

# **SU968**

## **COM Express Compact Module User's Manual**

## Copyright

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

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

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

© 2018. All Rights Reserved.

## Trademarks

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

## COM Express Specification Reference

PICMG® COM Express Module™ Base Specification.

<http://www.picmg.org/>

## FCC and DOC Statement on Class B

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

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

### Notice:

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

# Table of Contents

Chapter 1 - Introduction.....	6	Chapter 7 - Intel AMT Settings .....	59
Specifications.....	6	Appendix A - Troubleshooting .....	72
Features .....	7	Appendix B - Insyde BIOS Standard Status POST Code .....	74
Chapter 2 - Concept.....	8		
COM Express Module Standards.....	8		
Specification Comparison Table.....	9		
Chapter 3 - Hardware Installation .....	10		
Board Layout.....	10		
Block Diagram .....	10		
Mechanical Diagram .....	11		
System Memory.....	12		
Connectors .....	13		
CPU Fan Connector.....	13		
COM Express Connectors .....	13		
COM Express Connectors .....	14		
COM Express Connectors Signals and Descriptions .....	15		
Standby Power LED .....	22		
Cooling Option.....	22		
Installing SU968 onto a Carrier Board.....	23		
Installing the COM Express Debug Card.....	25		
Chapter 4 - BIOS Setup .....	27		
Overview .....	27		
Insyde BIOS Setup Utility.....	28		
Main.....	28		
Advanced .....	28		
Security .....	35		
Boot .....	36		
Exit .....	38		
Updating the BIOS.....	39		
Notice: BIOS SPI ROM.....	39		
Chapter 5 - Supported Software .....	41		
Chapter 6 - RAID .....	55		

## About this Manual

This manual can be downloaded from the website, or acquired as an electronic file included in the optional CD/DVD. The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

## 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 consequential 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 SU968 board
- One Heat Sink (Height: 23.8mm)

## Optional Items

- COM332-B Carrier Board Kit
- Heat spreader (Height: 11mm)

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

## Before Using the System Board

Before using the system board, prepare basic system components.

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

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

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

## Chapter 1 - Introduction

### Specifications

<b>SYSTEM</b>	Processor	6th Generation Intel® Core™ Processors, BGA 1356 Intel® Core™ i7-6600U Processor, Dual Core, 4M Cache, 2.6GHz (3.4GHz), 15W Intel® Core™ i5-6300U Processor, Dual Core, 3M Cache, 2.4GHz (3.0GHz), 15W Intel® Core™ i3-6100U Processor, Dual Core, 3M Cache, 2.3GHz, 15W Intel® Celeron® Processor 3955U, Dual Core, 2M Cache, 2.0GHz, 15W	<b>WATCHDOG TIMER</b>	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds	
	Memory	Two 204-pin SODIMM up to 16GB Dual Channel DDR3L 1600MHz		<b>SECURITY</b>	TPM	Available Upon Request
	BIOS	Insyde SPI 128Mbit		<b>POWER</b>	Type	12V, 5VSB, VCC_RTC (ATX mode) 12V, VCC_RTC (AT mode)
<b>GRAPHICS</b>	Controller	Intel® HD Graphics	Consumption		Typical: I7-6600U: 12V @ 0.86A (10.28Watt) Max.: I7-6600U: 12V @ 1.372A (16.46Watt)	
	Feature	OpenGL 5.0, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1/WMV9, JPEG/MJPEG, HEVC/H265, VP8, VP9 HW Encode: AVC/H.264, MPEG2, JPEG, HEVC/H265, VP8, VP9	<b>OS SUPPORT</b>		Windows 7/WES7 (32/64-bit) Windows 8.1 (64-bit) Windows 10 IoT Enterprise 64-bit Ubuntu 16.04 (Intel graphic driver available)	
	Display	1 x VGA/DDI (DDI available upon request) 1 x LVDS/eDP (eDP available upon request) 1 x DDI VGA: resolution up to 1920x1200 @ 60Hz LVDS: dual channel 24-bit, resolution up to 1920x1200 @ 60Hz HDMI: resolution up to 4096x2160 @ 24Hz or 2560x1600 @ 60Hz DP++: resolution up to 4096x2304 @ 60Hz eDP: resolution up to 4096x2304 @ 60Hz		<b>ENVIRONMENT</b>	Temperature	Operating : 0 to 60°C : -40 to 85°C (with heat spreader) Storage: -40 to 85°C
	Triple Displays	VGA + LVDS + DDI DDI + eDP + DDI			Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
<b>EXPANSION</b>	Interface	5 PCIe x1 or 4 PCIe x1 + 1 PCIe x4 or 3 PCIe x1 + 2 PCIe x2 (support up to 5 devices and 8 lanes) 1 x LPC 1 x I <sup>2</sup> C 1 x SMBus 2 x UART (TX/RX)			MTBF	921,923 hrs @ 25°C; 460,715 hrs @ 45°C; 256,677 hrs @ 60°C Calculation Model: Telcordia Issue 2, Method Case 3 Environment: GB, GC – Ground Benign, Controlled
	<b>AUDIO</b>	Interface	HD Audio	<b>MECHANICAL</b>	Dimensions	COM Express® Compact 95mm (3.74") x 95mm (3.74")
<b>ETHERNET</b>	Controller	1 x Intel® I219LM with iAMT11.0 PCIe (10/100/1000Mbps) (only Core i7/i5 supports iAMT)	Compliance		PICMG COM Express® R2.1, Type 6	
<b>I/O</b>	USB	4 x USB 3.0 8 x USB 2.0				
	SATA	3 x SATA 3.0 (up to 6Gb/s) RAID 0/1/5/10				
	DIO	1 x 8-bit DIO				

## 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

DDR3L SDRAM provides backward compatibility to DDR3 memory modules but can operate at the same or at a lower power level.

### • 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/DDI, LVDS/eDP and DDI interfaces for triple display outputs.

### • Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance to be faster than the standard parallel ATA, which only has data transfer rate of 100MB/s. The bandwidth of the SATA 3.0 will be limited by carrier board design.

### • Gigabit LAN

The Intel® I219LM with iAMT11.0 Gigabit LAN controller supports up to 1Gbps data transmission (only Core i7/i5 supports iAMT).

### • 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.

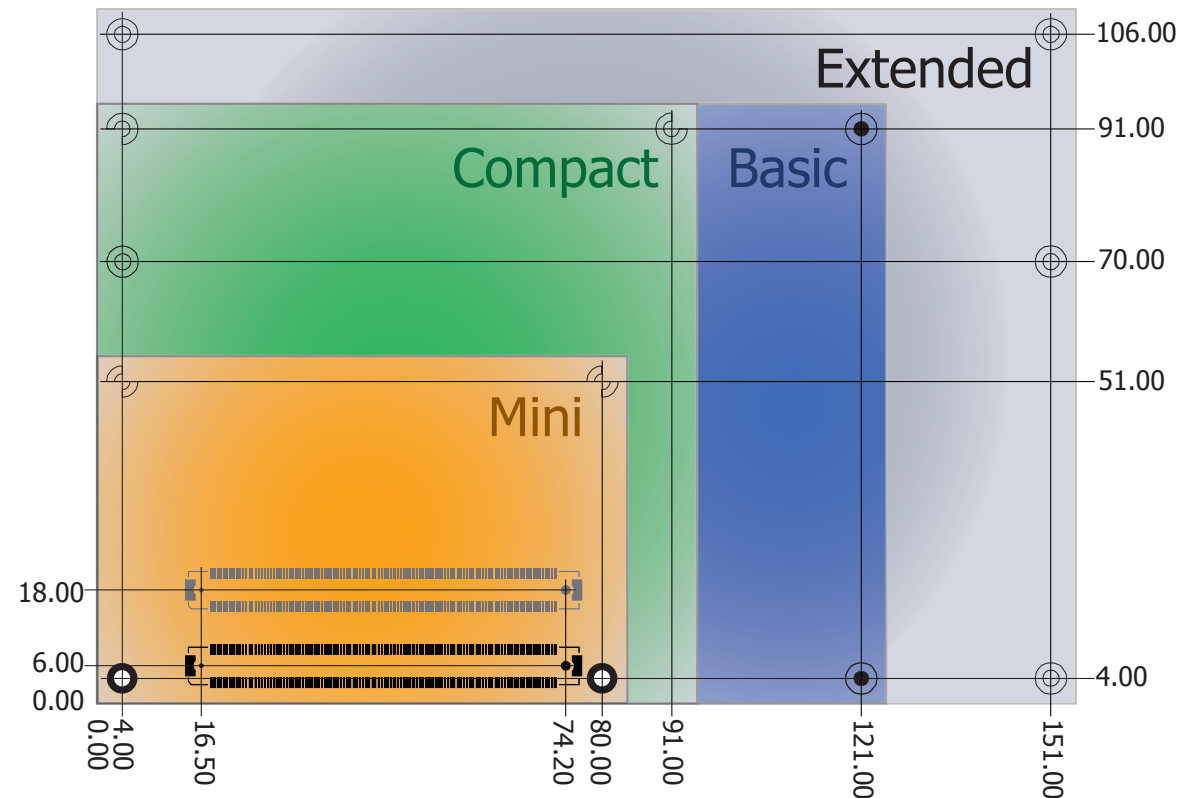
## Chapter 2 - Concept

### COM Express Module Standards

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

SU968 is a COM Express Compact module. The dimension is 95mm x 95mm.

- Common for all Form Factors
- Extended only
- Basic only
- Compact only
- Compact and Basic only
- Mini only





## Specification Comparison Table

The table below shows the COM Express standard specifications and the corresponding specifications supported on the SU968 module.

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI SU968 Type 6
<b>System I/O</b>			
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	1
A-B	VGA Port	0 / 1	0/1 (Option : DDI2 or VGA)
A-B	TV-Out	NA	NA
A-B	DDI 0	NA	NA
A-B <sup>5</sup>	Serial Ports 1 - 2	0 / 2	2
A-B	CAN interface on SER1	0 / 1	0
A-B	SATA / SAS Ports	1 / 4	3 (with Intel® Celeron®: 2)
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
<b>System Management</b>			
A-B <sup>6</sup>	SDIO (muxed on GPIO)	0 / 1	0
A-B <sup>6</sup>	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

- 5 Indicates 12V-tolerant features on former VCC\_12V signals.
- 6 Cells in the connected columns spanning rows provide a rough approximation of features sharing connector pins.

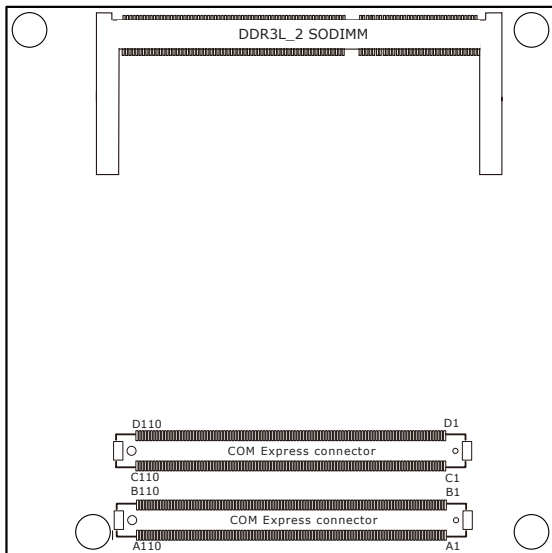
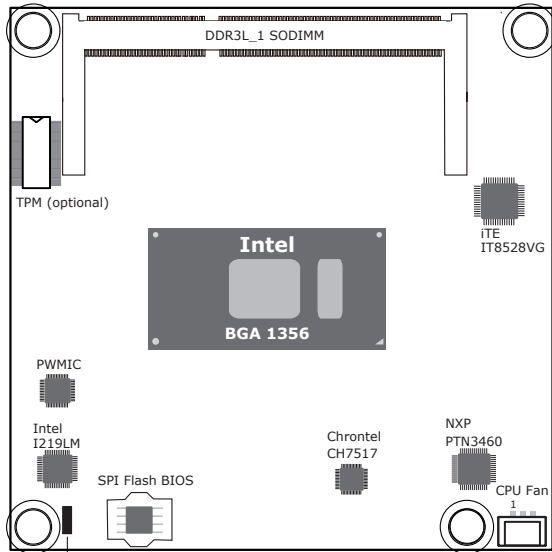
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI SU968 Type 6
<b>Power Management</b>			
A-B	Thermal Protection	0 / 1	1
A-B	Battery Low Alarm	0 / 1	1
A-B	Suspend/Wake Signals	0 / 3	1
A-B	Power Button Support	1 / 1	1
A-B	Power Good	1 / 1	1
A-B	VCC_5V_SBY Contacts	4 / 4	4
A-B <sup>5</sup>	Sleep Input	0 / 1	1
A-B <sup>5</sup>	Lid Input	0 / 1	1
A-B <sup>5</sup>	Fan Control Signals	0 / 2	2
A-B	Trusted Platform Modules	0 / 1	1
<b>Power</b>			
A-B	VCC_12V Contacts	12 / 12	12

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

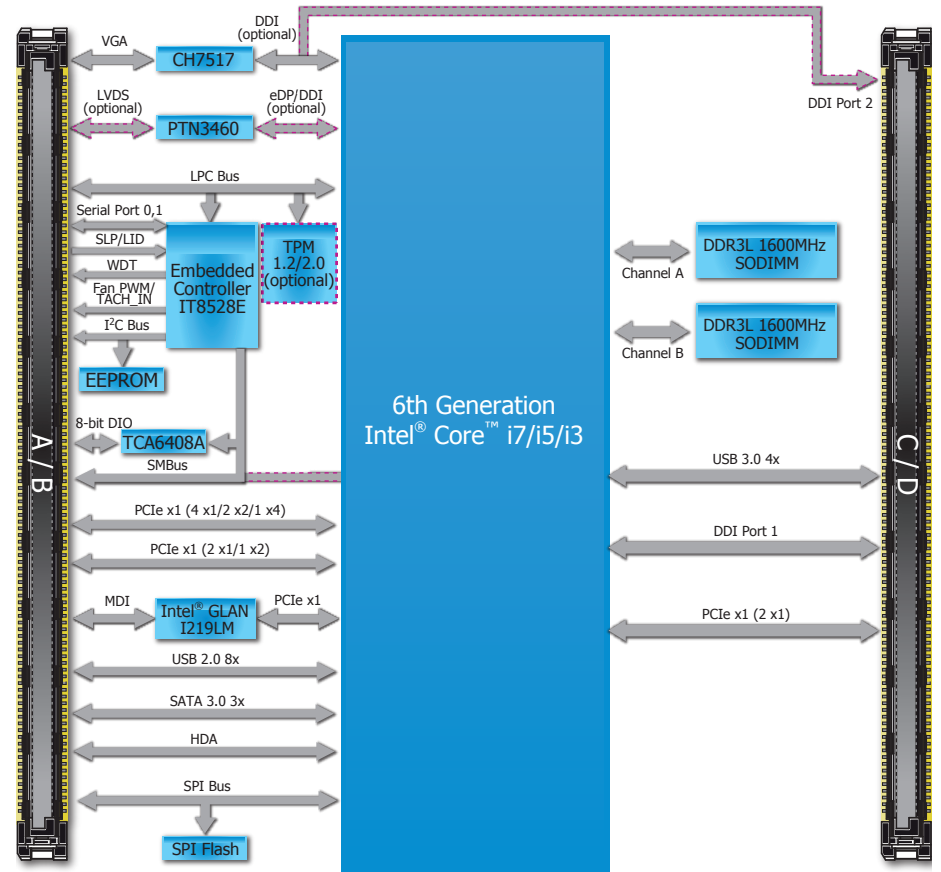
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI+ USB3) Min / Max	DFI SU968 Type 6
<b>System I/O</b>			
C-D	PCI Express Lanes 16 - 31	0 / 16	0
C-D	PCI Express Graphics (PEG)	0 / 1	0
C-D <sup>6</sup>	Muxed SDVO Channels 1 - 2	NA	NA
C-D	PCI Express Lanes 6 - 15	0 / 2	2
C-D	PCI Bus - 32 Bit	NA	NA
C-D	PATA Port	NA	NA
C-D	LAN Ports 1 - 2	NA	NA
C-D <sup>6</sup>	DDIs 1 - 3	0 / 3	1/2 (Option : DDI2 or VGA)
C-D <sup>6</sup>	USB 3.0 Ports	0 / 4	4
<b>Power</b>			
C-D	VCC_12V Contacts	12 / 12	12

# Chapter 3 - Hardware Installation

## Board Layout

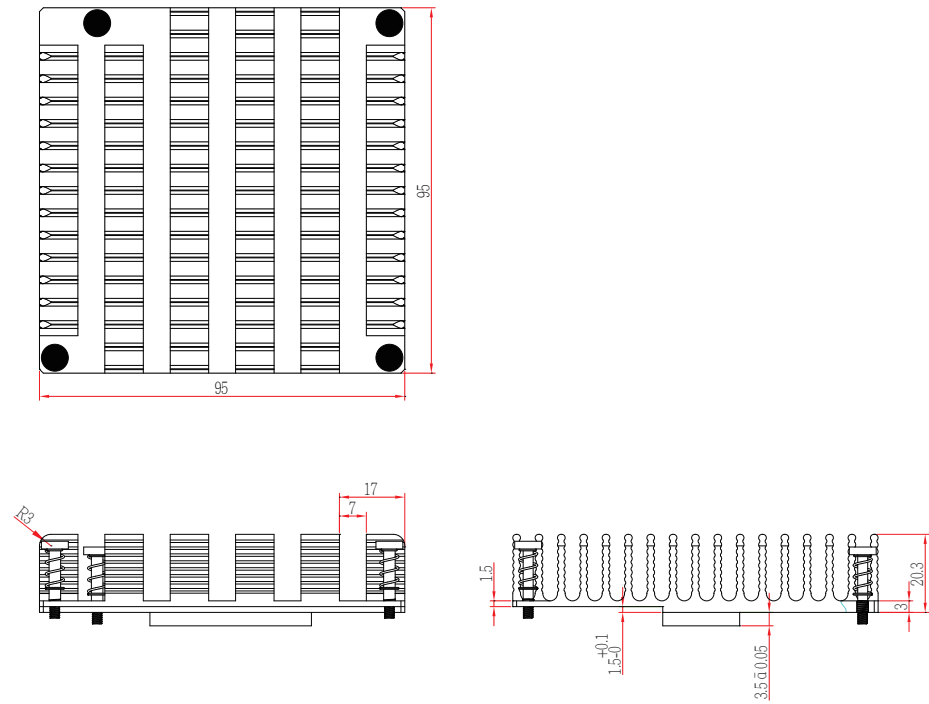


## Block Diagram

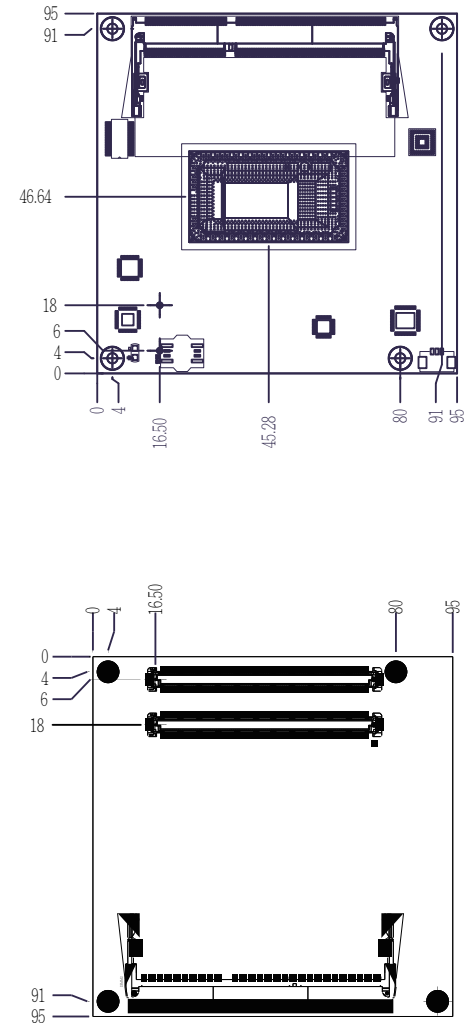


# Mechanical Diagram

Heat Sink



SU968 Module



Top View

Bottom View

**Important:**

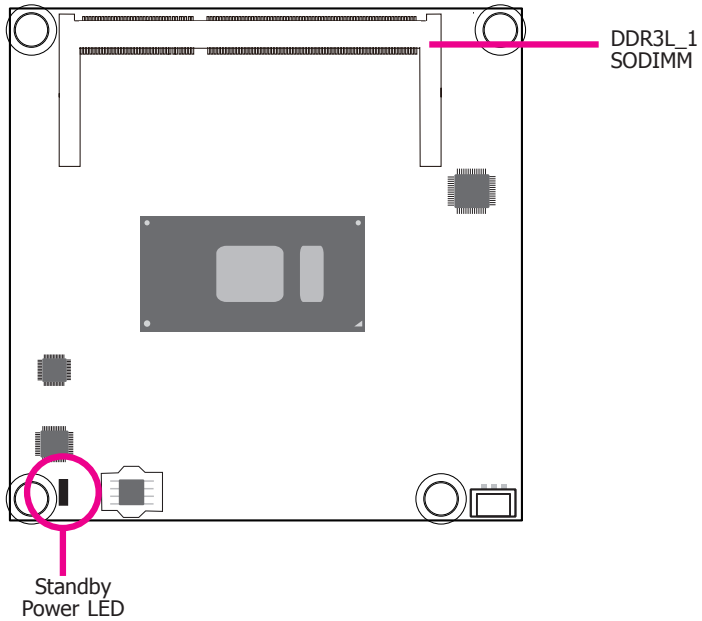
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to 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

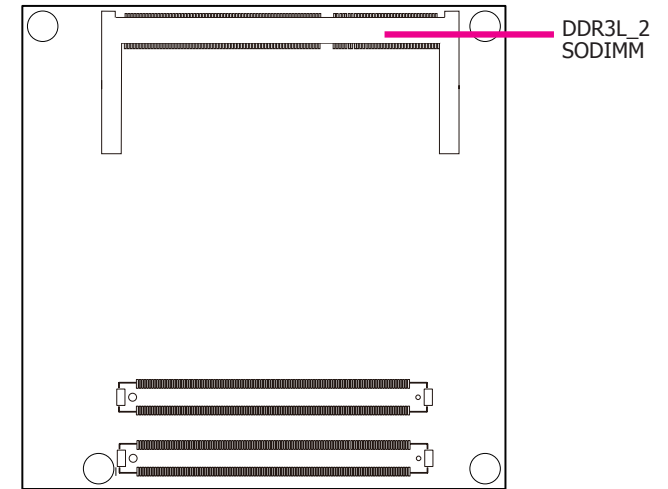
The system board is equipped with two 204-pin SODIMM sockets supporting up to 16GB system memory and dual channel DDR3L 1600MHz memory interface.

**Important:**

When the Standby Power LED is 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.



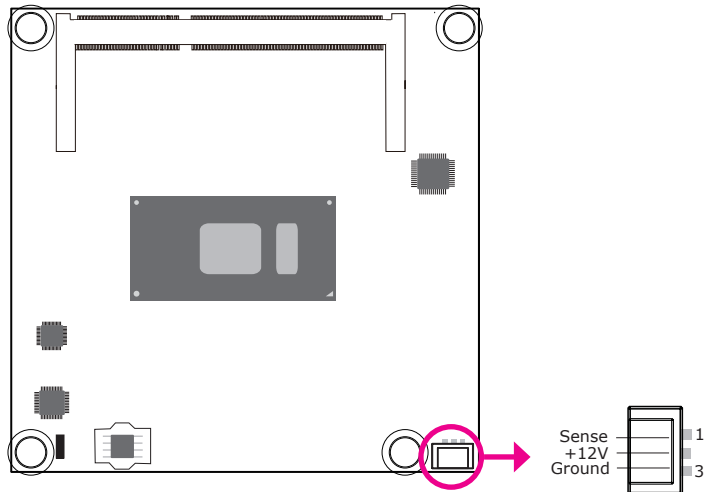
Top View



Bottom View

## 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.

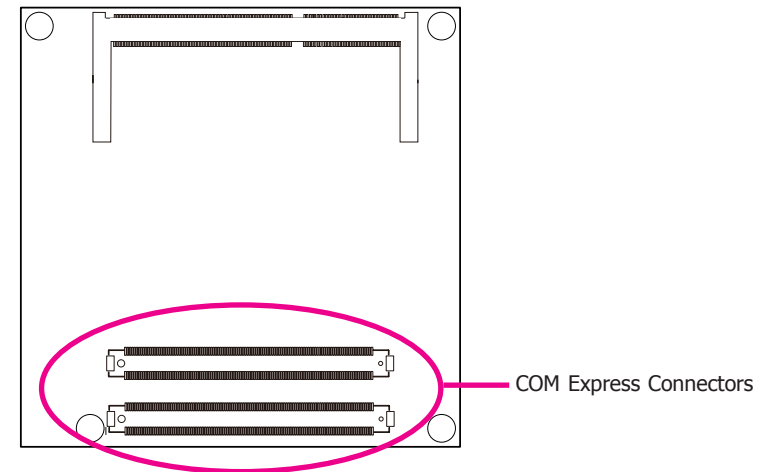
### BIOS Setting

"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 SU968 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 SU968 onto a Carrier Board" section in this chapter for more information.



