



**SQ588 Pentium™ PCI  
Motherboard**

**User's Manual**



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## Section 1: Introduction

### 1-1: HOW TO USE THIS MANUAL

This manual provides information necessary for Original Equipment Manufacturers (OEMs) to build a PC-AT compatible system using the SQ588 Pentium PCI motherboard. For the end-users, this manual is a good reference to understand and properly use the motherboard. Section 1 gives an overview of the motherboard. Section 2 guides user through configuration and installation process and Section 3 provides the Basic Input Output System (BIOS) firmware related information.

### 1-2: OVERVIEW

The Pentium SQ588 PCI motherboard is a state-of-the-art computer platform delivering the latest microprocessor and I/O technology in an industry standard Baby-AT form factor supporting INTEL Pentium 75/90 and 100(optional) MHz microprocessors. It is ideal for demanding desktop applications requiring the maximum in I/O expansion flexibility.

A Pentium processor is complemented by a second level Write-Back cache, which can be 256KB, 512KB or 1MB, to provide workstation level computing performance. A Pentium OverDrive™ socket provides access to future performance enhancements, and SIMM sockets support up to 128MB of DRAM.

The SQ588 motherboard offers outstanding I/O capabilities. Four PCI local bus slots provide a high bandwidth data path for data-movement intensive functions such as Graphics and Disk I/O. Integrated peripherals include the CMD640, which provides a PCI local bus primary and secondary IDE drive interface, as well as the SMC 37C665 Super I/O component, which provides floppy and two FIFO serial ports and an ECP-capable parallel port. Four ISA Slots complete the I/O mix. The SQ588 motherboards provide foundation for cost effective, high performance, highly expandable platforms that deliver the latest in CPU and I/O technology.

The SQ588 motherboard conforms to the industry standard Baby-AT form factor. The Baby-AT form factor specifies maximum board size, board mounting locations, and connector locations for the keyboard connector, as well as expansion slot placement.

**1-3: PRODUCT SPECIFICATION****CPU:**

- Intel Pentium 75/90 MHz processors
- Intel Pentium 100 MHz processor

**System Chipset:**

- High performance 100% PC/AT compatible SiS85C501/502/503 chip set

**Memory/Cache:**

- High performance direct mapped cache controller with write-back scheme
- 256KB cache memory on board with optional 512KB and 1MB upgrades upon the availability of 64Kx8 and 128Kx8 SRAMs
- Fully programmable cache and DRAM read/write cycles
- Flexible 64-bit main memory architecture supports four 72-pin memory sockets and up to 128 MB on board using 256KB, 1MB, 2MB, 4MB and 8MB x 32/36 parity or non-parity SIMM modules
- Hidden DRAM refresh to boost system performance
- Programmable shadow RAM area and non-cacheable memory area
- Support fast GATE A20 and fast CPU RESET to optimize OS/2 operations
- Support FLASH EEPROM for easy BIOS upgrade

**Expansion Bus:**

Four PCI slots, three ISA slots and one ISA/PCI shared slot

**I/O Devices:**

- Two PCI IDE interface with mode 3 support
- Two high speed serial ports
- One floppy controller
- One enhanced parallel port
- One AT keyboard port
- One PS/2 mouse header

**Software Compatibility:**

Compatible with major S/W including UNIX, NOVELL, WINDOWS, WINDOW NT, OS/2, and DOS

**BIOS:**

Phoenix or AMI

**Form Factor:**

Baby AT form factor

**1-4: BOARD LEVEL FEATURES****CPU**

The SQ588 motherboard is designed to operate with Pentium microprocessor. This processor supports both read and write burst mode bus cycles, and includes an on-chip 16 KB cache which is split into 8 KB code and 8 KB data caches employing a write-back policy. The Pentium processor also integrates an advanced numeric coprocessor which significantly increases the speed of floating point operations, while maintaining compatibility with i486DX math coprocessors.

**Performance Upgrade**

A Type 5 Zero Insertion Force (ZIF) socket provides users a performance upgrade path using Pentium Overdrive processors.

**Second Level Cache**

The Pentium processor's internal cache is complemented with a direct mapped, write-back second level cache which can be 256 KB, 512KB or 1 MB.

**System Memory**

The SQ588 motherboard provides four 72-pin SIMM sites for memory expansion. The sockets support 256K x 36 (1 MB), 512K x 36 (2 MB), 1M x 36 (4 MB), 2M x 36 (8 MB), 4M x 36 (16 MB), and 8M x 36 (32 MB) SIMM modules. Minimum memory size is 2 MB and maximum memory size, using four 8M x 36 SIMM modules, is 128 MB. Memory timing requires 70 ns fast page devices. The parity generation/checking circuitry can be disabled to allow for use of non-parity 32 bit SIMMs.

The four sockets are arranged as Bank 0 and Bank 1, with each bank consisting of two sockets, SIMM1 & 2 for BANK 0 and SIMM3 & 4 for BANK 1, and providing a 64-bit wide data path and 9 parity bits. Both SIMMs in a bank must be of same memory size and type, although BANK 0 and 1 may have different types of memory installed. The memory array is controlled by SiS 85C501 and 85C502.

**Expansion Slots**

Up to seven expansion slots may be populated on the SQ588 PCI motherboard. There are four ISA bus expansion connectors and four PCI expansion connectors. One slot is shared by connectors that will accommodate either an ISA or a PCI expansion card, but not both at the same time. All four PCI expansion slots accept PCI master cards.

