RUBY-9713VG2AR

Industrial Mainboard

User's Manual

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How to Use This Manual

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The manual describes how to configure your RUBY-9713VG2AR system to meet various operating requirements.   It is divided into five chapters, with each chapter addressing a basic concept and operation of Single Board Computer.

Chapter 1 : System Overview. Presents what you have in the box and give you an overview of the product specifications and basic system architecture for this series model of single board computer.

Chapter 2 : Hardware Configuration. Shows the definitions and locations of Jumpers and Connectors that you can easily configure your system.

Chapter 3 : System Installation. Describes how to properly mount the CPU, main memory and Compact Flash to get a safe installation and provides a programming guide of Watch Dog Timer function.

Chapter 4 : BIOS Setup Information. Specifies the meaning of each setup parameters, how to get advanced BIOS performance and update new BIOS. In addition, POST checkpoint list will give users some guidelines of trouble-shooting.

Chapter 5 : Troubleshooting. Provides various useful tips to quickly get RUBY-9713VG2AR running with success. As basic hardware installation has been addressed in Chapter 3, this chapter will basically focus on system integration issues, in terms of backplane setup, BIOS setting, and OS diagnostics.

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Chapter 1
System Overview

1.1 Introduction

Multi-core technology has been a major evolution in IT industry now since various applications are running in parallel. Multi-core processing will help address these computing challenges. This evolution in technology will allow for increased performance and efficiency in computers that can simultaneously run multiple complex applications and successfully complete more tasks at the same time. Moreover, on multi-core systems, since each core has its own cache, the operating system has sufficient resources to handle most compute intensive tasks in parallel. Since Intel has presented dual core technology in one processor package, it is good news for all users expect server adopters.

RUBY-9713VG2AR, uATX form factor Industrial Mainboard that adopts Intel's latest PCI Express chipset based on Intel® 945GM and ICH7R that supports up to 667MHz FSB processor. It delivers outstanding system performance through high-bandwidth interface such as dual–channel DDR2 667 memory, PCI-Express x16 graphic, up to four PCI slots, up to four PCI-E x 1 slots, two PCI-E based Gigabit Ethernet ports, four SATA 300 ports and one IDE channel. This chipset includes the Intel® GMA 950 graphics core which provides responsive graphics performance and stunning video playback.

In addition, RUBY-9713VG2AR also strengthens its storage capability with next-generation Serial ATA 300 ports and Intel® Matrix Storage Technology. The chipset have four integrated SATA ports for transfer rates up to 3 Gb/s, which is double the speed of the current SATA interface of 1.5Gb/s. SATA 3Gbits/sec essentially provides a larger pipe to move data faster. Together with Intel® Matrix Storage Technology, it adds support for RAID 0,1, 5 and 10 level providing quick access to data and protection against data loss for maximum performance, protection and upgradeability.

Following is brief specification of RUBY-9713VG2AR –

- Industrial mainboard in uATX form factor that supports Intel® Core Duo/ Core Solo processor for MoDT (Mobile on Desktop) application
- One 32-bit PCI expansion slot, and support up to four PCI slots by riser card
- One PCI-Express x 4 slot, and support up to four PCI Express x1 slot by riser card
- Support GPIO, TV-Out and LVDS on board
- Adopts Intel Matrix Storage Technology to support RAID 0/1 /5/10

- Dual Gigabit Ethernet ports that based on PCI Express x1 interface without sharing bandwidth of PCI expansion bus
- Optional function: TPM (Trusted Platform Module) 1.2, AMT (Active Management Technology) 1.0

1.2   Check List

The RUBY-9713VG2AR package should cover the following basic items:

- ✓ One RUBY-9713VG2AR Industrial Mainboard
- ✓ One I/O shield
- ✓ One IDE cable
- ✓ One 7-pin SATA signal cable
- ✓ One Installation Resources CD-Title
- ✓ One booklet of RUBY-9713VG2AR manual

If any of these items is damaged or missing, please contact your vendor and keep all packing materials for future replacement and maintenance.

1.3   Product Specification

- **Main processor**
  CPU & Package: Intel® Core Duo/ Core Solo processor
  FSB: 667/533MHz

- **BIOS**
  Award BIOS

- **Main Memory**
  - Support dual-channel & signal channel DDR memory interface
  - Non-ECC and non-buffered
  - Up to 4GB DDR2 667/533 SDRAM on two 200pin SO-DIMM sockets

- **L2 Cache Memory**
  Included in processor

- **Chipset**
  Intel 945GM and ICH7R chipset

- **Expansion Interface**
  - One 32-bit PCI expansion slot, and support up to four PCI slots by riser card
  - One PCI-Express x 4 slot, and support up to four PCI Express x1 slot by riser card
  - One PCI-Express x 16 slots

- **PCI IDE Interface**
  Support one enhanced IDE ports up to two HDD devices with Ultra DMA/33/66/100

- **SATA Interface**
  Four SATA 300 ports

- **Serial Ports**
  Support two serial ports, (RS-232x1, One RS-232/422/485 selectable)

- **IR Interface**
  Support one 6-pin header for serial Standard Infrared wireless communication

- **Parallel Port**
  Support one parallel port

- **USB Interface**
  Support eight USB (Universal Serial Bus) ports (four at rear for keyboard, mouse and external devices; four on-board for internal devices) for high-speed I/O peripheral devices

- **PS/2 Mouse and Keyboard Interface**
  Support dual 6-pin mini-DIN connector at rear I/O panel for PS/2 keyboard/mouse

- **Audio Interface**
  Connector and header of Line-in/Line-out/MIC for external and internal usage

- **Real Time Clock/Calendar (RTC)**
  Support Y2K Real Time Clock/Calendar with battery backup for 7-year data retention

- **Watchdog Timer**
  - Support WDT function through software programming for enable/disable and interval setting
  - Generate system reset

- **On-board VGA**
  - GMCH integrated graphics
  - Share system memory up to 224MB for system memory

- **On-board Ethernet LAN**
  Dual Gigabit (10/100/1000 Mbits/sec) LAN port using the Intel 82573L Gigabit Ethernet Controller

- **High Driving GPIO**
  Support 8 programmable high driving GPIO

- **Cooling Fans**
  Support one 4-pin power connector for CPU cooler and one 3-pin power connector for system fan

- **System Monitoring Feature**
  Monitor CPU temperature, system temperature and major power sources, etc

- **Outline Dimension (L X W):**
  243.8mm (9.6″) X 243.8mm (9.6″)

- **Power Requirements:**

- **Configuration:**
  - +12V (CPU) @1.2A
  - +12V (System) @1.4A
  - +5V (System) @1.8A
  - +3.3V (System) @1.5A
  - Test configuration:
    - CPU: Intel(R) Dual-Core (Yonah) 2.0 GHZ (166x12.0) (FSB: 667 / L2 cache: 2048Kx2)
    - Memory: Transcend (ELPIDA-E5108AG-6E-E) 512MB x2 DDR2 667
    - HDD: Seagate-ST380011A (80GB)
    - OS: Windows XP Pro
    - Test Programs: Burning Test V4.0
    - Connected Fans: Only CPU fan connected
    - Run Time: 30 minutes

- **Operating Temperature:**
  0°C ~ 55°C

- **Storage Temperature:**
  -20°C ~ 80°C

- **Relative Humidity:**
  0% ~ 95%, non-condensing

1.3.1   Mechanical Drawing
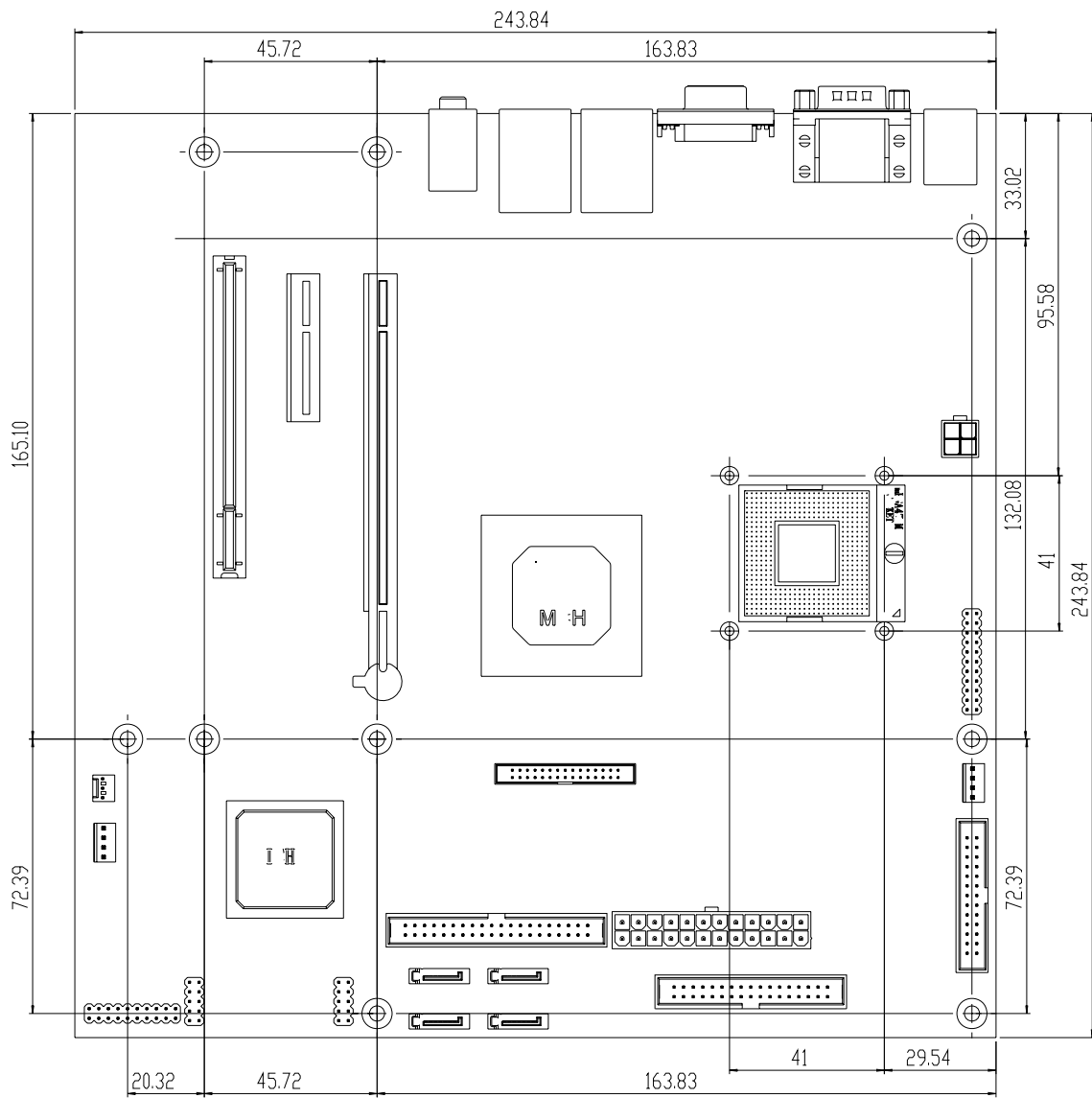
1.4   System Architecture

RUBY-9713VG2AR includes Intel 945GM PCI Express chipset, Intel 82573L PCI Express x1 interface Gigabit Ethernet controller and Winbond Super I/O.

The 945GM chipset supports the latest Intel Core Duo/ Core Solo processors with 667/533MHz front side bus; up to 4GB DDR 667/533 SDRAM system memory in dual So-DIMM sockets; four SATA ports; one IDE port and eight USB 2.0 on RUBY-9713VG2AR.

Winboard Super I/O provides connection of PS/2 interface keyboard & mouse; dual serial port; one parallel port; Watch-dog timer and GPIO interface.
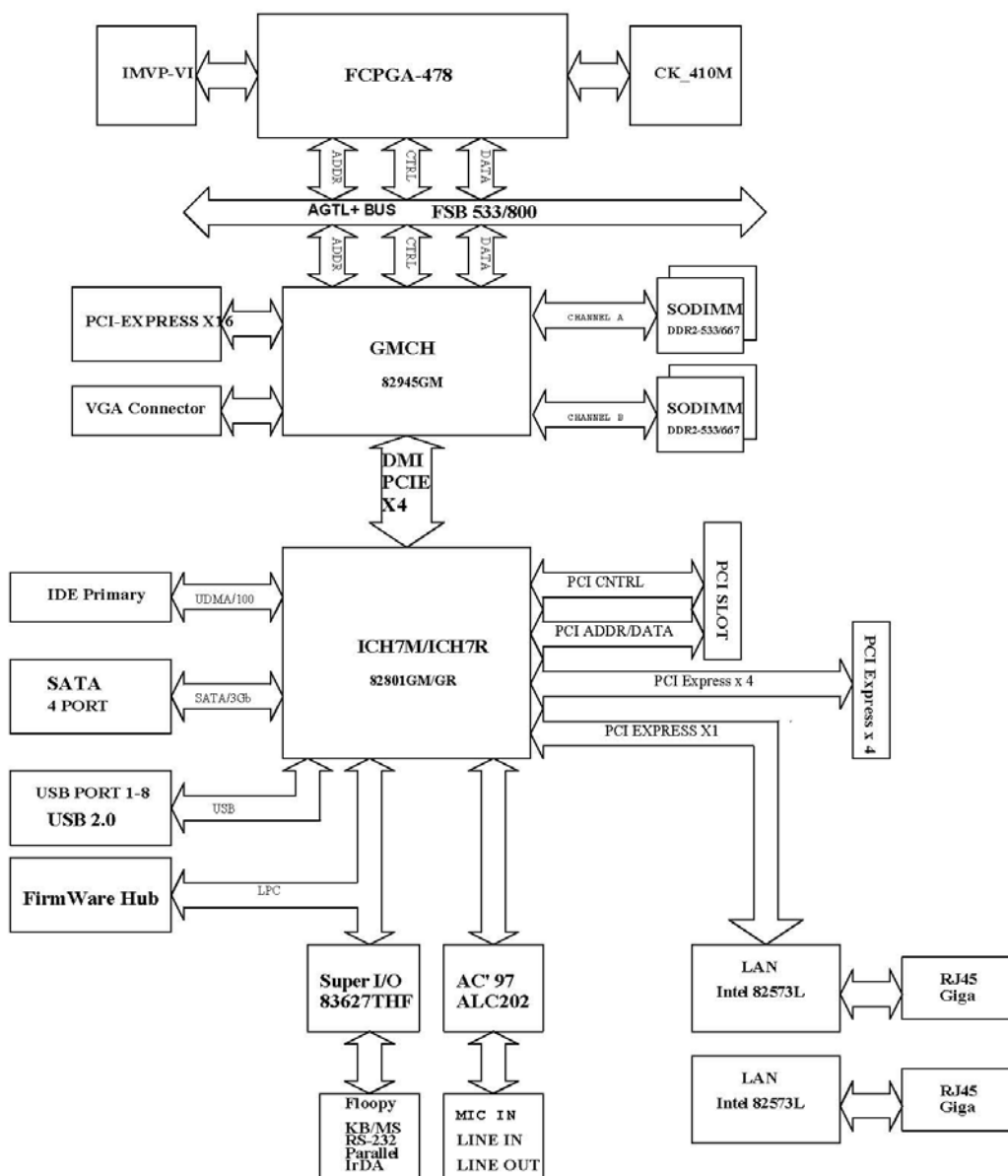
RUBY-9713VG2AR Block Diagram

Chapter 2
Hardware Configuration

This chapter gives the definitions and shows the positions of jumpers, headers and connector.   All of the configuration jumpers on RUBY-9713VG2AR are in the proper position.   The default settings shipped from factory are marked with a star (★).

