

# User Manual

## PCA-6013

Intel® Atom™ N455/D525 SBC  
with VGA/Dual GbE LAN with  
Surge protection

**ADVANTECH**

*Enabling an Intelligent Planet*

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# A Message to the Customer

## Advantech customer services

Each and every Advantech product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new Advantech equipment is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation for which the name Advantech has come to be known.

Your satisfaction is our primary concern. Here is a guide to Advantech's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

## Technical support

We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone.

So please consult this manual first. If you still cannot find the answer, gather all the information or questions that apply to your problem, and with the product close at hand, call your dealer. Our dealers are well trained and ready to give you the support you need to get the most from your Advantech products. In fact, most problems reported are minor and are able to be easily solved over the phone.

In addition, free technical support is available from Advantech engineers every business day. We are always ready to give advice on application requirements or specific information on the installation and operation of any of our products.

## Certification and Safety Instructions

This device complies with the requirements in part 15 of the FCC rules: Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. The user is advised that any equipment changes or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.

**Caution!** *There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.*



## Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Before you begin installing your single board computer, please make sure that the following materials have been shipped:

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

We have carefully inspected the PCA-6013 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt.

As you unpack the PCA-6013, check it for signs of shipping damage. (For example, damaged box, scratches, dents, etc.) If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

## Initial Inspection

Before you begin installing your single board computer, please make sure that the following materials have been shipped:

- 1 PCA-6013 single board computer
- 1 CPU Cooler for Atom D525 CPU (Only for G2 SKU) P/N: 1960046526N001
- 1 PCA-6013 Startup Manual
- 1 CD with driver utility and manual (in PDF format)
- 1 Ultra ATA 66/100 HDD cables P/N: 1701400452
- 1 Serial ATA HDD data cable P/N: 1700003194
- 1 Serial ATA HDD power cable P/N: 1700022749-11
- 1 Print port & COM part cable kit P/N: 1701260305
- 1 4-Port USB cable kit P/N: 1700008461-11
- 1 Y cable for PS/2 keyboard and PS/2 mouse P/N: 1700060202
- 1 Jumper Pack P/N: 9689000068
- 1 Warranty card

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

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As you unpack the PCA-6013, check it for signs of shipping damage. (For example, damaged box, scratches, dents, etc.) If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

**Note!**  Using PCA-6013G2's proprietary CPU cooler included in its package is a must. Other brands of CPU coolers are NOT compatible with PCA-6013. PCA-6013VG is a fanless CPU type and does not require installing a CPU cooler.

## Specification Comparison

P/N	CPU	Fan-Less	RAM	LAN	VGA	LVDS	FDD	SATA	USB	CF
PCA-6013VG-00A1E	Atom N455	Yes	Socket to 2G	Single GbE LAN	Yes	Yes	1	3	8	Optional
PCA-6013G2-00A1E	Atom D525	No	Socket to 3G	Dual GbE LAN	Yes	Optional	1	3	9	1

## Memory Compatibility

Brand	Size	Speed	Type	Memory	Advantech P/N
Transcend	1 GB	1066	SODIMM DDR3	SEC K4B1G0846D- HCF9 (128x8)	96AD04GS0000188T28
	1 GB	1333	SODIMM DDR3	ELPIDA J1108BFBG-DJ- F(128x8)	N/A
	2 GB	1333	SODIMM DDR3	HYNIX H5TQ2G83CFR(256x8)	N/A
	2 GB	1333	SODIMM DDR3	SEC 234 HYK0 K4B2G0846D(256x8)	N/A
	2 GB	1333	SODIMM DDR3	MICRON IVM77 D9PFJ(256x8)	N/A
Apacer	1 GB	1333	SODIMM DDR3	HYNIX H5TQ1G83DFR- H9C(128x8)	96SD3-1G1333NN-AP1
	2 GB	1333	SODIMM DDR3	ELPIDA J1108BABG-AE- E(128x8)	96SD3-2G1333NN-AP1
	1 GB	1333	SODIMM DDR3	HYNIX H5TQ1G83TFR- H9C(256x8)	96SD3-1G1333NN-AP1
	2 GB	1600	SODIMM DDR3	HYNIX H5TQ2G83CFR(256x8)	N/A
	2 GB	1600	SODIMM DDR3	MICRON IYM22 D9PFJ(256x8)	N/A
DSL	2 GB	1600	SODIMM DDR3	SEC 113 HCK0 K4B2G0846C(256x8)	N/A

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# Chapter 1

Hardware  
Configuration

## 1.1 Introduction

PCA-6013 is an Intel® Atom™ dual-core D525 / fanless N455 CPU and follows the PICMG 1.0 specification full-size single board computer. With high performance Atom D525 dual-core computing power, it is ideal for intense data or graphic processing applications; with fanless Atom™ N455 CPU, it has ultra high reliability to resist heat, dust, vibration and shock in any application environment.

PCA-6013 is designed with an Intel® Atom™ D525/N455 CPU and ICH8M I/O control hub. The Atom™ D525 dual core CPU brings new generation computing capability, low power consumption (Total power consumption  $\leq 24.58$  W) and dual-core parallel computing power and maximum 3 GB of DDR3 800 MHz memory capacity makes the PCA-6013G2 a powerful computer platform for modern industrial applications that require high computing power. The fanless Atom™ N455 CPU (Total power consumption  $\leq 16.62$  W) is ideal for data-acquisition, environment monitoring system and factory automation that requires no air flow environments.

PCA-6013 has an integrated graphic core of Intel Embedded Gen3.5+ graphic technology with 224 MB shared memory. This feature makes PCA-6013 is capable of handling complex and intense 2D/3D graphic processing without an add-on graphic card.

PCA-6013 is rich in I/O interfaces: it has three SATA ports (300 MB/sec), HDD, and ODD connections, one legacy IDE port for the ODD connection. It also has 8-9 USB support. Additionally, the two RS-232 serial ports (COM ports) can be used as reliable legacy device control interfaces. Users can also purchase Advantech's COM port upgrade module (P/N: PCA-COM485-00A1E) to have four extra RS-485 ports with auto flow control capability.

The PCA-6013 is designed for extended reliability, and is built especially to suit demanding industrial environments. The CMOS data backup and restore function protects the BIOS setup data from loss due to battery failure.

The PCA-6013 also adopts Advantech's unique patented "AT Mode Control Circuit" for AT Power Mode. With all these excellent features and outstanding performance, the PCA-6013 is an ideal platform for today's industrial applications.

## 1.2 Features

- Ultra low power (Total Power Consumption  $\leq 16.62$  W), fanless N455 CPU and maximum 2 GB DDR3 667 memory (Only for N SKU)
- Dual-core D525 CPU and maximum 3 GB DDR3 800 memory (Only for G2 SKU)
- Supports Dual-Gigabit Ethernet LANs with teaming capability (Only for G2 SKU)
- Supports Embedded Software SUSI APIs and Utilities. (SUSI APIs: watchdog, hardware monitor, brightness control, programmable GPIO, backlight On/Off; Utilities: BIOS flash, eSOS (Requires BIOS Customization), system monitoring, Flash Lock, software protection)

## 1.3 Specifications

### 1.3.1 System

- **CPU:** Soldered-down (BGA type) Intel® Atom™ 1.8 GHz D525 dual-core CPU or 1.66GHz N455 fanless CPU
- **L2 Cache:** CPU built-in 1 MB / 512 KB L2 cache
- **BIOS:** AMI 16 MB SPI Flash
- **System Chipset:** Intel® ICH8M
- **SATA/EIDE hard disk drive interface:** Supports up to 3 independent Serial ATA hard drives (up to 300 MB/s) One on-board IDE connector supporting up to two enhanced IDE devices.
- **Floppy disk drive interface:** Supports floppy disk drives, 5<sup>1</sup>/<sub>4</sub> (360 KB and 1.2 MB) and/or 3<sup>1</sup>/<sub>2</sub> (720 KB, 1.44 MB). BIOS enabled/disabled.

### 1.3.2 Memory

- **RAM:**
  - VG SKU: Maximum 2 GB DDR3 memory in SO-DIMM socket and 1 GB on-board
  - G2 SKU: Maximum 3 GB DDR3 memory in SO-DIMM socket and 1 GB on-board

### 1.3.3 Input/Output

- **Enhanced parallel port:** Configurable to LPT1 or disabled. Standard DB-25 female connector provided. Supports EPP/ECP
- **Serial ports:** Two dedicated serial RS-232 ports on board, plus four ports RS-422/485 w/ autoflow controlled by module (Optional, Advantech P/N: PCA-COM485-00A1E)
- **Keyboard and PS/2 mouse connector:** One 6-pin mini-DIN connector is located on the mounting bracket for easy connection to a keyboard or PS/2 mouse. An on board keyboard pin header connector is also available
- **High Definition Audio:** PCA-6013 can provide audio function with the optional audio extension module PCA-AUDIO-HDA1E
- **USB ports:** PCA-6013 supports up to 8 USB 2.0 ports with transmission rates up to 480 Mbps for VG SKU and 9 USB 2.0 ports for G2 SKU.

### 1.3.4 Graphic interface

- **Controller:** Integrated graphics core of Embedded Gen3.5+ technology
- **VRAM:** Shared with 224MB system memory
- **Output Interfaces:**
  - VGA: Supports up to SXGA 1400 x 1050 @ 60Hz for Atom N455 VG SKU, up to QXGA 2048 x 1536 @ 60 Hz for Atom™ D525 G2 SKU
  - Optional LVDS: Supports 18-bit single channel and up to WXGA 1366 x 768 or 1280 x 800 for both Atom D525 and N455 CPUs

### 1.3.5 Ethernet LAN

- Supports signal 10/100/1000 Mbps Ethernet networking for VG SKU  
Supports Dual 10/100/1000 Mbps Ethernet networking for G2 SKU
- **Controller:**
  - LAN1: Intel® 82567V

- LAN2: Intel® 82583V (G2 SKU only)

### 1.3.6 Industrial features

- **Watchdog timer:** Can generate a system reset. The watchdog timer is programmable, with each unit equal to one second or one minute (255 levels).
- Fanless N455 CPU for VG SKU for ultra high reliability and long MTBF

### 1.3.7 Mechanical and environmental specifications

- **Operating temperature:** 0 ~ 60° C (32 ~ 140° F) (operating humidity:40° C @ 85% RH Non-Condensing)
- **Storage temperature:** -40 ~ 85° C (-40 ~ 185° F) non-condensing and 60° C @ 95% RH non-condensing
- **Demanded Power supply voltage:** +12 V, +5 V
- **Power consumption:**
  - **G2 SKU:**
    - CPU:** Dual-core Atom D525 CPU 1.8 GHz
    - Memory:** 1 GB on-board DDR3 800 MHz and 1 pieces of 2 GB 800 MHz SO-DIMM
    - Storage:** One SATA HDD
    - +12 V: 0.44 A
    - +5 V: 3 A
    - +3.3 V: 0 A
    - +5 VSB: 0.15 A
    - 12 V: 0 A
    - 5 V: 0 A
    - Total Power Consumption: 24.58 W
  - **VG SKU:**
    - CPU:** Single Core Atom N455 CPU 1.66 GHz
    - Memory:** 1 GB on-board DDR3 800 MHz and 1 pieces of 1 GB 800 MHz SO-DIMM
    - Storage:** One SATA HDD
    - +12 V: 0.16 A
    - +5 V: 2.1 A
    - +3.3 V: 0 A
    - +5 VSB: 0.13 A
    - 12 V: 0 A
    - 5 V: 0 A
    - Total Power Consumption: 16.62 W
- **Board size:** 338 x 122mm (13.3" x 4.8")
- **Board weight:** 0.5 Kg (net weight)

## 1.4 Jumpers and Connectors

Connectors on the PCA-6013 single board computer link it to external devices such as hard disk drives and a keyboard. In addition, the board has a number of jumpers used to configure your system for your application.

Below, Tables 1.1 and 1.2 list the jumper and connector functions. Later sections in this chapter give instructions on setting jumpers. Chapter 2 gives instructions for connecting external devices to your single board computer.

**Table 1.1: Jumper descriptions**

Label	Function
CMOS1	CMOS Clear
JWDT1	Watchdog timer output option

**Table 1.2: Connector descriptions**

Label	Function
IDE1	Primary IDE connector
FDD1	Floppy drive connector
LPT1	Parallel port
VGA1	VGA connector
COM1/COM2	RS-232 serial ports connector, or COM1: RS-232 9-pin Box Header (for G2 sku)
KBMS1	PS/2 keyboard and mouse connector
KBMS2	External keyboard/mouse pin header
JIR1	Infrared port pin header
CPUFAN1	3-pin Atom D525 CPU fan connector
JFP1	Power and Reset Button connector
JFP2	HDD LED/Speaker connector
JFP3	Power LED & Keyboard lock connector
LAN1	LAN RJ45 connector
LAN2	LAN RJ45 connector (for G2 sku)
HDAUD1	High Definition Audio interface connector
SATA1	Serial ATA1
SATA2	Serial ATA2
SATA3	Serial ATA3
LANLED1	LAN LED1 connector
USB 12	USB port 1 and port 2 pin-header
USB 34	USB port 3 and port 4 pin-header
USB 56	USB port 5 and port 6 pin-header
USB 78	USB port 7 and port 8 pin-header
USB 9	USB port 9 on bracket I/O (only for G2 SKU)
GPIO1	GPIO header
JOBS1	HW Monitor Alarm Close: Enable OBS Alarm Open: Disable OBS Alarm
JCASE1	Case open
DIMM1	Memory connector 1
CF1	CF Socket (only for G2 sku)
ATXF1	ATX feature connector
LPC1	Low pin count connector
SMBUS1	SMBUS1 connector

## 1.5 Board Layout: Jumper and Connector Locations

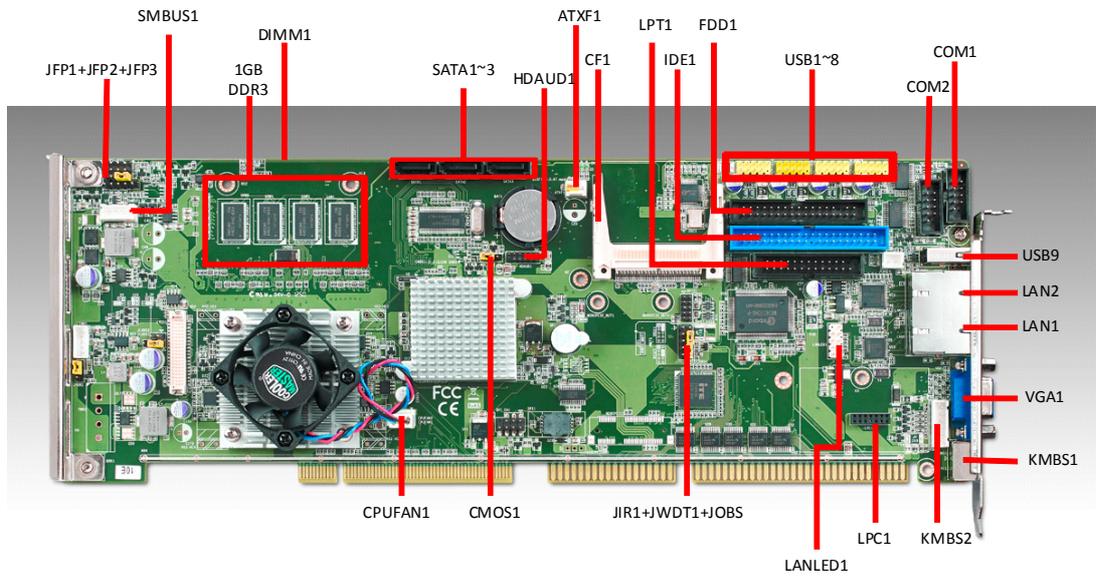


Figure 1.1 Board Layout

## 1.6 PCA-6013 Block Diagram

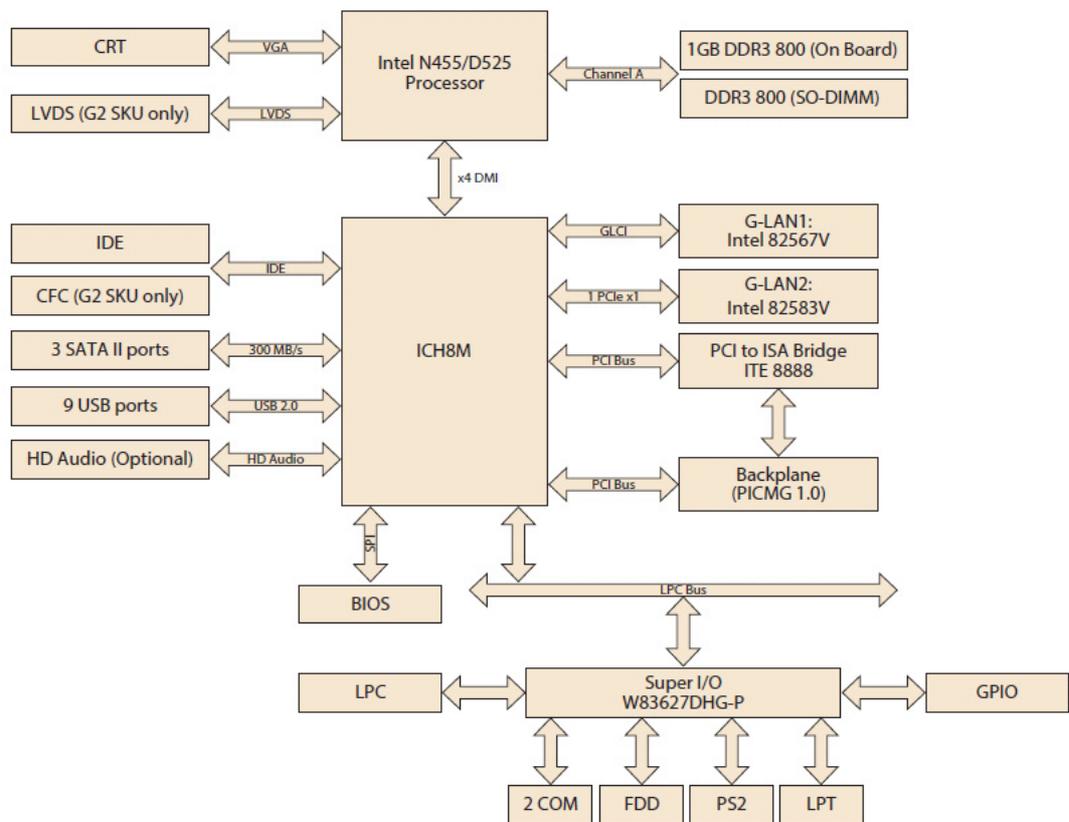


Figure 1.2 Block Diagram

## 1.7 Safety Precautions

**Warning!** *Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.*



**Caution!** *Always ground yourself to remove any static charge before touching the single board computer. Modern electronic devices are very sensitive to electrostatic discharges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis.*



**Caution!** *The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Discard used batteries according to manufacturer's instructions.*



**Note!** *Before installing your PCA-6013 into a chassis, make sure that no components on either side of the CPU card can touch any metal parts, especially the chassis wall and add-on card in the adjacent slot.*



## 1.8 Jumper Settings

This section provides instructions on how to configure your PCA-6013 by setting the jumpers. It also includes the PCA-6013's default settings and your options for each jumper.