***SiS PCI Chip features***

The SiS 85C501/502/503 chipset consists of one 85C501 PCI/ISA Cache Memory Controller (PCMC), one 85C502 PCI Local Data Buffer(PLDB) and one 85C503 PCI System I/O(PSIO). The SiS Chipset provides the following functions:

- CPU L1 cache control
- L2 cache control
- Cache burst cycle support
- Supports Direct Mapped and Write Back Cache Modes
- Option for write protected, cacheable Video and system BIOS
- Supports SMI for Green-PC Power Management
- Supports 3-2-2-2 SRAM Burst Cycles
- Programmable cache and DRAM read/write cycles
- Shadow RAM option
- Hidden refresh and CAS before RAS refresh support
- Four PCI Master Support
- Programmable I/O recovery delay for 8/16-bit AT bus cycles
- Transparent 8042 emulation for fast CPU reset and GATEA20 generation

***PCI IDE Controller Chip (CMD640)***

The on-board PCI local bus IDE interface is provided by CMD640 controller. The CMD640 provides a 32-bit buffered interface to four IDE drives, allowing these drives to be accessed at full PCI bandwidth. The component also supports Enhanced IDE Mode 3 timing, allowing the drive to transfer data at its full bandwidth. The system BIOS also supports Logical Block Addressing(LBA) which allows the use of drives larger than 528 MB.

***SMC 37C665 Super I/O Controller***

Control for the integrated serial ports, parallel port, floppy drive interface is incorporated into a single component, the SMC FDC37C665. This component provides:

- Two NS16C552-compatible UARTs with send/receive 16 byte FIFO
- Multi-mode bi-directional parallel port
  - Standard mode; IBM and Centronics compatible
  - Enhanced Parallel Port (EPP) with BIOS/Driver support
  - High Speed mode; Enhanced Capabilities Port (ECP) compatible
- Industry standard floppy controller with 16 byte data FIFO (2.88 MB floppy support)
- IDE hard disk decode and chip select which are not used by SQ588

***System BIOS***

The SQ588 motherboard uses an AMI or Phoenix BIOS, which is stored in Flash EEPROM and easily upgraded using a floppy disk-based program. In addition to the BIOS, the Flash EEPROM also contains the Setup utility and the Power-On Self Tests (POST). This motherboard supports system BIOS shadowing, allowing the BIOS to execute from 32-bit on-board write-protected DRAM.

**Basic Features:**

- Ultra-fast memory testing
- Speed independence
- Power-on Self Tests
- Detection of coprocessor
- Memory caching
- Selection of diskette and fixed-disk type
- User-defined fixed-disk type
- Selection of video display
- Support for 2.88MB diskettes
- Support for extended memory beyond 64MB

**Advanced Features:**

- Password control of Bootup, SETUP menu access, diskette drive access
- Support of PS/2 mouse
- Power-on reminders about backup and virus scan
- NumLock control during bootup
- Automatic configuration of IDE fixed disks
- Selection of data transfer method for fixed disks: standard or block PIO
- Shadowing of system and video BIOS
- Automatic memory sizing
- Power Management
- Logic Block Addressing
- Four IDE Drive Support
- Sizing and control of cache

### BIOS Upgrades

The SQ588 motherboard BIOS is programmed in a FLASH EEPROM which makes distributing BIOS upgrades easy. A new version of the BIOS can be installed from a diskette. Security to prevent unauthorized changes to the BIOS is provided via a write-protect jumper on the motherboard. The default setting is to not allow BIOS upgrades. Instructions on BIOS upgrade will be provided with flash utility.

### Setup Utility

The ROM-based Setup utility allows the configuration to be modified without opening the system for most basic changes. The motherboard also incorporates many new capabilities into the Flash EEPROM, including:

- Auto configuration of IDE hard disk.
- Support for four IDE disk interfaces.
- An option allowing the user to assign a block of addresses below the 1 MB boundary as non-shadowed, non-cached. This area is primarily used for expansion card ROM which causes timing problems when shadowed and cached.
- ISA interrupts assigned to add-in card ISA adapters, thereby informing the PCI configuration utility which interrupts not to use.

The Setup utility is accessible only during the Power-On Self Test (POST) by pressing the <Del> key after the POST memory test has begun and before boot begins. A prompt may be enabled that informs users to press the <Del> key to access Setup utility.

### Security features

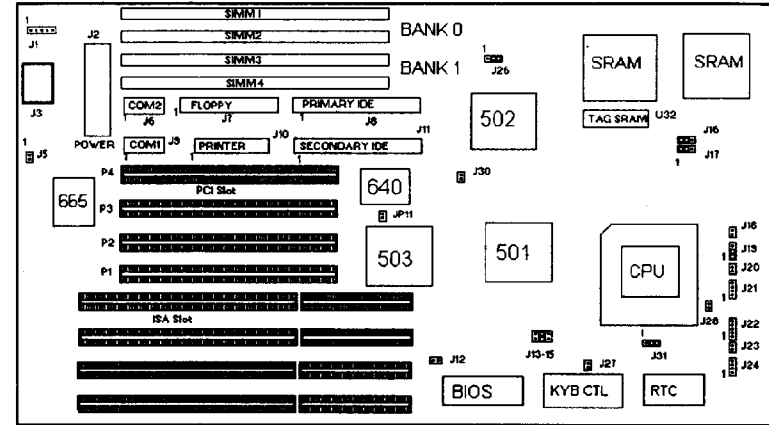
#### BIOS Password

A BIOS password feature provides security during the boot process. A password can be entered using the Setup utility and must be re-entered prior to disk boot each time the system is reset.

If password is forgotten, J27 may be used to erase password and clear all CMOS information.

