

80486

DX/SX CACHE MAINBOARD
A USER'S GUIDE &
TECHNICAL REFERENCE

About this Guide

This User's Guide is designed to be of assistance to both computer system manufacturers and end users. The first part, the User's Guide is a relatively non-technical introduction to the 486SX/DX mainboard. The second part, the Technical Reference, provides ample detail for engineers and technicians.

Precautions

Before handling the 486SX/DX board be sure to earth yourself by touching a grounded metal object. This will avoid damage to the electronic components through electrostatic discharge. This problem will chiefly be encountered in dry or air-conditioned environments.

Edition

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486SX/DX

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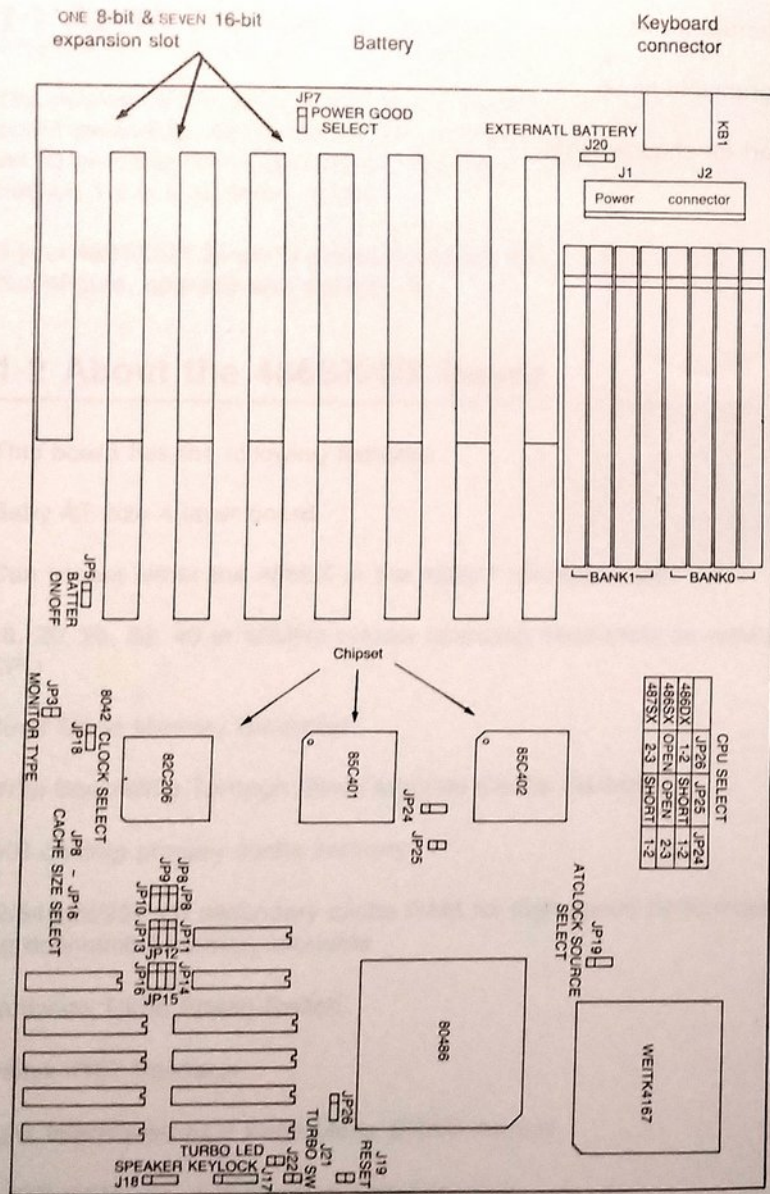
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PART 1

486SX/DX

User's Guide

1-3 Layout Diagram



1-4 Jumper Settings & Connectors Summary

- JP3 Monitor Type
Short Color or EGA display
Open Monochrome (default)
- JP5 Battery ON/OFF
1-2 Hold CMOS data (default)
2-3 Clear CMOS data
- JP7 Power Good Signal of 85C206
1-2 LM393 Circuit (default)
2-3 Power Supply
- JP18 8042 Clock Selector
1-2 programable source from 85C402
2-3 7MHz
- JP19 AT Clock Source Selector
1-2 System speed large than or equal to 25MHz
2-3 System speed small than 25MHz

Cache RAM Jumpers

Number	32KB cache	64KB cache	128KB cache	256KB cache
JP8	1-2	2-3	2-3	2-3
JP9	1-2	1-2	2-3	2-3
JP10	1-2	1-2	1-2	2-3
JP11	1-2	2-3	2-3	2-3
JP12	1-2	1-2	2-3	2-3
JP13	1-2	1-2	1-2	2-3
JP14	1-2	2-3	1-2	2-3
JP15	1-2	2-3	1-2	2-3
JP16	1-2	1-2	2-3	2-3

80486DX/80486SX Installation

Number	80486DX	80486SX	80487SX
JP24	1-2	2-3	1-2
JP25	short	open	short
JP26	1-2	open	2-3

Case Connectors

Number	Purpose
J17	Power LED and Keylock
J18	Speaker
J19	Hardware Reset Button
J20	External Battery Control
J21	Turbo SW
J22	Turbo LED Connector

