# ***Santafe-MV*** *Motherboard Hardware Document*

*Jan. 29, 2001*

*Revision 0.99*

## *Document Revision History*

| Released date | Revision | Description |
|---|---|---|
| June 12, 2000 | Rev. 0.9 | First prepared for this document.<br>This document describes the major specification of the ***Santafe*** motherboard and the functional feature to be extended by the customer.<br>The motherboard revision number is EVT1 |
| January 9, 2001 | Rev. 0.93 | *Santafe* motherboard has come to be divided to ***Santafe-MV*** & ***Santafe-M*** & ***Santafe-L***. HW Document is divided for each model. Contains major specifications for ***Santafe-MV*** motherboard EVT2. |
| January 29, 2001 | Rev. 0.99 | Contains major specifications for ***Santafe-MV*** motherboard Rev.A. |
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### *User's Notice*

## ***Contents of Table***

# I. Introduction

The *Santafe-KM* mATX motherboard offers a time-to-market consumer desktop solution featuring the AMD SocketA processor with the 200MHz front side bus and VIA KM133 chipset. The Santafe-KM motherboard was designed to have highly minimized system cost, so it is a good solution for a value PC system. Integrated AGP graphics controller core and PCI audio solution with AC97 Codec make the expensive graphic and audio add-in cards unnecessary. After all, the Santafe-KM motherboard is a good solution for the PC users with an affordable price.

## 1. General description

- Motherboard
  - PCB size in the mATX form factor
  - 228mm * 238mm * 1.6t (4 Layers)

- Processors
  - AMD socketA processors (Athlon & Duron)

- Main Chipset
  - System Core (North bridge)
    **- VIA KM133** (Includes savage4-pro video controller core)
  - Super I/O & Integrated Peripheral PCI Controller (South Bridge)
    **- VIA VT82C686A**
  - Audio : SoundBlaster Pro Hardware and Direct Sound AC97 Audio at VT82C686A and CS4299 Codec
  - DC-DC Converter : Intersil HIP6302 + HIP6601
  - Clock : Cypress W230
  - EtherNet : Realtek RTL8139C

- Memory Configuration
  - System Memory
    - Four banks (2 DIMM) of 64-Bits Advanced Memory Controller supporting PC100
    - DRAM interface runs at 100MHz speed with 200MHz FSB
  - Flash Memory : Programmable 2MB Flash memory

- I/O Features
  - Integrated standard I/O ports in the rear side
    - One multi-mode parallel port
    - One FIFO serial port
    - PS/2 style keyboard and mouse ports
    - Stacked two USB ports & one RJ-45 jack
    - Three audio jack for Line-In, Line-Out and MIC-In
  - Other integrated extended I/O ports
    - Two USB port & one joystick port (both in header type)
    - One FIFO serial port in header type
    - One TV-Out header
    - One Speaker-Out port and one S/PDIF port (both in header type)
    - One CD-Audio-In port and one AUX-In port
    - One TV-Audio-Out port

- UltraDMA-33 / 66 Master Mode PCI EIDE Controller
  - Transfer rate up to 33MB/sec to cover PIO mode 4, multi-word DMA mode 2, and Ultra DMA-33/66 interface
  - Increased reliability using UltraDMA-66 transfer protocol
  - Support ATAPI compliant devices including DVD devices
  - Dual channel master mode PCI supporting four Enhanced IDE devices

