IB990

Intel® Xeon® E3 v5 Family / 6th Gen. Core™ i7/i5/i3 Full-Size CPU Card

User's Manual

Version 1.1
(Dec. 2016)

Compliance

CE

In a domestic environment, this product may cause radio interference in which case users may be required to take adequate measures.

FC

This product has been tested and found to comply with the limits for a Class A device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications.

WEEE

This product must not be disposed of as normal household waste, in accordance with the EU directive of for waste electrical and electronic equipment (WEEE - 2012/19/EU). Instead, it should be disposed of by returning it to a municipal recycling collection point. Check local regulations for disposal of electronic products.

Green IBASE

This product is compliant with the current RoHS restrictions and prohibits use of the following substances in concentrations exceeding 0.1% by weight (1000 ppm) except for cadmium, limited to 0.01% by weight (100 ppm).

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent chromium (Cr6+)
- Polybrominated biphenyls (PBB)
- Polybrominated diphenyl ether (PBDE)

Important Safety Information

Carefully read the precautions before using the board.

Environmental conditions:

- Use this product in environments with ambient temperatures between 0˚C and 60˚C.
- Do not leave this product in an environment where the storage temperature may be below -20° C (-4° F) or above 80° C (176° F). To prevent from damages, the product must be used in a controlled environment.

Care for your IBASE products:

- Before cleaning the PCB, unplug all cables and remove the battery.
- Clean the PCB with a circuit board cleaner or degreaser, or use cotton swabs and alcohol.
- Vacuum the dust with a computer vacuum cleaner to prevent the fan from being clogged.

WARNING

Attention during use:

- Do not use this product near water.
- Do not spill water or any other liquids on this product.
- Do not place heavy objects on the top of this product.

Anti-static precautions

- Wear an anti-static wrist strap to avoid electrostatic discharge.
- Place the PCB on an anti-static kit or mat.
- Hold the edges of PCB when handling.
- Touch the edges of non-metallic components of the product instead of the surface of the PCB.
- Ground yourself by touching a grounded conductor or a grounded bit of metal frequently to discharge any static.

CAUTION

Danger of explosion if the internal lithium-ion battery is replaced by an incorrect type. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions or recycle them at a local recycling facility or battery collection point.

Warranty Policy

- **IBASE standard products:**

  24-month (2-year) warranty from the date of shipment. If the date of shipment cannot be ascertained, the product serial numbers can be used to determine the approximate shipping date.

- **3rd-party parts:**

  12-month (1-year) warranty from delivery for the 3rd-party parts that are not manufactured by IBASE, such as CPU, CPU cooler, memory, storage devices, power adapter, panel and touchscreen.

* PRODUCTS, HOWEVER, THAT FAIL DUE TO MISUSE, ACCIDENT, IMPROPER INSTALLATION OR UNAUTHORIZED REPAIR SHALL BE TREATED AS OUT OF WARRANTY AND CUSTOMERS SHALL BE BILLED FOR REPAIR AND SHIPPING CHARGES.

Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you need any further assistance from your distributor or sales representative, prepare the following information of your product and elaborate upon the problem.
   - Product model name
   - Product serial number
   - Detailed description of the problem
   - The error messages in text or in screenshots if there is any
   - The arrangement of the peripherals
   - Software in use (such as OS and application software, including the version numbers)
3. If repair service is required, please log in to the RMA system of the website or and contact your distributor or sales representative for assistance.

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Chapter 1
General Information

The information provided in this chapter includes:

- Features
- Packing List
- Optional Accessories
- Block Diagram
- Specifications
- Board Overview
- Board Dimensions

1.1 Introduction

The IB990 PICMG1.3 SHB Express CPU Card is based on the latest Intel® Q170, C236. The platform supports 6th Gen. Intel® Xeon® E3 v5 family or Core™ i7/i5/i3 DT processors with speeds of up to 4.0GHz and features an integrated graphics core that work with CRT, DVI-I and DVI-D display outputs.

IB990 utilizes the dramatic increase in performance provided Intel's latest cutting-edge technology. Measuring 338mm x122mm, the IB990 offers fast 6Gbps SATA support (up to 6 ports), USB3.0 (6 ports) and interfaces for two Gigabit Ethernet.

Photo of IB990AF (for Q170)

1.2 Features

- Intel® Xeon® E3 v5 Family / 6th Gen. Core™ i7/i5/i3 Processor, up to 4.0 GHz
- 2 x DDR4- 2133 UDIMM, Max. 32GB, ECC supported per CPU SKUs
- Intel® Processor integrated graphics, supports DVI-I, CRT, DVI-D
- 2 x Intel® PCI-E Gigabit LAN
- 3 x USB3.0, 2 x USB2.0, 4 x COM, max. 6 x SATA III
- 1 x Mini PCI-E slot
- Watchdog timer, Digital I/O, iAMT (11.0)

1.3 Packing List

Your IB990 package should include the items listed below. If any of the items below is missing, contact the distributor or dealer from whom you purchased the product.