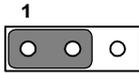
### 1.8.1 How to set jumpers

You can configure your PCA-6013 to match the needs of your application by setting the jumpers. A jumper is a metal bridge that closes an electrical circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" (or turn ON) a jumper, you connect the pins with the clip. To "open" (or turn OFF) a jumper, you remove the clip. Sometimes a jumper consists of a set of three pins, labeled 1, 2, and 3. In this case you connect either pins 1 and 2, or 2 and 3. A pair of needle-nose pliers may be useful when setting jumpers.

## 1.8.2 CMOS clear (CMOS1)

The PCA-6013 single board computer contains a jumper that can erase CMOS data and reset the system BIOS information. Normally this jumper should be set with pins 1-2 closed. If you want to reset the CMOS data, set CMOS1 to 2-3 closed for just a few seconds, and then move the jumper back to 1-2 closed. This procedure will reset the CMOS to its default setting.

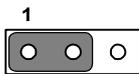
**Table 1.3: CMOS (CMOS1)**

Function	Jumper Setting
* Keep CMOS data	 1-2 closed
Clear CMOS data	 2-3 closed
* default setting	

## 1.8.3 Watchdog timer output (JWDT1)

The PCA-6013 contains a watchdog timer that will reset the CPU in the event the CPU stops processing. This feature means the PCA-6013 will recover from a software failure or an EMI problem. The JWDT1 jumper settings control the outcome of what the computer will do in the event the watchdog timer is tripped.

**Table 1.4: Watchdog timer output (JWDT1)**

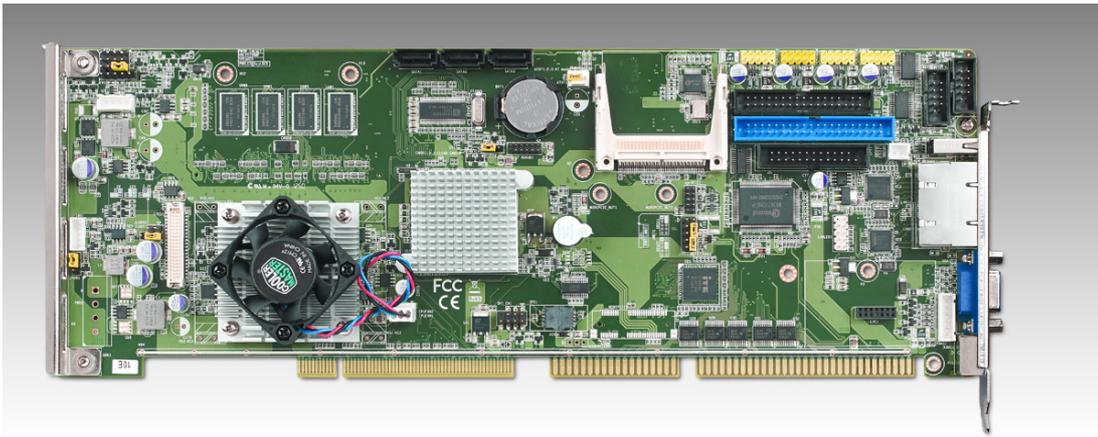
Function	Jumper Setting
N/A	 1-2 closed
*Reset	 2-3 closed
* default setting	

## 1.9 System Memory

The PCA-6013 has two sockets for 204-pin DDR3 800MHz SO-DIMM memory modules. All these sockets use 1.5 V unbuffered double data rate synchronous DRAMs. They are available in capacities of 512 MB, 1 GB, and 2 GB. The sockets can be filled in any combination with DIMMs of any size, giving a total memory size up to 2 GB (for VG N455 SKU) and up to 4 GB (for G2 D525 SKU).

## 1.10 Memory Installation Procedures

1. See picture below to locate DIMM1 and DIMM2 204-pin SODIMM sockets.
2. A memory module and expansion socket are keyed. The plastic bridge in the socket must align with the notch in the module. The keyed bridge and notch make sure a SODIMM cannot be installed going the wrong direction.
3. Insert the SODIMM module into the socket at a 30-45 degree angle. Make sure the notch and the module are properly aligned. Slowly push down the SODIMM toward the CPU card PCB until the clips at each end of the expansion socket click into place.



## 1.11 Processor Installation

PCA-6013 series are equipped with soldered-down (BGA type) CPUs. No need for a user to install a CPU.



# Chapter 2

Connecting  
Peripherals & Jumper  
Settings

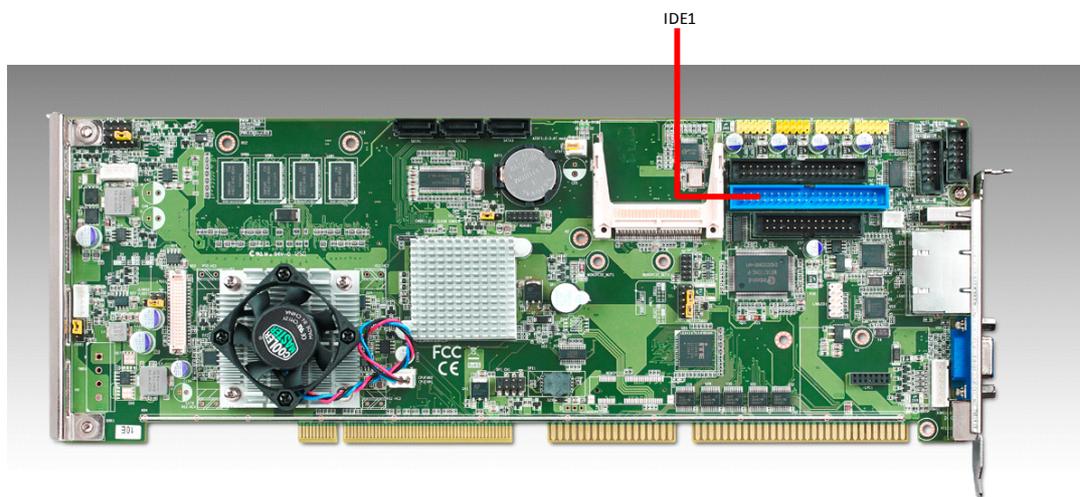
## 2.1 Introduction

You can access most of the connectors from the top of the board while it is installed in the chassis. If you have a number of cards installed or have a packed chassis, you may need to partially remove the card to make all the connections.

You can configure your single board computer to match the needs of your application by setting the jumpers. A jumper is a metal bridge that closes an electrical circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" (or turn ON) a jumper, you connect the pins with the clip. To "open" (or turn OFF) a jumper, you remove the clip.

Sometimes a jumper consists of a set of three pins, labeled 1, 2, and 3. In this case, you connect either pins 1 and 2, or 2 and 3. A pair of needle-nose pliers may be useful when setting jumpers.

## 2.2 IDE Connector (IDE1)



**Figure 2.1 IDE Connector (IDE1)**

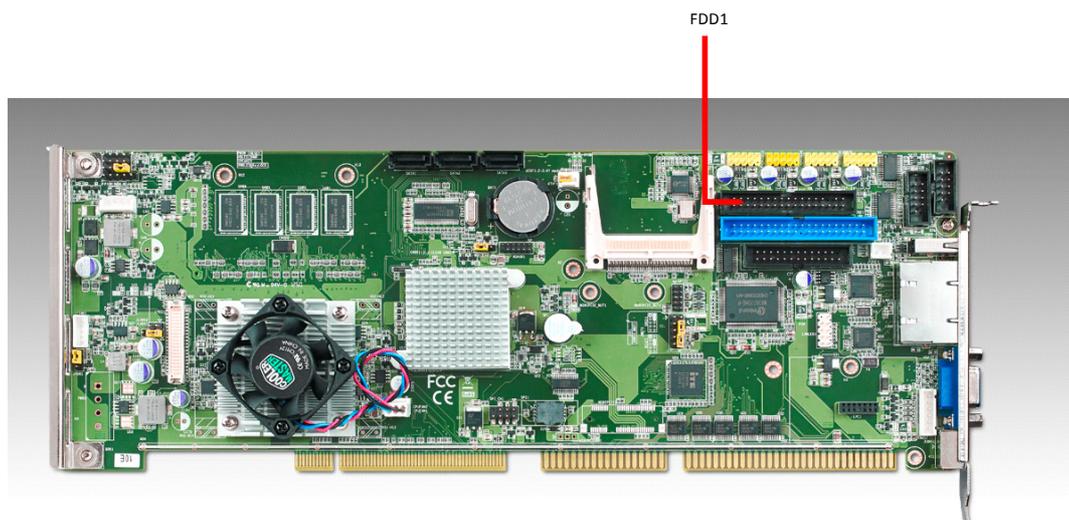
You can attach up to two IDE (Integrated Drive Electronics) drives to the PCA-6013's built-in controller.

Wire number 1 on the cable is red or blue and the other wires are gray. Connect one end to connector IDE1 on the single board computer. Make sure that the red/blue wire corresponds to pin 1 on the connector (in the upper right hand corner). See Chapter 1 for help finding the connector.

Unlike floppy drives, IDE hard drives can connect in either position on the cable. If you install two drives to a single connector, you will need to set one as the master and the other as the slave. You do this by setting the jumpers on the drives. If you use just one drive per connector, you should set each drive as the master. See the documentation that came with your drive for more information.

Connect the first hard drive to the other end of the cable. Wire 1 on the cable should also connect to pin 1 on the hard drive connector, which is labeled on the drive circuit board. Check the documentation that came with the drive for more information.

## 2.3 Floppy Drive Connector (FDD1)

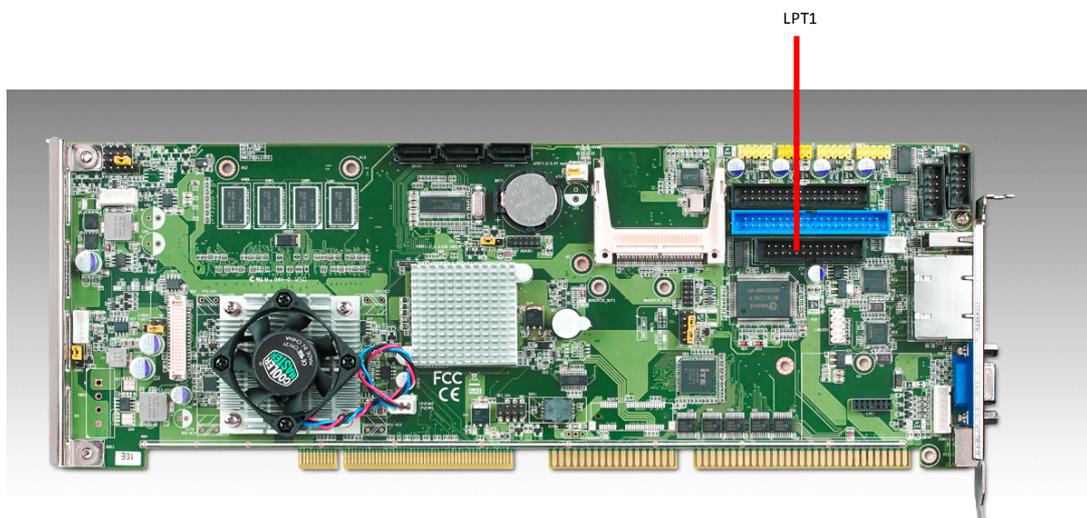


**Figure 2.2 FDD Connector (FDD1)**

You can attach one floppy disk drives to the PCA-6013's on board controller. You can use 3.5" (720 KB, or 1.44 MB) drives.

The single board computer comes with a 34-pin daisy-chain drive connector cable. On one end of the cable is a 34-pin flat-cable connector. On the other end are two sets of 34-pin flat-cable connector (usually used for 3.5" drives). The set on the end (after the twist in the cable) connects to the A: floppy drive.

## 2.4 Parallel Port (LPT1)



**Figure 2.3 LPT Connector (LPT1)**

The parallel port is normally used to connect the single board computer to a printer. The PCA-6013 includes an onboard parallel port, accessed through a 26-pin flat-cable connector, LPT1. The card comes with an adapter cable which lets you use a traditional DB-25 connector. The cable has a 26-pin connector on one end and a DB-25 connector on the other, mounted on a retaining bracket. The bracket installs at the end of an empty slot in your chassis, giving you access to the connector.

To install the bracket, find an empty slot in your chassis. Unscrew the plate that covers the end of the slot. Screw in the bracket in place of the plate. Next, attach the flat-cable connector to LPT1 on the CPU card. Wire 1 of the cable is red or blue, and the other wires are gray. Make sure that wire 1 corresponds to pin 1 of LPT1. Pin 1 is on the upper right side of LPT1.

## 2.5 VGA Connector (VGA1)

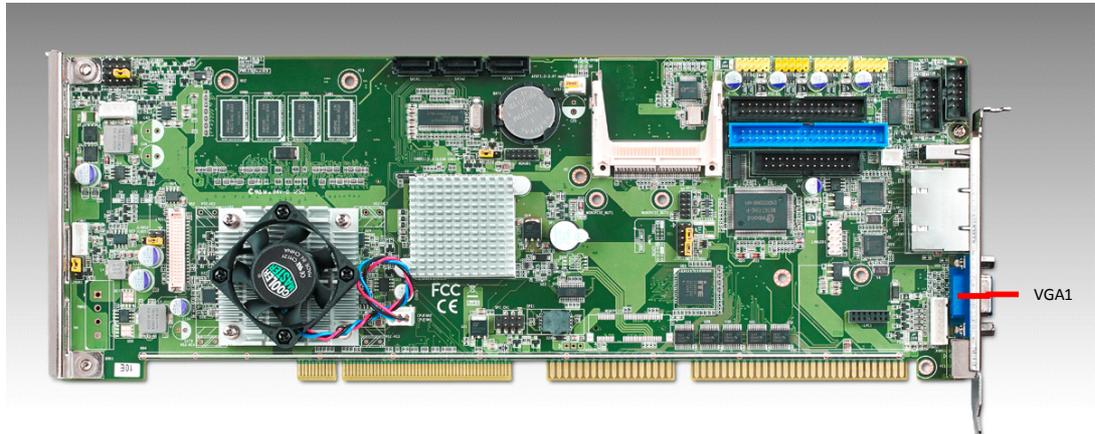


Figure 2.4 VGA Connector (VGA1)

The PCA-6013 includes a VGA interface that can drive conventional CRT displays. VGA1 is a standard 15-pin D-SUB connector commonly used for VGA. Pin assignments for CRT connector VGA1 are detailed in Appendix A.

