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1. INTRODUCTION

1.1. PREFACE

Welcome to use the **5AX** motherboard. The motherboard is a Pipeline 512 KB CACHE Pentium® Processor based PC/AT compatible system with ISA bus and PCI Local Bus, and has been designed to be the fastest PC / AT system. There are some new features allow you to operate the system with the performance you want.

This manual also explains how to install the motherboard for operation, and how to set up your CMOS CONFIGURATION with BIOS SETUP program.

1.2. KEY FEATURES

- ❑ Pentium® Processor based PC / AT compatible mainboard with PCI / ISA / AGP Bus.
- ❑ 4 PCI Bus slots, 3 ISA Bus slots, 1 AGP slot.
- ❑ Supports :
 - Pentium® Processor :100-233 MHz; P54CT (166); MMX (166 / 200 / 233), P54CTB (166 / 200)
 - AMD :K5-(PR133 / PR166); K6-(166 / 200(2.9V) / 233(3.2V)/266/300(2.2V);K6-2(266/300(2.2V))
 - Cyrix/IBM :6x86(133(PR166+));6x86L(133PR166+(2.8V)) ; 6x86MX (PR200 (66x2.5(2.9V) / (75x2(2.9V) / PR233 (66x3(2.9V) / (75x2.5 2.9V)) / PR266 (66x3.5 2.9V) (75x3 2.9V) (83x2.5 2.9V)); M2-PR300(66x3.5 2.9V)
 - IDT :C6-(200; 225; 266)
- ❑ Supports true 64 bits CACHE and DRAM access mode.
- ❑ Supports 321 Pins (Socket 7) ZIF white socket on board.
- ❑ Supports 512 KB Pipeline Burst Sync. 2nd Level Cache.

- ❑ CPU L1 / L2 Write-Back cache operation.
- ❑ Supports 8 - 768 MB DRAM memory on board.
- ❑ Supports 3*168 pin 64/72 Bit DIMM module.
- ❑ Supports 2-channel Enhanced PCI IDE ports for 4 IDE Devices.
- ❑ Supports 2*COM (16550), 1*LPT (EPP / ECP), 1*1.44MB Floppy port.
- ❑ Supports Green function, Plug & Play function.
- ❑ Licensed AWARD BIOS, FLASH RAM for BIOS update.
- ❑ 30.5cm*17cm, ATX Form factor.
- ❑ Supports USB port & PS/2 Mouse and K/B port.
- ❑ Supports 3 steps ACPI LED.

1.3. PERFORMANCE LIST

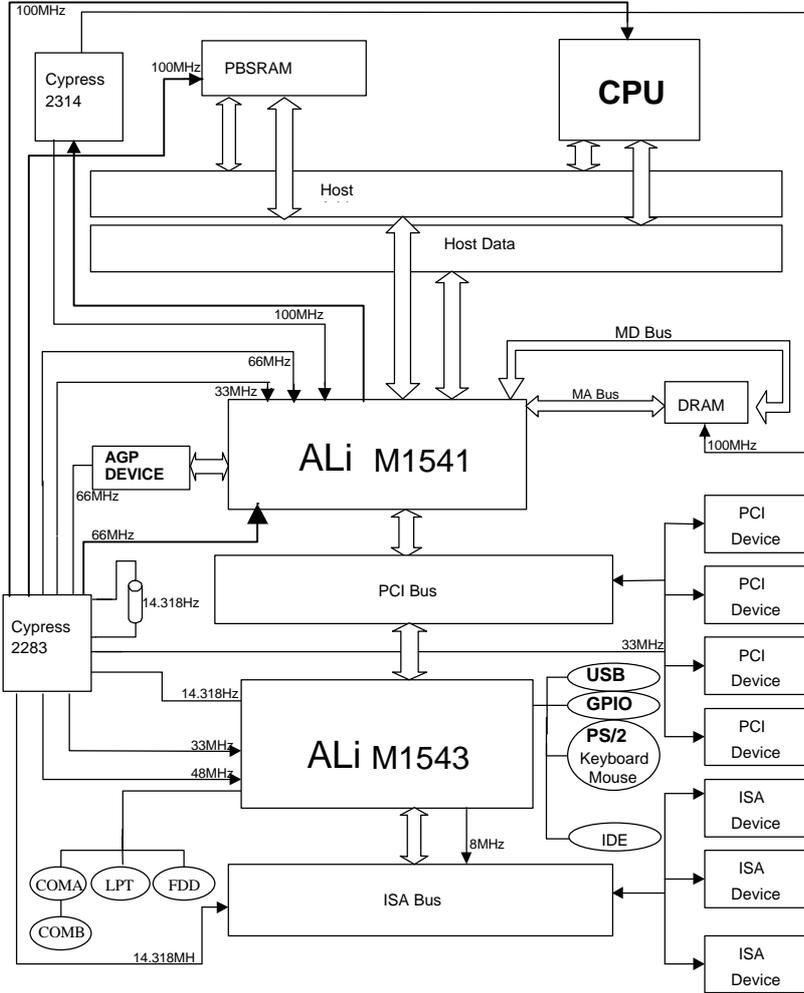
The following list of performance data is the testing results of some popular benchmark testing programs.

