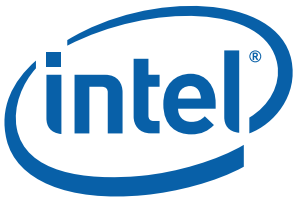

Intel® Embedded Compact Extended Form Factor

Proof-of-Concept Board

Based on Intel® 915GM Chipset

User's Manual

June 2007

Order Number: 310915-002

Contents

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Revision History

Date	Revision	Description
June 2007	002	Added disclaimer
January 2006	001	Initial public release

1 Product Overview

1.1 Introduction

The Proof of Concept board utilizes the Intel® Pentium® M Processor Low Voltage 738 or Intel® Celeron® M Processor Ultra Low Voltage 373, and the Intel® 915GM and Intel® I/O Controller Hub 6-M (ICH6-M) chipset. It is a fanless design which provides higher processing capability with excellent power consumption control. It offers a stable and efficient solution for customer who is seeking a trade-off between high performance and low power consumption. The POC board supports multiple display modes including CRT, LCD and TV-out. With the dimension of 146mm X 105mm, Intel® Embedded Compact Extended Form Factor also has the expansion capability through on-board Mini-PCI Type 3-B slot.

1.2 Related Documents

For more information, please contact your Intel local representative.

Table 1. Related Documents

Intel Order Number	Document	Location
302189	Intel® Pentium® M Processor on 90 nm Process with 2-MB L2 Cache Datasheet	http://developer.intel.com/design/mobile/datashts/302189.htm
302209	Intel® Pentium® M Processor on 90 nm Process with 2-MB L2 Cache Specification Update	http://developer.intel.com/design/mobile/specupdt/302209.htm
303110	Intel® Celeron® M Processor on 90 nm Process Datasheet	http://developer.intel.com/design/mobile/datashts/303110.htm
300303	Intel® Celeron® M Processors Specification Update	http://developer.intel.com/design/mobile/specupdt/300303.htm
305264	Mobile Intel® 915PM/GM/GMS and 910GML Express Chipset Datasheet	http://developer.intel.com/design/mobile/datashts/305264.htm
307167	Mobile Intel® 915GM/PM/GMS and 910GML Express Chipset Specification Update	http://developer.intel.com/design/mobile/specupdt/307167.htm
301473	Intel® I/O Controller Hub 6 (ICH6) Family Datasheet	http://developer.intel.com/design/chipsets/datashts/301473.htm
301474	Intel® I/O Controller Hub 6 (ICH6) Family Specification Update	http://developer.intel.com/design/chipsets/specupdt/301474.htm

1.3 Product Contents

The Intel® ECX Form Factor POC board based on Intel® 915GM chipset is shipped with the following peripherals:

- One POC board with two heat sinks – one for the CPU and one for the GMCH
- 15 Jumper caps

1.4 Proof-of-Concept Board Features

The proof-of-concept board features are summarized as below:

System:

- CPU (Onboard 479-ball µFCBGA) supported:
  - Intel® Pentium® M Processor Low Voltage 738 or
  - Intel® Celeron® M Processor Ultra Low Voltage 373 (default)
- Memory supported:
  - 200-pin DDR2 400MHz SODIMM x 1, Max. 1GB
- Chipset :
  - Intel® 915GM GMCH + Intel® 82801 FBM (ICH6-M)
- Super I/O:
  - W83627HF
- Ethernet
  - FAST Ethernet with Intel® 82551QM (default)
  - Gigabit Ethernet with Intel® 82541ER (optional)
  - On board RJ-45 interface
- Extension Slot (140 pins AMP connector):
  - SDVO x1
  - LPC x1
  - PCI Master x2
  - PCI Express x1
- BIOS :
  - Phoenix-Award 4Mbit FLASH ROM
- Watchdog Timer :
  - 255 levels as SMI
  - Reset from 0~255 seconds controlled by W83627HF
- Battery :
  - Lithium battery
- Power Supply Voltage :
  - 5/12V. AT/ATX
- Board Size :
  - 146mm x 105mm
- Gross Weight :
  - 0.55lb(0.4kg)
- Operating Temperature :
  - 32ºF~140ºF (0ºC~60ºC)

Display:

