Tyan S1856
Tomahawk BX/A+

Motherboard User's Manual
Revision 1.00

PRINTED IN USA.

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chapter 1

Introduction

Overview

The S1856 (S1856S Tomahawk BX, and S1856S-V Tomahawk A+) is a quality, high performance motherboard designed for Socket 370 Intel Celeron microprocessors. The Tomahawk BX utilizes the Intel 440BX AGPset with AMI BIOS. The Tomahawk A+ uses the VIA Apollo Pro Plus AGPset with Award BIOS. Both boards can support Celeron CPU speeds of 300MHz through 400MHz, and host bus speeds of 66MHz to 100MHz.

The S1846 motherboard, with built-in AGP slot, provides high performance capabilities that are ideal for a wide range of demanding applications such as CAD, CAM, CAE, desktop publishing, 3D animation, and video production.

This system board in an ATX form factor offers far more features and expandability than Micro ATX models. Some of the features included are onboard dual channel PCI PIO, Bus Master IDE and UltraDMA/33, onboard floppy controller, and onboard high speed I/O.

Flexibility and expandability have been designed into the Tomahawk BX/A+. With I/O and drive controller support built onboard, the one AGP slot, five PCI and two ISA slots (one shared, seven usable) are free for numerous add-on expansion cards.

Remember to take a look at TYAN Computer's web site located at http://www.tyan.com. There you can find information on all of TYAN's products along with FAQs, distributors list, drivers, and BIOS setting explanations.

Icons

In order to help you navigate this manual and set up your system, we have added several icons to our format.

This icon alerts you to particularly important details regarding the setup or maintenance of your system. This icon often appears next to information that may keep you from damaging your board or system. While we will often point out the most vital paragraphs in a chapter, you should always read every word in the text. Failing to do so can lead to exasperation and expense.

Wherever possible, we have included step-by-step instructions for setting up your system, which are indicated by this icon. However, it is in your best interest to read an entire section (and perhaps the entire manual) before you begin to fiddle with your motherboard.

While we have alerted you to potential dangers in several places in the manual with this icon, these warnings should not be regarded as the whole of your safety regimen. Never forget that computers are electrical devices, and are capable of delivering a shock. Prevent damage to yourself and to your board: always ensure that your system is turned off and unplugged whenever you are working with it, and that you are equipped with a static safety device.

Hardware Specifications/Features

Processor Information

- One Socket 370 CPU connector
- 66MHz to 100MHz bus support (BIOS selectable)
- Celeron 300 to 500MHz

Chipset Information	•Intel 440BX AGPset with PIIX4e (S1856S) •Via Apollo Pro Plus: 82C596A+82C692 (S1856S-V) •Winbond '977 Super I/O chipset
Voltage and Power Information	•ATX power supply connector •+12V power source for DC fan onboard •3.3V DRAM support •Utilizes GTL+ bus to reduce power consumption and EMI
Main Memory	•Up to 768MB onboard* •Three 168-pin DIMM sockets •Supports 100MHz SDRAM with SPD
System Management	•Optional Analog Devices ADM9240 ASICs with onboard alarm for monitoring temperature, supply voltages, and fan speed •Intel LANDesk Client Manager software optn •Chassis intrusion detection capable
Expansion Slots	•One 32-bit AGP slot •Five 32-bit PCI Bus Master slots •Two 16-bit ISA slots •One shared, seven usable slots
Physical Dimensions	•ATX design •12 inches x 8.2 inches •S1856 requires Intel Venus compatible I/O shield •S1856SLA (with sound) requires Intel Cave man compatible I/O shield
BIOS Information	•AMI Plug and Play flash BIOS (S1856S) •Award Plug and Play flash BIOS (S1856S-V) •Deep Green, Energy Star, ACPI, Year 2000, and PC98 compliant •Soft power-down, multiple boot options •Win98/NT5 ready, DMI 2.0 compliant •PCI 2.1, APM 1.1 compliant

Disk Drive & System I/O	•Two PCI bus mastering EIDE channels •Supports EIDE CD-ROMs •PIO Mode 3 & 4 (up to 17MB/sec DTR) •UltraDMA/33 bus mastering mode (up to 33MB/sec DTR) •Support for two floppy drives (up to 2.88MB) •Two serial ports (16550 UARTs) •One ECP/EPP parallel port •One IR (InfraRed) I/O interface port •Two USB rev 1.2 (universal serial bus) connectors •One PS/2 mouse port •One PS/2 keyboard port •One Analog Video Out port
Ensoniq ES 1373 PCI Audio (S1856SLA only)	•AC97 Codec •Uses a single, shared IRQ •High performance PCI bus master •Spatial enhanced 3D sound (SWS) •Wavetable synthesis built in •Joystick, Audio in, Speaker, Microphone connectors

* Only 384MB validated at time of print.

Software Specifications

OS	•Operates with MS-DOS, Windows 3.x, Windows for WorkGroup 3.x, Windows 95, Windows 98, Windows NT, OS/2, Novell Netware, Solaris, and SCO Unix

Technical Support

If a problem arises with your system, you should turn to your dealer for help first. Your system has most likely been configured by them, and they should have the best idea of what hardware and software your system contains. Hence, they should be of the most assistance. Further, if you purchased your system from a dealer near you, you can actually bring your system in to them to have it serviced, instead of attempting to do so yourself (which can have

expensive consequences).

Help resources:
1. See FAQ and beep codes sections of this manual.
2. See Tyan web site for FAQ, bulletins, driver updates, etc.
   http://www.tyan.com
3. Contact your dealer or distributor for help BEFORE calling Tyan.
4. Check the Tyan user group: alt.comp.periphs.mainboard.tyan
5. Email Tyan tech support: techsupport@tyan.com
6. Call Tyan tech support: 510-440-8808

Returning Merchandise for Service

During the warranty period, contact your distributor or system vendor **FIRST** for any product problems. This warranty only covers normal customer use and does not cover damages incurred during shipping or failure due to the alteration, misuse, abuse, or improper maintenance of products.

For Resellers Only:
A receipt or copy of your invoice marked with the date of purchase is required before any warranty service can be rendered. You can obtain service by calling the manufacturer for a Return Merchandise Authorization (RMA) number. The RMA number should be prominently displayed on the outside of the shipping carton and the package should be mailed prepaid, or hand-carried to the manufacturer. TYAN will pay to have the board shipped back to you.

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chapter 2

Board Installation

Unpacking

The motherboard package should contain the following:

(1) S1856 mainboard
(1) 40-pin IDE and 34-pin floppy cable pack
(1) S1856 User's Manual
(1) Driver disk

Installation

You are now ready to install your motherboard. The mounting hole pattern of the S1856 matches the ATX system board specifications. Your chassis should support a standard ATX mainboard form factor.

How to install our products right...the first time.

What's the first thing I should do?
The first thing you should do is read this user's manual. It contains important information which will make configuration and setup much easier.

Here are some precautions you should follow when installing your motherboard:

(1) **Ground yourself properly before removing your motherboard from the antistatic bag.** Unplug the power from your computer and then touch any metal part on the computer case. (Or wear a grounded wrist strap.)
(2) **Hold the motherboard by its edges and do not touch the bottom of the board.**
(3) **Avoid touching motherboard components, IC chips, connectors, and leads.**
(4) **Avoid touching pins of memory modules and chips.**
(5) **Place motherboard on a grounded antistatic surface or on the antistatic bag.**

Having reviewed the precautions above, the next step is to take the motherboard out of the cardboard box and static bag, hold it by its edges, and place it on a grounded antistatic surface, component side up. Inspect the board for damage.

DO NOT APPLY POWER TO THE BOARD IF IT HAS BEEN DAMAGED!

Press down on any of the socket ICs if it appears that they are not properly seated (the board should still be on an antistatic mat). Do not touch the bottom of the board. Remember, don't take any electronic device out of its protective bag until you are ready to actually install it into the computer case. If you do not ground yourself, you risk zapping the motherboard or adapter card. Subsequent problems may not arise immediately because electrostatic discharge damage, unlike physical damage, causes the device to fail over time.

Installation Steps

1. Set Jumpers
2. Mount Motherboard in Chassis
3. Install Memory
4. Install CPU & Cooling Fan
5. Connect IDE and Floppy Drives
6. Connect Power Supply
7. Install Add-on Cards
8. Connect PS/2, USB, Serial and Parallel Devices

Quick References for Jumpers

In this manual, the terms “closed” and “on” are used when referring to jumpers (or jumper pins) that are active; “open” and “off” are used when referring to jumpers (or jumper pins) that are inactive. See the **Figure 2-1** for examples of “on” and “off” pins and jumpers. The square pin in the diagram is Pin 1.

Jumpers and pins are connected by slipping the blue plastic jumper connector overtop of two adjacent jumper pins (indicated by **1-2** or **2-3**). The metal rod inside the plastic shell bridges the gap between the two pins, completing the circuit. See **Figure 2-2** for more example of pin connections.

2 pin jumpers

Figure 2-1

3 (or more) pin jumpers

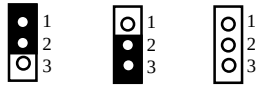
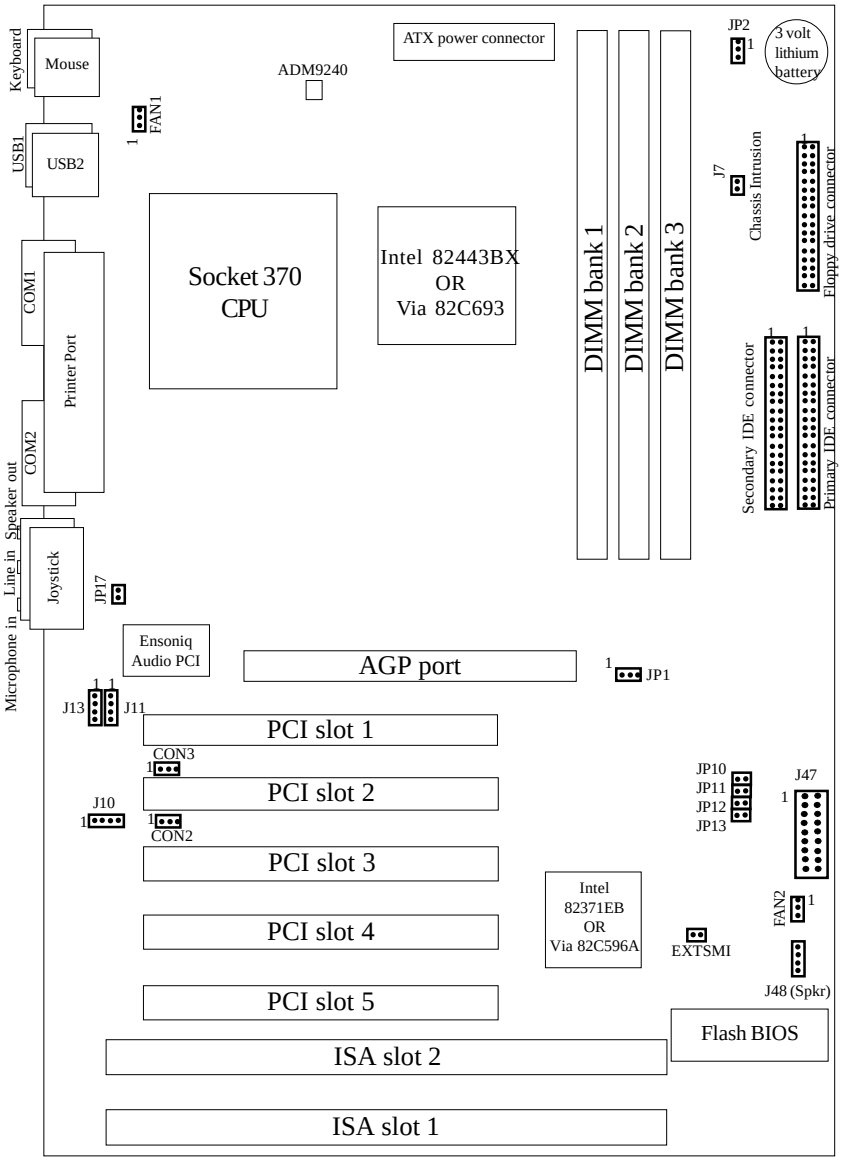


Figure 2-2

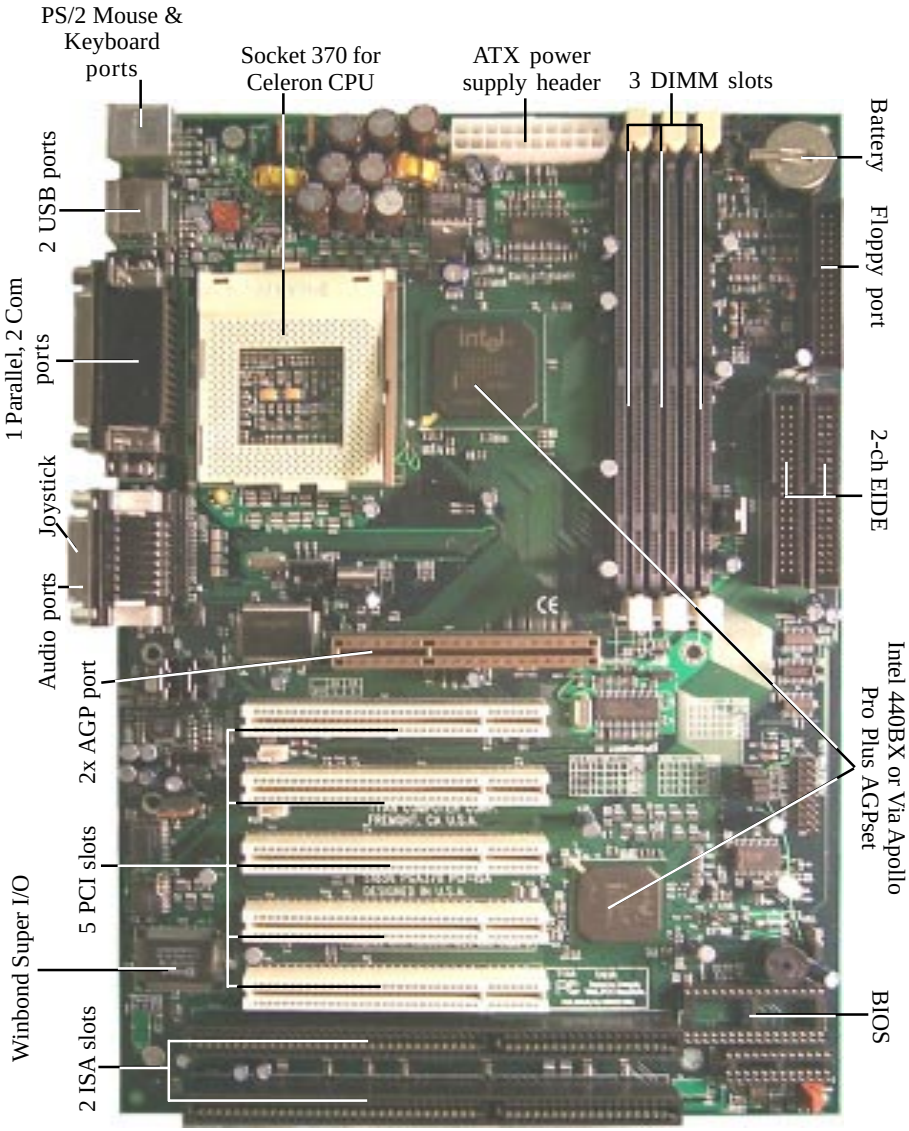
The tables and maps on the following pages will help you set the jumpers for CPU speed, Infrared, and external connector pin assignments, among others. The miniature motherboard maps will help you locate the jumpers on your board. A full-page map of the motherboard can be found on the next two pages.