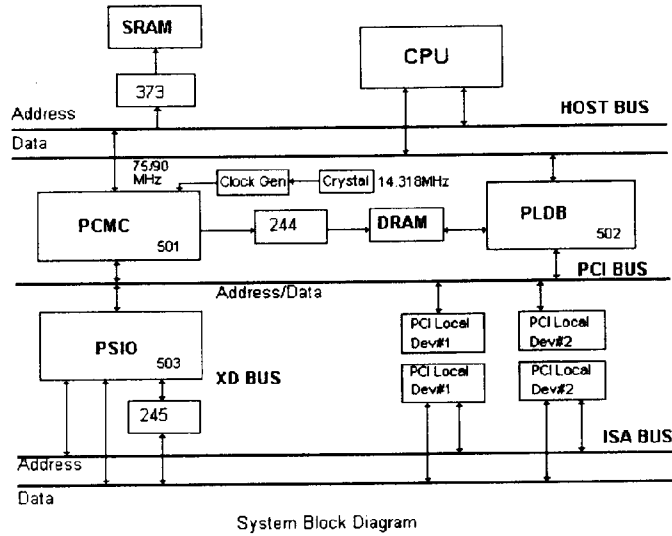
### 1-5: BOARD LAYOUT

The SQ588 board layout is shown below:



SQ588 Board Layout

1-6: SYSTEM BLOCK DIAGRAM



Section 2: Configuration Guide

2-1: MEMORY CONFIGURATION

Table 2-1 shows the possible memory combinations. The SQ588 motherboard supports parity or non-parity SIMMs. SIMM requirements are 70ns, Fast Page Mode.

BANK 0 (SIMM 1 & 2) SIMM Type (Amount)	BANK 1 (SIMM 3 & 4) SIMM Type (Amount)	Total System Memory
1 MB - S	-	2 MB
1 MB - S	1 MB - S	4 MB
2 MB - D	-	4 MB
2 MB - D	2 MB - D	8 MB
2 MB - D	8 MB - D	20 MB
2 MB - D	16 MB - S	36 MB
4 MB - S	-	8 MB
4 MB - S	4 MB - S	16 MB
4 MB - S	16 MB - S	40 MB
8 MB - D	-	16 MB
8 MB - D	8 MB - D	32 MB
8 MB - D	16 MB - S	48 MB
8 MB - D	32 MB - D	80 MB
16 MB - S	-	32 MB
16 MB - S	16 MB - S	64 MB
32 MB - D	-	64 MB
32 MB - D	32 MB - D	128 MB
64 MB - S	64 MB - S	128 MB

Table 2-1. Possible SIMM Memory Combinations

Note:

Jumper J26 must be set at 2-3 position for Single-sided SIMMs and 1-2 position for Doubled-sided SIMMs.

**2-2: JUMPER SETTINGS**

There are several jumper blocks that are used to configure the SQ588 Pentium motherboard.

**CPU Clock Selection Jumpers(J13,14,15,31):**

These jumpers must be set correctly according to CPU's speed.

Clock Speed	J13	J14	J15	J31
75MHz	Open	Open	Close	1-2
90MHz	Close	Open	Open	1-2
100MHz	Open	Close	Open	2-3

**Cache Size Jumpers(J16,17):**

These jumpers must be set correctly according to the cache size installed.

Cache Size	J16	J17	Data SRAM	Tag SRAM(U32)
256 KB	1-2	1-2	8, 32Kx8	32K x 8
512 KB	2-3	1-2	8, 64Kx8	32K x 8
1 MB	2-3	2-3	8, 128Kx8	32K x 8

**Flash EPROM (J12)**

This jumper must be set correctly to flash BIOS.

Flash EPROM	J12
Normal Operation	Open(Default)
FLASH Programming	Close

**Disable On-Board PCI IDE Controller(JP11):**

This jumper is used to disable on-board PCI IDE controller. Phoenix BIOS setup allows user to enable or disable on-board PCI IDE controller only when JP11 is closed.

On-board PCI IDE Controller	JP11
Enabled	Open
Disabled	Close

**Manufacturer Test Jumper(J27):**

J27 should be open at all time. This jumper may also be used to clear CMOS if supported by BIOS. If J27 is closed, system BIOS will clear CMOS and display CMOS checksum error message right after memory test is finished.

**Factory Reserved Jumpers:**

J30: Open, J28: Open.

→ close enable parity. Rev A05 Board only Requires Rev A00 Bios or newer.

**2-3: EXTERNAL CONNECTIONS****J24: External Speaker Connector**

Pin	Signal Name
1	SPKR_DAT
2	Key
3	No Connect
4	+5V Vcc

**J23: Reset Switch Connector**

Pin	Signal Name
1	Ground
2	Reset

**J22: Power LED and Keylock Connector**

Pin	Signal Name
1	LED_PWR
2	Key
3	Ground
4	KEY LOCK
5	Ground

**J21: Hard Disk LED Connector**

Pin	Signal Name
1	Pull_Up
2	HD_Active-
3	NC
4	Pull_Up



**J20: Turbo LED Connector**

Pin	Mode
1	Turbo
2	Ground

**J18: StandBy Switch Connector**

J18 may be connected to a standby button on the front panel to enter into standby mode when it is pressed.

Pin	Signal Name
1	Ground
2	-StandBy

**J1: PS/2 Mouse Header**

J1 is used to connect a PS/2 mouse connector.

**J2: Power Connector**

Pin	Signal Name	Description
1	PWRGD	Power Good
2	+5 V	+ 5 volts Vcc
3	+12 V	+ 12 volts
4	-12 V	- 12 volts
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	-5 V	-5 volts
10	+5 V	+ 5 volts Vcc
11	+5 V	+ 5 volts Vcc
12	+5 V	+ 5 volts Vcc

**J3: Keyboard Connector**

Pin	Signal Name
1	Clock
2	Data
3	No Connect
4	Ground
5	Vcc(fused)
6	Shield

**J5: Green Control Port Connector**

Pin 2 of J5 may be used to shut off green power supply or cut off video sync signals when system is in standby mode.