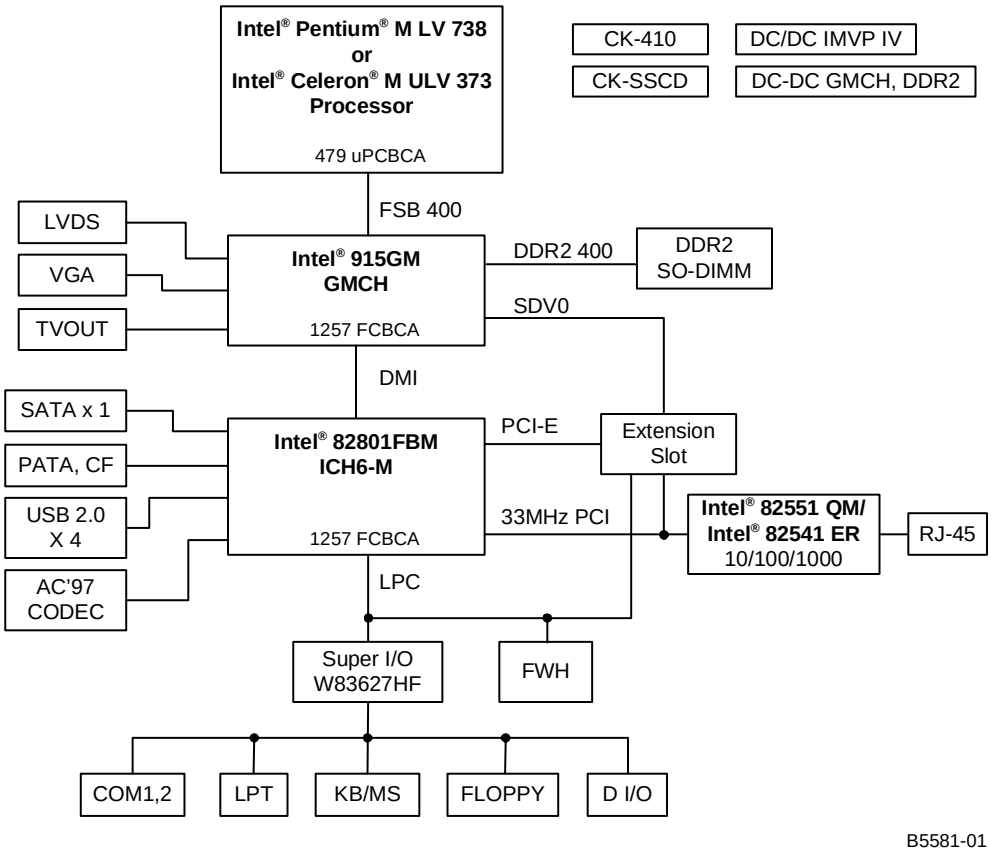
- Analog CRT DAC interface support
  - 24-bit RAMDAC support (8-bit for each RGB signal DAC)
  - Resolution up to 2048 x 1536 at 75Hz
  - DDC2B compliant
- Analog TV-Out interface support
  - On board S-Video 4-pin mini DIN connector
- Dedicated Local Flat Panel(LFP) LVDS interface
  - Compliant with ANSI/TIA/EIA-644-2001 spec
  - Supports 25 to 112 MHz single/dual channel LVDS interface with Spread Spectrum Clocking (SSC)
  - Support TFT panel type with maximum pixel format of 1x18 bpp for single channel and 2x18 bpp for dual channels
  - Maximum Panel size supported up to UXGA
  - Maximum Wide Panel size supported up to WUXGA
- SDVO support through Extension Slot
  - Two SDVO ports are supported
  - Supports a variety display devices such as DVI, TV Out, LVDS, etc
- Dual display support
  - Independent: different images and native display timings on each display device
  - Simultaneous: same images and native display timings on each display device
- Dynamic Video Memory Technology (DVMT) 3.0 to dynamically allocate up to 128 MB of system memory for graphics usage

I/O:

- Storage :
  - Integrated IDE controller support PIO IDE and Ultra ATA 100/66/33
  - One SATA ports support data transfer rate up to 1.5Gb/s (150 MB/s)
  - Support Advanced Host Controller Interface (AHCI)
  - Type I/II CompactFlash* slot x 1
- Keyboard
- PS/2 Mouse
- Audio :
  - Realtek ALC202A AC'97 codec audio
  - Amplifier for speaker-out with 2.5 W for each channel
  - MIC-in, Line-in, Line-out/Speaker-out (jumper selectable)
- USB :
  - USB 2.0 ports x2
  - USB 2.0 on pins header x2

1.5 Intel® ECX Form Factor POC Board Based on Intel® 915GM Chipset Block Diagram

Figure 1. Block Diagram



2 Installation Guide for POC Board

2.1 Before You Begin

Table 2 shows the additional hardware that may be needed to set up the board.

