

386SX MAIN BOARD (25/33/40 MHz)

PT-319A

USER'S MANUAL

BEFORE INSTALLING THE PT-319A PLEASE READ
THIS MANUAL COMPLETELY AND RETAIN IT FOR FUTURE
REFERENCE

Note:

1. For the first time installation with error message on the screen, please leave the system on for about 15-30 minutes to recharge the battery, then you can enter system configuration.
2. Leave your system on for about 24 hours to recharge the battery fully.
3. If you have switched off the computer system for more than two weeks, you might be required to repeat step 2 to recharge the battery fully.
4. To protect the Main Board, After the power is switched OFF, please wait 5 seconds before you pull out the add-on card.

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SECTION 1

INTRODUCTION

1.1 Overview

The RC2016A is a Single Chip AT high performance controller for the 25/33/40 MHz 386SX or Cx486SLC based PC-AT system. For 33/40 MHz operation, only 80/70ns DRAM is required and no cache memory is needed. Advanced independent I/O channel memory and on board memory refresh architecture assist better system performance. The memory management supports page and block interleave mode functions. Hardware EMS and flexible Shadow RAM features are also provided to implement a "SMALL WONDER" system.

Furthermore, the RC2016A Chip supports many advanced features such as **STEPPING BUS, LOCAL DEVICE, USER ROM, SLOT POINTER, EMS**, remapping of 384K memory, and PCMCIA applications that can let you achieve a very reliable and powerful system.

The RC2016A includes: dual 8237 DMA controller, dual 8259 interrupt controller, an 8254 programmable timer, a 74612 memory mapper, an 82288 bus controller, and an 82284 clock generator.

1.2 Checklist

Please check your PT-319A package to ensure that it contains the following items :

- PT-319A Main board
- PT-319A User's manual

If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

SECTION 2

SPECIFICATIONS

2.1 General Features

- IBM AT compatible
- Single Chip 386SX or Cx486SLC PC-AT Compatible Solution that supports 25/33/40 MHz non-cache system
- Two banks, up to 16MB Memory on board using 256K, 512K, 1M or 4M type DRAM
- Page Mode and two-way Block Interleave DRAM access management
- Single (8-bit) SYSTEM BIOS ROM
- Hardware EMS function
- Programmable DRAM access timing
- Independent DRAM refresh control for I/O CHANNEL and ON BOARD memory
- Programmable DRAM refresh rate and burst refresh mode
- Asynchronous I/O CHANNEL clock
- Shadow RAM support, range from 0C0000 to 0FFFFF on 16K boundaries
- Stepping address to reduce system noise
- Control signals for 16MB user ROM on board and 16MB RAM on I/O channel
- Dedicated Alternative RESET to prevent losing CMOS RAM data
- Intelligent DRAM BANK identification and swapping
- 208-Pin QFP, 0.8u CMOS Technology

2.2 Jumpers and Connectors

Jumpers / Connectors	Description
JP1	External Battery Connector
JP2	Display Type Select Connector
JP3	387SX Clock Select
JP5	Turbo Speed Connector
JP6	RESET Connector
JP7	TURBO LED Connector
JP8	Power LED and Keylock Connector
JP9	Speaker

SECTION 2

SPECIFICATION

2.2 Jumpers and Connectors

JP1 : External Battery Connector Pin Assignment

1	+6V DC
2	Not Used
3	Ground
4	Ground

JP2 : Display Type Select Connector Pin Assignment

Closed	Color	<Default>
Open	Monochrome	

JP3 : 387SX Clock Select Pin Assignment

1-2	Synchronous (CLK2)	<Default>
2-3	Asynchronous (OSC2)	

Note : If the speed of the CPU & Math Co-processor are in the same speed, then **JP3 1-2** should be connected.

If the speed of the CPU & Math Co-processor aren't in the same speed, then **JP3 2-3** should be connected. An additional oscillator needs to be added.

