## AEC-6915  Rev.B

Fanless Embedded Controller
Intel® Core™ 2 Duo Processor,
4 PCI slots, 4 COMs, 4 USB,
Audio, VGA, Single LAN

# Copyright Notice

# Acknowledgments

All other products' name or trademarks are properties of their respective owners.

- Award is a trademark of Award Software International, Inc.

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- PC/AT, PS/2, and VGA are trademarks of International Business Machines Corporation.

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# Packing List

Before you begin operating your PC, please make sure that the following materials are enclosed:

- 1 AEC-6915 Rev.B Embedded Controller
- 1 Phoenix Power Connector
- 2 Wallmount Brackets
- 1 Audio Cable
- 1 Screw Package
- 1 CD-ROM for manual (in PDF format) and drivers

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

# Safety & Warranty

1.  Read these safety instructions carefully.

2.  Keep this user's manual for later reference.

3.  Disconnect this equipment from any AC outlet before cleaning. Do not use liquid or spray detergents for cleaning. Use a damp cloth.

4.  For pluggable equipment, the power outlet must be installed near the equipment and must be easily accessible.

5.  Keep this equipment away from humidity.

6.  Put this equipment on a firm surface during installation. Dropping it or letting it fall could cause damage.

7.  The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.

8.  Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

9.  Position the power cord so that people cannot step on it. Do not place anything over the power cord.

10. All cautions and warnings on the equipment should be noted.

11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient over-voltage.

12. Never pour any liquid into an opening. This could cause fire or electrical shock.

13. Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.

14. If any of the following situations arises, get the equipment checked by service personnel:

    a.   The power cord or plug is damaged.

    b.   Liquid has penetrated into the equipment.

    c.   The equipment has been exposed to moisture.

    d.    The equipment does not work well, or you cannot get it to work according to the user's manual.

    e.    The equipment has been dropped and damaged.

    f.    The equipment has obvious signs of breakage.

15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -20°C (-4°F) OR ABOVE 60°C (140°F). IT MAY DAMAGE THE EQUIPMENT.

# FCC

**Warning!**

This device complies with Part 15 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.

**Below Table for China RoHS Requirements**
产品中有毒有害物质或元素名称及含量

**AAEON Boxer/ Industrial System**

| 部件名称 | 有毒有害物质或元素 | | | | | |
|---|---|---|---|---|---|---|
| | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr(VI)) | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 印刷电路板<br>及其电子组件 | × | ○ | ○ | ○ | ○ | ○ |
| 外部信号<br>连接器及线材 | × | ○ | ○ | ○ | ○ | ○ |
| 外壳 | × | ○ | ○ | ○ | ○ | ○ |
| 中央处理器<br>与内存 | × | ○ | ○ | ○ | ○ | ○ |
| 硬盘 | × | ○ | ○ | ○ | ○ | ○ |
| 电源 | × | ○ | ○ | ○ | ○ | ○ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**O**：表示该有毒有害物质在该部件所有均质材料中的含量均在
   **SJ/T 11363-2006** 标准规定的限量要求以下。

**X**：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出
   **SJ/T 11363-2006** 标准规定的限量要求。

备注：
一、此产品所标示之环保使用期限，系指在一般正常使用状况下。
二、上述部件物质中央处理器、内存、硬盘、电源为选购品。

# Contents

## Chapter 4   Driver Installation

## Appendix A   Programming The Watchdog Timer

## Appendix B   I/O Information

# Chapter

# 1

# General Information

## 1.1 Introduction

The AEC-6915 Rev.B BOXER 2 Advanced Embedded Control system continues the BOXER design concept but focuses on the fast expanding Machine Automation market. The AEC-6915 Rev.B can provide four PCI slots for expansion. Therefore AEC-6915 Rev.B's expandable function, compact size combined with fanless design and highly efficient heat conduction mechanism can fulfill any rugged technical application in industrial automation, factory control, test instrumentation and safety surveillance.

### Outstanding Over-spec Design

Intel® Core™ 2 Duo processor with 2.0GHz combined with fanless design and high performance is widely acceptable and dependable in this market. USB 2.0, Ethernet and 4 Serial ports allow communication with diverse devices with a high transfer rate. Furthermore, the AEC-6915 Rev.B can concurrently support 4 PCI for expansion. These interfaces are fully integrated within the BOXER series and allow an upgrade to their usefulness. It is a leading-edge thermal and vibration design (up to 60 degree operation and 5G RMS vibration) and also an innovation for Machine Automation in the IPC industry. AEC-6915 Rev.B plays a role in connecting all subsystems in common applications.

AAEON not only enhances your competitive value but also gives you an excellent solution for the future.

### Strict Quality Control Process

AAEON retains the perfect product design and management team. Our Quality Control through multiple level experience and test has earned a good reputation in IPC field. AAEON's whole product series are subjected to high-level standards which make them our best guarantee and assurance to customers. Excellent product quality will always be AAEON's best advertisement.

### 24-hour FAE System

AAEON's e-RMA and e-FAE 24-hour a day systems for all customers' prompt request was formally launched in 2005. No matter if it is a holiday or weekend; we can handle all kinds of requests and give you a satisfactory response in 10 days. AAEON is proud of our quick service and professional teamwork to provide our customers with continual support.

Great design, great value and great service are hallmarks of the AAEON BOXER embedded control PCs. There really is no other choice for your application than AAEON if you want the best performance and best value!

## 1.2 Features

- All I/O on the same side (front panel)

- Supports Intel$^®$ Core$^{TM}$ 2 Duo Processor up to 2.0GHz

- 4 PCI Slots

- Operating Temperature: -20°C ~ 60°C

- Anti-vibration up to 5grms / Anti-shock up to 50 g

## 1.3 Specifications

### System

- CPU:                 Intel$^®$ Core$^{TM}$ 2 Duo Processor
- System Memory:       DDR II SDRAM SODIMM x 1, Max. 2GB
- Expansion:           PCI slot x 4
- VGA:                 DB-15 VGA connector
- Keyboard/Mouse:      PS/2 Keyboard & Mouse
- Ethernet:            10/100/1000Base-TX RJ-45 Connector x 1
- SSD:                 CompactFlash$^{™}$ slot x 1 (Internal)
- Device Bay:          Internal 2.5" HDD Bay with slim DVD-ROM (8X COMBO suck in type) driver
- Serial Port:         RS-232 x 3, RS-232/422/485 x 1 (COM2)
- Audio:               Audio x 1 (by an extension cable)
- USB:                 USB 2.0 port x 4
- Watchdog Timer:      Generates a time-out system reset, setting via software
- Power Supply:        1. DC Input -- Internal DC-DC

Converter (Default)

Input voltage:

DC 9V/4.38A~ DC 30V/1.52A

2. AC Input -- External Power

Adapter (Optional)