## 2.6 Serial Ports (COM1, COM2)

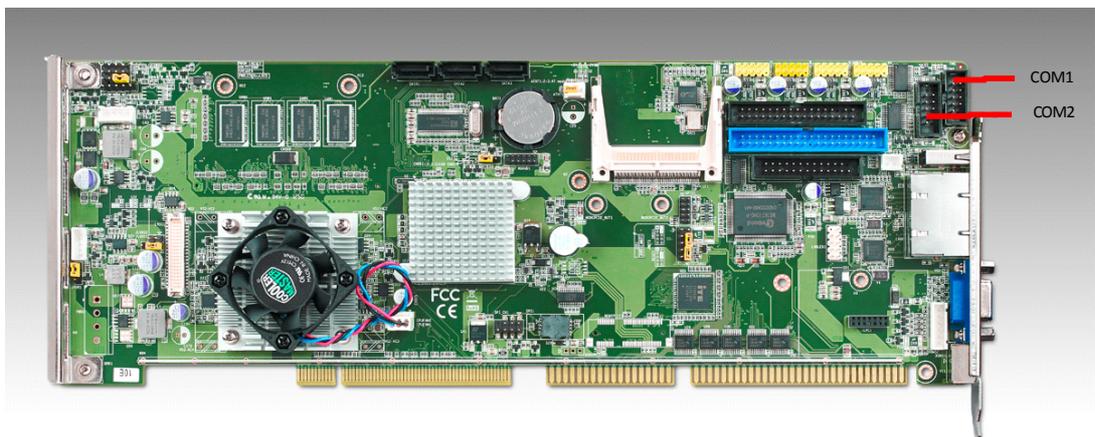
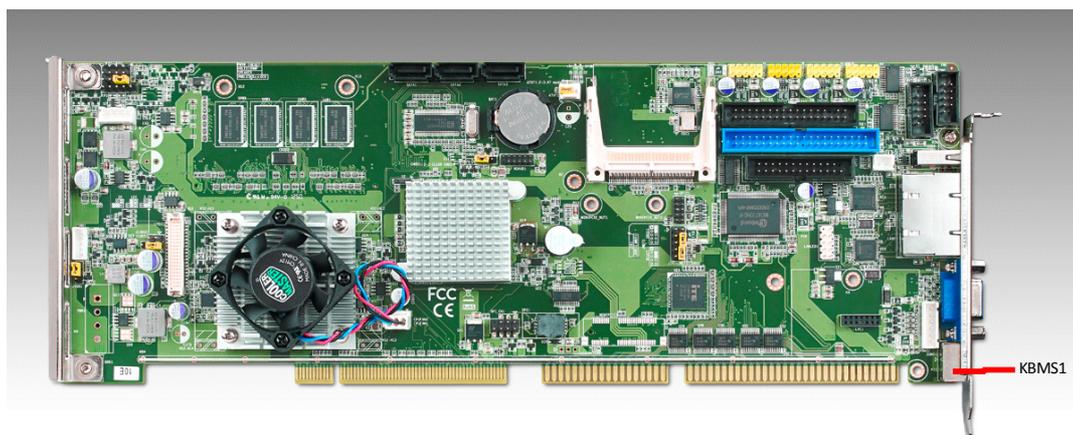


Figure 2.5 Serial Ports (COM1, COM2)

The PCA-6013 offers two serial ports: COM1 and COM2. These ports can connect to serial devices.

The IRQ and address ranges for all ports are fixed. However, if you want to disable the port or change these parameters later, you can do this in the system BIOS setup. Different devices implement the RS-232 standard in different ways. If you are having problems with a serial device, be sure to check the pin assignments for the connector.

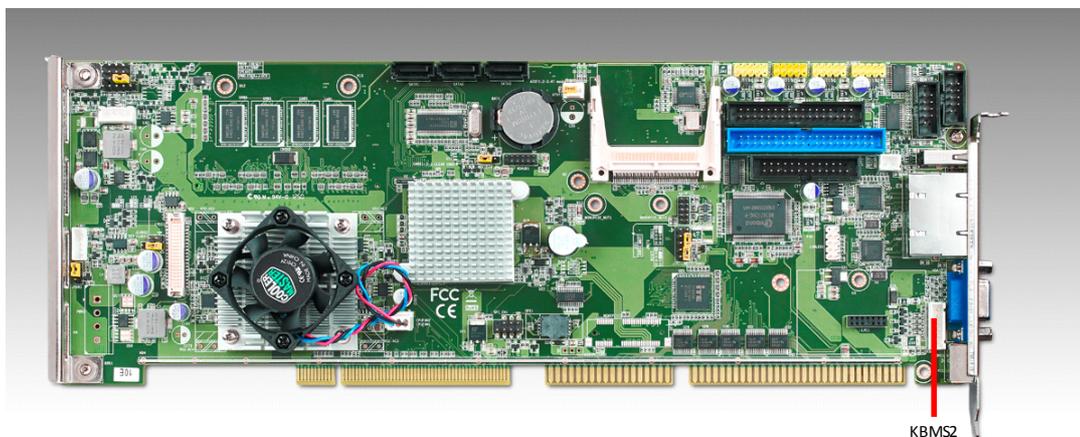
## 2.7 PS/2 Keyboard/Mouse Connector (KBMS1)



**Figure 2.6 PS/2 Keyboard/Mouse Connector (KBMS1)**

One 6-pin mini-DIN connector (KBMS1) on the card mounting bracket provides connection to a PS/2 keyboard or a PS/2 mouse, respectively. KBMS1 can also be connected to an adapter cable (P/N: 1700060202) for connecting to both a PS/2 keyboard and a PS/2 mouse.

## 2.8 External Keyboard Pin Header (KBMS2)



**Figure 2.7 External Keyboard Connector (KBMS2)**

In addition to the PS/2 mouse/keyboard connector on the PCA-6013's rear plate, there is also an extra onboard external keyboard pin header. This gives system integrators greater design flexibility in designing their systems.

## 2.9 CPU Fan Connectors (CPUFAN1)

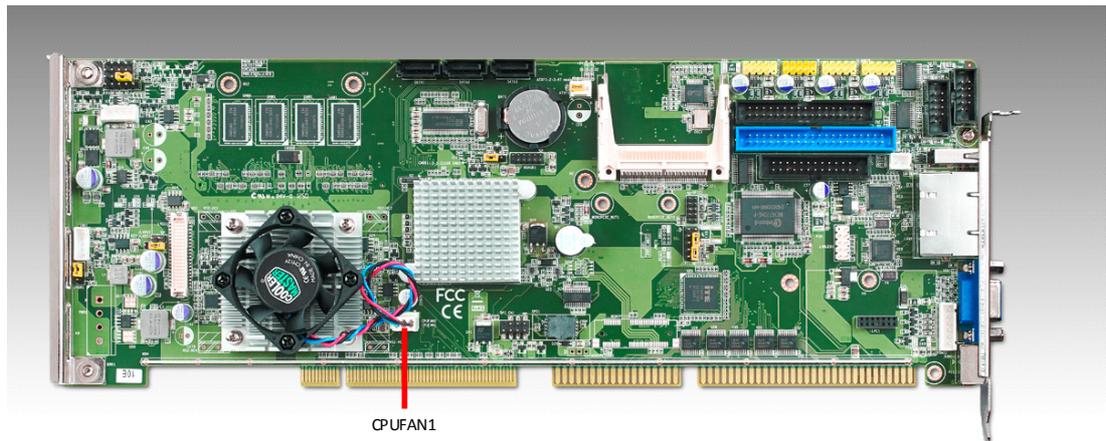


Figure 2.8 CPU Fan Connectors (CPUFAN1)

If a fan is used, this connector supports cooling fans of 12 V/1 A (12 W) or less.

## 2.10 Front Panel Connectors (JFP1+JFP2, JFP3)

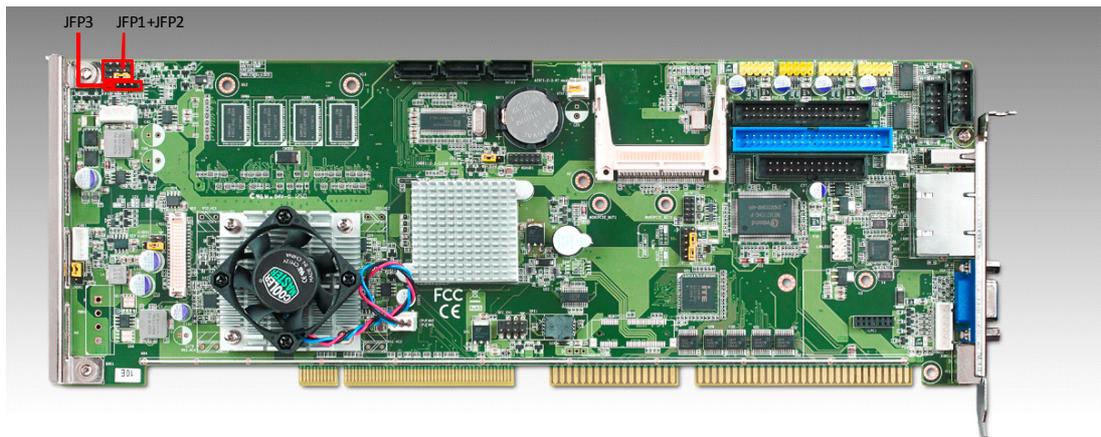
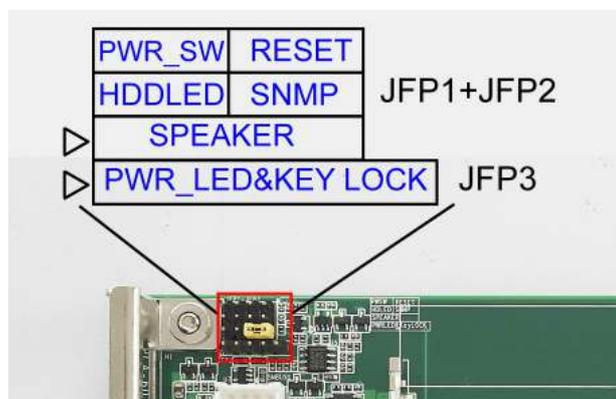


Figure 2.9 Front Panel Connectors (JFP1+JFP2, JFP3)



There are several external switches to monitor and control the PCA-6013.

### 2.10.1 ATX soft power switch (JFP1 / PWR\_SW)

If your computer case is equipped with an ATX power supply, you should connect the power on/off button on your computer case to (JFP1 / PWR\_SW). This connection enables you to turn your computer on and off.

### 2.10.2 Reset (JFP1 / RESET)

Many computer cases offer the convenience of a reset button. Connect the wire for the reset button.

### 2.10.3 HDD LED (JFP2 / HDDLED)

You can connect an LED to connector (JFP2 / HDDLED) to indicate when the HDD is active.

### 2.10.4 SMBus Connector (JFP2 / SNMP)

This connector is reserved for Advantech's SNMP-1000 HTTP/SNMP Remote System Manager. The SNMP-1000 allows users to monitor the internal voltages, temperature and fans from a remote computer through an Ethernet network.

(JFP2 / SNMP) can be connected to CN19 of SNMP-1000. Please be careful about the pin assignments, pin 1 must be connected to pin 1 and pin 2 to pin 2 on both ends of cable.

### 2.10.5 External speaker (JFP2 / SPEAKER)

(JFP2 / SPEAKER) is a 4-pin connector for an external speaker. If there is no external speaker, the PCA-6013 provides an onboard buzzer as an alternative. To enable the buzzer, set pins 3-4 as closed.

### 2.10.6 Power LED and keyboard lock connector (JFP3/ PWR\_LED&KEY LOCK)

(JFP3 / PWR\_LED&KEY LOCK) is a 5-pin connector for the power on LED and Key Lock function. Refer to Appendix A for detailed information on the pin assignments.

The Power LED cable should be connected to pin 1-3. The key lock button cable should be connected to pin 4-5.

There are 3 modes for the power supply connection. The first is "ATX power mode", where the system is turned on/off by a power button. The second is "AT Power Mode", where the system is turned on/off by the switch on the power supply. The third is another "AT Power Mode" which uses the front panel power switch. The power LED status is indicated as per the following table:

**Table 2.1: ATX Power Supply LED Status (No support for AT Power)**

Power Mode	LED (ATX Power Mode) (on/off by tentative button)	LED (AT power Mode) (On/off by switching power supply)	LED (AT power mode) (On/off by front panel switch)
System On	On	On	On
System Suspend	Fast flashes	-	-
System Off	Slow flashes	Off	Off

## 2.11 Watch Dog Timer (JWDT1) / Infrared (JIR1)/ Hardware Monitor Alarm(JOBS1)

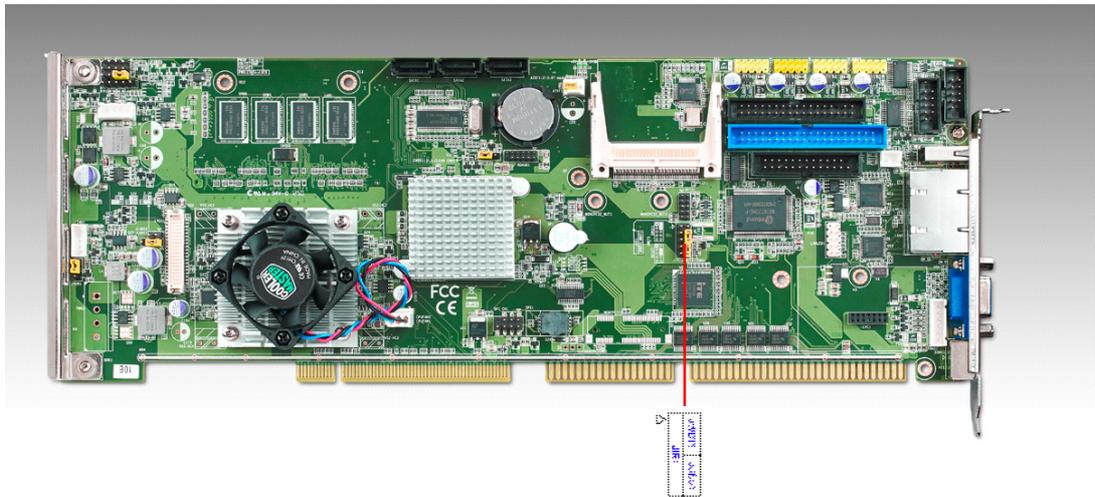
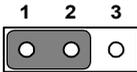
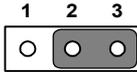


Figure 2.10 Watch Dog Timer (JWDT1) / Infrared (JIR1)/Hardware Monitor Alarm(JOBS1)

### 2.11.1 Watchdog timer output (JWDT1)

The PCA-6013 contains a watchdog timer that will reset the CPU in the event the CPU stops processing. This feature means the PCA-6013 will recover from a software failure or an EMI problem. The JWDT1 jumper settings control the outcome of what the computer will do in the event the watchdog timer is tripped.

Table 2.2: Watchdog timer output (JWDT1)

Function	Jumper Setting
N/A	 1 - 2 closed
* System Reset	 2 - 3 closed

\* default setting

### 2.11.2 Infrared Connector (JIR1)

This 5-pin header is for connecting infrared device connector.

### 2.11.3 H/W Monitor Alarm (JOBS1)

(JOBS1) is a 2-pin jumper to enable/disable the alarm for on board security events.

Table 2.3: Hardware Monitor Alarm setting

Pin setting	Function
Closed	Enable OBS alarm
Open	Disable OBS alarm

## 2.12 LAN RJ45 connector (LAN1/LAN2)

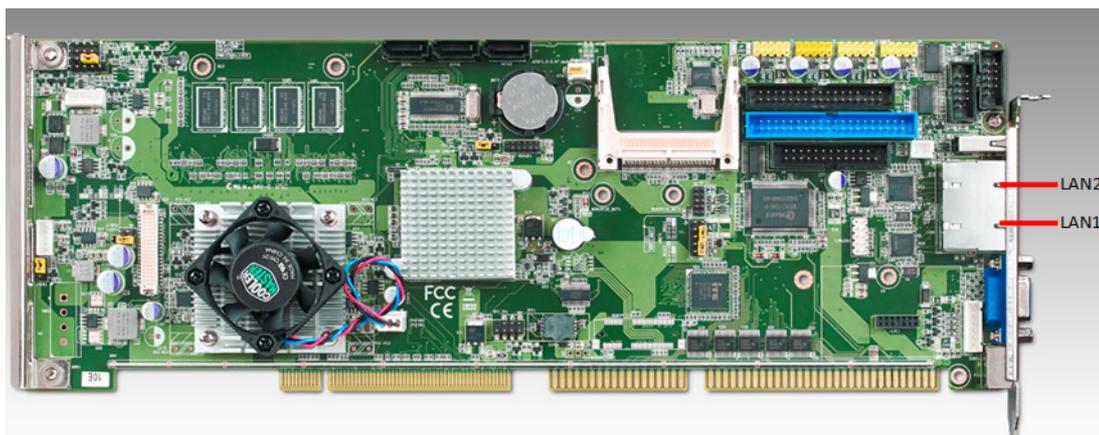


Figure 2.11 LAN RJ45 connector (LAN1/LAN2)

PCA-6013 is equipped the Intel® 82567V Gigabit LAN chips on LAN1 and Intel® 82583V Gigabit LAN chips on LAN2. (LAN2 is only for G2 SKU). PCA-6013 provide high throughputs for heavy loading networking environment. It provides one or two RJ-45 connectors in the rear side and is convenient for most industrial applications.