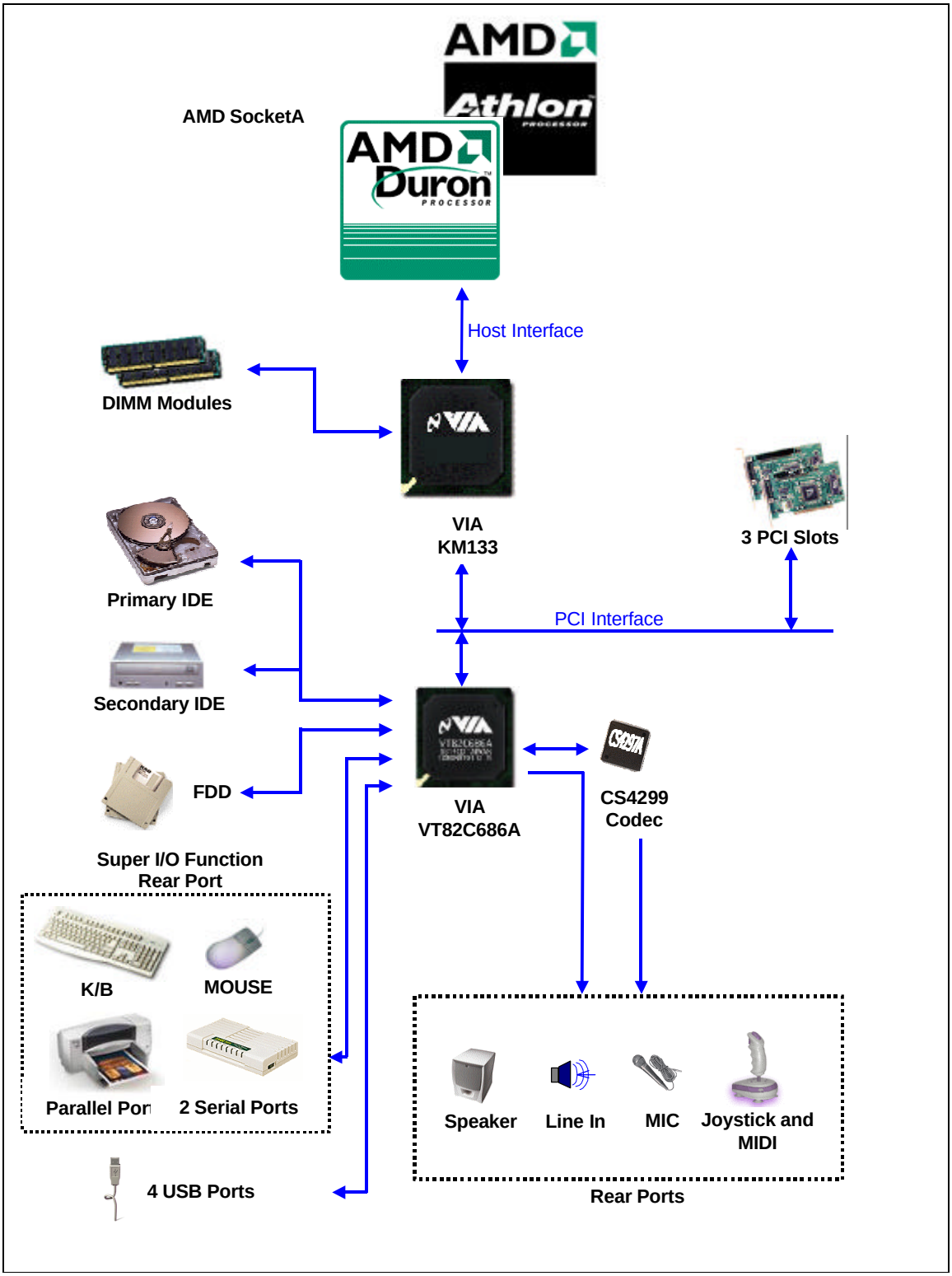
❑ Audio Subsystem (Manufacturer Option)
- **Built in PCI Audio Controller in VIA VT82C686A and CS4299 Codec**
  - SoundBlaster Pro Hardware and Direct Sound Ready AC97 Digital Audio Controller
  - Dual full-duplex Direct Sound channels between system memory and AC97 link
  - 32 byte FIFO for each direct sound channel

❑ Graphic Subsystem (AGP)
- Full Featured Accelerated Graphics Port (AGP) Controller
  - Supports full AGP v2.0 capability for maximum bus utilization including 2x and 4x mode transfers
  - Supports SideBand Addressing (SBA) mode (non-multiplexed address / data)
  - Supports 266 MHz 4x mode for AD and SBA signaling
  - Pipelined split-transaction long-burst transfers up to 1GB/sec

❑ Graphic Subsystem (on chip)
- Integrated S3 Savage4 AGP Graphics Controller core