These data are just referred by users, and there is no responsibility for different testing data values gotten by users. (The different Hardware & Software configuration will result in different benchmark testing results.)

- CPU Pentium® Processor MMX-233 MHz , Cyrix 6x86M2-PR300 , AMD K6-2 300
- DRAM (128 x 1) MB SDRAM (LGS GM72N66841CT7J)
- CACHE SIZE 512 KB
- DISPLAY GA-600 (4MB SGRAM)
- STORAGE Onboard IDE (IBM DHEA-36451)
- O.S. Windows® NT 4.0
- DRIVER Display Driver at 1024 x 768 x 256 colors x 75Hz.
ALi Bus Master IDE Driver

Processor	Intel-MMX 233MHz (66x3.5)	AMD K6-2 300 (100x3)	Cyrix M-2 PR300 (66x3.5)
Winbench98 CPU mark32	467	756	478
FPU Winmark	912	979	534
Business Disk	1760	1840	1820
Hi-End Disk	4160	4550	4450
Business Graphics	105	153	139
Hi-End Graphics	109	156	150
Winstone98 Business	22.5	29.1	25.9
Hi-End	23.8	29.6	26.7

1.4. BLOCK DIAGRAM



1.5. INTRODUCE THE PCI - BUS

Connecting devices to a CPU local bus can dramatically increase the speed of I/O-bound peripherals with only a slight increase in cost over traditional systems.

This price / Performance point has created a vast market potential for local bus products.

The main barrier to this market has been the lack of an accepted standard for local bus peripherals.

Many mainboard and chipset manufactures developed their own local bus implementations, but they are incompatible with each other.

The VL (Video Electronics Standards Association) local bus and PCI (Peripheral Component Interconnect) bus specification was created to end this confusion.

The PCI - bus standard, under development since Jun. 1992, which is designed to bring workstation-level performance to standard PC platform. The PCI - bus removes many of the bottlenecks that have hampered PC for several years.

On the PCI - bus, peripherals operate at the native speed of the computer system, thus enabling data transfer between peripherals and the system at maximum speed.

This performance is critical for bandwidth-constrained devices such as video, multimedia, mass storage, and networking adapters.

PCI - bus standard provides end-users with a low-cost, extendible and portable local bus design, which will allow system and peripherals from different manufactures to work together.

1.6. FEATURES

- 32 bits bus transfer mode.
- Bus Master or Slave access.
- Memory burst transfer to 132 MB/sec.
- 33 MHz operation speed.
- 10 device loading ability.
- CPU independent.

1.7. What is AGP

The Accelerated Graphics Port (AGP) is a new port on the Host-To-PCI bridge device that supports an AGP port. The main purpose of the AGP port is to provide fast access to system memory.

The AGP port can be used either as fast PCI port (32-bits at 66MHz vs. 32-bits at 33MHz) or as an AGP port which supports 2x data-rate, a read queue, and side band addressing. When the 2x-data rate is used the port can transmit data at 533Mb/sec ($66.6 \times 2 \times 4$). The read-queue can be used to pipeline reads – removing the effects of the reads-latency. Side band addressing can be used to transmit the data address on a separate line in order to further speed the transaction.