## 2.13 Serial ATA interface (SATA1 ~ SATA3)

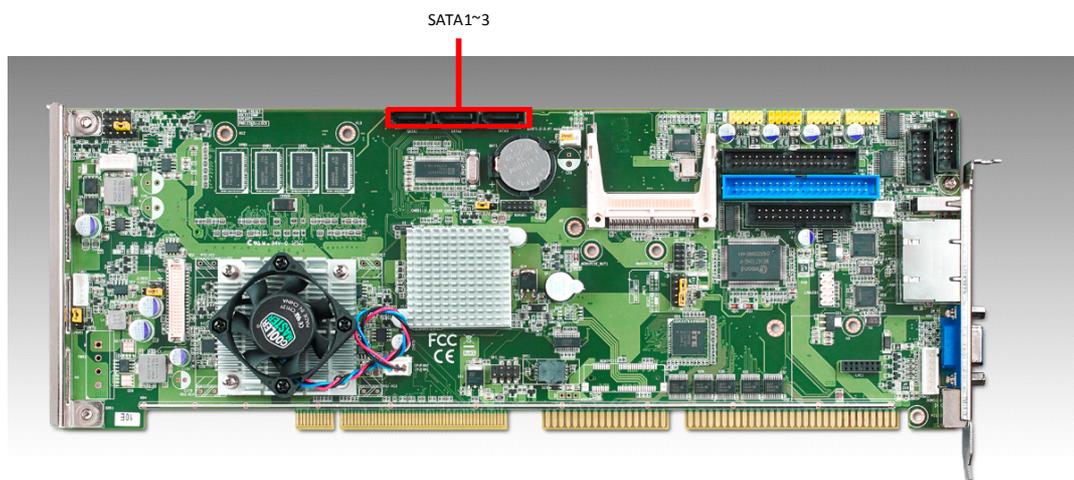


Figure 2.12 Serial ATA interface (SATA1 ~ SATA3)

In addition to the EIDE interface (up to two devices), the PCA-6013 features three high performance Serial ATA interfaces (up to 300 MB/s) for easy hard drive cabling with long, thin SATA cables.

## 2.14 GPIO header (GPIO1)

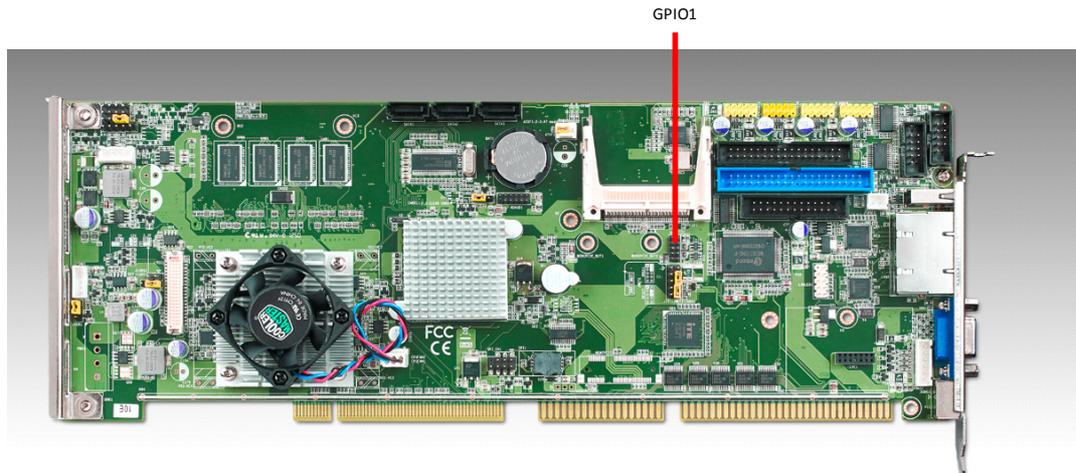


Figure 2.13 GPIO header (GPIO1)

PCA-6013 provides a 10-pin header for Digital I/O usage. Refer to Appendix A for detailed information on the pin assignments.

## 2.15 HD Link connector (HDAUD1)

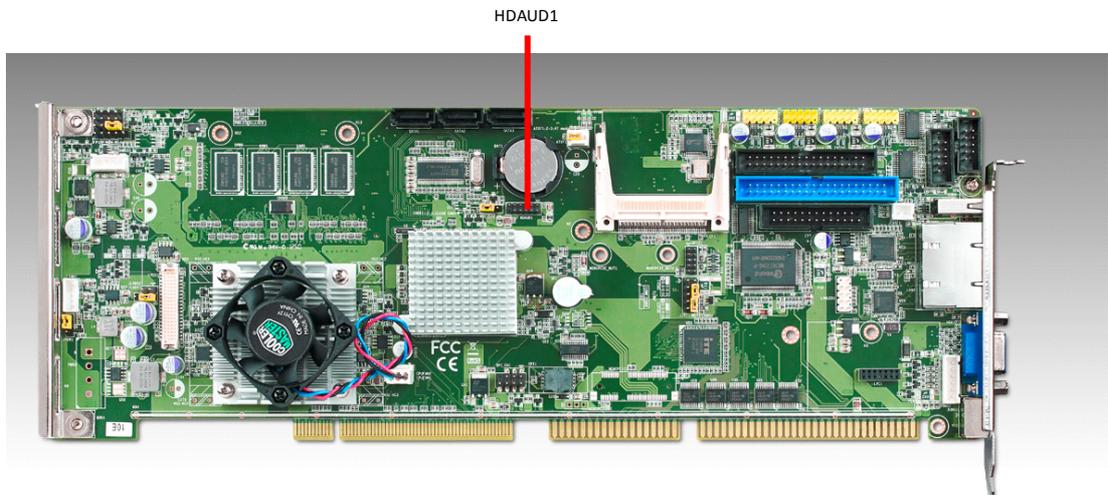
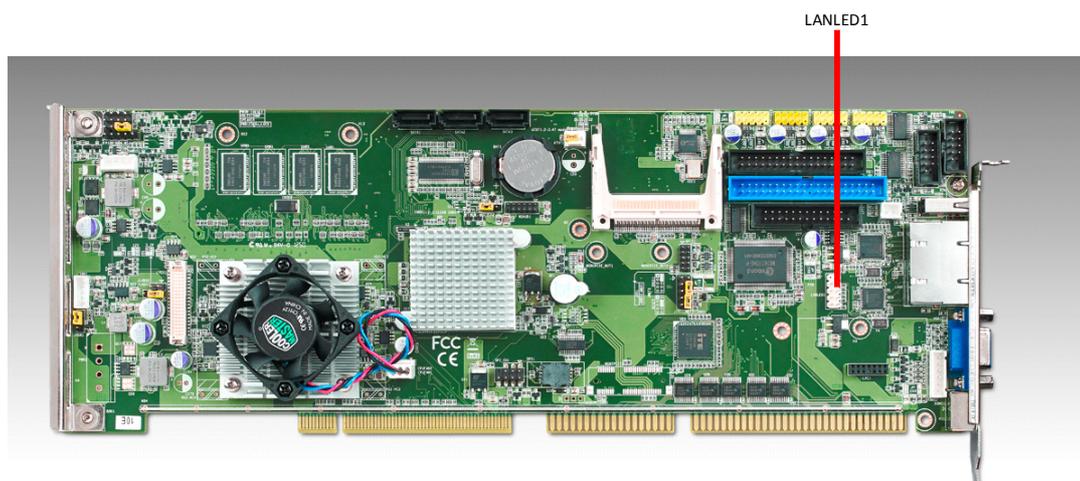


Figure 2.14 HD Audio connector (HDAUD1)

The PCA-6013 provides HD audio through PCA-AUDIO-HDA1E module from Advantech.

## 2.16 LAN LED connector (LANLED1)



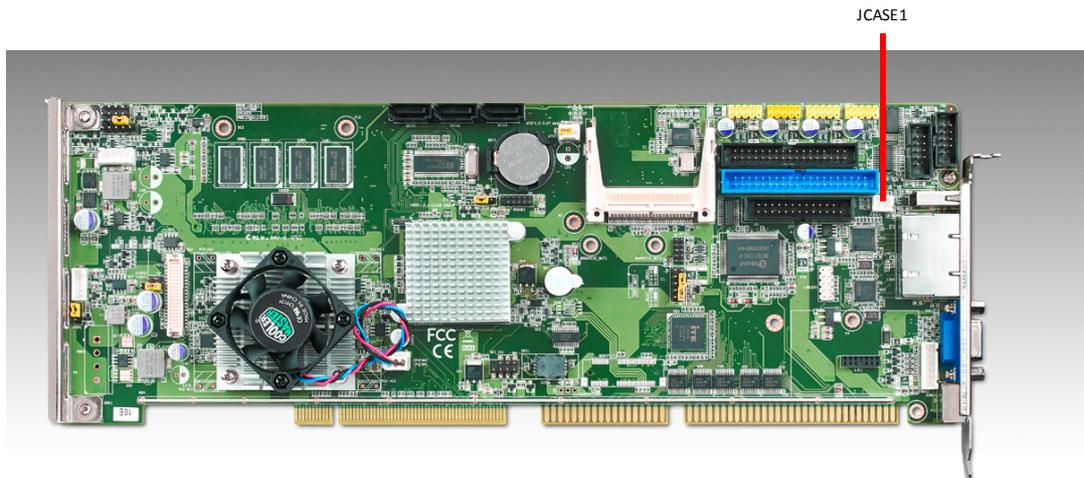
**Figure 2.15 LANLED connector (LANLED1)**

PCA-6013 provides an external LAN LED Pin header for connecting to the front side of the chassis. With this convenient design users can easily see whether the LAN port is active or not. Refer to Appendix A for detailed information on the pin assignments.

**Table 2.4: Front Panel LAN indicator connector**

LAN Mode	LED1	LED2
1000Mbps Link On	Green On	On
1000Mbps Active	Green On	Green Flashes
1000Mbps Link Off	Off	Off
100Mbps Link On	Green On	Green On
100Mbps Active	Green On	Green Flashes
100Mbps Link Off	Off	Off
10Mbps Link On	Off	Green On
10Mbps Active	Off	Green Flashes
10Mbps Link Off	Off	Off

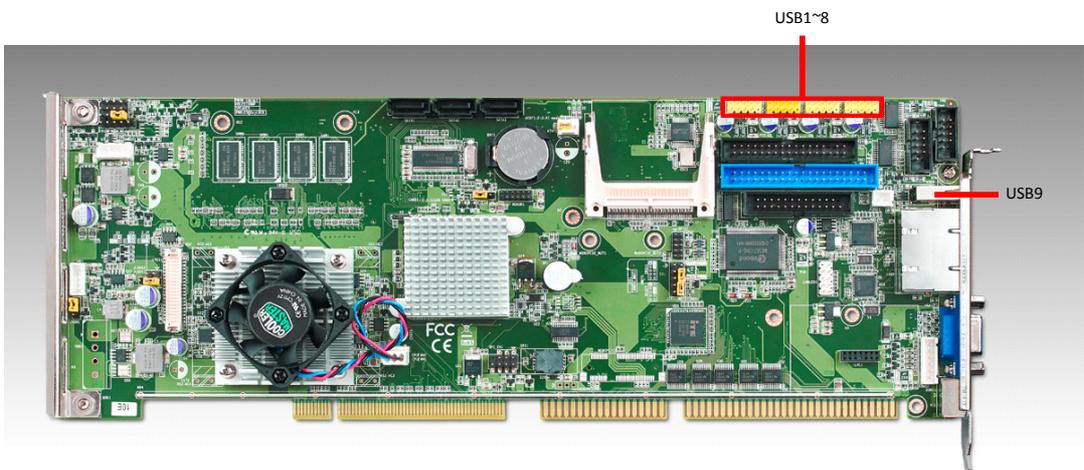
## 2.17 Case open (JCASE1)



**Figure 2.16 JCASE connector (JCASE1)**

PCA-6013 provides 2-Pin pin header for case open detection. This function could be enabled or disabled in the BIOS setting. When the PIN is shorted, it will cause the on board buzzer to sound.

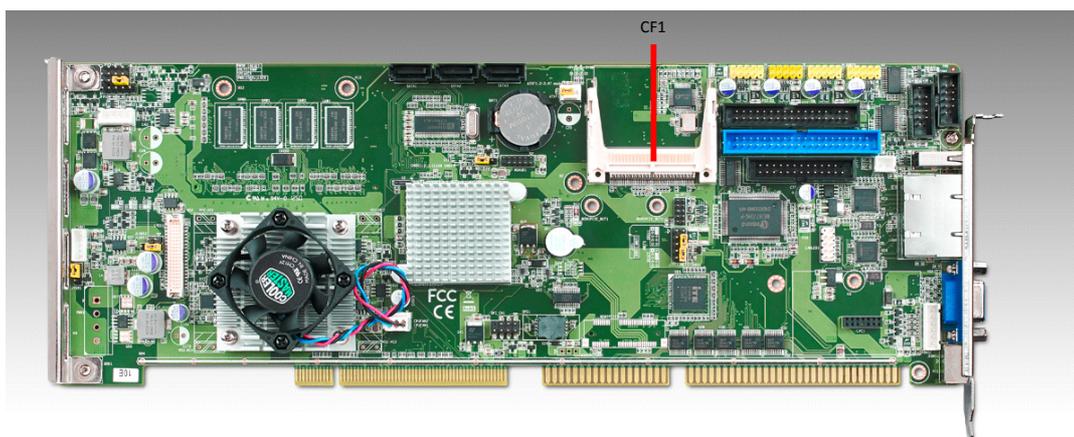
## 2.18 USB Ports (USB 1 ~ 9)



**Figure 2.17 USB connector (USB1 to USB8)**

The PCA-6013 provides eight on board USB 2.0 ports and one on bracket I/O (only for G2 SKU) which support transmission rates up to 480 Mbps and which are fuse-protected. To install the USB cable (p/n:1700008461) bracket, find an empty slot in your chassis and unscrew the plate that covers the end of the slot. Screw in the bracket in place of the plate.

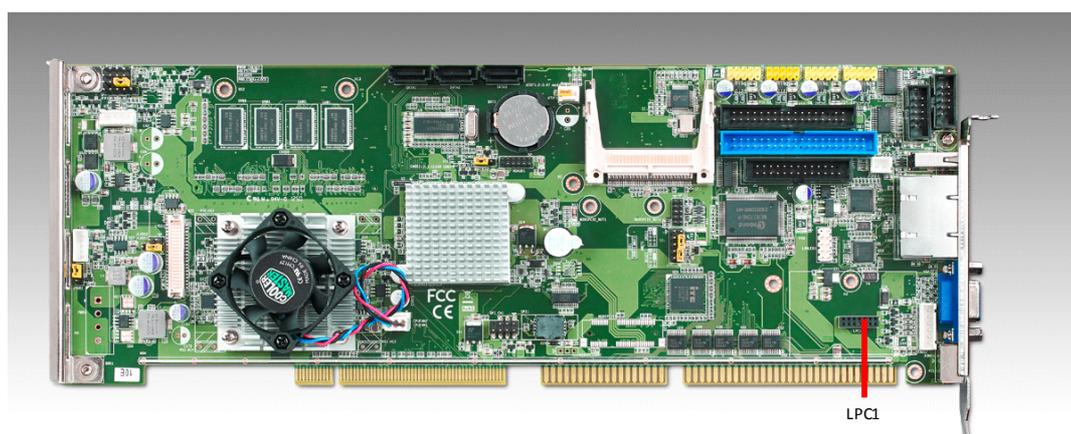
## 2.19 CF Card Socket



**Figure 2.18 CF socket (CF1)**

PCA-6013 supports a CF card device, an installed CF card will occupy the master IDE device. Please locate it on the solder side of the CPU card.

## 2.20 Low Pin Count Device Connection Pin Header



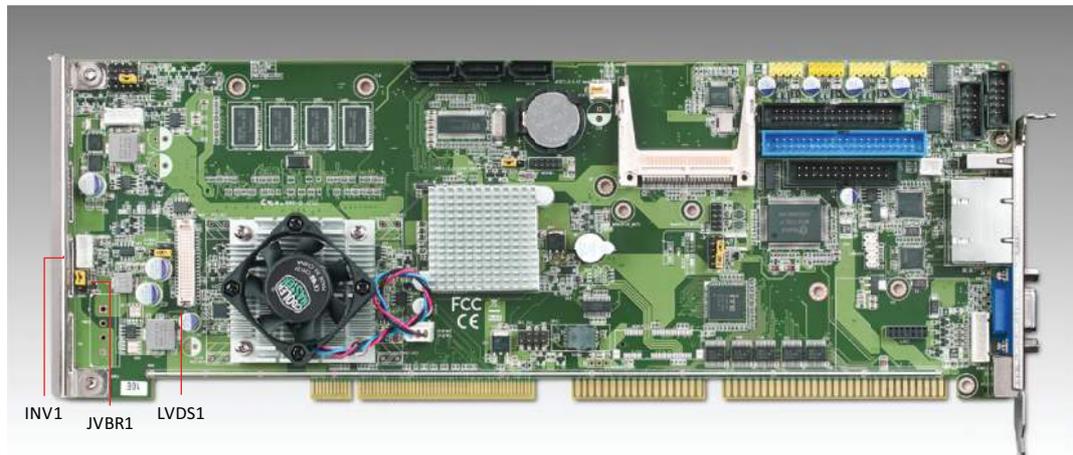
**Figure 2.19 LPC connector (LPC1)**

PCA-6013 has a 14-pin female pin header on its solder side to support Advantech COM port extension modules. You may purchase them to add 4 more RS-485 serial ports (COM ports) with auto flow control function. Please see ordering information below.

**Part Number and Description:**

PCA-COM485-00A1E: Four RS 422/485 COM module with auto flow control function.

## 2.21 LVDS Signal and Power Connectors (LVDS1/INV1/JVBR1)



LVDS1 consists of a 40-pin connector which can support 18-bit single channel LVDS with resolution up to 1366 x 768. The LCD inverter is connected to INV1 via a 5-pin connector to provide power to the LCD display. JVBR1 provides inverter voltage selection: close pins 1, 2 for 3.3V power input inverter; close pins 2, 3 for 5V power input inverter.