1-5 Installation Guide Summary

- 1 Observe anti-static precautions. Mount at least 1MB of SIMM memory on the board according to the instructions in this guide.
- 2 Mount the board in the case.
- 3 Connect the keylock, turbo LED, speaker and reset button cables to their connectors.
- 4 Plug the keyboard jack into the DIN connector.
- 5 Connect the power supply cables to the white J1/J2 connector.
- 6 Insert your display card into an expansion slot and connect the monitor video cable to the card's serial port.
- 7 Set the display mode at jumper JP3.
- 8 Check the jumper settings for JP5, JP24-JP26, JP8-JP16, JP19, JP7, JP18 & JP3 ..
- 9 Install any other compatible equipment e.g. more memory modules, RAM card, I/O card, disk drives.
- 10 Recheck all mountings and connections.
- 11 Connect the power supply and the monitor power cables to the power source.

- 12 Switch on the monitor and the power supply.
- 13 Go through the CMOS setup program.
- 14 The system should now be operational.

2 The Hardware

2-1 CPU & Processing Speed

The 486SX/DX board uses an Intel 80486 microprocessor. The SX model can run at a clock speed of 20MHz or 25MHz, and the DX model at 25, 33 or 50MHz.

2-2 Math Coprocessor

A math coprocessor chip will speed up computation-intensive tasks, e.g. recalculating spreadsheets, CAD drawings. The 80486 CPU already has a coprocessor on chip, identical to the 80387 math coprocessor.

You can also select to install the Weitek 4167 on the board. The speed of the coprocessor must match the speed of your 80486 CPU, i.e 25 or 33MHz. There is a large square socket for this purpose labelled WTL4167. The chip orientation is indicated by a notch in both the chip and the chip socket. When installing be careful not to bend any pins.

2-3 Chipset

The 486SX/DX chipset consists of the following:

SiS/85C401 CPU/Cache/DRAM Controller
SiS/85C402 Bus Controller & Data Buffer
82C206 Intergrated Peripherals Controller

The chipset is a two-chip solution for a 80486SX/DX AT-based system running at 16/20/25/33/40/50MHz CPU speed. The SIS85C401 CPU/Cache DRAM Controller provides powerful cache, DRAM and CPU interfaces utilizing the integration of faster and configurable memory functions and most efficient cache system. It's memory logic circuit can respond to the CPU burst cycle allowing fast transfer operations. With it's bank (or double-word) memory interleaving, system running at full speed can attain the utmost memory speed. The SIS85C402 Bus Controller/Data Buffer provides all the logic for data conversion and byte swapping for 32, 16 and 8-bit transfer, AT clock generation, parity generation and detection, and AT bus machine and state control.

2-4 Memory

2-4-1 Main memory

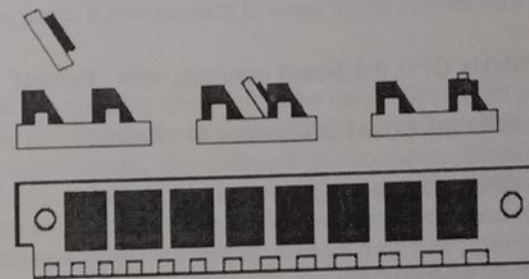
The memory subsystem on the 486SX/DX can support seven possible memory maps, from 1MB up to 32MB. See below for a list of these possibilities.

2-4-2 SIMM Sockets & Modules

The board has two on-board memory banks-Banks 0 & 1. There are 4 SIMM sockets in each bank. The SIMM sockets can accomodate either 256KB, 1MB or 4MB SIMM modules.

In order to be used, a bank must be completely filled. Banks are filled starting from Banks 0. A bank of 256KB modules will total 1MB, a bank of 1MB modules will total 4MB, a bank of 4MB modules will total 16MB.

To install SIMM modules is simple. Switch off your system. Open the case. Locate the SIMM memory banks. See the board layout diagram, if necessary. Starting from bank 0, orientate each module so that the notch on the module corresponds to the shape of the socket. The module enters the socket at an angle to the vertical. Press the module into the vertical plane and the metal catches at each end will grasp the module firmly. Refer to the following diagram:



When complete, reassemble your system. The start up memory test should recognise the new memory total. If not, run the CMOS setup.

2-4-3 Possible Memory Layouts

Configuration	Bank 0	Bank 1	Total
1	256K	0	1M
2	256K	256K	2M
3	1M	0	4M
4	1M	1M	8M
5	4M	0	16M
6	1M	4M	20M
7	4M	4M	32M

2-4-4 Main Memory Bank (Double-Word)/Interleave

The 80486 burst read is so fast that wait states are needed for DRAM accesses even in page hit burst cycles. Because the burst cycles are sequential -- in even-odd-even-odd sequence, the word interleave scheme is adaptive to hide pre-charge overhead in the burst read cycles. When even bank (double word) is accessed, the odd bank does the pre-charge, and vice versa. The commonly used "page interleave" scheme does not take the advantage of the sequential burst because all of the four reads will access the same bank.

2-4-5 Wait States

The 486SX/DX board use 80ns DRAM SIMM modules for the main memory.