Input voltage: 100V AC ~

240V AC @ 50 ~ 60Hz

### Mechanical and Environmental

- Construction: Rugged Aluminum Alloy
  chassis
- Color: Mustard
- Mounting: Wallmount
- Dimension: 6.1"(W) x 8.89"(H) x 9.4"(D)
  (154.3mm x 225.7mm x
  237.8mm)
- Net Weight: 14.3 lb (6.5 kg)
- Operating Temperature: 5°F ~ 131°F (-15°C~55°C)
  (Pentium M 2.0G, CFD);
  -4°F ~ 140°F (-20°C ~ 60°C)
  (Pentium M 2.0, HDD)
- Storage Temperature: -4°F ~ 158°F (-20°C~70°C)
- Storage Humidity: 5~95%@40°C,
  non-condensing
- Vibration: 5g rms / 5~500Hz / random

|           |                                           |
|-----------|-------------------------------------------|
|           | operation (CFD); 3g rms / 5~500Hz / random operation (Internal HDD active Module) |
| • Shock:  | 50g peak acceleration (11msec. duration)(CFD) 20g peak acceleration (11 msec. duration) (HDD) |
| • EMC:    | CE/FCC class A                            |

# Front Side
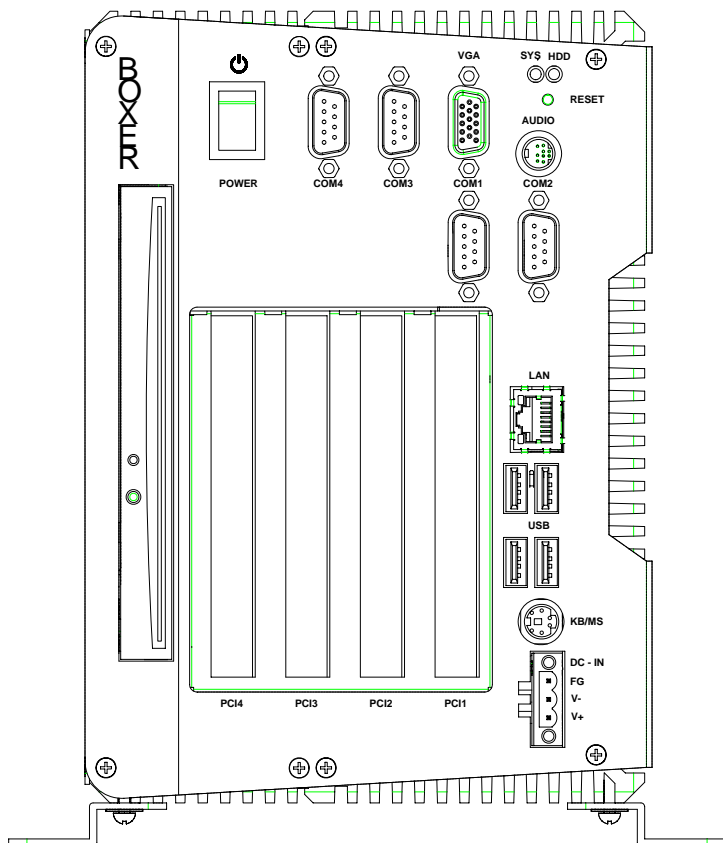
## Rear Side
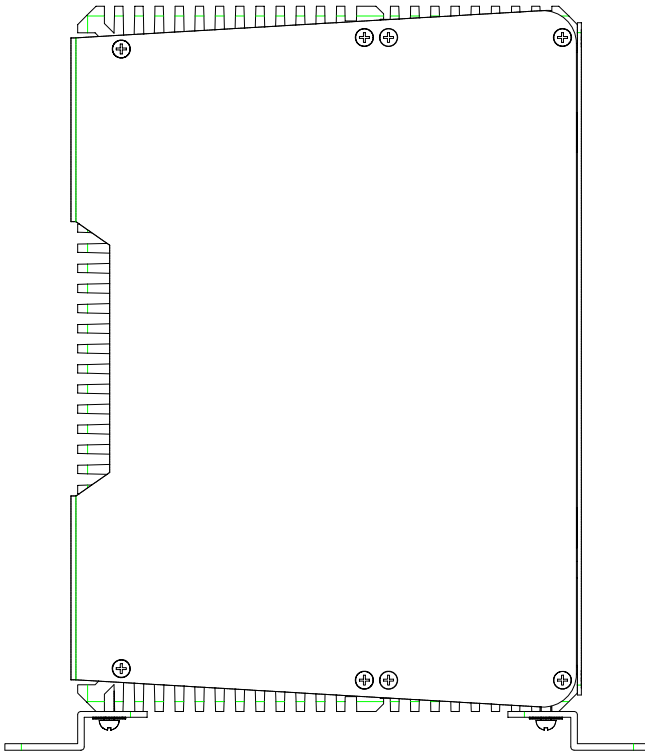
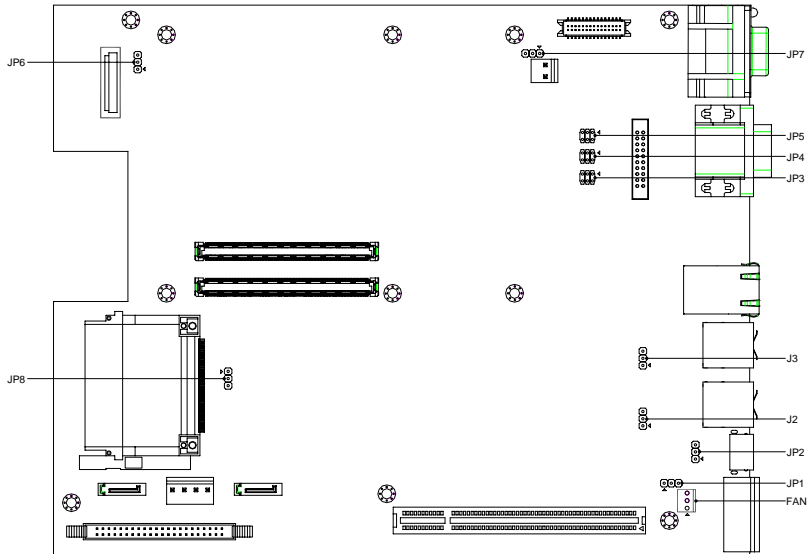Chapter

2

# Hardware Installation

## 2.1 Jumper and Connector

## 2.2 FAN Power Selection (JP1) (For special usage)

| JP1 | Function |
|-----|----------|
| 1-2 | +12V |
| 2-3 | +5V |
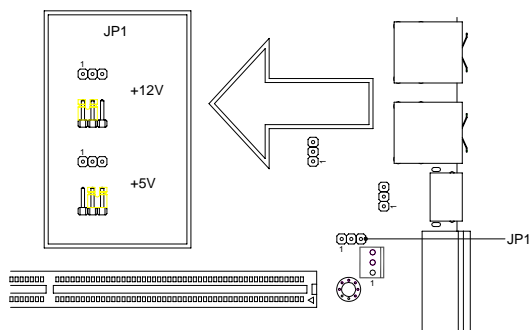


