AMI

AMI Mark IV

Screamer Guide

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Preface

To the OEM

The AMI Mark IV Screamer system is a state of the art combination of a motherboard and CPU Cards that includes the AMI Hi-Flex BIOS. It is assumed that you have also licensed the rights to use the AMI documentation for the AMI Mark IV Screamer.

This manual was written for the OEM. It is the purpose of this manual to assist in the proper installation, use, and operation of the Mark IV Screamer board products. This manual describes the many features of the Mark IV Screamer. It explains how to connect the cables to the board and how to use the AMI Hi-Flex BIOS.

This manual is not meant to be read by the computer owner who purchases a computer with the Mark IV Screamer. It is assumed that you, the computer manufacturer, will use this manual as a sourcebook of information, and that parts of this manual will be included in the computer owner's manual.

Technical Support

If an Mark IV Screamer board fails to operate as described or you need more information, call the AMI technical support staff at 404-246-8600.

Acknowledgments

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Chapter 1

Introduction

Overview

The AMI 80386/80486 Mark IV Screamer is an AT-Compatible motherboard with an Intel 80386 processor.

Motherboard Size

The AMI Mark IV Screamer motherboard is approximately 13 inches wide by 12 inches high. It is the same size as a standard AT motherboard.

Features

Easily Upgraded

The AMI Mark IV Screamer can easily be converted to an 80486 with an 80486 Adapter Card. The motherboard contains sockets for both Intel 80387 and Weitek math coprocessors.

Memory

The AMI Mark IV supports up to 64 MB of memory on the motherboard. The Mark IV can support combinations of 256 KB x 9, 1 MB x 9, and 4 MB x 9 SIMM modules.

Cache Memory

The AMI Mark IV can use either 64 KB or 256 KB of cache memory, operating at 0 wait states for both read and write operations. The AMI cache circuitry uses a write-back algorithm for increased performance.

AMI Mark IV Description

The AMI Mark IV Screamer:

- operates with either an Intel or AMD 80386 or Intel 80486 microprocessor

- supports the following processor clock speeds:

High	80386 at 25, 33, or 40 MHz
	80486 at 25 or 33 MHz
Low	8 MHz

- supports keyboard or pushbutton processor speed switching

- memory cache operates at 0 wait state on cache read and write

- has a 64 KB or 256 KB cache memory that can cache a 64 MB memory address space

- supports RAM shadowing for system BIOS, video BIOS and option ROMs

* access 32-, 16-, and 8-bit memory devices and 16- and 8-bit I/O devices

- supports up to 64 MB on the motherboard using 4 MB SIMMs.

- supports 256 KB, 1 MB, or 4 MB fast page mode SIMMs

- BIOS Setup and hard disk utilities

- optional Intel 80387/Weitek 3167 Numeric Coprocessor support onboard, Weitek 4167 support on proprietary AMI 80486/Coprocessor card.

- option 64K ROM/EPROM socket to be accessed at E000h.

- 128 byte of CMOS RAM for system configuration data with battery backup for configuration data

AMI Mark IV Description, Continued

- system support function:
  - seven Direct Memory Access (DMA) channels, channels 0-3 for 8-bit data transfer and channel 5-7 for 16-bit data transfer)
  - three programmable timers
  - system clock
- real-time clock
- keyboard locking
- 8 MHz I/O bus timing compatibility for AT compatible expansion slots at 25/33 MHz
- expansion slots
  - six 16-bit slots
  - two 8-bit slots
  - AMI Proprietary daughterboard slot for Intel 80486 and Weitek Coprocessors
- 26-bit memory addresses to access 64 MB. With 8/16-bit memory cards, 24-bit memory addresses can access an additional 16 MB.
- supports eleven interrupt levels (IRQ 3 - IRQ 7, IRQ 9 - IRQ 12, IRQ 14, and IRQ 15).
- I/O channel check to generate NMI
- I/O wait state generation
- open bus structure (allowing multiple microprocessors to share the system resources, including memory)
- refresh of system memory from channel microprocessors

Memory Configurations

Total Memory	Number of SIMM Modules	Type of SIMMs
1 MB	4	256 KB x 9
2 MB	8	256 KB x 9
4 MB	4	1 MB x 9
6 MB	4 4	1 MB x 9 256 KB x 9
8 MB	8	1 MS SIMMs
10 MB	8 8	1 MB SIMMs 256 KB SIMMs
12 MB	12	1 MB SIMMs
16 MB	16	1 MB x 9 SIMMs
18 MB	4	4 MB x 9 SIMMs
24 MB	4 8	4 MB x 9 SIMMs 1 MB x 9 SIMMs
32 MB	8	4 MB x 9 SIMMs
34 MB	8 8	4 MB x 9 SIMMs 256 KB x 9 SIMMs
36 MB	8 4	4 MB x 9 SIMMs 1 MB x 9 SIMMs
40 MB	8 8	4 MB x 9 SIMMs 1 MB x 9 SIMMs
48 MB	12	4 MB x 9 SIMMs
64 MB	16	4 MB x 9 SIMMs

Chapter 2

Installation

Unpacking

The AMI 386 AT Mark IV main processor board contains sensitive electronic components which can be easily damaged by static electricity. Follow the instructions carefully to ensure correct installation and to avoid static damage.

Step	Action
1.	Inspect the cardboard carton for obvious damage. If damaged, call AMI Technical Services at 404-263-8181. Leave the Mark IV board in its original packing until you are ready to install it.
2.	Perform all unpacking and installation procedures on a ground connected anti-static mat. The operator should wear an anti-static wristband, grounded at the same point as the anti-static mat. Or use a sheet of conductive aluminum foil grounded through a 1 megaohm resistor instead of the anti-static mat. Similarly, a strip of conductive aluminum foil wrapped around the wrist and grounded through a 1 megaohm resistor serves the same purpose as the wrist-band.
3.	Inside the carton, the Mark IV board is packed in an anti-static bag, and sandwiched between sheets of sponge. Remove the sponge and remove the anti-static bag. Place the Mark IV board on a grounded anti-static surface component-side up. Save the original packing material in case of reshipment.
4.	Inspect the board for damage. Press down on all ICs mounted in sockets to verify proper seating. Do not apply power to the board if it has been damaged.
5.	If the board is undamaged, it is ready to be installed.

Troubleshooting

Technical Support Calls

Before you call AMI technical support, have the following information available:

Serial number and revision number of the board
DIP and SIMM memory types and speed
System BIOS reference number
List of adapter cards installed to the system
A clear description of the problem.

Installation

Standoffs and mounting screws are not supplied with the Mark IV board.

Set all user-configurable jumpers and switches and install coprocessors before attempting to install the board into a chassis.

Mark IV Motherboard Graphic

Refer to the graphic of the Mark IV motherboard during installation.

Mark IV Layout

Assembly Steps

The steps for assembling a system that uses the Mark IV motherboard and optional CPU card are shown in the following table. Each step is discussed in detail in the following pages.

Step	Action	Turn to
1.	Set initial switch settings	Page 9
2.	Install SIMMs	Page 9
3.	Install motherboard	Page 11
4.	Connect the power supply	Page 13
5.	Connect the keyboard	Page 15
6.	Connect the mouse	Page 15
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8.	Install adapter cards	Page 18
9.	Install floppy disk drives	Page 21
10.	Install hard disk drives	Page 23
11.	Perform initial test and configuration	Page 24

Step 1 Set Initial Switch Settings

The only switch on the Mark IV motherboard is labeled SW1, which is the manufacturing test switch and should always be set off. The AMI Mark IV motherboard is shipped with factory set jumper and switch settings.

SW1

The 2-position switch labeled DIAG is used for factory testing only. It must be Off.

COL/MONO

This switch sets the type of video display adapter in the system. This switch is factory set Off for a Monochrome display. Set On to use a color display (CGA). The switch has no effect with EGA or VGA.

J2, J3

J2 and J3 are three-pin bergs. The factory setting is pins 1 and 2 shorted by a jumper block.