# Chapter 3

AMI BIOS Setup

## 3.1 Introduction

With the AMI BIOS Setup program, you can modify BIOS settings and control the special features of your computer. The BIOS Setup program uses a number of menus for making changes and turning special features on or off. This chapter describes the basic navigation of the PCA-6013 setup screens.

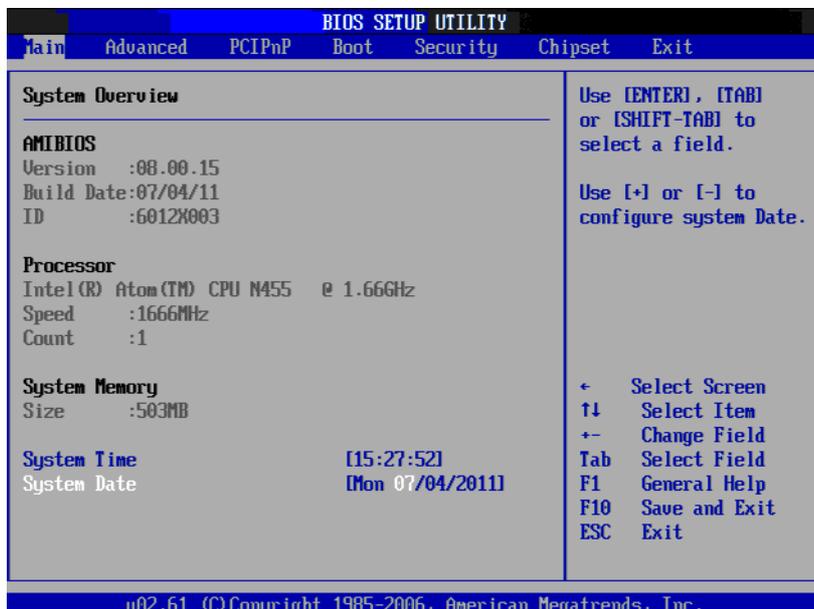


Figure 3.1 Setup Program Initial Screen

AMI's BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This information is stored in battery-backed up CMOS and it is retained when the power is turned off.

## 3.2 Entering Setup

Press the "Del" key during the Power On Self Test (POST) process to enter the BIOS setup screen, otherwise the system will continue the POST process.

## 3.3 Main Setup

When you first enter the BIOS Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.

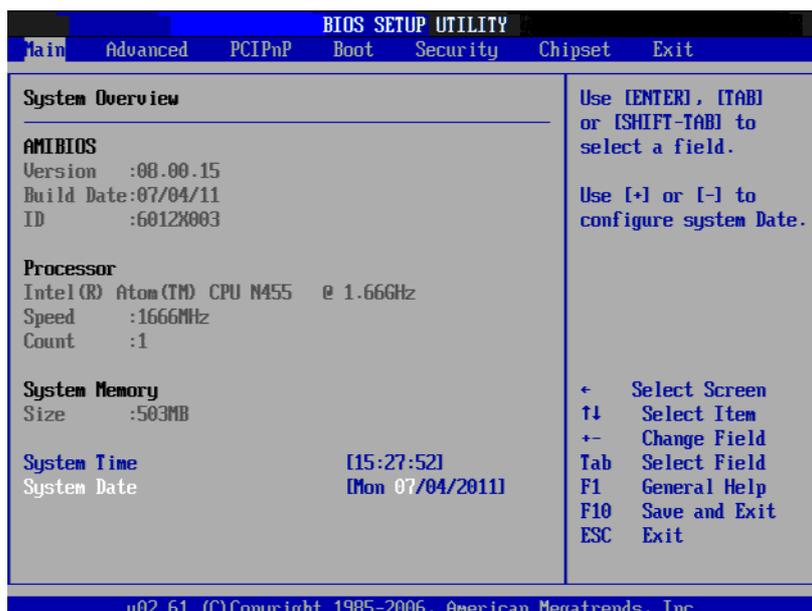


Figure 3.2 Main Setup Screen

The Main BIOS setup screen has two main frames. The left frame displays all the options that can be configured. Grayed-out options cannot be configured; options in blue can. The right frame displays the key legend.

Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

### 3.3.1 System time / System date

Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time must be entered in HH:MM:SS format.

## 3.4 Advanced BIOS Features Setup

Select the Advanced tab from the PCA-6013 setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screen is shown below. The sub menus are described on the following pages.



**Figure 3.3 Advanced BIOS Features Setup Screen**

### 3.4.1 CPU Configuration

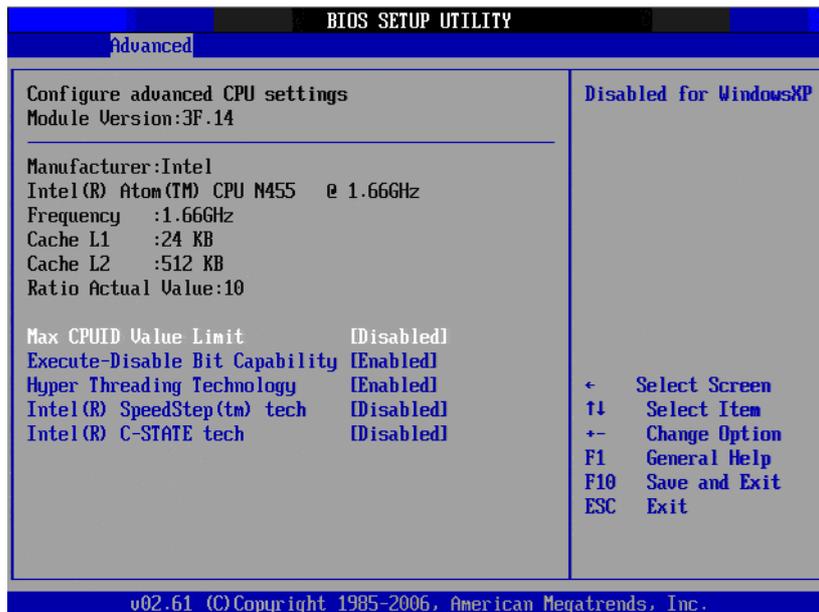


Figure 3.4 CPU Configuration Settings

- **Max CPUID Value Limit**  
This is disabled for Windows XP.
- **Execute Disable Bit**  
This item specifies the Execute Disable Bit Feature. The settings are Enabled and Disabled. The Optimal and Fail-Safe default setting is Enabled. If Disabled is selected, the BIOS forces the XD feature flag to always return to 0.
- **Hyper-Threading Technology**  
While using a CPU with Hyper-Threading technology, you can select "Enabled" to enable Hyper-Threading Technology in an OS which supports Hyper-Threading Technology or select "Disabled" for other OSs which do not support Hyper-Threading technology.
- **Intel® SpeedStep™ tech**  
Intel SpeedStep Technology centralizes the control mechanism in the processor, eliminating the need for coordination with the chipset during the frequency/voltage configuration. This option is used to enable/disable the GV3 bit.
- **Intel® C-STATE tech**  
Intel® CPU Enhanced Halt (C1E) function, a function to save CPU power consumption in system halt state. When enabled, the CPU speed and voltage will be reduced during system halt state to save power consumption. You may choose to enable or disable it.

## 3.4.2 IDE Configuration

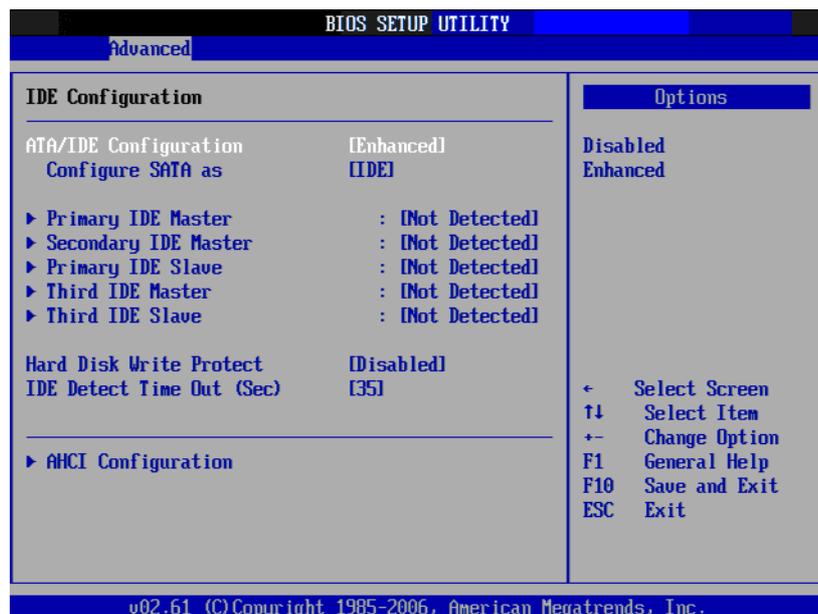


Figure 3.5 IDE Configuration

- **ATA/IDE Configuration**  
This can be configured as Disabled or Enhanced.
  - Configure SATA as  
This can be configured as IDE or AHCI.
- **Hard Disk Write Protect**  
This will be effective only if device is accessed through BIOS. You may choose to enable or disable it
- **IDE Detect Time Out (sec)**  
Select the time out value for detecting IDE devices.
- **AHCI Configuration**  
AHCI is a new interface specification that allows the SATA controller driver to support advanced features. While entering setup, BIOS auto detects the presence of AHCI devices. This displays the status of auto detection of AHCI devices.

### 3.4.3 Super I/O Configuration

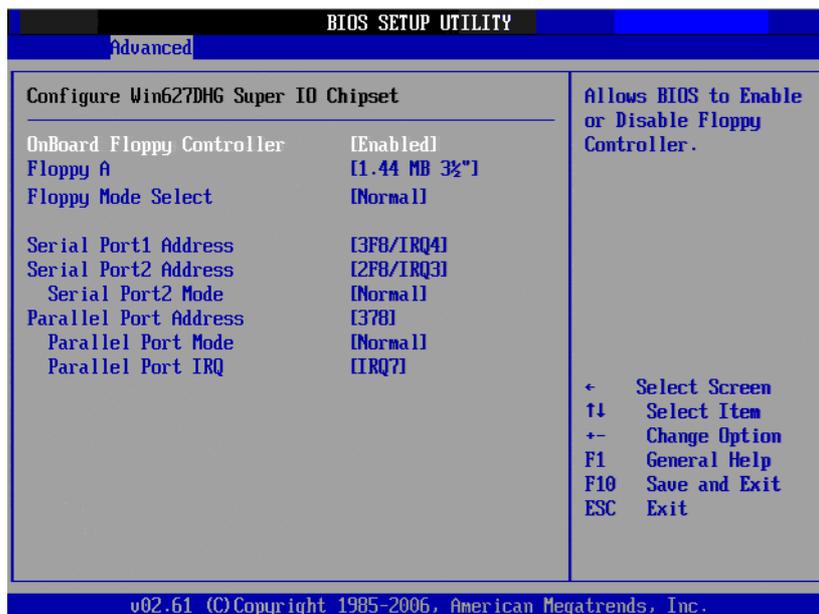


Figure 3.6 Super I/O Configuration

- **OnBoard Floppy Controller**  
Enable or disable the floppy function.
- **Floppy A**  
Select the type of floppy drive connected to the system. The available options are 360 KB 5 1/4", 1.2 MB 5 1/4", 720 KB 3 1/2", 1.44 MB 3 1/2", 2.88 MB 3 1/2". We suggest you disable the floppy if installing Windows Vista without a floppy drive.
- **Floppy Mode Select**  
For user to set floppy mode, Normal / Write Protect.
- **Serial Port1 Address**  
This option configures serial port 1 base addresses.
- **Serial Port2 Address**  
This option configures serial port 2 base addresses. The following options are also available:
  - Serial port2 Mode  
This option configures serial port 2 mode. Available options include Normal, IrDA, ASK IR.
- **Parallel Port Address**  
This configures parallel port base addresses. The following options are also available:
  - Parallel Port Mode  
This option configures Parallel Port mode. Available options include Normal, Bi-directional, ECP, EPP, ECP & EPP.
  - Parallel Port IRQ  
This option configures s Parallel Port base IRQ.

### 3.4.4 Hardware Health Function

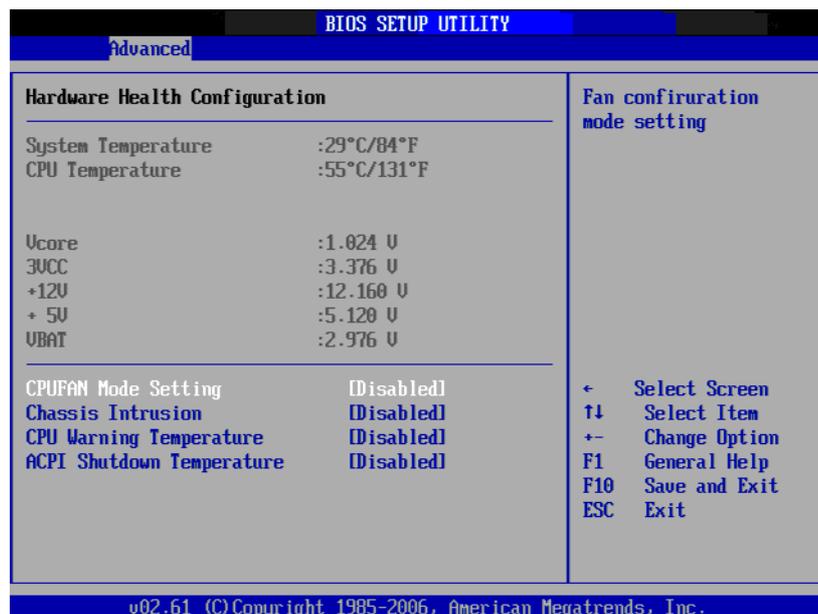


Figure 3.7 Hardware Health Configuration.

- **CPUFAN Mode Setting (only for G2 D525 SKU)**  
Use this to set the SmartFan control function or disabled SmartFan.
- **Chassis Intrusion**  
Enable/Disable the Chassis Intrusion monitoring function. When the case is opened, the buzzer beeps.
- **CPU warning temperature**  
Use this to set the CPU warning temperature threshold. When the system reaches the warning temperature, the buzzer will beep.
- **ACPI Shut Down Temperature (Under ACPI supported O.S.)**  
This option allows user to set the CPU temperature at that the system will automatically shut down for preventing CPU from over heat damage.

### 3.4.5 APM Configuration

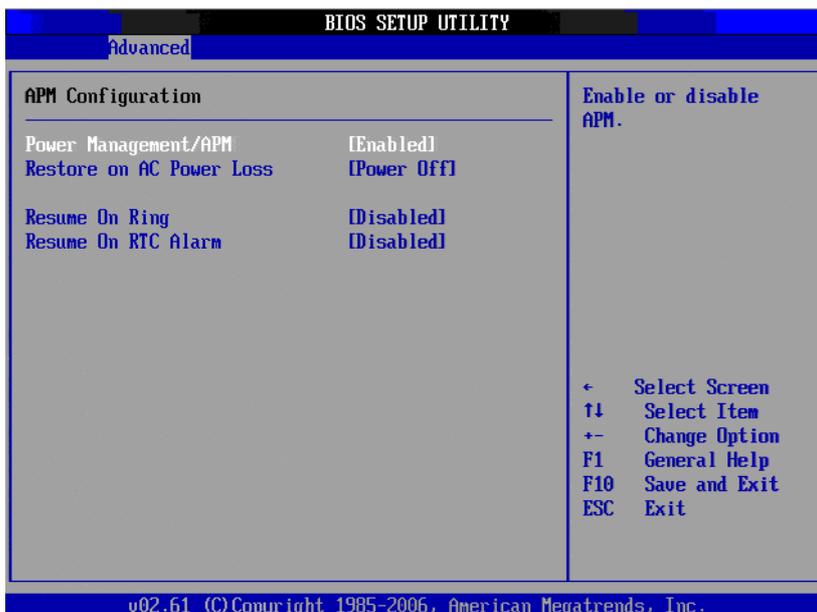


Figure 3.8 APM Configuration

- **Power Management/APM**  
Enable or disable APM power management function.
- **Restore on AC Power Loss**  
This option allows user to set system action when AC power restores after AC power loss. Available options include Power Off, Power On, Last Status.
- **Resume On Ring**  
Disable/Enable RI wake event.
- **Resume On RTC Alarm**  
Disable/Enable RTC wake event.

