# UMC

## 486DX / 486DX2 / 486SX

## System Board

## User's Manual

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# 1. *INTRODUCTION*

The manual is prepared for both the users who want to install the 486DX system board in their system and the programmers who want to utilize the 486DX system for special functions.

The 486DX system board is based on the 80486DX (or 80486SX) microprocessor and the high performance UMC 82C481B / 82C482A / 82C206 chipset which includes peripheral controller, data/address buffer and advanced memory manager. The system board is fully compatible with the IBM PC/AT.

On-board memory can be expandable from 1MB up to 16M bytes (or 48MB if *HDSIMM* RAM modules are installed). The cache memory size can be configurable as 64K, 128K or 256K.

# 2. *GENERAL SPECIFICATIONS*

The 486 system board has the following general specifications:

- ❑ The 486 system board is based on the 80486DX-33 or 80486SX-25 CPU.
- ❑ High performance UMC 82C481B / 82C482A / 82C206 486 AT compatible chipset is used.
- ❑ On-board DRAM sub-system expandable from 1MB to 16MB (or 48MB if HDSIMM are installed).
- ❑ Support 256KBX9, 1MBX9 or 4MBX9 SIMM memory module.X

  Support shadow RAM for system BIOS and video BIOS.
- ❑ AMI AT compatible BIOS is used.
- ❑ The CPU speed is selectable by jumper or eyboard control.
- ❑ 3 Programmable timer/counters.
- ❑ 16 Levels of system interrupts.
- ❑ 7 Direct Memory Access (DMA) channels.
- ❑ On-board battery bac up for CMOS configuration table and real-time cloc .
- ❑ Six 16-bit expansion slots and two 8-bit expansion slots.

# 3. *MEMORY CONFIGURATION*

## 3.1. Memory Ban Configuration

| JP8 | JP9 | SM1-4 | SM5 |
|---|---|---|---|
| X | 1 - 2 | Ban 0 | Ban 1 & 2 |
| 2 - 3 | 2 - 3 | Ban 1 | Ban 0 |
| 1 - 2 | 2 - 3 | Ban 2 | Ban 0 & 1 |

Remar : X means don't care

## 3.2. Possible Memory Configuration

i. Jumper Setting (JP8 = X, JP9 = 1-2)

| Ban 0<br>SM1 - SM4 | Ban 1 & 2<br>SM5 | Total |
|---|---|---|
| 256Kx9 x 4 | | 1M |
| 256Kx9 x 4 | 256Kx36 | 2M |
| 256Kx9 x 4 | 512Kx36 | 3M |
| 1Mx9 x 4 | | 4M |
| 256Kx9 x 4 | 1Mx36 | 5M |
| 1Mx9 x 4 | 1Mx36 | 8M |
| 256Kx9 x 4 | 2Mx36 | 9M |
| 1Mx9 x 4 | 2Mx36 | 12M |
| 4Mx9 x 4 | | 16M |
| 1Mx9 x 4 | 4Mx36 | 20M |
| 4Mx9 x 4 | 4Mx36 | 32M |
| 1Mx9 x 4 | 8Mx36 | 36M |
| 4Mx9 x 4 | 8Mx36 | 48M |

ii. Jumper Setting (JP8 = 2 - 3, JP9 = 2 - 3)

| Ban 0<br>SM5 | Ban 1<br>SM1 - SM4 | Total |
|---|---|---|
| 256Kx36 | | 1M |
| 256Kx36 | 256Kx9 x 4 | 2M |
| 1Mx36 | | 4M |
| 256Kx36 | 1Mx9 x 4 | 5M |
| 1Mx36 | 1Mx9 x 4 | 8M |
| 4Mx36 | | 16M |
| 1Mx36 | 4Mx9 x 4 | 20M |
| 4Mx36 | 4Mx9 x 4 | 32M |

ii. Jumper Setting (JP8 = 1 - 2, JP9 = 2 - 3)

| Ban 0 & 1<br>SM5 | Ban 2<br>SM1 - SM4 | Total |
|---|---|---|
| 512Kx36 | | 2M |
| 512Kx36 | 256Kx9 x 4 | 3M |
| 512Kx36 | 1Mx9 x 4 | 6M |
| 2Mx36 | | 8M |
| 2Mx36 | 1Mx9 x 4 | 12M |
| 2Mx36 | 4Mx9 x 4 | 24M |
| 8Mx36 | | 32M |
| 8Mx36 | 4Mx9 x 4 | 48M |

