CR960-QM77/HM76

COM Express Basic
User's Manual

Copyright

This publication contains information that is protected by copyright. No part of it may be reproduced in any form or by any means or used to make any transformation/adaptation without the prior written permission from the copyright holders.

This publication is provided for informational purposes only. The manufacturer makes no representations or warranties with respect to the contents or use of this manual and specifically disclaims any express or implied warranties of merchantability or fitness for any particular purpose. The user will assume the entire risk of the use or the results of the use of this document. Further, the manufacturer reserves the right to revise this publication and make changes to its contents at any time, without obligation to notify any person or entity of such revisions or changes.

Changes after the publication's first release will be based on the product's revision. The website will always provide the most updated information.

© 2015. All Rights Reserved.

Trademarks

Product names or trademarks appearing in this manual are for identification purpose only and are the properties of the respective owners.

COM Express Specification Reference

PICMG® COM Express Module™ Base Specification.

http://www.picmg.org/

FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

Table of Contents

About this Manual

An electronic file of this manual is included in the CD. To view the user's manual in the CD, insert the CD into a CD-ROM drive. The autorun screen (Main Board Utility CD) will appear. Click "User's Manual" on the main menu.

Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequencial damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.

2. Wear an antistatic wrist strap.

3. Do all preparation work on a static-free surface.

4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.

5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

> **Important:**
> Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

To avoid damage to the system:
*   Use the correct AC input voltage range.

To reduce the risk of electric shock:
*   Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- One CR960 board
- One DVD
- One QR (Quick Reference)
- Heat spreader with heat sink and fan

Optional Items

- COM331-B carrier board kit

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

Before using the system board, prepare basic system components.

If you are installing the system board in a new system, you will need at least the following internal components.

- Storage devices such as hard disk drive, CD-ROM, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

Specifications (CR960-QM77)

Processor	• BGA 1023 packaging technology - 3rd generation Intel® Core™ processors (22nm process technology) : Intel® Core™ i7-3615QE, 6M Cache, 2.3GHz (3.3GHz), 45W : Intel® Core™ i7-3612QE, 6M Cache, 2.1GHz (3.1GHz), 35W : Intel® Core™ i7-3555LE, 4M Cache, 2.5GHz (3.2GHz), 25W : Intel® Core™ i7-3517UE, 4M Cache, 1.7GHz (2.8GHz), 17W : Intel® Core™ i5-3610ME, 3M Cache, 2.7GHz (3.3GHz), 35W : Intel® Core™ i3-3120ME, 3M Cache, 2.4GHz, 35W
Chipset	• Intel® QM77 Express Chipset
System Memory	• Two 204-pin DDR3/DDR3L SODIMM sockets • Supports DDR3/DDR3L 1333/1600 MHz (i7/i5/i3) Supports DDR3/DDR3L 1066/1333/1600 MHz (i7 Quad Core) • Supports dual channel memory interface • Supports up to 16GB system memory • DRAM device technologies: 1Gb, 2Gb and 4Gb DDR3 DRAM technologies are supported for x8 and x16 devices, unbuffered, non-ECC
Graphics	• Intel® HD Graphics 4000 • Supports VGA, LVDS and DDI interfaces • VGA: resolution up to 2048x1536 @ 75Hz • LVDS: Single Channel - 18/24-bit; Dual Channel - 36/48-bit, resolution up to 1920x1200 @ 60Hz • Digital Display Interfaces: HDMI, DVI, DP or SDVO (for Port B) • HDMI, DVI, DP: resolution up to 1920x1200 @ 60Hz • Intel® Clear Video Technology • DirectX Video Acceleration (DXVA) for accelerating video processing - Full AVC/VC1/MPEG2 HW Decode • Supports DirectX 11/10.1/10/9 and OpenGL 3.0
Audio	• Supports High Definition Audio interface
Serial ATA	• Supports 4 Serial ATA interfaces • 2 SATA 3.0 with data transfer rate up to 6Gb/s 2 SATA 2.0 with data transfer rate up to 3Gb/s • Integrated Advanced Host Controller Interface (AHCI) controller • Supports RAID 0/1/5/10
LAN	• Intel® 82579LM Gigabit Ethernet PHY • Integrated 10/100/1000 transceiver • Fully compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3ab
Expansion Interfaces	• Supports 4 USB 3.0 ports • Supports 8 USB 2.0 ports • Supports 1 PCIe x16 interface • Supports 7 PCIe x1 interfaces • Supports LPC interface • Supports I²C interface • Supports SMBus interface • Supports 2 serial interfaces (TX/RX) • Supports 4-bit input and 4-bit output GPIO

SSD (optional)	• 2GB/4GB/8GB/16GB/32GB/64GB • Write: 30MB/sec (max), Read: 70MB/sec (max) • SATA to SSD onboard
Trusted Platform Module - TPM (optional)	• Provides a Trusted PC for secure transactions • Provides software license protection, enforcement and password protection
Watchdog Timer	• Watchdog timeout programmable via software from 1 to 255 seconds
BIOS	• 64Mbit SPI BIOS
Power Consumption	• CR960-QM77BS0-3120ME: 45.46W with i3-3120ME at 2.4GHz and 2x 4GB DDR3L SODIMM
OS Support	• Windows XP Professional x86 & SP3 (32-bit) • Windows XP Professional x64 & SP2 (64-bit) • Windows 7 Ultimate x86 & SP1 (32-bit) • Windows 7 Ultimate x64 & SP1 (64-bit) • Windows 8 Enterprise x86 (32-bit) • Windows 8 Enterprise x64 (64-bit)
Temperature	• 0°C to 60°C
Humidity	• 5% to 90%
Power	• Input: 5VSB (optional), 12V, VCC_RTC
PCB	• Dimensions: 95mm (3.74") x 125mm (4.9") • Compliance: PICMG COM Express® R2.1 basic form factor, Type 6

6

Specifications (CR960-HM76)

Processor	• BGA 1023 packaging technology
	  - 3rd generation Intel® Core™ processors (22nm process technology)
	  : Intel® Core™ i5-3610ME, 3M Cache, 2.7GHz (3.3GHz), 35W
	  : Intel® Celeron™ 1020E, 2M Cache, 2.20 GHz, 35W
	  - 2nd generation Intel® Core™ processors (32nm process technology)
	  : Intel® Celeron™ B810E, 2M Cache, 1.6GHz, 35W
	  : Intel® Celeron™ 847E, 2M Cache, 1.1GHz, 17W
	  : Intel® Celeron™ 827E, 1.5M Cache, 1.4GHz, 17W

Chipset	• Intel® HM76 Express Chipset

System Memory	• Two 204-pin DDR3/DDR3L SODIMM sockets
	• 3rd generation processors
	  - Supports DDR3/DDR3L 1333/1600 MHz
	• 2nd generation processors
	  - Supports DDR3 1066/1333 MHz
	• Supports dual channel memory interface
	• Supports up to 16GB system memory
	• DRAM device technologies: 1Gb, 2Gb and 4Gb DDR3 DRAM technologies are supported for x8 and x16 devices, unbuffered, non-ECC

Graphics	• Intel® HD Graphics 4000 (3rd generation processors) • Intel® HD Graphics 3000 (2nd generation processors) • Intel® HD Graphics (Intel® Celeron™ processors) • Supports VGA, LVDS and DDI interfaces • VGA: resolution up to 2048x1536 @ 75Hz • LVDS: Single Channel - 18/24-bit; Dual Channel - 36/48-bit, resolution up to 1920x1200 @ 60Hz • Digital Display Interfaces: HDMI, DVI, DP or SDVO (for Port B) • HDMI, DVI, DP: resolution up to 1920x1200 @ 60Hz • Intel® Clear Video Technology • DirectX Video Acceleration (DXVA) for accelerating video processing - Full AVC/VC1/MPEG2 HW Decode • Supports DirectX 11/10.1/10/9 and OpenGL 3.0 (3rd generation processors) • Supports DirectX 10.1/10/9 and OpenGL 3.0 (2nd generation processors)
Serial ATA	• Supports 4 Serial ATA interfaces • 2 SATA 3.0 with data transfer rate up to 6Gb/s 2 SATA 2.0 with data transfer rate up to 3Gb/s • Integrated Advanced Host Controller Interface (AHCI) controller
LAN	• Intel® 82579LM Gigabit Ethernet PHY • Integrated 10/100/1000 transceiver • Fully compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3ab
Expansion Interfaces	• Supports 4 USB 3.0 ports • Supports 8 USB 2.0 ports • Supports 1 PCIe x16 interface • Supports 7 PCIe x1 interfaces • Supports LPC interface • Supports I²C interface • Supports SMBus interface • Supports 2 serial interfaces (TX/RX) • Supports 4-bit input and 4-bit output GPIO

Audio	• Supports High Definition Audio interface
SSD (optional)	• 2GB/4GB/8GB/16GB/32GB/64GB • Write: 30MB/sec (max), Read: 70MB/sec (max) • SATA to SSD onboard
Trusted Platform Module - TPM (optional)	• Provides a Trusted PC for secure transactions • Provides software license protection, enforcement and password protection
Watchdog Timer	• Watchdog timeout programmable via software from 1 to 255 seconds
BIOS	• 64Mbit SPI BIOS
Power Consumption	• TBD
OS Support	• Windows XP Professional x86 & SP3 (32-bit) • Windows XP Professional x64 & SP2 (64-bit) • Windows 7 Ultimate x86 & SP1 (32-bit) • Windows 7 Ultimate x64 & SP1 (64-bit) • Windows 8 Enterprise x86 (32-bit) • Windows 8 Enterprise x64 (64-bit)
Temperature	• 0ºC to 60ºC
Humidity	• 5% to 90%
Power	• Input: 5VSB (optional), 12V, VCC_RTC
PCB	• Dimensions: 95mm (3.74") x 125mm (4.9") • Compliance: PICMG COM Express® R2.1 basic form factor, Type 6

Features

• Watchdog Timer

The Watchdog Timer function allows your application to regularly "clear" the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

• DDR3

DDR3 delivers increased system bandwidth and improved performance. The advantages of DDR3 are its higher bandwidth and its increase in performance at a lower power than DDR2.

• Graphics

The integrated Intel® HD graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications. Supports VGA, LVDS and DDI (HDMI, DVI and DisplayPort) for up to 3 display outputs.

• Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 3Gb/s (SATA 2.0) and 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s.

• Gigabit LAN

The Intel® 82579LM Gigabit LAN controller supports up to 1Gbps data transmission.

• USB

The system board supports the new USB 3.0. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.0 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

Chapter 2 - Concept

COM Express Module Standards

The figure below indicates the dimensions of the different types of COM Express modules.

CR960-QM77/HM76 is a COM Express Basic. The dimension is 95mm x 125mm.

⬤ Common for all Form Factors
◎ Extended only
◉ Basic only
↻ Compact only
↻ Compact and Basic only
↻ Mini only

9
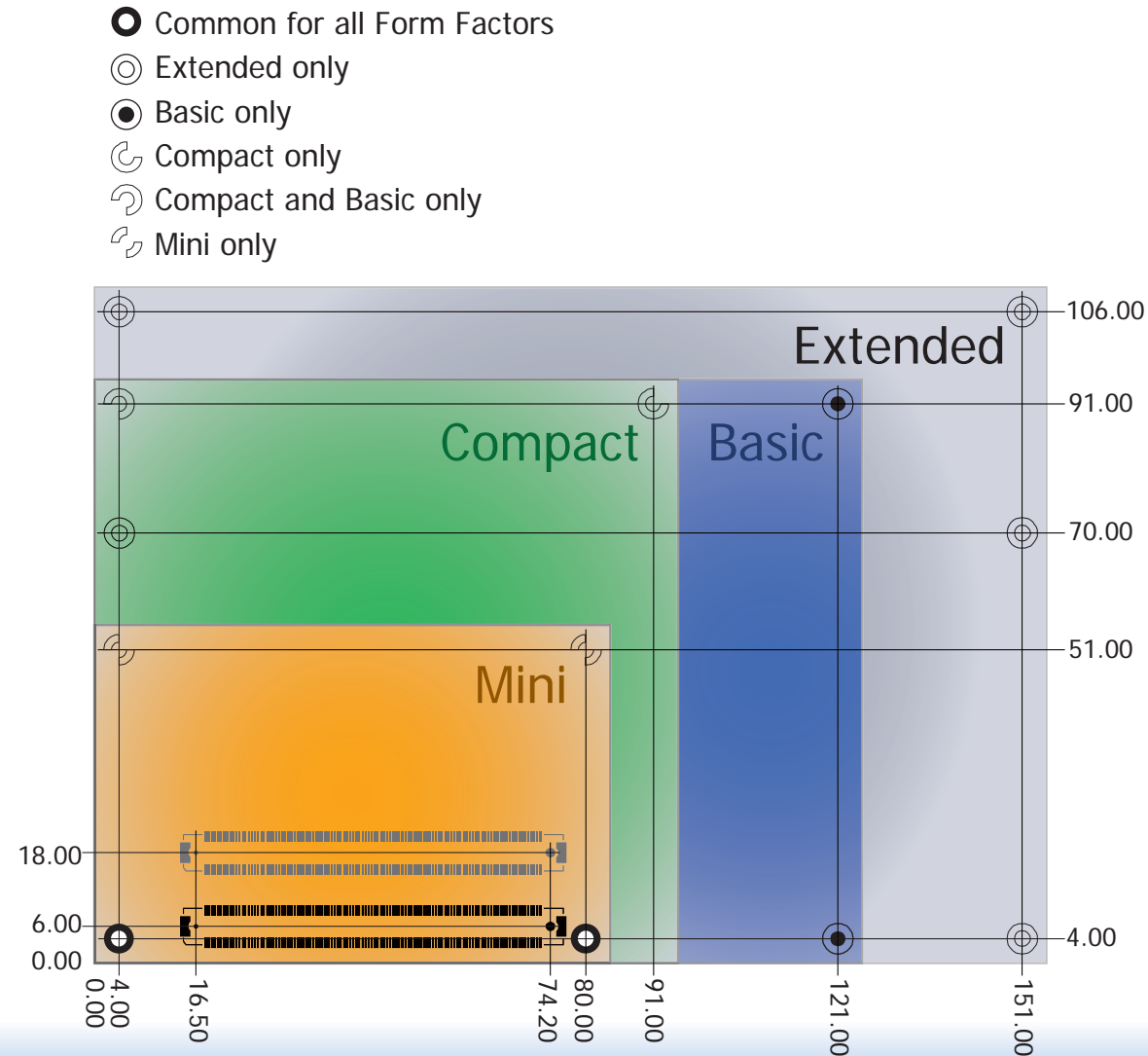
Specification Comparison Table

The table below shows the COM Express standard specifications and the corresponding specifications supported on the CR960-QM77/HM76 module.

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI CR960-QM77/HM76 Type 6
A-B	System I/O		
A-B	PCI Express Lanes 0 - 5	1 / 6	6
A-B	LVDS Channel A	0 / 1	1
A-B	LVDS Channel B	0 / 1	1
A-B	eDP on LVDS CH A pins	0 / 1	0
A-B	VGA Port	0 / 1	1
A-B	TV-Out	NA	NA
A-B	DDI 0	NA	NA
A-B[5]	Serial Ports 1 - 2	0 / 2	2
A-B	CAN interface on SER1	0 / 1	0
A-B	SATA / SAS Ports	1 / 4	4
A-B	AC'97 / HDA Digital Interface	0 / 1	1
A-B	USB 2.0 Ports	4 / 8	8
A-B	USB Client	0 / 1	0
A-B	USB 3.0 Ports	NA	NA
A-B	LAN Port 0	1 / 1	1
A-B	Express Card Support	1 / 2	2
A-B	LPC Bus	1 / 1	1
A-B	SPI	1 / 2	1
A-B	System Management		
A-B[6]	SDIO (muxed on GPIO)	0 / 1	0
A-B[6]	General Purpose I/O	8 / 8	8
A-B	SMBus	1 / 1	1
A-B	I2C	1 / 1	1
A-B	Watchdog Timer	0 / 1	1
A-B	Speaker Out	1 / 1	1
A-B	External BIOS ROM Support	0 / 2	1
A-B	Reset Functions	1 / 1	1

Note:
- 5 Indicates 12V-tolerant features on former VCC_12V signals.
- 6 Cells in the connected columns spanning rows provide a rough approximation of features sharing connector pins.

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI CR960-QM77/HM76 Type 6
A-B	Power Management		
A-B	Thermal Protection	0 / 1	1
A-B	Battery Low Alarm	0 / 1	1
A-B	Suspend/Wake Signals	0 / 3	3
A-B	Power Button Support	1 / 1	1
A-B	Power Good	1 / 1	1
A-B	VCC_5V_SBY Contacts	4 / 4	4
A-B[5]	Sleep Input	0 / 1	1
A-B[5]	Lid Input	0 / 1	1
A-B[5]	Fan Control Signals	0 / 2	2
A-B	Trusted Platform Modules	0 / 1	1
A-B	Power		
A-B	VCC_12V Contacts	12 / 12	12

Module Pin-out - Required and Optional Features C-D Connector.

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI CR960-QM77/HM76 Type 6
C-D	System I/O		
C-D[6]	PCI Express Lanes 16 - 31	0 / 16	16
C-D[6]	PCI Express Graphics (PEG)	0 / 1	1
C-D[6]	Muxed SDVO Channels 1 - 2	NA	NA
C-D[6]	PCI Express Lanes 6 - 15	0 / 2	1
C-D[6]	PCI Bus - 32 Bit	NA	NA
C-D[6]	PATA Port	NA	NA
C-D[6]	LAN Ports 1 - 2	NA	NA
C-D[6]	DDIs 1 - 3	0 / 3	3
C-D[6]	USB 3.0 Ports	0 / 4	4
C-D	Power		
C-D	VCC_12V Contacts	12 / 12	12

10

Chapter 3 - Hardware Installation

Board Layout

Top View

Bottom View

Block Diagram

CR960-QM77

Processor
CORE | CORE | CORE | CORE
3rd Generation
Intel® Core™ i7/i5/i3
Graphics CORE | Memory Controller

DDR3 SODIMM — Channel A 1333/1600MHz
DDR3 SODIMM — Channel B 1333/1600MHz

IMVP7 (Vcore,Vgfx)

PEG 16X LANES

FDI
DMI x4 (Direct Media Interface)

LPC Bus
SLP/LID
WDT
Serial Port 0/1
System Fan
PWM/TACH_IN
I^2C
Embedded Controler
LPC TPM 1.2 (Opt.)
Backup EEPROM
SM Bus
8bit DIO
DIO SMBus
HD Audio
USB 2.0 8x
SATA 2.0 4x
LVDS (Dual Channel)
CRT
PCIe x1/Lanes 1~6
SPI Bus
SPI Flash
LAN Ports | PCIe x1, Lane 8

Panther Point Mobile Intel® QM77

DDI Port B/SDVO Port B
DDI Port C
DDI Port D
USB 3.0 4x
PCIe x1/ Lane 7
PCIe x1/ Lane 8 (Opt. share with on board LAN)
SATA Ports 4 (Opt.)
SSD Chip

A / B
C / D

Intel® GLAN PHY 82579LM

CR960-HM76

Processor
CORE | CORE | CORE | CORE
3rd/2nd Generation
Intel® Core™ i7/i5/i3
Graphics CORE | Memory Controller

DDR3 SODIMM — Channel A 1333/1600MHz
DDR3 SODIMM — Channel B 1333/1600MHz

IMVP7 (Vcore,Vgfx)

PEG 16X LANES

FDI
DMI x4 (Direct Media Interface)

LPC Bus
SLP/LID
WDT
Serial Port 0/1
System Fan
PWM/TACH_IN
I^2C
Embedded Controler
LPC TPM 1.2 (Opt.)
Backup EEPROM
SM Bus
8bit DIO
DIO SMBus
HD Audio
USB 2.0 8x
SATA 2.0 4x
LVDS (Dual Channel)
CRT
PCIe x1/Lanes 1~6
SPI Bus
SPI Flash
LAN Ports | PCIe x1, Lane 8

Panther Point Mobile Intel® HM76

DDI Port B/SDVO Port B
DDI Port C
DDI Port D
USB 3.0 4x
PCIe x1/ Lane 7
PCIe x1/ Lane 8 (Opt. share with on board LAN)
SATA Ports 4 (Opt.)
SSD Chip

A / B
C / D

Intel® GLAN PHY 82579LM

12

Mechanical Diagram

CR960-QM77/HM76 Module with Heat Sink

CR960-QM77/HM76 Module

Top View

Bottom View

Fan
Heatsink
Heat spreader
Module PCB
Standoff
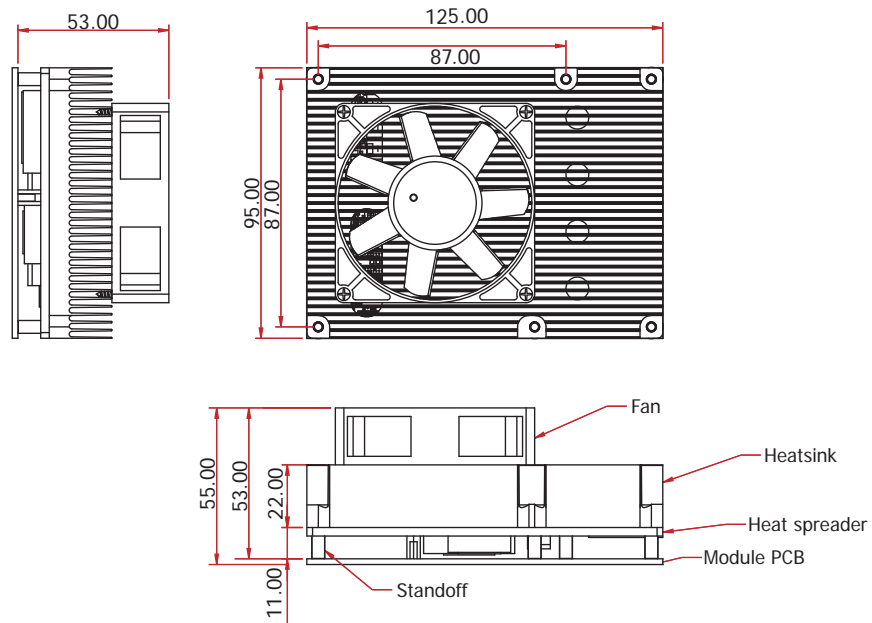
Side View of the Module with Heat Sink and Carrier Board
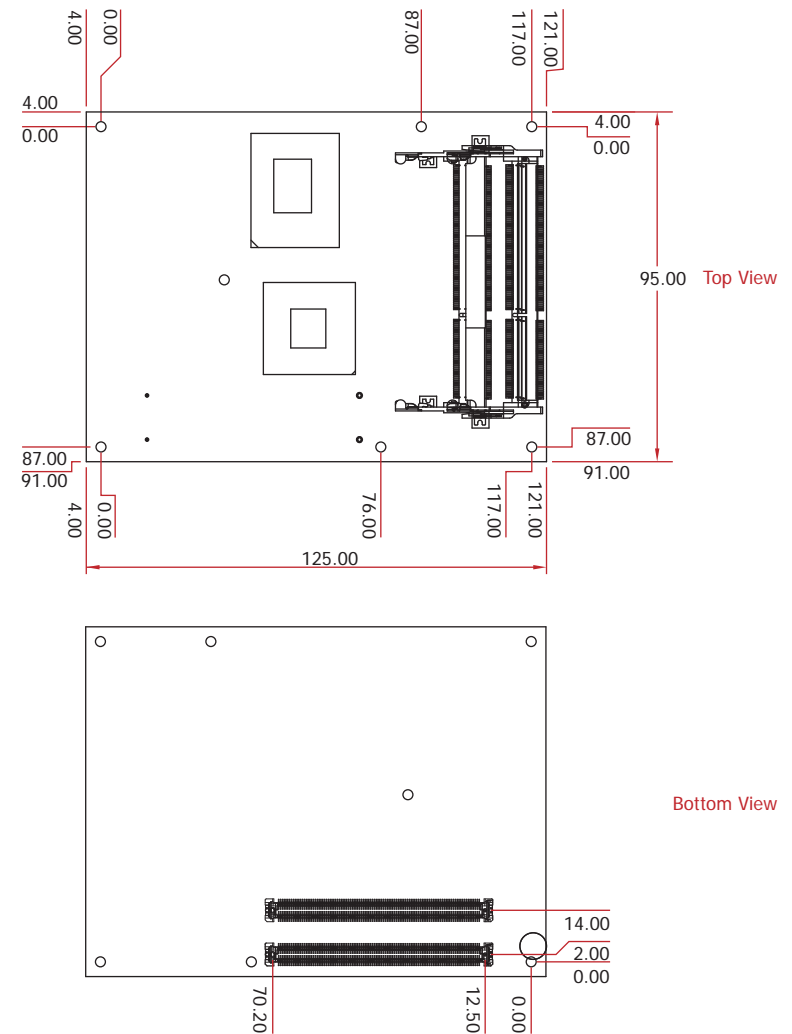
> **Important:**
> Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

System Memory

The system board is equipped with two 204-pin SODIMM sockets that support DDR3L(1.35V) memory modules; depends on CPU supported. However, DDR3L memory module can run at 1.5V.