With a 20 or 25MHz CPU the board operates with "Fastest"

With a 33MHz CPU the board operates with "Faster"

With a 50MHz CPU the board operates with "Slowest"

2-4-6 Cache Memory

The 80486 board can have 32KB, 64KB, 128KB or 256KB of 25nSec SRAM memory.

Cache Size	U21-U22	U23-U26	U40-U43
32KB	4K*4	8K*8	0
64KB	4K*4	8K*8	8K*8
128KB	16K*4	32K*8	0
256KB	16K*4	32K*8	32K*8

For the necessary jumper configuration see the Jumper Settings section.

2-4-7 Oscillator

Install an oscillator at OSC1 according to the following table:

CPU	486SX-20	486SX-25	486DX-33	486DX-50	486DX2-50
OSC1	20MHz	25MHz	33.33MHz	50MHz	25MHz

2-5 Expansion Slots

The 486SX/DX uses an AT style expansion bus. There are seven 16-bit slots, one 8-bit slots.

You should check to make sure that any cards added are speed compatible with the 80486 CPU.

The slots each have two parallel rows of connecting pins. When the connecting edge of an expansion card (the "golden finger") is inserted between these pins they grip the fingers and establish the connection between the board and the card. It is important to keep these connectors clean and dust free.

The 8-bit slot are typically used for video card. The 16-bit expansion slots will commonly be used by cards such as hard disk controllers, network cards and I/O expansion cards. The slots are of two-piece construction with one long section and one short. The long sections are the same as an 8-bit slot. The additional short sections have 36 pins divided into two rows of 18 each. These two sections together make up a 16-bit data path. Cards that use these slots must be plugged fully into both sections of the slot.

2-6 Real-Time Clock Battery

The 486SX/DX has an on-board nickel cadmium battery (NiCd battery) that maintains the system configuration information in the CMOS RAM. The battery automatically recharges while the power is on. It can be augmented or replaced by using an external battery pack of four "AA" batteries or a battery specially designed for this purpose.

The system senses when an external battery is in use and will opt to use this in preference to the on-board battery.

The pack or battery must have wire leads to connect it to the J20 battery connector the board.

2-6-1 Restoring Configuration Settings

If you do not use your system for a number of weeks and you do not have an external battery connected to the board, the on-board battery will lose it's charge and the setup information stored in the CMOS RAM will be lost. If this happens follow the procedure:

Turn your system on.

Re-enter your system configuration by using the BIOS setup program as explained in section 7.

Leave your system on for at least 12 hours to allow the on-board battery to recharge.

The setup information in the CMOS RAM will now be maintained by the on-board battery. If it isn't, consider replacing your on-board battery. When discontinuing use of the system for any extended period, connect an external battery to maintain the configuration setup.

3 Installing the Board

In order to create your working system, follow through this section and section 4 and 7 in sequence. Section 1.4 gives a summary of these instructions.

You'll need the following:

- the 486SX/DX board
- a suitable case and mounting fixtures
- an AT compatible power supply with a "Power Good" signal
- an AT compatible keyboard
- a display adaptor card (Monochrome, EGA, VGA)
- a monitor compatible with your display adaptor
- a disk controller card (I/O card)
- an AT bus floppy disk drive

You'll probably wish to add some of the following:

- an AT bus hard disk
- a mouse, a modem, a printer, a fax card, a network card

3-1 Mounting the Board

The 486SX/DX has nine mounting holes drilled in the printed circuit board. Choose the ones which align with the holes in your case and attach the board to the case by using the mounting fasteners. Mounting fasteners may be either of metal or plastic. Their purpose is to keep the board fixed in place, and in a position that the components will be insulated from the case.

In some case designs, one edge of the board fits under a metal flange.

3-2 Case Connections

There are a number of connections to be made to various case-mounted devices. They are

- | | |
|---------------------|--|
| Reset Button | this allows you to "soft reboot" your system |
| Keylock | if present, your case has a key to lock it providing a minimum level of security |
| Power LED | shows the system is on |
| Speaker | the system loudspeaker |
| Turbo LED | the system speed display |

The connectors look the same as jumper switches and have varying numbers of pins. The devices on the case will have wire leads extending from them with plastic female connectors attached. The connectors should be plugged onto the corresponding connecting pins on the board. If the lead requires a specific orientation when it is plugged on the pin, one wire will generally be separated from the other wires by a space, or be colored red. You should then orient the connector so that this wire plugs onto pin 1 of the connecting pins on the board. See Technical Reference section for pin-out details.

The case connectors are:

- | | |
|------------|-----------------------|
| J17 | Power LED and Keylock |
| J18 | Speaker |
| J19 | Hardware Reset Button |
| J20 | External Battery |
| J22 | Turbo LED |

3-2-1 Reset Button

J19 is the connector for a Reset Button. If this has been connected to the front panel of your system case, the button can be used to restart your system without turning the power off. Pushing the button will cause your system to restart from the memory test. This is known as a "soft reboot".

3-2-2 Power LED & Keyboard Lock

J17 is the connection for the Power LED & Keylock. The Power LED shows when your system is on. The 486SX/DX has a keyboard lock which is set by connection to J17. If a lock has been installed on the front panel of your case, a key provided with the case can be used to electrically disconnect the keyboard from the board. This device provides a minimum level of security from casual intrusion. It will not stop a determined intruder if your case can be opened and the function disconnected from inside.