## 2.3 PS2 Keyboard/ Mouse Power Selection (JP2)

| JP2 | Function |
|-----|----------|
| 1-2 | Normal → VCC5 |
| 2-3 | Standby (Default) → 5VDUAL |
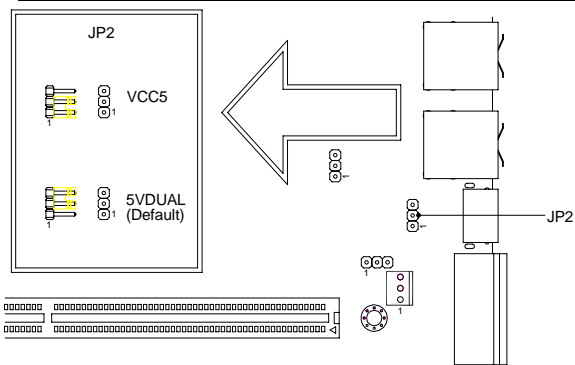
## 2.4 COM1, COM3, COM4, Pin 9 Selection (JP5, JP3, JP4)

| JP5 | Function |
| --- | --- |
| 1-2 | +12V |
| 3-4 | +5V |
| 5-6 | RI for COM1 (Default) |

| JP3 | Function |
| --- | --- |
| 1-2 | +12V |
| 3-4 | +5V |
| 5-6 | RI for COM3 (Default) |

| JP4 | Function |
| --- | --- |
| 1-2 | +12V |
| 3-4 | +5V |
| 5-6 | RI for COM4 (Default) |
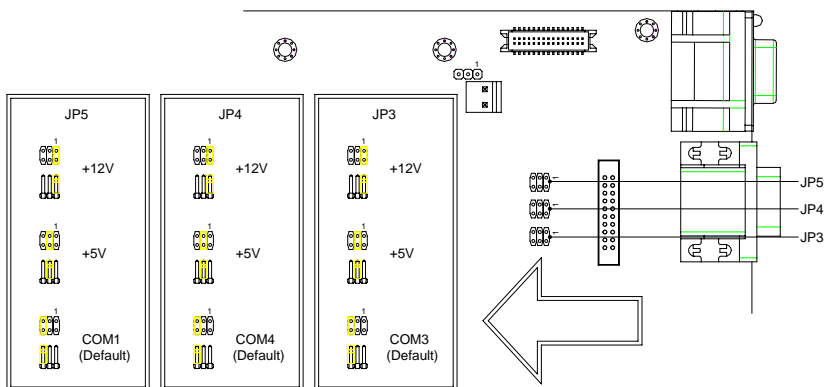
## 2.5 RTC Battery Selection (JP6)

| JP6 | Function |
|-----|----------|
| 1-2 | Normal (Default) |
| 2-3 | Clear CMOS |
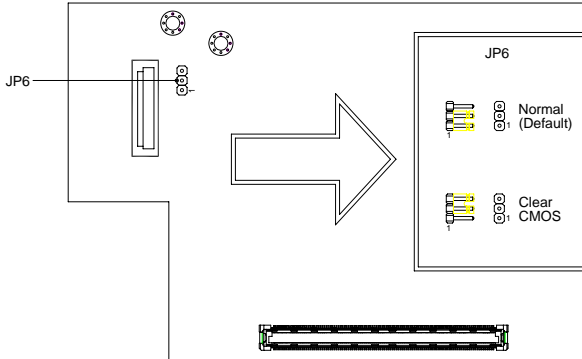


## 2.6 LVDS Power Selection (JP7) (Optional)

| JP7 | Function |
|-----|----------|
| 1-2 | +5V |
| 2-3 | +3.3V (Default) |
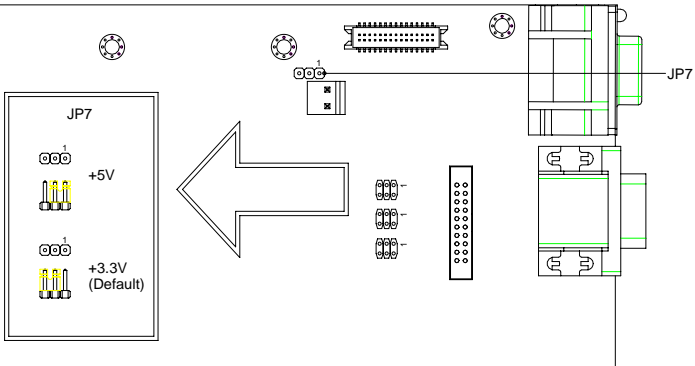
## 2.7 CF Slot Master/Slave Selection (JP8)

| JP8 | Function |
|-----|----------|
| 1-2 | Slave |
| 2-3 | Master (Default) |
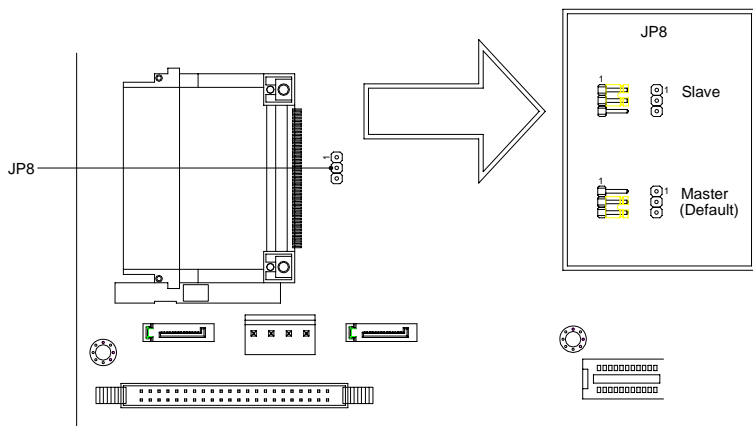


## 2.8 USB1, 2 (J2) & USB3, 4 (J3) Power Selection

| J2 | Function |
|-----|----------|
| 1-2 | Normal → VCC5 |
| 2-3 | Standby (Default) → 5VDUAL |

| J3 | Function |
|-----|----------|
| 1-2 | Normal → VCC5 |
| 2-3 | Standby (Default) → 5VDUAL |

J2,J3

VCC5

1          1

5VDUAL
(Default)

