DFI®


# HM961-QM87 / HM86

## COM Express Basic Module
## User's Manual

A30830527

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



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## 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 HM961 board
- One DVD
- One QR (Quick Reference)
- Heat spreader with heat sink and fan

## Optional Items

- COM331-B carrier board kit
- Heat spreader

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.

- Memory module
- 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

| | |
|---|---|
| **Processor** | • 4th generation Intel® Core™ processors<br>4700EQ : Intel® Core™ i7-4700EQ, 6M Cache, 2.4GHz (3.4GHz), 47W<br>4400E : Intel® Core™ i5-4400E, 3M Cache, 2.7GHz (3.3GHz), 37W<br>4402E : Intel® Core™ i5-4402E, 3M Cache, 1.6GHz (2.7GHz), 25W<br>4100E : Intel® Core™ i3-4100E, 3M Cache, 2.4 GHz, 37W<br>4102E : Intel® Core™ i3-4102E, 3M Cache, 1.6 GHz, 25W<br>• BGA 1364 packaging technology<br>• 22nm process technology |
| **Chipset** | • Intel® QM87 Express Chipset (HM961-QM87)<br>• Intel® HM86 Express Chipset (HM961-HM86) |
| **System Memory** | • Two 204-pin DDR3L SODIMM sockets<br>• Supports DDR3L 1333/1600MHz ECC SODIMM<br>• Supports up to 16GB system memory<br>• DRAM device technologies: 1Gb, 2Gb and 4Gb DDR3L DRAM technologies are supported for x8 and x16 devices, ECC DRAM only |
| **Graphics** | • Intel® HD Graphics 4600<br>• Supports 1 VGA, 1 LVDS and 3 DDI<br>• VGA: resolution up to 2048x1536 @75Hz<br>• LVDS: NXP PTN3460, 24-bit, dual channel, resolution up to 1920x1200 @60Hz<br>• Digital Display Interfaces: HDMI, DVI and DP<br>• HDMI: resolution up to 4096x2304 @24Hz or 2560x1600 @60Hz<br>• DVI: resolution up to 1920x1200 @60Hz<br>• DP: resolution up to 3840x2160 @60Hz<br>• Intel® Clear Video Technology<br>• Intel® Advanced Vector Extensions (Intel® AVX) Instructions<br>• Supports DirectX 11.1, OpenGL 4.0, OpenCL 1.2 |
| **Audio** | • Supports High Definition Audio interface |
| **LAN** | • Intel® I217LM with iAMT9.0 Gigabit Ethernet Phy (HM961-QM87)<br>• Intel® I217LM Gigabit Ethernet Phy (HM961-HM86)<br>• Integrated 10/100/1000 transceiver<br>• Fully compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3ab |
| **Serial ATA** | HM961-QM87:<br>• Supports 4 SATA 3.0 with data transfer rate up to 6Gb/s<br>• Integrated Advanced Host Controller Interface (AHCI) controller<br>• Supports RAID 0/1/5/10<br>• Supports Intel® Smart Response Technology |
| | HM961-HM86:<br>• Supports 2 SATA 3.0, and 2 SATA 2.0<br>• Supports 2 SATA 3.0, 1 SATA 2.0, and 1 SSD* (optional)<br>• Integrated Advanced Host Controller Interface (AHCI) controller |
| **USB Interface** | HM961-QM87:<br>• XHCI Host Controller supports up to 4 super speed USB 3.0 ports |
| | HM961-HM86:<br>• XHCI Host Controller supports up to 2 super speed USB 3.0 ports |
| **SSD* (optional)** | • 2GB/4GB/8GB/16GB/32GB/64GB<br>• Write: 30MB/sec (max), Read: 70MB/sec (max)<br>• SATA to SSD onboard |
| **Expansion Interfaces** | HM961-QM87:<br>• Supports 4 USB 3.0 interfaces<br>• Supports 8 USB 2.0 interfaces<br>• Supports 1 PCIe x16 Gen 3 interface<br>• Supports 7 PCIe x1 interfaces<br>• Supports LPC interface<br>• Supports SMBus interface<br>• Supports $I^2C$ interface<br>• Supports 2 serial interfaces (TX/RX)<br>• Supports 4-bit input and 4-bit output GPIO |
| | HM961-HM86:<br>• Supports 2 USB 3.0 interfaces<br>• Supports 8 USB 2.0 interfaces<br>• Supports 1 PCIe x16 Gen 3 interface<br>• Supports 7 PCIe x1 interfaces<br>• Supports LPC interface<br>• Supports SMBus interface<br>• Supports $I^2C$ interface<br>• Supports 2 serial interfaces (TX/RX)<br>• Supports 4-bit input and 4-bit output GPIO |
| **Trusted Platform Module - TPM* (optional)** | • Provides a Trusted PC for secure transactions<br>• Provides software license protection, enforcement and password protection |
| **Intel® Active Management Technology - AMT (HM961-QM87)** | • Supports iAMT9.0<br>• Out-of-band system access<br>• Remote troubleshooting and recovery<br>• Hardware-based agent presence checking<br>• Proactive alerting<br>• Remote hardware and software asset tracking |
| **Damage Free Intelligence** | • Monitors CPU temperature and overheat alarm<br>• Monitors CPU fan speed and failure alarm<br>• Monitors Vcore/1.05V/DDR voltages and failure alarm |
| **BIOS** | • AMI BIOS<br>- 64Mbit SPI BIOS |
| **WatchDog Timer** | • Software programmable from 1 to 255 seconds |
| **Power** | • Input: 12V, VCC_RTC, 5VSB* (optional) |
| **Power Consumption** | • HM961-QM87BS4-4700EQ: 55.39W with i7-4700EQ at 2.4GHz and 2x 8GB DDR3L SODIMM |
| **Temperature** | • Operating: 0°C to 60°C<br>• Storage: -20°C to 85°C |
| **Humidity** | • 5% to 90% |

| | |
|---|---|
| **OS Support** | • Windows XP Professional x86 & SP3 (32-bit) (limited function)<br>• Windows 7 Ultimate x86 & SP1 (32-bit)<br>• Windows 7 Ultimate x64 & SP1 (64-bit)<br>• Windows 8 Enterprise x86 (32-bit)<br>• Windows 8 Enterprise x64 (64-bit) |
| **PCB** | • Dimensions<br>- COM Express® Basic<br>- 95mm (3.74") x 125mm (4.9")<br>• Compliance<br>- PICMG COM Express® R2.1, Type 6 |

**Note:**
*Optional and is not supported in standard model. Please contact your sales representative for more information.

# 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.

## • DDR3L ECC

DDR3L ECC supports low-voltage processors and also ensures high-quality processing performance and computing density, in line with the needs of end systems. The issue of dramatically reducing system power consumption is the most trusted memory solutions for cloud data centers.

## • 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. It supports VGA, LVDS and DDI interfaces for 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. The bandwidth of the SATA 3.0 will be limited by carrier board design.

## • Gigabit LAN

The Intel® I217LM Gigabit LAN controller supports up to 1Gbps data transmission.

## • USB

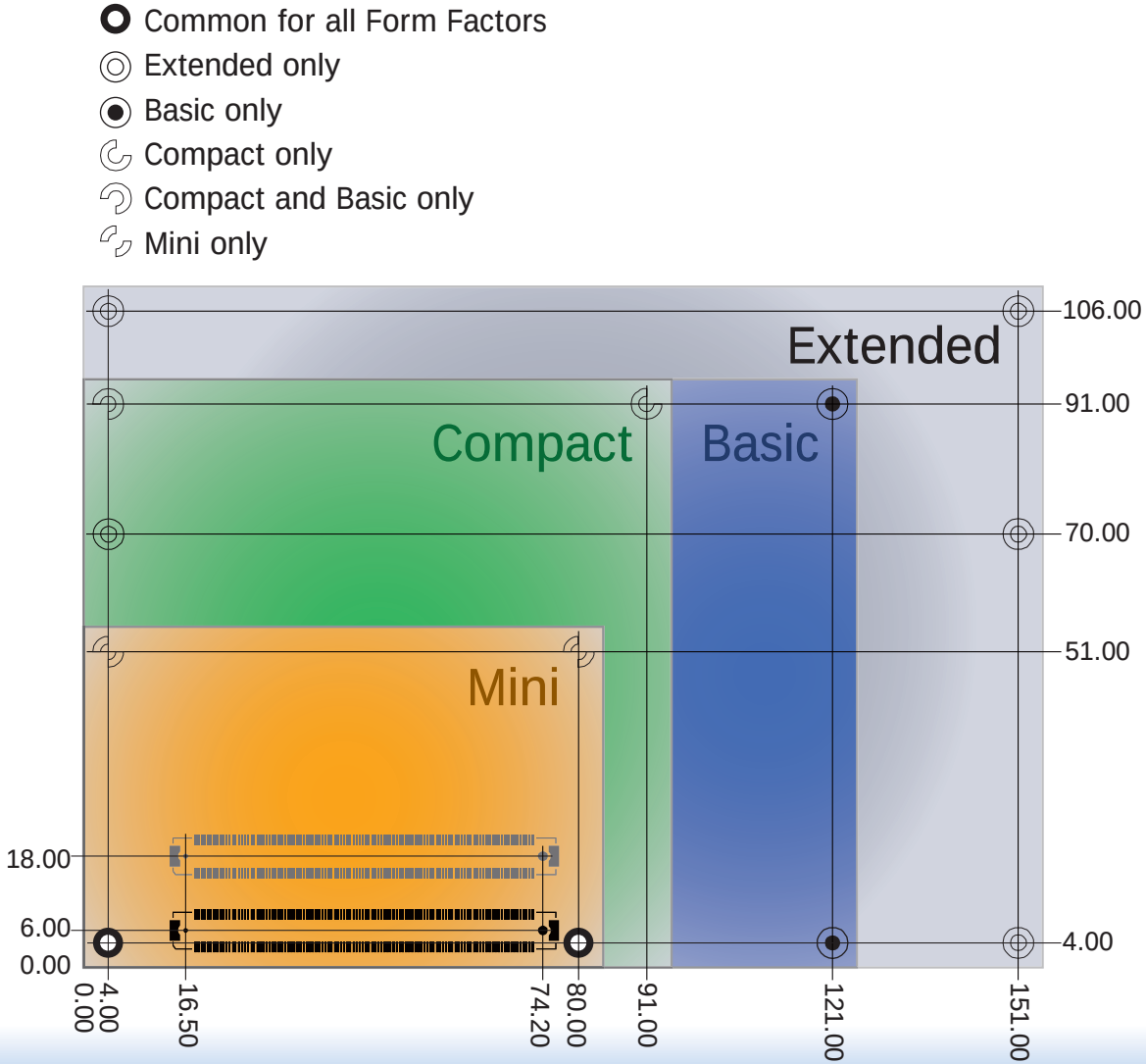
The system board supports the new USB 3.0. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.0 reduces the time required for data transmission, reduces power consumption, and is backward 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 shows the dimensions of the different types of COM Express modules.

HM961-QM87/HM86 is a COM Express Basic module. The dimension is 95mm x 125mm.



# Specification Comparison Table

The table below shows the COM Express standard specifications and the corresponding specifications supported on the HM961-QM87/HM86 module.

| Connector | Feature | COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max | DFI HM961-QM87/HM86 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 |
| | 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 |

| Connector | Feature | COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max | DFI HM961-QM87/HM86 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 | 2 |
| 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 |

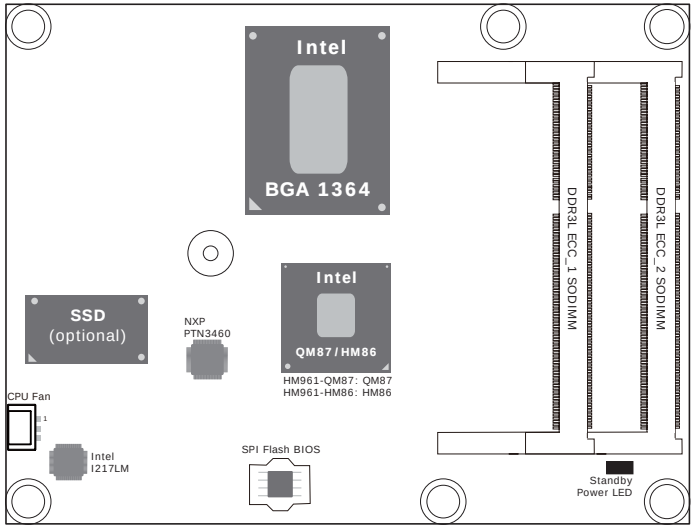
Module Pin-out - Required and Optional Features C-D Connector. PICMG® COM.0Revision 2.1

| Connector | Feature | COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max | DFI HM961-QM87/HM86 Type 6 |
|---|---|---|---|
| C-D | **System I/O** | | |
| | PCI Express Lanes 16 - 31 | 0 / 16 | 16 |
| | PCI Express Graphics (PEG) | 0 / 1 | 1 |
| C-D[6] | Muxed SDVO Channels 1 - 2 | NA | NA |
| | PCI Express Lanes 6 - 15 | 0 / 2 | 1 |
| | PCI Bus - 32 Bit | NA | NA |
| | PATA Port | NA | NA |
| | LAN Ports 1 - 2 | NA | NA |
| | 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 |

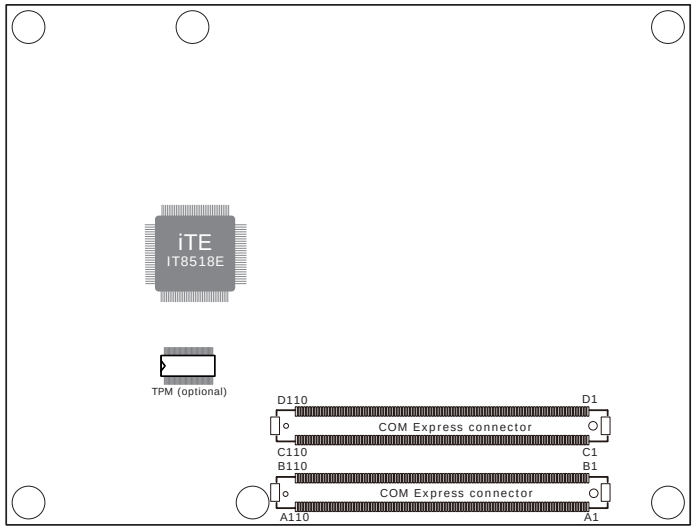
- 5 Indicates 12V-tolerant features on former VCC_12V signals.
- 6 Cells in the connected columns spanning rows provide a rough approximation of features sharing connector pins.

# Chapter 3 - Hardware Installation

## Board Layout

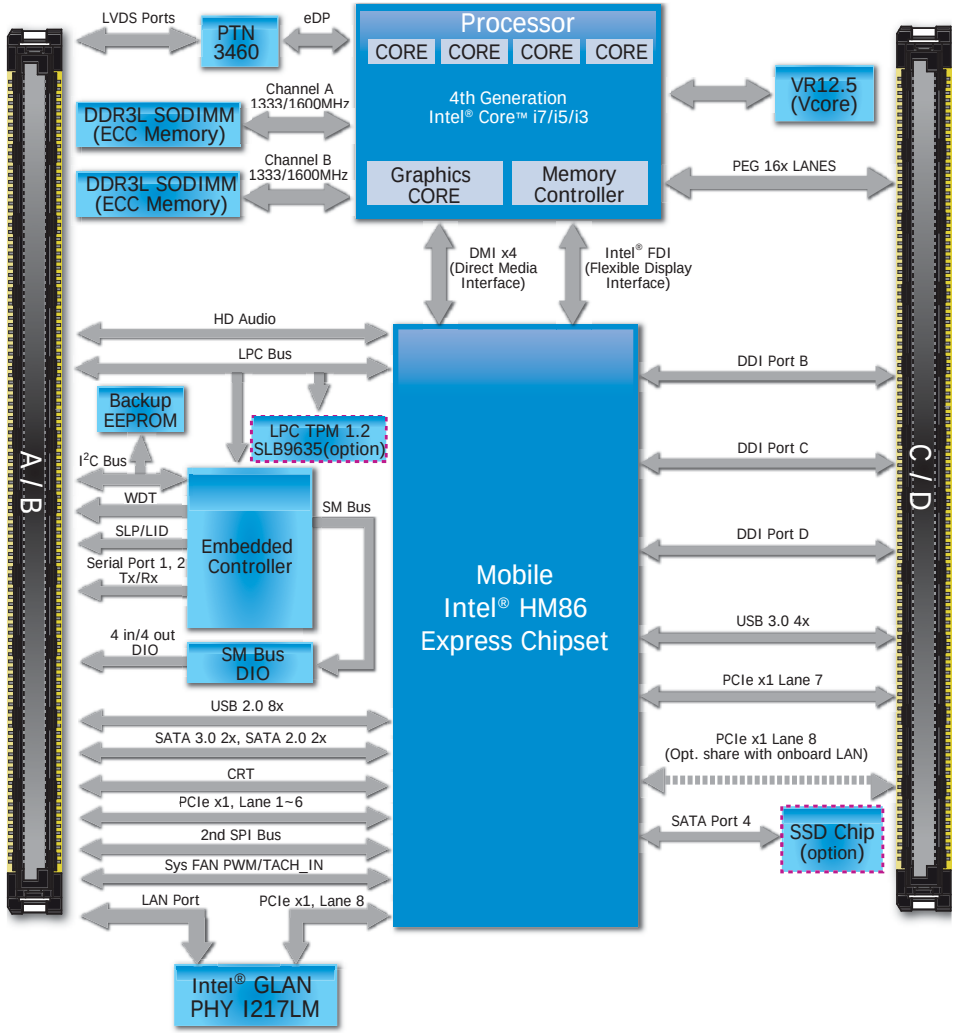



Top View

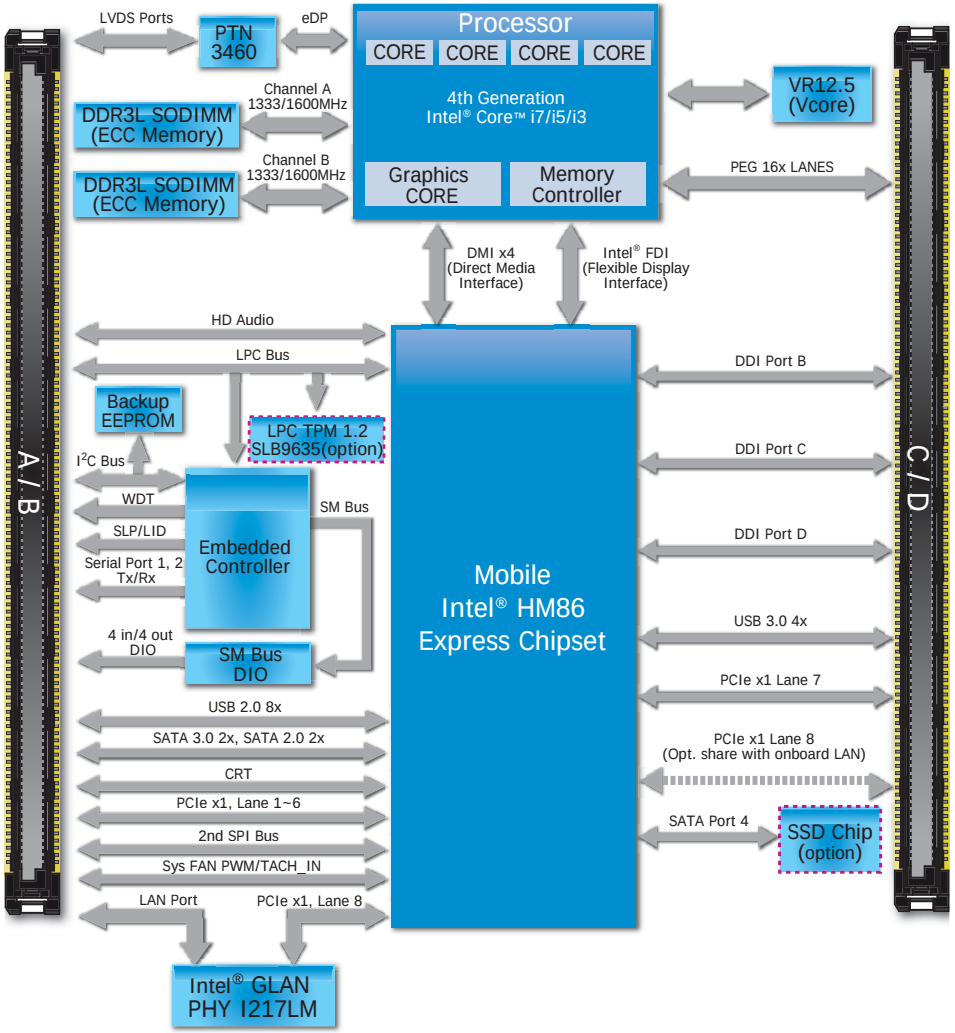



Bottom View

## Block Diagram For HM961-QM87

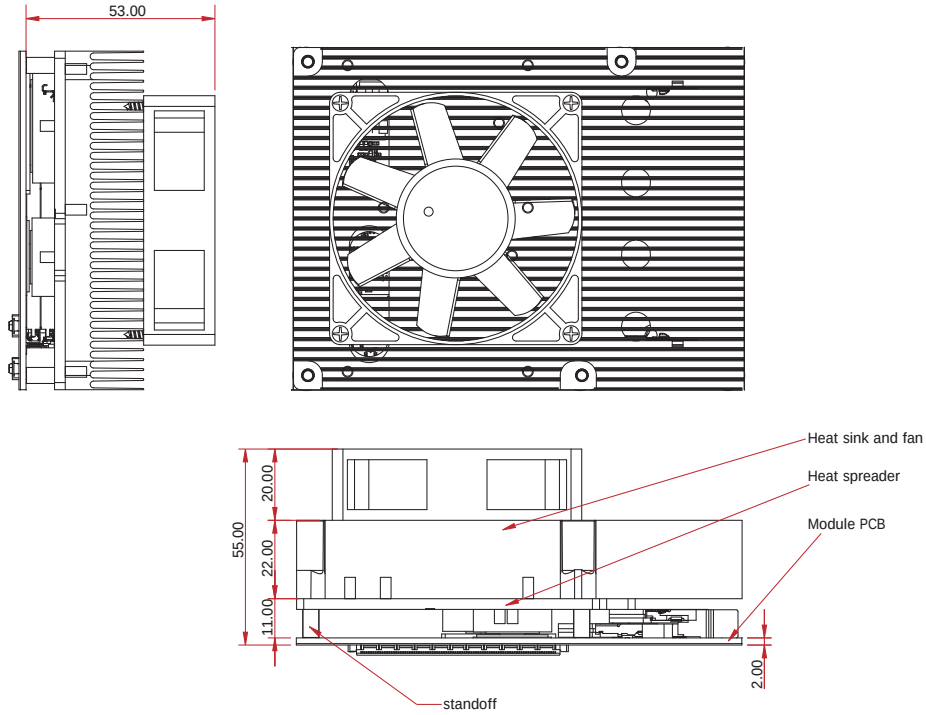


## For HM961-HM86



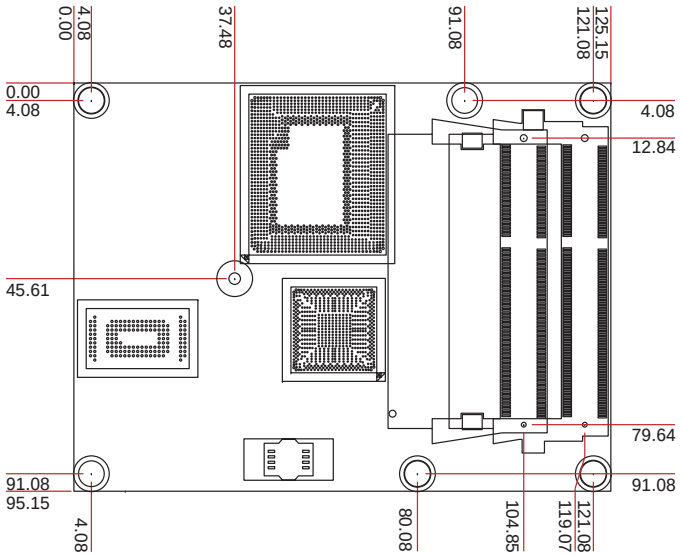
# Mechanical Diagram

**HM961-QM87/HM86 Module with Heat Sink**

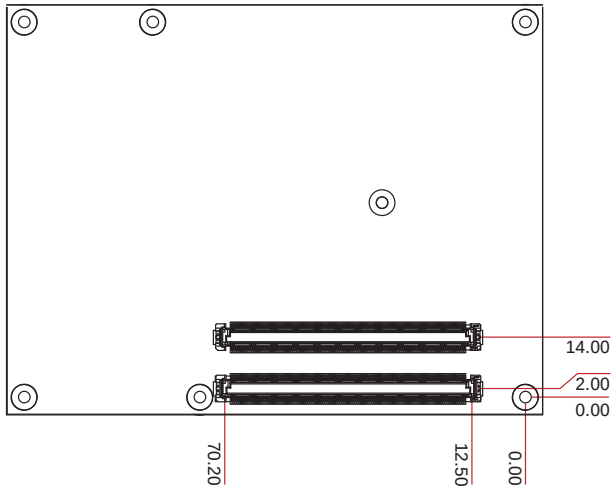



**Side View of the Module with Heat Sink and Carrier Board**

**HM961-QM87/HM86 Module**




Top View



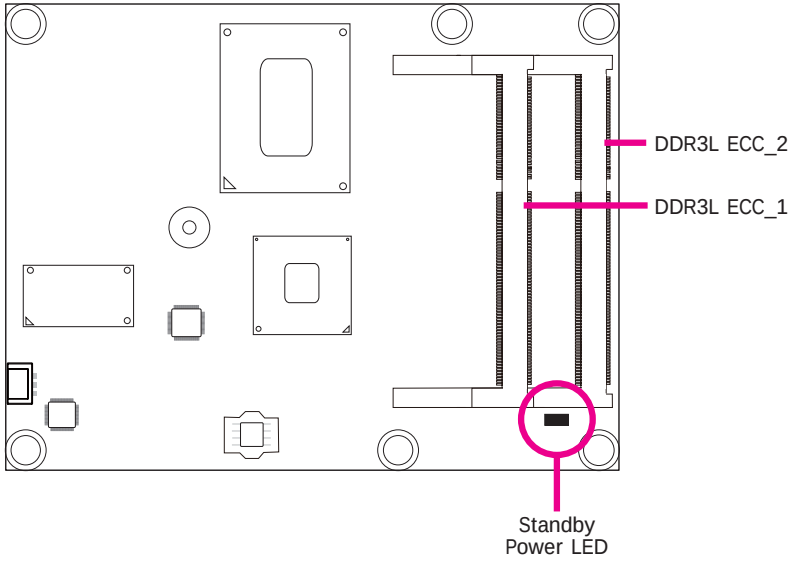

Bottom View

**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 only support DDR3L ECC memory modules. Supports up to 16GB system memory.

**Important:**
When the Standby Power LED lights 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.

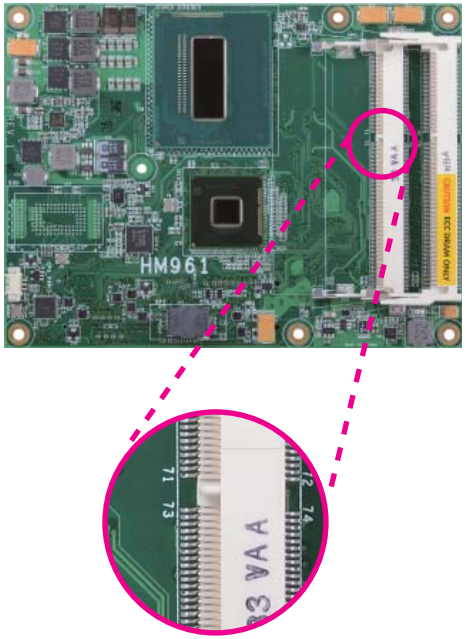



**Warning:**
HM961-QM87/HM86 **ONLY** supports DDR3L ECC DRAM.

## 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.

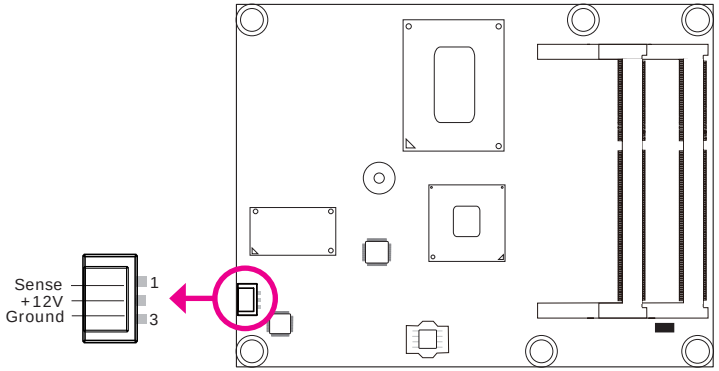


5. Grasping the module by its edges, align the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.


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.