> **Important:**
> When the Standby Power LED lit red, it indicates that there is power on the board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the board and components.

DDR3_2
DDR3_1
Standby
Power LED
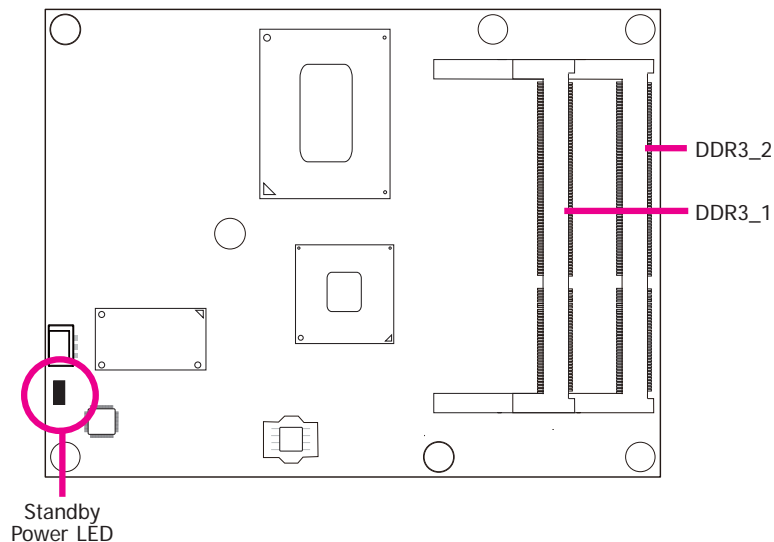
Installing the DIMM Module

> **Note:**
> The system board used in the following illustrations may not resemble the actual one. These illustrations are for reference only.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.

2. Disconnect all power cords and cables.

3. Locate the SODIMM socket on the system board.

4. Note the key on the socket. The key ensures the module can be plugged into the socket in only one direction.

14
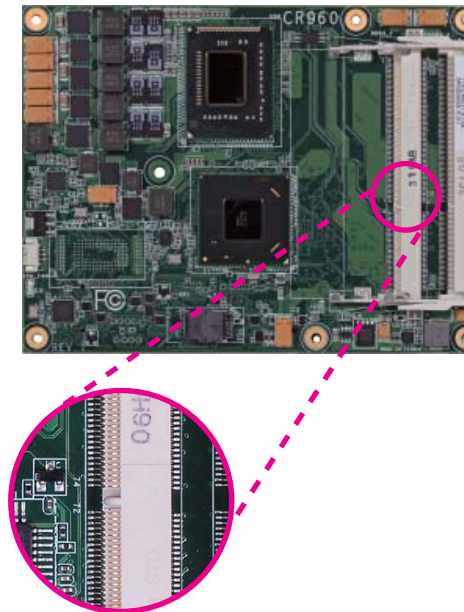
5. Grasping the module by its edges, align the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.

6. Push down the module until the clips at each end of the socket lock into position. You will hear a distinctive "click", indicating the module is correctly locked into position.

Clip   Clip

Connectors

CPU Fan Connector

Sense
+12V
Ground
1
3
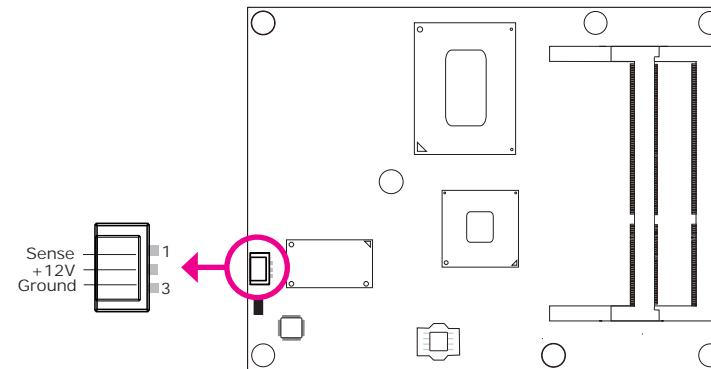
Connect the CPU fan's cable connector to the CPU fan connector on the board. The cooling fan will provide adequate airflow throughout the chassis to prevent overheating the CPU and board components.

BIOS Setting

"Module Board H/W Monitor" submenu in the Advanced menu of the BIOS will display the current speed of the cooling fan. Refer to chapter 4 of the manual for more information.

15

COM Express Connectors

The COM Express connectors are used to interface the CR960-QM77/HM76 COM Express board to a carrier board. Connect the COM Express connectors (lcoated on the solder side of the board) to the COM Express connectors on the carrier board.

Refer to the "Installing CR960-QM77/HM76 onto a Carrier Board" section for more information.

COM Express Connectors
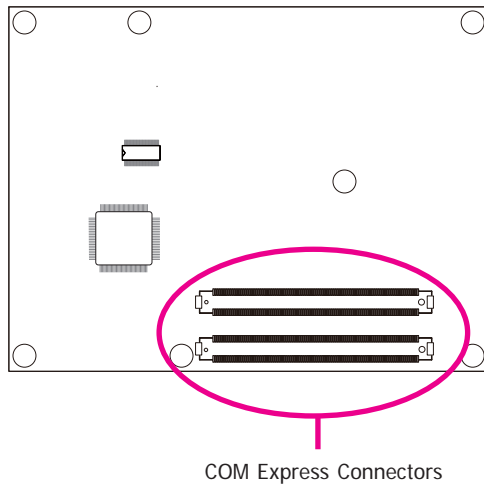
Refer to the following pages for the pin functions of these connectors.

COM Express Connectors

Row A		Row B	
A1	GND (FIXED)	B1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#
A3	GBE0_MDI3+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MDI2-	B6	LPC_AD2
A7	GBE0_MDI2+	B7	LPC_AD3
A8	GBE0_LINK#	B8	LPC_DRQ0#
A9	GBE0_MDI1-	B9	LPC_DRQ1#
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	GBE0_CTREF	B14	SMB_DAT
A15	SLP_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SLP_S4#	B18	SUS_STAT#
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND (FIXED)	B21	GND (FIXED)
A22	SATA2_TX+	B22	SATA3_TX+
A23	SATA2_TX-	B23	SATA3_TX-
A24	SUS_S5#	B24	PWR_OK
A25	SATA2_RX+	B25	SATA3_RX+
A26	SATA2_RX-	B26	SATA3_RX-
A27	BATLOW#	B27	WDT
A28	(S)ATA_ACT#	B28	AC/HDA _SDIN2
A29	AC/HDA_SYNC	B29	AC/HDA _SDIN1
A30	AC/HDA _RST#	B30	AC/HDA _SDIN0
A31	GND (FIXED)	B31	GND (FIXED)
A32	AC/HDA _BITCLK	B32	SPKR
A33	AC/HDA _SDOUT	B33	I2C_CK
A34	BIOS_DIS0#	B34	I2C_DAT
A35	THRMTRIP#	B35	THRM#
A36	USB6-	B36	USB7-
A37	USB6+	B37	USB7+
A38	USB_6_7_OC#	B38	USB_4_5_OC#
A39	USB4-	B39	USB5-
A40	USB4+	B40	USB5+
A41	GND (FIXED)	B41	GND (FIXED)
A42	USB2-	B42	USB3-
A43	USB2+	B43	USB3+
A44	USB_2_3_OC#	B44	USB_0_1_OC#
A45	USB0-	B45	USB1-
A46	USB0+	B46	USB1+
A47	VCC_RTC	B47	EXCD1_PERST#
A48	EXCD0_PERST#	B48	EXCD1_CPPE#
A49	EXCD0_CPPE#	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#

Row A		Row B	
A51	GND (FIXED)	B51	GND (FIXED)
A52	PCIE_TX5+	B52	PCIE_RX5+
A53	PCIE_TX5-	B53	PCIE_RX5-
A54	GPI0	B54	GPO1
A55	PCIE_TX4+	B55	PCIE_RX4+
A56	PCIE_TX4-	B56	PCIE_RX4-
A57	GND	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+
A59	PCIE_TX3-	B59	PCIE_RX3-
A60	GND (FIXED)	B60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+
A62	PCIE_TX2-	B62	PCIE_RX2-
A63	GPI1	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND	B66	WAKE0#
A67	GPI2	B67	WAKE1#
A68	PCIE_TX0+	B68	PCIE_RX0+
A69	PCIE_TX0-	B69	PCIE_RX0-
A70	GND (FIXED)	B70	GND (FIXED)
A71	LVDS_A0+	B71	LVDS_B0+
A72	LVDS_A0-	B72	LVDS_B0-
A73	LVDS_A1+	B73	LVDS_B1+
A74	LVDS_A1-	B74	LVDS_B1-
A75	LVDS_A2+	B75	LVDS_B2+
A76	LVDS_A2-	B76	LVDS_B2-
A77	LVDS_VDD_EN	B77	LVDS_B3+
A78	LVDS_A3+	B78	LVDS_B3-
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+
A82	LVDS_A_CK-	B82	LVDS_B_CK-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY
A86	RSVD	B86	VCC_5V_SBY
A87	RSVD	B87	VCC_5V_SBY
A88	PCIE0_CK_REF+	B88	BIOS_DIS1#
A89	PCIE0_CK_REF-	B89	VGA_RED
A90	GND (FIXED)	B90	GND (FIXED)
A91	SPI_POWER	B91	VGA_GRN
A92	SPI_MISO	B92	VGA_BLU
A93	GPO0	B93	VGA_HSYNC
A94	SPI_CLK	B94	VGA_VSYNC
A95	SPI_MOSI	B95	VGA_I2C_CK
A96	TPM_PP	B96	VGA_I2C_DAT
A97	TYPE10#	B97	SPI_CS#
A98	SER0_TX	B98	RSVD
A99	SER0_RX	B99	RSVD
A100	GND (FIXED)	B100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT
A102	SER1_RX	B102	FAN_TACHIN
A103	LID#	B103	SLEEP#
A104	VCC_12V	B104	VCC_12V
A105	VCC_12V	B105	VCC_12V
A106	VCC_12V	B106	VCC_12V
A107	VCC_12V	B107	VCC_12V
A108	VCC_12V	B108	VCC_12V
A109	VCC_12V	B109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)

17

Row C		Row D	
C1	GND (FIXED)	D1	GND (FIXED)
C2	GND	D2	GND
C3	USB_SSRX0-	D3	USB_SSTX0-
C4	USB_SSRX0+	D4	USB_SSTX0+
C5	GND	D5	GND
C6	USB_SSRX1-	D6	USB_SSTX1-
C7	USB_SSRX1+	D7	USB_SSTX1+
C8	GND	D8	GND
C9	USB_SSRX2-	D9	USB_SSTX2-
C10	USB_SSRX2+	D10	USB_SSTX2+
C11	GND (FIXED)	D11	GND (FIXED)
C12	USB_SSRX3-	D12	USB_SSTX3-
C13	USB_SSRX3+	D13	USB_SSTX3+
C14	GND	D14	GND
C15	DDI1_PAIR6+	D15	DDI1_CTRLCLK_AUX+
C16	DDI1_PAIR6-	D16	DDI1_CTRLDATA_AUX-
C17	RSVD	D17	RSVD
C18	RSVD	D18	RSVD
C19	PCIE_RX6+	D19	PCIE_TX6+
C20	PCIE_RX6-	D20	PCIE_TX6-
C21	GND (FIXED)	D21	GND (FIXED)
C22	PCIE_RX7+	D22	PCIE_TX7+
C23	PCIE_RX7-	D23	PCIE_TX7-
C24	DDI1_HPD	D24	RSVD
C25	DDI1_PAIR4+	D25	RSVD
C26	DDI1_PAIR4-	D26	DDI1_PAIR0+
C27	RSVD	D27	DDI1_PAIR0-
C28	RSVD	D28	RSVD
C29	DDI1_PAIR5+	D29	DDI1_PAIR1+
C30	DDI1_PAIR5-	D30	DDI1_PAIR1-
C31	GND (FIXED)	D31	GND (FIXED)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	RSVD	D35	RSVD
C36	DDI3_CTRLCLK_AUX+	D36	DDI1_PAIR3+
C37	DDI3_CTRLDATA_AUX-	D37	DDI1_PAIR3-
C38	DDI3_DDC_AUX_SEL	D38	RSVD
C39	DDI3_PAIR0+	D39	DDI2_PAIR0+
C40	DDI3_PAIR0-	D40	DDI2_PAIR0-
C41	GND (FIXED)	D41	GND (FIXED)
C42	DDI3_PAIR1+	D42	DDI2_PAIR1+
C43	DDI3_PAIR1-	D43	DDI2_PAIR1-
C44	DDI3_HPD	D44	DDI2_HPD
C45	RSVD	D45	RSVD
C46	DDI3_PAIR2+	D46	DDI2_PAIR2+
C47	DDI3_PAIR2-	D47	DDI2_PAIR2-
C48	RSVD	D48	RSVD
C49	DDI3_PAIR3+	D49	DDI2_PAIR3+
C50	DDI3_PAIR3-	D50	DDI2_PAIR3-

Row C		Row D	
C51	GND (FIXED)	D51	GND (FIXED)
C52	PEG_RX0+	D52	PEG_TX0+
C53	PEG_RX0-	D53	PEG_TX0-
C54	TYPE0#	D54	PEG_LANE_RV#
C55	PEG_RX1+	D55	PEG_TX1+
C56	PEG_RX1-	D56	PEG_TX1-
C57	TYPE1#	D57	TYPE2#
C58	PEG_RX2+	D58	PEG_TX2+
C59	PEG_RX2-	D59	PEG_TX2-
C60	GND (FIXED)	D60	GND (FIXED)
C61	PEG_RX3+	D61	PEG_TX3+
C62	PEG_RX3-	D62	PEG_TX3-
C63	RSVD	D63	RSVD
C64	RSVD	D64	RSVD
C65	PEG_RX4+	D65	PEG_TX4+
C66	PEG_RX4-	D66	PEG_TX4-
C67	NC	D67	GND
C68	PEG_RX5+	D68	PEG_TX5+
C69	PEG_RX5-	D69	PEG_TX5-
C70	GND (FIXED)	D70	GND (FIXED)
C71	PEG_RX6+	D71	PEG_TX6+
C72	PEG_RX6-	D72	PEG_TX6-
C73	GND	D73	GND
C74	PEG_RX7+	D74	PEG_TX7+
C75	PEG_RX7-	D75	PEG_TX7-
C76	GND	D76	GND
C77	RSVD	D77	RSVD
C78	PEG_RX8+	D78	PEG_TX8+
C79	PEG_RX8-	D79	PEG_TX8-
C80	GND (FIXED)	D80	GND (FIXED)
C81	PEG_RX9+	D81	PEG_TX9+
C82	PEG_RX9-	D82	PEG_TX9-
C83	RSVD	D83	RSVD
C84	GND	D84	GND
C85	PEG_RX10+	D85	PEG_TX10+
C86	PEG_RX10-	D86	PEG_TX10-
C87	GND	D87	GND
C88	PEG_RX11+	D88	PEG_TX11+
C89	PEG_RX11-	D89	PEG_TX11-
C90	GND (FIXED)	D90	GND (FIXED)
C91	PEG_RX12+	D91	PEG_TX12+
C92	PEG_RX12-	D92	PEG_TX12-
C93	GND	D93	GND
C94	PEG_RX13+	D94	PEG_TX13+
C95	PEG_RX13-	D95	PEG_TX13-
C96	GND	D96	GND
C97	RSVD	D97	RSVD
C98	PEG_RX14+	D98	PEG_TX14+
C99	PEG_RX14-	D99	PEG_TX14-
C100	GND (FIXED)	D100	GND (FIXED)
C101	PEG_RX15+	D101	PEG_TX15+
C102	PEG_RX15-	D102	PEG_TX15-
C103	GND	D103	GND
C104	VCC_12V	D104	VCC_12V
C105	VCC_12V	D105	VCC_12V
C106	VCC_12V	D106	VCC_12V
C107	VCC_12V	D107	VCC_12V
C108	VCC_12V	D108	VCC_12V
C109	VCC_12V	D109	VCC_12V
C110	GND (FIXED)	D110	GND (FIXED)

18

COM Express Connectors Signal Description

Pin Types
I   Input to the Module
O   Output from the Module
I/O   Bi-directional input / output signal
OD   Open drain output

AC97/HDA Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
AC/HAD_RST#	A30	O CMOS	3.3V Suspend/3.3V		Connect to CODEC pin 11 RESET#	Reset output to CODEC, active low.
AC/HDA_SYNC	A29	O CMOS	3.3V/3.3V	PU 1K to 3.3VSB	Connect to CODEC pin 10 SYNC	Sample-synchronization signal to the CODEC(s).
AC/HDA_BITCLK	A32	I/O CMOS	3.3V/3.3V		Connect to CODEC pin 6 BIT_CLK	Serial data clock generated by the external CODEC(s).
AC/HDA_SDOUT	A33	O CMOS	3.3V/3.3V		Connect to CODEC pin 5 SDATA_OUT	Serial TDM data output to the CODEC.
AC/HDA_SDIN2	B28	I/O CMOS	3.3V Suspend/3.3V		Connect 33 Ω in series to CODEC2 pin 8 SDATA_IN	
AC/HDA_SDIN1	B29	I/O CMOS	3.3V Suspend/3.3V		Connect 33 Ω in series to CODEC1 pin 8 SDATA_IN	Serial TDM data inputs from up to 3 CODECs.
AC/HDA_SDIN0	B30	I/O CMOS	3.3V Suspend/3.3V		Connect 33 Ω in series to CODEC0 pin 8 SDATA_IN	

Gigabit Ethernet Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
GBE0_MDI0+	A13	I/O Analog	3.3V max Suspend		Connect to Magnetics Module MDI0+/-	Gigabit Ethernet Controller 0: Media Dependent Interface Differential Pairs 0,1,2,3. The MDI can operate in 1000, 100 and 10 Mbit / sec modes. Some pairs are unused in some modes, per the following:
GBE0_MDI0-	A12	I/O Analog	3.3V max Suspend			
GBE0_MDI1+	A10	I/O Analog	3.3V max Suspend		Connect to Magnetics Module MDI1+/-	
GBE0_MDI1-	A9	I/O Analog	3.3V max Suspend			
GBE0_MDI2+	A7	I/O Analog	3.3V max Suspend		Connect to Magnetics Module MDI2+/-	1000BASE-T 100BASE-TX 10BASE-T
GBE0_MDI2-	A6	I/O Analog	3.3V max Suspend			MDI[0]+/- B1_DA+/- TX+/- TX+/-
GBE0_MDI3+	A3	I/O Analog	3.3V max Suspend		Connect to Magnetics Module MDI3+/-	MDI[1]+/- B1_DB+/- RX+/- RX+/-
GBE0_MDI3-	A2	I/O Analog	3.3V max Suspend			MDI[2]+/- B1_DC+/- MDI[3]+/- B1_DD+/-
GBE0_ACT#	B2	OD CMOS	3.3V Suspend/3.3V		Connect to LED and **recommend** current limit resistor 150 Ω to 3.3VSB	Gigabit Ethernet Controller 0 activity indicator, active low.
GBE0_LINK#	A8	OD CMOS	3.3V Suspend/3.3V		NC	Gigabit Ethernet Controller 0 link indicator, active low.
GBE0_LINK100#	A4	OD CMOS	3.3V Suspend/3.3V		Connect to LED and **recommend** current limit resistor 150 Ω to 3.3VSB	Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low.
GBE0_LINK1000#	A5	OD CMOS	3.3V Suspend/3.3V		Connect to LED and **recommend** current limit resistor 150 Ω to 3.3VSB	Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low.

SATA Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
SATA0_TX+	A16	O SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA0 Conn TX pin	Serial ATA or SAS Channel 0 transmit differential pair.
SATA0_TX-	A17	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA0_RX+	A19	I SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA0 Conn RX pin	Serial ATA or SAS Channel 0 receive differential pair.
SATA0_RX-	A20	I SATA	AC coupled on Module	AC Coupling capacitor		
SATA1_TX+	B16	O SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA1 Conn TX pin	Serial ATA or SAS Channel 1 transmit differential pair.
SATA1_TX-	B17	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA1_RX+	B19	I SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA1 Conn RX pin	Serial ATA or SAS Channel 1 receive differential pair.
SATA1_RX-	B20	I SATA	AC coupled on Module	AC Coupling capacitor		
SATA2_TX+	A22	O SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA2 Conn TX pin	Serial ATA or SAS Channel 2 transmit differential pair.
SATA2_TX-	A23	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA2_RX+	A25	I SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA2 Conn RX pin	Serial ATA or SAS Channel 2 receive differential pair.
SATA2_RX-	A26	I SATA	AC coupled on Module	AC Coupling capacitor		
SATA3_TX+	B22	O SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA3 Conn TX pin	Serial ATA or SAS Channel 3 transmit differential pair.
SATA3_TX-	B23	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA3_RX+	B25	I SATA	AC coupled on Module	AC Coupling capacitor	Connect to SATA3 Conn RX pin	Serial ATA or SAS Channel 3 receive differential pair.
SATA3_RX-	B26	I SATA	AC coupled on Module	AC Coupling capacitor		
ATA_ACT#	A28	I/O CMOS	3.3V / 3.3V	PU 10K to 3.3V	Connect to LED and **recommend** current limit resistor 220Ω to 3.3V	ATA (parallel and serial) or SAS activity indicator, active low.

PCI Express Lanes Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
PCIE_TX0+	A68	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 0
PCIE_TX0-	A69			AC Coupling capacitor		
PCIE_RX0+	B68	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 0
PCIE_RX0-	B69				**Slot** - Connect to PCIE Conn pin	
PCIE_TX1+	A64	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 1
PCIE_TX1-	A65			AC Coupling capacitor		
PCIE_RX1+	B64	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 1
PCIE_RX1-	B65				**Slot** - Connect to PCIE Conn pin	
PCIE_TX2+	A61	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 2
PCIE_TX2-	A62			AC Coupling capacitor		
PCIE_RX2+	B61	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 2
PCIE_RX2-	B62				**Slot** - Connect to PCIE Conn pin	
PCIE_TX3+	A58	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 3
PCIE_TX3-	A59			AC Coupling capacitor		
PCIE_RX3+	B58	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 3
PCIE_RX3-	B59				**Slot** - Connect to PCIE Conn pin	
PCIE_TX4+	A55	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 4
PCIE_TX4-	A56			AC Coupling capacitor		
PCIE_RX4+	B55	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 4
PCIE_RX4-	B56				**Slot** - Connect to PCIE Conn pin	
PCIE_TX5+	A52	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 5
PCIE_TX5-	A53			AC Coupling capacitor		
PCIE_RX5+	B52	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 5
PCIE_RX5-	B53				**Slot** - Connect to PCIE Conn pin	
PCIE_TX6+	D19	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 6
PCIE_TX6-	D20			AC Coupling capacitor		
PCIE_RX6+	C19	I PCIE	AC coupled off Module		**Device** - Connect AC Coupling cap 0.1uF	PCI Express Differential Receive Pairs 6
PCIE_RX6-	C20				**Slot** - Connect to PCIE Conn pin	
PCIE_TX7+	D22	O PCIE	AC coupled on Module	NA	NA	PCI Express Differential Transmit Pairs 7 (Optional with on board LAN, Default setting as NC)
PCIE_TX7-	D23			NA		
PCIE_RX7+	C22	I PCIE	AC coupled off Module		NA	PCI Express Differential Receive Pairs 7 (Optional with on board LAN, Default setting as NC)
PCIE_RX7-	C23					
PCIE0_CK_REF+	A88	O PCIE	PCIE		Connect to PCIE device, **PCIe CLK Buffer** or slot	Reference clock output for all PCI Express and PCI Express Graphics lanes.
PCIE0_CK_REF-	A89					

PEG Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
PEG_TX0+	D52	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 0
PEG_TX0-	D53			AC Coupling capacitor		
PEG_RX0+	C52	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 0
PEG_RX0-	C53					
PEG_TX1+	D55	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 1
PEG_TX1-	D56			AC Coupling capacitor		
PEG_RX1+	C55	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 1
PEG_RX1-	C56					
PEG_TX2+	D58	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 2
PEG_TX2-	D59			AC Coupling capacitor		
PEG_RX2+	C58	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 2
PEG_RX2-	C59					
PEG_TX3+	D61	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 3
PEG_TX3-	D62			AC Coupling capacitor		
PEG_RX3+	C61	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 3
PEG_RX3-	C62					
PEG_TX4+	D65	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 4
PEG_TX4-	D66			AC Coupling capacitor		
PEG_RX4+	C65	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 4
PEG_RX4-	C66					
PEG_TX5+	D68	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 5
PEG_TX5-	D69			AC Coupling capacitor		
PEG_RX5+	C68	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 5
PEG_RX5-	C69					

20

PEG Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
PEG_TX6+	D71	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 6
PEG_TX6-	D72			AC Coupling capacitor		
PEG_RX6+	C71	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 6
PEG_RX6-	C72					
PEG_TX7+	D74	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 7
PEG_TX7-	D75			AC Coupling capacitor		
PEG_RX7+	C74	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 7
PEG_RX7-	C75					
PEG_TX8+	D78	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 8
PEG_TX8-	D79			AC Coupling capacitor		
PEG_RX8+	C78	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 8
PEG_RX8-	C79					
PEG_TX9+	D81	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 9
PEG_TX9-	D82			AC Coupling capacitor		
PEG_RX9+	C81	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 9
PEG_RX9-	C82					
PEG_TX10+	D85	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 10
PEG_TX10-	D86			AC Coupling capacitor		
PEG_RX10+	C85	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 10
PEG_RX10-	C86					
PEG_TX11+	D88	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 11
PEG_TX11-	D89			AC Coupling capacitor		
PEG_RX11+	C88	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 11
PEG_RX11-	C89					
PEG_TX12+	D91	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 12
PEG_TX12-	D92			AC Coupling capacitor		
PEG_RX12+	C91	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 12
PEG_RX12-	C92					
PEG_TX13+	D94	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 13
PEG_TX13-	D95			AC Coupling capacitor		
PEG_RX13+	C94	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 13
PEG_RX13-	C95					
PEG_TX14+	D98	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 14
PEG_TX14-	D99			AC Coupling capacitor		
PEG_RX14+	C98	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 14
PEG_RX14-	C99					
PEG_TX15+	D101	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Graphics transmit differential pairs 15
PEG_TX15-	D102			AC Coupling capacitor		
PEG_RX15+	C101	I PCIE	AC coupled off Module		Connect AC Coupling cap 0.22uF	PCI Express Graphics receive differential pairs 15
PEG_RX15-	C102					
PEG_LANE_RV#	D54	I CMOS	3.3V / 3.3V			PCI Express Graphics lane reversal input strap. Pull low on the Carrier board to reverse lane order.