1          1

J3

J2

1

1

1
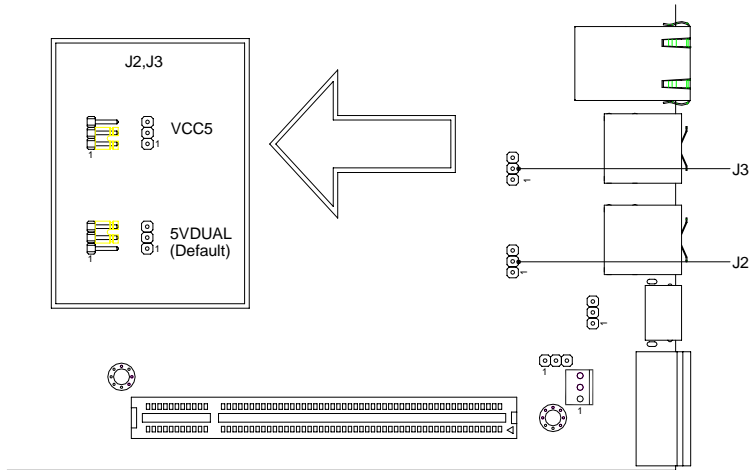
## 2.9 COM2 RS-232/422/485 Selection

COM2 RS-232/422/485 selection for AAEON BOXER S series is set in BIOS setting as following:

*Entering BIOS Setting Menu:    Choose "Integrated Peripherals→ Super IO device → COM2 select". (Default setting is at "RS-232")*

## 2.10 COM2 RS-232/422/485 Serial Port Connector

Different devices implement the RS-232/422/485 standard in different ways. If you have problems with a serial device, check the pin assignments below for the connector.
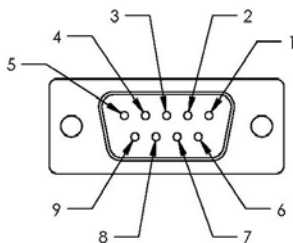


| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | DCD (422TXD-/485DATA-) | 2 | RXD (422RXD+) |
| 3 | TXD (422TXD+/485DATA+) | 4 | DTR (422RXD-) |
| 5 | GND | 6 | DSR |
| 7 | RTS | 8 | CTS |
| 9 | RI | 10 | N.C. |

## 2.11 Hard Disk Drive Installation

For Hard Disk Drive (HDD) installation, you have to disassemble the bottom lid of AEC-6915 Rev.B and some components and covers in the AEC-6915 Rev.B and then install the HDD.

Step 1: Unfasten the four screws on the side panel.
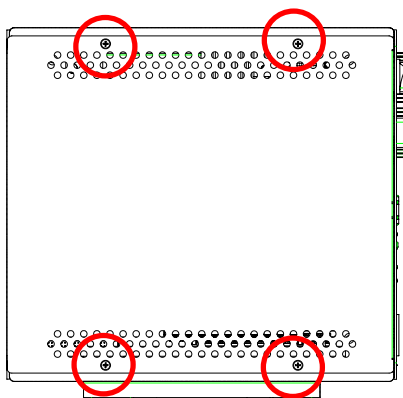
Step 2: Unfasten the four screws on the HDD cover.
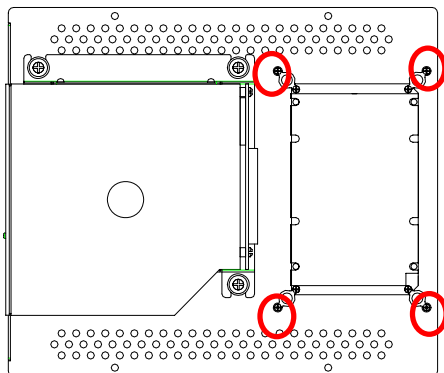
Step 3: Get the HDD module and HDD cover ready.　Use the four

screws to fasten the HDD cover and HDD module.
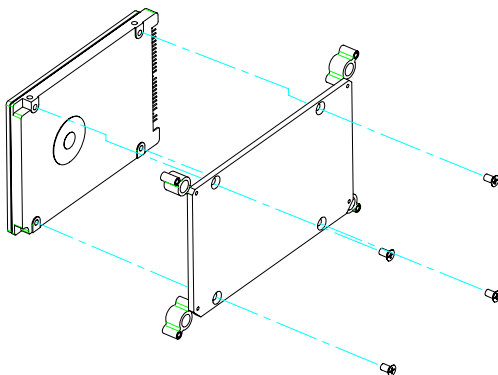


Step 4:　Fasten the four screws to lock the HDD
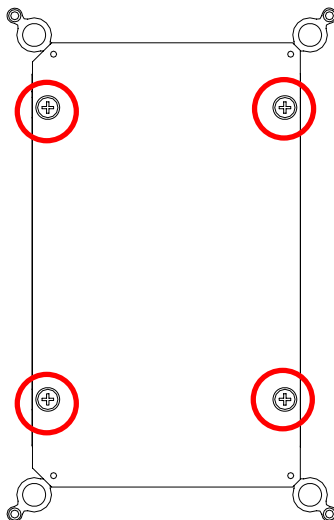
Step 5: Connect the HDD cable (for SATA HDD)
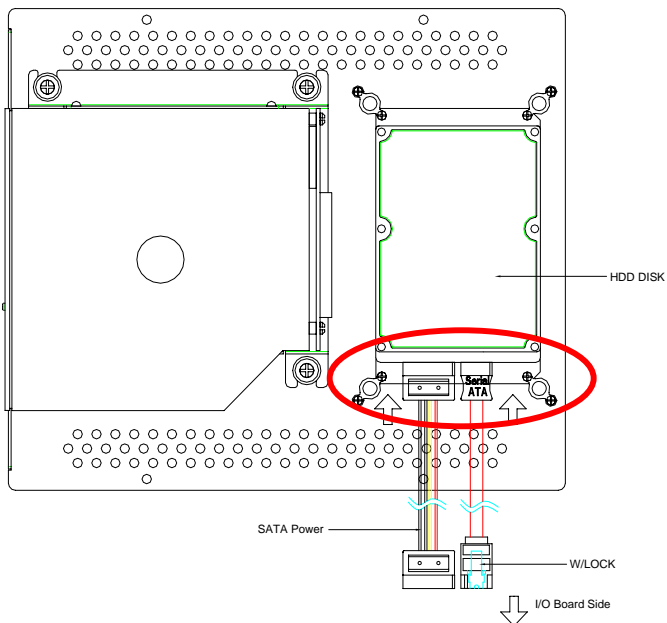


Step 6: Fasten the four screws on the side panel of the AEC-6915 Rev.B
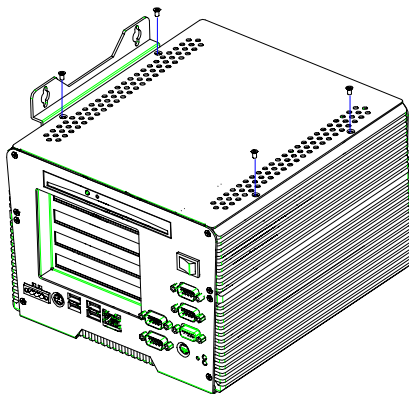
## 2.12 PCI Card Installation