- The IB990 PICMG1.3 SHB x 1
- SATA cable (SATA-5) x 1
- PS/2 Keyboard & Mouse Cable (KBMS-3) x 1
- COM Ports Cable (PK1-20BK) x 1
- USB 2.0 Cable (USB2K-9)

1.4 Optional Accessories

- Audio Cable (Audio-18K)
- DVI-D Cable (DVIK-3)
- VGA Cable (VGA23)
- USB 3.0 Cable (USB-3K)
- Printer Port Cable (PK3K)

1.5 Specifications

Product Name	IB990AF (for Q170)	IB990AF-C236 (for C236)
Form Factor	PICMG 1.3 SHB Express full size CPU card	
System		
Operating System	• Windows 10 (64b) • Windows 8.1 (64b) / Embedded Industrial (64b) • Windows 7 Pro (32b/64b) • Linux Fedora (64b) / Ubuntu (64b)	
CPU Type	• Intel® Xeon® E3 processor v5 Family (14nm monolithic) • Intel® 6th Gen. Core™ i7 / i5 / i3 DT processor (14nm monolithic) TDP: QC @ 35W / 65W / 80W ; DC@ 35W / 65W Package: 37.5 mm x 37.5 mm x 4.4 mm	
CPU Speed	Up to 4.0 GHz	
CPU Socket	LGA1151	
Chipset	Intel® PCH-H, Package = FCBGA 23 mm x 23 mm x 0.5 mm	
	Q170	C236
Security	TPM 1.2	N/A
Memory	Intel® 6th Gen. Core™ DT processors integrated memory controller • DDR4-2133 MHz at 1.2V • 2 x UDIMM (288-pin vertical type), Max. 32GB * ECC will be supported by identified CPU SKUs.	
iAMT 11.0	Yes	
Watchdog Timer	Yes (256 segments, 0, 1, 2…255 sec / min)	
BIOS	AMI BIOS	

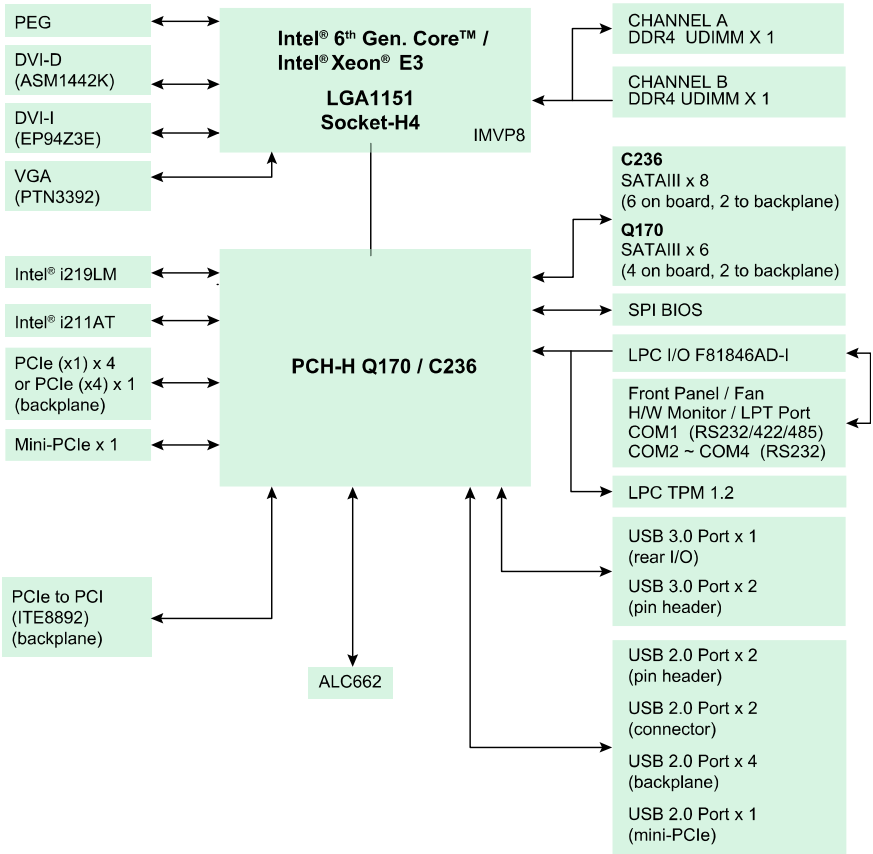
Product Name	IB990AF (for Q170)	IB990AF-C236 (for C236)
System Voltage	+5V, +3.3V, +12V, -12V & 5VSB	
Dimensions	338mm x 126mm	
RoHS	Yes	
Certification	CE, FCC, LVD	
I/O Ports		
SATA	Intel® PCH-H built-in SATA controller, SATAIII (3.0) 6 Gbps	
	6 ports: • 4 ports on board • 2 ports to backplane	8 ports: • 6 ports on board • 2 ports to backplane
LAN	• Intel® I219LM GbE PHY (Supports iAMT) • Intel® I211AT GbE LAN as 2nd GbE * There is no LAN signal to the backplane.	
USB	**4 x USB 2.0 host controller (PCH-H Integrated)** • 2 ports (on-board pin header) • 2 ports (on-board USB connector, vertical type) **3 x USB 3.0 host controller (PCH-H integrated)** • 1 port via the rear panel I/O • 2 ports via on board box header	
Audio	Intel® PCH-H built-in high definition audio with Realtek ALC662 Codec Supports 5.1 channel	

