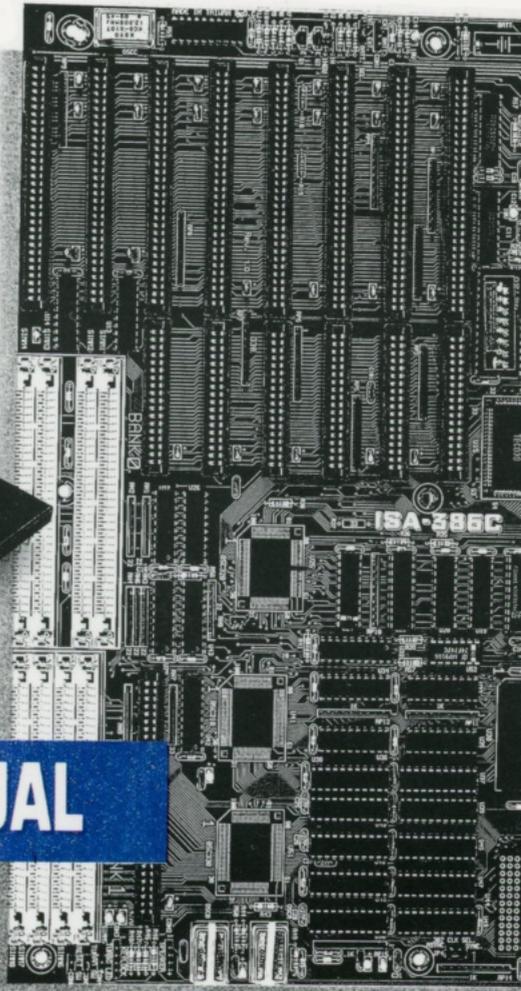# ISA-386C MAIN BOARD

USER'S MANUAL

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Table of Contents

ISA-386C Features

This manual introduces the ISA-386C system board and explains how to setup and use it. In addition to an overview of the design and features of the main board, the manual provides useful information if you want to change the configuration of the board or a system it is installed in.

First a word of caution. If the ISA-386C main board is already installed in a system, it was most likely set up by your system dealer to meet the specific requirements of your system. This may include changes to the basic settings of the board. If you decide to make any changes yourself, be advised that opening the case might violate your system warranty.

This manual provides all the information you need to upgrade or change the setup of the board. If however, you don't feel confident of your ability to work on it yourself, ask your dealer or a qualified technician to do it for you.

ISA-386C Features
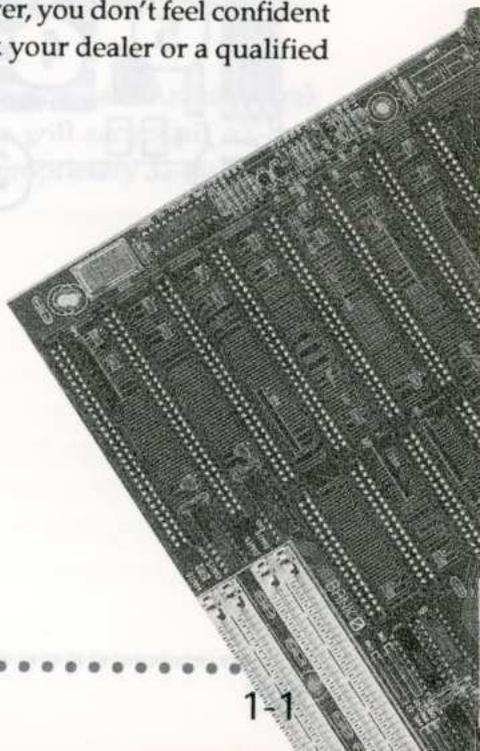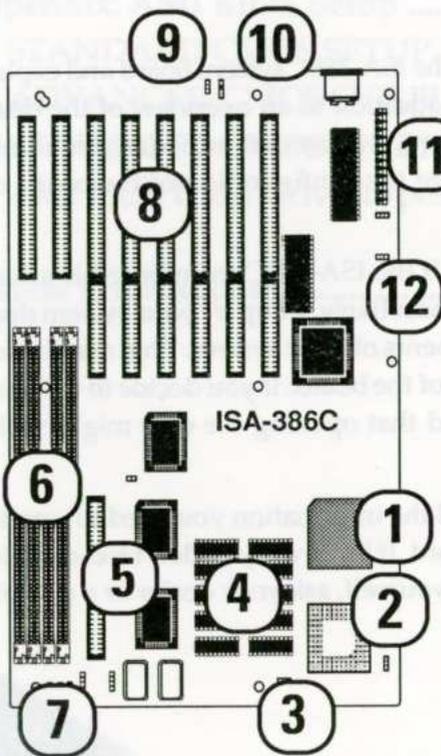
1. The CPU: Intel 386DX-33 or AMD Am386™DX-40 or -33

2. Socket for Intel 80387-33, 33/40MHz 80387-compatibles or Weitek 3167 numeric coprocessor.

3. Numeric coprocessor clock selection jumper JP4.

4. Cache RAM subsystem with 64KB of SRAM.

5. 32-bit proprietary memory card slot with 4~32MB capacity.

6. Module sockets for 1~32MB on board. With the 32-bit memory card, supports a total of 64 MB.

7. Case function connectors: Reset switch, Turbo switch, Turbo LED, Keylock, and Speaker connectors.

8. Expansion slots, two 8-bit and six 16-bit.

9. Battery Source selection jumper JP1, External Battery connector.

10. Standard 5-pin Keyboard connector jack.

11. Power supply connectors.

12. Video display mode jumper JP2, Power Good selection jumper JP3.

Features

Before we go further, we'll review the main features of the ISA-386C. Later in the manual we will explain in more detail anything else you will need to know.

The ISA-386C system board can use either a 33MHz (megahertz) or 40Mhz microprocessor. It is suitable for use with either the Intel 386DX or AMD Am386™ DX microprocessor (CPU). The board also has 64K bytes of cache memory. The very fast speed of this SRAM (Static Random Access Memory) cache greatly improves performance.

The board is compact (13.1 by 8.6 inches), a size sometimes referred to as "Baby AT". It has nine mounting holes, two of which are double drilled. This allows the board to be mounted in a wide variety of cases.

The mainboard has eight ISA (Industry Standard Architecture) expansion slots. These 8 and 16-bit slots will accept all AT-bus compatible expansion cards. It also has a proprietary 32-bit slot for an optional memory expansion card.

85C310D DRAM & Cache Controller

The cache is a 64K byte static RAM direct map cache which uses ten 16x4K bit chips. This allows the ISA-386C system board to take full advantage of the speed of the CPU.

This cache memory system responds much faster than ordinary DRAM chips or modules. The cache is designed to hold recently added and/or frequently called data. In this way, whenever the CPU calls for data, the cache controller first looks in the cache. If it finds what it needs, this is called a "hit". If the information is there, it is returned to the CPU without waiting for the slower DRAM to be searched.

As this system has a very high "hit" rate and its few misses are averaged over a large number of accesses, the "wait state" of the system is virtually zero. This also means that the system bus is more available for use by other bus masters.

The 85C310 DRAM & Cache controller provides the cache directory and logic support for the 64K byte cache

The Cache Concept

The ISA-386C mainboard includes 64K bytes of cache RAM. This cache improves performance by reducing external bus activity and increasing instruction throughput. In an 386-based system, a cache subsystem improves total performance about 20% or more than an 386 based-system that is without cache subsystem. The practical efficiency of the cache depends on the application programs used.

Feature Guide

In principle, cache memory is a small but fast amount of memory located between the CPU and the main memory. It usually consists of SRAM (Static RAM) and is used to improve CPU operation efficiency because it is much faster than DRAM (Dynamic RAM). The cache can be treated as a high speed memory buffer in main memory, used to store a copy of frequently used data or routines for CPU access.

The cache RAM is empty when you first turn on the system. When the CPU issues an address to read main memory DRAM, the data in the main memory is copied into cache RAM concurrently. The next time the CPU reads the data from the same memory address it will access the cache RAM data. To be able to detect whether the same data is being accessed, the addresses used need to be stored for comparison. The tag register is in charge of keeping the addresses. The ISA-386C mainboard implements the tag register with two 16Kx4 SRAM chips.

The basis of the cache concept is "program locality". Program locality can be proven by the following:

Programs usually execute in a sequential or loop manner; the PUSH and POP commands always execute sequentially from the top of the stack; character strings are usually sequential; data variables are usually used again and again; and subroutines are usually called (executed) again and again.

A cache subsystem takes advantage of the above characteristics of program locality. Cache RAM is located between the CPU and DRAM to store data or routines accessed by the CPU from DRAM. Every time the CPU accesses memory, the cache control logic checks the address generated by the CPU to determine whether the data is already in cache RAM. If it is in cache RAM, then a CACHE HIT is achieved. If not, then a CACHE MISS occurs. During a CACHE HIT, the CPU accesses the data at a very high speed from the Cache RAM,

this improves the overall system performance. During a CACHE MISS, the CPU processes a CACHE UPDATE CYCLE that accesses data from DRAM and the CPU reads the data, while the cache RAM makes a data copy concurrently. The DRAM is a slower device than the cache RAM. Taking advantage of program locality, over 90% or higher percentage of instructions and data can be accessed from cache RAM.

The average number of successful accesses from the cache RAM is called the HIT RATE. The higher the hit rate, the more efficiently the computer system is implemented. Normally the ISA-386C has a 90% - 99% hit rate, depending on the application program.

The Expansion Bus

The ISA-386C expansion bus has two 8-bit and six 16-bit expansion slots. There is also one proprietary 32-bit memory expansion slot. These slots consist of parallel rows of connection pins which match the connecting edges ("golden fingers") of ISA (AT-bus) expansion cards.

The slot grips of the edge connector create a connection between the board and the card. So it is important that these connections be kept clean to avoid problems.

The Expansion Slots

The 8 and 16-Bit slots will accept all AT compatible expansion cards but you must be sure that any cards you add run at a compatible speed. The expansion bus runs at 8MHz with a 40MHz CPU or 8.33MHz with a 33MHz one.

The 8-Bit Slots

The two 8-bit expansion slots can be used for expansion cards that do not require a 16-bit path. An example of this type of card would be some I/O port cards. The slots are one piece and shorter than the others.

The 16-Bit Slots

The six 16-bit expansion slots provide a wider data transmission pathway and will commonly be used by cards such as hard disk controllers, network cards and many 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 the 8-bit slots. These 2 sections together make up a 16-bit data path. Cards that use these slots must be plugged fully into both sections of the slot.

The 32-Bit Slot

The ISA-386C system board also has one 32-bit slot to accommodate an optional proprietary DRAM memory expansion card with a capacity of up to 32MB. The slot has only 1 section which looks exactly like the 8-bit slot. It is located next to SIMM Bank 1.

The Memory Card

The optional memory card provides for installing up to an additional 32MB of system memory. It uses the same memory modules as the memory subsystem on the ISA-386C.

Feature Guide
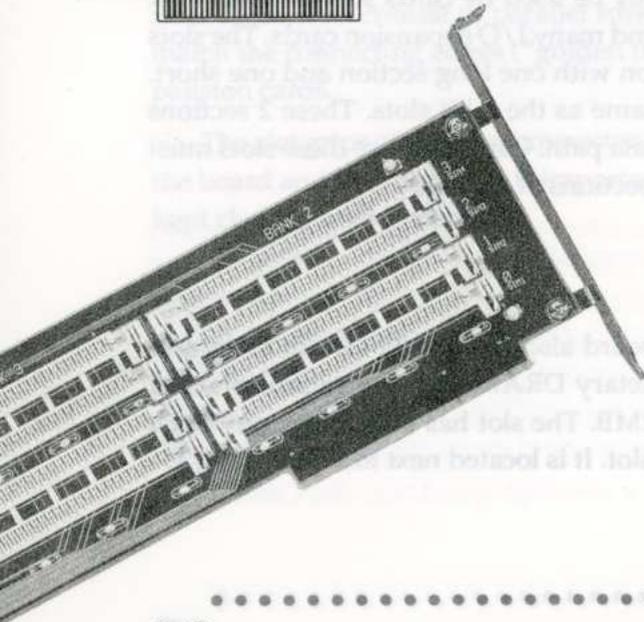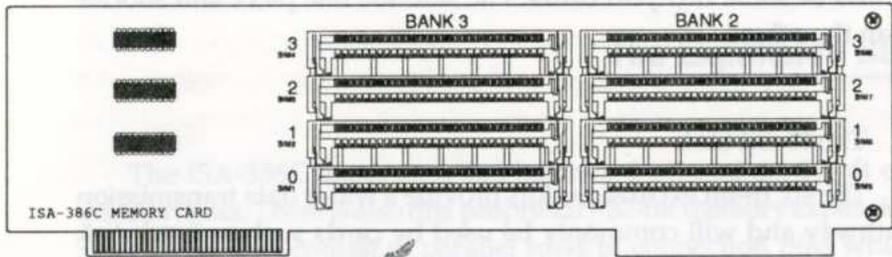
The ASIC Chips

The ISA-386C uses a set of ASIC chips to implement control logic. Together these chips perform a variety of functions. For your reference, we have listed some basic information about them. You do not need to understand them in detail to use the board.

