*TriGem Micro-ATX Motherboard (**NARA-M**)*
Hardware Document

November 18, 2000

Revision 1.1

Document Revision History

Released date	Revision	Description
May 16, 2000	Rev. 0.9	First prepared for this document. This document describes the major specification of the ***NARA-M*** motherboard and the functional feature to be extended by the customer. The motherboard revision number is EVT1
July 18,2000	Rev. 1.0	Mass Product
Nov 18,2000	Rev. 1.1	- Updated CPU Specification - Change the Chipset Mark for Vt82C694X(z) - Changed the Clock gen. From ICworks W144H to ICS9248CF-98

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Contents of Table

I. Introduction

The *NARA-M Micro*-ATX motherboard offers a time to market consumer and corporate desktop solution featuring the Intel Pentium-III FC-PGA processor with 66/100/133MHz front side bus and the VIA VT82C694Z sets in an Micro-ATX low profile motherboards.

The *NARA-M* motherboard was designed to be highly minimized system cost. In this effort, ATX gives the greater space economy and more affordable systems. Integrating 4X AGP slot, as well as PCI audio solution with AC97 Codec onto the motherboard eliminates the need for more expensive graphic and audio add-in cards. The end result is a system platform with a primary component level of integration with translates into affordable solution for entry level users.

1. General description

- Motherboard
  - Small PCB size in the Micro ATX form factor (ATX V1.2 form factor)
  - 228mm * 238mm * 1.6t (4 Layers)

- Processor
  - Intel Pentium-III FC-PGA 500E up to 1GEB MHz processor support

- Main Chipset
  - System Core (North bridge)
    - VIA VT82C694Z
  - PCI Super I/O Integrated Peripheral Controller (South Bridge)
    - VIA VT82C686A
  - Audio : SoundBlaster Pro Hardware and Direct Sound AC97 Audio at VT82C686A and CS4297A Codec or **CS4281 PCI Audio Controller and CS4297A Codec**
  - Super I/O : Integrated Super I/O Controller in VT82C686A
  - DC-DC Converter: Semtech SC1164
  - Clock : ICS 9248-98 (66MHz/100MHz/133MHz host clock support)

- Memory Configuration
  - System Memory
    - Four banks (2 DIMM) of 64-Bits Advanced Memory controller supporting PC100/PC133 SDRAM, VCM SDRAM, and ESDRAM with max 2GB(512Mb DRAM technology)
    - DRAM interface runs synchronous (66/66, 100/100, 133/133) mode and pseudo-synchronous (66/100, 100/66, 100/133, 133/100) mode with FSB
  - Flash Memory : Programmable 2MB Flash memory

- I/O Feature
  - Integrated standard I/O functions in the rear side
    - One multi-mode parallel port
    - Two FIFO serial ports
    - PS/2 styles keyboard and mouse port
    - Tow USB ports
    - Three audio jack for Line input, Speaker output and MIC input
  - Integrated extended I/O functions
    - Two USB port (Header Connector type)

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

- Audio Subsystem (Manufactory Option parts)
  - **Built in PCI Audio Controller in VIA VT82C686A and CS4297A Codec**
    - SoundBlaster Pro Hardware and Direct Sound Ready AC97 Digital Audio Controller
    - Dual full-duplex Direct Sound channels between system memory and AC97 link
    - PCI master interface with scatter / gather and bursting capability

- 32 byte FIFO of each direct sound channel
- Standard v1.0 or v2.0 AC97 Codec interface for single or cascaded AC97 Codec