# 4. CPU OPERATING SPEED

The 486 system board can run at either non-turbo mode or turbo mode. The selection can be done by either a turbo switching button connected to jumper TB SW or using eyboard control.

| Key-in Sequence | Operating Mode |
|---|---|
| Ctrl-Alt_+ | Turbo mode |
| Ctrl_Alt_- | Non-turbo mode |

# 5. *JUMPER SETTING*

Following are the details specification of jumpers:

| Reset | Reset Switch |
|---|---|
| Short | Reset the system |
| Open | Normal |

| TB SW | Turbo Switch Connector |
|---|---|
| Open | Non-turbo mode |
| Short | Turbo mode |

| JP5 | Display Type Selection |
|---|---|
| Short | CGA |
| Open | Monochrome / EGA / VGA |

| JP7 | External / Internal Battery |
|---|---|
| Open | Select External Battery |
| Short | Select Internal Battery |

| JP2 | JP11 | CPU Type |
|---|---|---|
| 2 - 3 | 1 - 2, 3 - 4 | 486DX |
| Open | 2 - 3 | 486SX |
| 1 - 2 | 1 - 2, 3 - 4 | 487SX |

| W15 | W14 | W17 | W16 | W10 | W11 | W13 | W12 | Cache RAM | Tag RAM | Cache Size | Cacheable Size |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-2 | 1-2 | Off | 1-2 | Off | Off | Off | Off | 8Kx8 U25-32 | 8Kx8 U24 | 64K | 16MB |
| 2-3 | 1-2 | 1-2 | 2-3 | On | Off | Off | On | 8Kx8 U25, U27 U29, U31 | 8Kx8 U24 | 128K | 32MB |
| 2-3 | 2-3 | 2-3 | 1-2 | On | On | On | On | 32Kx8 U25-U32 | 32Kx8 U24 | 256K | 64MB |

# 6. *CONNECTOR PIN ASSIGNMENT*

| CN1 | Power Connector |
|---|---|
| 1 | Power Good |
| 2 | +5V |
| 3 | +12V |
| 4 | -12V |
| 5 | Ground |
| 6 | Ground |
| 7 | Ground |
| 8 | Ground |
| 9 | -5V |
| 10 | +5V |
| 11 | +5V |
| 12 | +5V |

| KB1 | Keyboard Connector |
|---|---|
| 1 | Cloc |
| 2 | Data |
| 3 | Spare |
| 4 | Ground |
| 5 | +5V |

| Spea er | Spea er Connector |
|---|---|
| 1 | Spea er - |
| 2 | No Connection |
| 3 | Ground |
| 4 | Spea er + |

| Keyloc | Keyloc & Power LED |
|---|---|
| 1 | +5V |
| 2 | No Connection |
| 3 | Ground |
| 4 | Keyboard Inhibit |
| 5 | Ground |

| TB LED | Turbo LED |
|---|---|
| 1 | LED + |
| 2 | LED - |

| J6 | External Battery Connector |
|---|---|
| 1 | 3.6V - 4.5V |
| 2 | No Connection |
| 3 | Ground |
| 4 | Ground |

