Dublin *Motherboard Hardware Document*

August. 03, 2001

Revision 0.9

Document Revision History

Released date	Revision	Description
August 03, 2001	Rev. 0.9	First prepared for this document. This document describes the major specification of the ***Dublin*** motherboard and the functional feature to be extended by the customer. The motherboard revision number is EVT1.

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I. Introduction

The ***Dublin*** u-ATX motherboard offers a time-to-market consumer desktop solution featuring the Intel Pentium-4 processor in the 478 Pin package and the Northwood Processor with the 400MHz front side bus and Intel 845 Chipset. The ***Dublin*** motherboard was designed to have highly minimized system cost. Additional H/W platform features include AGP 4x mode, PC133 System memory, Ultra ATA/100, Low Pin Count (LPC) interface, Universal Serial Bus and PCI audio solution with AC97 CODEC make the expensive audio add-in cards unnecessary. The platform is also ACPI compliant and support Full-on, Stop Grant, STR, STD, and Soft-off power management states. After all, the ***Dublin*** motherboard is a good solution for the customers who want a PC with an affordable price.

1. General description

- ❑ Motherboard
  - PCB size in the u-ATX form factor
  - 9.6" * 9.6" * 1.6t (4 Layers)

- ❑ Processors
  - Intel Pentium-4 Processor in the 478 Pin Package/Northwood Processor

- ❑ Main Chipset
  - Intel Memory Controller Hub-MCH (North bridge)
    - Intel 82845
  - Intel I/O Controller Hub2-ICH2 (South Bridge)
    - Intel 82801BA
  - LPC I/O Controller : **SMSC SMC47M112**
  - Audio Subsystem : **AC 97 Link** for Audio and Telephony CODECs in **ICH2** and **Crystal CS4201 CODEC**
  - DC-DC Converter : **Intersil HIP6301** + **HIP6601A***2
  - Clock Generator : **ICS9250-38**(CK408)
  - EtherNet Controller : **ADMTek AN983B**

- ❑ Memory Subsystem
  - System Memory
    - Supports **up to 3 double-sided DIMMs** (6 device rows) with 64-bit data interface
    - Supports **up to 1.5GB using 256Mb** technology and **up to 3GB using 512Mb** technology
    - SDR-DRAM interface runs at **133MHz speed** with 400MHz FSB
  - Flash Memory : Programmable **4Mb Flash** memory for BIOS

- ❑ I/O Features
  - Integrated standard Bus interface slots
    - Three PCI slots
    - One AGP slot with 1.5V(Only 4x)
  - Integrated standard I/O ports in the **Rear side**
    - One multi-mode parallel port (LPT1)
    - One FIFO serial port (COM1)
    - PS/2 style Keyboard and Mouse ports
    - Stacked two USB ports (USB0,1) & One RJ-45 Jack for LAN
    - Three Audio jacks for Line-In, MIC-In, and Line-Out (or SPK-Out)
    - One Joystick port
  - Other integrated extended I/O ports (by the Header type)
    - 20 Pin Headers for Power Button/Sleep button/Power LED/HDD LED/Reset button/Key-Lock
    - Two USB ports (USB2,3)
    - One FIFO serial port (COM2)
    - One Speaker-Out port
    - One CD-Audio-In port and One AUX-In(for 2nd CD-In) port
    - One S/PDIF port
    - One Video Sound-In port
    - One Headphone port and One MIC-In port
    - One PC-PCI port

