M-396B

80386SX Mainboard

User's Guide

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Chapter 1
Introduction

The M396B mainboard is a high-performance, IBM AT compatible system board based on a powerful 32-bit 80386SX CPU running at 33/25/20/16 MHz. The mainboard provides you with all the basic elements on which to build an advanced computer.

The compact size of the mainboard is achieved by using the PC CHIP2, which integrates most of the circuits required by an 80386SX based system board.

The M396B mainboard provides a socket for installing an optional 80387SX math coprocessor. The mainboard can be configured with up to 16MB of memory using both SIMM memory modules and DIP chips.

Key Features

The advanced features of the M396B mainboard include:

- 80386SX CPU running at 33/25/20/16 MHz
- Socket support for an 80387SX coprocessor
- Memory configurations up to 16MB
- Supports speed control via turbo switch or keyboard

- Address remapping/shadow RAM for the BIOS, video ROM
- Hardware emulation of fast Gate A20 and RC reset for OS/2 optimization
- Six 16-bit I/O slots
- 4 layer PCB with dimensions of 22cm x 17cm

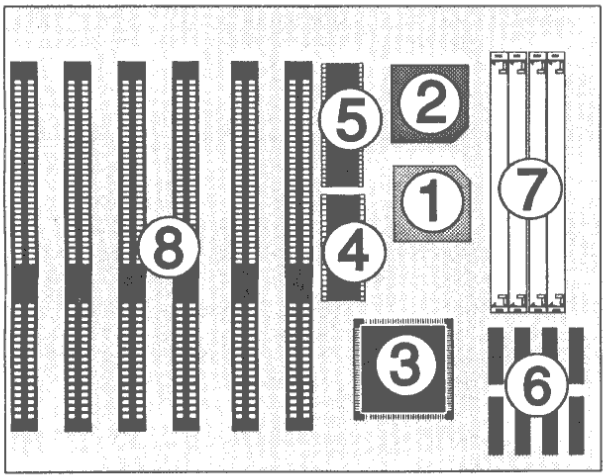


Figure 1–1. Key Components of the M396B Mainboard

Mainboard Components

This section gives a brief description of key components on the mainboard. Refer to Figure 1–1 for component locations.

① *System Microprocessor*

The system microprocessor is a high-performance 32-bit 80386SX microprocessor running at 33/25/20/16 MHz.

② *Math Coprocessor Socket*

This socket lets you add an optional 80387SX math coprocessor. A numeric coprocessor significantly increases the speed of calculation intensive applications.

③ *PC CHIP2 Integrated Chip*

The PC CHIP2 contains AT bus control logic, data bus conversion logic, CPU reset logic, clock generation for CPU, keyboard and timer, DMA/refresh logic, peripheral interface logic, and page mode DRAM controller.

④ *System BIOS*

The AMI BIOS is included on this ROM chip. The BIOS lets you control the mainboard's microprocessor speed, shadow RAM and other functions from the keyboard.

⑤ *Keyboard Controller*

The 8042 is a single chip keyboard interface controller.

⑥ ***Main Memory – DIP***

Eight DIP (Dual In-Line Package) sockets are provided for 256K, and 1M DIP DRAM chips. Memory can be configured from 512KB to 4MB using only DIP chips, and 2MB or 8MB using DIP chips and SIMM combinations.

⑦ ***Main Memory – SIMM***

Four SIMM (Single In-line Memory Module) sockets are provided for 256K, 1MB, and 4MB SIMM modules. Using SIMM, memory can be configured from 1MB to 16MB.

⑧ ***Expansion Slots***

Six standard 16-bit ISA Bus expansion slots are provided on the mainboard.

Chapter 2
Hardware Configuration

Before you install the M396B mainboard into the system chassis, you may find it convenient to first configure the mainboard's hardware. This chapter describes how to set the mainboard jumpers for cache memory and display type, and where to attach components.