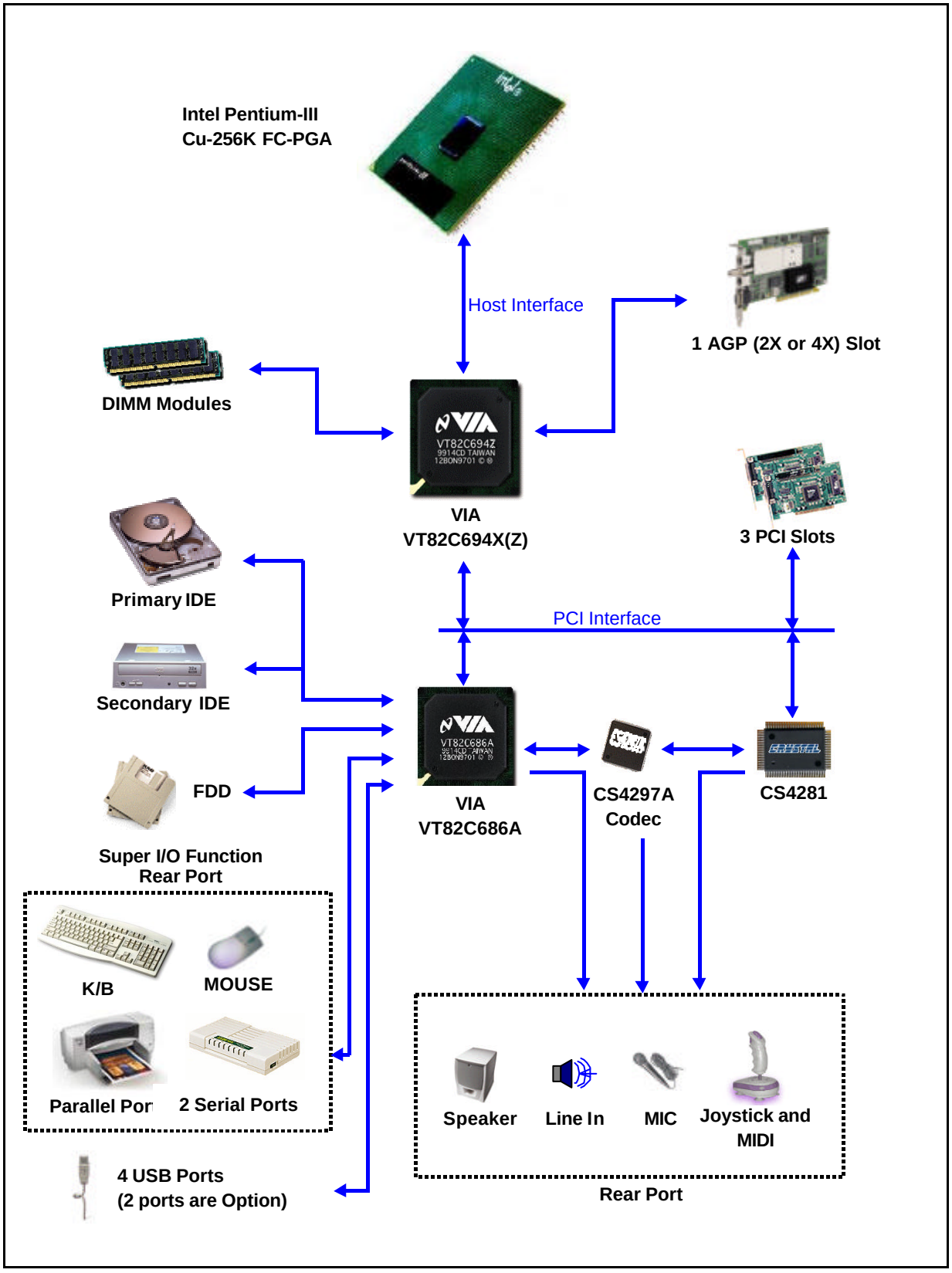
- **Crystal CS4281 PCI audio controller and CS4297A Codec(Default)**
  - PCI version 2.1 bus master
  - MPU-401 interface, FM synthesizer, and game port
  - Full duplex operation
  - PC 97 and PC 98 Compliance (and compliance with preliminary PC 99)
  - Digital Docking Solution with AC 97 2.0 Codec