The ISA-386C board's chipset is made up of four surface mounted components:

The 85C310D Cache and DRAM Controller

The 85C320F AT-bus Signal Controller,

The 85C330C Data Buffer and

The 82C206 Integrated Peripherals Controller, which has 7 DMA channels, 13 interrupt request channels, 2 timer/counter channels, a real time clock, and CMOS Ram.

The ROM BIOS

All system boards of this type have some basic software permanently recorded in a ROM (Read Only Memory) chip on the board. This software checks the computer hardware when you turn it on. It also provides an interface between the CPU and the rest of the board's components and peripherals. Most of this software located in the ROM chip is called the BIOS (Basic Input Output System). Refer to Section 5 for more information about optional BIOS settings.

Battery Connector

The ISA-386C does not have an on-board battery and so must depend on an external battery to maintain system configuration.

The separate battery which comes with the ISA-386C provides 3.6V of power provides extended battery life. You can use a replacement battery or battery pack that supplies up to 4.5V. However, if you use a higher voltage battery, it will have a shorter life span. Please refer to page 2-3 for more details.

Numeric Coprocessor

To speed up the overall performance of the board, you may want to add a numeric coprocessor which can take over some calculation-intensive work from the CPU. The numeric coprocessor socket can accommodate a variety of numeric coprocessors from several vendors including Intel, Cyrix, ULSI and Weitek. The ISA-386C can use either a 33MHz or 40MHz coprocessor which should match the CPU speed. You can also install an Intel 80387-33 with 40 Mhz CPU for more information please refer to page 2-8 for more details.

ISA-386C Setup

Before you can use your board you must install and configure it for use with your system. If the board is already installed, you won't need the information in this section since your system dealer will already have made the necessary adjustments. However, if you want to make changes to your system or set up the board for the first time, read on.

Jumper Switches

The ISA-386C system board has four jumper switches to adjust the system's configuration.

ISA-386C Jumper locations
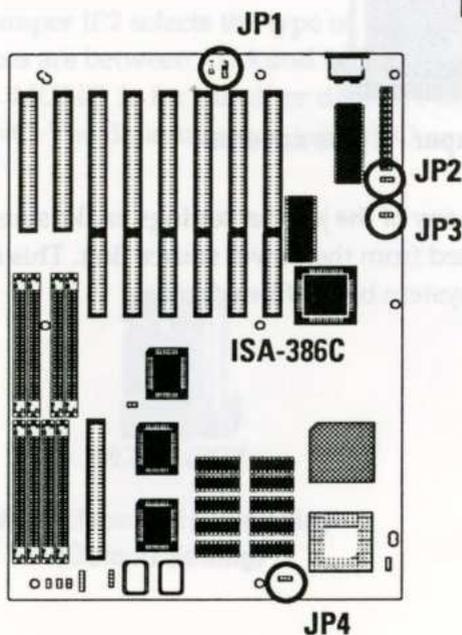
These switches consist of three pins set in a plastic base. Two of the pins are covered by a cap which connects or "shorts" them. It is possible to change the switch settings by moving the cap between the first or last two pins.

Jumpers, open & shorted

Open Jumper

Jumper cap

Shorted jumper - 2 pins covered

If you decide to change any of the jumper settings, make sure the board has been disconnected from the power source first. This is to protect both you and the system board from damage.

The Battery Selection Jumper JP1

The ISA-386C board does not normally have an on board battery so the factory setting for this jumper is EXT. For this, the center and EXT pins are shorted and an external battery maintains the BIOS setup information record and the system clock .

Battery source selection jumper JP1:
Set for external battery.

The standard model has no on board battery. The jumper must be set to EXT.

The Video Display Mode Jumper JP2

Jumper JP2 selects the type of video display you are using. The choices are between CGA and MONO. CGA is only for a CGA display. MONO is for all other displays including EGA, VGA and MONO. The default setting is MONO.

VideoDisplay Mode
jumper JP2 settings

MONO/CGA

**Monochrome video display
(Default Setting)**

MONO/CGA

**CGA video display
only**

The "Power Good" Signal Jumper JP3

Normally, the power supply for an AT class board supplies the "Power Good" signal. If your power supply has this feature, then short the center and EXT. pins of JP3. If it does not, or if you are not sure, then short the INT. and center pins to enable the board's internal "Power Good" signal. The original factory setting for this switch shorts the center and EXT. pins.

JP3 Power Good Signal jumper settings

INT setting
PG signal generated on board

EXT setting
PG signal generated by power supply (Default Setting)

The '387 Clock Selection Jumper JP4

If you use a Intel 80387-33 numeric coprocessor with a 40MHz CPU, this jumper must be set to ASYNC. Note that the ASYNC setting only accommodates Intel 80387-33 coprocessors.

JP4 Numeric Coprocessor clock selection jumper settings

33MHz Numeric Coprocessor (default Setting)_

40MHz Numeric Coprocessor

2

Test Points

There are four components on the board which look like jumpers but are actually manufacturer's test points. They serve no function for the user and should not be used. In different versions of this product their number and placement may vary. You should ignore any jumper-like components not mentioned in this section.

Connectors

In addition to the three jumper switches, the ISA-386C system board also has seven connectors. Six of them resemble jumper switches without caps. The seventh, is a larger double connector for the power connection.

___

Case feature connectors

External Battery connector

| Reset SW | Turbo SW | Turbo LED | KeyLock | Speaker |
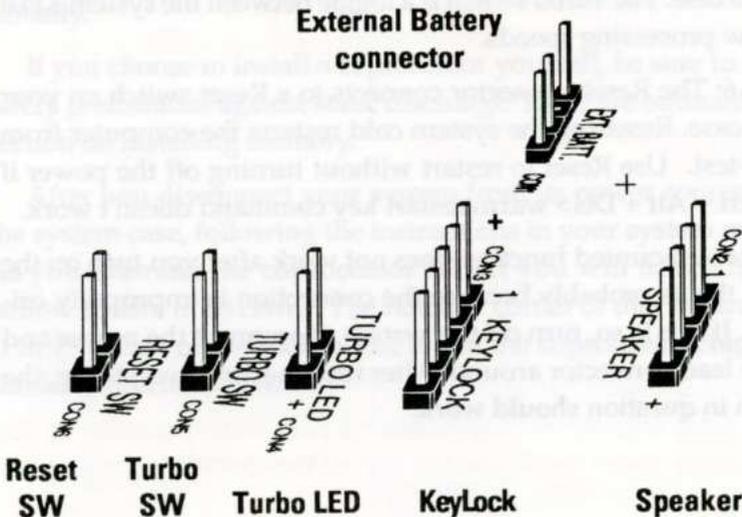
Con 1: The EXT. BATT. connector is where the external battery attaches. The battery comes with the ISA-386C system board. Note that when you use an external battery, the proper setting for JP1 shorts the center and EXT. pins. **Make sure the leads have the correct polarity orientation.** For more details see page 4-2.

Con 2: The Speaker connector hooks up to the speaker most system cases have.

Con 3: The Keylock connector is for the keylock switch on the system case. This allows you to switch off the keyboard and so provide limited security against casual intruders.

Con 4: The Turbo LED connector connects to the Turbo LED lights on the system case. These lights come on when you are using the high processing speed. As you make this connection make sure the lead's polarity corresponds to the connector's polarity indications.

Con 5: The Turbo connector leads to the Turbo switch on the system's case. The Turbo switch is a toggle between the system's fast and slow processing speeds.

Con 6: The Reset connector connects to a Reset switch on your system case. Resetting the system cold restarts the computer from the self-test. Use Reset to restart without turning off the power if the <Ctrl + Alt + Del> warm restart key command doesn't work.

If a case-mounted function does not work after you turn on the system, this is probably because the connection is improperly orientated. If this is so, turn off the system, disconnect the power and turn the lead connector around. After reconnecting everything, the function in question should work.

2

Installing A Numeric Coprocessor

The numeric coprocessor socket on the ISA-386C system board is designed to use 33MHz or 40MHz i387™ or compatible coprocessors such as those from Cyrix and ULSI. The ISA-386C can also use the Weitek 3167-33 numeric coprocessor. If your ISA-386C has a 40MHz CPU you can install either a 40 MHz or Intel 80387-33.

A numeric coprocessor can often be installed even if the board is already installed in a system case. Any non-Intel numeric coprocessor other than the Weitek must be compatible with and the same size as the Intel 387 chip. The Intel coprocessor uses only the 68 round pin holes in the two inner rings of the socket. The Weitek chip uses all 121 pin holes.

Since both types have many pins, you must be very careful to avoid misalignment and maintain correct orientation when you plug either of them in. You may want to have the chip installed professionally.

If you choose to install a coprocessor yourself, be sure to follow safety precautions against static discharge. These are outlined in the section on installing memory.

After you disconnect your system from its power source, open the system case, following the instructions in your system manual. As you examine the coprocessor socket you will notice it has a hollow square in its center. The notched corner of this square is the "Pin 1" corner of the socket. The top of the coprocessor chip has a similarly notched corner.

Numeric Coprocessor
installation

Chip orientation
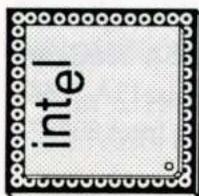
Pin 1

i387 or compatible
Outer row unused
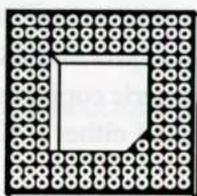
Pin 1
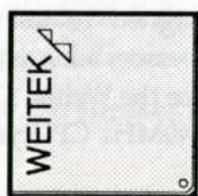
Pin 1

Weitek 3167
All pin-holes used

VERY IMPORTANT!:
If you don't orient the coprocessor correctly it will burn out when you turn the computer on, destroying the chip.

Jumper JP4 settings

CPU	Coprocessor	JP4
40MHz	40MHz	SYNC
40MHz	33MHz	ASYNC
33MHz	33MHz	SYNC

Carefully center and position the chip so that its Pin 1 corner is oriented in the same direction as the Pin 1 corner of the socket. After you have aligned the coprocessor's pins with the holes of the socket, press down firmly on the top of the chip to complete the connection.

Align the chip

Intel or compatible

Weitek

Press it into the socket
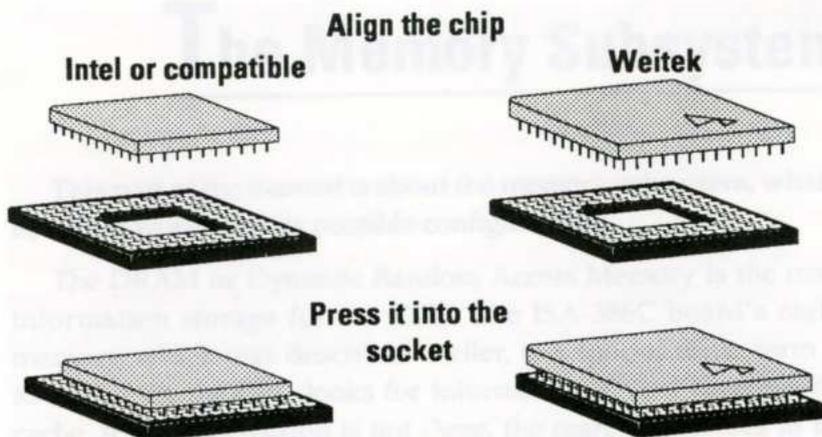
Once your ISA-386C system is fully operational you should check the BIOS setup program to be sure it accurately reflects the presence of the numeric coprocessor you have installed.