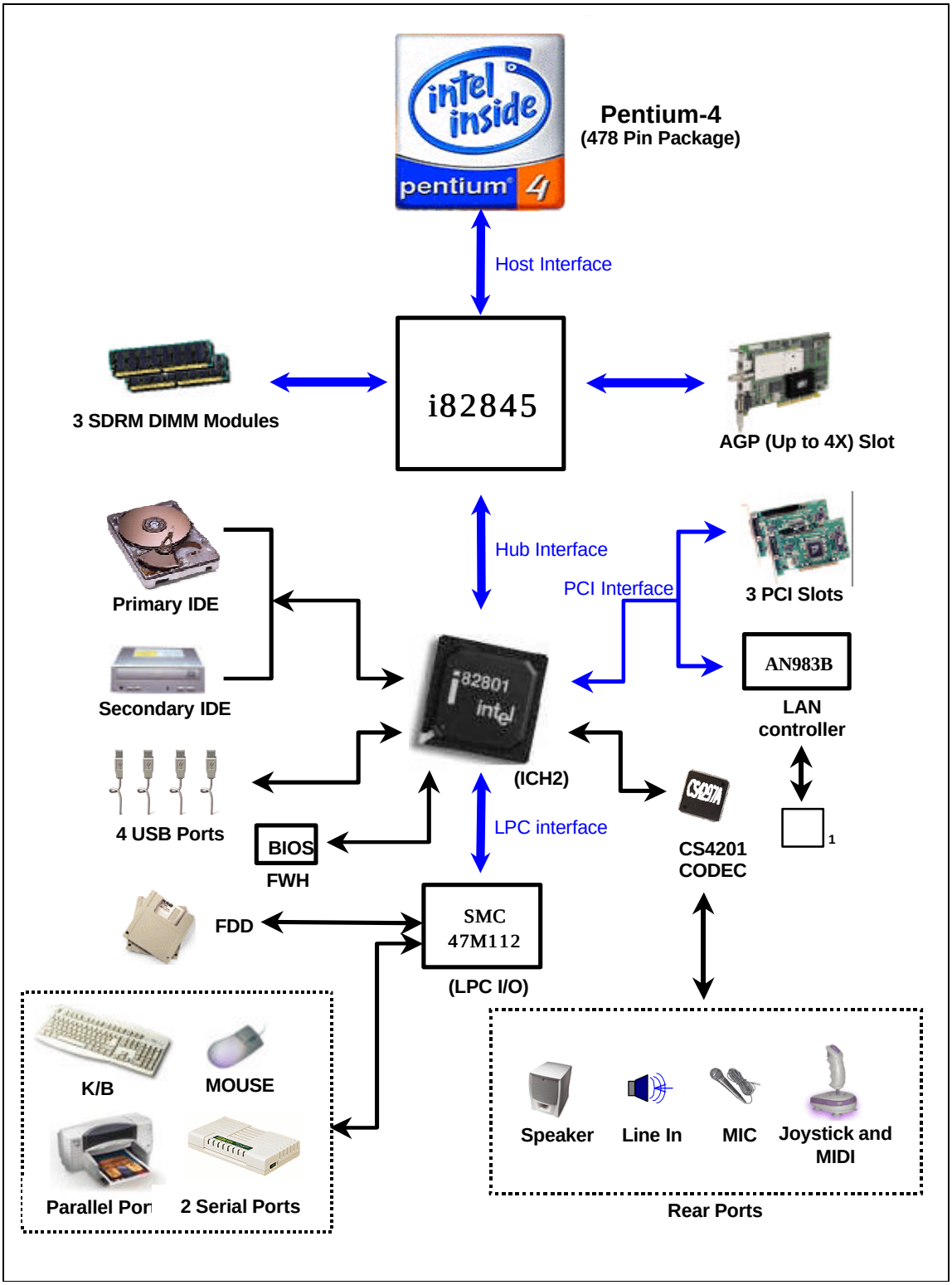
- ❑ Integrated IDE Subsystem
  - Supports **Ultra DMA-100/66/33**, BMIDE and PIO modes
  - Independent timing of up to 4 drives
  - Separate IDE connections for Primary and Secondary cables
  - Read transfers up to 100MB/s. Writes to 89MB/s
  - Dual channel master mode PCI supporting four Enhanced IDE devices

- ❑ Audio Subsystem
  - Built in PCI Audio Controller in Intel ICH2 and CS4201 CODEC
    - AC'97 2.1 compliant
    - Independent bus master logic for 5 channels (PCM In/Out, MIC Input, Modem In/Out)
    - Support for up to six channels of PCM Audio output (full AC3 decode)
    - Supports wake-up events
  - Crystal CS4201 CODEC
    - AC'97 2.1 compliant
    - Supports the S/PDIF (IEC-958) optical digital out
    - Stereo Headphone Amplifier