☞ *Refer to* PCI interrupt & master number routing map *part at pages 10*

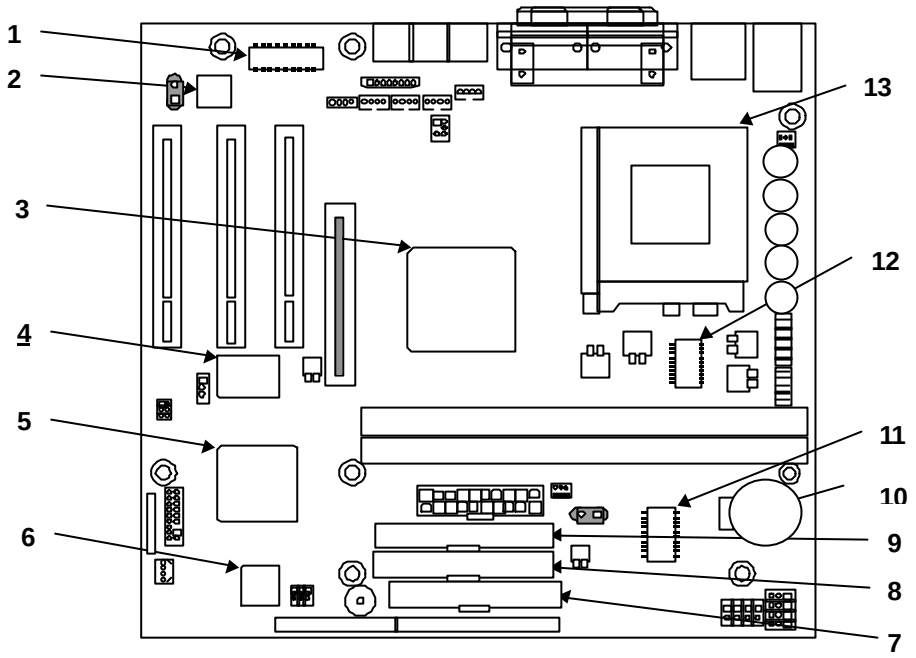
❑ Graphic Subsystem

- 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

II. System Overview



1. Major Units



1. Audio Power AMP	: TPA1517
2. AC97 Codec	: CS4297A
3. North bridge	: VT82C694X(z)
4. PCI Sound	: CS4281
5. South bridge	: VT82C686A
6. Flash ROM	: W29C020P-12
7. FDD Connector	: FDD (34 Pins)
8. IDE Connector2	: Secondary IDE (40 Pins)
9. IDE Connector1	: Primary IDE (40 Pins)
10. Battery	: CR2032
11. Clock generator	: ICS9248-98
12. DC-DC Converter	: SC1164
13. CPU Socket	: Intel FC-PGA Pentium III processor

2. Upgradeability

2-1. Processor

NARA-M motherboard provides the 370pin PGA370 socket that is not backward compatible with ZIF socket-7 processors The Processor's VID pin automatically program the voltage regulator on the motherboard to the required processor voltage. The motherboard supports processors that run internally at Variable speed clock.

❑ Supported Intel Pentium-III Processors (PGA-370 Socket Type)

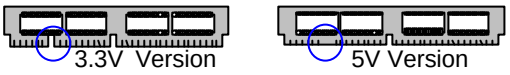
- Intel : Cu-256K **500E MHz** up to **1GEB MHz** (FC-PGA Type)
  - ☞ *E: Processor with Advanced transfer code*
    B: 133 MHz system bus frequency

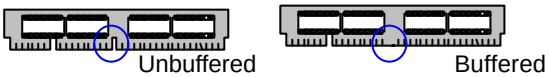
2-2. Memory

The motherboard has two, dual inline memory module (DIMM), minimum 16MB to maximum 512MB memory size. The BIOS can automatically detect the memory type, size, and speed through SMBUS interface between the core chipset and DIMM module.