JP5 : TURBO Speed Connector

Closed	select high speed
Open	select low speed

JP6 : Reset Connector Pin Assignment

1	GND
2	Reset

JP7 : Turbo LED Connector Pin Assignment

1	Anode (+)
2	Cathode (-)

JP8 Power LED and Keylock Connector

1	LED Power
2	NC
3	Ground
4	Keyboard Inhibit
5	Ground

SECTION 2

SPECIFICATION

2.2 Jumpers and Connectors

JP9 Key Lock & Power LED Pin Assignment

1	Data
2	NC
3	Ground
4	+5V dc

2.3 Memory Configurations

Total Memory	SIMM1	SIMM2	SIMM3	SIMM4
512K	256K	256K	None	None
1M	256K	256K	256K	256K
1M	512K	512K	None	None
2M	512K	512K	512K	512K
2M	1M	1M	None	None
4M	1M	1M	1M	1M
8M	4M	4M	None	None
16M	4M	4M	4M	4M

2.4 Installation Procedures

1. Connect power supply connectors
2. Plug in keyboard connector to the keyboard receptacle at the back
3. Install monochrome or color graphic display card in expansion slot
4. Select monochrome or color at JP2
5. Connector monitor cable to display board
6. RC2016A-386SX has battery, however, you can plug in an external backup power back (+6Vdc) to external battery connector at the JP1
7. Plug in the 'Speaker' connector, 'Power LED' and 'Keylock' connector at the front
8. Turn on the monitor
9. Turn on the power supply

SECTION 2

SPECIFICATION

2.5 Installation of Co-processor

There is a 68 pin PLCC socket U9 for either Intel 80387 or Cyrix Cx387SLC Math co-processor. Make sure OSC2 is corrected when math co-processor is added into the main board. PT-319A System Board can support math co-processor running either in Synchronous or Asynchronous Mode.

Refer to the section of Jumper Configurations for correct installation. Double check the settings before power up the system board.

If any question found, please contact your local dealer for assistance.

SECTION 3

INPUT/OUTPUT CHANNEL SLOTS

The input/output channel of PT-319A supports:

- Refresh of system memory from channel microprocessors
- Selection of data accesses (either 8-bit or 16-bit)
- Interrupt
- DMA channels
- I/O wait-state generation
- Open-bus structure (allowing multiple microprocessors to share the system's resources including memory)

3.1 I/O address map

Hex range	Devices	Usage
000-01F	DMA controller 1	System
020-03F	Interrupt controller 1	System
040-05F	Timer	System
060-06F	8042 (Keyboard)	System
070-07F	Real time clock/NMI mask	System
080-09F	DAM page register	System
0A0-0BF	Interrupt controller 2	System
0C0-0DF	DMA controller 2	System
0F0	Clear math co-processor busy	System
0F1	Reset math co-processor	System
0F8-0FF	Math co-processor	System
1F0-1F8	Fixed disk	I/O
200-207	Game I/O	I/O
278-27F	Parallel printer port 2	I/O
2F8-2FF	Serial port 2	I/O
300-31F	Prototype card	I/O
360-36F	Reserved	I/O
378-37F	Parallel printer port 1	I/O
380-38F	SDLC, bisynchronous 2	I/O
3A0-3AF	Bisynchronous 1	I/O
3B0-3BF	Monochrome display and printer adapter	I/O
3C0-3CF	Reserved	I/O
3D0-3DF	Color/graphic monitor adapter	I/O
3F0-3F7	Floppy diskette controller	I/O
3F8-3FF	Serial port 1	I/O

SECTION 3

INPUT/OUTPUT CHANNEL SLOTS

3.2 62-Pin, 36-Pin I/O Bus

REAR PANEL			
GND	B1	-	A1 -I/O CH CK
RESET DRV	B2	-	A2 SD7
-5V DC	B3	-	A3 SD6
IRQ9	B4	-	A4 SD5
-5V DC	B5	-	A5 SD4
DRQ2	B6	-	A6 SD3
-12V DC	B7	-	A7 SD2
OVS	B8	-	A8 SD1
+12V DC	B9	-	A9 SD0
GND	B10	-	A10 -I/O CH RDY
-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
CLK	B20	-	A20 SA11
IRQ7	B22	-	A22 SA9
IRQ5	B24	-	A24 SA7
IRQ3	B25	-	A25 SA6
-DACK2	A26	-	A26 SA5
T/C	B27	-	A27 SA4
BALE	B28	-	A28 SA3
+5V DC	B29	-	A29 SA2
OSC	B30	-	A30 SA1
GND	B31	-	A31 SA0
-MEM CS16	D1	-	C1 SEBIE
-I/O CS16	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 SD08
-DACK6	D12	-	C12 SD09
DRQ6	D13	-	C13 SD10
-DACK7	D14	-	C14 SD11
DRQ7	D15	-	C15 SD12
+5V DC	D16	-	C16 SD13
- MASTER	D17	-	C17 SD14
GND	D18	-	C18 SD15