2. SPECIFICATION

2.1. HARDWARE

- CPU
 - Pentium® Processor 100 - 233 MHz, MMX, P54CT, P54CTB, AMDK5(PR133 / PR166), AMD-K6 (166 / 200 (2.9V) / 233 (3.2V) / 266 (2.2V) / 300 (2.2V)), AMD-K6-2 (266 / 300(2.2V))), Cyrix / IBM 6x86 (PR166+ / PR200+), Cyrix / IBM 6x86L (PR166+/ PR200+ (2.8V)), Cyrix / IBM 6x86MX (PR200 (66x2.5 2.9V) (75x2 2.9V) / PR233 (66x3 2.9V) (75x2.5 2.9V) (83x2) / PR266 (66x3.5) (75x3) (83x2.5), Cyrix M-2 (300(2.9V)), IDT C6-(200, 225, 266)
 - 321 pins (socket 7) ZIF white socket on board.
 - 3.52V / 2.0V-3.5V Dual Power Ready.
- COPROCESSOR
 - Included in processor.
- SPEED
 - 66 / 75 / 83 / 100MHz system speed.
 - 66 MHz AGP-Bus speed.
 - 33 MHz PCI-Bus speed.
 - 8 MHz AT bus speed.
- DRAM MEMORY
 - 3 banks 168 pins DIMM module socket on board.
 - Use 8 / 16 / 32 / 64 / 128 / 256 MB 50~60 ns DIMM module DRAM.
 - 8 ~ 768 MB DRAM size.
 - Supports 3.3V SDRAM / EDO type DRAM.
 - Supports ECC or Non-ECC type DRAM.
- CACHE MEMORY
 - 16 / 24 / 32 / 64KB L1cache included in CPU.
 - 512 KB 2nd Level cache on board.
 - Supports Write Back cache function for both CPU & on board cache.
- I/O BUS SLOTS
 - 4 xMaster / Slave PCI-BUS Slots.
 - 3 x16 bits ISA BUS Slots.
 - 1 xAGP Slot.

- IDE PORTS
 - 2-channel Enhanced IDE port on board.(Using IRQ14,15)
 - Supports Mode 3,4 IDE & ATAPI CD – ROM.
- I/O PORTS
 - Supports 2 x16550 COM ports. (Using IRQ4, 3)
 - Supports 1 x EPP/ECP LPT port. (Using IRQ7 or 5 and DMA3 or 1)
 - Supports 1 x 1.44/2.88 MB Floppy port. (Using DMA2 & IRQ6)
 - Supports PS/2 Mouse. (Using IRQ12)
- GREEN FUNCTION
 - Suspend mode support.
 - Green switch & ACPI LED support.
 - IDE & Display power down support.
 - Monitor all IRQ / DMA / Display / I/O events.
- BIOS
 - 1Mbit FLASH RAM.
 - Supports Plug & Play Function.
- DIMENSION
 - ATX Form Factor, 4 layers PCB.

2.2. SOFTWARE

- BIOS
 - Licensed AWARD BIOS.
 - AT CMOS Setup, BIOS / Chipset Setup, Green Setup, Hard Disk Utility included.
- O.S.
 - Operation with MS-DOS®, Windows®95, WINDOWS™ NT, OS/2, NOVELL and SCO UNIX.

2.3. ENVIRONMENT

- Ambient Temp.
 - 0°C to +50°C (Operating).
- Relative Hum.
 - 0 to +85% (Operating).
- Altitude
 - 0 to 10,000 feet (Operating).
- Vibration
 - 0 to 1,000 Hz.
- Electricity
 - 4.9 V to 5.2 V.
 - Max. 20A current at 5V.

3. HARDWARE INSTALLATION

3.1. UNPACKING

The mainboard package should contain the following:

- The **5AX** mainboard.
- USER'S MANUAL for mainboard.
- Cable set for IDE ; Floppy.
- Diskette for Mainboard Utility.

The mainboard contains sensitive electric components which can be easily damaged by static electricity, so the mainboard should be left in its original packing until it is installed.

Unpacking and installation should be done on a grounded anti-static mat.

The operator should be wearing an anti static wristband, grounded at the same point as the anti-static mat.

Inspect the mainboard carton for obvious damage. Shipping and handling may cause damage to your board. Be sure there are no shipping and handling damage on the board before proceeding.

After opening the mainboard carton, extract the system board and place it only on a grounded anti-static surface component side up. Again inspect the board for damage.

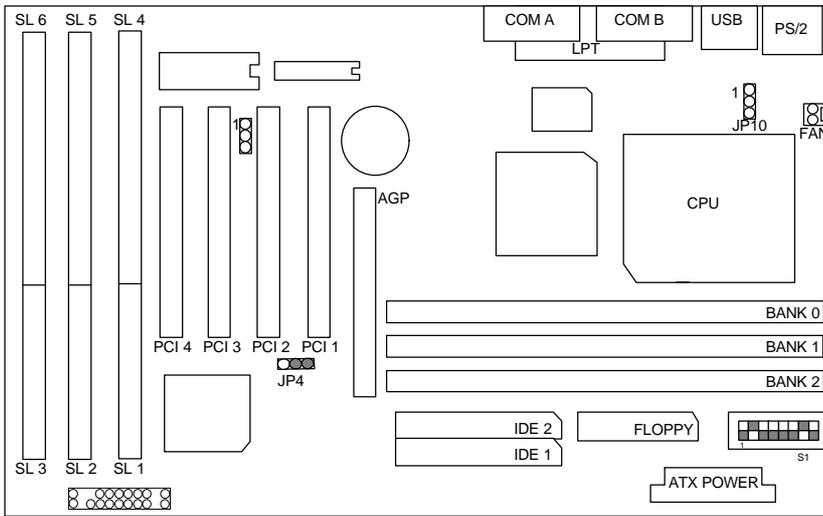
Press down on all of the socket IC's to make sure that they are properly seated. Do this only on with the board placed on a firm flat surface.