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

## COM Express Connectors

Row A	Row B	Row A	Row B
A1	GND (FIXED)	B1	GND (FIXED)
A2	GBE0_MD13-	B2	GBE0_ACT#
A3	GBE0_MD13+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MD12-	B6	LPC_AD2
A7	GBE0_MD12+	B7	LPC_AD3
A8	GBE0_LINK#	B8	NA
A9	GBE0_MD11-	B9	NA
A10	GBE0_MD11+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MD10-	B12	PWRBTN#
A13	GBE0_MD10+	B13	SMB_CK
A14	GBE0_CTREF	B14	SMB_DAT
A15	SUS_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_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	NA
A23	SATA2_TX-	B23	NA
A24	SUS_S5#	B24	PWR_OK
A25	SATA2_RX+	B25	NA
A26	SATA2_RX-	B26	NA
A27	BATLOW#	B27	WDT
A28	(S)ATA_ACT#	B28	NA
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#
A51	GND (FIXED)	B51	GND (FIXED)
A52	PCIE_TX5+	B52	PCIE_RX5+
A53	PCIE_TX5-	B53	PCIE_RX5-
A54	GPIO	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	GPIO	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND	B66	WAKE0#
A67	GPIO	B67	NA
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	GPIO	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	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 (FIXED)
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	NA	D15	DDI1_CTRLCLK_AUX+
C16	NA	D16	DDI1_CTRLCLK_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	NA	D25	RSVD
C26	NA	D26	DDI1_PAIR0+
C27	RSVD	D27	DDI1_PAIR0-
C28	RSVD	D28	RSVD
C29	NA	D29	DDI1_PAIR1+
C30	NA	D30	DDI1_PAIR1-
C31	GND (FIXED)	D31	GND (FIXED)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLCLK_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	RSVD	D35	RSVD
C36	NA	D36	DDI1_PAIR3+
C37	NA	D37	DDI1_PAIR3-
C38	NA	D38	RSVD
C39	NA	D39	DDI2_PAIR0+
C40	NA	D40	DDI2_PAIR0-
C41	GND (FIXED)	D41	GND (FIXED)
C42	NA	D42	DDI2_PAIR1+
C43	NA	D43	DDI2_PAIR1-
C44	NA	D44	DDI2_HPD
C45	RSVD	D45	RSVD
C46	NA	D46	DDI2_PAIR2+
C47	NA	D47	DDI2_PAIR2-
C48	RSVD	D48	RSVD
C49	NA	D49	DDI2_PAIR3+
C50	NA	D50	DDI2_PAIR3-
C51	GND (FIXED)	D51	GND (FIXED)
C52	NA	D52	NA
C53	NA	D53	NA
C54	TYPE0#	D54	PEG_LANE_REV#
C55	NA	D55	NA
C56	NA	D56	NA
C57	TYPE1#	D57	TYPE2#
C58	NA	D58	NA
C59	NA	D59	NA
C60	GND (FIXED)	D60	GND (FIXED)
C61	NA	D61	NA
C62	NA	D62	NA
C63	RSVD	D63	RSVD
C64	RSVD	D64	RSVD
C65	NA	D65	NA
C66	NA	D66	NA
C67	RSVD	D67	GND
C68	NA	D68	NA
C69	NA	D69	NA
C70	GND (FIXED)	D70	GND (FIXED)
C71	NA	D71	NA
C72	NA	D72	NA
C73	GND	D73	GND
C74	NA	D74	NA
C75	NA	D75	NA
C76	GND	D76	GND
C77	RSVD	D77	RSVD
C78	NA	D78	NA
C79	NA	D79	NA
C80	GND (FIXED)	D80	GND (FIXED)
C81	NA	D81	NA
C82	NA	D82	NA
C83	RSVD	D83	RSVD
C84	GND	D84	GND
C85	NA	D85	NA
C86	NA	D86	NA
C87	GND	D87	GND
C88	NA	D88	NA
C89	NA	D89	NA
C90	GND (FIXED)	D90	GND (FIXED)
C91	NA	D91	NA
C92	NA	D92	NA
C93	GND	D93	GND
C94	NA	D94	NA
C95	NA	D95	NA
C96	GND	D96	GND
C97	RSVD	D97	RSVD
C98	NA	D98	NA
C99	NA	D99	NA
C100	GND (FIXED)	D100	GND (FIXED)
C101	NA	D101	NA
C102	NA	D102	NA
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 Signals and Descriptions

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 and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
AC/HAD_RST#	A30	O CMOS	3.3V Suspend/3.3V			Reset output to CODEC, active low.
AC/HDA_SYNC	A29	O CMOS	3.3V/3.3V			Connect to CODEC pin 10 SYNC
AC/HDA_BITCLK	A32	I/O CMOS	3.3V/3.3V			Connect to CODEC pin 6 BIT_CLK
AC/HDA_SDOUT	A33	O CMOS	3.3V/3.3V			Connect to CODEC pin 5 SDATA_OUT
AC/HDA_SDIN2	B28	I/O CMOS	3.3V Suspend/3.3V	NA		Serial TDM data output to the CODEC.
AC/HDA_SDIN1	B29	I/O CMOS	3.3V Suspend/3.3V			Serial TDM data inputs from up to 2 CODECS.
AC/HDA_SDIN0	B30	I/O CMOS	3.3V Suspend/3.3V			Connect 33 Ω in series to CODEC0 pin 8 SDATA_IN

## Gigabit Ethernet Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
GBE0_MDIO+	A13	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MDIO+/-  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: 1000BASE-T 100BASE-TX 10BASE-T MDI[0]+/- B1_DA+/- TX+/- TX+/- MDI[1]+/- B1_DB+/- RX+/- RX+/- MDI[2]+/- B1_DC+/- MDI[3]+/- B1_DD+/-
GBE0_MDIO-	A12	I/O Analog	3.3V max Suspend			
GBE0_MD11+	A10	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD11+/-
GBE0_MD11-	A9	I/O Analog	3.3V max Suspend			
GBE0_MD12+	A7	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD12+/-
GBE0_MD12-	A6	I/O Analog	3.3V max Suspend			
GBE0_MD13+	A3	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD13+/-
GBE0_MD13-	A2	I/O Analog	3.3V max Suspend			
GBE0_ACT#	B2	OD CMOS	3.3V Suspend/3.3V			Connect to LED and <b>recommend</b> current limit resistor 150 Ω to 3.3VSB
GBE0_LINK#	A8	OD CMOS	3.3V Suspend/3.3V			NC
GBE0_LINK100#	A4	OD CMOS	3.3V Suspend/3.3V			Connect to LED and <b>recommend</b> current limit resistor 150 Ω to 3.3VSB
GBE0_LINK100#	A4	OD CMOS	3.3V Suspend/3.3V			Connect to LED and <b>recommend</b> current limit resistor 150 Ω to 3.3VSB
GBE0_LINK1000#	A5	OD CMOS	3.3V Suspend/3.3V			Connect to LED and <b>recommend</b> current limit resistor 150 Ω to 3.3VSB

## SATA Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
SATA0_TX+	A16	O SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA0 Conn TX pin
SATA0_TX-	A17	O SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 0 transmit differential pair.
SATA0_RX+	A19	I SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA0 Conn RX pin
SATA0_RX-	A20	I SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 0 receive differential pair.
SATA1_TX+	B16	O SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA1 Conn TX pin
SATA1_TX-	B17	O SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 1 transmit differential pair.
SATA1_RX+	B19	I SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA1 Conn RX pin
SATA1_RX-	B20	I SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 1 receive differential pair.
SATA2_TX+	A22	O SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA2 Conn TX pin
SATA2_TX-	A23	O SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 2 transmit differential pair.
SATA2_RX+	A25	I SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA2 Conn RX pin
SATA2_RX-	A26	I SATA	AC coupled on Module	AC Coupling capacitor		Serial ATA or SAS Channel 2 receive differential pair.
SATA3_TX+	B22	O SATA	AC coupled on Module	NA		
SATA3_TX-	B23	O SATA	AC coupled on Module	NA		Serial ATA or SAS Channel 3 transmit differential pair.
SATA3_RX+	B25	I SATA	AC coupled on Module	NA		
SATA3_RX-	B26	I SATA	AC coupled on Module	NA		Serial ATA or SAS Channel 3 receive differential pair.
ATA_ACT#	A28	I/O CMOS	3.3V / 3.3V	PU 10K to 3.3V		Connect to LED and <b>recommend</b> current limit resistor 220Ω to 3.3V

## PCI Express Lanes Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - 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		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - Connect to PCIE Conn pin	PCI Express Differential Receive Pairs 6
PCIE_RX6-	C20					
PCIE_TX7+	D22	O PCIE	AC coupled on Module	AC Coupling capacitor	Connect to PCIE device or slot	PCI Express Differential Transmit Pairs 7
PCIE_TX7-	D23			AC Coupling capacitor		
PCIE_RX7+	C22	I PCIE	AC coupled off Module		<b>Device</b> - Connect AC Coupling cap 0.1uF <b>Slot</b> - Connect to PCIE Conn pin	PCI Express Differential Receive Pairs 7
PCIE_RX7-	C23					
PCIE0_CLK_REF+	A88	O PCIE	PCIE		Connect to PCIE device, <b>PCIE CLK Buffer</b> or slot	Reference clock output for all PCI Express and PCI Express Graphics lanes.
PCIE0_CLK_REF-	A89					

## PEG Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
PEG_TX0+	D52	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 0
PEG_TX0-	D53			NA		
PEG_RX0+	C52	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 0
PEG_RX0-	C53			NA		
PEG_TX1+	D55	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 1
PEG_TX1-	D56			NA		
PEG_RX1+	C55	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 1
PEG_RX1-	C56			NA		
PEG_TX2+	D58	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 2
PEG_TX2-	D59			NA		
PEG_RX2+	C58	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 2
PEG_RX2-	C59			NA		
PEG_TX3+	D61	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 3
PEG_TX3-	D62			NA		
PEG_RX3+	C61	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 3
PEG_RX3-	C62			NA		
PEG_TX4+	D65	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 4
PEG_TX4-	D66			NA		
PEG_RX4+	C65	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 4
PEG_RX4-	C66			NA		
PEG_TX5+	D68	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 5
PEG_TX5-	D69			NA		
PEG_RX5+	C68	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 5
PEG_RX5-	C69			NA		
PEG_TX6+	D71	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 6
PEG_TX6-	D72			NA		
PEG_RX6+	C71	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 6
PEG_RX6-	C72			NA		
PEG_TX7+	D74	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 7
PEG_TX7-	D75			NA		
PEG_RX7+	C74	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 7
PEG_RX7-	C75			NA		
PEG_TX8+	D78	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 8
PEG_TX8-	D79			NA		
PEG_RX8+	C78	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 8
PEG_RX8-	C79			NA		
PEG_TX9+	D81	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 9
PEG_TX9-	D82			NA		
PEG_RX9+	C81	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 9
PEG_RX9-	C82			NA		



## PEG Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
PEG_TX10+	D85	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 10
PEG_TX10-	D86	O PCIE	AC coupled on Module	NA		
PEG_RX10+	C85	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 10
PEG_RX10-	C86	I PCIE	AC coupled off Module	NA		
PEG_TX11+	D88	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 11
PEG_TX11-	D89	O PCIE	AC coupled on Module	NA		
PEG_RX11+	C88	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 11
PEG_RX11-	C89	I PCIE	AC coupled off Module	NA		
PEG_TX12+	D91	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 12
PEG_TX12-	D92	O PCIE	AC coupled on Module	NA		
PEG_RX12+	C91	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 12
PEG_RX12-	C92	I PCIE	AC coupled off Module	NA		
PEG_TX13+	D94	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 13
PEG_TX13-	D95	O PCIE	AC coupled on Module	NA		
PEG_RX13+	C94	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 13
PEG_RX13-	C95	I PCIE	AC coupled off Module	NA		
PEG_TX14+	D98	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 14
PEG_TX14-	D99	O PCIE	AC coupled on Module	NA		
PEG_RX14+	C98	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 14
PEG_RX14-	C99	I PCIE	AC coupled off Module	NA		
PEG_TX15+	D101	O PCIE	AC coupled on Module	NA		PCI Express Graphics transmit differential pairs 15
PEG_TX15-	D102	O PCIE	AC coupled on Module	NA		
PEG_RX15+	C101	I PCIE	AC coupled off Module	NA		PCI Express Graphics receive differential pairs 15
PEG_RX15-	C102	I PCIE	AC coupled off Module	NA		
PEG_LANE_RV#	D54	I CMOS	3.3V / 3.3V	PU 10K to 3.3V		PCI Express Graphics lane reversal input strap. Pull low on the Carrier board to reverse lane order.

## ExpressCard Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
EXCD0_CPPE#	A49			PU 10k to 3.3V		PCI ExpressCard: PCI Express capable card request, active low, one per card
EXCD1_CPPE#	B48	I CMOS	3.3V /3.3V	PU 10k to 3.3V		
EXCD0_PERST#	A48					PCI ExpressCard: reset, active low, one per card
EXCD1_PERST#	B47	O CMOS	3.3V /3.3V			

## DDI Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	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	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR4+/SDVO1_INT+	C25	I PCIE	AC coupled off Module	NA		Serial Digital Video B interrupt input differential pair.
DDI1_PAIR4-/SDVO1_INT-	C26	I PCIE	AC coupled off Module	NA		
DDI1_PAIR5+/SDVO1_TVCLKIN+	C29	I PCIE	AC coupled off Module	NA		Serial Digital Video TVOUT synchronization clock input differential pair.
DDI1_PAIR5-/SDVO1_TVCLKIN-	C30	I PCIE	AC coupled off Module	NA		
DDI1_PAIR6+/SDVO1_FLDSTALL+	C15	I PCIE	AC coupled off Module	NA		Serial Digital Video Field Stall input differential pair.
DDI1_PAIR6-/SDVO1_FLDSTALL-	C16	I PCIE	AC coupled off Module	NA		
DDI1_CTRLCLK_AUX+/SDVO1_CTRLCLK	D15	I/O PCIE	AC coupled on Module	PD 100K 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 4.7K to 3.3V, PD 100K 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 4.7K to 3.3V/PU 100K to 3.3V (S/W IC between 4.7K/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-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI2_PAIR0+	D39	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 2 Pair 0 differential pairs
DDI2_PAIR0-	D40	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		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	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI2_CTRLCLK_AUX+	C32	I/O PCIE	AC coupled on Module	PD 100K 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 4.7K to 3.3V, PD 100K to GND (S/W IC between Rpu/Rpd resistor)	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI2_DDC_AUX_SEL is pulled high

DDI Signals and Descriptions							
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description	
DDI2_CTRLCLK_AUX-	C33	I/O PCIE	AC coupled on Module	PU 100K to 3.3V <b>(S/W IC between Rpu/PCH)</b>		Connect to DP AUX-	DP AUX- function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 4.7K to 3.3V/PU 100K to 3.3V <b>(S/W IC between 4.7K/100K resistor)</b>		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-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI3_PAIR0+	C39	O PCIE	AC coupled off Module	NA			DDI 3 Pair 0 differential pairs
DDI3_PAIR0-	C40			NA			
DDI3_PAIR1+	C42	O PCIE	AC coupled off Module	NA			DDI 3 Pair 1 differential pairs
DDI3_PAIR1-	C43			NA			
DDI3_PAIR2+	C46	O PCIE	AC coupled off Module	NA			DDI 3 Pair 2 differential pairs
DDI3_PAIR2-	C47			NA			
DDI3_PAIR3+	C49	O PCIE	AC coupled off Module	NA			DDI 3 Pair 3 differential pairs
DDI3_PAIR3-	C50			NA			
DDI3_CTRLCLK_AUX+	C36	I/O PCIE	AC coupled on Module	NA			DP AUX+ function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	NA			HDMI/DVI I2C CTRLCLK if DDI3_DDC_AUX_SEL is pulled high
DDI3_CTRLCLK_AUX-	C37	I/O PCIE	AC coupled on Module	NA			DP AUX- function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	NA			HDMI/DVI I2C CTRLDATA if DDI3_DDC_AUX_SEL is pulled high
DDI3_HPD	C44	I CMOS	3.3V / 3.3V	NA			DDI Hot-Plug Detect
DDI3_DDC_AUX_SEL	C38	I CMOS	3.3V / 3.3V	NA			Selects the function of DDI3_CTRLCLK_AUX+ and DDI3_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort

USB Signals and Descriptions							
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description	
USB0+	A46	I/O USB	3.3V Suspend/3.3V			Connect 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 7
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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 90 Ω @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 and Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
USB_SSRX2+	C10	I PCIE	AC coupled off Modul			Connect 90 Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector
USB_SSRX2-	C9					
USB_SSTX3+	D13	O PCIE	AC coupled on Module	AC Coupling capacitor		Connect 90 Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector
USB_SSTX3-	D12			AC Coupling capacitor		
USB_SSRX3+	C13	I PCIE	AC coupled off Modul			Connect 90 Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector
USB_SSRX3-	C12					

LVDS Signals and Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
LVDS_A0+	A71	O LVDS	LVDS			Connect to LVDS connector
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_A_CK-	A82					
LVDS_B0+	B71	O LVDS	LVDS			Connect to LVDS connector
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_B_CK-	B82					
LVDS_VDD_EN	A77	O CMOS	3.3V / 3.3V			Connect to enable control of LVDS panel power circuit
LVDS_BKLT_EN	B79	O CMOS	3.3V / 3.3V			Connect to enable control of LVDS panel backlight power circuit.
LVDS_BKLT_CTRL	B83	O CMOS	3.3V / 3.3V			Connect to brightness control of LVDS panel backlight power circuit.
LVDS_I2C_CLK	A83	I/O OD CMOS	3.3V / 3.3V	PU 4.7K to 3.3V		Connect to DDC clock of LVDS panel
LVDS_I2C_DAT	A84	I/O OD CMOS	3.3V / 3.3V	PU 4.7K to 3.3V		Connect to DDC data of LVDS panel

LPC Signals and Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
LPC_AD0	B4					
LPC_AD1	B5	I/O CMOS	3.3V / 3.3V			Connect to LPC device
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	PU 10K to 3.3V		NC
LPC_DRQ1#	B9			PU 10K to 3.3V		NC
LPC_SERIRQ	A50	I/O CMOS	3.3V / 3.3V	PU 10K to 3.3V		Connect to LPC device
LPC_CLK	B10	O CMOS	3.3V / 3.3V			LPC clock output - 24MHz nominal

SPI Signals and Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
SPI_CS#	B97	O CMOS	3.3V Suspend/3.3V			Connect to Carrier Board SPI Device CS# pin
SPI_MISO	A92	I CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SO pin
SPI_MOSI	A95	O CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SI pin
SPI_CLK	A94	O CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SCK pin
SPI_POWER	A91	O	3.3V Suspend/3.3V			Power supply for Carrier Board SPI – sourced from Module – nominally 3.3V. The Module shall provide a minimum of 100mA on SPI_POWER. Carriers shall use less than 100mA of SPI_POWER. SPI_POWER shall only be used to power SPI devices on the Carrier
BIOS_DIS0#	A34					Selection straps to determine the BIOS boot device. The Carrier should only float these or pull them low, please refer to COM Express Module Base Specification Revision 2.1 for strapping options of BIOS disable signals.
BIOS_DIS1#	B88	I CMOS	NA			

BIOS DIS1#	BIOS DIS0#	Chipset SPI CS1# Destination	Chipset SPI CS0# Destination	Carrier SPI_CS#	SPI Descriptor	Bios Entry	Ref Line
1	1	Module	Module	High	Module	SPI0/SPI1	0
1	0	Module	Module	High	Module	Carrier FWH	1
0	1	Module	Carrier	SPI0	Carrier	SPI0/SPI1	2
0	0	Carrier (Default)	Module (Default)	SPI1 (Default)	Module (Default)	SPI0/SPI1 (Default)	3

**VGA Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
VGA_RED	B89	O Analog	Analog	PD 150 to GND		Red for monitor. Analog output. <b>PD 150R connect to VGA connector with EMI filter &amp; ESD protect component.</b>
VGA_GRN	B91	O Analog	Analog	PD 150 to GND		Green for monitor. Analog output. <b>PD 150R connect to VGA connector with EMI filter &amp; ESD protect component.</b>
VGA_BLU	B92	O Analog	Analog	PD 150 to GND		Blue for monitor. Analog output. <b>PD 150R connect to VGA connector with EMI filter &amp; ESD protect component.</b>
VGA_HSYNC	B93	O CMOS	3.3V / 3.3V			Horizontal sync output to VGA monitor. <b>Connect to VGA connector with a3.3V Buffer IC to isolate PCH &amp; Display Device</b>
VGA_VSYNC	B94	O CMOS	3.3V / 3.3V			Vertical sync output to VGA monitor. <b>Connect to VGA connector with a 33V Buffer IC to isolate PCH &amp; Display Device</b>
VGA_I2C_CLK	B95	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V		DDC clock line (I2C port dedicated to identify VGA monitor capabilities) <b>Connect to VGA connector with a 3.3V to 5V Level shift circuit.</b>
VGA_I2C_DAT	B96	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V		DDC data line. <b>Connect to VGA connector with a 3.3V to 5V Level shift circuit.</b>

**Serial Interface Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
SER0_TX	A98	O CMOS	5V / 12V		PD 4.7K to GND	General purpose serial port 0 transmitter <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
SER0_RX	A99	I CMOS	5V / 12V	PU 10K to 3.3V		General purpose serial port 0 receiver <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
SER1_TX	A101	O CMOS	5V / 12V		PD 4.7K to GND	General purpose serial port 1 transmitter <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
SER1_RX	A102	I CMOS	5V / 12V	PU 10K to 3.3V		General purpose serial port 1 receiver <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>

**Miscellaneous Signal and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
I2C_CLK	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 / 3.3V			Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan's RPM. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
FAN_TACHIN	B102	I OD CMOS	3.3V / 3.3V	PU 47K to 3V3		Fan tachometer input for a fan with a two pulse output. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
TPM_PP	A96	I CMOS	3.3V / 3.3V			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 and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	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	PD 100K to GND		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	PD 100K to GND		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	PD 100K to GND		Indicates system is in Suspend to Disk state. Active low output.
SUS_S5#	A24	O CMOS	3.3V Suspend/3.3V	PD 100K to GND		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	NA		General purpose wake up signal. May be used to implement wake-up on PS2 keyboard or mouse activity.
BATLOW#	A27	I CMOS	3.3V Suspend/ 3.3V	PU 10K to 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.

### Power and System Management Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
LID#	A103	I OD CMOS	3.3V Suspend/12V	PU 47K to 3V3_DU_EC		LID switch. Low active signal used by the ACPI operating system for a LID switch. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
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. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
THRM#	B35	I CMOS	3.3V / 3.3V	PU 4.7K to 3V3		Input from off-Module temp sensor indicating an over-temp situation.
THRMTRIP#	A35	O CMOS	3.3V / 3.3V	PU 10K to 3.3V		Active low output indicating that the CPU has entered thermal shutdown.
SMB_CLK	B13	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3V3_DU_EC		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		System Management Bus bidirectional data line.
SMB_ALERT#	B15	I CMOS	3.3V Suspend/3.3V	PU 2.2K to 3V3_DU_EC		System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system.

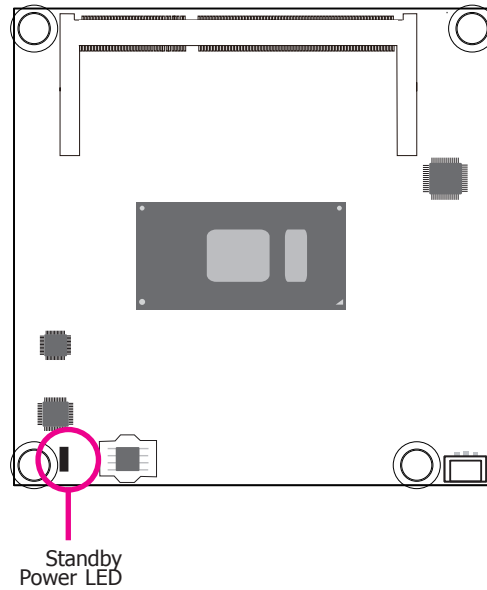
### GPIO Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
GPO0	A93	O CMOS	3.3V / 3.3V			General purpose output pins. <b>Upon a hardware reset, these outputs should be low.</b>
GPO1	B54					
GPO2	B57					
GPO3	B63					
GPI0	A54	I CMOS	3.3V / 3.3V	PU 100K to 3.3V		General purpose input pins. <b>Pulled high internally on the Module.</b>
GPI1	A63			PU 100K to 3.3V		
GPI2	A67			PU 100K to 3.3V		
GPI3	A85			PU 100K to 3.3V		

### Power and GND Signal Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	SU968	Carrier Board	Description
VCC_12V	A104~A109 B104~B109 C104~C109 D104~D109	Power				Primary power input: +12V nominal. All available VCC_12V pins on the connector(s) shall be used.
VCC_5V_SBY	B84~B87	Power				Standby power input: +5.0V nominal. If VCC5_SBY is used, all available VCC_5V_SBY pins on the connector(s) shall be used. Only used for standby and suspend functions. May be left unconnected if these functions are not used in the system design.
VCC_RTC	A47	Power				Real-time clock circuit-power input. Nominally +3.0V.
GND	A1, A11, A21, A31, A41, A51, A57, A60, A66, A70, A80, A90, A100, A110, B1, B11, B21, B31, B41, B51, B60, B70, B80, B90, B100, B110, C1, C2, C5, C8, C11, C14, C21, C31, C41, C51, C60, C70, C73, C76, C80, C84, C87, C90, C93, C96, C100, C103, C110, D1, D2, D5, D8, D11, D14, D21, D31, D51, D60, D67, D70, D73, D76, D80, D84, D87, D90, D93, D96, D100, D103, D110	Power				Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to Carrier Board GND plane.

## Standby Power LED



This LED will be lit when the system is in standby mode.

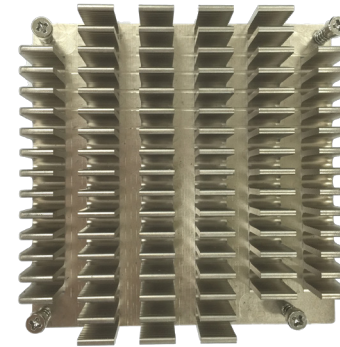
## Cooling Option

### Heat Sink

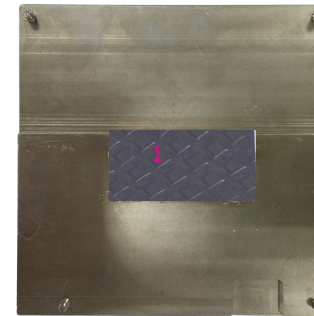


**Note:**

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" denotes the location of the thermal pad designed to contact the corresponding components that are on the SU968.



**Important:**

Remove the plastic covering from the thermal pads prior to mounting the heat sink onto the SU968.