2.1   Jumper Setting
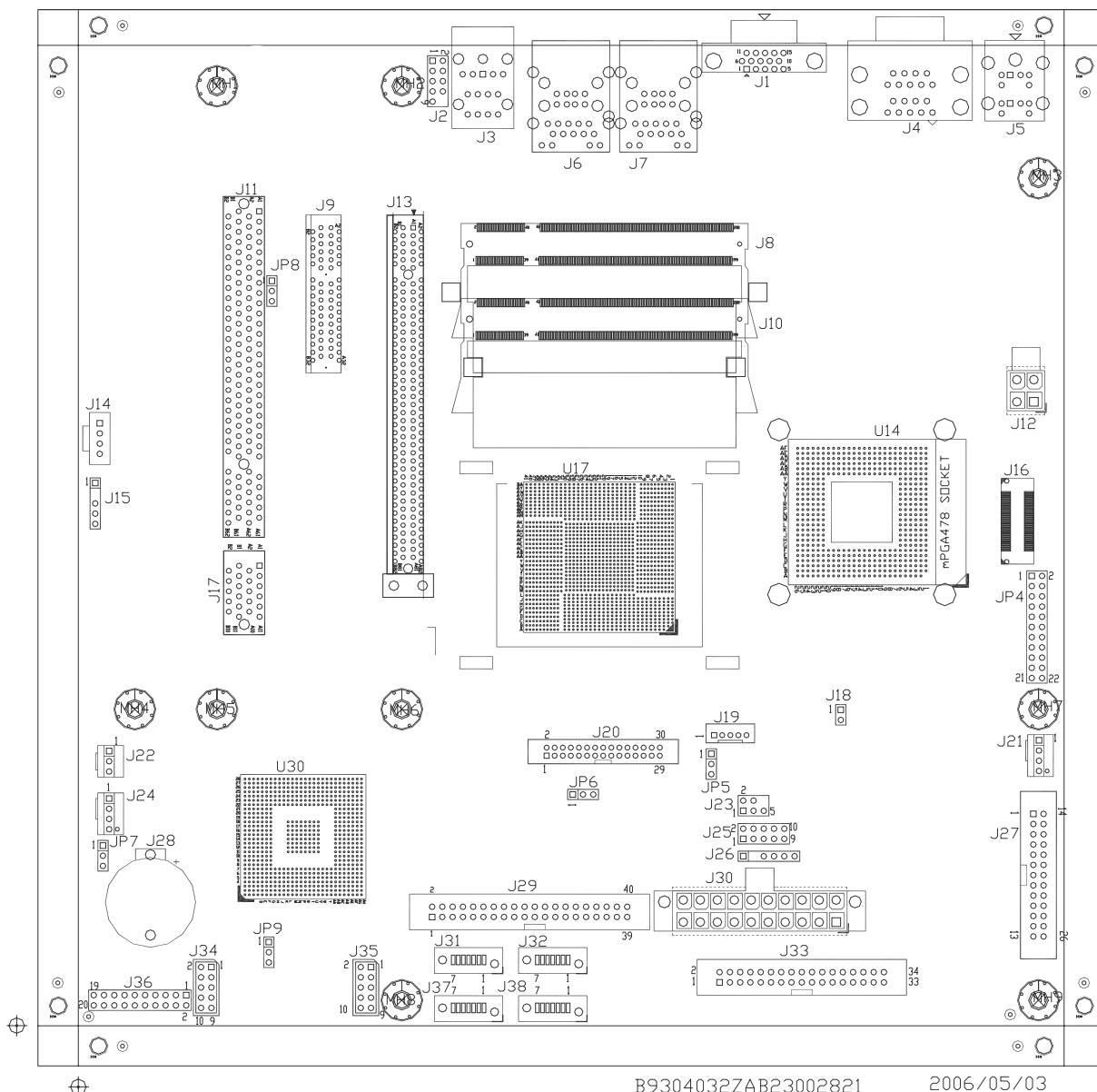
Figure 2-1   RUBY-9713VG2AR Jumper & Connector Location

JP4 : COM1(J4) Interface Selection

JP4	Function
5-6,9-11,10-12,15-17,16-18 Short	RS-232 ★
3-4,7-9,8-10,13-15,14-16,21-22 Short	RS-422
1-2,7-9,8-10,19-20 Short	RS-485

JP5 : LVDS Backlight-On Signal Selection

JP5	Function
1-2 Short	3V, Active ★
2-3 Short	5V, Active

JP6 : LVDS Panel Power (VDD) Selection

JP6	Function
1-2 Short	3.3V ★
2-3 Short	5V

JP7 : CMOS CLEAR

JP7	Function
1-2 Short	Normal Operation ★
2-3 Short	Clear CMOS Contents

JP8 : PCI VIO Selection

JP8	Function
1-2 Short	5V ★
2-3 Short	3.3V

JP9 : PCIe Slot type

JP9	Function
1-2 Short	One PCIe x 4 ★
2-3 Short	Four PCIe x 1

2.2 Connector Allocation

I/O peripheral devices are connected to the interface connectors on this Industrial Mainboard.

Connector Function List

Connector	Description	Remark
J1	On-board VGA CRT Connector	
J2	Audio MIC/Line-in/Line-out Connector	
J3	Audio Jack	
J4 (UP Port)	COM1 Serial Port 1 Connector	
J4 (Bottom Port)	COM2 Serial Port 2 Connector	
J5	PS/2 Keyboard/Mouse Connector	
J6	Primary USBx2 + LAN Connector	
J7	Secondary USBx2 + LAN Connector	
J8, J10	DDR2 SODIMM	
J9	PCI-Express x 4 Connector	
J11	PCI Connector	
J12	ATX4, 12V POWER CON.	
J13	PCI-Express x 16 Connector	
J14	Audio CD-in Connector	
J15	SMBus Connector	
J16	XDP Port (Optional)	
J17	PCI Connector Extention	
J18	External Wake On Ring Connector	
J19	LVDS Panel Control Connector	
J21	4-pin Fan Connector	
J22	3-pin Fan Connector	
J23	TV-out Connector	
J24	4-pin Fan Connector	
J25	General Purpose I/O Connector	
J26	IrDA Connector	
J27	Parallel Port Connector	
J28	Battery Connector	
J29	IDE Connector	
J30	ATX Power Connector	
J31, J32, J37, J38	SATA Connector	
J33	FDC Interface Connector	
J34	3rd pairs of USB Connector	
J35	4th pairs of USB Connector	
J36	Front Panel Connector	

Note:
Power Button : J36-pin 9 and J36-pin 11
Reset Button : J36-pin 17 and J36-pin 19
Power LED : J36-pin 2 and J36-pin 6
Speaker :J36-pin 14 and J36-pin 20
HDD LED : J36-pin 1 and J36-pin 3

Pin Assignments of Connectors

J1 : On-board VGA CRT Connector

PIN No.	Signal Description
1	Red
2	Green
3	Blue
4	Monitor ID0 (MONID0) (5V I/F)
5	Ground
6	Ground
7	Ground
8	Ground
9	+5V
10	Ground
11	Monitor ID1 (MONID1) (5V I/F)
12	VGA DDC Data (5V I/F)
13	Horizontal Sync. (HSYNC) (5V I/F)
14	Vertical Sync. (VSYNC) (5V I/F)
15	VGA DDC Clock (5V I/F)

J2 : Audio MIC/Line-in/Line-out Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	MIC with Reference Voltage	2	Analog Ground
3	Line-in Left Channel	4	Analog Ground
5	Line-in Right Channel	6	Analog Ground
7	Line-out Left Channel	8	Analog Ground
9	Line-out Right Channel	10	N/C

Note:
The Reference Voltage on MIC signal offers 2.25V~2.75V with 5mA drive.

J3 : Audio Jack

J4 : COM1 Serial Port 1 Connector (UP)

PIN No.	Signal Description		
	RS-232	RS-422	RS-485
1	DCD (Data Carrier Detect)	TX-	DATA-
2	RXD (Receive Data)	TX+	DATA+
3	TXD (Transmit Data)	RX+	N/C
4	DTR (Data Terminal Ready)	RX-	N/C
5	GND (Ground)	GND	GND
6	DSR (Data Set Ready)	N/C	N/C
7	RTS (Request to Send)	N/C	N/C
8	CTS (Clear to Send)	N/C	N/C
9	RI (Ring Indicator)	N/C	N/C

Note:
J2 (COM1) could be configurable as RS-232/422/485 with jumper JP4

J4 : COM2 Serial Port 2 Connector (Bottom)

PIN No.	Signal Description
	RS-232
1	DCD (Data Carrier Detect)
2	RXD (Receive Data)
3	TXD (Transmit Data)
4	DTR (Data Terminal Ready)
5	GND (Ground)
6	DSR (Data Set Ready)
7	RTS (Request to Send)
8	CTS (Clear to Send)
9	RI (Ring Indicator)

J5 : PS/2 Keyboard/Mouse Connector

PIN No.	Signal Description
7	Mouse Data
1	Keyboard Data
3,9	Ground
4	5V Dual
2,6,8,12	N/C
11	Mouse Clock
5	Keyboard Clock

J6 : Primary USBx2 + LAN Connector

PIN No.	Signal Description	PIN No.	Signal Description (Top Con.)
1	MDI0+ (MDI0P)	1	5V Dual
2	MDI0- (MDI0N)	2	USB0-
3	MDI1+ (MDI1P)	3	USB0+
4	MDI2+ (MDI2P)	4	Ground
5	MDI2- (MDI2N)	5	5V Dual
6	MDI1- (MDI1N)	6	USB1-
7	MDI3+ (MDI3P)	7	USB1+
8	MDI3- (MDI3N)	8	Ground

J7 : Secondary USBx2 + LAN Connector

PIN No.	Signal Description	PIN No.	Signal Description (Top Con.)
1	MDI0+ (MDI0P)	1	5V Dual
2	MDI0- (MDI0N)	2	USB2-
3	MDI1+ (MDI1P)	3	USB2+
4	MDI2+ (MDI2P)	4	Ground
5	MDI2- (MDI2N)	5	5V Dual
6	MDI1- (MDI1N)	6	USB3-
7	MDI3+ (MDI3P)	7	USB3+
8	MDI3- (MDI3N)	8	Ground

J9 : PCI-Express x 4 Connector

PIN No.	Signal Description	PIN No.	Signal Description
A01	N/C	B01	12V
A02	12V	B02	12V
A03	12V	B03	12V
A04	GND	B04	GND
A05	N/C	B05	SMBus Clock
A06	N/C	B06	SMBus Data
A07	N/C	B07	GND
A08	N/C	B08	VCC3
A09	VCC3	B09	N/C
A10	VCC3	B10	3V Stand By
A11	PLTRSY#	B11	WAKE#
A12	GND	B12	N/C
A13	CK_PE_X16P	B13	GND
A14	CK_PE_X16N	B14	EXP_TX0P

A15	GND	B15	EXP_TX0N
A16	EXP_RX0P	B16	GND
A17	EXP_RX0N	B17	SDVO_CLK
A18	GND	B18	GND
A19	N/C	B19	EXP_TX1P
A20	GND	B20	EXP_TX1N
A21	EXP_RX1P	B21	GND
A22	EXP_RX1N	B22	GND
A23	GND	B23	EXP_TX2P
A24	GND	B24	EXP_TX2N
A25	EXP_RX2P	B25	GND
A26	EXP_RX2N	B26	GND
A27	GND	B27	EXP_TX3P
A28	GND	B28	EXP_TX3N
A29	EXP_RX3P	B29	GND
A30	EXP_RX3N	B30	N/C
A31	GND	B31	SDVO_DATA
A32	N/C	B32	GND

J11 : PCI Connector

PIN No.	Signal Description	PIN No.	Signal Description
A01	TRST# (Pull-Low)	B01	-12V
A02	12 V	B02	4.7K Pull-Low
A03	PTMS (2.7K Pull-high 5V)	B03	GND
A04	PTDI (2.7K Pull-high 5V)	B04	N/C
A05	VCC	B05	VCC
A06	PIRQ#F	B06	VCC
A07	PIRQ#G	B07	PIRQ#E
A08	VCC	B08	PIRQ#A
A09	N/C	B09	N/C
A10	VCC	B10	N/C
A11	N/C	B11	N/C
A12	GND	B12	GND
A13	GND	B13	GND
A14	N/C	B14	NC
A15	PCIRST#	B15	GND
A16	VCC	B16	PCI Clock
A17	PGNT#0	B17	GND
A18	GND	B18	PREQ#0
A19	PME#	B19	VCC
A20	AD30	B20	AD31

A21	VCC3	B21	AD29
A22	AD28	B22	GND
A23	AD26	B23	AD27
A24	GND	B24	AD25
A25	AD24	B25	VCC3
A26	IDSEL (AD26)	B26	C/BE#3
A27	VCC3	B27	AD23
A28	AD22	B28	GND
A29	AD20	B29	AD21
A30	GND	B30	AD19
A31	AD18	B31	VCC3
A32	AD16	B32	AD17
A33	VCC3	B33	C/BE#2
A34	FRAME#	B34	GND
A35	Ground	B35	IRDY#
A36	TRDY#	B36	VCC3
A37	GND	B37	DEVSEL#
A38	STOP#	B38	GND
A39	VCC3	B39	LOCK#
A40	N/C	B40	PERR#
A41	N/C	B41	VCC3
A42	GND	B42	SERR#
A43	PAR	B43	VCC3
A44	AD15	B44	C/BE#1
A45	VCC3	B45	AD14
A46	AD13	B46	Ground
A47	AD11	B47	AD12
A48	GND	B48	AD10
A49	AD9	B49	GND
A50	KEY	B50	KEY
A51	KEY	B51	KEY
A52	C/BE#0	B52	AD8
A53	VCC3	B53	AD7
A54	AD6	B54	VCC3
A55	AD4	B55	AD5
A56	Ground	B56	AD3
A57	AD2	B57	GND
A58	AD0	B58	AD1
A59	VCC	B59	VCC
A60	4.7K Pull-High VCC	B60	4.7K Pull-High VCC
A61	VCC	B61	VCC
A62	VCC	B62	VCC

J12 : ATX4, 12V POWER CON.

PIN No.	Signal Description	PIN No.	Signal Description
1	Ground	3	+12V
2	Ground	4	+12V

J13 : PCI-Express x 16 Connector

PIN No.	Signal Description	PIN No.	Signal Description
A01	N/C	B01	12V
A02	12V	B02	12V
A03	12V	B03	12V
A04	GND	B04	GND
A05	N/C	B05	SMBus Clock
A06	N/C	B06	SMBus Data
A07	N/C	B07	GND
A08	N/C	B08	VCC3
A09	VCC3	B09	N/C
A10	VCC3	B10	3V Stand By
A11	PLTRSY#	B11	WAKE#
A12	GND	B12	N/C
A13	CLK_PE_X16P	B13	GND
A14	CLK_PE_X16N	B14	GEXP_TX0P
A15	GND	B15	GEXP_TX0N
A16	GEXP_RX0P	B16	GND
A17	GEXP_RX0N	B17	SDVO_CLK
A18	GND	B18	GND
A19	N/C	B19	GEXP_TX1P
A20	GND	B20	GEXP_TX1N
A21	GEXP_RX1P	B21	GND
A22	GEXP_RX1N	B22	GND
A23	GND	B23	GEXP_TX2P
A24	GND	B24	GEXP_TX2N
A25	GEXP_RX2P	B25	GND
A26	GEXP_RX2N	B26	GND
A27	GND	B27	GEXP_TX3P
A28	GND	B28	GEXP_TX3N
A29	GEXP_RX3P	B29	GND
A30	GEXP_RX3N	B30	N/C
A31	GND	B31	SDVO_DATA
A32	N/C	B32	GND
A33	N/C	B33	GEXP_TX4P
A34	GND	B34	GEXP_TX4N
A35	GEXP_RX4P	B35	GND
A36	GEXP_RX4N	B36	GND

A37	GND	B37	GEXP_TX5P
A38	GND	B38	GEXP_TX5N
A39	GEXP_RX5P	B39	GND
A40	GEXP_RX5N	B40	GND
A41	GND	B41	GEXP_TX6P
A42	GND	B42	GEXP_TX6N
A43	GEXP_RX6P	B43	GND
A44	GEXP_RX6N	B44	GND
A45	GND	B45	GEXP_TX7P
A46	GND	B46	GEXP_TX7N
A47	GEXP_RX7P	B47	GND
A48	GEXP_RX7N	B48	EXP_EN_HDR
A49	GND	B49	GND
A50	N/C	B50	GEXP_TX8P
A51	GND	B51	GEXP_TX8N
A52	GEXP_RX8P	B52	GND
A53	GEXP_RX8N	B53	GND
A54	GND	B54	GEXP_TX9P
A55	GND	B55	GEXP_TX9N
A56	GEXP_RX9P	B56	GND
A57	GEXP_RX9N	B57	GND
A58	GND	B58	GEXP_TX10P
A59	GND	B59	GEXP_TX10N
A60	GEXP_RX10P	B60	GND
A61	GEXP_RX10N	B61	GND
A62	GND	B62	GEXP_TX11P
A63	GND	B63	GEXP_TX11N
A64	GEXP_RX11P	B64	GND
A65	GEXP_RX11N	B65	GND
A66	GND	B66	GEXP_TX12P
A67	GND	B67	GEXP_TX12N
A68	GEXP_RX12P	B68	GND
A69	GEXP_RX12N	B69	GND
A70	GND	B70	GEXP_TX13P
A71	GND	B71	GEXP_TX13N
A72	GEXP_RX13P	B72	GND
A73	GEXP_RX13N	B73	GND
A74	GND	B74	GEXP_TX14P
A75	GND	B75	GEXP_TX14N
A76	GEXP_RX14P	B76	GND
A77	GEXP_RX14N	B77	GND
A78	GND	B78	GEXP_TX15P
A79	GND	B79	GEXP_TX15N
A80	GEXP_RX15P	B80	GND
A81	GEXP_RX15N	B81	N/C
A82	GND	B82	N/C

