SBC8241

486 All-in-One Half-size CPU Card

User's Manual

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Unpacking

After unpacking the CPU card, check and see if the following items are included and in good condition. If any of the items is missing or damaged, notify your dealer immediately.

- SBC8241 half-size CPU card
- User's Manual
- Warranty Card
- Keyboard connector
- FDD & HDD cable
- Printer cable bracket
- Nuts x 4
- Screws x 4

Make sure that all of the items listed above are present.

What To Do If There Is A Problem

If there are damaged or missing parts, contact your supplier and/or dealer immediately. Do not attempt to apply power to the workstation if there is damage to any of its components.

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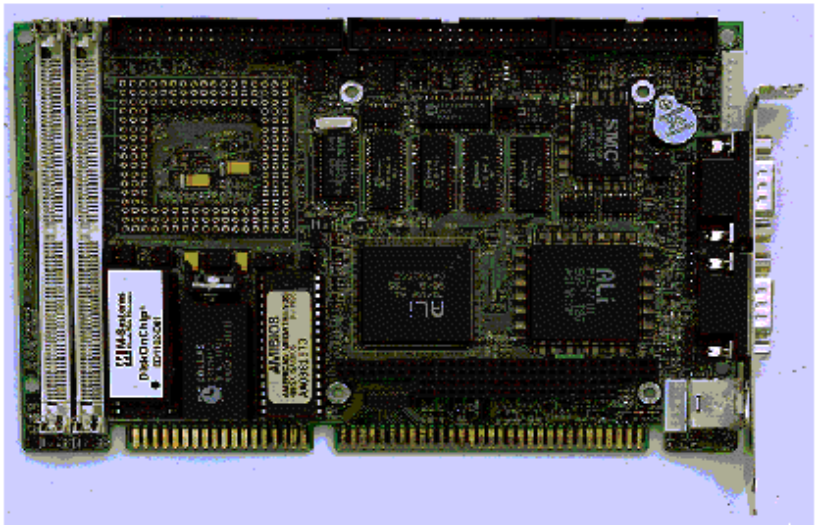
Chapter 1
Introduction



The SBC8241 is a high-performance IBM™ PC AT-compatible half-size CPU card that offers outstanding features and performance for building advanced personal computers or industrial workstations. Based on the ALI M1487 / M1489 chipset, SBC8241 also comes equipped with Intel, AMD, or SGS Thomson 80486 microprocessor.

The SBC8241 supports two 72-pin SIMM sockets, allowing DRAM expansion up to a maximum of 64MB using EDO/FPM. In addition, there are two serial ports, one-RS232 & one RS232/422/485 port (both with 16C550 UARTs). Its standard enhanced bi-directional SPP/ECP/EPP parallel port supports up to two IDE hard disk drives and two FDDs.

The SBC8241 also incorporates a 16-level watchdog timer that can generate a system RESET with interval from 0.5 - 1000 seconds.

Other features include one socket for Flash Disk, a PCI enhanced IDE hard disk drive interface, AMI PnP BIOS, and a PC/104 connector accommodating easy expansion to meet various application needs. This half-size 486 CPU card with industrial-grade architecture ensures continuous, reliable operation in harsh industrial environments.

The functionality of this CPU card allows the conversion of any system into a 32-bit 486 compatible computer. Its highly compact form and numerous features make it an ideal cost/performance solution for high-end commercial and industrial applications where high CPU speed and low mean-time-to-repair are critical.

1.1 Specifications

- **Bus Type:** ISA bus; 98 pins for 16-bit ISA interface
- **CPU:** Supports Intel/AMD 80486DX 33/66/100/133 MHz
- **Cache:** 512KB L2 synchronous cache
- **Memory:** Two 72-pin SIMM sockets accepting 1, 2, 4, 8, 16 or 32 MB SIMM modules; supports FPM/EDO DRAM
- **Chipset:** System Chipset: ALI M1487/ M1489 I/O Chipset: SMC 37C669
- **RTC:** Dallas DS-12B887 with lithium battery backup for 10 years of data retention
- **S.S.D.:** Socket for M-Systems DiskOnChip™
- **IDE:** Supports up to two, PIO mode 3, 4 EIDE hard disk and ATAPI CD-ROM interface
- **FDD:** Supports up to two floppy disk drivers, 3.5" and/or 5.25"

- **Parallel Port:** Enhanced bi-directional SPP/EPP/ECP parallel port
- **Serial port:**
  - One RS232 port with 16C550 UART
  - One RS232/422/485 port with 16C550 UART
- **Watchdog Timer:** Can generate a system RESET with timer intervals at 0.5 – 1000 seconds (16-level)
- **Keyboard Connector:**
  - One 6-pin Mini-Din connector is located on the mounting bracket
  - One pin header connector for external keyboard adapter
- **Expansion Bus:** 16-bit PC/104 connector for expansion modules
- **Power Supply Voltage:** Single power +5V/2.5A with 8-pin PS/2 type connector
- **Operating Temp.:** 32°F to 140°F (0°C to 60°C)
- **Board Size:** 7.2" (185mm) x 4.8" (122mm)

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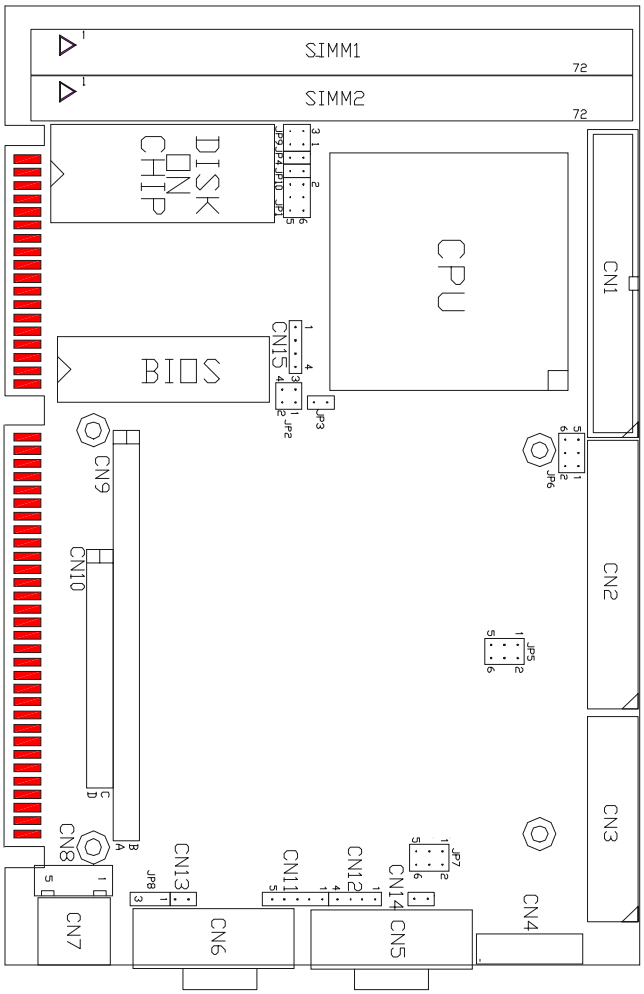
Chapter 2

Jumpers and Connectors

The figure below shows the location of all jumpers and connectors on the SBC8241.