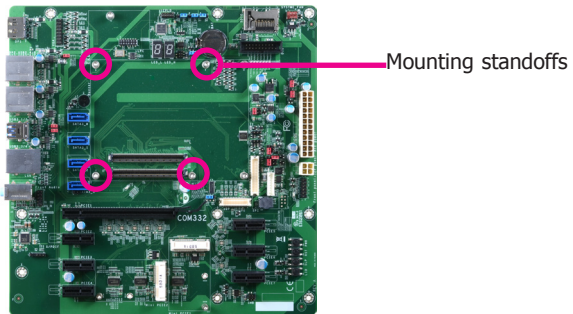
## Installing SU968 onto a Carrier Board



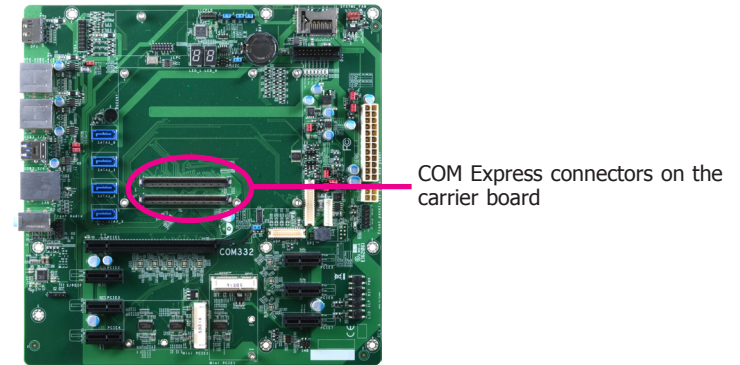
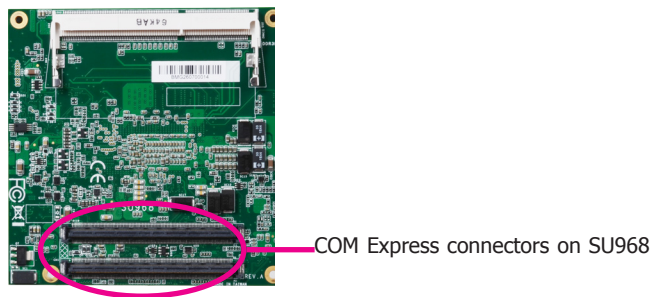
### Important:

The carrier board (COM332-B) and COM Express module used in this section are for reference purpose only and may not resemble your carrier board and the actual SU968 module. These illustrations are mainly to guide you on how to install SU968 onto the carrier board of your choice.

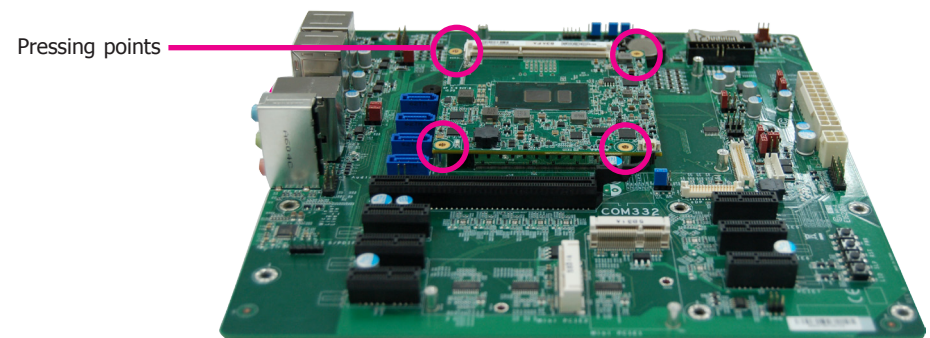
1. Install the module and heat sink assembly onto the carrier board. The photo below shows the location of the mounting holes on the carrier board.



2. Grasp SU968 by its edges and position it on top of the carrier board with the mounting holes of SU968 aligning with the standoffs on the carrier board. This will also align the COM Express connectors of the two boards to each other.



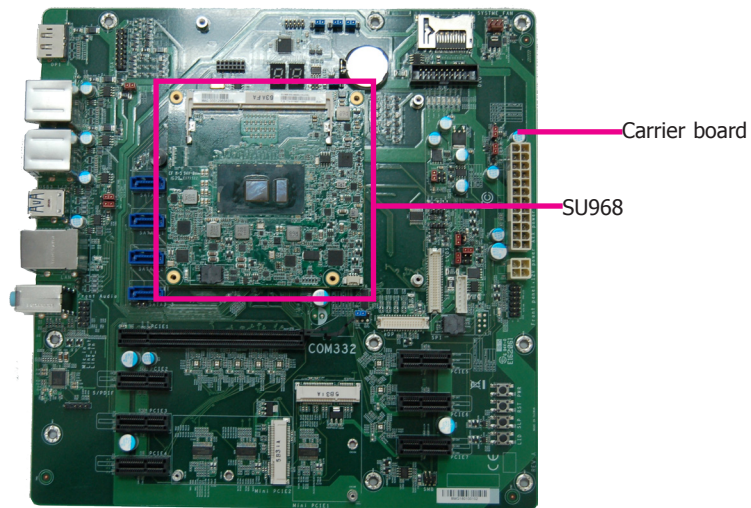
3. Press SU968 down firmly to seat it in the COM Express connectors of the carrier board.



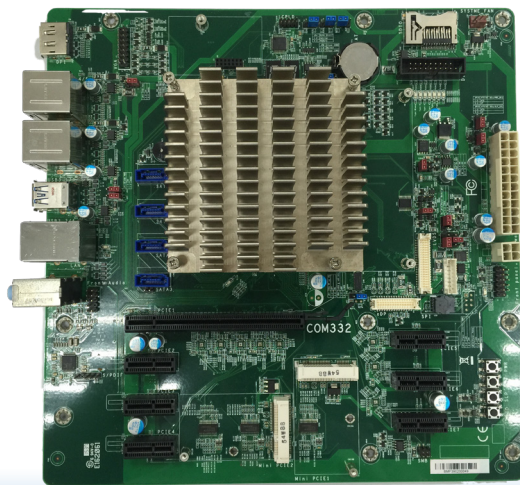
### Note:

The illustration above shows the pressing points of the module onto the carrier board. Be careful when pressing the module to avoid damages to the connectors.

- Verify that SU968 is firmly seated in the COM Express connectors of the carrier board.



- Install a heat sink onto the SU968 with the carrier board. The photo below shows the heat sink installed on SU968.





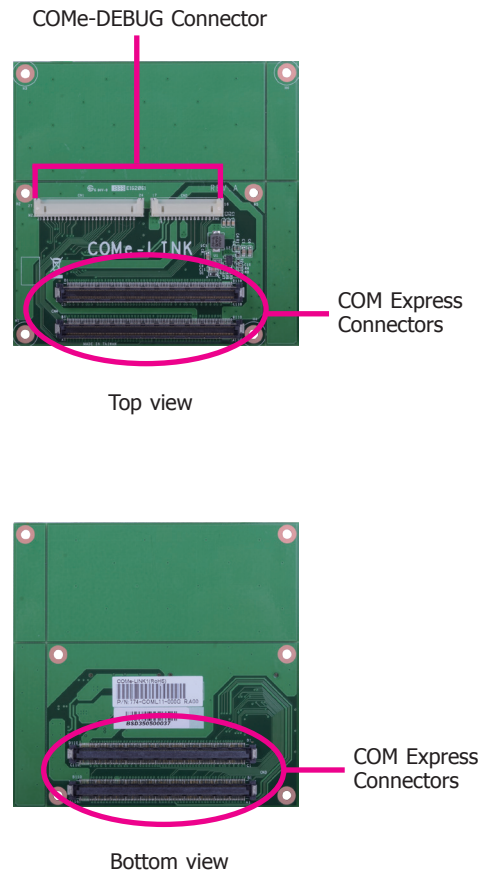
## Installing the COM Express Debug Card



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

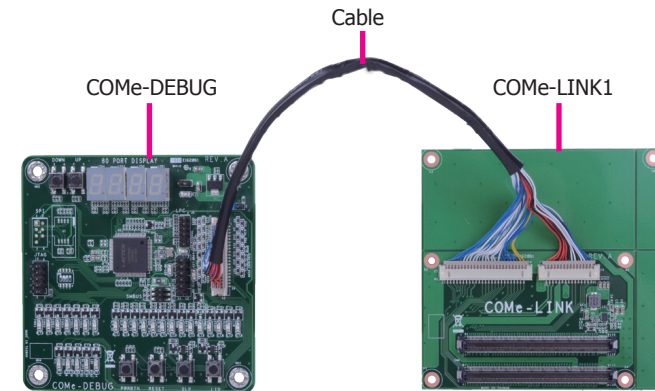
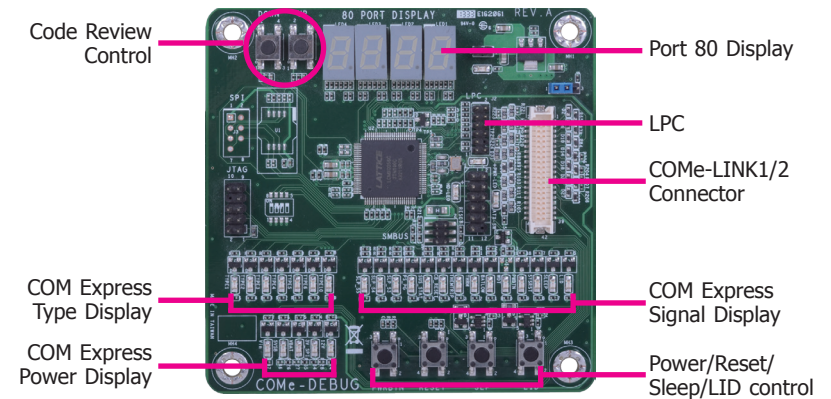
1. COMe-LINK1 is the COM Express debug card designed for COM Express Compact modules to debug and display signals and codes of COM Express modules.

### COMe-LINK1

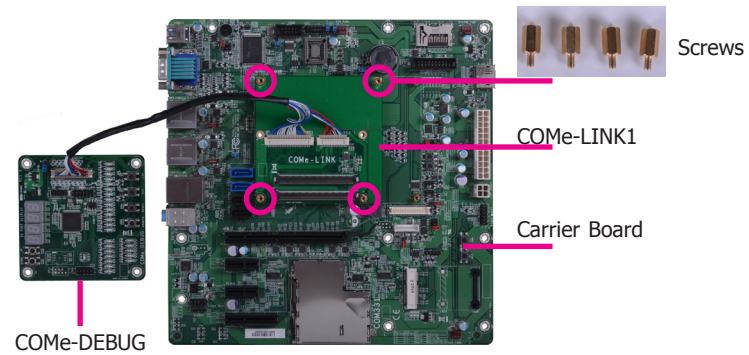


2. Connect the COMe-DEBUG card to COMe-LINK1 via a cable.

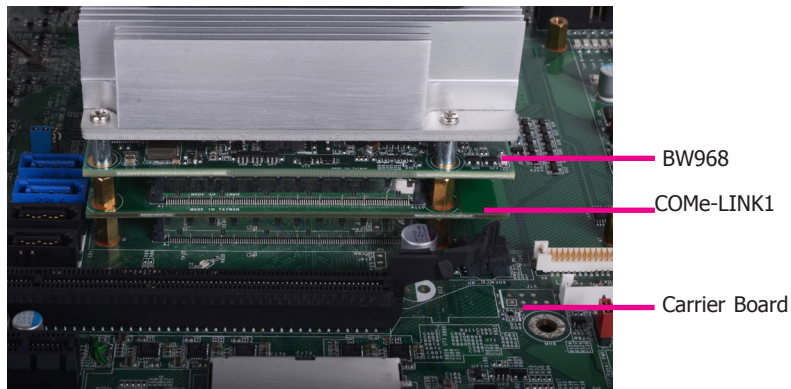
### COMe-DEBUG



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



- Then use the instructions from the previous section to install SU968 and heat sink on the top of the COMe-LINK1 debug card.



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

## 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
<F1>	Displays general help
<F5/F6>	Changes the highlighted value
<F9>	Changes to the default setup
<F10>	Saves and exits 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.

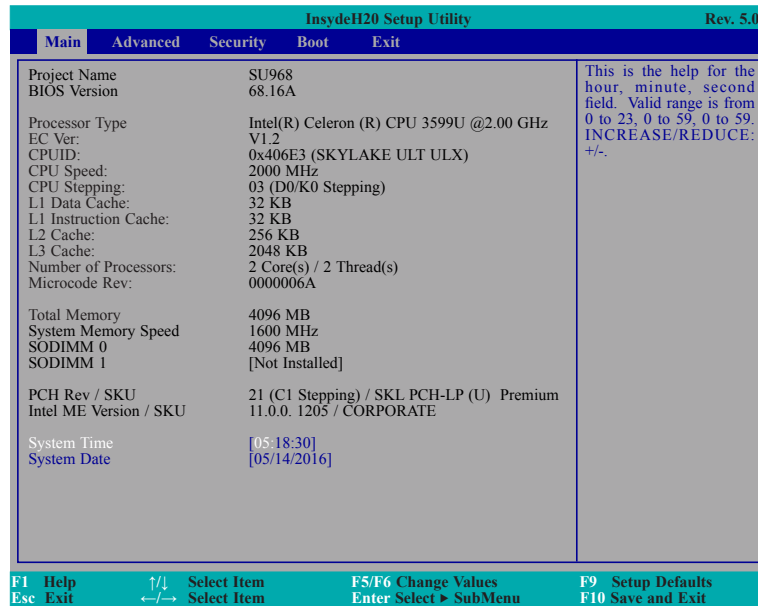
### Submenu

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>.

## Insyde 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 <month>, <date>, <year>. 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.

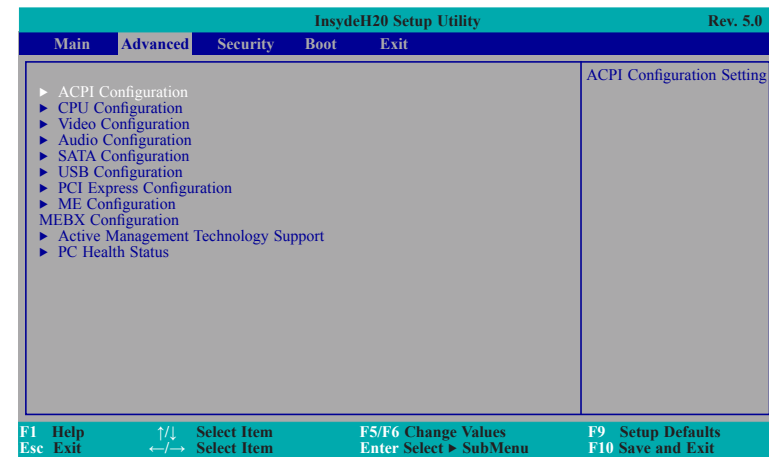
## Advanced

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.



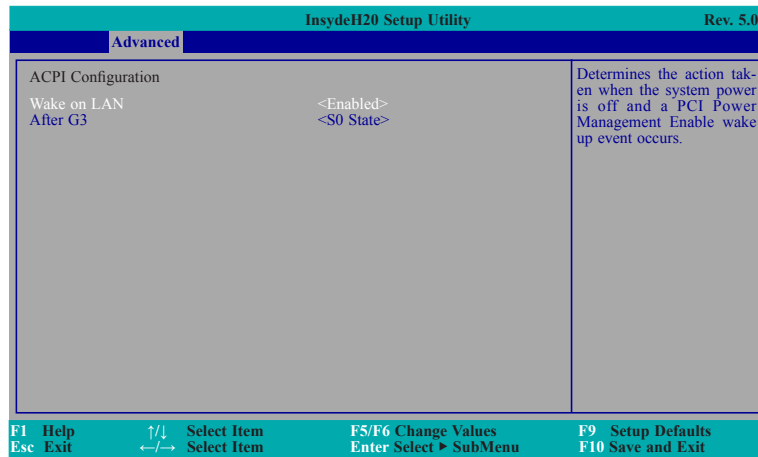
### Important:

Setting incorrect field values may cause the system to malfunction.



## ACPI Settings

This section configures the ACPI settings.



### Wake on LAN

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

### State After G3

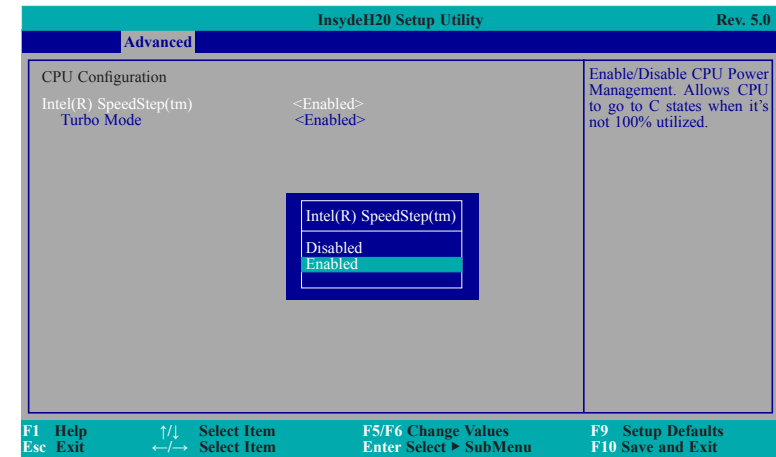
This field is to specify what state to go when power is re-applied after a power failure (G3 state).

**S0 State** Power on the system when power is re-applied after AC power loss.

**S5 State** The system appears to be off when power is re-applied after AC power loss.

## CPU Configuration

This section configures the CPU.



### Intel® SpeedStep™

This field is used to enable or disable the Enhanced Intel SpeedStep® Technology, which helps optimize the balance between system's power consumption and performance.

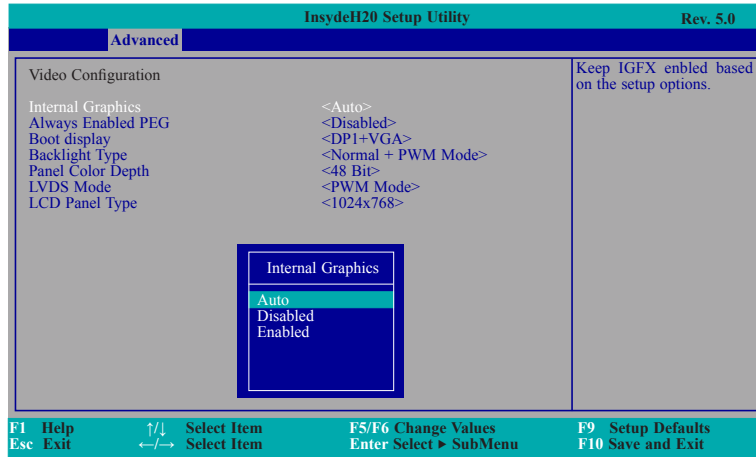
### Turbo Mode

This field is used to enable or disable processor turbo mode (requires that EMTTM is enabled too), which allows the processor core to automatically run faster than the base frequency when the processor's power, temperature, and specification are within the limits of TDP.

## Video Configuration

This section configures the video settings.

### Primary Display



### Internal Graphics

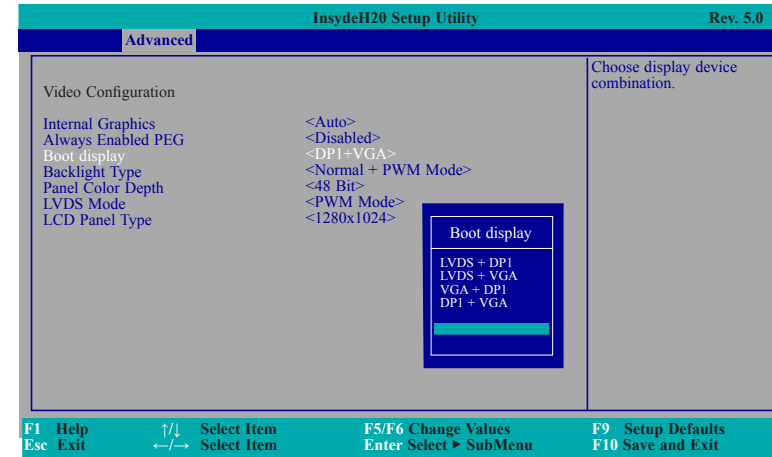
Keep IGFX enabled or disabled based on the setup options.

### Always Enabled PEG

Enable or disable the PCIe graphics function.

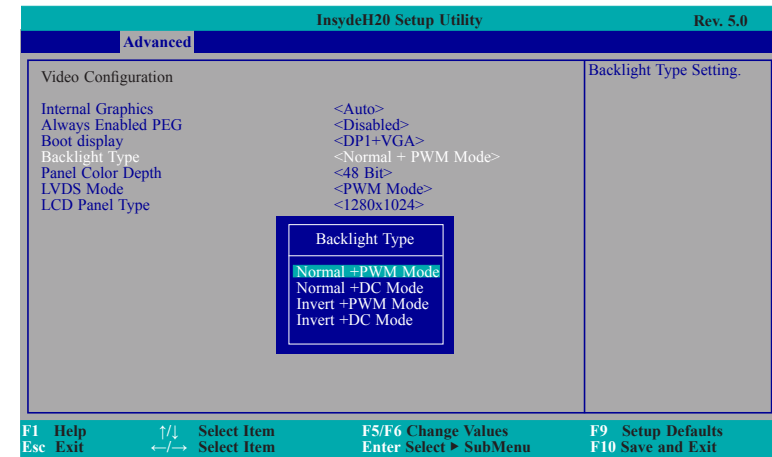
## Boot display

Set the display device combination during system booting.



## Backlight Type

Select the backlight type.



### Panel Color Depth

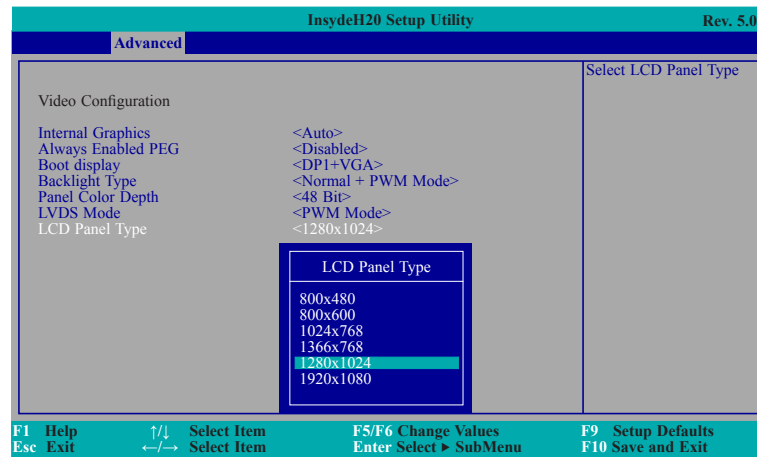
Select the LFP panel color depth: 18 bit, 24 bit, 36 bit, and 48 bit.

### LVDS Mode

Select PTN3460 (eDP to LVDS bridge IC) LVDS Mode: PWM Mode and DC Mode

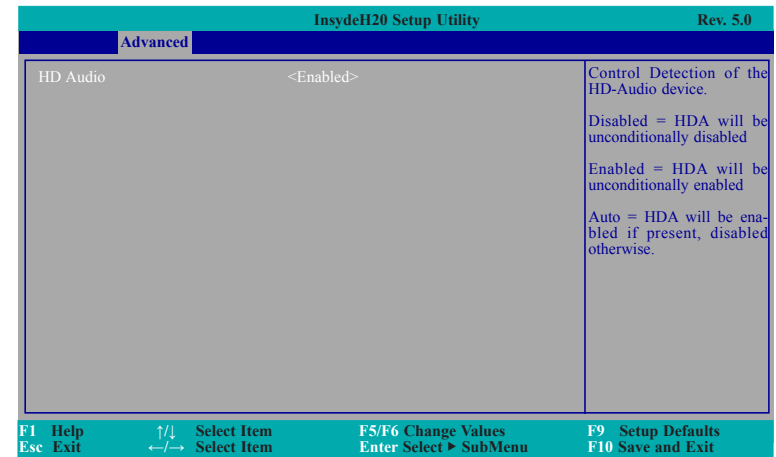
### LCD Panel Type

Select the LCD panel type.



### Audio Configuration

This section configures the audio settings.



### HD Audio

Control the detection of the high-definition audio device.

#### Disabled

The high-definition audio will be unconditionally disabled.

#### Enabled

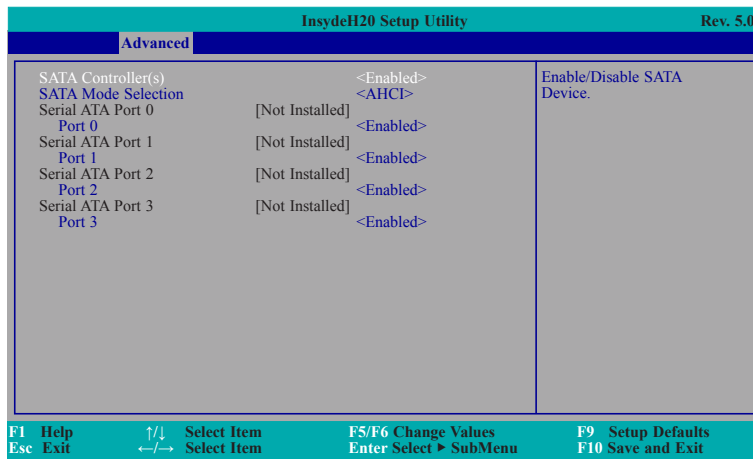
The high-definition audio will be unconditionally enabled.

#### Auto

The high-definition audio will be enabled if present and disabled otherwise.

## SATA Configuration

This section configures the SATA controller.



### SATA Controller(s)

This field is used to enable or disable Serial ATA devices.

### SATA Mode Selection

The mode selection configures the SATA controller(s).