### 3.4.6 Event Logging Details

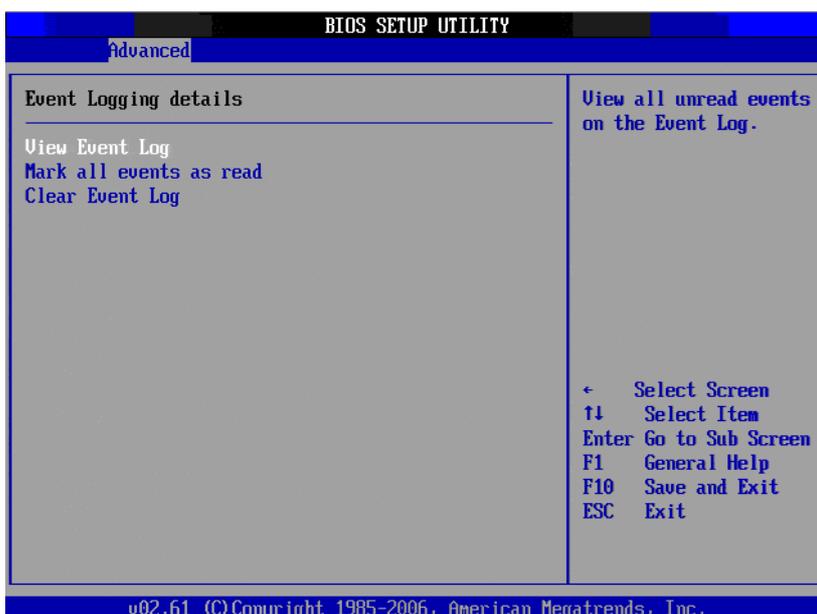
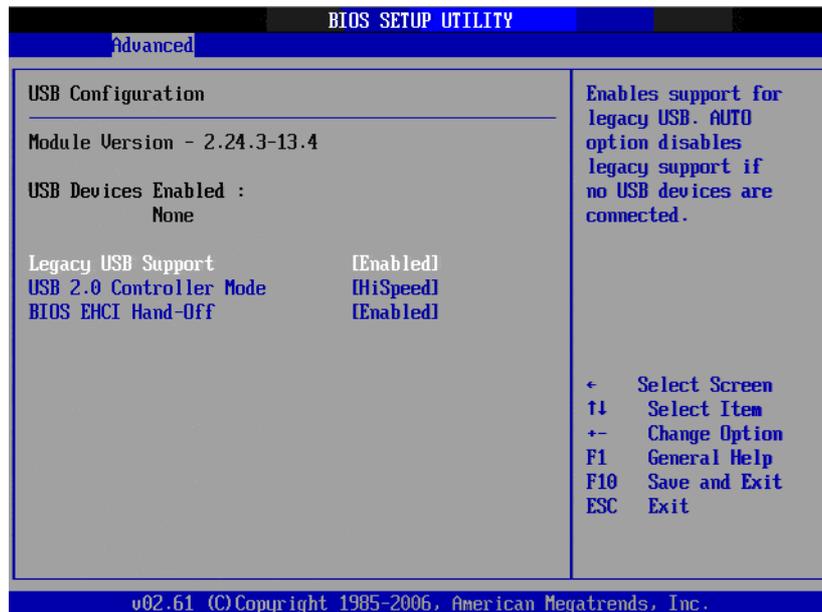


Figure 3.9 Event Logging Details

- **View Event Log**

This is for read or clear event log.

### 3.4.7 USB Configuration



**Figure 3.10 USB Configuration**

- **Legacy USB Support**

This is for supporting USB device under legacy OS such as DOS. When choosing "AUTO", the system will automatically detect if any USB device is plugged into the computer and enable USB legacy mode when a USB device is plugged and disable USB legacy mode when no USB device is plugged.

- **USB 2.0 Controller Mode**

This is to set speed of the USB 2.0 Controller.

- **BIOS EHCI Hand-off**

This enables or disables supporting OS without EHCI hand-off feature.

## 3.5 PCI/PnP Setup

Select the PCI/PnP tab from the PCA-6013 setup screen to enter the Plug and Play BIOS Setup screen. Highlighting a Plug and Play BIOS Setup option by using the <Arrow> keys displays a description in the right-hand panel. All Plug and Play BIOS Setup options are described in this section. The Plug and Play BIOS Setup screen is shown below.

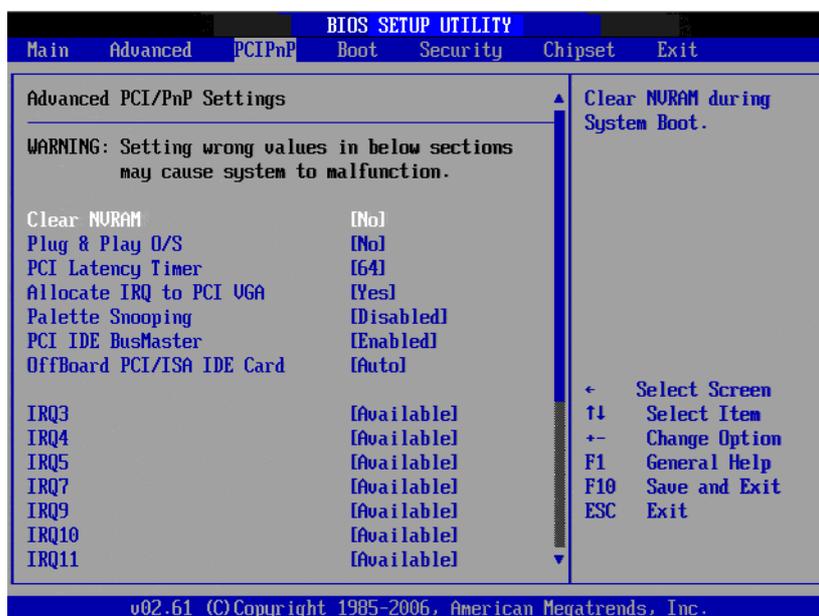


Figure 3.11 PCI/PnP Setup

- **Clear NVRAM**  
Set this value to force the BIOS to clear the Non-Volatile Random Access Memory (NVRAM). The Optimal and Fail-Safe default setting is No.
- **Plug and Play O/S**  
Set this value to allow the system to modify the settings for Plug and Play operating system support. The Optimal and Fail-Safe default setting is No.
- **PCI Latency Timer**  
Use this to adjust the PCI Latency Timer. This option sets the latency of all PCI devices on the PCI bus. The Optimal and Fail-Safe default setting is 64.
- **Allocate IRQ to PCI VGA**  
Set this value to allow or stop the system from giving the VGA adapter card an interrupt address. The Optimal and Fail-Safe default setting is Yes.
- **Palette Snooping**  
Set this value to allow the system to modify the Palette Snooping settings. The Optimal and Fail-Safe default setting is Enabled.
- **PCI IDE BusMaster**  
Set this value to allow or prevent the use of PCI IDE Busmastering. The Optimal and Fail-Safe default setting is enabled.
- **Off Board PCI/ISA IDE card**  
Set this value to allow an add-on PCI/ISA IDE card to be selected. The Optimal and Fail-Safe default setting is Auto.
- **IRQ**

- IRQ[3,4,5,7,9,10,11,14,15]:  
Available: Specified IRQ is available to be used by PCI/PnP devices.  
Reserved: Specified IRQ is reserved for use by Legacy ISA devices.
- DMA Channel [0,1,3,5,6,7]:  
Available: Specified DMA is available to be used by PCI/PnP devices.  
Reserved: Specified DMA is reserved for use by legacy ISA devices.  
Reserved Memory Size: Size of memory block to reserve for legacy ISA devices.

## 3.6 Boot Setup Utility

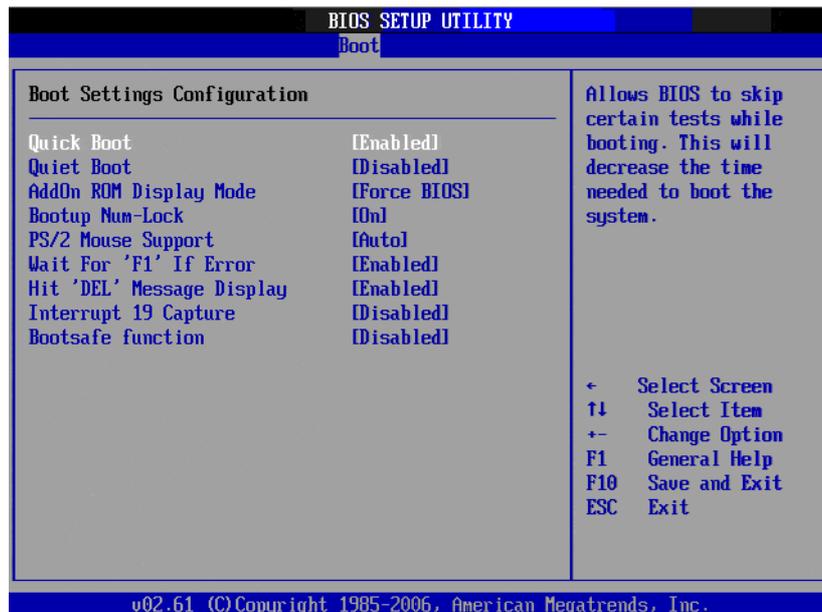


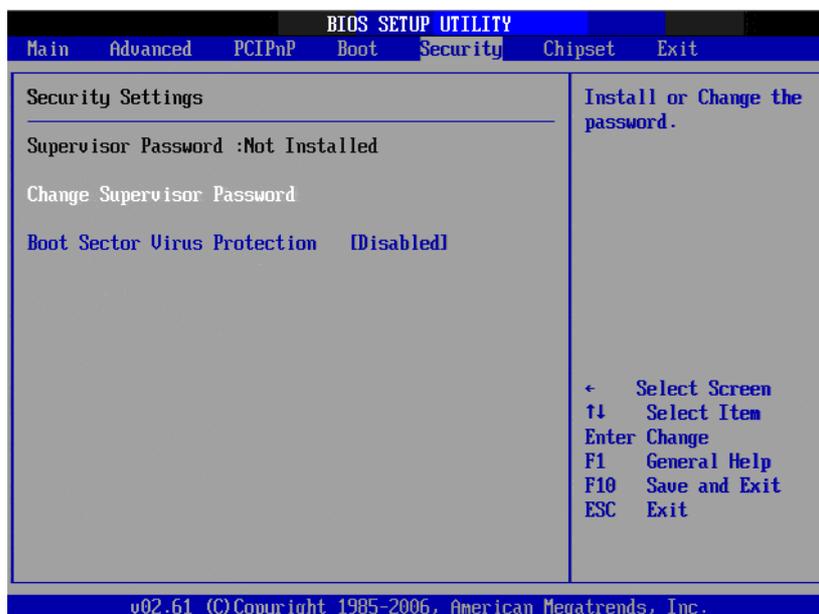
Figure 3.12 Boot Settings Configuration

The following options are available:

- **Quick Boot**  
Allows the BIOS to skip certain tests while booting. This will decrease the time needed to boot the system.
- **Quiet Boot**  
If this option is set to Disabled, the BIOS displays normal POST messages. If Enabled, an OEM Logo is shown instead of POST messages.
- **AddOn ROM Display Mode**  
This is for choosing display mode of option ROM information under DOS environment during booting up process. Available options include Force BIOS, Keep Current.
- **Bootup Num-Lock**  
Select the Power-on state for Numlock.
- **PS/2 Mouse Support**  
Enable or disable PS/2 interface mouse support. Available options include Auto, Enable, Disable.
- **Wait For 'F1' If Error**  
Wait for the F1 key to be pressed if an error occurs.
- **Hit 'DEL' Message Display**  
Displays "Press DEL to run Setup" in POST.

- **Interrupt 19 Capture**  
Enable or disable option ROM to trap interrupt 19.
- **Bootsafe function**  
Enable or disable Advantech proprietary Bootsafe function. (only reserve this item. If need this function, need customize BIOS).

## 3.7 Security Setup



**Figure 3.13 Password Configuration**

Select Security Setup from the PCA-6013 Setup main BIOS setup menu. All Security Setup options, such as password protection and virus protection are described in this section. To access the sub menu for the following items, select the item and press <Enter>:

- **Change Supervisor Password**  
Provides for either installing or changing the password.
- **Boot sector Virus protection:** The boot sector virus protection will warn if any program tries to write to the boot sector.

## 3.8 Advanced Chipset Settings



Figure 3.14 Advanced Chipset Settings

- **North Bridge Configuration**  
Allows user to set graphic and memory controller configurations.
- **South Bridge Configuration**  
Allows user to set I/O port configurations.
- **Spread Spectrum**  
Enable/Disable spread spectrum. Enable spread spectrum function can have better EMI compatibility but may cause some unexpected peripheral device incompatibility issue.

### 3.8.1 North Bridge Configuration

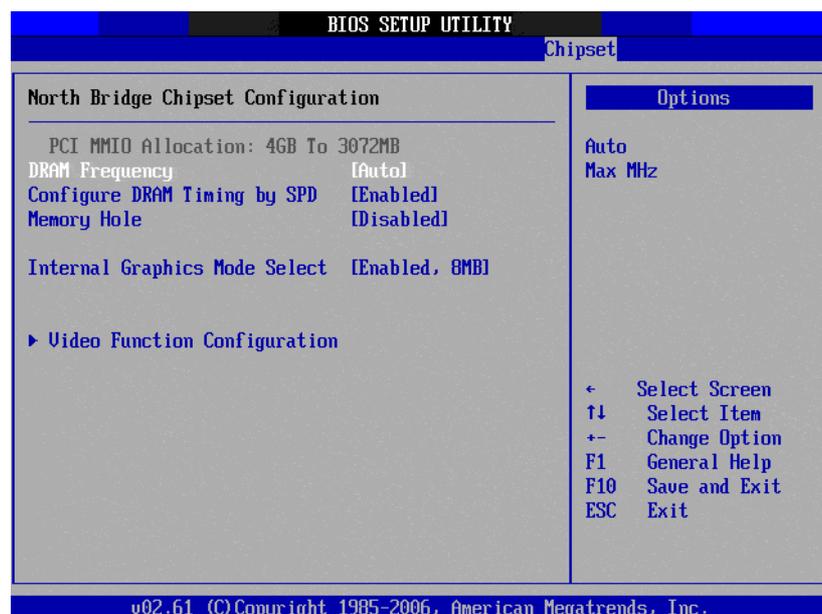
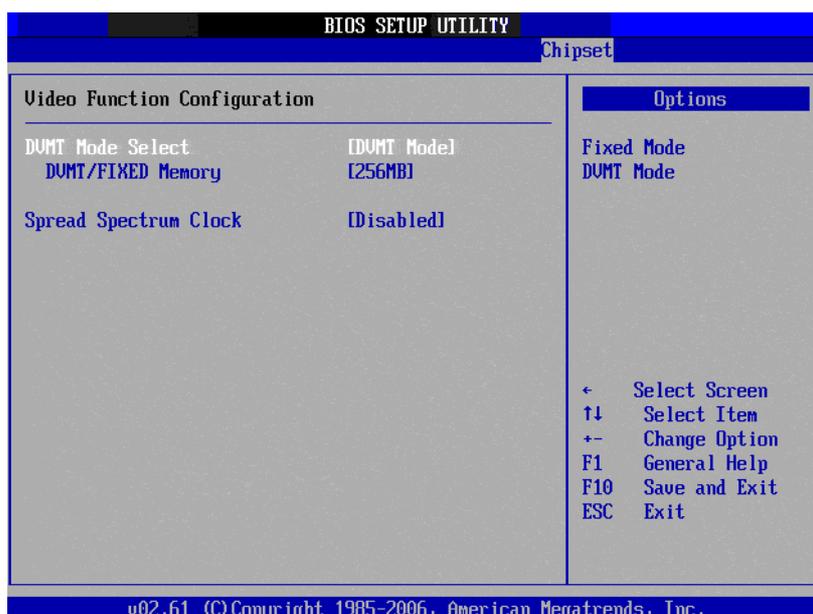


Figure 3.15 North Bridge Configuration

- **DRAM Frequency**  
Allows user to set DDR3 memory operating frequency.
- **Configure DRAM Timing by SPD**  
Allows user to set DRAM operating timing coefficients by SPD or Manual.
- **Memory Hole**  
Disable or setting 15-16M memory hole.
- **Internal Graphics Mode Select**  
Graphic mode setting for DOS environment.
- **Video Function Configuration**  
This allows user to set IGD (Integrated Graphics Device) configuration.



**Figure 3.16 Video Function Configuration**

- **DVMT model select**  
Displays the active system memory mode.
- **DVMT / FIXED Memory**  
Specify the amount of DVMT / FIXED system memory to allocate for video memory.
- **Spread Spectrum Clock**  
Enable/Disable Spread Spectrum Clock. Enable spread spectrum function can have better EMI compatibility but may cause some unexpected peripheral device incompatibility issue.