- ❑ Graphic Subsystem (AGP)
  - Full-featured Accelerated Graphics Port (AGP) Controller
    - Supports full AGP 2.0 capability for maximum bus utilization including 2x and 4x mode transfers
    - AGP 1.5V connector support only
    - High priority access support

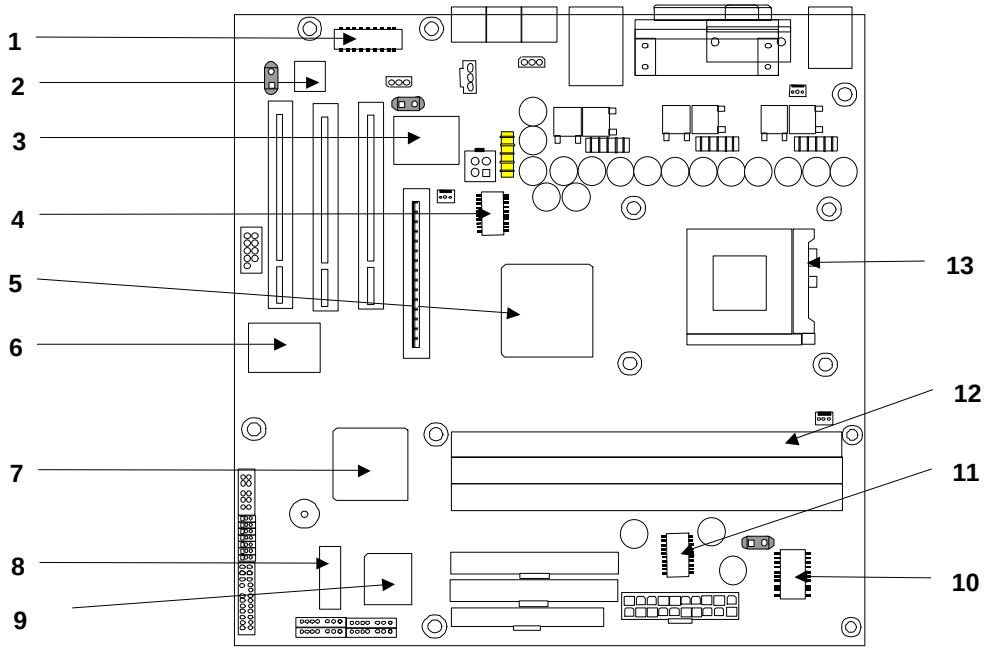
- ❑ Ethernet Subsystem (LAN)
  - Industry Standard
    - IEEE802.3u 100BASE-TX and IEEE802.3 10BASE-T compliant
    - Support for IEEE802.3x flow control
    - IEEE802.3u Auto-Negotiation support for 10BASE-T and 100BASE-TX
    - PCI Specification 2.2 compliant
    - ACPI and PCI power management ver 1.1. Compliant
    - Support PC9 wake-on LAN
  - PCI interface
    - Provides 32-bit PCI bus master data transfer
    - Supports network operation with PCI system clock from 20MHz to 33MHz
    - Provides burst transmit packet interrupt and transmit/receive early interrupt to reduce host CPU utilization
    - Supports memory-read, memory-read-line, memory-read-multiple, memory-write, memory-write-and-invalidate command while being bus master
    - Supports big or little endian byte ordering
  - EEPROM/BOOT ROM interface
    - Provides write-able EEPROM as boot ROM with size up to 128KB
    - Re-writes Flash boot ROM through I/O port by programming register
    - Provides serial interface for read/write 93C36 EEPROM
  - MAC/Physical interface
    - Integrates the whole Physical layer function of 100BASE-TX and 10BASE-T
    - Provides Full-duplex operation on boot 100Mbps and 10Mbps modes
    - Provides Auto-negotiation (NWAY) function of full/half duplex operation for both 10 and 100Mbps
    - Provides MAC and Transceiver (TXCVR) loop-back modes for diagnostic
    - Builds in Stream Cipher Scrambler / De-scrambler and 4B/5B encoder/decoder