The motherboard supports the following memory features

- 3.3V and unbuffered 168-pin DIMM

Voltage detection 

Unbuffered detection 

- DRAM interface synchronous with host CPU (66/100/133 MHz) or AGP (66MHz) for most flexible configuration.
- Supports FP, EDO, SDRAM, ESDRAM, and VCM SDRAM memory types
- Different DRAM types may be used in mixed combinations
- Different DRAM timing for each bank
- 4 banks up to 2 GB DRAMs at 100 / 133 MHz

2-3 BIOS

The motherboard uses a TriGem-AMI BIOS, which is stored in flash memory and can be upgraded using a disk-based program. A new version of the BIOS can be upgraded from a diskette using the Flash Memory Update utility.

❑ Flash memory organization

Address (Hex)	Size	Functional description
FFFFC000 - FFFFFFFF	16KB	Boot block
FFFF8000 - FFFBFFFF	16KB	NVRAM block
FFFC0000 - FFF7FFFF	224KB	Main BIOS block

❑ On-board device management

The BIOS can manage the devices on the motherboard over the CMOS setup menu. However, the corresponding jumper as described Jumper setting section later can disable the built-in Audio controller.

Device	Description	CMOS setup menu	Default value
Internal Cache	Processor	Enable / Disable	Enabled
PS/2 Mouse	VIA VT82C686A	Enable / Disable	Enabled
USB Function	VIA VT82C686A	Enable / Disable	Enabled
On board FDC	VIA VT82C686A	Auto / Enable / Disable	Auto
On board serial	VIA VT82C686A	Auto / 3F8 / 2F8 / 3E8 / 2E8	Auto
On board parallel	VIA VT82C686A	Auto / Disable / 378 / 278 / 3BC	Auto
On board IDE	VIA VT82C686A	Disable / Primary / Secondary / Both	Both

2-4. Expansion Slot

The motherboard support PCI and AGP function. PCI functions are extended to the additional slot with three PCI, and AGP function is designed in the motherboard with AGP graphics controller.

❑ PCI configuration space map

Bus number	Device number	Function number	Device
00	00	00	Host/PCI Bridge(VIA VT82C694Z)
00	01	00	AGP Controller
00	07	00	PCI/ISA bridge (VT82C686A)
00	07	01	IDE bus master (VT82C686A)
00	07	02	USB Controller 1(VT82C686A)
00	07	03	USB Controller 2(VT82C686A)
00	07	04	Power management (VT82C686A)
00	0D	00	PCI Audio(CS4281)
01	00	00	AGP Slot
00	13	00	PCI slot1
00	12	00	PCI slot2
00	11	00	PCI slot3

❑ PCI interrupt & master number routing map

VIA VT82C686A PCI/ISA bridge has five 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 PCI Audio	VT82C686A
PIRQA	INTA	INTB	INTC		
PIRQB	INTB	INTC	INTD		
PIRQC	INTC	INTD	INTA		
PIRQD	INTD	INTA	INTB		INTA
Master	REQ0	REQ1	REQ2	REQ4	
IDSEL	AD30	AD29	AD27	AD24	AD18

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 Window-NT 5.0 or Windows 98. ACPI feature include

- Plug and play and APM functionality normally contained in the BIOS
- Power management control of individual devices: add-in cards, hard disk drives, USB devices, and Video
- A soft-off feature that enables operating system to power off the computer
- Support for multiple wakeup events
- Indication LED for normal mode (Green), standby mode (Blinking Green), and suspend mode (Blinking Green) but this function is dependent on the LED logic.