2.1 Jumpers Settings

2.1.1 CPU Voltage Select: JP1

Options	Settings
5.0V	Short 1-3, 2-4
3.45V	Short 3-5, 4-6

2.1.2 CPU L1 Cache Type: JP3

Options	Settings
Write Back	Open
Write Through	Short

2.1.3 CPU Type Select: JP4

Options	Settings
Intel DX/DX2/DX4 W/T	Open
Intel DX4 W/B	Open: 3x; Short: 2x
AMD/ST DX2/DX4	Open: 3x; Short: 2x
AMD 5x86	Open: 3x; Short: 4x

2.1.4 COM2 RS-232/422/485 Settings: JP5 ~ JP7

COM2	JP5	JP6	JP7
RS-232	1-2	3-5,4-6	3-5,4-6
RS-422	3-4	1-3,2-4	1-3,2-4
RS485	5-6	1-3,2-4	1-3,2-4

2.1.5 Watchdog Timer Function Select: JP8

Options	Settings
Activate NMI when watchdog triggered	1-2
Reset system when watchdog triggered	2-3
Watchdog function disable	Open

2.1.6 M-Systems Address Select: JP9

Options	Settings
C8000-CFFFF	Open
D0000-D7FFF	1-2
D8000-DFFFF	3-4
E0000-E7FFF	1-2,3-4

2.1.7 Clear CMOS Jumper: JP10

Options	Settings
Clear CMOS data	Short
Normal Operation	Open

2.2 Connectors

The connectors allow the CPU card to connect with other parts of the system. Some problems encountered with your system may be caused by loose or improper connections. Ensure that all connectors are in place and firmly attached.

Connectors	Label
HDD (IDE) connector	CN1
FDD connector	CN2
Parallel port	CN3
PC/104 connector	CN9,CN10
Keyboard connectors	CN7
Reset switch connector	CN13
External speaker connector	CN12
HDD LED connector	CN14
SBC power connector	CN4
RS-232 serial port	CN5,CN6
RS-422, 485 serial port	CN6
Keylock & Power LED	CN11
External keyboard connector	CN8

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Chapter 3
Installation

This chapter describes the procedures when installing the SBC8241 486 all-in-one CPU board into your system.

The following is a list of typical peripherals required to build a minimum system:

- Passive backplane (optional)
- Power supply
- IBM PC/AT keyboard
- Display monitor
- Floppy or hard disk with MS-DOS or Flash Disk emulator

3.1 Installing SIMMs

1. Insert the first SIMM edge connector at a slight angle into the socket of SIMM 1, close to CPU socket. Note that the SIMMs are latched and will only go in one direction.
2. Gently push the SIMM backward into the connector until the locking tabs at both ends snap into place.
3. Check and make sure the SIMM is secured properly into the socket.
4. Repeat steps 1-3 for the remaining SIMM in SIMM 2 socket.

3.2 Mounting the CPU

1. Place the CPU at the middle of the socket, orienting its pin 1 (notched corner) with pin 1 of the socket.
2. Align the CPU to the socket in order to avoid breaking the pins.
3. Mount the CPU carefully onto the socket.
4. Be sure to configure the jumper settings of JP1, JP2, JP3 and JP4.

NOTE: *When the CPU speed over 75MHz, a CPU COOLER to reduce CPU temperature is highly recommended.*

3.3 Completing the Installation

To complete the installation, follow the steps below:

1. Configure the jumpers according to your system configuration and the corresponding jumper settings listed in Chapter 2.
2. Make sure the power is OFF.
3. Firstly when using PC/104 peripherals, install the PC/104 card into the PC/104 socket of the half-sized 486 CPU card.
4. Install the half-sized 486 CPU card into an ISA passive backplane or just let it stand alone as a Single Board Computer.
5. Connect the I/O cables and peripherals, i.e. floppy disk, hard disk, monitor, keyboard, power supply, etc..

NOTE: *The color of pin one on I/O cables is usually red or blue, while others are gray.*

6. Turn ON the system power.

Chapter 4
AMI BIOS Setup

This chapter describes the purpose of the SETUP program and when you need to run it.

SETUP is a program for customizing your computer. Each computer can have its own unique combination of add-on equipment like memory expansion, fixed disk drives, and so on (i.e., a custom configuration). SETUP is the program you run to tell your computer what equipment is installed on your computer.

The equipment list, or configuration of your computer is stored in configuration memory. Configuration memory is part of the real-time clock/calendar. Both configuration memory and the real-time clock/calendar are battery powered. The battery (on the CPU card) allows the computer to remember the date, time, and equipment configuration after the computer is turned off.

SETUP allows for a balance between flexibility and convenience. Even though every computer user has his own combination of equipment, SETUP is flexible enough to accommodate everyone. For convenience, SETUP need not be run frequently; once the configuration is entered, the battery preserves the equipment list. You only need to run SETUP when that configuration changes. For most people, this is not very often.

You will need to run SETUP in the following situations:

- **New systems** - if the system is new and has never had the configuration list entered, you will need to run SETUP and select "Auto Configuration with Optimal Settings".
- **After equipment additions** - if you change the equipment configuration by adding or removing add-on options, you will need to re-run SETUP and enter the new configuration.
- **Configuration memory loss** - if the contents of configuration memory are lost (due to a worn out battery,

for example), you will need to re-enter the configuration with SETUP.

- **Activating/deactivating various features** - the chipset on CPU card allows software control of shadow RAM and other features. You will need to run SETUP to activate or deactivate these features.