SECTION 4

HARDWARE COMPATIBILITY

4.1 System Timers

The system has three programmable timer/counters controlled by an Intel 8254-2 timer/counter chip. These are channel 0 through 2, defined as follows :

Channel 0	System timer
GATE 0	Tied on
CLK IN 0	1.190Mhz OSC
CLK OUT 0	8259A IRQ 0

Channel 1	Refresh Request Generator
GATE 1	Tied on
CLK IN 1	1.190Mhz OSC
CLK OUT 1	Request Refresh Cycle

Note : Channel is programmed to generate a 15 microsecond period signal.

Channel 2	Tone Generation for speaker
GATE 2	Controlled by bit 0 of hex 61 PPI bit
CLK IN 2	1.190Mhz OSC
CLK OUT 2	Used to drive the speaker

4.2 System Interrupts

Sixteen levels of system interrupts are provided by the 80286 NMI & two 8259A interrupt controller chips. The following shows the various interrupt-level assignments in decreasing priority :

Level	Function
Microprocessor NMI	Parity or I/O channel check
Interrupt controllers	
CTLR 1	CTLR 2
IRQ0	Timer output 0
IRQ1	Keyboard (Output buffer full)
IRQ2	Interrupt from CTLR 2
IRQ8	Real time clock interrupt
IRQ9	Software redirected to INT 0AH(IRQ 2)
IRQ10	Reserved
IRQ11	Reserved
IRQ12	Reserved
IRQ13	Numeric co-processor
IRQ14	Fixed disk controller
IRQ15	Reserved
IRQ3	Serial Port 2
IRQ4	Serial Port 1
IRQ5	Parallel Port 2
IRQ6	Diskette controller
IRQ7	Parallel port 1

SECTION 4

HARDWARE COMPATIBILITY

4.3 Direct Memory Access

Each DMA channels are supported by the system. Two Intel 8237-5 DMA controller chips (Four channels in each chip) are used. DMA channels are assigned as follows :

CTLR 1	CTLR 2
Ch 0-Spare	Ch 4-Cascade for CTLR 1
Ch 1-SDLC	Ch 5-Spare
Ch 2-Diskette	Ch 6-Spare
Ch 3-Spare	Ch 7-Spare

Channels from 0 through 3 are contained in DMA controller 1. Transfers of 8-bit data, 8-bit I/O adapters and 8-bit or 16-bit system memory are supported by these channels. Each of these channels will transfer data in 64KB block throughout the 16-megabyte system address space.

Channels from 4 through 7 are contained in DMA controller 2. To cascade channels 0 through 3 to the microprocessor, use channel 4. Transfer of 16-bit data between 16-bit adapters and 16-bit system memory are then supported by channels 5, 6 & 7. DMA channels from 5 through 7 transfer data in 128K blocks throughout the 16-megabyte system address space. These channels will not transfer data on odd-byte boundaries.

The address for the page register are as follows :

Page Register	I/O HEX address
DMA channel 0	0087
DMA channel 1	0083
DMA channel 2	0081
DMA channel 3	0082
DMA channel 5	008B
DMA channel 6	0089
DMA channel 7	008A
Refresh	008F

Address generation for the DMA channels is as follows :

For DMA channels 3 through 0 :

Source	DMA Page Registers 8237A-5
Address	A23.....A16 A15.....A1

For DMA channels 7 through 5 :

Source	DMA Page Registers 8237A-5
Address	A23 A17 A16.....A0

Note : The BIHE and A0 addressing signals are forced to a logic 0. DMA channel addressees do not increase or decrease through page boundaries (64KB for channels 0 through 3 and 128KB for channels 5 through 7).

