Messages (continued)

Error Message	Explanation
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 computer is powered down.
HDD Controller Failure	The BIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the computer 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 computer. Use another boot disk.
Keyboard Is Locked...Unlock It	The keyboard lock on the computer is engaged. The computer must be unlocked to continue.
KB/Interface Error	There is an error in the keyboard connector.
Parity Error - System Halted	A fatal error occurred. The system was halted.

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.