3-2-3 Turbo LED

The 80486 can run over 10 times faster than the original PC/AT. But some old applications may get into trouble if the system speed is too fast. The system offer a de-turbo function that can be controlled through a hardware switch or software programming. When the de-turbo function is turned on, the system disable both the 80486 internal and secondary caches, which decreases the system speed to approximately 1/4 of that of the normal speed.

3-2-4 Battery Setting

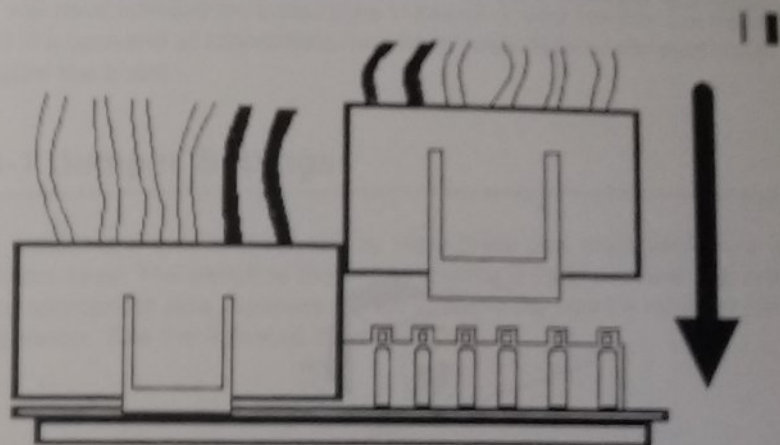
The system will preferentially use an external source of battery power to maintain in CMOS RAM. If no external battery is attached then it will use the on-board battery. Locate the 4-pin connector J20. If you are connecting the external battery, the connector will cover pins 1 to 4. If you are using the on-board battery, leave the connector open.

3-3 Power Connection

The 486SX/DX requires a power supply of at least 200 watts. If a large number of I/O cards are installed the power requirement may be higher.

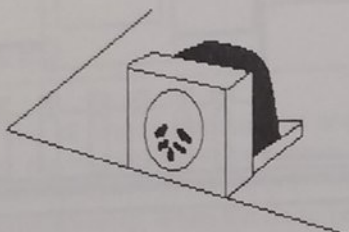
Be sure that your power supply has a "Power Good" signal.

The Power Connector is the large white 12-pin connector (J1 & J2). The two female 6-wire connectors from the power supply plug directly onto the connector. The female connectors (usually labelled P8 & P9) can only be plugged on in one way and they are placed so that the black leads are in the centre.



3-4 Keyboard Connection

Connect your keyboard cable jack into the female DIN socket KB1.



3-5 Video Adaptor Connection

Insert your video display card into an expansion slot. Connect your monitor's video cable to the card's serial port.

3-5-1 486SX/DX Connector Summary

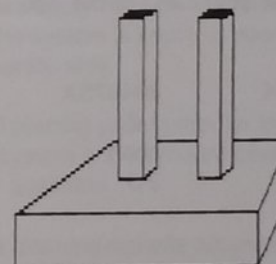
Number	Purpose
J1, J2	Power Connector
J17	Power LED and Keylock
J18	Speaker
J19	Hardware Reset Control
J20	External Battery Connector
J22	Turbo LED Connector (no function)
KB1	Keyboard Interface

4 Hardware Setup

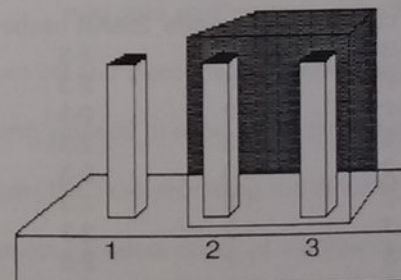
If you have followed the instructions in section 3, your board is now installed in a case and all connections have been made. Now we can start to configure the board.

4-1 Jumper Settings

A jumper is a switch. It has two or more brass pins stand vertically in a plastic base. The switch is shorted by placing a plastic-covered cap over the appropriate pins. Jumpers are set to define the board's hardware configuration. See the following examples:



A 2-pin jumper switch left open



A 3-pin jumper switch with pins 2 & 3 shorted by a cap

4-2 Setting the Display

Jumper JP3 is set according to the type of display adaptor card you are using. The factory setting is to open for the monochrome mode. Place the open for monochrome, or close for colour.

4-3 CMOS RAM Jumper

Normally this JP5 jumper will be set with a cap shorting pins 1 & 2. Only in a case where you need to dump the system configuration data from the CMOS RAM would you cover pins 2 & 3 for about five seconds.

4-4 CPU Setting

Set JP24, JP25 & JP26 according to whether your CPU is the 486SX or 486DX model:

Number	80486DX	80486SX	80487SX
JP24	1-2	2-3	1-2
JP25	short	open	short
JP26	1-2	open	2-3

4-5 Cache RAM Jumpers

The jumpers JP8-JP16 are set according to the size of cache RAM installed.