Weitek offers a daughterboard that allows you to use either their coprocessor or an Intel or compatible coprocessor. The daughterboard then plugs into the coprocessor socket on the ISA-386C.

Note: The dautghter board allows you to have both kinks of coprocessors available but each must have its own software support.

Installing two coprocessors at once
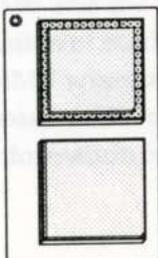
Both coprocessors mounted on a WTL-1167 daughterboard

Note: This illustration is not an exact depiction of the daughterboard

Aligning the daughterboard to the coprocessor socket

Memory Guide
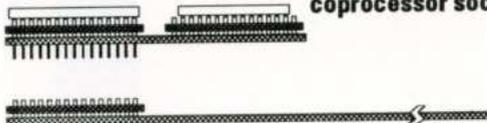
The Memory Subsystem

This part of the manual is about the memory subsystem, what it is, how it works and its possible configurations.

The DRAM or Dynamic Random Access Memory is the main information storage for the CPU. The ISA-386C board's cache memory, which was described earlier, is a special static form of RAM. When the CPU looks for information, it first searches the cache. If the information is not there, the search continues in the DRAM. If the DRAM does not have the information either, then the CPU goes to a hard disk or another information storage peripheral.

The speed at which memory is addressed is measured in nano-seconds (ns). The ISA-386C requires fast page mode DRAM modules with a speed of at least 80ns. Consult your dealer to upgrade your system memory.

The ISA-386C uses memory chips in sets of nine or three which are permanently mounted on small circuit boards to form "SIMMs" (Single In-line Memory Modules).

The ISA-386C system board can use three varieties of SIMMs. The first has a capacity of 256KB of storage. The second can hold up to 1MB and the third can hold up to 4MB. Depending on the combination of modules used, the ISA-386C board can use between 1 and 64MB when all four SIMM banks of 4 sockets each are filled (2 on-board and 2 on-card). Later in this section we will provide more information on possible configurations.

Memory Design & Specifications

This section is about the organization of memory on your ISA-386C system board. As we mentioned earlier, system memory can be installed in two places, on-board memory of up to 32MB and on-card memory with an additional capacity of 32MB. You install the first directly on the mainboard. The on-card memory is on an optional 32-bit memory card which connects the mainboard at a dedicated expansion slot.

On-board RAM

The on-board memory of the ISA-386C installs in eight module mounting sockets which are divided into "banks" of four sockets each. These on-board banks are labeled Bank 0 and Bank 1. Memory added to these banks must be installed a full bank at a time, and in sequence (0 then 1).
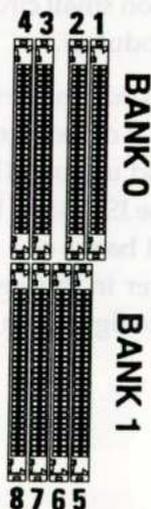
Memory Card RAM

This memory installs on a memory card which uses the dedicated 32-bit slot mentioned earlier. The installation procedure for this card is explained later, in the Installation section.

Like the on-board memory, this card has eight module sockets. These sockets are more acutely slanted than the on board ones, but they serve the same function. The memory card sockets are also divided into two banks, in this case Bank 2 and Bank 3. Here again memory must be installed sequentially, a full bank at a time.

The procedures for installing SIMMs on the board and card are described later in this section.

ISA-386C optional
memory expansion card

BANK 3   BANK 2

ISA-386C MEMORY CARD
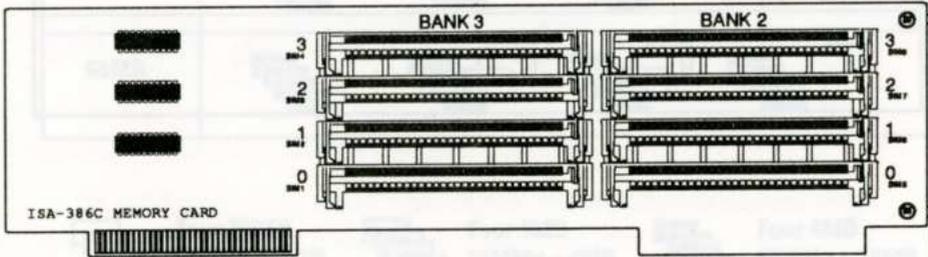
Possible Memory Configurations

You can configure the memory of the ISA-386C in a variety of ways, using different combinations of SIMMs. However you must always use the banks in numerical order starting with the on-board banks and continuing to the on-card banks (0,1,2 ,then 3).

SIMMs come in a variety of forms and configurations. Whichever you use, they must have a speed of 80ns or faster and match the dimensions noted in Chapater 6. Note that height is not an important factor except with regard to the 8-bit slots near the on-board memory banks. If you want to use these slots you should install "low profile" modules so that they won't conflict for space with any cards installed in the slots.

Total Memory	On Board		On Card	
	Bank 0	Bank 1	Bank 2	Bank 3
1MB	SIMM			
2MB	SIMM	SIMM		

DRAM Module Requirements

Total Memory	On Board Bank 0	Bank 1	On Card Bank 2	Bank 3
4MB				
8MB				
12MB				
16MB				
16MB				
32MB				
48MB				
64MB				

Four 256KB SIMMs = 1MB   Four 1MB SIMMs = 4MB   Four 4MB SIMMs = 16MB

Possible Memory Configurations

Total Memory	On Board		On Card	
	Bank 0	Bank 1	Bank 2	Bank 3
5MB				
6MB				
9MB				
10MB				
20MB				
24MB				

Four 256KB SIMMs = 1MB   Four 1MB SIMMs = 4MB   Four 4MB SIMMs = 16MB

DRAM Module Requirements

Due to the high-speed design of the ISA-386C, there are some special requirements regarding what kind of DRAM modules you can use for system memory.

There are several types of SIMM memory modules, not all of which can be used with the ISA-386C mainboard. This board requires modules with the following specifications:

Module Size: 256KB, 1MB or 4MB

DRAM Mode: Fast Page Mode

DRAM Speed: 80ns (or faster)

RAS access time [Trac]: 60ns - 80ns

CAS access time [Tcac]: 10ns - 25ns

You'll note that in the preceding list "Fast Page Mode" is mentioned. This is the type of access method used for the DRAM. Almost all DRAM components use either "Normal" or "Page Mode" control. Normal is slower but more simply implemented. Fast Page mode is quicker but more complex.

Fast Page Mode has a more efficient data transfer speed than Normal Mode. When adding memory to the ISA-386C you should use only Fast Page Mode DRAM.

In addition, you must also check the module's access time specifications. Previous mainboard designs let the user consider only the module's RAS access time. Due to the the ISA-386C's high speed design, the CAS access time must also be considered. DRAM with the same RAS access times can have an unsuitable CAS access time. Make sure that any memory yo add meets all of the specifications noted in the list.

NOTE:

Most 256K-bit DRAM is Page Mode, while almost all 1M-bit and 4M-bit DRAM is Fast Page Mode. Almost all CMOS-type DRAM is Fast Page Mode. When you purchase memory for the ISA-386C you must make sure that the modules you buy meet the requirements noted above. The diagrams below are a visual representation of the difference between Normal and Fast Page modes. The ISA-386C can only use Fast Page mode.

Installing Memory Modules

This section explains how to install SIMMs on both the mainboard and the memory card. Although the sockets on these cards are different, the installation procedure is very much the same. The sockets used at the time of manufacture may vary from those illustrated but they are still functionally the same.

Normal Mode

RAS — RAS access time = Trac = 70~120ns — Precharge time 60~100ns

CAS — CAS access time = Tcac = 20~50ns

Fast Page Mode

RAS — RAS access time = Trac = 70~100ns

CAS — CAS access time = Tcac = 10~50ns — Cycle time — Precharge time 5~15ns
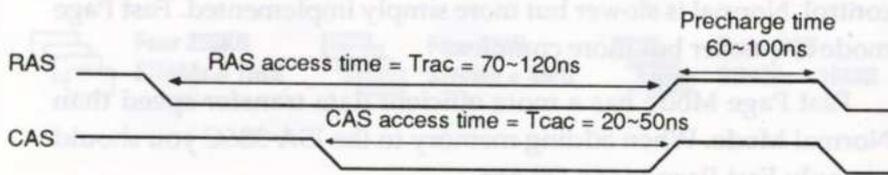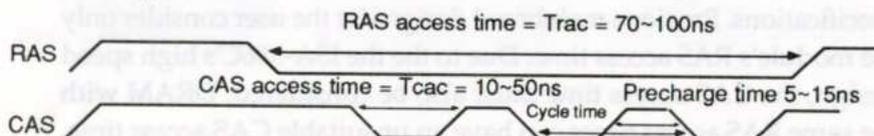
Safety Precautions

There are two main precautions to be aware of during installation. The first is static discharges, the second is finger prints on the edge connectors. Both of these are easy to prevent.

Static discharge occurs when your body has a buildup of static electricity. This can be caused by walking on carpet, the clothing you are wearing or by touching other things that have a static charge. Static discharges are most common in a dry environment.

To prevent a static discharge while you are assembling the system there are several things that can be done to remove the static. One way is to wear a static wrist strap, this device fits around your wrist and is connected to a natural earth ground. The second way is walk over and touch a fixture that you know has a natural earth ground, such as a water faucet. Either of these methods will remove any static buildup.

While installing components it is important not to touch the edge connectors with your fingers. The oils on your fingers can cause corrosion to form on the connectors. The best way to prevent this is just to be careful not to touch the connector surfaces that might be damaged.

Installation Procedure

Decide what needs to go where and make sure you have every-thing you need. Check all your safety and anti-static precautions. See the installation section for more information on this.

As you follow the procedure described, remove the modules from their anti-static protection one at a time only as you need them.

Installing Modules On The Mainboard

a. The modules should face to the left.
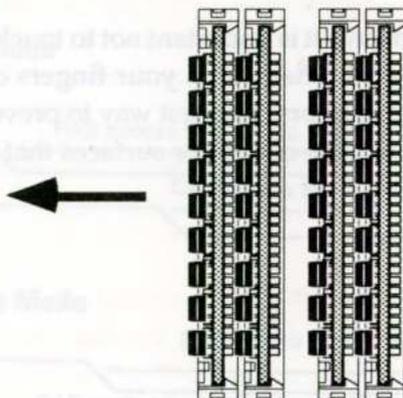
b. Insert the module edge connector into the socket at a slight angle to the board.

Insert the SIMM at an angle into the socket's edge connector slot

Press it forward into the retaining clips

The installed SIMM should be at 90° to the board
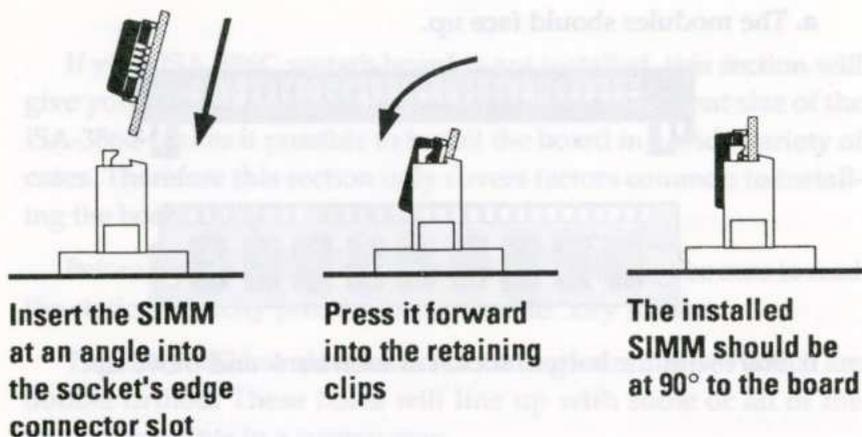
c. The module should click into place as the plastic retaining clips at each end of the socket snap into the retaining holes on the module.

d. Repeat this procedure until the entire bank is filled with four modules.