Product Name	IB990AF (for Q170)	IB990AF-C236 (for C236)
Super I/O	**Fintek F81846AD-I** • COM1 (RS-232 /422 / 485) supports ring-in with power at 500 mA (selectable for 5V or 12V) *F81439 transceiver for jumper-less selection • COM2~ COM4 (RS-232 only) **Hardware Monitor** (2 thermal inputs, 4 voltage monitor inputs & 2 Fan headers) • 1 x CPU Fan (PWM fan type, 4-pin connector) • 1 x SYS Fan (DC fan type, 3-pin connector) • 1 x Parallel port	
Digital IO	4 In & 4 Out	
KB / Mouse	Supports PS/2 Keyboard / Mouse	
Interface	1 x PCIe (x16) 4 x PCIe (x1) or 1 x PCIe (x4) 4 x PCI masters (through ITE IT8892E)	
Expansion Slots	1 x Mini-PCIe slot • Supports USB 2.0 • Supports PCIe (x1) signal	
Display		
VGA	Intel® Xeon® E3 v5 family or Intel® 6th Gen. Core™ i7/i5/i3 DT processors integrated graphics • 1 x DVI-I • 1 x CRT (header on board) • 1 x DVI-D (header on board)	

Product Name	IB990AF (for Q170)	IB990AF-C236 (for C236)
Environment		
Temperature	• Operation: 0 ~ 60 °C • Storage: -20 ~ 80 °C	
Humidity	Relative humidity: 0 ~ 90 %, non-condensing	

All specifications are subject to change without prior notice.

1.6 Block Diagram



1.7 Overview

Top View

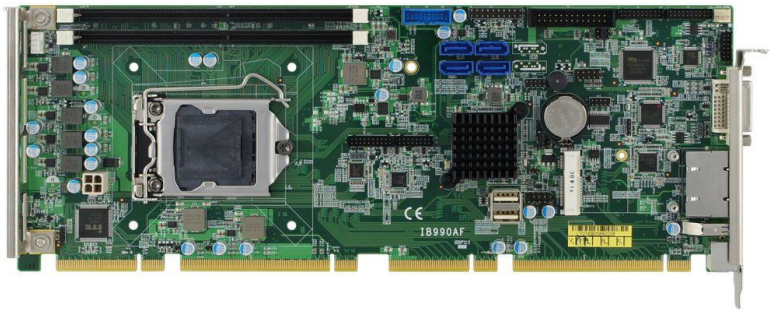


Photo of IB990AF (for Q170)

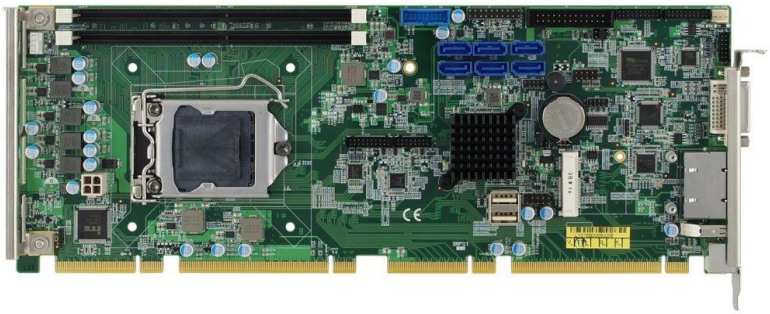
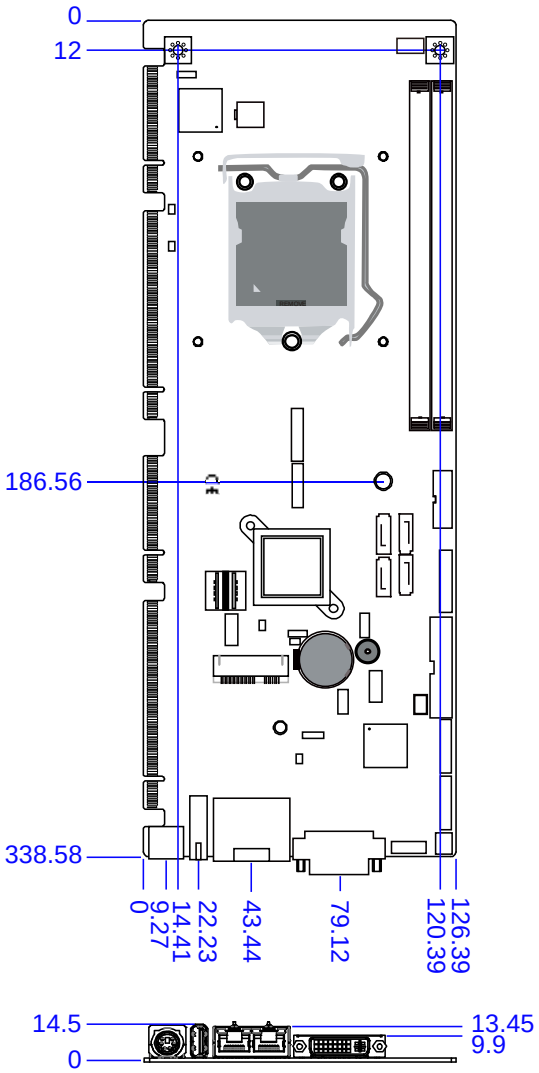


Photo of IB990AF-C236 (for C236)

I/O View

* The photos above are for reference only. Some minor components may differ.