Number	32KB cache	64KB cache	128KB cache	256KB cache
JP8	1-2	2-3	2-3	2-3
JP9	1-2	1-2	2-3	2-3
JP10	1-2	1-2	1-2	2-3
JP11	1-2	2-3	2-3	2-3
JP12	1-2	1-2	2-3	2-3
JP13	1-2	1-2	1-2	2-3
JP14	1-2	2-3	1-2	2-3
JP15	1-2	2-3	1-2	2-3
JP16	1-2	1-2	2-3	2-3

4-6 The Hardware is Ready

If you have followed the instructions in section 3 & 4, your system hardware is now assembled and configured. All that remains to do is to carry out the firmware setup. Follow section 7 on the CMOS setup at the end of this manual.

5 Care & Maintenance

To maintain your computer, it is wise to take the following steps:

Pay attention to the possibility of overheating. The 80486 board can accommodate a large number of I/O cards. The cooling fan supplied with the power supply may be insufficient if a large number of cards are installed and the system is kept in a poorly ventilated environment (as network servers frequently are).

Avoid placing your computer in a dusty environment. When not in use, keep your system and keyboard covered. Specially designed covers are commercially available.

Use a cleaning diskette occasionally to remove dirt from your floppy disk drive.

At regular intervals, clean the inside of your computer, as follows:

NOTE: If you purchased your computer system complete, opening the case may void your warranty. Check your documentation.

Turn off and disconnect all connections to the system

Earth yourself to avoid static discharge damage to the 486SX/DX board.

Open the case according to the directions in your system manual.

Conduct a visual check of the interior.

Make sure all cards, chips and memory modules are securely seated.

If anything seems to be wrong then close your system case and take it to your dealer for inspection.

If available, use a miniature vacuum designed for cleaning this type of equipment. Be careful not to loosen or disconnect anything. When finished check that all connections are intact, then close the case and reattach the peripheral connections.

6 Glossary

RAM Random Access Memory

When you call up a program, the system copies the program to this memory. RAM is a temporary storage place where data can be manipulated. Switching off or rebooting the computer erases all the data in RAM. Data you wish to keep must be saved to hard or floppy disk or other storage device.

Cache RAM

This is a small amount of high speed memory which acts as a buffer for the larger, slower main memory. When making a memory access, the CPU will check the cache first for the data required. Because memory accesses are usually sequential, cache RAM can produce enormous increases in system throughput. Users experience much faster program response times.

SIMM Single In-Line Memory Module

This is a high density approach to putting RAM on a board. The RAM chips are mounted in sets of three on a rigid plastic module. This module can then be slotted into a special type of slot fixed to the board.

ROM Read Only Memory

A ROM chip can store information indefinitely without power. The data is programmed in at manufacture and cannot be rewritten except by rather advanced techniques.

BIOS Basic Input/Output System

The BIOS is a set of routines which check and control the very basic operations of the computer. The BIOS routines are stored in ROM. You will see BIOS checks on the screen when you boot up the computer.

7 BIOS Setup

Once your 486SX/DX board is installed in a system case and has a power supply, a keyboard, a video adaptor and a monitor, you can input information to the system about itself, so that it can function correctly. To help us do this there is a piece of software (the BIOS) stored on the board in Read Only Memory (ROM) which is available each time you power on the machine.

The values you input will be stored in the CMOS RAM. A memory device which is supported by the on-board battery, thus the values you set are preserved as long as the battery is good.

Your system comes supplied with the AMI BIOS from American Megatrends Inc. These are described below:

7-1 AMI BIOS

The AMI BIOS firmware contains a hardware setup program. It can be run after the system has been turned on and the memory test is finished or has been escaped.

7-1-1 BIOS Setup Program

If your 486 board has the AMI BIOS, when you start up the system you will see a display similar to the follow:

```
ROM BIOS (C)1990 American Megatrends Inc.,
01664 KB OK
Hit (DEL), if you want to run setup
```

Please press the **DEL** key, you will enter the **BIOS SETUP PROGRAM**. Then you will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES
(C)1990 American Megatrends Inc., All Rights Reserved

STANDARD CMOS SETUP
ADVANCED CMOS SETUP
ADVANCED CHIPSET 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

Load BIOS Setup Default Values for Advanced CMOS and Advanced
CHIPSET Setup

| ESC:Exit | → | ← : Sel F2/F3:Color F10:Save & Exit |

Please select 'AUTO CONFIGURATION WITH BIOS DEFAULTS', then
press **ENTER** key.

You will see a display similar to the following:

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

Please press **Y** key, then press **ENTER** key.
You will see a display similar to the following:

Load BIOS Setup Default Values from ROM table (Y/N) ? Y
Default values loaded. Press any key to continue

Please press any key to continue.
You will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES
(C)1990 American Megatrends Inc., All Rights Reserved

STANDARD CMOS SETUP
ADVANCED CMOS SETUP
ADVANCED CHIPSET 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

Standard CMOS Setup for Changing Time, Date, Hard Disk Type, etc.

| ESC:Exit | → | ← : Sel F2/F3:Color F10:Save & Exit |

Please select 'STANDARD CMOS SETUP', then press **ENTER** key.