Most people only need to run SETUP once in a while. The values you enter into SETUP will remain in the computer's memory as long as the battery power is supplied to the CPU card. Sometimes, during normal servicing, it is necessary to disconnect that battery. In this case, all configuration memory will be lost.

Write down your equipment configuration. If the contents of configuration memory are lost, it will save you a lot of time bringing your machine back to its old self.

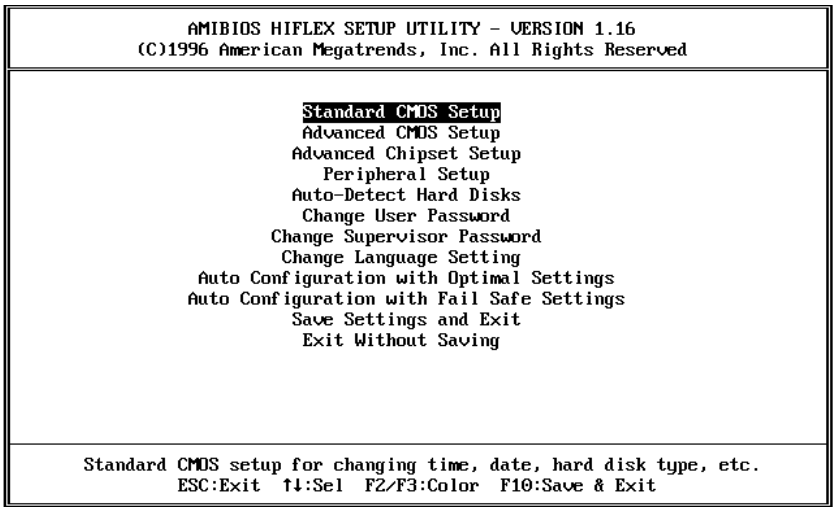
4.1 Standard CMOS SETUP

This section explains how to enter the Standard CMOS SETUP program, and how to select and modify the equipment list.

4.1.1 Entering Standard CMOS SETUP

To run the Standard CMOS SETUP, turn on the computer or reset it. After the Memory Test, the computer will give you the option to run SETUP.

Press <DEL> and the AMI BIOS SETUP Utilities main menu will appear as shown on the following page.



Press the <Enter> key to select STANDARD CMOS SETUP and the Standard CMOS SETUP screen will appear on your display.

4.1.2 Moving Around the Standard CMOS SETUP Screen

The bottom of the screen lists the important keys for moving around the BIOS screen. Each time you press the down(↓) or right-arrow(→) keys, the cursor moves to the next item on the list. Each time you press the up(↑) or left(←) arrow keys, the cursor backs up to the previous item on the list.

4.1.3 Using Standard CMOS SETUP

The basic Standard CMOS SETUP screen display indicates what equipment you have installed on the computer plus the date and time and some configuration options. The Standard CMOS menu options are listed and described below:

- **Date / Time**
  Select this item to change the date or time. The current date and time are displayed. Enter new values through the displayed window.

- **Floppy Drive A:, B:**
  Choose the Floppy Drive A: or B: item to specify the floppy drive type. The settings are *360 KB 5¼"*, *1.2 MB 5¼"*, *720 KB 3½"*, *1.44 MB 3½"*, *2.88 MB 3½",* or *Not Installed.*

- **Pri Master, Pri Slave, Sec Master, Sec Slave**
  Choose these items to configure the hard disk drive named in the option. When you click on an item, the following parameters are listed: Type, LBA Mode, Block Mode, PIO Mode, and 32Bit Mode. All parameters relate to IDE drives except Type.

  - **Configuring an MFM Drive**
    If configuring an old MFM hard disk drive, select Type and choose the appropriate hard disk drive type (1 - 46). Refer to Appendix B for the Hard Disk Drive types available. If the MFM drive parameters do not match any drive type listed, select *User* in the Type field and enter the drive parameters on the screen that appears.
  - **User-Defined Drive**
    When configuring SCSI drive or an MFM, RLL, ARLL, or ESDI drive with drive parameters that do not match drive types 1-46, select *User* in the Type field. Enter the drive parameters on the screen that appears.
  - **Configuring IDE Drives**
    If the hard disk drive is an IDE drive, select the appropriate drive icon (Pri Master, Pri Slave, Sec Master, or Sec Slave). Choose the Type parameter and select Auto. AMIBIOS automatically detects the IDE drive parameters and displays them. Click on the OK button to accept these parameters.

    LBA Mode - LBA (Logical Block Addressing) is a new method of addressing data on a disk drive. In the ST506 (MFM) ISA hard disk drive standard, data is accessed via a Cylinder-Head-Sector format. Because the number of cylinders, disk drive heads, and sector is limited, an MFM drive can hold a maximum of 528 MB of data. In LBA mode, the maximum drive capacity is 8.4 GB.

    If LBA Mode is disabled in AMI BIOS Setup, AMI BIOS uses the physical parameters of the hard disk and AMIBIOS does not translate parameters. The operating system that uses the parameter table will only see 528 MB hard disk space even if the hard disk is greater than 528 MB.

If enabled in BIOS Setup and supported by the hard disk, AMI BIOS enables LBA mode and translates the physical parameters of the hard disk drive. If the hard disk is formatted, AMIBIOS enables LBA mode. If a hard disk that supports LBA mode and has a capacity greater than 528 MB was formatted with LBA mode disabled, AMIBIOS does not enable LBA mode even if LBA mode is enabled in AMIBIOS Setup. Choose *On* to enable support for IDE drives with capacities greater than 528 MB.

Block Mode - Block mode boosts IDE drive performance by increasing the amount of data transferred. Only 512 bytes of data can be transferred per interrupt if block mode is not used. Block mode allows transfers of up to 64 KB per interrupt.

If the IDE drive supports block mode and it is enabled in BIOS Setup, AMIBIOS enables multi-sector transfers. AMIBIOS sets the number of sectors to be transferred per interrupt to the value returned by the identify drive command.

PIO Mode - IDE PIO mode programs timing cycles between the IDE drive and the programmable IDE controller. As the PIO mode increases, the cycle time decreases. IDE PIO modes 3 through 7 are the advanced PIO modes. The IDE controller on the CPU card must support the IORDY signal before an advanced IDE PIO mode can be implemented.

Select *Auto* to allow AMIBIOS to automatically choose the PIO mode that the IDE drive being configured uses. If you select *0-5* you must be absolutely certain that you are selecting the PIO mode supported by the IDE drive being configured.