ExpressCard Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
EXCD0_CPPE#	A49	I CMOS	3.3V /3.3V	PU 10k to 3.3V		PCI ExpressCard: PCI Express capable card request, active low, one per card
EXCD1_CPPE#	B48			PU 10k to 3.3V		
EXCD0_PERST#	A48	O CMOS	3.3V /3.3V			PCI ExpressCard: reset, active low, one per card
EXCD1_PERST#	B47					

21

DDI Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
DDI1_PAIR0+/SDVO1_RED+	D26	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 0 differential pairs/Serial Digital Video B red output differential pair
DDI1_PAIR0-/SDVO1_RED-	D27				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR1+/SDVO1_GRN+	D29	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 1 differential pairs/Serial Digital Video B green output differential pair
DDI1_PAIR1-/SDVO1_GRN-	D30				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR2+/SDVO1_BLU+	D32	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 2 differential pairs/Serial Digital Video B blue output differential pair
DDI1_PAIR2-/SDVO1_BLU-	D33				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR3+/SDVO1_CK+	D36	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 3 differential pairs/Serial Digital Video B clock output differential pair.
DDI1_PAIR3-/SDVO1_CK-	D37				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR4+/SDVO1_INT+	C25	I PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	Serial Digital Video B interrupt input differential pair.
DDI1_PAIR4-/SDVO1_INT-	C26				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR5+/SDVO1_TVCLKIN+	C29	I PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	Serial Digital Video TVOUT synchronization clock input differential pair.
DDI1_PAIR5-/SDVO1_TVCLKIN-	C30				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR6+/SDVO1_FLDSTALL+	C15	I PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	Serial Digital Video Field Stall input differential pair.
DDI1_PAIR6-/SDVO1_FLDSTALL-	C16				Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_CTRLCLK_AUX+/SDVO1_CTRLCLK	D15	I/O PCIE	AC coupled on Module	PD 49.9K to GND **(S/W IC between Rpd/PCH)**	Connect to DP AUX+	DP AUX+ function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V, PD 49.9K to GND **(S/W IC between 2.2K/49.9K resistor)**	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI1_DDC_AUX_SEL is pulled high
DDI1_CTRLCLK_AUX-/SDVO1_CTRLDATA	D16	I/O PCIE	AC coupled on Module	PU 100K to 3.3V **(S/W IC between Rpu/PCH)**	Connect to DP AUX-	DP AUX- function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V/PU 100K to 3.3V **(S/W IC between 2.2K/100K resistor)**	Connect to HDMI/DVI I2C CTRLDATA	HDMI/DVI I2C CTRLDATA if DDI1_DDC_AUX_SEL is pulled high
DDI1_HPD	C24	I CMOS	3.3V / 3.3V		PD 1M and Connect to device Hot Plug Detect	DDI Hot-Plug Detect
DDI1_DDC_AUX_SEL	D34	I CMOS	3.3V / 3.3V	PD 1M	PU 100K to 3.3V for DDC(HDMI/DVI)	Selects the function of DDI1_CTRLCLK_AUX+ and DDI1_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI2_PAIR0+	D39	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 2 Pair 0 differential pairs
DDI2_PAIR0-	D40				Connect AC Coupling Capacitors 0.1uF to Device	
DDI2_PAIR1+	D42	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 2 Pair 1 differential pairs
DDI2_PAIR1-	D43				Connect AC Coupling Capacitors 0.1uF to Device	
DDI2_PAIR2+	D46	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 2 Pair 2 differential pairs
DDI2_PAIR2-	D47				Connect AC Coupling Capacitors 0.1uF to Device	
DDI2_PAIR3+	D49	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 2 Pair 3 differential pairs
DDI2_PAIR3-	D50				Connect AC Coupling Capacitors 0.1uF to Device	
DDI2_CTRLCLK_AUX+	C32	I/O PCIE	AC coupled on Module	PD 49.9K to GND **(S/W IC between Rpd/PCH)**	Connect to DP AUX+	DP AUX+ function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V, PD 49.9K to GND **(S/W IC between 2.2K/49.9K resistor)**	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI2_DDC_AUX_SEL is pulled high
DDI2_CTRLCLK_AUX-	C33	I/O PCIE	AC coupled on Module	PU 100K to 3.3V **(S/W IC between Rpu/PCH)**	Connect to DP AUX-	DP AUX- function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V/PU 100K to 3.3V **(S/W IC between 2.2K/100K resistor)**	Connect to HDMI/DVI I2C CTRLDATA	HDMI/DVI I2C CTRLDATA if DDI2_DDC_AUX_SEL is pulled high

DDI Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
DDI2_HPD	D44	I CMOS	3.3V / 3.3V		PD 1M and Connect to device Hot Plug Detect	DDI Hot-Plug Detect
DDI2_DDC_AUX_SEL	C34	I CMOS	3.3V / 3.3V	PD 1M to GND	PU 100K to 3.3V for DDC(HDMI/DVI)	Selects the function of DDI2_CTRLCLK_AUX+ and DDI2_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI3_PAIR0+	C39	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 3 Pair 0 differential pairs
DDI3_PAIR0-	C40				Connect AC Coupling Capacitors 0.1uF to Device	
DDI3_PAIR1+	C42	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 3 Pair 1 differential pairs
DDI3_PAIR1-	C43				Connect AC Coupling Capacitors 0.1uF to Device	
DDI3_PAIR2+	C46	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 3 Pair 2 differential pairs
DDI3_PAIR2-	C47				Connect AC Coupling Capacitors 0.1uF to Device	
DDI3_PAIR3+	C49	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 3 Pair 3 differential pairs
DDI3_PAIR3-	C50				Connect AC Coupling Capacitors 0.1uF to Device	
DDI3_CTRLCLK_AUX+	C36	I/O PCIE	AC coupled on Module	PD 49.9K to GND (S/W IC between Rpd/PCH)	Connect to DP AUX+	DP AUX+ function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V, PD 49.9K to GND (S/W IC between 2.2 k/49.9K resistor)	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI3_DDC_AUX_SEL is pulled high
DDI3_CTRLCLK_AUX-	C37	I/O PCIE	AC coupled on Module	PU 100K to 3.3V (S/W IC between Rpu/PCH)	Connect to DP AUX-	DP AUX- function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V/PU 100K to 3.3V (S/W IC between 2.2K/100K resistor)	Connect to HDMI/DVI I2C CTRLDATA	HDMI/DVI I2C CTRLDATA if DDI3_DDC_AUX_SEL is pulled high
DDI3_HPD	C44	I CMOS	3.3V / 3.3V		PD 1M and Connect to device Hot Plug Detect	DDI Hot-Plug Detect
DDI3_DDC_AUX_SEL	C38	I CMOS	3.3V / 3.3V	PD 1M to GND	PU 100K to 3.3V for DDC(HDMI/DVI)	Selects the function of DDI3_CTRLCLK_AUX+ and DDI3_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort

USB Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
USB0+	A46	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 0
USB0-	A45					
USB1+	B46	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 1
USB1-	B45					
USB2+	A43	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 2
USB2-	A42					
USB3+	B43	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 3
USB3-	B42					
USB4+	A40	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 4
USB4-	A39					
USB5+	B40	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 5
USB5-	B39					

USB Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
USB6+	A37	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 6
USB6-	A36					
USB7+	B37	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 7, USB7 may be configured as a USB client or as a host, or both, at the Module designer's discretion.(CR901-B default set as a host)
USB7-	B36					
USB_0_1_OC#	B44	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 0 and 1. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_2_3_OC#	A44	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 2 and 3. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_4_5_OC#	B38	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 4 and 5. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_6_7_OC#	A38	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 6 and 7. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_SSTX0+	D4	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX0-	D3			AC Coupling capacitor		
USB_SSRX0+	C4	I PCIE	AC coupled off Modul		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX0-	C3					
USB_SSTX1+	D7	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX1-	D6			AC Coupling capacitor		
USB_SSRX1+	C7	I PCIE	AC coupled off Modul		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX1-	C6					
USB_SSTX2+	D10	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX2-	D9			AC Coupling capacitor		
USB_SSRX2+	C10	I PCIE	AC coupled off Modul		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX2-	C9					
USB_SSTX3+	D13	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX3-	D12			AC Coupling capacitor		
USB_SSRX3+	C13	I PCIE	AC coupled off Modul		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX3-	C12					

24

LVDS Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
LVDS_A0+	A71	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel A differential pairs Ther LVDS flat panel differential pairs (LVDS_A[0:3]+/-, LVDS_B[0:3]+/-. LVDS_A_CK+/-, LVDS_B_CK+/-) shall have 100Ω terminations across the pairs at the destination. These terminations may be on the Carrier Board if the Carrier Board implements a LVDS deserializer on-board
LVDS_A0-	A72					
LVDS_A1+	A73	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A1-	A74					
LVDS_A2+	A75	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A2-	A76					
LVDS_A3+	A78	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A3-	A79					
LVDS_A_CK+	A81	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel A differential clock
LVDS_A_CK-	A82					
LVDS_B0+	B71	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel B differential pairs Ther LVDS flat panel differential pairs (LVDS_A[0:3]+/-, LVDS_B[0:3]+/-. LVDS_A_CK+/-, LVDS_B_CK+/-) shall have 100Ω terminations across the pairs at the destination. These terminations may be on the Carrier Board if the Carrier Board implements a LVDS deserializer on-board
LVDS_B0-	B72					
LVDS_B1+	B73	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B1-	B74					
LVDS_B2+	B75	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B2-	B76					
LVDS_B3+	B77	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B3-	B78					
LVDS_B_CK+	B81	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel B differential clock
LVDS_B_CK-	B82					
LVDS_VDD_EN	A77	O CMOS	3.3V / 3.3V	PD 100K to GND	Connect to enable control of LVDS panel power circuit	LVDS panel power enable
LVDS_BKLT_EN	B79	O CMOS	3.3V / 3.3V	PD 100K to GND	Connect to enable control of LVDS panel backlight power circuit.	LVDS panel backlight enable
LVDS_BKLT_CTRL	B83	O CMOS	3.3V / 3.3V	PD 100K to GND	Connect to brightness control of LVDS panel backlight power circuit.	LVDS panel backlight brightness control
LVDS_I2C_CK	A83	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	Connect to DDC clock of LVDS panel	I2C clock output for LVDS display use
LVDS_I2C_DAT	A84	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	Connect to DDC data of LVDS panel	I2C data line for LVDS display use

LPC Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
LPC_AD0	B4	I/O CMOS	3.3V / 3.3V		Connect to LPC device	LPC multiplexed address, command and data bus
LPC_AD1	B5					
LPC_AD2	B6					
LPC_AD3	B7					
LPC_FRAME#	B3	O CMOS	3.3V / 3.3V			LPC frame indicates the start of an LPC cycle
LPC_DRQ0#	B8	I CMOS	3.3V / 3.3V			LPC serial DMA request
LPC_DRQ1#	B9					
LPC_SERIRQ	A50	I/O CMOS	3.3V / 3.3V	PU 10K to 3.3V		LPC serial interrupt
LPC_CLK	B10	O CMOS	3.3V / 3.3V			LPC clock output - 33MHz nominal

25

SPI Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
SPI_CS#	B97	O CMOS	3.3V Suspend/3.3V		**Connect a series resistor 33Ω to Carrier Board SPI Device CS# pin**	Chip select for Carrier Board SPI - may be sourced from chipset SPI0 or SPI1
SPI_MISO	A92	I CMOS	3.3V Suspend/3.3V		**Connect a series resistor 33Ω to Carrier Board SPI Device SO pin**	Data in to Module from Carrier SPI
SPI_MOSI	A95	O CMOS	3.3V Suspend/3.3V		**Connect a series resistor 33Ω to Carrier Board SPI Device SI pin**	Data out from Module to Carrier SPI
SPI_CLK	A94	O CMOS	3.3V Suspend/3.3V		**Connect a series resistor 33Ω to Carrier Board SPI Device SCK pin**	Clock from Module to Carrier SPI
SPI_POWER	A91	O	3.3V Suspend/3.3V			Power supply for Carrier Board SPI – sourced from Module – nominally 3.3V. The Module shall provide a minimum of 100mA on SPI_POWER. Carriers shall use less than 100mA of SPI_POWER. SPI_POWER shall only be used to power SPI devices on the Carrier
BIOS_DIS0#	A34					Selection straps to determine the BIOS boot device. The Carrier should only float these or pull them low, please refer to COM Express Module Base Specification Revision 2.1 for strapping options of BIOS disable signals.
BIOS_DIS1#	B88	I CMOS	NA			

VGA Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
VGA_RED	B89	O Analog	Analog	PD 150R	PD 150R	Red for monitor. Analog output
VGA_GRN	B91	O Analog	Analog	PD 150R	PD 150R	Green for monitor. Analog output
VGA_BLU	B92	O Analog	Analog	PD 150R	PD 150R	Blue for monitor. Analog output
VGA_HSYNC	B93	O CMOS	3.3V / 3.3V			Horizontal sync output to VGA monitor
VGA_VSYNC	B94	O CMOS	3.3V / 3.3V			Vertical sync output to VGA monitor
VGA_I2C_CK	B95	I/O OD CMOS	3.3V / 3.3V	PD 2.2K to 3.3V		DDC clock line (I2C port dedicated to identify VGA monitor capabilities)
VGA_I2C_DAT	B96	I/O OD CMOS	3.3V / 3.3V	PD 2.2K to 3.3V		DDC data line.

Serial Interface Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
SER0_TX	A98	O CMOS	5V/5V		PD 4.7K	General purpose serial port 0 transmitter
SER0_RX	A99	I CMOS	3.3V/5V	PU 47K to 3.3V		General purpose serial port 0 receiver
SER1_TX	A101	O CMOS	5V/5V		PD 4.7K	General purpose serial port 1 transmitter
SER1_RX	A102	I CMOS	3.3V/5V	PU 47K to 3.3V		General purpose serial port 1 receiver

Miscellaneous Signal Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
I2C_CK	B33	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		General purpose I2C port clock output
I2C_DAT	B34	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		General purpose I2C port data I/O line
SPKR	B32	O CMOS	3.3V / 3.3V			Output for audio enunciator - the "speaker" in PC-AT systems. This port provides the PC beep signal and is mostly intended for debugging purposes.
WDT	B27	O CMOS	3.3V / 3.3V			Output indicating that a watchdog time-out event has occurred.
FAN_PWNOUT	B101	O OD CMOS	3.3V / 12V			Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan's RPM.
FAN_TACHIN	B102	I OD CMOS	3.3V / 12V			Fan tachometer input for a fan with a two pulse output.
TPM_PP	A96	I CMOS	3.3V / 3.3V	PD 1K		Trusted Platform Module (TPM) Physical Presence pin. Active high. TPM chip has an internal pull down. This signal is used to indicate Physical Presence to the TPM.

Power and System Management Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
PWRBTN#	B12	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		A falling edge creates a power button event. Power button events can be used to bring a system out of S5 soft off and other suspend states, as well as powering the system down.
SYS_RESET#	B49	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3V		Reset button input. Active low request for Module to reset and reboot. May be falling edge sensitive. For situations when SYS_RESET# is not able to reestablish control of the system, PWR_OK or a power cycle may be used.
CB_RESET#	B50	O CMOS	3.3V Suspend/3.3V			Reset output from Module to Carrier Board. Active low. Issued by Module chipset and may result from a low SYS_RESET# input, a low PWR_OK input, a VCC_12V power input that falls below the minimum specification, a watchdog timeout, or may be initiated by the Module software.
PWR_OK	B24	I CMOS	3.3V / 3.3V	PU 10K to 3.3V		Power OK from main power supply. A high value indicates that the power is good. This signal can be used to hold off Module startup to allow Carrier based FPGAs or other configurable devices time to be programmed.
SUS_STAT#	B18	O CMOS	3.3V Suspend/3.3V			Indicates imminent suspend operation; used to notify LPC devices.
SUS_S3#	A15	O CMOS	3.3V Suspend/3.3V			Indicates system is in Suspend to RAM state. Active low output. An inverted copy of SUS_S3# on the Carrier Board may be used to enable the non-standby power on a typical ATX supply.
SUS_S4#	A18	O CMOS	3.3V Suspend/3.3V			Indicates system is in Suspend to Disk state. Active low output.
SUS_S5#	A24	O CMOS	3.3V Suspend/3.3V			Indicates system is in Soft Off state.
WAKE0#	B66	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		PCI Express wake up signal.
WAKE1#	B67	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		General purpose wake up signal. May be used to implement wake-up on PS2 keyboard or mouse activity.
BATLOW#	A27	I CMOS	3.3V Suspend/ 3.3V	PU 10K to 3.3VSB		Indicates that external battery is low. This port provides a battery-low signal to the Module for orderly transitioning to power saving or power cut-off ACPI modes.
LID#	A103	I OD CMOS	3.3V Suspend/12V			LID switch. Low active signal used by the ACPI operating system for a LID switch.
SLEEP#	B103	I OD CMOS	3.3V Suspend/12V	PU 10K to 3.3VSB		Sleep button. Low active signal used by the ACPI operating system to bring the system to sleep state or to wake it up again.
THRM#	B35	I CMOS	3.3V / 3.3V	PU 10K to 3.3V		Input from off-Module temp sensor indicating an over-temp situation.
THRMTRIP#	A35	O CMOS	3.3V / 3.3V	PU 10K to 3.3V		Active low output indicating that the CPU has entered thermal shutdown.
SMB_CK	B13	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		System Management Bus bidirectional clock line.
SMB_DAT	B14	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		System Management Bus bidirectional data line.
SMB_ALERT#	B15	I CMOS	3.3V Suspend/3.3V			System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system.

GPIO Signals Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
GPO0	A93	O CMOS	3.3V / 3.3V			General purpose output pins.
GPO1	B54					
GPO2	B57					
GPO3	B63					
GPI0	A54	I CMOS	3.3V / 3.3V	PU 47K to 3.3V		General purpose input pins.
GPI1	A63			PU 47K to 3.3V		
GPI2	A67			PU 47K to 3.3V		
GPI3	A85			PU 47K to 3.3V		

27

Power and GND Signal Descriptions

Signal	Pin#	Pin Type	Pwr Rail /Tolerance	CR960	Carrier Board	Description
VCC_12V	A104~A109 B104~B109 C104~C109 D104~D109	Power				Primary power input: +12V nominal. All available VCC_12V pins on the connector(s) shall be used.
VCC_5V_SBY	B84~B87	Power				Standby power input: +5.0V nominal. If VCC5_SBY is used, all available VCC_5V_SBY pins on the connector(s) shall be used. Only used for standby and suspend functions. May be left unconnected if these functions are not used in the system design.
VCC_RTC	A47	Power				Real-time clock circuit-power input. Nominally +3.0V.
GND	A1, A11, A21, A31, A41, A51, A57, A60, A66, A70, A80, A90, A100, A110, B1, B11, B21 ,B31, B41, B51, B60, B70, B80, B90, B100, B110, C1, C2, C5, C8, C11, C14, C21, C31, C41, C51, C60, C70, C73, C76, C80, C84, C87, C90, C93, C96, C100, C103, C110, D1, D2, D5, D8, D11, D14, D21, D31, D51, D60, D67, D70, D73, D76, D80, D84, D87, D90, D93, D96, D100, D103, D110	Power				Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to Carrier Board GND plane.

Standby Power LED
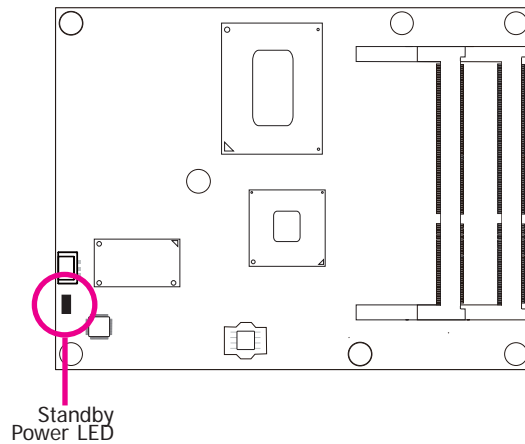
Standby
Power LED

This LED will light when the system is in the standby mode.

Cooling Option

Heat Spreader with Heat Sink and Fan

Note:
The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.

Top View of the Heat Sink
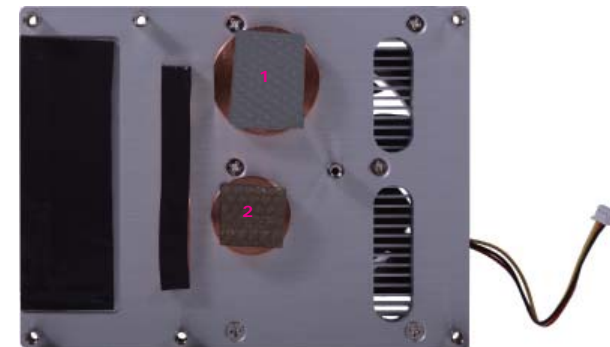
Bottom View of the Heat Sink

• "1" and "2" denote the locations of the thermal pads designed to contact the corresponding components that are on CR960-QM77/HM76.

Important:
Remove the plastic covering from the thermal pads prior to mounting the heat sink onto CR960-QM77/HM76.

29

Installing CR960-QM77/HM76 onto a Carrier Board

Important:
The carrier board (COM331-B) used in this section is only for the purpose of reference and may not resemble your carrier board. These illustrations are mainly to guide you on how to install CR960-QM77/HM76 onto the carrier board of your choice.