Installing Modules On The Memory Card

a. The modules should face up.
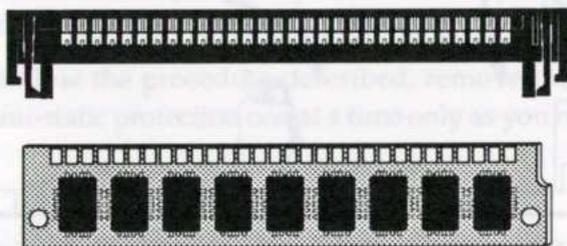
b. Start with the bottom socket of each bank and move up.

c. Insert the module edge connector into the socket at a 45° angle
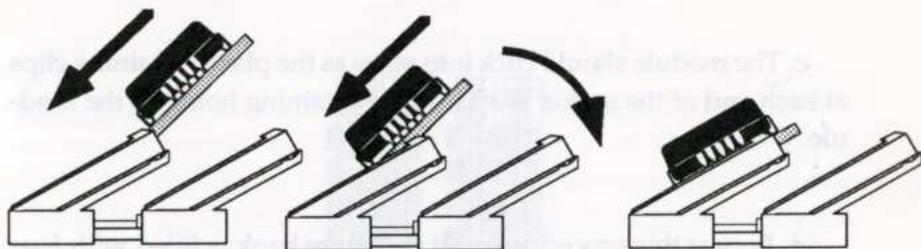
d. Press the module down into the socket until the plastic retaining clips snap over the top edge of the module.

e. Repeat the procedure for the rest of the sockets in the bank.

Installation

If your ISA-386C system board is not installed, this section will give you some useful basic information. The convenient size of the ISA-386C makes it possible to install the board in a wide variety of cases. Therefore this section only covers factors common to installing the board in most situations.

Before removing the board from its anti-static bag, be sure to read the static electricity precautions in the Memory section.

The ISA-386C has nine drilled mounting holes. Two of which are double drilled. These holes will line up with some or all of the mounting points in a system case.

Mounting holes

ISA-386C
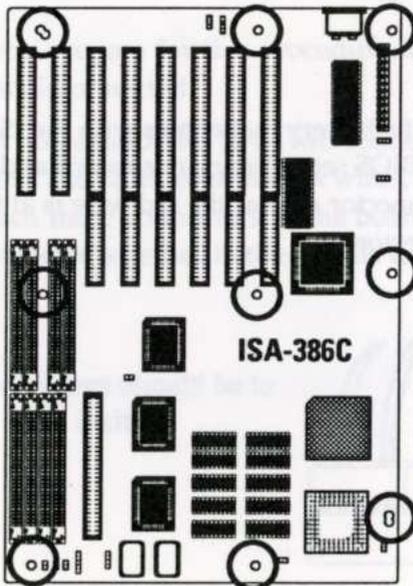
Usually screws are the only mounting hardware you need to securely anchor the board to the case. In some other cases the board's edge(s) fits under metal flanges built into the case frame.

Cases can come with a variety of mounting fasteners made of either metal or plastic. Most of the metal fasteners have two sections. The first part screws into the case and the second part screws the board to the fastener. Plastic fasteners usually snap into the case and then into the board. There are even cases which use both types since metal fasteners can ground the board to the case.

The next step is to hook up the case mounted functions with their appropriate connectors on the board as described in the section on connectors. These points are numbered and, except for the power connection, are labeled with their function. Most cases have these. When the case has a particular requirement for the orientation of a connector, check the positive ("+") markings on the board. If for some reason the function does not work, first turn off the system, next disconnect it from the power source. Then turn the connection around and try it again.

IMPORTANT NOTE:

Make sure to connect the battery that comes with the ISA-386C. The battery supports the BIOS setup program's record and the real time clock. Orient the connector so that the red wire is at the Pin1 end of the on-board connector.

External Battery
connector

External connectors

Reset Turbo Turbo KeyLock Speaker
SW SW LED
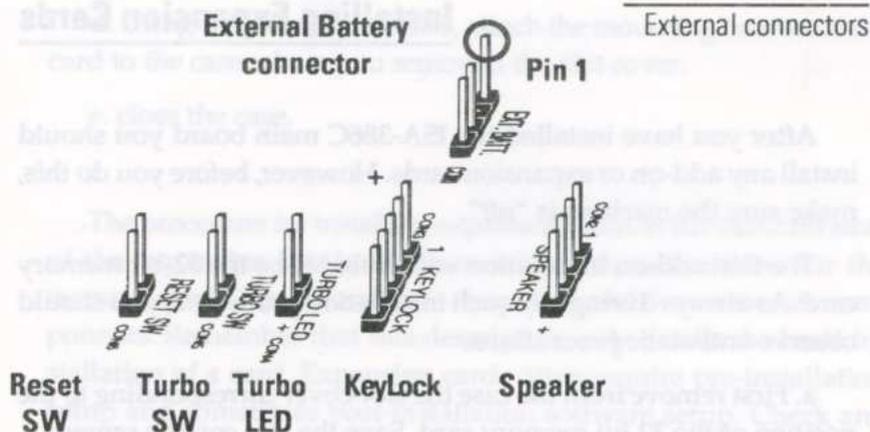
The last connection to attach is the power connection. Check whether the power supply produces a "Power Good" signal so that you know how to adjust the setting of jumper JP3 if necessary. See the Setup Guide for more information on this.

As you prepare for this procedure, make sure that the power source is disconnected.

Most power supplies have two connectors which go to the system board. Each connector has six wires, two of which are black. As you attach these connectors to the board, orient them so that the black wires are together in the middle forming a row of four.

Power supply
connection

**The black wires should be to
the inside**
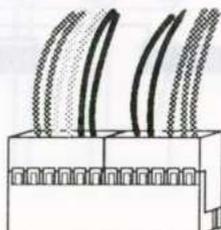
Installing Expansion Cards

After you have installed the ISA-386C main board you should install any add-on or expansion cards. However, before you do this, make sure the machine is "off".

The first add-on installation will probably be the 32-bit memory card. As always during any such installation procedure, you should observe anti-static precautions.

a. First remove from the case the slot-cover corresponding to the position of the 32-bit memory card. Save the slot cover's screws.

b. Remove the card from its protective packaging.

c. Insert the card in the proprietary 32-bit slot. As you insert the card, keep it at a 90° angle to the mainboard with the edge connectors aligned to the slots.

32-bit memory card
    installation

d. Using the slot cover screws, attach the mounting bracket of the card to the case where you removed the slot cover.

e. close the case.

The procedure for installing expansion cards in the standard slots of the expansion bus is the same as that described here for the memory card. The difference is the position of the connector components. Remember that this description only details the basic installation of a card. Expansion cards often require pre-installation setup and sometimes post-installation software setup. Check any documentation that comes with a card for instructions on this.

Attaching a card to the case

BIOS Setup Program

All computer mainboards of this type have the BIOS setup program stored in ROM. This program creates a record of the basic system hardware present and some of the settings that control some functions of the board. If you received the ISA-386C mainboard installed as part of a system the proper entries have probably already been made. If this is the case, you might want to open the setup program as described later to check them for future reference.

If you are installing the board, you'll need to enter the setup information for the first time. This section explains how to use the program and make the appropriate entries.

The ISA-386C comes equipped with the 386 ISA BIOS by Award Software Inc. The AMI BIOS is an option for the ISA-386C. If your version of the board has this BIOS installed see the appendix for information on it.

When you turn the computer on, a screen message appears to give you the opportunity to get into the setup program. Do this by pressing these keys at the same time:

<CTRL> + <ALT> + <ESC>

The information that appears on the screen when you turn on the computer is created by the POST (Power On Self Test). During this test the BIOS checks the record created with the Setup program. If it discovers a problem, a message will appear on the screen asking you to enter the setup program and correct the information there.

When you call up the Award BIOS setup program you will see the screen below. It is an example of the settings for a possible system.

```
Date:   17 Jun 1991                    386 ISA BIOS (#401A0)
Time:   14:30:27                       Award Software Inc.

Drive A: 1.2M, 5¹/₄ in.
Drive B: 1.44M,3¹/₂ in.

Video: EGA/VGA

Halt On: All Errors               Base Memory:      640K
                              Extended Memory:     3328K
Shadow VGA BIOS    : Enable    Expanded Memory:       0K
Shadow system BIOS : Enable       Other Memory:      384K
Ken VGA BIOS       : Enable
Cache Controller   : Enable      Total Memory:      4352K

                CYLS.  HEADS  SECTORS  PRECOMP  LANDZONE
Drive C: 17 ( 40Mb)  977     5       17      300       977
Drive D: None          0     0        0        0         0

Alt-F1 for Menu Help                        F10 exits
Page 01: Status Page                  F2 changes colors
```

Award BIOS Set-up

If you do not call up the BIOS setup program, the computer will automatically load an operating system (i.e. DOS) if there is an available system disk.

To select the field of information you want to alter, use the cursor arrows to move the cursor up, down, left or right. Make settings in the highlighted field.

You can use the "+" and "-" keys of the numeric keypad of an extended keyboard or the "+" key on the main section to choose among optional settings.

If you need information about what changes to make press the "Alt" and "F1" keys simultaneously. The help window will then give you information based on the position of the cursor.

The first section lets you set the date and time. Use the "+" and "-" keys to change the numeric values. Use the left, right, up and down arrows to move between hours, minutes, days etc.

The next section records the types of disk drives present. The five possible choices for drives A & B are:

360K, 5 1/4 in.

1.2M, 5 1/4 in.

720K, 3 1/2 in.

1.44M, 3 1/2 in.

None

Next come the Video choices:

EGA/VGA

CGA 40

CGA 80

MONO

Below the video section is a field which controls whether the system stops in case of an error. The "Halt On" field has the following suggestions:

All Errors

- - - - -

All, But Keyboard

All, But Diskette

All, But Disk/Key

The default setting is "All Errors". For most purposes we suggest that you leave the setting on the "All Errors" setting, unless you have some reason not to.

After the "Halt On" setting there are four lines that set up the ISA-386C's shadow cache feature.

The Shadow and Cache field are as follows:

Shadow VGA BIOS

Shadow System BIOS

Ken VGA BIOS

Cache Controller

The default setting for all is "Enable". These features allow you to copy the BIOS and/or the VGA's BIOS into the RAM. This feature can speed up your system. It uses some of the 384KB of memory between 640KB and 1024 KB to do this.

The "Ken VGA BIOS" setting allows you to cache the shadowed display BIOS code. When you enable the "Ken VGA BIOS" option, the shadowed VGA BIOS is moved into the cache memory. This additionally improves performance.

The "Cache Controller" feild allows you to enable or disable this function. It should alwasy be left on the default "enabled" setting.

The diagrams on the next page show how the shadow feature affects memory allocation. The ISA-386C is designed to move 256KB to high memory whether or not you enable the Shadow feature. This feature is not available for configurations over 4MB.

Moved 256k
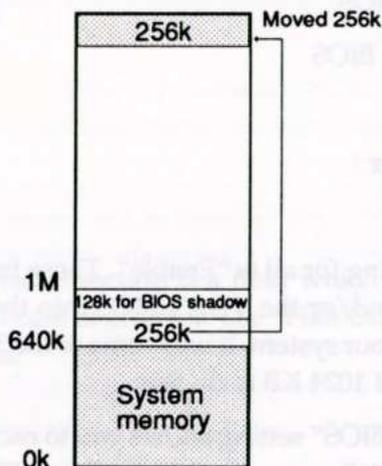
Note: 1, 2 or 4MB only, over 4MB there is no move out feature .

1M

128k for BIOS shadow

640k

256k

System memory

0k

Memory Map
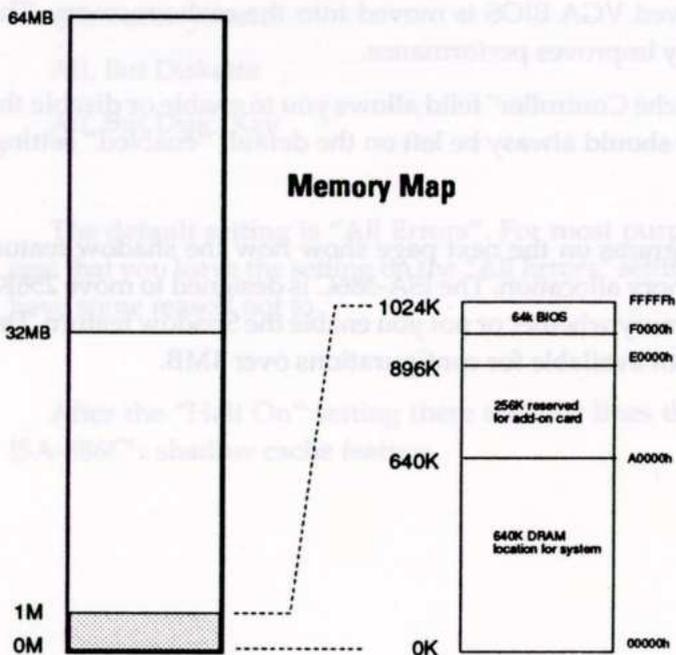
The last section asks you to record the types of hard disks present. Be sure to check the specifications of your drives. A hard disk will not work properly if you enter incorrect information in this section. There are forty-eight possible disk type numbers. The first is "None". Number 15 is reserved.