Pin	Signal Name
1	Ground
2	-Green

**J6/J9: COM1/COM2 Serial Port Connectors**

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

**J7: Floppy Connector**

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

**J10: Parallel Port Connector**

Signal Name	Pin	Pin	Signal Name
STROBE-	1	2	AUTO FEED-
Data Bit 0	3	4	ERROR-
Data Bit 1	5	6	INIT-
Data Bit 2	7	8	SLCT IN-
Data Bit 3	9	10	Ground
Data Bit 4	11	12	Ground
Data Bit 5	13	14	Ground
Data Bit 6	15	16	Ground
Data Bit 7	17	18	Ground
ACJ-	19	20	Ground
BUSY	21	22	Ground
PE (Paper End)	23	24	Ground
SLCT	25	26	N.C.

**J8/J11: Primary/Secondary PCI IDE Connectors**

Signal Name	Pin	Pin	Signal Name
Reset IDE	1	2	Ground
Host Data 7	3	4	Host Data 8
Host Data 6	5	6	Host Data 9
Host Data 5	7	8	Host Data 10
Host Data 4	9	10	Host Data 11
Host Data 3	11	12	Host Data 12
Host Data 2	13	14	Host Data 13
Host Data 1	15	16	Host Data 14
Host Data 0	17	18	Host Data 15
Ground	19	20	Key
DRQ3	21	22	Ground
I/O Write-	23	24	Ground
I/O Read-	25	26	Ground
IOCHRDY	27	28	BALE
DACK3-	29	30	Ground
IRQ14	31	32	IOCS16-
Addr 1	33	34	Ground
Addr 0	35	36	Addr 2
Chip Select 0-	37	38	Chip Select 1-
LED Active-	39	40	Ground

## Section 3: System Setup

This section provides the information for the system setup procedure and also briefs the setup procedures for system BIOS.

### 3-1: SYSTEM SETUP

The system BIOS supports an internal ROM-based system setup utility. When the first time you power up the system, the system CMOS memory contains incorrect configuration information and the BIOS prompts you to get into the SETUP utility. The system requires correct configuration information stored in the CMOS memory. The SETUP utility will guide you to properly configure the system in a simple and straightforward way. A typical setup procedure is as follows:

1. Properly install the system.
  - A basic system should include at least
    - the SQ588 Pentium motherboard with CPU installed,
    - a heat sink and cooling fan for CPU,
    - a standard AT case,
    - an AT compatible keyboard,
    - a floppy drive/controller,
    - a monitor/controller,
    - two megabyte memory(two 256K x 36 SIMMs), and
    - a power supply that provides good airflow.
2. Turn the system power on.
3. The system BIOS will run Power-On-Self-Test(POST). When the test is completed, the system prompts you to go through the system SETUP utility. You can ignore the prompt if system setup has been configured correctly.
4. Follow the on-screen instructions provided by the SETUP utility to
  - Set Date and Time
  - Select correct floppy disk type and number
  - Select correct hard disk type and number
  - Set the advanced features if necessary
5. Exit the SETUP utility when done
6. System starts to reboot.
7. The system should have correct configuration information by now and should have no problem booting up the operating system from floppy or hard disk. If not, check the peripheral types, memory size and connections and go through the SETUP utility again.

### 3-2: PCI DEVICE SETUP

PCI device setup allows user to allocate IRQs and specify IRQ's sensitivity for PCI and ISA devices. Follow the on-screen setup instructions and refer to the manual provided with the PCI device for proper installation.

**Appendix A: ISA Connectors**

Signal Name	Pin	Pin	Signal Name
GND	B1	A1	IOCHK
RSTDRV	B2	A2	SD7
Vcc	B3	A3	SD6
IRQ9	B4	A4	SD5
-5V	B5	A5	SD4
DRQ2	B6	A6	SD3
-12V	B7	A7	SD2
OWS-	B8	A8	SD1
+12V	B9	A9	SD0
GND	B10	A10	IOCHRDY
SMEMW-	B11	A11	AEN
SMEMR-	B12	A12	SA19
IOW-	B13	A13	SA18
IOR-	B14	A14	SA17
DACK3-	B15	A15	SA16
DRQ3	B16	A16	SA15
DACK1-	B17	A17	SA14
DRQ1	B18	A18	SA13
REFRESH-	B19	A19	SA12
SYSCLK	B20	A20	SA11
IRQ7	B21	A21	SA10
IRQ6	B22	A22	SA9
IRQ5	B23	A23	SA8
IRQ4	B24	A24	SA7
IRQ3	B25	A25	SA6
DACK2-	B26	A26	SA5
TC	B27	A27	SA4
BALE	B28	A28	SA3
Vcc	B29	A29	SA2
OSC	B30	A30	SA1
GND	B31	A31	SA0
	KEY	KEY	
MEMCS16-	D1	C1	SBHE-
IOCS16-	D2	C2	LA23
IRQ10	D3	C3	LA22
IRQ11	D4	C4	LA21
IRQ12	D5	C5	LA20
IRQ15	D6	C6	LA19
IRQ14	D7	C7	LA18
DACK0-	D8	C8	LA17
DRQ0	D9	C9	MEMR-
DACK5-	D10	C10	MEMW-
DRQ5	D11	C11	SD8
DACK6-	D12	C12	SD9
DRQ6	D13	C13	SD10
DACK7-	D14	C14	SD11
DRQ7	D15	C15	SD12
Vcc	D16	C16	SD13
Master-	D17	C17	SD14
GND	D18	C18	SD15