Figure 2-3 : Map of Motherboard Jumpers



The tiny “1”s next to jumpers of 3 pins or more indicate the position of pin 1 for that jumper.

Figure 2-4 : Map of S1856 Features



1. Setting Jumpers

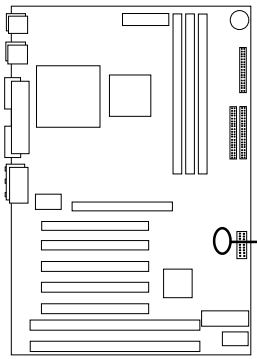
1-A. CPU Speed Settings (Jumpers JP10, JP11, JP12, JP13)

There are two steps to set the CPU speed. First, set the **clock multiplier** with jumpers JP10 -13 according to the specification of your CPU using the chart below. After the system is ready to boot up you will need to set the **bus speed** in the BIOS setup. This is covered in detail in Chapter 3 of this manual.

important!

Presently all Celeron CPUs use a 66MHz bus speed. Tyan does not recommend operating CPUs, memory, or PCI Bus at higher than rated speed. Tyan takes no responsibility for any problems related to overclocking any bus or component on the system board.

Multiplier (set Jmprs on board)	Bus Speed (set in BIOS)	CPU speed	JP10	JP11	JP12	JP13
3.5	100	350	ON	OFF	OFF	ON
4	100	400	OFF	ON	ON	ON
4.5	66 100	300 450	OFF	ON	OFF	ON
5	66 100	333 500	OFF	OFF	ON	ON
5.5	66 100	366 550	OFF	OFF	OFF	ON
6	66 100	400 600	ON	ON	ON	OFF
6.5	66	433	ON	ON	OFF	OFF
7	66	466	ON	OFF	ON	OFF



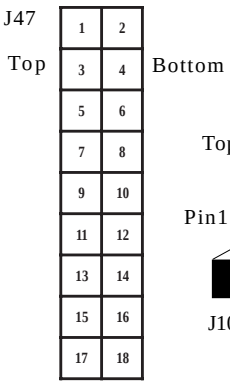
1-B. Bus Speed Settings (JP1)

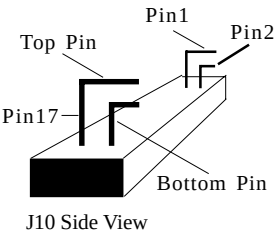
	Auto	66	100
JP1	1-2	2-3	Open

1-C. Panel Connector Settings (Jumper J47)

VCC	1	2	Power LED
HDD LED	3	4	Sleep LED
Ground	5	6	Power On/Off
Reset	7	8	Ground
VCC	9	10	No Connect
IR Receive	11	12	VCC
Ground	13	14	No Connect
IR Transmit	15	16	VCC
No Connect	17	18	No Connect

*Power LED: For 2-pin:
bicolor/single color -
Use pins 2-4
For 3-pin: bicolor -
Use pins 2-4 and GND pin 13





J10 Side View

1-D. Speaker Connector (Jumper J48)

The speaker should be connected to pins 1-4 of jumper J48. As default, pins 3-4 of jumper J48 are connected to the internal buzzer.

1-E. Wake-On LAN (CON3)

1-F. Wake-On Ring (CON2)

1-G. Clear CMOS and Reset Password (Jumper JP3)

	Default	Reset
JP3	1-2	2-3

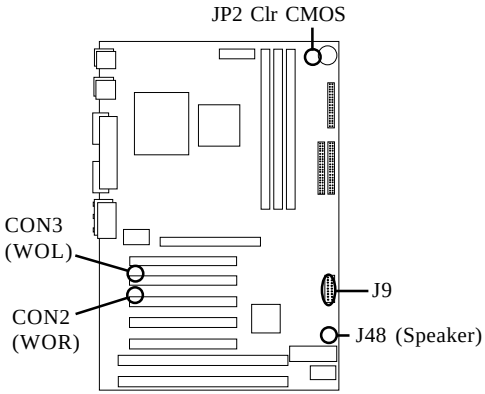
If you have been locked out of your system because you forgot your password or set the CMOS incorrectly, follow the instructions below.

1. Power off the system
2. Set jumper JP2 to pins 2 and 3
3. Wait for 2 seconds, then return jumper JP2 to pins 1 and 2.
4. Power on the system again.

By following this procedure, you will erase your password and reset the CMOS to the BIOS defaults.

Fan Speed Detect

When using Intel's LANDesk system management software, you may monitor the status of the CPU Fans by connecting them to the **Fan1** and/or **Fan2** connectors. You will NOT be able to monitor your CPU fan with the other Fan connectors.



Soft Power Connector

The Soft Power Connector is part of jumper block J47. The Tomahawk BX/A+ uses the chipset for power management, including turning on and off the system. If the Power Button Function option in the BIOS Power Management Menu is set to On/Off (which is the default), pressing the power button once after the BIOS has booted up will turn the system on and off. If the Power Button Function option is set to Suspend, pressing the power button once will wake the system or send it to Suspend mode. In this case, you cannot turn the system off unless you shut down through the Windows operating system or you hold the power button down for four seconds.

Hardware Reset Switch Connector Installation

The Reset switch on your case's display panel provides you with the Hardware Reset function, which is the same as power on/off. The system will do a cold start after the Reset button is pushed.

Creative Labs Audio Connectors (S1856SLA only)

There are four black 4-pin connectors onboard which are used for various peripherals' audio signals. The digital signal that comes in through these connectors is directed through the Creative Labs ES1373 PCI sound chip, and the digital signal is turned into an audio signal which goes out through the speaker. The TDA connector (J10) is for modem audio; the MPEG connector (J9) is for DVD and TV cards; the VIDEO connector is (J11); the CD connector (J13) is for CD-ROMs.

External SMI

The EXTSMI (External System Management Interface) connector, jumper JP16, is used by some plug-in cards. Certain applications associated with these plug-in cards use the interface for hardware control and queries.

Chassis Intrusion Alarm Connector

The J7 connector is an intrusion alarm, that can be connected to the system chassis. When active (J7 is connected to the chassis), this alarm will alert the system administrator anytime someone opens the system's case.

CMOS RTC

The Real Time Clock (RTC) circuit, which provides the date and time for the system is integrated into the 440BX or Via Apollo Pro Plus AGPset. If the external battery for the RTC is low, it will prevent your system from POSTing, and you will not get a display. Normally the life span of an external battery is 2 years. If yours is running low, you will need to replace it with a new 3V lithium battery (Sony CR2032).

Flash EEPROM

The Tomahawk BX/A+ uses flash memory to store BIOS firmware. It can be updated as new versions of the BIOS become available. You can upgrade your BIOS easily using the flash utility (see page 59).

2. Mounting the Motherboard in the Chassis

Follow the instructions provided by the case manufacturer for proper installation guidelines. TYAN recommends that you use only one screw to hold down the motherboard. The rest of the mounting holes should be used for the plastic standoffs. If your case does not have a hole for a standoff, simply cut off the bottom of the plastic standoff so that the flat portion rests on the metal. The adapter cards and the screws holding them down will keep your board flat. The fastening screw should not short any of the traces on the motherboard. Make certain that you do not overtighten the screw, as it will damage the motherboard and possibly break internal traces in the surrounding area. The hole you should use is located at the top-center of the board where the adapter cards are fastened to the case.

3. Installing Memory

Since TYAN boards are manufactured with performance in mind, you should use add-in components that match. Some DIMM modules may seem to be high quality because of name or feel but that does not guarantee real-world usability. Some cheaper or OEM memory may have brand-name components, but they may contain inferior or substandard parts which do not meet the critical tolerances our products require. Because of this, your memory may not work correctly in a TYAN board though it may work well in a competitor's board. This is because many of our competitors do not adhere to the strict tolerances required for high performance. If you buy a TYAN board, you are getting the best system available. To make installation easy and trouble free, get high quality parts. Some brands we recommend are Advantage Memory, Corsair Microsystems, Millenium, Kingston Memory, QesTec Incorporated, Unigen, Micron Technology, and Crucial Technology. These DIMMs have proven to be very stable on our boards and perform extremely well.

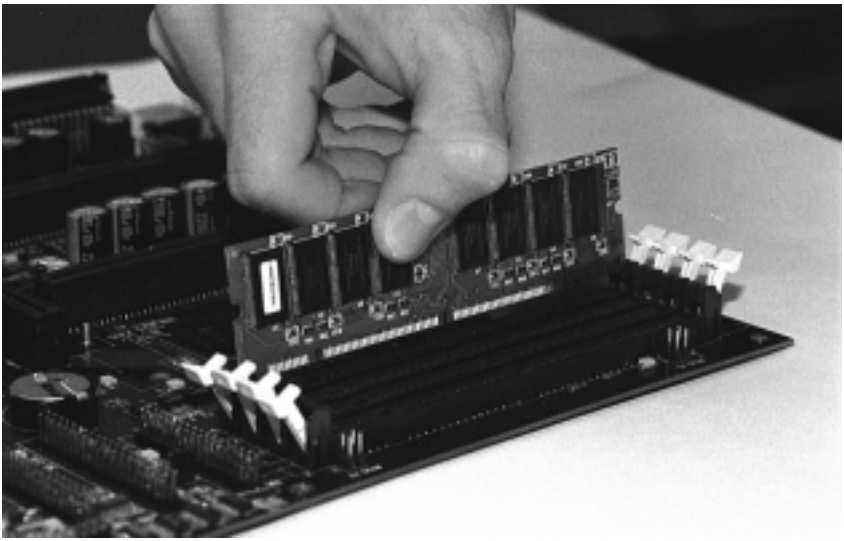


Figure 2-5

To install your DIMMs, line your module up so that the pins fit into the slot. There is only one way that your DIMM can fit properly. Make sure that the short row of pins is lined up with the short gap in the DIMM slot. Figure 2-5 shows how to sit the DIMM into its slot. To insert the DIMM, push down vertically on the module with even force, as shown in the photo. Do not shove one end in first; doing so will bend the DIMM pins.

To lock the DIMM into place, push the plastic clips on either end of the slot onto the notches in the ends of the DIMM (see Figure 2-6 on the next page). To remove your DIMM, simply pull the clips back, and pull up on the module.

Place the DIMMs in an anti-static bag as soon as you remove them to avoid static damage.

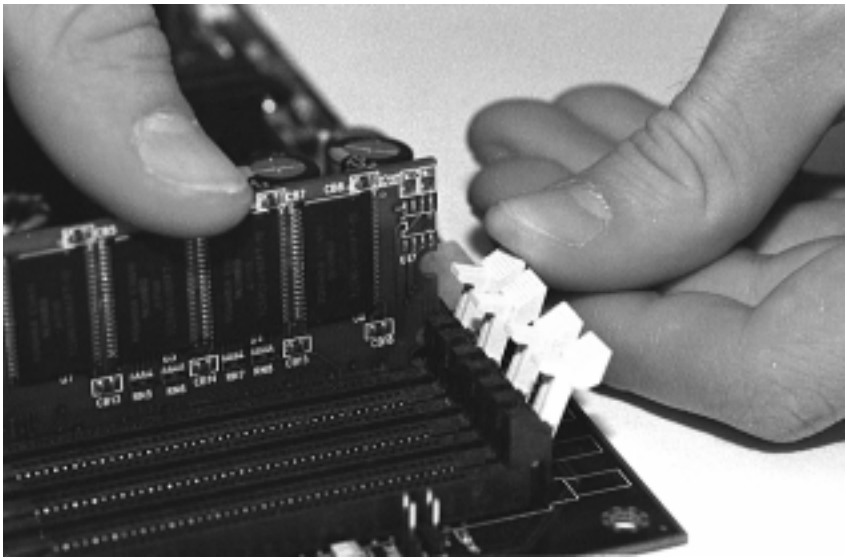


Figure 2-6

The Tomahawk BX/A+ uses a 64-bit data path from memory to CPU and can accommodate up to 768MB of SDRAM. The 168-pin DIMMs (Dual In-line Memory Modules) must be of the 3.3V, **unbuffered** variety. The position of the notch in the SDRAM key position will tell you whether or not a DIMM is unbuffered (see the Figure 2-7 below). All installed memory will be automatically detected, so there is no need to set any jumpers.

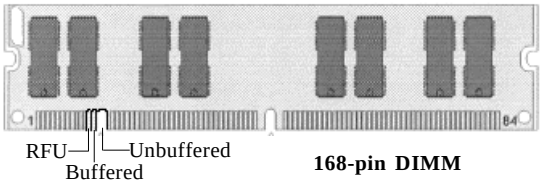


Figure 2-7

Some details of memory installation:

- At least one unbuffered DIMM must be installed for the system to POST.
- The mainboard supports 32MB, 64MB, 128MB SDRAM; and supports 256MB registered SDRAM DIMM modules*, but not in combination with non-registered modules.
- PC-100 DIMM is required if CPU bus speed is at 100MHz

The table below shows some of the possible memory configurations. Not all possible configurations are listed.

DIMM Bank 1	DIMM Bank 2	DIMM Bank 3	Total
8MBx1	0	0	8MB
8MBx1	8MBx1	0	16MB
8MBx1	8MBx1	8MBx1	24MB
16MBx1	8MBx1	8MBx1	32MB
16MBx1	16MBx1	8MBx1	40MB
16MBx1	16MBx1	16MBx1	48MB
32MBx1	16MBx1	16MBx1	64MB
32MBx1	32MBx1	16MBx1	80MB
32MBx1	32MBx1	32MBx1	96MB
64MBx1	32MBx1	32MBx1	128MB
64MBx1	64MBx1	32MBx1	160MB
64MBx1	64MBx1	64MBx1	192MB
128MBx1	64MBx1	64MBx1	256MB
128MBx1	128MBx1	64MBx1	320MB
128MBx1	128MBx1	128MBx1	384MB
256MBx1	256MBx1	0	512MB*
256MBx1	256MBx1	256MBx1	768MB*

*256MB modules not validated at time of print. See www.tyan.com for latest memory compatibility information.

Cache Memory

Celeron processors have the L2 (Level 2) cache built into their architecture, so there is no need for an L2 cache on the motherboard. The Celeron processor has a physical L2 cache size of 128KB and a cacheable memory area of 512MB.

4. Installing the CPU and Cooling Fan

Socket 370 type Celeron processors (300 through 400MHz) can be used on the Tomahawk BX/A+. Please refer to page 15 for the correct CPU jumper settings for your CPU. Remember:

- The CPU is a sensitive electronic component and it can easily be damaged by static electricity. Do not touch the CPU pins with your fingers. You should be able to insert the CPU into the socket with virtually zero force. Do not press down hard on the CPU as you will bend or break pins.

Pin 1 on the CPU is denoted by a small dot on one of the corners and Pin 1 on the ZIF socket is denoted by an angled corner. Never force a CPU into a socket. Forcing a CPU to seat will bend the pins on the CPU and possibly damage the motherboard. Check with your vendor or manufacturer for proper voltage selection.

Figure 2-8

Push down lightly on the CPU, and lower the arm on the ZIF socket to secure the CPU. A squeaking noise is normal as the arm lowers. After the CPU is securely seated, install the appropriate cooling device. Tyan strongly recomends a heatsink/fan combination. Consult with your case manufacturer for other cooling options.