Table 2. Additional Hardware

Component	Description
VGA Monitor	Standard VGA or greater resolution monitor.
Keyboard	Keyboard with a PS/2 connector or adapter.
Mouse	Mouse with a PS/2 connector or adapter.
IDE Devices	Up to two IDE devices can be connected to the POC board. One cable is included in this kit. The cable accommodates the included hard drive and one other IDE device, such as a CD-ROM drive or another hard drive.
Network Adapter	An Intel® 82551 QM Ethernet Controller is included in the development kit. A CAT-5 cable with an RJ-45 connector is required to connect this Ethernet adapter to local area network.
AT Power Supply	An AT power supply is required in order to power up the board. If you are using an ATX power supply see **Section 2.2** for details on how to make ATX work.
Memory	One module of 200-pin DDR2 400 MHz SODIMM (max 1 GByte) is required.
Other Devices and Adapters	Many PC-compatible peripherals can be attached and configured to work with the POC board. For example, installing an additional network adapter into the mini PCI slot. Procuring and installing any drivers required for additional devices will need to be done by user.

2.2 Setting up the Intel® ECX POC Board

Gather the hardware described in section 2.1 and follow the steps below to set up the POC board. This manual assumes the user is familiar with basic concepts of installing and configuring hardware for an x86 architecture platform.

1. **Ensure a static free work environment.** Static-free procedures must be completed before removing any components from various anti-static packaging. The POC board is susceptible to electrostatic discharge (ESD), which may cause product failure or unpredictable operation.

Caution: Connecting the wrong cable or reversing a cable may damage the POC board and may damage the device being connected. Since the board is not in a protective chassis, use caution when connecting cables to this product.

2. **Verify contents.** Inspect the contents of your kit, and ensure that everything listed in Section 1.3 is included. Check for damage that may have occurred during shipment.

3. **Check jumper settings.** Verify that the following jumpers are set in their default state (see Table 3).

Table 3. Jumper Settings

Jumper	Function		Default Setting
J1	Compact Flash Power Select		3.3 V : Short 1-2
J2	LVDS Voltage select		3.3 V : Short 1-2
J3	COM1 Mode Select		RS-232 : Short 3-5,4-6
J4	COM1 Mode Select	CN15 Pin 1	DCD : Short 3-5
		CN15 Pin 8	RI : Short 4-6
J5	COM2 Mode Select	CN15 Pin 1	DCD : Short 3-5
		CN15 Pin 8	RI : Short 4-6
J6	COM1 Mode Select		RS-232 : Short 3-5,4-6
J7	COM1 Mode Select		RS-232 : Short 1-2
J8	Clear CMOS Setting		Normal : Short 1-2
J9	Audio Line Out/Speaker Out		Line Out : Short 1-3, 2-4

4. **Verify installed hardware.** Make sure the following hardware is populated on your POC board:

- One on-board Intel Intel® Celeron® M Processor Ultra Low Voltage 373 processor in the 479-ball µFCBGA package
- BIOS FWH
- Battery
- Heatsink

Note: The above hardware should have been correctly installed at the factory. If they are not installed correctly, DO NOT power on the board. Correctly re-install the components before proceeding.

5. **Install memory.** Install the SODIMM in memory slot DIMM1. Insert the SODIMM above the slot (the DIMM is keyed so that it only fits in the slot in one orientation). Firmly, but carefully, insert the SODIMM into the slot until the tabs close.