## 3.8.2 South Bridge Configuration

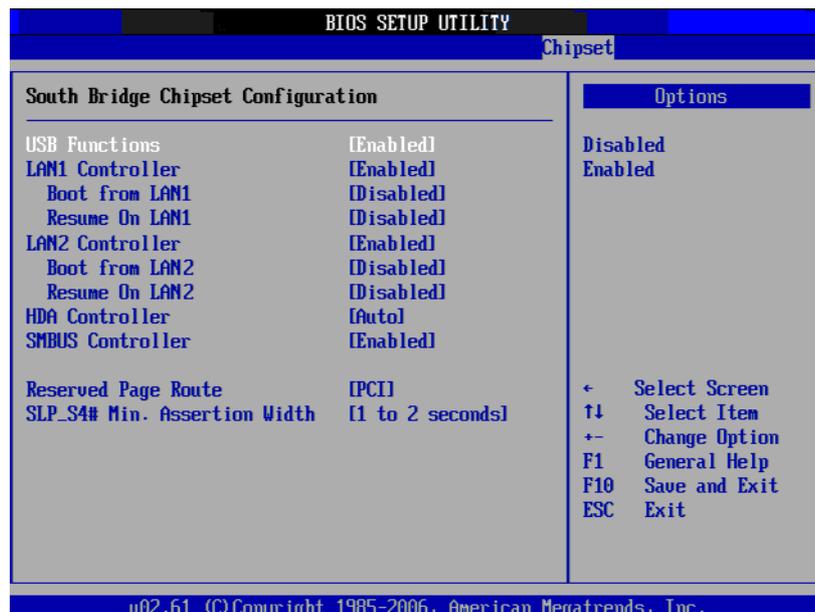


Figure 3.17 South Bridge Configuration

- **USB Functions**  
Enable/ Disable.
- **USB 2.0 Controller**  
Enables or disables the USB 2.0 controller.
- **LAN 1/2 Controller**  
Enables or disables the LAN1/LAN2 controller. The options below are also available.
  - Boot from LAN1/2  
Allows user to enable or disable the function of LAN booting from a PXE server.
  - Resume on LAN 1/2  
Allows user to enable or disable the function of system resuming from LAN1/2.
- **HDA Controller**  
Enables or disables the High Definition audio controller.
- **SMBUS Controller**  
Enables or disables the SMBUS controller.
- **Reserved Page Route**  
Allows user to set Port 80 information output port. Available options include PCI, LPC.
- **SLP\_S4# Min. Assertion Width**  
This is for setting delay time between stand by power readiness and ICH SLP\_S4# signal triggering. Available options include 1 to 2 seconds, 2 to 3 seconds, 3 to 4 seconds, 4 to 5 seconds.

## 3.9 Exit Options

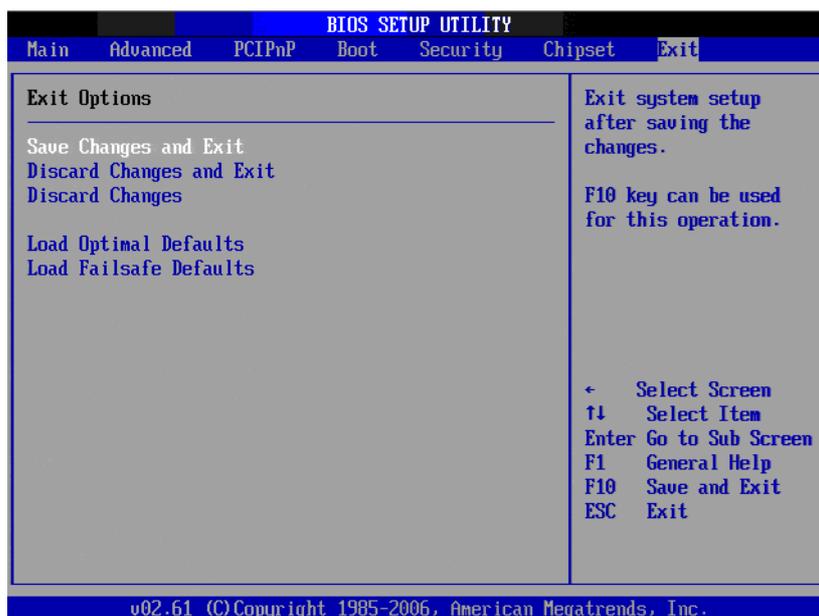


Figure 3.18 Exit Options

### 3.9.1 Save Changes and Exit

When you have completed system configuration, select this option to save your changes, exit BIOS setup and reboot the computer so the new system configuration parameters can take effect.

1. Select Save Changes and Exit from the Exit menu and press <Enter>. The following message appears:  
Save Configuration Changes and Exit Now?  
[Ok] [Cancel]
2. Select Ok or Cancel.

### 3.9.2 Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration.

1. Select Discard Changes and Exit from the Exit menu and press <Enter>. The following message appears:  
Discard Changes and Exit Setup Now?  
[Ok] [Cancel]
2. Select Ok to discard changes and exit.

### 3.9.3 Discard Changes

Select Discard Changes from the Exit menu and press <Enter>.

---

### 3.9.4 Load Optimal Defaults

The PCA-6013 automatically configures all setup items to optimal settings when you select this option. Optimal Defaults are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Optimal Defaults if your computer is experiencing system configuration problems. Select Load Optimal Defaults from the Exit menu and press <Enter>.

### 3.9.5 Load Failsafe Defaults

The PCA-6013 automatically configures all setup options to failsafe settings when you select this option. Failsafe Defaults are designed for maximum system stability, but not maximum performance. Select Failsafe Defaults if your computer is experiencing system configuration problems.

1. Select Load Failsafe Defaults from the Exit menu and press <Enter>. The following message appears:  
Load Failsafe Defaults?  
[OK] [Cancel]
2. Select OK to load Failsafe defaults.

# Chapter 4

## Value-Added Software Services

## 4.1 Value-Added Software Services

Software API: An interface that defines the ways in which an application program may request services from libraries and/or operating systems. Provides not only the underlying drivers required but also a rich set of user-friendly, intelligent and integrated interfaces, which speeds development, enhances security and offers add-on value for Advantech platforms. It plays the role of catalyst between developer and solution, and makes Advantech embedded platforms easier and simpler to adopt and operate with customer applications.

### 4.1.1 Software API

#### 4.1.1.1 Control

##### GPIO



General Purpose Input/Output is a flexible parallel interface that allows a variety of custom connections. allows users to monitor the level of signal input or set the output status to switch on/off the device. Our API also provide Programmable GPIO, allows developers to dynamically set the GPIO input or output status.

#### 4.1.1.2 Monitor

##### Watchdog



A watchdog timer (WDT) is a device that performs a specific operation after a certain period of time if something goes wrong and the system does not recover on its own. A watchdog timer can be programmed to perform a warm boot (restarting the system) after a certain number of seconds.

##### Hardware Monitor



The Hardware Monitor (HWM) API is a system health supervision API that inspects certain condition indexes, such as fan speed, temperature and voltage.

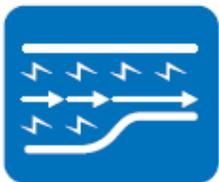
#### 4.1.1.3 Power Saving

##### CPU Speed



Make use of Intel SpeedStep technology to reduce power consumption. The system will automatically adjust the CPU speed depending on the system loading.

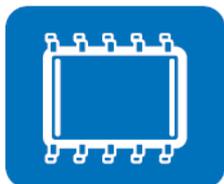
### System Throttling



Refers to a series of methods for reducing power consumption in computers by lowering the clock frequency. This API allows the user to reduce the clock speed to 87.5% to 12.5% of normal.

## 4.1.2 Software Utility

### BIOS Flash



The BIOS Flash utility allows customers to update the flash ROM BIOS version, or use it to back up current BIOS by copying it from the flash chip to a file on customers' disk. The BIOS Flash utility also provides a command line version and API for fast implementation into customized applications.

### Embedded Security ID



The embedded application is the most important property of a system integrator. It contains valuable intellectual property, design knowledge and innovation, but it is easily copied! Embedded Security ID utility provides reliable security functions for customers to secure their application data within embedded BIOS.

### Monitoring



Monitoring is a utility for customer to monitor the system health, like voltage, CPU and system temperature and fan speed. These items are important to a device; if the critical errors happen and are not solved immediately, permanent damage may be caused.

### Flash Lock



Flash Lock is a mechanism to bind the Board and CF card (SQFlash) together. User can "Lock" SQFlash via Flash Lock function and "Unlock" by BIOS while booting. A locked SQFlash cannot be read by any card reader or boot from other platforms without a BIOS with an "Unlock" feature.

### eSOS (Requires BIOS Customization)



The eSOS is a small OS stored in BIOS ROM. It will boot up in case of main OS crash. It will diagnose the hardware status, and then send an e-mail to administrator. The eSOS also provide Remote Connection: Telnet server and FTP server for administrator to rescue the system. Note: This function requires BIOS customization.



# Chapter 5

Chipset Software  
Installation Utility

## 5.1 Before You Begin

To facilitate the installation of the enhanced display drivers and utility software, read the instructions in this chapter carefully. The drivers for the PCA-6013 are located on the software installation CD. The driver in the folder of the driver CD will guide and link you to the utilities and drivers under a Windows system. Updates are provided via Service Packs from Microsoft\*.

**Note!** *The files on the software installation CD are compressed. Do not attempt to install the drivers by copying the files manually. You must use the supplied SETUP program to install the drivers.*



Before you begin, it is important to note that most display drivers need to have the relevant software application already installed in the system prior to installing the enhanced display drivers. In addition, many of the installation procedures assume that you are familiar with both the relevant software applications and operating system commands. Review the relevant operating system commands and the pertinent sections of your application software's user manual before performing the installation.

## 5.2 Introduction

The Intel® Chipset Software Installation (CSI) utility installs the Windows INF files that outline to the operating system how the chipset components will be configured. This is needed for the proper functioning of the following features:

- Core PCI PnP services
- IDE Ultra ATA 100/66/33 and Serial ATA interface support
- USB 1.1/2.0 support (USB 2.0 driver needs to be installed separately for Win98)
- Identification of Intel® chipset components in the Device Manager
- Integrates superior video features. These include filtered sealing of 720 pixel DVD content, and MPEG-2 motion compensation for software DVD

## 5.3 Windows 7/XP Driver Setup

1. Insert the driver CD into your system's CD-ROM drive. You can see the driver folder items. Navigate to the "01\_Chipset" folder and click "ininst\_autol.exe" to complete the installation of the driver.

**Note!** *Wrong driver installation may cause unexpected system instability.*



# Chapter 6

Integrated Graphic  
Device Setup

---

## 6.1 Introduction

To benefit from the Intel® Atom™ D525/N455 integrated graphics controller, you need to install the graphic driver.

## 6.2 Windows 7/XP Driver Setup

**Note!** *Before installing this driver, make sure the CSI utility has been installed in your system. See Chapter 4 for information on installing the CSI utility.*



Insert the driver CD into your system's CD-ROM drive. You can see the driver folders items. Navigate to the "02\_Graphic" folder and choose the right OS version folder, then click "setup.exe" to complete the installation of the driver.

**Note!** *Wrong driver installation may cause unexpected system instability.*



# Chapter 7

## LAN Configuration

---

## 7.1 Introduction

The PCA-6013 has Signal Gigabit Ethernet LANs via dedicated PCI Express x1 lanes (Intel 82567V offers bandwidth of up to 500 MB/sec, eliminating the bottleneck of network data flow and incorporating Gigabit Ethernet at 1000 Mbps).

## 7.2 Installation

**Note!** *Before installing the LAN drivers, make sure the CSI utility has been installed on your system. See Chapter 4 for information on installing the CSI utility.*



The PCA-6013's Intel 82567V (LAN1) Gigabit integrated controllers support all major network operating systems. However, the installation procedure varies from system to system. Please find and use the section that provides the driver setup procedure for the operating system you are using.

## 7.3 Windows 7/XP Driver Setup

Insert the driver CD into your system's CD-ROM drive. Navigate to the "04\_LAN" folder and click "Autorun.exe" to complete the installation of the driver.

**Note!** *Wrong driver installation may cause unexpected system instability.*



# Appendix **A**

## Programming the Watchdog Timer

---

## A.1 Programming the Watchdog Timer

The PCA-6011 watchdog timer can be used to monitor system software operation and take corrective action if the software fails to function within the programmed period. This section describes the operation of the watchdog timer and how to program it.

### A.1.1 Watchdog timer overview

The watchdog timer is built in to the super I/O controller W83627DHG-P. It provides the following functions for user programming:

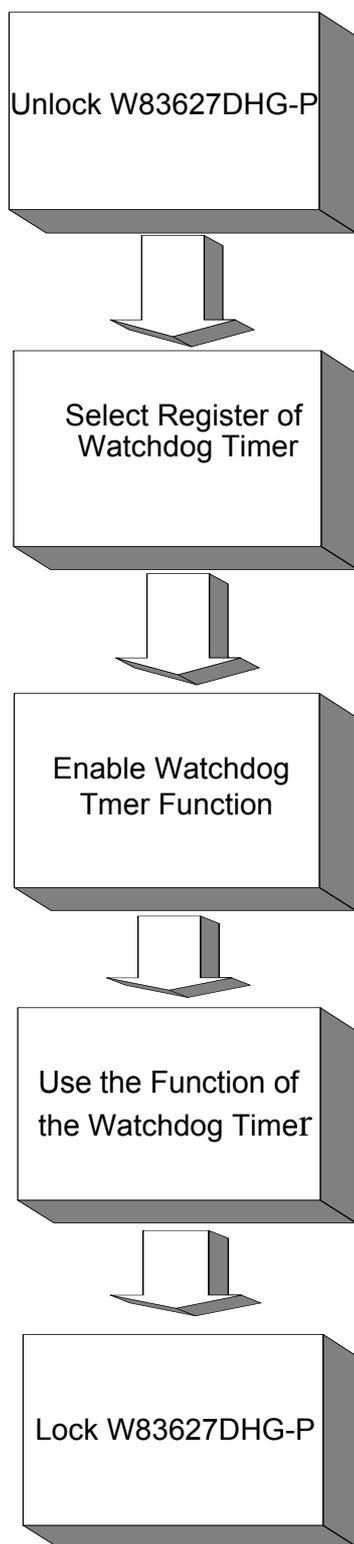
- Can be enabled and disabled by user's program.
- Timer can be set from 1 to 255 seconds or 1 to 255 minutes.
- Generates an interrupt or reset signal if the software fails to reset the timer before time-out.

### A.1.2 Jumper selection

The JWDT1 jumper is used to select reset in the event the watchdog timer is tripped. See Chapter 1 for detailed jumper settings.

### A.1.3 Programming the Watchdog Timer

The I/O port address of the watchdog timer is 2E(hex) and 2F(hex). 2E (hex) is the address port. 2F(hex) is the data port. You must first assign the address of register by writing an address value into address port 2E (hex), then write/read data to/from the assigned register through data port 2F (hex).



**Table A.1: Watchdog Timer Registers**

Address of Register (2E)	Attribute	Value (2F) & Description
87 (hex)	----	Write this address to I/O address port 2E (hex) twice to unlock the W83627DHG-P
07 (hex)	write	Write 08 (hex) to select register of watchdog timer.
30 (hex)	write	Write 01 (hex) to enable the function of the watchdog timer. Disabled is set as default.
F5 (hex)	write	Set seconds or minutes as units for the timer. Write 0 to bit 3: set second as counting unit. [default] Write 1 to bit 3: set minutes as counting unit
F6 (hex)	write	0: stop timer [default] 01~FF (hex): The amount of the count, in seconds or minutes, depends on the value set in register F5 (hex). This number decides how long the watchdog timer waits for strobe before generating an interrupt or reset signal. Writing a new value to this register can reset the timer to count with the new value.
F7 (hex)	read/write	Bit 7: Write 1 to enable mouse to reset the timer, 0 to disable.[default] Bit 6: Write 1 to enable keyboard to reset the timer, 0 to disable.[default] Bit 5: Write 1 to generate a timeout signal immediately and automatically return to 0. [default=0] Bit 4: Read status of watchdog timer, 1 means timer is "timeout".
AA (hex)	----	Write this address to I/O port 2E (hex) to lock the watchdog timer 2.