J14 : Audio CD-in Connector

PIN No.	Signal Description
1	CD-in Left Channel
2	CD Ground
3	CD Ground
4	CD-in Right Channel

J15 : SMBus Connector

PIN No.	Signal Description
1	SMBus Clock
2	N/C
3	Ground
4	SMBus Data
5	+3V Stand-by

J16 : XDP Port

PIN No.	Signal Description	PIN No.	Signal Description
1	GND	2	GND
3	BPM5	4	N/C
5	BPM4	6	N/C
7	GND	8	GND
9	BPM3	10	N/C
11	BPM2	12	N/C
13	GND	14	GND
15	BPM1	16	N/C
17	BPM0	18	N/C
19	GND	20	GND
21	N/C	22	N/C
23	N/C	24	N/C
25	GND	26	GND
27	N/C	28	N/C
29	N/C	30	N/C
31	GND	32	N/C
33	N/C	34	GND
35	N/C	36	N/C
37	GND	38	GND
39	CPU_PWRGD	40	CLK_XDP_P
41	TEST_IN#	42	CLK_XDP_N

43	VCCP	44	VCCP
45	CLK_PE_XDP_P	46	CPU_RESET
47	CLK_PE_XDP_N	48	DBR#
49	GND	50	GND
51	SMB_DATA	52	TDO
53	SMB_CLK	54	TRST#
55	N/C	56	TDI
57	TCK	58	TMS
59	GND	60	GND

J17: PCI Connector Extention

PIN No.	Signal Description	PIN No.	Signal Description
A01	PGNT#1	B01	GND
A02	GND	B02	PCI Clock
A03	PGNT#2	B03	GND
A04	GND	B04	PREQ#1
A05	N/C	B05	GND
A06	N/C	B06	PCI Clock
A07	N/C	B07	GND
A08	N/C	B08	PREQ#2
A09	N/C	B09	GND
A10	12 V	B10	PREQ#3
A11	N/C	B11	PGNT#3

J18: External Wake On Ring Connector

PIN No.	Signal Description
1	Ring Signal Input (Active low)
2	Ground

J19: LVDS Panel Control Connector

PIN No.	Signal Description
1	12 V
2	12 V
3	Backlight-on Signal Output
4	Brightness Control Signal
5	GND

J21 : 4-pin Fan Connector

PIN No.	Signal Description
1	Ground
2	+12V
3	Fan Speed Detecting signal
4	Fan Control Signal

Note:
The fan must be a 12V fan. And there is not any over current protection.

J22 : 3-pin Fan Connector

PIN No.	Signal Description
1	Ground
2	+12V
3	Fan Speed Detecting signal

Note:
The fan must be a 12V fan. And there is not any over current protection.

J23: TV-out Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Ground	2	COMP/B
3	Y/G	4	C/R
5	SYNC	6	N/C

J24 : SYSTEM Fan Connector

PIN No.	Signal Description
1	Ground
2	+12V
3	Fan Speed Detecting signal
4	Fan Control Signal

Note:
The fan must be a 12V fan. And there is not any over current protection.

J25: General Purpose I/O Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	General Purpose I/O Port 0 (GPIO0)	2	General Purpose I/O Port 4 (GPIO4)
3	General Purpose I/O Port 1 (GPIO1)	4	General Purpose I/O Port 5 (GPIO5)
5	General Purpose I/O Port 2 (GPIO2)	6	General Purpose I/O Port 6 (GPIO6)
7	General Purpose I/O Port 3 (GPIO3)	8	General Purpose I/O Port 7 (GPIO7)
9	Ground	10	+5V

Note:
2.7K pull-high to 5V for each GPIO pin

J26: IrDA Connector

PIN No.	Signal Description
1	+5V
2	N/C
3	IRRX
4	Ground
5	IRTX
6	N/C

J27: Parallel Port Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Strobe#	14	Auto Form Feed#
2	Data 0	15	Error#
3	Data 1	16	Initialization#
4	Data 2	17	Printer Select IN#
5	Data 3	18	Ground
6	Data 4	19	Ground
7	Data 5	20	Ground
8	Data 6	21	Ground
9	Data 7	22	Ground
10	Acknowledge#	23	Ground
11	Busy	24	Ground
12	Paper Empty	25	Ground
13	Printer Select	26	N/C

J28 : Battery Connector

PIN No.	Signal Description
1	3V Battery In
2	Ground

J29 : IDE Connector (IDE)

PIN No.	Signal Description	PIN No.	Signal Description
1	RESET#	2	Ground
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	Ground	20	N/C
21	DMA REQ	22	Ground
23	IOW#	24	Ground
25	IOR#	26	Ground
27	IOCHRDY	28	Pull-down
29	DMA ACK#	30	Ground
31	INT REQ	32	N/C
33	SA1	34	CBLID#
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD Active#	40	Ground

J30: ATX Power Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	ATX 3.3V	11	ATX 3.3V
2	ATX 3.3V	12	ATX -12V
3	ATX Ground	13	ATX Ground
4	ATX 5V	14	ATX Power On Control (PS-ON)
5	ATX Ground	15	ATX Ground
6	ATX 5V	16	ATX Ground
7	ATX Ground	17	ATX Ground
8	ATX Power Good	18	ATX -5V
9	ATX 5V Stand By	19	ATX 5V
10	ATX 12V	20	ATX 5V

J37, J38, J31. J32: Primary/Secondary/3rd/4th SATA Connector

PIN No.	Signal Description
1	Ground
2	SATATX+ (SATATXP)
3	SATATX- (SATATXN)
4	Ground
5	SATARX- (SATARXN)
6	SATARX+ (SATARXP)
7	Ground

J33: FDC Interface Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Ground	2	Density Select 0
3	Ground	4	N/C
5	Ground	6	Density Select 1
7	Ground	8	Index#
9	Ground	10	Motor ENA#
11	Ground	12	Drive Select B#
13	Ground	14	Drive Select A#
15	Ground	16	Motor ENB#
17	Ground	18	Direction#
19	Ground	20	Step#
21	Ground	22	Write Data#
23	Ground	24	Write Gate#
25	Ground	26	Track 0#

27	Ground	28	Write Protect#
29	Ground	30	Read Data#
31	Ground	32	Head Select#
33	Ground	34	Disk Change#

J34: 3rd pairs of USB Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	5V Dual	2	Frame Ground
3	USB4-	4	Ground
5	USB4+	6	USB5+
7	Ground	8	USB5-
9	Frame Ground	10	5V Dual

Note:

5V Dual is always available. It's supplied by either 5V VCC power source in normal operation mode or 5V standby power source in standby mode.

J35: 4th pairs of USB Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	5V Dual	2	Frame Ground
3	USB6-	4	Ground
5	USB6+	6	USB7+
7	Ground	8	USB7-
9	Frame Ground	10	5V Dual

Note:

5V Dual is always available. It's supplied by either 5V VCC power source in normal operation mode or 5V standby power source in standby mode.

J36: Front Panel Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	150 ohm Pull-High VCC (HDD LED+)	2	330 ohm Pull-High Stand-by VCC (Power LED+)
3	HDD LED -	4	N/C
5	N/C	6	Power LED -
7	N/C	8	N/C
9	150 ohm Pull-High Stand-by VCC	10	N/C
11	ATX Power On Control (PS-ON) (Active High)	12	N/C

13	Ground	14	VCC
15	N/C	16	Ground
17	Reset Signal Input (Active low)	18	Ground
19	Ground	20	Speaker-out

Note:

The pull-high voltage of external speaker is limited at 5V maximum.

Power Button : J36-pin 9 and J36-pin 11

Reset Button : J36-pin 17 and J36-pin 19

Power LED : J36-pin 2 and J36-pin 6

Speaker :J36-pin 14 and J36-pin 20

Chapter 3
System Installation

This chapter provides you with instructions to set up your system. The additional information is enclosed to help you set up onboard PCI / PCI-Express device and handle WDT operation in software programming.

3.1 Pentium 4 Processor

Configuring System Bus

RUBY-9713VG2AR will automatically detect the CPU used. Support Package µFCPGA478 LV Yonah Dual Core processor CPU.

Installing mPGA 478MT Socket

1) Lift the handling lever of CPU socket outwards and upwards to the other end.
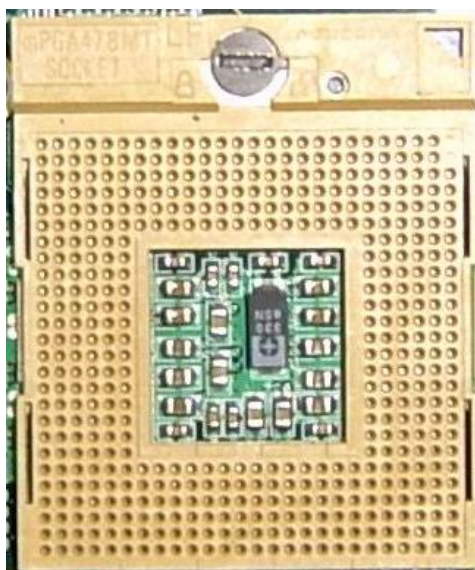
2) Align the processor pins with pinholes on the socket. Make sure that the notched corner or dot mark (pin 1) of the CPU corresponds to the socket's bevel end. Then press the CPU gently until it fits into place. If this operation is not easy or smooth, don't do it forcibly. You need to check and rebuild the CPU pin uniformly.

3) Push down the lever to lock processor chip into the socket once CPU fits.
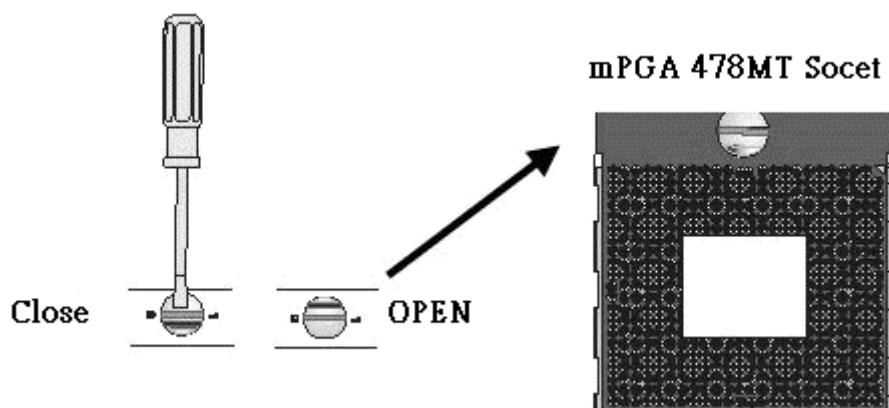
To un-install the current processor, use a screwdriver to disengage (open) the socket actuator, as shown in Figure 1 below. The socket actuator should open after only a half turn or so, and you should then be able to remove the processor with your fingers.

J12: ATX4, 12V POWER CON.

PIN No.	Signal Description
1	Ground
2	Ground
3	+12V
4	+12V

Removing CPU

1) Unlock the cooling fan first.
2) Lift the lever of CPU socket outwards and upwards to the other end.
3) Carefully lifts up the existing CPU to remove it from the socket.
4) Follow the steps of installing a CPU to change to another one or place handling bar to close the opened socket.

3.2   Main Memory

RUBY-9713VG2AR provides 2 x 200-pin SODIMM sockets (dual channel) Support only unbuffered SODIMM and non ECC memory as Smallest memory capacity possible is 128MB on-board main memory. Largest memory capacity possible is 4GB (2GB per channel). Memory clock Auto detecting to BIOS CMOS settings.

For system compatibility and stability, don't use memory module without brand. You can also use single-sided or double-sided SODIMM in both slots.

Watch out the contact and lock integrity of memory module with socket, it will impact on the system reliability. Follow normal procedures to install your DRAM module into memory socket. Before locking, make sure that all modules have been fully inserted into the card slots.

Dual Channel DDR2 SODIMM

Dual Channel DDR2 memory technology doubles the bandwidth of memory bus. Adequate or higher bandwidth of memory than processor would increase system performance. To enable Dual Channel DDR2 memory technology, you have to install dual identical memory modules in both memory sockets. Following tables show bandwidth information of different processor and memory configurations.

Memory Frequency	Dual Channel DDR Bandwidth	Single Channel DDR Bandwidth
667MHz	10.7 GB/s	5.3 GB/s

Note:
To maintain system stability, don't change any of DRAM parameters in BIOS setup to upgrade your system performance without acquiring technical information.

CPU FSB / Memory Frequency synchronization

Support different memory frequencies depending on the CPU front side bus and the type of DDR2 SO-DIMM.

CPU FSB	Memory Frequency
667 MHz	533 MHZ / 667 MHz

JP8 PCI VIO Selection

Select PCI Slot VIO support 3.3V/5V PCI v2.3 Connector.

JP8	Function
1-2 Short	5V ★
2-3 Short	3.3V

JP9 PCI-Express Slot type

ROBO-9713VG2AR supports One PCI-Express by 4 Device, or for PCI-Express by 1 Slot.

JP9	Function
1-2 Short	One PCI-Express by 4 ★
2-3 Short	Four PCI-Express by 1

3.3 Installing the Single Board Computer

To install your RUBY-9713VG2AR into standard chassis or proprietary environment, you need to perform the following:

Step 1: Check all jumpers setting on proper position.
Step 2: Install and configure CPU and memory module on right position.
Step 3: Place RUBY-9713VG2AR into the dedicated position in your system.
Step 4: Attach cables to existing peripheral devices and secure it.

WARNING

One 32-bit, 3.3V/5V PCI slot fully compatible with Revision 2.3 of the PCI local bus specification shall be placed on the component side of the board.

The connector shall be positioned in accordance to the micro ATX motherboard placement specification such that the board may be mounted in a generic chassis.

Note:
Please refer to section 3.3.1 to 3.3.5 to install INF/VGA/LAN/Audio/Intel Matrix Storage Manager Device drivers.
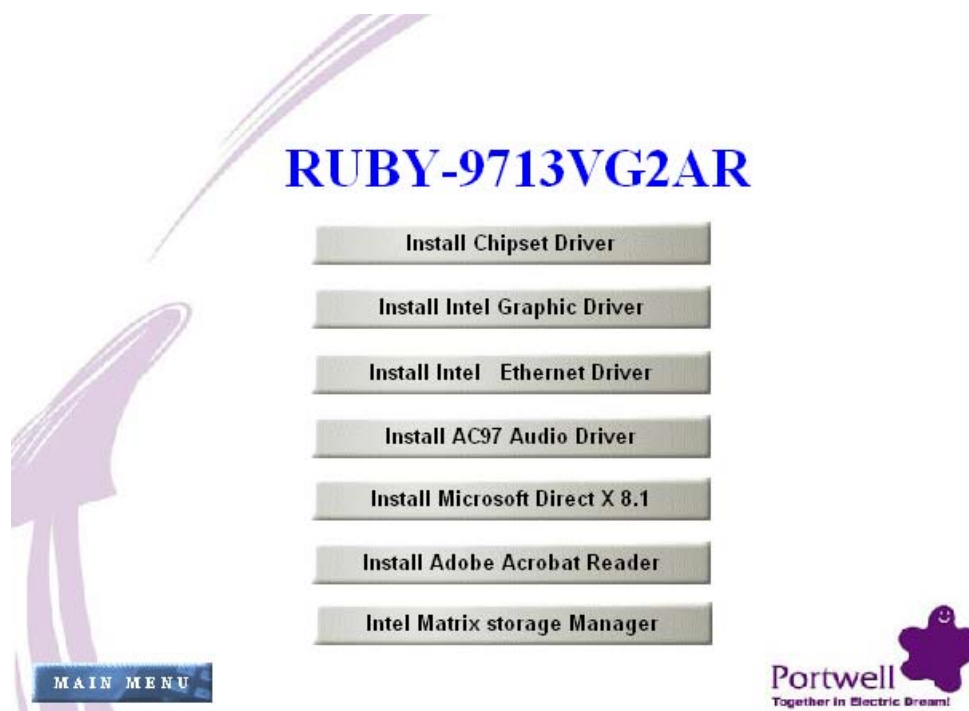
3.3.1 Chipset Component Driver

The chipset on RUBY-9713VG2AR is a new chipset that a few old operating systems might not be able to recognize. To overcome this compatibility issue, for Windows Operating Systems such as Windows 2000 /XP / Server 2003, please install its INF before any of other Drivers are installed. You can find very easily this chipset component driver in RUBY-9713VG2AR CD-title.