• **To download COM331-B datasheet and manual**

1. Use the provided screw to install the heatsink onto the module. First align the mounting hole of the heatsink with the mounting hole of the module and then from the bottom side of the module, secure them with the provided screw. The module and heatsink as sembly should look like the one shown below.

bottom side of heat sink

Mounting hole

Mounting hole

Mounting screw

Bottom view   Top view
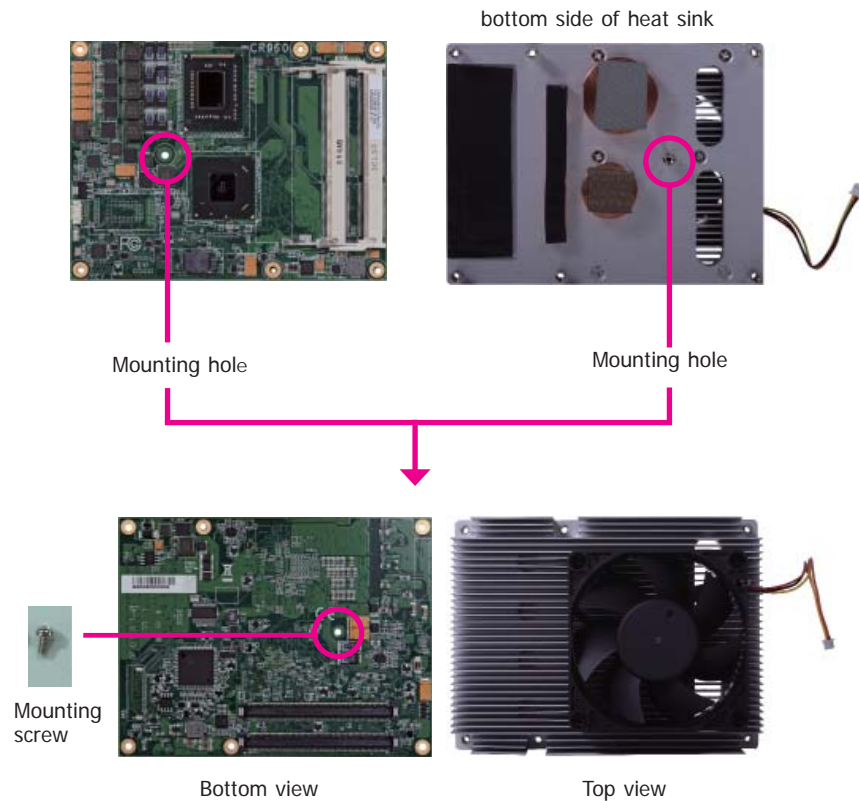
2. Now install the module and heatsink assembly onto the carrier board. The photo below shows the locations of the mounting holes on carrier board.
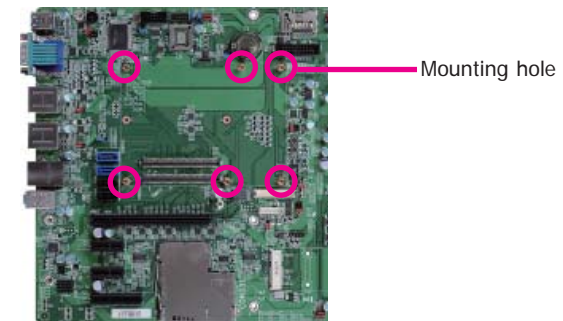
Mounting hole

3. Insert the provided mounting screws into the mounting holes - from the bottom through the top of the carrier board.

Mounting screws

30
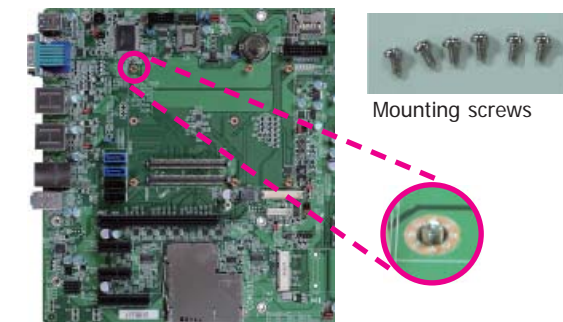
4. While supporting the mounting screw at the bottom, from the top side of the board, fasten a bolt into the screw.
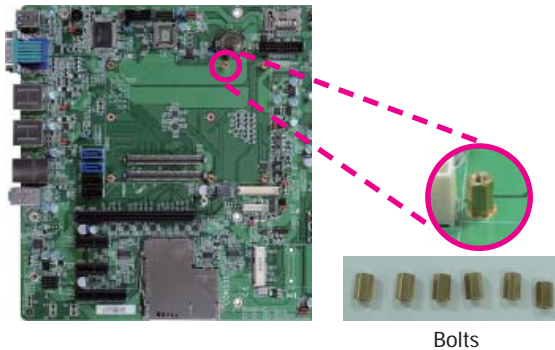
Bolts

5. The photo below shows the solder side of the board with the screws already fixed in place.

Mounting screw
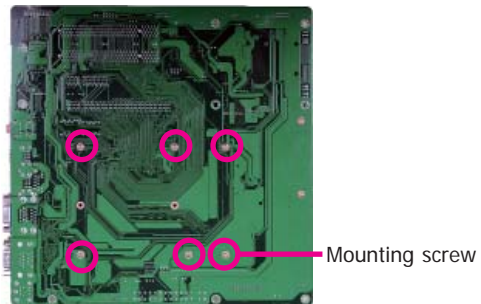
6. The photo below shows the component side of the board with the bolts already fixed in place.

Bolts
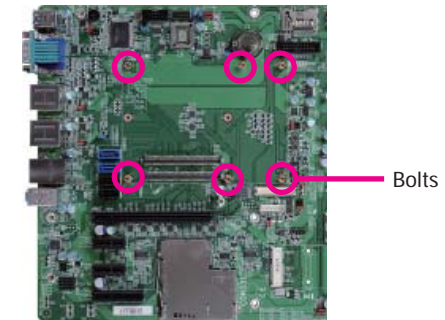
7. Position the heat sink on the top of CR960-QM77/HM76 with the heat sink's mounting holes aligned with CR960-QM77/HM76 mounting holes. Insert one of the provided long screws into the mounting hole shown in the photo below.

Mounting hole

Long screw

31
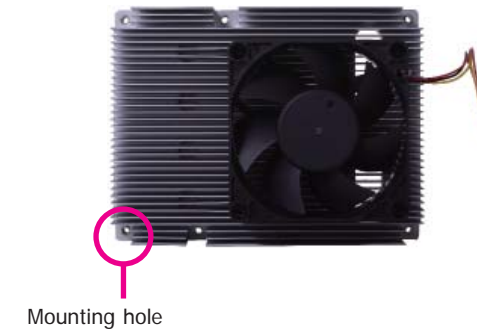
8. From the bottom of the board, fasten the provided bolt into the screw and then connect the heat spreader/heat spreader with heat sink and fan's cable to the fan connector on CR960-QM77/HM76.

Fan connector

9. Grasping CR960-QM77/HM76 by its edges, position it on top of the carrier board with its mounting holes aligned with the bolts on the carrier board. This will also align the COM Express connectors of the two boards to each other.

COM Express connectors on CR960-QM77/HM76
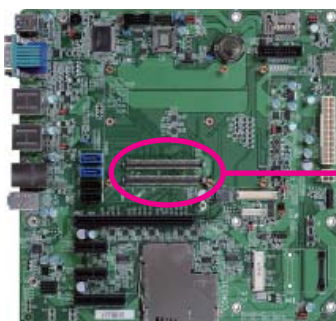
COM Express connectors on the carrier board

10. Press CR960-QM77/HM76 down firmly until it is completely seated on the COM Express connectors of the carrier board.
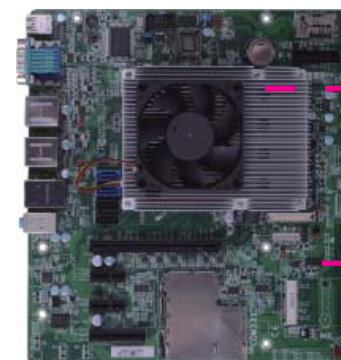
CR960-QM77/HM76

Carrier board

11. Use the provided mounting screws to secure CR960-QM77/HM76 with heat sink to the carrier board. The photo below shows the locations of the long/short mounting screws.

Long screws

32
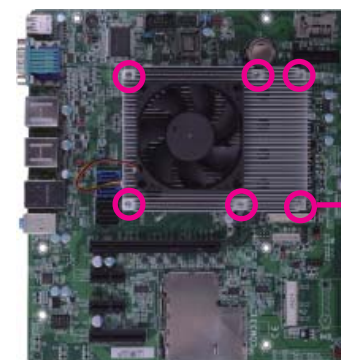
Chapter 4 - BIOS Setup

Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.

It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.

Note:
The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.

The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

Legends

KEYs	Function
Right and Left Arrows	Moves the highlight left or right to select a menu.
Up and Down Arrows	Moves the highlight up or down between submenus or fields.
<Esc>	Exits to the BIOS setup utility
+ (plus key)	Scrolls forward through the values or options of the hightlighted field.
- (minus key)	Scolls backward through the values or options of the hightlighted field.
<F1>	Displays general help
<F2>	Displays previous values
<F3>	Optimized defaults
<Enter>	Press <Enter> to enter the highlighted submenu

Scroll Bar

When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu

When "▶" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

AMI BIOS Setup Utility

Main

The Main menu is the first screen that you will see when entering the BIOS Setup Utility.

```
             Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
      Main   Advanced   Chipset   Boot   Security   Save & Exit

                                                        Choose the system default
   BIOS Information                                     language
   BIOS Vendor                   American Megatrends
   Core Version                  4.6.5.3
   Compliancy                    UEFI 2.3; PI 1.2
   Project Version               1APTJ 0.18 64x
   Build Date and Time           07/15/2013 19:16:49

   System Language               [English]

   System Date                   [Tue 01/06/2009]
   System Time                   [05:16:19]
                                                        →←:  Select Screen
   Access Level                  Administraor           ↑↓:   Select Item
                                                        Enter: Select
                                                        +/-:    Change Opt.
                                                        F1:     General Help
                                                        F2:     Previous Values
                                                        F3:     Optimized Defaults
                                                        ESC:  Exit

               Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

System Date

The date format is <day>, <month>, <date>, <year>. Day displays a day, from Sunday to Saturday. Month displays the month, from January to December. Date displays the date, from 1 to 31. Year displays the year, from 1980 to 2099.

System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.

> **Important:**
> Setting incorrect field values may cause the system to malfunction.

```
             Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
      Main   Advanced   Chipset   Boot   Security   Save & Exit

   ▶ ACPI Settings                                      System ACPI Parameters.
   ▶ PC Health Status
   ▶ CPU Configuration
   ▶ SATA Configuration
   ▶ Intel TXT(LT) Configuration
   ▶ PCH-FW Configuration
   ▶ Intel(R) Anti-Theft Technology Configuration
   ▶ USB Configuration
   ▶ Network Stack
   ▶ CPU PPM Configuration
   ▶ WatchDog Configuration
                                                        →←:  Select Screen
                                                        ↑↓:   Select Item
                                                        Enter: Select
                                                        +/-:    Change Opt.
                                                        F1:     General Help
                                                        F2:     Previous Values
                                                        F3:     Optimized Defaults
                                                        ESC:  Exit

               Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

ACPI Settings

This section is used to configure the ACPI parameters.

```
          Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
   Advanced

 ACPI Settings                                          Enables or Disables BIOS
                                                        ACPI Auto Configuration.
 Enable ACPI Auto Configuration       [Disabled]

 ACPI Sleep State                     [S3 (Suspend to RAM)]

 Resume by PME                        [Disabled]
 Resume by RTC Alarm                  [Disabled]


                                                        → ←:  Select Screen
                                                        ↑↓:    Select Item
                                                        Enter: Select
                                                        +/-:   Change Opt.
                                                        F1:    General Help
                                                        F2:    Previous Values
                                                        F3:    Optimized Defaults
                                                        ESC:  Exit

              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Enable ACPI Auto Configuration

Enable or disable ACPI Auto Configuration.

ACPI Sleep State

Select the highest ACPI sleep state that the system will enter when the Suspend button is pressed.

S1(CSC) Enable the CPU Stop Clock function.

S3(STR) Enable the Suspend to RAM function.

Resume by PME

Enable this field to use the PME signal to wake up the system (via PCI, PCIE and onboard LAN).

Resume by RTC Alarm

When Enabled, the system uses the RTC to generate a wakeup event.

PC Health Status

This section displays hardware health monitor.

```
          Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
   Advanced

 System Hardware Monitor                                Enable/ Disable CPU
 CPU Smart Fan               [Enabled]                  SmartFan
 CPU Temperature             : +46 C
 CPU FAN Speed               : N/A
 System FAN Speed            : 7986 RPM
 VCore                       : +0.873 V
 VCCRTC                      : +3.337 V
 DDR                         : +1.513 V
 +1.05V                      : +1.046 V
 CPU VCCSA                   : +0.794 V
 EC Version                  2013.06.11 V1.1
                                                        → ←:  Select Screen
                                                        ↑↓:    Select Item
                                                        Enter: Select
                                                        +/-:   Change Opt.
                                                        F1:    General Help
                                                        F2:    Previous Values
                                                        F3:    Optimized Defaults
                                                        ESC:  Exit

              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

CPU Smart Fan

When this feature is enabled, the speed of CPU's fan will rotate according to the CPU's temperature. The higher the temperature, the faster the speed of rotation.

35

CPU Configuration

This section is used to configure the CPU. It will also display the detection of CPU information.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
     Advanced

                                                      Disabled for Windows XP.
  CPU Configuration

  Intel(R) Celeron(R) CPU 827E @1.40GHz
  CPU Signature                206a7
  Microcode Patch              25
  Max CPU Speed                1400 MHz
  Min CPU Speed                800 MHz
  CPU Speed                    1400 MHz
  Processor Cores              1
  Intel HT Technology          Not Supported
  Intel VT-X Technology        Supported
  Intel SMX Technology         Not Supported
  64-bit                       Supported

  L1 Data Cache                32 KB x 1
  L1 Code Cache                32 KB x 1      → ←:  Select Screen
  L2 Cache                     256 KB x 1     ↑↓:   Select Item
  L3 Cache                     1536 KB        Enter: Select
                                              +/-:   Change Opt.
  Limit CPUID Maximum          [Disabled]     F1:    General Help
  Intel Virtualization Technology [Diaabled]  F2:    Previous Values
                                              F3:    Optimized Defaults
                                              ESC:  Exit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Limit CPUID Maximum

The CPUID instruction of some newer CPUs will return a value greater than 3. The default is Disabled because this problem does not exist in the Windows series operating systems. If you are using an operating system other than Windows, this problem may occur. To avoid this problem, enable this field to limit the return value to 3 or less than 3.

Intel Virtualization Technology

When this field is set to Enabled, the VMM can utilize the additional hardware capabilities provided by the Intel Virtualization technology. A full reset is required to change the setting.

SATA Configuration

This section is used to configure the settings of SATA device.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
     Advanced

  SATA Controller(s)           [Enabled]             Enable or disable SATA
  SATA Mode Selection          [IDE]                 Device.
  SATA Test Mode               [Disabled]

  Serial ATA Port 0            ST500DM002-1BD (500.1)
    Software Preserve          SUPPORTED
  Serial ATA Port 1            Empty
    Software Preserve          Unknown
  Serial ATA Port 2            ATAPI iHOS10 ATAPI
    Software Preserve          N/A
  Serial ATA Port 3            Empty
    Software Preserve          Unknown          → ←:  Select Screen
                                                ↑↓:   Select Item
                                                Enter: Select
                                                +/-:   Change Opt.
                                                F1:    General Help
                                                F2:    Previous Values
                                                F3:    Optimized Defaults
                                                ESC:  Exit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

SATA Controller(s)

This field is used to enable or disable the Serial ATA device.

SATA Mode Selection

The mode selection determines how the SATA controller(s) operates.

IDE Mode
This option configures the Serial ATA drives as Parallel ATA storage devices.

AHCI Mode
This option allows the Serial ATA devices to use AHCI (Advanced Host Controller Interface).

RAID Mode
This option allows the Serial ATA devices to use RAID 0/1/5/10/Recovery (Redundant Array of Independent Disks).

SATA Test Mode

This field is used to enable or disable the Serial ATA Test Mode.

36

When AHCI is selected in the SATA Mode Selection, it will display the following information:

When RAID is selected in the SATA Mode Selection, it will display the following information:

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

  SATA Controller(s)                [Enabled]          Determines how SATA
  SATA Mode Selection               [AHCI]             controller(s) operate.
  SATA Test Mode                    [Disabled]
  Aggressive LPM Support            [Enabled]
▶ Software Feature Mask Configuration

  Serial ATA Port 0                 ST500DM002-1BD (500.1)
    Software Preserve               SUPPORTED
    Port 0                          [Enabled]
    Hot Plug                        [Disabled]
    External SATA                   [Disabled]
    SATA Device Type                [Hard Disk Driver]
    Spin Up Device                  [Disabled]
  Serial ATA Port 1                 Empty
    Software Preserve               Unknown
    Port 1                          [Enabled]
    Hot Plug                        [Disabled]           → ←:  Select Screen
    External SATA                   [Disabled]           ↑↓:   Select Item
    SATA Device Type                [Hard Disk Driver]    Enter: Select
    Spin Up Device                  [Disabled]           +/-:   Change Opt.
  Serial ATA Port 2                 ATAPI iHOS10 ATAPI    F1:    General Help
    Software Preserve               N/A                  F2:    Previous Values
    Port 2                          [Enabled]            F3:    Optimized Defaults
    Hot Plug                        [Disabled]           ESC:  Exit
    External SATA                   [Disabled]
    Spin Up Device                  [Disabled]
  Serial ATA Port 3                 Empty
    Software Preserve               Unknown
    Port 3                          [Enabled]
    Hot Plug                        [Disabled]
    External SATA                   [Disabled]
    Spin Up Device                  [Disabled]

          Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```
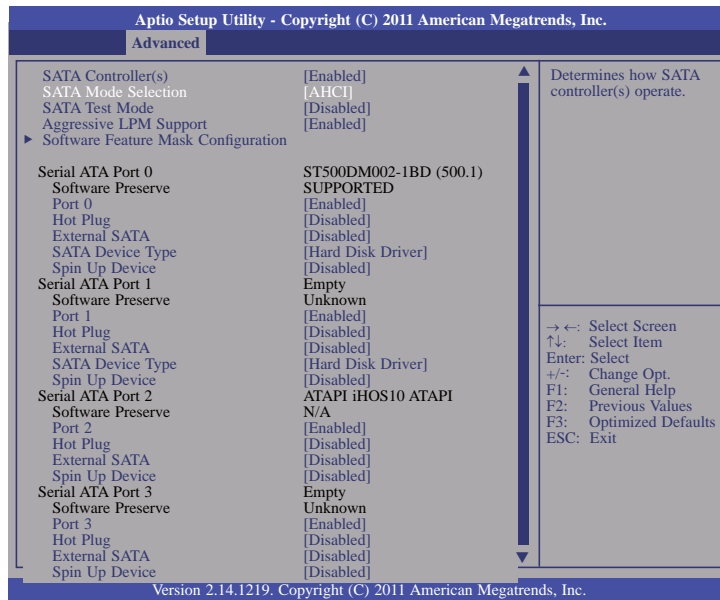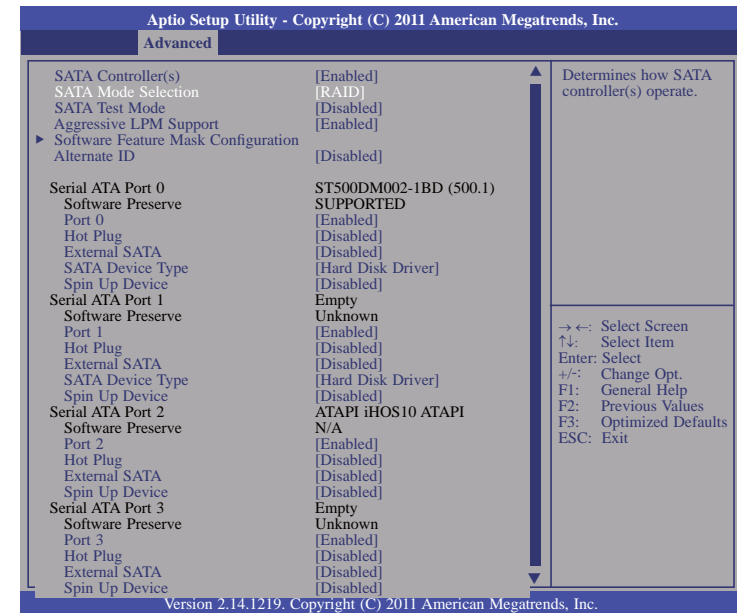
```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

  SATA Controller(s)                [Enabled]          Determines how SATA
  SATA Mode Selection               [RAID]             controller(s) operate.
  SATA Test Mode                    [Disabled]
  Aggressive LPM Support            [Enabled]
▶ Software Feature Mask Configuration
  Alternate ID                      [Disabled]

  Serial ATA Port 0                 ST500DM002-1BD (500.1)
    Software Preserve               SUPPORTED
    Port 0                          [Enabled]
    Hot Plug                        [Disabled]
    External SATA                   [Disabled]
    SATA Device Type                [Hard Disk Driver]
    Spin Up Device                  [Disabled]
  Serial ATA Port 1                 Empty
    Software Preserve               Unknown
    Port 1                          [Enabled]           → ←:  Select Screen
    Hot Plug                        [Disabled]           ↑↓:   Select Item
    External SATA                   [Disabled]           Enter: Select
    SATA Device Type                [Hard Disk Driver]   +/-:   Change Opt.
    Spin Up Device                  [Disabled]           F1:    General Help
  Serial ATA Port 2                 ATAPI iHOS10 ATAPI   F2:    Previous Values
    Software Preserve               N/A                  F3:    Optimized Defaults
    Port 2                          [Enabled]            ESC:  Exit
    Hot Plug                        [Disabled]
    External SATA                   [Disabled]
    Spin Up Device                  [Disabled]
  Serial ATA Port 3                 Empty
    Software Preserve               Unknown
    Port 3                          [Enabled]
    Hot Plug                        [Disabled]
    External SATA                   [Disabled]
    Spin Up Device                  [Disabled]

          Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Aggressive LPM Support

Enable PCH to aggressively enter link power state.

Alternate ID

Report the alternate device ID.

Port 0/1/2/3

Enable or disable the Serial ATA port 0/1/2/3.

Hot Plug

Designate the Serial ATA port 0/1/2/3 as Hot Pluggable.

External SATA

Enable or disable the support of external Serial ATA device.
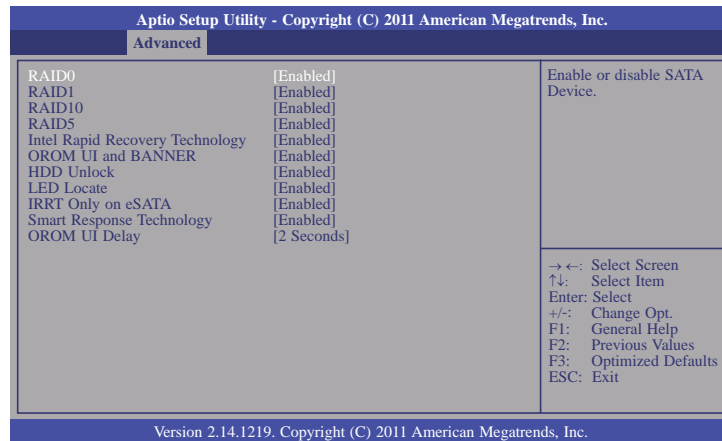
SATA Device Type

Identify the Serial ATA port connected to Solid State Drive or Hard Disk Drive.

Spin Up Device

On an edge detect from 0 to 1, the PCH starts a sequence of COMRESET initialization to the device.

37

Software Feature Mask Configuration

AHCI or RAID OROM/RST driver will refer to the SWFM configuration to enable or disable the storage features.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
          Advanced

 RAID0                             [Enabled]            Enable or disable SATA
 RAID1                             [Enabled]            Device.
 RAID10                            [Enabled]
 RAID5                             [Enabled]
 Intel Rapid Recovery Technology   [Enabled]
 OROM UI and BANNER                [Enabled]
 HDD Unlock                        [Enabled]
 LED Locate                        [Enabled]
 IRRT Only on eSATA                [Enabled]
 Smart Response Technology         [Enabled]
 OROM UI Delay                     [2 Seconds]

                                                        → ←:  Select Screen
                                                        ↑↓:    Select Item
                                                        Enter: Select
                                                        +/-:   Change Opt.
                                                        F1:    General Help
                                                        F2:    Previous Values
                                                        F3:    Optimized Defaults
                                                        ESC:   Exit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

RAID 0/1/5/10

Enable or disable RAID 0/1/5/10 feature.

Intel Rapid Recovery Technology

Enable or disable Intel Rapid Recovery Technology.

OROM UI and BANNER

If enabled, then the OROM UI is shown. Otherwise, no OROM banner or information will be displayed if all disks and RAID volumes are Normal.

HDD Unlock

If enabled, it indicates that the HDD password is unlocked in the OS which is enabled.

LED Locate

If enabled, it indicates that the LED/SGPIO hardware is attached and ping to locate feature on the OS which is enabled.

IRRT Only on eSATA

If enabled, then only IRRT volumes can span internal and eSATA drives. If disabled, then any RAID volume can span internal and eSATA drives.
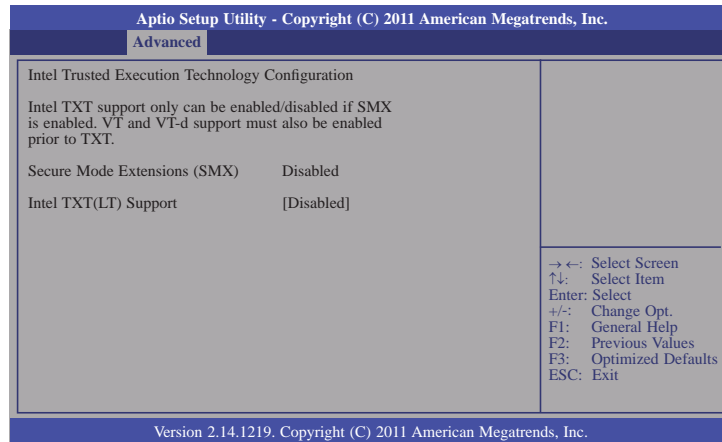
Smart Response Technology

Enable or disable Smart Response Technology.

OROM UI Delay

If enabled, it indicates that the delay of the OROM UI splash screen in a normal status.
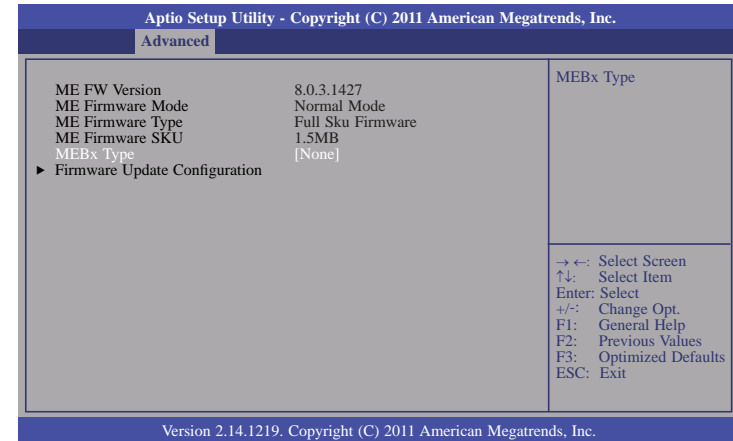
38

Intel TXT(LT) Configuration

This section only displays the configuration of Intel Trusted Execution Technology.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

  Intel Trusted Execution Technology Configuration

  Intel TXT support only can be enabled/disabled if SMX
  is enabled. VT and VT-d support must also be enabled
  prior to TXT.

  Secure Mode Extensions (SMX)        Disabled

  Intel TXT(LT) Support               [Disabled]

                                                     → ←:  Select Screen
                                                     ↑↓:     Select Item
                                                     Enter: Select
                                                     +/-:    Change Opt.
                                                     F1:    General Help
                                                     F2:    Previous Values
                                                     F3:    Optimized Defaults
                                                     ESC:  Exit

                  Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

PCH-FW Configuration

This section is used to configure the parameters of Management Engine Technology.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

  ME FW Version                  8.0.3.1427             MEBx Type
  ME Firmware Mode               Normal Mode
  ME Firmware Type               Full Sku Firmware
  ME Firmware SKU                1.5MB
  MEBx Type                      [None]
  ▶ Firmware Update Configuration

                                                     → ←:  Select Screen
                                                     ↑↓:     Select Item
                                                     Enter: Select
                                                     +/-:    Change Opt.
                                                     F1:    General Help
                                                     F2:    Previous Values
                                                     F3:    Optimized Defaults
                                                     ESC:  Exit

                  Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

ME Firmware SKU

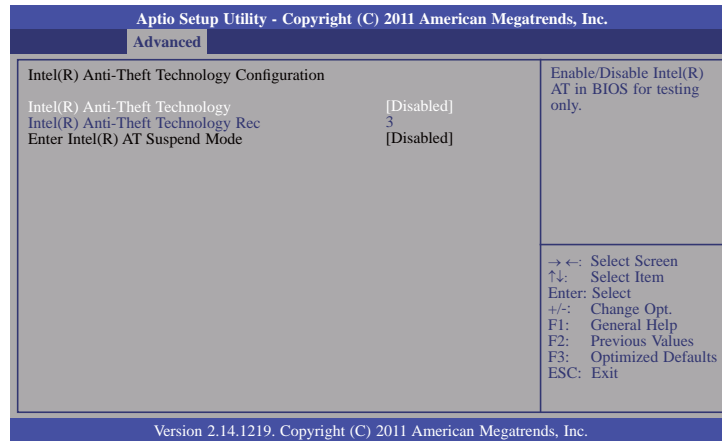QM77 Express Chipset: 5MB
HM76 Express Chipset: 1.5MB

MEBx Type

This field is used to select the Type of ME BIOS Extension: None or miniMEBx.

39

Intel(R) Anti-Theft Technology Configuration

This section disables the Intel(R) AT Service in order to allow users to login into the platform. This is strictly used for testing only. This does not disable Intel(R) AT Service in ME.