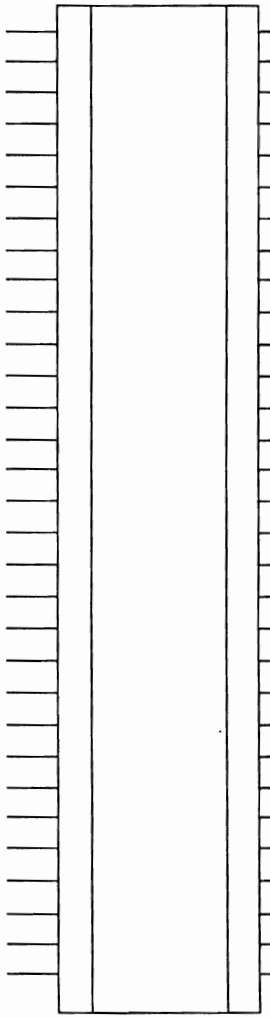
# 7 *I/O ADDRESS MAPPING*

| Hex Range | Devices | Usage |
|---|---|---|
| 000 - 01F | DMA Controller 1 | system |
| 020 - 03F | Interrupt Controller 1 | system |
| 040 - 05F | Timer | system |
| 060 - 06F | 8042 ( eyboard) | system |
| 070 - 07F | Real-time cloc , NMI mas | system |
| 080 - 09F | DMA Page register | system |
| 0A0 - 0BF | Interrupt Controller 2 | system |
| 0C0 - 0DF | DMA Controller 2 | system |
| 0F0 | Clear Maths Coprocessor | system |
| 0F1 | Reset Maths Coprocessor | system |
| 0F8 - 0FF | Maths Coprocessor | system |
| 1F0 - 1F8 | Fixed dis | I/O |
| 200 - 207 | Game I/O | I/O |
| 278 - 27F | Parallel printer port 2 | I/O |
| 2F8 - 2FF | Serial port 2 | I/O |
| 300 - 31F | Prototype Card | I/O |
| 360 - 36F | Reserved | I/O |
| 378 - 37F | Parallel printer port 1 | I/O |
| 380 - 38F | SDLC, bisynchronous 2 | I/O |
| 3A0 - 3AF | Bisynchronous 1 | I/O |
| 3B0 - 3BF | Monochrome display and printer adapter | I/O |
| 3C0 - 3CF | Reserved | I/O |
| 3D0 - 3DF | Color/Graphics Adapter | I/O |
| 3F0 - 3F7 | Floppy dis ette controller | I/O |
| 3F8 - 3FF | Serial port 1 | I/O |

# 8 EXPANSION SLOTS

## 8.1. 62 pin I/O BUS

| Signal | Pin | Pin | Signal |
|---|---|---|---|
| GND | B1 | A1 | - I/O CH CK |
| RESET DRV | B2 | A2 | SD7 |
| +5Vdc | B3 | A3 | SD6 |
| IRQ9 | B4 | A4 | SD5 |
| -5Vdc | B5 | A5 | SD4 |
| DRQ2 | B6 | A6 | SD3 |
| -12Vdc | B7 | A7 | SD2 |
| 0 WS | B8 | A8 | SD1 |
| +12Vdc | B9 | A9 | SD0 |
| GND | B10 | A10 | -I/O CHRDY |
| -SMEMW | B11 | A11 | AEN |
| -SMEMR | B12 | A12 | SA19 |
| -IOW | B13 | A13 | SA18 |
| -IOR | B14 | A14 | SA17 |
| -DACK3 | B15 | A15 | SA16 |
| DRQ3 | B16 | A16 | SA15 |
| -DACK1 | B17 | A17 | SA14 |
| DRQ1 | B18 | A18 | SA13 |
| -REFRESH | B19 | A19 | SA12 |
| BUSCLK | B20 | A20 | SA11 |
| IRQ7 | B21 | A21 | SA10 |
| IRQ6 | B22 | A22 | SA9 |
| IRQ5 | B23 | A23 | SA8 |
| IRQ4 | B24 | A24 | SA7 |
| IRQ3 | B25 | A25 | SA6 |
| -DACK2 | B26 | A26 | SA5 |
| T/C | B27 | A27 | SA4 |
| BALE | B28 | A28 | SA3 |
| +5Vdc | B29 | A29 | SA2 |
| OSC | B30 | A30 | SA1 |
| GND | B31 | A31 | SA0 |