Locate the cooling fan connector (e.g. CPU Fan, J4) on the motherboard. Plug the CPU's cooling fan cable into the cooling fan connector on the board. There will be a plastic clip assembly similar to that of the ATX power connector that will force you to connect the fan cable correctly (see Figure 2-9 below).

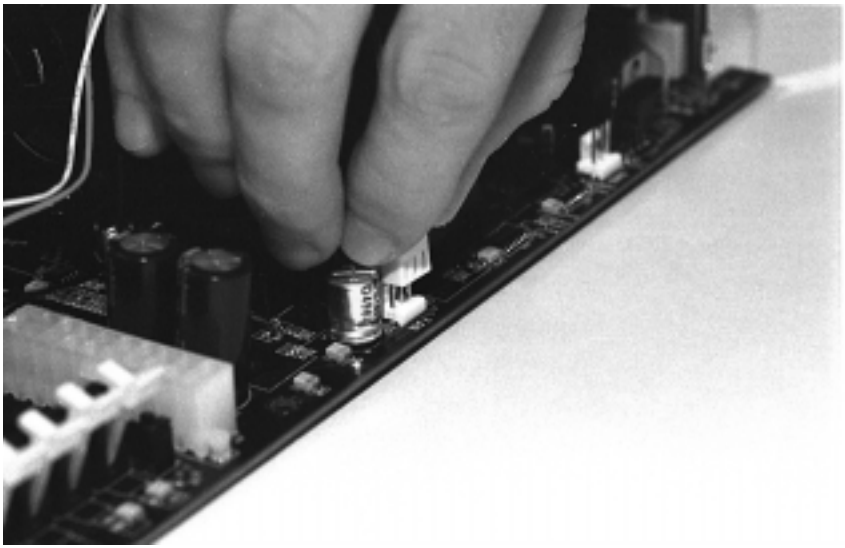


Figure 2-9

You will need to connect the CPU's fan cable to the fan power connector on the board. Locate the fan connector (e.g. FAN1) on the motherboard. Plug the CPU's fan cable into the fan connector. There will be a plastic clip assembly similar to that of the ATX power connector that will force you to connect the fan cable correctly.

5. Connecting IDE and Floppy Drives

The colored stripe on a ribbon cable should face toward the battery on the motherboard. Make sure that Pin 1 (denoted by a red stripe) is connected so that it is next to the power connector of the drive. The primary IDE connector is black; the secondary IDE connector is white. In most cases, this is the proper way of connecting your IDE cable to the hard drive. Figure 2-10 on the next page shows the IDE cable properly connected to the motherboard. Contact your hard disk drive manufacturer or documentation for more information.

Some symptoms of incorrectly installed HDDs are:

- Hard disk drives are not auto-detected: may be a Master/ Slave problem or a bad IDE cable. Contact your vendor.
- Hard Disk Drive Fail message at bootup: may be a bad cable or lack of power going to the drive.
- No video or beeps on bootup: usually means the cable is on backwards.
- Hard drive lights are constantly on: bad IDE cable or defective drives/motherboard. Try another HDD.
- Hard drives do not power up: check power cables and cabling. May also be a bad power supply or IDE drive.

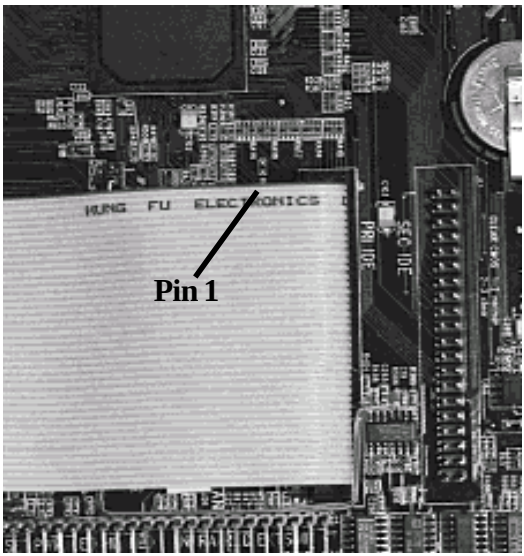


Figure 2-10

Connecting Floppy Drives

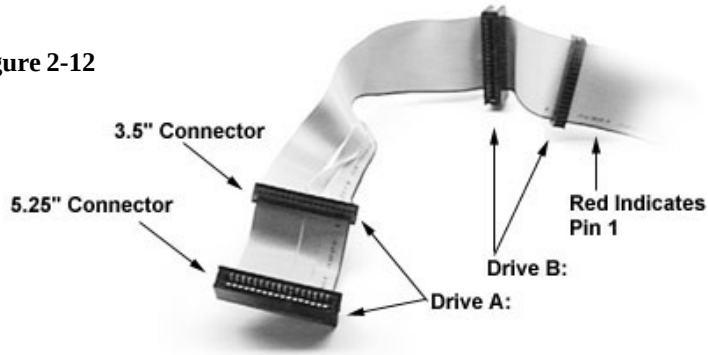
Pin 1 on the floppy cable is usually denoted by a red or colored stripe down one side of the cable (see Figure 2-11 on the following page). Most of the current floppy drives on the market require that the colored stripe be positioned so that it is right next to the power connector. In most cases, there will be a key pin on the cable which will force you to connect the cable properly.

Drive A: is usually attached to the end of the cable with the twist in it. Drive B: is usually connected to the middle of the cable. Refer to your installation instructions or call your dealer if you are unsure about attaching floppy drives. Refer to Figure 2-12 for a detailed anatomy of the floppy cable. Remember, you can only have 2 floppy drives connected at any given time.

The color stripe on the cable should face toward the top of your chassis, or toward the battery on the motherboard. Please refer to your documentation for proper installation.

Figure 2-11

Figure 2-12



Some symptoms of incorrectly installed floppies are:

- Floppy drives are not detected: usually caused by faulty cables, backward cables, or a bad floppy or motherboard. Try another single floppy drive to verify the problem or try another cable. Also, check to see if the onboard floppy is enabled in the BIOS.
- Floppy Drive Fail message at bootup: the cable, floppy, or motherboard may be faulty. Try another cable or floppy drive to verify.
- Light on the floppy is on constantly: a dead giveaway that the cable is on backwards. Reverse the cable at the motherboard end and try again.

6. Connecting the Power Supply

Tyan recommends using an ATX power supply that conforms to industry standard revision 2.01. The Tomahawk BX/A+ motherboard comes equipped with one onboard power connector.

Figure 2-13 below shows an ATX power connector. When plugging in the power connector, make sure that the plastic clip on the power connector is aligned with the plastic tab on the onboard connector (see Figure 2-14 below). Make certain that you do not miss any pins because if you do, you will void your warranty and cause damage to yourself or your motherboard when you turn the system on. After connecting the power, make sure the connector is seated firmly into its socket so it will not become loose or fall off when the computer is jostled or moved.

7. Installing Add-on Cards

There are a few rules you need to follow when plugging in a card. In order to assure proper operation and a quick installation, adhere to these guidelines:

- If you are going to install a PCI-Bus interface card on your system,

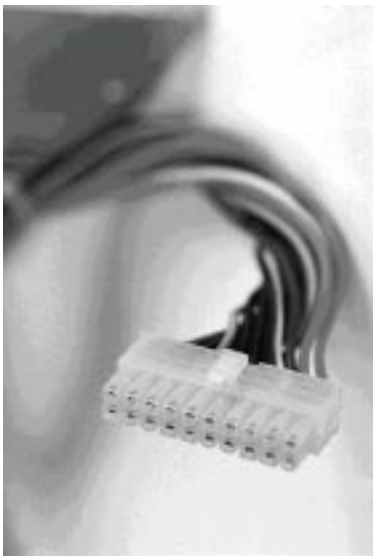


Figure 2-13

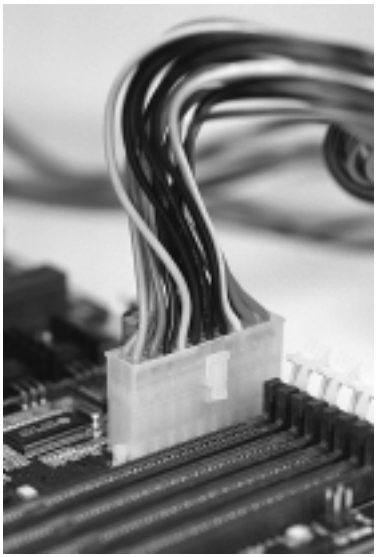


Figure 2-14

be aware that any one of the 5 PCI slots can support a Master or Slave device.

- NEVER force a card into a slot. If it doesn't fit, look at the socket on the computer to make sure there are no wires or other obstructions to the slot.
- NEVER plug an ISA card into a PCI slot or a PCI card in an ISA slot. You will void your warranty and damage your system board if you do this.
- When plugging the card in, especially when installing long cards, try to push the entire card in at one time. Don't force one end of the card into the socket first and then the other. This will create a rocking motion between the card and the slot and it will damage the pins within the socket.
- Make sure that the cards are seated securely into the slots.
- Before turning on the system, make sure no cards are touching

- **NOTE:** This motherboard operates on a 3.3 volt standby for PCI v2.2. Because of this, you need to UNPLUG the AC power cord before installing your card. Otherwise, the motherboard may automatically power up when the card is inserted into the slot.

If you follow these basic guidelines, there shouldn't be any problems with installation. However, if you do encounter any problems, have a qualified professional install your cards for you or contact your card manufacturer.

Remember, always read the manuals and installation notes that come with the adapter cards. They contain important information which will help you install the components right, the first time.

8. Connecting PS/2, USB, Serial & Parallel Devices

This board includes ports for USB, PS/2 mouse, and PS/2 keyboard devices. Note that, for this board, the PS/2 mouse port is the upper PS/2 port, and the PS/2 keyboard port is the lower PS/2 port.

The PS/2 connectors are probably quite familiar to you. The USB connectors, however, may be foreign. The USB (Universal Serial Bus) is a versatile port. This one port type can function as a serial, parallel, mouse, keyboard, or joystick port. It is fast enough to support video transfer, and is capable of supporting up to 127 daisy-chained peripheral devices. Figures 2-15 and 2-16

Figure 2-15

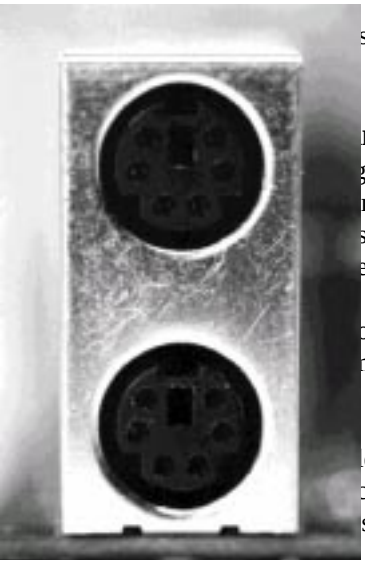


Figure 2-16

s the USB ports on the left and PS/2 ports on the right

nd Printer Ports

ging in your keyboard and mouse, or when plugging
r Com port, make sure that the power is off. Connecting
s while the power is on is called “hot plugging,” and
em.

of the next page shows the ATX double row connectors
n and Printer ports, as well as the other ports, are

es will work on this motherboard. If you are using an
cables, your system will not function properly. Use only
s.

You are done!

Other than checking the jumper settings and cable connections and putting the case back on, you are done. Installing a new motherboard may sound

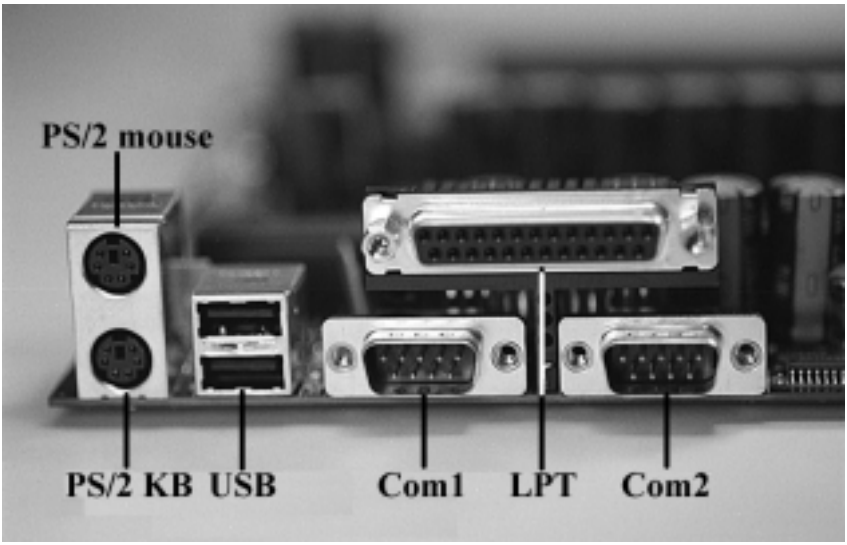


Figure 2-17

difficult, but by following these directions, you should have a fairly uneventful time installing our products. If you do encounter problems, your dealer will be able to help you, or you can consult one of our many technical support resources (see page 7).

Frequently Asked Questions

Q: Why don't I get a display after I put in my old DIMM module?
A: The 440BX chipset requires the memory manufacturer to program an EEPROM chip with **SPD** (Serial Presence Detection) on the module in order for the BIOS to program the 440BX's timing registers properly. Your DIMM may not have the EEPROM chip on the module, or the EEPROM may not contain the correct program. Check with your memory vendor for details. The figure on the following page shows a DIMM module with an EEPROM chip.

Q: My system sometimes becomes unstable. How should I check the system?
A: The first thing to do is to check and see if you have any device conflict in address, IRQ, or DMA. If you are using Windows 95, the Device Manager is a good place to start. Please consult your operating system manual for details. Second of all, slowing down the memory timing in the BIOS's chipset setup section will help the situation, as well. Many memory modules are not suitable

for high performance systems and are probably the main source of your problem.

Q: Can I use EDO DIMMs on this motherboard?
A: No. The Intel 440BX AGPset does not support EDO memory. The 440BX AGPset supports bus speeds of 100MHz, and EDO memory does not. You must use SDRAM (which does support 100MHz bus speeds) on this board.

Q: What is AGP?
A: AGP (Accelerated Graphics Port) is a new bus architecture for 3D graphics. The AGP slot eliminates the PCI bandwidth bottleneck by bypassing the PCI interface and accessing the system memory directly. Currently, the AGP supports 1X and 2X modes, which yield bandwidths of 264MB/s (at 33MHz bus speed) and 533MB/s (at 66MHz bus speed), respectively. Compare this with the mere 132MB/s (at 33MHz bus speed) that you get with the PCI bus.

Q: Does my operating system support AGP?
A: Currently, only Windows 98 and Windows NT 5.0 will have built-in support for AGP. Some AGP cards require Windows 95 OSR2.1 or a special driver from Intel. Please check with your graphics vendor for more details.

chapter 3

BIOS Configuration

Introduction to Setup

This manual describes the Award EliteBIOS Setup program. The Setup program lets you modify basic system configuration settings. The settings are then stored in a dedicated battery-backed memory, called CMOS RAM, that retains the information when the power is turned off.

The EliteBIOS in your computer is a customized version of an industry-standard BIOS for IBM PC AT–compatible personal computers. It supports Intel x86 and compatible processors. The BIOS provides critical low-level support for the system central processing, memory, and I/O subsystems.