3.3.2 Intel Integrated Graphics GMCH Chip

Using GMCH High performance graphic integrated chipset is aimed to gain an outstanding graphic performance. Shared 64 accompany it to 160MB system DDR-SDRAM with Total Graphics Memory. This combination makes RUBY-9713VG2AR an excellent piece of multimedia hardware.

With no additional video adaptor, this onboard video will usually be the system display output. By adjusting the BIOS setting to disable on-board VGA, an add-on PCI or PCI Express by 16, VGA Card can take over the system display.

Drivers Support

Please find 82945GM Express GMCH drivers in the RUBY-9713VG2AR CD-title. Drivers support Windows 2000 / XP System 32-bit & Windows XP System 64-bit.
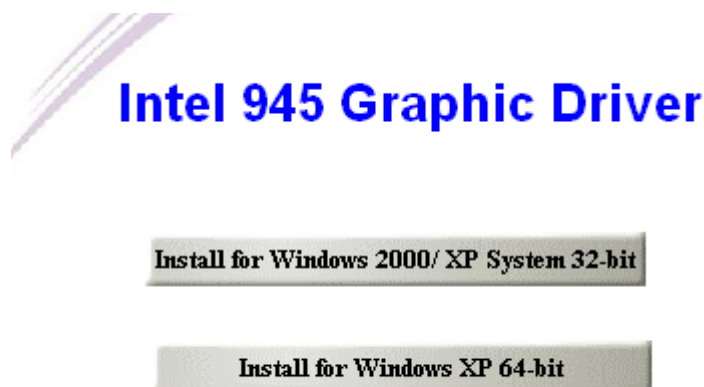
Intel 945 Graphic Driver

Install for Windows 2000/ XP System 32-bit

Install for Windows XP 64-bit

Windows 2000/XP (32bit): Please execute Install for Windows 2000/XP System 32-Bit file to start graphics driver installation.

Windows XP (64-bit): Please execute Install for Windows XP System 64-bit file to start graphics driver installation.

3.3.3   On-board Fast Ethernet Controller

<u>Drivers Support</u>

Please find Intel 82573E (Eth 0)/ 82573V (Eth 1) Gigabit LAN driver in /Ethernet directory of RUBY-9713VG2AR CD-title. The drivers support Windows 2000/XP System 32-Bit & Windows XP System 64-bit.

Intel PRO 100/1000 Ethernet Driver

Please choose your OS to install

Install for Windows 2000 /XP 32-bit System

Install for Windows XP 64-bit System
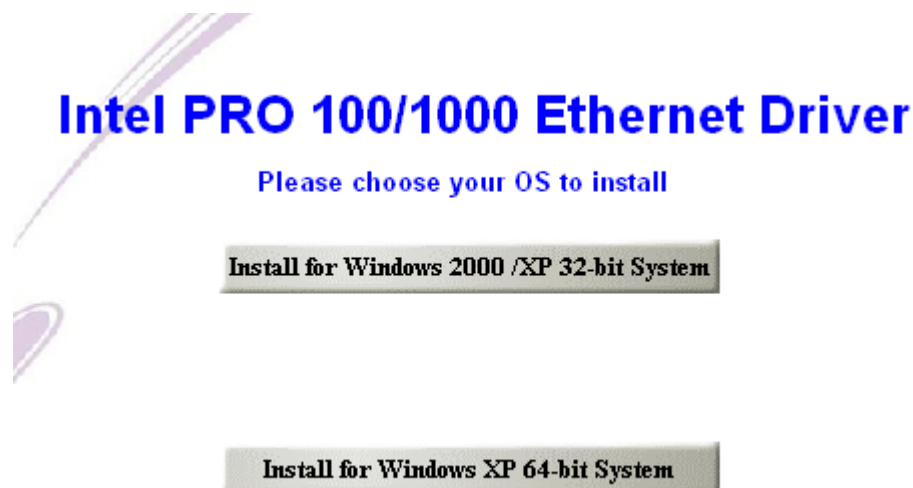
Windows 2000/XP (32bit): Please execute Install for Windows 2000/XP System 32-Bit file to start Intel LAN driver installation.

Windows XP (64-bit): Please execute Install for Windows XP System 64-bit file to "Ethernet\intel\intel_Gigabit_64bit\"; Pass below button into the dictionary.

<u>LED Indicator (for LAN status)</u>

RUBY-9713VG2AR provides three LED indicators to report Intel 82573E / 82573V Gigabit Ethernet interfaces status. Please refer to the table below as a quick reference guide.

82573E / 82573V	Color	Name of LED	Operation of Ethernet Port		
			Linked	Active	
Status LED	Yellow	LAN Linked & Active LED	On	Blinking	
Speed LED	Orange	LAN speed LED	Giga Mbps	100 Mbps	10 Mbps
	Green		Orange	Green	Off

3.3.4 On-board AC-97 Audio Device

Please find Realtek ALC202A Audio driver of RUBY-9713VG2AR CD-title. The drivers support Windows 98SE/ME/2000/ XP.
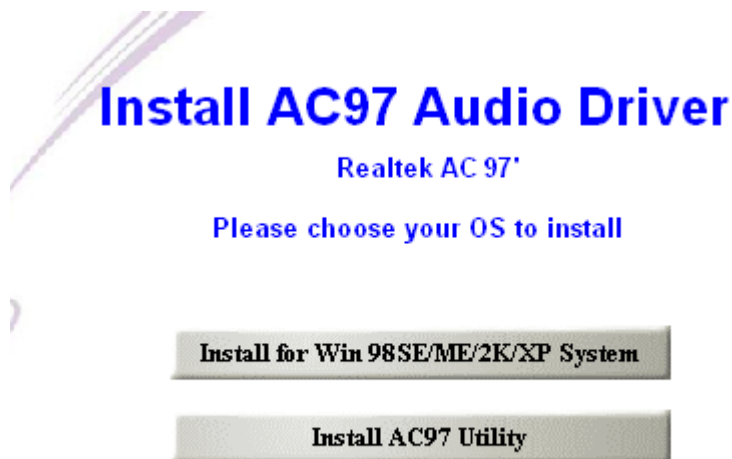
J14: Audio CD-in Connector

PIN No.	Signal Description
1	CD-in Left Channel
2	CD Ground
3	CD Ground
4	CD-in Right Channel

3.3.5 Intel Matrix Storage Manager Device

<u>Drivers Support</u>

Please find Intel ICH7R driver of RUBY-9713VG2AR CD-title. The drivers support Windows 2000/XP System 32-Bit & Windows XP System 64-bit.

<u>Installing Serial ATA hard disks</u>

The RUBY-9713VG2AR supports Serial ATA hard disk drives. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

To install the SATA hard disks for a RAID configuration:

1. Install the SATA hard disks into the drive bays.
2. Connect the SATA signal cables.
3. Connect a SATA power cable to the power connector on each drive.

<u>Intel RAID configurations</u>

This RUBY-9713VG2AR supports RAID 0, RAID 1, RAID 5, RAID 10 (0+1) and Intel® Matrix Storage configurations for Serial ATA hard disks drives through the Intel ICH7R Southbridge chip.

RAID configurations

RAID 0 (Data striping) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

RAID 1 (Data mirroring) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

RAID 10 is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.

RAID 5 stripes both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

Intel Matrix Storage Manager. The Intel® Matrix Storage technology supported by the ICH7R chip allows you to create a RAID 0 and a RAID 1 set using only two identical hard disk drives. The Intel® Matrix Storage technology creates two partitions on each hard disk drive to create a virtual RAID 0 and RAID 1 sets. This technology also allows you to change the hard disk drive partition size without losing any data.

3.4 Clear CMOS Operation

The following table indicates how to enable/disable CMOS Clear Function hardware circuit by putting jumpers at proper position.
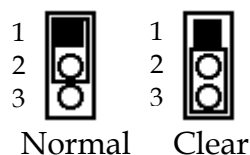
Normal   Clear

JP7	Function
1-2 Short	Normal Operation ★
2-3 Short	Clear CMOS contents

3.5 WDT Function

The working algorithm of the WDT function can be simply described as a counting process. The Time-Out Interval can be set through software programming. The availability of the time-out interval settings by software or hardware varies from boards to boards.

RUBY-9713VG2A allows users control WDT through dynamic software programming. The WDT starts counting when it is activated. It sends out a signal to system reset or to non-maskable interrupt (NMI), when time-out interval ends. To prevent the time-out interval from running out, a re-trigger signal will need to be sent before the counting reaches its end. This action will restart the counting process. A well-written WDT program should keep the counting process running under normal condition. WDT should never generate a system reset or NMI signal unless the system runs into troubles.

The related Control Registers of WDT are all included in the following sample program that is written in C language. User can fill a non-zero value into the Time-out Value Register to enable/refresh WDT. System will be reset after the Time-out Value to be counted down to zero. Or user can directly fill a zero value into Time-out Value Register to disable WDT immediately. To ensure a successful accessing to the content of desired Control Register, the sequence of following program codes should be step-by-step run again when each register is accessed.

Additionally, there are maximum 2 seconds of counting tolerance that should be considered into user' application program. For more information about WDT, please refer to Winbond W83627THF data sheet.

There are two PNP I/O port addresses that can be used to configure WDT,
1) 0x2E:EFIR (Extended Function Index Register, for identifying CR index number)
2) 0x2F:EFDR (Extended Function Data Register, for accessing desired CR)

Below are some example codes, which demonstrate the use of WDT.

```
// Enter Extended Function Mode
outp(0x002E, 0x87);
outp(0x002E, 0x87);
// Assign Pin 89 to be a WDTO
outp(0x002E, 0x2B);
outp(0x002F, inp(0x002F) & 0xEF);
// Select Logic Device 8
outp(0x002E, 0x07);
outp(0x002F, 0x08);
// Active Logic Device 8
outp(0x002E, 0x30);
outp(0x002F, 0x01);
// Select Count Mode
outp(0x002E, 0xF5);
outp(0x002F, (inp(0x002F) & 0xF7) | ( Count-mode Register  & 0x08));
// Specify Time-out Value
outp(0x002E, 0xF6);
outp(0x002F,  Time-out Value Register );
// Disable WDT reset by keyboard/mouse interrupts
outp(0x002E, 0xF7);
outp(0x002F, 0x00);
// Exit Extended Function Mode
outp(0x002E, 0xAA);
```

Definitions of Variables:

Value of Count-mode Register :
1) 0x00 -- Count down in seconds (Bit3=0)
2) 0x08 -- Count down in minutes (Bit3=1)
Value of Time-out Value Register :
1) 0x00 -- Time-out Disable
2) 0x01~0xFF -- Value for counting down

3.6 GPIO

The RUBY-9713VG2AR provides 8 programmable input or output ports that can be individually configured to perform a simple basic I/O function. Users can configure each individual port to become an input or output port by programming register bit of I/O Selection. To invert port value, the setting of Inversion Register has to be made. Port values can be set to read or write through Data Register.

3.6.1 Pin assignment

J38: General Purpose I/O Connector

PIN No.	Signal Description
1	General Purpose I/O Port 0 (GPIO0)
2	General Purpose I/O Port 4 (GPIO4)
3	General Purpose I/O Port 1 (GPIO1)
4	General Purpose I/O Port 5 (GPIO5)
5	General Purpose I/O Port 2 (GPIO2)
6	General Purpose I/O Port 6 (GPIO6)
7	General Purpose I/O Port 3 (GPIO3)
8	General Purpose I/O Port 7 (GPIO7)
9	Ground
10	+5V

All General Purpose I/O ports can only apply to standard TTL $\pm$ 5% signal level (0V/5V), and each source sink capacity up to 12mA.

3.6.2 RUBY-9713VG2AR GPIO Programming Guide

There are 8 GPIO pins on RUBY-9713VG2AR. These GPIO pins are from SUPER I/O (W83627THF) GPIO pins, and can be programmed as Input or Output direction.

J38 pin header is for 8 GPIO pins and its pin assignment as following :

J38_Pin1=GPIO1:from SUPER I/O_GPIO10 with Ext. 2.7K PH
J38_Pin3=GPIO2:from SUPER I/O_GPIO11 with Ext. 2.7K PH
J38_Pin5=GPIO3:from SUPER I/O_GPIO12 with Ext. 2.7K PH
J38_Pin7=GPIO4:from SUPER I/O_GPIO13 with Ext. 2.7K PH
J38_Pin2=GPIO5:from SUPER I/O_GPIO14 with Ext. 2.7K PH
J38_Pin4=GPIO6:from SUPER I/O_GPIO15 with Ext. 2.7K PH
J38_Pin6=GPIO7:from SUPER I/O_GPIO16 with Ext. 2.7K PH
J38_Pin8=GPIO8:from SUPER I/O_GPIO17 with Ext. 2.7K PH
<<<<< Be careful Pin9=GND , Pin10=VCC >>>>>

There are several Configuration Registers (CR) of W83627THF needed to be programmed to control the GPIO direction, and status(GPI)/value(GPO). CR00h ~ CR2F are common (global) registers to all Logical Devices (LD) in W83627THF. CR07h contains the Logical Device Number that can be changed to access the LD as needed. LD7 contains the GPIO10~17 registers.

Programming Guide:

Step1: CR2A_Bit [7.2]. P [1,1,1,1,1,1]; to select multiplexed pins as GPIO10~17 pins
Step2: LD7_CR07h.P [07h]; Point to LD7
Step3: LD7_CR30h_Bit0.P1; Enable LD7
Step4: Select GPIO direction, Get Status or output value.

LD7_CRF0h; GPIO17 ~ 10 direction, 1 = input, 0 = output pin
LD7_CRF2h.P [00h]; Let CRF1 (GPIO data port) non-invert to prevent from confusion
LD7_CRF1h; GPIO17~10 data port, for input pin, get status from the related bit, for output pin, write value to the related bit.

For example,
        LD7_CRF0h_Bit4.P0; Let GPIO14 as output pin
        LD7_CRF2h_Bit4.P0; Let CRF1_Bit4 non-inverted
        LD7_CRF1h_Bit4.P0; Output "0" to GPIO14 pin (J38_Pin2)

        LD7_CRF0h_Bit0.P1; Let GPIO10 as input pin
        LD7_CRF2h_Bit0.P0; Let CRF1_Bit0 non-inverted
        Read LD7_CRF1h_Bit0; Read the status from GPIO10 pin (J38_Pin1)

How to access W83627THF CR?

In RUBY-9713VG2AR, the EFER = 002Eh, and EFDR = 002Fh.
EFER and EFDR are 2 IO ports needed to access W83627THHF CR.
EFER is the Index Port, EFDR is the Data Port.
CR index number needs to be written into EFER first,
Then the data will be read/written from/to EFDR.

To R/W W83627THF CR, it is needed to Enter/Enable Configuration Mode first. When completing the programming, it is suggested to Exit/Disable Configuration Mode.

    Enter Configuration Mode: Write 87h to IO port EFER twice.
    Exit Configuration Mode: Write AAh to IO port EFER.