**Appendix B: PCI Connectors**

*PCI Connectors P1,P2, P3 and P4*

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

Signal Name	Pin	Pin	Signal Name
AD16	A32	B32	AD17
3.3V	A33	B33	CBE2-
FRAME-	A34	B34	GND
GND	A35	B35	IRDY-
TRDY-	A36	B36	
GND	A37	B37	DEVSEL-
STOP-	A38	B38	GND
3.3V	A39	B39	PLOCK-
SDONE	A40	B40	PERR-
SBO-	A41	B41	
GND	A42	B42	SERR-
PAR	A43	B43	
AD15	A44	B44	CBE1-
3.3V	A45	B45	AD14
AD13	A46	B46	GND
AD11	A47	B47	AD12
GND	A48	B48	AD10
AD9	A49	B49	GND
KEY	A50	B50	KEY
KEY	A51	B51	KEY
CBEO-	A52	B52	AD8
3.3V	A53	B53	AD7
AD6	A54	B54	
AD4	A55	B55	AD5
GND	A56	B56	AD3
AD2	A57	B57	GND
AD0	A58	B58	AD1
Vcc	A59	B59	Vcc
SREQ64-	A60	B60	SACK64-
Vcc	A61	B61	Vcc
Vcc	A62	B62	Vcc

### Appendix C: Memory Map

Address Range (Deci-)	Address Range (hex)	Size	Description
1024K-131072K	100000-8000000	130048K	Extended Memory
960K-1023K	F0000-FFFFF	64K	System BIOS
952K-959K	EE000-EFFFF	8K	FLASH Boot Block (Available as HIMEM)
948K-951K	ED000-EDFFF	4K	OEM LOGO (available as HIMEM if no user info is here)
928K-947K	E8000-ECFFF	20K	BIOS RESERVED
640K-927K	A000-E7FFF	288K	Available HI DOS Memory (open to the ISA & PCI bus)
639K	9FC00-9FFFF	1K	Extended BIOS Data (moveable by QEMM, 386MAX)
512K-638K	80000-9FBFF	127K	Extended conventional
0K-511K	00000-7FFFF	512K	Conventional

Table C-1 Memory Map

### Appendix D: I/O Map

Address (hex)	Size(Dec)	Description
0000 - 000F	16 bytes	SIO - DMA 1
0020 - 0021	2 bytes	SIO - Interrupt Controller 1
0040 - 0043	4 bytes	SIO - Timer 1
0048 - 004B	4 bytes	SIO - Timer 2
0060	1 byte	Keyboard Controller Data Byte
0061	1 byte	SIO - NMI, speaker control
0064	1 byte	Kbd Controller, CMD/STAT Byte
0070, bit 7	1 bit	SIO - Enable NMI
0070, bits 6:0	7 bits	SIO - Real Time Clock, Address
0071	1 byte	SIO - Real Time Clock, Data
0073	1 byte	Reserved - Brd. Config.
0075	1 byte	Reserved - Brd. Config., RD only
0076	1 byte	SIO - BIOS Timer
0080 - 008F	16 bytes	SIO - DMA Page Register
00A0 - 00A1	2 bytes	SIO - Interrupt Controller 2
00C0 - 00DE	31 bytes	SIO - DMA 2
00F0	1 byte	Reset Numeric Error
0170 - 0177	8 bytes	Secondary IDE Channel

Address (hex)	Size(Dec)	Description
01F0 - 01F7	8 bytes	Primary IDE Channel
0278 - 027B	4 bytes	Parallel Port 2
02F8 - 02FF	8 bytes	On-Board Serial Port 2
0376	1 byte	Secondary IDE Chan Cmd Port
0377	1 byte	Secondary IDE Chan Stat Port
0378 - 037F	8 bytes	Parallel Port 1
03BC - 03BF	4 bytes	Parallel Port x
03E8 - 03EF	8 bytes	Serial Port 3
03F0 - 03F5	6 bytes	Floppy Channel 1
03F6	1 bytes	Primary IDE Channel Cmd 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	On-Board Serial Port 1
0CF8	1 byte	PCI Configuration Space Enable
0CF9	1 byte	Deturbo Mode Enable

Table D-1. I/O Address Map

\* Only accessible after PCI configuration space is enabled

### Appendix E: Interrupts & DMA Channels

IRQ	System Resource
NMI	Parity Error
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	Parallel Port 2
6	Floppy
7	Parallel Port 1
8	Real Time Clock
9	User available
10	User available
11	User available
12	On-board Mouse Port
13	Reserved, Math coprocessor
14	Primary IDE if enabled, else available to user
15	Secondary IDE if enabled, else available to user

Table E-1. Interrupts

DM	Data Width	System Resource
0	8- or 16-bits	Open
1	8- or 16-bits	Open - Normally used for LAN
2	8- or 16-bits	Floppy
3	8- or 16-bits	Open or Enhanced Parallel Port
4		Reserved - Cascade channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

Table E-2. DMA Map

## Appendix F: AMI BIOS SETUP

When you see the screen message:

"Hit Del, if you want to run SETUP"

Press "Del", if you want to run SETUP. There is a reference number at the bottom of the screen, write down this number if you want to call for assistance with the AMI BIOS.

After you press "Del", there will be Setup, Utility, Security and Default windows. You can use TAB key to move between windows and use arrow keys or mouse to select a menu.

**STANDARD SETUP** allows user to change Time, Data, Hard Disk Type, etc..

**ADVANCED SETUP** allows user to configure system options, such as boot sequence, coprocessor support, cache enable/disable and shadow BIOS range, etc.. See details in Appendix.

**CHIPSET SETUP** allows user to configure chipset registers, hidden refresh enable/disable and Internal/external cache mode, etc..