32Bit Mode - Hard disk drives connected to the computer via the ISA bus transfer data 16 bits at a time. An IDE drive on the PCI or VL-Bus local bus can use a 32-bit data path. If enabled in AMI BIOS Setup, AMI BIOS enables 32-bit data transfers. If the host does not support 32-bit transfer, this feature should be disabled.

- **Boot Sector Virus Protection**
  When this item is enabled, AMIBIOS issues a warning when any program (or virus) issues a Disk Format command or attempts to write to the boot sector of the hard disk drive. The settings are *Enabled* or *Disabled (default).* If enabled, the following message appears when a write is attempted to the boot sector. You may have to type <N> several times to prevent the boot sector write.

Boot Sector Write!!!
Possible VIRUS: Continue (Y/N)? _

The following appears after any attempt to format any cylinder, head, or sector of any hard disk drive via the BIOS INT 13 Hard Disk Drive Service:

Format!!!
Possible VIRUS: Continue (Y/N)? _

The memory configuration section of Standard CMOS SETUP displays the current memory devices on the upper right corner of the screen. These are displayed only and may not be changed. During Memory Test, the computer will automatically scan for memory allotted for the system and display the amount installed in the computer.

- **Base Memory** - amount of memory installed from 0 to 640KB
- **Extended Memory** - amount of memory installed beyond 1MB

4.1.4 Changing Standard CMOS SETUP Values

To change the equipment list, first using the left/right arrow keys or up/down keys, move the cursor to the item you want to change. Then choose from the options for that item by pressing the <PgUp> or <PgDn> keys.

4.2 Advanced CMOS and Chipset SETUP

In addition to the Standard CMOS SETUP, there is an Advanced CMOS and Chipset SETUP that allows configuration of the chipset for enhanced system functions of the CPU card.

The default settings will enable you to start the machine. The Advanced CMOS SETUP is for advanced technicians and engineers who wish to fine-tune the CPU card for a specific purpose.

To enter the Advanced SETUP, first reboot and press the <DEL> key after the Memory Test. Once the SETUP selection menu is displayed on the screen, choose either ADVANCED CMOS or ADVANCED CHIPSET SETUP.

4.2.1 Making Changes Under the Advanced SETUP

The bottom part of the SETUP display shows you a few reminders on how to make changes. The following keys are active under the Advanced SETUP:

- **<Up arrow >- <Down arrow> Keys** - goes to the previous or next register
- **<Right arrow> - <Left arrow> Keys** - goes to previous or next entry
- **<PgUp/PgDn> Keys** - changes the allowable setting according to the options
- **<ESC> Key** - returns you back to the main menu
- **<Return> Key** - enters the selection
- **<F2/F3> Keys** - color selection

4.2.2 Advanced CMOS SETUP

To enter the ADVANCED CMOS SETUP, move the highlighted bar to the ADVANCED CMOS SETUP option from the main menu then press <Enter>. The ADVANCED CMOS SETUP screen will pop-up from the screen right after.

- **Quick Boot**
  Set this option to *Enabled* to instruct AMIBIOS to boot quickly when the computer is powered on. This option replaces the old Above 1 MB Memory Test Advanced Setup option. The settings are listed on the following page.

Setting	Description
Disabled	AMIBIOS test all system memory. AMIBIOS waits up to 40 seconds for a READY signal from the IDE hard disk drive. AMIBIOS waits for .5 seconds after sending a RESET signal to the IDE drive to allow the IDE drive time to get ready again. AMIBIOS checks for a <Del> key press.
Enabled (default)	AMIBIOS does not test system memory above 1 MB. AMIBIOS does not wait up to 40 seconds for a READY signal from the IDE hard disk drive. If a READY signal is not received immediately from the IDE drive, AMIBIOS does not configure that drive. AMIBIOS does not wait for .5 seconds after sending a RESET signal to the IDE drive to allow the IDE drive time to get ready again.

- **BootUp Sequence**
  This option sets the sequence of boot drives (floppy drive A:, hard disk drive C:, or a CD-ROM drive) where the AMIBIOS attempts to boot from after AMIBIOS POST completes. The settings are *C:,A:,CDROM (default), CDROM,A:,C:* or *A:,C:, CDROM.*

- **BootUp Num-Lock**
  Set this option to *Off* to turn the Num Lock key off when the computer is booted so you can use the arrow keys on both the numeric keypad and the keyboard. The settings are *On (default)* or *Off.*

- **Floppy Drive Swap**
  Set this option to *Enabled* to permit swapping between drives A: and B:. The available settings are *Enabled* or *Disabled (default).*

- **Floppy Drive Seek**
  Setting this option to *Enabled* instructs floppy drive A: to perform a Seek operation at system boot. The settings are *Disabled (default)* or *Enabled.*

- **Primary Display**
  This option specifies the type of display monitor and adapter connected to the computer. The settings are *Mono, CGA40x25, CGA80x25, VGA/EGA (default),* or *Absent*.

- **Password Check**
  This option enables password checking every time the computer is powered on or every time BIOS Setup is executed. If *Always* is chosen, a user password prompt appears every time the computer is turned on. If *Setup (default)* is chosen, the password prompt only appears if BIOS is executed.

- **OS/2 Compatible Mode**
  Set this option to *Enabled* to permit AMIBIOS to run with IBM OS/2. The settings are *Enabled* or *Disabled (default).*

- **Internal Cache**
  This option specifies the caching algorithm used for L1 internal cache memory. The settings are:

Setting	Description
Disabled	Neither L1 internal cache memory on the CPU or L2 secondary cache memory is enabled.
WriteBack (default)	Uses the write-back caching algorithm. This setting changes from WriteBack to WriteThru depending on the CPU

- **External Cache**
  This option specifies the caching algorithm used for L2 secondary (external) cache memory. The settings are:

Setting	Description
Disabled	Neither L1 internal cache memory on the CPU or L2 secondary cache memory is enabled.
WriteBack	Uses the write-back caching algorithm.
WriteThru	Uses the write-through caching algorithm.