You will see a display similar to the following:

BIOS SETUP PROGRAM - WARNING INFORMATION
(C)1990 American Megatrends Inc., All Rights Reserved

Improper Use of Setup may Cause Problem !!

If System Hangs, Reboot System and Enter Setup by Pressing the
 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

Please press any key to continue.
You will see a display similar to the following:

BIOS SETUP PROGRAM - STANDARD CMOS SETUP
(C)1990 American Megatrends Inc., All Rights Reserved

Date (mn/date/year): Mon, Jun 14 1991 Base memory : 640 KB
 Time (hour/min/sec): 11 : 18 : 20 Ext. memory : 15360 KB
 Daylight saving : Disabled Cyln Head WPcom LZone Sect Size
 Hard disk C: type : 7 462 8 256 511 17 31 MB
 Hard disk D: type : Not Installed
 Floppy drive A: : 1.2 MB, 5 1/4"
 Floppy drive B: : Not Installed
 Primary display : Monochrome
 Keyboard : Installed

Sun	Mon	Tue	Wed	Thu	Fri	Sat
24	25	26	27	28	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
31	1	2	3	4	5	6

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

ESC:Exit !-!-:Select F2/F3:Color PU/PD:Modify

If the standard CMOS setup is complete, then press **ESC** key return to main menu.

You will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES
(C)1990 American Megatrends Inc., All Rights Reserved

STANDARD CMOS SETUP
ADVANCED CMOS SETUP
 ADVANCED CHIPSET 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

Advanced CMOS Setup for Configuring System Option

ESC: Exit !-!-: Sel F2/F3:Color F10:Save & Exit

Please select '**ADVANCED CMOS SETUP**', then press **ENTER** key.
 You will see a display similar to the following:

BIOS SETUP PROGRAM - ADVANCED CMOS SETUP
(C)1990 American Megatrends Inc., All Rights Reserved

Typematic Rate Programming : Disabled:	Video ROM Shadow C000,32K Enabled
Typematic Rate Delay (msec): 500	Adaptor ROM Shadow C800,32K Disabled
Typematic Rate (Chars/Sec) : 15	Adaptor ROM Shadow D000,32K Disabled
Above 1 MB Memory Test : Enabled	Adaptor ROM Shadow D800,32K Disabled
Memory Test Tick Sound : Enabled	Adaptor ROM Shadow E000,32K Disabled
Memory Parity Error Check : Enabled	Adaptor ROM Shadow E800,32K Disabled
Hit Message Display : Enabled	System ROM Shadow F000,64K Enabled
Hard Disk Type 47 Data Area: 0:300	384K Shadow RAM Display Enabled
Wait For <F1> If Any Error : Enabled	
System Boot Up Num Lock : On	
Weitek Processor : Absent	
Floppy Drive Seek At Boot : Disabled	
System Boot Up Sequence : A:, C:	
System Boot Up CPU Speed : High	
External Cache Memory : Enabled	
Internal Cache Memory : Enabled	
Turbo Switch Function : Enabled	
Password Checking Option : Disabled	

ESC:Exit !-!-: Sel (Ctrl)Pu/Pd:Modify F1:Help F2/F3:Color

F5:Old Values F6:BIOS Setup Defaults F7:Power-On Defaults

7-1-1-1 MAIN BIOS AND VIDEO BIOS SHADOW SETUP :

a. MAIN BIOS SHADOW SETUP

System ROM Shadow F000,64K: **Enabled** ----> (default)

b. VIDEO BIOS SHADOW SETUP

Video ROM Shadow C000,32k: **Enabled** ---> (default)

(NOTE)

If you select to enable ROM shadow, then each time you boot up the computer they will be written into the memory segment between 640Kbyte and 1,024 Kbyte. They will then be more swiftly available.

7-1-1-2 Password Checking Setup :

Password Checking Option : **Disabled**--> (default)

If you select to enable Password Checking Option, then each time you want to run setup it will quest you to enter your password.

If the Advanced CMOS Setup is complete, then press **ESC** key return to main menu. You will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES (C)1990 American Megatrends Inc., All Rights Reserved
STANDARD CMOS SETUP ADVANCED CMOS SETUP ADVANCED CHIPSET 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
Advanced CHIPSET Setup for configuring the CHIPSET Registers
ESC:Exit I--I--: Sel F2/F3 Color F10:Save & Exit

Please select 'ADVANCED CHIPSET SETUP', then press **ENTER** key.

You will see a display similar to the following:

BIOS SETUP PROGRAM - ADVANCED CHIPSET SETUP (C)1990 American Megatrends Inc., All Rights Reserved	
Slow CPU (below 25 MHz) : Disabled	
80486 DX2 CPU (50 MHz) : Disabled	
ESC:Exit I--I--: Sel (Ctrl)Pul/Pd:Modify F1:Help F2/F3:Color	
F5:Old Values F6:BIOS Setup Defaults F7:Power-On Defaults	

7-1-1-3 Slow CPU (below 25 MHz)

Choose Enabled or Disabled.

Disabled: Default

Enabled : When CPU Clock below 25 MHz

7-1-1-4 DX2 CPU (50 MHz)

Choose Enabled or Disabled.

Disabled: Default

Enabled : As DX2 CPU is Installed.