#### AHCI Mode

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

#### RAID Mode

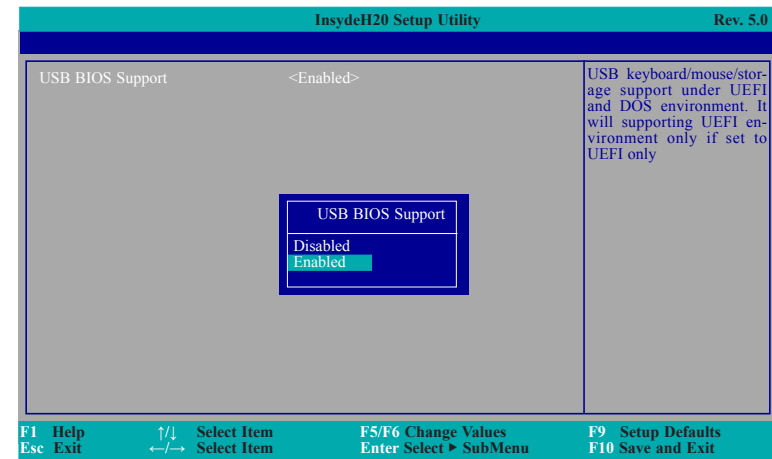
This option allows you to create RAID or Intel Matrix Storage configurations on Serial ATA devices.

### Serial ATA Port 0, 1, 2, and 3

This field is used to enable or disable each serial ATA port.

## USB Configuration

This section configures the parameters of the USB devices.



### USB BIOS Support

#### Disabled

Disable the USB keyboard/mouse/storage support.

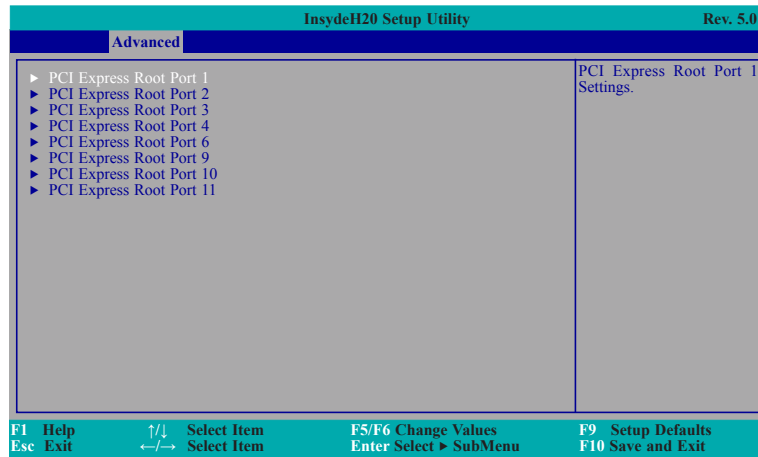
#### Enabled

Enable the USB keyboard/mouse/storage support under UEFI and DOS environment.

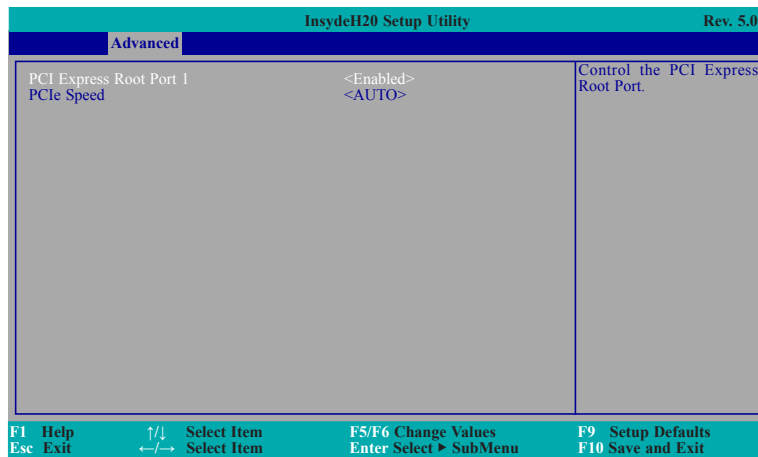


## PCI Express Configuration

This section configures settings of PCI Express root ports.



### PCI Express Root Ports



### PCI Express Root Port

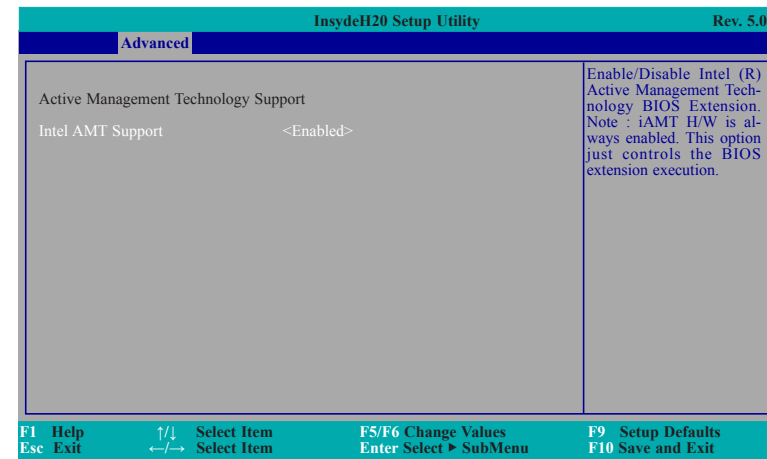
This field is used to enable or disable the PCI Express Root Port.

### PCIe Speed

Select the speed of the PCI Express Root Port: Auto, Gen1, Gen2 or Gen3.

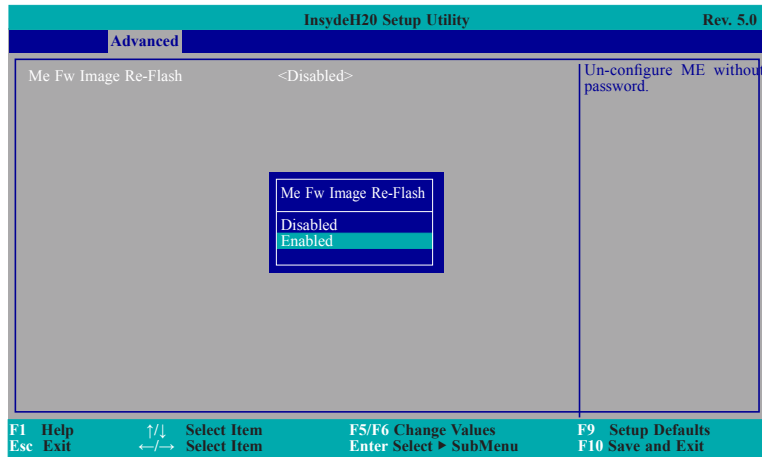
## Active Management Technology Support

The section allows users to enable or disable the Intel® Active Management Technology (Intel® AMT) BIOS extension. Please refer to Chapter 7- Intel AMT Settings for more information.



## ME Configuration

This section configures flashing of Intel® Active Management Engine region.

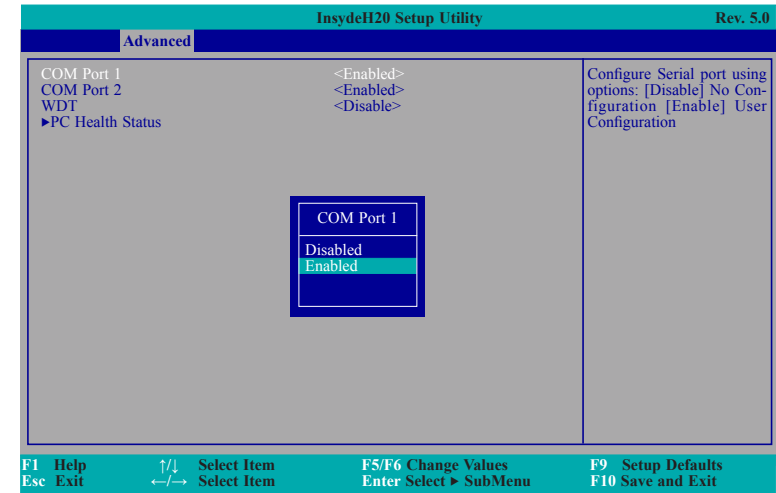


### Me Fw Image Re-Flash

Enable or disable flashing of the Intel® ME region.

## PC Health Status

This section configures the Embedded Controller (EC) settings.



### COM Port 1 and COM Port 2

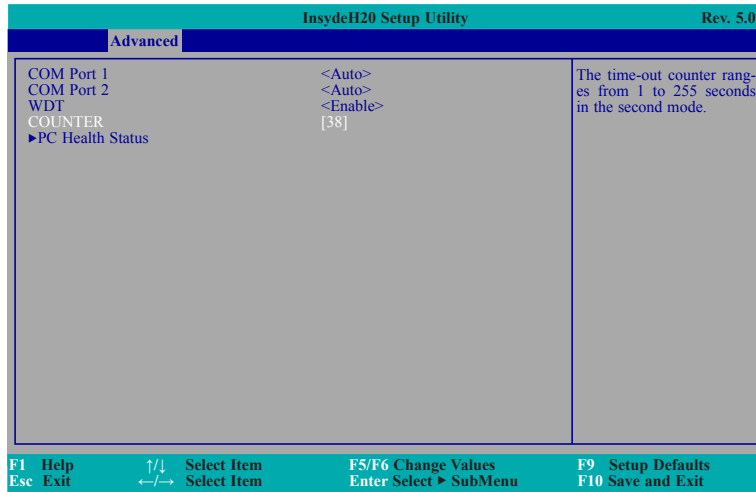
Configure the settings of the serial ports.

**Disable** Disable the serial port.

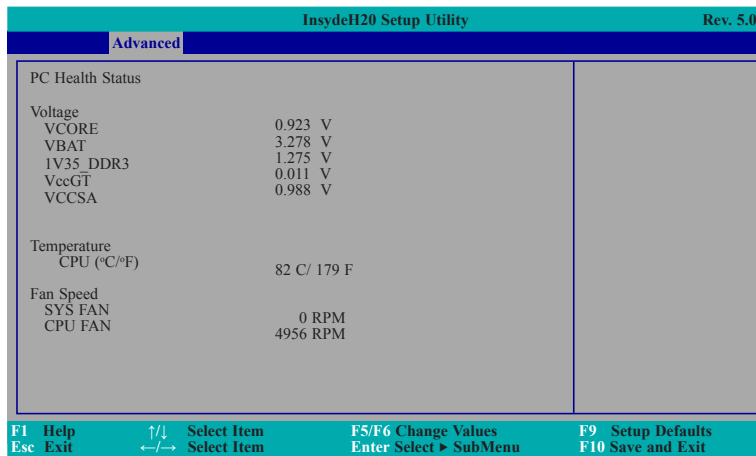
**Enable** Enable the serial port.

**WDT**

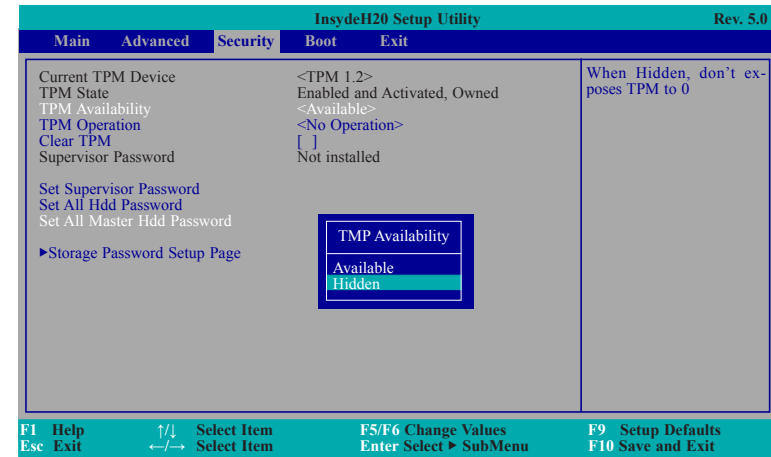
Enable or disable the watchdog function. A counter will appear if you select to enable WDT. Input any value between 1 to 255 seconds.

**PC Health Status**

This screen displays PC health information.

**Security**

This section configures the trusted platform module (TPM) and storage security.

**TPM Availability**

Show or hide the TPM availability and its configurations.

**TPM Operation**

Enable or disable the TPM function. It displays the following options:

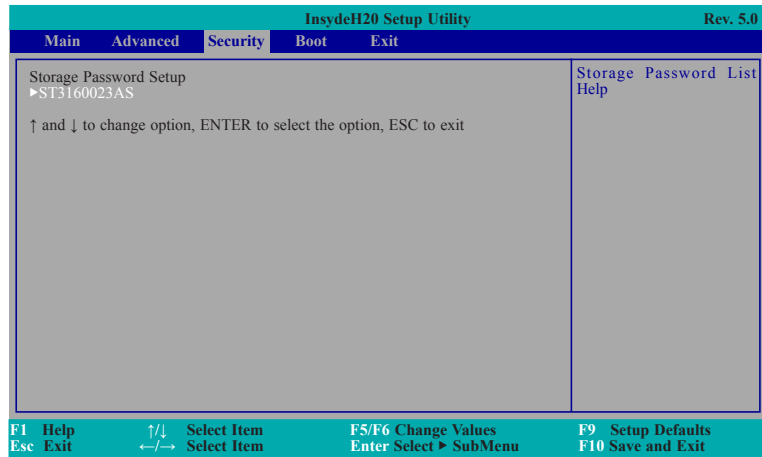
- No Operation: No changes to the current state.
- Disable: Disable and deactivate TPM.
- Enable: Enable and activate TPM.

**Clear TPM**

Remove all TPM ownership contents.

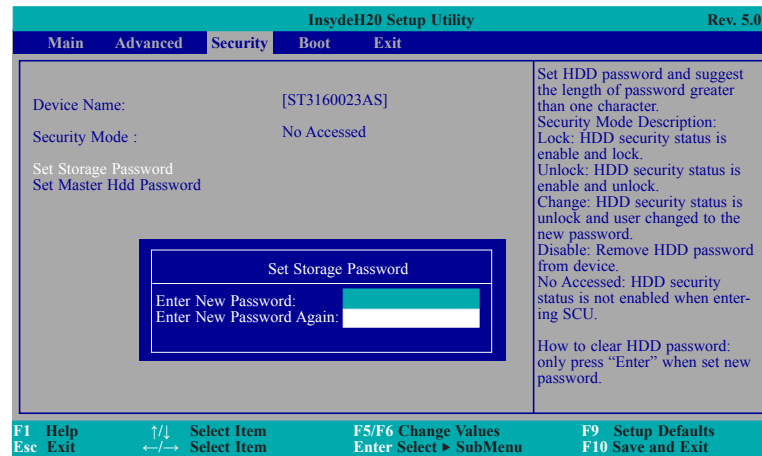
## Storage Password Setup Page

Enhance the HDD security by using a password.



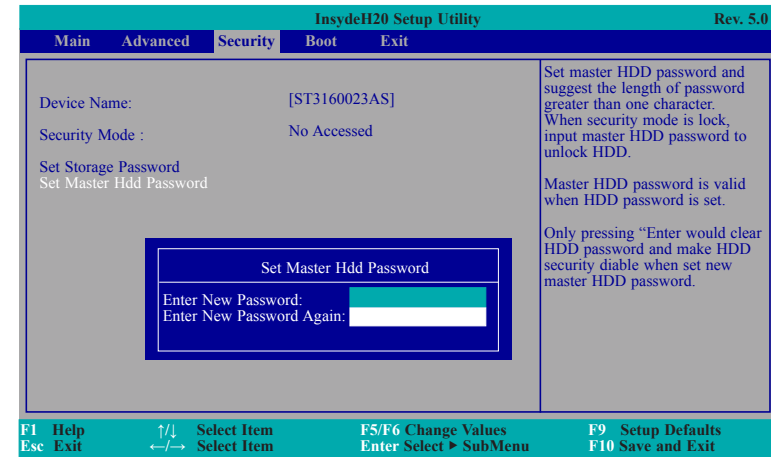
## Set Storage Password

Set all HDD password. The length of the password must be greater than one character.



## Set Master HDD Password

Set a password for the master HDD.

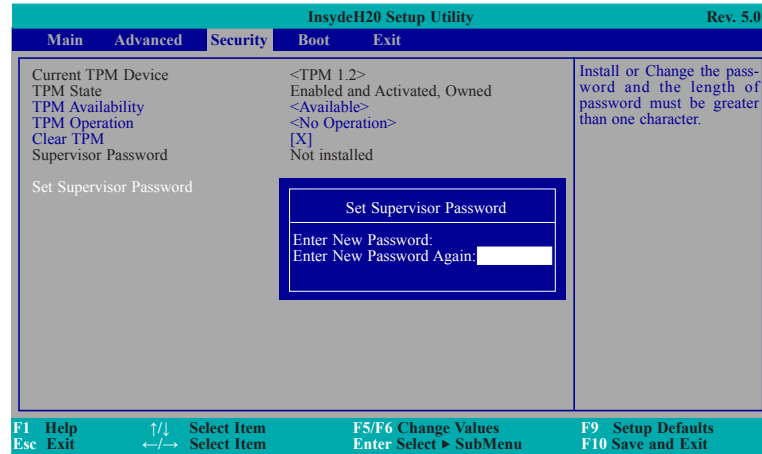


## Set Master Hdd Password

Set master HDD password. The length of password must be greater than one character. When the security mode is set to Lock, input the master HDD password to unlock the HDD. Clear the HDD password by pressing "Enter" to set HDD security to be disabled and set a new master HDD password.

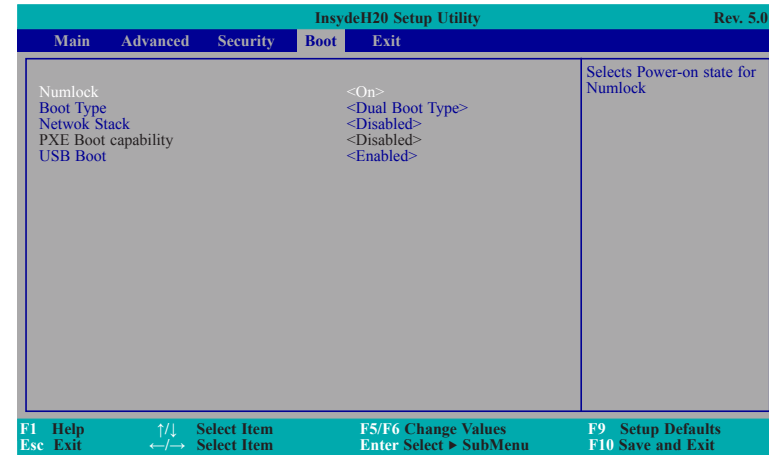
## Set Supervisor Password

Set the administrative passwords. The length of the password must be greater than one character.



## Boot

This section configures boot options.



### Numlock

Select the power-on state for numlock.

### Boot Type

Select the boot type. The options include Dual Boot Type, Legacy Boot Type, and UEFI Boot Type.

### Network stack

Enable or disable UEFI network stack. It supports the operation of these functions or software: Windows 8 BitLocker Network Unlock, UEFI IPv4/IPv6 PXE and legacy PXE Option ROM.

### USB Boot

Enable or disable the booting to USB boot devices.

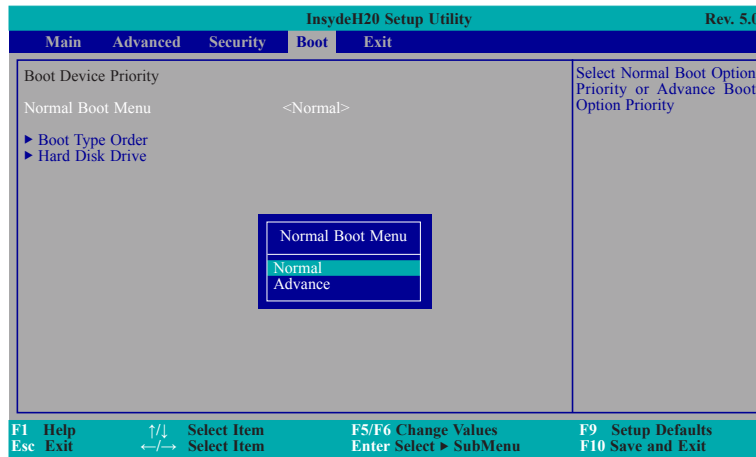


#### Note:

If the boot type is set to UEFI, the method for RAID volume creation will be different. Please refer to Chapter 6 – RAID for more information.

## Legacy

This section configures legacy boot order.



### Normal Boot Menu

#### Normal

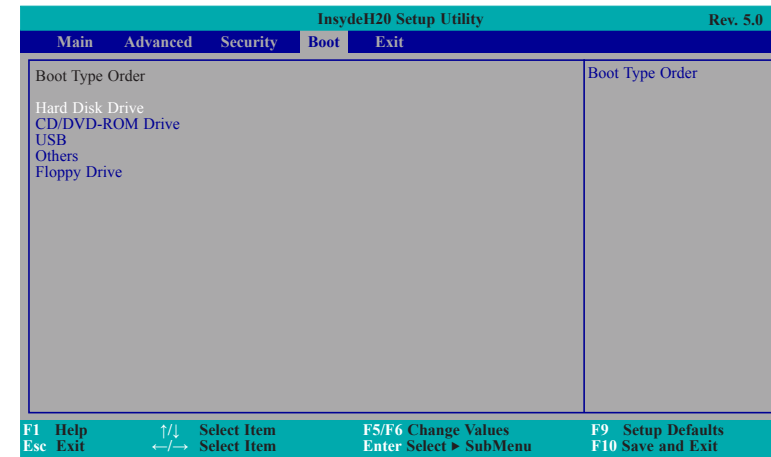
Select the boot menu type: normal or advanced.

For the advanced menu type: Use + and - keys to arrange the priority of the listed boot devices.

For normal menu type: Select the "Boot Type Order" or "Hard Disk Drive" category to view and arrange the order of the detected devices.

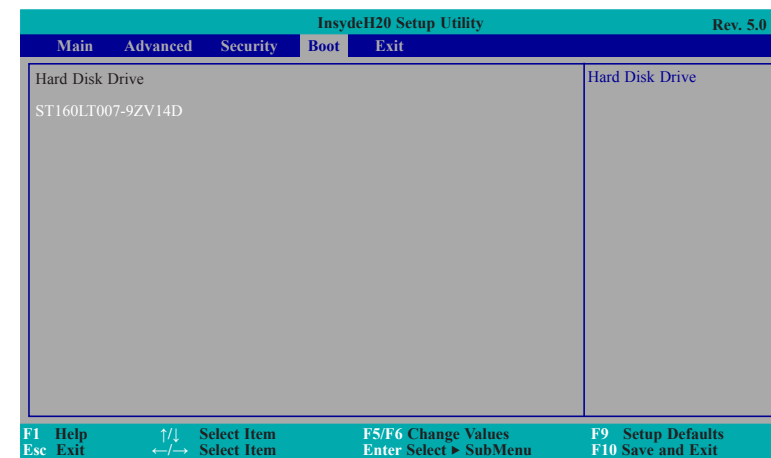
## Boot Type Order

Use + and - keys to arrange the sequence of storage devices that the system's hardware will check in the operating system's boot files. The first device in the order list has the first boot priority.



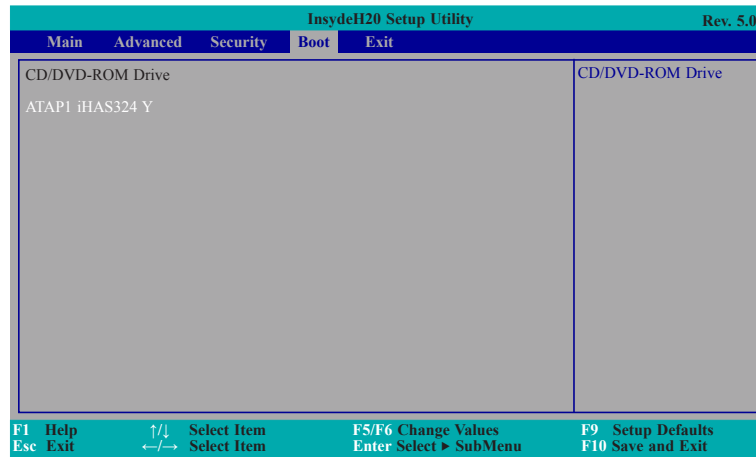
### Hard Disk Drive

All installed hard disk drives will be displayed in this field. Use + and - keys to arrange the sequence of hard disk drives that the system's hardware will check in the operating system's boot files.



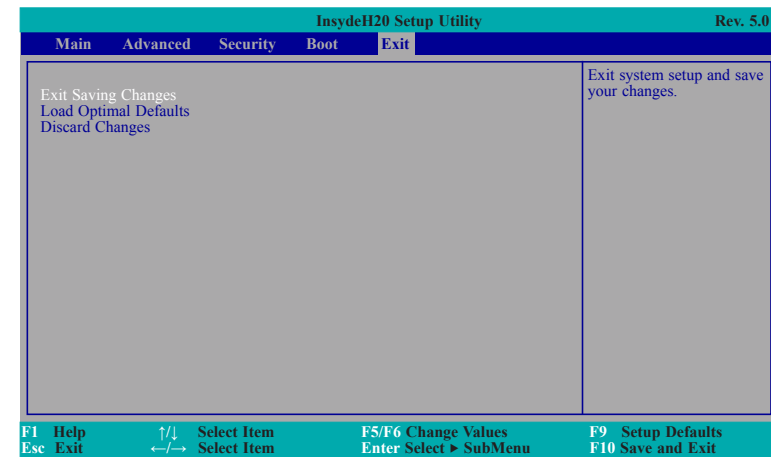
## CD/DVD-ROM Drive

All installed CD/DVD-ROM drives will be displayed in this field. Use + and - keys to arrange the sequence of CD/DVD-ROM drives that the system's hardware checks for the operating system's boot files.



## Exit

This section configures the parameters for exiting the BIOS menu.



### Exit Saving Changes

Select this field and then press <Enter> to exit the BIOS setup and save your changes.

### Load Optimal Defaults

Select this field and then press <Enter> to load optimal defaults.

### Discard Changes

Select this field and then press <Enter> to exit the BIOS setup without saving your changes.

## Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility.