2. Functional Block Diagram



II. System Overview

1. Major Units



1. Audio Power AMP	: TI TPA1517
2. AC97 CODEC	: Crystal CS4201
3. PCI Ethernet controller	: ADMTek AN983B
4. DC-DC Converter	: HIP6301
5. North Bridge	: Intel i82845(MCH)
6. LPC I/O Controller	: SMSC SMC47M112
7. South bridge	: Intel i82801BA(ICH2)
8. Battery	: CR2032
9. Firmware Hub(BIOS)	: Intel 82802AB(FWH)
10. Clock generator	: ICS9250-38(CK408)
11. ACPI Power Controller	: HIP6503
12. DIMM sockets	: PC133 SDRAM
13. CPU Socket	: Intel Pentium-4 478 Processor Socket

2. Upgradeability

2-1. Processor

The ***Dublin*** motherboard provides the 478-pin FC-BGA socket, which supports Willamette & Northwood and is not backward compatible with PGA 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.

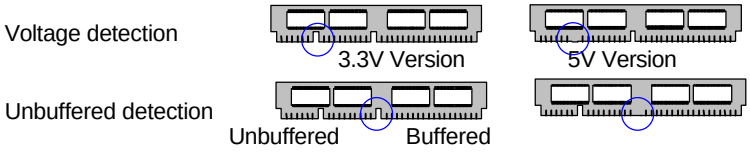
- ❑ Supported Intel 478 Pin Package Processors: Willamette and Northwood

2-2. Memory

The ***Dublin*** motherboard has three Dual Inline Memory Modules (DIMMs), minimum 32MB to maximum 3GB 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 (400 MHz)
- Supports 64Mb, 128Mb, 256Mb and 512Mb technology for x8 and x16 devices
- All supported devices must have 4 banks
- Supports page sizes of 2KB, 4KB, 8KB and 16KB
- Supports up to 1.5GB using 256Mb technology and up to 3GB using 512Mb technology
- ECC DIMM support
- 133MHz(PC133) SDRAM interface
- No registered DIMM support
- Support for Symmetric and Asymmetrical DRAM addressing
- Refresh Mechanism: CAS-before-RAS only
- Support for DIMM Serial Presence Detect (SPD) scheme via SMBus interface
- STR power management support via self refresh mod using CKE

2-3 BIOS

❑ Flash memory (FWH) organization

The motherboard uses a Phoenix BIOS, which is stored in the flash memory (FWH) 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	SMSC SMC47M112	Enabled / Disabled / Auto Detect	Auto Detect
On board serial A	SMSC SMC47M112	Enabled/ Disabled	Enabled
On board serial B	SMSC SMC47M112	Enabled/ Disabled	Enabled
On board parallel	SMSC SMC47M112	Enabled/ Disabled	Enabled
Audio Controller	Intel 82801BA	Enabled / Disabled	Enabled
Midi Port	SMSC SMC47M112	Enabled/ Disabled	Enabled
Game Port	SMSC SMC47M112	Enabled/ Disabled	Enabled
On board LAN	ADMTek AN983B	Enabled/ Disabled	Enabled

<CMOS setup options for on-board devices>

2-4. Expansion Slot

❑ On-board PCI devices information

The ***Dublin*** 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	North Bridge (Intel 82845-MCH)
00	01h	00	AGP Controller ((Intel 82845-MCH)
00	07h	00	South bridge (Intel 82801BA-ICH2)
00	07h	01	IDE bus master (Intel 82801BA-ICH2)
00	07h	02	USB Controller 1(Intel 82801BA-ICH2)
00	07h	03	USB Controller 2(Intel 82801BA-ICH2)
00	07h	04	Power management (Intel 82801BA-ICH2)
00	07h	05	AC97 Controller (Intel 82801BA-ICH2)
01	00h	00	AGP Slot
02	09h	00	PCI slot1
02	0Ah	00	PCI slot2
02	0Bh	00	PCI slot3
02	02h	00	AN983B LAN Controller

<On-board PCI devices address map>

❑ PCI interrupt & master number routing map

Intel I/O controller Hub-2 (ICH2) has eight programmable interrupt request input signals. Each of the PCI interrupt source is connected to one of these interrupts signals and assigned to the free proper interrupt number by PnP BIOS.