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

It is assumed that the chassis is designed for a standard ATX mainboard mounting. Place the chassis on the anti-static mat and remove the cover.

Take the plastic clips, Nylon stand-off and screws for mounting the system board, and keep them separate.

3.2. MAINBOARD LAYOUT

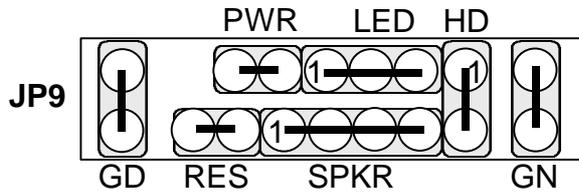


<Figure 3.1>

3.3. QUICK REFERENCE FOR JUMPERS & CONNECTORS

◆ CN1-6, LPT, JP11, U1	
CN1	For Primary IDE port.
CN2	For Floppy port.
CN3	For Secondary IDE port.
CN4	For USB port.
CN5	For Serial port2 (COM B){Support Modem Ring On}.
CN6	For Serial port1 (COM A).
LPT	For LPT port.
JP11	For PS/2 Mouse & Keyboard Connector.
U1	For ATX Power Connector.

JP3 : 2*11 PIN Jumper



PWR: Soft Power Connector



On – Off : For POWER ON or Suspend IN / OUT.
 On 4 sec : For POWER OFF before VGA Enable or CMOS setup select "delay 4sec." for POWER OFF mode.

RES: Reset Switch



Open: Normal Operation
 Short: For Hardware Reset System

LED: Power LED



PIN 1: anode (+)
 PIN 2: cathode (-)
 PIN 3: cathode (-)

SPKR: Speaker Connector



PIN 1: VCC
 PIN 2: NC
 PIN 3: NC
 PIN 4: Data

HD: IDE Hard Disk Active LED



PIN 1: LED anode (+)
 PIN 2: LED cathode (-)

GN: Green Switch



Open: Normal operation
Short: Entering Green Mode

GD: Green Function Active LED



PIN 1: LED canode (-)
PIN 2: LED athode (+)

◆ JP8: Wake on Lan	
Pin No.	Function
1	+5V SB
2	GND
3	Signal

◆ FAN: CPU cooling FAN Power Connector	
Pin No.	Function
1	GND.
2	+12V
3	SENSE

◆ JP10: Keyboard Power On Connector (Optional)	
Pin No.	Function
1,2 Close	Enabled Keyboard power on.
2,3 Close	Disabled Keyboard power on.

3.4. SRAM INSTALLATION

Sync. SRAM (Pipeline Burst SRAM)

If Sync SRAM Chip is installed, it consists of Pipeline Burst 1 Pc 64 K x 64 512KByte.

3.5. DRAM INSTALLATION

The mainboard can be installed with 8 / 16 / 32 / 64 / 128 / 256 MB 168 pins DIMM module DRAM, and the DRAM speed must be 67~100 MHz for SDRAM. The DRAM memory system on mainboard consists of bank 0, 1 & bank 2.

Because the 168 pins DIMM module is 64 bits width, using 1 PCS which can match a 64 bits system. The total memory size is 8 MB ~ 768 MB DRAM. The DRAM installation position refer to Figure 3.1, and notice the Pin 1 of DIMM module must match with the Pin 1 of DIMM socket. Insert the DRAM DIMM module into the DIMM socket at Vertical angle. If there is a wrong direction of Pin 1, the DRAM DIMM module couldn't be inserted into socket completely.