The EliteBIOS has been customized by adding important, but nonstandard, features such as virus and password protection, power management, and detailed fine-tuning of the chipset controlling the system. The rest of this manual is intended to guide you through the process of configuring your system using Setup.

Starting Setup

The EliteBIOS is immediately activated when you first turn on the computer. The BIOS reads system configuration information in CMOS RAM and begins

the process of checking out the system and configuring it through the power-on self test (POST).

When these preliminaries are finished, the BIOS seeks an operating system on one of the data storage devices (hard drive, floppy drive, etc.). The BIOS launches the operating system and hands control of system operations to it.

During POST, you can start the Setup program in one of two ways:
1. By pressing <Del> immediately after switching the system on, or
2. By pressing the <Del> key or by simultaneously pressing <Ctrl>, <Alt>, and <Esc> keys when the following message appears briefly at the bottom of the screen during POST:

TO ENTER SETUP BEFORE BOOT PRESS DEL KEY

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the RESET button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys. If you do not press the keys at the correct time and the system does not boot, an error message appears and you are again asked to

PRESS F1 TO CONTINUE, DEL TO ENTER SETUP

Setup Keys

The table on the following page shows how to navigate in Setup using the keyboard.

Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the F1 key again.

In Case of Problems

If, after making and saving system changes with Setup, you discover that your computer no longer is able to boot, the EliteBIOS supports an override to the CMOS settings that resets your system to its default configuration.

Key	Function
Up arrow	Move to previous item.
Down arrow	Move to next item.
Left arrow	Move to iten on the left hand.
Right arrow	Move to item on the right hand.
Esc key	Main Menu: Quit and do not save changes into CMOS RAM. Status Page Setup Menu: Exit current page and return to Main Menu.
PgUp key	Increase the numeric value or make changes.
PgDn key	Decrease the numeric value or make changes.
+ key	Increase the numeric value or make changes.
- key	Decrease the numeric value or make changes.
F1 key	General help, only for Status Page Setup Menu and Option Page Setup Menu.
F2 key Shift-F2	Change color from total 16 colors. F2 to select color forward, Shift-F2 to select color backwards.
F3 key	Calendar, only for Status Page Setup Menu.
F4 key	Reserved.
F5 key	Restore the previous CMOS value from CMOS, only for Option Page Setup Menu.
F6 key	Load the default CMOS RAM value from BIOS default table, only for Option Page Setup Menu.
F7 key	Load the default.
F8 key	Reserved.
F9 key	Reserved.
F10 key	Save all the CMOS changes, only for Main Menu.

You can invoke this override by immediately pressing <Insert> when you restart your computer. You can restart by either using the ON/OFF switch, the RESET button or by pressing <Ctrl>, <Alt> and <Delete> at the same time.

The best advice is to alter only settings that you thoroughly understand. In particular, do not change settings in the Chipset screen without a good reason. The Chipset defaults have been carefully chosen by Award Software or your system manufacturer for the best performance and reliability. Even a seemingly small change to the Chipset setup may causing the system to become unstable.

Setup Variations

Not all systems have the same Setup. While the basic look and function of the Setup program remains the same for all systems, the appearance of your Setup screens may differ from the screens shown here. Each system design and chipset combination require custom configurations. In addition, the final appearance of the Setup program depends on your system designer. Your system designer can decide that certain items should not be available for user configuration and remove them from the Setup program.

Main Setup Menu

When you enter the EliteBIOS CMOS Setup Utility, a Main Menu, similar to the one shown below, appears on the screen. The Main Menu allows you to select from several Setup functions and two exit choices. Use the arrow keys to select among the items and press enter to accept and enter the sub-menu.

A brief description of each highlighted selection appears at the bottom of the screen. Following is a brief summary of each Setup category.


```
ROM PCI/ISA BIOS (2A5LET5A)
CMOS SETUP UTILITY
AWARD SOFTWARE, INC.
```

STANDARD CMOS SETUP	INTEGRATED PERIPHERALS
BIOS FEATURES SETUP	SUPERVISOR PASSWORD
CHIPSET FEATURES SETUP	USER PASSWORD
POWER MANAGEMENT SETUP	IDE HDD AUTO DETECTION
PNP/PCI CONFIGURATION	HDD LOW LEVEL FORMAT
LOAD BIOS DEFAULTS	SAVE & EXIT SETUP
LOAD SETUP DEFAULTS	EXIT WITHOUT SAVING

Esc : Quit	↑ ↓ → ← : Select Item
F10 : Save & Exit Setup	(Shift)F2 : Change Color

Standard CMOS Setup
Options in the original PC AT-compatible BIOS.

BIOS Features Setup
Award Software enhanced BIOS options.

Chipset Features Setup
Options specific to your system chipset.

Power Management Setup
Advanced Power Management (APM) options.

PnP/PCI Configuration
Plug and Play standard and PCI Local Bus configuration options.

Integrated Peripherals
I/O subsystems that depend on the integrated peripherals controller in your system.

Supervisor/User Password
Change, set, or disable a password. In BIOS versions that allow separate user and supervisor passwords, only the supervisor password permits access to Setup. The user password generally allows only power-on access.

IDE HDD Auto Detection
Automatically detect and configure IDE hard disk parameters.

HDD Low Level Format
A utility for formatting hard disks..

Load BIOS Defaults
BIOS defaults are factory settings for the most stable, minimal-performance system operations.

Load Setup Defaults
Setup defaults are factory settings for optimal-performance system operations.

Save & Exit Setup
Save settings in nonvolatile CMOS RAM and exit Setup.

Exit Without Saving

Abandon all changes and exit Setup.

Standard CMOS Setup

In the Standard CMOS menu you can set the system clock and calendar, record disk drive parameters and the video subsystem type, and select the type of errors that stop the BIOS POST.

```
                ROM PCI/ISA BIOS (2A5LET59)
                  STANDARD CMOS SETUP
                AWARD SOFTWARE, INC.

 Date (mm:dd:yy) : Fri, Jul 10 1998
 Time (hh:mm:ss) : 10 :  7 :  7

 HARD DISKS            TYPE  SIZE  CYLS  HEAD PRECOMP  LANDZ  SECTOR  MODE

 Primary Master   :  Auto   0     0     0      0      0      0     AUTO
 Primary Slave    :  Auto   0     0     0      0      0      0     AUTO
 Secondary Master :  Auto   0     0     0      0      0      0     AUTO
 Secondary Slave  :  Auto   0     0     0      0      0      0     AUTO

 Drive A : 1.44M, 3.5 in.
 Drive B : None                          Base Memory:    640K
                                       Extended Memory:130048K
                                          Other Memory:    384K

 Video      : EGA/VGA                    Total Memory:131072K
 Halt On    : All But Keyboard

ESC : Quit      ↑ ↓ → ←  : Select Item    PU/PD/+/- : Modify
F1 : Help     (Shift)F2 : Change Color
```

Date
The BIOS determines the day of the week from the other date information. This field is for information only. Press the arrow keys to move to the desired field (date, month, year). Press the PgUp or PgDn key to increment the setting, or type the desired value into the field.

Time
The time format is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Press the arrow keys to move to the desired field. Press the PgUp or PgDn key to increment the setting, or type the desired value into the field.

HARD DISKS

The BIOS supports up to four IDE drives. This section does not show information about other IDE devices, such as a CD-ROM drive, or about other hard drive types, such as SCSI drives. Note: We recommend that you select type auto for all drives.

The BIOS can automatically detect the specifications and optimal operating mode of almost all IDE hard drives. When you select type auto for a hard drive, the BIOS detects its specifications during POST, every time the system boots. If you do not want to select drive type auto, other methods of selecting the drive type are available:

1. Match the specifications of your installed IDE hard drive(s) with the preprogrammed values for drive types 1 through 45.
2. Select User and enter values into each drive parameter field.
3. Use the IDE HDD Auto Dectection function in Setup.

Here is a brief explanation of drive specifications:

Type: The BIOS contains a table of pre-defined drive types. Each defined drive type has a specified number of cylinders, number of heads, write precompensation factor, landing zone, and number of sectors. Drives whose specifications do not accommodate any pre-defined type are classified as type user.

Size: Disk drive capacity (approximate). Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.

Cyls: Number of cylinders

Head: Number of heads

Precomp: Write precompensation cylinder

Landz: Landing zone

Sector: Number of sectors

Mode: Auto, Normal, large, or LBA

Auto: The BIOS automatically determines the optimal mode.

Normal: Maximum number of cylinders, heads, and sectors supported are 1024, 16, and 63.

Large: For drives that do not support LBA and have more than 1024 cylinders.

LBA (Logical Block Addressing): During drive accesses, the IDE controller transforms the data address described by sector, head, and cylinder number into a physical block address, significantly improving data transfer rates. For drives with greater than 1024 cylinders.

Drive A, Drive B

Select the correct specifications for the diskette drive(s) installed in the computer.

None	No diskette drive installed
360K, 5.25 in	5-1/4 inch PC-type standard drive; 360 kilobyte capacity
1.2M, 5.25 in	5-1/4 inch AT-type high-density drive; 1.2 megabyte capacity
720K, 3.5 in	3-1/2 inch double-sided drive; 720 kilobyte capacity
1.44M, 3.5 in	3-1/2 inch double-sided drive; 1.44 megabyte capacity
2.88M, 3.5 in	3-1/2 inch double-sided drive; 2.88 megabyte capacity

Video

Select the type of primary video subsystem in your computer. The BIOS usually detects the correct video type automatically. The BIOS supports a secondary video subsystem, but you do not select it in Setup.

EGA/VGA	Enhanced Graphics Adapter/Video Graphics Array. For EGA, VGA, SEGA, SVGA, or PGA monitor adapters.
CGA 40	Color Graphics Adapter, power up in 40 column mode.
CGA 80	Color Graphics Adapter, power up in 80 column mode.
MONO	Monochrome adpater, includes high resolution monochrome adapters.

Halt On

During the power-on self-test (POST), the computer stops if the BIOS detects a hardware error. You can tell the BIOS to ignore certain errors during POST and continue the boot-up process. These are the selections:

No errors	POST does not stop for any errors.
All errors	If the BIOS detects any non-fatal error, POST stops and prompts you to take corrective action.
All, But Keyboard	POST does not stop for a keyboard error, but stops for all other errors.
All, But Diskette	POST does not stop for diskette drive errors, but stops for all other errors.
All, But Disk/Key	POST does not stop for a keyboard or disk error, but stops for all other errors.

Memory
You cannot change any values in the Memory fields; they are only for your information. The fields show the total installed random access memory (RAM) and amounts allocated to base memory, extended memory, and other (high) memory. RAM is counted in kilobytes (KB: approximately one thousand bytes) and megabytes (MB: approximately one million bytes).

RAM is the computer's working memory, where the computer stores programs and data currently being used, so they are accessible to the CPU. Modern personal computers may contain up to 64 MB, 128 MB, or more.

Base Memory: Typically 640 KB. Also called conventional memory. The DOS operating system and conventional applications use this area.
Extended Memory: Above the 1-MB boundary. Early IBM personal computers could not use memory above 1 MB, but current PCs and their software can use extended memory.
Other Memory: Between 640 KB and 1 MB; often called high memory. DOS may load terminate-and-stay-resident (TSR) programs, such as device drivers, in this area, to free as much conventional memory as possible for applications. Lines in your config.sys file that start with loadhigh load programs into high memory.

BIOS Features Setup

The screen (shown on the following page) contains industry-standard options additional to the core PC AT BIOS. This section describes all fields offered by Award Software in this screen. The example screen below may vary from the one in your Setup program. Your system board designer may omit or modify some fields.

ROM PCI/ISA BIOS (2A5LET59)
BIOS FEATURES SETUP
AWARD SOFTWARE, INC.

Virus Warning	: Disabled	Video BIOS Shadow	: Enabled
CPU Internal Cache	: Enabled	C8000-CBFFF Shadow	: Disabled
External Cache	: Enabled	CC000-CFFFF Shadow	: Disabled
Quick Power On Self Test	: Disabled	D0000-D3FFF Shadow	: Disabled
CPU L2 Cache ECC Checking	: Disabled	D4000-D7FFF Shadow	: Disabled
Boot Sequence	: A, C, SCSI	D8000-DBFFF Shadow	: Disabled
Swap Floppy Drive	: Disabled	DC000-DFFFF Shadow	: Disabled
Boot Up Floppy Seek	: Enabled		
Boot Up NumLock Status	: On		
IDE HDD Block Mode	: Disabled		
Gate A20 Option	: Normal		
Memory Parity/ECC Check	: Disabled		
Typematic Rate Setting	: Disabled		
Typematic Rate (Chars/Sec)	: 6		
Typematic Delay (Msec)	: 250		
Security Option	: Setup	ESC : Quit	↑↓→← : Select Item
PCI/VGA Palette Snoop	: Disabled	F1 : Help	PU/PD/+/- : Modify
OS Select For DRAM > 64MB	: Non-OS2	F5 : Old Values	(Shift)F2 : Color
		F6 : Load BIOS Defaults	
		F7 : Load Setup Defaults	

BIOS Feature Setup - Default Settings Chart

Setting Option	BIOS Default	Setup Default
Virus Warning	Disabled	Disabled
CPU Internal Cache	Enabled	Enabled
External Cache	Enabled	Enabled
CPU L2 Cache ECC Checking	Enabled	Enabled
Quick Power On Self Test	Disabled	Enabled
Boot Sequence	A,C, SCSI	A,C, SCSI
Swap Floppy Drive	Disabled	Disabled
Boot Up Floppy Seek	Enabled	Enabled
Boot Up NumLock Status	On	On
IDE HDD Block Mode	Disabled	Enabled
Gate A20 Option	Normal	Fast
Memory Parity / ECC Check	Disabled	Disabled
Typematic Rate Setting	Disabled	Disabled
Typematic Rate (Chars/Sec)	6	6
Typematic Delay (Msec)	250	250
Security Option	Setup	Setup
PCI / VGA Palette Snoop	Disabled	Disabled
OS Select For DRAM > 64MB	Non-OS2	Non-OS2
Video BIOS Shadow	Enabled	Enabled
C8000-CBFFF Shadow	Disabled	Disabled
CC000-CFFFF Shadow	Disabled	Disabled

Settings Chart (Continued)

Setting Option	BIOS Default	Setup Default
D000-D3FFF Shadow	Disabled	Disabled
D4000-D7FFF Shadow	Disabled	Disabled
D8000-DBFFF Shadow	Disabled	Disabled
DC000-DFFFF Shadow	Disabled	Disabled

Virus Warning

When enabled, you receive a warning message if a program (specifically, a virus) attempts to write to the boot sector or the partition table of the hard disk drive. You should then run an anti-virus program. Keep in mind that this feature protects only the boot sector, not the entire hard drive. Note: Many disk diagnostic programs that access the boot sector table can trigger the virus warning message. If you plan to run such a program, we recommend that you first disable the virus warning.

CPU Internal Cache/External Cache

Cache memory is additional memory that is much faster than conventional DRAM (system memory). CPUs from 486-type on up contain internal cache memory, and most, but not all, modern PCs have additional (external) cache memory. When the CPU requests data, the system transfers the requested data from the main DRAM into cache memory, for even faster access by the CPU. The External Cache field may not appear if your system does not have external cache memory.

CPU L2 Cache ECC Checking

Enables Error Checking and correction (ECC) on the L2 cache onboard the CPU.