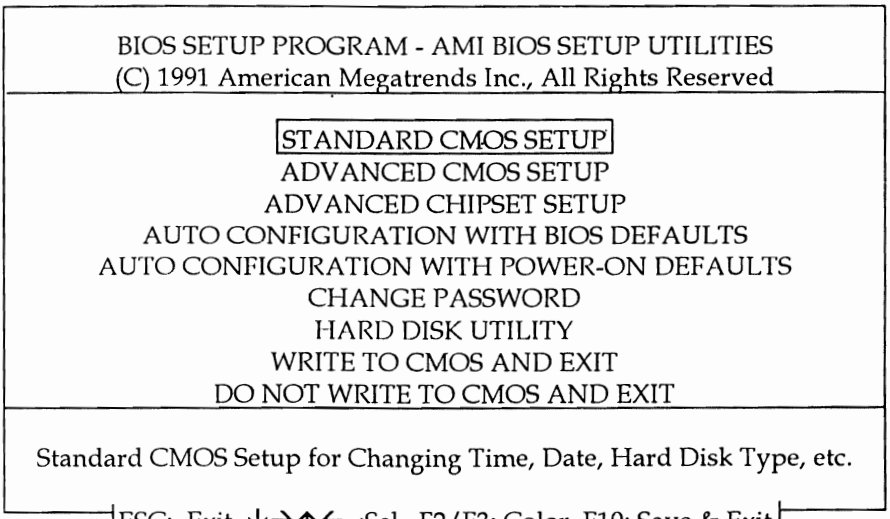
## 8.2. *36 pin I/O BUS*

| *Signal* | *Pin* | *Rear panel* | *Pin* | *Signal* |
|---|---|---|---|---|
| -MEM CS16 | D1 | | C1 | SBHE |
| -I/O CS16 | D2 | | C2 | LA23 |
| IRQ10 | D3 | | C3 | LA22 |
| IRQ11 | D4 | | C4 | LA21 |
| IRQ12 | D5 | | C5 | LA20 |
| IRQ15 | D6 | | C6 | LA19 |
| IRQ14 | D7 | | C7 | LA18 |
| -DACK0 | D8 | | C8 | LA17 |
| DRQ0 | D9 | | C9 | -MEMR |
| -DACK5 | D10 | | C10 | -MEMW |
| DRQ5 | D11 | | C11 | SD8 |
| -DACK6 | D12 | | C12 | SD9 |
| DRQ6 | D13 | | C13 | SD10 |
| -DACK7 | D14 | | C14 | SD11 |
| DRQ7 | D15 | | C15 | SD12 |
| +5Vdc | D16 | | C16 | SD13 |
| -MASTER | D17 | | C17 | SD14 |
| GND | D18 | | C18 | SD15 |

# 9 *BIOS SETUP*

AMI AT compatible BIOS (Basic Input Output System) is supplied along with the 486 system board. The BIOS provides an on-screen interactive configuration setup utility. This setup utility allows setting of time, date, type of floppy drivers, type of hard disk, type of display adapter, CPU speed, memory configuration, and BIOS shadow memory.

The SETUP utility is built-in with the BIOS. It can be invoked by pressing the DEL key as instructed on the screen after the system warm or cold start. A main menu will pop up as follows.




Use arrow keys to move cursor to the desired selection. For the ease of configuration, you can select "Auto Configuration With BIOS Defaults" first and then go to the "Standard CMOS Setup". You need not go through the "Advanced CMOS Setup" or "Advanced Chipset Setup" unless you have a good technical knowledge of the chipset or want to use some extended features.

## 9.1. *Warning Information*

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

BIOS SETUP PROGRAM - WARNING INFORMATION
(C)1991 American Megatrends Inc., All Rights Reserved

Improper Use of Setup may Cause Problems !!

If System Hangs, Reboot 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 BIOS Setup Defaults
(iii) Load Power-On Defaults

Hit <ESC> to Stop now. Any other key to Continue

## 9.2. *Standard CMOS Setup*

Standard CMOS Setup is the first option on the main setup menu. Press ENTER at the highlighted selection to access this option. The screen as below will appear.

BIOS SETUP PROGRAM - STANDARD CMOS SETUP
(C)1991 American Megatrends Inc., All Rights Reserved

Date (mn/date/year) : Mon, Apr 22 1991
Time (hour/min/sec) : 10:42:44

Base memory : 640 KB
Ext. memory : 0 KB

| | | Cyln | Head | WPcom | Lzone | Sect | Size |
|---|---|---|---|---|---|---|---|
| Hard disk C: type: | : 17 | 977 | 5 | 300 | 977 | 17 | 41MB |
| Hard disk D: type | : Not Installed | | | | | | |
| Floppy drive A: | : 1.2 MB, 5 1/4" | | | | | | |
| Floppy drive B: | : 1.44 MB, 3 1/2" | | | | | | |
| Primary display | : VGA/PGA/EGA | | | | | | |
| Keyboard | : Installed | | | | | | |

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|
| 31 | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |

Month: Jan, Feb,.....Dec
Date : 01, 02, 03.....31
Year : 1901, 1902.....2099

ESC:Exit ↓→↑←Select F2/F3:Color PU/PD:Modify

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

i. *Date*
Enter in the format Month/Date/Year. Ranges for each value are listed below in prompt box in the lower left corner of the CMOS Setup Screen.

ii. *Time*
Enter in the format Hour/Minute/Second. Uses 24 hour clock format.

iii. *Hard Disk C and Hard Disk D*
Hard disk types from 1 to 46 are standard ones. If the hard disk in your system which does not belong to any one of the standard types, you can choose type 47 for user definable type and enter hard disk parameters (Cylinders, Heads, Write-precompensation, Landing Zone).

iv. *Floppy Drive A and Floppy Drive B*
The options are 360KB 5 1/4", 1.2MB 5 1/4", 720KB 3 1/2", 1.44MB 3 1/2", and Not Installed. Not Installed could be used as an option for diskless workstations.