❑ Wakeup devices and events

Wakeup device	Wakeup events and functionality
Power switch	Wakeup from Power-off status and power-off function
LAN	Wakeup from power-off status
Modem	Wakeup from power-off status
Sleep button	Wakeup from power-off status and go to suspend mode (option)

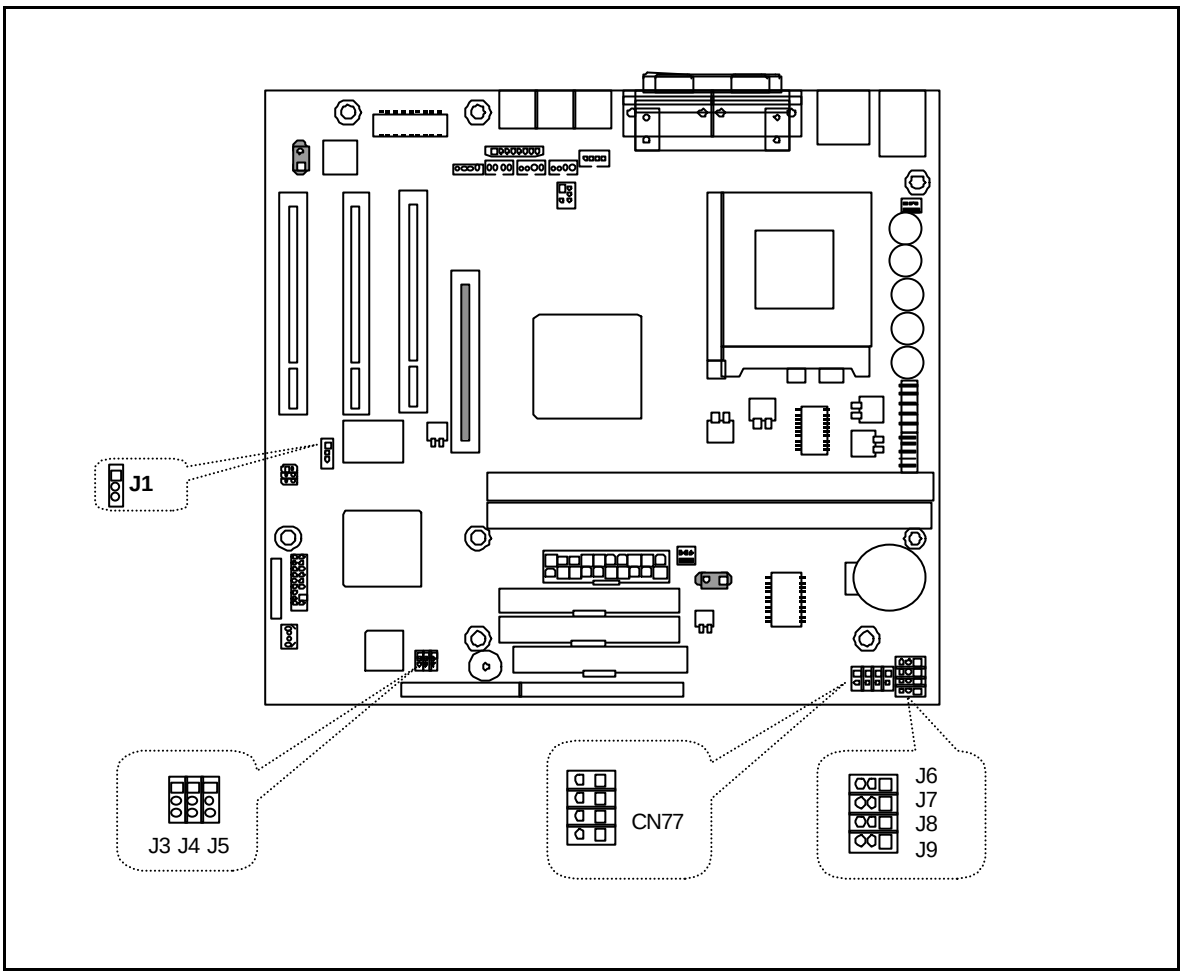
2-6. Manufacturing Options

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	
Sound function	PCI Audio & AC97 / On chip Sound & AC97	InstallCS4281 PCI Audio & CS4297A or Install CS4297A

III. Jumper & Connector Description

1. Motherboard Jumper Setting



1-1. Selection for Processor CPU Clock

- Intel Coppermine FC-PGA Processor is auto set the core to bus frequency ratio.
- Not used CN77, This is debugging option.