# Connectors

## CPU Fan Connector




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.

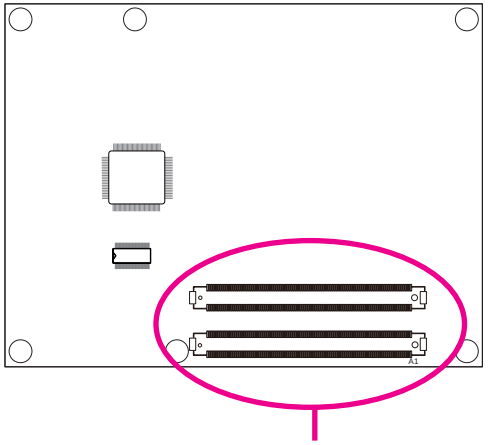
## BIOS Setting

“PC Health Status” 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.

## COM Express Connectors

The COM Express connectors are used to interface the HM961-QM87/HM86 COM Express board to a carrier board. Connect the COM Express connectors (located on the solder side of the board) to the COM Express connectors on the carrier board.

Refer to the “Installing HM961-QM87/HM86 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) |

| 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) |

# 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 | HM961-QM87/HM86 | 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 | | 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 | Serial TDM data inputs from up to 3 CODECs. |
| AC/HDA_SDIN1 | B29 | I/O CMOS | 3.3V Suspend/3.3V | | Connect 33 Ω in series to CODEC1 pin 8 SDATA_IN | |
| 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 | HM961-QM87/HM86 | 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:<br>1000BASE-T 100BASE-TX 10BASE-T<br>MDI[0]+/- B1_DA+/- TX+/- TX+/-<br>MDI[1]+/- B1_DB+/- RX+/- RX+/-<br>MDI[2]+/- B1_DC+/-<br>MDI[3]+/- B1_DD+/- |
| 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+/- | |
| GBE0_MDI2- | A6 | I/O Analog | 3.3V max Suspend | | | |
| GBE0_MDI3+ | A3 | I/O Analog | 3.3V max Suspend | | Connect to Magnetics Module MDI3+/- | |
| GBE0_MDI3- | A2 | I/O Analog | 3.3V max Suspend | | | |
| GBE0_ACT# | B2 | OD CMOS | 3.3V Suspend/3.3V | | Connect to LED and **recommend** current limit resistor 150Ω 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 | | | Gigabit Ethernet Controller 0 100 Mbit / sec link indicator, active low. |
| GBE0_LINK1000# | A5 | OD CMOS | 3.3V Suspend/3.3V | | Connect to LED and **recommend** current limit resistor 150Ω to 3.3VSB | Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low. |

## SATA Signals Descriptions

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
|---|---|---|---|---|---|---|
| SATA4_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. |
| SATA4_TX- | A17 | O SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA4_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. |
| SATA4_RX- | A20 | I SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA5_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. |
| SATA5_TX- | B17 | O SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA5_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. |
| SATA5_RX- | B20 | I SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA0_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. |
| SATA0_TX- | A23 | O SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA0_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. |
| SATA0_RX- | A26 | I SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA2_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. |
| SATA2_TX- | B23 | O SATA | AC coupled on Module | AC Coupling capacitor | | |
| SATA2_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. |
| SATA2_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 | HM961-QM87/HM86 | 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 0 |
| PCIE_RX0- | B69 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 1 |
| PCIE_RX1- | B65 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 2 |
| PCIE_RX2- | B62 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 3 |
| PCIE_RX3- | B59 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 4 |
| PCIE_RX4- | B56 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 5 |
| PCIE_RX5- | B53 | | | | | |
| 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<br>**Slot** - Connect to PCIE Conn pin | PCI Express Differential Receive Pairs 6 |
| PCIE_RX6- | C20 | | | | | |
| PCIE_TX7+ | D22 | O PCIE | AC coupled on Module | NA | NA | PCI Express Differential Transmit Pairs 7<br>(Optional with on board LAN, Default setting as NC) |
| PCIE_TX7- | D23 | | | NA | | |
| PCIE_RX7+ | C22 | I PCIE | AC coupled off Module | NA | NA | PCI Express Differential Receive Pairs 7<br>(Optional with on board LAN, Default setting as NC) |
| PCIE_RX7- | C23 | | | NA | | |
| 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 | HM961-QM87/HM86 | 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 | | | | | |

| PEG Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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 | HM961-QM87/HM86 | Carrier Board | Description |
| EXCD0_CPPE# | A49 | I CMOS | 3.3V /3.3V | | | PCI ExpressCard: PCI Express capable card request, active low, one per card |
| EXCD1_CPPE# | B48 | | | | | |
| EXCD0_PERST# | A48 | O CMOS | 3.3V /3.3V | | | PCI ExpressCard: reset, active low, one per card |
| EXCD1_PERST# | B47 | | | | | |

**DDI Signals Descriptions**

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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 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, PD 49.9K to GND **(S/W IC between Rpu/Rpd 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 TO GND | PU 100K to 3.3V for DDC(HDMI/DVI) | Selects the function of DDI1_CTRLCLK_AUX+ and DDI1_CTRLDATA_AUX-. |
| 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 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, PD 49.9K to GND **(S/W IC between Rpu/Rpd** | 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 |
| 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-. |
| 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 | |

**DDI Signals Descriptions**

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
|---|---|---|---|---|---|---|
| DDI3_CTRLCLK_AUX+ | C36 | I/O PCIE | AC coupled on Module | PD 49.9K to GND **(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, PD 49.9K to GND **(S/W IC between Rpu/Rpd** | 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 | NC | 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-. |

**USB Signals Descriptions**

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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 | | | | | |
| 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.(HM961-QM87/HM86 default set as a host) |
| USB7- | B36 | | | | | |
| USB_0_1_OC# | B44 | I CMOS | 3.3V Suspend/3.3V | PU 10K TO 3V3_DU | 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 3V3_DU | 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 3V3_DU | 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 3V3_DU | 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 Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
| 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 | | | | | |

| LVDS Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
| LVDS_A0+ | A71 | O LVDS | LVDS | | Connect to LVDS connector | LVDS Channel A differential pairs |
| 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 |
| 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 | | Connect to enable control of LVDS panel power | LVDS panel power enable |
| LVDS_BKLT_EN | B79 | O CMOS | 3.3V / 3.3V | | Connect to enable control of LVDS panel backlight | LVDS panel backlight enable |
| LVDS_BKLT_CTRL | B83 | O CMOS | 3.3V / 3.3V | | Connect to brightness control of LVDS panel backlight | LVDS panel backlight brightness control |
| LVDS_I2C_CK | A83 | I/O OD CMOS | 3.3V / 3.3V | PU 4.7K TO 3V3 | 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 4.7K TO 3V3 | Connect to DDC data of LVDS panel | I2C data line for LVDS display use |

| LPC Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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 8.2K TO 3V3 | | LPC serial interrupt |
| LPC_CLK | B10 | O CMOS | 3.3V / 3.3V | | | LPC clock output - 33MHz nominal |

| SPI Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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** | 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** | 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** | 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 | I CMOS | NA | | | 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 | | | | | |

| VGA Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
| VGA_RED | B89 | O Analog | Analog | PD 150 TO GND | **PD 150R,connect to VGA connector with EMI** | Red for monitor. Analog output |
| VGA_GRN | B91 | O Analog | Analog | PD 150 TO GND | **PD 150R,connect to VGA connector with EMI** | Green for monitor. Analog output |
| VGA_BLU | B92 | O Analog | Analog | PD 150 TO GND | **PD 150R,connect to VGA connector with EMI** | Blue for monitor. Analog output |
| VGA_HSYNC | B93 | O CMOS | 3.3V / 3.3V | | **Connect to VGA connector with a3.3V Buffer** | Horizontal sync output to VGA monitor |
| VGA_VSYNC | B94 | O CMOS | 3.3V / 3.3V | | **Connect to VGA connector with a 33V Buffer** | Vertical sync output to VGA monitor |
| VGA_I2C_CK | B95 | I/O OD CMOS | 3.3V / 3.3V | PU 2.2K TO 3V3 | **Connect to VGA connector with a 3.3V to 5V** | DDC clock line (I2C port dedicated to identify VGA monitor capabilities) |
| VGA_I2C_DAT | B96 | I/O OD CMOS | 3.3V / 3.3V | PU 2.2K TO 3V3 | **Connect to VGA connector with a 3.3V to 5V** | DDC data line. |

| Serial Interface Signals Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
| SER0_TX | A98 | O CMOS | 3.3V/5V | | PD 4.7K TO GND | General purpose serial port 0 transmitter |
| SER0_RX | A99 | I CMOS | 3.3V/5V | PU 47K TO 3V3 | | General purpose serial port 0 receiver |
| SER1_TX | A101 | O CMOS | 3.3V/5V | | PD 4.7K TO GND | General purpose serial port 1 transmitter |
| SER1_RX | A102 | I CMOS | 3.3V/5V | PU 47K TO 3V3 | | General purpose serial port 1 receiver |

| Miscellaneous Signal Descriptions | | | | | | |
|---|---|---|---|---|---|---|
| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
| I2C_CK | B33 | I/O OD CMOS | 3.3V Suspend/3.3V | PU 2.2K TO 3V3_DU_EC | | General purpose I2C port clock output |
| I2C_DAT | B34 | I/O OD CMOS | 3.3V Suspend/3.3V | PU 2.2K TO 3V3_DU_EC | | 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 | PU 10K TO 3V3 | | Fan tachometer input for a fan with a two pulse output. |
| TPM_PP | A96 | I CMOS | 3.3V / 3.3V | PU 10K TO GND | | 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 | HM961-QM87/HM86 | Carrier Board | Description |
|---|---|---|---|---|---|---|
| PWRBTN# | B12 | I CMOS | 3.3V Suspend/3.3V | PU 10K TO 3V3_DU_EC | PU 4.7K TO 3V3_SB | 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 3V3_DU | NC PU 4.7K TO 3V3_SB | 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 3V3 | | 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 1K TO 3V3_DU | | PCI Express wake up signal. |
| WAKE1# | B67 | I CMOS | 3.3V Suspend/3.3V | PU 10K TO 3V3_DU | NC PU 10 K TO 3V3_DU | 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 8.2K TO 3V3_DU | | 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 3V3_DU | | 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 3V3 | | Input from off-Module temp sensor indicating an over-temp situation. |
| THRMTRIP# | A35 | O CMOS | 3.3V / 3.3V | PU 10K TO 3V3 | | 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 3V3_DU_EC | NC PU 4.7K TO 3V3_DU | System Management Bus bidirectional clock line. |
| SMB_DAT | B14 | I/O OD CMOS | 3.3V Suspend/3.3V | PU 2.2K TO 3V3_DU_EC | NC PU 4.7K TO 3V3_DU | 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. |

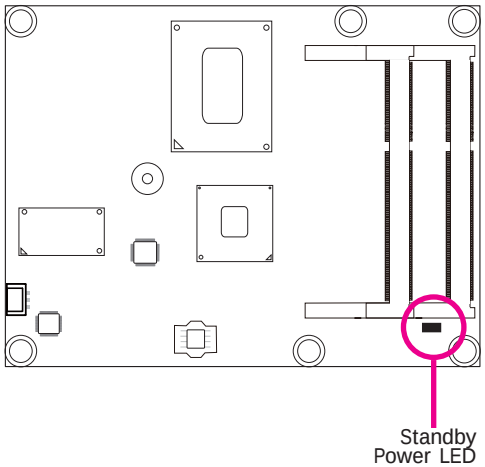
**GPIO Signals Descriptions**

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | 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 3V3 | | General purpose input pins. |
| GPI1 | A63 | | | PU 47K TO 3V3 | | |
| GPI2 | A67 | | | PU 47K TO 3V3 | | |
| GPI3 | A85 | | | PU 47K TO 3V3 | | |

**Power and GND Signal Descriptions**

| Signal | Pin# | Pin Type | Pwr Rail /Tolerance | HM961-QM87/HM86 | Carrier Board | Description |
|---|---|---|---|---|---|---|
| VCC_12V | A104~A109<br>B104~B109<br>C104~C109<br>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.<br>All available GND connector pins shall be used and tied to Carrier Board GND plane. |

## Standby Power LED



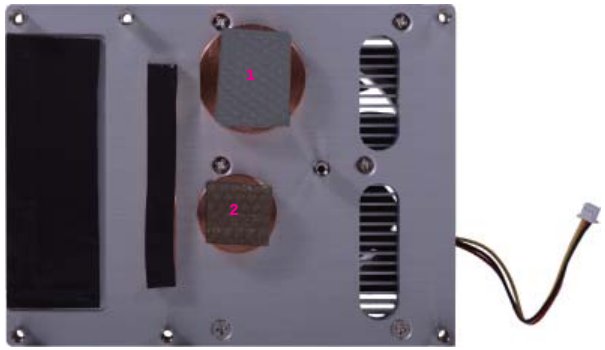

This LED will light when the system is in the standby mode.

## 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 HM961-QM87/HM86.

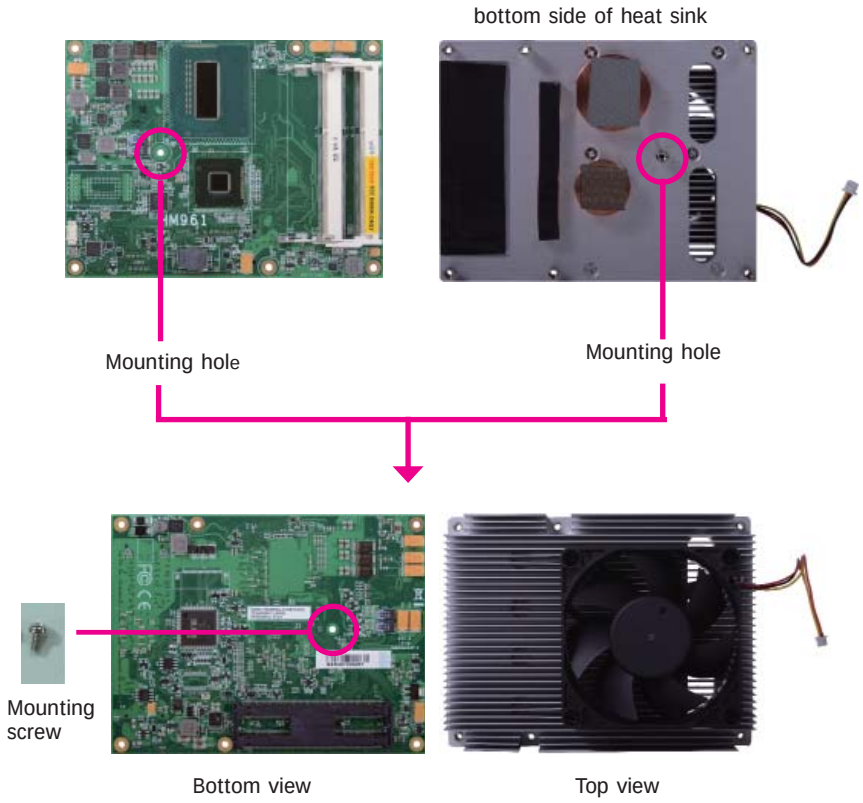
**Important:**
Remove the plastic covering from the thermal pads prior to mounting the heat sink onto HM961-QM87/HM86.

## Installing HM961-QM87/HM86 onto a Carrier Board

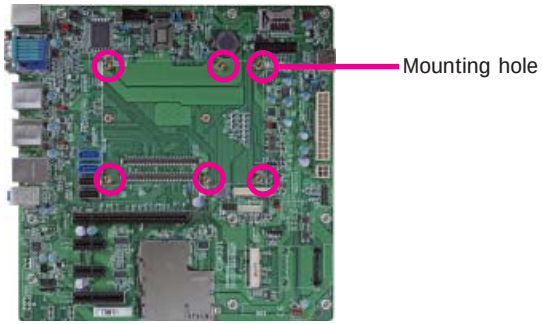
**Important:**
The carrier board (COM331-B) used in this section is for reference purpose only and may not resemble your carrier board. These illustrations are mainly to guide you on how to install HM961-QM87/HM86 onto the carrier board of your choice.

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

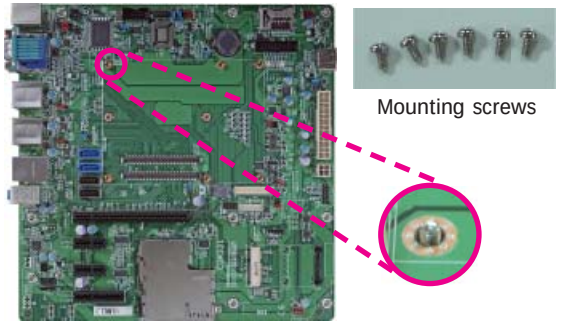
1. Use the provided screw to install the heatsink onto the module. First align the mounting hole of the heatsink with the mounting hole of the module and then from the bottom side of the module, secure them with the provided screw. The module and heatsink as sembly should look like the one shown below.



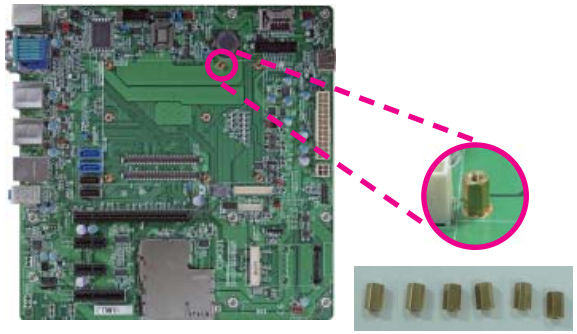

2. Now install the module and heatsink assembly onto the carrier board. The photo below shows the locations of the mounting holes on carrier board.




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

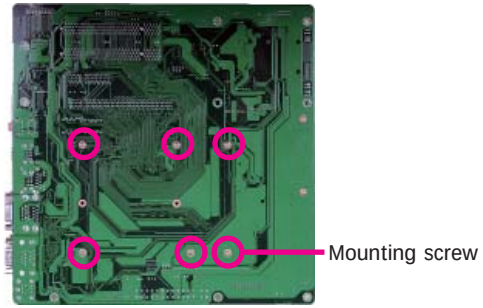


4. While supporting the mounting screw at the bottom, from the top side of the board, fasten a bolt into the screw.

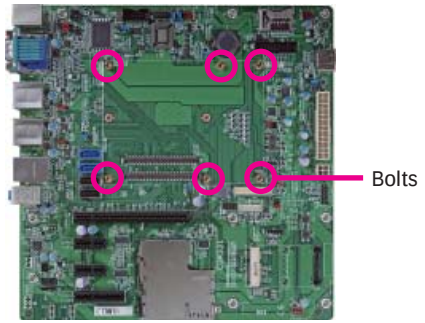


Bolts

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



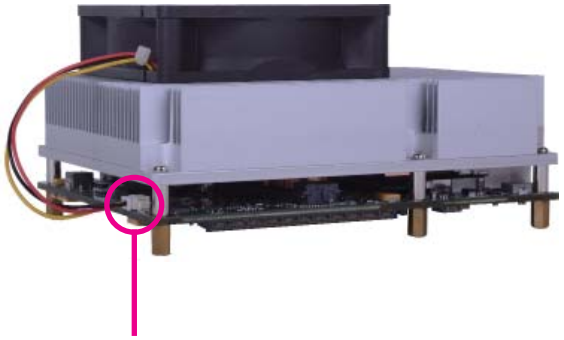

6. The photo below shows the component side of the board with the bolts already fixed in place.



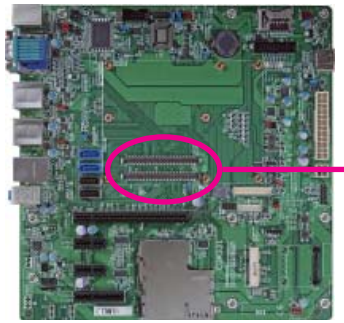

7. Position the heat sink on the top of HM961-QM87/HM86 with the heat sink's mounting holes aligned with HM961-QM87/HM86 mounting holes. Insert one of the provided long screws into the mounting hole shown in the photo below.


Long screw

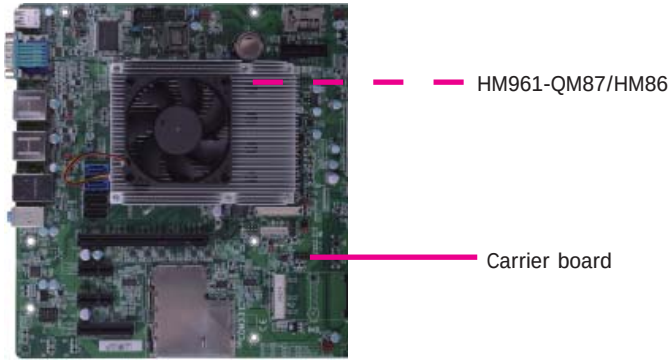
8. From the bottom of the board, fasten the provided bolt into the screw and then connect the heat spreader/heat spreader with heat sink and fan's cable to the fan connector on HM961-QM87/HM86.



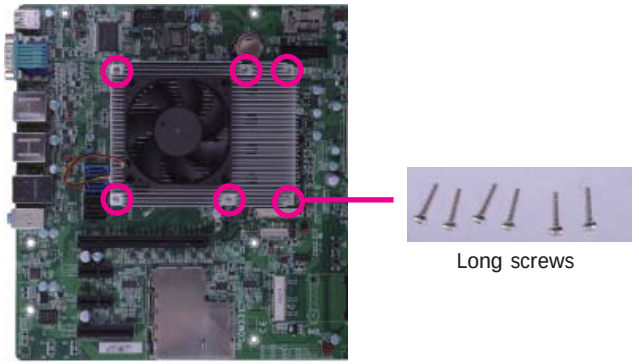

9. Grasping HM961-QM87/HM86 by its edges, position it on top of the carrier board with its mounting holes aligned with the bolts on the carrier board. This will also align the COM Express connectors of the two boards to each other.


10. Press HM961-QM87/HM86 down firmly until it is completely seated on the COM Express connectors of the carrier board.




11. Use the provided mounting screws to secure HM961-QM87/HM86 with heat sink to the carrier board. The photo below shows the locations of the long/short mounting screws.

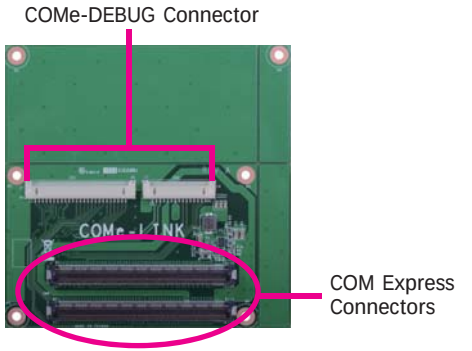


## Installing the COM Express Debug Card

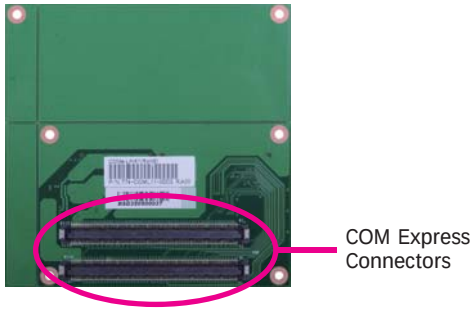
**Note:**
The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.

1. COMe-LINK1 is the COM Express debug card designed for COM Express Basic modules to debug and display signals and codes of COM Express modules.

### COMe-LINK1



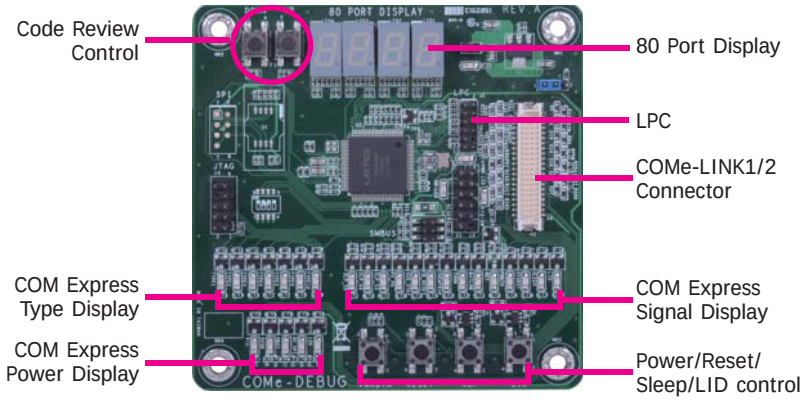

Top view

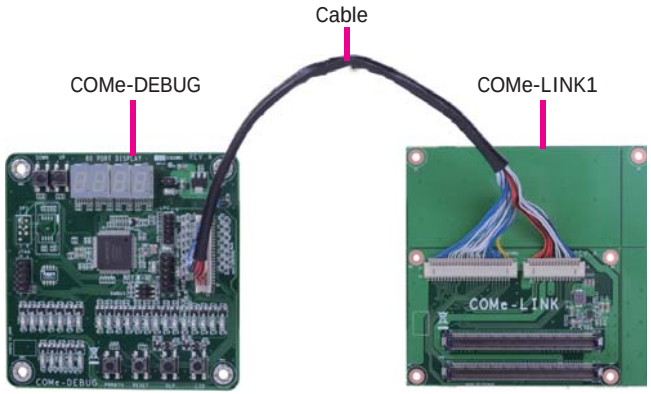



Bottom view

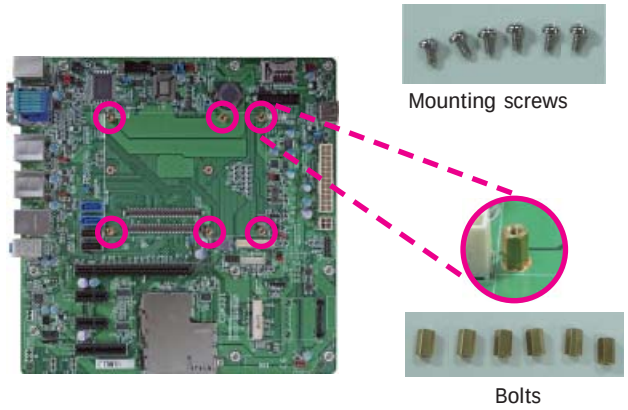
2. Connect the COMe-DEBUG card to COMe-LINK1 via a cable.