SECTION 4

HARDWARE COMPATIBILITY

4.4 Real Time Clock and Non-volatile RAM

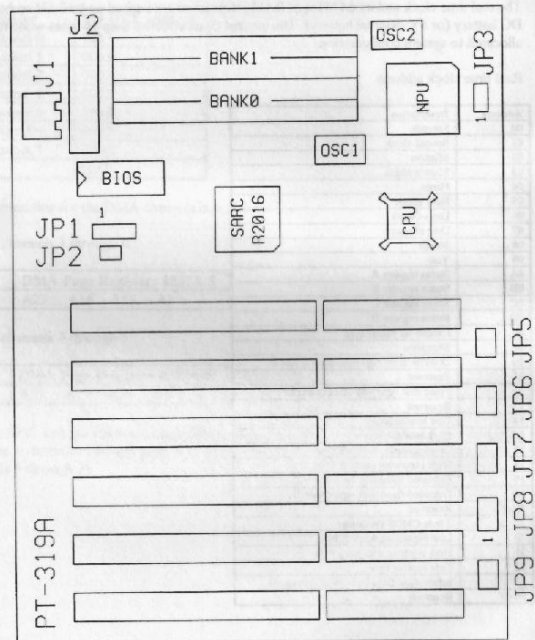
The real time clock and its 64 bytes of RAM information are backed up by 3.6V rechargeable DC battery (or 6V external battery). The internal clock circuitry uses 14 bytes while the rest is allocated to system configuration.

Real time clock address :

Address	Description
00	Seconds
01	Second alarm
02	Minutes
03	Minute alarm
04	Hours
05	Hour alarm
06	Day of week
07	Date of month
08	Month
09	Year
0A	Status register A
0B	Status register B
0C	Status register C
0D	Status register D
0E	Diagnostic Status byte
0F	Shutdown
10	Diskette drive type byte-drive A and B
11	Reserved
12	Fixed disk type byte-drive C and D
13	Reserved
14	Low base memory
16	High base memory
17	Low expansion memory byte
18	High expansion memory byte
19	Extended fixed disk type-driver C
1A	Extended fixed disk type-driver D
1B-2D	Reserved
2E-2F	2 byte CMOS checksum
30	Low expansion memory byte
31	High expansion memory byte
32	Data century byte
33	Information flags (set during power on)
34-3F	Reserved

SECTION 5

LAYOUT DIAGRAM



SECTION 6

BIOS Setup

6.1 About CMOS Setup

Once the mainboard has been integrated into a system, you must run the mainboard's Setup program to record and/or change configuration information, such as the current date and time or your hard disk drive type. The Setup program is stored in read-only memory (ROM), and can only be accessed when you turn on or reset the system.

The settings you specify with the Setup program are recorded in a special area of memory called CMOS RAM. This memory is backed up by a battery so that it will not be erased when you turn off or reset the system. Whenever you turn on the power, the system reads the settings stored in CMOS RAM and compares them to the equipment check conducted during the POST. If an error occurs, an error message will be displayed on screen, and you will be prompted to run the Setup program.

The BIOS Setup program is accessed through a menu which allows you to easily configure your system. Standard CMOS Setup allows you to record basic system information regarding date and time, video type and installed drives. Advanced CMOS Setup gives you access to the advanced features supported by the BIOS and your mainboard's RC2016A-386SX chipset.

6.2 Entering CMOS Setup

After powering on the system and in the course of the system POST, you will be presented with the screen depicted below.

- To enter the Setup program at this time, press the [Del] key. This will display the first page of the AMI BIOS Setup menu, which is illustrated on the next page.
- If you do not press these keys at the correct time and the system boots, press [Ctrl-Alt-Del] to restart the system and try again.
- If you do not press the key at the correct time and the system fails to boot, an error message will be displayed (such as KEYBOARD ERROR) and you will again be asked to

RUN SETUP UTILITY

Press <F1> to resume

This is normal. Press [Ctrl-Alt-Del] at this time to restart the system and then enter Setup by pressing the [Del] key.

SECTION 6

BIOS SETUP

6.2 Entering CMOS Setup

- After you enter Setup, you will be presented with the main menu of the AMI Setup program, which is pictured below.
- Select Standard CMOS Setup to access the Standard CMOS Setup menu, which is discussed in section 6.4 below.
- Select Advanced CMOS Setup to access the Advanced CMOS Setup menu, which is discussed in section 6.5 below.

The Advanced Chipset Setup menu option is not implemented.