1.8 Dimensions



Board diagram of IB990AF (for Q170)

Chapter 2
Hardware Configuration

This section provides information on jumper settings and connectors on the IB990 in order to set up a workable system. On top of that, you will also need to install crucial pieces such as the CPU and the memory before using the product. The topics covered are:

- Essential installations before you begin: CPU and the memory
- Jumper and connector locations
- Jumper settings and information of connectors

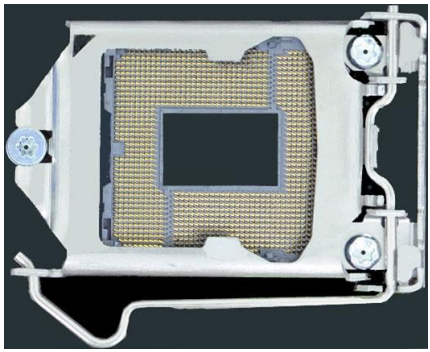
2.1 Essential Installations Before You Begin

Follow the instructions below to install the CPU and the memory.

2.1.1 Installing the CPU

The IB990 board supports an LGA1151 Socket (shown below) for Intel® Xeon® E3 v5 family or Intel® 6th Gen. Core™ i7 / i5 / i3 DT processor processors. Follow the instructions below to install the CPU.

1. Unlock the socket by pressing the lever sideways, then lift up the lever and the metal lid.
2. Position the CPU above the socket such that the CPU corner aligns with the gold triangle matching the socket corner with a small triangle.
3. Carefully insert the CPU into the socket and push down the lever to secure the CPU.

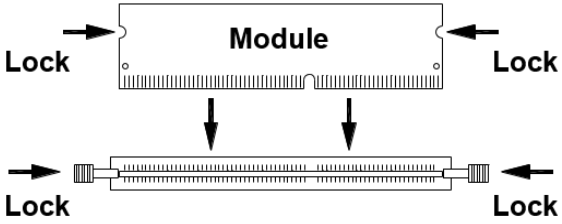


Then you can install the CPU cooler and fan.

Note: Ensure that the CPU cooler and the CPU top surface are in total contact to avoid CPU overheating problem that would cause your system to hang or be unstable.

2.1.2 Installing the Memory

The IB990 board supports two DDR4 memory socket for a maximum total memory of 32GB in DDR4 UDIMM memory type. To install the modules, locate the memory slot on the board and perform the following steps:



1. Hold the module so that the key of the module aligned with that on the memory slot.
2. Gently push the module in an upright position until the clips of the slot close to hold the module in place when the module touches the bottom of the slot.

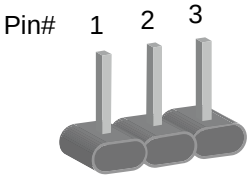
To remove the module, press the clips outwards with both hands

2.2 Setting the Jumpers

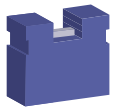
Set up and configure your IB990 by using jumpers for various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your use.

2.2.1 How to Set Jumpers

Jumpers are short-length conductors consisting of several metal pins with a non-conductive base mounted on the circuit board. Jumper caps are used to have the functions and features enabled or disabled. If a jumper has 3 pins, you can connect either PIN1 to PIN2 or PIN2 to PIN3 by shorting.

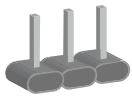
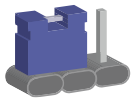
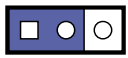
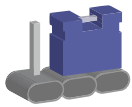
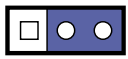


A 3-pin jumper



A jumper cap

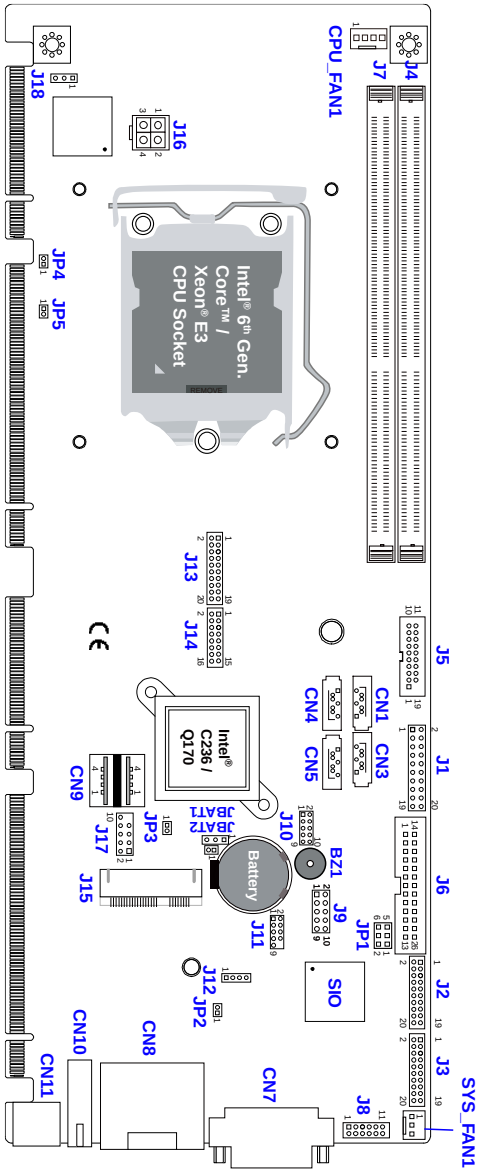
Refer to the illustration below to set jumpers.