When you download the given BIOS file, you may find a BIOS flash utility attached with the BIOS file. This is the utility for performing BIOS updating procedure. For your convenience, we will also provide you with an auto-execution file in the BIOS file downloaded. This auto-execution file will bring you directly to the flash utility menu soon after system boots up and finishes running the boot files in your boot disk.

```

Read file successfully. (path= "platform.ini")

Information
Please do not remove the AC power

Insyde H20FFT (Flash Firmware Tool) Version (SEG) 100.00.08.10
Copyright(c) 2012 - 2016, Insyde Software Corp. All Rights Reserved.

Initializing
Current BIOS Model name: SU968
New BIOS Model name: SU968

Current BIOS version: 65.05A
New BIOS version: 65.05A

Updating Block at FFFFF000h
0%      25%      50%      75%      100%
|-----|-----|-----|-----|
C:\SU968>_

```

## 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:



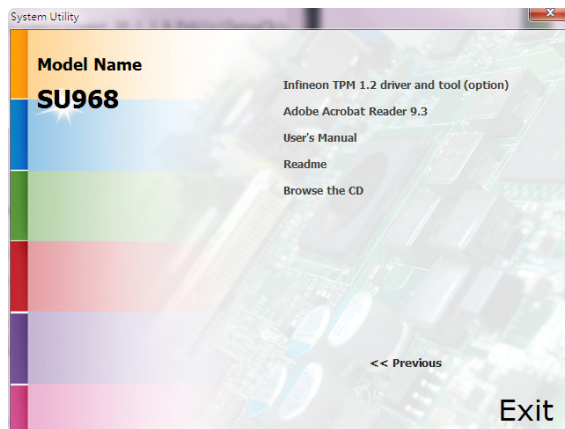
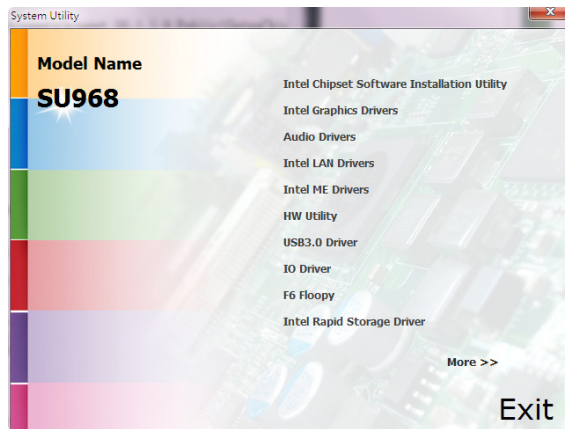
- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's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



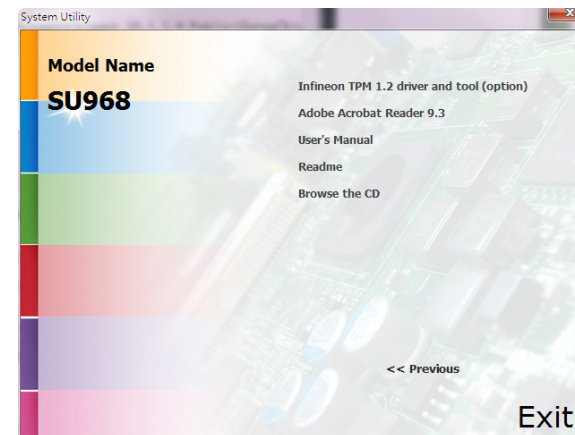
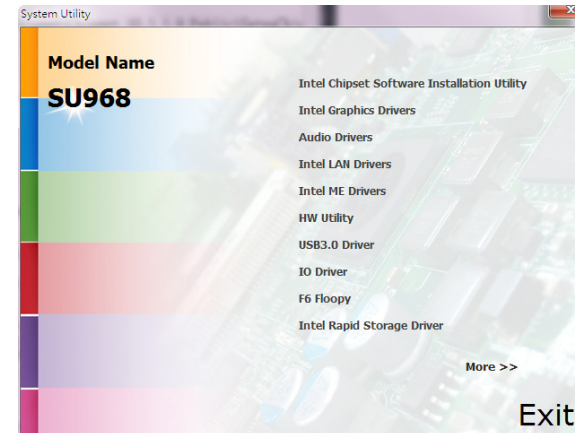
## Chapter 5 - Supported Software

Install drivers, utilities and software applications that are required to facilitate and enhance the performance of the system board. You may acquire the software from your sales representatives, from an optional DVD included in the shipment, or from the website download page at <https://www.dfi.com/DownloadCenter>.

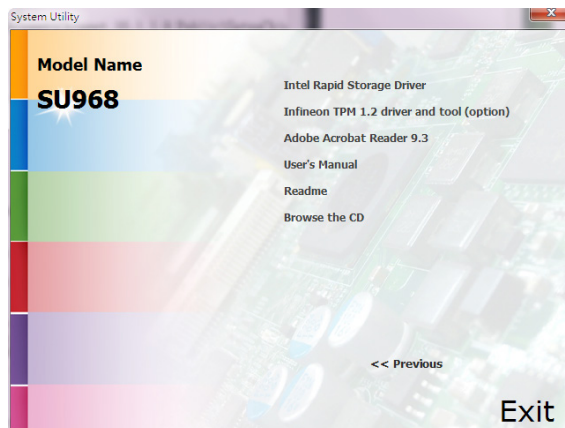
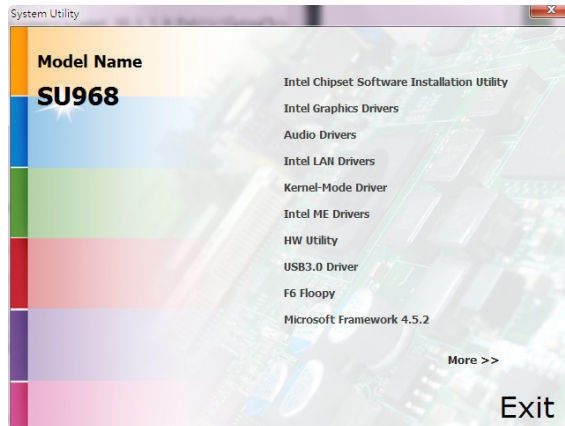
### Auto Run Page (For Windows 10)



### Auto Run Page (For Windows 8.1)



## Auto Run Page (For Windows 7)



### Note:

This step can be ignored if the applications are standalone files.

## 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.

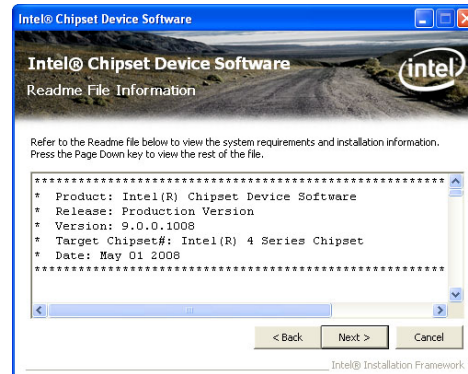
1. Setup is ready to install the utility. Click "Next".



2. Read the license agreement then click "Yes".



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



- After completing installation, click "Finish" to exit setup.



## Intel Graphics Drivers

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

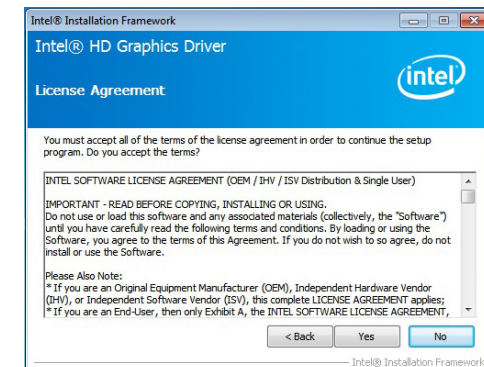
- Setup is now ready to install the graphics driver. Click "Next".



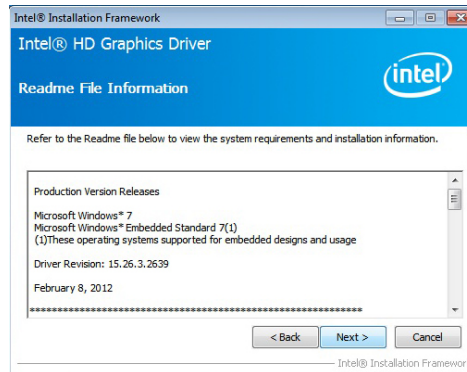
By default, the "Automatically run WinSAT and enable the Windows Aero desktop theme" is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 7/ Windows 8.1/ Windows 10 desktop 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".

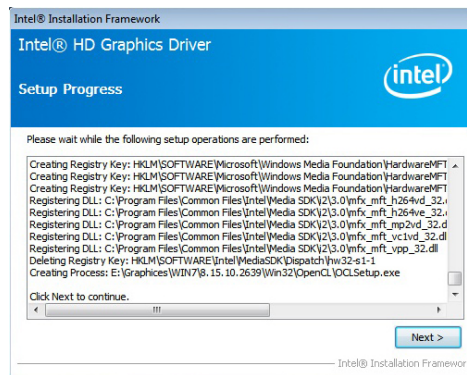
- Read the license agreement then click "Yes".



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

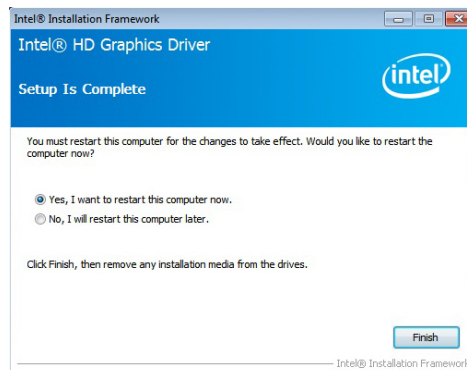


- Setup is now installing the driver. Click "Next" to continue.



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

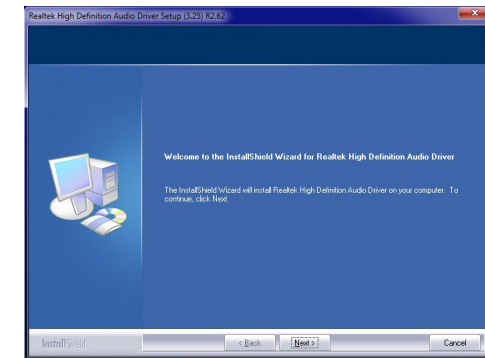
Restarting the system will allow the new software installation to take effect.



## Audio Drivers (For COM332-B Carrier Board)

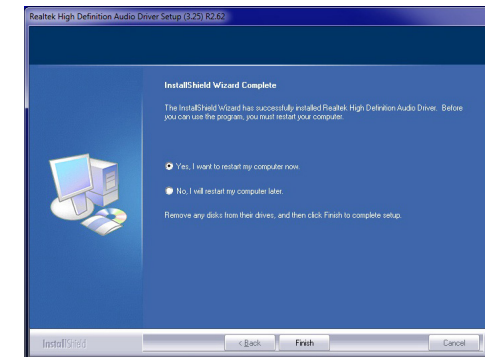
To install the driver, click "Audio Drivers (for COM332-B Carrier Board)" on the main menu.

- Setup is now ready to install the audio driver. Click "Next".
- Follow the remainder of the steps on the screen; clicking "Next" each time you finish a step.



- Click "Yes, I want to restart my computer now" then click "Finish".

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



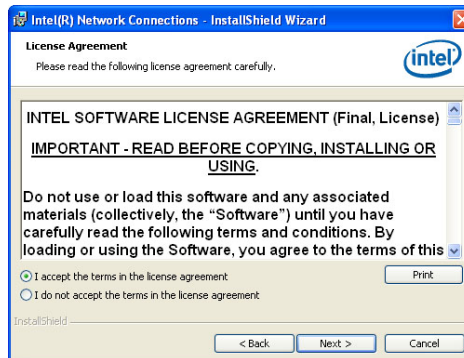
## Intel LAN Drivers

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

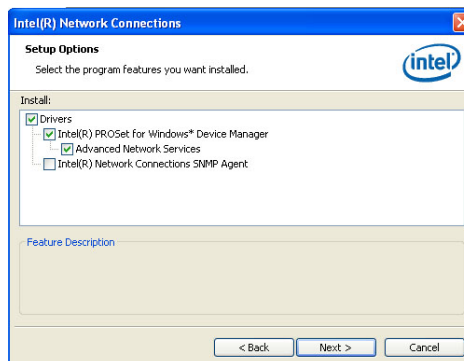
1. Setup is ready to install the driver. Click "Next".



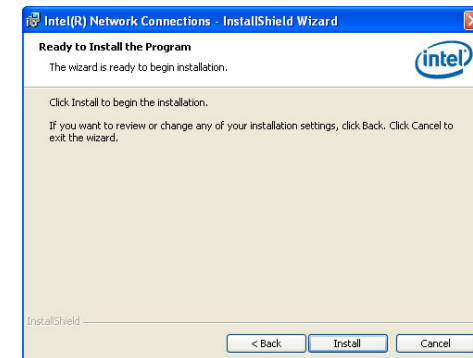
2. Click "I accept the terms in the license agreement" then click "Next".



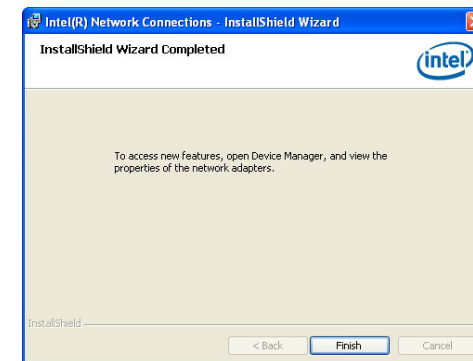
3. Select the program features you want installed then click "Next".



4. Click "Install" to begin the installation.



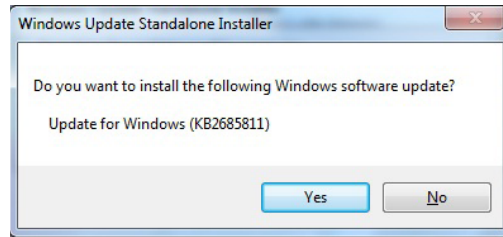
5. After completing installation, click "Finish".



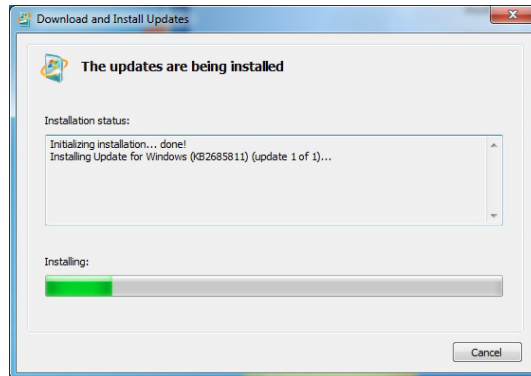
## Kernel Mode Driver (For Windows 7 only)

To install the driver, click "Kernel Mode Driver Framework" on the main menu.

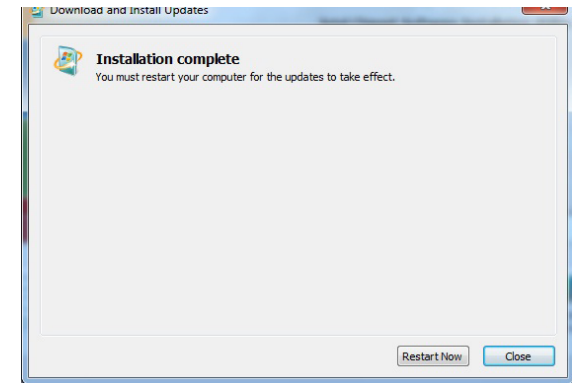
1. Click "Yes" to install the update.



2. The update is installed now.



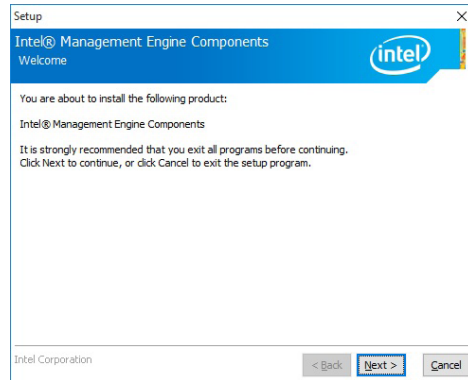
3. Click "Restart Now" to restart your computer when the installation is complete.



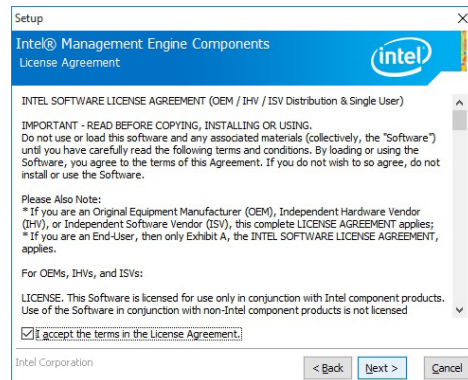
## Intel Management Engine Drivers

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

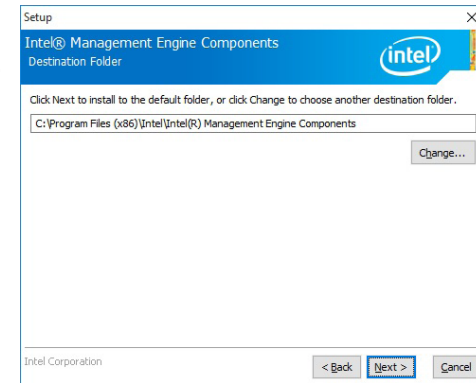
1. Setup is ready to install the driver. Click "Next".



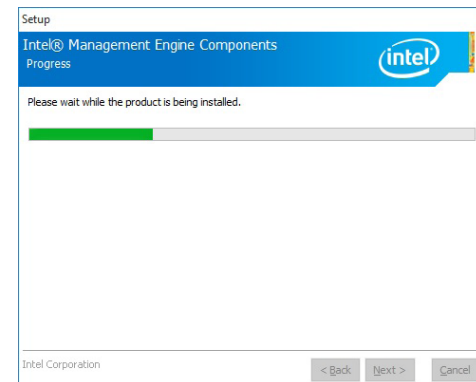
2. Read the license agreement then click "Next".



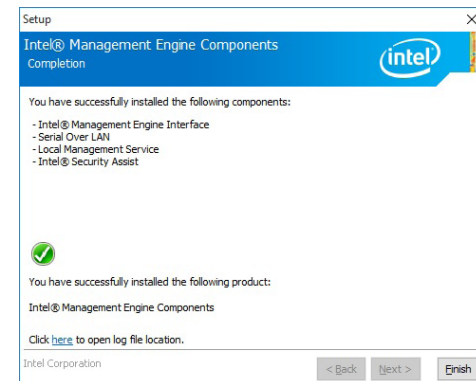
3. Setup is currently installing the driver. After installation has completed, click "Next".



4. Please wait while the product is being installed.



5. After completing installation, click "Finish".



## HW Utility

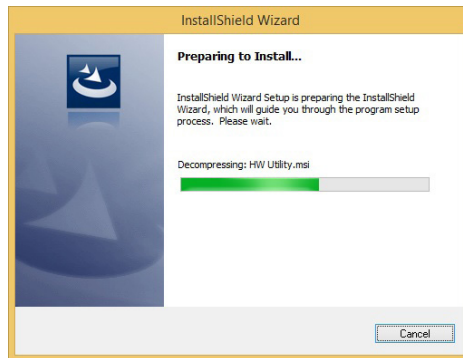
HW Utility provides information about the board, Watchdog, and DIO. To access the utility, click "HW Utility" on the main menu.



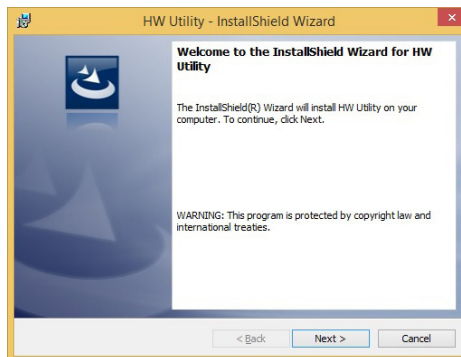
### Note:

If you are using Windows 7 or later versions, you need to access the operating system as an administrator to be able to install the utility.

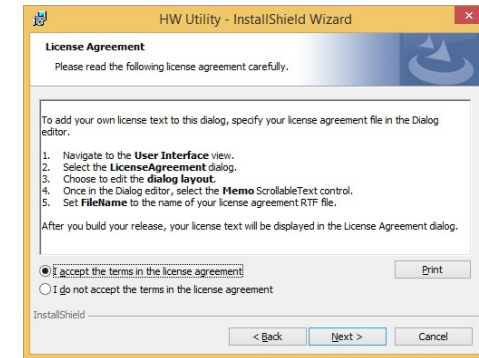
1. Setup is ready to install the driver.



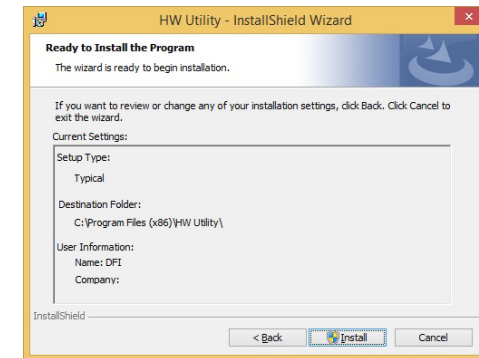
2. Click "Next" to continue.



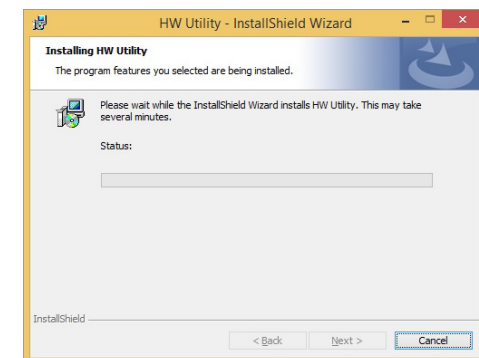
3. Read the license agreement then click "I accept the terms in the license agreement". Click "Next".



4. The wizard is ready to begin installation. Click "Install".



5. Please wait while the program features are being installed.

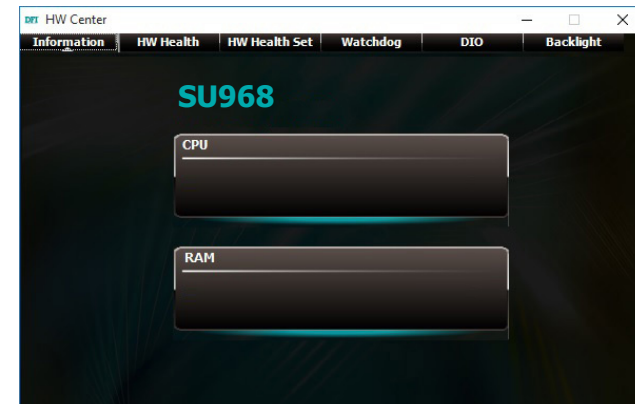




- After completing installation, click "Finish".



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



**Note:**

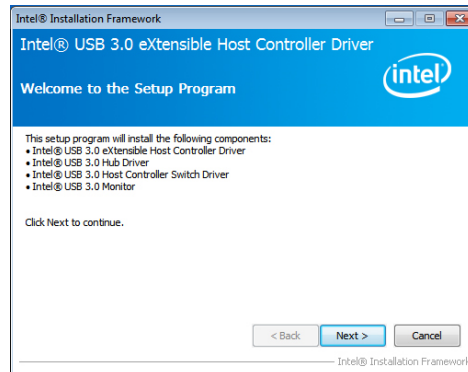
Note: The screenshot displayed above is for illustrative purpose only, and may not resemble the actual screen.

The SU968 HW Utility features the following tabs: Information, HW Health, HW Healthset, Watchdog, DIO and Backlight. Click on the tabs to access information about the board.

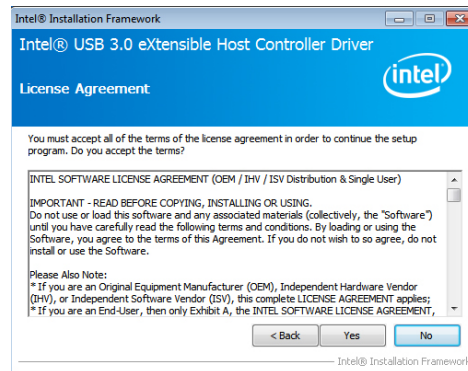
## Intel USB 3.0 Drivers

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

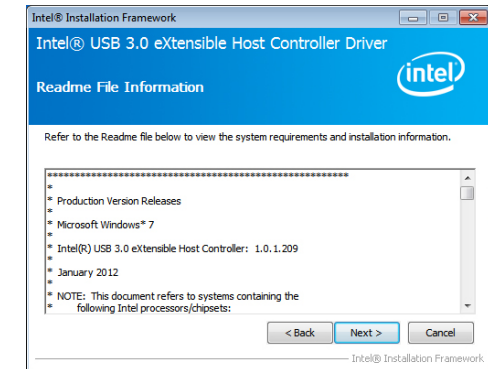
1. Setup is ready to install the driver. Click "Next".



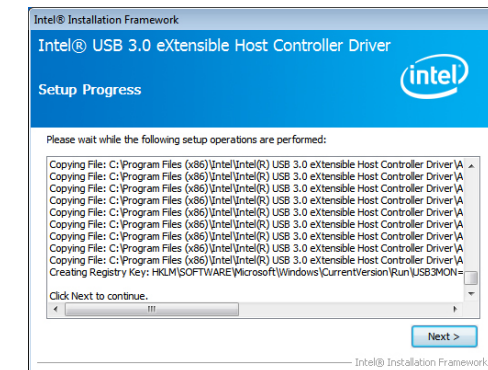
2. Read the license agreement then click "Yes".



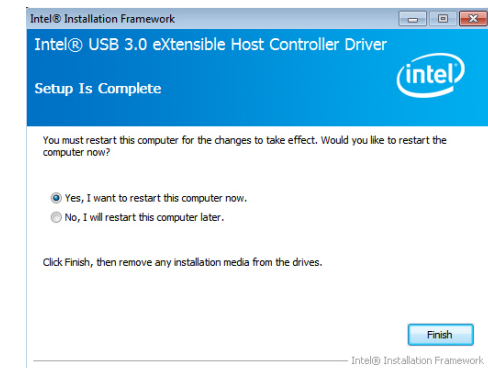
3. Go through the readme document for more installation tips then click "Next".



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



5. After completing installation, click "Finish".



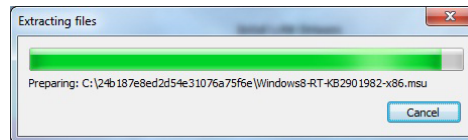
## Microsoft Framework 4.5.2 (For Windows 7)


**Note:**

Before installing Microsoft Framework 4.5.2, make sure you have updated your Windows 7 operating system to Service Pack 1.