Power Precautions

Before you begin configuration, make sure you are working with an unplugged mainboard. Many components are powered by low-voltage current, but there still may be a dangerous electric current coming from the leads and power supply. You should take the following precautions:

- Turn off the mainboard, and unplug the power cord before you begin
- Unplug all cables that connect the mainboard to any external devices.

Jumper, Connector, and Socket Locations

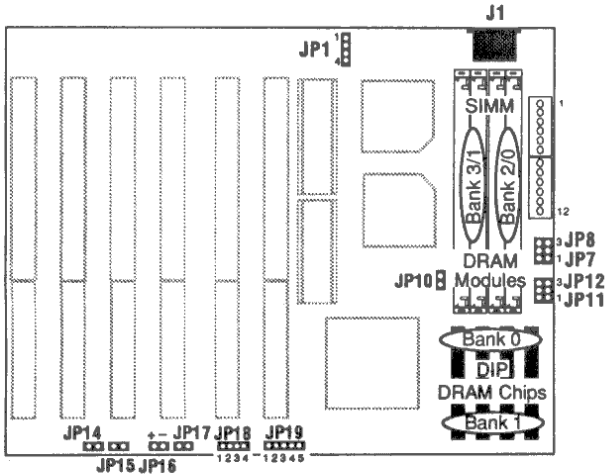


Figure 2–1. Jumper, Connector, and Socket Locations

Connectors

Attach system components and case devices to the mainboard via connectors. A description of each connector follows. See Figure 2 - 1 for connector locations.

J1-Keyboard Connector

A standard five-pin female DIN keyboard connector is located at the rear of the board. Plug the jack on the keyboard cable into this connector.

Pin	Description
1	Keyboard Clock
2	Keyboard Data
3	Spare
4	Ground
5	+5V DC

Power Supply Connectors

The power supply connector has two six-pin male header connectors. Plug the dual connectors from the power directly onto the board connectors.

Pin	Description	Pin	Description
1	Power Good	7	Ground
2	+5V DC	8	Ground
3	+12V DC	9	–5V DC
4	–12V DC	10	+5V DC
5	Ground	11	+5V DC
6	Ground	12	+5V DC

JP1-External Battery

The M396B mainboard has a battery on-board; however, you can also attach an external battery to connector JP1. Using an external battery helps you conserve the on-board battery.

Pin	Description
1	VDD (6V)
2	Rechargeable battery pin
3	Rechargeable battery pin
4	Ground

Note 1: The factory default setting has a jumper cap on pins 2 and 3 for an installed rechargeable battery. When you install an external battery, remove this jumper cap.

Note 2: To clear the CMOS configuration, place a jumper cap on pins 3-4 and then place the cap back on pins 2-3 for normal operation.

JP15-Reset Switch Connector

Attach the Reset switch cable to this connector. The Reset switch restarts the system.

Setting	Description
Short	Reset
Open	Not Reset

JP16-Turbo LED Connector

JP16 is usually connected to a Turbo LED on front of the system case. If the system board select is in Turbo mode, the indicator lights during high-speed operation.

Pin	Description
1	+Anode
2	–Cathode

JP17-Turbo Switch Connector

JP17 connects to the Turbo switch, which is used to select the mainboard's clock speed.

Setting	Description
Open	Turbo Mode
Short	Low speed Mode

In addition to switching clock speed using hardware control via the turbo switch, you can also switch the clock speed using software control via keyboard commands.

The keyboard commands are as follows:

CTRL, ALT, [+] : Press these three keys simultaneously to select Turbo Mode.

CTRL, ALT, [–] : Press these three keys simultaneously to select Low Speed Mode.

Note that the Turbo Switch must be in Low Speed mode (Shorted) before you can use the keyboard speed switching function.

JP18-Speaker Connector

Attach the system speaker to connector JP18.

Pin	Description
1	Data Out
2	Not Used
3	Ground
4	+5V

JP19-Keylock & Power LED Connector

JP19 is a keylock connector that enables and disables the keyboard and the Power-LED on the case.