Figure 2. Assembly board, Top View

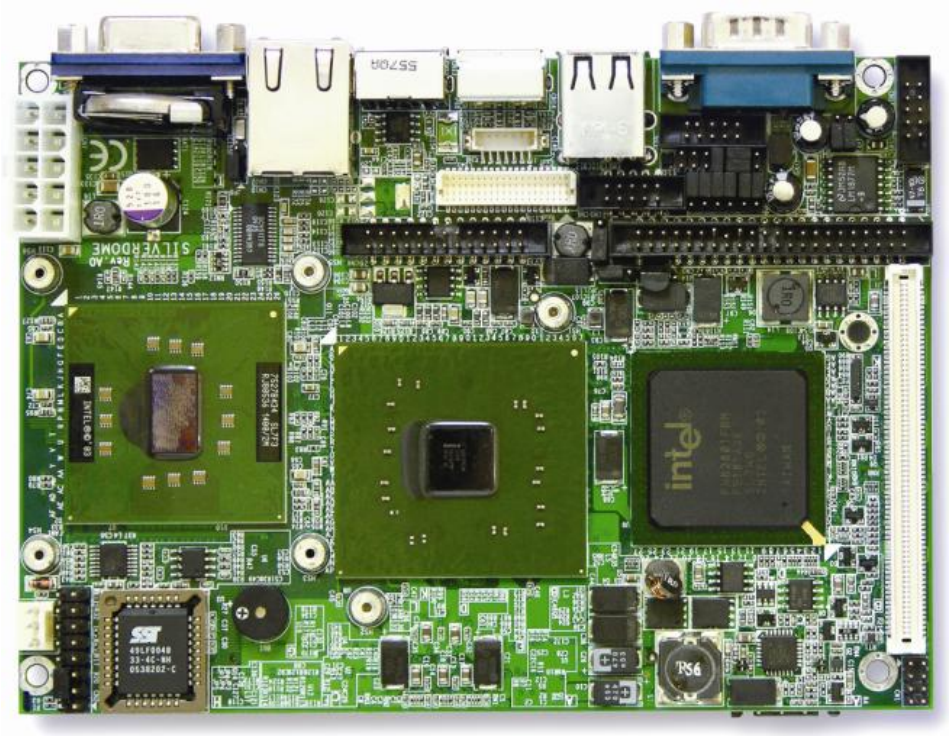
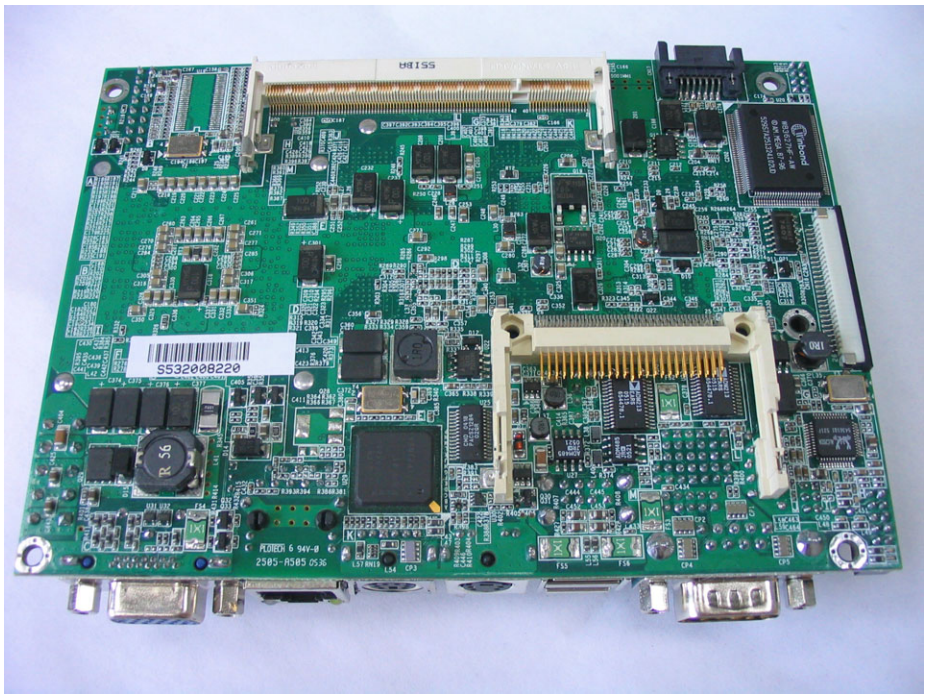


Figure 3. Assembly board, Bottom View



6. **Install storage devices.** There is one IDE and one SATA connector on the POC board, which supports up to 3 hard drives (two PATA IDE devices—a master and a slave and one SATA IDE device.

Note: Master/slave settings are determined by a jumper on each IDE device. Consult the device label/documentation to verify that the jumper is set correctly for the configuration you choose. A CD-ROM drive or additional hard drive may be installed as a primary slave device.

Warning: Failure to properly align the IDE cable may damage the POC board and/or the hard drive.

7. Install the CD-ROM drive
   a) Verify that the jumper on the CD-ROM drive is set for slave.

   b) Connect the unused end of the IDE cable you have already attached to the POC board to the CD-ROM drive. Ensure that the cable tracer is aligned with pin 1 of the CD-ROM drive connector.

   c) Connect the four-pin power connector from the power supply to the CD-ROM drive.

8. **Connect the monitor.** Connect the monitor cable to the VGA port.