Quick Power On Self Test

Select Enabled to reduce the amount of time required to run the power-on self-test (POST). A quick POST skips certain steps. We recommend that you normally disable quick POST. Better to find a problem during POST than lose data during your work.

Boot Sequence

The original IBM PCs loaded the operating system from drive A (floppy disk), so IBM PC-compatible systems are designed to search for an operating system first on drive A, and then on drive C (hard disk). However, modern computers usually load the operating system from the hard drive, and may even load it from a CD-ROM drive. The BIOS now offers a large number of boot devices and boot sequence options.

Swap Floppy Drive
This field is effective only in systems with two floppy drives. Selecting Enabled assigns physical drive B to logical drive A, and physical drive A to logical drive B.

Boot Up Floppy Seek
When Enabled, the BIOS tests (seeks) floppy drives to determine whether they have 40 or 80 tracks. Only 360-KB floppy drives have 40 tracks; drives with 720 KB, 1.2 MB, and 1.44 MB capacity all have 80 tracks. Because very few modern PCs have 40-track floppy drives, we recommend that you set this field to Disabled to save time.

Boot Up NumLock Status
Toggle between On or Off to control the state of the NumLock key when the system boots. When toggled On, the numeric keypad generates numbers instead of controlling cursor operations.

IDE HDD Block Mode
Enables multi-sector transfers from the IDE drive in PIO mode.

Gate A20 Option
Gate A20 refers to the way the system addresses memory above 1 MB (extended memory). When set to Fast, the system chipset controls Gate A20. When set to Normal, a pin in the keyboard controller controls Gate A20. Setting Gate A20 to Fast improves system speed, particularly with OS/2 and Windows.

Memory Parity/ECC Check
Select Enabled or Disabled. If Enabled, allows memory checking when the BIOS detects the presence of ECC or Parity DRAM.

Typematic Rate Setting
When Disabled, the following two items (Typematic Rate and Typematic Delay) are irrelevant. Keystrokes repeat at a rate determined by the keyboard controller in your system. When Enabled, you can select a typematic rate and typematic delay.

Typematic Rate (Chars/Sec)
When the typematic rate setting is enabled, you can select a typematic rate (the rate at which character repeats when you hold down a key) of 6, 8, 10,12, 15, 20, 24 or 30 characters per second.

Typematic Delay (Msec)
When the typematic rate setting is enabled, you can select a typematic delay (the delay before key strokes begin to repeat) of 250, 500, 750 or 1000 milliseconds.

Security Option
If you have set a password, select whether the password is required every time the System boots, or only when you enter Setup.

PCI/VGA Palette Snoop
Your BIOS Setup many not contain this field. If the field is present, leave at Disabled.

OS Select for DRAM > 64MB
Select OS2 only if you are running OS/2 operating system with greater than 64 MB of RAM on your system.

Video BIOS Shadow
Software that resides in a read-only memory (ROM) chip on a device is called firmware. The EliteBIOS permits shadowing of firmware such as the system BIOS, video BIOS, and similar operating instructions that come with some expansion peripherals, such as, for example, a SCSI adaptor.

Shadowing copies firmware from ROM into system RAM, where the CPU can read it through the 16-bit or 32-bit DRAM bus. Firmware not shadowed must be read by the system through the 8-bit X-bus. Shadowing improves the performance of the system BIOS and similar ROM firmware for expansion peripherals, but it also reduces the amount of high memory (640 KB to 1 MB) available for loading device drivers, etc.

Enable shadowing into each section of memory separately. Many system designers hardwire shadowing of the system BIOS and eliminate a System BIOS Shadow option.

Video BIOS shadows into memory area C0000-C7FFF. The remaining areas shown on the BIOS Features Setup screen may be occupied by other expansion card firmware. If an expansion peripheral in your system contains ROM-based firmware, you need to know the address range the ROM occupies to shadow it into the correct area of RAM.

Chipset Features Setup

This section describes features of the Intel 440EX chipset.

Advanced Options

The parameters in this screen are for system designers, service personnel, and technically competent users only. Do not reset these values unless you understand the consequences of your changes. Note: This chapter describes all fields offered by Award Software in this screen. Your system board designer may omit or modify some fields.

ROM PCI/ISA BIOS (2A5LET59)
CHIPSET FEATURES SETUP
AWARD SOFTWARE, INC.

Bank 0/1 DRAM Timing	: FP/EDO 70ns	Auto Detect DIMM/PCI Clk	: Enabled
Bank 2/3 DRAM Timing	: FP/EDO 70ns	Spread Spectrum Modulate	: Disabled
Bank 4/5 DRAM Timing	: SDRAM 10ns	CPU Host/PCI Clock	: Default
SDRAM Cycle Length	: 3		
DRAM Clock	: Disabled		
Memory Hole	: Disabled		
Read Around Write	: Disabled		
Concurrent PCI/Host	: Disabled		
System BIOS Cacheable	: Disabled		
Video RAM Cacheable	: Disabled		
AGP Aperture Size	: 64M		
AGP-2x Mode	: Enabled		
PC 98 LED	: Disabled		
OnChip USB	: Disabled		

ESC : Quit	↑↓→← : Select Item
F1 : Help	PU/PD/+/- : Modify
F5 : Old Values	(Shift)F2 : Color
F6 : Load BIOS Defaults	
F7 : Load Setup Defaults	

Chipset Features Setup - Default Settings Chart

Setting Option	BIOS Default	Setup Default
Bank 0/1 DRAM Timing	SDRAM 10ns	SDRAM 8ns
Bank 2/3 DRAM Timing	SDRAM 10ns	SDRAM 8ns
Bank 4/5 DRAM Timing	SDRAM 10ns	SDRAM 8ns
SDRAM Cycle Length	3	3
DRAM Clock	Host CLK	Host CLK
Memory Hole	Disabled	Disabled
Read Around Write	Disabled	Disabled
Concurrent PCI/Host	Disabled	Disabled
System BIOS Cacheable	Disabled	Disabled
Video RAM Cacheable	Disabled	Disabled
AGP Aperture Size	64M	64M
AGP-2x Mode	Enabled	Enabled
PC '98 LED	Disabled	Disabled
OnChip USB	Disabled	Disabled
Auto Detect DIMM / PCI CLK	Enabled	Enabled
Spread Spectrum Modulated	Disabled	Disabled
CPU Host/PCI Clock	Default	Default

Bank 0/1, 2/3, 4/5 DRAM Timing
The system board designer must select the proper value for these fields, according to the specifications of the installed DRAM chips. Turbo mode reduces CAS access time by 1 clock tick.

SDRAM Cycle Length
This field sets the CAS latency timing.

DRAM Clock
Allows you to set the memory clock speed to either 66MHz or equal to the CPU clock speed, depending on your memory speed.

Memory Hole
This option specifies the location of an area of memory that cannot be addressed on the ISA bus. The settings are Disabled, 512KB-64KB, or 15MB-16MB.

Read Around Write
Increases memory throughput.

Concurrent PCI/Host
Allows access of multiple PCI devices simultaneously by the CPU.

System BIOS Cacheable
If Enabled, results in better system performance by permitting caching of the system BIOS ROM at F0000h-FFFFFh. Any program which tries to write to this memory area, however, may cause a system error.

Video RAM Cacheable
Increases video performance by caching video memory.

AGP Aperture Size
Select the size of the Accelerated Graphics Port (AGP) aperture. The aperture is a portion of the PCI memory address range dedicated for graphics memory address space. Host cycles that hit the aperture range are forwarded to the AGP without any translation. See www.agpforum.org for AGP information.

AGP-2x Mode
Enables the 2X AGP mode for higher AGP throughput. A 2X AGP graphics card is required to enable this function.

PC '98 LED
When enabled, the Power LED on the motherboard will be green when power is on, yellow when in sleep mode, and off when power is off.

OnChip USB
The chipset contains an integrated USB controller. Select Enabled if you have USB peripherals.

Auto Detect DIMM/ PCI CLK
Allows you to manually select DRAM wait states, or let wait states be auto detected via the specs programmed into the SPD EPROM chip on your memory modules.

Spread Spectrum Modulated
Reduces EMI from the CPU clock.

CPU Host/PCI Clock
Controls the clock speeds for the CPU and PCI bus. The maximum rated PCI bus speed is 33MHz. This feature allows overclocking the CPU, memory and PCI bus. Tyan does not recommend and is not responsible for functional problems associated with overclocking. If lockups or memory errors occur you may need to reduce the CPU Host/PCI Clock speeds.

Power Management Setup

Note: This chapter describes all fields offered by Award Software in this screen. Your system board designer may omit or modify some fields.

```
                    ROM PCI/ISA BIOS (2A5LET5A)
                    POWER MANAGEMENT SETUP
                    AWARD SOFTWARE, INC.

ACPI Function              : Disabled      Primary INTR        : ON
Power Management           : User Define   IRQ3(COM2)          : Primary
PM Control by APM          : No            IRQ4(COM1)          : Primary
Video Off Option           : Suspend->Off  IRQ5(LPT2)          : Primary
Video Off Method           : V/H SYNC+Blank IRQ6(Floppy Disk)  : Primary
MODEM Use IRQ              : 3             IRQ7(LPT1)          : Primary
Soft-Off by PWRBTN         : Delay 4 sec.  IRQ8(RTC Alarm)     : Disabled
HDD Power Down             : Disabled      IRQ9(IRQ2 Redir)    : Secondary
Doze Mode                  : Disabled      IRQ10(Reserved)     : Secondary
Suspend Mode               : Disabled      IRQ11(Reserved)     : Secondary
        ** PM Events **                    IRQ12(PS/2 Mouse)   : Primary
VGA                        : OFF           IRQ13(Coprocessor)  : Disabled
LPT & COM                  : LPT/COM       IRQ14(Hard Disk)    : Primary
HDD & FDD                  : ON            IRQ15(Reserved)     : Disabled
DMA/master                 : OFF
Modem Ring Resume          : Disabled      ESC : Quit     ↑↓→←  : Select Item
RTC Alarm Resume           : Disabled      F1 : Help       PU/PD/+/- : Modify
                                           F5 : Old Values  (Shift)F2 : Color
                                           F6 : Load BIOS  Defaults
Wake Up On LAN             : Disabled      F7 : Load Setup Defaults
```

Power Management Setup - Default Settings Chart

Settings Chart (Continued)

Setting Option	BIOS Default	Setup Default
ACPI Function	Enabled	Enabled
Power Management	User Define	User Define
PM Control by APM	Yes	Yes
Video Off Option	Suspend	Suspend
Video Off Method	V/ H SYNC+Blank	V/ H SYNC+Blank
MODEM Use IRQ	3	3
Soft-Off by PWRBTN	Instant Off	Delay 4 sec
HDD Power Down	Disabled	Disabled
Doze Mode	Disabled	Disabled
Suspend Mode	Disabled	Disabled

Setting Option	BIOS Default	Setup Default
VGA	OFF	OFF
LPT & COM	LPT / COM	LPT / COM
HDD & FDD	ON	ON
DMA/master	OFF	OFF
Modem Ring Resume	Disabled	Disabled
RTC Alarm Resume	Disabled	Disabled
Wake Up on LAN	Disabled	Disabled
Primary INTR	ON	ON
IRQ3 (COM2)	Primary	Primary
IRQ4 (COM1)	Primary	Primary
IRQ5 (LPT2)	Primary	Primary
IRQ6 (Floppy Disk)	Primary	Primary
IRQ7 (LPT1)	Primary	Primary
IRQ8 (RTC Alarm)	Disabled	Disabled
IRQ9 (IRQ2 Redir)	Secondary	Secondary
IRQ10 (Reserved)	Secondary	Secondary
IRQ11 (Reserved)	Secondary	Secondary
IRQ12 (PS/2 Mouse)	Primary	Primary
IRQ13 (Coprocessor)	Disabled	Primary
IRQ14 (Hard Disk)	Primary	Primary
IRQ15 (Reserved)	Disabled	Disabled

ACPI Function
Enable or disable Advanced Configuration Power Interface.

Power Management
This option allows you to select the type (or degree) of power saving for Doze, Standby, and Suspend modes. See the section PM Timers for a brief description of each mode. This table describes each power management mode:

Max saving	Maximum power savings. Only available for SL CPUs. Inactivity period is 1 minute in each mode.
User Define	Set each mode individually. Select time-out periods in the PM Timers section, following.
Min Saving	Minimum power savings. Inactivity period is 1 hour in each mode (except the hard drive).

PM Control by APM
If Advanced Power Management (APM) is installed on your system, selecting Yes gives better power savings.

Video Off Option
Selects the power-saving modes during which the monitor goes blank.

Always On	Monitor remains on during power-saving modes.
Suspend --> Off	Monitor blanked when system enters Suspend mode.
All Modes--> Off	Monitor blanked when system enters any power-saving mode.

Video Off Method
Determines the manner in which the monitor is blanked. The Blank Screen option will let the system BIOS blank the screen when disabling video. V/H sync+Blank will allow the system BIOS to turn off the V-SYNC and H-SYNC signals running from the VGA card to the monitor.

V/H SYNC+Blank	System turns off vertical and horizontal synchronization ports and writes blanks to the video buffer.
DPMS Support	Select this option if your monitor supports the Display Power Management Signaling (DPMS) standard of the Video Electronics Standards Association (VESA). Use the software supplied for your video subsystem to select video power management values.
Blank Screen	System only writes blanks to the video buffer.

MODEM Use IRQ
If Modem Ring Resume is Enabled, it is possible to wake the system by dialing in to it. This field determines which IRQ will be monitored for the incoming call.

Soft-Off by PWRBTN
When you select Instant Off or Delay 4 Sec., turning the system off with the on/off button places the system in a very low power usage state, either immediately or after 4 seconds, with only enough circuitry receiving power to detect wake-up event activity.

**** PM Timers ****
The following modes are Green PC power saving functions that are user-configurable only in User Defined Power Management mode.

HDD Power Down
After the selected period of drive inactivity (1 to 15 minutes), the hard disk drive powers down while all other devices remain active.

Doze Mode
After the selected period of system inactivity (1 minute to 1 hour), the CPU clock runs at slower speed while all other devices still operate at full speed.

Suspend Mode
After the selected period of system inactivity (1 minute to 1 hour), all devices except the CPU shut off.

**** PM Events ****

A power management (PM) event awakens the system from, or resets activity timers for, Suspend mode. You can disable monitoring of common interrupt requests so they do not generate PM events.

VGA
When On, any video activity is a PM event.

LPT & COM
Select none, or one or more, ports whose activity is a PM event.

HDD & FDD
When On, any hard drive or floppy drive activity is a PM event.

DMA/master
When On, any DMA or bus master activity is a PM event.

Modem Ring Resume
When Enabled, an input signal on the serial Ring Indicator (RI) line (in other words, an incoming call on the modem) awakens the system from Suspend mode.

RTC Alarm Resume
When Enabled, you can set the date and time at which the RTC (real-time clock) alarm awakens the system from Suspend mode.

Wake Up on LAN
This feature allows remote power up through a LAN connection when used in conjunction with a Wake on LAN compliant network adapter and appropriate software.

Primary INTR
A system peripheral signals that it wants to gain the attention of the operating

system by sending an interrupt request. When the system is in Suspend mode, IRQ activity can cause a Primary or Secondary wake-up. When Primary INTR is On, the IRQs in the above fields can be configured as Primary, Secondary, or Disabled.