ICH2 INT Signals	First PCI slot	Second PCI slot	Third PCI slot	On Board Ethernet	i82810BA
PIRQA					
PIRQB				INTA	
PIRQC					
PIRQD					INTD
PIRQE	INTD	INTC	INTB		
PIRQF	INTA	INTD	INTC		
PIRQG	INTB	INTA	INTD		
PIRQH	INTC	INTB	INTA		INTC
Master	REQ0	REQ1	REQ2	REQ3	
IDSEL	AD25	AD26	AD27	AD18	

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

The ***Dublin*** motherboard and system BIOS support the ACPI 1.0b that requires an ACPI-aware operating system such as Windows-2000 or Windows-XP. ACPI feature include

- System Sleeping State Control
  - ACPI S1 state : Like C2 state(only STPCLK# active, and SLP# optional)
  - ACPI S3 state : Suspend to RAM (STR)
  - ACPI S4 state : Suspend to Disk (STD)
  - ACPI S5 state : Soft Off (SOFF)
- Plug and play functionality normally contained in the BIOS
- Indication LED for normal mode (Green) and suspend mode (Blinking Green) *but this function is dependent on the LED logic or BIOS control*
- Supports multiple wakeup events

❑ Wakeup devices and operations

Wakeup devices	Wakeup operations
Power switch	Wakeup from Suspend mode (S1, S3 and S4) and Soft Off (S5)
USB device	Wakeup from Suspend mode (S1 and S3)
PS/2 Mouse and K/B	Wakeup from Suspend mode (S1 and S3)
PCI device (PME#)	Wakeup from Suspend mode (S1 and S3)
LAN	Wakeup from Suspend mode (S1 and S3)