```
                    Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
    Advanced

  Intel(R) Anti-Theft Technology Configuration        Enable/Disable Intel(R)
                                                      AT in BIOS for testing
  Intel(R) Anti-Theft Technology        [Disabled]    only.
  Intel(R) Anti-Theft Technology Rec    3
  Enter Intel(R) AT Suspend Mode        [Disabled]




                                                      → ←:  Select Screen
                                                      ↑↓:   Select Item
                                                      Enter: Select
                                                      +/-:   Change Opt.
                                                      F1:    General Help
                                                      F2:    Previous Values
                                                      F3:    Optimized Defaults
                                                      ESC:  Exit

              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Intel(R) Anti-Theft Technology

Enable or disable Intel(R) Anti-Theft Technology in BIOS for testing only.

Intel(R) Anti-Theft Technology Rec

Set the number of times Recovery attempted will be allowed.

Enter Intel(R) AT Suspend Mode

The options are Enabled and Disabled (Default).

USB Configuration

This section is used to configure the parameters of USB device.

```
                    Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
    Advanced

  USB Configuration                                   Enables Legacy USB
                                                      support. AUTO option
  USB Devices:                                        disables legacy support if
       1 Keyboard, 1 Mouse, 2 Hubs                    no USB devices are
                                                      connected. DISABLE
  Legacy USB Support           [Enabled]              option will keep USB
  USB3.0 Support               [Enabled]              devices available only for
  XHCI Hand-off                [Enabled]              EFI applications.
  EHCI Hand-off                [Disabled]

  USB hardware delays and time-outs:
  USB transfer time-out        [20 sec]               → ←:  Select Screen
  Device reset time-out        [20 sec]               ↑↓:   Select Item
  Device power-up delay        [Auto]                 Enter: Select
                                                      +/-:   Change Opt.
                                                      F1:    General Help
                                                      F2:    Previous Values
                                                      F3:    Optimized Defaults
                                                      ESC:  Exit

              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```
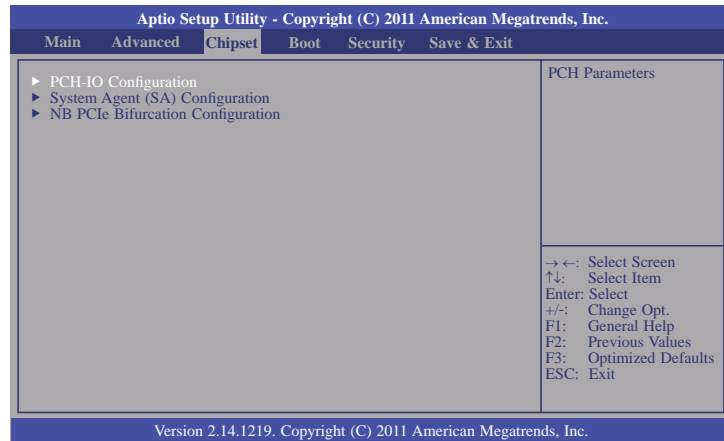
Legacy USB Support

Enabled
Enable legacy USB.

Auto
Disable support for legacy when no USB devices are connected.

Disabled
Keep USB devices available only for EFI applications.

USB 3.0 Support

Enable or disable the support of USB 3.0 (XHCI) Controller.

XHCI Hand-off

This is a workaround for OSes without the support of XHCI hand-off. The change of XHCI ownership should be claimed by the XHCI driver.

EHCI Hand-off

This is a workaround for OSes without the support of EHCI hand-off. The change of EHCI ownership should be claimed by the EHCI driver.

USB transfer time-out

The time-out value for Control, Bulk and Interrupt transfers.

40

Device reset time-out

Select the USB mass storage device start unit command time-out.

Device power-up delay

The device will take maximum time before it properly reports itself to the Host Controller. "Auto" uses default value: for a Root port, it is 100 ms; for a Hub port, the delay is taken from Hub descriptor.

Network Stack

This section is used to enable or disable UEFI Network Stack.

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.		
Advanced		
Network Stack	[Disable Link]	Enable/disable UEFI network stack.
		→←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.		

41
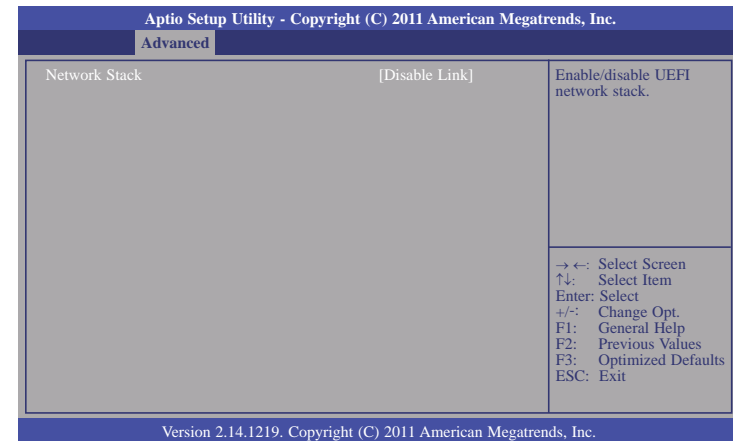
CPU PPM Configuration

This section is used to represent the parameters of CPU PPM configuration.

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

CPU PPM Configuration                                 Enable/Disable Intel
                                                      SpeedStep
EIST                           [Enabled]




                                         → ←:  Select Screen
                                         ↑↓:    Select Item
                                         Enter: Select
                                         +/-:    Change Opt.
                                         F1:    General Help
                                         F2:    Previous Values
                                         F3:    Optimized Defaults
                                         ESC:  Exit

        Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

EIST

This field is used to enable or disable the Intel Enhanced SpeedStep Technology.

WatchDog Configuration

This section is used to configure the parameters of IT8518 WDT.

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced

                                                      Enable/Disable IT8518
                                                      WatchDog Timer.
WatchDog function              [Disabled]




                                         → ←:  Select Screen
                                         ↑↓:    Select Item
                                         Enter: Select
                                         +/-:    Change Opt.
                                         F1:    General Help
                                         F2:    Previous Values
                                         F3:    Optimized Defaults
                                         ESC:  Exit

        Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

WatchDog function

This field is used to enable or disable the function of Watchdog timer.

42

Chipset

The section configures the relevant functions of chipset.

```
              Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
     Main    Advanced    Chipset    Boot    Security    Save & Exit

   ▶ PCH-IO Configuration                              PCH Parameters
   ▶ System Agent (SA) Configuration
   ▶ NB PCIe Bifurcation Configuration




                                                       → ←:  Select Screen
                                                       ↑↓:    Select Item
                                                       Enter: Select
                                                       +/-:    Change Opt.
                                                       F1:     General Help
                                                       F2:     Previous Values
                                                       F3:     Optimized Defaults
                                                       ESC:  Exit


              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

PCH-IO Configuration

This section configures PCH parameters.

```
              Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                                      Chipset

   Intel PCH RC Version            1.1.0.0          PCI Express Configuration
   Intel PCH SKU Name              HM76             settings.
   Intel PCH Rev ID                04/C1

   ▶ PCI Express Configuration
   ▶ USB Configuration
   ▶ PCH Azalia Configuration

   PCH LAN Controller              [Enabled]
      Wake on LAN                  [Enabled]
                                                    → ←:  Select Screen
   After G3                        [Power On]       ↑↓:    Select Item
                                                    Enter: Select
                                                    +/-:    Change Opt.
                                                    F1:     General Help
                                                    F2:     Previous Values
                                                    F3:     Optimized Defaults
                                                    ESC:  Exit


              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

PCH LAN Controller

Enable or disable onboard NIC.

Wake on LAN

Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is at Six state.)

After G3

Select the state of AC power when the power is re-applied after a power failure.

Power off/WOL
Power-on the system via WOL after G3.

Power on
Power-on the system after G3.

43

PCI Express Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.	
Chipset	
PCI Express Configuration	Enable or disable PCI Express Clock Gating for each root port.
PCI Express Clock Gating [Enabled]	
▶ PCI Express Root Port 1	
▶ PCI Express Root Port 2	
▶ PCI Express Root Port 3	
▶ PCI Express Root Port 4	
▶ PCI Express Root Port 5	
▶ PCI Express Root Port 6	→←: Select Screen
▶ PCI Express Root Port 7	↑↓: Select Item
PCIE Port 8 is assigned to LAN	Enter: Select
	+/-: Change Opt.
	F1: General Help
	F2: Previous Values
	F3: Optimized Defaults
	ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.	

PCI Express Root Port 1 to PCI Express Root Port 7

Control the PCI Express Root Port.

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.	
Chipset	
PCI Express Root Port 1 [Enabled]	Control the PCI Express Root Port.
Hot Plug [Disabled]	
PCIe Speed [Gen1]	
	→←: Select Screen
	↑↓: Select Item
	Enter: Select
	+/-: Change Opt.
	F1: General Help
	F2: Previous Values
	F3: Optimized Defaults
	ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.	
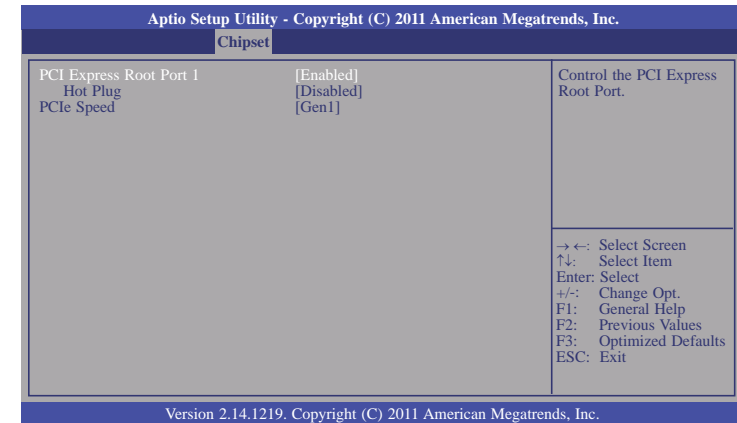
Hot Plug

Enable or disable PCI Express Hot Plug.

PCIe Speed

Select the speed of PCIe Express port: Gen1 or Gen 2.

44

USB Configuration

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                        Chipset

USB Configuration                                        Enable or disable XHCI
                                                         Pre-Boot Driver Support.
XHCI Pre-Boot Driver              [Enabled]
xHCI Mode                         [Auto]
   HS Port #1 Switchable          [Enabled]
   HS Port #2 Switchable          [Enabled]
   HS Port #3 Switchable          [Enabled]
   HS Port #4 Switchable          [Enabled]
   xHCI Streams                   [Enabled]

EHCI1                             [Enabled]              → ←:  Select Screen
                                                         ↑↓:   Select Item
EHCI2                             [Enabled]              Enter: Select
                                                         +/-:   Change Opt.
                                                         F1:    General Help
                                                         F2:    Previous Values
                                                         F3:    Optimized Defaults
                                                         ESC:  Exit

        Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

XHCI Pre-Boot Driver

Enable or disable the support of XHCI Pre-Boot Driver.

xHCI Mode

Select the operation mode of XHCI controller. These options are Smart Auto, Auto, Enabled, and Disabled.

HS Port #1~4 Switchable

Allow HS port to switch between xHCI and EHCI. If disabled, HS port is routed to EHCI. If HS port is routed to xHCI, the corresponfing SS port is enabled.

xHCI Streams

Enable or disable xHCI Maximum Primary Stream Array Size.

EHCI 1 and EHCI 2

These fields are used to control the functions of USB EHCI (USB 2.0) controllers. One EHCI controller must always be enabled.

PCH Azalia Configuration

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                        Chipset

PCH Azalia Configuration                                 Control detection of the
                                                         Azalia device.
Azalia                            [Auto]                 Disabled= Azalia will be
   Azalia Internal DP/HDMI Codec  [Enabled]              unconditionally disabled.
   Azalia HDMI Codec Port B       [Enabled]              Enabled= Azalia will be
   Azalia HDMI Codec Port C       [Enabled]              unconditionally enabled.
   Azalia HDMI Codec Port D       [Enabled]              Auto=Azalia will be ena-
                                                         bled if present, disabled
                                                         otherwise.

                                                         → ←:  Select Screen
                                                         ↑↓:   Select Item
                                                         Enter: Select
                                                         +/-:   Change Opt.
                                                         F1:    General Help
                                                         F2:    Previous Values
                                                         F3:    Optimized Defaults
                                                         ESC:  Exit

        Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Azalia

Enable or disable the onboard audio.

Azalia Internal DP/HDMI Codec

Enable or disable internal HDMI codec for Azalia.

Azalia HDMI Codec Port B/C/D

Enable or disable internal HDMI codec port for Azalia.

45

System Agent (SA) Configuration

This section configures System Agent (SA) parameters.

```
               Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                   Chipset

System Agent Bridge Name          SandyBridge          Config Graphics Settings.
System Agent RC Version           1.1.0.0
VT-d Capability                   Unsupported

► Graphics Configuration
► NB PCIe Configuration
► Memory Configuration

                                                       → ←:  Select Screen
                                                       ↑↓:    Select Item
                                                       Enter: Select
                                                       +/-:   Change Opt.
                                                       F1:    General Help
                                                       F2:    Previous Values
                                                       F3:    Optimized Defaults
                                                       ESC:  Exit

               Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Graphics Configuration

This section is used to configure the graphics settings.

```
               Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                   Chipset

Graphics Configuration                                 Select which of IGFX/
IGFX VBIOS Version                2132                  PEG/PCI Graphics device
IGfx Frequency                    350 MHz               should be primary display
                                                        or select SG for Switch-
Primary Display                   [Auto]                able Gfx.
DVMT Total Gfx Mem                [256M]
► LCD Control

                                                       → ←:  Select Screen
                                                       ↑↓:    Select Item
                                                       Enter: Select
                                                       +/-:   Change Opt.
                                                       F1:    General Help
                                                       F2:    Previous Values
                                                       F3:    Optimized Defaults
                                                       ESC:  Exit

               Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Primary Display

Auto   When the system boots, it will auto detects the display device.
IGFX   When the system boots, it will first initialize the onboard VGA.
PEG   When the system boots, it will first initialize the PCI Express x16 graphics
            card.

DVMT Total Gfx Mem

Select DVMT 5.0 total graphics memory size used by the Internal Graphics Device. Please refer to the screen shown below.

```
               Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                   Chipset

Graphics Configuration                                 Select DVMT5.0 Total
IGFX VBIOS Version                2132                  Graphics Memory size
IGfx Frequency                    350 MHz               used by the Internal
                                                        Graphics Device.
Primary Display                   [Auto]
DVMT Total Gfx Mem                [256M]
► LCD Control

                        ┌─ DVMT Total  Gfx Mem ─┐
                        │                        │
                        │   128M                 │
                        │   256M                 │
                        │                        │      → ←:  Select Screen
                        │   MAX                  │      ↑↓:    Select Item
                        └────────────────────────┘      Enter: Select
                                                        +/-:   Change Opt.
                                                        F1:    General Help
                                                        F2:    Previous Values
                                                        F3:    Optimized Defaults
                                                        ESC:  Exit

               Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

46

LCD Control

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                                        Chipset

 LCD Control                                         Select the Video Device
                                                     which will be activated
 Primary IGFX Boot Display          [VBIOS Default]  during POST. This has no
 LCD Panel Type                     [VBIOS Default]  effect if external graphics
                                                     present.
                                                     Secondary boot display
                                                     selection will appear based
                                                     on your selection.
                                                     VGA modes will be sup-
                                                     ported only on primary
                                                     display.

                                                     → ←:  Select Screen
                                                     ↑↓:   Select Item
                                                     Enter: Select
                                                     +/-:   Change Opt.
                                                     F1:    General Help
                                                     F2:    Previous Values
                                                     F3:    Optimized Defaults
                                                     ESC:   Exit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Primary IGFX Boot Display

Select the Video Device which will be activated during POST. This has no effect if the external graphics presents. The selection of secondary boot display will appear based on your selection. VGA modes will be supported only on primary display.

When any device is selected in the Primary IGFX Boot Display, it will display the following information:

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                                        Chipset

 LCD Control                                         Select the Video Device
                                                     which will be activated
 Primary IGFX Boot Display          [CRT]            during POST. This has no
 Secondary IGFX Boot Display        [Disabled]       effect if external graphics
 LCD Panel Type                     [VBIOS Default]  present.
                                                     Secondary boot display
                                                     selection will appear based
                                                     on your selection.
                                                     VGA modes will be sup-
                                                     ported only on primary
                                                     display.

                                                     → ←:  Select Screen
                                                     ↑↓:   Select Item
                                                     Enter: Select
                                                     +/-:   Change Opt.
                                                     F1:    General Help
                                                     F2:    Previous Values
                                                     F3:    Optimized Defaults
                                                     ESC:   Exit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Secondary IGFX Boot Display

Selects secondary display device.

LCD Panel Type

Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.

```
                Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                                        Chipset

 LCD Control                                              Select LCD panel used
                                                          by Internal Graphics
 Primary IGFX Boot Display          [VBIOS Default]       Device by selecting the
 LCD Panel Type                                           appropriate setup item.
                         ┌──── LCD Panel Type ────┐
                         │ VBIOS Default            │
                         │ Type 1-640x480      18 Bit
                         │ Type 2-800x600      18 Bit
                         │ Type 3-1024x768     18 Bit
                         │ Type 4-1280x1024    36 Bit
                         │ Type 5-1400x1050 (108MHz) 36 Bit
                         │ Type 6-1400x1050 (122MHz) 36 Bit
                         │ Type 7-1600x1200    36 Bit   → ←:  Select Screen
                         │ Type 8-1366x768     18 Bit   ↑↓:   Select Item
                         │ Type 9-1680x1050    36 Bit   Enter: Select
                         │ Type 10-1920x1200   36 Bit   +/-:   Change Opt.
                         │ Type 11-1440x900    36 Bit   F1:    General Help
                         │ Type 12-1024x768    24 Bit   F2:    Previous Values
                         │ Type 13-1280x1024   48 Bit   F3:    Optimized Defaults
                         │ Type 14-1280x800    36 Bit   ESC:   Exit
                         │ Type 15-1920x1080   48 Bit
                         │ Type 16-2048x1536   48 Bit

                Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

47

NB PCIe Configuration

This section is used to configure the settings of NB PCI Express.

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.		
Chipset		
NB PCIe Configuration		Configure PEG0
PEG0 - Gen X	[Gen1]	B0:D1:F0 Gen1-Gen3.
Enable PEG	[Enabled]	
		→←: Select Screen
		↑↓: Select Item
		Enter: Select
		+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.		
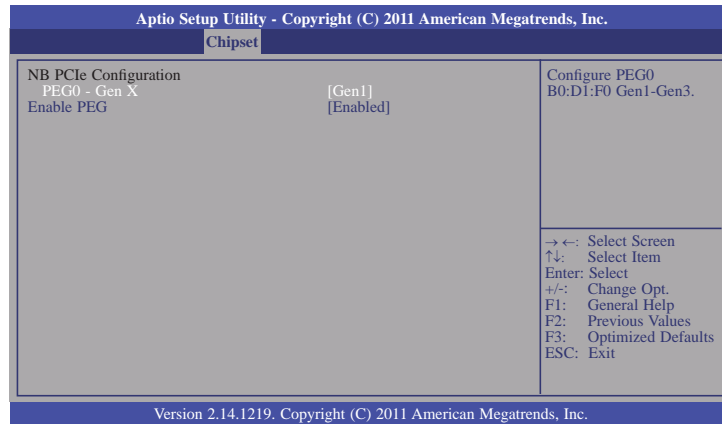
PEG0-Gen X

Configure PEG0 Gen1-Gen3.

Enable PEG

Enable or disable the PEG.

Memory Configuration

This section only displays the parameters of memory configuration.

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.		
Chipset		
Memory Information		DDR3 or DDR3L
		Selection.
Memory RC Version	1.2.2.0	
Memory Frequency	1333 MHz	
Total Memory	2048 MB (DDR3)	
DIMM#1	Not present	
DIMM#2	2048 MB (DDR3)	
CAS Latency (tCL)	9	
Minimum delay time		
CAS to RAS (tRCDmin)	9	
Row Precharge (tRPmin)	9	→←: Select Screen
Active to Precharge (tRASmin)	24	↑↓: Select Item
		Enter: Select
DDR Selection	[DDR3]	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.		

DDR Selection

Select DDR3 or DDR3L.

48

NB PCIe Bifurcation Configuration

This field is used to configure the parameters of CPU PEG Bifurcation.

```
             Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
                                    Chipset

NB PCIe Bifurcation Configuration                        PEG bifurcated configura-
                                                         tion.
PEG Bifurcation                         [x16]

                    ┌─────────────────────────┐
                    │    PEG Birfurcation      │
                    │                          │
                    │   x8, x4, x4             │
                    │   Reserved               │
                    │   x8, x8                 │
                    │   x16                    │       →←:  Select Screen
                    └─────────────────────────┘       ↑↓:   Select Item
                                                       Enter: Select
                                                       +/-:   Change Opt.
                                                       F1:   General Help
                                                       F2:   Previous Values
                                                       F3:   Optimized Defaults
                                                       ESC:  Exit

             Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Boot

```
             Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
   Main    Advanced   Chipset   Boot   Security   Save & Exit

Boot Configuration                                       Select the keyboard
Bootup NumLock State              [On]                   NumLock state.

Quiet Boot                        [Disabled]
Fast Boot                         [Disabled]

CSM16 Module Version              07.69

Boot Option Priorities
Boot Option #1                    [SATA PS:ATAPI...]
Boot Option #2                    [SATA PM:ST500DM0...]

Hard Drive BBS Priorities                                →←:  Select Screen
CD/DVD ROM Drive BBS Priorities                          ↑↓:   Select Item
►  CSM Parameters                                        Enter: Select
                                                         +/-:   Change Opt.
                                                         F1:   General Help
                                                         F2:   Previous Values
                                                         F3:   Optimized Defaults
                                                         ESC:  Exit

             Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Bootup NumLock State

This allows you to determine the default state of the numeric keypad. By default, the system boots up with NumLock on wherein the function of the numeric keypad is the number keys. When set to Off, the function of the numeric keypad is the arrow keys.

Quiet Boot

Enable or disable the quiet boot function.

Fast Boot

Enable or disable boot with initialization of a minimal set of devices required to launch active boot option. It has no effect on BBS boot options.

Skip VGA   When it is enabled, BIOS will skip EFI VGA driver.
Skip USB   When it is enabled, USB devices will not be available after OS boot. When it is disabled, USB devices will be available before OS boot.
Skip PS2   When it is enabled, PS2 devices will be skipped.

Boot Option #1 and #2

Set the order of the system boot.

49

Hard Drive BBS Priorities

Sets the order of the legacy devices in this group.

CD/DVD ROM Drive BBS Priorities

This field is used to select the boot sequence of the CD/DVD-ROM drives. Move the cursor to this field then press <Enter>. Use the Up or Down arrow keys to select a device then press <+> to move it up or <-> to move it down the list.

CSM

```
                 Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
    Main      Advanced    Chipset    Boot    Security    Save & Exit

    Launch PXE OpROM policy            [Do not launch]        Controls the execution of
    Launch Storage OpROM policy        [Legacy only]          UEFI and Legacy PXE
                                                              OpROM.