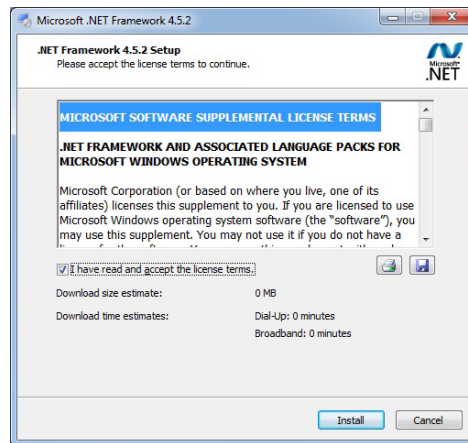
To install the driver, click "Microsoft Framework 4.5.2" on the main menu.

1. Setup is now extracting files.

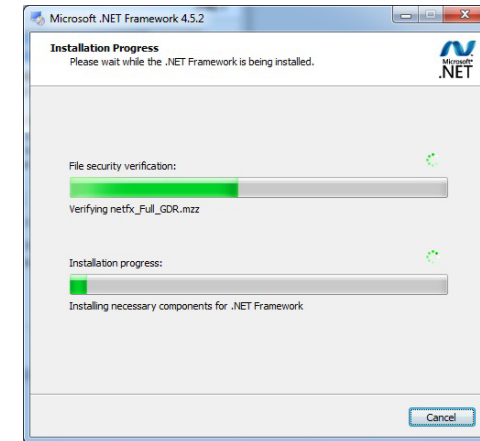


2. Read the license agreement carefully.

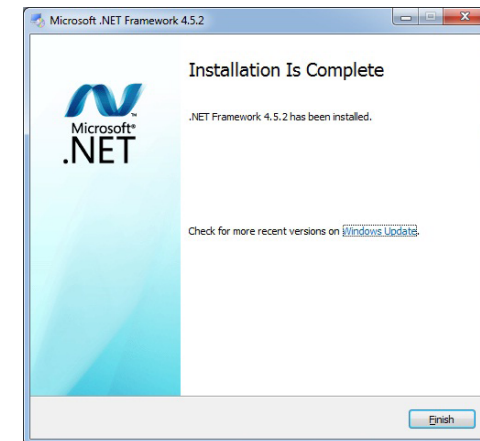
Click "I have read and accept the terms of the License Agreement" then click "Install".



3. Setup is now installing the driver.



4. Click "Finish".



## Intel Rapid Storage Technology

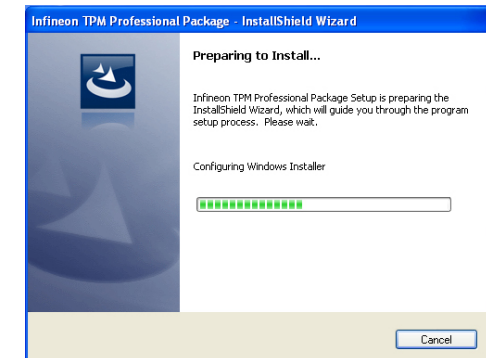
The Intel Rapid Storage Technology is a utility that allows you to monitor the current status of the SATA drives. It enables enhanced performance and power management for the storage subsystem.

To install the driver, click "Intel Rapid Storage Technology" on the main menu. Please refer to **Chapter 6** for more information.

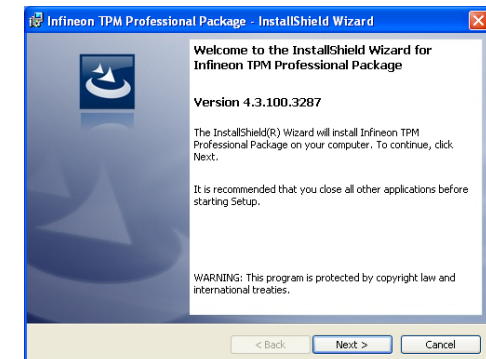
## Infinion TPM 1.2 Driver and Tool (Optional)

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

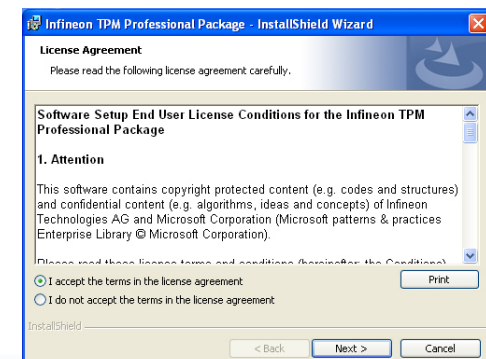
1. The setup program is preparing to install the driver.



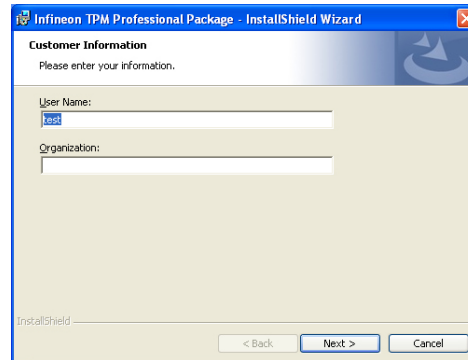
2. The setup program is now ready to install the utility. Click "Next".



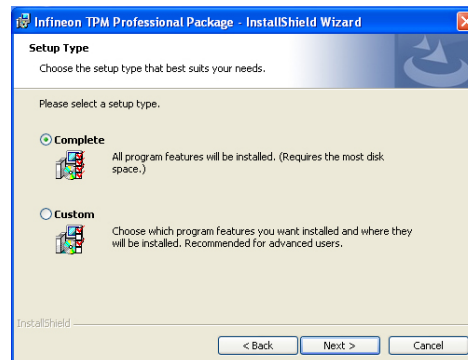
3. Click "I accept the terms in the license agreement" and then click "Next".



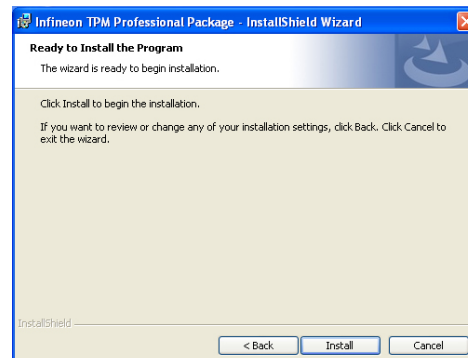
4. Enter the necessary information and then click "Next".



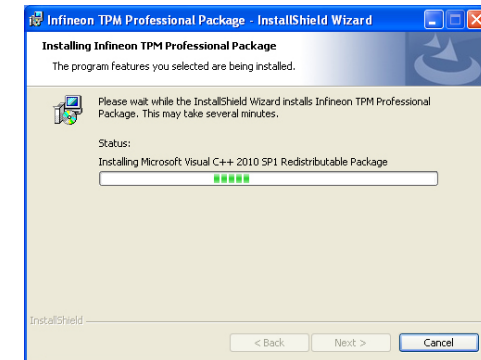
5. Select a setup type and then click "Next".



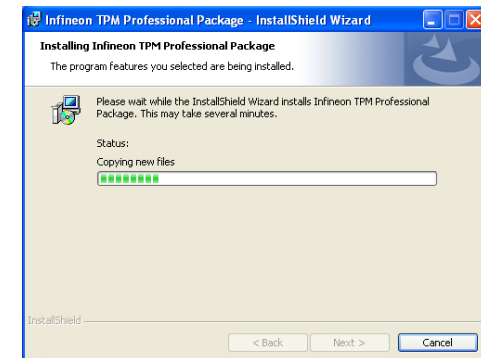
6. Click "Install".



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".



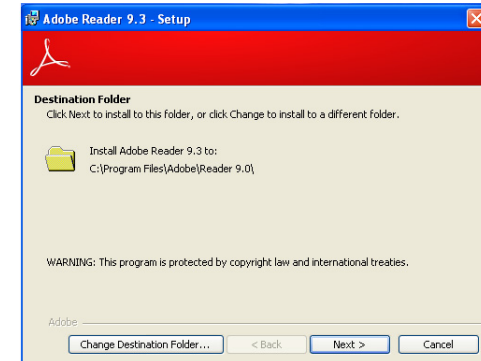
10. Click "Yes" to restart your system.



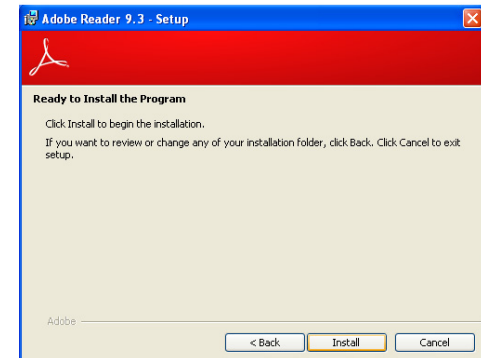
## Adobe Acrobat Reader 9.3

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

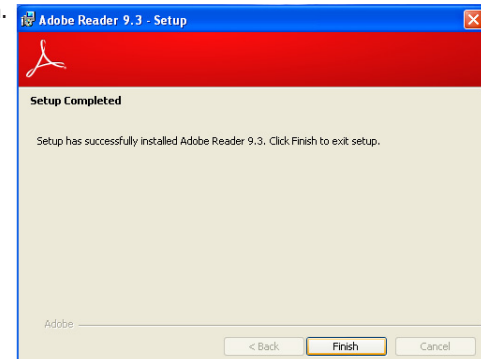
1. Click Next to install or click Change Destination Folder to select another folder.



2. Click "Install" to begin installation.



3. Click "Finish" to exit installation.



## Chapter 6 - RAID

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.

RAID Level	Min. Drives	Protection	Description
RAID 0	2	None	Data striping without redundancy
RAID 1	2	Single Drive Failure	Disk mirroring
RAID 5	3	Single Drive Failure	Block-level data striping with distributed parity
RAID 10	4	1 Disk Per Mirrored Stripe (not same mirror)	Combination of RAID 0 (data striping) and RAID 1 (mirroring)

### Settings

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

1. Connect the Serial ATA drives.
2. Enable Serial ATA in the Insyde BIOS.
3. Create a RAID volume.
4. Install the Intel Rapid Storage Technology Utility.

#### 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: Enable RAID in the Insyde BIOS

1. Power-on the system then press <Del> to enter the main menu of the Insyde BIOS.
2. Go to "Advanced" menu, and select the "SATA Configuration" menu.
3. Change the "SATA Mode Selection" to "RAID" mode.
4. Save the changes in the "Save & Exit" menu.
5. Reboot the system.

### Step 3: Create a RAID Volume

1. When the Intel® RST option ROM status screen displays during POST, press <Ctrl> and <I> simultaneously to enter the option ROM user interface.
2. Select 1: Create RAID Volume and press <Enter>.
3. Use the up or down arrow keys to select the RAID level and press <Enter>.
4. Use the up or down arrow keys to select the strip size and press <Enter>.
5. Press <Enter> to select the physical disks.
6. Use the up or down arrow keys to scroll through the list of hard drives and press <Space> to select the drive.
7. Press <Enter>.
8. Select the volume size and press <Enter>. You must select less than one hundred percent of the available volume space to leave space for the second volume.
9. Press <Enter> to create the volume.
10. At the prompt, press <Y> to confirm volume creation.
11. Select 4: Exit and press <Enter>.
12. Press <Y> to confirm exit.



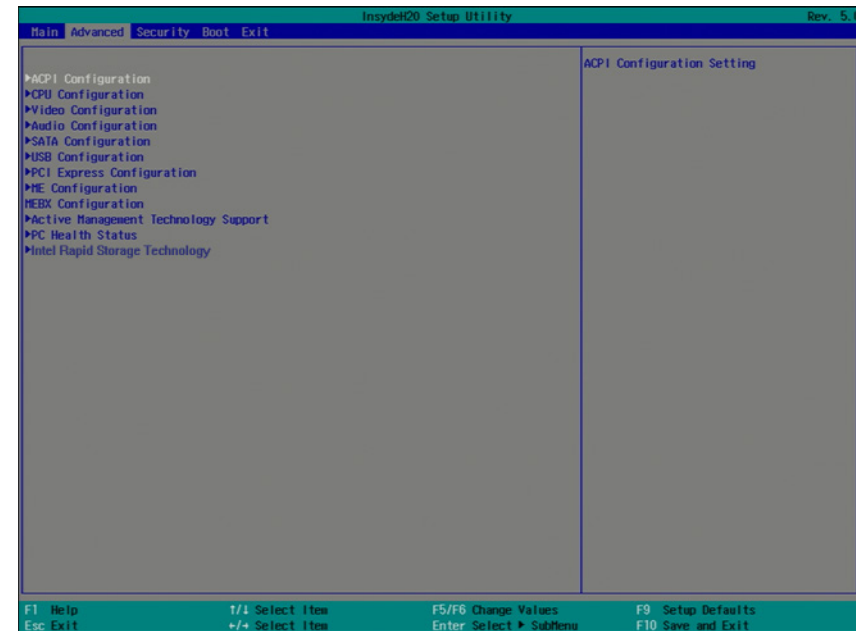
#### Note:

These steps are cited from the Intel® Support site, "Set Up a System with Intel® Matrix RAID Technology" (Article ID: 000005789).  
<http://www.intel.com/content/www/us/en/support/boards-and-kits/000005789.htm>

### Step 3-1: Create a RAID Volume if the boot type is UEFI

If the boot type is set to UEFI, RAID volume creation will be different. Please use the following steps to create RAID volumes. To set the boot type, enter the Insyde BIOS and go to "Boot" > "Boot type".

1. Go to the "Advanced" menu of the Insyde BIOS.
2. The "Intel® Rapid Storage Technology" menu appears. Enter this menu.



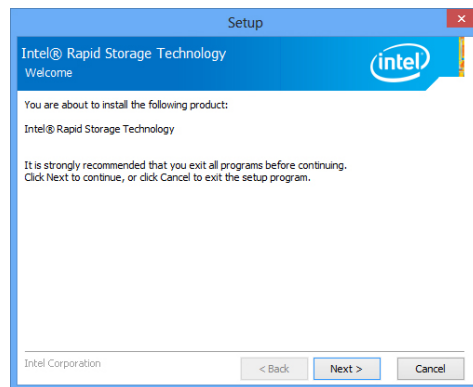
3. The screen displays all available drives. Select "Create RAID volume" to create a RAID volume".
4. Use the up or down arrow keys to select the RAID level and press <Enter>.
5. Use the up or down arrow keys to scroll through the list of hard drives and press <Space> to select the drive.
6. Press <Enter>.
7. Use the up or down arrow keys to select the strip size and press <Enter>.
8. Enter the volume size and press <Enter>.
9. At the prompt, press <Y> to confirm volume creation.



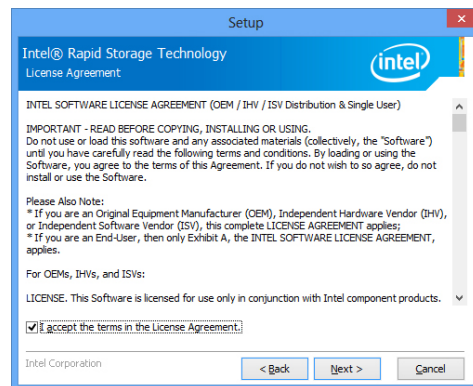
## Step 4: Install the Intel Rapid Storage Technology Utility

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.

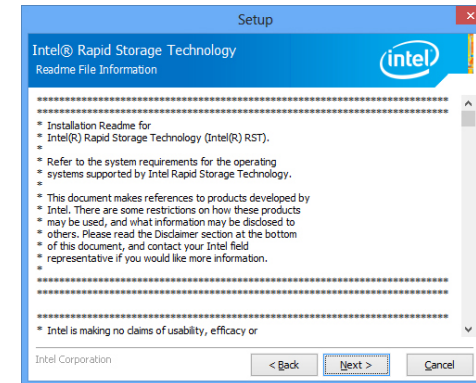
1. Insert the provided DVD into an optical drive.
2. Click "Intel Rapid Storage Technology Utility" on the main menu.
3. Setup is ready to install the utility. Click "Next".



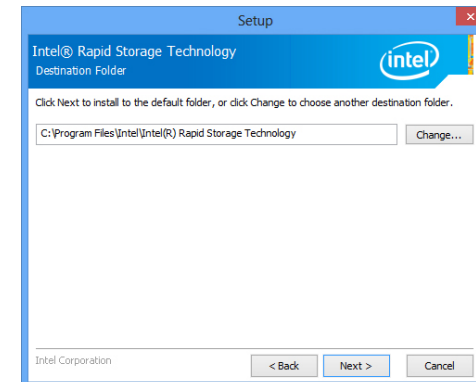
4. Read the license agreement and click "I accept the terms in the License Agreement." Then, click "Next".



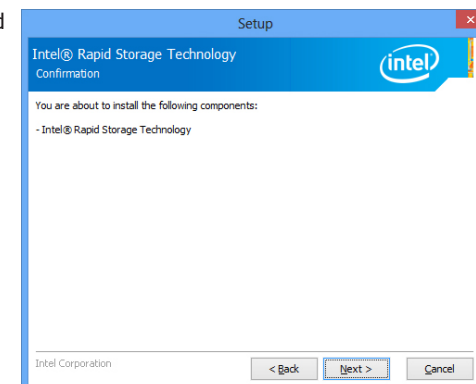
5. Go through the readme document to view system requirements and installation information then click "Next".



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 7 - Intel AMT Settings

### 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**

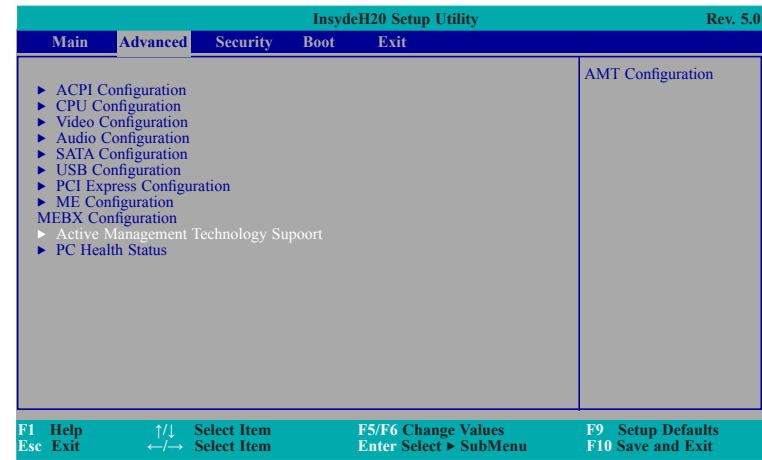
Remotely repair systems after OS failures. Alerting and event logging help detect problems quickly to reduce downtime.

- **Protect**

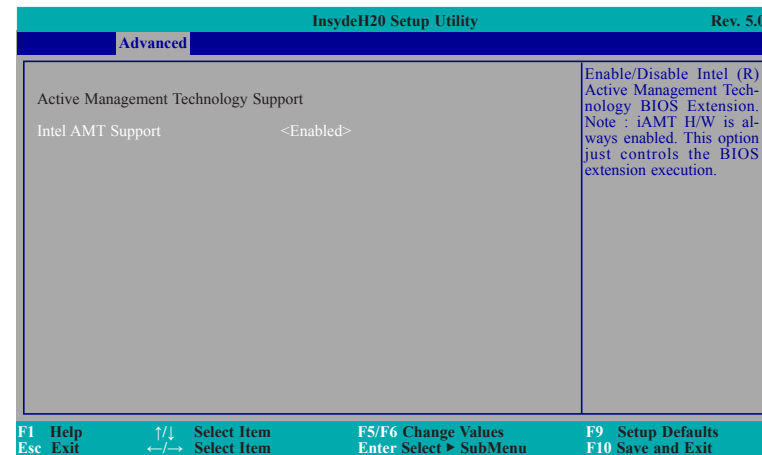
Intel AMT's System Defense capability remotely updates all systems with the latest security software. It protects the network from threats at the source by proactively blocking incoming threats, reactively containing infected clients before they impact the network, and proactively alerting when critical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

### Enable Intel® AMT in the Insyde BIOS

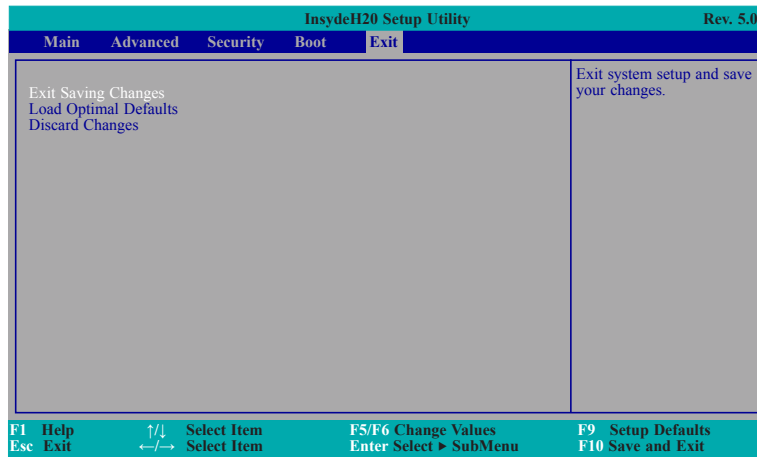
1. Power-on the system then press <Del> to enter the main menu of the Insyde BIOS.
2. In the **Advanced** menu, select **AMT Configuration**.



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

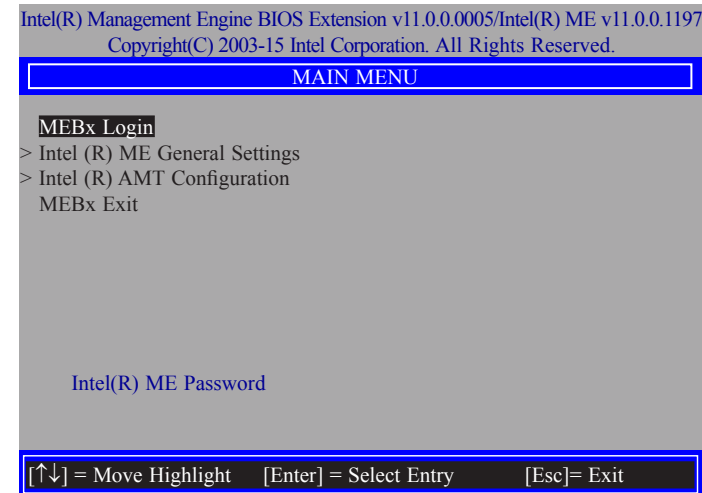


4. In the **Save & Exit** menu, select **Save Changes and Reset** then select **OK**.

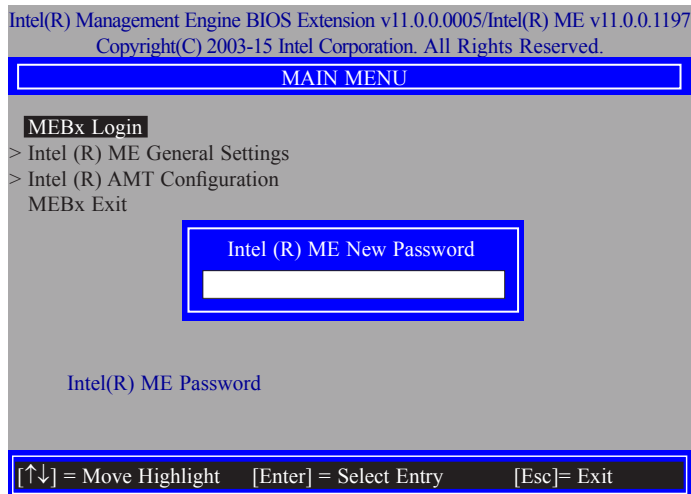


## Enable Intel® AMT in the Intel® Management Engine BIOS Extension (MEBX) Screen

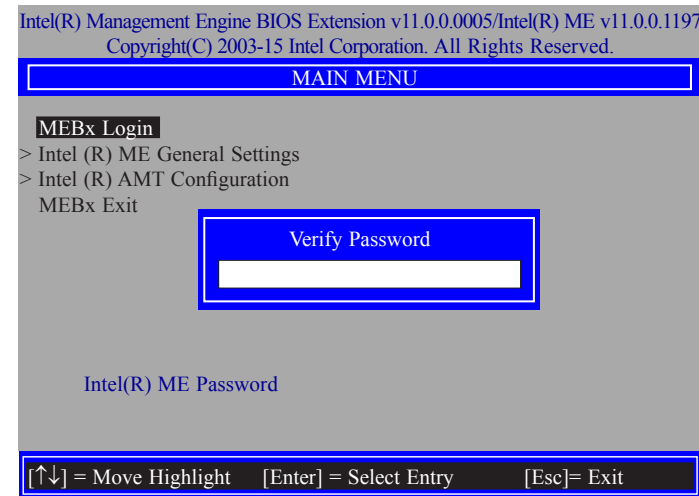
1. When the system reboots, you will be prompted for a password. The default password is "admin". Enter the default password in the space provided under Intel(R) ME Password then press Enter.