Pin	Description
1	LED power
2	Not Used
3	Ground
4	Keyboard Inhibiter
5	Ground

Jumper Switches

You can configure hardware options by setting jumper switches on the mainboard. Set a jumper switch as follows:

- *Short* a jumper switch by placing the plastic jumper cap over two pins of the jumper.
- *Open* a jumper switch by removing the jumper cap.

Note: *When you open a jumper, attach the plastic jumper cap to one of the pins so you won't lose it.*

Symbols:

For setting multi-pin jumpers, the symbols below are used:

Pins 1 and 2 are Shorted with a jumper cap.

Pins 2 and 3 are Shorted with a jumper cap.

For setting 2-pin jumpers, the following symbols are used:

The jumper is Shorted when the jumper cap is placed over the two pins of the jumper.

The jumper is Open when the jumper cap is removed from the jumper.

Memory Configuration

You can add system memory via DIP chip DRAM sockets and SIMM DRAM sockets on the mainboard. On-board memory is located in four banks: Bank 0, Bank 1, Bank 2, and Bank 3. You can install either a 256K or 1M DIP DRAM in each DIP socket, and a 256K, 1M, or 4M SIMM module in each SIMM socket. Note that each bank must have DIP chips or SIMM modules that are all of the same capacity. Required memory speed for DIP and SIMM DRAM is 80ns, page mode. See Figure 2-1 for jumper and socket locations.

JP7, JP8, JP11, JP12 – DRAM Configuration Jumpers

These jumpers configure the mainboard to accept DIP and/or SIMM type DRAM.

DRAM Type	JP7, JP8, JP11, JP12
DIP DRAM Only	
SIMM DRAM Only	
Both DIP and SIMM together	

Configurations for Installing One Type of DRAM Only

If you want to use SIMM DRAM only, short pins 1-2 on jumpers **JP7, JP8, JP11** and **JP12.** If you want to use DIP DRAM only, short pins 2-3 on jumpers **JP7, JP8, JP11** and **JP12.** When you short pins 1-2 for using SIMM DRAM only, you cannot use DIP DRAM and SIMM DRAM together. See Figure 2-1 for Bank locations.

	DIP DRAM Only	
Socket Locations	U20, U21, U22, U23	U25, U26, U27, U28
Memory Size	**Bank 0**	**Bank 1**
512K	44256x4	—
1 M	44256x4	44256x4
2 M	441000x4	—
4 M	441000x4	441000x4

	SIMM DRAM Only	
Socket Locations	U15, U16	U13, U14
Memory Size	**Bank 0**	**Bank 1**
512K	256Kx2	—
1 M	256Kx2	256Kx2
2 M	1Mx2	—
4 M	1Mx2	1Mx2
8 M	4Mx2	—
16 M	4Mx2	4Mx2

Configurations for Installing Both Types of DRAM

If you want to use **both** DIP DRAM **and** SIMM DRAM, close pins 2-3 on jumpers **JP7, JP8, JP11** and **JP12.** When you choose this setting, you can use both DIP DRAM, and SIMM DRAM together in the configurations shown below. Note that when you use this setting you must first install DIP DRAM in both Banks 0 and 1. See Figure 2-1 for Bank locations.

	Both DIP and SIMM Together			
Socket Locations	U20, U21, U22, U23	U25, U26, U27, U28	U15, U16	U13, U14
Memory Size	**Bank 0**	**Bank 1**	**Bank 2**	**Bank 3**
2 M	44256x4	44256x4	256Kx2	256Kx2
8 M	441000x4	441000x4	1Mx2	1Mx2

JP10 - Parity Check Selector

Jumper JP10 enables or disables the parity check function on the mainboard. Refer to Figure 2–1 for the location of JP10. Set the jumper as below.

JP10 – Parity Check Selector

Parity Check	JP10
Disable (Default)	
Enable	

JP14 - Display Adapter Selector

Set jumper JP14 to configure the mainboard for either a color display card or a monochrome display card. Refer to Figure 2–1 for the location of JP14. Set the jumper as below.

JP14 – Display Adapter Selector

Display Adapter	JP14
Color Display	
Mono Display (Default)	

Chapter 3
AMI BIOS Setup

After you have configured the mainboard, and have assembled the components, you can turn on the completed system. At this point, run the software setup to ensure that the system information is correct.