9. **Connect the keyboard and mouse.** Connect the KB/Mouse cable to the Mini-DIN PS/2 connector CN13 on the board. Then connect a PS/2 mouse and keyboard to the KB/Mouse cable. Alternatively, USB keyboard and a USB mouse may be plugged into one or both of the USB connectors (CN12) on the board. Note that a legacy (PS/2) keyboard is needed to for entering BIOS setup mode.

Note: If you connect the USB keyboard and USB mouse to the front panel, you must connect the USB cable from the front panel to the connector CN5 on the board first.

10. **Connect the power supply.** Make sure the power supply is turned off and unplugged. Connect the AT 4P power supply cables to connector CN7 on the board. Next, plug the power cord into the power supply on the wall.

11. **Power up the system.** Turn on the monitor and follow by the power supply. Please refer to Table 19: CN7 for the power supply pin configuration and tap it from ATX power supply.

Warning: A loose jumper wire could lead to intermittent power which could damage the board or cause an electrical short.

Figure 4. 20-pin Power Supply Connector

Notes: Powering up without all components installed correctly could lead to a power-up failure that could damage that board. Do not power up the board until the source of any loose components is fixed and the component has been replaced on the board.

3 Connectors and Jumpers

This section describes the placement of the connectors as well as jumper settings on the board.

Figure 5. Connectors and Jumpers

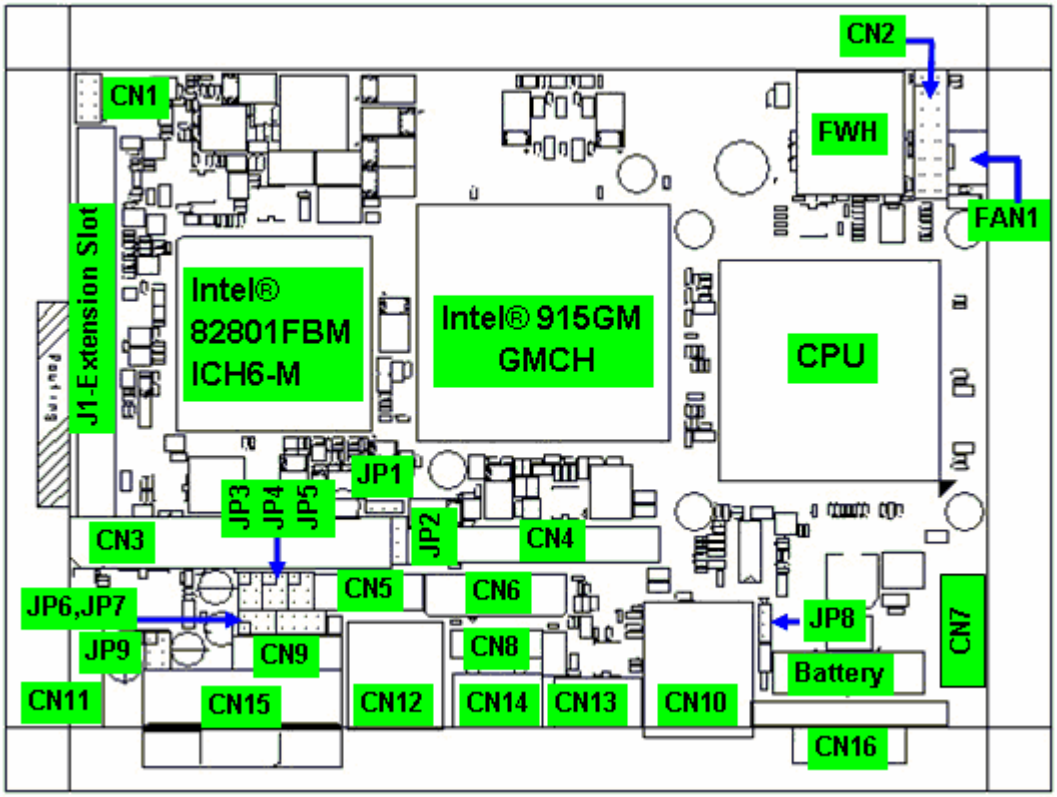
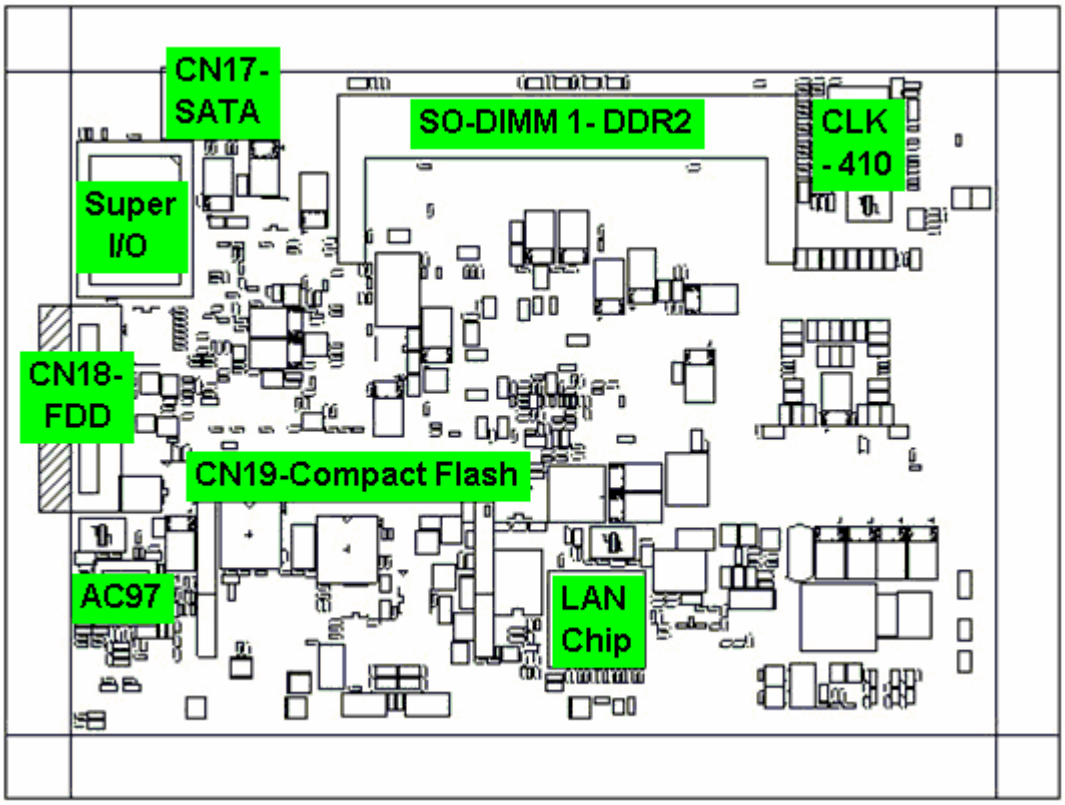