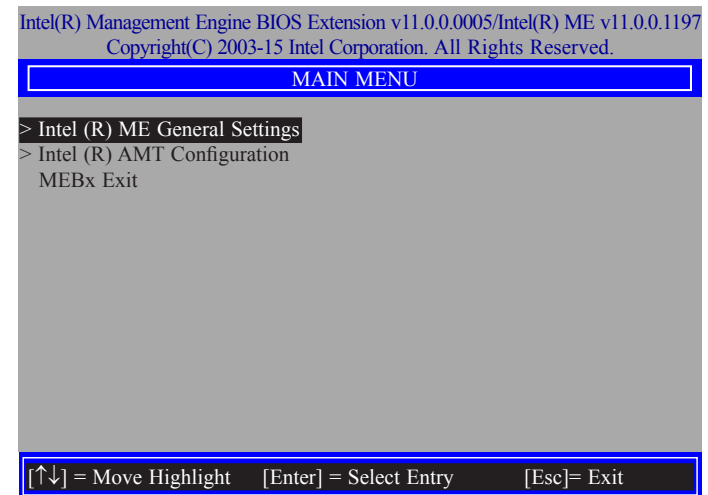
2. Enter a new password in the space provided under Intel(R) ME New Password then press Enter. The password must include:
- 8-32 characters
  - Strong 7-bit ASCII characters excluding : , and " characters
  - At least one digit character (0, 1, ...9)
  - At least one 7-bit ASCII non alpha-numeric character, above 0x20, (e.g. !, \$, ;)
  - Both lower case and upper case characters



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



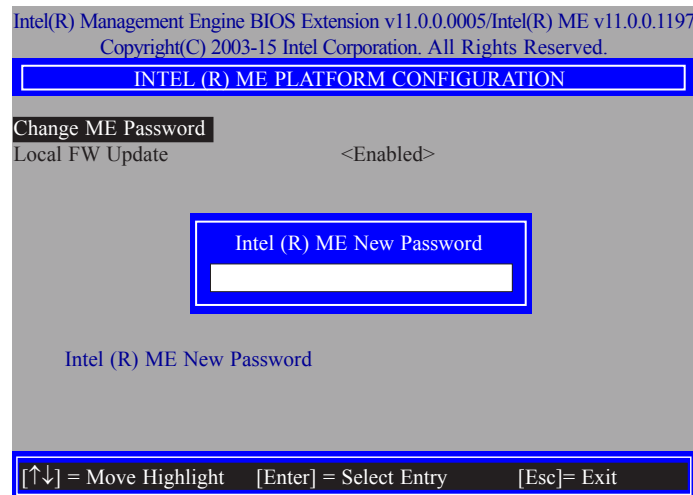
4. Select **Intel(R) ME General Settings** then press Enter.



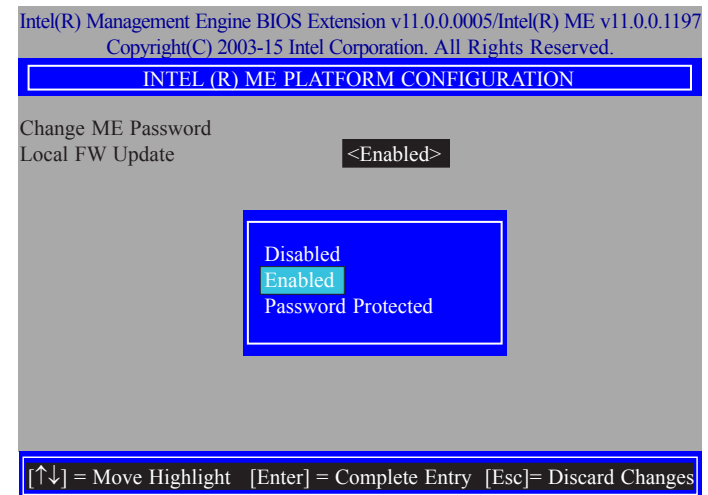
5. Select **Change Intel(R) ME Password** then press Enter.

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.

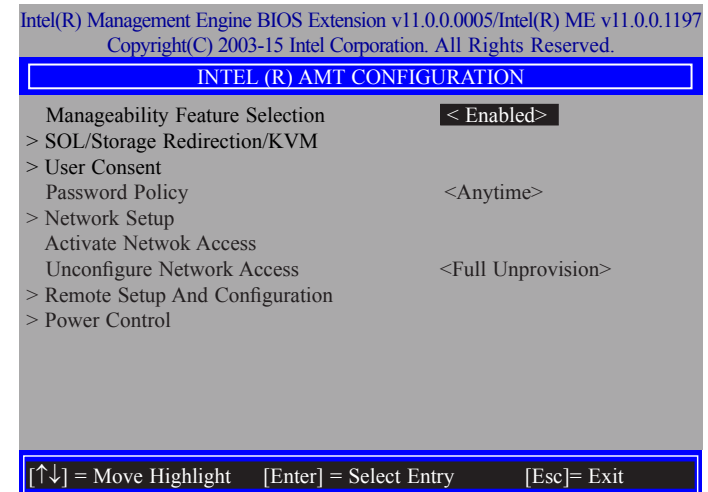
- 8-32 characters
- Strong 7-bit ASCII characters excluding : , and " characters
- At least one digit character (0, 1, ...9)
- At least one 7-bit ASCII non alpha-numeric character, above 0x20, (e.g. !, \$, ;)
- Both lower case and upper case characters



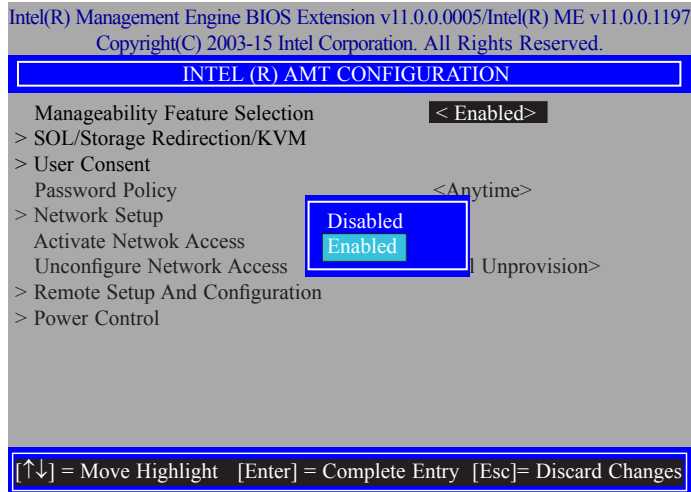
6. Select **Local FW Update** then press Enter. Select **Enabled** then press Enter.



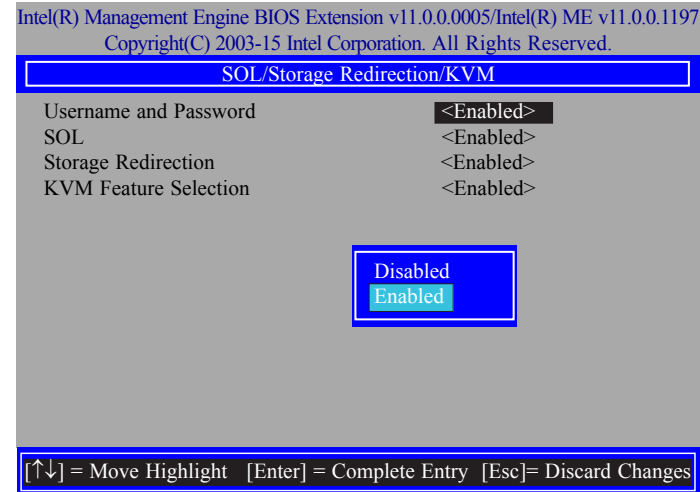
7. Select Previous Menu until you return to the **Main Menu**. Select **Intel(R) AMT Configuration** then press Enter.



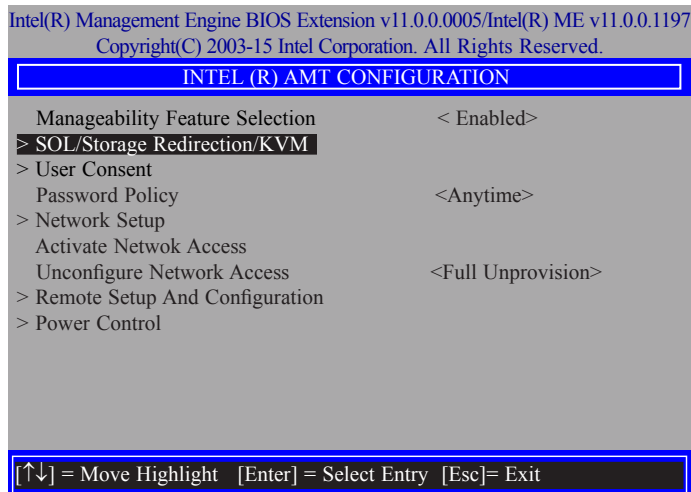
8. In the **Intel(R) AMT Configuration** menu, select **Manageability Feature Selection** then press Enter. Select **Enabled** or **Disabled** then press Enter.



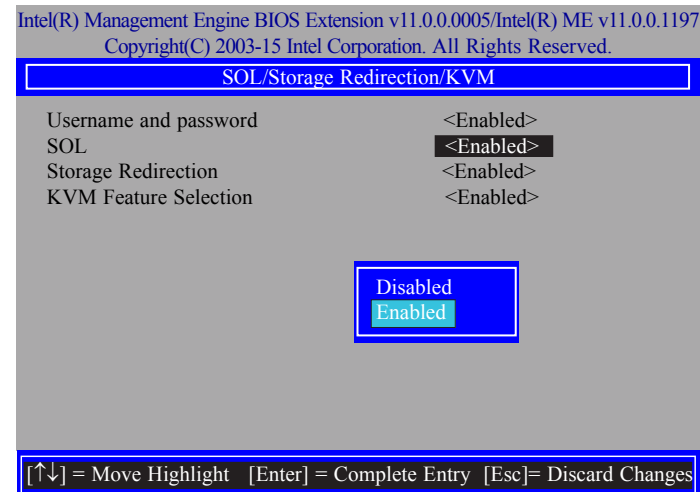
10. In the **SOL/Storage Redirection/KVM** menu, select **Username and Password** then press Enter. Select **Enabled** or **Disabled** then press Enter.



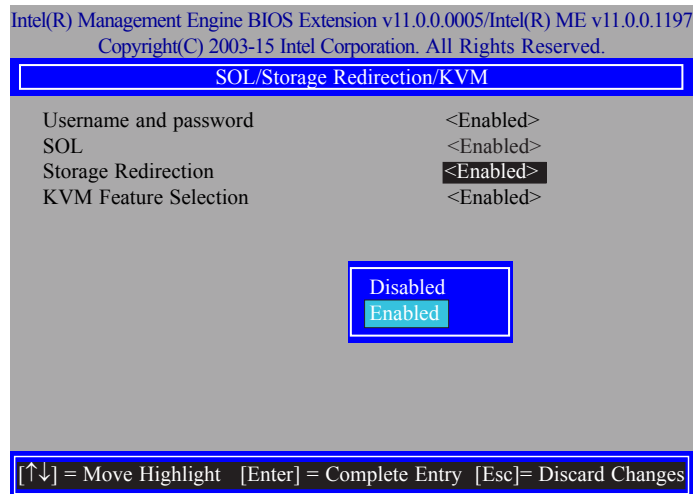
9. In the **Intel(R) AMT Configuration** menu, select **SOL/Storage Redirection/KVM** then press Enter.



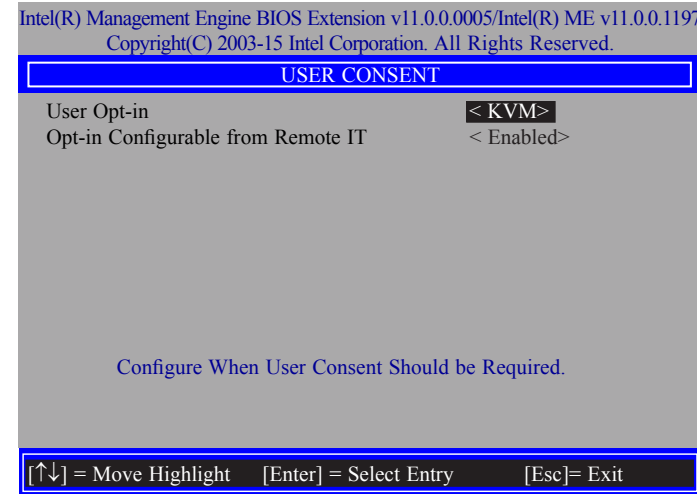
11. In the **SOL/Storage Redirection/KVM** menu, select **SOL** then press Enter. Select **Enabled** or **Disabled** then press Enter.



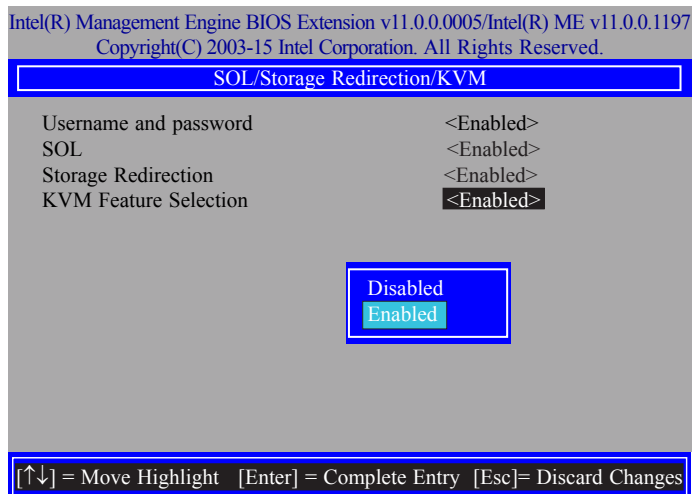
12. In the **SOL/Storage Redirection/KVM** menu, select **Storage Redirection** then press Enter. Select **Enabled** or **Disabled** then press Enter.



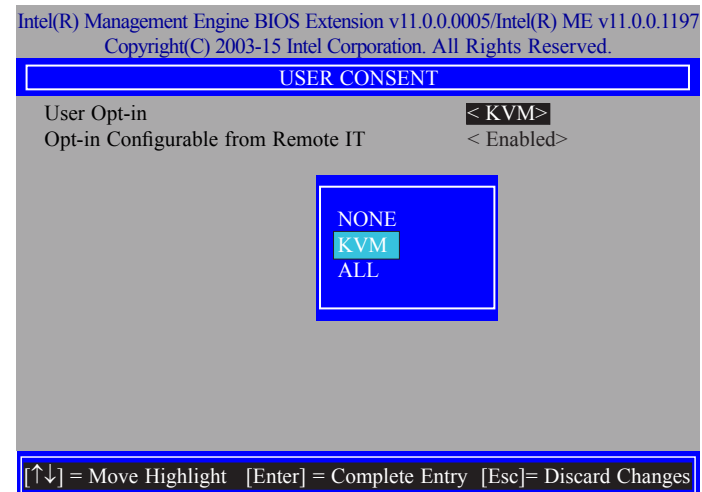
14. Select Previous Menu until you return to the **Intel(R) AMT Configuration** menu. Select **User Consent** then press Enter.



13. In the **SOL/Storage Redirection/KVM** menu, select **KVM Feature Selection** then press Enter. Select **Enabled** or **Disabled** then press Enter.

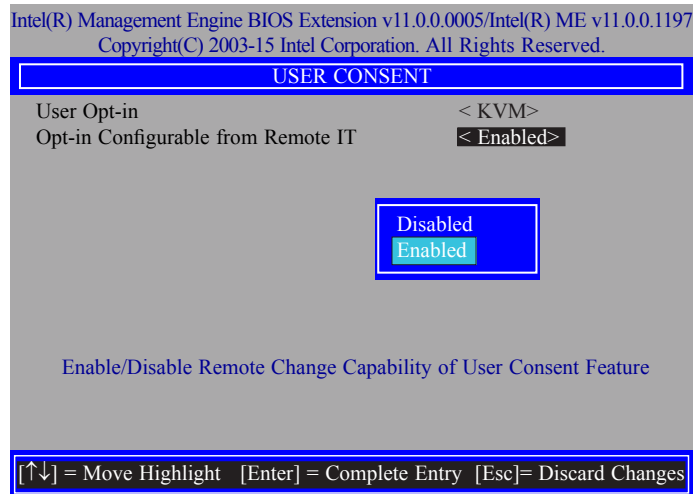


15. In the **User Consent** menu, select **User Opt-in** then press Enter. Select **None** or **KVM** or **ALL** then press Enter.



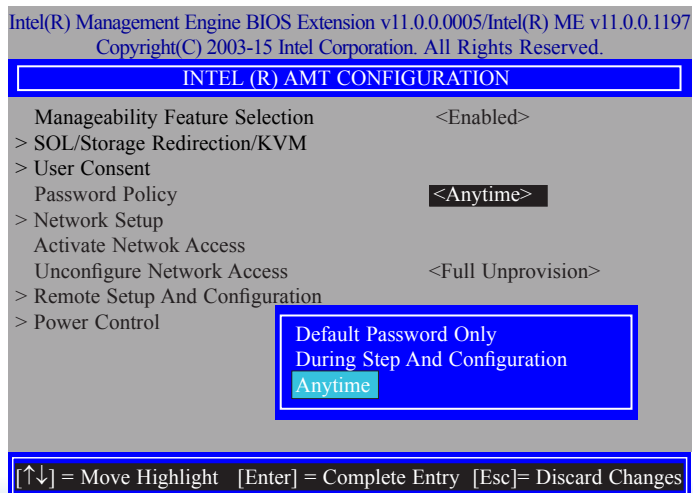


16. In the **User Consent** menu, select **Opt-in Configurable from Remote IT** then press Enter. Select **Enabled** or **Disable Remote Control of KVM Opt-in Policy** then press Enter.

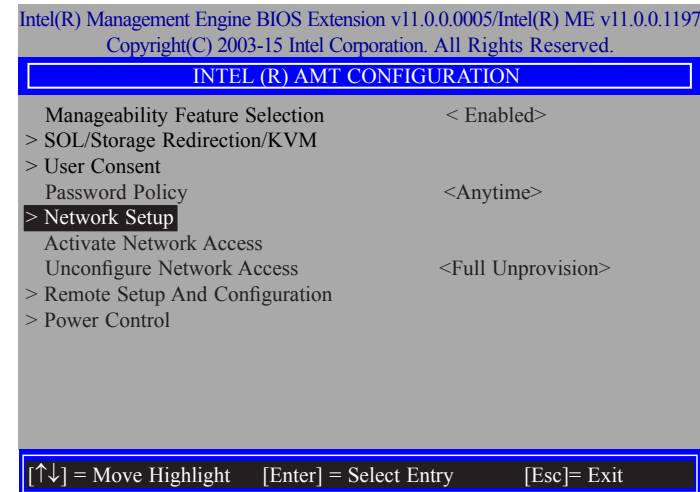


17. Select Previous Menu until you return to the **Intel(R) AMT Configuration** menu. Select **Password Policy** then press Enter.

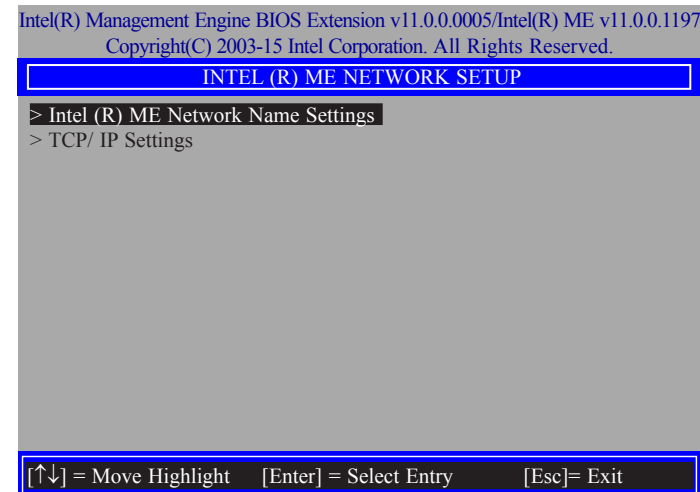
You may choose to use a password only during setup and configuration or to use a password anytime the system is being accessed.



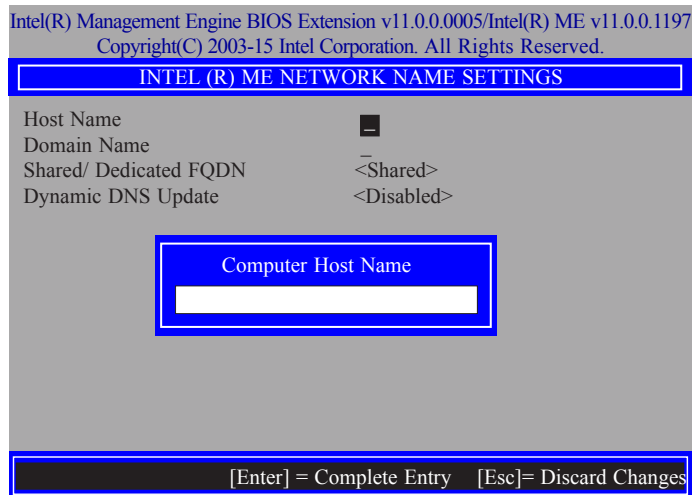
18. In the **Intel(R) AMT Configuration** menu, select **Network Setup** then press Enter.



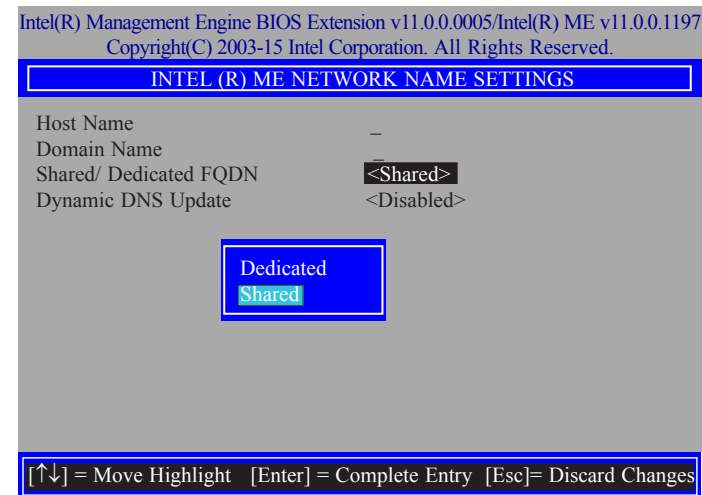
19. In the **Intel(R) ME Network Setup** menu, select **Intel(R) ME Network Name Settings** then press Enter.



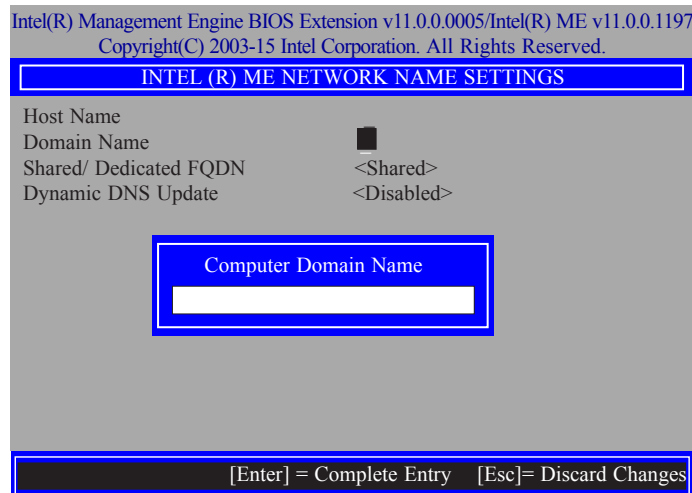
20. In the **Intel(R) ME Network Name Settings** menu, select **Host Name** then press Enter. Enter the computer's host name then press Enter.



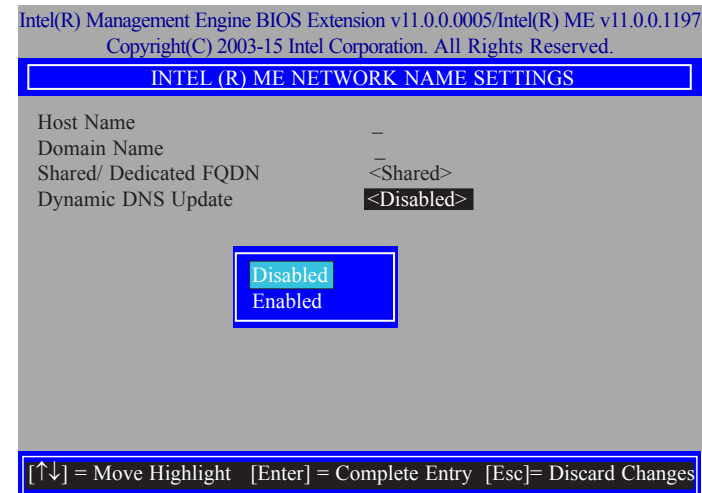
22. Select **Shared/Dedicated FQDN** then press Enter. Select **Shared** or **Dedicated** then press Enter.



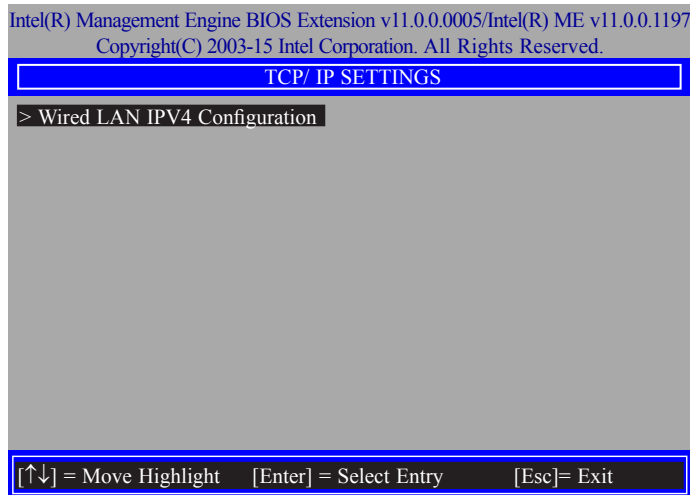
21. Select **Domain Name** then press Enter. Enter the computer's domain name then press Enter.



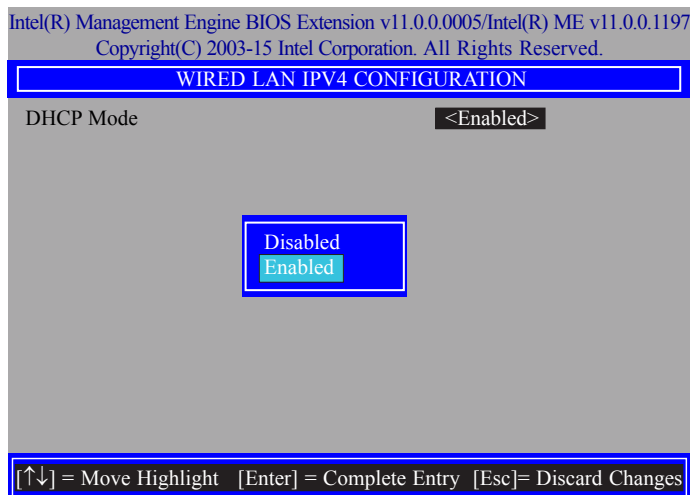
23. Select **Dynamic DNS Update** then press Enter. Select **Enabled** or **Disabled** then press Enter.