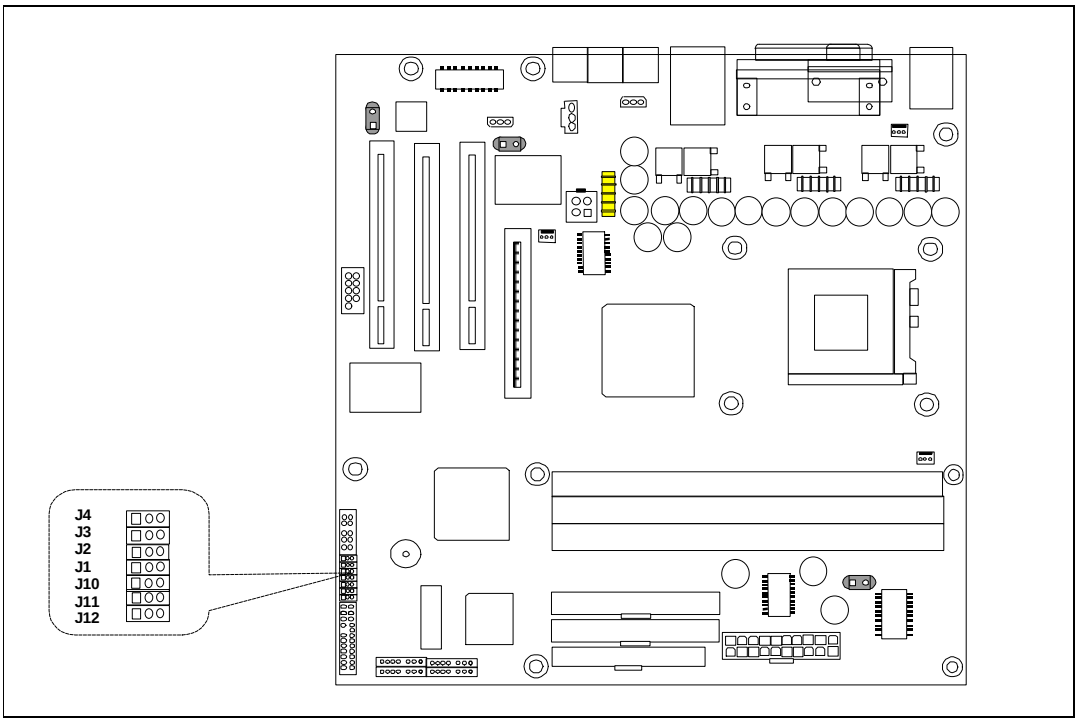
2-6. Manufacturing Options

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	Number of Ports
Joystick port	1EA
USB port	4EA
2nd CD-In(AUX-In)	1EA
S/PDIF	1EA
TV-Audio-In	1EA

III. Jumpers & Connectors Descriptions

1. Motherboard Jumpers Settings



1-1. Selection for Processor CPU Clock

🕮 Intel Pentium-4 478 Pin Package Processor sets the core to bus frequency ratio for itself

1-2. Configuration Jumper Descriptions

Jumper	Function	1-2	2-3
J1	CMOS Clear	Normal	CMOS Clear
J2	CMOS Setup control	Enable	Disable
J3	PASSWARD control	Enable	Disable
J4	FDD Write Protection	Normal	Write Protection

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

1-3. OEM/ODM Selector (J12, J1 and J10)

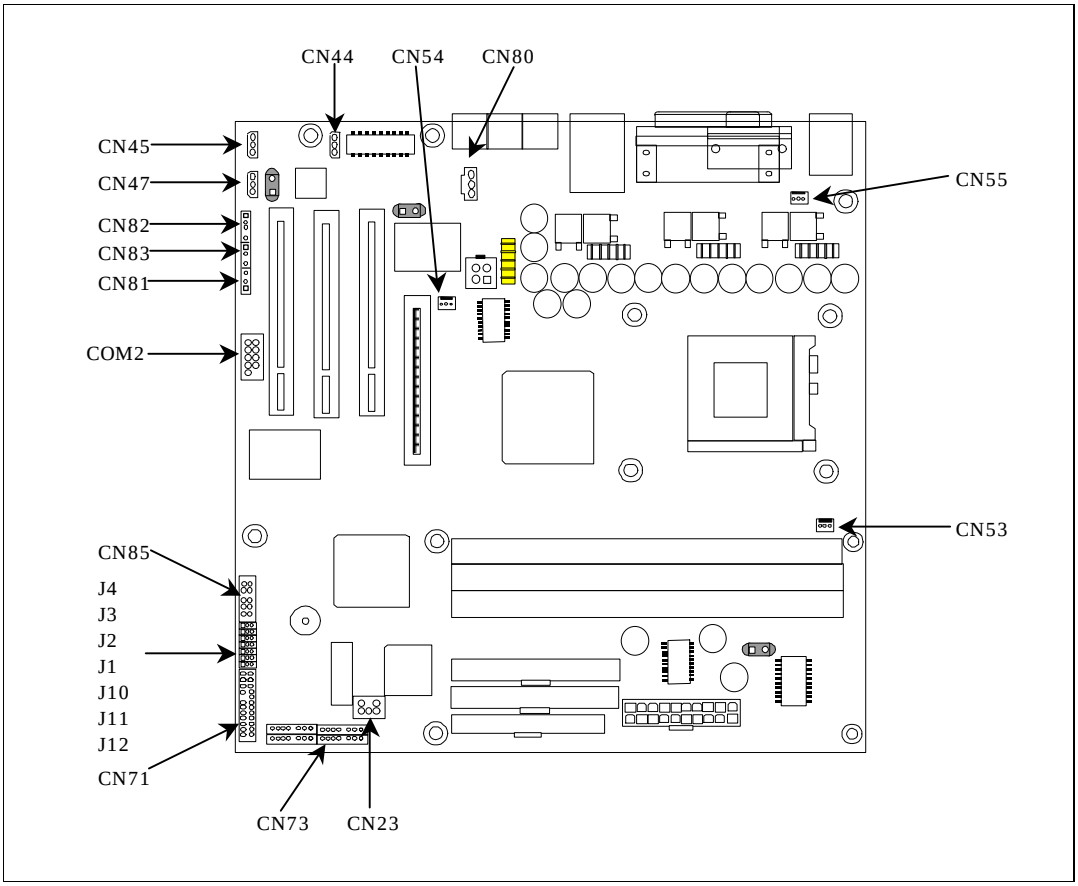
The jumpers (J12, J11 & J10) are optional parts for the OEM/ODM logo message selector