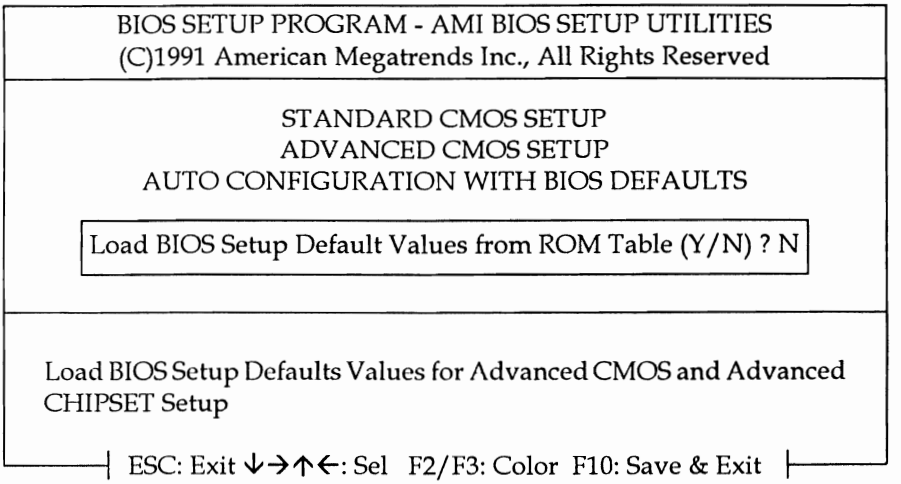
v. *Primary Display*
Options are Monochrome, Color 40x25, VGA/PGA/EGA, Color 80x25, and Not installed. The Not installed option could be used for network file servers.

vi. *Keyboard*
Options are Installed or Not Installed

vii. *Extended Memory*
If 1MB or more memory is installed, 128KB is reduced from the total memory and reserved for BIOS shadow.

## 9.3. *Auto Configuration with BIOS Defaults*

The Auto Configuration with BIOS feature uses the default system values before the user has changed any CMOS values. If the CMOS is corrupted, the BIOS defaults will automatically loaded. The system board will have the optimal performance with the BIOS defaults. Usually you need not alter the Advanced CMOS Setup once the BIOS defaults have been loaded.

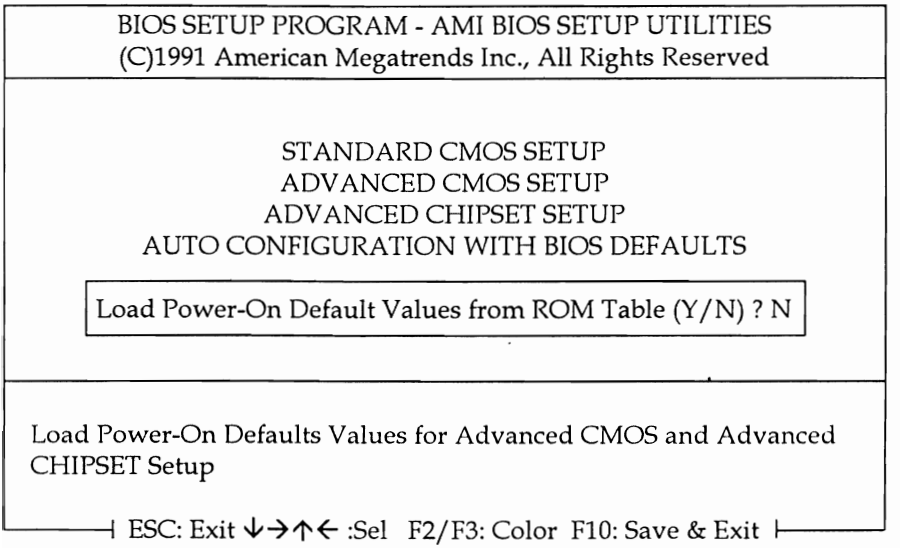



If you want to use the BIOS defaults, change the prompt to Y and press ENTER. The following message will appear on the screen.

"Default values loaded. Press any key to continue"

## 9.4. *Auto Configuration with Power-On Defaults*

This feature uses the default Power-On values. You may want to use this option as diagnostic aid if your system is behaving erratically.




If you want to use the Power-On defaults, change the prompt to Y and press ENTER. The following message will appear on the screen.