The software setup of the system board is achieved through Basic Input-Output System (BIOS) programming. You use the BIOS setup program to tell the operating system what type of devices (such as disk drives) are connected to your system board.

The system setup is also called CMOS setup. Normally, you need to run system setup if either the hardware is not identical with information contained in the CMOS RAM, or if the CMOS RAM has lost power.

AMI BIOS Setup

The setup program provided with the M396B mainboard is the AMI BIOS from American Megatrends Inc. Enter the AMI Setup program's Main Menu as follows:

1. Turn on or reboot the system. After a series of diagnostic checks, the following message appears:

   "Hit <DEL> if you want to run SETUP"

2. Press the <DEL> key to enter the AMI BIOS setup program and the following screen appears:

   STANDARD CMOS SETUP
   ADVANCED CMOS SETUP
   AUTO CONFIGURATION WITH BIOS DEFAULTS
   AUTO CONFIGURATION WITH POWER-ON DEFAULTS
   CHANGE PASSWORD
   HARD DISK UTILITY
   WRITE TO CMOS AND EXIT
   DO NOT WRITE TO CMOS AND EXIT

3. Choose an option and press <Enter>. Modify the system parameters to reflect the options installed in the system. (See the following sections for more information.)

4. Press <ESC> at anytime to return to the Main Menu.

5. In the Main Menu, choose "WRITE TO CMOS AND EXIT" to save your changes and reboot the system. Choosing "DO NOT WRITE TO CMOS AND EXIT" ignores your changes and exits the program.

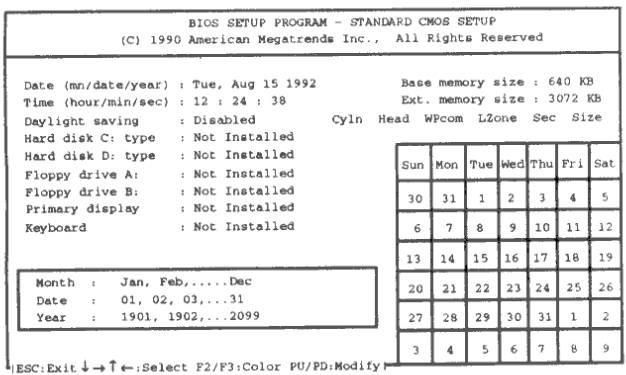
Main Menu Options

The Main Menu options of the AMI BIOS are as below.

STANDARD CMOS SETUP

Run the Standard CMOS Setup as follows.

1. Choose "STANDARD CMOS SETUP" from the Main Menu and a screen with a list of items appears.



2. Use the arrow keys to move between items and to select values. Modify the selected fields using the PgUp/PgDn keys or enter numeric values directly.

3. After you have finished with the Standard CMOS Setup program, press the <ESC> key and then follow screen instruction to save or disregard your settings.

AMI Hard Disk Table

Refer to the following table when selecting hard disk types in the Standard CMOS Setup. The AMI BIOS supports the following hard disk types.

Type	Cylinders	Heads	WPrec	LZone	Sect	Capacity (MB)
1	306	4	128	305	17	10
2	615	4	300	615	17	20
3	615	6	300	615	17	31
4	940	8	512	940	17	62
5	940	6	512	940	17	47
6	615	4	65535	615	17	20
7	462	8	256	511	17	31
8	733	5	65535	733	17	30
9	900	15	65535	901	17	112
10	820	3	65535	820	17	20
11	855	5	65535	855	17	35
12	855	7	65535	855	17	50
13	306	8	128	319	17	20
14	733	7	65535	733	17	43
16	612	4	0	663	17	20
17	977	5	300	977	17	41
18	977	7	65535	977	17	57
19	1024	7	512	1023	17	60
20	733	5	300	732	17	30
21	733	7	300	732	17	43