Pin closed	Oblique view	Schematic illustration in the manual
Open		
1-2		
2-3		

When two pins of a jumper are encased in a jumper cap, this jumper is **closed**, i.e. turned **On**.

When a jumper cap is removed from two jumper pins, this jumper is **open**, i.e. turned **Off**.

2.3 Jumper & Connector Locations on IB990

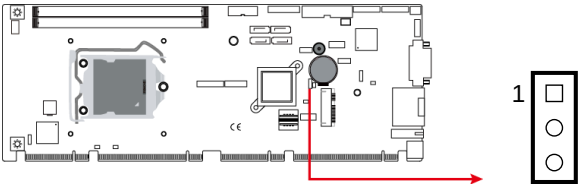


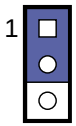
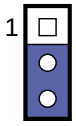
Board diagram of IB990AF (for Q170)

2.4 Jumpers Quick Reference

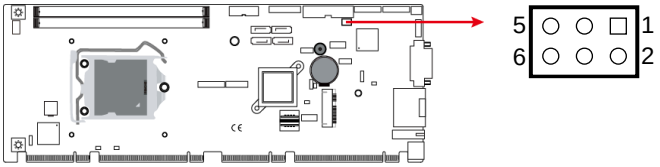
Function	Jumper Name	Page
Clear CMOS Content	JBAT1	16
COM1 RS-232 Power Setting	JP1	17
PCIe (x16) Bifurcation Selection	JP4, JP5	18

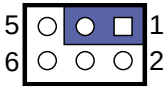
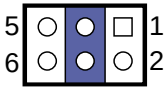
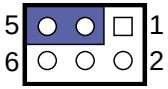
2.4.1 Clear CMOS Content (JBAT1)



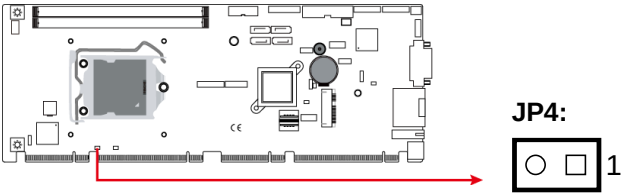
Function	Pin closed	Illustration
Normal	1-2	
Clear CMOS	2-3	

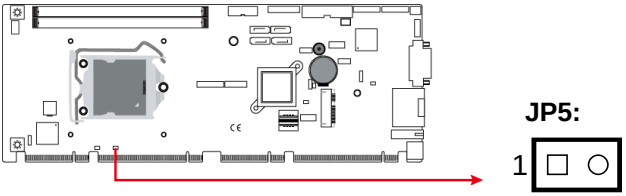
2.4.2 COM1 RS232 Power Setting (JP1)



Function	Pin closed	Illustration
+12V	1-3	
RI	3-4	
+5V	3-5	

2.4.3 PCIe (x16) Bifurcation Selection (JP4 & JP5)



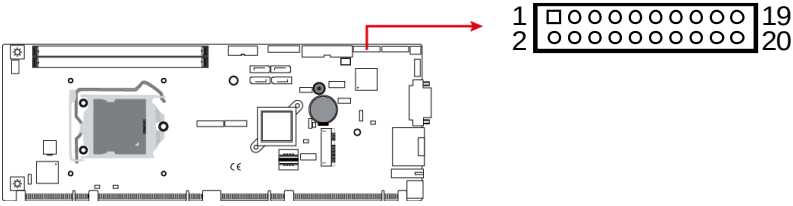


Function	Pin closed	Illustration
1 x PCIe (x16)	**JP4:** Open	○ □ 1
	JP5: Open	1 □ ○
2 x PCIe (x8)	**JP4:** Open	○ □ 1
	JP5: Close	1 ■ ○
1 x PCIe (x8) 2 x PCIe (x4)	**JP4:** Close	○ ■ 1
	JP5: Close	1 ■ ○

2.5 Connectors Quick Reference

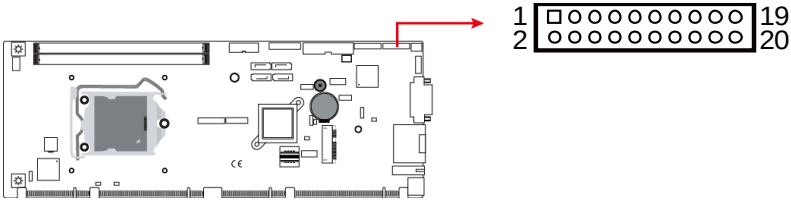
Function	Connector Name	Page
COM1 and COM2 Serial Port	J2	20
COM3, COM4 Serial Port	J3	21
USB3.0 / USB 2.0 Connector	J5	22
USB2.0 Connectors	J17	23
Front Panel Function Connector	J1	24
External Audio Connector	J8	25
ATX 12V Power Connector	J16	26
Digital I/O 4 In/4 Out	J9	26
DVI-D Port	J13	27
Parallel Port	J6	28
VGA Port	J14	29
CPU Fan Power Connector	CPU_FAN1	30
System Fan1 Power Connector	SYS_FAN1	30