Nos. 1-46 are pre-defined.

Nos 47 & 48 are user definable.

You must enter the number that corresponds to the hard disk or disks you have installed in the computer. There are five categories of information as shown on the screen. The hard disk vendor's or system manufacturer's documentation should provide you with the information on the hard disk drive(s) you will use. If this documentation is not in evidence, you can look on the hard disk drive itself, if it is accessible. If all else fails, you will need to ask your hard disk drive or system vendor for the information.

NOTE:

Entering the incorrect type number will result in the hard disk drive functioning improperly or not at all.

In order for a user-defined hard drive to be recognized, Novell Netware 286 must be system BIOS shadowed (type 47 only).

Novell Netware 286 cannot support a user-defined hard disk unless the system BIOS is shadowed. It only supports the No. 47 user defined number. No. 48 is not availble for Netware 286.

When you are finished making whatever entries are necessary, you must record them for the computer's future reference. Every time you turn the computer on, it checks this record and compares it to the hardware it finds.

To record the information and exit the Setup program, do as noted below:

Press F10 - This initiates the exit procedure.

When you press F10 a message will appear asking you to choose between two options:

Press the F5 key to save the information and exit the program. This records the current settings.

Press F1 to exit without saving. You might want to do this if you opened the program just to check the settings.

If you decide that you want to return to the setup program instead of exiting, press the Esc key.

No.	MB	Cyls	Heads	Sectors	Precomp	Landzone
1	10	306	4	17	128	305
2	20	615	4	17	300	615
3	30	615	6	17	300	615
4	62	940	8	17	512	940
5	46	940	6	17	512	940
6	20	615	4	17	none	615
7	30	462	8	17	256	511
8	30	733	5	17	none	733
9	112	900	15	17	none	901
10	20	820	3	17	none	820
11	35	855	5	17	none	855
12	49	855	7	17	none	855
13	20	306	8	17	128	319
14	42	733	7	17	none	733
16	20	612	4	17	none	663
17	40	977	5	17	300	977
18	56	977	7	17	none	977
19	59	1024	7	17	512	1023
20	30	733	5	17	300	732
21	42	733	7	17	300	732
22	49	751	8	17	none	752
23	100	755	16	17	none	756
24	40	977	5	17	none	976
25	76	1024	9	17	none	1023
26	71	1224	7	17	none	1223
27	111	1224	11	17	none	1223

28	152	1224	15	17	none	1223
29	68	1024	8	17	none	1023
30	93	1024	11	17	none	1023
31	83	918	11	17	none	1023
32	69	925	9	17	none	926
33	85	1024	10	17	none	1023
34	40	965	5	17	none	966
35	80	965	10	17	none	966
36	114	814	9	32	none	815
37	160	968	10	34	none	969
38	199	873	13	36	none	874
39	114	918	15	17	none	1023
40	40	820	6	17	none	820
41	42	1024	5	17	none	1023
42	65	1024	5	26	none	1023
43	40	809	6	17	none	852
44	61	809	6	26	none	852
45	100	776	8	33	none	775
46	203	684	16	38	none	685
47	User definable					
48	User definable					

This concludes this section and the main portion of the manual. The next section contains a variety of technical information and specifications of the ISA-386C.

Technical Information

This section contains a variety of technical information about and specifications of the ISA-386C mainboard. It is provided as a reference for those interested in or requiring technical information about this product. The end user does not need to understand or use this information in order to use the ISA-386C mainboard.

Fundamental Clock Sources

All the operations of computer circuits depend on the "fundamental clock sources" and treat it as a timing base. The Clock is generated with an oscillation circuit that construct by crystal and electronic elements.

ISA-386C main board generates clock with "oscillator" and buffer by "drive circuit", CPU, cache subsystem, 8/16-bit I/O system, all the participants of ISA-386C refer the clock source as a timing base of the system.

Some major fundamental clock sources is shown below:

(1) CPU CLK2 provides the fundamental timing for the 386-40 CPU, it is a 80MHz clock,time period = 1/80MHz = 12.5ns, this is a very high frequency clock source, 80MHz also widely used in other circuits that have to be synchronous with CPU, such as the cache subsystem.

(2) 40 MHz is a clock that just for reference only in concept, you can not test it in main board. 40MHz is generated in the CPU internally to indicate the phase of the Am386DX-40 CPU.

(3) PROCLK is a clock that just for reference only in concept, you can not test it in main board. PROCLK is simulated like a clock source of the 80286-8 and is usually referred in the discussion of the 8/16-bit AT bus cycle.

(4) SYSCLK is the standard reference clock for add-on card that plugged into the 8/16-bit slot. This is a important clock source for AT-bus compatible devices.

(1)	CPU CLK2 80MHz
(2)	40MHz
(3)	PROCLK 16MHz
(4)	SYSCLK 8MHz
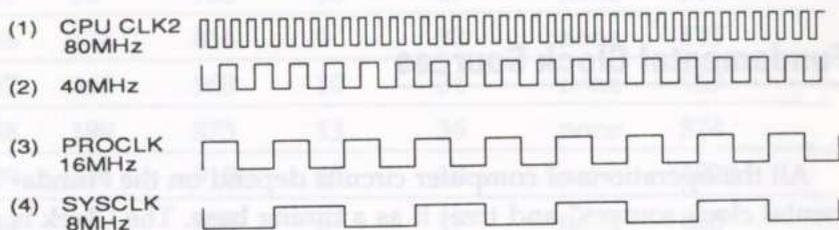
Four types of basic cycle are shown below:

(1) CACHE RAM CYCLE is the fastest execution cycle in the ISA-386C main board, CACHE CYCLE with 7.76~8.02 MIPS high performance, this means almost 48 times performance than the standard 8-bit AT bus cycle. MIPS stands for "Millions Instruction Per Second".

(2) 32-BIT DRAM CYCLE is executed when cache miss or update data into DRAM. Figure shows a 32-BIT DRAM READ CYCLE, it executes in a very high speed, the speed just under CACHE CYCLE.

(3) AT-BUS 16-BIT CYCLE is an execution cycle when CPU, DMA, or other bus master access 16-bit I/O devices or memories. It is a "Industry Standard architecture" 16-bit execution cycle. All of 16-bit AT compatible add-on card will meet this standard.

(4) AT-BUS 8-BIT CYCLE is an execution cycle when CPU, DMA, or other bus master access 8-bit I/O devices or memories like as 8-bit EPROM. It is a "Industry Standard architecture" 8-bit execution cycle. All of 8-bit XT compatible add-on card will meet this standard.
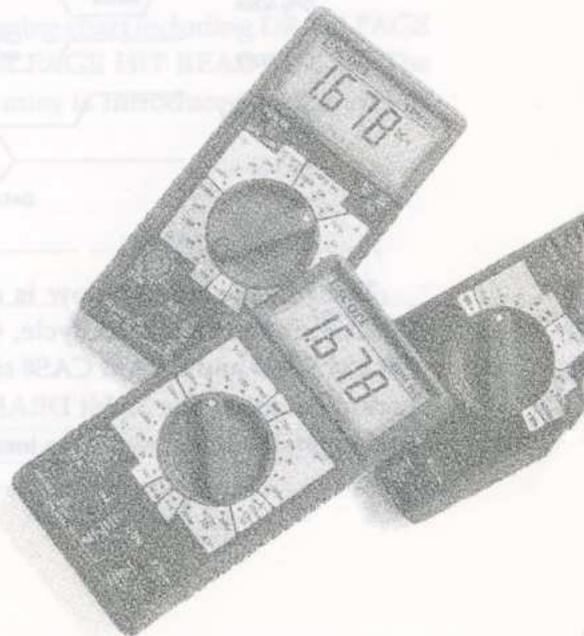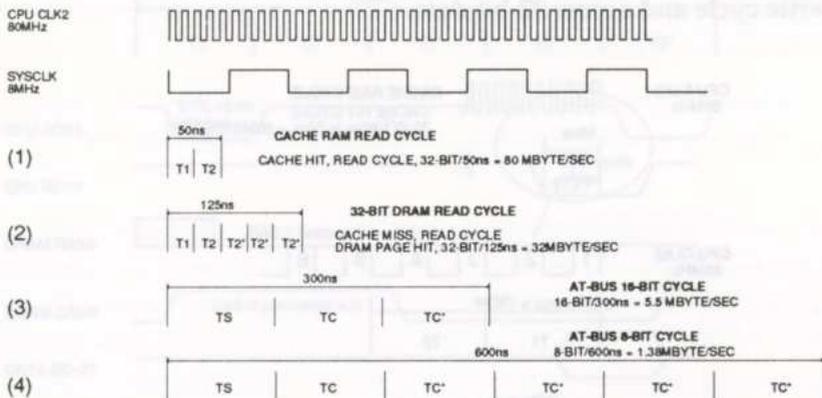
Timing Analysis

The figure shown below is a timing example about CACHE RAM CYCLE. The CPU cycle is started by the CPU ADS signal and cache subsystem will declare the end of the cycle with the CPU RDY signal. During the 50ns time period completes a cache read or cache write cycle and access 32-bit data.
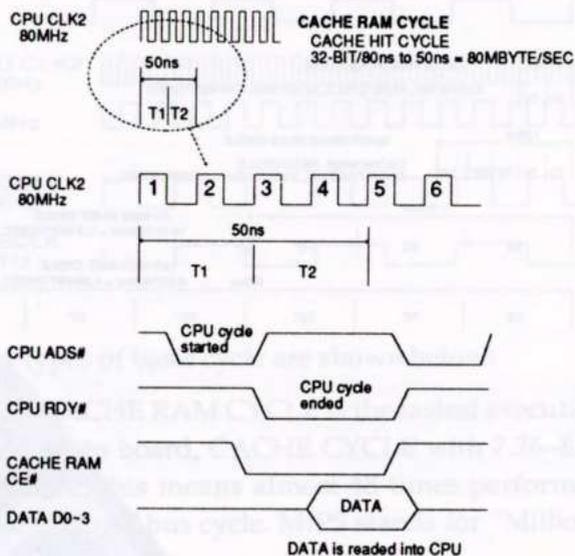
The figure shown below is a timing example about DRAM CYCLE, it shows a read cycle, CPU ADS# means a start point, DRAM RAS# and DRAM CAS# signal active low and in 125ns time period complete the 32-bit DRAM data access. DRAM subsystem declared CPU RDY# signal to terminate this read cycle.

CPU CLK2
80MHz

125ns

T1 | T2 | T2* | T2* | T2*

DRAM CYCLE
CACHE MISS, READ CYCLE
DRAM PAGE HIT, 32-BIT/125ns = 32MBYTE/SEC

CPU CLK2
80MHz

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

125ns

T1 | T2 | T2* | T2* | T2*

CPU ADS#   CPU cycle started   CPU cycle ended

CPU RDY#

DRAM RAS#   RAS # keep active = low

DRAM CAS#   CAS # precharge = hi   CAS # active = low

DATA D0~31
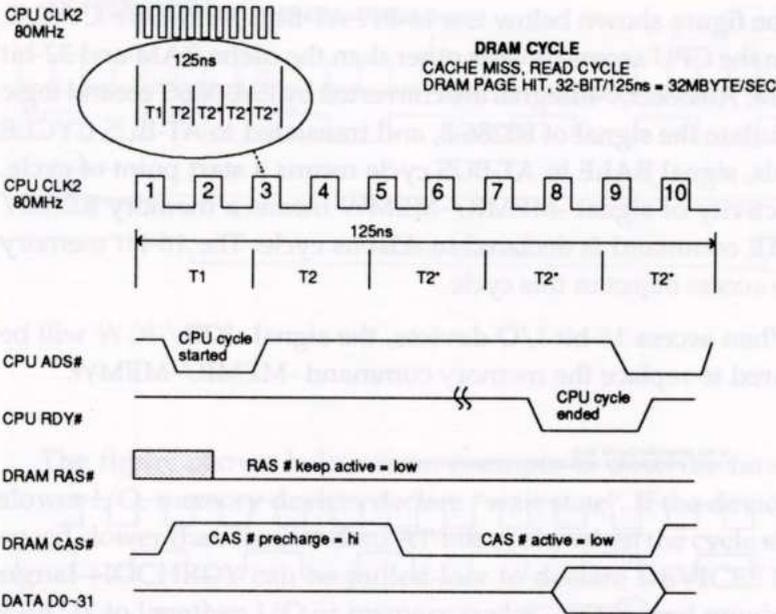
The figure shown below is a timing chart including DRAM PAGE MISS READ CYCLE and DRAM PAGE HIT READ CYCLE. The meaning of page hit and page miss is introduced in the end of chapter 3 (the Memory Guide).