Step 2 Install SIMMs

The AMI Mark IV motherboard memory system consists of four 32-bit Dynamic Random Access Memory (DRAM) memory banks. Both banks are designed to use Single inline memory module (SIMM) DRAMs. Use either 1 MB x 9 or 4 MB x 9 SIMMs. All SIMMs must support Column address strobe (CAS) before Row address strobe (RAS) refresh and should have Fast page mode accessing capability. The possible Mark IV memory configurations are shown on page .

There must be an even number of SIMM modules (two, four, six, or eight) installed on the motherboard. The minimum number of SIMMs is two. For maximum speed, SIMM modules should be installed in groups of four. Each group of two modules is a bank. 256 KB x 9, 1 MB x 9, 4 MB x 9, or 16 MB x 9 SIMMs can be used. Both modules in a given bank must be the same size. If 256 KB x 9 modules are used, place them in the lower banks first.

Step 2 Install SIMMs, Continued

Installing SIMM Modules

The SIMM modules must be installed or removed with care to make sure that the sockets are not damaged. The latching tabs on the sockets must be handled carefully. Make sure the SIMMs are firmly in place for reliable operation. Make sure that the modules do not interfere with adjacent expansion slots. See the following figure.

Install the SIMMs by gently sliding them in the socket. Tilt the SIMMs (in the direction away from the latching tangs). Once the modules are seated, move them towards the tangs till they snap in place. This does not require much force. The SIMM memory modules are keyed so that it is not possible to install them incorrectly.

SIMM Part Numbers

Use fast page SIMMs with 20 ns CAS access time (tCAS = 20 ns). The RAS access time should be 80 or 100 ns (tRAS = 70/80 ns).

SIMM Type	Manufacturer	Part Number
1 MBx9 80 ns	Siemens Toshiba Mitsubishi NEC Fujitsu	HYB511000AJ-80 THM91000AS-80 MH1M09A0JA-80 MC-421000A9-80 MB85235-80
4 MBx9 80 ns	Toshiba Toshiba OKI NEC	THM94000AS-80 THM94000AS-80 G44000EM9-80 MC-424100A98-80

SIMM Types with J3 Open

The tables below provide the possible memory configurations for the AMI Mark IV Screamer. There are two variables, the jumper PAL in J3 and PAL U68.

Banks 3 and 4 only take 1 or 4 MB SIMMs. These types of SIMMs can be used if PAL M00B2411 is in U68 and J3 is open. SIMM types cannot be mixed within a memory bank.

Bank 1	Bank 2	Bank 3	Bank 4	Total Memory
1 MB	None	None	None	4 MB
1 MB	1 MB	None	None	8 MB (relocatable)
1 MB	1 MB	1 MB	None	12 MB
1 MB	1 MB	1 MB	1 MB	16 MB
1 MB	1 MB	4 MB	None	24 MB
1 MB	1 MB	4 MB	4 MB	40 MB
4 MB	None	None	None	16 MB (relocatable)
4 MB	4 MB	None	None	32 MB (relocatable)
4 MB	4 MB	1 MB	None	36 MB
4 MB	4 MB	1 MB	1 MB	40 MB
4 MB	4 MB	4 MB	4 MB	64 MB (relocatable)

SIMM Types with J3 Jumpered

These types of SIMMs can be used if M01B2411 is in U68 and J3 is jumpered. SIMM types cannot be mixed within a memory bank.

Bank 1	Bank 2	Bank 3	Bank 4	Total Memory
256 KB	None	None	None	1 MB (relocatable)
256 KB	256 KB	None	None	2 MB (relocatable)
256 KB	256 KB	None	None	6 MB (relocatable)
256 KB	256 KB	1 MB	1 MB	10 MB (relocatable)
256 KB	256 KB	None	None	18 MB
256 KB	256 KB	4 MB	4 MB	34 MB
1 MB	None	None	None	4 MB (relocatable)
1 MB	1 MB	None	None	8 MB (relocatable)
1 MB	1 MB	None	None	12 MB
1 MB	1 MB	1 MB	1 MB	16 MB
1 MB	1 MB	None	None	24 MB
1 MB	1 MB	4 MB	4 MB	40 MB

Step 3 Install Motherboard

The motherboard can be installed in the case after the SIMMs are installed. The board should be oriented so that the keyboard connector and the expansion slot connectors are near the back of the case. The Mark IV motherboard is not supplied with mounting hardware, which normally comes with the case. The hardware typically contains screws and standoffs to firmly mount the chassis as well as insulate it from the case. At least one of the mounting holes must have a metal standoff which will securely ground the motherboard to the chassis.

Caution
Before proceeding, attach a ground wire from any bare metal area on the main chassis to the same grounding point as the wrist strap. This will protect the motherboard from electrostatic discharge.

Mounting Hardware

The AMI Mark IV motherboard will fit in any standard Baby AT board chassis. All required mounting hardware should have been supplied with the chassis. No hardware is supplied with the motherboard. Remove the chassis cover and position the chassis beside the board.

Carefully position the board inside the case. Determine the position of the holes for the plastic standoffs. Place the motherboard on a piece of the shipping foam and firmly press the standoffs into the required holes until the locking pins snap in place. On the chassis, install the plastic edge supports in the required holes. Install the metal standoffs in the drilled screw holes on the chassis. Do not strip the threads.

Slide the motherboard into the chassis, making sure that the stand-offs fit in the slots. Make sure that the motherboard is level with the chassis. The edge of the motherboard should fit in the mounted plastic clips. If the motherboard is not seated properly, remove it carefully and try again.

Put the two motherboard mounting screws in the holes provided for them and tighten them. The motherboard can be shifted slightly to align the screw mounting holes on the motherboard with those on the chassis.

Step 4 Connect the Power Supply

The power supply should match the physical configuration of the chassis. Make sure that the power switch is Off.

Before attaching all components, make sure that the proper voltage has been selected. Power supplies often can run on a wide range of voltages, but must be set (usually with a switch) to the proper range. Use at least a 200 watt (or larger) power supply, which should have built-in filters to suppress radiated emissions. The filters will help pass the appropriate FCC certification testing.

The power supply is connected to P8 and P9 on the motherboard. The connectors should be keyed to prevent mistakes. The keys on the connector must be cut to fit in some power supplies.

See the figure above for the location of connectors P8 and P9, standard 6-pin power supply connectors. AT-compatible power supplies have two 6-pin connectors that are inserted in P8 and P9. The 6-pin connector with 3 red wires and 2 black wires is connected to P9 and the remaining 6-pin connector is connected to P8.

Step 4 Connect the Power Supply, Continued

P8 and P9 Power Supply Connectors

P8 and P9 are 6-pin Power Supply Connectors. The power supply connectors are polarized to avoid insertion of the wrong cable.

P8 Pinout

Pin	Assignment
1	Power good
2	VCC
3	+12 volts
4	-12 volts
5	Ground
6	Ground

P9

Pin	Assignment
1	Ground
2	Ground
3	- 5 volts
4	VCC
5	VCC
6	VCC

Step 5 Connect the Keyboard

The keyboard connector is a 5-pin DIN socket and is labeled KEYBRD on the motherboard. It will accept a regular IBM AT-compatible keyboard. A 5-pin DIN to 6-pin mini DIN converter is needed to connect a PS/2-type keyboard.

J11 Keyboard Connector

J11 is a 5-pin DIN socket. Connect an IBM AT compatible keyboard cable to J11.

Pin	Assignment
1	Keyboard clock
2	Keyboard Data
3	Not used
4	Ground
5	VCC

Step 6 Connect the Mouse

The mouse connector is a 6-pin mini DIN socket. PS/2-compatible mouses can be connected to this socket.

Step 7 Connect Cables

When connecting chassis connectors to the motherboard, make sure the correct connector end. Most connector wires are color-coded. Match the color of the wires leaving the switch or LED to the same pin on the connector end. There can be two connectors with the same color-coded wires. Follow the wire to the switch or LED.

Pin 1 of all connectors is labeled to identify the pin orientation when plugging in cables. See the following graphic.

The following cables should be connected to the motherboard from the chassis:

- Reset Switch cable to J5
- Speaker cable to J4.
- Keyboard Lock cable to J7.

Connect the Reset Button Connector

J5 is a 2-pin single-inline berg. When this button is pressed, the system does a hard reset. Pin 1 is Hard reset and pin 2 is Ground.