J12	J11	J10	Type descriptions
0	0	1	ODM
0	0	1	TriGem Export
0	1	0	TriGem Domestic
Others			Reserved

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

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 (CN55)

CN105

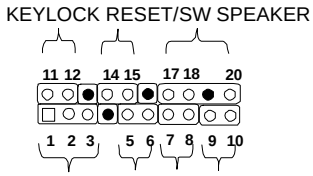
Pin number	*Signal description*
1	GND
2	FAN control
3	N.C

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

CN54

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

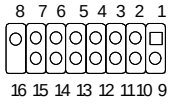
❑ **4** : Indicator Header (CN73)



CN73

Pin	*Signal description*
1	POWER/STR LED signal
2	GND
3	BLINK LED signal
4	NC
5	LED POWER
6	HDD access signal
7	GND
8	Power-ON switch signal
9	Suspend/Resume switch signal
10	GND
11	Key Lock signal
12	GND
13	NC
14	RESET switch signal
15	GND
16	NC
17	SPEAKER POWER
18	GND
19	NC
20	SPEAKER signal

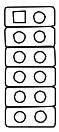
❑ **5** : Joystick (CN71)



CN71

Pin	*Signal description*	*Pin*	*Signal description*
1	VCC	9	VCC
2	JAB(1)	10	JBB(1)
3	JACX	11	JBCX
4	GND	12	MIDI OUT
5	GND	13	JBCY
6	JACY	14	JBB(2)
7	JAB(2)	15	MIDI IN
8	VCC	16	Key

❑ **6** : USB (CN85)



CN85

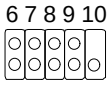
Pin	*Signal description*	*Pin*	*Signal description*
1	GND	7	GND
2	Over Current detect2	8	Over Current detect3
3	Key	9	Key
4	USB2 – DATA	10	USB3 – DATA
5	USB2 + DATA	11	USB3 + DATA
6	GND	12	GND

❑ **7** : AUX In –2nd CD-In (CN47)

CN47

Pin	*Signal description*
1	LEFT
2	GND
3	RIGHT

❑ **8** : Serial port (COM2)



COM2

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 (CN80)

CN80

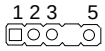
Pin	*Signal description*
1	RIGHT
2	GND
3	LEFT

❑ **10** : CD Sound In (CN44)

CN44

Pin	*Signal description*
1	LEFT
2	GND
3	RIGHT

❑ **11** : Headphone In (CN82)



CN82

Pin	*Signal description*	*Pin*	*Signal description*
1	RIGHT OUT	4	Key
2	Mute Control signal	5	LEFT OUT
3	GND		

❑ **12** : MIC2 In (CN83)

CN83

Pin	*Signal description*	*Pin*	*Signal description*
1	GND	3	Key
2	MIC2 In signal	4	POWER

❑ **13** : S/PDIF OUT (CN81)

CN81

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

❑ **14** : Video Sound-In (CN45)