### COMe-DEBUG

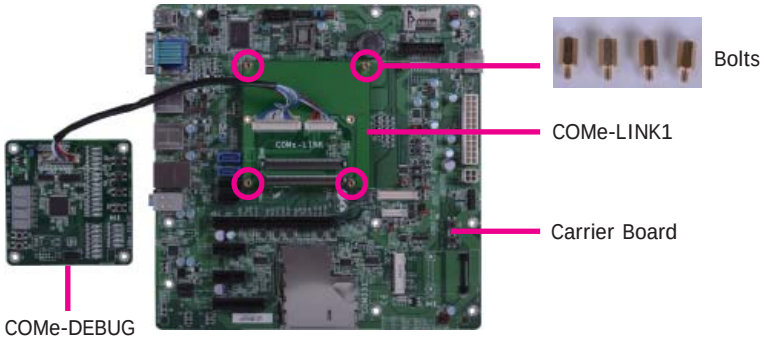


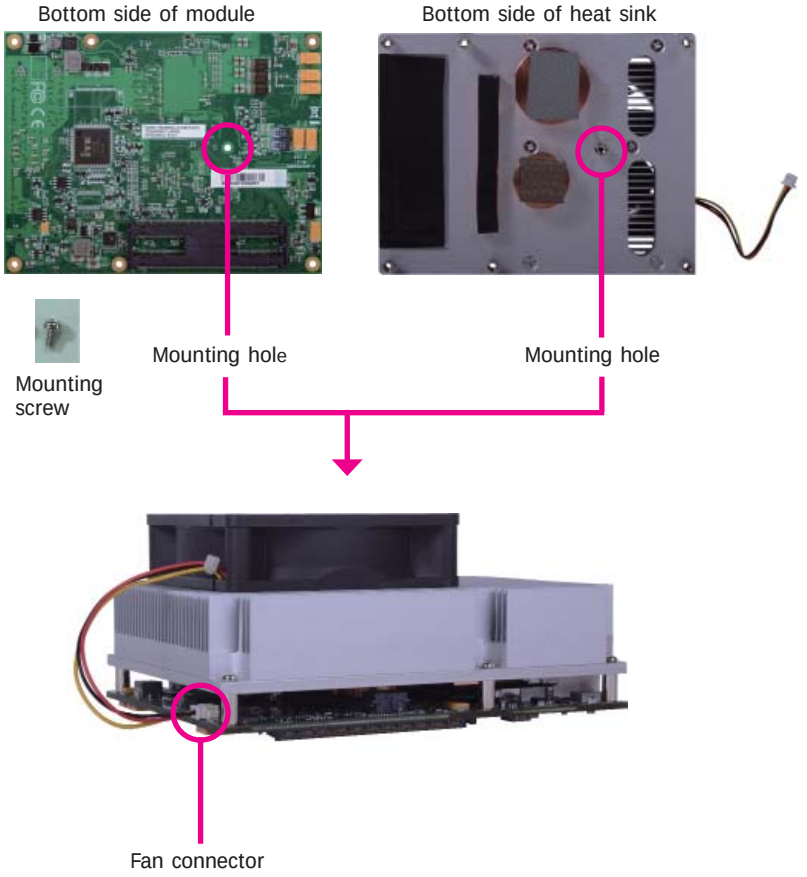
3. Fasten bolts with mounting screws through mounting holes to be fixed in place.



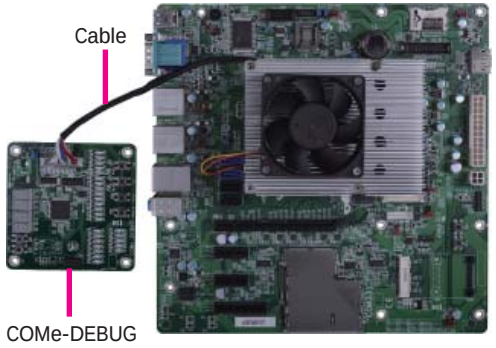

4. Use the provided bolts to fix the COMe-LINK1 debug card onto the carrier board.

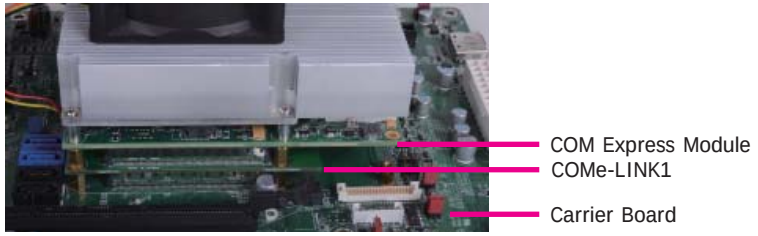



5. Align the mounting hole on the heat sink with the mounting hole on the module and secure the heat sink onto the module by a mounting screw from the bottom side of the module.



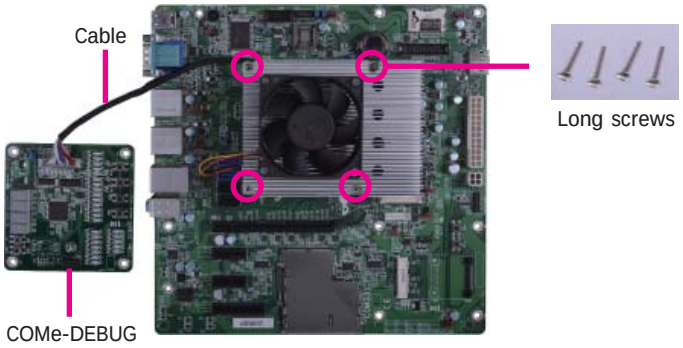
6. Grasp HM961-QM87/HM86 with the heat sink by its edges and position them down firmly on the top of the COMe-LINK1 debug card.




**Side View of the Module, Debug Card and Carrier Board**

7. Use the long mounting screws to secure them on the top of the COMe-LINK1 debug card and the carrier board. The photo below shows the locations of long mounting screws.



# 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 |
| <F4> | Saves and reset the setup program. |
| <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.

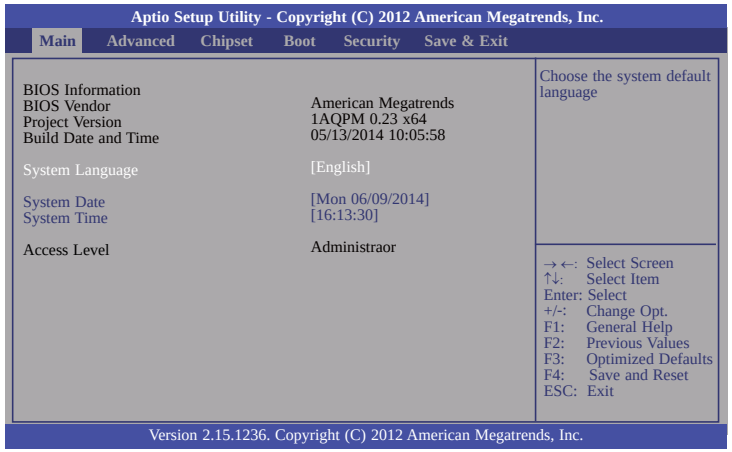
### Submenu

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 you enter the BIOS Setup Utility.




### 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.

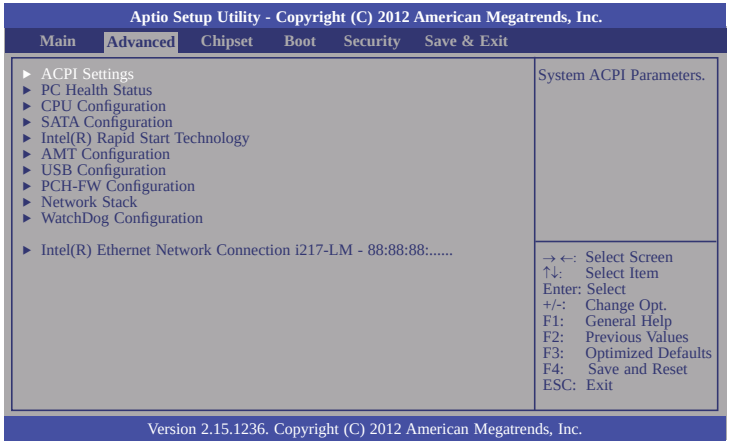
### System Time

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

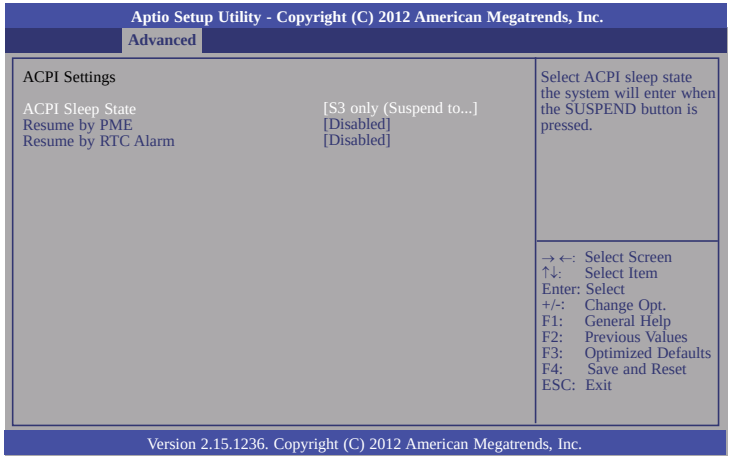
The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.

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



## ACPI Settings

This section is used to configure the ACPI settings.




### ACPI Sleep State

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

**S3(STR)** Enable the Suspend to RAM function.

### Resume by PME

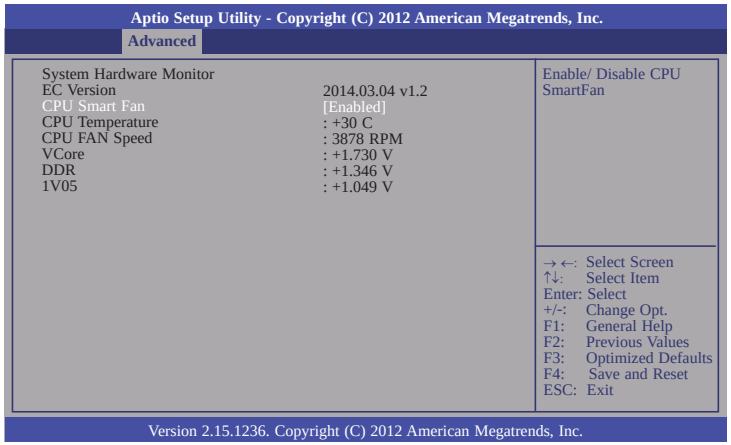
Enable this field to use the PME signal to wake up the system (via PCI, PCIE and onboard LAN).

### Resume by RTC Alarm

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

## PC Health Status

This section displays the hardware health monitor.

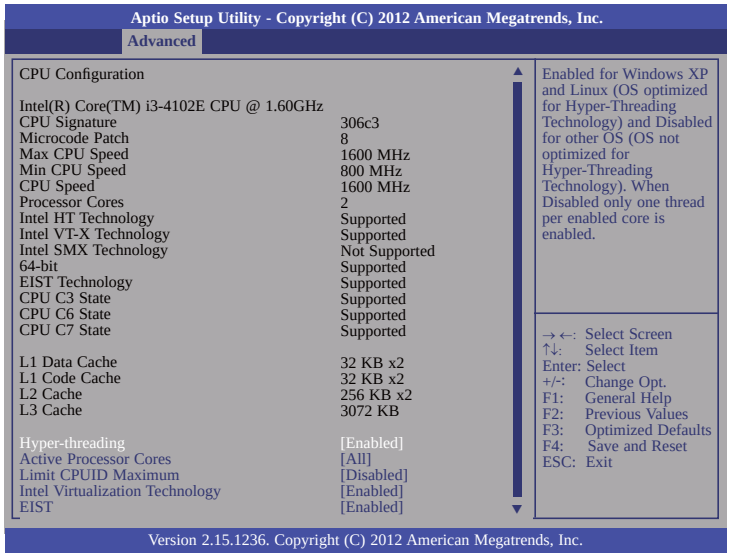



### CPU Smart Fan

Enable or disable the CPU smart fan.

## CPU Configuration

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




### Hyper-threading

Enable this field for Windows XP and Linux which are optimized for Hyper-Threading technology. Select disabled for other OSes not optimized for Hyper-Threading technology. When disabled, only one thread per enabled core is enabled.

### Active Processor Cores

Enables number of cores in each processor package.

### 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

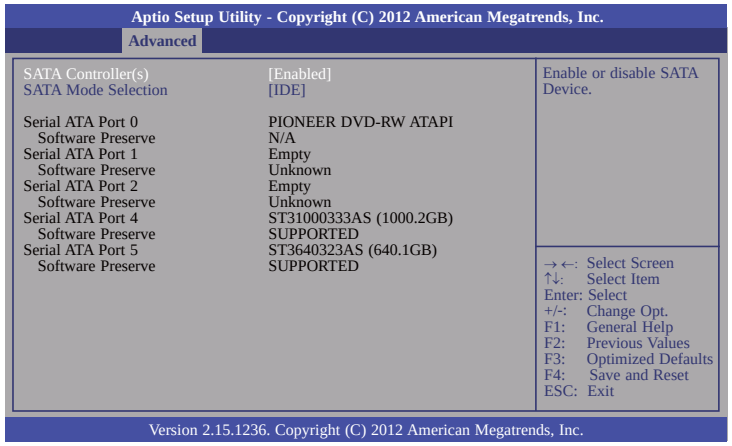
When this field is set to Enabled, the VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

### EIST

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

## SATA Configuration

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




### SATA Controller(s)

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

### SATA Mode Selection

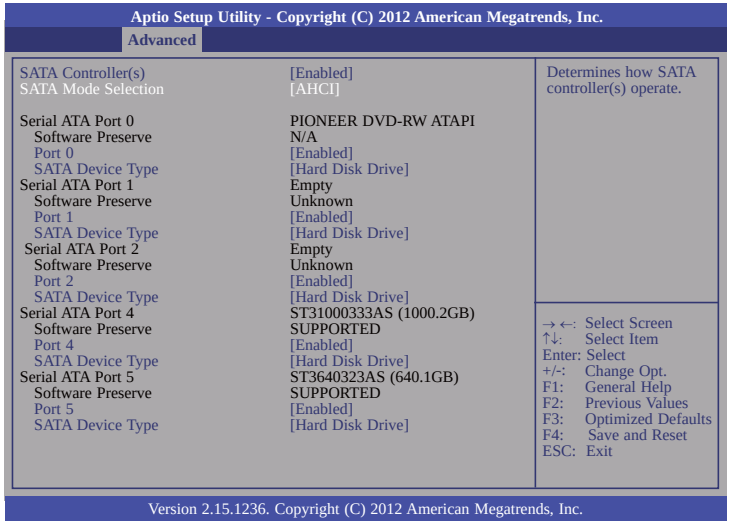
Determine how the Serial ATA controller(s) operates.

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

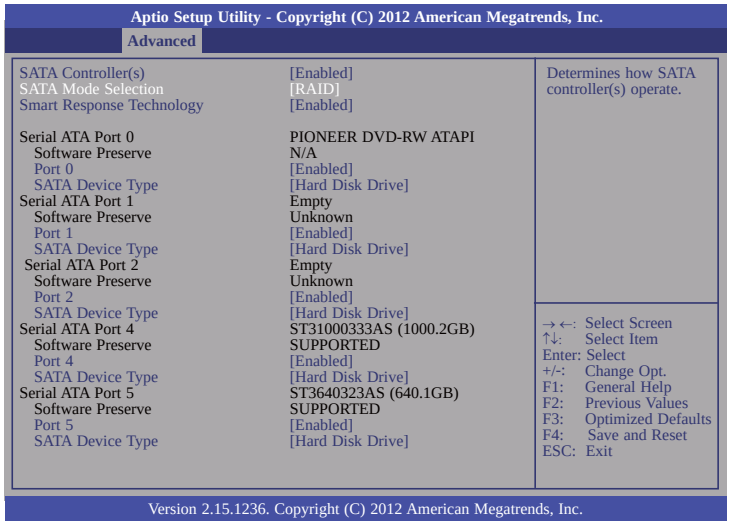
**AHCI Mode**
This option allows the Serial ATA devices to use AHCI (Advanced Host Controller Interface).

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

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




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



**Smart Response Technology**

This field is used to enable or disable the Smart Response Technology.

**Port 0/1/2/4/5**

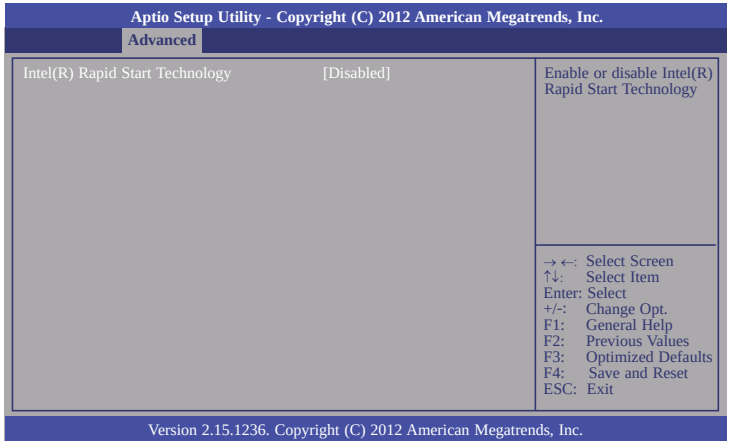
Enable or disable the Serial ATA port.

**SATA Device Type**

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

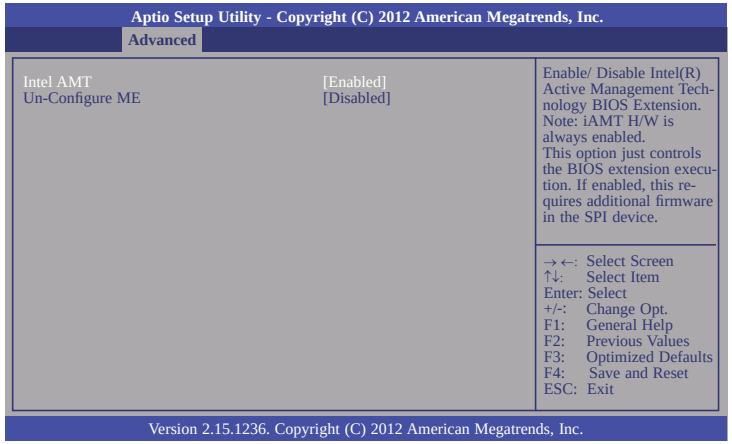
## Intel(R) Rapid Start Technology

This section is used to enable or disable the Intel Rapid Start Technology.



## AMT Configuration

This section configures the parameters of Active Management Technology.




### Intel AMT

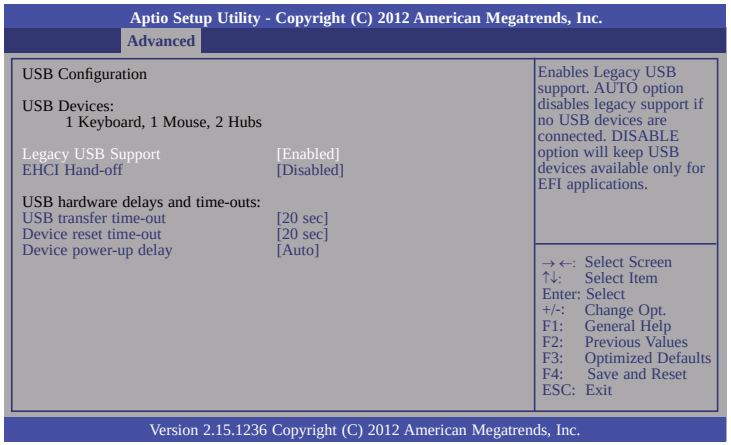
Enable or disable the AMT function.

### Un-Configure ME

Select Enabled to unconfigure the ME function without the need for a password.

## USB Configuration

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




### 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.

### EHCI Hand-off

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

### USB transfer time-out

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

### Device reset time-out

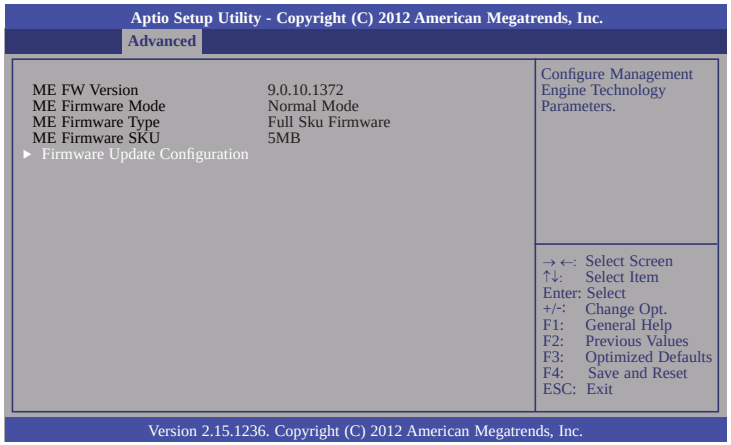
Select the command timeout for the USB mass storage device to start.

### Device power-up delay

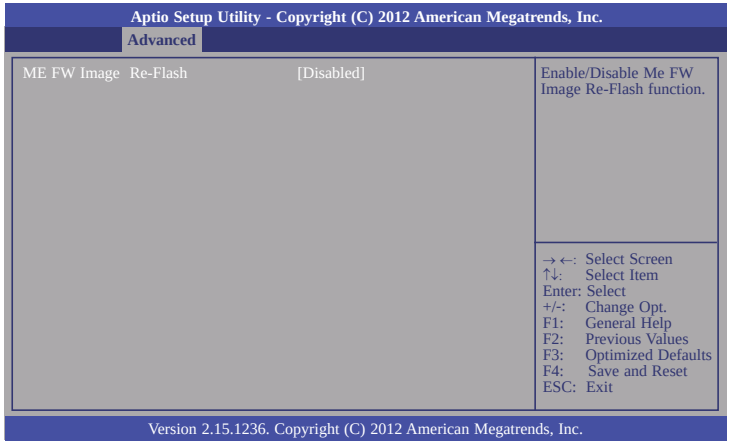
Maximum time the device will take before it properly reports itself to the Host Controller. “Auto” is the default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

### PCH-FW Configuration

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

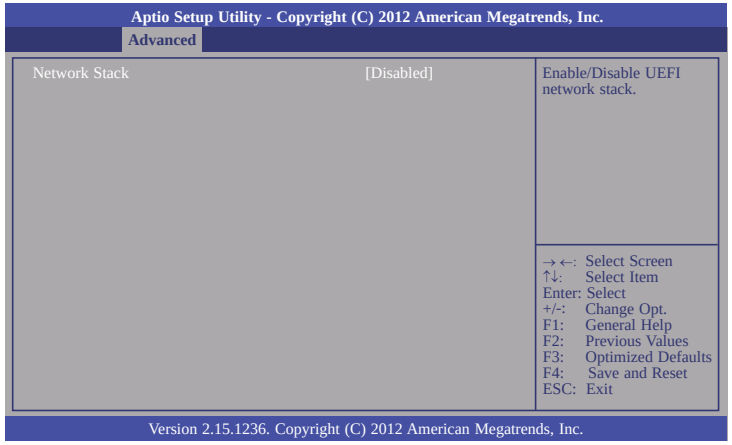



### Firmware Update Configuration

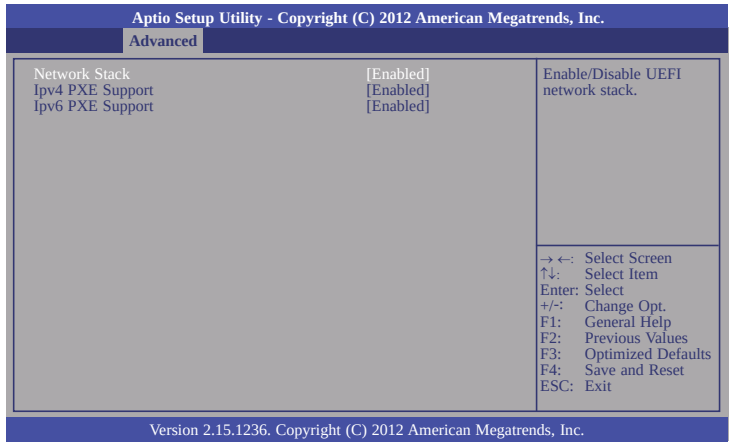


## Network Stack

This section is used to enable or disable UEFI network stack.




When Network Stack is set to enabled, it will display the following information:




### Ipv4 PXE Support

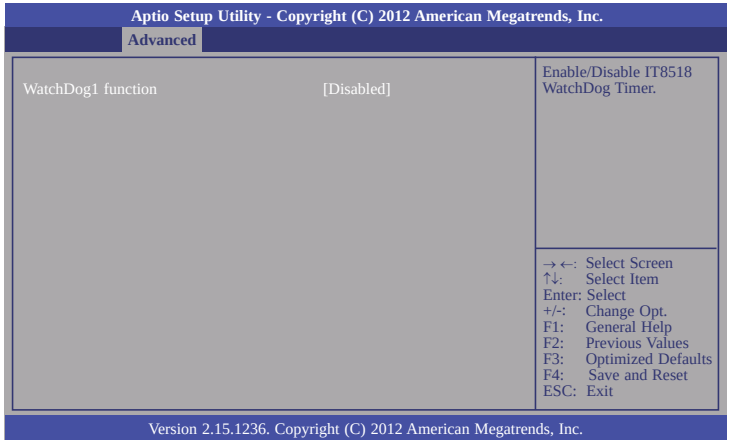
When enabled, Ipv4 PXE boot supports. When disabled, Ipv4 PXE boot option will not be created.

### Ipv6 PXE Support

When enabled, Ipv6 PXE boot supports. When disabled, Ipv6 PXE boot option will not be created.

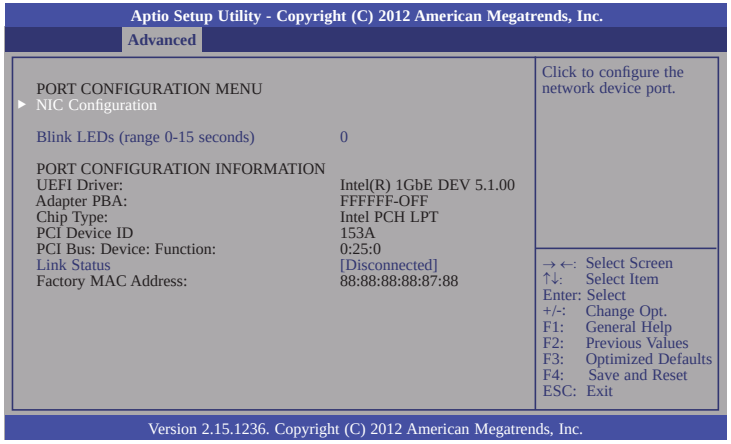
### WatchDog Configuration

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




### Intel(R) Ethernet Network Connection i217-LM - 88:88:88:...

This section is used to configure the parameters of Gigabit Ethernet device.




#### Blink LEDs

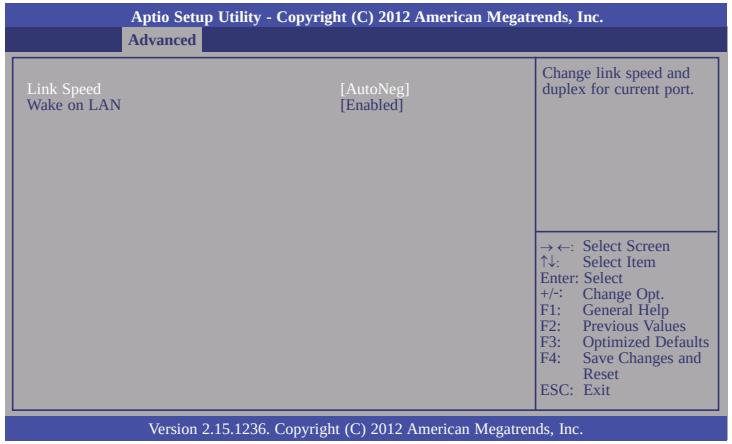
Blink LEDs for the specified duration (up to 15 seconds).

#### Link Status

This field indicates the link status of the network device.

### NIC Configuration

This field is used to configure the network device.




**Link Speed**

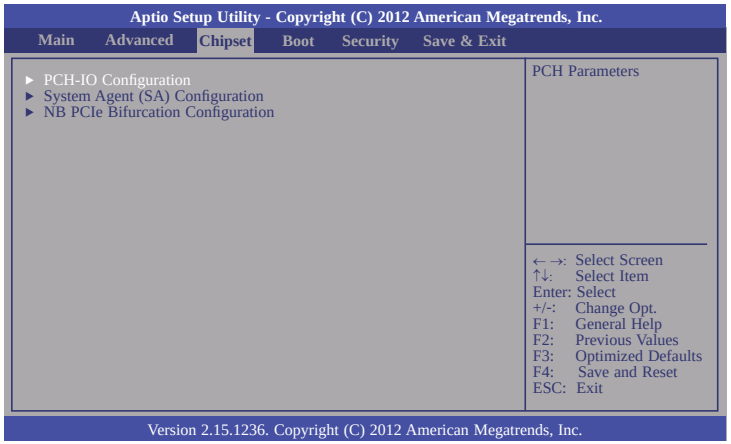
Selects the link speed and duplex for the current network port.

**Wake on LAN**

Enables this option to wake the system with a magic packet.