Connect the Speaker Cable

J4 is a 4 pin single-in-line berg. The AMI BIOS signals hardware problems through the speaker. Pin 1 on the motherboard is labeled by a plus (+).

Pin	Description
1	Data Out
2	Key
3	Ground
4	VCC

Connect the Keyboard Lock Connector

J7 is a 5-pin single-inline berg. The keyboard lock allows the user to lock the keyboard, protecting the system from unauthorized use. This connector is keyed with a blank hole. Pin 1 on the motherboard is labeled with a plus (+) sign.

Pin	Description
1	LED power
2	Key
3	Ground
4	Keyboard Inhibit
5	Ground

J6 Turbo LED Connector

J6 is a 2 pin single-inline berg. The Turbo LED is lit when the processor is running at high speed. Pin 1 is Clock speed and Pin 2 is LED power.

J8 Test Connector

J8 is a 2-pin single-inline berg. This connector is used for manufacturing testing and must remain open.

J9 Option ROM Enable

J9 is a 2 pin single-inline berg. This jumper is used to enable option ROM. If installed, the option ROM (27512-200) is enabled for access at E000:0000h to E000:FFFFh.

J10 AMI 80486/Coprocessor Adapter Socket

J10 is a 140-pin 4 row socket for the AMI 80486/Coprocessor card.

Step 7 Connect Cables, Continued

J1 Battery Connector

J1 is a 4-pin single-inline berg. Connect a 6 Volt Battery pack to this connector.
Ensure that the positive (+) terminal, normally indicated by a red wire, of the battery connects to the pin marked + on J1.

Pin	Assignment
1	6 Volt DC
2	Not used
3	Not used
4	Ground

J2 Test Connector

J2 is a 2 pin single-inline berg. This connector is used for manufacturing test and must remain open.

J3 Test Connector

J3 is a 2 pin single-inline berg. This connector is set at the factory. Do not change this setting.

Serial Ports

The serial port pinout is shown below.

Pin	Use	Pin	Use
1	Carrier Detect	2	Data Set Ready
3	Receive Data	4	Request to Send
5	Transmit Data	6	Clear to Send
7	Data Terminal Ready	8	Ring Indicator
9	GND	10	Key (N/C)

J8 Parallel Port for Printer

Pin	Use	Pin	Use
1	-STROBE	2	-AUTOFEED
3	PD0	4	-ERROR
5	PD1	6	-INIT
7	PD2	8	-SLCTIN
9	PD3	10	GND
11	PD4	12	GND
13	PD5	14	GND
15	PD6	16	GND
17	PD7	18	GND
19	-ACK	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	N/C

Step 8 Install Adapter Cards

The Mark IV board contains several peripheral controllers. For maximum efficiency, these controllers should be used instead of adapter cards. The board supplies controllers for 2 serial, 1 Centronics-compatible parallel, and floppy disk drives. Use the AMI Hi-Flex BIOS Setup to disable the controllers if you do not want to use them.

The AMI 80386/80486 Mark IV Screamer uses standard adapter cards. The cards can be any IBM compatible 8-bit or 16-bit Adapter Card. These cards plug into the expansion slots on the AMI 80386/80486 Mark IV Screamer.

In addition to the normal expansion slots, the AMI 80386/80486 Mark IV Screamer provides one proprietary connector for the AMI 80486/Coprocessor Adapter Board.

The AMI Mark IV motherboard provides full compatibility with all IBM XT or AT compatible adapter cards. It will also take 16 adapter cards. The AMI Mark IV motherboard has seven 16-bit AT-Compatible slots and one 8-bit ISA (XT compatible) slot. The slots are numbered on the motherboard from Slot 1 through Slot 7. The AT slots can accept 8/16 bit ISA (XT or AT compatible) adapter cards. The slots are described below:

If using an adapter card disk controller, install it in the 16-bit slot closest to the keyboard connector. Installing the disk controller in this slot improves the timing margin slightly. The other slots can then be used on a best fit basis for the other cards.

In addition to the normal expansion slots, the AMI 80386/80486 Mark IV Screamer has a proprietary connector for the AMI 80486/Coprocessor Adapter Board.

16-bit Adapter Card Slots

JA1-JA9, JA2-JA10, JA5-JA11, JA6-JA12, JA7-JA13, and JA8-JA14 are 62+36 pin expansion slot connectors that can be used for either 16-bit or 8-bit adapter cards.

8-bit Adapter Card Slots

JA3 and JA4 are 62 pin expansion slot connectors used for 8-bit adapter cards.

Adapter Card Pinout

Pin	Use	Pin	Use
A1	IOCHCK-	B1	GND
A2	SD07	B2	RSTDRV
A3	SD06	B3	+5
A4	SD05	B4	IRQ9
A5	SD04	B5	-5
A6	SD03	B6	DREQ2
A7	SD02	B7	-12
A8	SD01	B8	OWS-
A9	SD00	B9	+12
A10	IOCHRDY	B10	GND
A11	AEN	B11	SMEMW-
A12	SA19	B12	SMEMR-
A13	SA18	B13	IOW-
A14	SA17	B14	IOR-
A15	SA16	B15	DACK3-
A16	SA15	B16	DREQ3
A17	SA14	B17	DACK1-
A18	SA13	B18	DREQ1
A19	SA12	B19	REF-
A20	SA11	B20	SYSCLK
A21	SA10	B21	IRQ7
A22	SA09	B22	IRQ6
A23	SA08	B23	IRQ5
A24	SA07	B24	IRQ4
A25	SA06	B25	IRQ3
A26	SA05	B26	DACK2-
A27	SA04	B27	T/C
A28	SA03	B28	BALE
A29	SA02	B29	+5
A30	SA01	B30	OSC
A31	SA00	B31	GND

Adapter Card Pinout, Cont'd

Pin	**Use**	**Pin**	**Use**
C1	SBHE-	D1	MEMCS16-
C2	LA23	D2	IOCS16-
C3	LA22	D3	IRQ10
C4	LA21	D4	IRQ11
C5	LA20	D5	IRQ12
C6	LA19	D6	IRQ13
C7	LA18	D7	IRQ14
C8	LA17	D8	DACK0-
C9	MEMR-	D9	DREQ0
C10	MEMW-	D10	DACK5-
C11	SD08	D11	DREQ5
C12	SD09	D12	DACK6-
C13	SD10	D13	DREQ6
C14	SD11	D14	DACK7-
C15	SD12	D15	DREQ7
C16	SD13	D16	+5
C17	SD14	D17	MASTER-
C18	SD15	D18	GND

Step 9 Install Floppy Disk Drive

Floppy Pinout

Pin	Use	Pin	Use
1	GND	2	RPM/LC
3	GND	4	N/C
5	GND	6	N/C
7	GND	8	-INDEX
9	GND	10	-MOTOR0
11	GND	12	-FDSEL1
13	GND	14	-FDSEL0
15	GND	16	-MOTOR1
17	GND	18	DIR
19	GND	20	-STEP
21	GND	22	-WDATA
23	GND	24	-WGATE
25	GND	26	-TRK0
27	GND	28	-WRPROT
29	GND	30	-RDATA
31	GND	32	HDSEL
33	GND	34	DSKCHNG

Twist in Floppy Cable

Floppy B to Floppy A	Floppy B to Floppy A	Floppy B to Floppy A	Floppy B to Floppy A
10 to 16	12 to 14	14 to 12	16 to 10
11 to 15	13 to 13	15 to 11	

Step 10 Install Hard Disk Drive

The hard disk drives should be attached to the chassis using the mounting hardware supplied with the drives or the chassis. The drives need mounting guides before they can be attached to the chassis. Mounting guides should be supplied with either the drive or the chassis. Attach the cable to a hard disk controller card.

Hard Disk Drive Connector Pinout

Pin	Use	Pin	Use
1	-RESET	2	GND
3	DATA7	4	DATA8
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	KEY (N/C)
21	N/C	22	GND
23	-IOW	24	GND
25	-IOR	26	GND
27	N/C	28	ALE
29	N/C	30	GND
31	INT14	32	-IOCS16
33	HA1	34	N/C
35	HA0	36	HA2
37	-CS0	38	-CS1
39	-IDEACT	40	GND

Step 11 Perform Initial Test and Configuration

Install the necessary blank panels on the back of the chassis. Failing to install the covers permits electromagnetic energy to escape.