Type	Cylinders	Heads	WPrec	LZone	Sect	Capacity (MB)
22	733	5	300	733	17	30
23	306	4	0	336	17	10
24	925	7	0	925	17	54
25	925	9	65535	925	17	69
26	754	7	754	754	17	44
27	754	11	65535	754	17	69
28	699	7	756	699	17	41
29	823	10	65535	823	17	68
30	918	7	918	918	17	53
31	1024	11	65535	1024	17	94
32	1024	15	65535	1024	17	128
33	1024	5	1024	1024	17	43
34	612	2	128	612	17	10
35	1024	9	65535	1024	17	77
36	1024	8	512	1024	17	68
37	615	8	128	128	17	41
38	987	3	987	128	17	25
39	987	7	987	987	17	57
40	820	6	820	820	17	41
41	977	5	977	977	17	41
42	981	5	981	981	17	41
43	830	7	512	830	17	48
44	830	10	65535	830	17	69
45	917	15	65535	918	17	114
46	000	00	000	000	17	152

ADVANCED CMOS SETUP

Run the Advanced CMOS Setup as follows.

1. Choose "ADVANCED CMOS SETUP" from the Main Menu and a screen with a list of items appears.

```
BIOS SETUP PROGRAM - ADVANCED CMOS SETUP
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Typematic Rate Programming  : Disabled   Adaptor ROM Shadow D800, 32K: Disabled
Typematic Rate Delay (msec) : 500        Adaptor ROM Shadow E000, 32K: Disabled
Typematic Rate (Chars/Sec)  : 15         Adaptor ROM Shadow E800, 32K: Disabled
Above 1 MB Memory Test      : Disabled   System  ROM Shadow F000, 64K: Enabled
Memory Test Tick Sound      : Enabled    Memory Wait State          : Disabled
Memory Parity Error Check   : Enabled
Hit <DEL> Message Display   : Enabled
Hard Disk Type 47 RAM Area  : 0:300
Wait For <F1> If Any Error  : Enabled
System Boot Up Num Lock     : On
Numeric Processor           : Enabled
Floppy Drive Seek At Boot   : Disabled
System Boot Up Sequence     : C:, A:
Internal Cache Memory       : Disabled
Password Checking Option    : Setup
Video  ROM Shadow C000, 32K: Enabled
Adaptor ROM Shadow C800, 32K: Disabled
Adaptor ROM Shadow D000, 32K: Disabled

ESC:Exit ↓→↑←:Sel <CTRL>PU/PD:Modify F1:Help F2/F3:Color
F5: Old Values F6: BIOS Setup Defaults F7:Power-On Defaults
```

2. Use the arrow keys to move between items and to select values. Modify the selected fields using the PgUp/PgDn keys.

A short description of the screen items follows:

Typematic Rate Programming — Enable this option to adjust the keystroke repeat rate.

Typematic Rate Delay (msec) — Choose the delay a character takes to appear on screen after a keystroke.

Typematic Rate	Choose the rate a character keeps repeating.
Above 1 MB Memory Test	Enable this for POST memory routines in the RAM above 1MB. Disable and BIOS only checks the first 1MB of RAM.
Memory Test Tick Sound	Enable this option to turn on the "ticking" sound during memory test.
Memory Parity Error Check	Enable the memory parity error checking routines in the BIOS.
Hit <DEL> Message Display	Disable to prevent "Hit <DEL> ..." message from appearing when system boots-up.
Hard Disk Type 47 Data Area	Data for user-definable disk types are stored at 0:300 lower system RAM. If software problems occur, setting option "DOS 1 KB" relocates the data to the upper DOS shell.
Wait for F1 if any Error	Enable to display "Press <F1> to continue" when a POST non-fatal error occurs. Disable to eliminate the need for a user response to a non-fatal error condition message.
System Boot Up Num Lock	**On** puts numeric keypad in Num Lock mode at boot-up. **Off** puts keypad in arrow key mode at boot-up.
Numeric Processor Test	Marks the 387SX math coprocessor as Enabled or Disabled.
Floppy Drive Seek at Boot	Disabled provides a fast boot and reduces the possibility of damage to the heads.
System Boot Up Sequence	"A: C:" tries to boot from drive A: and then from drive C:. Reverse this sequence with "C: A:", but then drive A: can't boot directly.