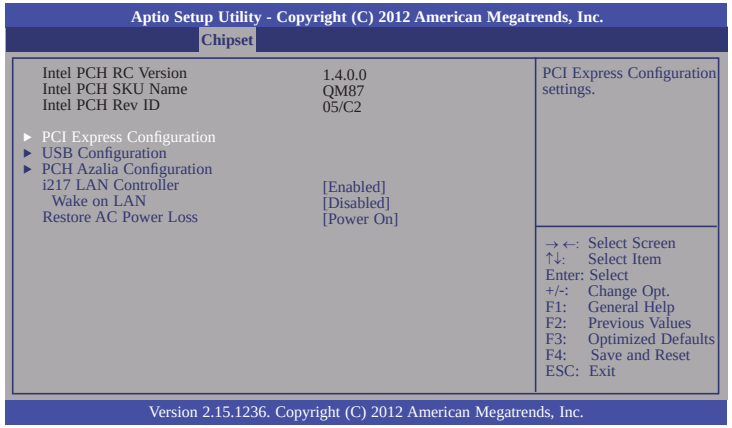
## Chipset

The section configures the relevant functions of chipset.



## PCH-IO Configuration

This section configures PCH parameters.




### i217 LAN Controller

Enable or disable onboard NIC.

### Wake on LAN

Set this field to enable to wake up the system via the onboard LAN or via a LAN card that supports the remote wake up function.

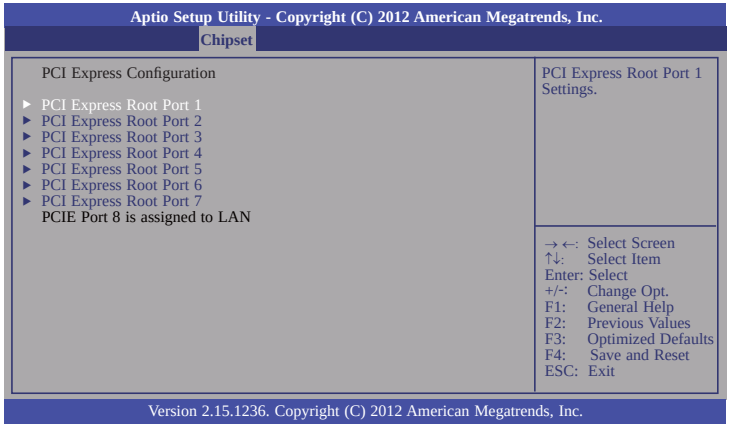
### Restore AC Power Loss

**Power-off**
When power returns after an AC power failure, the system's power is off. You must press the Power button to power-on the system.

**Power-on**
When power returns after an AC power failure, the system will automatically power-on.

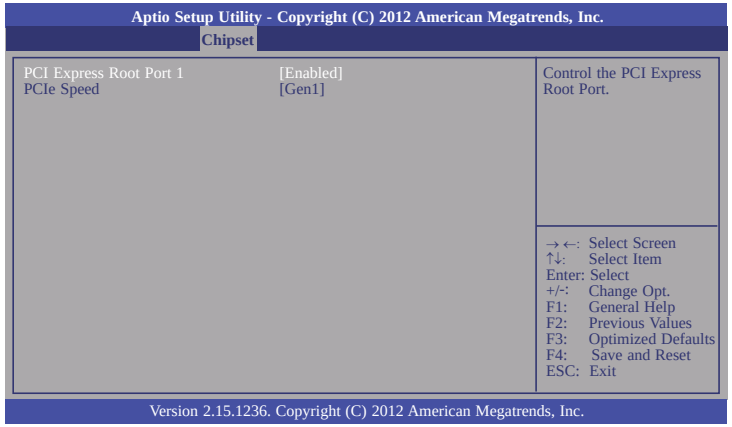
**Last State**
When power returns after an AC power failure, the system will return to the state where you left off before power failure occurs. If the system's power is off when AC power failure occurs, it will remain off when power returns. If the system's power is on when AC power failure occurs, the system will power-on when power returns.

## PCI Express Configuration




### PCI Express Root Port 1 to PCI Express Root Port 7

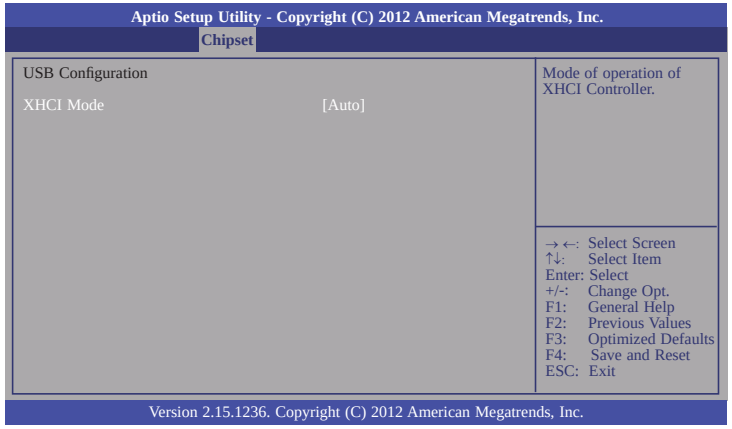
Control the PCI Express Root Port.




**PCIe Speed**

Select the PCIe Speed: Gen1 or Gen 2.

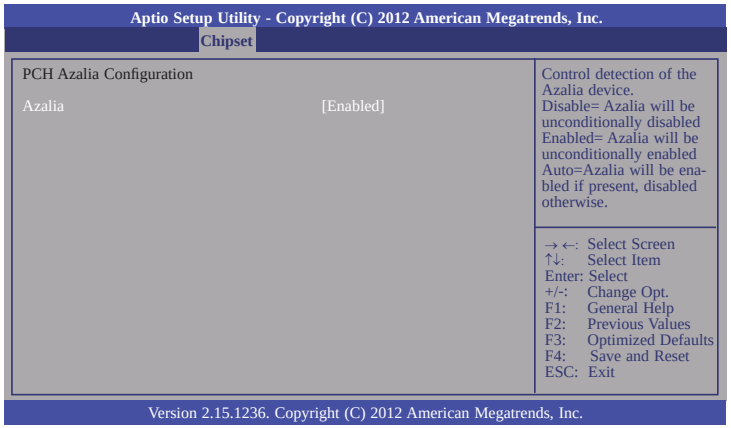
## USB Configuration




### XHCI Mode

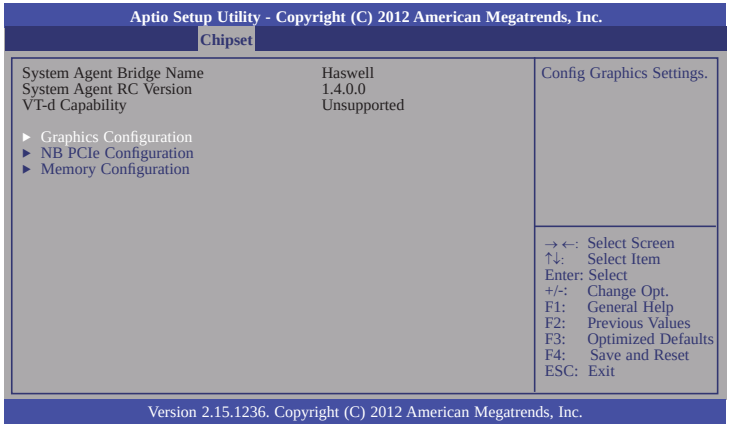
Select the operation mode of the XHCI controller. These options are Smart Auto, Auto, Enabled, Disabled and Manual.

## PCH Azalia Configuration

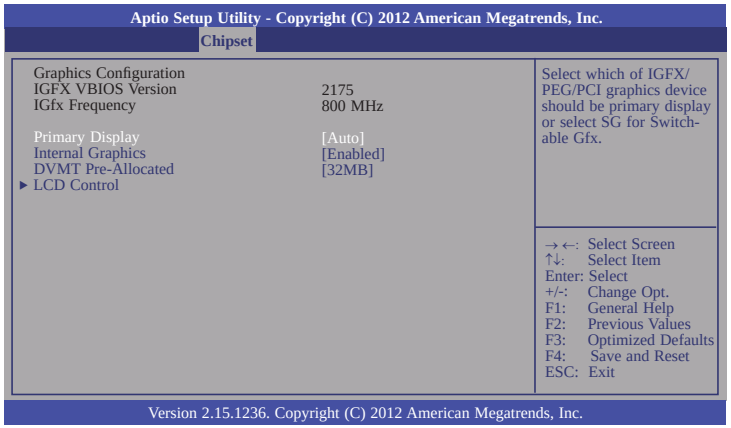


## System Agent (SA) Configuration

This section configures System Agent (SA) parameters.




## Graphics Configuration




### Primary Display

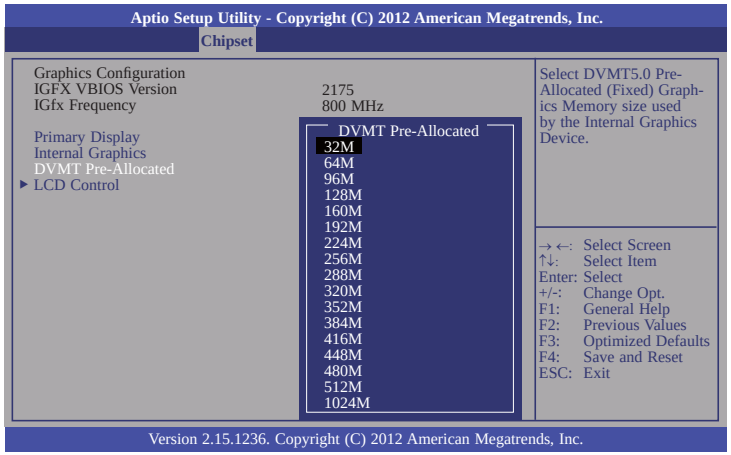
**Auto** When the system boots, it will auto detects the display device.
**IGFX** When the system boots, it will first initialize the onboard VGA.
**PEG** When the system boots, it will first initialize the PCI Express x16 graphics card.

### Internal Graphics

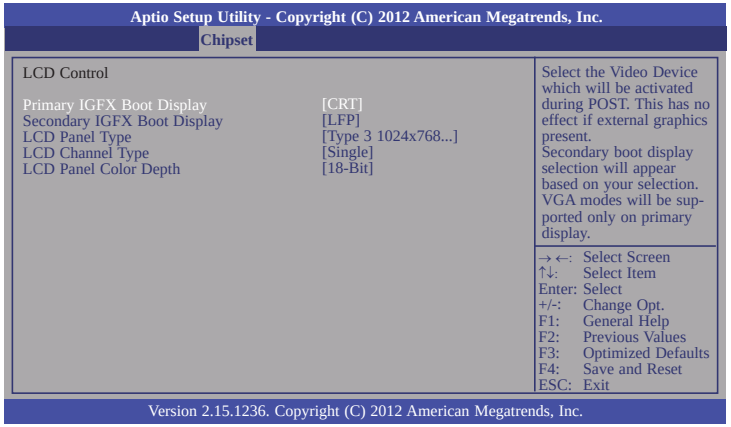
Keep IGD enabled based on setup options.

### DVMT Pre-Allocated

Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device. Please refer to the screen shown below.




### LCD Control




### Primary IGFX Boot Display

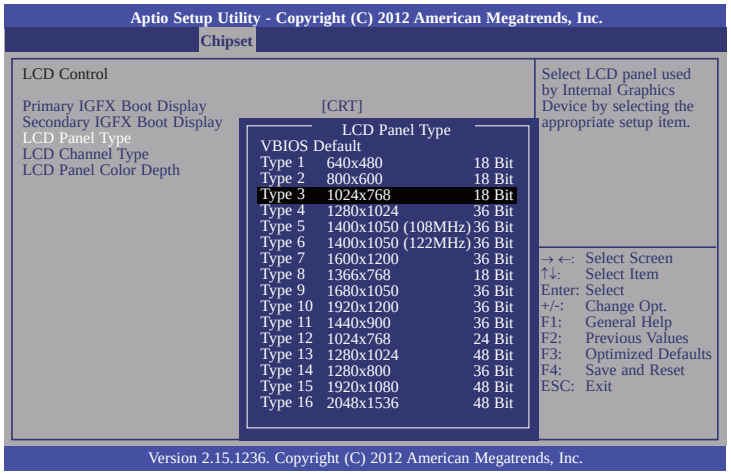
Select the Video Device which will be activated during POST. This has no effect if the external graphics presents. The selection of secondary boot display will appear based on your selection. VGA modes will be supported only on primary display.

### Secondary IGFX Boot Display

Select secondary display device.

### LCD Panel Type

Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item. Please refer to the screen shown below.




### LCD Channel Type

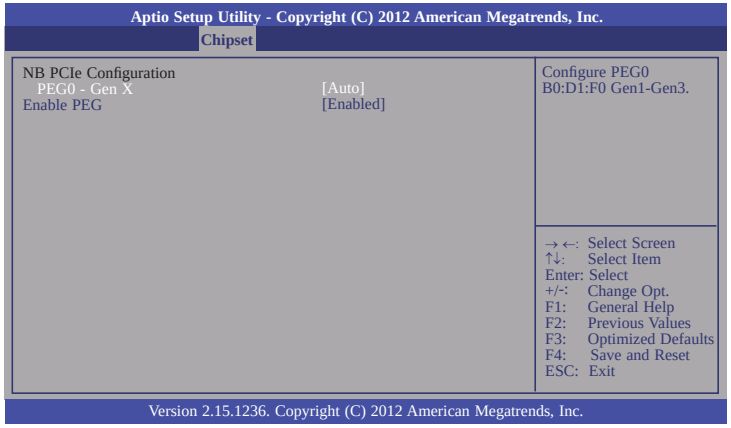
Select the LCD Channel Type. The option is dual or single.

### LCD Panel Color Depth

Select the color mode of the LCD display. The option is 24-bit or 18-bit.

## NB PCIe Configuration

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




**PEG0-Gen X**

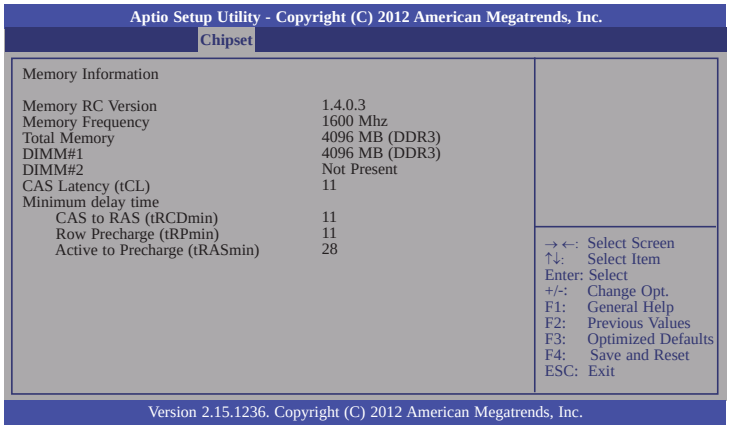
Configure PEG0 Gen1-Gen3.

**Enable PEG**

Enable or disable the PEG.

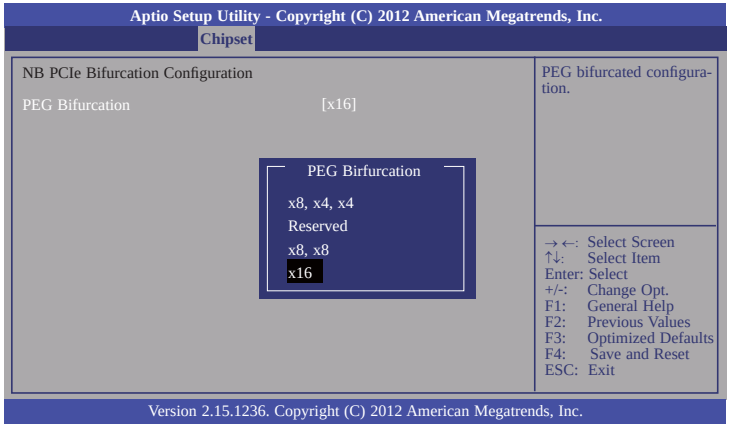
## Memory Configuration

This section only display the parameters of memory configuration.



### NB PCIe Bifurcation Configuration

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




## Boot


### Setup Prompt Timeout

Select the number of seconds to wait for the setup activation key. 65535(0xFFFF) denotes indefinite waiting.

### 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.

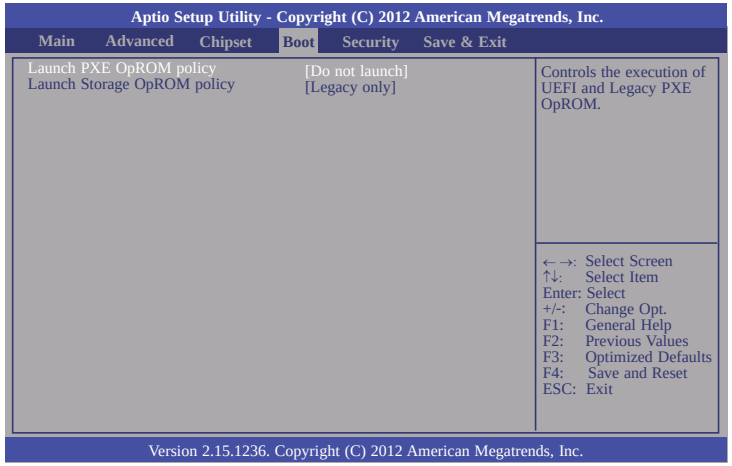
### Boot Option #1 and #2

Set the order of the system boot.

### Hard Driver BBS Priorities

Set the order of the legacy devices in this group.

### CSM Parameters



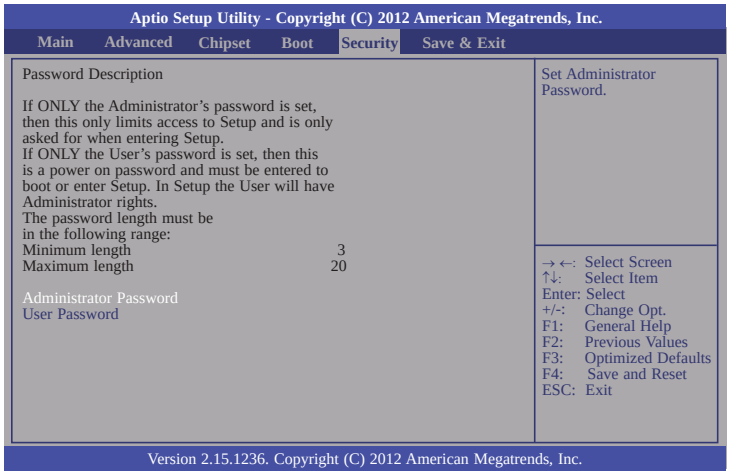

**Launch PXE OpROM policy**

Control the execution of UEFI and legacy PXE OpROM.

**Launch Storage OpROM policy**

Control the execution of UEFI and legacy storage OpROM.

## Security



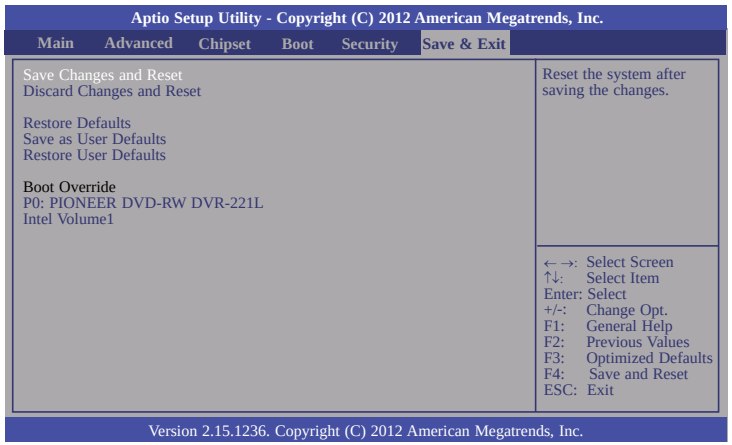

### Administrator Password

Set the administrator password.

### User Password

Set the user password.

# Save & Exit




### 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.

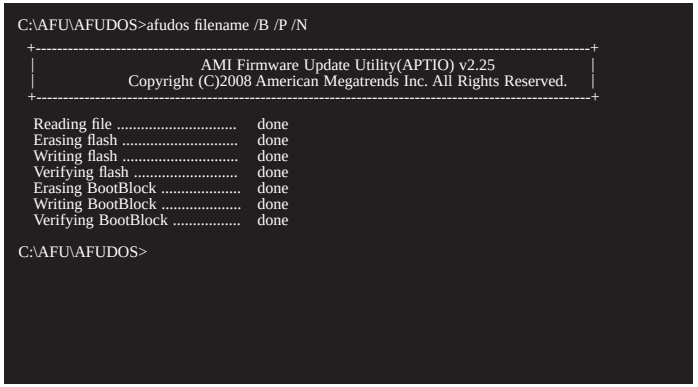
### Restore User Defaults

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.

# 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>.




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.

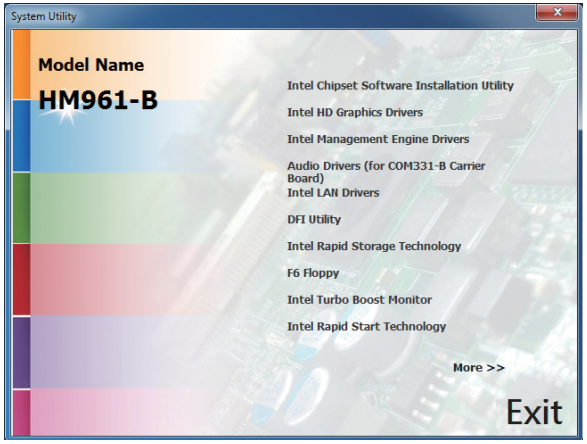
**Note:**
a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical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

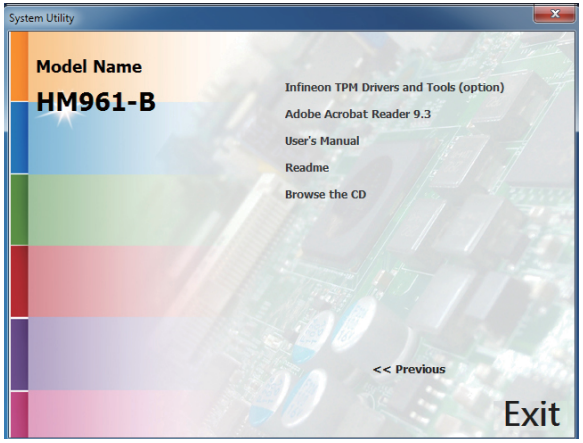
# Chapter 5 - Supported Software

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

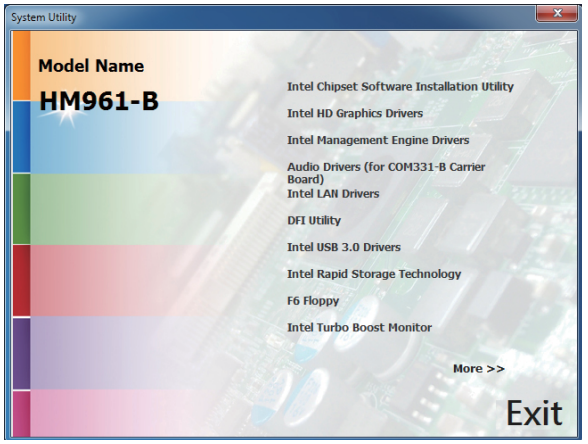
Insert the CD into a CD-ROM drive. The autorun screen (Mainboard Utility CD) will appear. If after inserting the CD, “Autorun” did not automatically start (which is, the Mainboard Utility CD screen did not appear), please go directly to the root directory of the CD and double-click “Setup”.

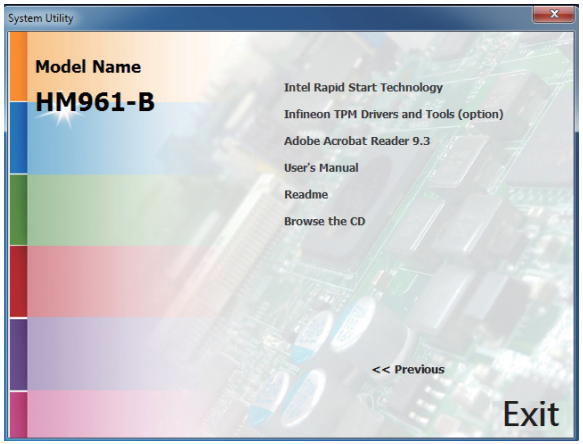
## Auto Run Page (For Windows 8)



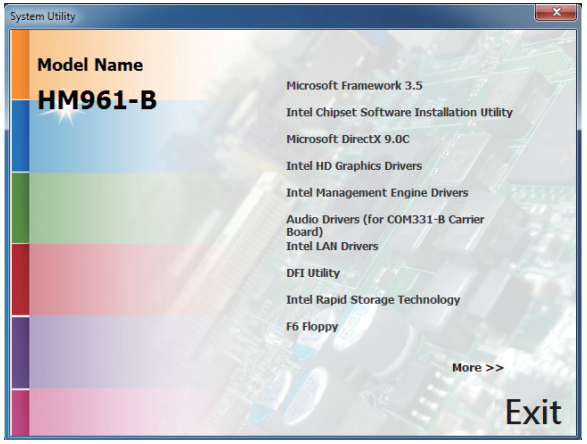



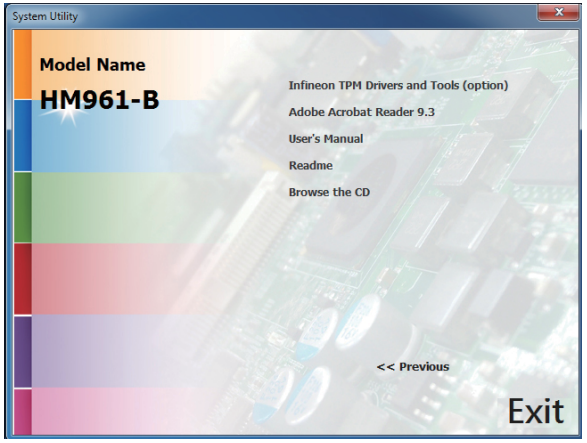

## Auto Run Page (For Windows 7)



## Auto Run Page (For Windows XP)




## Microsoft Framework 3.5 (For Windows XP)

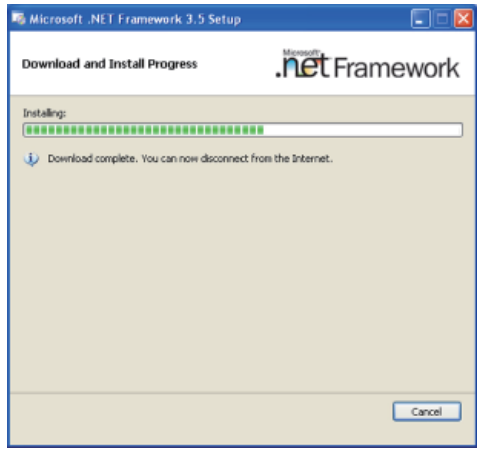
**Note:**
Before installing Microsoft .NET Framework 3.5, make sure you have updated your Windows XP operating system to Service Pack 3.

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

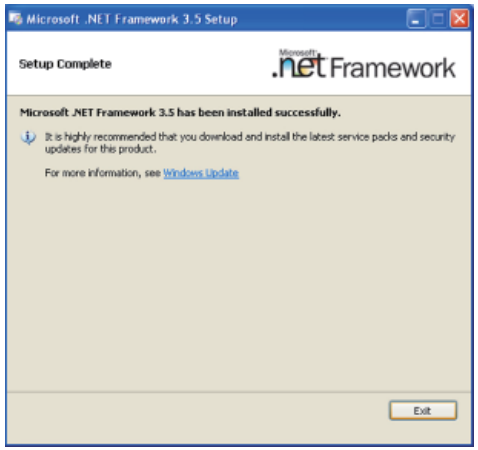
1. Read the license agreement carefully.

   Click "I have read and accept the terms of the License Agreement" then click Install.


2. Setup is now installing the driver.



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.