- Select Auto Configuration with BIOS Defaults to load the default system values. You will be prompted for confirmation, and notified that the values have been loaded.
- Select Auto Configuration with Power-On Defaults to load the default power-on values, which disable all performance options. This option serves a useful diagnostic function in the event of a compatibility problem. You will be prompted for confirmation, and notified that the values have been loaded.
- Select Change Password to access the password security menu, which is discussed in section 6.6 below.
- Select Hard Disk Utility to access the hard disk utility menu, which is discussed in section 6.7 below.
- Select Write to CMOS and Exit to save your configuration and exit the Setup program. You will be prompted for confirmation before the changes are written to CMOS and the system reboots.
- Select Do Not Write to CMOS and Exit to cancel any changes to your configuration and exit the Setup program. You will be prompted for confirmation before the system reboots.

6.3 Getting Help

- Help screens are displayed for each option in the Standard CMOS Setup menu, and can be accessed in the Advanced CMOS Setup menu by pressing [F1]. A "pop-up" window will appear, similar to the one pictured below, listing the available selections for that option. To exit the Help window, press any key.
- If you have trouble reading the Setup menu, toggle the menu colors by pressing [F2] for background color and [F3] for foreground color.

SECTION 6

BIOS SETUP

6.4 Using Setup

The following keys and key combinations are used to maneuver among Setup options and to change values.

To move the highlight bar from one option to another, use cursor (or arrow) keys, with [NumLock] turned off.

- Press [PgUp] or [PgDn] to change the value of option.
- Press the [Esc] key to exit back to the AMI Setup program's main menu.
- Press [F5] to restore the values that were resident when the Setup program was entered.

6.5 Standard CMOS Setup

The Standard CMOS Setup menu allows you to specify the following system configuration information:

Date and time. Enter the date and time, respectively.

Daylight saving. Choose Enabled or Disable.

Hard disk C: and D: type. The BIOS supports 47 fixed disk drive types, 46 of which are predefined in the ROM-resident table. If your hard disk type is not directly supported, you may need to manually enter the correct parameters (heads, cylinders, sectors, write precompensation, and landing zone) under type 47. If no hard drive is installed, select Not Installed.

- Floppy drive A: and B: Enter the diskette configuration your system is equipped with. If no floppy drive is installed, select Not Installed.
- Primary display. Enter the type of video display adapter you have connected to your system. The AMI BIOS will usually auto detect the correct type.
- Keyboard. Choose Installed or Not Installed (e.g. for a file server), as appropriate.

SECTION 6

BIOS SETUP

6.6 Advanced CMOS Setup

The Advanced CMOS Setup menu allows you to set various BIOS and chipset performance options, as illustrated and described below.

AMIBIOS SETUP PROGRAM - ADVANCED CMOS SETUP			
(C)1992 American Megatrends Inc., All Rights Reserved			
Typematic Rate Programming	: Disabled	Cyrix cache	: Disabled
Typematic Rate Delay (msec)	: 500	ATEUS Stepping	: Enabled
Typematic Rate (Chars/Sec)	: 15	Refresh (rate burst)	: 8 burst4
Above 1 MB Memory Test	: Disabled	Ras Precharge time	: CLK2 * 4
Memory Test Tick Sound	: Enabled	Ras to Cas Width	: CLK2 * 4
Memory Parity Error Check	: Enabled		
Hit Message Display	: Enabled		
Hard Disk Type 47 RAM Area	: 0:300		
Wait for <F1> If Any Error	: Enabled		
System Boot Up Num Lock	: On		
Numeric Processor Test	: Disabled		
Floppy Drive Seek At Boot	: Disabled		
System Boot Up Sequence	: C, A:		
Fast Gate A20 Option	: Disabled		
Password Checking Option	: Setup		
Video ROM Shadow C000,32K	: Disabled		
System ROM Shadow F000,64K	: Disabled		
Fast reset	: Disabled		

Sel (Ctrl)Pu/Pd:Modify F1:Help F2/F3:Color
 F5:Old Values F6:BIOS Setup Defaults F7:Power-On Defaults

- Typematic Rate Programming. This option enables or disables programming of the keystroke repeat rate, which is adjusted by means of the next two options.
- Typematic Rate Delay (msecs). If Typematic Rate Programming is enabled, this option allows you to specify the delay between holding down a key and when the character begins repeating.
- Typematic Rate (Char/Sec). If Typematic Rate Programming is enabled, this option allows you to specify the rate at which a character keeps repeating.
- Above 1MB Memory Test. When Enable this option causes memory above 1MB to be checked during the POST. If Disable, only the first 1MB is checked during the POST.
- Memory Test Tick Sound. This option enables or disables an audible sound during the POST memory test.
- Memory Parity Error Check. This option enables or disables BIOS memory parity error checking routines.
- Hit Message Display. Disable this option to prevent the "Hit , If you want to run Setup" message from appearing on screen after the POST.