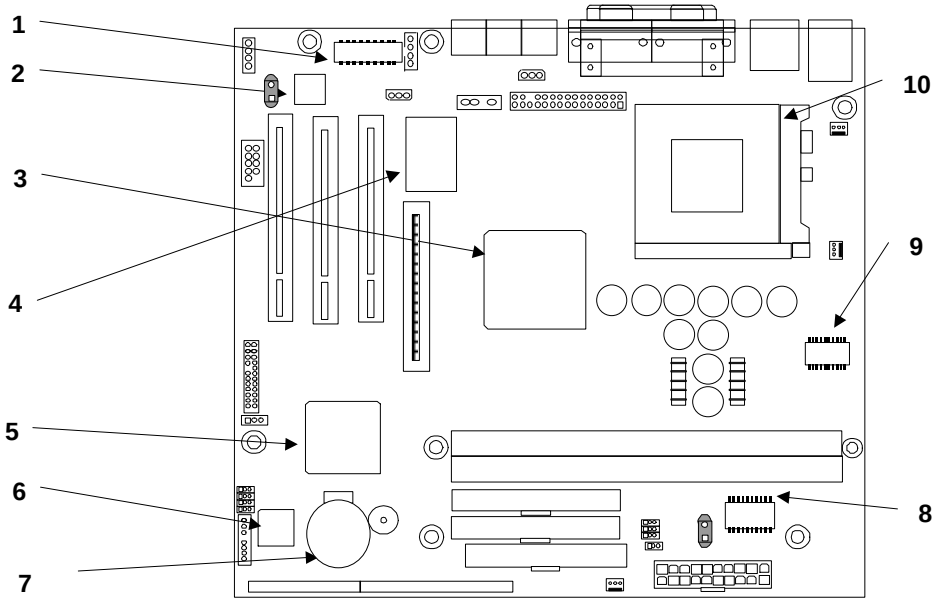
- Optimized Shared Memory Architecture (SMA)
- From 2 to 32 MB frame buffer using system memory
- Floating point triangle setup engine
- Single cycle 128-bit 3D architecture
- 8M triangles/second setup engine
- 140M pixels/second trilinear fill rate
- Full AGP 4x, including sideband addressing and execute mode
- S3 DX6 texture compression (S3TC)
- Next generation, 128-bit 2D graphics engine
- High quality DVD video playback
- Flat panel monitor support
- 2D/3D resolutions up to 1920x1440

## 2. Functional Block Diagram



# II. System Overview

## 1. Major Units




1. Audio Power AMP : TPA1517
2. AC97 Codec : CS4299
3. North bridge : KM 133
4. PCI Ethernet controller : RTL8139
5. South bridge : VT82C686A
6. Flash ROM : W29C020P-12
7. Battery : CR2032
8. Clock generator : W230
9. DC-DC Converter : HIP6302
10. CPU Socket : AMD SocketA

# 2. Upgradeability

## 2-1. Processor

*Santafe-KM* motherboard provides the 462pin SocketA which supports Athlon & Duron and is not backward compatible with ZIF socket-7 processors. The voltage regulator on the motherboard is programmed to output the required voltage by the processor itself through the processor's VID pin.

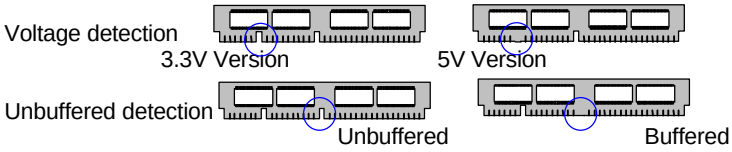
- ❑ Suppported AMD SocketA Processors : Athlon, Duron

## 2-2. Memory

Santafe-KM motherboard has two, dual inline memory module (DIMM), minimum 16MB to maximum 256MB memory size. The BIOS detects the memory type, size, and speed through SMBUS interface between the core chipset and DIMM module automatically.

The motherboard supports the following memory features

- 3.3V and unbuffered 168-pin DIMM




- DRAM interface synchronous with host CPU (200 MHz)
- Supports SDRAM memory types
- Different DRAM types may be used in mixed combinations
- Different DRAM timing for each bank

## 2-3 BIOS

❑ Flash memory organization

The motherboard uses a Phoenix BIOS, which is stored in the flash memory and can be upgraded using a disk-based program. An old version of the BIOS can be updated to the newer version using the Flash Memory Update utility in a floppy diskette.