Primary	The system wakes up fully when it detects IRQ activity.
Secondary	The system does not wake up, but the interrupt request is processed. Secondary interrupts are typically housekeeping devices needed to maintain the system while not requiring the use of the rest of the system resources. For example, IRQ8, the RTC Alarm, is configured as Secondary by default. Another example might be a network adapter continually polled by the network.

IRQ*n*

The following is a list of IRQs (Interrupt Request Lines) assigned to common system peripherals.

IRQ3 (COM2)
IRQ4 (COM1)
IRQ5 (LPT2)
IRQ6 (Floppy Disk)
IRQ7 (LPT1)
IRQ8 (RTC Alarm)
IRQ9 (IRQ2 Redir)
IRQ10 (Reserved)
IRQ11 (Reserved)
IRQ12 (PS/2 Mouse)
IRQ13 (Coprocessor)
IRQ14 (Hard Disk)
IRQ15 (Reserved)

PnP/PCI Configuration

Note: This chapter describes all fields offered by Award Software in this screen. Your system board designer may omit or modify some fields.

```
ROM PCI/ISA BIOS (2A5LET5A)
PNP/PCI CONFIGURATION
AWARD SOFTWARE, INC.
```

PNP OS Installed	: No	CPU to PCI Write Buffer	: Enabled
Resources Controlled By	: Auto	PCI Dynamic Bursting	: Enabled
Reset Configuration Data	: Disabled	PCI Master 0 WS Write	: Enabled
		PCI Delay Transaction	: Enabled
		PCI#2 Access #1 Retry	: Disabled
		AGP Master 1 WS Write	: Enabled
		AGP Master 1 WS Read	: Disabled
		PCI IRQ Activated By	: Level
		Assign IRQ for VGA	: Disabled

ESC : Quit ↑↓→← : Select Item
F1 : Help PU/PD/+/- : Modify
F5 : Old Values (Shift)F2 : Color
F6 : Load BIOS Defaults
F7 : Load Setup Defaults

BIOS

PnP / PCI Configuration - Default Settings Chart

Setting Option	BIOS Default	Setup Default
PnP OS Installed	No	No
Resources Controlled By	Auto	Auto
Reset Configuration Data	Disabled	Disabled
CPU to PCI Write Buffer	Enabled	Enabled
PCI Dynamic Bursting	Disabled	Enabled
PCI Master 0 WS Write	Enabled	Enabled
PCI Delay Transaction	Disabled	Enabled
PCI Master Read Prefetch	Disabled	Enabled
PCI#2 Access #1 Retry	Disabled	Disabled
AGP Master 1 WS Write	Disabled	Enabled
AGP Master 1 WS Read	Disabled	Disabled
PCI IRQ Activated By	Level	Level
Assign IRQ for VGA	Disabled	Enabled

PNP OS Installed
Select Yes if the system operating environment is Plug-and-Play aware (e.g., Windows 95).

Resources Controlled By
The Plug and Play EliteBIOS can automatically configure all the boot and Plug and Play-compatible devices. If you select Auto, all the interrupt request (IRQ) and DMA assignment fields disappear, because the BIOS automatically assigns them.

Reset Configuration Data
Normally, you leave this field Disabled. Select Enabled to reset Extended System Configuration Data (ESCD) when you exit Setup if you have installed a new add-on and the system reconfiguration has caused such a serious conflict that the operating system cannot boot.

IRQ-*n* Assigned to
When resources are controlled manually, assign each system interrupt as one of the following types, depending on the type of device using the interrupt:

Legacy ISA: Devices compliant with the original PC AT bus specification, requiring a specific interrupt (such as IRQ4 for serial port 1).

PCI/ISA PnP: Devices compliant with the Plug and Play standard, whether designed for PCI or ISA bus architecture.

DMA-*n* Assigned to
When resources are controlled manually, assign each system DMA channel as one of the following types, depending on the type of device using the interrupt:

Legacy ISA: Devices compliant with the original PC AT bus specification, requiring a specific DMA channel

PCI/ISA PnP: Devices compliant with the Plug and Play standard, whether designed for PCI or ISA bus architecture.

CPU to PCI Write Buffer
When this field is Enabled, writes from the CPU to the PCI bus are buffered, to compensate for the speed differences between the CPU and the PCI bus. When Disabled, the writes are not buffered and the CPU must wait until the write is complete before starting another write cycle.

PCI Dynamic Bursting
When Enabled, every write transaction goes to the write buffer. Burstable transactions then burst on the PCI bus; nonburstable transactions do not.

PCI Master 0 WS Write
When this field is Enabled, writes to the PCI bus are executed with zero wait states.

PCI Delay Transaction
The chipset has an embedded 32-bit posted write buffer to support delay transaction cycles. Select Enabled to support compliance with PCI specification version 2.1.

PCI Master Read Prefetch
A prefetch occurs during a read operations process when the controller "peeks" at the next instruction and actually begins the next read instruction. When this field is Enabled, the PCI bus master device is allowed to prefetch the next read instruction and initiate the next read operation.

PCI#2 Access #1 Retry
Select Enabled to rotate priority of PCI masters.

AGP Master 1 WS Write
Select Enabled to add one clock tick to AGP write operations.

AGP Master 1 WS Read
Select Enabled to add one clock tick to AGP read operations.

PCI IRQ Activated By
Leave the IRQ trigger set at Level unless the PCI device assigned to the interrupt specifies Edge-triggered interrupts.

Assign IRQ for USB
Assign an IRQ number to the onboard USB port.

Assign IRQ for VGA
Assign an IRQ number to your VGA adapter.

Assign IRQ for ACPI
Assign an IRQ number to ACPI.

Integrated Peripherals

Note: This chapter describes all fields offered by Award Software in this screen. Your system board designer may omit or modify some fields.

```
                ROM PCI/ISA BIOS (2A5LET59)
                INTEGRATED PERIPHERALS
                 AWARD SOFTWARE, INC.

OnChip IDE Channel 0          : Enabled      UART2 Mode                : Normal
OnChip IDE Channel 1          : Enabled
IDE Prefetch Mode             : Disabled
IDE Primary Master PIO        : Auto         Onboard Parallel Port     : 378/IRQ7
IDE Primary Slave  PIO        : Auto         Onboard Parallel Mode     : SPP
IDE Secondary Master PIO      : Auto
IDE Secondary Slave  PIO      : Auto
IDE Primary Master UDMA       : Disabled     PWRON After PWR Fail      : Off
IDE Primary Slave  UDMA       : Disabled
IDE Secondary Master UDMA     : Disabled
IDE Secondary Slave  UDMA     : Disabled
Init Display First            : PCI Slot

Power On Function             : Button Only

                                             ESC : Quit     ↑↓→←  : Select Item
KBC Input Clock               : 8MHz         F1 : Help       PU/PD/+/- : Modify
Onboard FDD Controller        : Enabled      F5 : Old Values  (Shift)F2 : Color
Onboard Serial Port 1         : 3F8/IRQ4     F6 : Load BIOS  Defaults
Onboard Serial Port 2         : 2F8/IRQ3     F7 : Load Setup Defaults
```

Integrated Peripherals - Default Settings Chart

Setting Option	BIOS Default	Setup Default
OnChip IDE First Channel	Enabled	Enabled
OnChip IDE Second Channel	Enabled	Enabled
IDE Prefetch Mode	Disabled	Disabled
IDE Primary Master PIO	Auto	Auto
IDE Primary Slave PIO	Auto	Auto
IDE Secondary Master PIO	Auto	Auto
IDE Secondary Slave PIO	Auto	Auto
IDE Primary Master UDMA	Disabled	Disabled
IDE Primary Slave UDMA	Disabled	Disabled
IDE Secondary Master UDMA	Disabled	Disabled
IDE Secondary Slave UDMA	Disabled	Disabled
Init Display First	PCI Slot	PCI Slot
POWER ON Function	BUTTON ONLY	BUTTON ONLY
KBC Input Clock	8 MHz	8 MHz

Settings Chart (Continued)

Setting Options	BIOS Default	Setup Default
Onboard Serial Port 1	3F8 / IRQ4	3F8 / IRQ4
Onboard Serial Port 2	2F8 / IRQ3	2F8 / IRQ3
UART2 Mode	Standard	Standard
Onboard Parallel Port	378 / IRQ7	378 / IRQ7
Onboard Parallel Mode	SPP	SPP
PWRON After PWR-Fail	Off	Off

On-Chip PCI IDE First/Second Channel
This chipset contains a PCI IDE interface with support for two IDE channels. Select Enabled to activate the primary and/or secondary onboard IDE interface. Select Disabled to deactivate this interface, if you install a primary and/or secondary add-in IDE interface.

IDE Prefetch Mode
The onboard IDE drive interface supports IDE prefetching for faster drive accesses. If you install a primary and/or secondary add-in IDE interface, set this field to Disabled if the interface does not support prefetching.

IDE Primary/Secondary Master/Slave PIO
The four IDE PIO (Programmed Input/Output) fields let you set a PIO mode (0-4) for each of up to four IDE devices that the internal PCI IDE interface supports. Modes 0 through 4 provide successively increased performance. In Auto mode, the system automatically determines the best mode for each device.

IDE Primary/Secondary Master/Slave UDMA
UDMA (Ultra DMA) is a DMA data transfer protocol that utilizes ATA commands and the ATA bus to allow DMA commands to transfer data at a maximum burst rate of 33 MB/s. When you select Auto in the four IDE UDMA fields (for each of up to four IDE devices that the internal PCI IDE interface supports), the system automatically determines the optimal data transfer rate for each IDE device.

Init Display First
Select the type of display adapter used in your system.

POWER ON Function
This option enables power on from Windows 98 keyboard, right or left mouse

button, password, hotkey, or power button. **Note:** If you use the keyboard password option to power on your system, the power button will be disabled.

KBC Input Clock
Allows you to adjust the keyboard clock signal.

Onboard FDD Controller
Select Enabled if your system has a floppy disk controller (FDC) installed on the system board and you wish to use it. If you install an add-in FDC or the system has no floppy drive, select Disabled in this field.

Onboard Serial Port 1/ 2
Select a logical COM port address and corresponding interrupt for the first and second serial ports. The second serial port offers infrared options in the next field.

UART2 Mode
Select an operating mode for the second serial port:

Standard	RS-232C serial port
HPSIR	IrDA compliant serial infrared port
ASKIR	Amplitude shift keyed infrared port

Onboard Parallel Port
Select a logical LPT port address and corresponding interrupt for the physical parallel port.

Onboard Parallel Mode
Select a mode for the onboard parallel port.

PWRON After PWR Fail
This option enables the system to: (1) always power on when power is restored following a power outage; (2) always remain off when power is restored following a power outage; or (3) restore / maintain the last power status before power failure.

User Password

When you select this function, a message appears at the center of the screen:

ENTER PASSWORD:

Type the password, up to eight characters, and press Enter. Typing a password clears any previously entered password from CMOS memory. Now the message changes:

CONFIRM PASSWORD:

Again, type the password and press Enter. To abort the process at any time, press Esc.

In the Security Option item in the BIOS Features Setup screen, select System or Setup:

System	Enter a password each time the system boots and whenever you enter Setup.
Setup	Enter a password whenever you enter Setup.

Note: To clear the password, simply press Enter when asked to enter a password. Then the password function is disabled.

Flash Writer Utility

You can upgrade the BIOS on your motherboard by using the Flash Memory Writer (FMW) utility. This utility can be downloaded from TYAN's BBS and from the TYAN website. The system BIOS is stored on a flash EEPROM chip on the mainboard, which can be erased and reprogrammed by the FMW. The following three files make up the FMW:

AWDFLASH.EXE	The Flash Memory Writer utility for Award to Award upgrade.
README.TXT	A text file of instructions.
S71AWXX.BIN*	The new BIOS file.

(*This file name is subject to change and can have either a .bin or .rom extension.)

The FMW records (or programs) a new BIOS onto the flash memory chip. You cannot upgrade an Award BIOS to an AMI BIOS or vice-versa.

Note: You should always clear your CMOS after flashing a BIOS. This will clear out any stray settings from your old BIOS which may have been carried over

from the flashing process. Most problems encountered after flashing a BIOS

will be solved by this simple procedure (see Hardware CMOS & Password Reset, page 33).

To reprogram the system BIOS, the CPU must be running in real mode. FMW will not run if the CPU is operating in a protected or virtual mode. This means that you cannot run it with Windows running or with any memory manager software. You must disable any memory manager software before you can run FMW. The easiest way to do this is as follows:

1) Boot your system from a bootable floppy disk with no CONFIG.SYS or AUTOEXEC.BAT files, and then run FMW from a backup copy of your support disk. You can make your back-up floppy bootable when you format it, and use one disk for both purposes.

2) If you are using MS-DOS 6.x, you can use the feature that allows you to bypass the CONFIG.SYS and AUTOEXEC.BAT files. You can access this feature by pressing <F5> while the "Starting MS-DOS..." line is on the screen during boot-up.

If you are uncertain whether or not you have a memory manager running, try FMW. If it works, then there is no active memory manager on your system. If you see a warning message about the CPU mode, follow the above directions to get around the memory manager.

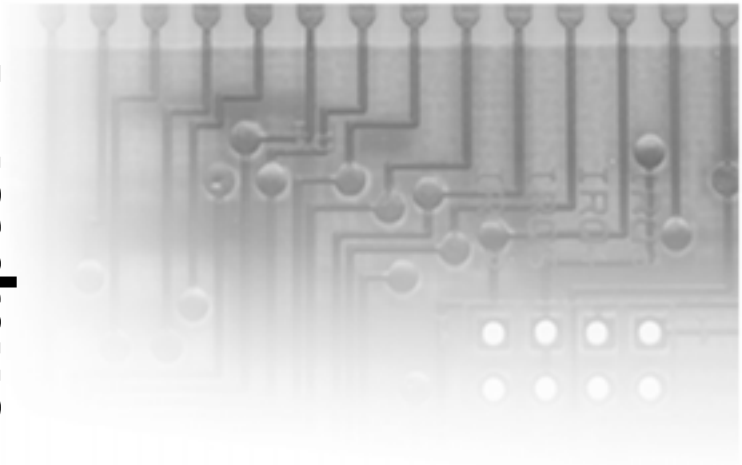
Once you have your CPU in real mode, you can run FMW. You can copy the contents of the "Flash" directory to your hard drive, or you can run the utility from a backup of the support floppy disk. Either way, make sure that the new BIOS file is in the same directory as the FMW utility.
To start FMW, change to the "Flash" directory if you are not already in it. Type "awdflash" at the DOS command line and press the <Enter> key. The FMW utility screen will appear:

```
                FLASH MEMORY WRITER V3.0
          Copyright(C) 1993, AWARD SOFTWARE, INC.

      For VX/HX-2A59CT51      Date:4/13/98




File Name to Program:

Error Message:
```

Type in the whole file name, e.g. A61AW10.BIN, and confirm that you want to program the BIOS. The utility will then "Blank," "Erase," and "Program" the flash memory on the mainboard with the new BIOS file. You should choose "Yes" to save the original system BIOS to a floppy diskette **before** you program the new BIOS. This leaves you with a backup of your original BIOS in case you need to re-install it. If you cannot successfully program the new BIOS file for some reason, re-install your original BIOS from the backup file. Remember, always reset the CMOS after flashing to a new BIOS (see page 33).