3.6. CPU INSTALLATION AND JUMPERS SETUP

The system speed depends on the frequency of CLOCK GENERATOR. The user can change SW selection to set up the system speed to 66 / 75 /83 / 100MHz for 3.3V/2.5V Pentium[®] Processor (100-233 MHz) / AMDK5(PR133 / PR166) / AMD-K6(166/200(2.9V)/233(3.2V)/266/300(2.2V)) / AMD-K6-2(266/300(2.2V)), Cyrix / IBM 6x86 (PR166+/ PR200+), Cyrix / IBM 6x86L (PR166+/PR200+ (2.8V)), Cyrix / IBM 6x86MX (PR200 (66x2.5 2.9V) (75x2 2.9V)/ PR233 (66x3 2.9V) (75x2.5 2.9V) / PR266 (66x3.5 2.9V) (75x3 2.9V) (83x2.5 2.9V)), Cyrix M-2 PR300 (66*3.5 2.9V); IDT C6-200(66*3) / 225(75*3) / 266(66*4).

The mainboard can use Pentium[®] Processor, P54CT, MMX or P54CTB, AMDK5, AMD-K6, AMD-K6-2, Cyrix / IBM 6x86, Cyrix M2, IDT C6 CPU, and the CPU speed must match with the frequency of CLOCK GEN. It will cause system hanging up if the CLOCK GEN.'S frequency is faster than CPU's.

- **The CPU is a sensitive electric component and it can be easily damaged by static electricity, so users must keep it away from metal surface when the CPU is installed onto mainboard.**
- **When the user installs the CPU on socket, please notice that the PIN 1 of CPU is in the same corner as the PIN 1 of socket!**
- **Before the CPU is installed, the mainboard must be placed on a flat**

plane in order to avoid being broken by the pressure of CPU installation.

◆ SW: CPU INT./ EXT. FREQ. RATIO

X	OFF
O	ON

SW	2	3	8
x 1.5	X	X	X
x 2	O	X	X
x 2.5	O	O	X
x 3	X	O	X
x 3.5	X	X	X
x 4	O	X	O
x 4.5	O	O	O
x 5	X	O	O
x 5.5	X	X	O

SW	4	5	6	7
AUTO	X	X	X	O
2.0 V	X	X	X	X
2.1 V	X	X	O	X
2.2 V	X	O	X	X
2.3 V	X	O	O	X
2.4 V	O	X	X	X
2.5 V	O	X	O	X
2.6 V	O	O	X	X
2.7 V	O	O	O	X
2.8 V	X	X	X	O
2.9 V	X	X	O	O
3.0 V	X	O	X	O
3.1 V	X	O	O	O
3.2 V	O	X	X	O
3.3 V	O	X	O	O
3.4 V	O	O	X	O
3.5 V	O	O	O	O

MHz	SW1	JP4
66	OFF	2-3
75	OFF	1-2
83	ON	2-3
100	ON	1-2

★ Note: If Cyrix 6x86 is being used, please check the CPU Date Code after 605.

★ Note: If you want to run 75, 83 or 100MHz in your system properly, it depends on your hardware configurations: CPU, SDRAM, Cards, etc.

3.7. CMOS RTC & ISA CFG CMOS SRAM

Built-in Real Time Clock (RTC) With 256B CMOS SRAM in M5819.

3.8. SPEAKER CONNECTOR INSTALLATION

There is a speaker in AT system for sound purpose. The 4-Pins connector **SPKR** is used to connect speaker. The speaker can work well in both direction of connector when it is installed to the connector **SPKR** on mainboard.

3.9. ACPI LED CONNECTOR INSTALLATION

This mainboard uses the existing power LED as ACPI LED .The ACPI LED will light on when system is power-on .The ACPI LED is off when the system is power-off. The ACPI LED will blink when system is in Green mode.This connector should be installed to ACPI LED jumper of the mainboard in correct direction.

3.10. HARDWARE RESET SWITCH CONNECTOR INSTALLATION

The RESET switch on panel provides users with HARDWARE RESET function which is almost the same as power-on/off. The system will do a cold start after the RESET switch is pushed and released by user. The RESET switch is a 2 PIN connector and should be installed to **RES** on mainboard.

3.11. GREEN FUNCTION INSTALLATION

There is one jumper for the purpose of power saving, **GN**, to indicate the power saving function . This mainboard uses the existing power LED as ACPI LED . If the ACPI LED is blinking, the system is in green mode. The **GN** switch will force the system into green mode .

3.12. PERIPHERAL DEVICE INSTALLATION

After installation of the device and setup of the jumpers, the mainboard can be mounted into the case and fixed by screw. To complete the mainboard installation, the peripheral devices could be installed now. The basic system needs a display interface card and a storage device.

If a PCI - Bus device is to be installed in the system, any one of three PCI - Bus slots can be used for Slave or Master PCI - Bus device.

After installing the peripheral device, the user should check everything again and prepare to power-on the system.