| Address (Hex) | Size | Functional description |
|---|---|---|
| FFFFC000 – FFFFFFFF | 16KB | Main BIOS block#1 |
| FFFFA000 – FFFFBFFF | 8KB | ESCD |
| FFFC0000 – FFF9FFFF | 232KB | Main BIOS block#2 |

<Simplified flash memory address map>

❑ On-board device management

The BIOS enables or disables the devices on the motherboard with reference to the values of the contents in CMOS setup menu. User can also disable the CMOS setup by setting the corresponding jumper (described in **III-1 Motherboard Jumper Setting** section).

| Device | Description | CMOS setup menu | Default value |
|---|---|---|---|
| PS/2 Mouse | VIA VT82C686A | Enabled / Disabled / Auto Detect | Auto Detect |
| USB 2 Device | VIA VT82C686A | Enabled/ Disabled | Enabled |
| On board FDC | VIA VT82C686A | Enabled / Disabled / Auto | Enabled |
| On board serial A | VIA VT82C686A | Enabled/ Disabled | Enabled |
| On board serial B | VIA VT82C686A | Enabled/ Disabled | Enabled |
| On board parallel | VIA VT82C686A | Enabled/ Disabled | Enabled |
| Audio Codec | VIA VT82C686A | Enabled / Disabled / Auto | Auto |
| Midi Port | VIA VT82C686A | Enabled/ Disabled | Enabled |
| Game Port | VIA VT82C686A | Enabled/ Disabled | Enabled |
| On board LAN | RTL8139 | Enabled/ Disabled | Enabled |

<CMOS setup options for on-board devices>

## 2-4. Expansion Slot

❑ On-board PCI devices information

The Santafe-KL motherboard has integrated PCI devices and AGP graphics controller core, and three PCI slots for the expansion purpose.

| Bus number | Device number | Function number | Device |
|---|---|---|---|
| 00 | 00h | 00 | Host/PCI Bridge(VIA KL133) |
| 00 | 01h | 00 | AGP Controller |
| 00 | 07h | 00 | PCI/ISA bridge (VT82C686A) |
| 00 | 07h | 01 | IDE bus master (VT82C686A) |
| 00 | 07h | 02 | USB Controller 1(VT82C686A) |
| 00 | 07h | 03 | USB Controller 2(VT82C686A) |
| 00 | 07h | 04 | Power management (VT82C686A) |
| 00 | 07h | 05 | AC97 Controller(VT82C686A) |
| 01 | 00h | 00 | AGP Slot (Not used for KL) |
| 00 | 13h | 00 | PCI slot1 |
| 00 | 12h | 00 | PCI slot2 |
| 00 | 10h | 00 | PCI slot3 |
| 00 | 0Dh | 00 | RTL8139 |

<On-board PCI devices address map>

❑ PCI interrupt & master number routing map

VIA VT82C686A PCI/ISA bridge has four programmable interrupt request input signals. Any PCI interrupt source connects to one of these interrupts signals and assigned to the free proper interrupt number by PnP BIOS.

| SB INT signals | First PCI slot | Second PCI slot | Third PCI slot | On Board Ethernet | VT82C686A |
|---|---|---|---|---|---|
| PIRQA | INTA | INTB | INTC | INTC | |
| PIRQB | INTB | INTC | INTD | | |
| PIRQC | INTC | INTD | INTA | | INTC |
| PIRQD | INTD | INTA | INTB | | INTD |
| Master | REQ0 | REQ1 | REQ2 | REQ3 | |
| IDSEL | AD30 | AD29 | AD27 | AD24 | AD18 |

☞ *VIA VT82C694Z supports up to five REQ and GNT signals.*

## 2-5. Advanced Configuration and Power Interface (ACPI)

The motherboard and system BIOS support the ACPI that requires an ACPI-aware operating system such as Windows-NT 5.0 or Windows 98/ME. ACPI feature include

- Plug and play functionality normally contained in the BIOS
- A soft-off feature that enables operating system to power off the computer
- Indication LED for normal mode (Green) and suspend mode (Blinking Green) but this function is dependent on the LED logic or BIOS control.
- Support multiple wakeup events

❑ Wakeup devices and operations

| Wakeup devices | Wakeup operations |
|---|---|
| Power switch | Wakeup from sleep state and power-off status |
| LAN | Wakeup from sleep state |
| Modem | Wakeup from sleep state |