**POWER MANAGEMENT** allows user to setup power saving features.

**ORIGINAL/OPTIMAL DEFAULT** allows user to configure system with original values or BIOS default values.

**PASSWORD SECURITY** allows user to store password information in CMOS memory. Once the password is configured, users will be required to enter a password every time the system boots, or whenever an attempt is made to enter the SETUP program. The password cannot exceed 6 characters in length.

**AUTO DETECT HARD DISK UTILITY** detects IDE Drive's parameters and saves drive type in CMOS.

### **Standard Setup:**

The standard Setup utility is used to configure the following features:

#### **Date: (Month/Date/Year)**

- Set Date.

#### **Time: (Hour/Minute/Second)**

- Set time.

#### **Floppy Drive A and B:(360KB/720KB/1.2MB/1.44MB/2.88MB)**

- Set floppy type.

#### **Hard Disk C and Hard Disk D:**

- Hard disk types from 1 to 46 are standard ones; type 47 is user definable. The user must enter the hard disk parameters for each drive or use hard disk autodetection utility.

The drive type are identified by the following characteristics:

*Type* - This is the number designation for a drive with certain identification parameters.

*Cyl* - This is the number of cylinders found in the specified drive type.

*Heads* - This is the number of heads found in the specified drive type.

*WPcom* - WPcom is the read delay circuitry which takes into account the timing difference between the inner and outer edges of the surface of the disk platter. The number designates the starting cylinder of the signals.

*L-zone* - L-zone is the landing zone of the heads. This number determines the cylinder location where the heads will normally park when the system is shut down.

*Capacity* - This is the formatted capacity of the drive based on the following formula:

$(\# \text{ of heads}) \times (\# \text{ of cylinders}) \times (\# \text{ secs/cyl.}) \times (512 \text{ bytes/sec})$

**Advanced Setup:****Typematic Rate Programming: (Enabled/Disabled)**

- By enabling this option, the user can adjust the rate at which a keystroke is repeated. The options "Typematic Rate Delay" and "Typematic Rate" affect this rate. When a key is pressed and held down, the character appears on the screen and after a delay set by the Typematic Rate Delay, it keeps on repeating at a rate set by the Typematic Rate value. When two or more keys are pressed and held down simultaneously, only the last key pressed will be repeated at the typematic rate. This stops when the last key pressed is released, even if other keys are depressed.

**Typematic Rate Delay (msec): (250 500 750 1000)**

**Typematic Rate (chars/sec) : (30.0 26.7 24.0 ... 2.0)**

**System Keyboard:(Present/Absent)**

- If absent is selected, the system can boot without a keyboard.

**Primary Display:(Absent/VGA/EGA/CGA40x25/CGA80x25/Mono)**

- Set the monitor type.

**Mouse Support:(Enabled/Disabled)**

- Enable this feature if a PS/2 mouse is connected.

**Above 1 MB Memory Test: (Enabled/Disabled)**

- This feature, when enabled, will invoke the POST memory routines on the RAM above 1 MB (if present on the system). If disabled, the BIOS will only check the first 1 MB of RAM.

**Hit <Del> Message Display:(Enabled/Disabled)**

- Enable or disable the "Hit <Del> if you want to run SETUP" screen message.

**System Boot Up NUM Lock: (On/Off)**

- Default to turn on or off the "Num Lock" key when power on.

**Numeric Processor Test: (Enabled/Disabled)**

- These options allow the user to test the numeric processor.

**Floppy Drive Seek At Boot:(Disabled/Enabled)**

- If "disabled" is selected, the system will not look for floppy drive at boot.

**System Boot Up Sequence: (C:, A: /A:, C:)**

- If set to "C:, A:", the system will attempt to boot from hard drive C:, and then A: if C: is not present. The sequence is reversed if option "A:, C:" was set.

**External Cache : (Enabled/Disabled)**

- Enable or disable the external(secondary) cache memory.

**Internal Cache : (Enabled/Disabled)**

- Enable or disable the internal cache memory.

**Password Checking:(Always/Setup)**

- The "Always" option enables the system to ask for user password when the system is turned on. The "Setup" option enables the system to check the password only when user tries to enter the setup program. A password must be installed for these options to be effective.

**Video, Adapter or System ROM Shadow: (Enabled/Disabled)**

- This option allows the ROM in 32K segment to be copied into RAM which can be accessed a lot faster compared to ROM.

**Video Cacheable C000,32K:(Yes/No)**

- Enable or disable the cacheability of the video BIOS.

**IDE Block Mode:(Enabled/Disabled)**

- Enable or disable IDE block transfer mode.

**IDE Prim Controller 32bit Xfer:(Enabled/Disabled)**

- Enable or disable 32-bit data transfer mode.

**IDE Prim Master/Slave HDD LBA Mode:(Enabled/Disabled)**

- Enable or disable primary master/slave hard disk LBA mode.

**Number of HDDs in Sec Controller:(Disabled/1/2)**

- Specify number of hard disks connected in the secondary IDE controller.

**IDE Sec Controller 32bit Xfer:(Enabled/Disabled)**

- Enable or disable 32-bit data transfer mode.

**IDE Sec Master/Slave HDD LBA Mode:(Enabled/Disabled)**

- Enable or disable secondary master/slave hard disk LBA mode.

**ChipSet Setup:****Cache speed**

- This option is set by manufacturer according to the type of SRAM installed. Default setting is "Slower".

**Cache Burst Read/Write Cycle**

- This option is set by manufacturer according to the type of SRAM installed. Default setting is "2T" for 15ns SRAM. If 20ns SRAMs are installed, this option have to be set at "3T".