Step 1: Unfasten the four screw on the side panel.
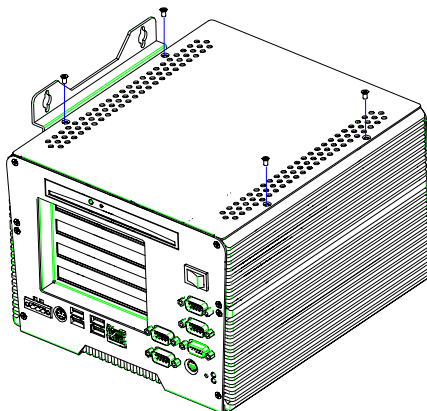


Step 2:  Remove the screw with your finger and get the PCI card ready

to install.    You should keep the shield and screw for use later.
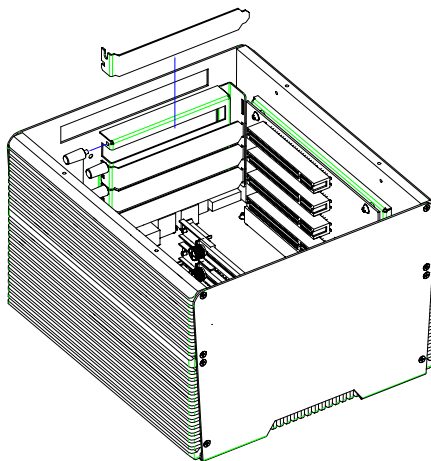
Step 3: Insert the PCI card into the PCI slot and reattach the screw.
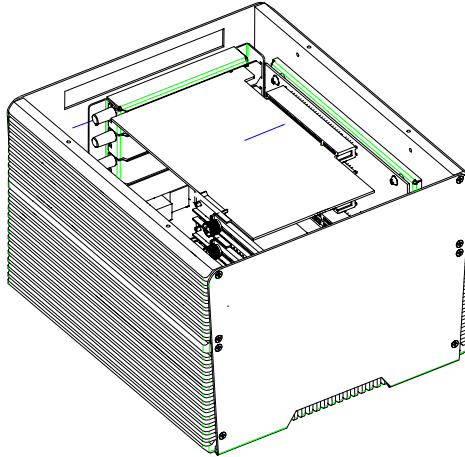


Step 4: Unfasten the screws and push the tenon to lock the PCI card in

position.
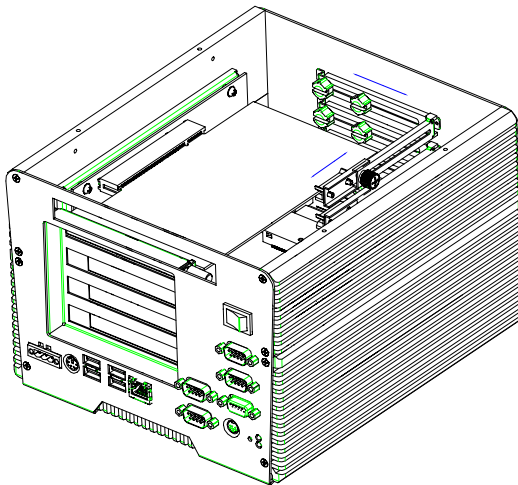
Step 5: Close the side lid of the AEC-6915 Rev.B and fasten four screws

on side lid.
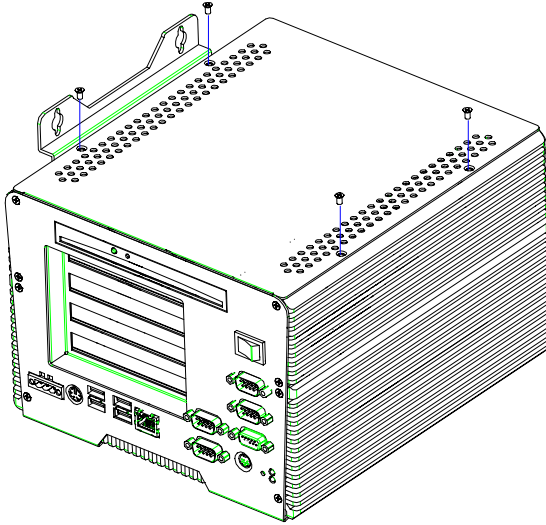
## 2.13 Wallmount kit Installation

Step 1: Get the brackets ready and fasten appropriate two screws on

each bracket. After fastening the two brackets on the rear panel

of AEC-6915 Rev.B, the wallmount kit installation is finished
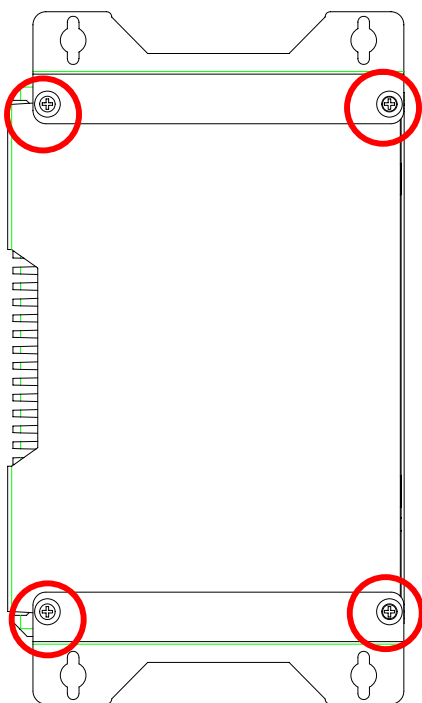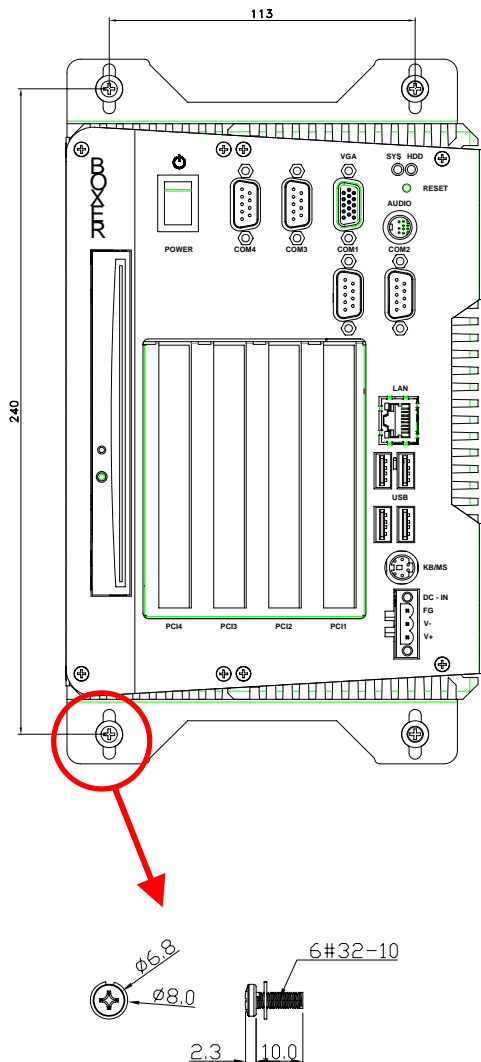
Chapter

3

# Award BIOS Setup

### 3.1 System Test and Initialization

These routines test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

Press <F1> to RESUME

Write down the message and press the F1 key to continue the boot up sequence.