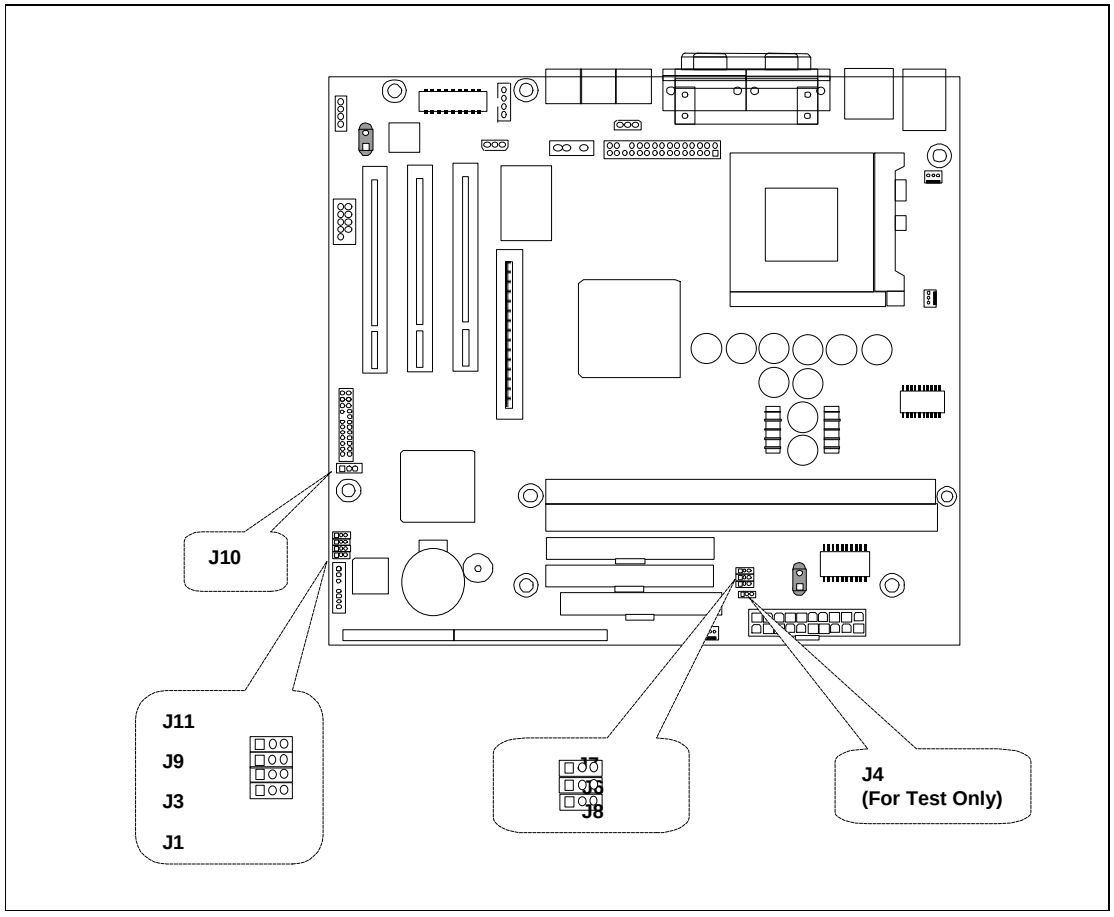
## 2-6. Manufacturing Options

The motherboard has several manufacturing options according to OEM/ODM requirement. Make sure that these options can be applied in the assembly stage, and it's impossible to upgrade or change in the customer field.

| Option items | Selectable functionality | Feature changes |
|---|---|---|
| Joystick port | Front side | |
| USB port | Front side | |

# III. Jumpers & Connectors Descriptions

## 1. Motherboard Jumpers Settings




### 1-1. Selection for Processor CPU Clock

- AMD SocketA Processor sets the core to bus frequency ratio for itself.