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BIOS SETUP

6.6 Advanced CMOS Setup

- Hard Disk Type 47 RAM Area. Select 0:300 unless your system is running a network operation system which uses the 0:300 address for system operations.
- Wait for <F1> If Any Error. Disable this option to eliminated the need for any user response to a non-fatal error condition during the POST.
- System Boot Up Num Lock. Select On or Off to enable or disable the keyboard NumLock switch.
- Numeric Processor. Select Installed if you have installed an 80387SX numeric co-processor.
- Floppy Drive Seek at Boot. Select Disabled to speed up the boot process and prevent possible damage to the diskette drive heads.

- **System Boot Up Sequence.** As a general guideline, select A then C (A:, C:) if you will normally boot the operating system from a floppy disk. Select C then A (C:, A:) if you will normally boot the operating system from the hard disk drive.
- **Gate A20 Emulation** Gate-A20 is controlled by Chipset.
- **Password Checking Option.** This allows you to optionally limit access to the system or to the Setup program alone. If you enable security by selecting Always or Setup, access to the system and/or the Setup program is restricted to valid password entry.
- **Video ROM Shadow.** This option allows you to shadow the video BIOS address range from C000h to C7FFh. Shadow RAM is a technique that copies slower 8-bit or 16-bit ROMs to faster RAM system memory. Unless you encounter a compatibility problem, you should enable video ROM shadowing to improve performance.
- **System ROM Shadow.** This option allows you to shadow the system BIOS address range from F000h to FFFFh. Shadow RAM is a technique that copies slower 8-bit or 16-bit ROMs to faster RAM system memory. Unless you encounter a compatibility problem, you should enable system ROM shadowing to improve performance.

SECTION 6

BIOS SETUP

6.6 Advanced CMOS Setup

- **Memory Wait State.** This option allows you to enable or disable a DRAM access wait-state. Unless you encounter a compatibility problem, you should set this option to Disabled for improved performance.

6.7 Changing the Password

If the Password Checking Option under the Advanced CMOS Setup menu is set to either Always or Setup, password entry is required every time the system boots or an attempt is made to enter the Setup program, respectively. The Change Password menu allows you to change the current password, as illustrated below.

- To change the current password, select the Change Password menu option from the Setup main menu. You will be prompted to enter the old password before gaining access. If this is the first time you attempt to change passwords, the default password is AMI.
- After entering the correct current password, you will be prompted to enter a new password. The password can be no longer than 6 characters. After entering the new password, you will be prompted to enter it a second time for confirmation. If the second entry matches the first, you will be notified that the new password has been installed.

If you forget or lose your password, the only way to access the system and/or Setup program is to discharge the CMOS battery. When the CMOS battery becomes corrupted or is discharged, the default password becomes AMI.

SECTION 6

BIOS SETUP

6.8 Hard Disk Utility

If the Hard Disk Utility menu is selected from the Setup main menu, you will be presented with three options: Hard Disk Format, Auto Interleave, and Media Analysis. Performing any of these operations will destroy all data on the hard disk, so be sure to backup your data before selecting any of these options.

- **Hard Disk Format.** This option performs a low-level format if the hard disk. Note that many hard drives are factory low-level formatted, and should not be re-formatted. Check with your hard disk manufacturer before selecting this option.
- **Auto Interleave.** This option determines the optimum inter-leave factor prior to a low-level format of the hard disk.
- **Media Analysis.** This option analyzes each track on the hard disk to determine if it is usable. If it is unusable, the track is marked as "bad" so that the system will not write data to it. Many manufacturers provide a list of bad tracks so that this step may not be necessary.

IDE and SCSI hard drive should not normally be low-level formatted. Refer to your hard disk dealer or manufacturer before using the AMI Hard Disk Utility.

6.9 Exiting Setup

- To exit Setup, press [Esc] to return to the Setup main menu.
- To save your changes and exit Setup, select Write to CMOS and Exit.
- To exit Setup without saving your changes, select Do Not Write to CMOS and Exit.