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

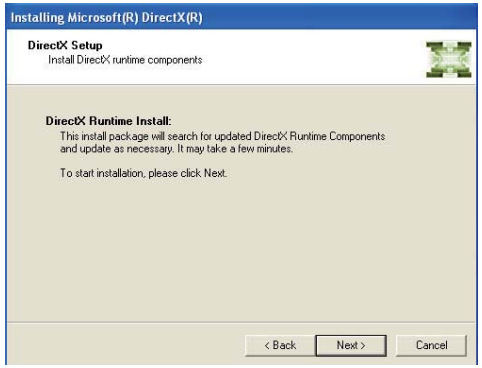

4. After completing installation, click Finish to exit setup.


## Microsoft DirectX 9.0C (For Windows XP)

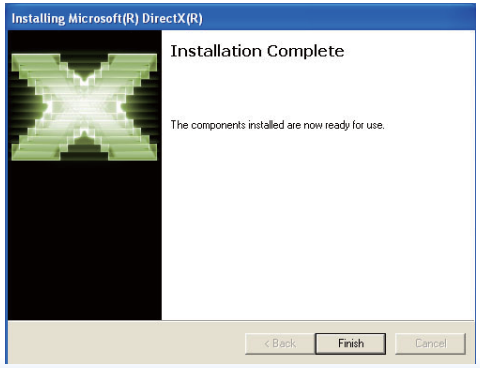
To install the utility, click “Microsoft DirectX 9.0C Driver” on the main menu.

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.

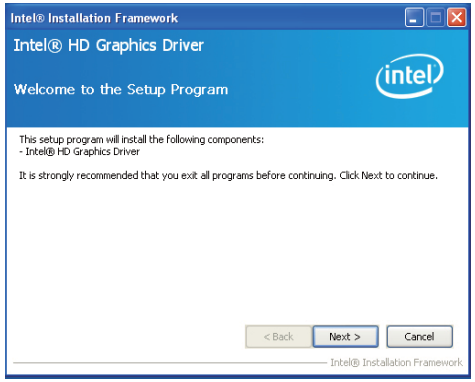


## Intel HD Graphics Drivers (For Windows XP)

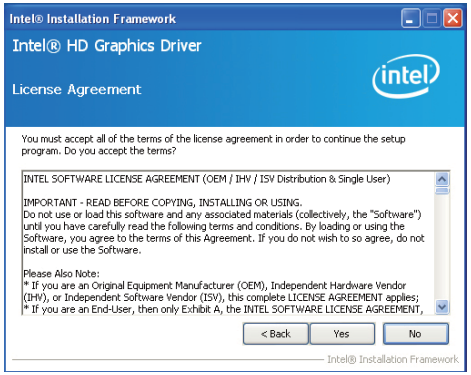
**Note:**
Before installing Intel HD Graphics Drivers, make sure you have installed Microsoft .NET Framework 3.5 SP1.

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

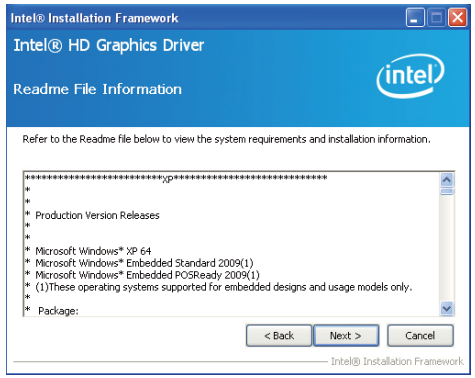
1. Setup is ready to install the graphics driver. Click Next.



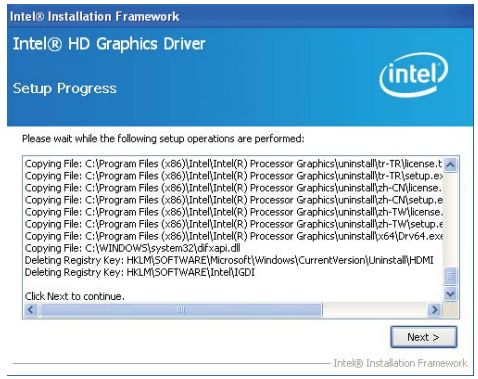

2. Read the license agreement then click Yes.




3. Go through the readme document for more installation tips then click Next.

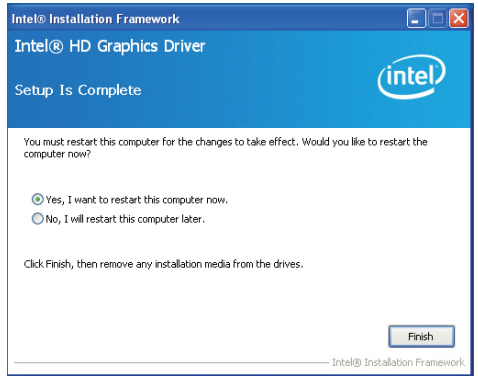



4. Setup is currently installing the driver. After installation has completed, click Next.




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

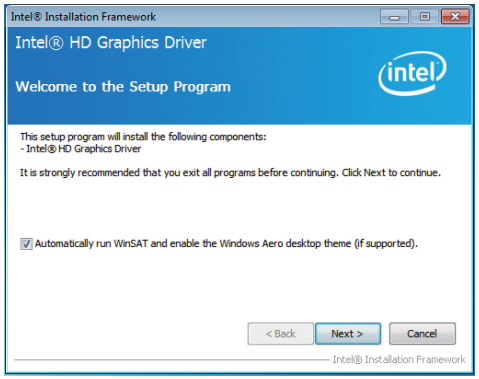
Restarting the system will allow the new software installlation to take effect.



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

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

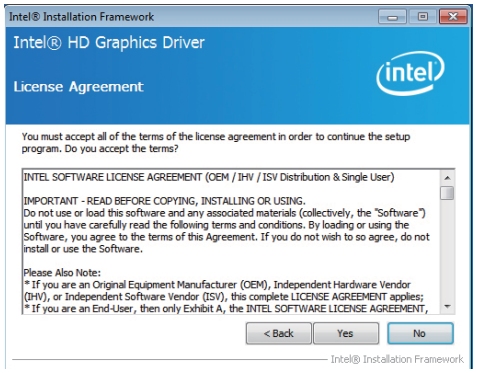
1. Setup is now ready to install the graphics driver. Click Next.



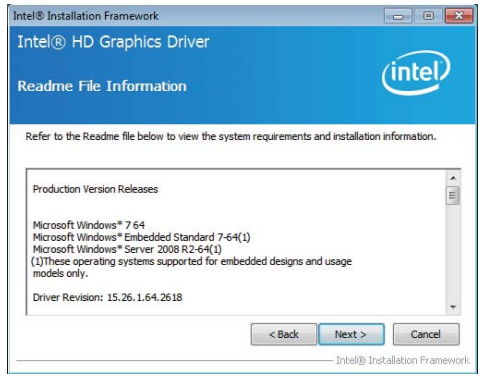

By default, the “Automatically run WinSAT and enable the Windows Aero desktop theme” is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 7/ Windows 8 desktop appears. The “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.

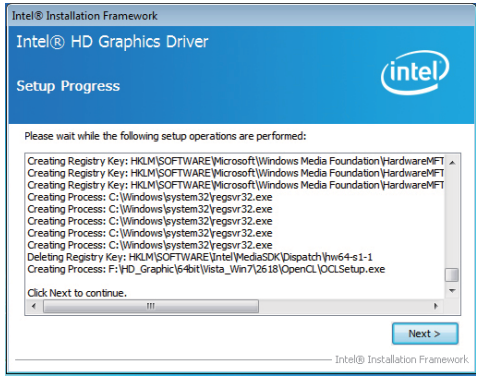
2. Read the license agreement then click Yes.




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

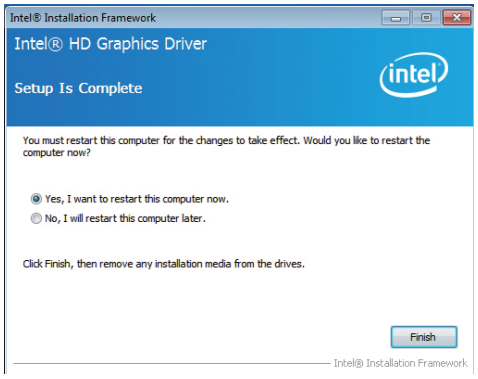



4. Setup is now installing the driver. Click Next to continue.




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

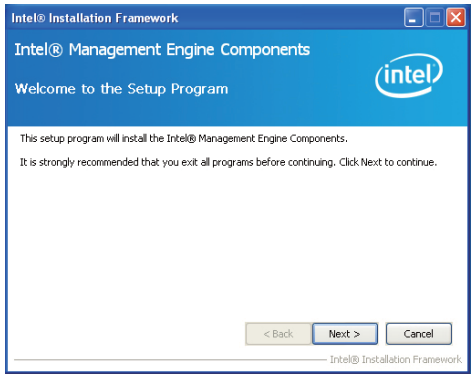
Restarting the system will allow the new software installation to take effect.



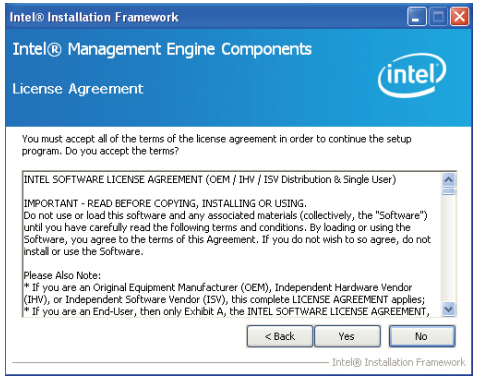
## Intel Management Engine Drivers

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

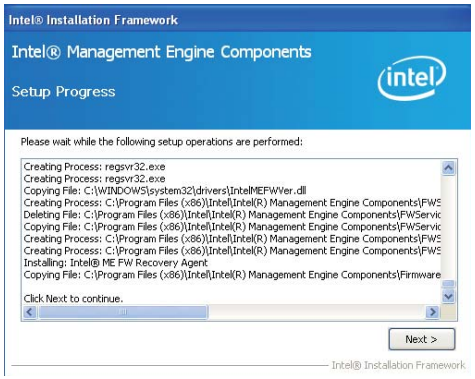
1. Setup is ready to install the driver. Click Next.



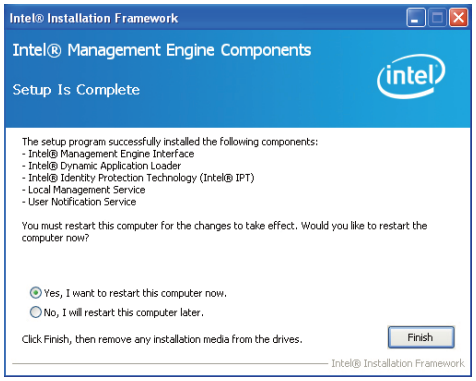

2. Read the license agreement then click Yes.




3. Setup is currently installing the driver. After installation has completed, click Next.




4. After completing installation, click Finish.

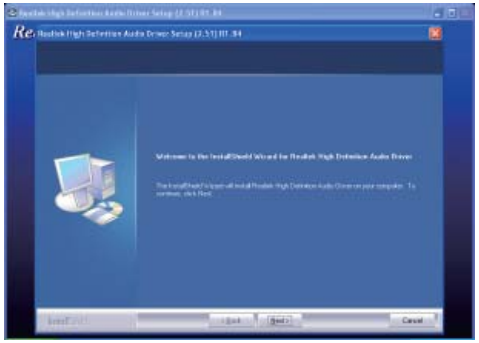


## Audio Drivers (For COM331-B Carrier Board)

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

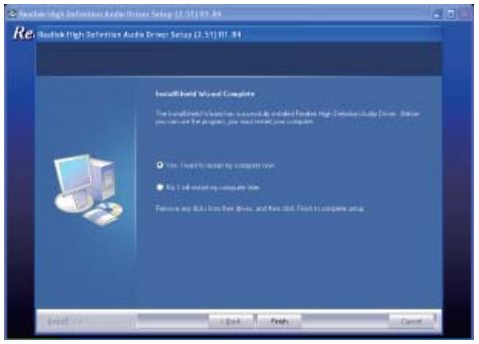
1. Setup is now ready to install the audio driver. Click Next.

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.

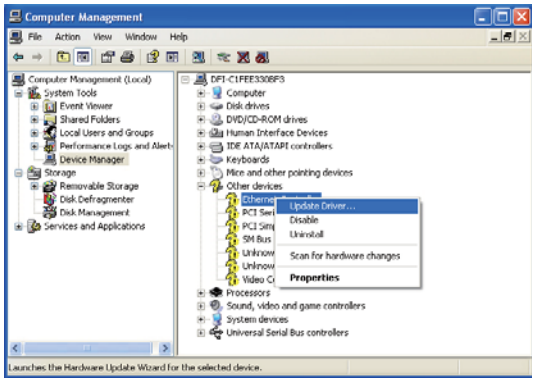
Restarting the system will allow the new software installation to take effect.



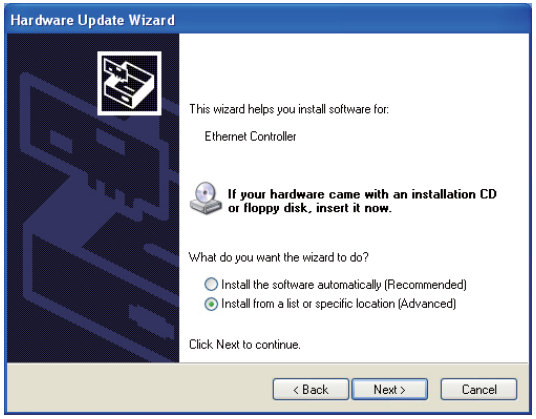
## Intel LAN Drivers (For Windows XP)

The LAN drivers for Windows XP supporting on the HM961-QM87/HM86 system board has to be installed manually. When you want to install the LAN driver for Windows XP, please follow the steps below to accomplish the installation.

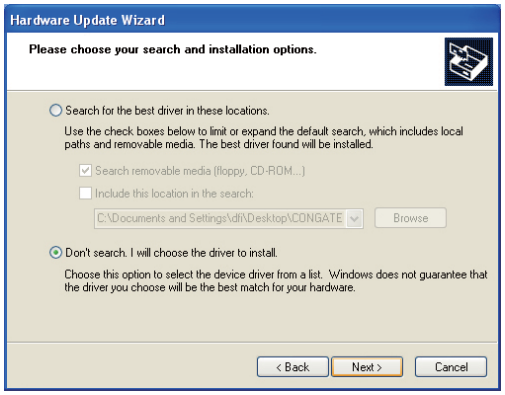
1. Launch the Hardware Update Wizard for the selected device. Select "Update Driver."



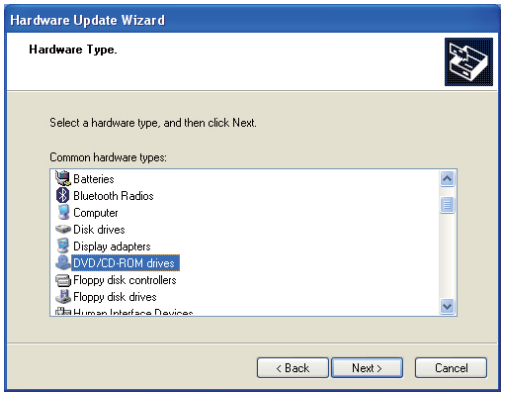

2. Choose "Install from a list or specific location (Advanced)" and click "Next" to continue the installation.



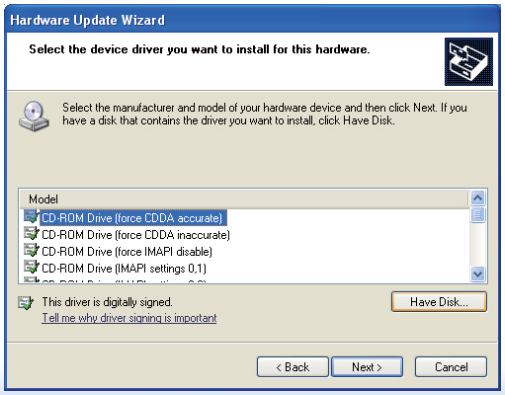
3. Choose the option "Don't search. I will choose the driver to install" in order to select the device driver from a list, and click "Next."




4. Select a hardware type: DVD/CD-ROM drives. Then, click "Next."



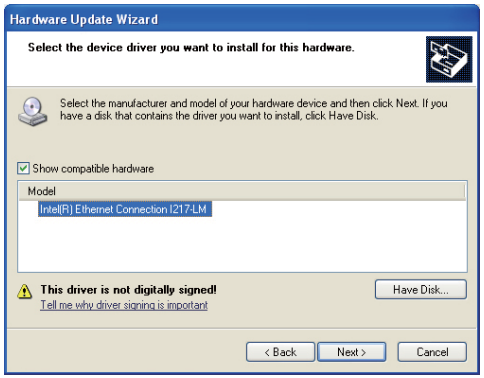

5. Select your hardware disk and then click "Have Disk..."



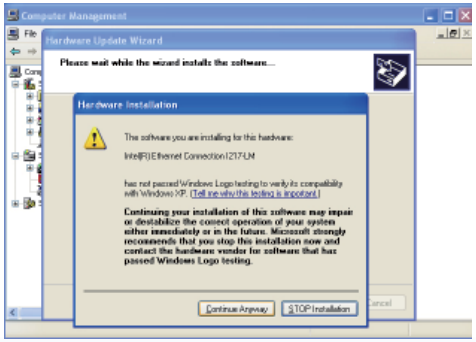

6. Insert the installation disk and make sure the selected drive is correct.


(For 32-bit, the file name is “e1d5132.inf”.)

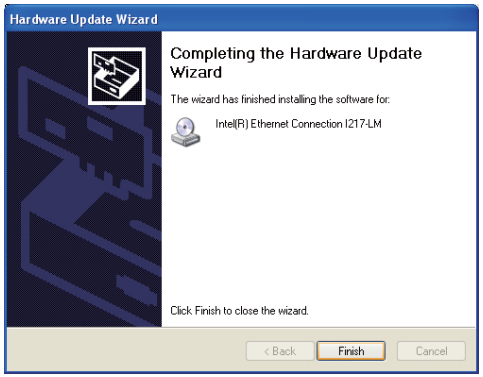
7. Select the device driver you want to install for this hardware and then click "Next."



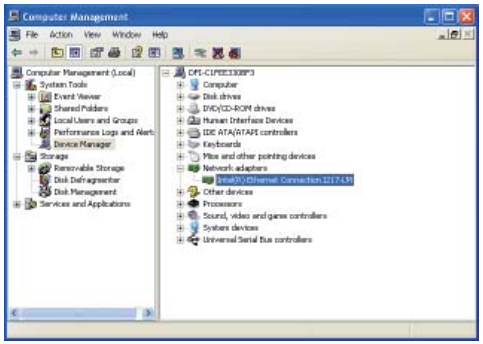

8. Check the software you are installing, Then, click "Continue Anyway" to start the installation.



9. Click "Finish" to close the wizard.



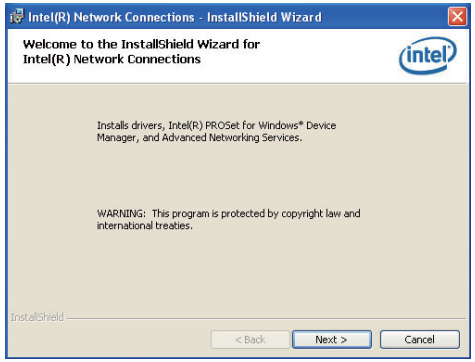

10. After completing the installation, the Network adapters "Intel(R) Ethernet Connection I217LM" will appear on the computer management list.



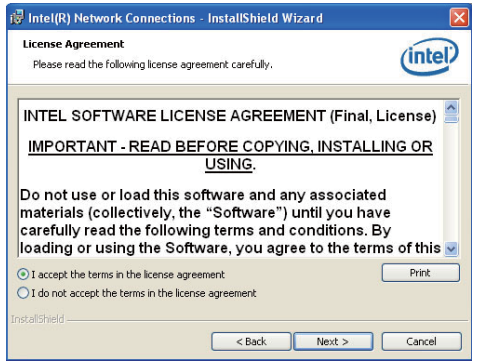

## Intel LAN Drivers (For Windows 7/8)

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

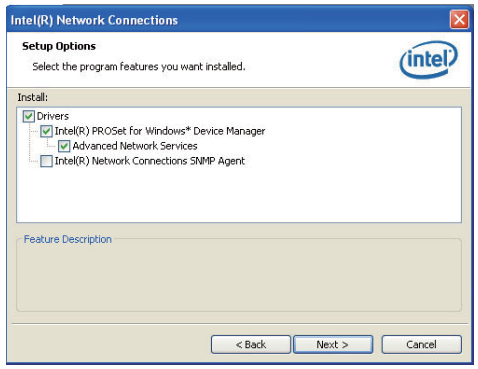
1. Setup is ready to install the driver. Click Next.



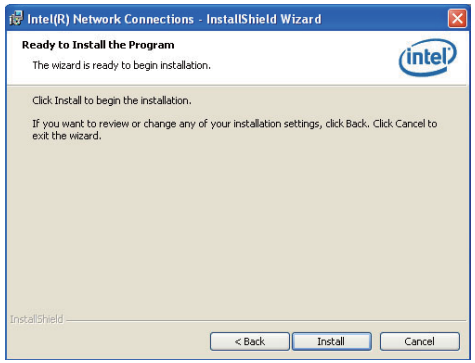

2. Click “I accept the terms in the license agreement” then click “Next”.



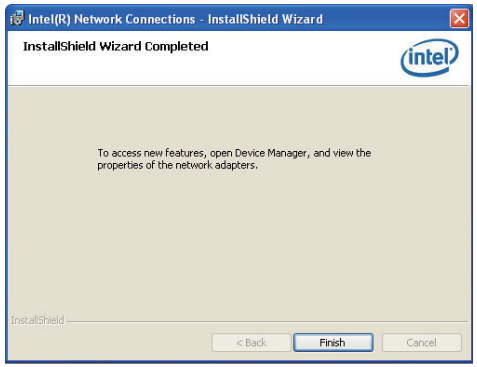

3. Select the program featuers you want installed then click Next.



4. Click Install to begin the installation.



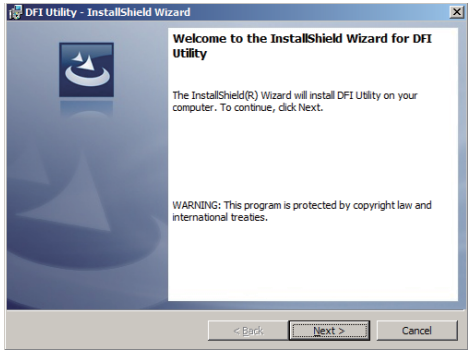

5. After completing installation, click Finish.



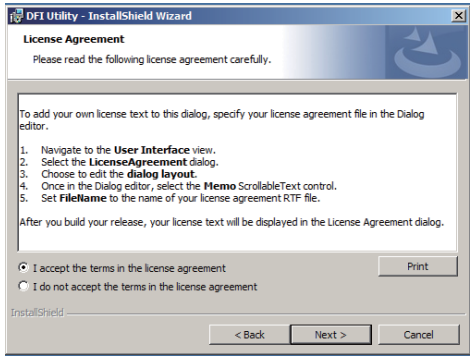

## DFI Utility

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

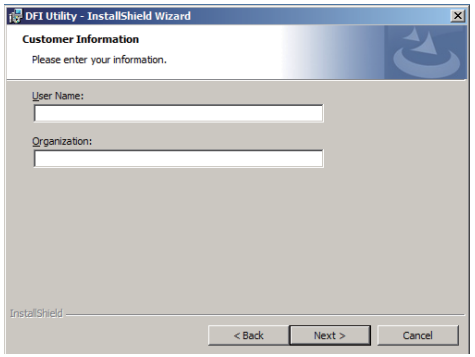
1. Setup is ready to install the DFI Utility drifer. Click Next.



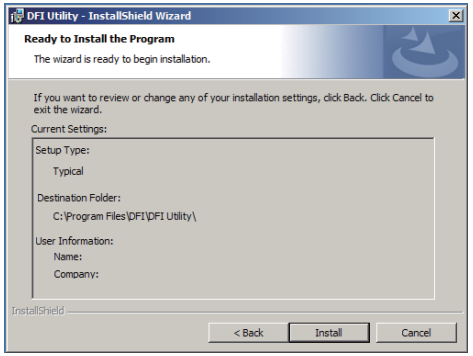

2. Click “I accept the terms in the license agreement” and then click Next.



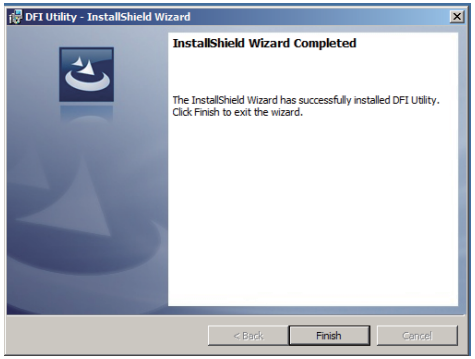
3. Enter “User Name” and “Organization” information and then click Next.



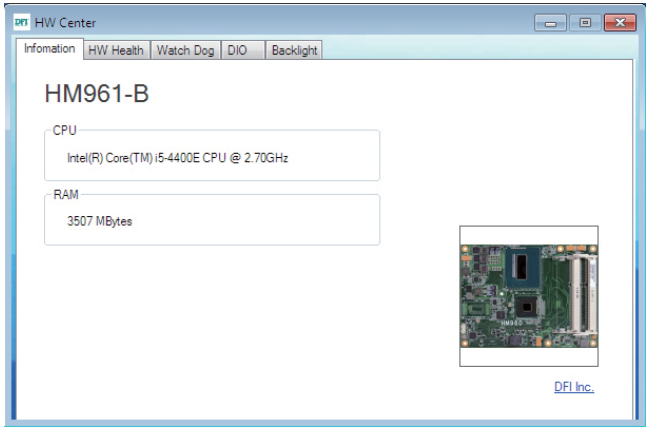

4. Click Install to begin the installation.



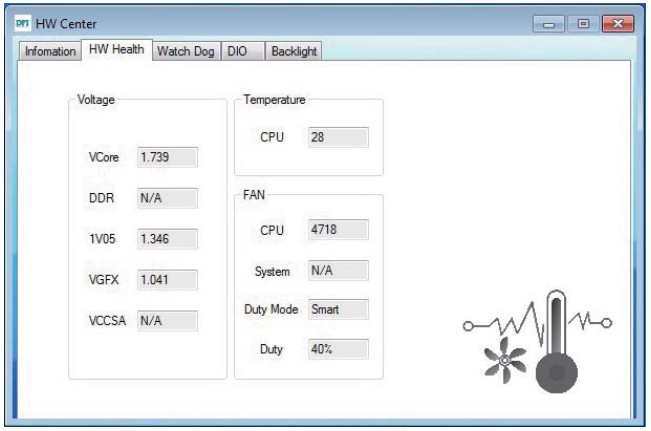

5. After completing installation, click Finish.



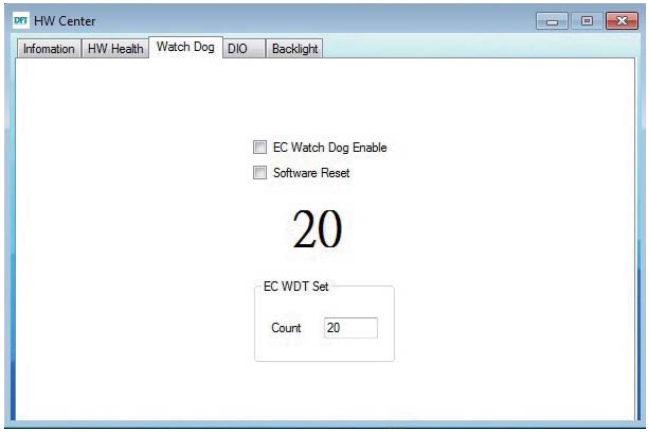

The DFI Utility icon will appear on the desktop. Double-click the icon to open the utility.