### A.1.4 Example Program

1. Enable watchdog timer and set 10 sec. as timeout interval

```

;-----
Mov dx,2eh      ; Unlock W83627DHG-P
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h      ; Select registers of watchdog timer
Out  dx,al
Inc  dx
Mov  al,08h
Out  dx,al
;-----
Dec dx          ; Enable the function of watchdog timer
Mov  al,30h
Out  dx,al
Inc  dx
Mov  al,01h
Out  dx,al
;-----
Dec dx          ; Set second as counting unit
Mov  al,0f5h
Out  dx,al
Inc  dx
In   al,dx
And al,not 08h
Out  dx,al
;-----
Dec dx          ; Set timeout interval as 10 seconds and start counting
Mov  al,0f6h
Out  dx,al
Inc  dx
Mov  al,10
Out  dx,al
;-----
Dec dx          ; lock W83627DHG-P
Mov  al,0aah
Out  dx,al

```

2. Enable watchdog timer and set 5 minutes as timeout interval

```

;-----
Mov dx,2eh      ; unlock W83627DHG-P
Mov al,87h
Out dx,al
Out dx,al

```

```

;-----
Mov al,07h      ; Select registers of watchdog timer
Out  dx,al
Inc  dx
Mov  al,08h
Out  dx,al
;-----
Dec dx          ; Enable the function of watchdog timer
Mov  al,30h
Out  dx,al
Inc  dx
Mov  al,01h
Out  dx,al
;-----
Dec dx          ; Set minute as counting unit
Mov  al,0f5h
Out  dx,al
Inc  dx
In   al,dx
Or  al,08h
Out  dx,al
;-----
Dec dx          ; Set timeout interval as 5 minutes and start counting
Mov  al,0f6h
Out  dx,al
Inc  dx
Mov  al,5
Out  dx,al
;-----
Dec dx          ; lock W83627DHG-P
Mov  al,0aah
Out  dx,al
3.  Enable watchdog timer to be reset by mouse
;-----
Mov dx,2eh      ; unlock W83627DHG-P
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h      ; Select registers of watchdog timer
Out  dx,al
Inc  dx
Mov  al,08h
Out  dx,al
;-----

```

```

Dec dx          ; Enable the function of watchdog timer
Mov  al,30h
Out  dx,al
Inc  dx
Mov  al,01h
Out  dx,al

```

```

;-----
Dec dx          ; Enable watchdog timer to be reset by mouse
Mov  al,0f7h
Out  dx,al
Inc  dx
In   al,dx
Or  al,80h
Out  dx,al

```

```

;-----
Dec dx          ; lock W83627DHG-P
Mov  al,0aah
Out  dx,al

```

#### 4. Enable watchdog timer to be reset by keyboard

```

;-----
Mov dx,2eh      ; unlock W83627DHG-P
Mov al,87h
Out dx,al
Out dx,al

```

```

;-----
Mov al,07h      ; Select registers of watchdog timer
Out  dx,al
Inc  dx
Mov  al,08h
Out  dx,al

```

```

;-----
Dec dx          ; Enable the function of watchdog timer
Mov  al,30h
Out  dx,al
Inc  dx
Mov  al,01h
Out  dx,al

```

```

;-----
Dec dx          ; Enable watchdog timer to be strobed reset by keyboard
Mov  al,0f7h
Out  dx,al
Inc  dx
In   al,dx
Or  al,40h
Out  dx,al

```

```

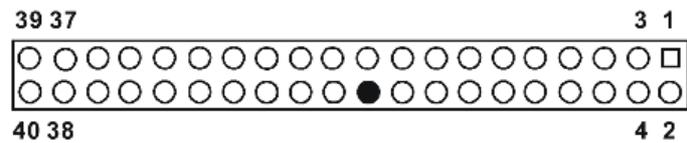
;-----
Dec dx          ; lock W83627DHG-P
Mov  al,0aah
Out  dx,al
5.  Generate a time-out signal without timer counting
;-----
Mov dx,2eh      ; unlock W83627DHG-P
Mov al,87h
Out dx,al
Out dx,al
;-----
Mov al,07h      ; Select registers of watchdog timer
Out  dx,al
Inc  dx
Mov  al,08h
Out  dx,al
;-----
Dec dx          ; Enable the function of watchdog timer
Mov  al,30h
Out  dx,al
Inc  dx
Mov  al,01h
Out  dx,al
;-----
Dec dx          ; Generate a time-out signal
Mov  al,0f7h
Out  dx,al      ;Write 1 to bit 5 of F7 register
Inc  dx
In   al,dx
Or  al,20h
Out  dx,al
;-----
Dec dx          ; lock W83627DHG-P
Mov  al,0aah
Out  dx,al

```

# Appendix **B**

I/O Pin Assignments

## B.1 IDE Hard Drive Connector (IDE1)

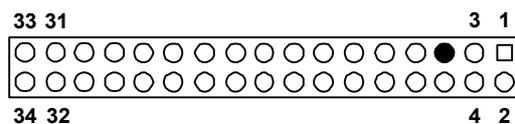


**Table B.1: IDE Hard Drive Connector (IDE1)**

Pin	Signal	Pin	Signal
1	IDE RESET*	2	GND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	SIGNAL GND	20	N/C
21	DISK DMA REQUEST	22	GND
23	IO WRITE	24	GND
25	IO READ	26	GND
27	IO CHANNEL READY	28	CSEL
29	HACKO*	30	GND
31	IRQ14	32	IDSC16-
33	ADDR 1	34	PDIAG
35	ADDR 0	36	ADDR 2
37	HARD DISK SELECT 0*	38	HARD DISK SELECT 1*
39	IDE ACTIVE*	40	GND

\* low active

## B.2 Floppy Drive Connector (FDD1)

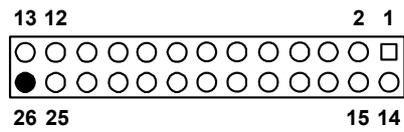


**Table B.2: Floppy Drive Connector (FDD1)**

Pin	Signal	Pin	Signal
1	GND	2	FDHDIN*
3	GND	4	N/C
5	N/C	6	N/C
7	GND	8	INDEX*
9	GND	10	MOTOR 0*
11	GND	12	N/C
13	GND	14	DRIVE SELECT 0*
15	GND	16	N/C
17	GND	18	DIRECTION*
19	GND	20	STEP*
21	GND	22	WRITE DATA*
23	GND	24	WRITE GATE*
25	GND	26	TRACK 0*
27	GND	28	WRITE PROTECT*
29	GND	30	READ DATA*
31	GND	32	HEAD SELECT*
33	GND	34	DISK CHANGE*

\* low active

## B.3 Parallel Port Connector (LPT1)

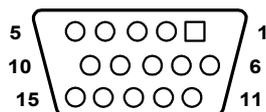


**Table B.3: Parallel Port Connector (LPT1)**

Pin	Signal	Pin	Signal
1	STROBE*	2	AUTOFD*
3	D0	4	ERR
5	D1	6	INIT*
7	D2	8	SLCTINI*
9	D3	10	GND
11	D4	12	GND
13	D5	14	GND
15	D6	16	GND
17	D7	18	GND
19	ACK*	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	N/C

\* low active

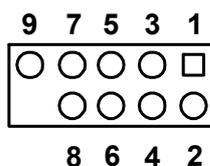
## B.4 VGA Connector (VGA1)



**Table B.4: VGA Connector (VGA1)**

Pin	Signal	Pin	Signal
1	RED	2	GREEN
3	BLUE	4	N/C
5	GND	6	VGA_En
7	GND	8	GND
9	VCC	10	GND
11	N/C	12	SDT
13	H-SYNC	14	V-SYNC
15	SCK		

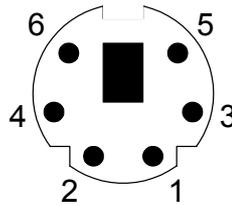
## B.5 RS-232 Serial Port (COM1, COM2)



**Table B.5: RS-232 Serial Port (COM1, COM2)**

Pin	Signal (COM1)	Signal (COM2)
1	DCDA	DCDB
2	DSRA	DSRB
3	SINA	SINB
4	RTSA	RTSB
5	SOUTA	SOUTB
6	CTSA	CTSB
7	DTRA	DTRB
8	RIA	RIB
9	GND	GND

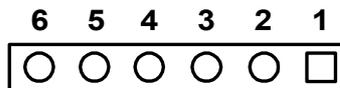
## B.6 PS/2 Keyboard/Mouse Connector (KBMS1)



**Table B.6: PS/2 Keyboard/Mouse Connector (KBMS1)**

Pin	Signal
1	KB DATA
2	MS DATA
3	GND
4	VCC
5	KB CLOCK
6	MS CLOCK

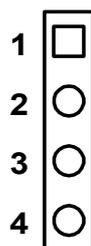
## B.7 External Keyboard Connector (KBMS2)



**Table B.7: External Keyboard Connector (KBMS2)**

Pin	Signal
1	KBCLK
2	KBDAT
3	MSDAT
4	GND
5	MSVCC
6	MSCLK

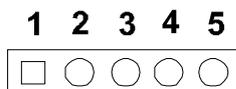
## B.8 CPU Fan Power Connector (CPUFAN1)



**Table B.8: CPU Fan Power Connector (CPUFAN1)**

Pin	Signal
1	GND
2	+12 V
3	Detect
4	N/C

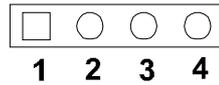
## B.9 Power LED and Keyboard Lock Connector (JFP3 / PWR\_LED & KEY LOCK)



**Table B.9: Power LED and Keyboard Lock Connector (JFP3 / PWR\_LED & KEY LOCK)**

Pin	Signal
1	Power LED(+5 V)
2	N/C
3	GND
4	KEYLOCK#
5	GND

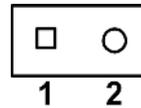
## B.10 External Speaker Connector (JFP2 / SPEAKER)



**Table B.10: External Speaker Connector (JFP2 / SPEAKER)**

Pin	Signal
1	SPK+
2	N/C
3	SPK_IN
4	SPK-

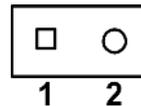
## B.11 Reset Connector (JFP1 / RESET)



**Table B.11: Reset Connector (JFP1 / RESET)**

Pin	Signal
1	RESET #
2	GND

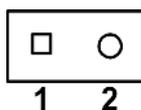
## B.12 HDD LED (JFP2 / HDDLED)



**Table B.12: HDD LED (JFP2 / HDDLED)**

Pin	Signal
1	VCC
2	#HD_ACT

## B.13 ATX Soft Power Switch (JFP1 / PWR\_SW)



**Table B.13: ATX Soft Power Switch (JFP1 / PWR\_SW)**

Pin	Signal
1	PANSWIN#_R
2	GND

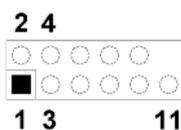
## B.14 SM Bus Connector (JFP2/SNMP)



**Table B.14: SM BUX Connector (JFP2/SNMP)**

Pin	Signal
1	SMB_DATA
2	SMB_CLK

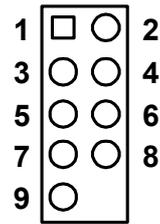
## B.15 HD Link connector (HDAUD1)



**Table B.15: HD Link Connector (HDAUD1)**

Pin	Signal	Pin	Signal
1	VCC	2	GND
3	Sync	4	BITCLK
5	SDOUT	6	SDIN0
7	SDIN1	8	RST
9	+12V	10	GND
11	GND	12	N/C

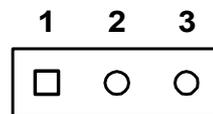
## B.16 LAN LED Connector (LAN LED1)



**Table B.16: LAN LED Connector (LANLED1)**

Pin	Signal
1	#LAN1_ACT
2	#LAN2_ACT
3	VCC3_LANLED1
4	VCC3_LANLED2
5	LAN1_1000#
6	LAN2_1000#
7	LAN1_LED0
8	LAN2_LED0
9	VCC 3SB

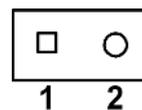
## B.17 AT Power Connector (ATXF1)



**Table B.17: AT Power Connector (ATXF1)**

Pin	Signal
1	#PSON
2	VCC
3	5VSB

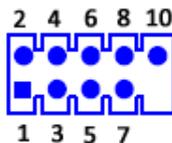
## B.18 H/W Monitor Alarm (JOBS1)



**Table B.18: H/W Monitor Alarm (JOBS1)**

Pin	Signal
1	OBS_BEEP
2	ERR_BEEP

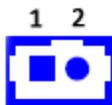
## B.19 USB Connector (USB12, USB34, USB56, USB78)



**Table B.19: USB Connector (USB12, USB34, USB56, USB78)**

Pin	Signal	Pin	Signal
1	+5V	2	+5V
3	USB_D0-	4	USB_D1-
5	USB_D0+	6	USB_D1+
7	GND	8	GND
9	N/C	10	GND

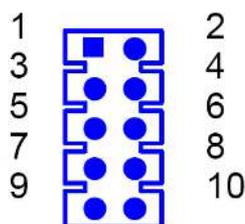
## B.20 Case Open Connector (JCASE1)



**Table B.20: Case Open Connector (JCASE1)**

Pin	Signal
1	CASEOP#
2	GND

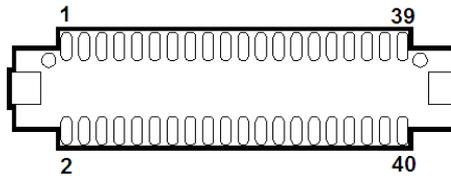
## B.21 GPIO Pin Header (GPIO1)



**Table B.21: GPIO Pin Header (GPIO1)**

Pin	Signal	Pin	Signal
1	GPIO_PORT80_0	2	GPIO_PORT80_4
3	GPIO_PORT80_1	4	GPIO_PORT80_5
5	GPIO_PORT80_2	6	GPIO_PORT80_6
7	GPIO_PORT80_3	8	GPIO_PORT80_7
9	+5V_DUAL	10	GND

## B.22 LVDS Connector (LVDS1)



**Table B.22: LVDS Connector (LVDS1)**

Pin	Signal	Pin	Signal
1	LVDS_VCC	2	LVDS_VCC
3	GND	4	GND
5	LVDS_VCC	6	LVDS_VCC
7	LVDS0_D0-	8	LVDS1_D0-
9	LVDS0_D0+	10	LVDS1_D0+
11	GND	12	GND
13	LVDS0_D1-	14	LVDS1_D1-
15	LVDS0_D1+	16	LVDS1_D1+
17	GND	18	GND
19	LVDS0_D2-	20	LVDS1_D2-
21	LVDS0_D2+	22	LVDS1_D2+
23	GND	24	GND
25	LVDS0_CLK-	26	LVDS1_CLK-
27	LVDS0_CLK+	28	LVDS1_CLK+
29	GND	30	GND
31	LVDS0_DDC_SC	32	LVDS0_DDC_SD
33	GND	34	GND
35	NC	36	NC
37	NC	38	NC
39	NC	40	NC

## B.23 System I/O Ports

**Table B.23: System I/O Ports**

Addr. range (Hex)	Device
000-01F	DMA controller
020-02D	Interrupt controller
02E-02F	LPC SIO
030-03D	Interrupt Controller
040-043 & 050-053	8254 timer
04E-04F	LPC SIO
060-06F	8042 (keyboard controller)
070-07F	Real-time clock, non-maskable interrupt (NMI) mask
080-09F	DMA page register
0A0-0BF	Interrupt controller
0C0-0DF	DMA controller
0F0	Process I/F
1F0-1F7	IDE or SATA controller
290-297	On-board hardware monitor
2F8-2FF	Serial port 2
378-37F	Parallel printer port (LPT1)
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1
C80-C87	COM3
C88-C8F	COM4
C90-C97	COM5
C98-C9F	COM6
4D0-4D1	Interrupt Controller
CF9	Reset Generator

## B.24 DMA Channel Assignments

**Table B.24: DMA Channel Assignments**

Channel	Signal
0	Available
1	Available
2	Floppy disk (8-bit transfer)
3	Available
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available

## B.25 Interrupt Assignments

**Table B.25: Interrupt Assignments**

Priority	Interrupt#	Interrupt Source
1	NMI	Parity error detected
2	IRQ0	Interval timer
3	IRQ1	Keyboard
-	IRQ2	Interrupt from controller 2 (cascade)
4	IRQ8	Real-time clock
5	IRQ9	Cascaded to INT 0A (IRQ 2)
6	IRQ10	Available
7	IRQ11	Available
8	IRQ12	PS/2 mouse
9	IRQ13	INT from co-processor
10	IRQ14	IDE Channel
12	IRQ3	Serial communication port 2
13	IRQ4	Serial communication port 1
14	IRQ5	Parallel port 2
15	IRQ6	Diskette controller (FDC)
16	IRQ7	Parallel port 1 (print port)

## B.26 1st MB Memory Map

**Table B.26: 1st MB Memory Map**

Addr. range (Hex)	Device
E0000h - FFFFFh	BIOS
D0000h - DFFFFh	Unused
C0000h - CFFFFh	VGA BIOS
A0000h - BFFFFh	Video Memory
00000h - 9FFFFh	Base memory

# Appendix **C**

Programming the  
GPIO

---

## C.1 Supported GPIO Register

Bellow are detailed description of the GPIO addresses and programming sample.

### C.1.1 GPIO Registers

#### **Extended Function Index Registers (EFIRs)**

The EFIRs are write-only registers with port address 2Eh on PC/AT systems.

#### **Extended Function Data Registers(EFDRs)**

The EFDRs are read/write registers with port address 2Fh on PC/AT systems.

#### **CR07 (Logical Device Number Register)**

Set to '09' to modify GPIO settings.

#### **CRF0 (GP10-GP17 I/O selection register. Default 0xFF)**

When set to '1', the respective GPIO port is programmed as an input port.

When set to '0', the respective GPIO port is programmed as an output port.

#### **CRF1 (GP10-GP17 data register. Default 0x00)**

If a port is programmed to be an output port, then its respective bit can be read/written.

If a port is programmed to be an input port, then its respective bit can only be read.

#### **CRF2 (GP10-GP17 inversion register. Default 0x00)**

When set to '1', the incoming/outgoing port value is inverted.

When set to '0', the incoming/outgoing port value is the same as in data register.

## C.1.2 GPIO Example Program-1

-----  
 Enter the extended function mode, interruptible double-write  
 -----

```
MOV DX, 2Eh
MOV AL, 87h
OUT DX, AL
OUT DX, AL
```

-----  
 Configure logical device 7(GP10~GP17), configuration register CRF0,CRF1,CRF2  
 -----

```
MOV DX, 2Eh
MOV AL, 07h; point to Logical Device Number Reg.
OUT DX, AL
MOV DX, 2Fh
MOV AL, 07h; select logical device 7
OUT DX, AL
MOV DX, 2Eh
MOV AL, F0h
OUT DX, AL
MOV DX, 2Fh
MOV AL, 00h; 01: Input, 00: output for GP10~GP17
OUT DX, AL
MOV DX, 2Eh
MOV AL, F2h ;
OUT DX, AL
MOV DX, 2Fh
MOV AL, 00h; Set GPIO is normal not inverter
OUT DX, AL;
MOV DX, 2Eh
MOV AL, F1h
OUT DX, AL
MOV DX, 2Fh
MOV AL, ??h; Put the output value into AL
OUT DX, AL
```

-----  
Exit extended function mode

```
MOV DX, 2Eh
MOV AL, AAh
OUT DX, AL
```

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