**Non-Cacheable Area 1/2:(DRAM/AT-Bus)**

- Select the area to be non-cached.

**Non-Cacheable Size 1/2:**

- Set the size of the non-cache block.

**Non-Cacheable Base 1/2:**

- Set the base address of the non-cache block.

**PCI IDE Card Present in:(Absent/Slot 1/2/3/4)**

- Set the slot # for an external PCI IDE card installed

**PCI IDE IRQ Connected to:(INT A/B/C/D)**

- Specify the IRQ signal source from the PCI IDE card installed.

**PCI IRQ Allocate:(AMI PnP/Manual)**

- If "AMI PnP" is selected, PCI IRQs will be allocated automatically by system BIOS. Otherwise, the following options must be specified manually in accordance to the PCI cards installed.

**PCI Slot INT:(INTA/B/C/D)****PCI Slot IRQ:(3/4/5/7/9/10/11/14/15)****PCI IRQ Trigger Mode:(Edge/Level)**

- These options specify the PCI INTs, IRQs and trigger mode for each slot when Manual mode is selected for PCI IRQ allocation.

**Power Management Setup****BIOS Power Management Mode:(Enabled/Disabled)**

- Enable or disable power management mode.

**Standby System Timer:(Disable/30sec/1mins/5/10/30mins)**

- Set the power down timer.

**Power Down VGA Type:(Mono/Std VGA/542x/DPMS VGA)**

- Specify display controller type for controlling power down mode.

**APM Function:(Disabled/Enabled)**

- Enable or disable Advance Power Management(APM) feature.

**IRQ # Monitor:(Enabled/Disabled)**

- Enable IRQs to wake up system from power down mode.



### Peripheral Management

#### OnBoard FDC:(Enabled/Disabled)

- Enable or disable on board floppy controller.

#### Serial Port 1:(Disabled/3F8H/3E8H/2E8H)

- Select first serial port address.

#### Serial Port 2:(Disabled/2F8H/3E8H/2E8H)

- Select secondary serial port address.

#### Parallel Port :(Disabled/3BCH/378H/278H)

- Select parallel port address.

#### Parallel Port Mode:(Normal/Extended)

- Select normal or extended parallel port mode.

#### Parallel Port Extended Mode:(SPP/EPP&SPP/ECP/ECP&EPP)

- Select extended parallel port function. SPP mode enables Bidirectional Parallel Port, EPP mode is compatible to Enhanced Parallel Port and ECP mode enables Extended Capability Port.

## Appendix G: AMI BIOS Error Messages

### BIOS ERROR BEEP CODES

During the POST (Power-On-Self-Test) routines, which are performed each time the system is powered on, error may occur.

**Non-fatal errors** are those which, in most cases, allow the system to continue the boot up process. The error messages normally appear on the screen.

**Fatal errors** are those which will not allow the system to continue the boot-up procedure. If a fatal error occurs, you should consult with your system manufacturer for possible repairs. These fatal errors are usually communicated through a series of audible beeps. The numbers on the fatal error listed below correspond to the number of beeps for the corresponding error. All errors listed, with exception of #7, are fatal errors.

### BEEP CODES

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
2	Parity Error	Parity error in the first 64 KB of memory
3	Base 64 KB Memory Failure	Memory failure in the first 64 KB.
4	Timer Not Operational	Memory failure in the first 64 KB of memory, or Timer 1 on the motherboard is not functioning.
5	Processor Error	The CPU on the motherboard generated an error.
6	8042 - Gate A20 Failure	The keyboard controller (8042) may be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The CPU generated an exception interrupt.
8	Display Memory Read/Write Error	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.
11	Cache Error / External Cache Bad	The external cache is faulty.

**NON-FATAL ERROR MESSAGES**

If a non-fatal error occurs during the POST routines performed each time the system is powered on, the error message will appear on the screen in the following format:

ERROR Message Line 1  
 ERROR Message Line 2  
 Press <F1> to RESUME

Note the error message and press the <F1> key to continue with the boot-up procedure.

Note: If the "Wait for <F1> If Any Error" option in Advanced CMOS Setup portion of the BIOS SETUP PROGRAM has been set to "disabled", the prompt will not appear on the third line. For most of the error messages, there is no ERROR Message Line 2. Generally, for those message containing a line 2 ERROR Message, the text will be "RUN SETUP UTILITY". Pressing the <F1> key will invoke the BIOS SETUP PROGRAM.

**Error Messages**

Error Message	Explanation
8042 Gate - A20 Error	Gate A20 on the keyboard controller (8042) is not working. Replace the 8042
Address Line Short!	Error in the address decoding circuitry on the motherboard.
Cache Memory Bad, Do Not Enable Cache!	Cache memory is defective. Replace it.
CH-2 Timer Error	Most AT systems include two timers. There is an error in timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	After CMOS RAM values are saved, a checksum value is generated for error checking. The previous value is different from the current value. Run AMIBIOS Setup.
CMOS System Options Not Set	The values stored in CMOS RAM are either corrupt or nonexistent. Run Setup.
CMOS Display Type Mismatch	The video type in CMOS RAM does not match the type detected by the BIOS. Run AMIBIOS Setup.
CMOS Memory Size Mismatch	The amount of memory on the motherboard is different than the amount in CMOS RAM. Run AMIBIOS Setup.