2.5.1 COM1 and COM2 Serial Port (J2)



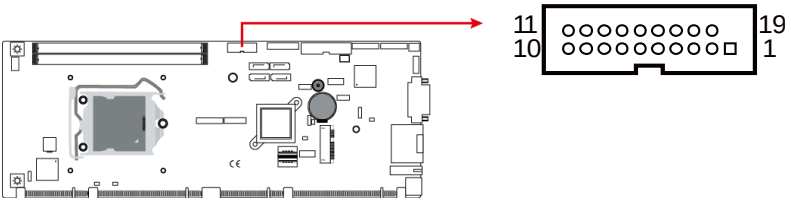
Pin #	Assigment	Pin #	Assigment
1	DCD1	11	DCD2
2	DSR1	12	DSR2
3	RXD1	13	RXD2
4	RTS1	14	RTS2
5	TXD1	15	TXD2
6	CTS1	16	CTS2
7	DTR1	17	DTR2
8	RI1	18	RI2
9	Ground	19	Ground
10	NC	20	NC

2.5.2 COM3, COM4 Serial Port (J3)



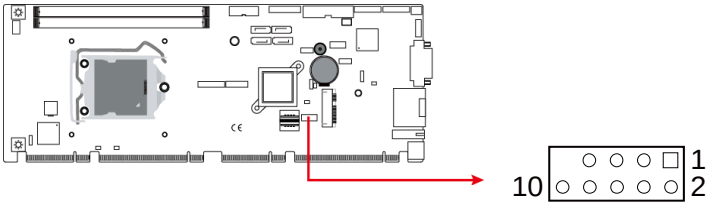
Pin #	Assigment	Pin #	Assigment
1	DCD3	11	DCD4
2	DSR3	12	DSR4
3	RXD3	13	RXD4
4	RTS3	14	RTS4
5	TXD3	15	TXD4
6	CTS3	16	CTS4
7	DTR3	17	DTR4
8	RI3	18	RI4
9	Ground	19	Ground
10	NC	20	NC

2.5.3 USB3.0/2.0 Connector (J5)



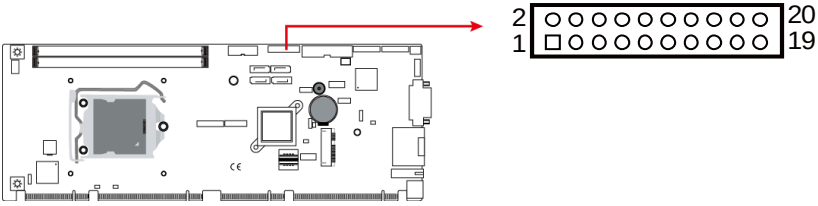
Pin #	Assigment	Pin #	Assigment
1	VCC(900mA)	11	P2_U2_D+
2	P1_SSRX-	12	P2_U2_D-
3	P1_SSRX+	13	GND
4	GND	14	P2_SSTX+
5	P1_SSTX-	15	P2_SSTX-
6	P1_SSTX+	16	GND
7	GND	17	P2_SSRX+
8	P1_U2_D-	18	P2_SSRX-
9	P1_U2_D+	19	VCC(900mA)
10	NC		

2.5.4 USB2.0 Connectors (J17)



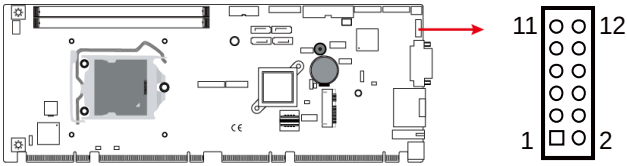
Pin #	Assigment	Pin #	Assigment
1	VCC (500mA)	6	D1+
2	VCC (500mA)	7	Ground
3	D0-	8	Ground
4	D1-	9	- -
5	D0+	10	NC

2.5.5 Front Panel Function Connector (J1)



Pin #	Assigment	Pin #	Assigment
1	VCC	11	Ground
2	Speaker Out	12	NC
3	NC	13	Ground
4	NC	14	PWR_SW
5	Ground	15	NC
6	Ground	16	NC
7	NC	17	Ground
8	VCC	18	RST
9	Ground	19	HDD LED +
10	NC	20	HDD LED -

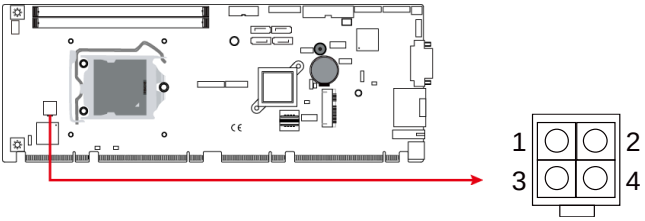
2.5.6 External Audio Connector (J8)



J8 is a 12-pin header that is used to connect to the optional audio cable.

Pin #	Assigment	Pin #	Assigment
1	Line out_L	7	JD_LINE IN
2	Line out_R	8	Ground
3	JD_FRONT	9	MIC-L
4	Ground	10	MIC-R
5	LINE IN_L	11	JD_MIC1
6	Line in_R	12	Ground

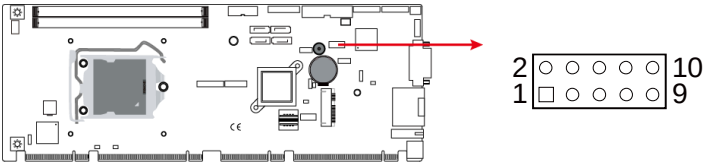
2.5.7 ATX 12V Power Connector (J16)



J16 connector supplies the CPU operating voltage.