- **System BIOS Shadow Cacheable**
  When this option is set to *Enabled,* the contents of the F0000h system memory segment can be read from or written to L2 secondary cache memory. The contents of the F0000h memory segment are always copied from the BIOS ROM to system RAM for faster execution. The settings are *Enabled* or *Disabled (default).*

- **C000,16K Shadow, C400,16K Shadow, C800,16K Shadow, CC00,16K Shadow, D000,16K Shadow, D400,16K Shadow, D800,16K Shadow, DC00,16K Shadow, E000,32K, Shadow**
  These options control the location of the contents of the 16KB of ROM beginning at the specified memory location. If no adapter ROM is using the named ROM area, this area is made available to the local bus. The settings are:

Setting	Description
Enabled	The contents of C0000h - C3FFFh are written to the same address in system memory (RAM) for faster execution.
Disabled (default)	The video ROM is not copied to RAM. The contents of the video ROM cannot be read from or written to cache memory.

4.2.3 Advanced Chipset Setup

To enter the Advanced CHIPSET SETUP, follow the procedure in the previous subsection. Move the highlighted bar to the ADVANCED CHIPSET SETUP option then press <Enter>. The screen will display a menu of choices.

- **DRAM Read/Write Timing**
  During read and write to the CPU, these options specify the RAS access speed of the SIMMs installed on the CPU card as system memory. The settings are *Slow, Normal, Fast (default), Faster, Fastest.*

  CAUTION: *You must always use SIMMs that have the same speed within a memory bank.*

- **Memory Parity Check**
  Set this option to *Enabled* to check the parity of all system memory. The settings are *Disabled (default)* or *Enabled*.

- **Memory Hole At 15-16M**
  Use this option to specify an area in memory that cannot be addressed on the ISA bus. The settings are *Disabled (default)* or *Enabled.*

4.3 Peripheral Setup

To enter Peripheral Setup, follow the procedure in the previous subsection. Move the highlighted bar to the Peripheral Setup option then press <Enter>. The screen will display a menu of choices.

- **Onboard FDC**
  This option enables the floppy drive controller on the CPU card. The settings are *Auto (default), Enabled* or *Disabled.*
- **Onboard Serial Port1**
  This option enables serial port 1 on the CPU card and specifies the base I/O port address for serial port 1.
  The settings are *2F8h, 3F8h, 2E8h, 3E8h, Auto (default)* or *Disabled.*
- **Onboard Serial Port2**
  This option enables serial port 2 on the motherboard and specifies the base I/O port address for serial port 2.
  The settings are *2F8h, 3F8h , 2E8h, 3E8h, Auto (default)* or *Disabled.*
- **Onboard Parallel Port**
  This option enables the parallel port on the CPU card and specifies the parallel port base I/O port address. The settings are *378, 278, 3BC, Auto (default)* or *Disabled.*
  - **Parallel Port Mode**
    This option specifies the parallel port mode. ECP and EPP are both bi-directional data transfer schemes that adhere to the IEEE P1284 specifications. The settings are:

Setting	Description
Normal	The normal parallel port mode is used. This is the default setting.
ECP+EPP	Use this setting to support bi-directional transfers on the parallel port.

Continued . . . . .

Setting	Description
EPP	The parallel port can be used with devices that adhere to the Enhanced Parallel Port (EPP) specification. EPP uses the existing parallel port signals to provide asymmetric bi-directional data transfer driven by the host device.
ECP	The parallel port can be used with devices that adhere to the Extended Capabilities Port (ECP) specification. ECP uses the DMA protocol to achieve transfer rates of approximately 2.5MB. ECP provides symmetric bi-directional communications.

- **Parallel Port DMA Channel**
  This option is only available if the setting for the Parallel Port Mode option is *ECP.* The settings are *Disabled, DMA CH (channel) 0, DMA CH 1,* or *DMA CH 3*. The default setting is *Disabled.*

- **Onboard IDE**
  This option specifies the onboard IDE controller channels that will be used. The settings are *Primary (default), Both*, or *Disabled.*

4.4 Auto-Detect Hard Disks

This section is an automatic detection of the hard drives installed in the system. After selecting the Auto-Detect Hard Disks from the main menu, SETUP utility will automatically detect all the drives installed.

NOTE: *Refer to Appendix B for the list of hard disk drive types. Hard disk type can be changed from the Standard CMOS SETUP.*

4.5 Change Supervisor Password

AMI BIOS Setup has an optional password feature. The system can be configured so that all users must enter a password every time the system boots or when Setup is executed. You can set either a Supervisor password or a User password.

When you select Change Supervisor Password from the main menu, AMI BIOS prompts for a password. Enter a 1 – 6 character password. The password does not appear on the screen when typed. After the new password is entered, retype the new password as prompted and press <Enter>. Make sure you write it down. If you forget it, you must clear the CMOS RAM and reconfigure the system.

If the password confirmation is incorrect, an error message appears. If the new password is entered without error, press <ESC> to return to the main menu. The password is then stored in CMOS RAM after completion. The next time the system boots, you are prompted for the password if the password function is present and is enabled.

4.6 Auto Configuration with Optimal Settings

You can load the optimal default settings for the AMI BIOS by selecting the option Auto Configuration with Optimal Settings. The Optimal default settings are best-case values that should optimize system performance. If CMOS RAM is corrupted, the Optimal settings are loaded automatically.

4.7 Auto Configuration with Fail Safe Settings

You can load the Fail Safe AMI BIOS Setup option settings by selecting the option Auto Configuration with Fail Safe Settings from the SETUP main menu.

The Fail Safe settings provide far from optimal system performance, but are the most stable settings. Use this option as a diagnostic aid if the system is behaving erratically.

4.8 Saving CMOS SETUP Values

After you have entered the correct equipment values for Standard CMOS SETUP, Advanced SETUP, and Peripheral Setup, press the <ESC> key to go back to the main menu and choose the "SAVE SETTINGS AND EXIT" option. The screen will display a message asking if you want to write the current data into the CMOS and exit. Press <Y> after you've made the necessary configurations or corrections. The new equipment configuration will be saved and the computer will reboot.

NOTE: *If the computer halts or there is no display after the SETUP values, reboot the system and enter SETUP by pressing the <DEL> key.*
Do any of the following after entering SETUP:
(i) Alter options to make system work
(ii) Load Auto Configuration with Optimal Settings
(iii) Load Auto Configuration with Fail Safe Settings

4.9 Leaving SETUP Without Changes

If you want to cancel all changes made under SETUP, go to the option "EXIT WITHOUT SAVING". Press <Y> and the computer will exit and reboot without saving any of the changes you made.