Plug everything in and turn on the switch. If there are any signs of a problem, turn off the unit immediately.

The monitor should come on. The BIOS Power On Self Test (POST) should run. If POST does not run successfully, it will beep or display error messages. If the unit needs to be configured, instructions on how to enter Setup are displayed.

If configuration is necessary, run Setup, provide the requested information and save the configuration data in CMOS RAM. The system will then reset, run POST, and boot the operating system.

In Case of Errors

If the system beeps during POST (power on self test), a serious problem exists with the system configuration or hardware. The beeps are part of a Beep Code (see Page) that almost always indicates a bad component or that the system must be reconfigured. If a beep code sounds, make sure the affected part is properly seated and connected. An error message can appear on the monitor if the error is non-fatal. See the BIOS non-fatal error messages on page . Recheck the system configuration or the connections to assure that the installation procedures were followed.

Chapter 3

AMI Hi-Flex BIOS Power-On Self Test

Overview

The AMI Hi-Flex BIOS provides all IBM standard POST routines, as well as enhanced AMI POST routines. AMI POST supports CPU internal diagnostics. AMI POST codes are accessible via the Manufacturing Test Port (I/O Port 80h).

POST Phases

When the system is powered on, the Hi-Flex BIOS will enter the Power-On Self Test (POST) routines. These routines have two phases:

System Test and Initialization (test and initialize motherboards for normal operations) and

System Configuration Verification (compare defined configuration with hardware actually installed).

BIOS Error Reporting

The Hi-Flex BIOS performs the various diagnostic checks at the time the system is powered up. If an error is encountered, the error will be reported in one of two different ways:

If...	Then...
the error occurs before the display device is initialized,	a series of beeps will sound. Beep codes indicate that a fatal error has occurred. The AMI BIOS Beep Codes are described on the next page.
the error occurs after the display device is initialized,	the error message is displayed. Non-fatal BIOS error messages are explained below. A prompt to press <F1> can also appear with non-fatal errors.

BIOS NMI Handler Messages

The AMI Hi-Flex BIOS may generate NMI messages. The NMI messages are:

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.

BIOS Beep Codes

Errors can occur during POST (Power On Self Test), which is performed every time the system is powered on.

Fatal errors (see the next page) are usually communicated through a series of audible beeps. All errors except Beep Code 8 are fatal errors. Fatal errors do not allow the system to continue the boot process. Consult AMI Technical Support for possible repairs if a fatal error occurs.

Non-fatal errors are those which, in most cases, allow the system to continue the boot process. They are normally displayed on the screen. The non-fatal BIOS error messages are shown below.

AMI BIOS Beep Codes

The following table contains all AMI BIOS beep codes. Except for Beep Code 8, they are always fatal.

Beep Code	Error message	Description
1 beep	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
2 beeps	Parity Error	A parity error was detected in the base memory (the first 64 KB block) of memory.
3 beeps	Base 64 KB Memory Failure	Memory failure in first 64 KB.
4 beeps	Timer Not Operational	A memory failure occurred within the first 64 KB of memory, or Timer #1 on the motherboard is not functioning.
5 beeps	Processor error	The CPU (Central Processing Unit) on the motherboard has generated an error.
6 beeps	8042 - Gate A20 Failure	Gate A20 on the keyboard controller (8042) contains the allows the CPU to operate in protected mode. The BIOS is not able to switch the CPU to protected mode.
7 beeps	Processor Exception Interrupt Error	The CPU on the CPU card has generated an exception interrupt.
8 beeps	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9 beeps	ROM Checksum Error	The ROM checksum value does not match the value encoded in the BIOS.
10 beeps	CMOS Shutdown Register Read/Write Error	The shutdown register for CMOS RAM has failed.

AMI BIOS Non-Fatal Error Messages

If a non-fatal error occurs during POST, the error message are displayed in the following format:

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

The non-fatal error messages are displayed first and then

Press the <F1> key to continue with the boot procedure.

is displayed. The <F1> prompt message is not displayed if the *Wait for <F1> If Any Error* option in the Advanced CMOS Setup has been *disabled.* For most non-fatal error messages, there is only one message. If a second message appears, it will be RUN SETUP UTILITY. If this message occurs, press <F1> to run AMI BIOS Setup.

AMI BIOS Non-Fatal Error Messages, Continued

Error Message	Explanation
8042 Gate-A20 Error	Gate A20 on the keyboard controller (8042) is not working. Replace the 8042.
Address Line Short!	An error has occurred in the address decoding circuitry on the motherboard.
C: Drive Error	The BIOS is not receiving any response from hard disk drive C:. Run the Hard Disk Utility to correct this problem. Also, check the C: hard disk type in Standard CMOS Setup to make sure that the hard disk drive type is correct.
C: Drive Failure	The BIOS cannot get a response from hard disk drive C:. Replace the hard drive. disk.
Cache Memory Bad, Do Not Enable Cache!	Cache memory on the motherboard is defective. Test the cache memory with a diagnostics utility, such as AMI Diag.
CH-2 Timer Error	Most AT motherboards 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. This message appears if 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 & Date Not Set	Run the Standard CMOS Setup to set the date and time in CMOS RAM.
D: Drive Error	The BIOS is not receiving any response from hard disk drive D:. Run the Hard Disk Utility. Also, check the D: hard disk type in Standard CMOS Setup to make sure that the hard disk drive type is correct.
D: drive failure	The BIOS cannot get a response from hard disk drive D:. Replace the hard disk.
Diskette Boot Failure	The boot diskette in floppy drive A: is corrupt. It cannot be used to boot the system. Use another boot diskette and follow the screen instructions.
Display Switch Not Proper	Some systems require that a video switch on the motherboard be set to either color or

	monochrome. Turn the system off, set the switch properly, then power on.
DMA Error	An error has occurred in the DMA controller.
DMA #1 Error	An error has occurred in the first DMA channel.
DMA #2 Error	An error has occurred in the second DMA channel.
FDD Controller Failure	The BIOS is not able to communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	The BIOS is not able to communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR #1 Error	The interrupt channel #1 has failed POST.
INTR #2 Error	The interrupt channel #2 has failed POST.
Invalid Boot Diskette	The BIOS can read the diskette in floppy drive A:, but it cannot boot the system with it. Use another boot diskette and follow the screen instructions.
Keyboard Is Locked...Unlock It	The keyboard lock on the system is engaged. The system must be unlocked to continue the boot process.
Keyboard Error	There is a timing problem with the keyboard. Make sure an AMI Keyboard BIOS is installed. Set the *Keyboard* option in Standard CMOS Setup to *Not Installed*, which skips the keyboard POST routines.
KB/Interface Error	There is an error with the keyboard connector.
No ROM BASIC	Cannot find a proper bootable sector on either diskette drive A: or hard disk drive C:. The BIOS cannot find ROM Basic.
Off Board Parity Error	There is a parity error with memory installed in an expansion slot. The message format is: OFF BOARD PARITY ERROR ADDR = (XXXX) where *XXXX* is the address (in hexadecimal) where the error has occurred. Off Board means that it is part of the memory installed via an expansion card in an expansion slot. Run memory diagnostic software, such as AMI Diag, to find and correct memory problems.
On Board Parity Error	There is a parity error in motherboard memory. The message format is: ON BOARD PARITY ERROR ADDR = (XXXX) where *XXXX* is the address (in hexadecimal) at which the error has occurred. On Board means that it is part of the memory attached directly to the motherboard. Run memory diagnostic software, such as AMI Diag, to find and correct memory problems.

Parity Error ????	There is a parity error with system memory, but the address of the error cannot be determined. Run memory diagnostic software, such as AMI Diag, to find and correct memory problems.

POST Memory Test

Normally, the only visible POST routine is the memory test. The screen that appears when the system is powered on is shown below.

A reference string is displayed at the left bottom corner of the screen, below the copyright message. Press <Ins> during system boot to display two additional reference strings. This screen displays the options installed in the Hi-Flex BIOS.

If a problem occurs with the system, copy these reference numbers on a sheet of paper before consulting AMI.