## System configuration verification

These routines check the current system configuration against the values stored in the CMOS memory. If they do not match, the program outputs an error message. You will then need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

1. You are starting your system for the first time

2. You have changed the hardware attached to your system

3. The CMOS memory has lost power and the configuration information has been erased.

The AEC-6915 Rev.B CMOS memory has an integral lithium battery backup for data retention. However, you will need to replace the complete unit when it finally runs down.

## 3.2 Award BIOS Setup

Awards BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This type of information is stored in battery-backed CMOS RAM so that it retains the Setup information when the power is turned off.

### Entering Setup
Power on the computer and press <Del> immediately. This will allow you to enter Setup.

### Standard CMOS Features
Use this menu for basic system configuration. (Date, time, IDE, etc.)

### Advanced BIOS Features
Use this menu to set the advanced features available on your system.

### Advanced Chipset Features
Use this menu to change the values in the chipset registers and optimize your system performance.

### Integrated Peripherals
Use this menu to specify your settings for integrated peripherals. (Primary slave, secondary slave, keyboard, mouse etc.)

### Power Management Setup
Use this menu to specify your settings for power management. (HDD power down, power on by ring, KB wake up, etc.)

### PnP/PCI Configurations
This entry appears if your system supports PnP/PCI.

**Note:** If you use the external PCI VGA Card (GC-R9250PCI-D3), the default setting of the Initial Display First must be selected the "PCI Slot".

### PC Health Status
This menu allows you to set the shutdown temperature for your system.

**Frequency/Voltage Control**
Use this menu to specify your settings for auto detect DIMM/PCI clock and spread spectrum.

**Load Fail-Safe Defaults**
Use this menu to load the BIOS default values for the minimal/stable performance for your system to operate.

**Load Optimized Defaults**
Use this menu to load the BIOS default values that are factory settings for optimal performance system operations. While AWARD has designated the custom BIOS to maximize performance, the factory has the right to change these defaults to meet their needs.

**Set Supervisor/User Password**
Use this menu to set Supervisor/User Passwords.

**Save and Exit Setup**
Save CMOS value changes to CMOS and exit setup.

**Exit Without Saving**
Abandon all CMOS value changes and exit setup.

**You can refer to the "AAEON BIOS Item Description.pdf" file in the CD for the meaning of each setting in this chapter.**

Chapter

4

# Driver Installation

The AEC-6915 Rev.B comes with a CD-ROM that contains all drivers and utilities that meet your needs.

### *Follow the sequence below to install the drivers:*

Step 1 – Install Chip Driver

Step 2 – Install VGA Driver

Step 3 – Install LAN Driver

Step 4 – Install Audio Driver

USB 2.0 Drivers are available for download using Windows Update for both Windows XP and Windows 2000. For additional information regarding USB 2.0 support in Windows XP and Windows 2000, please visit www.microsoft.com/hwdev/usb/.

Please read instructions below for further detailed installations.

## 4.1 Installation

Insert the AEC-6915 Rev.B CD-ROM into the CD-ROM Drive. The Autorun program will run automatically. You also can choose the drivers to install from step 1 to step 4 in order as following instructions.

Step 1 – Install Chipset Driver

1. Click on the *Step 1-chip* folder and then double click on the *infinst_autol.exe*

2. Follow the instructions that the window shows

3. The system will help you install the driver automatically

Step 2 – Install VGA Driver

1. Click on the *Step 2-vga* folder and then double click on the *win2k_xp14311.exe*

2. Follow the instructions that the window shows

3. The system will help you install the driver automatically

Step 3 – Install LAN Driver

1. Click on the *Step 3-LAN-Intel-82573* and then click on the *PRO2KXP.exe*

2. Follow the instructions that the window shows

3. The system will help you install the driver automatically

Step 4 – Install Audio Driver

1. Click on the *Step 4-Audio* folder and then click on the *WDM_A386.exe*

2. Follow the instructions that the window shows

3.  The system will help you install the driver automatically

**Note:**

Under the Window OS environment, if the CRT connector is connected to display monitor by the data switch device, the user need to set the color and resolution from Intel Graphic utility (VGA driver) instead of setting from the control panel in case of the wrong display appearance.

Appendix

# A

# Programming the Watchdog Timer

## A.1 Programming

AEC-6915 Rev.B utilizes ITE 8712 chipset as its watchdog timer controller.

Below are the procedures to complete its configuration and the AAEON intial watchdog timer program is also attached based on which you can develop customized program to fit your application.

### Configuring Sequence Description

After the hardware reset or power-on reset, the ITE 8712 enters the normal mode with all logical devices disabled except KBC. The initial state (enable bit ) of this logical device (KBC) is determined by the state of pin 121 (DTR1#) at the falling edge of the system reset during power-on reset.
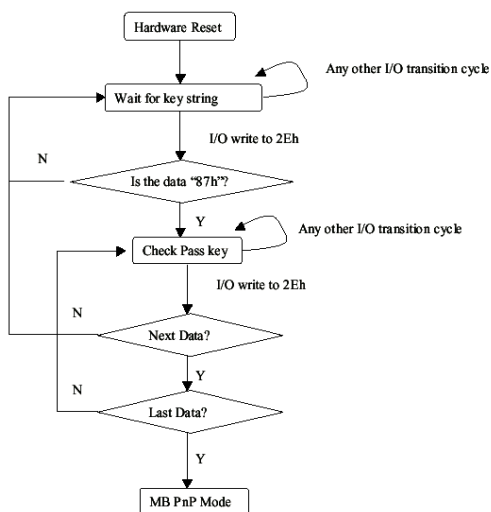
There are three steps to complete the configuration setup: (1) Enter the MB PnP Mode; (2) Modify the data of configuration registers; (3) Exit the MB PnP Mode. Undesired result may occur if the MB PnP Mode is not exited normally.