1-2. Other functionality

Jumper Pin	Function	**1-2**	2-3
J6	CMOS RAM function	**Enable write/save**	Clear CMOS RAM
J7	Password function	**Enable password**	Clear password
J8	CMOS setup function	**Enable to edit CMOS contents**	Disable to edit CMOS contents
J9	FDD write protect	**Enable to write data to Floppy disk**	Disable to write data to Floppy disk

1-3. On Board Audio device function

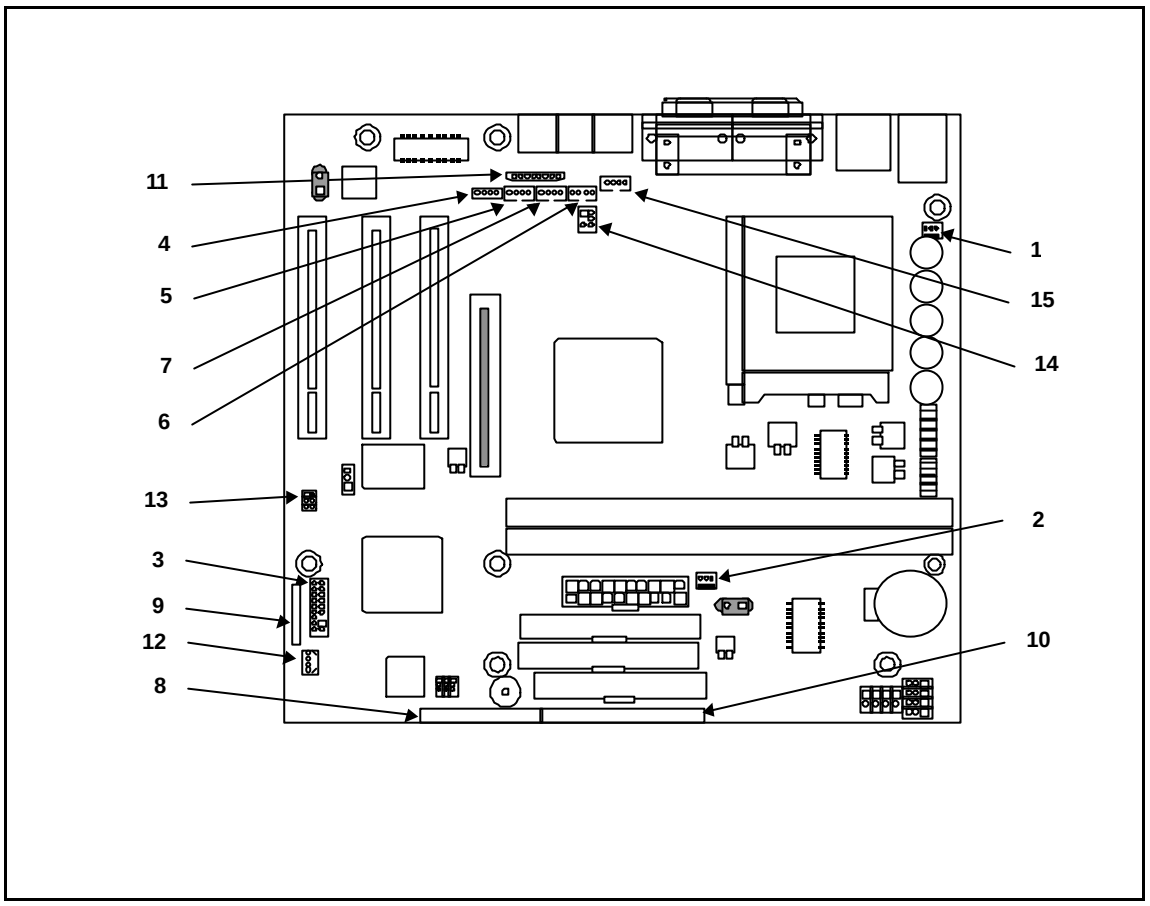
J1	On Board PCI audio device functionality
1-2***(default)***	***Enable PCI audio controller built in the motherboard***
2-3	Disable PCI audio controller built in the motherboard

1-4. OEM/ODM selector

The jumpers (J3, J4 & J5) will be optional parts for the OEM/ODM logo message selector.