When a problem occurs, freeze the screen by powering on the system and holding a key down on the keyboard. This will cause a *Keyboard Error* message. Copy the three lines and report this information to AMI. Press <F1> to continue the boot process.

Set the option *Wait for <F1> If any Error* in the Advanced CMOS Setup of Hi-Flex BIOS Setup to *Enabled* before using this method to freeze the screen.

The following message is displayed after POST is completed:

> Hit <DEL> if you want to run SETUP

Press <Del> to access Hi-Flex BIOS Setup.

BIOS Configuration Summary Screen

The AMI H-Flex BIOS displays the following screen when the POST routines are successfully completed.

System Configuration (C) Copyright 1985-1990 American Megatrends, Inc.			
Main Processor Numeric Coprocessor Floppy Drive A: Floppy Drive B: Display Type: ROM-BIOS Date:	: 80386 : Present : 1.2 MB ½ : 1.44 MB ¼ : VGA or EGA : 05/01/91	Base Memory Size Ext. Memory Size Hard Disk C: Type Hard Disk D: Type Serial Port(s) Parallel Port(s)	: 640 KB : 7808 KB : 44 : None : 3F8 : 378
Memory Found		Memory Configured	
Bank 1=1 MB Bank 2=1 Meg		Bank 1=1 MB Bank 2=1 Meg	
Shadow RAM	F000=Enable	Cache Memory=64K	
C000=Enable D000=Disable E000=Disable	C400=Enable D400=Disable E400=Disable	C800=Enable D800=Disable E800=Disable	CC00=Enable DD00=Disable EC00=Disable

Chapter 4

AMI BIOS

BIOS Features

The AMI Hi-Flex EISA BIOS has several features that can be accessed at any time.

Keyboard Speed Switching

The end user can increase processor speeds at any time by pressing <Ctrl> <Alt> <+>. Processor speed can be decreased by pressing <Ctrl> <Alt> <->. Of course, the OEM can modify these keystroke combinations through AMI BCP. The above values are merely the default settings.

Enable Cache Memory

Both external and internal (if the CPU is an 80486) cache memory can be enabled by pressing <Ctrl> <Alt> <Shift> <+> or disabled by pressing <Ctrl><Alt><Shift><->. The OEM can modify these keystroke combinations through the AMI BCP. The above values are merely the default settings.

Setup

The AMI Hi-Flex BIOS Setup utility is divided into three parts:

- Standard CMOS Setup,
- Advanced CMOS Setup, and
- Advanced Chip set Setup

Setup, Continued

Standard CMOS Setup

The AMI Hi-Flex BIOS Standard CMOS Setup utility permits the end user to configure and set system components such as floppy drives, hard disk drives, time and date, monitor type, and keyboard.

Advanced CMOS Setup

The Advanced CMOS Setup allows the end user to configure more advanced parts of memory configuration, peripheral support, and power management support. Advanced CMOS Setup is discussed in Section 3.

Advanced Chip Set Setup

Advanced Chip Set Setup configures chip set-specific features and is discussed in Section 4.

Advanced CMOS and Advanced Chip Set Setup Features

Default Settings

Every option in the AMI BIOS Setup utility contains two default values: a power-on default and the BIOS Setup default value.

Power-On Defaults

The power-on default settings consist of the safest set of parameters. Use them if the system is behaving erratically. They should always work but do not provide optimal system performance characteristics.

Setup Defaults

The BIOS Setup default values provide optimum performance settings for all devices and system features.

Section 1

Running AMI Setup

A record of the computer system parameters (such as amount of memory, disk drives, video displays, and numeric coprocessors) is stored in CMOS (Complementary Metal Oxide Semiconductor) RAM. When the computer is turned off, a back-up battery provides power to CMOS RAM, which retains the system parameters.

Each time the system is powered-on, it is configured with these values, unless CMOS RAM has been corrupted. The AMI BIOS Setup resides in the ROM BIOS (Read Only Memory Basic Input/Output System) and is available each time the computer is turned on.

If, for some reason, CMOS RAM becomes corrupted, the system is configured with the default values stored in this ROM file. There are two sets of BIOS values stored in the ROM file: the BIOS Setup default values and the Power-On default values.

Running Setup

When POST has completed, the following message appears:

Hit <DEL> if you want to run SETUP

Press <Del> to run Hi-Flex BIOS Setup.

Setup Key Usage

Keystroke	Action
Esc	Returns to previous screen.
Arrow keys	Move the cursor from one option to the next.
<PgUp> and <PgDn>; <Ctrl><PgUp> <Ctrl><PgDn>	Modify the default value of the options for the highlighted parameter. If there are fewer than 10 options, <Ctrl> <PgUp> and <Ctrl> <PgDn> operate like <PgUp> and <PgDn>.
<F1>	Displays Help.
<F2>	Change background colors.
<F3>	Change foreground colors.
<F5>	Restores the values resident when the current Setup session began. These values are taken from CMOS RAM if CMOS RAM was uncorrupted at the start of the session. Otherwise, they will be the BIOS Setup default values.
<F6>	Loads all features in the Advanced CMOS Setup/Advanced Chip Set Setup with the BIOS Setup defaults.
<F7>	Loads all features in the Advanced CMOS Setup/Advanced Chip Set Setup with the Power-On defaults.
<F10>	Saves all changes made to Setup and returns to DOS.

Note: The default value for <F5>, <F6>, and <F7> is always N. To execute these options, change the *N* to *Y* and press <Enter>.

Main Menu Setup Options

The Hi-Flex BIOS Setup Main Menu options are shown below.

Each option is explained in detail in this section.

Warning Message

A warning is displayed for Advanced CMOS Setup, or Advanced Chip Set Setup.

Auto Configuration With BIOS Defaults

Auto Configuration With BIOS Defaults uses the default system values. The BIOS default value are best-case values that should optimize system performance. If CMOS RAM is corrupted, the BIOS defaults will automatically be loaded.

To use the BIOS defaults, type Y and press <Enter>. The following message will appear:

> Default values loaded. Press any key to continue.

Auto Configuration With Power-On Defaults

This option configures the default Power-On values. Power-On default values are worst-case values for system performance, but are the most stable values that can be chosen. Use this option as a diagnostic aid if the system is behaving erratically.

Type *Y* and press <Enter> to use the Power-On defaults. The following message will appear:

> Default values loaded. Press any key to continue.

Write to CMOS and Exit

The features selected and configured in the Standard Setup, Advanced CMOS Setup, Advanced Chip Set Setup, and the New Password Setup will be stored in CMOS RAM when this option is selected. A CMOS RAM checksum is calculated and written to CMOS RAM. Control is then passed to the ROM BIOS.

Press *N* and <Enter> to return to the Main Menu. Press *Y* and <Enter> to save the system parameters and continue the boot process.

Do Not Write to CMOS RAM and Exit

This option passes control to the ROM BIOS without writing any changes to CMOS RAM.

Press *N* and <Enter> to return to the Main Menu. Press *Y* and <Enter> to continue the boot process without saving any system parameters.

Section 2

Standard CMOS Setup

Overview

Standard CMOS Setup is the first option on the Main Menu. Press <Enter> at the highlighted selection to display this option. The following screen appears.

Standard Options

The Standard CMOS Setup utility is used to configure the following features:

- Date: Month, Date, and Year. Ranges for each value are shown in the lower left corner of the CMOS Setup Screen.

- Time: Hour, Minute, and Second. Uses 24 hour clock format, i.e., for PM numbers, add 12 to the hour. Enter 4:30 P.M. as 16:30:00.

- Daylight Savings: Disabled or Enabled.

- Floppy Drives A: and B:. Supports for 720 KB and 1.44 MB 3½ inch drives, 360 KB and 1.1 MB 5¼ inch drives, and no drive systems.

- Hard Disk C and Hard Disk D: Hard disk types from 1 to 46 are standard. Type 47 is user-definable and can be used for both drive C: and D:. I Type 47 is selected, enter the hard disk parameters.

- Video Display. Support for MDA™ and CGA™ video BIOS, VGA, JEGA and no video is provided.

- Keyboard. Enabled and disabled are supported.

Date And Day Configuration

Move the cursor to the Date field with the arrow keys and set the Date and Day by pressing <PgUp> and <PgDn>.