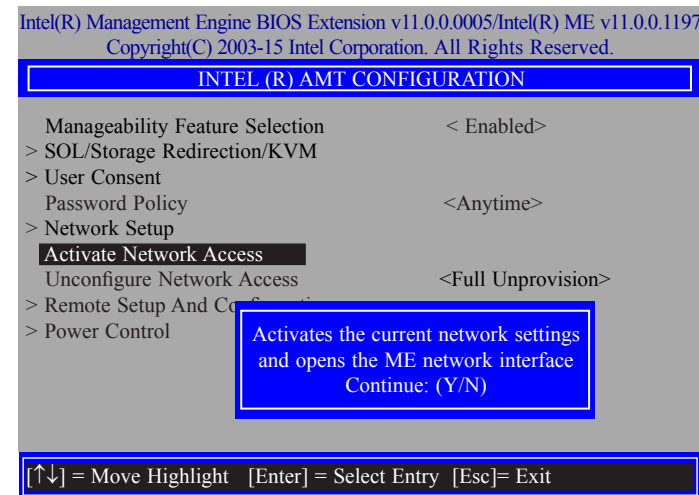
24. Select Previous Menu until you return to the **Intel(R) ME Network Setup** menu. Select **TCP/IP Settings** then press Enter.



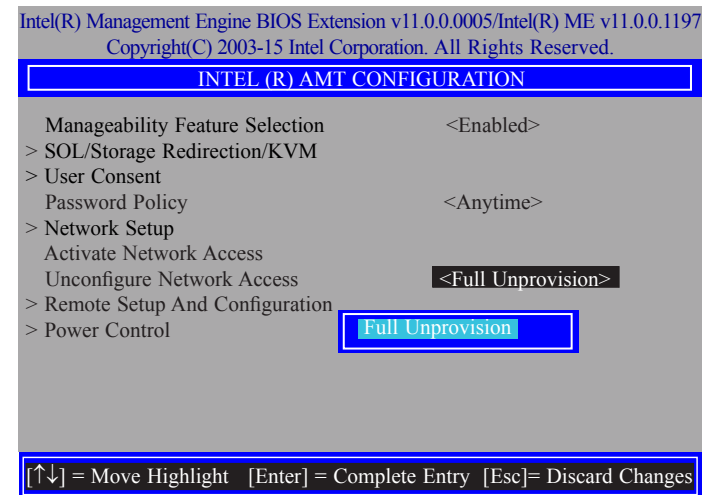
25. In the **TCP/IP Settings** menu, select **Wired LAN IPV4 Configuration** then press Enter. Select **Enabled** or **Disable IPV4 DHCP Mode** then press Enter.



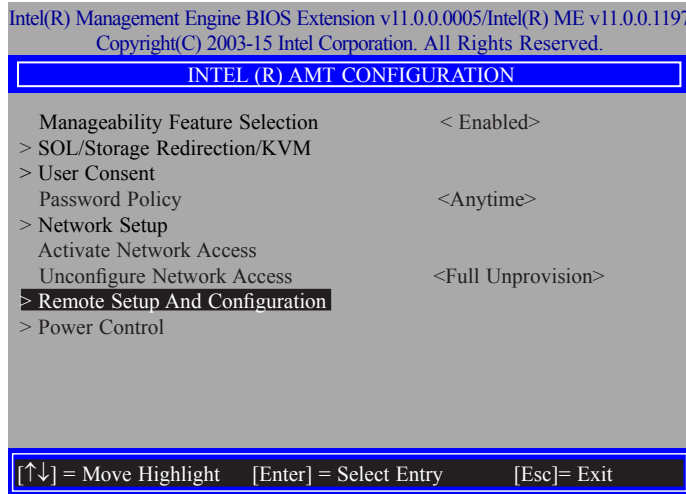
26. In the **Intel(R) AMT Configuration** menu, select **Activate Network Access** then press Enter. Press **Y** then press Enter.



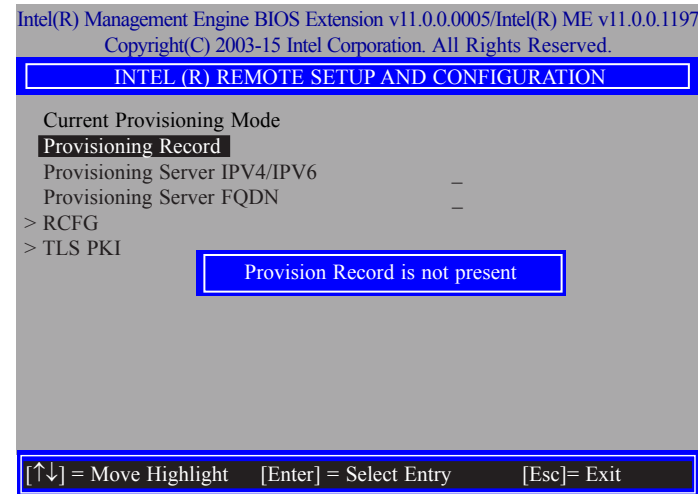
27. In the **Intel(R) AMT Configuration** menu, select **Unconfigure Network Access** then press Enter.



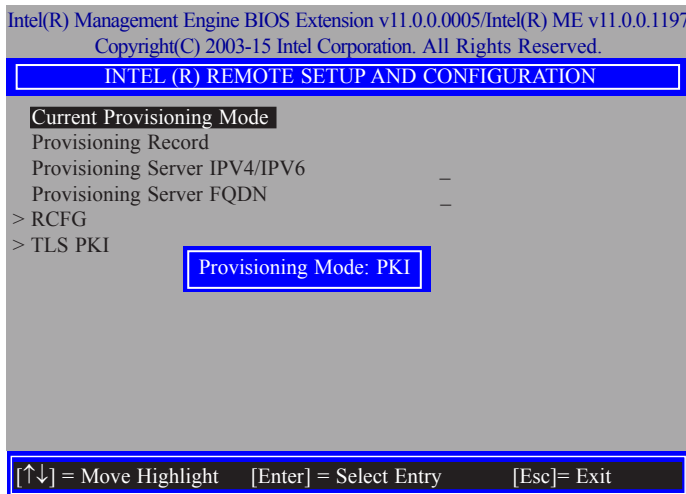
28. In the **Intel(R) AMT Configuration** menu, select **Remote Setup And Configuration** then press Enter.



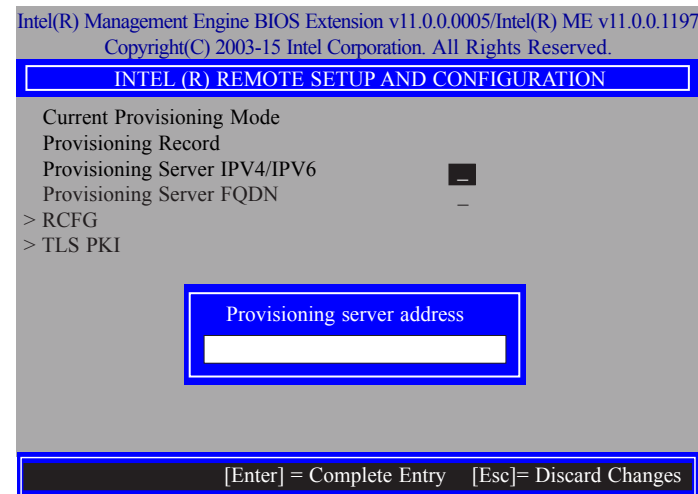
30. In the **Intel(R) Remote Setup And Configuration** menu, select **Provisioning Record** then press Enter.



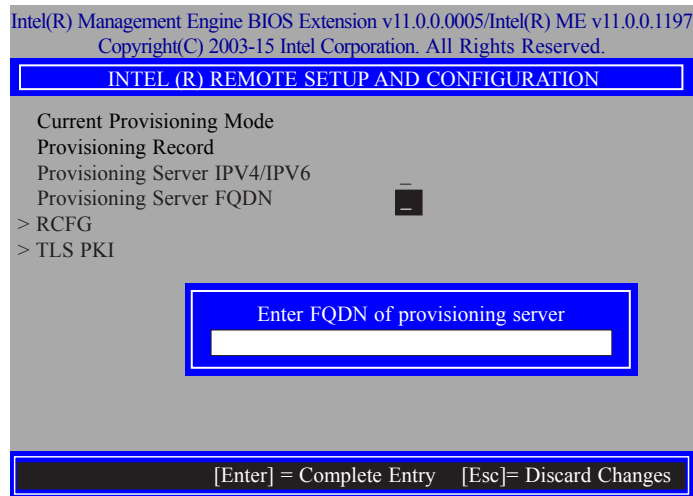
29. In the **Intel(R) Remote Setup And Configuration** menu, select **Current Provisioning Mode** then press Enter.



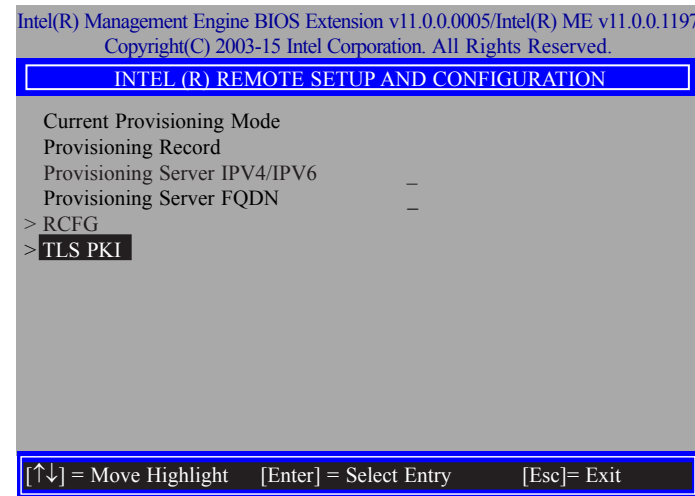
31. In the **Intel(R) Remote Setup And Configuration** menu, select **Provisioning server IPV4/IPV6**, enter the Provisioning server address then press Enter.



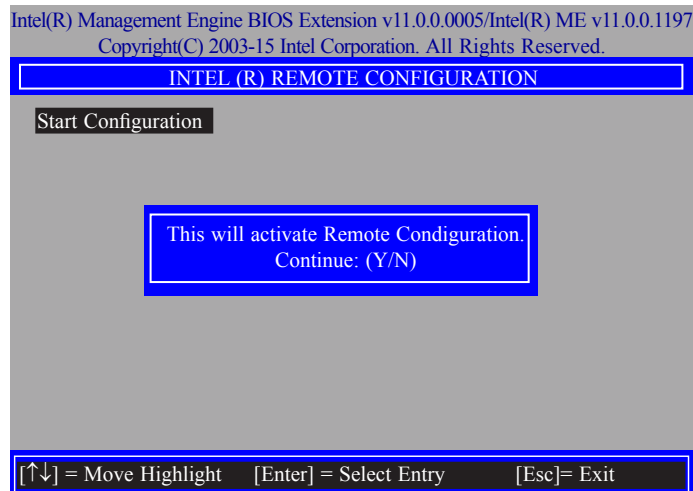
32. In the **Intel(R) Remote Setup And Configuration** menu, select **Provisioning server FQDN**, enter the FQDN of Provisioning server then press Enter.



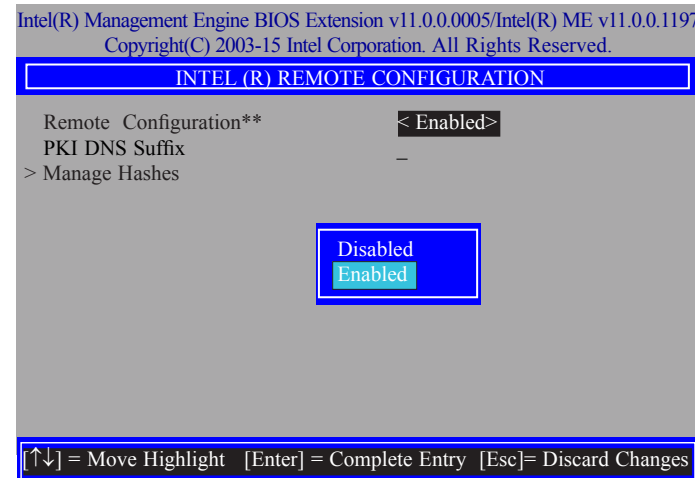
34. In the **Intel(R) Remote Setup And Configuration** menu, select **TLS PKI** then press Enter.



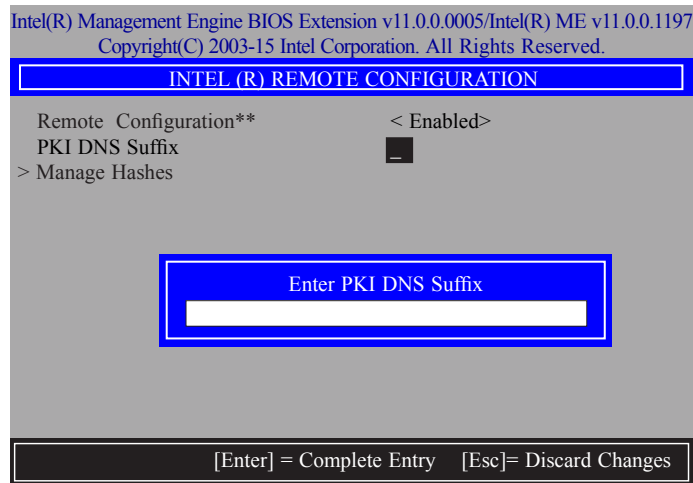
33. In the **Intel(R) Remote Setup And Configuration** menu, select **RCFG** then press Enter, and select **Start Configuration** then press enter. Type **Y** then press enter.



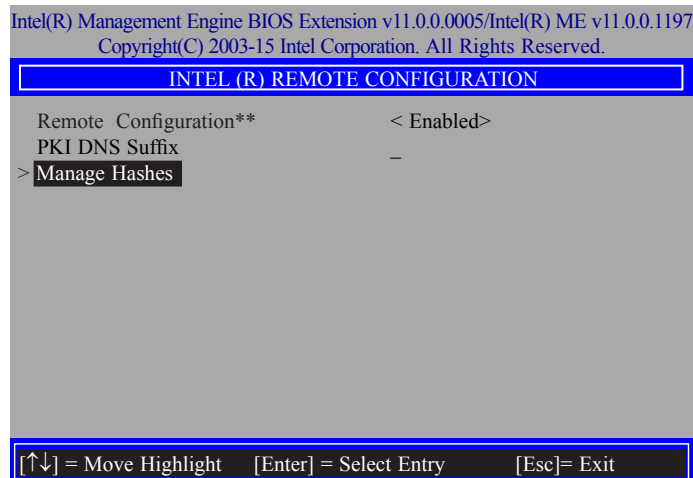
35. In the **Intel(R) Remote Configuration** menu, select **Remote Configuration\*\*** then press Enter, select **Enabled** or **Disabled** then press Enter.



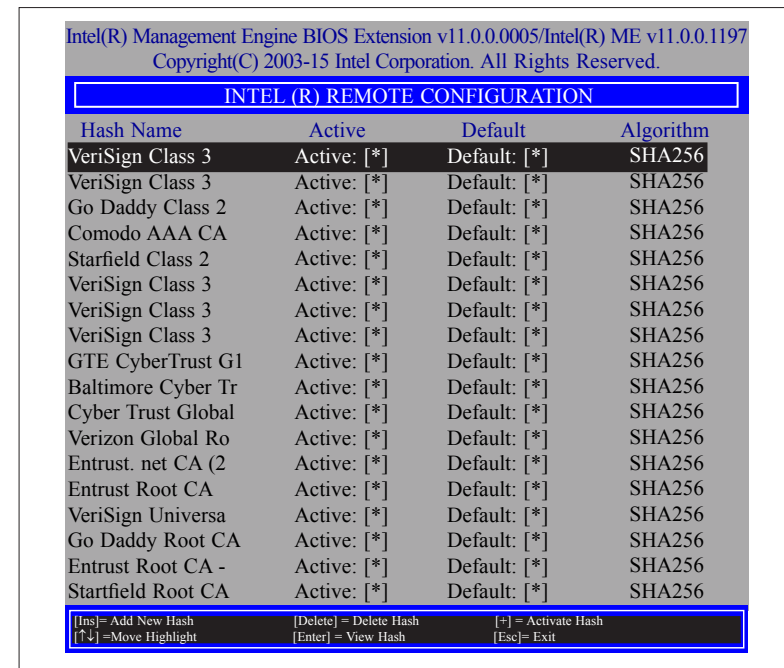
36. In the **Intel(R) Remote Configuration** menu, select **PKI DNS Suffix** then press Enter. Type PKI DNS Suffix then press Enter.



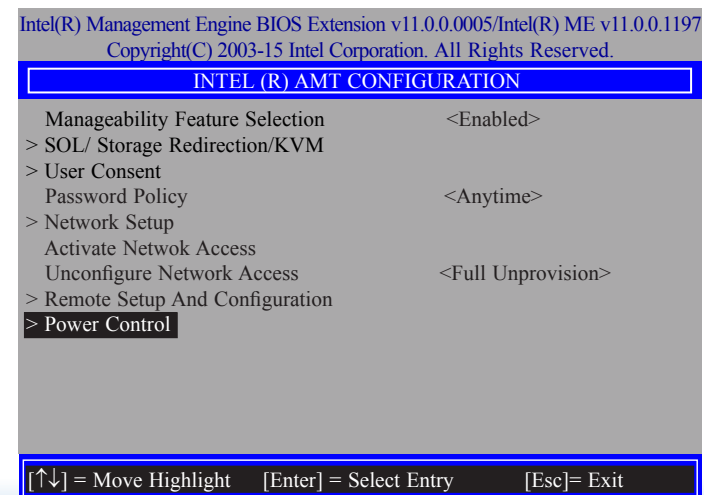
37. Select **Manage Hashes** then press Enter, and select one of hash name.



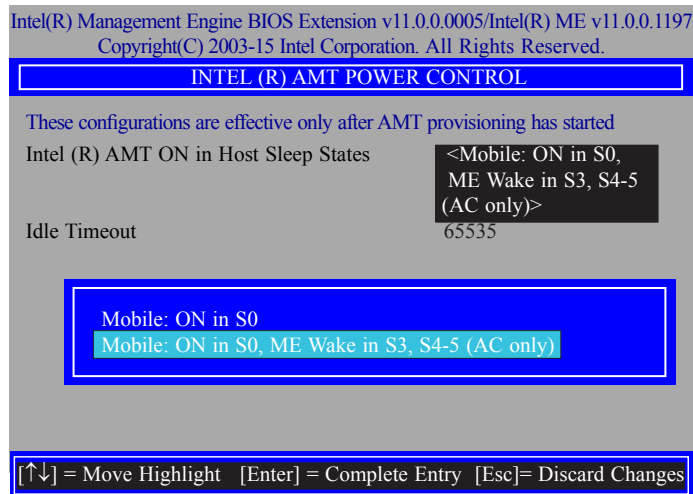
38. In the **Intel(R) Remote Configuration** menu, select **Manage Hashes** then press Enter.



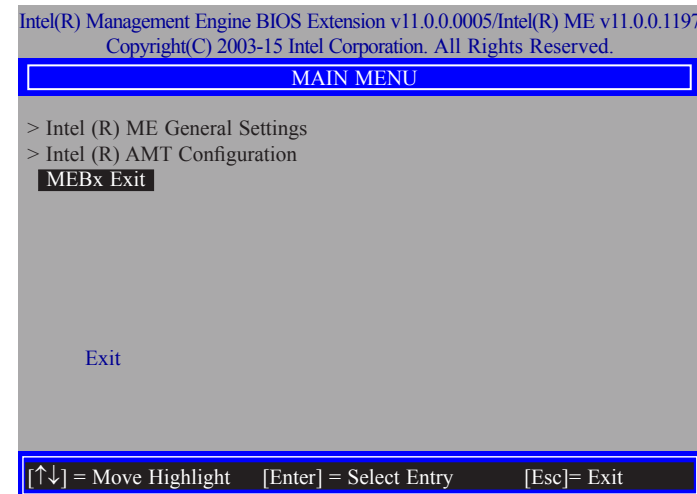
39. In the **Intel(R) AMT Configuration** menu, select **Power Control** then press Enter.



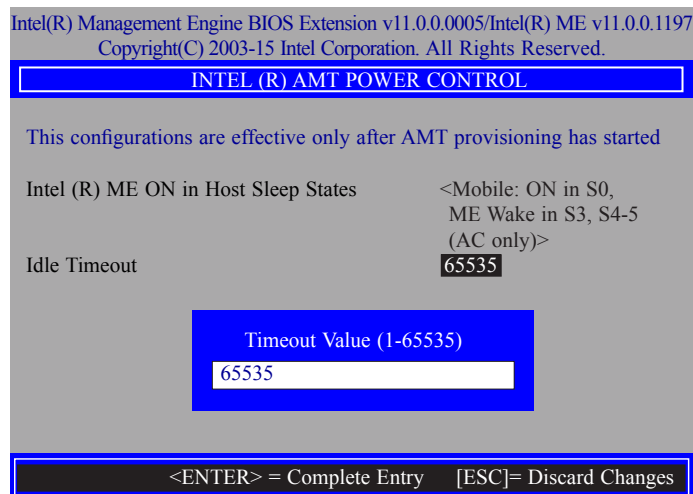
40. In the **Intel(R) AMT Power Control** menu, select **Intel(R) AMT ON in Host Sleep States** then press Enter. Select an option then press Enter.



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



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



## Appendix A - 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.

## Appendix B - Insyde BIOS Standard Status POST Code

### SEC Phase 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
SEC_SYSTEM_POWER_ON	01	CPU power on and switch to Protected mode
SEC_AFTER_MICROCODE_PATCH	03	Setup Cache as RAM
SEC_ACCESS_CSR	04	PCIE MMIO Base Address initial
SEC_GENERIC_MSRRINIT	05	CPU Generic MSR initialization
SEC_CPU_SPEEDCFG	06	Setup CPU speed
SEC_SETUP_CAR_OK	07	Cache as RAM test
SEC_FORCE_MAX_RATIO	08	Tune CPU frequency ratio to maximum level
SEC_GO_TO_SECSTARTUP	09	Setup BIOS ROM cache
SEC_GO_TO_PEICORE	0A	Enter Boot Firmware Volume

### PEI Phase 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
PEI_SIO_INIT	70	Super I/O initialization
PEI_CPU_REG_INIT	71	CPU Early Initialization
PEI_CPU_AP_INIT	72	Multi-processor Early initialization
PEI_CPU_HT_RESET	73	HyperTransport initialization
PEI_PCIE_MMIO_INIT	74	PCIE MMIO BAR Initialization
PEI_NB_REG_INIT	75	North Bridge Early Initialization
PEI_SB_REG_INIT	76	South Bridge Early Initialization
PEI_PCIE_TRAINING	77	PCIE Training
PEI_TPM_INIT	78	TPM Initialization
PEI_MEMORY_INSTALL	80	Simple Memory test
PEI_TXTPEI	81	TXT function early initialization
PEI_MEMORY_CALLBACK	83	Set cache for physical memory

### DXE Phase 8-Bit POST Code Values

Functionality Name	Post Code Values	Description
DXE_SB_SPI_INIT	41	South bridge SPI initialization
DXE_VARIABLE_RECLAIM	61	Variable store garbage collection and reclaim operation
DXE_FLASH_PART_NONSUPPORT	62	Flash part not supported.

### BDS Phase 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
BDS_ENTER_BDS	10	Enter BDS entry
BDS_INSTALL_HOTKEY	11	Install Hotkey service
BDS_ASF_INIT	12	ASF Initialization
BDS_PCI_ENUMERATION_START	13	PCI enumeration
BDS_BEFORE_PCIIO_INSTALL	14	PCI resource assign complete
BDS_PCI_ENUMERATION_END	15	PCI enumeration complete
BDS_CONNECT_CONSOLE_IN	16	Keyboard Controller, Keyboard and Mouse initializatio
BDS_CONNECT_CONSOLE_OUT	17	Video device initialization
BDS_CONNECT_STD_ERR	18	Error report device initialization
BDS_CONNECT_USB_HC	19	USB host controller initialization
BDS_CONNECT_USB_BUS	1A	USB BUS driver initialization
BDS_CONNECT_USB_DEVICE	1B	USB device driver initialization
BDS_NO_CONSOLE_ACTION	1C	Console device initialization fail
BDS_ENUMERATE_ALL_BOOT_OPTIO	27	Get boot device information
BDS_ENTER_SETUP	29	Enter Setup Menu
BDS_ENTER_BOOT_MANAGER	2A	Enter Boot manager
BDS_READY_TO_BOOT_EVENT	2E	Last Chipset initialization before boot to OS
BDS_GO_LEGACY_BOOT	2F	Start to boot Legacy OS
BDS_GO_UEFI_BOOT	30	Start to boot UEFI OS
BDS_LEGACY16_PREPARE_TO_BOOT	31	Prepare to Boot to Legacy OS
BDS_EXIT_BOOT_SERVICES	32	Send END of POST Message to ME via HECI

### PostBDS Phase 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
POST_BDS_NO_BOOT_DEVICE	F9	No Boot Device
POST_BDS_JUMP_BOOT_SECTOR	FE	Try to Boot with INT 19

### ACPI 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
ASL_ENTER_S1	51	Prepare to enter S1
ASL_ENTER_S3	53	Prepare to enter S3
ASL_ENTER_S4	54	Prepare to enter S4
ASL_ENTER_S5	55	Prepare to enter S5
ASL_WAKEUP_S1	E1	System wakeup from S1
ASL_WAKEUP_S3	E3	System wakeup from S3
ASL_WAKEUP_S4	E4	System wakeup from S4
ASL_WAKEUP_S5	E5	System wakeup from S5

### SMM 8-Bit POST Code Values

Functionality Name	POST Code Value	Description
SMM_ACPI_ENABLE_END	A7	ACPI enable function complete
SMM_S1_SLEEP_CALLBACK	A1	Enter S1
SMM_S3_SLEEP_CALLBACK	A3	Enter S3
SMM_S4_SLEEP_CALLBACK	A4	Enter S4
SMM_S5_SLEEP_CALLBACK	A5	Enter S5