CPU ADS#   CPU cycle 1 started   CPU cycle 1 ended   CPU cycle 2 started   CPU cycle 2 ended

CPU RDY#

DRAM RAS#

DRAM CAS#   RAS access time = 125ns   CAS access time = 75ns
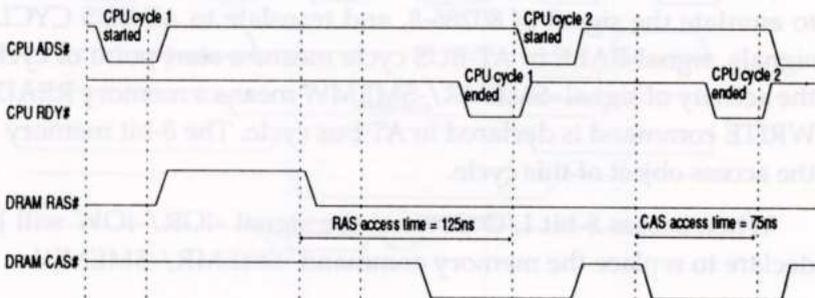
The figure shown below is a 16-BIT AT-BUS MEMORY CYCLE. When the CPU access devices other than the cache RAM and 32-bit DRAM, Am386DX-40 signal are converted by ISA-386C control logic to emulate the signal of 80286-8, and translated to AT-BUS CYCLE signals, signal BALE in AT-BUS cycle means a start point of cycle, the activity of signal -MEMR/-MEMW means a memory READ/ WRITE command is declared in AT-bus cycle. The 16-bit memory is the access object in this cycle.

When access 16-bit I/O devices, the signal -IOR/-IOW will be declared to replace the memory command -MEMR/-MEMW.

16-BIT MEMORY ON AT-BUS
1 WAIT STATE AT-BUS MEMORY READ OR MEMORY WRITE CYCLE

PROCLK 16MHz
TS TC TC*
SYSCLK 8MHz
BALE
16-bit cycle started
-MEMR or -MEMW
16-bit memory devices active
16-bit cycle ended
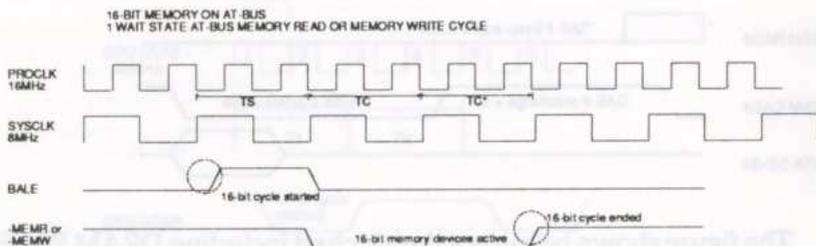
The figure shown below is a 8-BIT AT-BUS MEMORY CYCLE. When the CPU access devices other than the cache RAM and 32-bit DRAM, Am386DX-40 signal are converted by ISA-386C control logic to emulate the signal of 80286-8, and translate to AT-BUS CYCLE signals, signal BALE in AT-BUS cycle means a start point of cycle, the activity of signal -SMEMR/-SMEMW means a memory READ/ WRITE command is declared in AT-bus cycle. The 8-bit memory is the access object of this cycle.

When access 8-bit I/O devices, the signal -IOR/-IOW will be declare to replace the memory command -SMEMR/-SMEMW.

8-BIT MEMORY ON AT-BUS
4 WAIT STATE AT-BUS MEMORY READ OR MEMORY WRITE CYCLE

PROCLK
16MHz

TS   TC   TC*   TC*   TC*   TC*

SYSCLK
8MHz

BALE
8-bit cycle started

-SMEMR or
-SMEMW
8-bit memory devices active

cycle ended
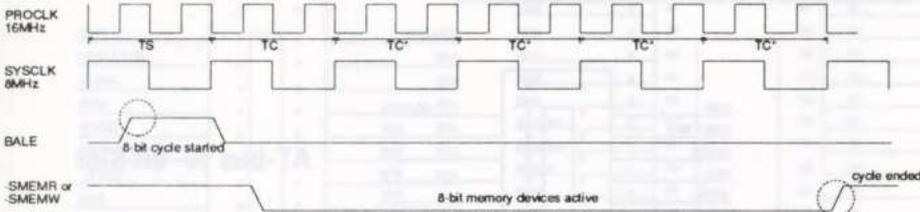
The figure shown below is an example to describe how the slower I/O, memory devices declare "wait state". If the devices' is speed slower than the standard AT-bus cycle, when the cycle starts, signal +IOCHRDY can be pulled low to declare DEVICES NOT READY to lengthen I/O or memory cycles. An integral number of SYSCLK cycle time period 125ns is extended.

16-BIT MEMORY ON AT-BUS, +IOCHRDY SIGNAL ASSERT LOW TO GENERATE ONE ADDITIONAL
WAIT STATE, 2 WAIT STATE AT-BUS MEMORY READ OR MEMORY WRITE CYCLE

PROCLK
16MHz

TS   TC   TC*   TC*   TS

SYSCLK
8MHz

BALE
bus cycle started   next cycle started

-MEMR or
-MEMW
devices active   extended time period

-ENDCYC

+IOCHRDY
slower device
declare wait   declare ready

Expansion Slot Pin Assignments

AT-bus 16- bit Slot

B	#	#	A
GND	1	1	-I/O CHCK
RESET DRV	2	2	SD7
+5 VDC	3	3	SD6
IRQ9	4	4	SD5
-5 VDC	5	5	SD4
DRQ2	6	6	SD3
-12 VDC	7	7	SD2
0WS	8	8	SD1
+12 VDC	9	9	SD0
GND	10	10	-I/O CH RDY
-SMEMW	11	11	AEN
-SMEMR	12	12	SA19
-IOW	13	13	SA18
-IOR	14	14	SA17
-DACK3	15	15	SA16
DRQ3	16	16	SA15
-DACK1	17	17	SA14
DRQ1	18	18	SA13
-REFRESH	19	19	SA12
CLK	20	20	SA11
IRQ7	21	21	SA10
IRQ6	22	22	SA9
IRQ5	23	23	SA8
IRQ4	24	24	SA7
IRQ3	25	25	SA6
-DACK2	26	26	SA5
T/C	27	27	SA4
BALE	28	28	SA3
+5 VDC	29	29	SA2
OSC	30	30	SA1
GND	31	31	SA0

D	#	#	C
-MEM CS16	1	1	SBHE
-I/O CS16	2	2	LA23
IRQ10	3	3	LA22
IRQ11	4	4	LA21
IRQ12	5	5	LA20
IRQ15	6	6	LA19
IRQ14	7	7	LA18
-DACK0	8	8	LA17
DRQ0	9	9	-MEMR
-DACK5	10	10	-MEMW
DRQ5	11	11	SD08
-DACK6	12	12	SD09
DRQ6	13	13	SD10
-DACK7	14	14	SD11
DRQ7	15	15	SD12
+5 VDC	16	16	SD13
-MASTER	17	17	SD14
GND	18	18	SD15

B		A
GND	1 / 1	I/O CHCK
RESET DRV	2 / 2	SD7
+5 VDC	3 / 3	SD6
IRQ9	4 / 4	SD5
-5 VDC	5 / 5	SD4
DRQ2	6 / 6	SD3
-12 VDC	7 / 7	SD2
0WS	8 / 8	SD1
+12 VDC	9 / 9	SD0
GND	10 / 10	-I/O CH RDY
-SMEMW	11 / 11	AEN
-SMEMR	12 / 12	SA19
-IOW	13 / 13	SA18
-IOR	14 / 14	SA17
-DACK3	15 / 15	SA16
DRQ3	16 / 16	SA15
-DACK1	17 / 17	SA14
DRQ1	18 / 18	SA13
-REFRESH	19 / 19	SA12
CLK	20 / 20	SA11
IRQ7	21 / 21	SA10
IRQ6	22 / 22	SA9
IRQ5	23 / 23	SA8
IRQ4	24 / 24	SA7
IRQ3	25 / 25	SA6
-DACK2	26 / 26	SA5
T/C	27 / 27	SA4
BALE	28 / 28	SA3
+5 VDC	29 / 29	SA2
OSC	30 / 30	SA1
GND	31 / 31	SA0

AT-bus 8- bit Slot

	A		B		
MA8	1	A1	B1	32	MA9
MA6	2	A2	B2	33	NA7
MA4	3	A3	B3	34	NA5
MA2	4	A4	B4	35	NA3
MA0	5	A5	B5	36	NA1
CAS2B#	6	A6	B6	37	CAS3B#
CAS0B#	7	A7	B7	38	CAS1B#
RAS2#	8	A8	B8	39	RAS3#
MP1	9	A9	B9	40	MP0
MP3	10	A10	B10	41	MP2
MD0	11	A11	B11	42	GND
MD2	12	A12	B12	43	MD1
MD4	13	A13	B13	44	MD3
MD6	14	A14	B14	45	MD5
GND	15	A15	B15	46	MD7
MD8	16	A16	B16	47	+5V
MD10	17	A17	B17	48	MD9
MD12	18	A18	B18	49	MD11
MD14	19	A19	B19	50	MD13
GND	20	A20	B20	51	MD15
MD16	21	A21	B21	52	+5V
MD18	22	A22	B22	53	MD17
MD20	23	A23	B23	54	MD19
MD22	24	A24	B24	55	MD21
GND	25	A25	B25	56	MD23
MD24	26	A26	B26	57	+5V
MD26	27	A27	B27	58	MD25
MD28	28	A28	B28	59	MD27
MD30	29	A29	B29	60	MD29
GND	30	A30	B30	61	MD31
+5V	31	A31	B31	62	WE#

**Proprietary 32-bit
Memory Slot**

Chipset Pin Assignment

82C206

Pin	Left signal	Right signal	Pin
75	VCC1	A17	11
32	VCC2	A18	10
15	PSRSTB#	A19	9
22	GATE2	A20	8
61	DMAMEMR#	A21	7
62	DMAMEMW#	A22	6
21	SCLK	A23	5
73	HLDA	DACK0	48
16	INTA#	DACK1	49
23	TMRCLK	DACK2	50
71	ASRTC	DACK3	51
14	PWRGOOD	DACK5	57
18	RESET	DACK6	56
72	OSC1	DACK7	55
44	DREQ0	IRQ3	3
45	DREQ1	IRQ4	2
46	DREQ2	IRQ5	1
47	DREQ3	IRQ6	64
60	DREQ5	IRQ7	83
59	DREQ6	IRQ8	82
58	DREQ7	IRQ10	81
66	IOCHRDY	IRQ11	80
33	ACK#	IRQ12	79
43	XA0	IRQ13	78
42	XA1	IRQ14	77
41	XA2	IRQ15	76
40	XA3	TC	67
39	XA4	INTR	70
38	XA5	HRQ	69
37	XA6	OUT1	20
36	XA7	OUT2	19
35	XA8	IRQ1	4
34	XA9	XA16	13
31	XD0	XIOR#	54
30	XD1	XIOW#	52
29	XD2	ADSTB16	65
28	XD3	AEN16#	64
27	XD4	ADSTB#	66
26	XD5	AEN#	63
25	XD6	TEST	17
24	XD7		