                                                              ← →:  Select Screen
                                                              ↑↓:     Select Item
                                                              Enter: Select
                                                              +/-:    Change Opt.
                                                              F1:     General Help
                                                              F2:     Previous Values
                                                              F3:     Optimized Defaults
                                                              ESC:  Exit

                 Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Launch PXE OpROM policy

Control the execution of UEFI and legacy PXE OpROM.

Launch Storage OpROM policy

Control the execution of UEFI and legacy storage OpROM.

Security

```
                 Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
    Main      Advanced    Chipset    Boot    Security    Save & Exit

    Password Description                                       Set Administrator
                                                              Password.
    If ONLY the Administrator's password is set,
    then this only limits access to Setup and is only
    asked for when entering Setup.
    If ONLY the User's password is set, then this
    is a power on password and must be entered to
    boot or enter Setup. In Setup the User will have
    Administrator rights.
    The password length must be
    in the following range:
    Minimum length                          3              ← →:  Select Screen
    Maximum length                          20             ↑↓:     Select Item
                                                           Enter: Select
    Administrator Password                                 +/-:    Change Opt.
    User Password                                          F1:     General Help
                                                           F2:     Previous Values
    HDD Security Configuration:                            F3:     Optimized Defaults
    HDD0: ST500DM002-1                                     ESC:  Exit


                 Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Administrator Password

Set the administrator password.

User Password

Set the user password.

HDD0: ST500DM002-1

Set the HDD password.

```
                 Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
    Main      Advanced    Chipset    Boot    Security    Save & Exit

    HDD Password Description:                                  Set HDD User Password.
                                                              *** Advisable to Power
    Allows Access to Set, Modify and Clear                    Cycle System after setting
    HardDisk User and Master Passwods.                        Hard Disk Passwords **
    User Password need to be installed for
    Enabling Security. Master Password can
    be modified only when successfully unlocked
    with Master password in POST.

    HDD PASSWORD CONFIGURATION:

    Security Supported        :     Yes
    Security Enabled          :     No                     ← →:  Select Screen
    Security Locked           :     No                     ↑↓:     Select Item
    Security Frozen           :     No                     Enter: Select
    HDD User Pwd Status             NOT INSTALLED          +/-:    Change Opt.
    HDD Master Pwd Status          INSTALLED               F1:     General Help
                                                           F2:     Previous Values
    Set User Password                                      F3:     Optimized Defaults
                                                           ESC:  Exit


                 Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

50

Set User Password

Set the HDD user password. Advisable to Power Cycle System after setting Hard Disk Passwords.

Save & Exit


```
              Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
     Main      Advanced    Chipset    Boot    Security   Save & Exit

    Save Changes and Reset                                    Reset the system after
    Discard Changes and Reset                                 saving the changes.

    Restore Defaults
    Save as User Defaults
    Restore User Defaults

    Boot Override
    SATA PM: ST500DM002-1BD142
    SATA PS: ATAPI iHOS104

    Launch EFI Shell from filesystem device
                                                              ← →:  Select Screen
                                                              ↑↓:    Select Item
                                                              Enter: Select
                                                              +/-:    Change Opt.
                                                              F1:    General Help
                                                              F2:    Previous Values
                                                              F3:    Optimized Defaults
                                                              F4:    Save and Reset
                                                              ESC:  Exit

              Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

Save Changes and Reset

To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

Discard Changes and Reset

To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Restore Defaults

To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

Save as User Defaults

To save changes done so far as user default, select this field and then press <Enter>. A dialog box will appear. Select Yes to save values as user default.

Restore User Defaults

To restore user default to all the setup options, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore user default.

51

Launch EFI Shell from filesystem device

Attempts to launch the application of EFI Shell (Shellx64.efi) from one of the available filesystem devices.

Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility, AFUDOS.EXE. Please contact technical support or your sales representative for the files.

To execute the utility, type:
A:> AFUDOS BIOS_File_Name /b /p /n
then press <Enter>.

```
C:\AFU\AFUDOS>afudos filename /B /P /N

    +-----------------------------------------------------------------------------+
    |                     AMI Firmware Update Utility(APTIO) v2.25                 |
    |             Copyright (C)2008 American Megatrends Inc. All Rights Reserved.  |
    +-----------------------------------------------------------------------------+

       Reading file .............................   done
       Erasing flash ............................   done
       Writing flash ............................   done
       Verifying flash ..........................   done
       Erasing BootBlock ....................   done
       Writing BootBlock ....................   done
       Verifying BootBlock .................   done