"Default values loaded. Press any key to continue"

## 9.5. *Advanced CMOS Setup*

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

BIOS SETUP PROGRAM - ADVANCED CMOS SETUP
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| | | | |
|---|---|---|---|
| Typematic Rate Programming | : Disabled | Adapter ROM ..... C400,16K | : Enabled |
| Typematic Rate Delay (msec) | : 500 | Adapter ROM ..... C800,16K | : Disabled |
| Typematic Rate (Chars/Sec) | : 15 | Adaptor ROM ..... CC00,16K | : Disabled |
| Above 1 MB Memory Test | : Disabled | Adaptor ROM ..... D000,16K | : Disabled |
| Memory Test Tick Sound | : Disabled | Adaptor ROM ..... D400,16K | : Disabled |
| Memory Parity Error Check | : Disabled | Adaptor ROM ..... D800,16K | : Disabled |
| Hit <DEL> Message Display | : Disabled | Adaptor ROM ..... DC00,16K | : Disabled |
| Hard Disk Type 47 RAM Area | : 0:300 | Adaptor ROM ..... E000,64K | : Disabled |
| Wait for <F1> If Any Error | : Disabled | Adaptor ROM ..... F000,64K | : Enabled |
| System Boot up Num Lock | : Enabled | | |
| Weitek Processor | : Absent | | |
| Floppy Drive Seek At Boot | : C:, A: | | |
| System Boot up Sequence | : Enabled | | |
| System Boot up CPU Speed | : High | | |
| Cache Memory | : Both | | |
| Gate A20 Emulation | : Both | | |
| Password Checking Option | : Setup | | |
| Video ROM ..... C000,16K | : Enabled | | |

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

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

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

iii. *Memory Test Tick Sound*
This option will enable or disable the "ticking" sound during the memory test.

iv. *Memory Parity Error Check*
If the system board does not have parity RAM, you may disable the memory parity error checking routines in the BIOS.

v. *Hit <DEL> Message Display*
Disabling this option, will prevent the message "Hit <DEL> if you want to run SETUP" from appearing on the screen when the system boot-up.

vi. *Hard Disk Type 47 Data Area*
The AMI BIOS SETUP features two user-definable hard disk types. Normally, the data for these disk types are stored at 0:300 in lower system RAM. If a problem occurs with other software, this data can be located at the upper limit of the DOS Shell (640KB). If the option is set to "DOS 1KB," the DOS Shell is shortened to 639KB, and the top 1KB is used for the hard disk data storage.

vii. *Weitek Processor*
This should be enabled if Weitek W4167 coprocessor is installed.

viii. *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.

ix. *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 disk C:, and then the A:. If the option is set to "A:, C:," the sequence is reversed.

x. *Password Check Option*
The password feature can be used to prevent unauthorized system boot-up or unauthorized use of BIOS SETUP. The option in the BIOS SETUP only allows the user to enable the password check option every time the system boots or upon entering SETUP only. The program allows three attempts to key in the correct password. After each incorrect attempt, the prompt to enter the current password will appear, followed by an "X". After the third incorrect attempt, the system will lock and it will be necessary to re-boot. The screen will not display the characters entered.

If the "Always" option is chosen at Setup, each time the system is turned on, i.e. "booted," the prompt for user password will appear.

The default option is "Setup". The password prompt will not appear when the system is turned on, but will appear if the user attempts to enter the Setup program.

xi. *Video or Adaptor ROM Shadow*
ROM shadow is a procedure in which BIOS code is copied from slower ROM to faster RAM. The BIOS is then executed from the RAM. Each option allows for a segment of 16KB to be shadowed from ROM to RAM. If one of these options is enabled, and there is BIOS present in that particular 16KB segment, the BIOS will be shadowed.

xii. *System ROM Shadow*
The same concept applies here as above, except that in this case, the system BIOS (64KB in length) is shadowed.

## 9.6. *Change Password*

The BIOS SETUP program has an optional password feature. The system can be configured so that the user is required to enter a password every time the system boots, or whenever an attempt is made to enter the setup program.

This section of the manual deals with changing the user password. The password check function is enabled in Advanced CMOS Setup (refer to previous). The password check function is enabled by choosing either "Always" or "Setup."

The password, which will be stored in the CMOS, cannot exceed 6 characters in length. A null default password, to be used if the CMOS is corrupted, is stored in the ROM. The null password will disable the Password Check option. So a user-defined password must be entered in the CHANGE PASSWORD option in the main setup screen before the Password Check Option can function.

To change the user password, select the Change Password option from the main Setup screen, by using the arrow keys to move the cursor to this selection and press ENTER. The message "Enter CURRENT Password:" will appear.

# 10. MAIN BOARD LAYOUT