Warning: If you do not successfully install a complete BIOS file in the flash memory on the mainboard, your system may not be able to boot. If this happens, it will require service by your system vendor. Follow the instructions in this section precisely to avoid such an inconvenience.

chapter 4



System Resources

Beep Codes

Fatal errors, which halt the boot process, are communicated through a series of audible beeps. If AMIBIOS POST can initialize the system video display, it displays the error message. Displayed error messages, in most cases, allow the system to continue to boot. Displayed error messages are described on pages 71-72. See the top of the next page for the beep code chart.

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

Troubleshooting System Problems

If the computer beeps...	then...
1, 2, or 3 times...	reseat the memory SIMMs or DIPs. If the system still beeps, replace the memory.
6 times...	reseat the keyboard controller chip. If it still beeps, replace the keyboard controller. If it still beeps, try a different keyboard, or replace the keyboard fuse, if there is one.
8 times...	there is a memory error on the video adapter. Replace the video adapter, or the RAM on the video adapter.
9 times...	the BIOS ROM chip is bad. The system probably needs a new BIOS ROM chip.
11 times...	reseat the cache memory on the motherboard. If it still beeps, replace the cache memory.
4, 5, 7, or 10 times...	for 5 or 7 beeps, first test with a new CPU - if that does not solve the problem, then motherboard must be replaced.

Bootblock Recovery Codes

The bootblock recovery checkpoint codes are listed in order of execution.

Checkpoint Code	Description
E0h	The onboard floppy controller if available is initialized. Next, beginning the base 512 KB memory test.
E1h	Initializing the interrupt vector table next.
E2h	Initializing the DMA and Interrupt controllers next.
E6h	Enabling the floppy drive controller and Timer IRQs. Enabling internal cache memory.
EDh	Initializing the floppy drive.
EEh	Looking for a floppy diskette in drive A:. Reading the first sector of the diskette.
EFh	A read error occurred while reading the floppy drive in drive A:.
F0h	Next, searching for the AMIBOOT.ROM file in the root directory.
F1h	The AMIBOOT.ROM file is not in the root directory.
F2h	Next, reading and analyzing the floppy diskette FAT to find the clusters occupied by the AMIBOOT.ROM file.
F3h	Next, reading the AMIBOOT.ROM file, cluster by cluster.
F4h	The AMIBOOT.ROM file is not the correct size.
F5h	Next, disabling internal cache memory.
FBh	Next, detecting the type of flash ROM.
FCh	Next, erasing the flash ROM.
FDh	Next, programming the flash ROM.
FFh	Flash ROM programming was successful. Next, restarting the system BIOS.

Uncompressed Initialization Codes

The following routine checkpoint codes are listed in order of execution. These codes are uncompressed in F000h shadow RAM. The table begins on the next page.

Checkpoint Code	Description
03h	The NMI is disabled. Next, checking for a soft reset or a power on condition.
05h	The BIOS stack has been built. Next, disabling cache memory.
06h	Uncompressing the POST code next.
07h	Next, initializing the CPU and the CPU data area.
08h	The CMOS checksum calculation is done next.
0Bh	Next, performing any required initialization before the keyboard BAT command is issued.
0Ch	The keyboard controller input buffer is free. Next, issuing the BAT command to the keyboard controller.
0Eh	The keyboard controller BAT command result has been verified. Next, performing any necessary initialization after the keyboard controller BAT command test.
0Fh	The initialization after the keyboard controller BAT command test is done. The keyboard command byte is written next.
10h	The keyboard controller command byte is written. Next, issuing the Pin 23 and 24 blocking and unblocking commands.
11h	Next, checking if the <End or <Ins> keys were pressed during power on. Initializing CMOS RAM if the Initialize CMOS RAM in every boot AMIBIOS POST option was set in AMIBCP or the <End> key was pressed.
12h	Next, disabling DMA controllers 1 and 2 and interrupt controllers 1 and 2.
13h	The video display has been disabled. Port B has been initialized. Next, initializing the chipset.
14h	The 8254 timer test will begin next.
19h	The 8254 timer test is over. Starting the memory refresh test next.
1Ah	The memory refresh line is toggling. Checking the 15 second on/off time next.
23h	Reading the 8042 input port and disabling the MEGAKEY Green PC feature next. Making the BIOS code segment writable and performing any necessary configuration before initializing the interrupt vectors.
24h	The configuration required before interrupt vector initialization has completed. Interrupt vector initialization is about to begin.
25h	Interrupt vector initialization is done. Clearing the password if the POST DIAG switch is on.
27h	Any initialization before setting video mode will be done next.
28h	Initialization before setting the video mode is complete. Configuring the monochrome mode and color mode settings next.
2Ah	Bus initialization system, static, output devices will be done next, if present. See page 71 for additional information.
2Bh	Passing control to the video ROM to perform any required configuration before the video ROM test.

Checkpoint Code	Description
2Ch	All necessary processing before passing control to the video ROM is done. Looking for the video ROM next and passing control to it.
2Dh	The video ROM has returned control to BIOS POST. Performing any required processing after the video ROM had control.
2Eh	Completed post-video ROM test processing. If the EGA/VGA controller is not found, performing the display memory read/write test next.
2Fh	The EGA/VGA controller was not found. The display memory read/write test is about to begin.
30h	The display memory read/write test passed. Look for retrace checking next.
31h	The display memory read/write test or retrace checking failed. Performing the alternate display memory read/write test next.
32h	The alternate display memory read/write test passed. Looking for alternate display retrace checking next.
34h	Video display checking is over. Setting the display mode next.
37h	The display mode is set. Displaying the power on message next.
38h	Initializing the bus input, IPL, and general devices next, if present. See page 71 for additional information.
39h	Displaying bus initialization error messages. See page 71 for additional information.
3Ah	The new cursor position has been read and saved. Displaying the Hit <DEL> message next.
40h	Preparing the descriptor tables next.
42h	The descriptor tables are prepared. Entering protected mode for the memory test next.
43h	Entered protected mode. Enabling interrupts for diagnostics mode next.
44h	Interrupts enabled if the diagnostics switch is on. Initializing data to check memory wraparound at 0:0 next.
45h	Data initialized. Checking for memory wraparound at 0:0 and finding the total system memory size next.
46h	The memory wraparound test has completed. The memory size calculation has been completed. Writing patterns to test memory next.
47h	The memory pattern has been written to extended memory. Writing patterns to the base 640 KB memory next.
48h	Patterns written in base memory. Determining the amount of memory below 1 MB next.
49h	The amount of memory below 1 MB has been found and verified. Determining the amount of memory above 1 MB memory next.
4Bh	The amount of memory above 1 MB has been found and verified. Checking for a soft reset and clearing the memory below 1 MB for the soft reset next. If this is a power on situation, going to checkpoint 4Eh next.

Checkpoint Code	Description
4Ch	The memory below 1 MB has been cleared via a soft reset. Clearing the memory above 1 MB next.
4Dh	The memory above 1 MB has been cleared via a soft reset. Saving the memory size next. Going to checkpoint 52h next.
4Eh	The memory test started, but not as the result of a soft reset. Displaying the first 64 KB memory size next.
4Fh	The memory size display has started. The display is updated during the memory test. Performing the sequential and random memory test next.
50h	The memory below 1 MB has been tested and initialized. Adjusting the displayed memory size for relocation and shadowing next.
51h	The memory size display was adjusted for relocation and shadowing. Testing the memory above 1 MB next.
52h	The memory above 1 MB has been tested and initialized. Saving the memory size information next.
53h	The memory size information and the CPU registers are saved. Entering real mode next.
54h	Shutdown was successful. The CPU is in real mode. Disabling the Gate A20 line, parity, and the NMI next.
57h	The A20 address line, parity, and the NMI are disabled. Adjusting the memory size depending on relocation and shadowing next.
58h	The memory size was adjusted for relocation and shadowing. Clearing the Hit <DEL> message next.
59h	The Hit <DEL> message is cleared. The <WAIT...> message is displayed. Starting the DMA and interrupt controller test next.
60h	The DMA page register test passed. Performing the DMA Controller 1 base register test next.
62h	The DMA controller 1 base register test passed. Performing the DMA controller 2 base register test next.
65h	The DMA controller 2 base register test passed. Programming DMA controllers 1 and 2 next.
66h	Completed programming DMA controllers 1 and 2. Initializing the 8259 interrupt controller next.
7Fh	Extended NMI source enabling is in progress.
80h	The keyboard test has started. Clearing the output buffer and checking for stuck keys. Issuing the keyboard reset command next.
81h	A keyboard reset error or stuck key was found. Issuing the keyboard controller interface test command next.
82h	The keyboard controller interface test completed. Writing the command byte and initializing the circular buffer next.
83h	The command byte was written and global data initialization has completed. Checking for a locked key next.

Checkpoint Code	Description
84h	Locked key checking is over. Checking for a memory size mismatch with CMOS RAM data next.
85h	The memory size check is done. Displaying a soft error and checking for a password or bypassing WINBIOS Setup next.
86h	The password was checked. Performing any required programming before WINBIOS Setup next.
87h	The programming before WINBIOS Setup has completed. Uncompressing the WINBIOS Setup code and executing the AMIBIOS Setup or WINBIOS Setup utility next.
88h	Returned from WINBIOS Setup and cleared the screen. Performing any necessary programming after WINBIOS Setup next.
89h	The programming after WINBIOS Setup has completed. Displaying the power on screen message next.
8Bh	The first screen message has been displayed. The <WAIT...> message is displayed. Performing the PS/2 mouse check and extended BIOS data area allocation check next.
8Ch	Programming the WINBIOS Setup options next.
8Dh	The WINBIOS Setup options are programmed. Resetting the hard disk controller next.
8Fh	The hard disk controller has been reset. Configuring the floppy drive controller next.
91h	The floppy drive controller has been configured. Configuring the hard disk drive controller next.
95h	Initializing the bus option ROMs from C800 next. See page 71 for additional information.
96h	Initializing before passing control to the adaptor ROM at C800.
97h	Initialization before the C800 adaptor ROM gains control has completed. The adaptor ROM check is next.
98h	The adaptor ROM had control and has now returned control to BIOS POST. Performing any required processing after the option ROM returned control.
99h	Any initialization required after the option ROM test has completed. Configuring the timer data area and printer base address next.
9Ah	Set the timer and printer base addresses. Setting the RS-232 base address next.
9Bh	Returned after setting the RS-232 base address. Performing any required initialization before the Coprocessor test next.
9Ch	Required initialization before the Coprocessor test is over. Initializing the Coprocessor next.
9Dh	Coprocessor initialized. Performing any required initialization after the Coprocessor test next.
9Eh	Initialization after the Coprocessor test is complete. Checking the extended keyboard, keyboard ID, and Num Lock key next. Issuing the keyboard ID command next.

Checkpoint Code	Description
A2h	Displaying any soft errors next.
A3h	The soft error display has completed. Setting the keyboard typematic rate next.
A4h	The keyboard typematic rate is set. Programming the memory wait states next.
A5h	Memory wait state programming is over. Clearing the screen and enabling parity and the NMI next.
A7h	NMI and parity enabled. Performing any initialization required before passing control to the adaptor ROM at E000 next.
A8h	Initialization before passing control to the adaptor ROM at E000h completed. Passing control to the adaptor ROM at E000h next.
A9h	Returned from adaptor ROM at E000h control. Performing any initialization required after the E000 option ROM had control next.
AAh	Initialization after E000 option ROM control has completed. Displaying the system configuration next.
ABh	Building the multiprocessor table, if necessary.
ACh	Uncompressing the DMI data and initializing DMI POST next.
B0h	The system configuration is displayed.
B1h	Copying any code to specific areas.
00h	Code copying to specific areas is done. Passing control to INT 19h boot loader next.

The system BIOS passes control to different buses at the following checkpoints:

Checkpoint Code	Description
2Ah	Initializing the different bus system, static, and output devices, if present.
38h	Initialized bus input, IPL, and general devices, if present.
39h	Displaying bus initialization error messages, if any.
95h	Initializing bus adaptor ROMs from C8000h through D8000h.

Additional Bus Checkpoints

While control is in the bus routines, additional checkpoints are ouput to I/O port address 0080h as word to identify the routines being executed. These are word checkpoints. The low byte of checkpoint is the system BIOS checkpoint where control is passed to the different bus routines. The high byte of checkpoint indicates that the routine is being executed in different buses.

The high byte of these checkpoints includes the following information:

Bits	Description
Bits 7-4	
0000	Function 0. Disable all devices on the bus.
0001	Function 1. Initialize static devices on the bus.
0010	Function 2. Initialize output devices on the bus.
0011	Function 3. Initialize input devices on the bus.
0100	Function 4. Initialize IPL devices on the bus.
0101	Function 5. Initiate general devices on the bus.
0110	Function 6. Initialize error reporting on the bus.
0111	Function 7. Initialize add-on ROMs for all buses.
Bits 3-0	Specify the bus
0	Generic DIM Device Initialization Manager.
1	Onboard System devices.
2	ISA devices.
3	EISA devices.
4	ISA PnP devices.
5	PCI devices.

Displayed Error Messages

If an error occurs after the system display has been initialized, the error message will be displayed as follows:

```
ERROR Message Line 1
ERROR Message Line 2
Press <F1> to continue
```

and the system will halt. The system will not halt if the Wait for <F1> If Any Error option in Advanced Setup is Disabled.

```
RUN SETUP UTILITY
```

may also appear. Press <F1> to run WINBIOS Setup if this message appears.

Error Message	Explanation
8042 Gate-A20 Error	Gate A20 on the keyboard controller (8042) is not working. Replace the 8042.
Address Line Short!	Error in the address decoding circuitry.
C: Drive Error	No response from drive C:. Run the AMIDiag Hard Disk Utility. Check the C: hard disk type in Standard Setup.
C: Drive Failure	No response from hard disk drive C:. Replace the drive.
Cache Memory Bad, Do Not Enable Cache!	Cache memory is defective. Run AMIDiag.
CH-2 Timer Error	An AT system has two timers. There is an error in timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	CMOS RAM checksum is different than the previous value. Run WINBIOS Setup.
CMOS System Options Not Set	The values stored in CMOS RAM have been destroyed. Run WINBIOS Setup.
CMOS Display Type Mismatch	The video type in CMOS RAM does not match the type detected. Run WINBIOS Setup.
CMOS Memory Size Mismatch	The amount of memory found by AMIBIOS is different than the amount in CMOS RAM. Run WINBIOS Setup.
CMOS Time and Date Not Set	Run Standard Setup to set the date and time.
D: Drive Error	No response from drive D:. Run the AMIDiag Hard Disk Utility. Check the hard disk type in Standard Setup.

Error Message	Explanation
D: drive failure	No response from hard disk drive D:. Replace the drive.
Diskette Boot Failure	The boot diskette in drive A: cannot be used to boot the system. Use another boot diskette and follow the screen instructions.
Display Switch Not Proper	Some systems require a video switch be set to either color or monochrome. Turn the system off, set the switch properly, then power on.
DMA Error	Error in the DMA controller.
DMA 1 Error	Error in the first DMA channel.
DMA 2 Error	Error in the second DMA channel.
FDD Controller Failure	AMIBIOS cannot communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	AMIBIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR1 Error	Interrupt channel 1 failed POST.
INTR2 Error	Interrupt channel 2 failed POST.
Invalid Boot Diskette	AMIBIOS can read the diskette in floppy drive A:, but it cannot boot the system with it. Use another boot diskette and follow the screen instructions.
Keyboard Is Locked...Unlock It	The keyboard lock on the system is engaged. The system must be unlocked to continue to boot.
Keyboard Error	The keyboard has a timing problem. Make sure a Keyboard Controller AMIBIOS is installed. Set Keyboard in Advanced Setup to Not Installed to skip the keyboard POST routines.
KB/Interface Error	There is an error in the keyboard connector.
No ROM BASIC	Cannot find a proper bootable sector on either drive A: or C:. AMIBIOS cannot find ROM Basic.
Off Board Parity Error	Parity error in memory installed on an adapter card in an expansion slot. The format is: OFF BOARD PARITY ERROR ADDR = (XXXX) XXXX is the hex address where the error occurred. Run AMIDiag to find and correct memory problems.
On Board Parity Error	Parity error in motherboard memory. The format is: ON BOARD PARITY ERROR ADDR = (XXXX) XXXX is the hex address where the error occurred. Run AMIDiag to find and correct memory problems.
Parity Error ????	Parity error in system memory at an unknown address. Run AMIDiag to find and correct memory problems.