2. I/O Header Connector Description

2-1. Motherboard Internal Connector



❑ **1** : CPU FAN connector (CN54)

CN54

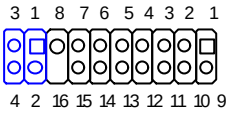
Pin number	*Signal description*
1	GND
2	FAN power
3	Tachometer (speed)

❑ **2** : System Chassis FAN connector (CN53)

CN53

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

❑ **3** : Joystick & USB connector (CN71) ; (***Do not used in ATX form Factor)***



Pin	*Signal description*	*Pin*	*Signal description*
1	VCC	9	VCC
2	GD(4)	10	GD(6)
3	GD(0)	11	GD(2)
4	GND	12	MIDI OUT
5	GND	13	GD(3)
6	GD(1)	14	GD(7)
7	GD(5)	15	MIDI IN
8	VCC	16	Key
1	GND	3	Positive DATA
2	Negative DATA	4	VCC

❑ **4** : Modem Sound (CN70)

CN70

Pin	*Signal description*	*Pin*	*Signal description*
1	MONO IN	3	GND
2	GND	4	MIC

❑ **5** : CD Sound (CN44)

Mitsumi CD (CN44)

Pin	*Signal description*	*Pin*	*Signal description*
1	GND	3	GND
2	Left Sound	4	Right Sound

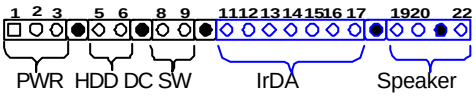
❑ **6** : LAN Wakeup (CN50)

Pin	*Signal description*	*Pin*	*Signal description*
1	+5VSB	3	LANWK
2	GND		

❑ **7** : Modem Wakeup (CN51)

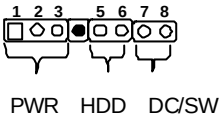
Pin	*Signal description*	*Pin*	*Signal description*
1	Modem Ring	3	+5VSB
2	GND		

❑ **8** : Indicator Header (CN48)



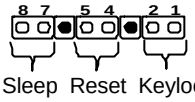
Pin	*Signal description*	*Pin*	*Signal description*
1	VCC	12	GND (Option)
2	PM indicator signal	13	IRTX (Option)
3	GND	14	VCC (Option)
4	Key	15	IRSEL (Option)
5	VCC	16	N.C
6	HDD access signal	17	GND (Option)
7	Key	18	Key (Option)
8	Power-ON switch signal	19	VCC (Option)
9	GND	20	GND (Option)
10	Key	21	N.C
11	IRRX (Option)	22	Speaker signal (Option)

❑ **9** : HPD Indicator Header (CN73) (TG Option)



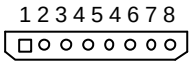
Pin	*Signal description*
1	NC
2	GND
3	LED POWER
4	NC
5	LED POWER
6	HDD access signal
7	GND
8	Power-ON switch signal

❑ **10** : Aux. Indicator Header (CN49) (Option)



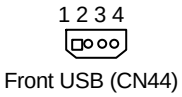
Pin	*Signal description*	*Pin*	*Signal description*
1	Key lock Signal to Super I/O	2	GND
3	Key	4	Reset signal
5	GND	6	Key
7	Sleep Function signal	8	GND

❑ **11** : Front Audio Control Connector (CN75) (Option) (***Do not used in ATX form Factor)***



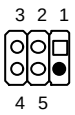
Pin	*Signal description*
1	LEFT_MIC_INPUT
2	+5VA
3	AGND
4	RIGHT_DAC_OUT
5	LEFT_DAC_OUT
6	AGND
7	NC
8	NC