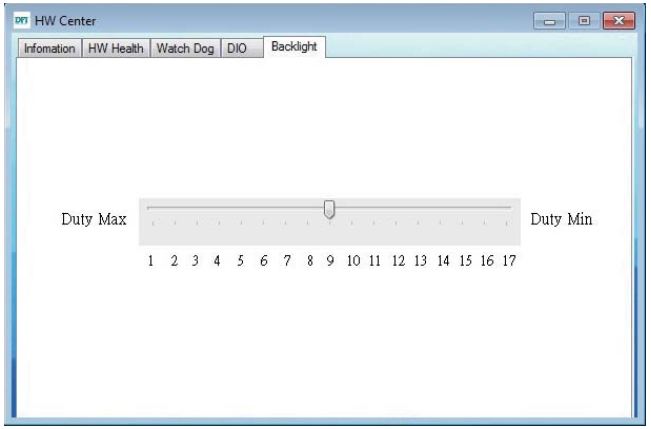

Information



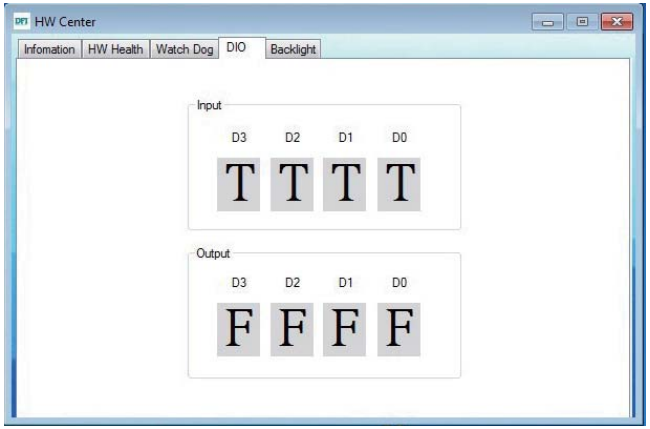

HW Health




WatchDog




Backlight

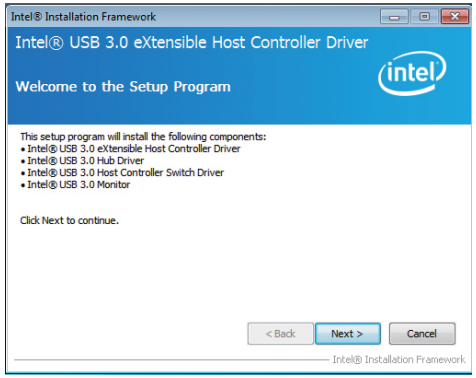



DIO

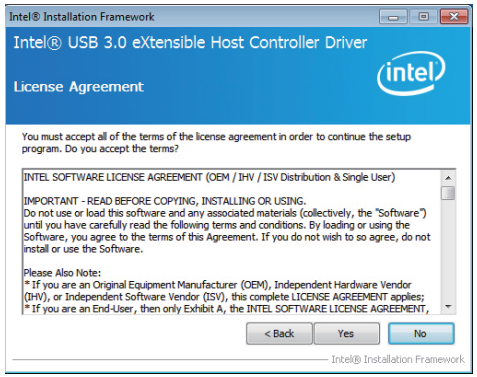
## Intel USB 3.0 Drivers (For Windows 7 only)

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

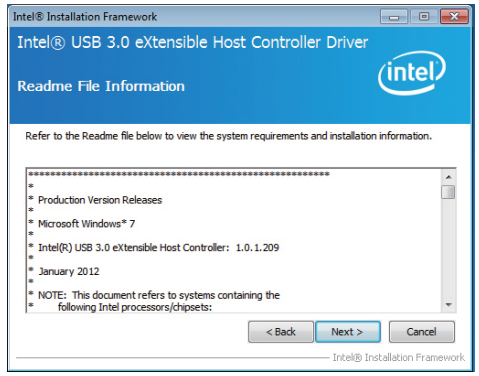
1. Setup is ready to install the driver. Click Next.



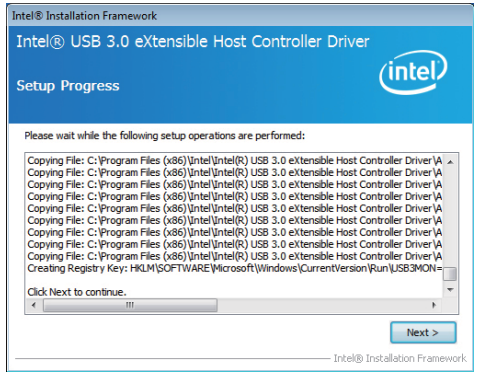

2. Read the license agreement then click Yes.




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.



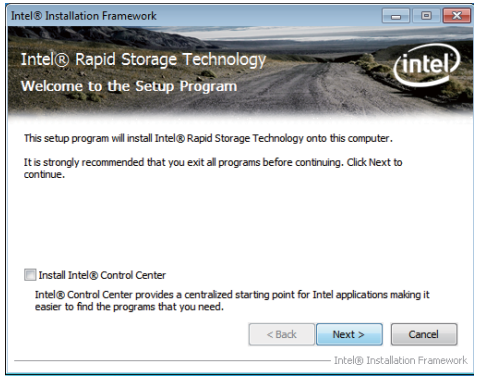

5. After completing installation, click Finish.

## 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.

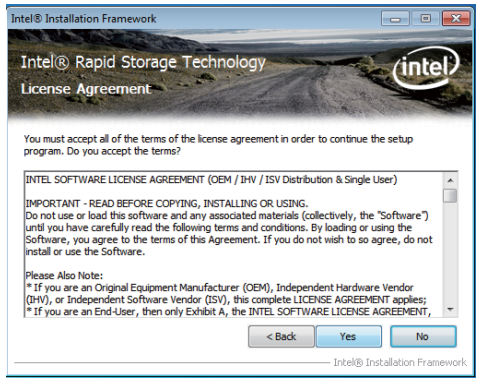
To install the driver, click “Intel Rapid Storage Technology” on the main menu.

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

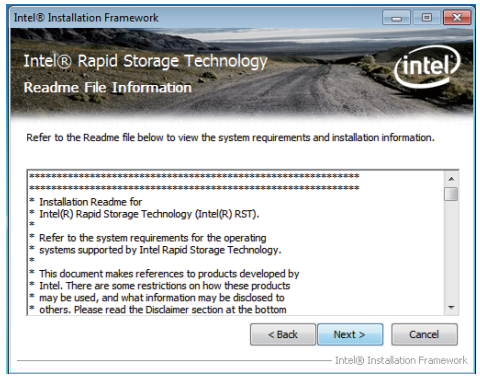



2. Read the warning then click Yes.

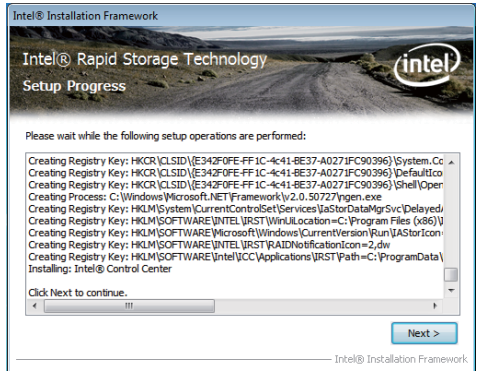

3. Read the license agreement then click Yes.




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.



6. Click “Yes, I want to restart my computer now” then click Finish.

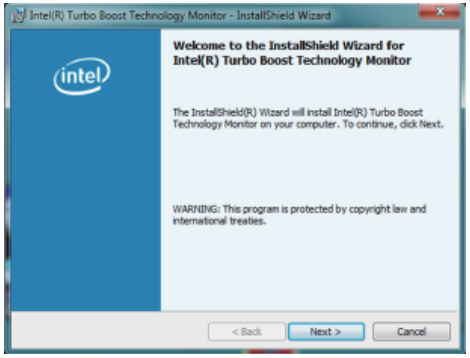
Restarting the system will allow the new software installation to take effect.


## 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.

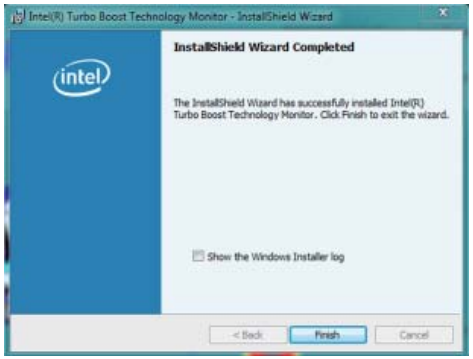



3. Read the license agreement and then click “I accept the terms in the license agreement”. Click Next.

4. Click Install.


5. The setup program is currently installing the software.


6. Click Finish.

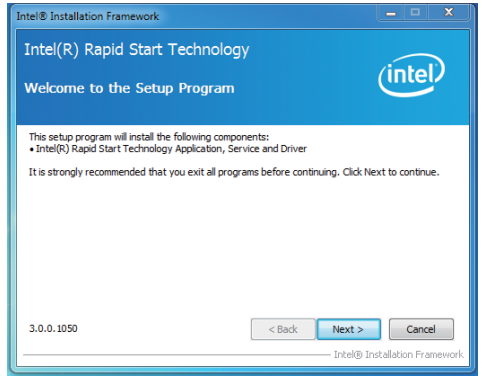



## Intel Rapid Start Technology (For Windows 7/8)

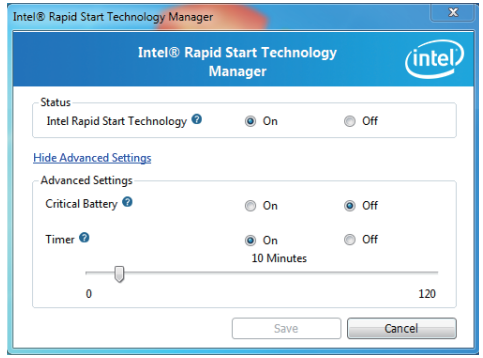
The Intel Rapid Start Technology is a utility that allows your system to wake up and run faster.

To install the driver, click “Intel Rapid Start Technology” on the main menu.

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



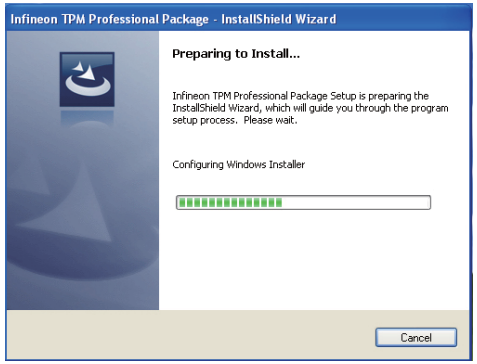

2. Click ON and select the Advanced Settings to enable the Intel Rapid Start Technology. Then, click Save.



## Infineon TPM Drivers and Tools (option)

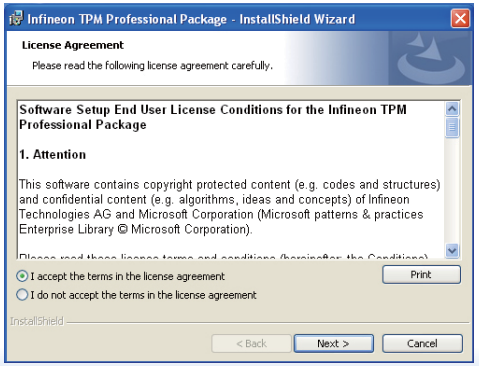
To install the driver, click “Infineon TPM driver and tool (option)” on the main menu.

1. The setup program is preparing to install the driver.

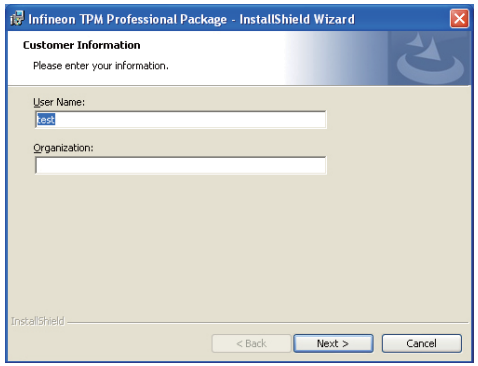



2. The setup program is now ready to install the utility. Click Next.

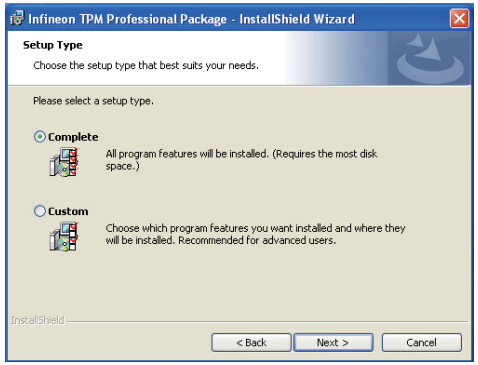

3. Click “I accept the terms in the license agreement” and then click “Next”.



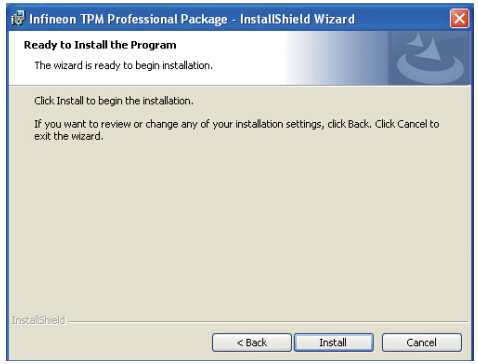

4. Enter the necessary information and then click Next.



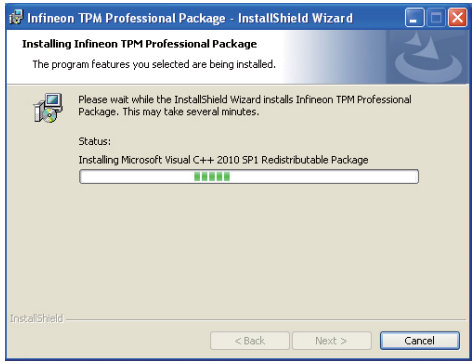

5. Select a setup type and then click Next.



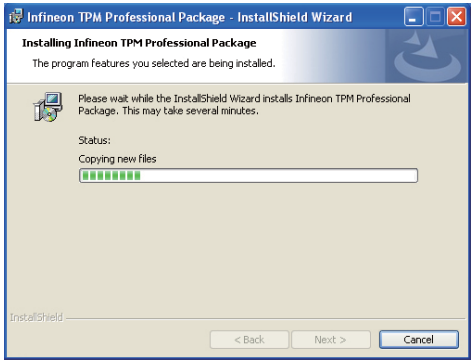

6. Click Install.



7. TPM requires installing the Microsoft Visual C++ package prior to installing the utility. Click Install.

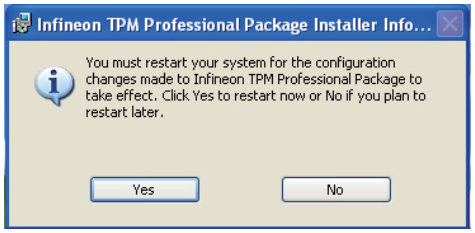



8. The setup program is currently installing the Microsoft Visual C++ package.




9. Click Finish.

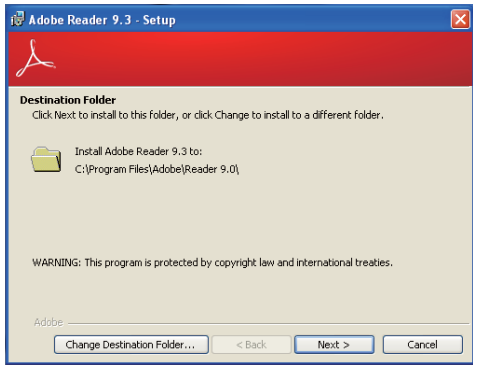

10. Click “Yes“ to restart your system.



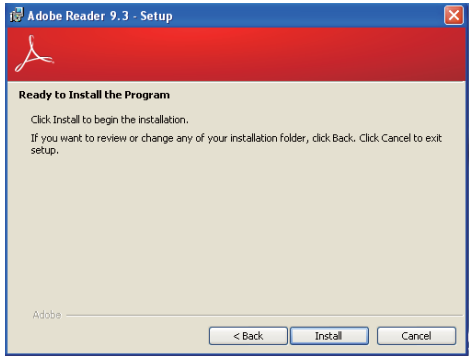
## Adobe Acrobat Reader 9.3

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

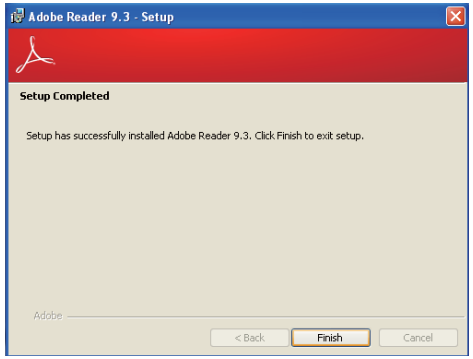
1. Click Next to install or click Change Destination Folder to select another folder.