Summary:

	SX-20	SX-25	DX-33	DX-50	DX2-50
486 CPU					
Slow CPU	ENABLED	DISABLED	DISABLED	DISABLED	DISABLED
80486 DX2 CPU	DISABLED	DISABLED	DISABLED	DISABLED	ENABLED

If the Advanced Chipset Setup is complete, then press **ESC** key return to main menu.

You will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES (C)1990 American Megatrends Inc., All Rights Reserved
STANDARD CMOS SETUP ADVANCED CMOS SETUP ADVANCED CHIPSET 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
Change the User Password Stored in the CMOS
ESC:Exit - - : Sel F2/F3:Color F10:Save & Exit

If you select to enable Password Checking Option, select '**CHANGE PASSWORD**' and press **ENTER** key.

You will see a display similar to the following:

Enter Current Password:

Please press '**AMI**' (default), then press **ENTER** key.
You will see a display similar to the following:

Enter NEW Password:

Please enter your new password.

NOTE: Password use maximum 6 ASCII characters.

You will see a display similar to the following:

RE-Enter NEW Password:

Please re-enter your new password.

You will see a display similar to the following:

NEW Password Installed

Your password install is complete, please press **ENTER** key.

You will see a display similar to the following:

BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES (C)1990 American Megatrends Inc., All Rights Reserved
STANDARD CMOS SETUP ADVANCED CMOS SETUP ADVANCED CHIPSET 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
Write the settings to the CMOS and Exit
ESC:Exit - - : Sel F2/F3:Color F10:Save & Exit

Please select 'WRITE TO CMOS AND EXIT', then press ENTER key.
You will see a display similar to the following:

Write to CMOS and Exit (Y/N)? N

Please press Y key, then ENTER key.

The AMI BIOS setup is complete.

7-2 Clearing the CMOS RAM

If incorrect values have been recorded during the setup program it is possible the 486SX/DX will "hang fire", i.e. the screen image will freeze and the system will not function even after being rebooted (turned off and on). If this happens use the following procedure to clear the incorrect information out of the CMOS RAM. You will then be able to enter the correct values. To clear the CMOS RAM do the following:

Turn the system off.

Press the INS key while you switch on the system. Keep the INS key depressed until the screen display appears and then release it.

Enter the correct values in the setup program.

If the above method fails to work, there is an alternative hardware based method of clearing the CMOS RAM.

Switch off the system and disconnect from the power source.
Open the system case and locate jumper JP5.
Change the jumper cap from pins 1 & 2 to cover pins 2 & 3.
Wait 5 seconds.
Replace the jumper cap on pins 1 & 2.
Reassemble system and run the setup program.

Part 2

486 SX/DX Technical Reference

1 Specifications

1-1 CPU

Intel 80486 32-bit microprocessor

1-2 Word Size

Data Path	8, 16, 32 bit
Physical addressing	20 address lines in Real mode 32 address lines in Protected mode

1-3 Clock Rates

Processor clock 20, 25, 33 or 50MHz

1-4 Memory

EPROM 1 no. 512Kbit
8KB primary cache on 80486 CPU
32, 64, 128 or 256KB (25nSec SRAM) secondary cache on board
Tag RAM (15nSec SRAM)
1-32M bytes (80nSec DRAM) on-board main memory

1-5 Dimensions

Size	33.2 * 21.7 cm
Height	1.6 cm without cables or expansion boards, with SIMM modules
PCB thickness	2mm
weight	510 grammes

1-6 Environment

Operating Temperature	10-40C
Reqd. Airflow	50 Linear ft/min across the 80486.
Storage Temperature	-40-70C
Humidity	0-90%, non-condensing
Altitude	0-3500metres

1-7 System ROM

The system board carries a 512Kbit chip which contain the system BIOS. This can be shadow mapped to the upper 256Kbytes of address space in the first megabyte of system memory and is also mapped into the upper 256Kbytes of total system memory when the processor switches to protected mode. In protected mode the BIOS can be accessed at either location.

The CPU accesses ROM at 16bits a cycle. The system board will function correctly with ROM devices that have a 200nSec or shorter access time.

The 486SX/DX does not contain the codes for the BASIC interpreter. Use the Microsoft GW-BASIC interpreter instead if you wish to run BASIC programs.

1-8 Expansion Slots

The one 8-bit slot addresses 20 bits.

The seven 16-bit slots each address 24 bits.

The slots all provide the same signal connection.

1-8-1 16-bit EXpansion Slot

Signal	Pin	Signal	Pin
SBHE	C1	MEMCS16#	D1
SA23	C2	IOCS16#	D2
SA22	C3	IRQ10	D3
SA21	C4	IRQ11	D4
SA20	C5	IRQ12	D5
SA19	C6	IRQ15	D6
SA18	C7	IRQ14	D7
SA17	C8	DACK0#	D8
MEMR#	C9	DREQ0	D9
MEMW#	C10	DACK5#	D10
SD8	C11	DREQ5	D11
SD9	C12	DACK6#	D12
SD10	C13	DREQ6	D13
SD11	C14	DACK7#	D14
SD12	C15	DREQ7	D15
SD13	C16	+5V	D16
SD14	C17	MASTER#	D17
SD15	C18	GND	D18