❑ **12** : Front USB(3' rd) Connector (CN74) (Option) (***Do not used in ATX form Factor)***



Pin	*Signal description*
1	VCC
2	Negative DATA
3	Positive DATA
4	GND

❑ **13** : USB(4' rd) Connector (CN76) (Option)



Pin	*Signal description*
1	NC
2	GND
3	Positive DATA
4	VCC
5	Negative DATA

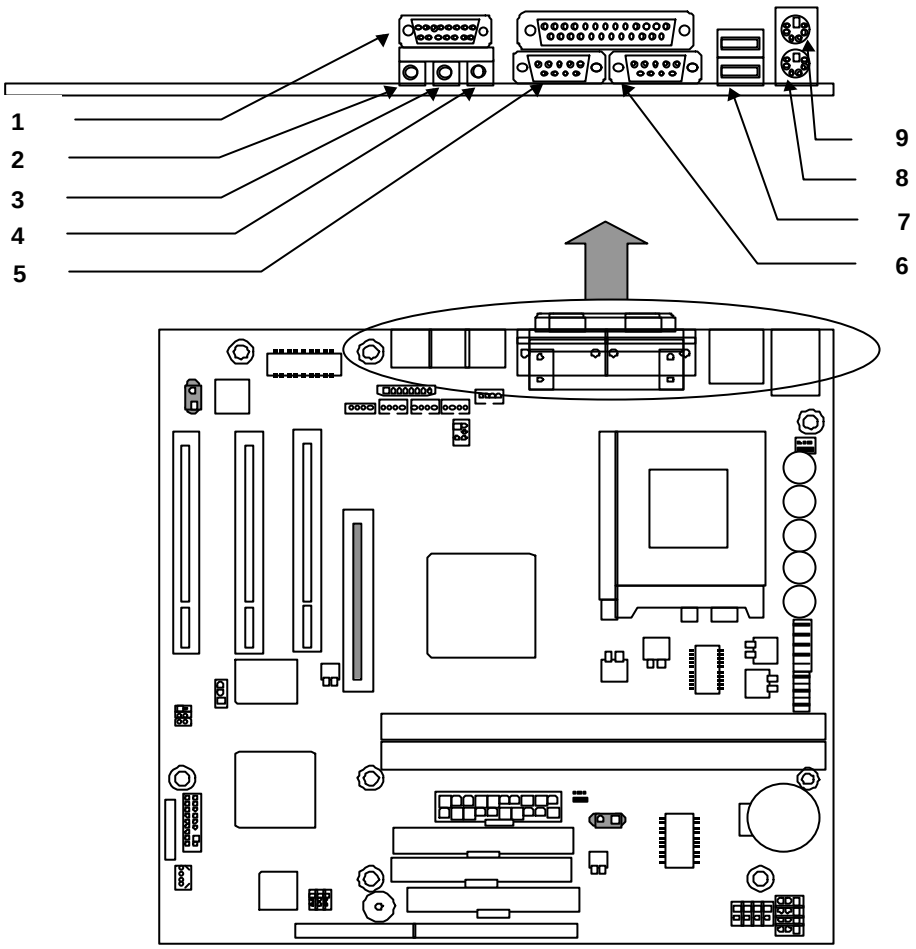
❑ **14** ; PC/PCI connector (CN23) ; ***Support Only SER_IRQ Pin***

Pin	*Signal description*	*Pin*	*Signal description*
1	N.C	4	N.C
2	GND	5	N.C
3	N.C	6	SER_IRQ

❑ **15** ; Video Sound (CN45)

Pin	*Signal description*	*Pin*	*Signal description*
1	Left Input Sound	3	GND
2	GND	4	Right Input Sound

2-2. Motherboard External I/O Port



1. Joystick/MIDI
2. Speak
3. Line-IN
4. MIC
5. Serial Port(COM2)
6. Serial Port(COM1)
7. USB
8. Keyboard
9. Mouse

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