2. Click Install to begin installation.




3. Click Finish to exit installation.



# 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 ;
}
```

# Chapter 7 - RAID (HM961-QM87)

The system board allows configuring RAID on Serial ATA drives. It supports RAID 0, RAID 1, RAID 5 and RAID 10.

## RAID Levels

### RAID 0 (Striped Disk Array without Fault Tolerance)

RAID 0 uses two new identical hard disk drives to read and write data in parallel, interleaved stacks. Data is divided into stripes and each stripe is written alternately between two disk drives. This improves the I/O performance of the drives at different channel; however it is not fault tolerant. A failed disk will result in data loss in the disk array.

### RAID 1 (Mirroring Disk Array with Fault Tolerance)

RAID 1 copies and maintains an identical image of the data from one drive to the other drive. If a drive fails to function, the disk array management software directs all applications to the other drive since it contains a complete copy of the drive's data. This enhances data protection and increases fault tolerance to the entire system. Use two new drives or an existing drive and a new drive but the size of the new drive must be the same or larger than the existing drive.

### RAID 5

RAID 5 stripes data and parity information across hard drives. It is fault tolerant and provides better hard drive performance and more storage capacity.

### RAID 10 (Mirroring and Striping)

RAID 10 is a combination of data striping and data mirroring providing the benefits of both RAID 0 and RAID 1. Use four new drives or an existing drive and three new drives for this configuration.

## Settings

To enable the RAID function, the following settings are required.

1. Connect the Serial ATA drives.
2. Configure Serial ATA in the AMI BIOS.
3. Configure RAID in the RAID BIOS.
4. Install the RAID driver during OS installation.
5. Install the Intel Rapid Storage Drivers.

### Step 1: Connect the Serial ATA Drives

Refer to chapter 2 for details on connecting the Serial ATA drives.

**Important:**

1. Make sure you have installed the Serial ATA drives and connected the data cables otherwise you won't be able to enter the RAID BIOS utility.
2. Treat the cables with extreme caution especially while creating RAID. A damaged cable will ruin the entire installation process and operating system. The system will not boot and you will lost all data in the hard drives. Please give special attention to this warning because there is no way of recovering back the data.

### Step 2: Configure Serial ATA in the AMI BIOS

1. Power-on the system then press <Del> to enter the main menu of the AMI BIOS.
2. Configure Serial ATA in the appropriate fields.
3. Save the changes in the Save & Exit menu.
4. Reboot the system.

### Step 3: Configure RAID in the RAID BIOS

When the system powers-up and all drives have been detected, the Intel RAID BIOS status message screen will appear. Press the <Ctrl> and <I> keys simultaneously to enter the utility. The utility allows you to build a RAID system on Serial ATA drives.

## Step 4: Install the RAID Driver During OS Installation

The RAID driver must be installed during the Windows® XP or Windows® 2000 installation using the F6 installation method. This is required in order to install the operating system onto a hard drive or RAID volume when in RAID mode or onto a hard drive when in AHCI mode.

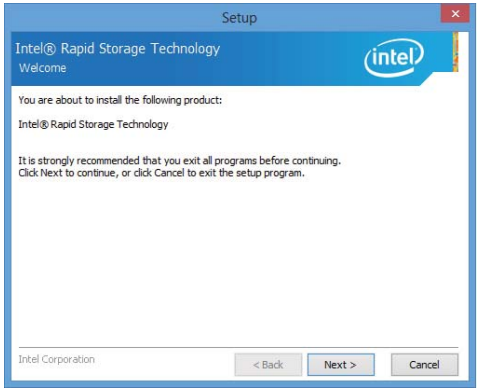
1. Start Windows Setup by booting from the installation CD.
2. Press <F6> when prompted in the status line with the 'Press F6 if you need to install a third party SCSI or RAID driver' message.
3. Press <S> to "Specify Additional Device".
4. At this point you will be prompted to insert a floppy disk containing the RAID driver. Insert the RAID driver diskette.
5. Locate for the drive where you inserted the diskette then select RAID or AHCI controller that corresponds to your BIOS setup. Press <Enter> to confirm.

You have successfully installed the driver. However you must continue installing the OS. Leave the floppy disk in the floppy drive until the system reboots itself because Windows setup will need to copy the files again from the floppy disk to the Windows installation folders. After Windows setup has copied these files again, remove the floppy diskette so that Windows setup can reboot as needed.

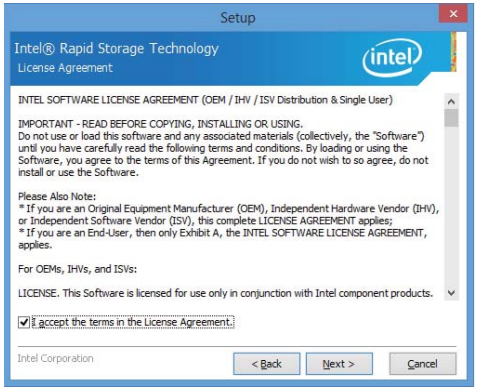
## Step 5: Install the Intel Rapid Storage Technology Utility

The Intel Rapid Storage Technology Utility can be installed from within Windows. It allows RAID volume management (create, delete, migrate) from within the operating system. It will also display useful SATA device and RAID volume information. The user interface, tray icon service and monitor service allow you to monitor the current status of the RAID volume and/or SATA drives. It enables enhanced performance and power management for the storage subsystem.

1. Insert the provided CD into an optical drive.
2. Click "Intel Rapid Storage Technology Utility" on the main menu.
3. Setup is ready to install the utility. Click Next.

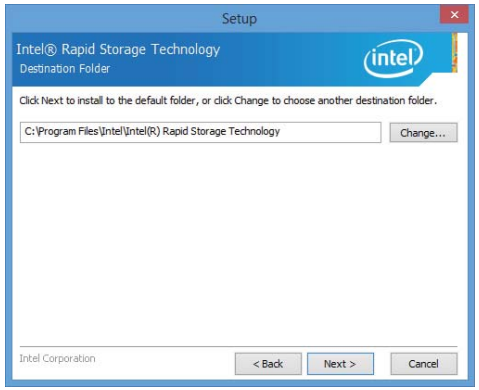



4. Read the license agreement and click "I accept the terms in the License Agreement." Then, click Next.

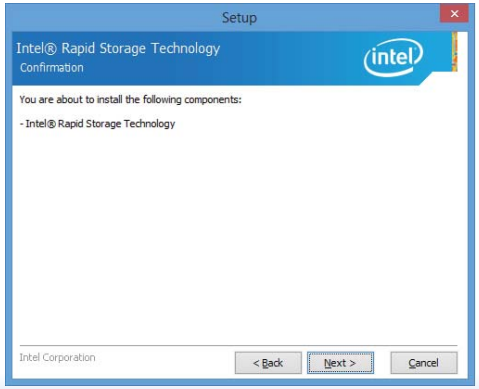


5. Go through the readme document to view system requirements and installation information then click Next.


6. Click Next to install to the default folder or click change to choose another destination folder.




7. Confirm the installation and click Next.




8. Click “Yes, I want to restart this computer now” to complete the installation and then click Finish.

# Chapter 8 - Intel AMT Settings (HM961-QM87)

## Overview

Intel Active Management Technology (Intel® AMT) combines hardware and software solution to provide maximum system defense and protection to networked systems.

The hardware and software information are stored in non-volatile memory. With its built-in manageability and latest security applications, Intel® AMT provides the following functions.

### • Discover

Allows remote access and management of networked systems even while PCs are powered off; significantly reducing desk-side visits.

### • Repair

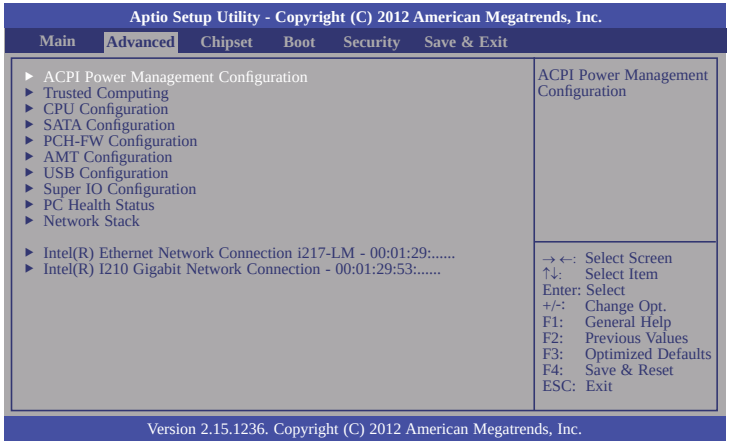
Remotely repair systems after OS failures. Alerting and event logging help detect problems quickly to reduce downtime.

### • Protect

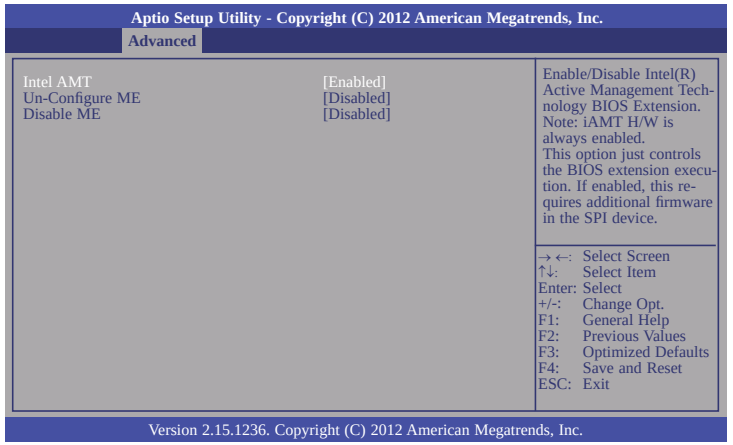
Intel AMT's System Defense capability remotely updates all systems with the latest security software. It protects the network from threats at the source by proactively blocking incoming threats, reactively containing infected clients before they impact the network, and proactively alerting when critical software agents are removed.

## Enable Intel® AMT in the AMI BIOS

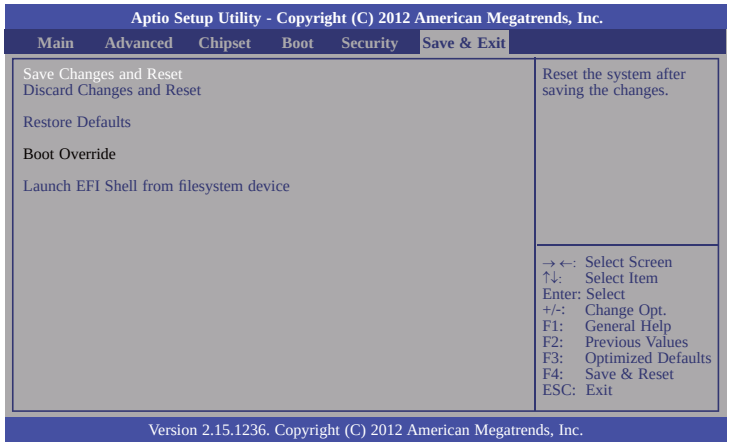
1. Power-on the system then press <Del> to enter the main menu of the AMI BIOS.
2. In the **Advanced** menu, select **AMT Configuration**.




3. In the **Advanced** menu, select **Enable** in the **AMT** field.



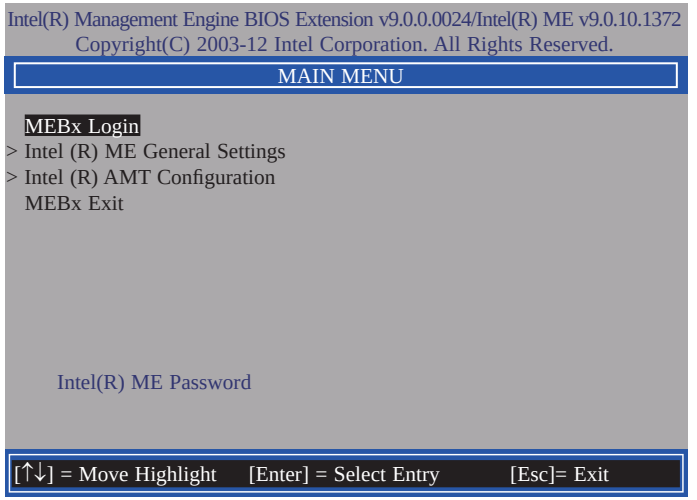
4. In the **Save & Exit** menu, select **Save Changes and Reset** then select **OK**.




## Enable Intel® AMT in the Intel® Management Engine BIOS Extension (MEBX) Screen

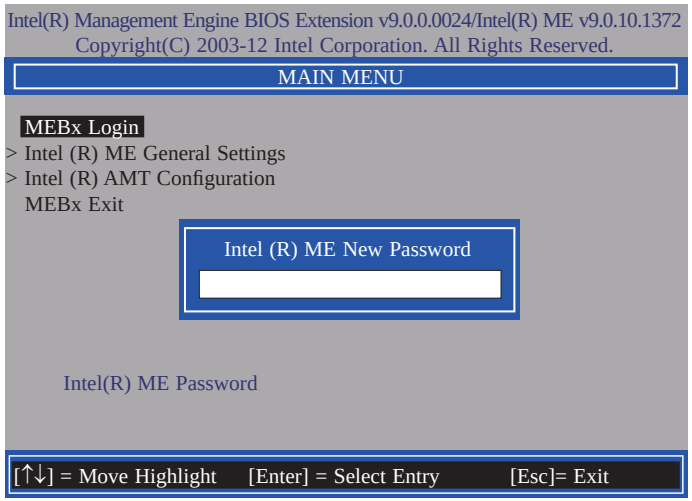
1. When the system reboots, the following message will be displayed. Press **<Ctrl-P>** as soon as the message is displayed; as this message will be displayed for only a few seconds.


2. You will be prompted for a password. The default password is "**admin**". Enter the default password in the space provided under Intel(R) ME Password then press Enter.

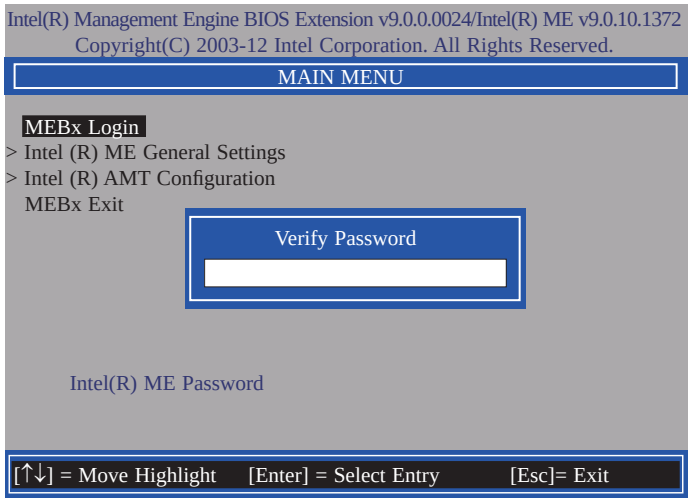


3. Enter a new password in the space provided under Intel(R) ME New Password then press Enter. The password must include:

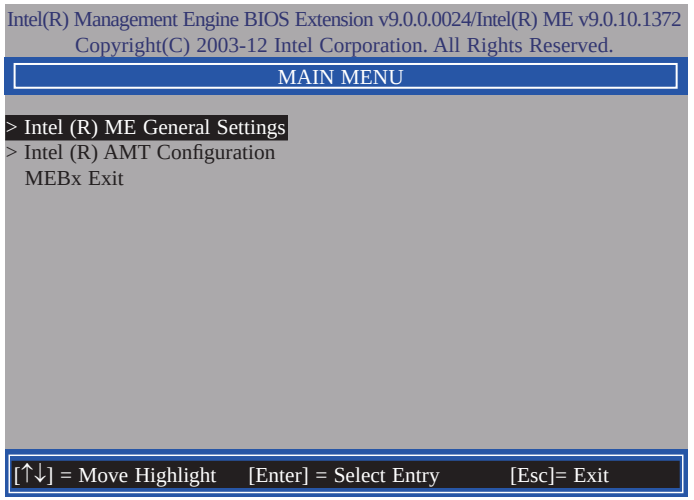
   - 8-32 characters
   - Strong 7-bit ASCII characters excluding **: ,** and **"** characters
   - At least one digit character (0, 1, ...9)
   - At least one 7-bit ASCII non alpha-numeric character, above 0x20, (e.g. !, $, ;)
   - Both lower case and upper case characters




4. You will be asked to verify the password. Enter the same new password in the space provided under Verify Password then press Enter.