3.6.3 Example

Define GPIO4 as output pin, and output "0" to this pin.

```
mov      dx,2eh      ; Enter Configuration Mode
mov      al,87h
out      dx,al
jmp      $+2
out      dx,al

mov      dx,2eh
mov      al,29h      ; Read CR29
out      dx,al
mov      dx,2fh
in       al,dx
or       al,40h      ; Set GPIO multiplexed pins as bit 7,6 as 01 for
                     ; Group 1 as GPIO
mov      ah,al

mov      dx,2eh
mov      al,29h
out      dx,al
mov      dx,2fh
mov      al,ah
out      dx,al

mov      dx,2eh
mov      al,07h      ; Point to LDN7
out      dx,al
mov      dx,2fh
mov      al,07h
out      dx,al
mov      dx,2eh      ; Read CR30
mov      al,30h
out      dx,al
mov      dx,2fh
in       al,dx
or       al,01h
mov      ah,al
```

```
        mov       dx,2eh      ; CR30_Bit0.P1
        mov       al,30h
        out       dx,al
        mov       dx,2fh
        mov       al,ah
        out       dx,al


        mov       dx,2eh
        mov       al,0f0h      ; Read    LD7_CRF0
        out       dx,al
        mov       dx,2fh
        in        al,dx
        and       al,0efh
        mov       ah,al


        mov       dx,2eh
        mov       al,0f0h      ; LD7_CRF0_Bit4.P0
        out       dx,al
        mov       dx,2fh
        mov       al,ah
        out       dx,al


        mov       dx,2eh
        mov       al,0f2h      ; Read    LD7_CRF2
        out       dx,al
        mov       dx,2fh
        in        al,dx
        and       al,0efh
        mov       ah,al


        mov       dx,2eh
        mov       al,0f2h      ; LD7_CRF2_Bit4.P0
        out       dx,al
        mov       dx,2fh
        mov       al,ah
        out       dx,al
        mov       dx,2eh
        mov       al,0f1h      ; Read    LD7_CRF1
        out       dx,al
        mov       dx,2fh
        in        al,dx
        and       al,0efh
        mov       ah,al
```

```
        mov     dx,2eh
        mov     al,0f1h     ; LD7_CRF1_Bit4.P0
        out     dx,al
        mov     dx,2fh
        mov     al,ah
        out     dx,al

        mov     dx,2eh      ; Exit Configuration Mode
        mov     al,0AAh
        out     dx,al
```

Chapter 4
BIOS Setup Information

RUBY-9713VG2AR is equipped with the AWARD BIOS stored in Flash ROM. These BIOS has a built-in Setup program that allows users to modify the basic system configuration easily. This type of information is stored in CMOS RAM so that it is retained during power-off periods. When system is turned on, RUBY-9713VG2AR communicates with peripheral devices and checks its hardware resources against the configuration information stored in the CMOS memory. If any error is detected, or the CMOS parameters need to be initially defined, the diagnostic program will prompt the user to enter the SETUP program. Some errors are significant enough to abort the start-up.

4.1 Entering Setup

Turn on or reboot the computer. The message "Hit <DEL> if you want to run SETUP" appears, press <Del> key immediately to enter BIOS setup program.

If the message disappears before you respond, but you still wish to enter Setup, please restart the system to try "COLD START" again by turning it OFF and then ON, or touch the "RESET" button. You may also restart from "WARM START" by pressing <Ctrl>, <Alt>, and <Delete> keys simultaneously. If you do not press the keys at the right time and the system will not boot, an error message will be displayed and you will again be asked to,

> Press <F1> to Run SETUP or Resume

In HIFLEX BIOS setup, you can use the keyboard to choose among options or modify the system parameters to match the options with your system. The table below will show you all of keystroke functions in BIOS setup.

General Help	
↑ ↓ → ←	: Move
Enter	: Select
+ / - /PU /PD	: Value
ESC	: Exit
F1	: General Help
F2	: Item Help
F5	: Previous Values
F6	: Fail-Safe Defaults
F7	: Optimized Defaults
F9	: Menu in BIOS
F10	: Save

4.2   Main Menu

Once you enter RUBY-9713VG2AR AWARD BIOS CMOS Setup Utility, you should start with the Main Menu. The Main Menu allows you to select from eleven setup functions and two exit choices. Use arrow keys to switch among items and press <Enter> key to accept or bring up the sub-menu.

Phoenix- AwardBIOS CMOS Setup Utility

▶ Standard CMOS Features	Load Fail-Safe Defaults
▶ Advanced BIOS Features	Load Optimized Defaults
▶ Advanced Chipset Features	Set Supervisor Password
▶ Integrated Peripherals	Set User Password
▶ Power Management Setup	Save & Exit Setup
▶ PnP/PCI Configurations	Exit Without Saving
▶ PC Health Status	

ESC : Quit   F9 : Menu in BIOS   ↑ ↓ → ← : Select Item
F10 : Save & Exit Setup

Time, Date, Hard Disk Type …

Note:

It is strongly recommended to reload Optimal Setting if CMOS is lost or BIOS is updated.

4.3   Standard CMOS Setup Menu

This setup page includes all the items in standard compatible BIOS. Use the arrow keys to highlight the item and then use the <PgUp>/<PgDn> or <+>/<-> keys to select the value or number you want in each item and press <Enter> key to certify it.

Follow command keys in CMOS Setup table to change Date, Time, Drive type, and Boot Sector Virus Protection Status.

Phoenix- AwardBIOS CMOS Setup Utility
Standard CMOS Features

		Item Help
Date (mm:dd:yy)	Mon, Jul 3 2006	
Time (hh:mm:ss)	15 : 19 : 30	
		Menu Level ▶
▶ IDE Channel 0 Master	[Maxtor 91021U2]	
▶ IDE Channel 0 Slave	[ASUS CRW-1210R]	Change the day, month,
▶ IDE Channel 1 Master	[None]	year and century
▶ IDE Channel 1 Slave	[None]	
▶ IDE Channel 2 Master	[ST3120827AS]	
▶ IDE Channel 2 Slave	[None]	
▶ IDE Channel 3 Master	[ST3120827AS]	
▶ IDE Channel 3 Slave	[None]	
Drive A	[1.44M, 3.5 in.]	
Drive B	[None]	
Video	[EVG/VGA]	
Halt On	[All, But Keyboard]	
Base Memory	640K	
Extended Memory	514048K	
Total Memory	515072K	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

■ **Menu Selections**

Item	Options	Description
Date	mm:dd:yy	Change the day, month, year and century
Time	hh:mm:ss	Change the internal clock
IDE Channel 0 Master	Options are in its sub menu	Press <Enter> to enter the sub menu of detailed options
IDE Channel 0 Slave	Options are in its sub menu	Press <Enter> to enter the next page for detail hard drive settings
Drive A Drive B	None 360K, 5.25 in 1.2M, 5.25 in 720K, 3.5 in 1.44M, 3.5 in 2.88M, 3.5 in	Press <Enter> to enter the next page for detail hard drive settings
Video	EGA/VGA CGA 40 CGA 80 MONO	Select the default video device
Halt On	All Errors No Errors All, but Keyboard All, but Diskette All, but Disk/Key	Select the situation in which you want the BIOS to stop the POST process and notify you
Base Memory	640K	Displays the amount of conventional memory detected during boot up
Extended Memory	N/A	Displays the amount of extended memory detected during boot up
Total Memory	N/A	Displays the total memory available in the system

4.4 IDE Adaptors Setup Menu

The IDE adapters control the IDE devices, such as Hard disk drive or CDROM drive. It uses a separate sub menu to configure each hard disk drive.

Phoenix- AwardBIOS CMOS Setup Utility
IDE Channel 0 Master

IDE HDD Auto-Detection	[Press Enter]	Item Help
IDE Channel 0 Master	[Auto]	Menu Level ▶
Access Mode	[Auto]	
Capacity	10246 MB	To auto-detect the HDD's size, head … on this channel
Cylinder	19852	
Head	16	
Precomp	0	
Landing Zone	19851	
Sector	63	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

■ **Menu Selections**

Item	Options	Description
IDE HDD Auto-detection	Press Enter	Press Enter to auto-detect the HDD on this channel. If detection is successful, it fills the remaining fields on this menu.
IDE Channel 0 Master	None Auto Manual	Selecting 'manual' lets you set the remaining fields on this screen. Selects the type of fixed disk. "User Type" will let you select the number of cylinders, heads, etc. Note: PRECOMP=65535 means NONE!
Access Mode	CHS LBA Large Auto	Choose the access mode for this hard disk
Capacity	Auto Display your disk drive size	Disk drive capacity (Approximated). Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.

The following options are selectable only if the 'IDE Channel 0 Master' item is set to 'Manual'		
Cylinder	Min = 0 Max = 65535	Set the number of cylinders for this hard disk.
Head	Min = 0 Max = 255	Set the number of read/write heads
Precomp	Min = 0 Max = 65535	**** Warning: Setting a value of 65535 means no hard disk
Landing zone	Min = 0 Max = 65535	****
Sector	Min = 0 Max = 255	Number of sectors per track

Phoenix- AwardBIOS CMOS Setup Utility
IDE Channel 2 Master

		Item Help
IDE HDD Auto-Detection	[Press Enter]	
IDE Channel 2 Master	[Auto]	Menu Level ▶
Access Mode	[Auto]	
Capacity	120GB	To atuo-detect the HDD's size, head … on this channel
Cylinder	57461	
Head	16	
Precomp	0	
Landing Zone	57460	
Sector	255	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

■ **Menu Selections**

Item	Options	Description
IDE HDD Auto-detection	Press Enter	Press Enter to auto-detect the HDD on this channel. If detection is successful, it fills the remaining fields on this menu.
IDE Channel 2 Master	None Auto	Selecting 'manual' lets you set the remaining fields on this screen. Selects the type of fixed disk. "User Type" will let you select the number of cylinders, heads, etc. Note: PRECOMP=65535 means NONE!
Access Mode	Large Auto	Choose the access mode for this hard disk
Capacity	Auto Display your disk drive size	Disk drive capacity (Approximated). Note that this size is usually slightly greater than the size of a formatted disk given by a disk-checking program.
The following options are selectable only if the 'IDE Channel 2 Master' item is set to 'Manual'		
Cylinder	Min = 0 Max = 65535	Set the number of cylinders for this hard disk
Head	Min = 0 Max = 255	Set the number of read/write heads
Precomp	Min = 0 Max = 65535	**** Warning: Setting a value of 65535 means no hard disk
Landing zone	Min = 0 Max = 65535	****
Sector	Min = 0 Max = 255	Number of sectors per track

4.5   Advanced BIOS Feature

This section allows you to configure your system for basic operation.   You have the opportunity to select the system's default speed, boot-up sequence, keyboard operation, shadowing and security.

Phoenix- AwardBIOS CMOS Setup Utility
Advanced BIOS Features

▶ CPU Feature	[Press Enter]	Item Help
▶ Hard Disk Boot Priority	[Press Enter]	
Virus Warning	[Disabled]	Menu Level ▶
CPU L1 & L2 Cache	[Enabled]	
Quick Power On Self Test	[Enabled]	
First Boot Device	[Hard Disk]	
Second Boot Device	[CD-ROM]	
Third Boot Device	[Floppy]	
Boot Other Device	[Enabled]	
Swap Floppy Drive	[Disabled]	
Boot Up Floppy Seek	[Enabled]	
Boot Up NumLock Status	[On]	
Gate A20 Option	[Fast]	
Typematic Rate Setting	[Disabled]	
X Typematic Rate (Chars/Sec)	6	
X Typematic Delay (Msec)	250	
Security Option	[Setup]	
APIC Mode	[Enabled]	
MPS Version Control For OS	[1.4]	
Small Logo(EPA) Show	[Disabled]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

4.6   CPU Feature

Phoenix- AwardBIOS CMOS Setup Utility
CPU Feature

Delay Prior to Thermal	[16 Min]	Item Help
Thermal Management	[Thermal Monitor 1]	
X TM2 Bus Ratio	10X	Menu Level ▶
X TM2 Bus VID	0.828V	
C1E Function	[Auto]	
Execute Disabled Bit	[Enabled]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

Delay Prior to Thermal

The choice: 4 Min, 8 Min, 16 Min, and 32 Min.

Thermal Management

Thermal Monitor 1 (On die throttling); Thermal Monitor 2 (Ratio & VID transition)

The choice: Thermal Monitor 1, Thermal Monitor 2.

C1E Function

Select Auto or disabled CPU C1E Function.

The choice: Auto, Disabled.

Execute Disabled Bit

When disabled, forces the XD feature flag to always return 0.

Execute Disable Bit currently requires one of the following operating systems to support it: OS: Windows* Server 2003 with SP 1 / Windows* XP* with SP 2 /
SUSE Linux* 9.2 / Red Hat Enterprise Linux 3 Update 3

The choice: Enabled, Disabled.

4.7 Hard Disk Boot Priority

Phoenix- AwardBIOS CMOS Setup Utility
Hard Disk Boot Priority

1. ch0 M. : Maxtor 91021U2 2. ch2 M. : ST3120827AS 3. ch3 M. : ST3120827AS 4. Bootable add-in Cards	Item Help
	Menu Level ▶ Use < ↑ > or < ↓ > to select a device, then press <+> to move it up, or <-> to move it down the list. Press <ESC> to exit this menu.
↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults	

Hard Disk Boot Priority

Select Hard Disk Boot Device Priority.   Use < ↑ > or < ↓ > to select a device, then press <+> to move it up, or <-> to move it down the list.   Press <ESC> to exit this menu.

Bootable Add-in Cards	Select SCSI Boot

Virus Warning

Allow you to choose the VIRUS warning feature for IDE Hard Disk boot sector protection. If this function is enabled and someone attempt to write data into this area, BIOS will show a warning message on screen and alarm beep.

Enabled	Activates automatically when the system boots up causing a warning message to appear when anything attempts to access the boot sector or hard disk partition table.
Disabled	No warning message will appear when anything attempts to access the boot sector or hard disk partition table.

CPU L1 Cache/L2 Cache

These two categories speed up memory access. However, it depends on CPU/chipset design.

Enabled	Enable Cache
Disabled	Disable Cache

Quick Power On Self Test

The system to skip certain tests while booting. This will decrease the time needed to boot the system.

Enabled	Enable quick POST
Disabled	Normal POST

First/Second/Third Boot Device

Select your boot device priority.

The choice: Floppy, LS120, Hard Disk, CDROM, ZIP100, USB-FDD, USB-ZIP, USB-CDROM, LAN and Disabled.

Boot Other Device
Select your boot device priority.

The choice: Enabled, Disabled.

Swap Floppy Drive

If the system has two floppy drives, choose enable to assign physical driver B to logical drive A and Vice-Versa.

The choice: Enabled, Disabled.

Boot Up Floppy Seek

Enabled tests floppy drives to determine whether they have 40 or 80 tracks.

The choice: Enabled, Disabled.

Boot Up NumLock Status

Select power on state for NumLock.

The choice: Off, On.

Gate A20 Option

Fast-lets chipsets control Gate A20 and Normal – a pin in the keyboard controller controls Gate A20. Default is Fast.

The choice: Normal, Fast.

Typematic Rate Setting

Keystrokes repeat at a rate determined by the keyboard controller – When enabled, the typematic rate and typematic delay can be selected.

The choice: Enabled, Disabled.

Typematic Rate (Chars/sec)

The rate at character repeats when you hold down a key.

The choice: 6, 8, 10, 12, 15, 20, 24, and 30.

Typematic delay (Msec)

The delay before keystrokes begins to repeat.

The choice: 250, 500, 750, and 1000.

Security Option

Select whether the password is required every time the system boots or only when you enter setup.

System	The system will not boot and access to Setup will be denied if the correct password is not entered at the prompt.
Setup	The system will boot, but access to Setup will be denied if the correct password is not entered at the prompt.

APIC Mode

Setting to Enabled can cause instabilities. Once the operating system is installed, such as Windows XP in my case, this setting cannot be changed without reinstalling the operating system, regardless of whether the initial setting is Disabled or Enabled. The purpose of setting it to Enabled is to extend the number of IRQ's, which sounds like a real risky proposition. I'm not surprised to see the conclusion reached at APIC: Benefit or Trouble. The number of IRQ's should be fine without being extended, anyway.

The choice: Enabled, Disabled.

MPS Version Control For OS

Not changeable with APIC Mode set to disabled.

The choice: 1.1, 1.4.

Small Logo (EPA) Show

The choice: Enabled, Disabled.

4.8   Advanced Chipset Feature

This section allows you to configure the system based on the specific features of the Intel 945GM chipset.   This chipset manages bus speeds and access to system memory resources, such as DRAM (DDR II SO-SDRAM) and the external cache. It also coordinates communications between the conventional PCI Express bus and PCI bus. It must be stated that these items should never need to be altered. The default settings have been chosen because they provide the best operating conditions for your system. The only time you might consider making any changes would be if you discovered that data was being lost while using your system.