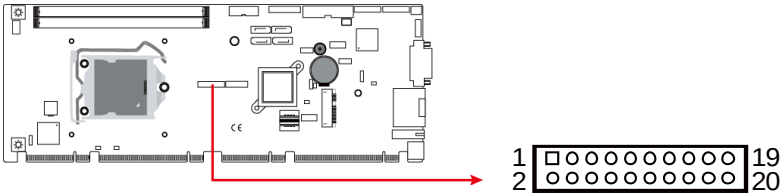
Pin #	Assigment	Pin #	Assigment
1	Ground	3	+12V-IN
2	Ground	4	+12V-IN

2.5.8 Digital I/O 4 In/4 Out (J9)



Pin #	Assigment	Pin #	Assigment
1	GND	6	OUT0
2	VCC	7	IN3
3	OUT3	8	IN1
4	OUT1	9	IN2
5	OUT2	10	IN0

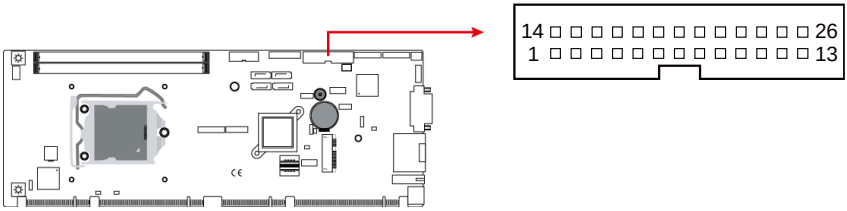
2.5.9 DVI-D Port (J13)



J13 is a 20-pin header used to connect to the optional DVI-D cable.

Pin #	Assigment	Pin #	Assigment
1	TDC1_B	11	TDC2_B
2	TDC1#_B	12	TDC2#_B
3	Ground	13	Ground
4	Ground	14	Ground
5	TLC_B	15	TDC0_B
6	TLC#_B	16	TDC0#_B
7	Ground	17	N.C.
8	5V	18	N.C.
9	HPDET_B	19	SD_DDC_B
10	N.C.	20	SC_DDC_B

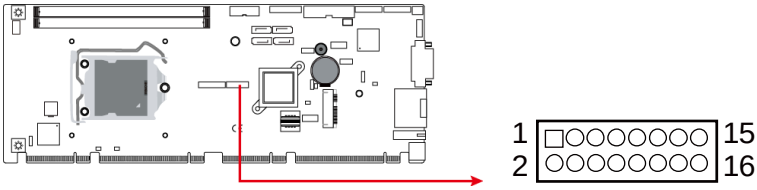
2.5.10 Parallel Port (J6)



J6 is a 26-pin header used to connect to the optional printer port cable.

Pin #	Assigment	Pin #	Assigment
1	Line printer strobe	14	Auto Feed
2	PD0, parallel data 0	15	Error
3	PD1, parallel data 1	16	Initialize
4	PD2, parallel data 2	17	Select
5	PD3, parallel data 3	18	Ground
6	PD4, parallel data 4	19	Ground
7	PD5, parallel data 5	20	Ground
8	PD6, parallel data 6	21	Ground
9	PD7, parallel data 7	22	Ground
10	ACK, acknowledge	23	Ground
11	Busy	24	Ground
12	Paper empty	25	Ground
13	Select	26	Ground

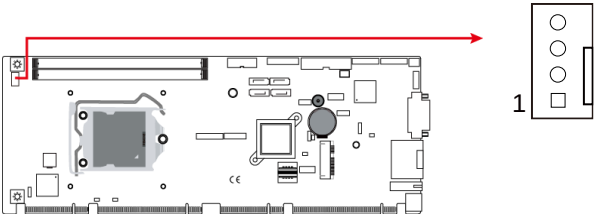
2.5.11 VGA Port (J14)



J14 is a 16-pin header used to connect to the optional VGA port cable.

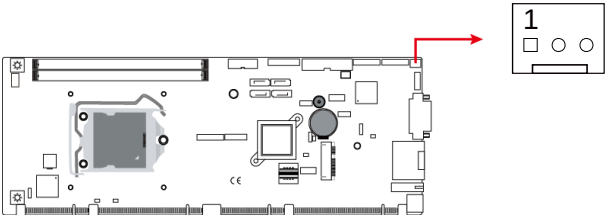
Pin #	Assigment	Pin #	Assigment
1	CRT1_RED	9	Ground
2	5V	10	CRT1_HSYN_R
3	CRT1_GREEN	11	Ground
4	Ground	12	CRT1_VSYN_R
5	CRT1_BLUE	13	Ground
6	NC	14	CRT1_DDC_CLK_ISO
7	NC	15	Ground
8	CRT1_DDC_DATA_ISO	16	NC

2.5.12 CPU Fan Power Connector (CPU_FAN1)



Pin #	Assigment	Pin #	Assigment
1	Ground	3	Rotation detection
2	+12V(1A)	4	Control

2.5.13 System Fan1 Power Connector (SYS_FAN1)



Pin #	Assigment	Pin #	Assigment
1	Ground	3	Rotation detection
2	+12V(1A)		

Chapter 3
Drivers Installation

This chapter introduces installation of the following drivers:

- Intel® Chipset Software Installation Utility
- VGA Driver
- HD Audio Driver
- LAN Driver
- Intel® Management Engine Interface
- Intel® USB 3.0 Driver

3.1 Introduction

This section describes the installation procedures for software and drivers. The contents of this section include the following:

Note: After installing your Windows operating system, you must install first the Intel Chipset Software Installation Utility before proceeding with the drivers installation.