## (1) Enter the MB PnP Mode

To enter the MB PnP Mode, four special I/O write operations are to be performed during Wait for Key state. To ensure the initial state of the key-check logic, it is necessary to perform four write opera-tions to the Special Address port (2EH). Two different enter keys are provided to select configuration ports (2Eh/2Fh) of the next step.

| | Address Port | Data Port |
|---|---|---|
| 87h, 01h, 55h, 55h: | 2Eh | 2Fh |

## (2) Modify the Data of the Registers

All configuration registers can be accessed after entering the MB PnP Mode. Before accessing a selected register, the content of Index 07h must be changed to the LDN to which the register belongs, except some Global registers.

## (3) Exit the MB PnP Mode

Set bit 1 of the configure control register (Index=02h) to 1 to exit the MB PnP Mode.

## WatchDog Timer Configuration Registers

| LDN | Index | R/W | Reset | Configuration Register or Action |
|-----|-------|-----|-------|----------------------------------|
| All | 02H | W | N/A | Configure Control |
| 07H | 71H | R/W | 00H | WatchDog Timer Control Register |
| 07H | 72H | R/W | 00H | WatchDog Timer Configuration Register |
| 07H | 73H | R/W | 00H | WatchDog Timer Time-out Value Register |

## Configure Control (Index=02h)

This register is write only. Its values are not sticky; that is to say, a hardware reset will automatically clear the bits, and does not require the software to clear them.

| Bit | Description |
|-----|-------------|
| 7-2 | Reserved |
| 1 | Returns to the Wait for Key state. This bit is used when the configuration sequence is completed |
| 0 | Resets all logical devices and restores configuration registers to their power-on states. |

## WatchDog Timer Control Register (Index=71h, Default=00h)

| Bit | Description |
|-----|-------------|
| 7 | WDT is reset upon a CIR interrupt |
| 6 | WDT is reset upon a KBC (mouse) interrupt |
| 5 | WDT is reset upon a KBC (keyboard) interrupt |
| 4 | WDT is reset upon a read or a write to the Game Port base address |
| 3-2 | Reserved |
| 1 | Force Time-out. This bit is self-clearing |
| 0 | WDT Status |
| | 1: WDT value reaches 0. |
| | 0: WDT value is not 0 |

## WatchDog Timer Configuration Register (Index=72h,

## Default=00h)

| Bit | Description |
| --- | --- |
| 7 | WDT Time-out value select |
|  | 1: Second |
|  | 0: Minute |
| 6 | WDT output through KRST (pulse) enable |
| 5-4 | Reserved |
| 3-0 | Select the interrupt level[Note] for WDT |

## WatchDog Timer Time-out Value Register (Index=73h,

## Default=00h)

| Bit | Description |
| --- | --- |
| 7-0 | WDT Time-out value 7-0 |

## A.2 IT8712 Watchdog Timer Initial Program

```
        .MODEL SMALL
        .CODE
Main:
        CALL Enter_Configuration_mode
        CALL Check_Chip
        mov cl, 7
        call Set_Logic_Device
        ;time setting
        mov cl, 10 ; 10 Sec
        dec al
Watch_Dog_Setting:
        ;Timer setting
        mov al, cl
        mov cl, 73h
        call Superio_Set_Reg
        ;Clear by keyboard or mouse interrupt
        mov al, 0f0h
        mov cl, 71h
        call Superio_Set_Reg
        ;unit is second.
        mov al, 0C0H
        mov cl, 72h
        call Superio_Set_Reg
```

```
; game port enable
mov cl, 9
call Set_Logic_Device


Initial_OK:
CALL Exit_Configuration_mode
MOV AH,4Ch
INT 21h


Enter_Configuration_Mode PROC NEAR
MOV SI,WORD PTR CS:[Offset Cfg_Port]

MOV DX,02Eh
MOV CX,04h
Init_1:
MOV AL,BYTE PTR CS:[SI]
OUT DX,AL
INC SI
LOOP Init_1
RET
Enter_Configuration_Mode ENDP


Exit_Configuration_Mode PROC NEAR
MOV AX,0202h
CALL Write_Configuration_Data
```

```
RET

Exit_Configuration_Mode ENDP


Check_Chip PROC NEAR


MOV AL,20h

CALL Read_Configuration_Data

CMP AL,87h

JNE Not_Initial


MOV AL,21h

CALL Read_Configuration_Data

CMP AL,12h

JNE Not_Initial


Need_Initial:

STC

RET

Not_Initial:

CLC

RET

Check_Chip ENDP

Read_Configuration_Data PROC NEAR

MOV DX,WORD PTR CS:[Cfg_Port+04h]

OUT DX,AL
```

```
MOV DX,WORD PTR CS:[Cfg_Port+06h]
IN AL,DX
RET
Read_Configuration_Data ENDP


Write_Configuration_Data PROC NEAR
MOV DX,WORD PTR CS:[Cfg_Port+04h]
OUT DX,AL
XCHG AL,AH
MOV DX,WORD PTR CS:[Cfg_Port+06h]
OUT DX,AL
RET
Write_Configuration_Data ENDP


Superio_Set_Reg proc near
push ax
MOV DX,WORD PTR CS:[Cfg_Port+04h]
mov al,cl
out dx,al
pop ax
inc dx
out dx,al
ret
Superio_Set_Reg endp.Set_Logic_Device proc near
Set_Logic_Device proc near
```

```
push ax
push cx
xchg al,cl
mov cl,07h
call Superio_Set_Reg
pop cx
pop ax
ret
Set_Logic_Device endp

;Select 02Eh->Index Port, 02Fh->Data Port
Cfg_Port DB 087h,001h,055h,055h

DW 02Eh,02Fh
```

**END Main**

*Note: Interrupt level mapping*

0Fh-Dh: not valid

0Ch: IRQ12

.

.