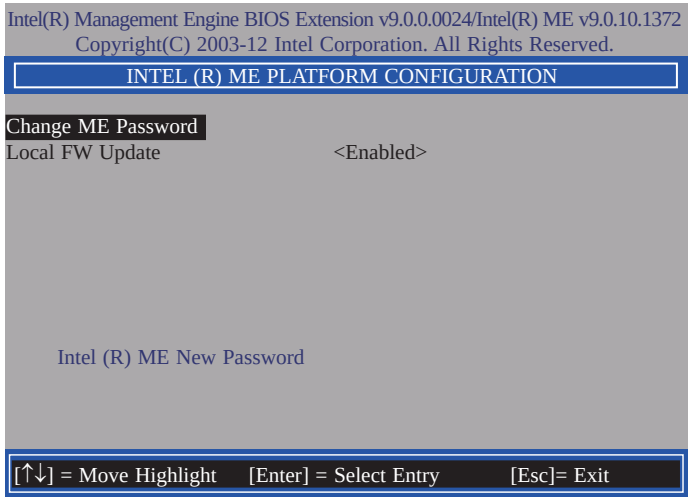

5. Select **Intel(R) ME General Settings** then press Enter.



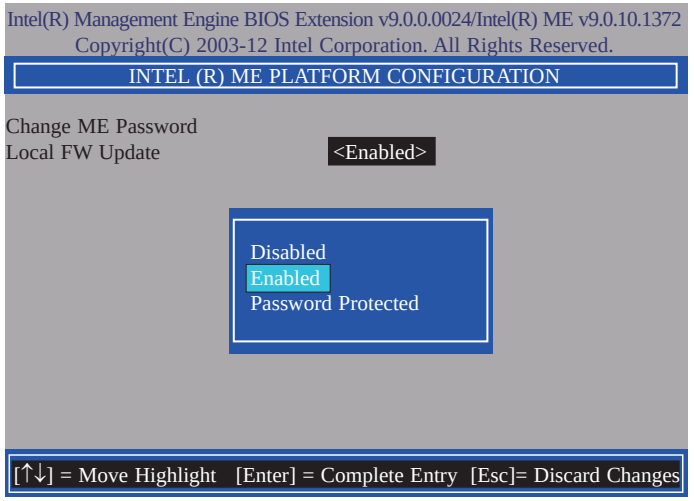
6. Select **Change Intel(R) ME Password** then press Enter.

   You will be prompted for a password. The default password is "**admin**". Enter the default password in the space provided under Intel(R) ME New Password then press Enter.

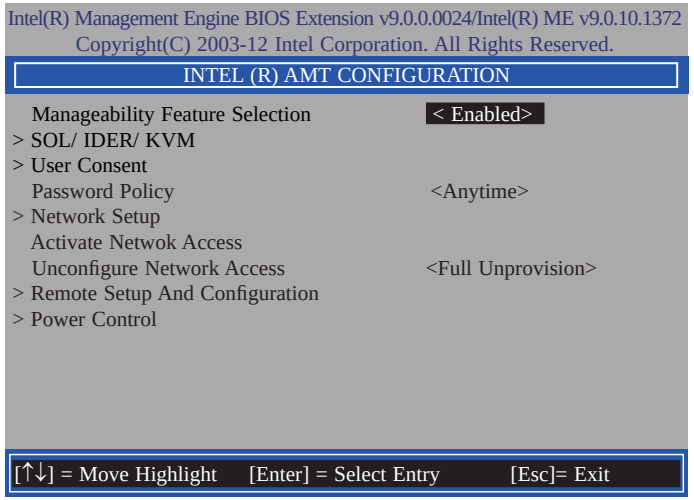
   - 8-32 characters
   - Strong 7-bit ASCII characters excluding **: ,** and **"** characters
   - At least one digit character (0, 1, ...9)
   - At least one 7-bit ASCII non alpha-numeric character, above 0x20, (e.g. !, $, ;)
   - Both lower case and upper case characters



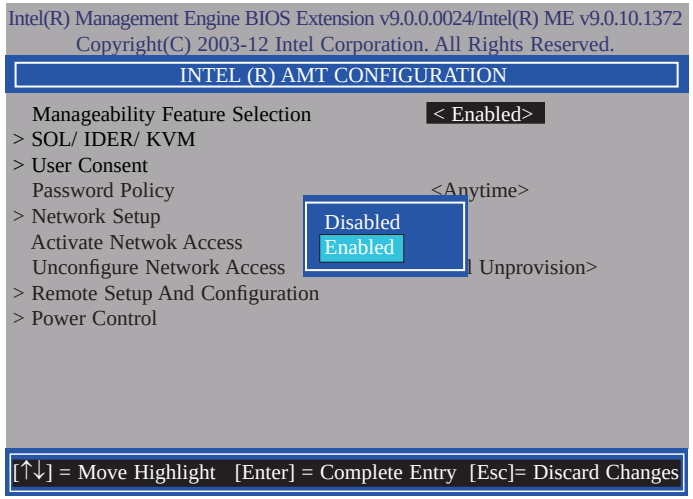

7. Select **Local FW Update** then press Enter. Select **Enabled** then press Enter.



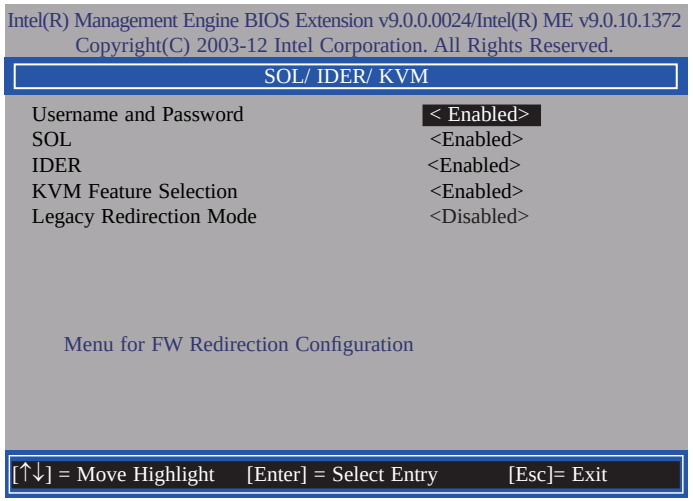

8. Select Previous Menu until you return to the **Main Menu**. Select **Intel(R) AMT Configuration** then press Enter.



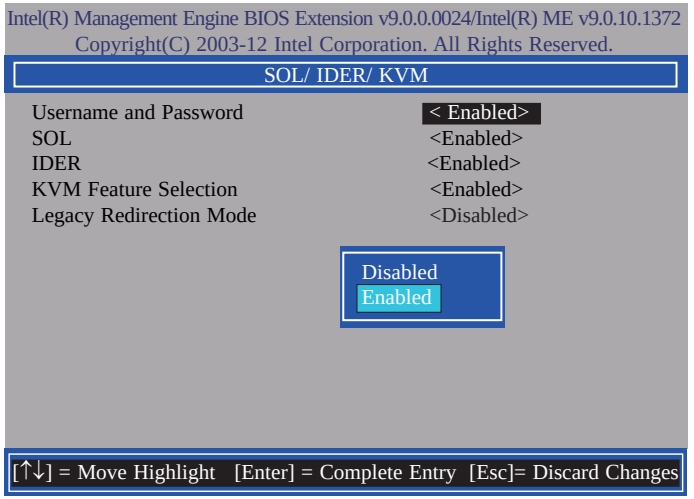
9. In the **Intel(R) AMT Configuration** menu, select **Manageability Feature Selection** then press Enter. Select **Disabled** then press Enter.



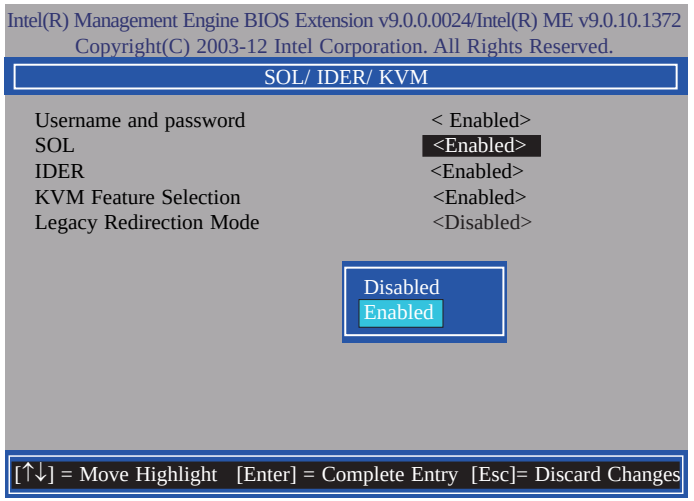

10. In the **Intel(R) AMT Configuration** menu, select **SOL/IDER/KVM** then press Enter.



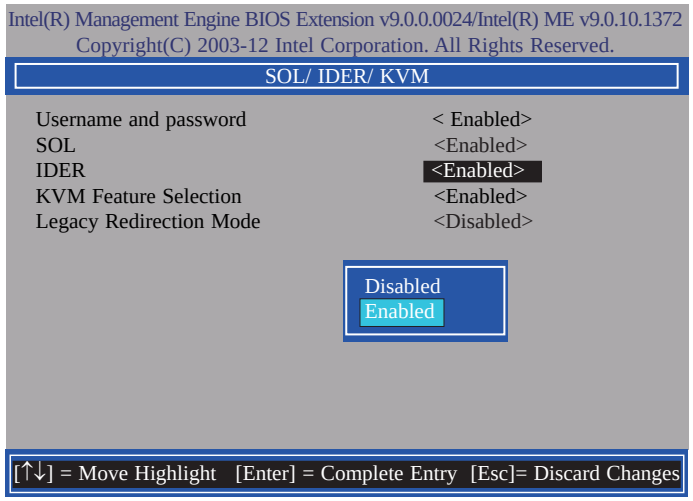

11. In the **SOL/IDER/KVM** menu, select **Username and Password** then press Enter. Select **Disabled** then press Enter.



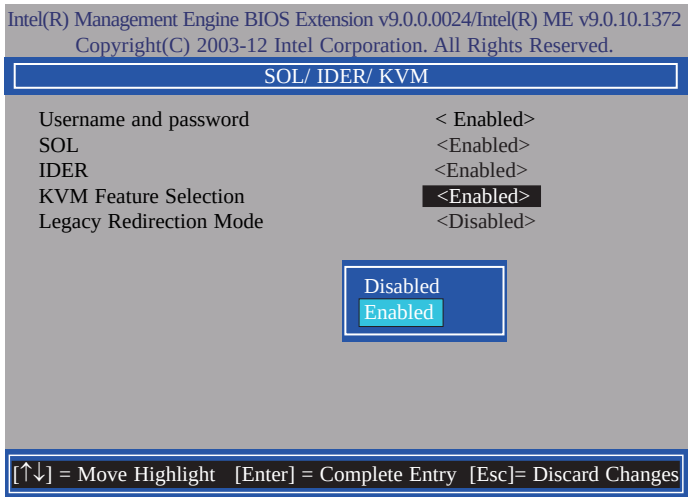

12. In the **SOL/IDER/KVM** menu, select **SOL** then press Enter. Select **Disabled** then press Enter.



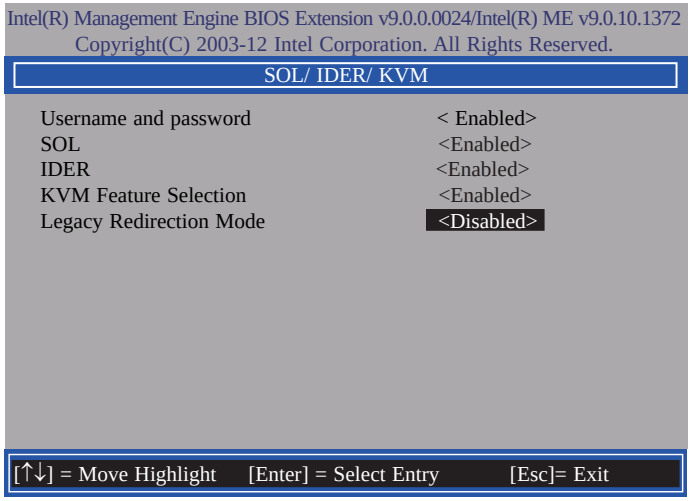
13. In the **SOL/IDER/KVM** menu, select **IDER** then press Enter. Select **Disabled** then press Enter.



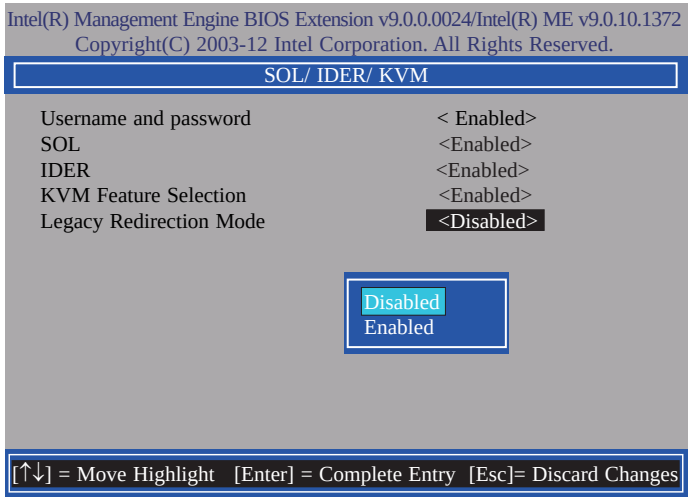

14. In the **SOL/IDER/KVM** menu, select **KVM Feature Selection** then press Enter. Select **Disabled** then press Enter.



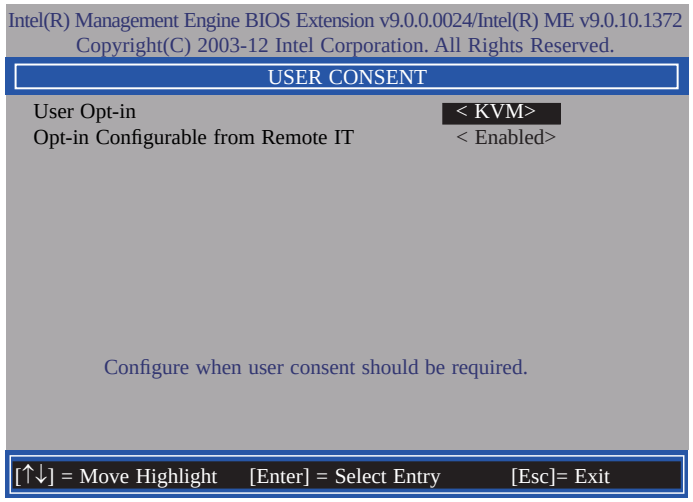

15. In the **SOL/IDER/KVM** menu, select **Legacy Redirection Mode** then press Enter.



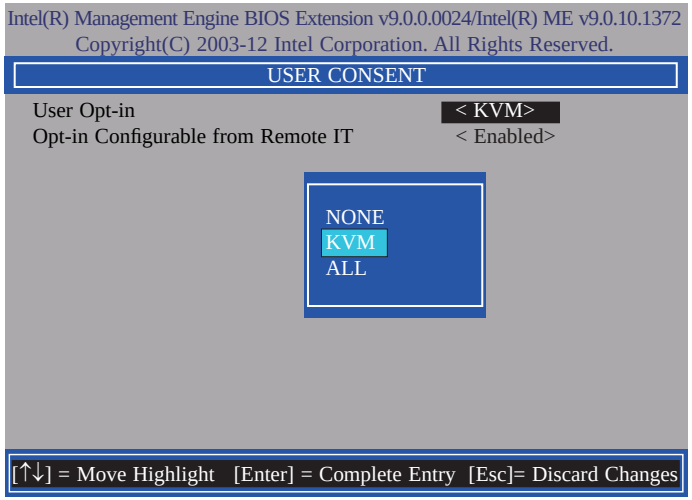

16. Select **Enabled** then press Enter.



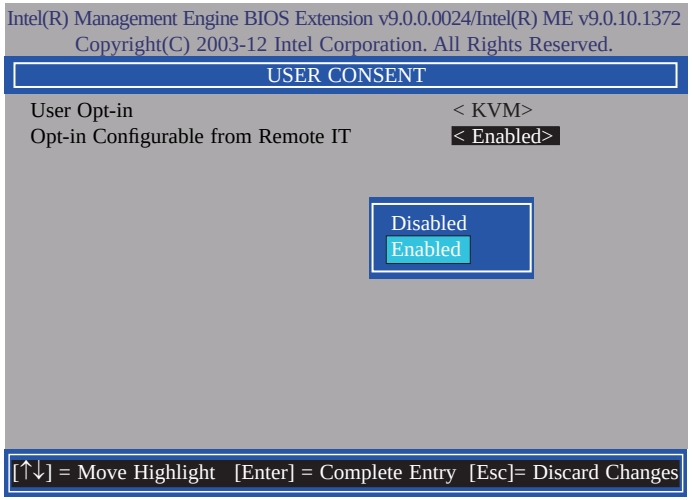
17. Select Previous Menu until you return to the **Intel(R) AMT Configuration** menu. Select **User Consent** then press Enter.




18. In the **User Consent** menu**,** select **User Opt-in** then press Enter. Select **None** then press Enter.

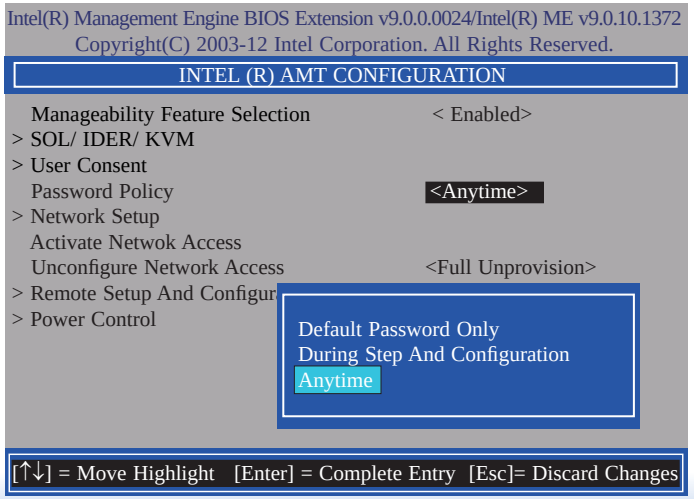



19. In the **User Consent** menu**,** select **Opt-in Configurable from Remote IT** then press Enter. Select **Disable Remote Control of KVM Opt-in Policy** then press Enter.

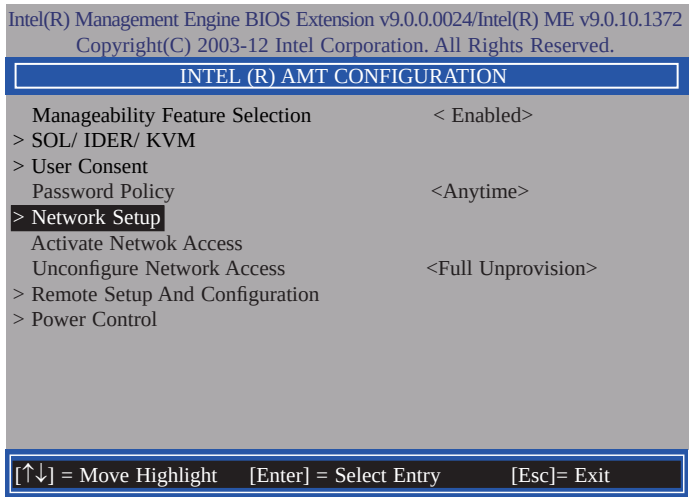



20. Select Previous Menu until you return to the **Intel(R) AMT Configuration** menu. Select **Password Policy** then press Enter.

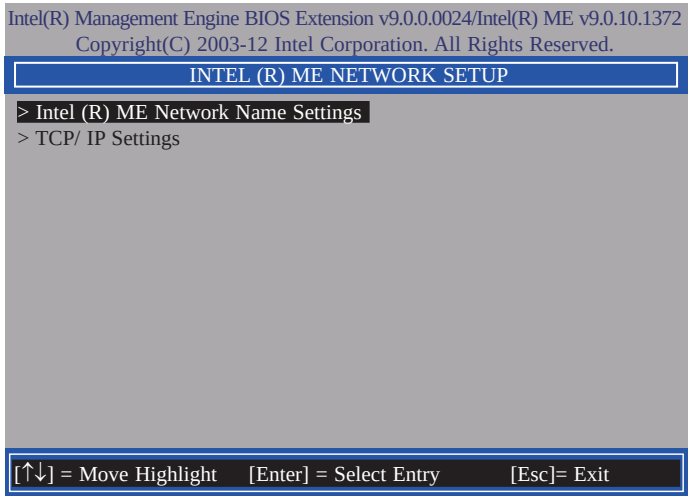
You may choose to use a password only during setup and configuration or to use a password anytime the system is being accessed.



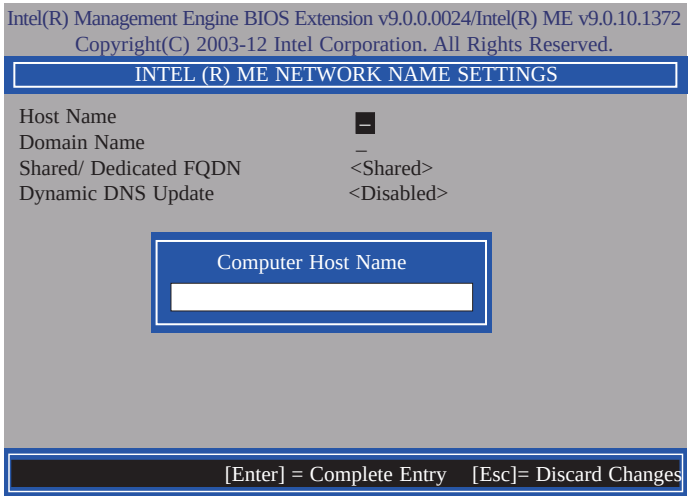
21. In the **Intel(R) AMT Configuration** menu**,** select **Network Setup** then press Enter.



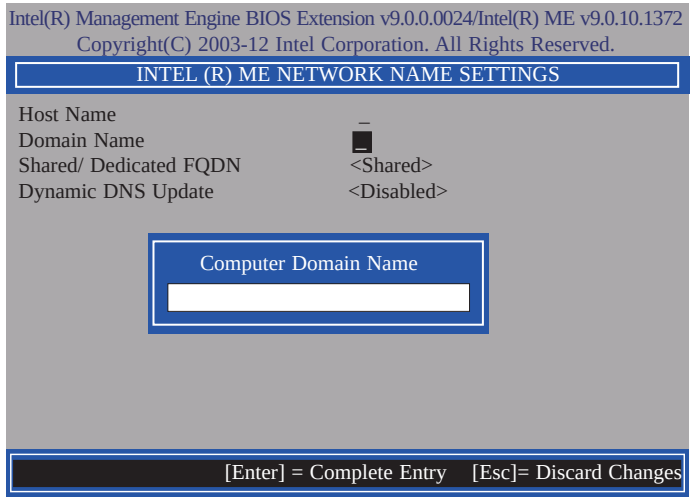

22. In the **Intel(R) ME Network Setup** menu, select **Intel(R) ME Network Name Settings** then press Enter.



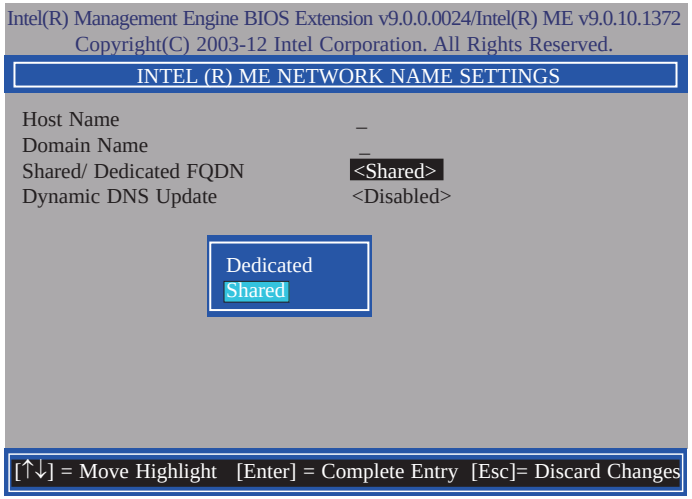

23. In the **Intel(R) ME Network Name Settings** menu, select **Host Name** then press Enter. Enter the computer's host name then press Enter.



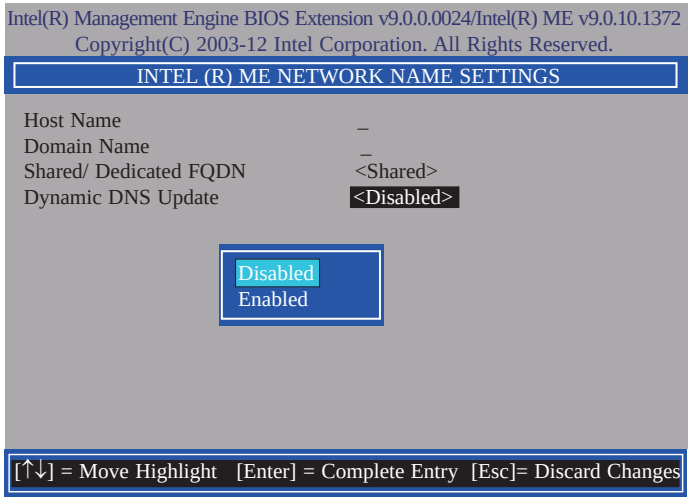

24. Select **Domain Name** then press Enter. Enter the computer's domain name then press Enter.



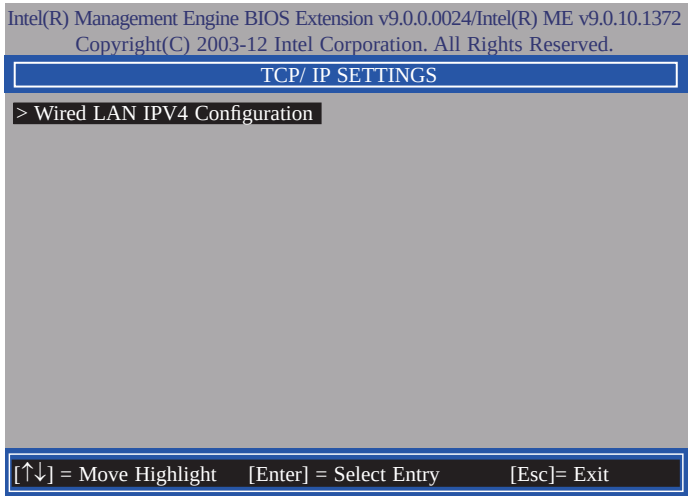
25. Select **Shared/Dedicated FQDN** then press Enter. Select **Shared** or **Dedicated** then press Enter.



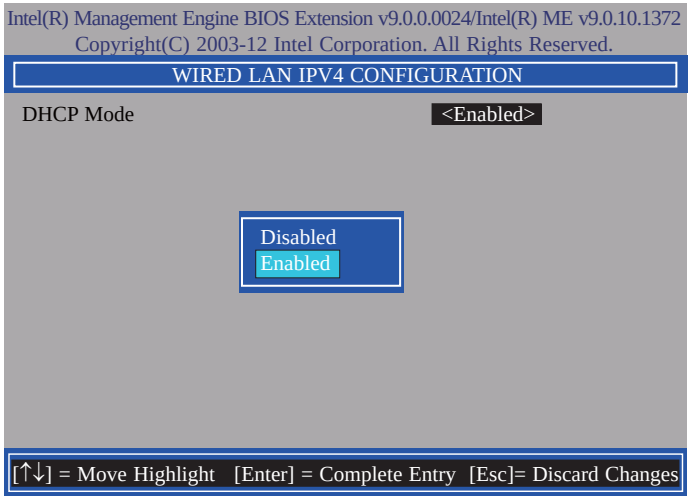

26. Select **Dynamic DNS Update** then press Enter. Select **Enabled** or **Disabled** then press Enter.



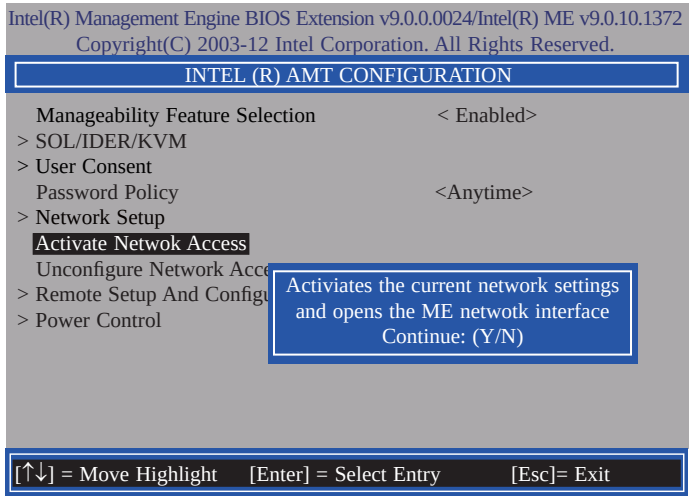

27. Select Previous Menu until you return to the **Intel(R) ME Network Setup** menu. Select **TCP/IP Settings** then press Enter.



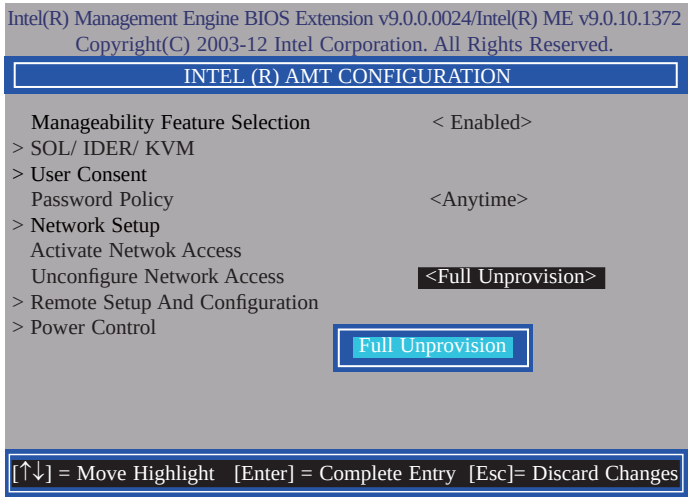

28. In the **TCP/IP Settings** menu, select **Wired LAN IPV4 Configuration** then press Enter.



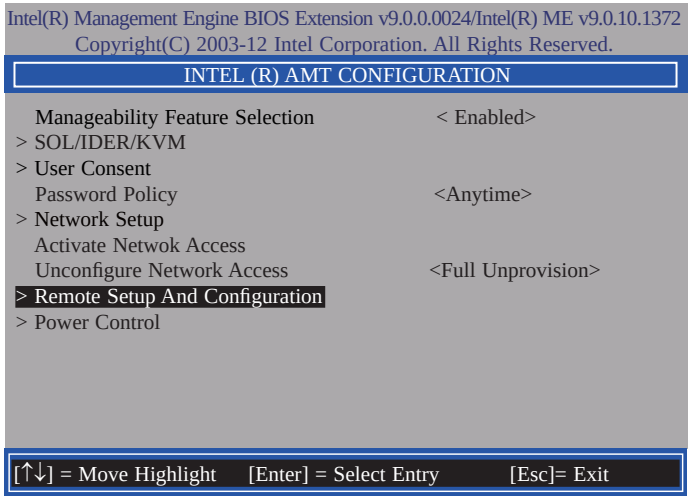
29. Select Previous Menu until you return to the **Intel(R) AMT Configuration** menu. Select **Activate Network Access** then press Enter. Type **Y** then press Enter.



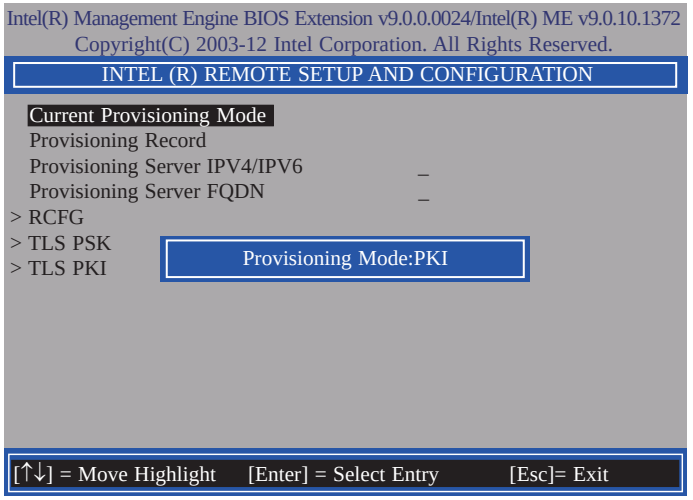

30. In the **Intel(R) AMT Configuration** menu, select **Unconfigure Network Access** then press Enter.



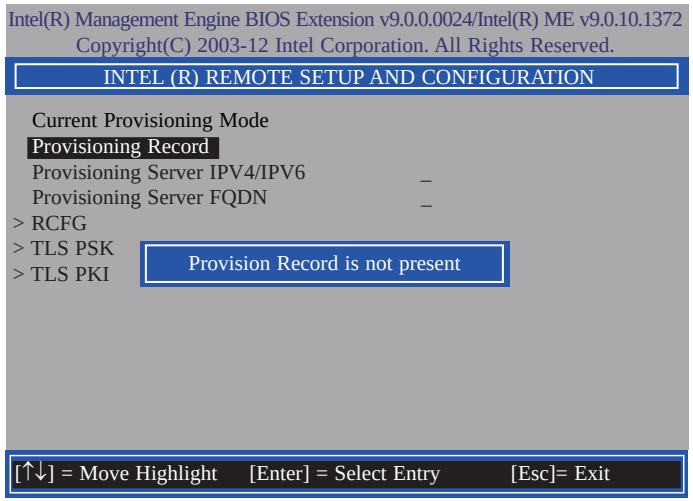

31. In the **Intel(R) AMT Configuration** menu, select **Remote Setup And Configuration** then press Enter.



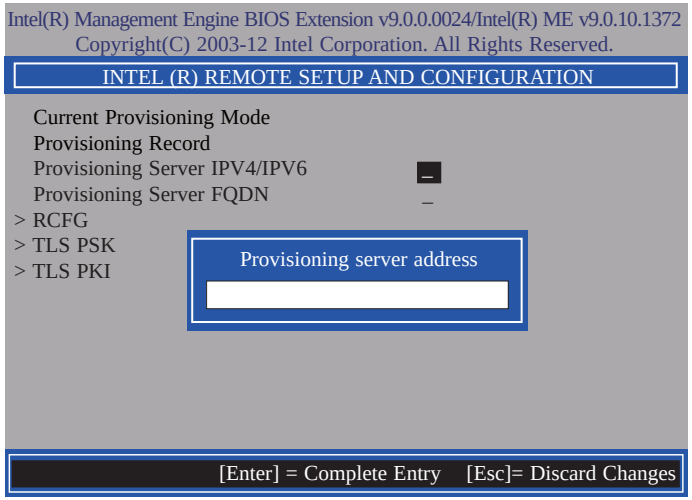

32. In the **Intel(R) Remote Setup And Configuration** menu**,** select **Current Provisioning Mode** then press Enter.



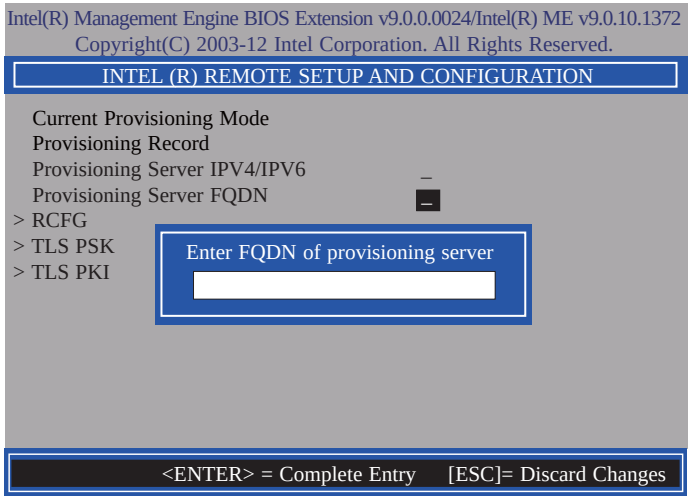
33. In the **Intel(R) Remote Setup And Configuration** menu, select **Provisioning Record** then press Enter.



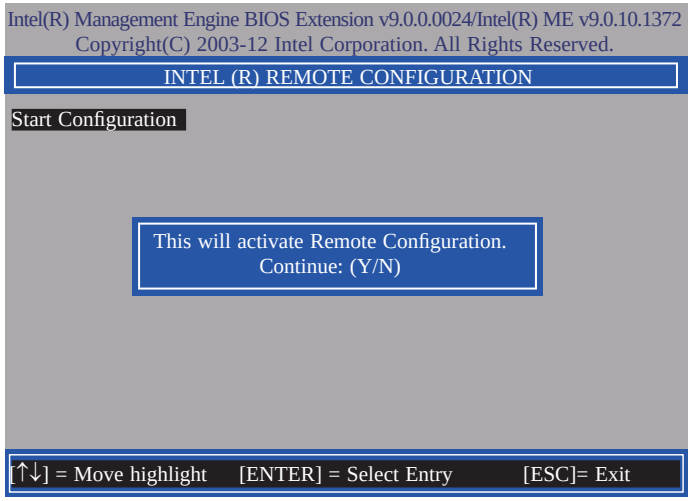

34. Select Previous Menu until you return to the **Intel(R) Remote Setup And Configuration** menu. Select **Provisioning Server IPV4/IPV6** then press Enter. Type server address then press Enter.



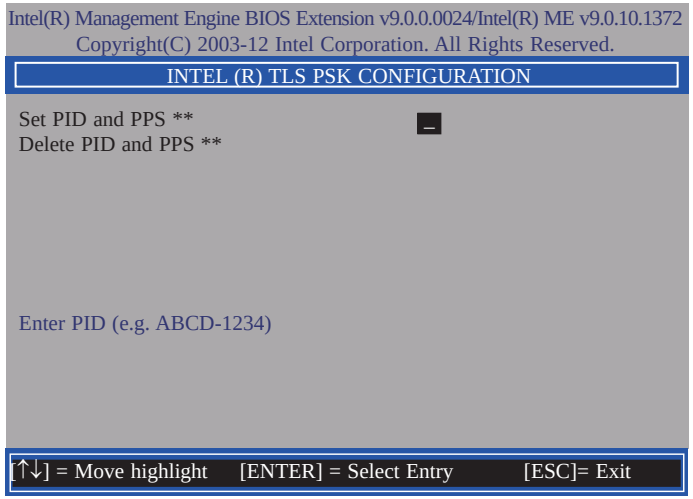

35. In the **Intel(R) Remote Automated Setup And Configuration** menu, select **Provisioning Server FQDN** then press Enter. Type FQDN of provisioning server then press Enter.



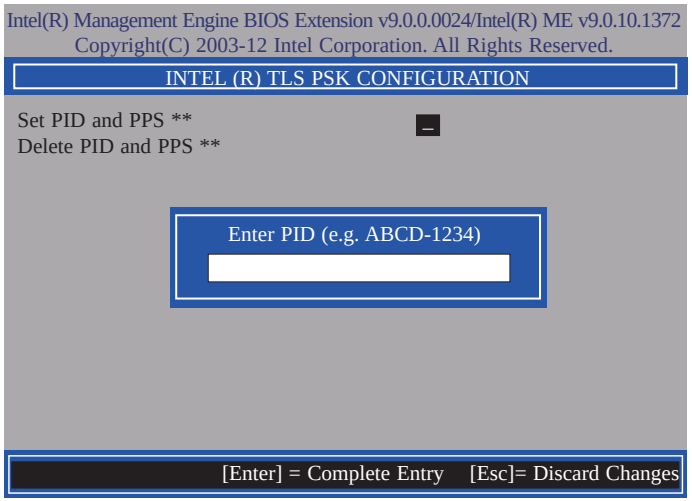

36. In the **Intel(R) Remote Automated Setup And Configuration** menu, select **RCFG** then press Enter. Select **Start Configuration**, and type **Y** then press Enter.



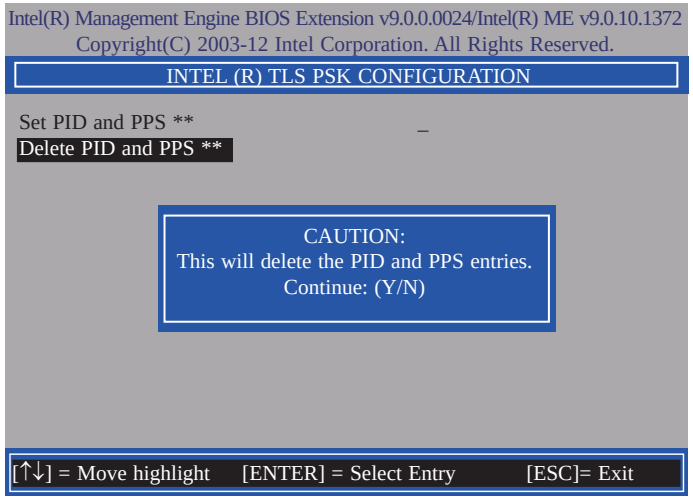
37. In the **Intel(R) Remote Automated Setup And Configuration** menu, select **TLS PSK** then press Enter.



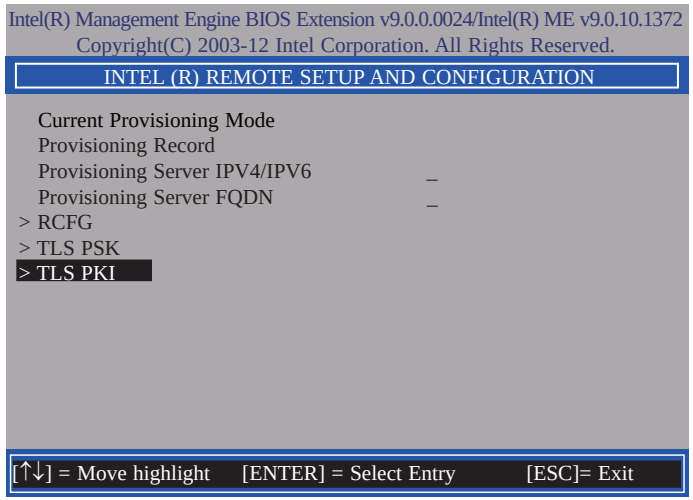

38. In the **Intel(R) TLS PSK Configuration** menu, select **Set PID and PPS **** then press Enter. Type PID code then press Enter.



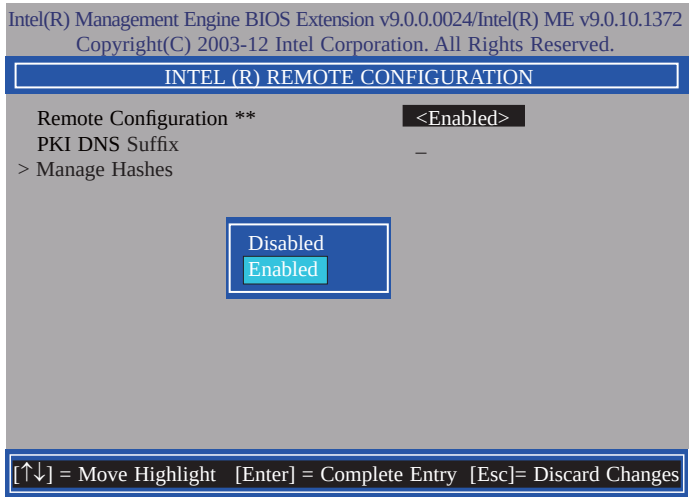

39. In the **Intel(R) TLS PSK Configuration** menu, select **Delete PID and PPS **** then press Enter. Type **Y** then press Enter.



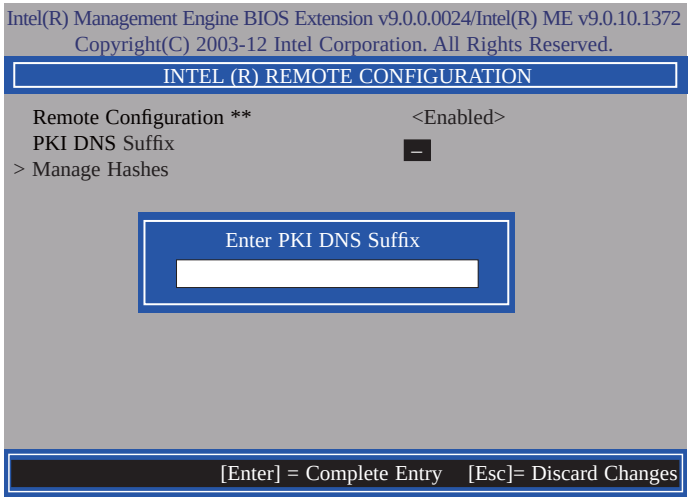

40. Select Previous Menu until you return to the **Intel(R) Remote Setup And Configuration** menu. Select **TLS PKI** then press Enter.



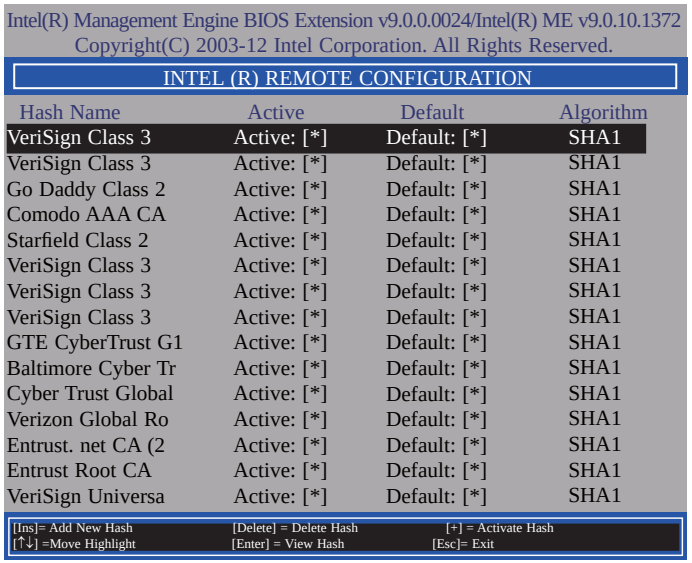
41. In the **Intel(R) Remote Configuration** menu, select **Remote Configuration **** then press Enter. Select **Disabled** then press Enter.



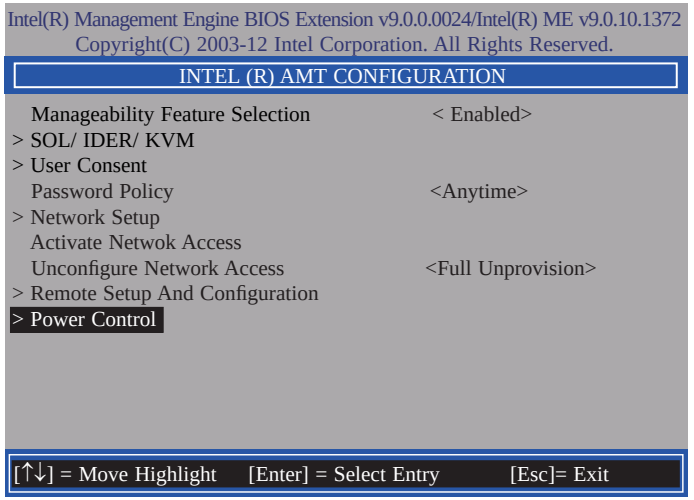

42. In the **Intel(R) Remote Configuration** menu, select **PKI DNS Suffix** then press Enter. Type PKI DNS Suffix then press Enter.



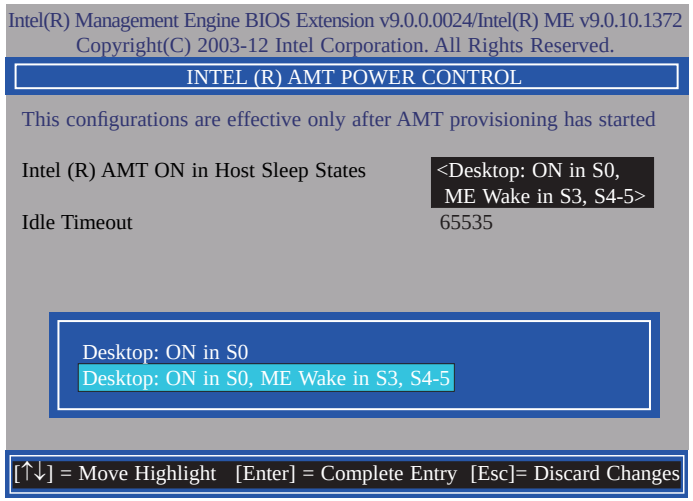

43. In the **Intel(R) Remote Configuration** menu, select **Manage Hashes** then press Enter.



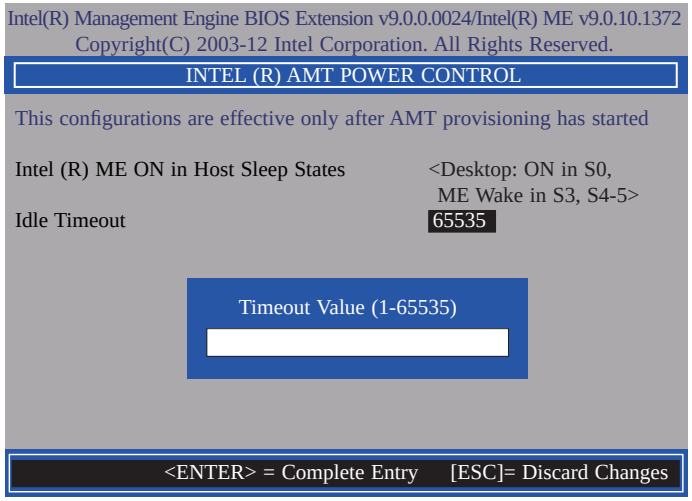

44. In the **Intel(R) AMT Configuration** menu**,** select **Power Control** then press Enter.



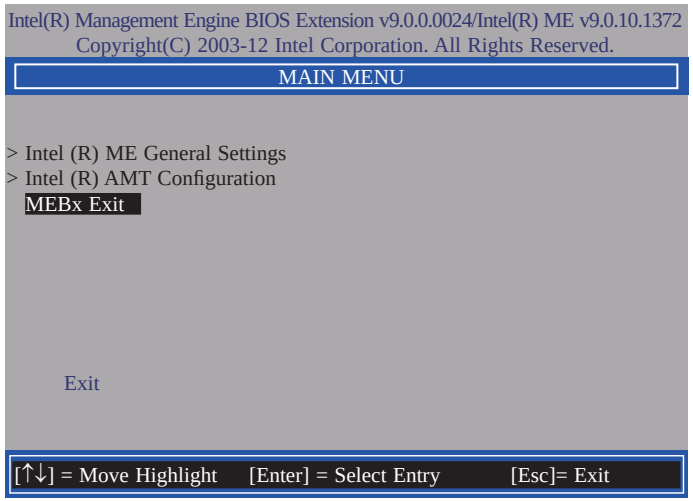
45. In the **Intel(R) AMT Power Control** menu, select **Intel(R) AMT ON in Host Sleep States** then press Enter. Select an option then press Enter.




46. In the **Intel(R) AMT Power Control** menu, select **Idle Timeout** then press Enter. Enter the timeout value (1-65535).




47. Select Previous Menu until you return to the **Main Menu**. Select **Exit** then press Enter. Type **Y** then press Enter.



# Appendix A - Watchdog Sample Code

```
#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(0xB5,count_H); //High Byte
  WriteEC(0xB6,count_L); //Low  Byte
  //Enable Watch Dog Timer
  WriteEC(0xB4,0x01);
}
//----------------------------------------------------------------
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,0xF4);
  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,0xF5);
  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 B - 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 C - 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.

## 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.