Time Configuration

Move the cursor to the Time field with the arrow keys and set the time by pressing <PgUp> and <PgDn> to change values.

Daylight Savings Configuration

Move the cursor to the Daylight Savings field with the arrow keys and select *Enabled* or *Disabled* by pressing <PgUp> and <PgDn>.

Hard Disk Configuration

Hard disk drive types are identified by the following parameters:

Parameter	Description
Type	The number designation for a drive with certain identification parameters.
Cylinders	The number of cylinders in the disk drive.
Heads	The number of heads.
Write Precompensation	The size of a sector gets progressively smaller as the track diameter diminishes. Yet each sector must still hold 512 bytes. Write precompensation circuitry on the hard disk compensates for the physical difference in sector size by boosting the write current for sectors on inner tracks. This parameter is the track number where write precompensation begins.
Landing Zone	This number is the cylinder location where the heads will normally park when the system is shut down.
Sectors	The number of sectors per track. Hard drives that use MFM have 17 sectors per track. RLL drives have 26 sectors per track. ERLL and ESDI drives have 34 sectors per track.
Capacity	The formatted capacity of the drive based on the following formula: (# of heads) X (# of cylinders) X (17 sectors/cylinder) X (512 bytes/sec)

Hard Disk Parameter Table

Type	# of Cylinders	# of Heads	Write Precompensation	Landing Zone	# of Sectors	Capacity
1	306	4	128	305	17	10 MB
2	615	4	300	615	17	20 MB
3	615	6	300	615	17	31 MB
4	940	8	512	940	17	62 MB
5	940	6	512	940	17	47 MB
6	615	4	65535	615	17	20 MB
7	462	8	256	511	17	31 MB
8	733	5	65535	733	17	30 MB
9	900	15	65535	901	17	112 MB
10	820	3	65535	820	17	20 MB
11	855	5	65535	855	17	35 MB
12	855	7	65535	855	17	50 MB
13	306	8	128	319	17	20 MB
14	733	7	65535	733	17	43 MB
15	0	0	0	0	0	0
16	612	4	0	663	17	20 MB
17	977	5	300	977	17	41 MB
18	977	7	65535	977	17	57 MB
19	1024	7	512	1023	17	60 MB
20	733	5	300	732	17	30 MB
21	733	7	300	732	17	43 MB
22	733	5	300	733	17	30 MB
23	306	4	0	336	17	10 MB
24	925	7	0	925	17	54 MB
25	925	9	65535	925	17	69 MB
26	754	7	754	754	17	44 MB
27	754	11	65535	754	17	69 MB
28	699	7	256	699	17	41 MB
29	823	10	65535	823	17	68 MB
30	918	7	918	918	17	53 MB
31	1024	11	65535	1024	17	94 MB
32	1024	15	65535	1024	17	128 MB
33	1024	5	1024	1024	17	43 MB

34	612	2	128	612	17	10 MB
35	1024	9	65535	1024	17	77 MB
36	1024	8	512	1024	17	68 MB
37	615	8	128	615	17	41 MB
38	987	3	987	987	17	25 MB
39	987	7	987	987	17	57 MB
40	820	6	820	820	17	41 MB
41	977	5	977	977	17	41 MB
42	981	5	981	981	17	41 MB
43	830	7	512	830	17	48 MB
44	830	10	65535	830	17	69 MB
45	917	15	65535	918	17	114 MB
46	1224	15	65535	1223	17	152 MB

Not Installed is an option that could be used for diskless workstations and SCSI hard disks. Type 47 can be used for both hard disks C: and D:. The parameters for type 47 under Hard Disk C: and Hard Disk D: can be different, which effectively allows 2 different user-definable hard disk types.

Standard Options, Continued

Floppy

Floppy Drive A and Floppy Drive B: The options are *360 KB 5¼ inch*, *1.2 MB 5¼ inch*, *720 KB 3½ inch*, *1.44 MB 3½ inch*, and *Not Installed*, which could be used as an option for diskless workstations.

Monitor

The Primary Display Options are *Monochrome*, *Color 40x25*, *VGA/PGA/EGA*, *Color 80x25*, and *Not Installed*, which could be used for network file servers.

Keyboard

The Keyboard Options are *Installed* and *Not Installed*.

Section 3

Advanced CMOS Setup

Overview

The Advanced CMOS Setup is equipped with a series of help screens, accessed by pressing <F1>, which will display the options available for a particular configuration feature and special help for some of the options.

The Advanced CMOS options are:

Typematic Rate Programming,
Password Checking,
System boot sequence,
System boot speed,
User-selectable EPROM wait states,
640 KB - 1 MB unused RAM remap option,
512 KB - 640 KB onboard memory disable,
Above 1 MB Memory Test,
Memory Test Tick Sound,
Memory Parity Error Check,
Hit <DEL> Message Display,
Wait for <F1> If Any Error,
Power-On Num Lock disable,
Internal/External Cache Memory (80486) or Cache Memory (80386),
Fast Gate A20 Option, *
Video or Adapter ROM Shadow, and *
Turbo Switch Function

* denotes a chip set specific option

The options for Numeric Processor and Weitek Processor are either *Present* or *Absent*. The options for Power-On Up Num Lock are *On* or *Off*. The options for System Boot Up Speed are *High* or *Low*.

Warning Message

A warning message is displayed each time one of the first three options (Standard CMOS Setup, Advanced CMOS Setup, and Advanced Chip Set Setup) is selected, before any changes are allowed to any of the setup parameters.

Advanced CMOS Setup First Screen

The first Advanced CMOS Setup screen is shown below.

Advanced CMOS Setup Options

A short description follows for each of the options on the Advanced CMOS Setup Screen.

The options which will appear on the Advanced CMOS Setup screen when <F1> is pressed are shown below.

Typematic Rate and Delay

Typematic Rate Delay and *Typematic Rate* control the speed at which a keystroke is repeated. When a key is pressed and held down, the character is displayed, and after a delay set by the Typematic Rate Delay, repeats 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. Repeating stops when the last key pressed is released, even if other keys are pressed.

Typematic Rate and Delay, cont'd

Above 1 MB Memory Test

This feature, when enabled, will execute 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.

Memory Test Tick Sound

This option will enable (turn on) or disable (turn off) the ticking sound during the memory test.

Memory Parity Error Check

If the motherboard does not contain parity RAM, you can disable the memory parity error checking routines in the BIOS.

Hit <DEL> Message Display

Disabling this option will prevent the message:

Hit <DEL> if you want to run Setup

from appearing when the system boots.

Hard Disk Type 47 Data Area

The Hi-Flex BIOS Setup has two user-definable hard disk types. Normally, the data for these disk types are stored in 0:300h in lower system RAM, but System BIOS shadowing must be turned off to configure a user-definable hard disk drive type.

By moving the storage area for the user-defined hard disk drive parameters to the top of the DOS applications area (address 639K), you can continue to use shadowing. Set *DOS 1 KB* to shorten the DOS conventional memory area to 639 KB, and to use the top 1 KB of the applications memory area for user-defined hard disk data. The screen shown below is displayed.

Wait for F1 If Any Error

Before the system boots, the BIOS executes POST (power-on self test), a series of system diagnostic routines. If any of these tests generate a non-fatal error and the system can still function, the BIOS will respond with an appropriate error message followed by:

Press <F1> to continue.

If this option is disabled, non-fatal errors will not generate the above statement, but the BIOS will still display the appropriate error message, eliminating the need for user responses to non-fatal errors.

System Boot Up Num Lock

You can turn off the *Num Lock* option on the Enhanced Keyboard when the system is powered on. This permits the use of the arrow keys on both the numeric keypad and the Enhanced Keyboard. The BIOS default is *Num Lock* on.

Numeric/Weitek Processor(s)

These options specify that the numeric processor (Intel 80*x*87 or compatible) or the Weitek numeric processor (WTL3167 or 4167) is present or absent.

Floppy Drive Seek At Boot

The default for this option is *Disabled* to allow a fast boot and to decrease the possibility of damage to the heads.

System Boot Up Sequence

The AMI BIOS will normally attempt to boot from floppy drive A: (if present), and if unsuccessful, it will attempt to boot from hard disk C: This sequence can be switched using this option. If the option is set to *C:, A:*, the system will attempt to boot from the hard drive C:, and then A:. If the option is set to *A:, C:*, the sequence is reversed.