### 1-2. Clock Setting (J6, J7, J8)

| J8 | J7 | J6 | Host (MHz) | PCI (MHz) | Spread Spectrum(%) |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 100.0 | 33.3 | -0.5 |
| 1 | 1 | 0 | 100.0 | 33.3 | +-0.25 |
| 1 | 0 | 1 | 100.0 | 33.3 | +-0.5 |
| 1 | 0 | 0 | 95.0 | 31.7 | Off |
| 0 | 1 | 1 | 133.3 | 33.3 | -0.5 |
| 0 | 1 | 0 | 133.3 | 33.3 | +-0.25 |
| 0 | 0 | 1 | 133.3 | 33.3 | +-0.5 |
| 0 | 0 | 0 | 102.0 | 34.0 | Off |

**Note : '1' indicates connecting the pin #1 & #2, '0' connecting pin #2 & #3.**

### 1-3. OEM/ODM Selector (J1, J3)

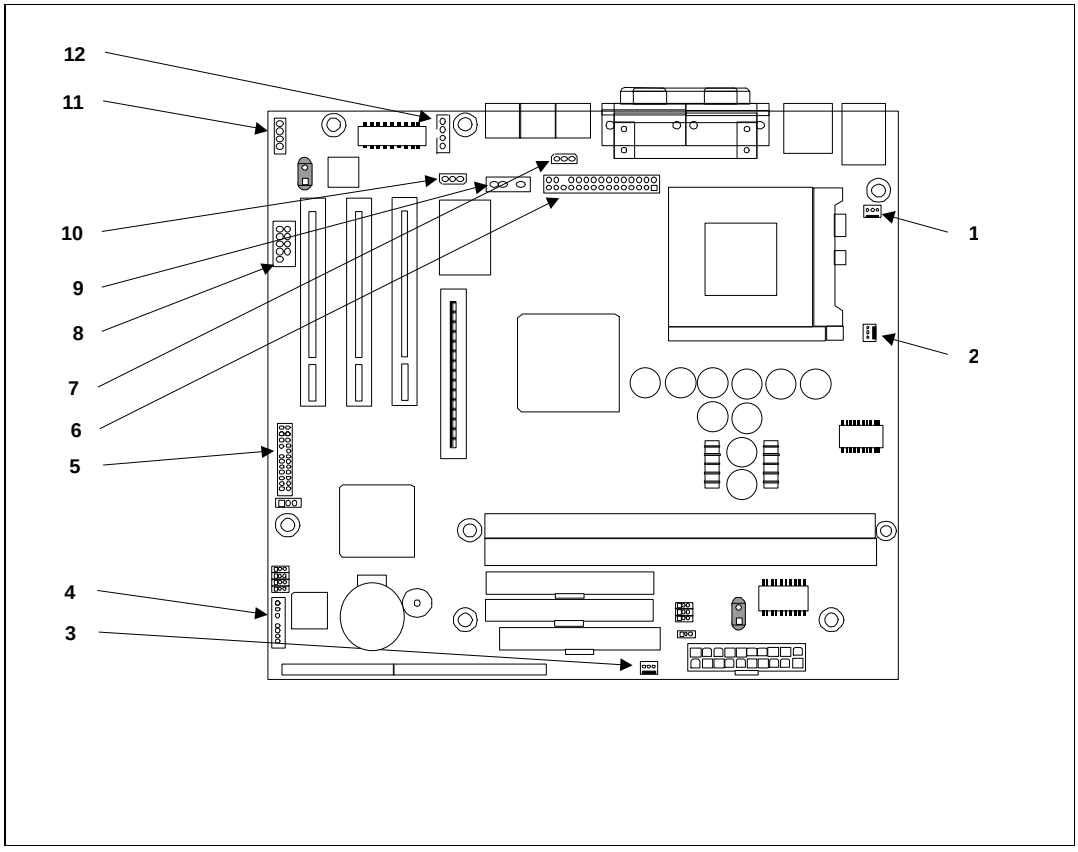
The jumpers (J1 & J3) are optional parts for the OEM/ODM logo message selector(Not used - disabled by BIOS).