1-8-2 8-BIT Expansion Slot

Signal	Pin	Signal	Pin
IOCHK#	A1	GND	B1
D7	A2	RSTDRV	B2
D6	A3	+5V	B3
D5	A4	IRQ9	B4
D4	A5	-5V	B5
D3	A6	DRQ2	B6
D2	A7	-12V	B7
D1	A8	OWS	B8
D0	A9	+12V	B9
IOCHRDY#	A10	GND	B10
AEN	A11	MEMW#	B11
A19	A12	MEMR#	B12
A18	A13	IOWC#	B13
A17	A14	IORC#	B14
A16	A15	DACK3#	B15
A15	A16	DRQ3	B16
A14	A17	DACK1#	B17
A13	A18	DRQ1	B18
A12	A19	MEMREF#	B19
A11	A20	SYSCLK	B20
A10	A21	IRQ7	B21
A9	A22	IRQ6	B22
A8	A23	IRQ5	B23
A7	A24	IRQ4	B24
A6	A25	IRQ3	B25
A5	A26	DACK2#	B26
A4	A27	TC	B27
A3	A28	BUSALE	B28
A2	A29	+5V	B29
A1	A30	OSC	B30
A0	A31	GND	B31

1-9 I/O Address Map

The CPU communicates with other devices via I/O ports. The following is a list of addresses.

Hex Address	Device
00-1F	Direct Memory Access Controller (DMA) NO.1 (82C206) for 8-bit devices
20-3F	Programmable Interrupt Controller NO.1 (82C206)
40-5F	Timer/Counter (82C206)
60,64	Keyboard Controller (8042)
61	On-board testing registers
70,71	Clock, calendar (82C206)
70, bit 7	NMI mask
78	On-board test stimulus register
80-9F	DMA Page Register
A0-BF	Programmable Interrupt Controller NO.2 (82C206)
C0-DF	Direct Memory Access Controller (DMA) NO.1 (82C206) for 16-bit devices
F0	Clear the Busy Signal of the Math Coprocessor
F1	Reset the Math Coprocessor
F8-FF	Math Coprocessor

1-10 Interrupt Controllers

The 486SX/DX board has an 82C206-N programmable Interrupt Controller that handles the hardware interrupts for the CPU. The following table lists the interrupt lines, their priorities, and the devices to which the interrupt lines are connected.

If an interrupt line is accessible via an expansion slot, the signal and type of slot are also shown.

Interrupt Lines

Priority	Source	Destination
	NMI Parity Error	80486 NMI input
0	Timer Channel 0	Master PIC, Interrupt 0
1	Keyboard Controller	Master PIC, Interrupt 1
2	Slave PIC	Master PIC, Interrupt
3	Clock/Calendar	Slave PIC, Interrupt 0
4	8-bit slot, IRQ 9	Slave PIC, Interrupt 1
5	16-bit slot, IRQ 10	Slave PIC, Interrupt 2
6	16-bit slot, IRQ 11	Slave PIC, Interrupt 3
7	16-bit slot, IRQ 12	Slave PIC, Interrupt 4
8	Math Coprocessor busy signal (NPXBSY#)	Slave PIC, Interrupt 5
9	16-bit slot, IRQ 14	Slave PIC, Interrupt 6
10	16-bit slot, IRQ 15	Slave PIC, Interrupt 7
11	8-bit slot, IRQ 3 Serial Port	Master PIC, Interrupt 3
12	8-bit slot, IRQ 4 Serial Port	Master PIC, Interrupt 4
13	8-bit slot, IRQ 5 Printer Port	Master PIC, Interrupt 5
14	8-bit slot, IRQ 6 Floppy disk drive	Master PIC, Interrupt 6
15	8-bit slot, IRQ 7 Printer Port	Master PIC, Interrupt 7

1-11 DMA Controllers

The 486SX/DX carries the 82C206 Direct Memory Access Controller for byte and word DMA.

The following table list the DMA channels and the corresponding signals on the expansion slots where these channels can be accessed.

1-11-1 DMA Channels

Slave DMA Controllers	Master DMA Controllers	Device
Byte transfers	Word transfers	
0		16-bit slot, DRQ0
1		8-bit slot, DRQ1
2		8-bit slot, DRQ2
3		8-bit slot, DRQ3
	4	Slave DMA controller input to Master
	5	16-bit slot, DRQ5
	6	16-bit slot, DRQ6
	7	16-bit slot, DRQ7

1-12 Connector Pin-Outs

The pin-outs of the various connectors on the 486SX/DX are below.

1-12-1 Battery Connector J20 Pin-Out

Function	Pin No.
Battery (+)	1
None	2
Ground (-)	3
Ground (-)	4

1-12-2 Keylock Connector J17 Pin-Out

Function	Pin No.
Power for Power LED	1
None	2
Ground	3
Keylock	4
Ground	5

1-12-3 Speaker Connector J18 Pin-Out

Function	Pin No.
Speaker Drive Out	1
+5V	2
Speaker Drive Out	3
+5V	4

1-12-4 Keyboard Connector Pin-Out

Function	Pin No.
KEYCLK (clock)	1
KEYDAT (data)	2
N/C	3
Ground	4
+5V	5

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