    C:\AFU\AFUDOS>
```

After finishing BIOS update, please turn off the AC power. Wait about 10 seconds and then turn on the AC power again.

Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.

2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.

3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.

Note:
a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

Chapter 5 - Supported Software

The CD that came with the system board contains drivers, utilities and software applications required to enhance the performance of the system board.

Insert the CD into a CD-ROM drive. The autorun screen (Mainboard Utility CD) will appear. If after inserting the CD, "Autorun" did not automatically start (which is, the Mainboard Utility CD screen did not appear), please go directly to the root directory of the CD and double-click "Setup".

Auto Run Page (For Windows XP)
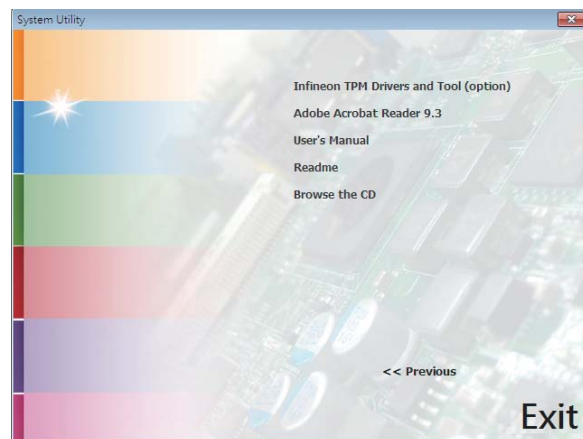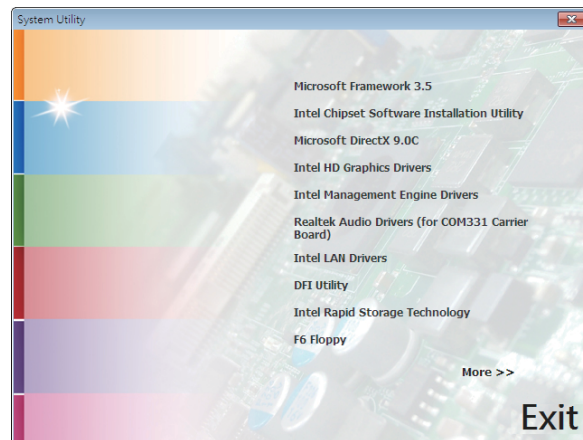
Auto Run Page (For Windows 7)

54
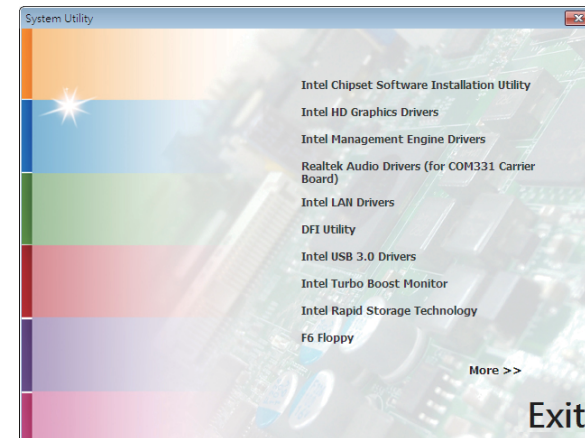
Auto Run Page (For Windows 8)
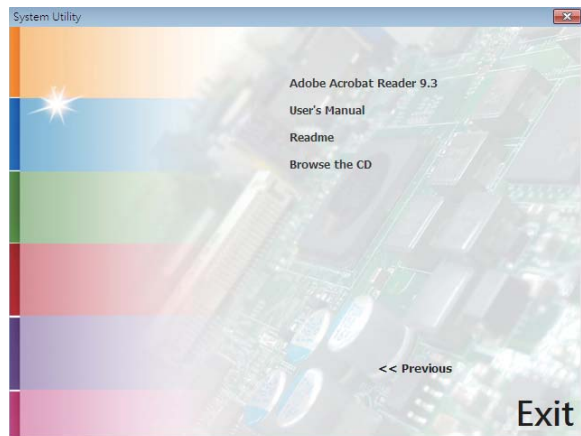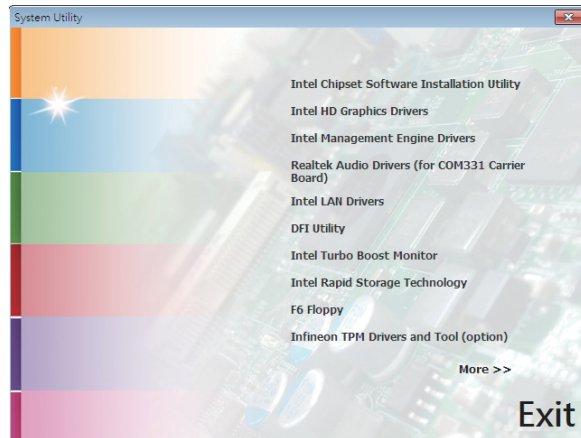
Microsoft Framework 3.5 (For Windows XP only)

Note:
Before installing Microsoft .NET Framework 3.5, make sure you have updated your Windows XP operating system to Service Pack 3.

To install the driver, click "Microsoft .NET Framework 3.5" on the main menu.

1. Read the license agreement carefully.

   Click "I have read and accept the terms of the License Agreement" then click Install.
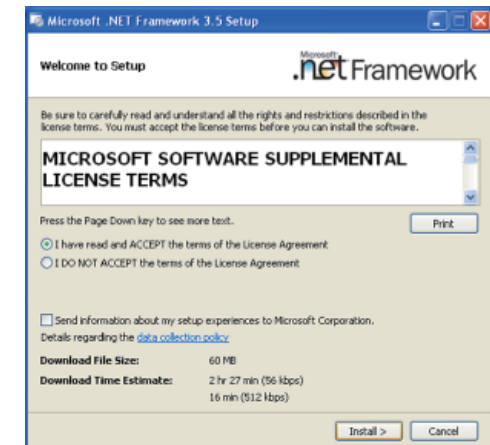
2. Setup is now installing the driver.

55
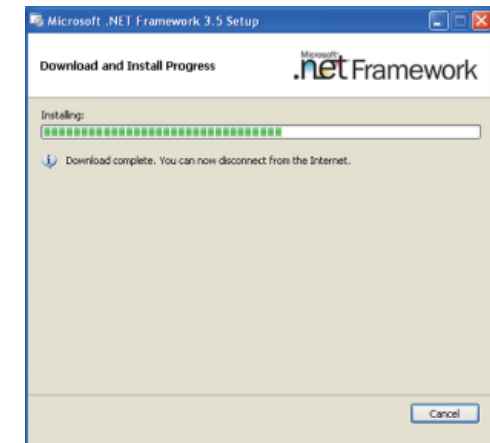
3. Click Exit.
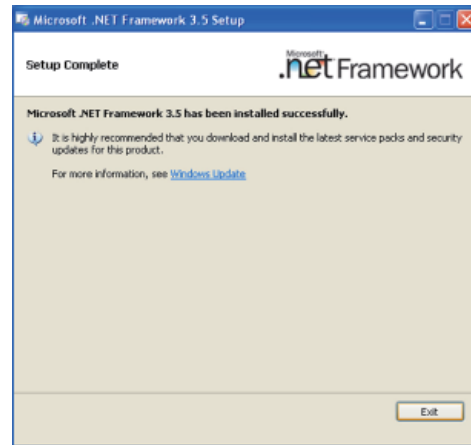
Intel Chipset Software Installation Utility

The Intel Chipset Software Installation Utility is used for updating Windows INF files so that the Intel chipset can be recognized and configured properly in the system.

To install the utility, click "Intel Chipset Software Installation Utility" on the main menu.

1. Setup is now ready to install the utility. Click Next.

2. Read the license agreement then click Yes.

56

3. Go through the readme document for system requirements and installation tips then click Next.

4. After completing installation, click Finish to exit setup.

Microsoft DirectX 9.0C (For Windows XP only)

To install the utility, click "Microsoft DirectX 9.0C Driver" on the main menu.

1. Click "I accept the agreement" then click Next.
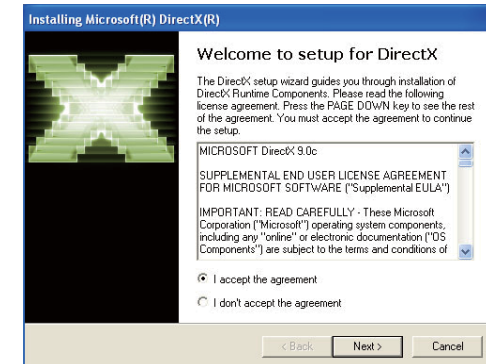
2. To start installation, click Next.
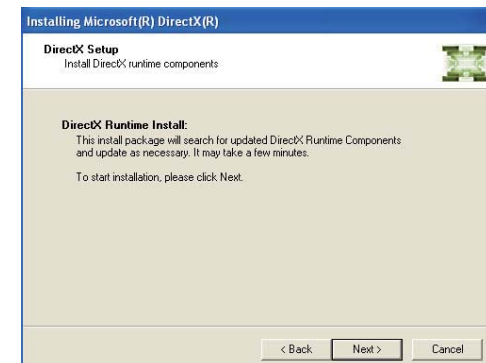
3. Click Finish. Reboot the system for DirectX to take effect.

57
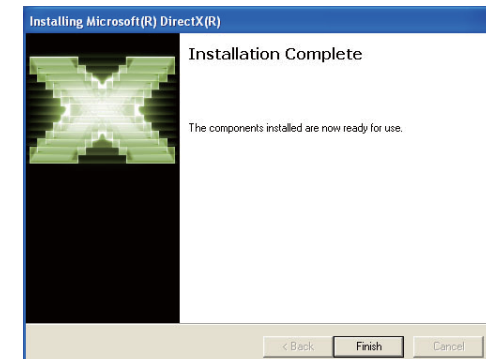
Intel HD Graphics Drivers (For Windows XP)

Note:
Before installing Intel HD Graphics Drivers, make sure you have installed Microsoft .NET Framework 3.5 SP1.

To install the driver, click "Intel HD Graphics Drivers" on the main menu.

1. Setup is ready to install the graphics driver. Click Next.
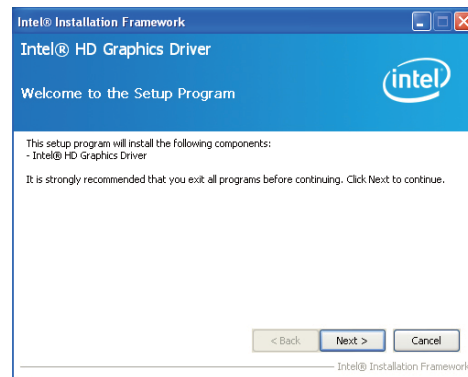
2. Read the license agreement then click Yes.
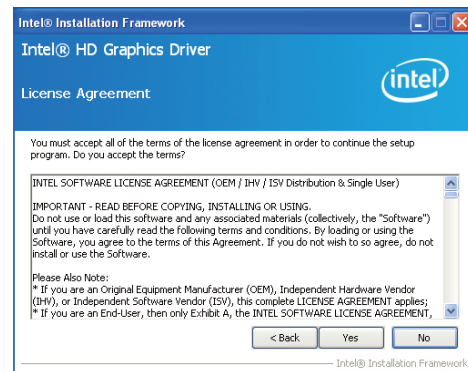
3. Go through the readme document for more installation tips then click Next.
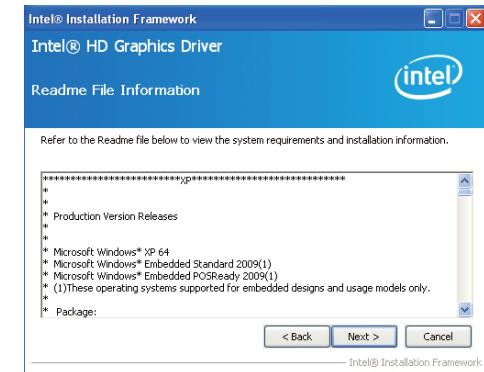
4. Setup is currently installing the driver. After installation has completed, click Next.

5. Click "Yes, I want to restart this computer now." then click Finish.

Restarting the system will allow the new software installlation to take effect.

58
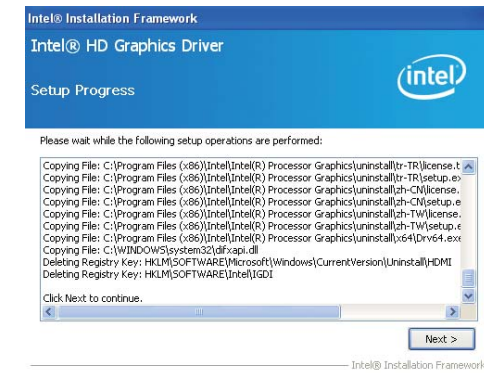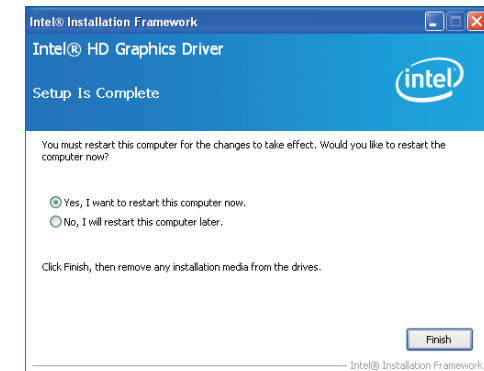
Intel HD Graphics Drivers (For Windows 7/8)

To install the driver, click "Intel HD Graphics Drivers" on the main menu.

1. Setup is now ready to install the graphics driver. Click Next.
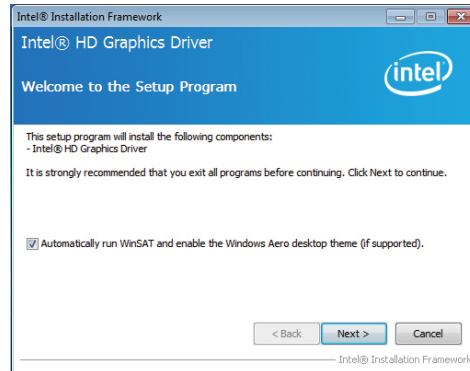
By default, the "Automatically run WinSAT and enable the Windows Aero desktop theme" is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 7/ Windows 8 desktop appears. The "blank screen" period is the time Windows is testing the graphics performance.

We recommend that you skip this process by disabling this function then click Next.

2. Read the license agreement then click Yes.

3. Go through the readme document for system requirements and installation tips then click Next.
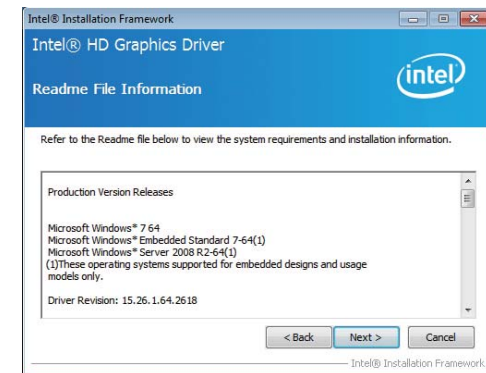
4. Setup is now installing the driver. Click Next to continue.
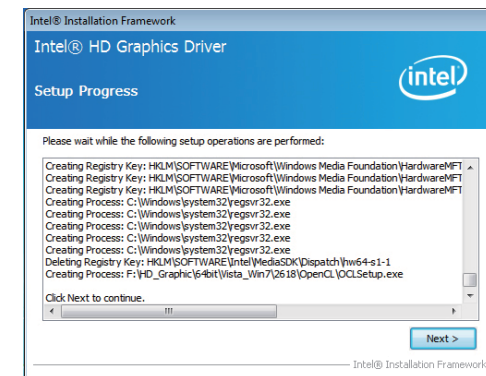
5. Click "Yes, I want to restart this computer now" then click Finish.

Restarting the system will allow the new software installation to take effect.

59
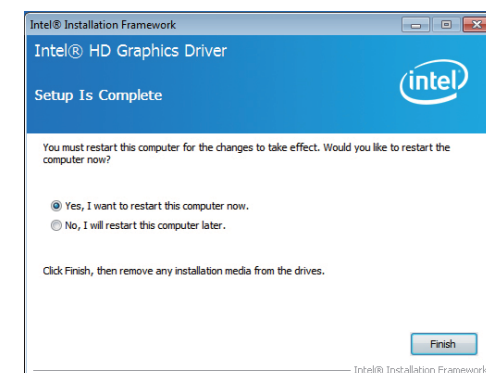
Intel Management Engine Drivers

To install the driver, click "Intel Management Engine Drivers" on the main menu.

1. Setup is ready to install the driver. Click Next.
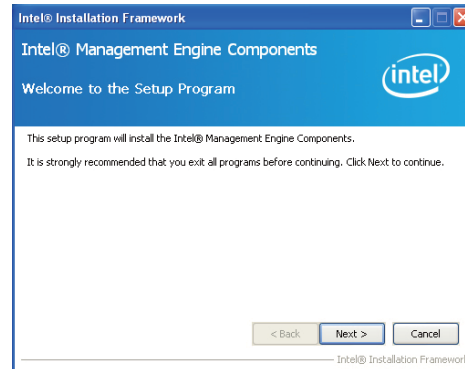
2. Read the license agreement then click Yes.
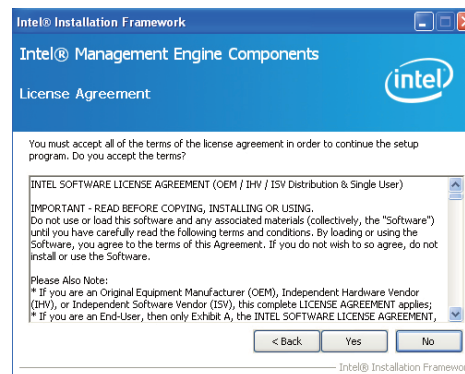
3. Setup is currently installing the driver. After installation has completed, click Next.
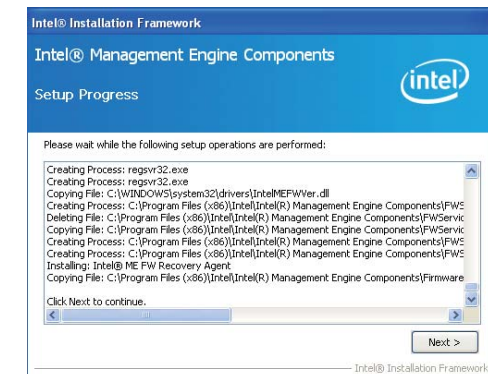
4. After completing installation, click Finish.
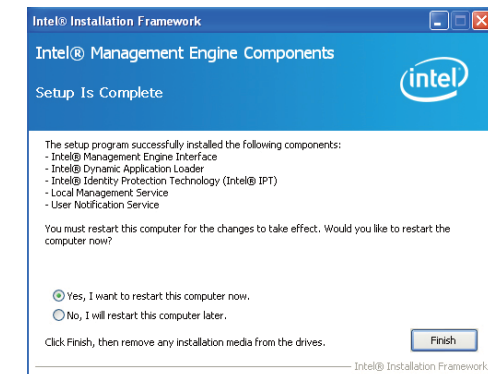
Realtek Audio Drivers (For COM331-B Carrier Board)

To install the driver, click "Realtek Audio Drivers (for COM331-B Carrier Board" on the main menu.

1. Setup is now ready to install the audio driver. Click Next.

2. Follow the remainder of the steps on the screen; clicking "Next" each time you finish a step.
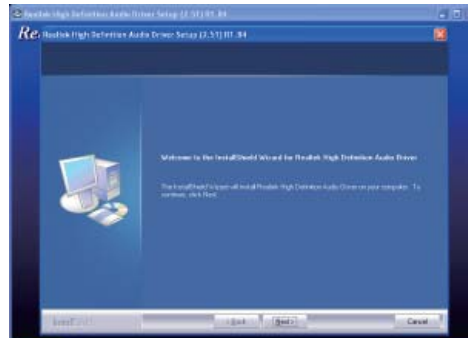
3. Click "Yes, I want to restart my computer now" then click Finish.

Restarting the system will allow the new software installation to take effect.
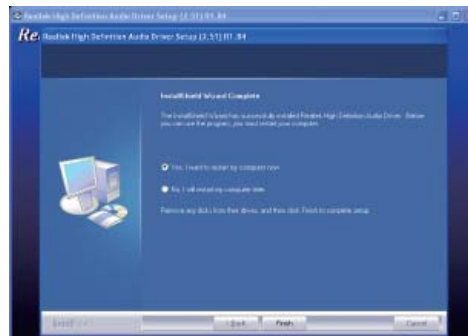
Intel LAN Drivers

To install the driver, click "Intel LAN Drivers" on the main menu.

1. Setup is ready to install the driver. Click Install Drivers and Sofeware.

2. Setup is now ready to install the LAN driver. Click Next.

3. Click "I accept the terms in the license agreement" then click Next.

61
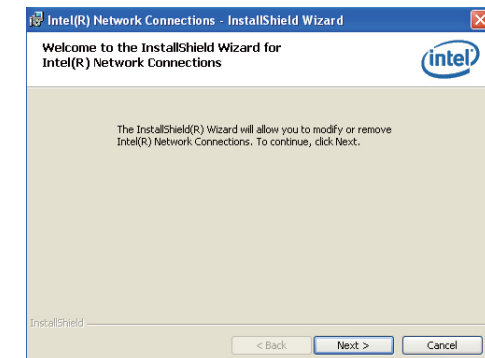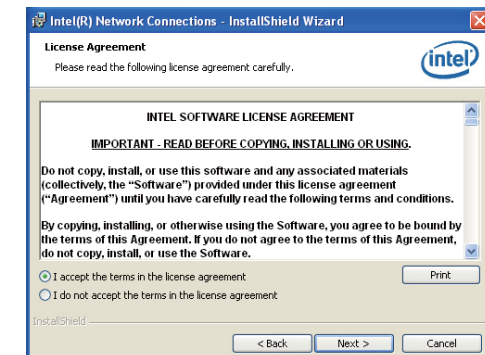
4. Select the program featuers you want installed then click Next.
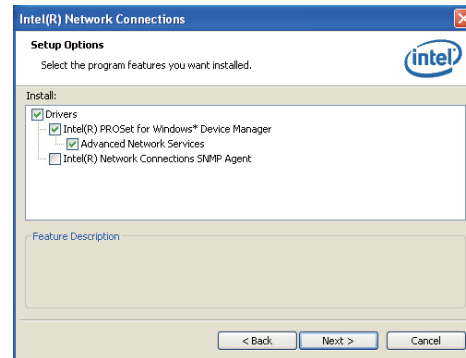
5. Click Install to begin the installation.
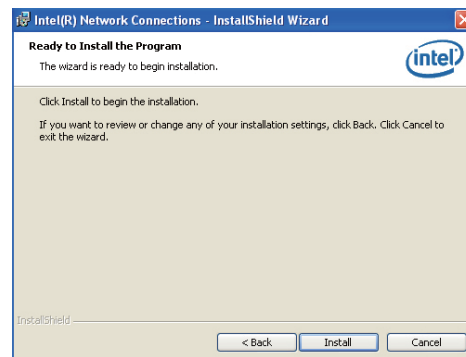
6. After completing installation, click Finish.
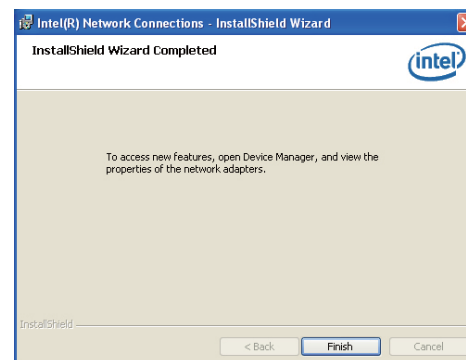
DFI Utility

DFI Utility provides information about the board, HW Health, Watchdog and DIO. To access the utility, click "DFI Utility" on the main menu.

1. Setup is ready to install the DFI Utility drifer. Click Next.

2. Click "I accept the terms in the license agreement" and then click Next.

62
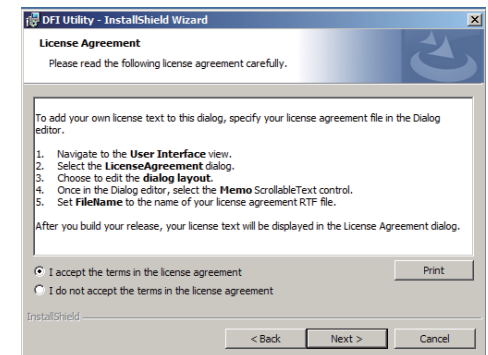
3. Enter "User Name" and "Organization" information and then click Next.
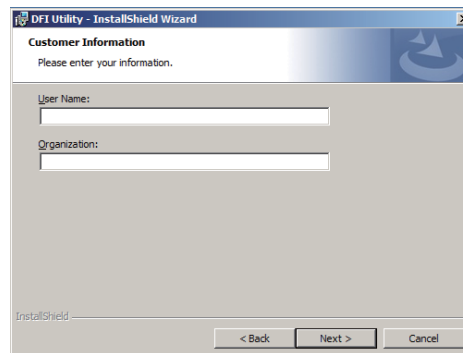
4. Click Install to begin the installation.
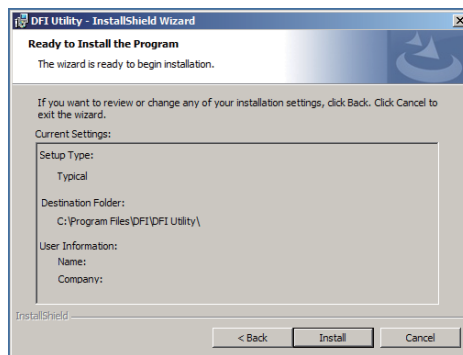
5. After completing installation, click Finish.
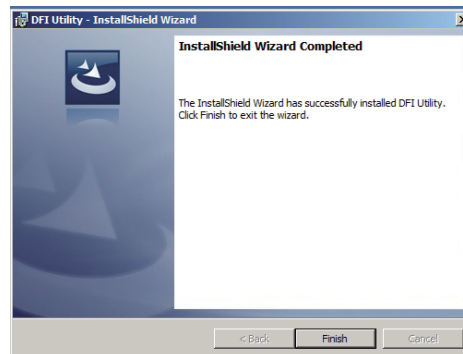
The DFI Utility icon will appear on the desktop. Double-click the icon to open the utility.
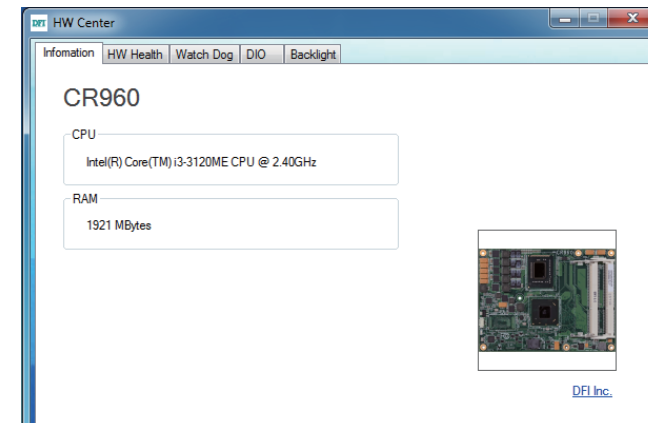
Information
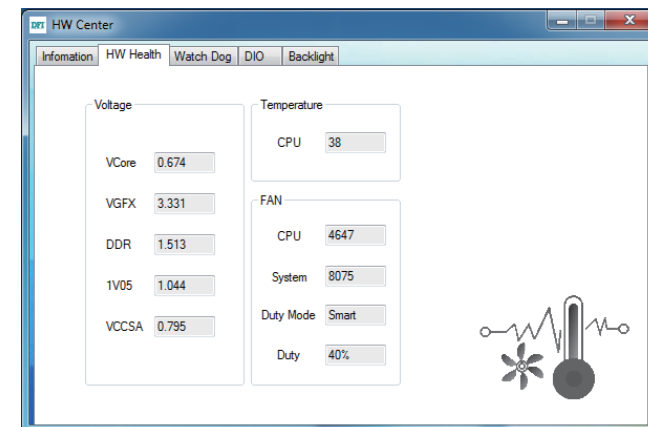
HW Health
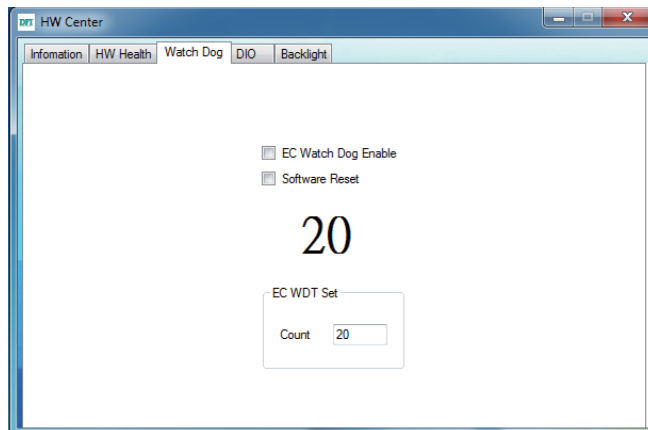
WatchDog

Backlight

DIO

64
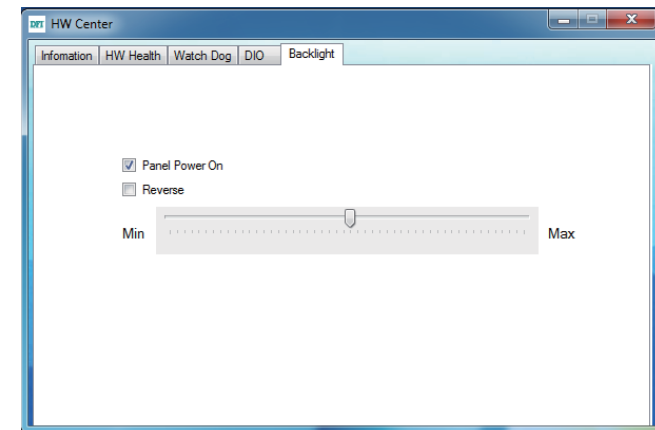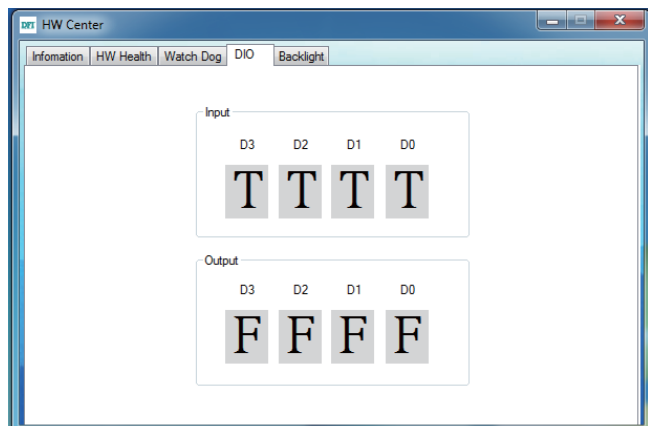
Intel Rapid Storage Technology

The Intel Rapid Storage Technology is a utility that allows you to monitor the current status of the SATA drives. It enables enhanced performance and power management for the storage subsystem.

To install the driver, click "Intel Rapid Storage Technology" on the main menu.

1. Setup is now ready to install the utility. Click Next.
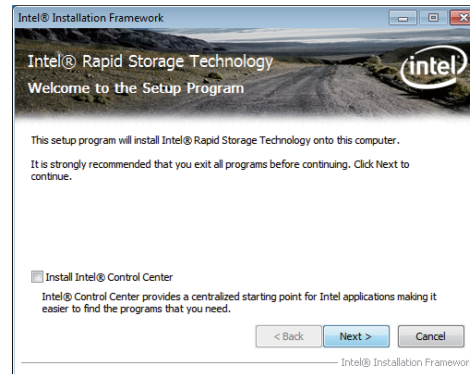
2. Read the warning then click Yes.
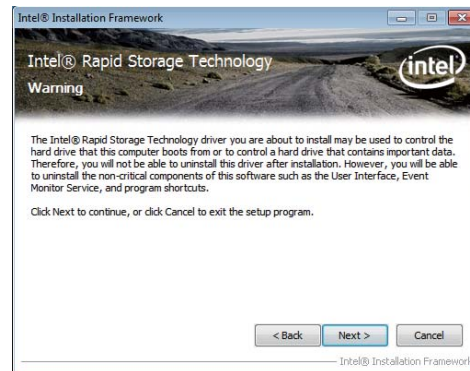
3. Read the license agreement then click Yes.
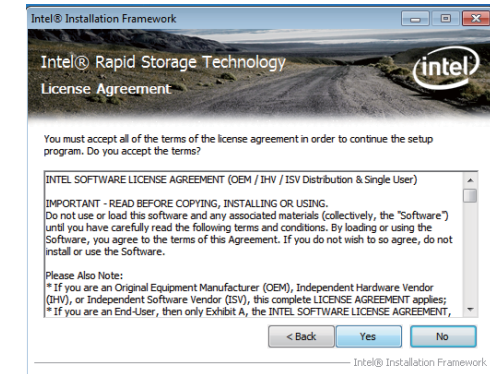
4. Go through the readme document for system requirements and installation tips then click Next.
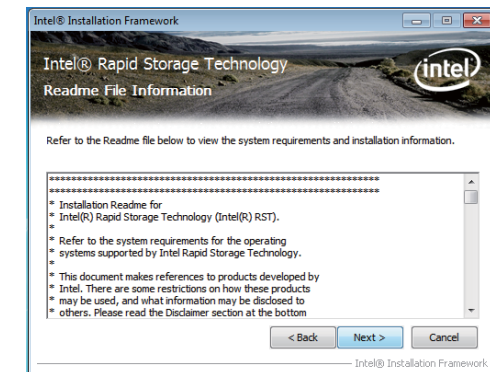
5. Setup is now installing the utility. Click Next to continue.

65

Chapter 5
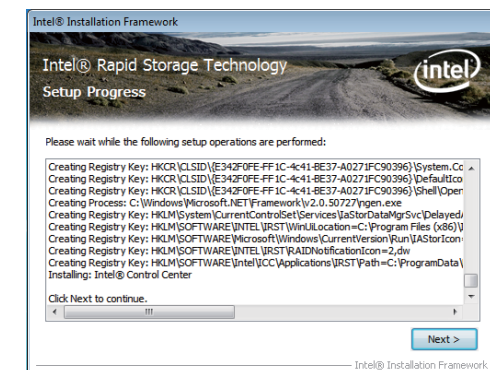
6. Click "Yes, I want to restart my computer now" then click Finish.

Restarting the system will allow the new software installation to take effect.

7. Run the Intel Matrix Storage Console utility to view the hard drives' configuration.
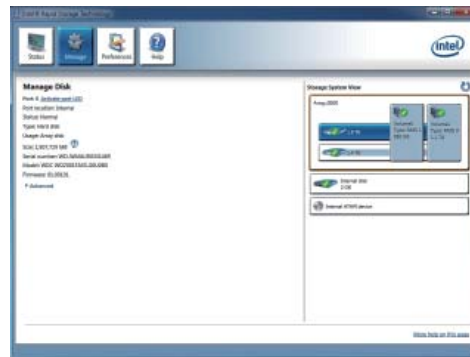
Intel Turbo Boost Monitor (For Windows 7/8)

To install the driver, click "Intel Turbo Boost Monitor" on the main menu.

1. The setup program is configuring the new software installation.

2. Click Next.
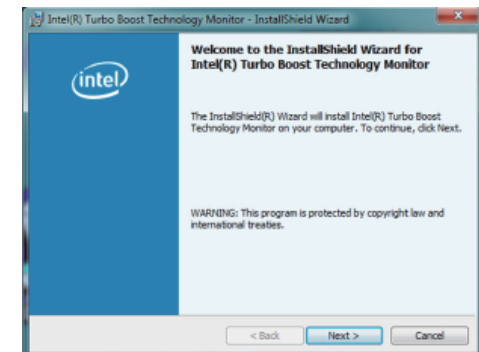
3. Read the license agreement and then click "I accept the terms in the license agreement". Click Next.

66

4. Click Install.

5. The setup program is currently installing the software.

6. Click Finish.

F6 Floppy

This is used to create a floppy driver diskette needed when you install Windows® XP using the F6 installation method. This will allow you to install the operating system onto a hard drive when in AHCI mode.

1. Insert a blank floppy diskette.

2. Locate for the drivers in the CD then copy them to the floppy diskette. The CD includes drivers for both 32-bit and 64-bit operating systems. The path to the drivers are shown below.

32-bit

CD Drive:\AHCI_RAID\F6FLOPPY\f6flpy32

64-bit

CD Drive:\AHCI_RAID\F6FLOPPY\f6flpy64

67

Infineon TPM Driver and Tool (optional)

To install the driver, click "Infineon TPM driver and tool (option)" on the main menu.

1. Read the message and click OK.
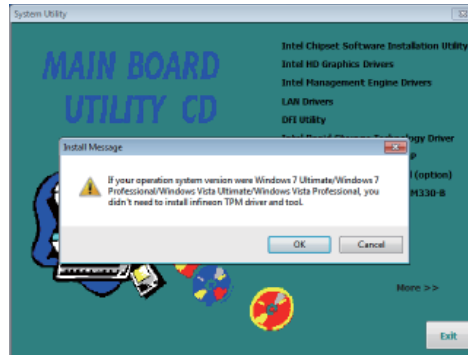
2. The setup program is preparing to install the driver.

3. Click "I accept the terms in the license agreement" and then click "Next".
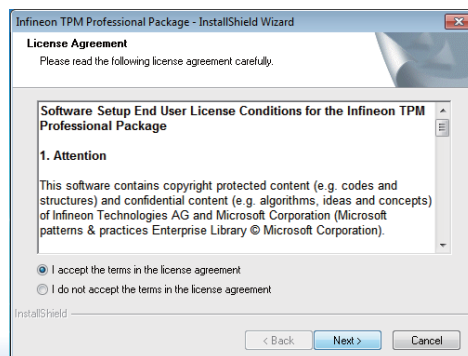
4. Enter the necessary information and then click Next.
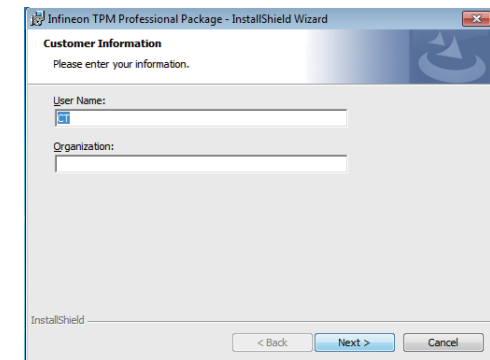
5. Select a setup type and then click Next.
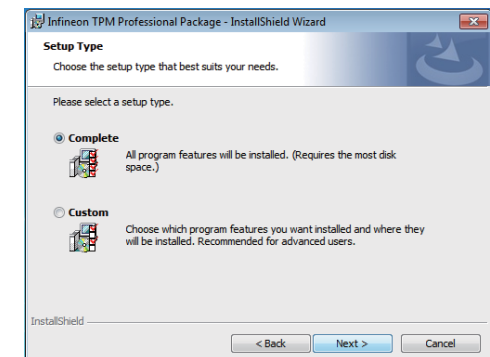
Intel USB 3.0 Drivers (For Windows 7 only)

To install the driver, click "Intel USB 3.0 Driver" on the main menu.

1. Setup is ready to install the driver. Click Next.
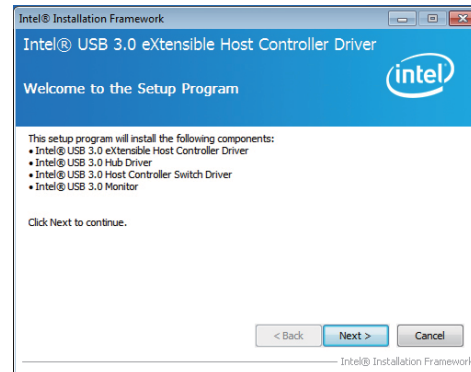
2. Read the license agreement then click Yes.

3. Go through the readme document for more installation tips then click Next.
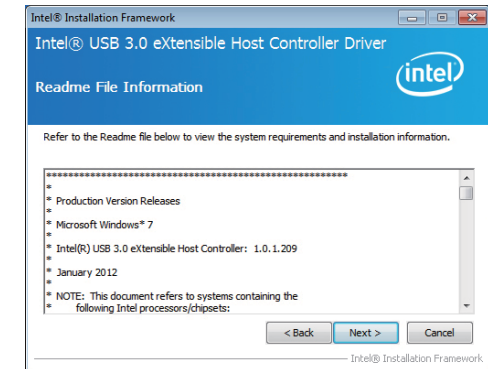
4. Setup is currently installing the driver. After installation has completed, click Next.

5. After completing installation, click Finish.

69
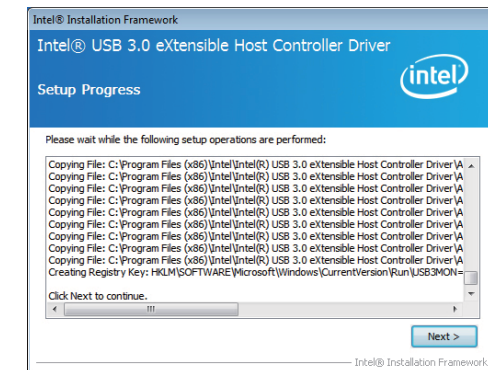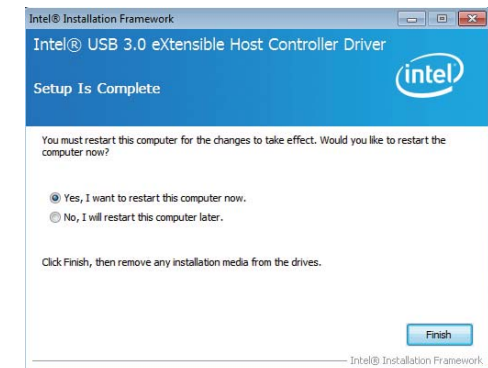
Adobe Acrobat Reader 9.3

To install the reader, click "Adobe Acrobat Reader 9.3" on the main menu.

1. Click Next to install or click Change Destination Folder to select another folder.
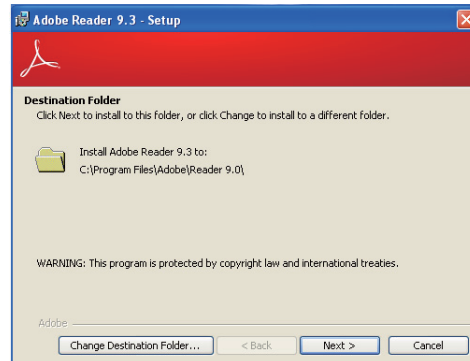
2. Click Install to begin installation.
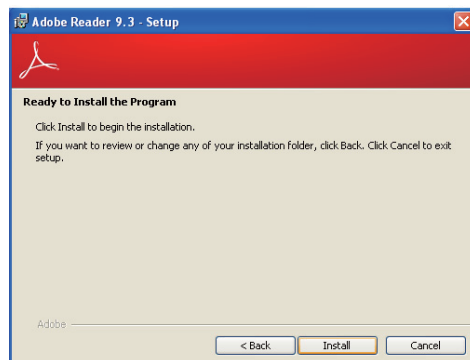
3. Click Finish to exit installation.

70
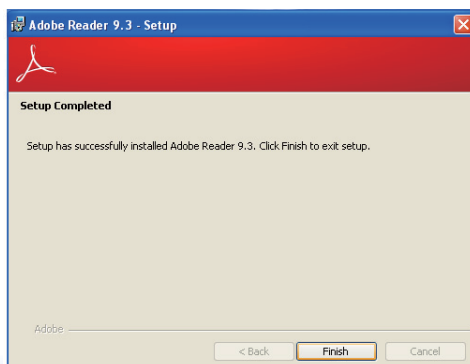
Chapter 6 - GPIO Programming Guide

Function Description

Get_EC_Data (unsigned char ucData): Read a Byte data from EC.
Write_EC_Data (unsigned char ucData, unsigned char Data): Write a Byte data to EC.

Sample Code

GPIO Input Process

```
EC_DIO_Read_Input()
{
    BYTE Data;

    //Pin0-3 Input Mode
    Data = Get_EC_Data(0xBA);
    Data |= 0x80;
    Write_EC_Data(0xBA, Data);
    while(((Get_EC_Data(0xBA) >> 7)&0x01))
    {
     Data = Get_EC_Data(0xBA);
    }