Phoenix- AwardBIOS CMOS Setup Utility
Advanced Chipset Features

		Item Help
DRAM Timing Selectable	[By SPD]	
X CAS Latency Time	Auto	
X DRAM RAS# to CAS# Delay	Auto	Menu Level ▶
X DRAM RAS# Precharge	Auto	
X Precharge delay (tRAS)	Auto	
X System Memory Frequency	Auto	
SLP_S4# Assertion Width	[4 to 5 Sec.]	
System BIOS Cacheable	[Enabled]	
Video BIOS Cacheable	[Disabled]	
Memory Hole At 15M-16M	[Disabled]	
▶ PCI Express Root Port Func	[Press Enter]	
** VGA Setting **		
PEG/Onchip VGA Control	[Auto]	
On-Chip Frame Buffer Size	[8MB]	
DVMT Mode	[DVMT]	
DVMT /FIXED Memory Size	[128MB]	
Boot Display	[CRT]	
Panel Scaling	[Auto]	
Panel Number	[640X480 18bit 1ch]	
TV Standard	[Off]	
Video Connector	[Automatic]	
TV Format	[Auto]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

DRAM Timing Selectable

This option provides DIMM plug-and-play support by serial presence detect (SPD) mechanism via the system management bus (SMBUS) interface.

The choice: Manual, By SPD.

CAS Latency Time

This option controls the number of SCLKs between the time a read command is sampled by the DRAMs and the time the GMCH samples correspondent data from the DRAMs.

The choice: 3, 4, 5, 6, and Auto.

DRAM RAS# to CAS# Delay

This option controls the number of SCLKs (SDRAM Clock) from a row activate command to a read or write command. If your system installs good quality of SDRAM, you can set this option to "3 SCLKs" to obtain better memory performance. Normally, the option will be set to Auto.

The choice: 2, 3, 4, 5, 6, and Auto.

DRAM RAS# Precharge

This option controls the number of SCLKs for RAS# precharge. If your system installs good quality of SDRAM, you can set this option to "3 SCLKs" to obtain better memory performance. It is set to auto normally.

The choice: 2, 3, 4, 5, 6, and Auto.

Precharge delay (tRAS)

The choice: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and Auto.

System Memory Frequency

Users are recommended to use Auto for memory frequency selection.

The choice: 533MHz, 667MHz, and Auto.

SLP_S4# Assertion Width

The choice: 4 to 5 Sec., 3to 4 Sec, 2 to 3 Sec., 1 to 2 Sec.

System BIOS Cacheable

Selecting Enabled allows caching of the system BIOS ROM at F0000h-FFFFFh, resulting in better system performance. However, if any program writes to this memory area, a system error may result.

The choice: Enabled, Disabled.

Video BIOS Cacheable

Select "Enabled" to enable caching VGA BIOS into L2 cache to get higher display performance. Select "Disabled" to ignore this BIOS caching function.

The choice: Enabled, Disabled.

Memory Hole At 15-16M

In order to improve performance, certain space in memory is reserved for ISA cards. This memory must be mapped into the memory space below 16MB.

The choice: Enabled, Disabled.

<div align="center">

Phoenix- AwardBIOS CMOS Setup Utility
PCI Express Root Port Func

</div>

PCI Express Port 1	[Auto]	Item Help
PCI Express Port 2	[Auto]	
PCI Express Port 3	[Auto]	
PCI Express Port 4	[Auto]	Menu Level ▶
PCI Express Port 5	[Auto]	
PCI Express Port 6	[Auto]	
PCI-E Compliancy Mode	[V1.0a]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

PCI Express Port 1 / Port 2 / Port 3 / Port 4 / Port 5 / Port6

PCI Express Port 1 ~ Port 4 Default On-board PCI Express x 4; PCI Express Port 5 & Port 6 Default On-board Gigi LAN.

The choice: Auto, Enabled, Disabled.

PCI-E Compliancy Mode

The choice: V1.0 / V1.0a.

PEG/Onchip VGA Control

The choice: Onchip VGA, PEG Port, and Auto.

On-Chip Frame Buffer Size

The choice: 1MB, 8MB.

DVMT Mode

The choice: DVMT, FIXED and BOTH.

DVMT /FIXED Memory Size

The choice: 64MB, 128MB, 224MB.

Boot Display

The choice: CRT, CRT+LEP.

Panel Scaling

The choice: Auto, On, Off.

Panel Number

The choice: 640X480 18bit 1ch, 800X600 18bit 1ch, 1024X768 18bit 1ch, 1024X768 24bit 1ch, 1280X768 24bit 1ch, 1280X768 24bit 2ch, 1400X1050 18bit 2ch, and 1600X1200 24bit 2ch.

TV Standard

The choice: Off, NTSC, PAL, and SECAM.

Video Connector

The choice: Automatic, Composite, and Component, Both.

TV Format

The choice: Auto, NTSC_M, NTSC_M_J, NTSC_433, NTSC_N, PAL_B, PAL_G, PAL_D, PAL_H, PAL_I, PAL_M, PAL_N, PAL_60, SECAM_L, SECAM_L1, SECAM_B, SECAM_D, SECAM_G, SECAM_H, SECAM_K, SECAM_K1.

4.9 Integrated Peripherals

Phoenix- AwardBIOS CMOS Setup Utility
Integrated Peripherals

		Item Help
▶ OnChip IDE Device	[Press Enter]	
▶ Onboard Device	[Press Enter]	
▶ Super IO Device	[Press Enter]	Menu Level ▶
Watch Dog Timer Select	[Disabled]	
Onboard LAN Boot ROM init	[Disabled]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

Watch Dog Timer Select

This BIOS testing option is able to reset the system according to the selected table.

The choice: Disabled, 10 Sec, 20 Sec, 30 Sec, 40 Sec, 1 Min, 2 Min, and 4 Min.

Onboard LAN Boot ROM init

Select "Enabled" to Onboard Load Boot ROM to shadow RAM.

The choice: Enabled, Disabled.

Phoenix- AwardBIOS CMOS Setup Utility
OnChip IDE Device

IDE HDD Block Mode	[Enabled]	Item Help
IDE DMA transfer access	[Enabled]	
On-Chip Primary PCI IDE	[Enabled]	Menu Level ▶
IDE Primary Master PIO	[Auto]	
IDE Primary Slave PIO	[Auto]	If you're IDE hard drive
IDE Primary Master UDMA	[Auto]	supports block mode
IDE Primary Slave UDMA	[Auto]	select Enabled for
*** On-Chip Serial ATA Setting ***		automatic detection of the optimal number of
X SATA Mode	IDE	block read/writes per
On-Chip Serial ATA	[Auto]	sector the drive can
X SATA PORT Speed Settings	Disabled	support.
X PATA IDE Mode	Secondary	
SATA Port	P0, P2 is Primary	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

IDE HDD Block Mode

If you're IDE hard drive supports block mode select Enabled for automatic detection of the optimal number of block read/writes per sector the drive can support.

The choice: Enabled, Disabled.

IDE DMA transfer access

The choice: Enabled, Disabled.

On-Chip Primary PCI IDE

The chipset contains a PCI IDE interface with support for two IDE channels.   Select Enabled to activate the primary IDE interface.   Select Disabled to deactivate this interface.

The choice: Enabled, Disabled.

IDE Primary Slave PIO

The four IDE PIO (Programmed Input/Output) fields let you set a PIO mode (0-4) for each of the four IDE devices that the onboard IDE interface supports.   Modes 0 through 4 provide successively increased performance. In Auto mode, the system automatically determines the best mode for each device.

The choice: Auto, Mode 0, Mode 1, Mode 2, Mode 3, and Mode 4.

IDE Primary Slave UDMA

Ultra DMA/33/66/100 implementation is possible only if your IDE hard drive supports it and the operating environment includes a DMA driver (Windows 95 OSR2 or a third-party IDE bus master driver). If you're hard drive and your system software both support Ultra DMA/33/66/100, select Auto to enable BIOS support.

The choice: Auto, Disabled.

SATA Mode

IDE	Use the Serial ATA hard disk drives as Parallel ATA physical Storage devices.
RAID	With Intel Matrix Storage Technology with RAID 0, 1, 5, 10 support.
AHCI	The Advanced Host Controller Interface (AHCI) specification describes the register-level interface for a Host Controller for Serial ATA 1.0a and Serial ATA II.

On-Chip Serial ATA

Disabled	Disabled SATA Controller.
Auto	Auto arrange by BIOS.
Combined Mode	PATA and SATA are combined. Max. Of 2 IDE drives in each channel.
Enhanced Mode	Enable both SATA and PATA. Max. Of 6 IDE drives are Supported.
SATA Only	SATA is operating in legacy mode.

SATA PORT Speed Settings

The choice: Disabled, Force GEN I, Force GEN II.

Phoenix- AwardBIOS CMOS Setup Utility
Onboard Device

USB Controller	[Enabled]	Item Help
USB 2.0 Controller	[Enabled]	
USB Keyboard Support	[Enabled]	Menu Level ▶
USB Mouse Support	[Enabled]	
AC97 Audio Select	[Auto]	
↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults		

USB Controller

This item allows you to enable/disable USB (Universal Serial Bus) function.

The choice: Enabled, Disabled.

USB 2.0 Controller

This entry is for disable/enable EHCI controller only. This BIOS itself may/may not have high speed USB support built in, the support will be automatically turn on when high speed device were attached.

The choice: Enabled, Disabled.

USB Keyboard Support

This item allows you to enable USB keyboard function under POST, BIOS setup menu, DOS, or Windows-NT with no USB driver loaded.

The choice: Enabled, Disabled.

USB Mouse Support

This item allows you to enabled USB Mouse function under POST, BIOS Setup menu, DOS, or Window-NT with no USB driver loaded.

The choice: Enabled, Disabled.

AC97 Audio Select

Users can enable or disable on board AC97 Audio Function.

The choice: Auto, Disabled.

Phoenix- AwardBIOS CMOS Setup Utility
Super IO Device

		Item Help
Onboard FDC Controller	[Enabled]	
Onboard Serial Port 1	[3F8/IRQ4]	
Onboard Serial Port 2	[2F8/IRQ3]	
UART Mode Select	[Normal]	Menu Level ▶
X RxD, TxD Active	Hi, Lo	
X IR Transmission Delay	Enabled	
X UR2 Duplex Mode	Half	
X Use IR Pins	IR-Rx2Tx2	
Onboard Parallel Port	[378/IRQ7]	
Parallel Port Mode	[SPP]	
X EPP Mode Select	EPP1.7	
X ECP Mode Use DMA	3	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

Onboard FDC Controller

This item allows you to enable/disable onboard Floppy disk controller.

The choice: Enabled, Disabled.

Onboard Serial Port 1/Port 2

Select an address and corresponding interrupt for the first and second serial ports.

The choice: Disabled, 3F8/IRQ4, 2F8/IRQ3, 3E8/IRQ4, 2E8/IRQ3, Auto.

UART Mode Select

This item allows users to select Infrared transmission mode.

Normal	Disable Infrared function
IrDA	Select IrDA mode transmission
ASKIR	Select ASKIR mode transmission

RxD, TxD Active

This item is to configure Infrared transmission rate. Four options are available:

Hi, Hi	High rate for receiving / High rate for transmitting
Hi, Lo	High rate for receiving / Low rate for transmitting
Lo, Hi	Low rate for receiving / High rate for transmitting
Lo, Lo	Low rate for receiving / Low rate for transmitting

IR Transmission Delay

This option will be available when IR is enabled.

The choice: Enabled, Disabled.

UR2 Duplex Mode

The available choices are full duplex mode and half duplex mode

The choice: Full, Half.

Use IR Pins

The available choices are IR-Rx2Tx2/ RxD2, TxD2.

The choice: IR-Rx2Tx2 / RxD2, TxD2.

Onboard Parallel Port

This item allows you to configure I/O address of the onboard parallel port.

The choice: Disabled, 378/IRQ7, 278/IRQ5, and 3BC/IRQ7.

Parallel Port Mode

There are four different modes for the onboard parallel port :

SPP	Switch to SPP mode
EPP	Switch to EPP mode
ECP	Switch to ECP mode
ECP + EPP	Switch to ECP + EPP mode
Normal	Switch to Normal mode

EPP Mode Select

Select different version of EPP mode.

The choice: EPP1.7, EPP1.9.

ECP Mode Use DMA

Select a proper DMA channel for ECP mode.

The choice: 1, 3.

4.10   Power Management Setup

The Power Management Setup allows you to configure you system to most effectively save energy while operating in a manner consistent with your own style of computer use.

<div align="center">

Phoenix- AwardBIOS CMOS Setup Utility
Power Management Setup

</div>

ACPI Function	[Enabled]	Item Help
ACPI Suspend Type	[S1(POS)]	
X Run VGABIOS if S3 Resume	No	Menu Level ▶
Power Management	[User Define]	
Video Off Method	[DPMS]	
Video Off In Suspend	[Yes]	
Suspend Type	[Stop Grant]	
Suspend Mode	[Disabled]	
HDD Power Down	[Disabled]	
Soft-Off by PWR-BTTN	[Instant-Off]	
PWRON After PWR-Fail	[On]	
Wake-up by PCI Card	[Disabled]	
Power On by Ring	[Disabled]	
X USB KB Wake-Up From S3	Disabled	
Resume by Alarm	[Disabled]	
X Date(of Month) Alarm	0	
X Time(hh:mm:ss) Alarm	0 : 0 :0	
** Reload Global Timer Events **		
Primary IDE 0	[Disabled]	
Primary IDE 1	[Disabled]	
Secondary IDE 0	[Disabled]	
Secondary IDE 1	[Disabled]	
COM Port	[Disabled]	
PCI PIRQ[A-D]#	[Disabled]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

ACPI Function

This item allows you to enable/disable the Advanced Configuration and Power Management (ACPI).

The choice: Enabled, Disabled.

ACPI Suspend Type

To decide which ACPI suspend mode to use.

The choice: S1(POS), S3(STR).

Run VGA BIOS if S3 Resume

The choice: Auto, Yes, No.

Power Management

This category allows you to select the type (or degree) of power saving and is directly related to "HDD Power Down", "Suspend Mode".

There are three selections for Power Management, three of which have fixed mode settings.

Min. Power Saving	Minimum power management. Suspend Mode = 1 Hour, and HDD Power Down = 15 Min.
Max. Power Saving	Maximum power management. Suspend Mode = 1 Min., and HDD Power Down = 1 Min.
User Defined	Allow you to set each mode individually. When not disabled, Suspend Mode ranges from 1 min. to 1 Hour and HDD Power Down ranges from 1 Min. to 15 Min.

Video Off Method

This determines the manner in which the monitor is blanked.

V/H SYNC+Blank	This selection will cause the system to turn off the vertical and horizontal synchronization ports and write blanks to the video buffer.
Blank Screen	This option only writes blanks to the video buffer.
DPMS	Initial display power management signaling.

Video Off In Suspend

This allows user to enable/disable video off in Suspend Mode.

The choice: Yes, No.

Suspend Type

Two options are available: Stop Grant and PwrOn Suspend.

The choice: Stop Grant, PwrOn Suspend.

Suspend Mode

When enabled and after the set time of system inactivity, all devices except the CPU will be shut off.

The choice: Disabled, 1 Min, 2 Min, 4 Min, 8 Min, 12 Min, 20 Min, 30 Min, 40 Min, and 1 Hour.

HDD Power Down

When enabled and after the set time of system inactivity, the hard disk drive will be powered down while all other devices remain active.

The choice: Disabled, 1 Min, 2 Min, 3 Min, 4 Min, 5 Min, 6 Min, 7 Min, 8 Min, 9 Min, 10 Min, 11 Min, 12 Min, 13 Min, 14 Min, and 15 Min.

Soft-Off by PWR-BTTN

This item allows users to set the time to remove the power after the power button is pressed.

The choice: Instant-Off, Delay 4 Sec.

PWRON After PWR-Fail

This item allows user to configure the power status of using ATX power supply after a serious power loss occurs.

On	System automatically restores power back
Off	System stays at power –off

Wake-Up by PCI Card

This option can be enabled to support Wake Up by PCI LAN Card.

The choice: Disabled, Enabled.

Power On by Ring

This option can be enabled to support Wake-On-Modem signal.