GND1 GND2 GND3
74 12 53

82C206

85C310D

VCC1 14 VCC3 87
VCC2 29 VCC4 88

Pin	Left signal	Right signal	Pin
77	BE0#	MA0	13
76	BE1#	MA1	12
75	BE2#	MA2	11
74	BE3#	MA3	10
73	A2	MA4	9
72	A3	MA5	8
71	A4	MA6	7
70	A5	MA7	6
69	A6	MA8	5
68	A7	MA9	4
65	A8		
64	A9	RAMW#	25
63	A10	RAS0#	24
62	A11	RAS1#	23
61	A12	RAS2#	22
60	A13	RAS3#	21
59	A14	CAS0#	19
58	A15	CAS1#	18
57	A16	CAS2#	17
56	A17	CAS3#	16
55	A18		
54	A19	ERROR#	39
79	A20	PREQ	38
52	A21	BUSY#	37
51	A22	IRQ13	36
50	A23	WTKRQ	35
49	A30	NPREQ	34
48	A31	NPBUSY#	33
		OUTF0#	32
		CACHEWR#	46
		CE0#	45
		CE1#	44
		CE2#	43
		CE3#	42
81	AOB#	TOWAIST#	28
85	WR#		
84	DC#	READY#	90
82	M/IO#	CPURST	87
86	387RDY#		
30	WTKPRES#	POSTED#	96
31	387ERR	ATCYC#	95
		ONBOMEM#	97
45	ATRDY#	ROMCS#	98
29	CONF0#	LMGCS#	99
82	PWRGOOD	SYSRST	94
47	KBRST#		
26	TMRCLK	POSTWR#	41
100	DMACYC		
3	REFREQ#	CLKFOUT	99
1	DMAMEMR#		
2	DMAMEMW#	GND1	15
53	CPUA23	GND2	27
79	A20GATE	GND3	40
		GND4	86
83	CPUOSC	GND5	90
91	CLK2IN		

85C310D

85C320F

Pin	Signal		Signal	Pin
5	XA0			
6	XA1			
7	XA2			
8	XA3			
9	XA4			
10	XA5			
11	XA6			
12	XA7			
16	XA8			
17	XA9			
18	XA10		XD0	57
19	XA11		XD1	58
20	XA12		XD2	59
21	XA13		XD3	60
22	XA14		XD4	61
23	XA15		XD5	62
24	XA16		XD6	63
			XD7	64
82	ADSTB#			
82	ADSTB16		XODIR	65
56	AEN0#		SODIR	25
56	AEN16#		CMODIR	67
54	OUT1#		SDEN0#	35
53	OUT2#		SDEN16#	37
			PIOD#	63
99	RESET		PIO16#	64
98	IOCHCK#			
100	MASTER#		ATCLK	3
95	IOCHRDY		DMACLK	67
94	DW8#		SYN2CLK	68
97	IOCS16#		TMRCLK	66
96	MCS16#		GATE2	80
			RTCAS#	79
29	CPUCLK		ALE	78
51	MIO#		INTA#	72
50	DC#		XIOR#	83
49	WR#		XIOW#	69
48	HLDA		XMEMR#	71
52	DMAHRQ		XMEMW#	70
			REFSH#	88
34	ATCYC#		SPHDATA	85
36	PCK#		NMI	47
33	POSTED#		PCKEN	38
31	ONBOARD#		CFGCS#	39
30	ROMCS#		OUTF0#	28
2	ROMSEL#		SY4.2CS#	81
31	LMGCS#		ATRDY#	40
61	14.3MHZ		HOLD	42
1	PWSEL#		DMAHLDA	77
			DMAACK#	82
48	BE0#		X8HG#	4
45	BE1#		SWAP	39
44	BE2#		SMEMR#	75
43	BE3#		SMEMW#	74
			NC1	15
			NC2	76
			GND1	14
			GND2	37
			GND3	86
			GND4	90

VCC1 (13), VCC2 (41), VCC3 (73) — 85C320

85C330C

Pin	Signal		Signal	Pin
93	D0		MD0	1
92	D1		MD1	2
91	D2		MD2	3
90	D3		MD3	4
79	D4		MD4	5
78	D5		MD5	6
77	D6		MD6	7
76	D7		MD7	8
75	D8		MD8	9
74	D9		MD9	10
73	D10		MD10	11
72	D11		MD11	12
71	D12		MD12	13
70	D13		MD13	14
69	D14		MD14	15
68	D15		MD15	16
65	D16		MD16	17
64	D17		MD17	18
63	D18		MD18	19
62	D19		MD19	20
61	D20		MD20	21
60	D21		MD21	22
59	D22		MD22	23
58	D23		MD23	24
57	D24		MD24	25
56	D25		MD25	26
55	D26		MD26	27
54	D27		MD27	28
53	D28		MD28	29
52	D29		MD29	30
51	D30		MD30	31
50	D31		MD31	32
				33
81	XA0		MPD0	87
82	XA1		MPD1	88
83	A2		MPD2	99
84	A3		MPD3	100
85	A4			
86	A5		PCKERR#	94
34	RAMWE#			
38	CAS0#			
37	CAS1#			
36	CAS2#			
35	CAS3#			
44	CBNKSEL#			
45	CWE#			
43	CBE0#			
42	CBE1#			
41	CBE2#			
39	CBE3#			
48	POSTWE#			
47	ATCYC#			
88	SWAP			
46	WR#		GND1	18
87	DMAMR#		GND2	40
86	DMAMW#		GND3	88
85	PCKEN		GND4	90

VCC1 (46), VCC2 (67), VCC3 (88) — 85C330

CPU Pin Assignments

|	A	B	C	D	E	F	G	H	J	K	L	M	N	P
1	VCC	ASS	A8	A11	A14	A15	A16	A17	A20	A21	A23	A26	A27	A30
2	VSS	A5	A7	A10	A13	VSS	VCC	A18	VSS	A22	A24	A29	A31	VCC
3	A3	A4	A6	A9	A12	VSS	VCC	A19	VSS	A25	A28	VCC	VSS	D30
4	NC	NC	A2									VSS	VCC	D29
5	VCC	VSS	VCC									D31	D27	D26
6	VSS	NC	NC									D28	D25	VSS
7	VCC	INTR	NC									VCC	VCC	D24
8	ERROR#	NMI	PEREQ									VSS	D23	VCC
9	VSS	BUSY#	RESET									D20	D21	D22
10	VCC	W/R#	LOCK#									VSS	D17	D19
11	D/C#	VSS	VSS									D15	D16	D18
12	M/IO#	NC	VCC	VCC	BE0#	CLK2	VCC	D0	VSS	D7	VCC	D10	D12	D14
13	BE3#	BE2#	BE1#	NA#	NC	NC	READY#	D1	VSS	D5	D8	VCC	D11	D13
14	VCC	VSS	BS16#	HOLD	ADS#	VSS	VCC	D2	D3	D4	D6	HLDA	D9	VSS

**View from Pin Side of Intel
80386 CPU**

AMI BIOS Setup

This appendix explains how to use the Setup program for the ISA-386C's optional AMI BIOS form American Megatrends Inc.

All computer system boards of this type have a set up program stored in the ROM BIOS. This program creates a record of the system hardware present and settings that control some functions of the board and system. If you received the ISA-386C mainboard installed as part of a system, the proper entries have probably already been made. If the settings are already made, you might want to call up the Sstup program as described later to take a look at them for future reference. If the settings aren't noted anywhere, write them down on the last page of this section.

If you are installing the board you'll need to enter the set up information for the first time. This section explains how to use the program and make the appropriate entries.
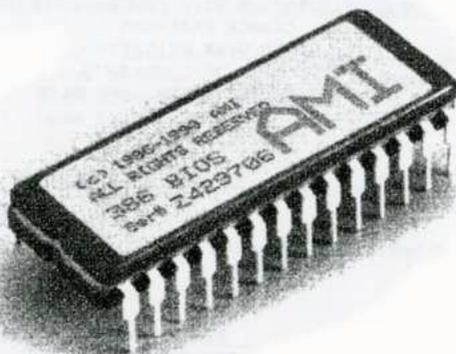
The Setup program is stored in the BIOS ROM. When you turn the computer on, a screen message appears to give you an opportunity to call up the Setup program. It displays briefly during the POST (Power On Self Test). If it disappears before you have a chance to respond, reset the system by turning it OFF then ON or pushing the "RESET" button on the system cabinet. You can also restart by simultaneously typing the <Ctrl>, <Alt> and <Delete> keys. This message will then reappear:

"Hit <Del>, If you want to run SETUP".

After you press the <Del> key a screen will appear displaying the following choices.

```
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
```

A

The Improper Use Caution

After you select and enter the any of the setup utilities a warning screen appears to caution you against "Improper Use of Setup".

This screen tells you what to do in case the system won't work properly because there are incorrect entries somewhere in the settings you have made. It also tells you what you may do after you enter the Setup program. Type <Esc> to go back to the main menu or any other key to use the utility you selected.

The Improper Use caution screen

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




          Improper Use of Setup may Cause Problems!!
   If System Hangs, Reboot System and Enter Setup by Pressing the "ESC" 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
```

STANDARD CMOS SETUP

Use "STANDARD CMOS SETUP" for recording the basic system hardware setup. If your ISA-386C is already installed in a working system you will not need to use this utility. If the configuration record is lost or you change your system hardware configuration you will need to recreate the record. The information can also be lost due to loss of battery support.

"STANDARD CMOS SETUP" displays a screen with a list of entries. Follow the on screen instructions to move around the screen. A small help window at the bottom of the screen explains how to use the arrow keys to move between the fields; <Page Up> and <Page Down> to make changes; <F2> and <F3> to change the color scheme of the display; and <Esc> to exit the utility. Another window in the lower left part of the screen displays choices for each item listed as you highlight that item. The calendar and memory displays at the right side of the screen are automatic.

AMI BIOS Setup

A

The STANDARD CMOS SETUP screen

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


Date (mn/date/year) : Tue, Mar 26 1991        Base memory: 640 KB
Time (hour/min/sec) : 11 : 54 : 04            Ext. memory: 3072 KB
Daylight saving     : Disabled       Cyln Head WPcom LZone Sect Size
Hard disk C: type   : 47 = USER TYPE  560  6   65535 560   26   43MB
Hard disk D: type   : Not Installed
Floppy drive A:     : 360 KB, 5¹/₄"
Floppy drive B:     : Not Installed
Primary display     : VGA/PGA/EGA
Keyboard            : Not 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
```

The first two lines on the screen have the date and time settings. Use the arrow keys to highlight the month, date, year, hour, minute or second field. Then use the <Page Up> or <Page Down> keys to select the value you want in each field. The "day" setting is determined automatically by the other calendar settings.

The **"Daylight saving"** feature adds one hour to the clock when daylight savings time begins. It also subtracts one hour when standard time begins.

"Hard disk C: type:" and **"Hard disk D: type"** refer to the types of hard disks present. Be sure to check the drive specifications. A hard disk will not work properly if you enter incorrect information in this section. There are forty-eight disk selection options. The first is "Not Installed".

Nos. 1-46 are a pre-defined list of drive specifications, many of which are standards for desktop computer hard disks. You should match your hard disk specifications to one of the listed types. If you cannot find a type that matches, you must enter the information manually, using the user-definable "Type 47".

Type number 47 is user defined and can be different for drive C: and drive D:. If you do choose "type: 47", there are an additional five categories of information you must enter: "Cyln" (number of cylinders), "Head" (number of heads), "WPcom" (write precom), "LZone" (landing zone) and "Sect" (number of sectors). "Size" is automatically determined by the other entries. The hard disk vendor's or system manufacturer's documentation should provide you with the information on the hard disk drive(s) you will use. If this information is not in evidence, you can look on the hard disk drive itself, if it is accessible. If all else fails, you must ask your hard disk drive or system vendor for the information.

Remember:

Entering an incorrect type number will result in the hard disk drive functioning improperly or not at all.

Novell Netware 286 Users:

You must shadow the system BIOS if you will use a user defined hard disk type.

The next two lines record the types of floppy disk drives present. The five options for drives A and B are:

360KB 5 1/4"

1.2MB 5 1/4"

720KB 3 1/2"

1.44MB 3 1/2"

Not Installed

"**Primary display**" refers to the type of video display your system has. The five options are:

Monochrome (for Hercules or MDA)

Color 40x25

VGA/PGA/EGA

Color 80x25

Not Installed

You should select the setting that matches your video display card and monitor.

The last line "**Keyboard**" has two options: "Installed" and "Not Installed". If you choose "Not Installed", the system won't halt on any keyboard errors.

When you have made your selections, exit to the initial screen of the program by pressing the <Esc> key. To finish the set up process, continue on to "ADVANCED CMOS SETUP" .