4.10 Error Messages

Part of the power-on self-test (POST) will make various equipment checks on your computer. If there are problems encountered, the computer will halt the boot process and give you a chance to run AMI BIOS SETUP Utility.

If there is a mismatch between the equipment list in configuration memory and what the computer finds on startup, you will see a message asking you to press the <DEL> key to run AMI BIOS SETUP Utility. The messages below indicate configuration errors.<F1>

C: drive error or C: drive failure	Check if your HDD cable is connected properly. Possible fixed disk or fixed disk controller failure. RUN SETUP Utility and enter the correct fixed disk drive type. If problem persists, run a disk diagnostic.
Keyboard error	Check if keyboard is connected properly.
CMOS battery state low CMOS system options not set CMOS display type mismatch	Check if the jumper for the battery is set correctly. Make sure that the battery is functioning properly. RUN SETUP Utility and enter the correct parameters.
CMOS memory size mismatch	The memory installed in the system is not the same parameter set in the configuration. RUN SETUP Utility and enter the correct parameter.

This page does not contain any information.

Appendix A
Pin Assignments

IDE Interface Connector: CN1

Pin	Description	Pin	Description
1	Reset #	2	GND
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 16
19	GND	20	N.C.
21	N.C.	22	GND
23	IOW#	24	GND
25	IOR#	26	GND
27	IOCHRDY	28	N.C.
29	N.C.	30	GND-Default
31	Interrupt	32	N.C.
33	SA1	34	N.C.
35	SA0	36	SA2
37	HDC CS0#	38	HDC CSI#
39	HDD Active #	40	GND

Floppy Disk Connector: CN2

Pin	Description	Pin	Description
1	GND	2	Reduce write current
3	GND	4	N.C.
5	GND	6	N.C.
7	GND	8	Index #
9	GND	10	Motor enable A#
11	GND	12	Drive select B#
13	GND	14	Drive select A#
15	GND	16	Motor enable B#
17	GND	18	Direction #
19	GND	20	STEP#
21	GND	22	Write data #
23	GND	24	Write gate #
25	GND	26	Track 0#
27	GND	28	Write protect #
29	GND	30	Read data #
31	GND	32	Side 1 select #
33	GND	34	Disk change #

Keylock/Power LED: CN11

Pin	Description
1	Power LED +
2	N.C.
3	Power LED - / GND
4	Keyboard lock
5	Power LED - / GND

Parallel Port Connector: CN3

Pin	Description	Pin	Description
1	Strobe #	14	Auto Form Feed #
2	Data 0	15	Error #
3	Data 1	16	Initialize #
4	Data 2	17	Printer Select In #
5	Data 3	18	GND
6	Data 4	19	GND
7	Data 5	20	GND
8	Data 6	21	GND
9	Data 7	22	GND
10	Acknowledge #	23	GND
11	Busy	24	GND
12	Paper Empty #	25	GND
13	Printer Select		

External Power Connector: CN4

Pin	Description
1	+5V
2	+12V
3	-12V
4	GND
5	GND
6	+5V
7	+12V
8	+5V

Serial Port Connectors: CN5, CN6

Pin	Description
1	Data Carrier Detect (DCD) (+5V/+12V)
2	Receive Data (RXD)
3	Transmit Data (DRT)
4	Data Terminal Ready (DTR)
5	Ground (GND)
6	Data Set Ready (DSR)
7	Request to Send (RTS)
8	Clear to Send (CTS)
9	Ring Indicator (RI) (+5V/+12V)

Mini-DIN PS/2 Keyboard Connector: CN7
External Keyboard: CN8

Pin	Description
1	Keyboard clock
2	Keyboard data
3	N.C.
4	Keyboard ground
5	Keyboard power

Reset Switch: CN13
IDE Active LED: CN14

Pin	Description
1	LED +
2	LED -

PC/104 Connectors: CN9, CN10

Pin	A	B	C	D
1	IOCHCHK*	GND	SBHE	MEMCS16*
2	SD7	RESETDRV	LA23	IOSC16*
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	-5V	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ15
7	SD2	-12V	LA18	IRQ14
8	SD1	OWS*	LA17*	DACK0*
9	SD0	+12V	MEMR*	DRQ0*
10	IOCHRDY*	GND	MEMW*	DACK5*
11	AEN	SMEMW*	SD8	DRQ5
12	SA19	SMEMR*	SD9	DACK6*
13	SA18	IOW*	SD10	DRQ6
14	SA17	IOR*	SD11	DACK7*
15	SA16	DACK3*	SD12	DRQ7
16	SA15	DRQ3	SD13	+5V
17	SA14	DACK1*	SD14	MASTER*
18	SA13	DRQ1	SD15	GND
19	SA12	REFRESH*	NC	GND
20	SA11	SYSCLK	--	--
21	SA10	IRQ7	--	--
22	SA9	IRQ6	--	--
23	SA8	IRQ5	--	--
24	SA7	IRQ4	--	--
25	SA6	IRQ3	--	--
26	SA5	DACK2*	--	--
27	SA4	TC	--	--
28	SA3	BALE	--	--
29	SA2	+5V	--	--
30	SA1	OSC	--	--
31	SA0	GND	--	--
32	GND	GND	--	--

'*' means 'Low active single'
'—' means 'None'

Speaker : CN12

Pin	Description
1	+5V
2	N.C.
3	Internal buzzer
4	External speaker (Remove 3-4)

CPU Fan Power Pin Assignment: CN15

Pin	Description
1	+12V
2	GND
3	GND
4	+5V

RS-232 Connector: COM1

Pin	Description	Pin	Description
1	DCD	6	DSR
2	RX	7	RTS
3	TX	8	CTS
4	DTR	9	RI
5	GND		

RS-232/422/485 Connector: COM2

Pin	RS232	RS422	RS485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	TX	RX+	
4	DTR	RX-	
5	GND	GND	
6	DSR		
7	RTS		
8	CTS		
9	RI		

Appendix B
AMI BIOS Fatal Error Codes

Beep Codes

Fatal errors, which halt the boot process, are communicated through a series of audible beeps. If AMI BIOS POST can initialize the system video display, it displays the error message. Displayed error messages, in most cases, allow the system to continue to boot. Displayed error messages are described on the following table.