System Boot UP CPU Speed

Sets that speed at which the system boots. Choices for this option are *high* or *low*. The default speed is *low*.

Password Check Option

A password can be used to prevent unauthorized system boot or Setup use. This option enables the password check option every time the system boots or the end user runs Setup. A third option is to disable the password option entirely.

The default option is *Disabled*. The password prompt will not appear when the system is rebooted.

If *Always* is chosen during Setup, a user password prompt appears every time the system is turned on.

If *Setup* is chosen, the password prompt will not appear when the system is turned on, but will appear if Setup is executed.

Advanced CMOS Setup Options, Continued

Password Check Option, cont'd

Setup permits up to three attempts to enter the correct password. After each incorrect attempt, the password prompt appears, followed by an *X*. After the third incorrect attempt, the system locks and reboots. The password will not be displayed as it is entered. See Section 5 (Page) for instructions on changing a password.

The **Internal Cache Memory** and **External Cache Memory** options appear on 80486-based systems. On 80386-based systems, **Cache Memory** will be displayed.

Internal Cache Memory

Appears only on 80486-based systems because the 80486 has an internal cache. Enables or disables the CPU internal cache.

External Cache Memory

Appears only on 80486-based systems that have a caching scheme external to the CPU. Specify whether external cache is present.

Video or Adaptor ROM Shadow

ROM shadow is a technique in which BIOS code is copied from slower ROM to faster RAM. The BIOS is then executed from the RAM. Shadow options are chip set-specific and are dependent on system hardware. They can appear on the Advanced CMOS Setup screen. Each option permits a 16 KB segment to be shadowed from ROM to RAM. If an option is enabled, and BIOS code resides in that particular 16 KB segment, the BIOS will be shadowed.

System ROM Shadow

The same concept applies here as above, except that in this case, the entire system BIOS (64 KB in length) is shadowed at RAM address F0000h.

Fast Gate A20

Gate A20 controls the ability to access memory addresses above 1 MB by enabling or disabling access to the processor address line A20. To remain XT-Compatible and be able to access conventional memory (from 0 - 1024K), address line A20 must always be low, so Gate A20 must be disabled.

However, some software programs both enter protected mode and shut down through the BIOS. For this software, Gate A20 must be constantly enabled and disabled via the keyboard controller, which can slow processing considerably.

Fast Gate A20 is an alternate method of enabling Gate A20, which permits access to memory addresses above 1 MB. All RAM accesses to extended memory addresses above 1 MB require that Gate A20 be enabled via the keyboard controller, which is a slow process.

Fast Gate A20 is an alternative method for handling Gate A20 found in many chip sets and some software products. Use Fast Gate A20 to speed Gate A20 enabling and disabling, which in turn speeds up programs that constantly change from addressing conventional memory to addressing memory addresses above 1 MB. For example, enabling this option makes programs such as network operating systems execute faster.

Turbo Switch Function

This option enables the turbo switch.

Section 4

AMI BIOS Password Support

The Hi-Flex BIOS Setup has an optional password feature. The system can be configured so the end user is required to enter a password every time the system boots, or whenever the end user runs Setup. The password function can also be disabled. If disabled, the prompt will not appear.

Changing a Password

The password check option is enabled or disabled in Advanced CMOS Setup (Page). The password check function is enabled by choosing either *Always* or *Setup*.

The Change Password option will generate an error message if the Password Checking Option is disabled in Advanced CMOS Setup. Enable Password Checking to change the password.

The password (1-6 characters) is stored in CMOS RAM. The default password (*AMI*) is stored in ROM and is only to be used if CMOS RAM is corrupted. The default password can be changed by the end user. To change a password, select the Change Password option from the main Setup screen and press <Enter>. Enter the default password (*AMI*) and press <Enter>. The typed characters do not display. After the current password has been correctly entered, the user is asked to retype it.

If the password confirmation is incorrect, an error message appears. If the new password confirmation is entered without error, press <Esc> to return to the Main Setup menu.

The password is stored in CMOS RAM after Setup completes. The next time the system boots, enter the password if the password function is present and has been enabled.

Password Options Control Prompt

When and if the prompt appears is dependent upon the options chosen in Advanced CMOS Setup. If *Always* was set in Advanced CMOS Setup, the prompt will appear each time the system is powered on. If *Setup* was set in Advanced CMOS Setup, the prompt will not appear when the system is powered on, but will appear each time Setup is run. If *Disabled* was set in Advanced CMOS Setup, the password prompt will never appear.

Using a Password

The end user must enter the new password when the password prompt appears and then press <Enter>. The end user should use the default password if CMOS RAM is corrupted.

The end user should keep a record of the new password when the password is changed. If the end user forgets the password and password protection is enabled, the only way to boot the system is to disable CMOS RAM by removing the battery for at least 20 minutes, replacing it, rebooting, and reconfiguring the system.

Section 5

Hard Disk Utility

Overview

The AMI BIOS includes three hard disk utilities:

Utility	Purpose	Turn to
Hard Disk Format	Performs a low level format of the hard drive(s). Read the system or hard disk drive documentation to find out if the hard disk has been preformatted.	Page
Auto Interleave	Determines the optimum interleave factor.	Page
Media Analysis	Analyzes each hard disk drive track to determine whether it is usable. The track is labeled bad if unusable.	Page
Hard Disk Utility Error Messages	Explanations of all error messages that can be generated by the Hard Disk Utilities	Page

These routines will work on drives that use the MFM, RLL, ERLL, or ESDI data recording techniques. They do not work on SCSI Disk Drives.

Warning
The AMI BIOS Hard Disk Utilities will destroy all hard disk data. Back up the data on the hard disk before running this utility.

When to Use AMI Hard Disk Utilities

When	Conditions	Run...
Installing a new hard disk.	The hard disk drive manufacturer provided a list of bad tracks, the system documentation includes the optimum interleave factor, and the drive is preformatted .	None
Installing a new hard disk.	You do not have a list of bad tracks.	Media Analysis
Installing a new hard disk.	You do not know the optimum interleave factor.	Auto Interleave
Installing a new hard disk.	The drive is not formatted.	Hard Disk Format
Installing a used hard disk drive.	N/A	All Hard Disk Utilities

When Hard Disk Diagnostics is selected, the following screen appears.

Select one of the three options and press <Enter>.

Hard Disk Format Utility

Warning
The Hard Disk Format utility will destroy all hard disk data. Back up the data on the hard disk before running this utility.

This routine will not work on a SCSI Disk Drive. Use the Hard Disk Format option to integrate a new hard disk to the system, or to reformat a used hard disk which has developed bad tracks as a result of aging or poor handling. Select the Media Analysis option to find bad tracks.

The following screen appears when you press <Enter> at the Hard Disk Format option.

Hard Disk Format Utility, Continued

Answer the questions on the screen. The first two questions are already completed if one disk was selected in Standard CMOS Setup. Enter C or D in Disk Drive and press <Enter>. If only one drive was selected in Standard CMOS Setup, the cursor will be at *Interleave*.

The Disk Drive Type is read from CMOS RAM. The Interleave factor can be selected manually or determined by Auto Interleave.

The hard disk drive manufacturer usually provides a list of bad tracks. Enter these tracks. They will then be labeled as bad to prevent data from being stored on them.

The following screen is displayed after entering *Y* in Mark Bad Tracks, pressing <Enter>, and selecting add, delete, revise, or clear from the Bad Track Edit Menu.

Hard Disk Format Utility, Continued

Type *Y* and press <Enter>. The warning screen appears.

Warning
Data on the hard drive will be irrevocably lost.

Auto Interleave Utility

Warning
The Auto Interleave utility will destroy hard disk data. Back up the data on the hard disk before running this utility.

The Auto Interleave utility calculates the optimum interleave factor through trial and error by measuring the transfer rate for four different interleave values. To determine the best interleave factor, the system will format a portion of the hard disk for each transfer rate calculated. The cylinders, heads and sectors formatted for each value will be displayed in the activity box. It will not work on a SCSI Disk Drive.