Internal Cache Memory Disabled turns off the internal cache. (Note that this option can only be enabled when the CPU is the Cyrix Cx486SLC.)

Password Checking Option Choose Setup or Always. Use this feature to prevent unauthorized system boot-up or use of Setup.

"Always"– Each time the system boots the password prompt appears.

"Setup"– Password prompt appears only if you attempt to enter the BIOS Setup program.

Video or Adaptor ROM Shadow ROM shadow copies BIOS code from slower ROM to faster RAM. BIOS executes from RAM. You can shadow these 32K segments from ROM to RAM. BIOS is shadowed in a 32K segment if enabled and BIOS present.

System ROM Shadow Enabled shadows the system BIOS (64K), if BIOS is present in this segment.

Memory Wait State Disabled provides a zero wait state memory cycle. Enabled adds one memory wait state.

3. After you have finished with the Advanced CMOS Setup program, press the <ESC> key and then follow screen instruction to save or disregard your settings.

AUTO CONFIGURATION WITH BIOS DEFAULTS

This Main Menu item loads the default system values. If the CMOS is corrupted the defaults are loaded automatically. Choose this item and the following message appears:

"Load BIOS Setup Default Values from ROM Table (Y/N)? N"

To use the BIOS defaults, change the prompt to "Y" and press <Enter>. The following message appears:

"Default values loaded. Press any key to continue."

AUTO CONFIGURATION WITH POWER-ON DEFAULTS

This Main Menu item uses the default Power-On values. Use this option as a diagnostic aid if your system behaves erratically. Choose this item and the following message appears:

"Load Power-On Default Values (Y/N)? N"

To use the Power-On defaults, change the prompt to "Y" and press <Enter>. The following message appears:

"Default values loaded. Press any key to continue."

CHANGE PASSWORD

This Main Menu item lets you configure the system so that a password is required every time the system boots or an attempt is made to enter the Setup program. The password cannot be longer than 8 characters. A default password is stored in the ROM in case the CMOS is corrupted. The default password is <AMI>.

Change the password as follows:

1. Choose "Change Password" in the Main Menu and press <Enter>. The following message appears:

   "Enter CURRENT Password:"

2. The first time you run this option, enter the default password <AMI> and press <Enter>. The screen does not display the characters entered.

3. Correctly enter the current password and the following prompts you for the new password:

   "Enter NEW Password:"

4. Enter the new password and the following appears:

   "Re-Enter NEW Password:"

5. Re-enter the new Password. If the password is keyed in correctly the following confirmation message appears:

   "NEW Password Installed"

6. Press <ESC> to exit to the Main Menu.

Note: You can disable the password function by typing <Enter> *when* "Re-Enter NEW Password" *appears.*

If you are not prompted for the password when you next boot the system, check that the "Password Checking Option" in the Advanced CMOS Setup is configured for "Always" or "Setup." See the section above on "Advanced CMOS Setup."

When the password prompt appears, key in the new password and press <Enter>. If disconnected batteries corrupt the CMOS, use the default password, <AMI> instead.

Important: Keep a safe record of the new password. If you forget or lose the password, the only way to access the system is to disconnect the CMOS batteries and use the default password <AMI>.

HARD DISK UTILITY

This Main Menu item gives you three options for analyzing and formatting a hard disk. The three options are:

- **Hard Disk Format** – performs a "low level" format of the hard disk. Check with the hard drive manufacturer to see if this option is required.
- **Auto Interleave** – determines optimum interleave factor before formatting the hard disk.
- **Media Analysis** - analyzes each track of the hard drive. Marks unusable tracks as "bad" to prevent future data storage on those tracks.

Error messages specific to the Hard Disk Utility options may appear during initialization or operation. Refer to Appendix B for a list of these messages.

WARNING! ***Performing any one of these options destroys all data on the hard disk. You must back-up the hard disk before performing any of these tests.***