Figure 6. Solder Side



3.1 List of Jumpers

Table 4 to Table 9 must be used in setting the jumpers on the POC board. These tables give details about the jumpers shown in Figure 5 and Figure 6. The jumpers allow configuring the system to user's application. The table below shows the function of each of the board's jumpers:

Table 4. Jumpers

Label	Function	
J1	Compact Flash Power Select	
J2	LVDS Voltage select	
J3	COM1 Mode Select	
J4	COM1 Mode Select	CN15 Pin 1
		CN15 Pin 8
J5	COM2 Mode Select	CN15 Pin 1
		CN15 Pin 8
J6	COM1 Mode Select	
J7	COM1 Mode Select	
J8	Clear CMOS Setting	
J9	Audio Line Out/Speaker Out	

Table 5. Compact Flash Power Select (JP1)

Option	JP1
3.3 V (default)	Short 1-2
5 V	Short 2-3

Table 6. LVDS Voltage select (JP2)

Option	JP2
3.3 V (default)	Short 1-2
5 V	Short 2-3

Table 7. COM1 Mode Select for RS-232/422/485 (JP3/JP6/JP7)

Option	JP3	JP6	JP7
RS232 (default)	Short 3-5, 4-6	Short 3-5, 4-6	Short 1-2
RS422	Short 1-3, 2-4	Short 1-3, 2-4	Short 3-4, 7-8
RS485	Short 1-3, 2-4	Short 1-3, 2-4	Short 5-6, 7-8

Table 8. COM1 Mode Select (JP4)

Option	JP4
Pin 1=DCD (default) Pin 1=5 V	Short 3-5 Short 1-3
Pin 8=RI (default) Pin 8=+12 V	Short 4-6 Short 2-4

Table 9. COM2 Mode Select (JP5)

Option	JP5
Pin 1=DCD (default) Pin 1=5 V	Short 3-5 Short 1-3
Pin 8=RI (default) Pin 8=+12 V	Short 4-6 Short 2-4

Table 10. CMOS Clear Jumper (JP8)

Option	JP8
Normal (default)	Short 1-2
Clear CMOS	Short 2-3

Table 11. Audio Output Select Jumper (JP9)