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Appendix 1

CPU Retention Module Options

Tyan offers two different options for securing Intel's Pentium II CPUs onto the motherboard. Each option provides retention for both older Pentium II's as well as newer Pentium II's (including Celeron).

OPTION 1:
Two different types of retention modules are included in the motherboard package. For older versions of Pentium II, use the retention module shown in Figure 1. For newer versions of Pentium II CPUs (including Celeron), use the retention module shown in Figure 2. (Screws for the retention modules are provided.)

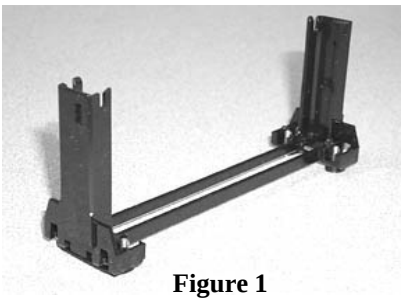


Figure 1

Figure 2

OPTION 2:
One universal retention module is included in the motheboard package. This type of retention module adapts to both old and new Pentium II CPUs - see Figure 3. (Screws for the retention modules are provided)

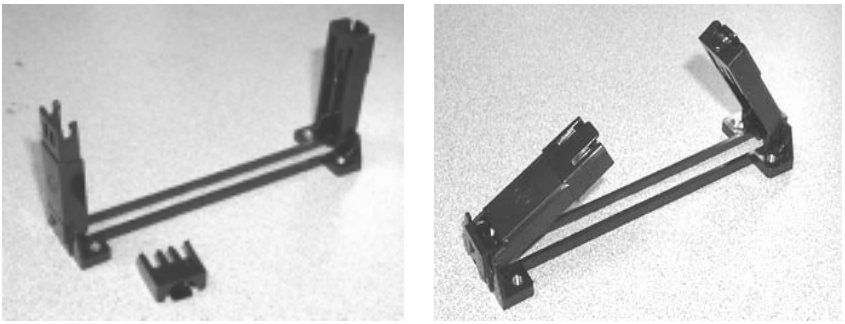
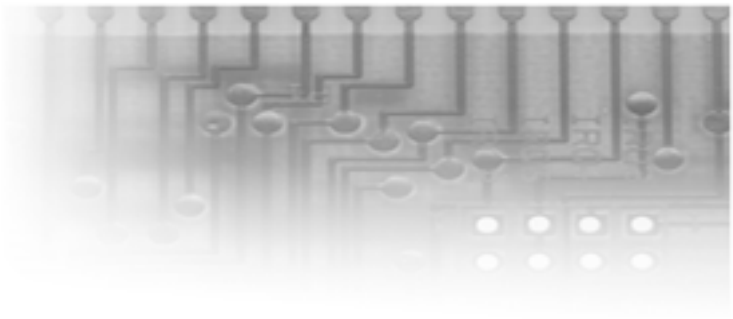


Figure 3

Appendix 2



Glossary

ACPI (**A**dvanced **C**onfiguration and **P**ower **I**nterface) is a power management specification that allows the operating system to control the amount of power distributed to the computer's devices. Devices not in use can be turned off, reducing unnecessary power expenditure.

AGP (**A**ccelerated **G**raphics **P**ort) is a PCI-based interface which was designed specifically for demands of 3D graphics applications. The 32-bit AGP channel directly links the graphics controller to the main memory. While the channel runs at only 66MHz, it supports data transmission during both the rising and falling ends of the clock cycle, yielding an effective speed of 133MHz.

AT was the original form factor of IBM's PC.

ATAPI (**AT A**ttachment **P**acket **I**nterface), also known as IDE or ATA, is a drive implementation that includes the disk controller on the device itself. It allows CD-ROMs and tape drives to be configured as master or slave devices, just like hard drives.

ATX form factor was designed to replace the AT form factor. It improves on the AT design by rotating the board ninety degrees, so that the IDE connectors are closer to the drive bays, and the CPU is closer to the power supply

and cooling fan. The keyboard, mouse, serial, USB, and parallel ports are built in.

Bandwidth refers to carrying capacity. The greater the bandwidth, the more data the bus, phone line, or other electrical path, can carry. Greater bandwidth, then, also results in greater speed.

A **BBS** (**B**ulletin **B**oard **S**ystem) is a computer system with a number of modems hooked up to it which acts as a center for users to post messages and access information.

The **BIOS** (**B**asic **I**nput/**O**utput **S**ystem) program resides in the ROM chip, and provides the basic instructions for controlling your computer's hardware. Both the operating system and application software use BIOS routines to ensure compatibility.

A **buffer** is a portion of RAM which is used to temporarily store data, usually from an application, though it is also used when printing, and in most keyboard drivers. The CPU can manipulate data in a buffer before copying it, all at once, to a disk drive. While this improves system performance--reading to or writing from a disk drive a single time is much faster than doing so repeatedly--there is the possibility of losing your data should the system crash. Information stored in a buffer is temporarily stored, not permanently saved.

A **bus** is a data pathway. The term is used especially to refer to the connection between the processor and system memory, and between the processor and PCI or ISA local buses.

Bus mastering allows peripheral devices and IDEs to access the system memory without going through the CPU (similar to DMA channels).

A **cache** is a temporary storage area for data that will be needed often by an application. Using a cache lowers data access times, since the needed information is stored in the SRAM instead of in the slower DRAM. Note that the cache is also much smaller than your regular memory: a typical cache size is 512KB, while you may have as much as 1GB of regular memory.

Cache size refers to the physical size of the cache onboard. This should not be confused with the cacheable area, which is the total amount of memory

which can be scanned by the system in search of data to put into the cache. A typical setup would be a cache size of 512KB, and a cacheable area of 512MB. In this case, up to 512MB of the main memory onboard is capable of being cached. However, only 512KB of this memory will be in the cache at any given moment. Any main memory above 512MB could never be cached.

Closed and open jumpers Jumpers and jumper pins are active when they are On or Closed, and inactive when they are Off or Open.

CMOS **C**omplementary **M**etal-**O**xide **S**emiconductors are chips that hold the basic start-up information for the BIOS.

The **COM port** is another name for the serial port, which is so-called because it transmits the eight bits of a byte of data along one wire, and receives data on another single wire (that is, the data is transmitted in serial form, one bit after another). Parallel ports transmit the bits of a byte on eight different wires at the same time (that is, in parallel form, eight bits at the same time).

DIMM **D**ual **I**n-line **M**emory **M**odules are a faster and more capacious form of RAM than SIMMs, and do not need to be installed in pairs.

DIMM bank DIMM banks are sometimes called DIMM sockets, because the physical slot and the logical unit are the same. That is, one DIMM module fits into one DIMM socket, which is capable of acting as a memory bank.

DMA **D**irect **M**emory **A**ccess channels are similar to IRQs. DMA channels allow hardware devices (like sound cards or keyboards) to access the main memory without involving the CPU. This frees up CPU resources for other tasks. As with IRQs, it is vital that you do not double up devices on a single line. Plug and Play devices will take care of this for you.

In **Doze mode**, only the CPU's speed is slowed.

DRAM **D**ynamic **RAM** is a widely available, very affordable form of RAM which has the unfortunate tendency to lose data if it is not recharged regularly (every few milliseconds). This refresh requirement makes DRAM three to ten times slower than non-recharged RAM such as SRAM.

EDO RAM (**E**xtended **D**ata-**O**ut **RAM**) speeds access to memory locations by assuming that memory addresses are static: the next time it looks for a bit of data, it will be at the same spot, or one nearby.

EEPROM Electrically Erasable Programmable ROM, also called Flash BIOS, is a ROM chip which can, unlike normal ROM, be updated. This allows you to keep up with changes in the BIOS programs without having to buy a new chip. TYAN's BIOS updates can be found at http://www.tyan.com/html/drivers.html

ESCD (**E**xtended **S**ystem **C**onfiguration **D**ata) is a format for storing information about Plug and Play devices in the system BIOS. This information helps properly configure the system each time it boots.

Firmware is low level software that controls the system hardware.

Form factor is an industry term for the size, shape, power supply type, and external connector type of the PCB (personal computer board) or motherboard. The standard form factors are the AT and ATX, although TYAN also makes some Baby-AT boards.

A **Global timer** is an onboard hardware timer, such as the Real Time Clock.

Handshaking is a form of encryption. One system, typically the server, sends an encryption scheme to another agent, typically a client. Thus, the client's data is protected during transmittal to the server.

HDD stands for **H**ard **D**isk **D**rive.

H-SYNC controls the horizontal properties of the monitor.

IC (**I**ntegrated **C**ircuit) is the formal name for the computer chip.

IDE **I**ntegrated **D**evice (or Drive) **E**lectronics is a simple, self-contained hard drive interface. It can handle drives up to 8.4GB in size. Almost all IDEs sold now are in fact Enhanced IDEs (EIDEs).

IDE INT (**IDE Int**errupt) is a hardware interrupt signal that goes to the IDE.

I/O **I**nput/**O**utput is the connection between your computer and another piece of hardware (mouse, keyboard, etc.).

IRQ An Interrupt Request is an electronic request that runs from a hardware device to the CPU. The interrupt controller assigns priorities to incoming requests and delivers them to the CPU. It is important that there is only one device hooked up to each IRQ line; doubling up devices on IRQ lines can lock up your system. Happily, Plug and Play operating systems take care of these details for you.

ISA stands for **I**ndustry **S**tandard **A**rchitecture. ISA is a slower 8- or 16-bit BUS (data pathway).

Latency is the amount of time that one part of a system spends waiting for another part to catch up. This is most common when the system sends data out to a peripheral device, and is waiting for the peripheral to send some data back (peripherals tend to be slower than onboard system components).

NVRAM ROM and EEPROM are both examples of **N**on-**V**olatile **RAM**, memory that holds its data without power. DRAM, in contrast, is volatile.

OEMs (**O**riginal **E**quipment **M**anufacturers) like Compaq or IBM package other companies' motherboards and hardware inside their case and sell them.

The **parallel port** transmits the bits of a byte on eight different wires at the same time (that is, in parallel form, eight bits at the same time).

PCI stands for **P**eripheral **C**omponent **I**nterconnect. PCI is a 32-bit local bus (data pathway) which is faster than the ISA bus. Local buses are those which operate within a single system (as opposed to a network bus, which connects multiple systems).

The **PCI PIO** (**PCI P**rogrammable **I**nput/**O**utput) modes are the data transfer modes used by IDE drives. These modes use the CPU for data transfer (DMA channels do not). PCI refers to the type of bus used by these modes to communicate with the CPU.

PCI-to-PCI bridge allows you to connect multiple PCI devices onto one PCI slot.

Pipeline burst SRAM is a fast secondary cache. It is used as a secondary cache because SRAM is slower than SDRAM, but usually larger. Data is cached first to the faster primary cache, and then, when the primary cache is full, to the slower secondary cache.

Pipelining improves system performance by allowing the CPU to begin executing a second instruction before the first is completed. A pipeline can be likened to an assembly line, with a given part of the pipeline repeatedly executing a set part of an operation on a series of instructions.

PM timers (**P**ower **M**anagement **timers**) are software timers that count down the number of seconds or minutes until the system times out and enters sleep, suspend, or doze mode.

PnP is an acronym for Plug and Play, a design standard that has become ascendant in the industry. Plug and Play devices require little set-up to use. Novice end users can simply plug them into a computer that is running on a Plug and Play-aware operating system (such as Windows 95), and go to work. Devices and operating systems that are not Plug and Play require you to reconfigure your system each time you add or change any part of your hardware.

The term **RAM** (**R**andom **A**ccess **M**emory), while technically referring to a type of memory where any byte can be accessed without touching the adjacent data, is often used to refer to the system's main memory. This memory is available to any program running on the computer.

ROM (**R**ead-**O**nly **M**emory) is a storage chip which contains the BIOS (Basic Input/Output System), the basic instructions required to boot the computer and start up the operating system.

SDRAM (**S**ynchronous **D**ynamic **RAM**) is so-called because it can keep two sets of memory addresses open simultaneously. By transferring data alternately from one set of addresses, and then the other, SDRAM cuts down on the delays associated with non-synchronous RAM, which must close one address bank before opening the next.

The **serial port** is so called because it transmits the eight bits of a byte of data along one wire, and receives data on another single wire (that is, the data is transmitted in serial form, one bit after another).

SIMM **S**ingle **I**n-line **M**emory **M**odules are the most common form of RAM. They must be installed in pairs, and do not have the carrying capacity or the speed of DIMMs.

SIMM bank/socket SIMM sockets are the physical slots into which you stick SIMM modules. A pair of SIMM sockets form a SIMM bank, and act as a unit. If only one socket is filled, the bank will not operate.

In **Sleep/Suspend mode**, all devices except the CPU shut down.

SRAM **S**tatic **RAM**, unlike DRAM, does not need to be refreshed in order to prevent data loss. Thus, it is faster, and more expensive.

In **Standby mode**, the video and fixed disk drive shut down; all other devices operate normally.

UltraDMA/33 is a fast version of the old DMA channel. UltraDMA is also called UltraATA. Without UltraDMA your system cannot take advantage of the higher data transmission rates of the new UltraATA hard drives.

Universal Serial Bus or USB, is a versatile port. This one port type can function as a serial, parallel, mouse, keyboard, or joystick port. It is fast enough to support video transfer, and is capable of supporting up to 127 daisy-chained peripheral devices.

VGA (**V**ideo **G**raphics **A**rray) is the PC video display standard.

V-SYNC controls the vertical properties of the monitor.

ZIF socket **Z**ero **I**nsertion **F**orce sockets make it possible to insert CPUs without damaging the sensitive pins. The CPU is lightly placed in an open ZIF socket, and the metal lever pulled down. This shifts the processor over and down, guiding it into place on the board.

Notice for the USA

Compliance Information Statement (Declaration of Conformity Procedure) DoC FCC Part 15: This Device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1) this device may not cause harmful interference, and

2) this device must accept any interference received including interference that may cause undesired operation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Plug the equipment into an outlet on a circuit different from that of the receiver.
- Consult the dealer or an experienced radio/television technician for help.

Notice for Canada

This apparatus complies with the Class B limits for radio interference as specified in the Canadian Department of Communications Radio Interference Regulations. (Cet appareil est conforme aux normes de Classe B d' interference radio tel que spécifié par le Ministére Canadien des Communications dans les réglements d'interférence radio.)

Notice for Europe (CE Mark)

This product is in conformity with the Council Directive 89/336/EEC, 92/31/EEC (EMC).

CAUTION: Lithium Batteries included with this board. Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to manufacturer instructions.

Note: The joystick port maximum output rating is 9 amperes at 5 volts.