The choice: Enabled, Disabled.

USB KB Wake-up From S3

This option can be enabled to support USB Keyboard in S3 mode, Wake-up System.

The choice: Enabled, Disabled.

Resume by Alarm

This item allows users to enable/disable the resume by alarm function. When "Enabled" is selected, system using ATX power supply could be powered on if a customized time and day is approached.

The choice: Enabled, Disabled.

Date(of Month) Alarm

When "Resume by Alarm" is enabled, this item could allow users to configure the date parameter of the timing dateline on which to power on the system.

The choice: 0 ~ 31.

Time(hh:mm:ss) Alarm

When "Resume by Alarm" is enabled, this item could allow users to configure the time parameter of the timing dateline on which to power on the system.

The choice: hh (0~23), mm (0~59), ss (0 ~59).

Primary/Secondary IDE 0/1

This item is to configure IDE devices being monitored by system so as to keep system out of suspend mode if the associated device is busy.

The choice: Enabled, Disabled.

COM Port

This item is to configure COM ports being monitored by system so as to keep system out of suspend mode if the associated device is busy.

The choice: Enabled, Disabled.

PCI PIRQ[A-D]#

This option can be used to detect PCI device activities. If they are activities, the system will go into sleep mode.

The choice: Enabled, Disabled.

4.11   PnP/PCI Configurations

This section describes configuring the PCI bus and PCI Express bus system. PCI, or **P**ersonal **C**omputer **I**nterconnect, is a system, which allows I/O devices to operate at speeds nearing the speed the CPU itself, uses when communicating with its own special components.

This section covers some very technical items and it is strongly recommended that only experienced users should make any changes to the default settings.

<div align="center">

Phoenix- AwardBIOS CMOS Setup Utility
PnP/PCI Configurations

</div>

		Item Help
Init Display First	[PCI Slot]	
Reset Configuration Data	[Disabled]	
		Menu Level ▶
Resources Controlled By	[Auto(ESCD)]	
X IRQ Resources	Press Enter	
PCI/VGA Palette Snoop	[Disabled]	
** PCI Express relative items **		
Maximum Payload Size	[4096]	

↑↓→←: Move   Enter: Select   +/-/PU/PD: Value   F10: Save   ESC: Exit   F1: General Help
F5: Previous Values   F6: Fail-Safe Defaults   F7: Optimized Defaults

Init Display First

This item allows you to select the first display port to be initialized.

The choice: PCI Slot, Onboard.

Reset Configuration Data

Default is disabled. Select Enabled to reset Extended System Configuration Data (ESCD) when you exit Setup if you have installed a new add-on and the system reconfiguration has caused such a serious conflict that the OS cannot boot.

The choice: Enabled, Disabled.

Resource Controlled By

BIOS can automatically configure the entire boot and Plug and Play compatible devices. If you choose Auto, you cannot select IRQ DMA and memory base address fields, since BIOS automatically assigns them.

The choice: Auto (ESCD), Manual.

IRQ Resources

When resources are controlled manually, assign each system interrupt a type, depending on the type of device using the interrupt.

Enter for more options IRQ-3/IRQ-4/IRQ-5/IRQ-7/IRQ-9/IRQ-10/IRQ-11/IRQ-12/IRQ-14/IRQ-15 assigned to.

The Legacy ISA for devices compliant with the original PC AT bus specification, PCI/ISA PnP for devices compliant with the plug and play standard whether designed for PCI or ISA bus architecture.

The choice: PCI Device / Reserved.

PCI/VGA Palette Snoop

The choice: Enabled, Disabled.

Maximum Payload Size

Set maximum TLP payload size for the PCI Express devices. The unit is byte.

The choice: 128, 256, 512, 1024, 2048, and 4096.

4.12   PC Health Status

Phoenix- AwardBIOS CMOS Setup Utility
PC Health Status

CPU Warning Temperature	[Disabled]	Item Help
Current System Temp	34℃ / 93℉	
Current CPU Temperature	33℃ / 91℉	Menu Level ▶
System Fan1 Speed	0 RPM	
CPU Fan Speed	6367RPM	
System Fan2 Speed	0 RPM	
Vcore	1.08 V	
+1.8 V	1.79 V	
+3.3 V	3.32 V	
+12 V	11.97 V	
VCC (V)	5.02 V	
VBAT (V)	3.26 V	
5VSB (V)	5.02 V	
↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help		
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults		

CPU Warning Temperature

This item allows you to set a temperature above which the system will start the beeping warning. Default setting is disabled. This function will only with "ACPI" power management and "S3 (STR)" suspends type.

The choices : Disabled, 50℃ /122℉, 53℃ /127℉, 56℃ /133℉, 60℃ /140℉, 63℃ /145
℉, 66℃ /151℉, 70℃ /158℉.

4.13 Default Menu

Selecting "Defaults" from the main menu shows you two options, which are described below

Load Fail-Safe Defaults

When you press <Enter> on this item you get a confirmation dialog box with a message similar to:

Load Fail-Safe Defaults (Y/N) ?   N

Pressing 'Y' loads the BIOS default values for the most stable, minimal-performance system operations.

Load Optimized Defaults

When you press <Enter> on this item you get a confirmation dialog box with a message similar to:

Load Optimized Defaults (Y/N) ?   N

Pressing 'Y' loads the default values that are factory settings for optimal performance system operations.

4.14 Supervisor/User Password Setting

You can set either supervisor or user password, or both of then. The differences between are:

Set Supervisor Password : can enter and change the options of the setup menus.

Set User Password : just can only enter but do not have the right to change the options of the setup menus. When you select this function, the following message will appear at the center of the screen to assist you in creating a password.

ENTER PASSWORD

Type the password, up to eight characters in length, and press <Enter>. The password typed now will clear any previously entered password from CMOS memory. You will be asked to confirm the password. Type the password again and press <Enter>.   You may also press <Esc> to abort the selection and not enter a password.

To disable a password, just press <Enter> when you are prompted to enter the password. A message will confirm the password will be disabled. Once the password is disabled, the system will boot and you can enter Setup freely.

PASSWORD DISABLED

When a password has been enabled, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also require the BIOS to request a password every time your system is rebooted. This would prevent unauthorized use of your computer.

You determine when the password is required within the BIOS Features Setup Menu and its Security option (see Section 3). If the Security option is set to "System", the password will be required both at boot and at entry to Setup. If set to "Setup", prompting only occurs when trying to enter Setup.

4.15   Exiting Selection

Save & Exit Setup

Pressing <Enter> on this item asks for confirmation:

Save to CMOS and EXIT (Y/N)?   Y

Pressing "Y" stores the selections made in the menus in CMOS – a special section of memory that stays on after you turn your system off. The next time you boot your computer, the BIOS configures your system according to the Setup selections stored in CMOS. After saving the values the system is restarted again.

Exit Without Saving

Pressing <Enter> on this item asks for confirmation:

Quit Without Saving (Y/N)?   N

This allows you to exit Setup without storing in CMOS any change. The previous selections remain in effect. This exits the Setup utility and restarts your computer.

Chapter 5
Troubleshooting

This chapter provides a few useful tips to quickly get RUBY-9713VG2A running with success. As basic hardware installation has been addressed in Chapter 2, this chapter will primarily focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

5.1   Hardware Quick Installation

CPU Installation

Due to the design of RUBY-9713VG2A, it only supports Yonah Base Processor as well-known as Intel ® Core Duo Processor. Before installing Processor, please ensure the processor chosen is the right one. Regarding to processor information, please refer to Intel website

(1) Locate Pin 1 in the socket and look for a tri-angle on CPU upper interface. Math Pin and tri-angle, and then insert the CPU into the socket as Figure 5-1.
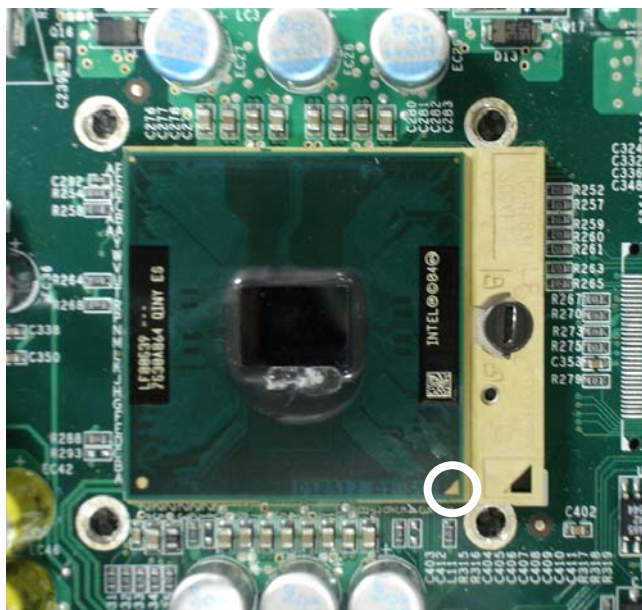
Figure 5-1

(2) After CPU is installed, please make CPU has been secure. To secure installed processor, please refer to Figure 5-2
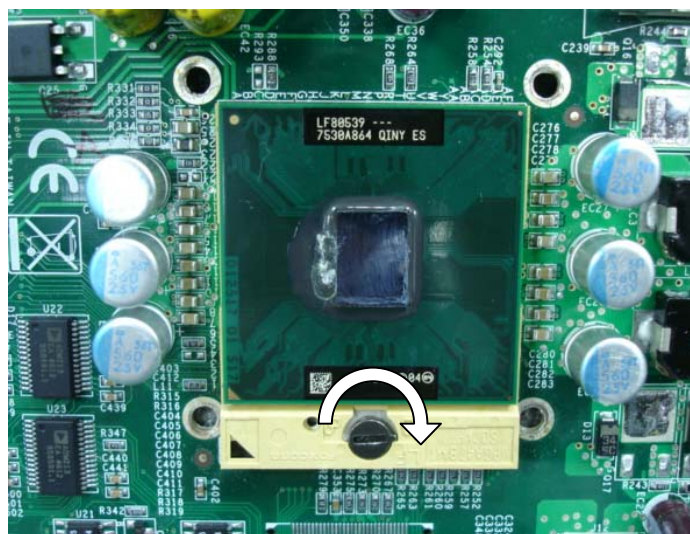
Figure 5-2

P4 Power connector

Unlike Most Pentium-M solution motherboards, +12V CPU Supplementary Power connector is required on RUBY-9713VG2A. It is because Portwell wants to provide customer better performance and more reliable system. By using this CPU Supplementary will enhance the power drawing to the motherboard. However, J12, +12V CPU Supplementary Power connector must be connected all the time. Otherwise, the system will fail to boot up. Please refer to Figure 5-3 to ensure J12 connected.
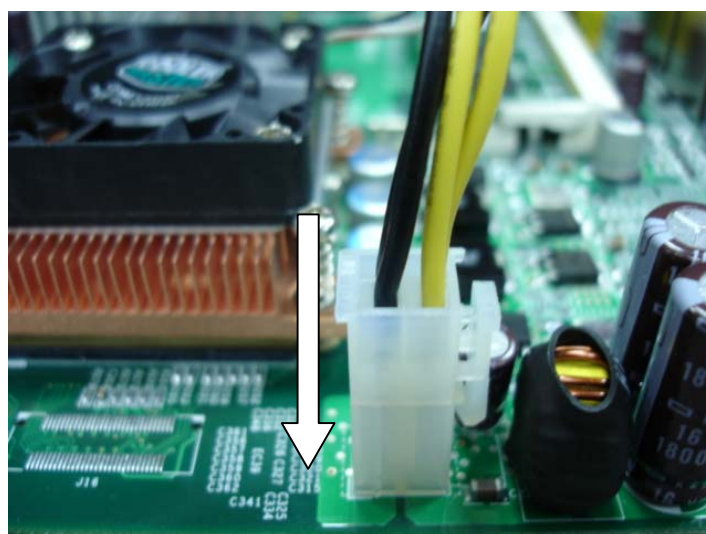
Figure 5-3

ATX Power Setting

Unlike other Single board computer, RUBY-9713VG2A supports ATX only. Therefore, there is no other setting that really needs to be set up. However, there are only two connectors that must be connected—J30 (20 pins Power Connector) Figure 5-4 and J36- Pin 9 and Pin 11 (Power Button) Figure 5-5.
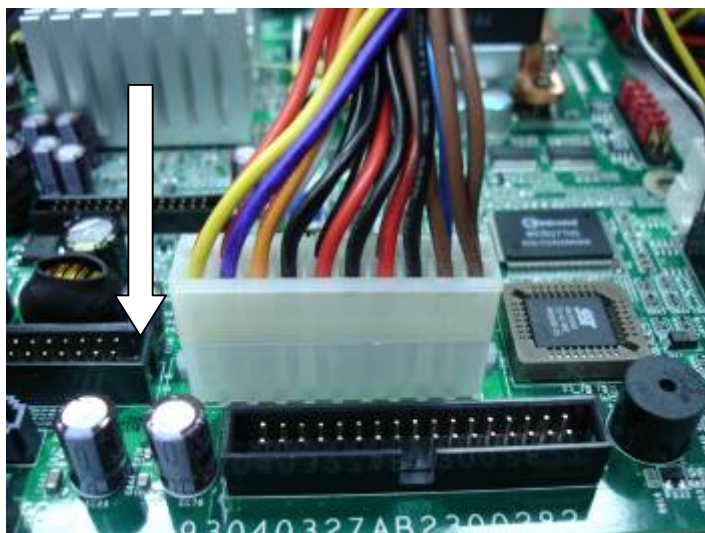
Figure 5-4
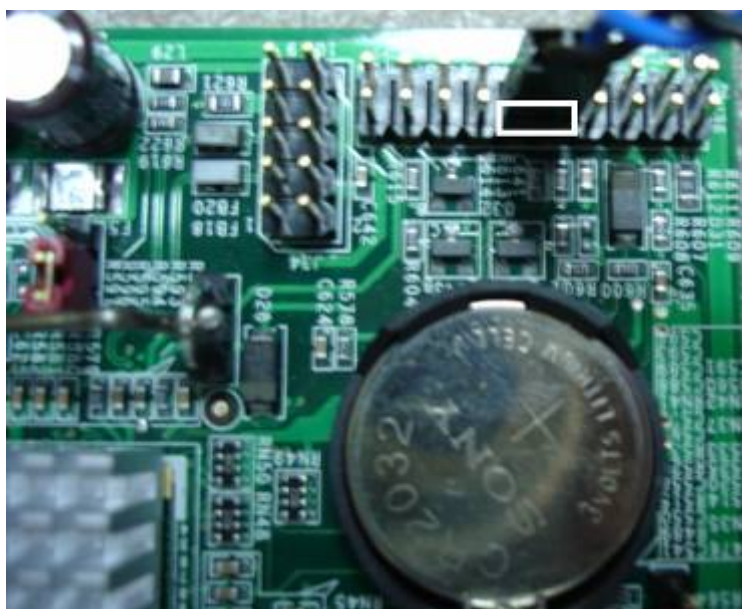
Figure 5-5

Serial ATA Hardware and SATA RAID Installation

Unlike IDE bus, each Serial ATA channel can only connect to one SATA hard disk at a time; there are total two connectors, J20 and J21. The installation of Serial ATA is simpler and easier than IDE, because SATA hard disk doesn't require setting up Master and Slave, which can reduce mistake of hardware installation. All you need to do is to plug in two cables and enable SATA in System BIOS. (The Serial ATA hard disk of installation, please see figure 5-5 as a below)
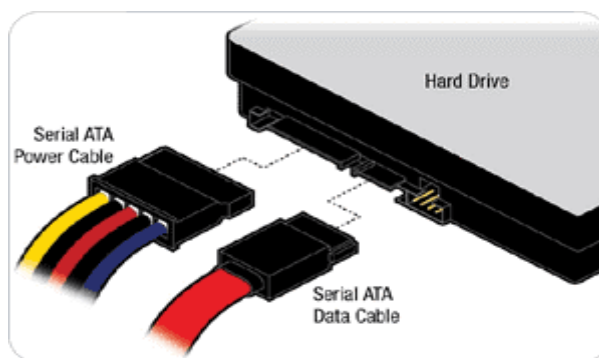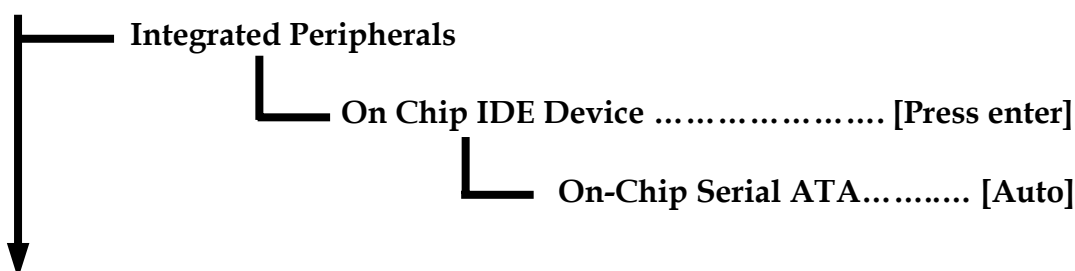