CN45

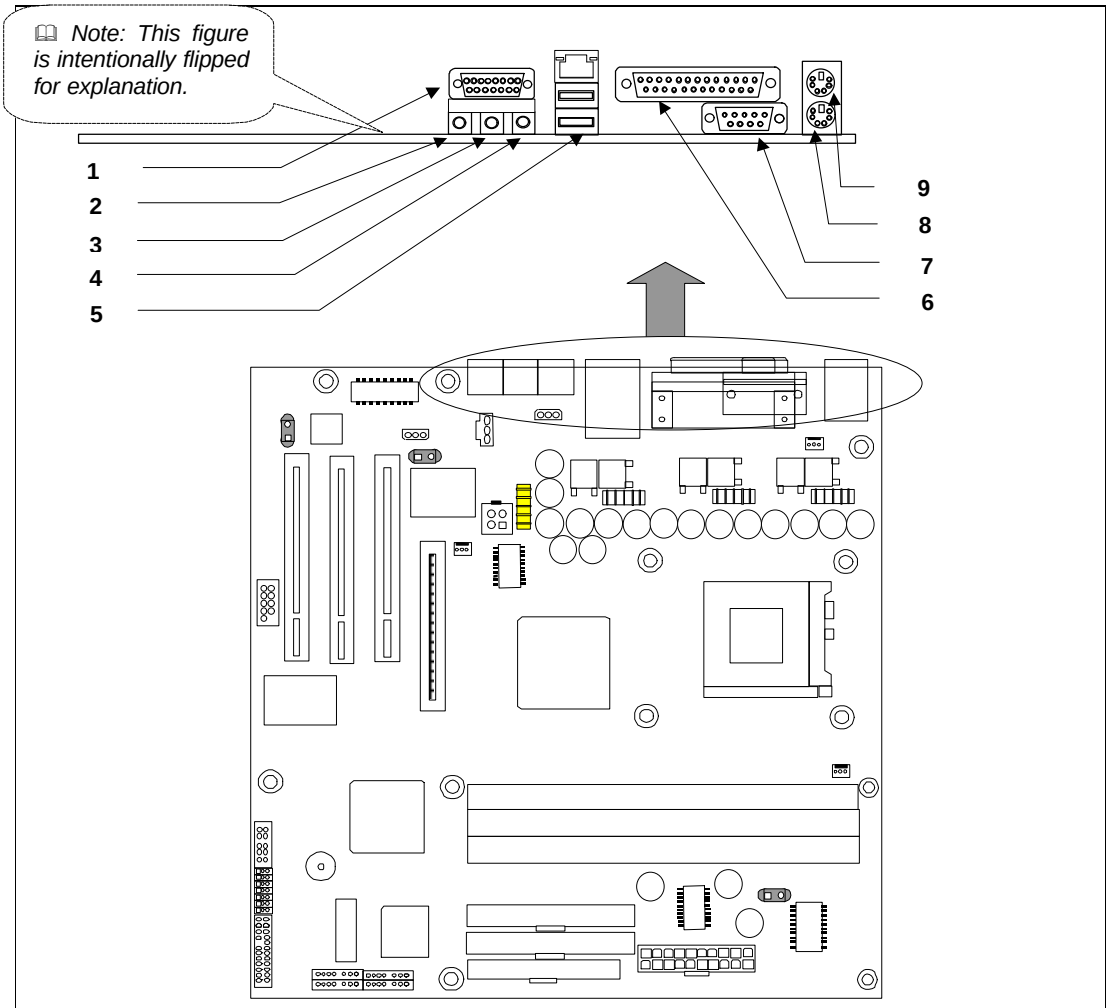
Pin	*Signal description*	*Pin*	*Signal description*
1	LEFT	3	GND
2	GND	4	RIGHT

❑ **15** : PC_PCI Header (CN23)

CN23

Pin	*Signal description*
1	PC_PCI GNTA signal
2	GND
3	Key
4	PC_PCI REQA signal
5	GND
6	Serial IRQ signal

2-2. Motherboard External I/O Port



1. Joystick/MIDI
2. Line-OUT
3. Line-IN
4. MIC-IN
5. RJ45 Jack for LAN and 2*USB
6. Printer Port (LPT1)
7. Serial Port (COM1)
8. PS/2 Keyboard
9. PS/2 Mouse

Trademarks