Option	JP8
Line Out (default)	Short 1-3, 2-4
Speaker Out	Short 3-5, 4-6

3.2 List of Connectors

The board has a number of connectors configuring the system to user's application. The table below shows the function of each board's connectors:

Table 12. Connectors

Label	Function
CN1	Digital I/O Connector
CN2	Front Panel Bezel Connector
CN3	Primary IDE Hard Drive Connector
CN4	Parallel Port Connector
CN5	USB Port2 & Port3 Connector
CN6	LVDS Connector
CN7	Power Connector
CN8	LVDS Voltage Connector
CN9	Serial Port2 Connector
CN10	LAN Connector
CN11	Audio Connector
CN12	USB Port0 & Port1 Connector
CN13	6-Pin Mini Dim Keyboard/Mouse Connector
CN14	TV-OUT Connector
CN15	Serial Port1 Connector
CN16	VGA Connector
CN17	SATA Connector
CN18	FDD Connector
CN19	Compact Flash Connector
J1	Extension SLOT
FAN1	FAN Connector
SODIMM1	DDR2 SODIMM

Table 13. Digital I/O Connector (CN1)

Pin	Signal	Pin	Signal
1	Digital Input 1	2	Digital Output 1
3	Digital Input 2	4	Digital Output 2
5	GND	6	Digital Output 3
7	GND	8	Digital Output 4

Table 14. Front Panel Bezel Connector (CN2)

Pin	Signal	Pin	Signal
1	System Power LED +	2	External Speaker +
3	GND	4	Jumper Pin
5	System Power LED -	6	Jumper Pin
7	NC	8	External Speaker +
9	Power On/Off GND	10	Power On/Off
11	System Reset GND	12	System Reset
13	Keyboard Lock GND	14	Keyboard Lock
15	HDD Activity LED -	16	HDD Activity LED +

Table 15. Primary IDE Hard Drive Connector (CN3)

Pin	Signal	Pin	Signal
1	PRI_IDERST#	2	GND
3	PDD7	4	PDD8
5	PDD6	6	PDD9
7	PDD5	8	PDD10
9	PDD4	10	PDD11
11	PDD3	12	PDD12
13	PDD2	14	PDD13
15	PDD1	16	PDD14
17	PDD0	18	PDD15
19	GND	20	NC
21	PDREQ	22	GND
23	PDIOW#	24	GND
25	PDIOR#	26	GND
27	PIORDY	28	GND
29	PDDACK#	30	GND
31	IRQ14	32	NC
33	PDA1	34	P66DET
35	PDA0	36	PDA2
37	PDCS#1	38	PDCS#3
39	IDEACTP#	40	GND
41	+5V	42	+5V
43	GND	44	NC

Table 16. Parallel Port Connector (CN4)

Pin	Signal	Pin	Signal
1	Strobe #	2	Auto Form Feed #
3	Data 0	4	Error #
5	Data 1	6	Initialize #
7	Data 2	8	Printer Select In #
9	Data 3	10	GND
11	Data 4	12	GND
13	Data 5	14	GND
15	Data 6	16	GND
17	Data 7	18	GND
19	Acknowledge #	20	GND
21	Busy	22	GND
23	Paper Empty #	24	GND
25	Printer Select	26	NC

Table 17. USB Port2 & Port3 Connector (CN5)

Pin	Signal	Pin	Signal
1	VCC	2	VCC
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
9	GND	10	GND

Table 18. LVDS Connector (CN6)

Pin	Signal	Pin	Signal
1	VCCM	2	VCCM
3	VCCM	4	VCCM
5	VCCM	6	VCCM
7	NC	8	NC
9	GND	10	GND
11	LVDSB_D3-	12	LVDSB_D0-
13	LVDSB_D3+	14	LVDSB_D0+
15	GND	16	GND
17	LVDSB_CLK-	18	LVDSB_D1-
19	LVDSB_CLK+	20	LVDSB_D1+
21	GND	22	GND
23	LVDSA_D0-	24	LVDSB_D2-
25	LVDSA_D0+	26	LVDSB_D2+
27	GND	28	GND
29	LVDSA_D1-	30	LVDSA_D3-
31	LVDSA_D1+	32	LVDSA_D3+
33	GND	34	GND
35	LVDSA_D2-	36	LVDSA_CLK-
37	LVDSA_D2+	38	LVDSA_CLK+
39	GND	40	GND

Table 19. Power Connector (CN7)

Pin	Signal	Pin	Signal
1	PS_ON	2	GND
3	GND	4	+12 V
5	NC	6	5V SB
7	5 V	8	5 V
9	NC	10	GND