03h: IRQ3

02h: not valid

01h: IRQ1

00h: no interrupt selected

Appendix

# B

# I/O Information

## B.1 I/O Address Map

```
AAAAA-D9E58E52A
├─ Direct memory access (DMA)
└─ Input/output (IO)
    ├─ [00000000 - 0000000F] Direct memory access controller
    ├─ [00000000 - 00000CF7] PCI bus
    ├─ [00000010 - 0000001F] Motherboard resources
    ├─ [00000020 - 00000021] Programmable interrupt controller
    ├─ [00000022 - 0000003F] Motherboard resources
    ├─ [00000040 - 00000043] System timer
    ├─ [00000044 - 0000005F] Motherboard resources
    ├─ [00000060 - 00000060] Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
    ├─ [00000061 - 00000061] System speaker
    ├─ [00000062 - 00000063] Motherboard resources
    ├─ [00000064 - 00000064] Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
    ├─ [00000065 - 0000006F] Motherboard resources
    ├─ [00000070 - 00000073] System CMOS/real time clock
    ├─ [00000074 - 0000007F] Motherboard resources
    ├─ [00000080 - 00000090] Direct memory access controller
    ├─ [00000091 - 00000093] Motherboard resources
    ├─ [00000094 - 0000009F] Direct memory access controller
    ├─ [000000A0 - 000000A1] Programmable interrupt controller
    ├─ [000000A2 - 000000BF] Motherboard resources
    ├─ [000000C0 - 000000DF] Direct memory access controller
    ├─ [000000E0 - 000000EF] Motherboard resources
    ├─ [000000F0 - 000000FF] Numeric data processor
    ├─ [000001F0 - 000001F7] Primary IDE Channel
    ├─ [00000274 - 00000277] ISAPNP Read Data Port
    ├─ [00000279 - 00000279] ISAPNP Read Data Port
    ├─ [00000290 - 0000029F] Motherboard resources
    ├─ [00000295 - 00000314] Motherboard resources
    ├─ [000002F8 - 000002FF] Communications Port (COM4)
    ├─ [00000378 - 0000037F] Printer Port (LPT1)
    ├─ [000003B0 - 000003BB] Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    ├─ [000003C0 - 000003DF] Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    ├─ [000003E8 - 000003EF] Communications Port (COM2)
    ├─ [000003F6 - 000003F6] Primary IDE Channel
    ├─ [000003F8 - 000003FF] Communications Port (COM1)
    ├─ [00000400 - 000004BF] Motherboard resources
    ├─ [000004D0 - 000004D1] Motherboard resources
    ├─ [00000500 - 0000051F] Intel(R) 82801FB/FBM SMBus Controller - 266A
    ├─ [00000880 - 0000088F] Motherboard resources
    ├─ [00000A79 - 00000A79] ISAPNP Read Data Port
    ├─ [00000D00 - 0000FFFF] PCI bus
    ├─ [0000B000 - 0000B0FF] Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller
    ├─ [0000B000 - 0000BFFF] Intel(R) 82801FB/FBM PCI Express Root Port - 2660
    ├─ [0000C000 - 0000C0FF] Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller #2
    ├─ [0000C000 - 0000CFFF] Intel(R) 82801FB/FBM PCI Express Root Port - 2662
    ├─ [0000D000 - 0000D0FF] Realtek AC'97 Audio
    ├─ [0000D800 - 0000D81F] Intel(R) 82801FB/FBM USB Universal Host Controller - 2659
    ├─ [0000D900 - 0000D91F] Intel(R) 82801FB/FBM USB Universal Host Controller - 265A
    ├─ [0000DA00 - 0000DA1F] Intel(R) 82801FB/FBM USB Universal Host Controller - 265B
    ├─ [0000DB00 - 0000DB07] Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    ├─ [0000DC00 - 0000DC3F] Realtek AC'97 Audio
    ├─ [0000DD00 - 0000DD1F] Intel(R) 82801FB/FBM USB Universal Host Controller - 2658
    └─ [0000F000 - 0000F00F] Intel(R) 82801FBM Ultra ATA Storage Controllers - 2653
```

## B.2 Memory Address Map

```
Memory
    [00000000 - 0009FFFF]  System board
    [000A0000 - 000BFFFF]  Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    [000A0000 - 000BFFFF]  PCI bus
    [000C0000 - 000DFFFF]  PCI bus
    [000D3800 - 000D3FFF]  System board
    [000E0000 - 000EFFFF]  System board
    [000F0000 - 000F7FFF]  System board
    [000F8000 - 000FBFFF]  System board
    [000FC000 - 000FFFFF]  System board
    [00100000 - 1F7EFFFF]  System board
    [1F7F0000 - 1F7FFFFF]  System board
    [1F800000 - FEBFFFFF]  PCI bus
    [C0000000 - CFFFFFFF]  Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    [D0000000 - D00FFFFF]  Intel(R) 82801FB/FBM PCI Express Root Port - 2660
    [D0020000 - D0023FFF]  Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller
    [D0100000 - D01FFFFF]  Intel(R) 82801FB/FBM PCI Express Root Port - 2662
    [D0120000 - D0123FFF]  Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller #2
    [D0200000 - D027FFFF]  Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    [D0280000 - D02FFFFF]  Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    [D0300000 - D033FFFF]  Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    [D0340000 - D03403FF]  Intel(R) 82801FB/FBM USB2 Enhanced Host Controller - 265C
    [D0341000 - D03411FF]  Realtek AC'97 Audio
    [D0342000 - D03420FF]  Realtek AC'97 Audio
    [E0000000 - EFFFFFFF]  Motherboard resources
    [FEC00000 - FEC00FFF]  System board
    [FED13000 - FED1DFFF]  System board
    [FED20000 - FED8FFFF]  System board
    [FEE00000 - FEE00FFF]  System board
    [FFB00000 - FFB7FFFF]  System board
    [FFB80000 - FFBFFFFF]  Intel(r) 82802 Firmware Hub Device
    [FFF00000 - FFFFFFFF]  System board
```

## B.3 IRQ Mapping Chart

```
Interrupt request (IRQ)
    (ISA) 0    System timer
    (ISA) 1    Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
    (ISA) 4    Communications Port (COM1)
    (ISA) 7    Communications Port (COM2)
    (ISA) 8    System CMOS/real time clock
    (ISA) 9    Microsoft ACPI-Compliant System
    (ISA) 11   Communications Port (COM4)
    (ISA) 12   PS/2 Compatible Mouse
    (ISA) 13   Numeric data processor
    (ISA) 14   Primary IDE Channel
    (PCI) 10   Intel(R) 82801FB/FBM SMBus Controller - 266A
    (PCI) 16   Intel(R) 82801FB/FBM PCI Express Root Port - 2660
    (PCI) 16   Intel(R) 82801FB/FBM USB Universal Host Controller - 265B
    (PCI) 16   Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller
    (PCI) 16   Mobile Intel(R) 915GM/GMS,910GML Express Chipset Family
    (PCI) 17   Intel(R) 82801FB/FBM PCI Express Root Port - 2662
    (PCI) 17   Marvell Yukon 88E8053 PCI-E Gigabit Ethernet Controller #2
    (PCI) 17   Realtek AC'97 Audio
    (PCI) 18   Intel(R) 82801FB/FBM USB Universal Host Controller - 265A
    (PCI) 19   Intel(R) 82801FB/FBM USB Universal Host Controller - 2659
    (PCI) 23   Intel(R) 82801FB/FBM USB Universal Host Controller - 2658
    (PCI) 23   Intel(R) 82801FB/FBM USB2 Enhanced Host Controller - 265C
```

## B.4 DMA Channel Assignments

```
AAAAA-D9E58E52A
    Direct memory access (DMA)
        4    Direct memory access controller
```