### 1-3. Configuration Selector (J9, J10, J11)

| Function | | 1-2 | 2 – 3 |
|---|---|---|---|
| CMOS CLEAR | J9 | Normal | CMOS Clear |
| PASSWORD | J10 | Normal | Password Clear |
| SETUP | J11 | Normal | Setup Disable |

## 2. I/O Headers & Connectors Descriptions

### 2-1. Motherboard Internal Connectors




❑ **1** : CPU FAN connector (CN53)


CN53

| *Pin number* | *Signal description* |
|---|---|
| 1 | GND |
| 2 | FAN control |
| 3 | Tachometer (Speed) |

❑ **2** : Power Supply FAN connector (CN105)


CN105

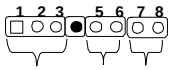
| *Pin number* | *Signal description* |
|---|---|
| 1 | GND |
| 2 | FAN control |
| 3 | GND |

❑ **3** : System Chassis FAN connector (CN54)

CN54

| *Pin number* | *Signal description* |
|---|---|
| 1 | GND |
| 2 | FAN control |
| 3 | Tachometer (Speed) |

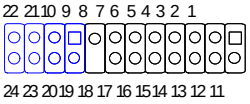
❑ **4** : Indicator Header (CN73) (TG Option)



PWR HDD DC/SW

| *Pin* | *Signal description* |
|---|---|
| 1 | NC |
| 2 | GND |
| 3 | LED POWER |
| 4 | NC |
| 5 | LED POWER |
| 6 | HDD access signal |
| 7 | GND |
| 8 | Power-ON switch signal |

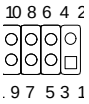
❑ **5** : Joystick & USB connector (CN104) ; (***Not used in ATX form Factor)***




| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | VCC | 11 | VCC |
| 2 | JAB(1) | 12 | JBB(1) |
| 3 | JACX | 13 | JBCX |
| 4 | GND | 14 | MIDI OUT |
| 5 | GND | 15 | JBCY |
| 6 | JACY | 16 | JBB(2) |
| 7 | JAB(2) | 17 | MIDI IN |
| 8 | VCC | 18 | Key |
| 9 | GND(2) | 19 | USB – DATA(2) |
| 10 | USB + DATA(2) | 20 | VCC(2) |
| 21 | USB + DATA(3) | 23 | VCC(3) |
| 22 | USB – DATA(3) | 24 | GND(3) |

**Note : Blue-colored pins are for USB.**

❑ **6** : TV Out (CN100)




| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | VCC | 2 | TV_DATA(0) |
| 3 | GND | 4 | GND |
| 5 | TV_DATA(9) | 6 | TV_DATA(1) |
| 7 | TV_DATA(10) | 8 | VCC |
| 9 | TV_BLANK | 10 | TV_DATA(2) |
| 11 | TV_DATA(11) | 12 | TV_DATA(3) |
| 13 | TV_VSYNC | 14 | GND |
| 15 | TV_HSYNC | 16 | TV_DATA(4) |
| 17 | RESET | 18 | TV_DATA(5) |
| 19 | TV_CLK_IN | 20 | TV_DATA(6) |
| 21 | TV_CLK_OUT | 22 | TV_DATA(7) |
| 23 | I2C_DATA | 24 | VCC |
| 25 | I2C_CLK | 26 | Key |
| 27 | GND | 28 | TV_DATA(8) |
| 29 | TV_DETECT | 30 | SEL_PAL |

❑ **7** : AUX In (CN106)

| *Pin* | *Signal description* |
|---|---|
| 2 | LEFT |
| 3 | GND |
| 4 | RIGHT |

**Note : 4-pinned connector is also available for the same PCB, but 3-pinned connector is used in Santafe. - Pin #1 is not used.**

❑ **8** : Serial port (COM2 : CN25)

| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | DCD | 6 | DSR |
| 2 | RXD | 7 | RTS |
| 3 | TXD | 8 | CTS |
| 4 | DTR | 9 | RI |
| 5 | GND | 10 | KEY |

❑ **9** : Speaker Out (CN107)

| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | RIGHT | 3 | KEY |
| 2 | GND | 4 | LEFT |

❑ **10** : CD Sound (CN44)

| *Pin* | *Signal description* |
|---|---|
| 2 | LEFT |
| 3 | GND |
| 4 | RIGHT |

**Note : 4-pinned connector is also available for the same PCB, but 3-pinned connector is used in Santafe. - Pin #1 is not used.**