Table 20. LVDS Voltage Connector (CN8)

Pin	Signal	Pin	Signal
1	12VM	2	12VM
3	5V	4	ENAB
5	GND	6	GND
7	GND		

Table 21. Serial Port2 Connector (CN9)

Pin	Signal	Pin	Signal
1	Data Carrier Detect (DCD)	2	Data Set Ready (DSR)
3	Receive Data (RXD)	4	Request to Send (RST)
5	Transmit Data (TXD)	6	Clear to Send (CTS)
7	Data Terminal Ready (DTR)	8	Ring Indicator (RI)
9	Ground (GND)	10	NC

Table 22. LAN Connector (CN10)

Pin	Signal	Pin	Signal
1	TX+	2	TX-
3	RX+	4	RJ45 Termination
5	RJ45 Termination	6	RX-
7	RJ45 Termination	8	RJ45 Termination

Table 23. Audio Connector (CN11)

Pin	Signal	Pin	Signal
1	Mic In	2	GND
3	Line In L	4	GND
5	Line In R	6	GND
7	Audio Out L	8	GND
9	Audio Out R	10	GND

Table 24. USB Port0 & Port1 Connector (CN12)

Pin	Signal	Pin	Signal
1	VCC	1	VCC
3	USB -	2	USB -
5	USB +	3	USB +
7	GND	4	GND

Table 25. 6-Pin Mini Dim Keyboard/Mouse Connector (CN13)

Pin	Signal	Pin	Signal
1	Keyboard Data	2	Mouse Data
3	GND	4	GND
5	Keyboard Clock	6	Mouse Clock

Table 26. TV-OUT Connector (CN14)

Pin	Signal	Pin	Signal
1	Red	2	Green
3	Blue	4	NC
5	GND	6	AGND
7	AGND	8	AGND
9	NC	10	GND
11	NC	12	DDC DAT
13	Horizontal Sync	14	Vertical Sync
15	DDC CLK		

Table 27. Serial Port1 Connector (CN15)

Pin	Signal	Pin	Signal
1	Data Carrier Detect (DCD)	2	Receive Data (RXD)
3	Transmit Data (RXD)	4	Data Terminal Ready (DTR)
5	GND	6	Data Set Ready (DSR)
7	Request To Send (RTS)	8	Clear To Send (CTS)
9	Ring Indicator (RI)		

Table 28. VGA Connector (CN16)

Pin	Signal	Pin	Signal
1	Red	2	Green
3	Blue	4	NC
5	GND	6	AGND
7	AGND	8	AGND
9	NC	10	GND
11	NC	12	DDC DAT
13	Horizontal Sync	14	Vertical Sync
15	DDC CLK		

Table 29. SATA Connector (CN17)

Pin	Signal	Pin	Signal
1	GND	2	TX +
3	TX -	4	GND
5	RX -	6	RX +
7	GND		

Table 30. FDD Connector (CN18)

Pin	Signal	Pin	Signal
1	5 V	2	INDEX
3	5 V	4	DRIVE0
5	5 V	6	DSKCHG
7	NC	8	NC
9	NC	10	MOTOR ON
11	NC	12	DIR
13	HDSEL	14	STEP
15	NC	16	WDATA
17	GND	18	WGATE
19	GND	20	TRK0
21	GND	22	WPT
23	GND	24	RDATA
25	GND	26	SIDE0

Table 31. Compact Flash Connector (CN19)

Pin	Signal	Pin	Signal
1	GND	2	DATA 3
3	DATA 4	4	DATA 5
5	DATA 6	6	DATA 7
7	CS0#	8	Address 10
9	ATASEL	10	Address 9
11	Address 8	12	Address 7
13	VCC	14	Address 6
15	Address 5	16	Address 4
17	Address 3	18	Address 2
19	Address 1	20	Address 0
21	DATA 0	22	DATA 1
23	DATA 2	24	IOCS16#
25	CD2#	26	CD1-
27	DATA 11	28	DATA 12
29	DATA 13	30	DATA 14
31	DATA 15	32	CS1#
33	VS1#	34	IORD#
35	IOWR#	36	WE#
37	INTR	38	VCC
39	CSEL#	40	VS2#
41	RESET#	42	IORDY#
43	DMAREQ	44	DMAACK-
45	DASP#	46	PDIAG#
47	DATA 8	48	DATA 9
49	DATA 10	50	GND

Table 32. Fan Connector (FAN1)

Pin	Signal	Pin	Signal
1	GND	2	12 V
3	Sensor		