ADVANCED CMOS SETUP

"ADVANCED CMOS SETUP" is a list of system features that allows you to fine tune your system setup. Some entries are defaults required by the ISA-386C's design. Others will improve your system's performance if enabled, or let you setup some system features according to your preference.

The "ADVANCED CMOS SETUP" screen displays information about Typematic features, Memory, Shadow RAM and Clock settings as well as several convenience features.

The following are the default settings (AUTO CONFIGURATION WITH BIOS DEFAULTS) for these areas.

The ADVANCED CMOS SETUP screen

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

Typematic Rate Programming   : Disabled   Adaptor ROM Shadow C800,32K : Disabled
Typematic Rate Delay (msec)  : 500        Adaptor ROM Shadow D000,32K : Disabled
Typematic Rate (Chars/Sec)   : 24         Adaptor ROM Shadow D800,32K : Disabled
Above 1 MB Memory Test       : Disabled   System ROM Shadow F000,64K : Enabled
Memory Test Tick Sound       : Enabled
Memory Parity Error Check    : Enabled
Hit (Del) Message Display    : Enabled
Hard Disk Type 47 RAM Area   : DOS 1KB
Wait For (F1), If Any Error  : Enabled
System Boot Up Num Lock      : On
Numeric Processor            : Absent
Weitek Processor             : Absent
Floppy Drive Seek At Boot    : Disabled
System Boot Up Sequence      : C:, A:
System Boot Up CPU Speed     : High
External Cache Memory        : Enabled
Password Checking Option     : Disabled
Video   ROM Shadow C000,32K  : Enabled


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

The Typematic features control the rate at which the system accepts and acts on information entered through the keyboard. They allow you four delay rate choices: 250ms, 500ms, 750ms and 1000ms (default is 500ms).

The character/second rate choices range from 2.0 to 30.0 (default is 10.0).

The **"Above 1 MB Memory Test"** is usually disabled in the interest of saving time during the Power On Self Test.

The **"Memory Test Tick Sound"** audibly clicks during the memory test. The default setting is "Enabled".

The **"Memory Parity Error Check"** tests for transmission errors in data read from memory. The default setting is "Enabled".

The **"Hit <Esc> Message Display"** controls the screen prompt to access the setup program. Pressing the <Esc> key will still access the Setup program even if the message is not displayed. The default setting is enabled.

"Hard Disk Type 47 RAM Area" If the BIOS Shadow RAM is disabled, the Hard Disk type 47 parameter table will use regular RAM.
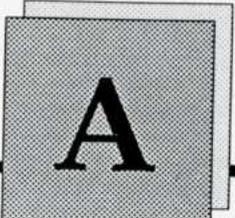There are two Options:

0:300 (lower system RAM)

DOS 1KB (the top 1KB of the 649K base memory)

The default is DOS 1KB.

If an error is detected, **"Wait for <F1>, If Any Error"** causes the system to halt until you press the <F1> key. If this is not enabled, the message will not appear. The default setting is "Enabled".

"**System Boot Up Num Lock**" is a convenience feature. When the computer boots, it selects the numeric values rather than the cursor control functions on the numeric keypad of IBM compatible keyboards. The extended keyboards supplied with most compatible systems have separate cursor control keys. It is therefore unnecessary to use the numeric keypad for this. The default setting is "On".

"**Numeric Processor**" indicates whether you are using a i387 compatible coprossor. The default setting is Absent.

"**Weitek Processor**" refers to an optional Weitek math coprocessor. Set it to "Present" if a Weitek coprocessor is installed on the ISA-386C. The default setting is "Absent".

The "**Floppy Drive Seek At Boot**" default setting is "Disabled". On this setting the system will ignore the floppy drive when it boots and will look first at the hard disk to find the disk operating system (DOS).

The "**System Boot Up Sequence**" default setting is "C:, A:"; the other option is "A:, C:". The setting determines which drive the computer searches first for the operating system. If the previous feature is disabled, the "A:, C:" setting will have no effect.

The setting for the "**System Boot Up CPU Speed**" is "High". This sets the CPU speed to its fastest speed. The alternate setting is "Low".

The setting for the "**External Cache Memory**" is "Enabled". This is a required setting for the ISA-386C design.

The "**Password Checking Option**" controls the Password feature. The default setting is "Disabled". Other settings are "Always" if you want to use the Password feature every time you boot up and "Setup" if you want to use the password only to protect the configuration settings from being tampered with. You create a password by using "CHANGE PASSWORD" .

The default setting for the "**Video ROM Shadow C000,64K**" is "Enabled".

The next three lines, "**Adaptor ROM Shadow C800,32K**", "**Adaptor ROM ShadowD000,32K**", "**Adaptor ROM Shadow D800,32K**" are for shadowing other adaptor ROMs. The default setting for these areas is "Disabled". If you have other expansion cards with ROMs on them, you will need to know which addresses the ROMs use. If you don't know and cannot find out, you can enable all of the ROM shadow settings. This ensures that the ROMs will be shadowed. The unused addresses will make no difference.

The default setting for the "**System ROM Shadow F000,64K**"is "Enabled".

After you have made your selections within the ADVANCED CMOS SETUP press the <Esc> key to go back to the utility menu. When you finish with the ADVANCED CMOS SETUP the next item is ADVANCED CHIPSET SETUP.

ADVANCED CHIPSET SETUP

The ADVANCED CHIPSET SETUP sets some memory wait states and enables you to move shadowed BIOS material into the cache memory.

AMI BIOS Setup   **A**

The "Cache write Wait State" and "DRAM write CAS Wait State" defaults are both "0" (zero). The other setting, "1", is for factory diagnostic use.

The "...SHADOW CACHEABLE" settings correspond to the shadow settings in the ADVANCED CMOS SETUP . If you shadow a ROM BIOS you can also cache it. This will additionally improve your overall system performance. The defaults are to Enable the "C000h 32K SHADOW CACHEABLE" and "F000h 64K SHADOW CACHEABLE" settings. If these are Enabled the video and system BIOSes must be shadowed.

When you are finished in this section press the <Esc> key to return to the main screen.

The ADVANCED CHIPSET SETUP screen

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

  Cache write Wait State    :0
  DRAM write CAS Wait State :0
  C000h 32K SHADOW CACHEABLE:Enabled
  C800h 32K SHADOW CACHEABLE:Disabled
  D000h 32K SHADOW CACHEABLE:Disabled
  D800h 32K SHADOW CACHEABLE:Disabled
  F000h 64K SHADOW CACHEABLE:Enabled












    ESC: Exit   |-|+Sel  (Ctrl)Pu/Pd:Modify  F1:Help  F2/F3:Color
    F5:Old Values  F6:BIOS Setup Defaults  F7:Power-On Defaults
```

AUTO CONFIGURATION WITH BIOS DEFAULTS

"AUTO CONFIGURATION WITH BIOS DEFAULTS" loads the default system values directly from ROM. If the stored record created by the Setup program becomes corrupted (and therefore unusable), these defaults will load automatically when you turn the computer on.

To use this feature, select it in the main menu and press <Enter>. A line will appear on screen asking if you want to load the default values. Press the <Y> key and then press the <Enter> key. The BIOS default settings will then load in the other utilities.

AUTO CONFIGURATION WITH POWER-ON DEFAULTS

The "AUTO CONFIGURATION WITH POWER-ON DE-FAULTS" loads the settings detected when you turn on the computer. If your system is behaving erratically you can use this feature to check for incorrect settings.

To use this feature, select it in the main menu and press <Enter>. A line will appear in the same way as the previous entry. Press the <Y> key and then press the <Enter> key. The power-on settings will then load in the other utilities.

AMI BIOS Setup
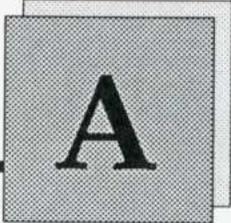
```
┌─────────────────────────────────────────────────────────────────┐
│         BIOS SETUP PROGRAM - AMI BIOS SETUP UTILITIES             │
│     (C)1990 American Megatrends Inc., All Rights Reserved         │
├─────────────────────────────────────────────────────────────────┤
│                                                                   │
│                    STANDARD CMOS SETUP                            │
│                    ADVANCED CMOS SETUP                            │
│                   ADVANCED CHIPSET SETUP                          │
│            AUTO CONFIGURATION WITH BIOS DEFAULTS                   │
│  ┌─────────────────────────────────────────────────────────┐     │
│  │ Load BIOS Setup Default Values from ROM Table (Y/N) ? N  │     │
│  │                                                          │     │
│  └─────────────────────────────────────────────────────────┘     │
│                                                                   │
├─────────────────────────────────────────────────────────────────┤
│                                                                   │
│  Standard CMOS Setup for Changing Time, Date, Hard Disk Type, etc.│
│                                                                   │
│                                                                   │
│ ESC:Exit      ⊢↑↓⊣ :Sel      F2/F3:Color      F10:Save & Exit     │
└─────────────────────────────────────────────────────────────────┘
```

CHANGE PASSWORD

The **"CHANGE PASSWORD"** utility allows you to change the user password. The ISA-386C is shipped with the default password "AMI". If you want to change it, you must first enter the current password ("AMI" in this case). Then at the prompt, enter your new password. At the next prompt, confirm the new password by entering it again. At the end of this operation, the screen automatically reverts to the utilities menu. Remember, to enable this feature, you must first select either "Setup" or "Always" in the ADVANCED CMOS SETUP, or the password feature won't work.

The CHANGE PASSWORD screen

```
          BIOS SETUP PROGRAM - CHANGE PASSWORD
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                 Enter CMOS password :




        Use ASCII Characters Only, ESC:Exit
```

HARD DISK UTILITY

The next utility is the **"HARD DISK UTILITY"**. This utility is basic drive setup software. All of the options are destructive to data existing on a disk and are used for low-level formatting before the DOS "FDISK" and "FORMAT", or similar utilities. You can use this utility on MFM encoded hard drives if they require but have not been low-level formatted by the manufacturer. IDE, ESDI and SCSI drives don't need this utility and you should not use it on them.

Note: The hard disk type should be set in the STANDARD CMOS SETUP. Using the HARD DISK UTILITY is destructive to existing data on a disk.

The HARD DISK UTILITY screen

```
            BIOS SETUP PROGRAM - HARD DISK UTILITIY
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                           Cyln  Head  WPcom  LZone  Sect  Size(MB)
Hard Disk C: Type : 47=USER TYPE  560  6        65535  560   26    43
Hard Disk D: Type : Not Installed

  Hard Disk Type can be changed from the STANDARD CMOS SETUP option in Main Menu



                    ┌─────────────────┐
                    │ Hard Disk Format │
                    └─────────────────┘
                      Auto Interleave
                      Media Analysis




              ESC:Exit   ↕:Sel   F2/F3:Color
```

The next selection on the Utilities menu is **"WRITE TO CMOS AND EXIT"**. If you select this and press the <Enter> key the values entered in the setup utilities will be recorded in the CMOS memory of the chip set. The microprocessor will check this every time you turn your system on and compare this to what it finds as it checks the system. This record is required for the system to operate.

The last selection on the Utilities menu is **"DO NOT WRITE TO CMOS AND EXIT"**. Selecting this option and pressing the <Enter> key lets you exit the Setup program without recording any new values or changing old ones. If you want to save a new configuration do not use this option. If you do, the new setting information will be lost.

You can now use your ISA-386C system without further reference to these programs unless you make a change in the system hardware configuration. If the system configuration information stored in CMOS RAM is lost, you will have to reenter it.

The next section has tips on the day-to-day use of your ISA-386C system board.

AMI BIOS Setup

A

Note your ADVANCED CMOS and CHIPSET settings here for reference

ADVANCED CMOS settings   **ADVANCED CHIPSET settings**

_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____   _____
_____
_____
_____
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_____
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_____

A

AMI BIOS Hard Drive Types

AType	Cyln	Head	WPcom	LandZone	Section	Size
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
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

AType	Cyln	Head	WPcom	LandZone	Section		Size
26	754	7	754	754	17	44	
27	754	11	65535	754	17	69	
28	699	7	256	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	615	17	41	
38	987	3	987	987	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	1224	15	65535	1223	17	152	
47	User Type						

AMI BIOS Hard Drive Types

ISA-386C MAIN BOARD

For 386DX-40, 386DX-33

Part No. 200.ISA3C.002