Select Auto Interleave on the main Hard Disk Utility Screen and press <Enter>. The following screen appears.

The cursor will be on Mark Bad Tracks. The default is *N*. To mark additional bad tracks, type *Y* and press <Enter>. The following screen appears.

After selecting options from the Bad Tracks Edit Menu, press <Esc>. Type *Y* and press <Enter> to proceed with the Auto Interleave process. A warning screen appears.

Auto Interleave Utility, Continued

Press <Enter> to return to the main Hard Disk Utility screen. To proceed, type *Y* and press <Enter>.

Media Analysis Utility

The Media Analysis utility performs a series of tests to locate bad or damaged tracks on the hard disk as a result of aging or poor handling. This utility locates all bad tracks and lists them in the Bad Track List Box. Since this test writes to all cylinders and heads on the hard disk to verify any bad tracks, the test requires several minutes to complete. For best results, run this test in its entirety. Media Analysis will not work on a SCSI Disk Drive.

Select Media Analysis from the main Hard Disk Utility Menu and press <Enter>. The following screen appears.

Media Analysis Utility, Continued

The cursor will be on Proceed. The warning screen appears.

Press <Enter> to stop. The main Hard Disk Utility screen appears. Type Y and press <Enter> to perform the hard disk drive analysis.

Hard Disk Utility Error Messages

Initialization Errors

These error messages can appear during the initialization process.

Message	Explanation
No Hard Disk Installed	There is no hard disk drive in the system but you tried to run the Hard Disk Utility.
FATAL ERROR Bad Hard Disk	No response from the hard disk, or the hard disk is not repairable. Check all cable and power connections to the hard disk.
Hard Disk Controller Failure	Error response from the reset command sent to the hard disk controller. The controller may not be seated properly in the BUS slot.
C: (D:) Hard Disk Failure	The hard disk drive (C: or D:) is not responding to commands. Check power and cable connections to the hard disk.

Operation Errors

Message	Explanation
Address Mark Not Found	The address mark (initial address) on the hard disk could not be found.
Attachment Failed to Respond	No response has been received from the hard disk drive. An operation has already begun and the hard disk did not respond. It had responded earlier.
Bad ECC on Disk Read	When the hard disk drive utility writes to the disk, it also calculates an ECC (Error Correction Code) value for the data being written. This ECC value is written to the drive and then read back. The value read back is different from the one calculated.
Bad Sector Flag Detected	An operation was perform on a sector that has been flagged as bad.
Controller Has Failed	A diagnostic command that failed was issued to the controller.
Drive Not Ready	An operation on the hard disk drive has timed out. The hard disk drive utility has waited beyond a preset specified time limit.
Drive Parameter Activity Failed	A reset command was sent to the controller followed by drive parameters. Using these

	parameters, the controller did not get a response from the hard disk. Make sure the drive type is correct.
ECC Corrected Data Error	The ECC value (explained above) read from the disk is not the same value which was written to the disk. The data is not correct. An attempt was made to correct the data, but the ECC value is not corrected.
Requested Sector Not Found	The requested sector could not be found.
Reset Failed	The reset command did not properly reset the hard disk.
Seek Operation Failed	A seek command failed. A seek operation is the act of finding a particular sector on the hard disk.
Undefined Error - Command Aborted	An unidentifiable error condition occurred.
Write Fault on Selected Drive	A write fault occurred during the write operation on the hard disk drive.

Appendix A

Upgrading Cache Memory

The AMI 80386/80486 Mark IV Screamer motherboard Cache memory system comes with a standard 64 KB of cache memory. You can upgrade this to 256 KB by replacing the SRAM in the Cache SRAM area on the motherboard.

Unpacking

The Cache SRAM are static sensitive devices and can be easily damaged by electrostatic discharge.

Do not remove the chips from their protective anti-static bag until you are ready to install them in the system. Unpacking should be done on an anti-static mat grounded to a good earth ground point. You should also be wearing an anti-static wristband, grounded at the same point as the anti-static mat. (An alternative is to use a sheet of conductive aluminum foil grounded through a 1 Meg-ohm resistor to ground. Similarly, a strip of conductive aluminum foil wrapped around the wrist and grounded through a 1 Meg-ohm resistor will serve the purpose of a wristband.)

Installing SRAM chips

Upgrading cache memory requires eight 64 KB x 4 20 ns and three 64K x 4 17 ns SRAM chips.

Locate the Cache SRAM sockets that have 16 KB x 4 SRAM chips. Using a chip removal tool or a small flat tipped screwdriver, gently remove all chips. Do not remove the chip in U52, located next to U53.

The 64 KB x 4 SRAMs will use the 2 rows that have 12 pins. Carefully insert the 64 KB x 4 SRAM chips into the 12 pin rows on the sockets. Insure that the notch etched on the motherboard and the notch on the SRAMs are correct.

Installing SRAM chips, Continued

Cache SRAM Reference

SRAM Sockets	Type of SRAM Used
U8, U9, U19, U20, U31, U32, U36, and U37	64 KB x 4 20 ns
U42, U48, and U53	64 KB x 4 17 ns

Checking the Cache installation

The amount of cache memory is displayed on the System Configuration Screen after he system boots.

Cache Test

If cache memory is faulty, the BIOS message is:

Cache memory bad - do not enable cache

Check the BIOS System Configuration screen after system boot to make sure that the proper amount of cache memory is installed.

Cache RAM Locations

A graphic that displays the cache memory SRAM locations appears on the following page.

Appendix B

Series 18 CPU/Coprocessor Card

There are two reasons to add a Series 18 CPU/Coprocessor Card to a system with an AMI Mark III Convertible or AMI Mark IV Screamer motherboard:

- to upgrade from an 80386 processor to an 80486 processor (an also a WTL4167 math coprocessor), or
- to add a Weitek WTK3167 math coprocessor to the system.

Upgrading to an 80486

The AMI Mark IV can be upgraded to a 25 or 33 MHz 80486DX by adding an AMI Series 18 80486 CPU/Coprocessor Card.

The end user can also add a Weitek WTL4167 math coprocessor when the 80486 microprocessor is installed.

Series 18 80486 CPU/Coprocessor Card Layout

The layout of the Mark IV 80486/80486SX CPU/Coprocessor Card is shown on the following page.

AMI Mark IV 80486 CPU/Coprocessor Card Layout

Installing a WTL4167 Math Coprocessor

The WTL4167 can be added only when an 80486 is installed in the Series 18 AMI MArk IV 80486 CPU/Coprocessor Card.

Pin 1 of the WTL4167 is near the chamfered edge of the coprocessor. Pin 1 of the socket is near the chamfered inner edge of the U8 math coprocessor socket. Make sure all pins on the coprocessor are straight. Align pin 1 of the processor with pin 1 of the socket and insert the processor. See the following figure.

Test for Math Coprocessor

The AMI BIOS displays a System Configuration screen at the end of POST where the math coprocessor will be displayed as *present*. If *present* is not displayed, reinstall the coprocessor. Switch off the power, check the orientation of the coprocessor, press the chip firmly to make sure that it is fully inserted, and then power the system up again. If you still get the same result, call AMI Technical Services.

Adding a WTK3167

A Weitek WTK3167 can be added to a Series 18 AMI Mark IV CPU/Coprocessor Card only if there is no 80486 installed on the CPU/Coprocessor Card. You can use both an Intel 80387 on the Mark IV motherboard and a Weitek WTK3167 on the Series 18 CPU/Coprocessor Card.

When the Series 18 CPU/Coprocessor Card with an Intel 80486 is installed, the 80386, 80387, and the WTK3167 are disabled and the only additional math coprocessor that can be used is a WTL4167.

Installing the WTK3167 on the Series 18 CPU/Coprocessor Card

Find the socket labeled WTK3167 in the upper left corner of the AMI Series 18 CPU/Coprocessor Card. Pin 1 of the socket is on the corner with the chamfered edge. Pin 1 of the WTL3167 is near the upper right corner. Align the pins of the coprocessor with the socket. After making sure that all pins are aligned and pin 1 is properly oriented, firmly press the coprocessor in the socket. See the following graphic.

Make sure that there is no 80486 on the CPU/Coprocessor Card and that the shorting bridges for J1 and J2 are removed.

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