    Return Data ;
}
```

GPIO Output Process

```
EC_DIO_Write_Output(unsigned char udata)
{
    //Pin4-7 Output Mode
    udata <<= 4;
    udata |= 0x01;
    Write_EC_Data(0xBB, udata);

    return 0;

EC_DIO_Read_Output()
{
     BYTE Data;

    //Pin4-7 Output Mode
    Write_EC_Data(0xBB, 0x02);
    Delay;
    Data = Get_EC_Data(0xBB);
    Data >>= 4;
    Return Data ;
}
```

Appendix A - NLITE and AHCI Installation Guide

nLite

nLite is an application program that allows you to customize your XP installation disc by integrating the RAID/AHCI drivers into the disc. By using nLite, the F6 function key usually required during installation is no longer needed.

> **Note:**
> The installation steps below are based on nLite version 1.4.9. Installation procedures may slightly vary if you're using another version of the program.

1. Download the program from nLite's offical website.

   http://www.nliteos.com/download.html

2. Install nLite.

> **Important:**
> Due to it's coding with Visual.Net, you may need to first install .NET Framework prior to installing nLite.

3. Download relevant RAID/AHCI driver files from Intel's website. The drivers you choose will depend on the operating system and chipset used by your computer.

The downloaded driver files should include iaahci.cat, iaAHCI.inf, iastor.cat, iaStor. inf, IaStor.sys, license.txt and TXTSETUP.OEM.
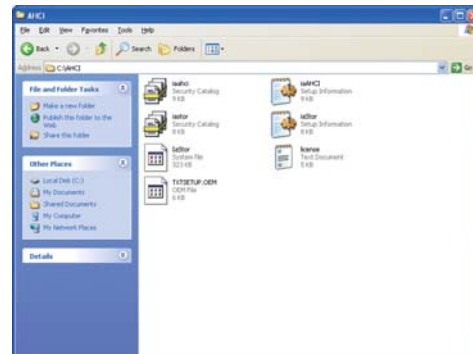
4. Insert the XP installation disc into an optical drive.

5. Launch nLite. The Welcome screen will appear. Click Next.
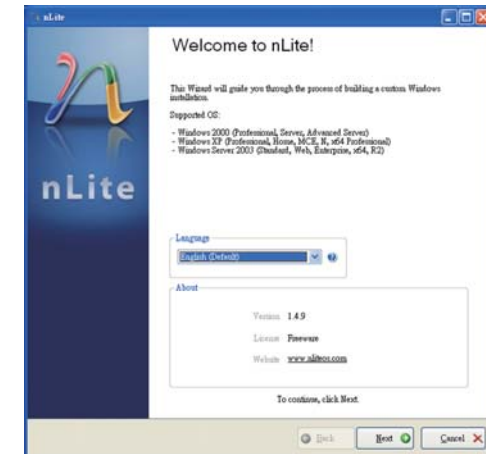
6. Click Next to temporarily save the Windows installation files to the designated default folder.

If you want to save them in another folder, click Browse, select the folder and then click Next.

72
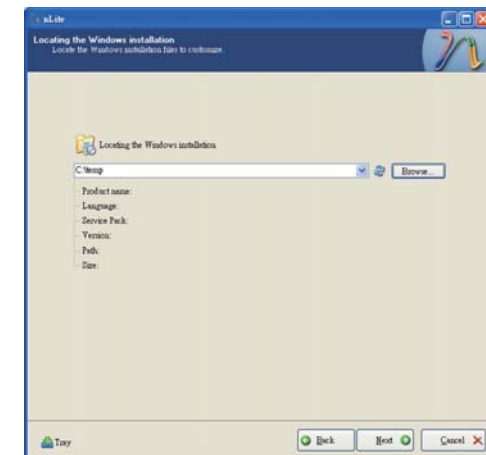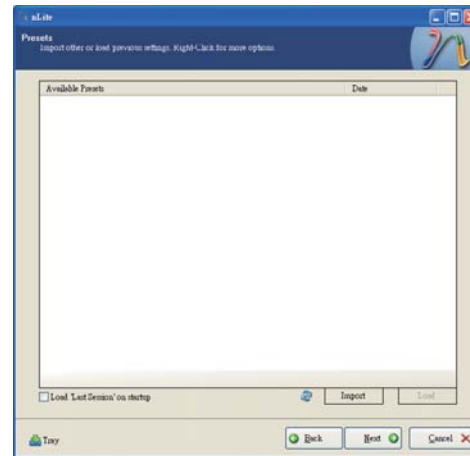
7. Click Next.

8. In the Task Selection dialog box, click Drivers and Bootable ISO. Click Next.
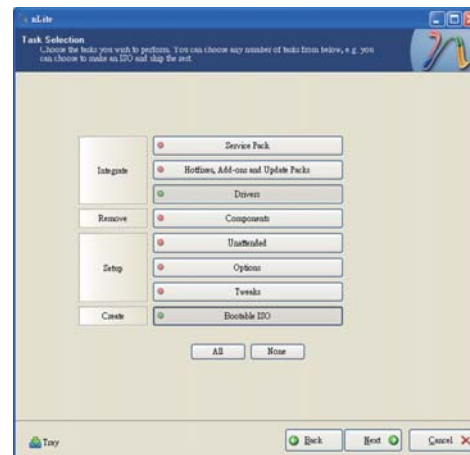
9. Click Insert and then select Multiple driver folder to select the drivers you will integrate. Click Next.
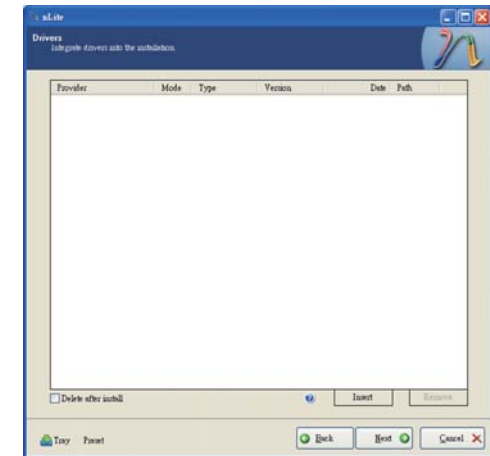
10. Select only the drivers appropriate for the Windows version that you are using and then click OK.

Integrating 64-bit drivers into 32-bit Windows or vice versa will cause file load errors and failed installation.

73
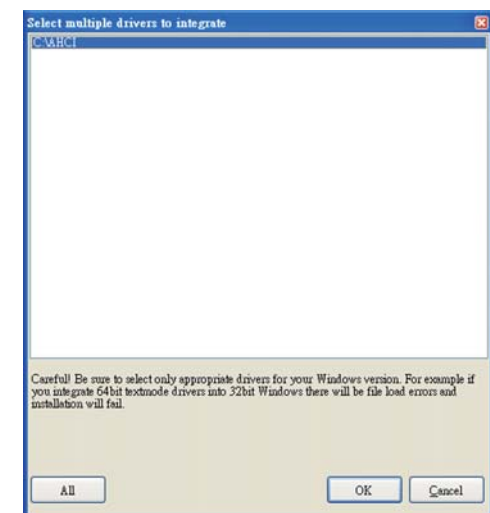
11. If you are uncertain of the southbridge chip used on your motherboard, select all RAID/AHCI controllers and then click OK.

12. Click Next.
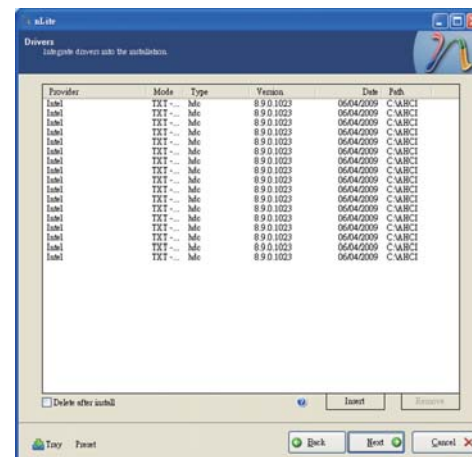
13. The program is currently integrating the drivers and applying changes to the installation.
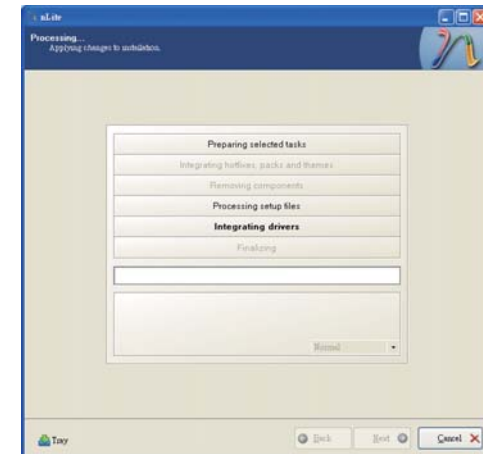
14. When the program is finished applying the changes, click Next.

74
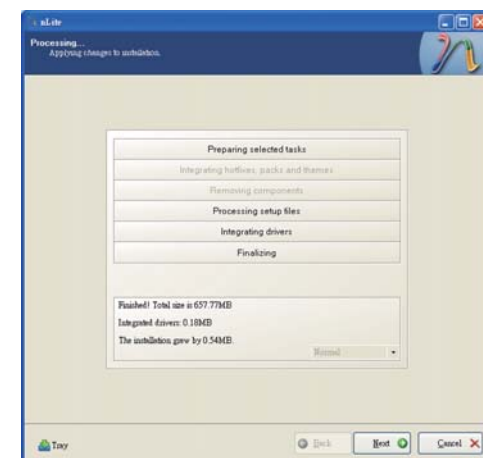
15. To create an image, select the Create Image mode under the General section and then click Next.
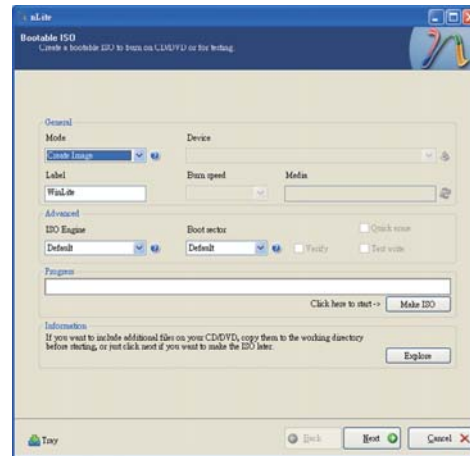
16. Or you can choose to burn it directly to a disc by selecting the Direct Burn mode under the General section.

    Select the optical device and all other necessary settings and then click Next.
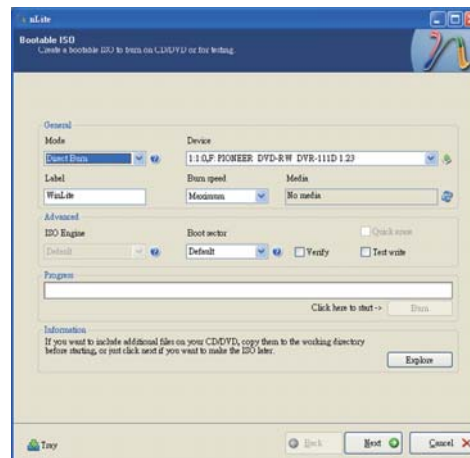
17. You have finished customizing the Windows XP installation disc. Click Finish.

    Enter the BIOS utility to configure the SATA controller to RAID/AHCI. You can now install Windows XP.

75
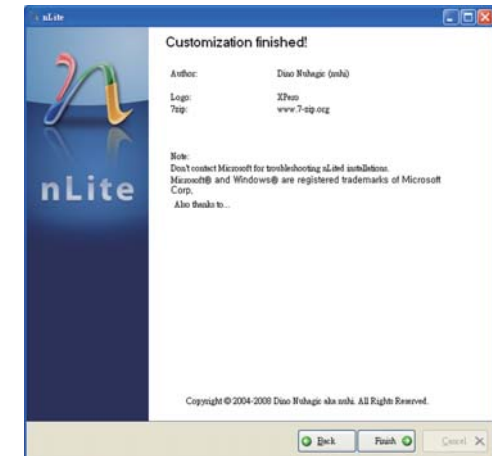
AHCI

The installation steps below will guide you in configuring your SATA drive to AHCI mode.

1. Enter the BIOS utility and configure the SATA controller to IDE mode.

2. Install Windows XP but do not press F6.

3. Download relevant RAID/AHCI driver files supported by the motherboard chipset from Intel's website.

Transfer the downloaded driver files to C:\AHCI.
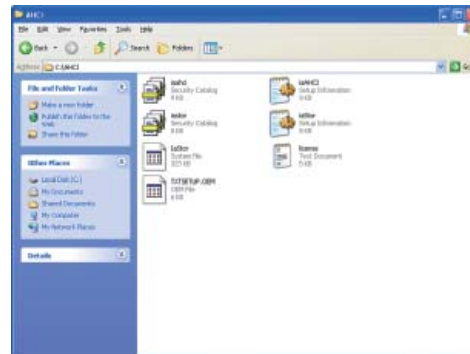
4. Open Device Manager and right click on one of the Intel Serial ATA Storage Controllers, then select Update Driver.

If the controller you selected did not work, try selecting another one.
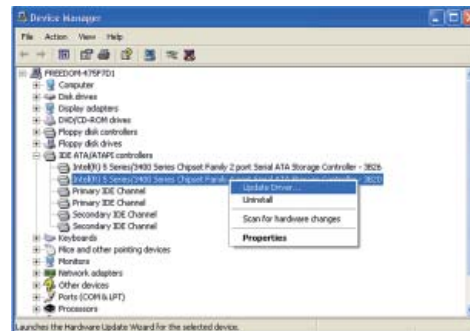
5. In the Hardware Update Wizard dialog box, select "No, not this time" then click Next.

6. Select "Install from a list or specific location (Advanced)" and then click Next.
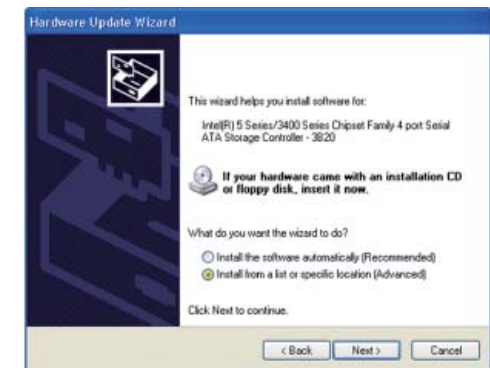
7. Select "Don't search. I will choose the driver to install" and then click Next.

76
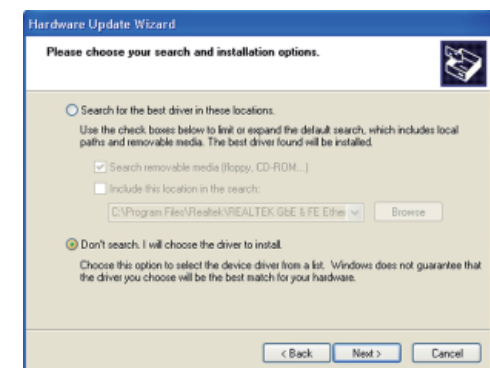
8. Click "Have Disk".
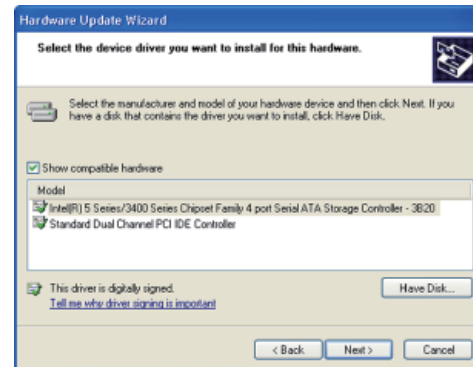
9. Select C:\AHCI\iaAHCI.inf and then click Open.
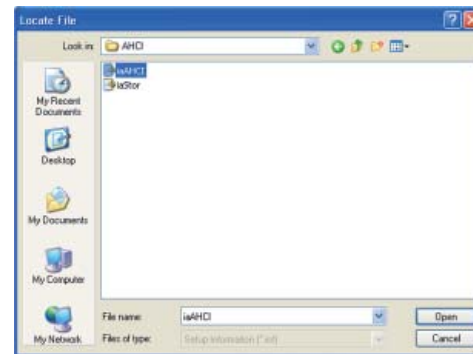
10. Select the appropriate AHCI Controller of your hardware device and then click Next.
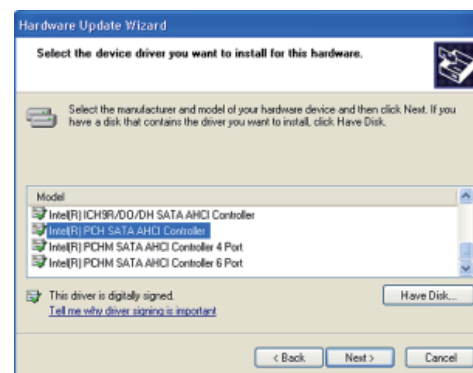
11. A warning message appeared because the selected SATA controller did not match your hardware device.
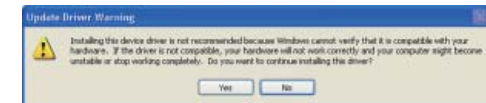
Ignore the warning and click Yes to proceed.

12. Click Finish.
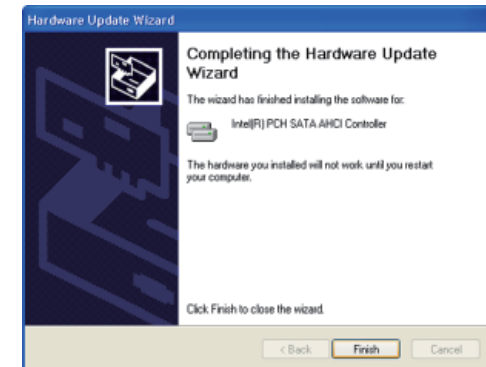
13. The system's settings have been changed. Windows XP requires that you restart the computer. Click Yes.

14. Enter the BIOS utility and modify the SATA controller from IDE to AHCI. By doing so, Windows will work normally with the SATA controller that is in AHCI mode.

77
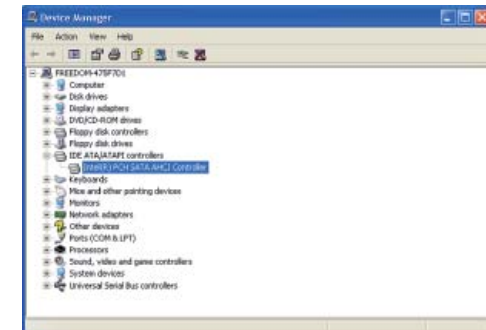
Appendix B - Watchdog Sample Code

```c
#include <stdio.h>
//------------------------------------------------------------
#define EC_EnablePort 0x66
#define EC_DataPort 0x62
//------------------------------------------------------------
void WriteEC(char,int);
void SetWDTime(int,int);
int  GetWDTime(void);
//------------------------------------------------------------
main()
{
   unsigned int countdown;
   unsigned int input,count_h,count_l;

   printf("Input WD Time: ");
   scanf("%d",&input);
   printf("\n");
   count_h=input>>8;
   count_l=input&0x00FF;
   SetWDTime(count_h,count_l);

   while(1)
   {
           countdown = GetWDTime();
           delay(100);
           printf("\rTime Remaining: %d ",countdown);
   }
}
//------------------------------------------------------------
void SetWDTime(int count_H,int count_L)
{
   //Set Count
   WriteEC(0xB7,count_H); //High Byte
   WriteEC(0xB8,count_L); //Low  Byte
   //Enable Watch Dog Timer
   WriteEC(0xB4,0x02);
}
//------------------------------------------------------------
```

```c
int GetWDTime(void)
{
   int sum,data_h,data_l;
   //Select EC Read Type
   outportb(EC_EnablePort,0x80);
   delay(5);
   //Get Remaining Count High Byte
   outportb(EC_DataPort,0xF6);
   delay(5);
   data_h=inportb(EC_DataPort);
   delay(5);
   //Select EC Read Type
   outportb(EC_EnablePort,0x80);
   delay(5);
   //Get Remaining Count Low Byte
   outportb(EC_DataPort,0xF7);
   delay(5);
   data_l=inportb(EC_DataPort);
   delay(5);

   data_h<<=8;
   data_h&=0xFF00;
   sum=data_h|data_l;
   return sum;
}
//------------------------------------------------------------
void WriteEC(char EC_Addr, int data)
{
   //Select EC Write Type
   outportb(EC_EnablePort,0x81);
   delay(5);
   outportb(EC_DataPort,EC_Addr);
   delay(5);
   outportb(EC_DataPort,data);
   delay(5);
}
//------------------------------------------------------------
```

Appendix C - System Error Message

When the BIOS encounters an error that requires the user to correct something, either a beep code will sound or a message will be displayed in a box in the middle of the screen and the message, PRESS F1 TO CONTINUE, CTRL-ALT-ESC or DEL TO ENTER SETUP, will be shown in the information box at the bottom. Enter Setup to correct the error.

Error Messages

One or more of the following messages may be displayed if the BIOS detects an error during the POST. This list indicates the error messages for all Awards BIOSes:

CMOS BATTERY HAS FAILED

The CMOS battery is no longer functional. It should be replaced.

> **Important:**
> Danger of explosion if battery incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the battery manufacturer's instructions.

CMOS CHECKSUM ERROR

Checksum of CMOS is incorrect. This can indicate that CMOS has become corrupt. This error may have been caused by a weak battery. Check the battery and replace if necessary.

DISPLAY SWITCH IS SET INCORRECTLY

The display switch on the motherboard can be set to either monochrome or color. This indicates the switch is set to a different setting than indicated in Setup. Determine which setting is correct, either turn off the system and change the jumper or enter Setup and change the VIDEO selection.

Appendix D - Troubleshooting

Troubleshooting Checklist

This chapter of the manual is designed to help you with problems that you may encounter with your personal computer. To efficiently troubleshoot your system, treat each problem individually. This is to ensure an accurate diagnosis of the problem in case a problem has multiple causes.

Some of the most common things to check when you encounter problems while using your system are listed below.

1. The power switch of each peripheral device is turned on.

2. All cables and power cords are tightly connected.

3. The electrical outlet to which your peripheral devices are connected is working. Test the outlet by plugging in a lamp or other electrical device.

4. The monitor is turned on.

5. The display's brightness and contrast controls are adjusted properly.

6. All add-in boards in the expansion slots are seated securely.

7. Any add-in board you have installed is designed for your system and is set up correctly.

Monitor/Display

If the display screen remains dark after the system is turned on:

1. Make sure that the monitor's power switch is on.

2. Check that one end of the monitor's power cord is properly attached to the monitor and the other end is plugged into a working AC outlet. If necessary, try another outlet.

3. Check that the video input cable is properly attached to the monitor and the system's display adapter.

4. Adjust the brightness of the display by turning the monitor's brightness control knob.

The picture seems to be constantly moving.

1. The monitor has lost its vertical sync. Adjust the monitor's vertical sync.

2. Move away any objects, such as another monitor or fan, that may be creating a magnetic field around the display.

3. Make sure your video card's output frequencies are supported by this monitor.

The screen seems to be constantly wavering.

1. If the monitor is close to another monitor, the adjacent monitor may need to be turned off. Fluorescent lights adjacent to the monitor may also cause screen wavering.

Power Supply

When the computer is turned on, nothing happens.

1. Check that one end of the AC power cord is plugged into a live outlet and the other end properly plugged into the back of the system.

2. Make sure that the voltage selection switch on the back panel is set for the correct type of voltage you are using.

3. The power cord may have a "short" or "open". Inspect the cord and install a new one if necessary.

81

Hard Drive

Hard disk failure.

1. Make sure the correct drive type for the hard disk drive has been entered in the BIOS.

2. If the system is configured with two hard drives, make sure the bootable (first) hard drive is configured as Master and the second hard drive is configured as Slave. The master hard drive must have an active/bootable partition.

Excessively long formatting period.

If your hard drive takes an excessively long period of time to format, it is likely a cable connection problem. However, if your hard drive has a large capacity, it will take a longer time to format.

Serial Port

The serial device (modem, printer) doesn't output anything or is outputting garbled

characters.

1. Make sure that the serial device's power is turned on and that the device is on-line.

2. Verify that the device is plugged into the correct serial port on the rear of the computer.

3. Verify that the attached serial device works by attaching it to a serial port that is working and configured correctly. If the serial device does not work, either the cable or the serial device has a problem. If the serial device works, the problem may be due to the onboard I/O or the address setting.

4. Make sure the COM settings and I/O address are configured correctly.

Keyboard

Nothing happens when a key on the keyboard was pressed.

1. Make sure the keyboard is properly connected.

2. Make sure there are no objects resting on the keyboard and that no keys are pressed during the booting process.

System Board

1. Make sure the add-in card is seated securely in the expansion slot. If the add-in card is loose, power off the system, re-install the card and power up the system.

2. Check the jumper settings to ensure that the jumpers are properly set.

3. Verify that all memory modules are seated securely into the memory sockets.

4. Make sure the memory modules are in the correct locations.

5. If the board fails to function, place the board on a flat surface and seat all socketed components. Gently press each component into the socket.

6. If you made changes to the BIOS settings, re-enter setup and load the BIOS defaults.