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry is faulty.
2	Parity Error	Parity error in the base memory (the first 64 KB block) of memory.
3	Base 64 KB Memory Failure	Memory failure in first 64 KB.
4	Timer Not Operational	A memory failure in the first 64 KB of memory, or Timer 1 is not functioning.
5	Processor Error	The CPU generated an error.
6	8042 - Gate A20 Failure	Cannot switch to protected mode.
7	Processor Exception Interrupt Error	The CPU on the CPU Card generated an exception interrupt.
8	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum Error	The ROM checksum value does not match the value encoded in AMIBIOS.
10	CMOS Shutdown Register Read/Write Error	The shutdown register for CMOS RAM has failed.
11	Cache Memory Bad — Do Not Enable Cache	The cache memory test failed. Cache memory is disabled. *Do not press <Ctrl> <Alt> <Shift> <+> to enable cache memory.*

Troubleshooting System Problems

If the Computer Beeps

If it beeps...	then...
1, 2, or 3 times...	re-install the memory SIMMs or DIPs. If the system still beeps, replace the memory.
6 times...	re-install the keyboard controller chip. If it still beeps, replace the keyboard controller. If it still beeps, try a different keyboard, or replace the keyboard fuse (if the keyboard has one).
8 times...	there is a memory error on the video adapter. Replace the video adapter, or the RAM on the video adapter.
9 times...	the BIOS ROM chip is bad. The system probably needs a new BIOS ROM chip.
11 times...	re-install the cache memory on the motherboard. If it still beeps, replace the cache memory.
4, 5, 7, or 10 times...	the motherboard must be replaced.

The following tables are the checkpoint lists generated by I/O 80h port in AMI runtime compressed BIOS in order of execution.

Uncompressed Code Checkpoints

Checkpoint	Description
C2	NMI is Disabled. Power on delay starting.
C5	Power-on delay complete. Going to enable ROM. (i.e., disable Cache if any)
C6	Calculating ROM BIOS checksum.
C7	ROM BIOS checksum passed. CMOS shutdown register test to be done next.
C8	CMOS shutdown register test done. CMOS checksum calculation to be done next.
CA	CMOS checksum calculation is done, CMOS Diag byte written. CMOS status register about to init for date and time.
CB	CMOS status register init done. Any initialization before keyboard BAT to be done next.

Continued . . . . .

Checkpoint	Description
CD	BAT command to keyboard controller is to be issued.
CE	Keyboard controller BAT result verified. Any initialization after KB controller BAT to be done next.
CF	Initialization after KB controller BAT done. Keyboard command byte to be written next.
D1	Keyboard controller command byte is written. Going to check pressing of <INS> key during power-on.
D2	Checking for pressing of <INS> key during power-on done. Going to disable DMA and Interrupt controllers.

Runtime Code is Uncompressed

Checkpoint	Description
D3	DMA controller #1, #2, interrupt controller #1, #2 disabled. Video display is disabled and port-B is initialized.
D4	Chipset initialization/ auto memory detection over. To uncompress the RUNTIME code.
D5	RUNTIME code is uncompressed.
DD	Transfer control to uncompressed code in shadow ram at F000:FFF0.
01	Processor's register test about to start, and NMI to be disabled.
02	NMI is Disabled. Power on delay starting.
03	Power on delay complete. To check soft reset/power-on.
05	Soft reset/power-on determined. Going to disable Cache if any.
06	POST code to be uncompressed.
08	POST code is uncompressed. CMOS checksum calculation to be done next.
09	CMOS checksum calculation is done, CMOS Diag byte written. CMOS init to begin (If "INIT CMOS IN EVERY BOOT IS SET").
0A	CMOS initialization done (if any). CMOS status register about to init for Date and Time.
0B	CMOS status register init done. Any initialization before keyboard BAT to be done next.

Continued . . . . .

Checkpoint	Description
0C	KB controller I/B free. Going to issue the BAT command to keyboard controller.
0D	BAT command to keyboard controller is issued. Going to verify the BAT command.
0E	Keyboard controller BAT result verified. Any initialization after KB controller BAT to be done next.
0F	Initialization after KB controller BAT done. Keyboard command byte to be written next.
10	Keyboard controller command byte is written. Going to issue Pin-23, 24 blocking/unblocking command.
11	Pin-23, 24 of keyboard controller is blocked/unblocked. Going to check pressing of <INS> key during power-on.
12	Checking for pressing of <INS> key during power-on done. Going to disable DMA and interrupt controllers.
13	DMA controller #1, #2, interrupt controller #1, #2 disabled. Video display is disabled and port-B is initialized. Chipset init about to begin.
14	Chipset initialization over. 8254 timer test about to start.
19	8254 timer test over. About to start memory refresh test.
1A	Memory Refresh line is toggling. Going to check 15 micro second ON/OFF time.
20	Memory Refresh period 30 micro second test complete. Base 64K test about to start.
23	Base 64K test passed. Going to set BIOS stack and to do any setup before Interrupt vector init.
24	Setup required before vector initialization complete. Interrupt vector initialization about to begin.
25	Interrupt Vector initialization done. Going to read input port of 9042 for turbo switch (if any) and to clear password if post diag switch is on.
26	Input port of 8042 is read. Going to initialize global data for turbo switch.
27	Global data initialization for turbo switch is over. Any initialization before setting Video mode to be done next.

Continued . . . . .

Checkpoint	Description
28	Initialization before setting Video mode is complete. Going for monochrome mode and color mode setting.
2A	Different BUSes init (system, static, output devices) to start if present. (Please see Reference for details of different BUSes)
2B	About to give control for any setup required before optional Video ROM check.
2C	Processing before Video ROM control is done. About to look for optional Video ROM and give control.
2D	Optional Video ROM control is done. About to give control to do any processing after Video ROM returns control.
2E	Return from processing after the Video ROM control. If EGA/VGA not found then do display memory R/W test.
2F	EGA/VGA not found. Display memory R/W test about to begin.
30	Display memory R/W test passed. About to look for the retrace checking.
31	Display memory R/W test or retrace checking failed. About to do alternate Display memory R/W test.
32	Alternate Display memory R/W test passed. About to look for the alternate display retrace checking.
34	Video display checking over. Display mode to be set next.
37	Display mode set. Going to display the power on message.
38	Different BUSes init (input, IPL, general devices) to start if present. (Please see Reference for details of different BUSes)
39	Display different BUSes initialization error messages. (Please see Reference for details of different BUSes)
3A	New cursor position read and saved. Going to display the Hit <DEL> message.
3B	Hit <DEL> message displayed. Virtual mode memory test about to start.
40	Going to prepare the descriptor tables.
42	Descriptor tables prepared. Going to enter in virtual mode for memory test.
43	Entered in the Virtual mode. Going to enable interrupts for diagnostics mode.