Figure 5-5

After done with the installation of SATA hardware, please enter system BIOS to enable Serial ATA function. Otherwise, Serial hardware won't be recognized. To enable SATA function, please see as following:

System BIOS

Integrated Peripherals

On Chip IDE Device ………………… [Press enter]

On-Chip Serial ATA……….. [Auto]

Besides, RUBY-9713VG2AR also supports RAID 0, 1, and 5 functions. To enable SATA RAID function, On-Chip Serial ATA must be set to "**Enhanced Mode**". After that, SATA Mode option will be unmasked automatically. Please set SATA Mode from "**IDE**" to "**RAID**", and then save reboot system after saving the new setting. Please refer to the following picture.
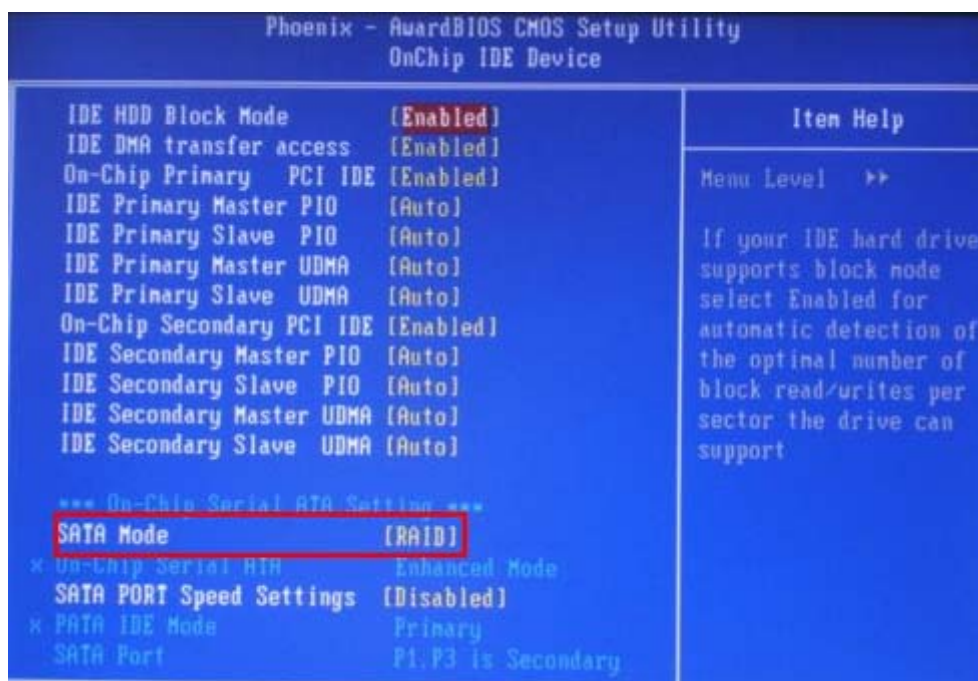
After rebooting system, you will see the RAID Configuration Utility appear during the post stage. However, to enter RAID Configuration Utility, please press "<CTRL+I>"


After entering RAID Configuration Utility, you will be able to Create, Delete, and Rest RAID Volume. Besides, RAID 0, 1, 0-1, and 5 can also be configured here as well.
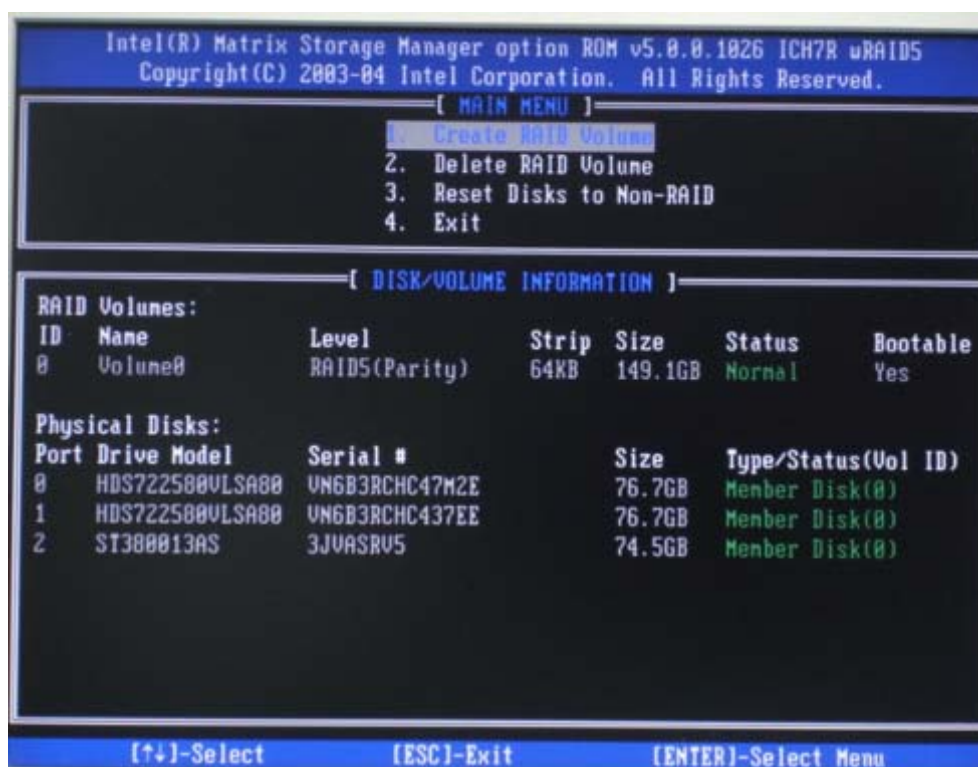
After configuring RAID, make sure you have RAID driver diskette ready before starting to install your operating system. As for RAID driver diskette, please kindly check Portwell Driver CD. Besides, to install RAID driver from disk, "**F6**" must be pressed as soon as system boots up from Windows XP installation CD.

After "F6", the following picture will be seen to specify RAID driver
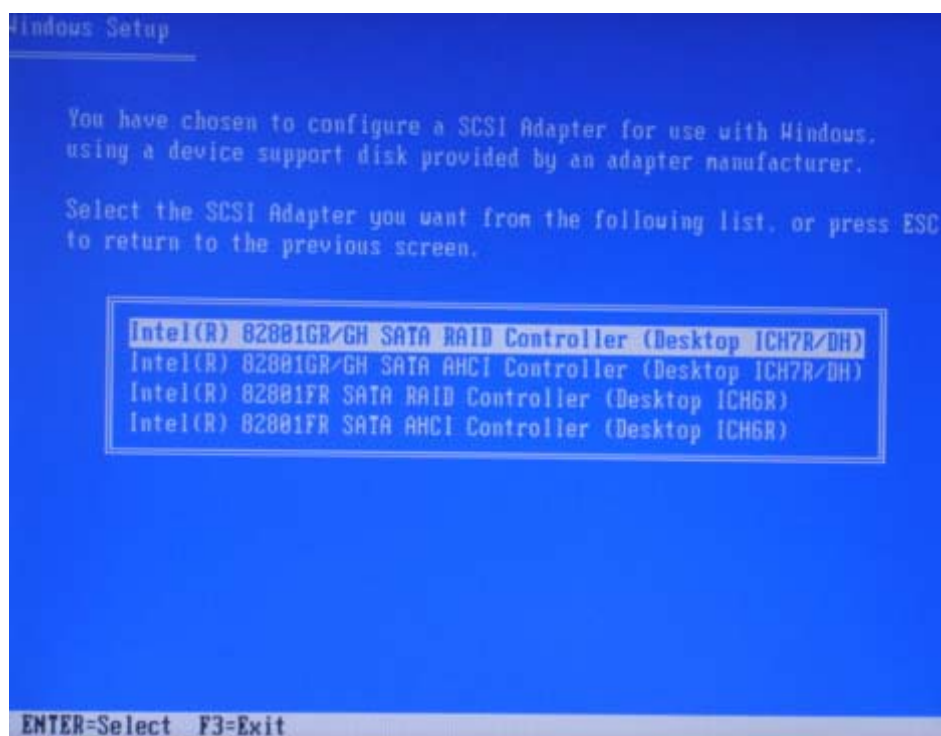
As you see the above picture, please select "**Intel® 82801GR/GH SATA RAID Controller (Desktop ICH7R/DH)**", and now you are ready to start your Windows XP storage partition configuration.

5.2 Frequency Asking Questions

Q: I have one IDE hard disk and one SATA hard disk. How can I assign SATA Hard disk as First boot device?

A: After entering system BIOS, access Advanced BIOS Feature. And then press enter on Hard disk boot Priority. You will see the mode of your SATA hard disk. Select it as first boot device. Besides, please also notice. Every time, when your hard disk devices have been changed, system bios will ask you to re-setup Hard disk boot priority.

Q: Since RUBY-9713VG2A has two Giga LAN onboard, can RUBY-9713VG2A support Intel fault tolerance function, or what people called teaming function?

A: Yes, RUBY-9713VG2A fully supports teaming function without any required change. What has to be done is to install Intel PRO drivers we provided in Portwell Driver CD, and then go to device manager to enable teaming function. However, for further information, please feel free to contact tsd@portwell.com.tw, we can send teaming function guideline to you.

Q:I am using an ATA-66 (or 100) hard drive, how can I know that ATA-66 function is enabled?

A: You need to use the 80-pin ATA-66 IDE flat cable to have this function. During the Post phase, you can see ATA-66 (or 100) message while hard drive is being detected. Besides, after installing Microsoft series OS successfully, you also need to Install ATA-66/100 driver to active ATA-66/100 function.

Q: Does RUBY-9713VG2A support boot from LAN function? If it does, how and where can I enable it?

A: RUBY-9713VG2A does support "boot from LAN" function to enable it, please change the setting in "**Onboard LAN BOOT ROM Init**" in **Integrated Peripherals** of BIOS.

Q: Is it possible to insert PCI-Express X 8, X4, or X1 card on PCI-Express x 16?

A: Yes, you can, but Intel only defines PCI-Express X 16 slot can only configure as PCI-Express x 16 and x 1 card. You may find some other x 8 and x 4 can work on PCI-Express X 16 slot, but there is no guarantee that all the cards will work. If you really need project requirement to use x 4 and x 8 card that currently fail to work on our motherboard, you may contact us to get the help. tsd@portwell.com.tw

Q: After installing PCI Card, why isn't it working?

A: As a matter of fact, some PCI cards will occupy shadow memory, which might cause SBC or PCI malfunction. However, the best way to see if the problem relates to shadow memory or not, please kindly disable USB controller and on board LAN to release more shadow memory space.

To solve this problem, you might also check our download center if there is BIOS for this issue.
http://www.portwell.com.tw/download.asp

if you cannot find a BIOS or the BIOS on our website cannot solve your problem, please kindly contact Portwell Technical Support department for solving issue.
Portwell Technical Support Department e-mail: tsd@portwell.com.tw

5.3   BIOS Setting

It is assumed that users have correctly adopted modules and connected all the devices cables required before turning on AT or ATX power. CPU, CPU Fan, 184-pin DDR SDRAM, keyboard, mouse, floppy drive, IDE hard disk, printer, VGA connector, device cables, ATX accessories or 12V 4-pin power cable are good examples that deserve attention. With no assurance of properly and correctly accommodating these modules and devices, it is very possible to encounter system failures that result in malfunction of any device.

To make sure that you have a successful start with RUBY-9713VG2A, it is recommended, when going with the boot-up sequence, to hit "DEL" key and enter the BIOS setup menu to tune up a stable BIOS configuration so that you can wake up your system far well.

Loading the default optimal setting

When prompted with the main setup menu, please scroll down to "**Load Optimal Defaults**", press "Enter" and "Y" to load in default optimal BIOS setup. This will force your BIOS setting back to the initial factory configuration. It is recommended to do this so you can be sure the system is running with the BIOS setting that Portwell has highly endorsed. As a matter of fact, users can load the default BIOS setting any time when system appears to be unstable in boot up sequence.

Auto Detect Hard Disks

In the BIOS => Standard CMOS setup menu, pick up any one from Primary/Secondary Master/Slave IDE ports, and press "Enter". Setup the selected IDE port and its access mode to "Auto". This will force system to automatically pick up the IDE devices that are being connected each time system boots up.

Improper disable operation

There are too many occasions where users disable a certain device/feature in one application through BIOS setting. These variables may not be set back to the original values when needed. These devices/features will certainly fail to be detected.

When the above conditions happen, it is strongly recommended to check the BIOS settings. Make sure certain items are set as they should be. These include the floppy drive, COM1/COM2 ports, Parallel port, USB ports, external cache, on-board VGA and Ethernet.

It is also very common that users would like to disable a certain device/port to release IRQ resource. A few good examples are

Disable COM1 serial port to release IRQ #4
Disable COM2 serial port to release IRQ #3
Disable Parallel port to release IRQ #7
Disable PS/2 mouse to release IRQ #12,
Etc…

A quick review of the basic IRQ mapping is given below for your reference.

IRQ#	Description
IRQ #0	System Timer
IRQ #1	Keyboard
IRQ #2	Unassigned
IRQ #3	COM2
IRQ #4	COM1
IRQ # 5	Multimedia Device/Network Controller
IRQ #6	Floppy Disk Controller
IRQ #7	Parallel port
IRQ #8	Real-time Clock
IRQ #9	Microsoft ACPI-Compliant System
IRQ #10	USB 1.0/1.1/2.0 EHCI Controller/Network Controller
IRQ #11	SMbus /Primary IDE Controller
IRQ #12	Network /Display Controller
IRQ #13	Data Processor
IRQ #14	IDE Controller
IRQ #15	Unused

It is then very easy to find out which IRQ resource is ready for additional peripherals. If IRQ resource is not enough, please disable some devices listed above to release further IRQ numbers.

System Memory Address Map

Each On-board device in the system is assigned a set of memory addresses, which also can be identical of the device. The following table lists the system memory address used.

Memory Area	Size	Device Description
0000 – 003F	1K	Interrupt Area
0040 – 004F	0.3K	BIOS Data Area
0050 – 006F	0.5K	System Data
0070 – 0E2E	54K	DOS
0E2F – 0F6B	5K	Program Area
0F6C – 9FFF	574K	[Available]
= Conventional memory ends at 636K =		
9F00 – 9FBF	3K	Extended BIOS Area
9FC0 – AFFF	1K	Unused
A000 – AFFF	64K	VGA Graphics
B800 – BFFF	32K	Unused
C000 – CE9F	32K	VGA Text
CEA0 – EFFF	58K	Video ROM
F000 – FFFF	133K	Unused
D400 – EEFF	64K	System ROM

Interrupt Request Lines (IRQ)

Peripheral devices can use interrupt request lines to notify CPU for the service required.   The following table shows the IRQ used by the devices on board.

IRQ#	Current Use	Default Use
IRQ 0	SMARTDRV	System Timer
IRQ 1	SMARTDRV	Keyboard Event
IRQ 2	[Unassigned]	Usable IRQ
IRQ 3	System ROM	COM 2
IRQ 4	System ROM	COM 1
IRQ 5	[Unassigned]	Usable IRQ
IRQ 6	System ROM	Diskette Event
IRQ 7	[Unassigned]	Usable IRQ
IRQ 8	System ROM	Real-Time Clock
IRQ 9	[Unassigned]	Usable IRQ
IRQ 10	[Unassigned]	Usable IRQ
IRQ 11	[Unassigned]	Usable IRQ
IRQ 12	System ROM	IBM Mouse Event
IRQ 13	System ROM	Coprocessor Error
IRQ 14	System ROM	Hard Disk Event
IRQ 15	[Unassigned]	Usable IRQ