**ERROR MESSAGES (cont.)**

CMOS Time and Date Not Set	Run Standard CMOS Setup to set the date and time in CMOS RAM.
Diskette Boot Failure	The boot disk in floppy drive A. is corrupt. It cannot be used to boot the system. Use another boot disk and follow the screen instructions.
Display Switch Not Proper	Some systems require a video switch on the motherboard be set to either color or monochrome. Turn the system off, set the switch, then power on.
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.
Keyboard is Locked...Unlock it	The keyboard lock on the system is engaged. The system must be unlocked to continue.
Keyboard Error	There is a timing problem with the keyboard. Set the Keyboard option in Standard CMOS Setup to <i>Not Installed</i> to skip the keyboard POST routines.
KB/Interface Error	There is an error in the keyboard connector.
Off Board Parity Error	Parity error in memory installed in an expansion slot. The format is:  OFF BOARD PARITY ERROR ADDR (HEX) = (XXXX)  XXXX is the hex address where the error occurred.
On Board Parity Error	Parity error in motherboard memory. The format is:  OFF BOARD PARITY ERROR ADDR (HEX) = (XXXX)  XXXX is the hex address where the error occurred.
Parity Error ????	Parity error in system memory at an unknown address.

**ISA NMI Error 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 <i>Memory Parity Error ????</i> .
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>I/O Card Parity Error ????</i> .
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

## Appendix H: Phoenix BIOS Setup

When you see the screen message:

"Press <Del> to enter setup"

Press "Del", if you want to run SETUP. After you press "Del", there will be a Main Menu with the following setup options:

**System Setup** allows user to change Time, Data, Floppy and Video Types.

**Fixed Disk Setup**, allows user to configure four hard disk types. Auto-detection mode, block transfer mode and LBA mode are provided.

**Advanced System Setup** allows user to configure chipset registers and PCI device control.

**Boot Options** allows user to select boot sequence and boot options.

**Security and Anti-Virus** allows user to enter system and setup passwords and enable boot sector protection feature. Two level of password security are also provided.

**Green PC Features** allows user to set options to control power saving functions.

**Load ROM Default Values** allows user to load default values for all setup items.

**Load Values from CMOS** allows user to get current setup values from CMOS.

**Save Values to CMOS** allows user to save setup values to CMOS.

Use on-screen instructions for help and function key definitions.

## ADVANCED SYSTEM SETUP

### *Integrated Peripherals*

#### **COM 1/2 port**

- This option allows user to disable on board serial ports or set different addresses. Auto detection is also provided to configure serial port addresses automatically.

#### **LPT port**

- This option allows user to disable on board parallel ports or set different addresses.

#### **Diskette controller**

- This option allows user to enable or disable on board floppy controller.

#### **ECP**

- This option allows user to enable or disable ECP mode for the on board parallel port.

#### **Local Bus IDE adapter**

- This option allows user to enable or disable on board PCI IDE controller. JP11 must be closed for this function to work.

### *Memory Cache*

#### **External Cache**

- This option allows user to enable or disable external L2 cache memory.

#### **Cache system BIOS**

- This option allows user to enable or disable cache system BIOS feature.

#### **Cache video BIOS**

- This option allows user to enable or disable cache video BIOS feature.

#### **Cache speed**

- This option is set by manufacturer according to the type of SRAM installed. Default setting is "Slower".

#### **Cache Burst Read/Write Cycle**

- This option is set by manufacturer according to the type of SRAM installed. Default setting is "2T" for 15ns SRAM and "3T" for 20ns SRAM.

#### **Non-Cacheable Area #1/2**

- This option allows user to set non-cacheable area.

#### **Allocation of non-cacheable area# 1/2**

- Select AT-Bus or local DRAM area to be non-cached.

**Non-Cacheable Size 1/2:**

- Set the size of the non-cache block.

**Non-Cacheable Start Address 1/2:**

- Set the start address of the non-cache block.

**Memory Shadow****System BIOS shadow**

- Always enabled.

**Video BIOS shadow**

- This option allows user to enable or disable video BIOS shadow feature.

**Shadow Option ROM's-**

- This option allows the external ROM in 32K segment to be copied into RAM which can be accessed a lot faster compared to ROM.

**Advanced Chipset Control****Fast reset latency**

- This option allows user to set fast reset latency time to emulate CPU reset via keyboard controller.

**16-bit I/O recovery time**

- This option allows user to set I/O recovery time for slow I/O devices.

**8-bit I/O recover time**

- This option allows user to set I/O recovery time for slow I/O devices.

**16-bit mem, I/O wait state**

- This option allows user to set wait state for slow I/O and memory devices installed in AT bus.

**CPU to PCI Memory Burst Write**

- This option allows user to enable burst write from CPU to PCI memory. Some PCI cards may have problem if this option is enabled.

**PCI Device****Base I/O Address**

- This option allows user to set PCI base I/O address.

**Base Memory Address**

- This option allows user to set PCI memory address.

**Multimedia mode**

- This option allows user to enable or disable PCI multimedia mode.

**PCI Device Slot #1/2/3/4****Interrupt # set to**

- This option allows user to set ISA IRQ number for each PCI slot.

**Edge/Level Select**

- This option allows user to set ISA IRQ sensitivity for each PCI slot.

**Green PC Features****Power Saving Mode**

- Enable or disable system power saving mode.

**System Suspend Timer**

- Enable or disable power management mode. CPU clock will be stopped if system CPU supports "STOPCLK" function.

**Hard Disk Standby Timer**

- Set IDE hard disk power down timer.

**VGA with Power Down Feature**

- Specify display controller type(None/Standard/CL 542X/DPMS) for controlling the power saving feature of monitor.

**Suspend Switch Select**

- Enable or disable standby switch

**APM SMI Function Support**

- Enable or disable APM BIOS support.

**VGA Access Detection**

- Enable VGA access event to reload suspend timer.

**IRQ1-15/NMI Activity**

- Enable or disable system to monitor IRQ and NMI to exit power saving mode.

**IRQ # Monitor**

- Enable IRQ event(s) to break system power saving mode.

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