Continued . . . . .

Checkpoint	Description
44	Interrupts enabled (if diagnostics switch is on). Going to initialize data to check memory wrap around at 0:0.
45	Data initialized. Going to check for memory wrap around at 0:0 and finding the total system memory size.
46	Memory wrap around test done. Memory size calculation over. About to go for writing patterns to test memory.
47	Pattern to be tested written in extended memory. Going to write patterns in base 640K memory.
48	Patterns written in base memory. Going to find out amount of memory below 1M memory.
49	Amount of memory below 1M found and verified. Going to find out amount of memory above 1M memory.
4B	Amount of memory above 1M found and verified. Check for soft reset and going to clear memory below 1M for soft reset. (If power on, go to check point # 4Eh).
4C	Memory below 1M cleared. (SOFT RESET) Going to clear memory above 1M
4D	Memory above 1M cleared. (SOFT RESET) Going to save the memory size. (Go to check point # 52h).
4E	Memory test started. (NOT SOFT RESET) About to display the first 64K memory size.
4F	Memory size display started. This will be updated during memory test. Going for sequential and random memory test.
50	Memory testing/initialization below 1M complete. Going to adjust displayed memory size for relocation/shadow.
51	Memory size display adjusted due to relocation/shadow. Memory test above 1M to follow.
52	Memory testing/initialization above 1M complete. Going to save memory size information.
53	Memory size information is saved. CPU registers are saved. Going to enter in real mode.
54	Shutdown successful, CPU in real mode. Going to disable gate A20 line.
57	A20 address line disable successful. Going to adjust memory size depending on relocation/shadow.
58	Memory size adjusted for relocation/shadow. Going to clear Hit <DEL> message.
59	Hit <DEL> message cleared. <WAIT...> message displayed. About to start DMA and interrupt controller test.

Continued . . . . .

Checkpoint	Description
60	DMA page register test passed. About to go for DMA #1 base register test.
62	DMA #1 base register test passed. About to go for DMA #2 base register test.
65	DMA #2 base register test passed. About to program DMA unit 1 and 2.
66	DMA unit 1 and 2 programming over. About to initialize 8259 interrupt controller.
67	8259 initialization over. About to start keyboard test.
7F	Extended NMI sources enabling is in progress.
80	Keyboard test started. Clearing output buffer, checking for stuck key. About to issue keyboard reset command.
81	Keyboard reset error/stuck key found. About to issue keyboard controller interface test command.
82	Keyboard controller interface test over. About to write command byte and init circular buffer.
83	Command byte written, Global data init done. About to check for lock-key.
84	Lock-key checking over. About to check for memory size mismatch with CMOS.
85	Memory size check done. About to display soft error and check for password or by pass setup.
86	Password checked. About to do programming before setup.
87	Programming before setup complete. Going to uncompress SETUP code and execute CMOS setup.
88	Returned from CMOS setup program and screen is cleared. About to do programming after setup.
89	Programming after setup complete. Going to display power on screen message.
8B	First screen message display. <WAIT...>message displayed. About to do Main and Video BIOS shadow.
8C	Main and Video BIOS shadow successful. Setup options programming after CMOS setup about to start.
8D	Set up options are programmed, mouse check and init to be done next.

Continued . . . . .

Checkpoint	Description
8E	Mouse check and initialization complete. Going for hard disk controller reset.
8F	Hard disk controller reset done. Floppy setup to be done next.
91	Floppy setup complete. Hard disk setup to be done next.
94	Hard disk setup complete. Going to set base and extended memory size.
95	Memory size adjusted due to mouse support, hdisk type-47. Init of different BUSes optional ROMs from C800 to start. (Please see Reference for details of different BUSes)
96	Going to do any init before C800 optional ROM control.
97	Any init before C800 optional ROM control is over. Optional ROM check and control will be done next.
98	Optional ROM control is done. About to give control to do any required processing after optional ROM returns control.
99	Any initialization required after optional ROM test over. Going to setup timer data area and printer base address.
9A	Return after setting timer and printer base address. Going to set the RS-232 base address.
9B	Returned after RS-232 base address. Going to do any initialization before coprocessor test.
9C	Required initialization before coprocessor is over. Going to initialize the coprocessor next.
9D	Coprocessor initialized. Going to do any initialization after coprocessor test.
9E	Initialization after co-processor test is complete. Going to check extd keyboard, keyboard ID and num-lock.
9F	Extd keyboard check is done, ID flag set, num-lock on/off, keyboard ID command to be issued.
A0	Keyboard ID command issued. Keyboard ID flag to be reset.
A1	Keyboard ID flag reset. Cache memory test to follow.
A2	Cache memory test over. Going to set the keyboard typematic rate.
A3	Soft error display complete. Going to set the keyboard typematic rate.
A4	Keyboard typematic rate set. Going to program memory wait states.

Continued . . . . .

Checkpoint	Description
A5	Memory wait states programming over. Going to clear the screen and enable parity/NMI.
A7	NMI and parity enabled. Going to do any initialization required before giving control to optional ROM at E000.
A8	Initialization before E000 ROM control over. E000 ROM to get control next.
A9	Returned from E000 ROM control. Going to do any initialization required after E000 optional ROM control.
AA	Initialization after E000 optional ROM control is over. Going to display the system configuration.
B0	System configuration is displayed. Going to uncompress SETUP code for hot-key setup.
B1	Uncompressing of SETUP code is complete. Going to copy any code to specific area.
00	Copying of code to specific area done. Going to give control to INT 19h boot loader.

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 the motherboard is faulty.
2 beeps	Parity Error	A parity error was detected in the first 64KB block of memory.
3 beeps	Base 64KB Memory Failure	Memory failure in first 64KB.
4 beeps	Timer Not Operational	A memory failure occurred within the first 64KB of memory, or Timer 1 on the motherboard is not functioning.
5 beeps	Processor Error	The CPU (Central Processing Unit) on the motherboard generated an error.
6 beeps	8042-Bate A20 Failure	Gate A20 on the keyboard controller (8042) 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 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 failed.
11 beeps	Cache Error/External Cache Bad	The external cache is faulty.