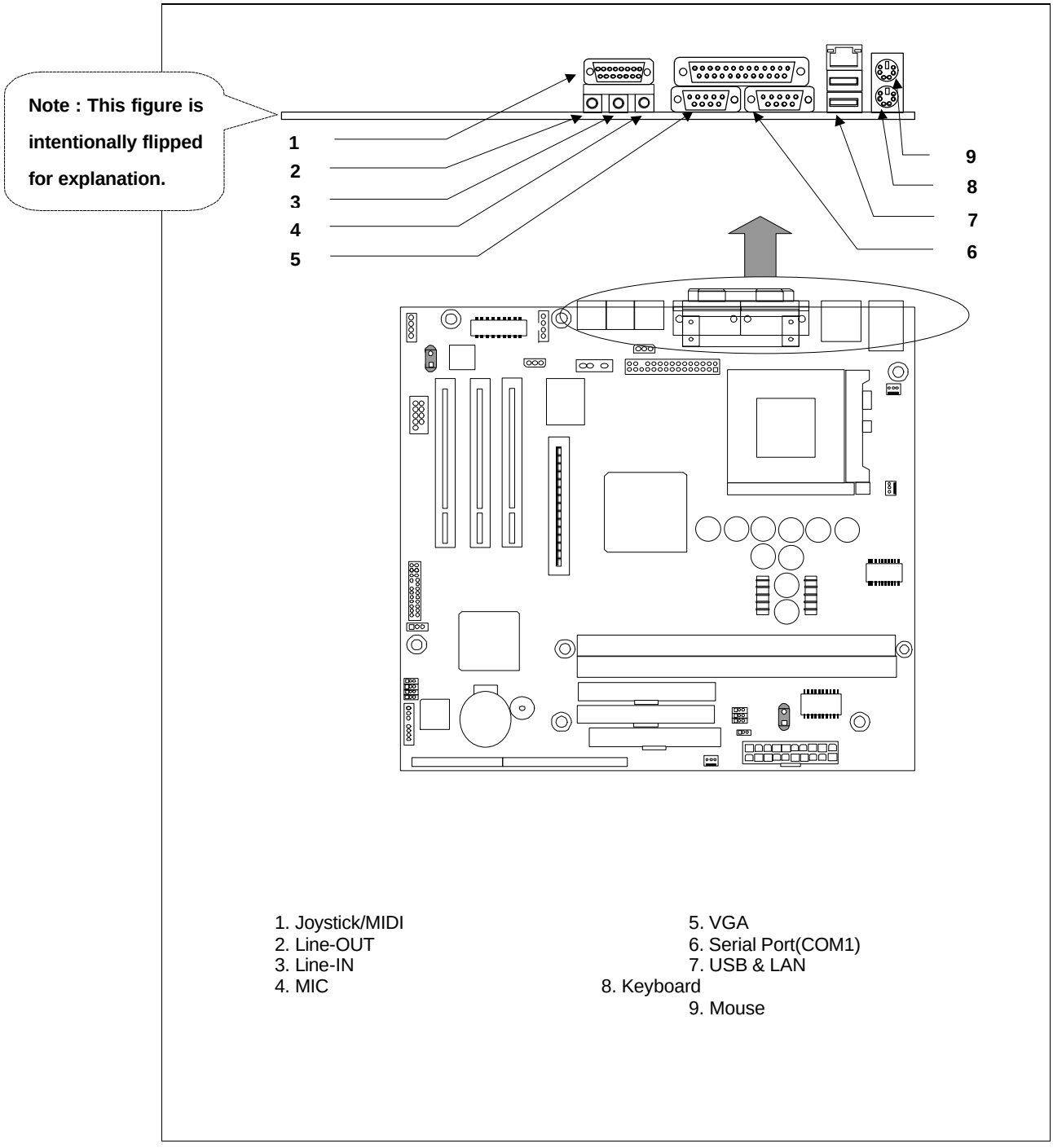
❑ **11** : S/PDIF OUT (CN58)

| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | S/PDIF DATA | 3 | NC |
| 2 | VCC | 4 | GND |

❑ **12** : TV Audio In (CN45 : Only for TG models)

| *Pin* | *Signal description* | *Pin* | *Signal description* |
|---|---|---|---|
| 1 | LEFT | 3 | GND |
| 2 | GND | 4 | RIGHT |

**2-2. Motherboard External I/O Port**




1. Joystick/MIDI
2. Line-OUT
3. Line-IN
4. MIC
5. VGA
6. Serial Port(COM1)
7. USB & LAN
8. Keyboard
9. Mouse

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