3.2 Intel® Chipset Software Installation Utility

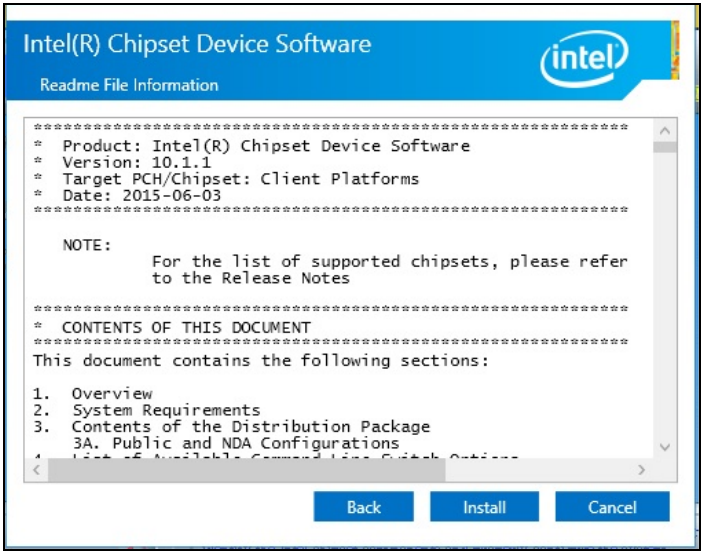
The Intel® Chipset drivers should be installed first before the software drivers to install INF files for Plug & Play function for Intel chipset components. Follow the instructions below to complete the installation.

1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. Click Intel(R) Chipset Software Installation Utility.

3. When the *Welcome* screen to the Intel® Chipset Device Software appears, click **Next** to continue.
4. Click **Yes** to accept the software license agreement and proceed with the installation process.

5. On the *Readme File Information* screen, click **Install** for installation.



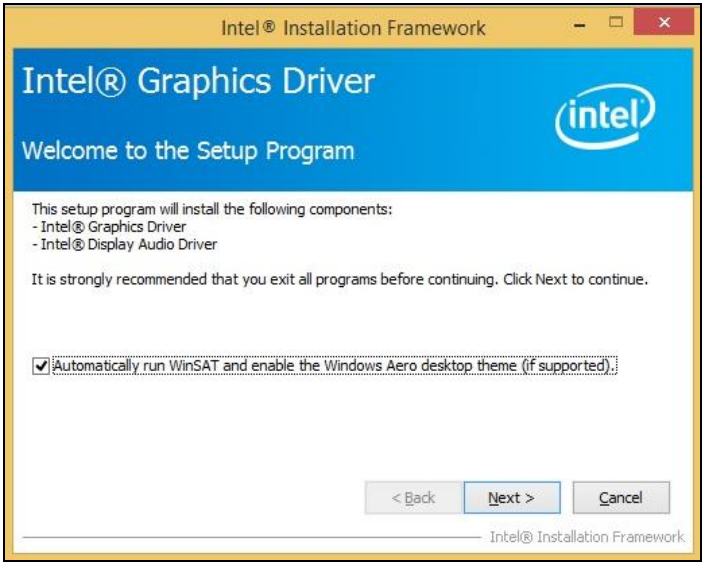
6. The driver has been completely installed. Click **Finish** to restart the computer and for changes to take effect.

3.3 VGA Driver Installation

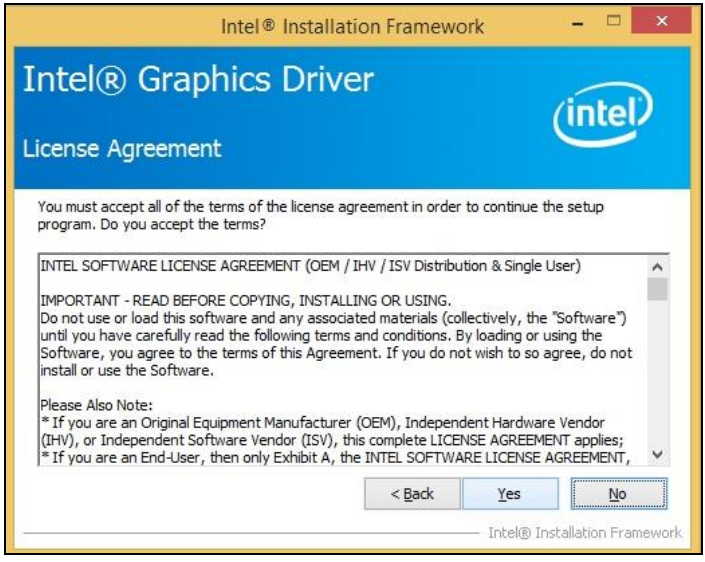
1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. Click **Intel(R) HD Graphics Driver**.

3. When the *Welcome* screen appears, click **Next** to continue.

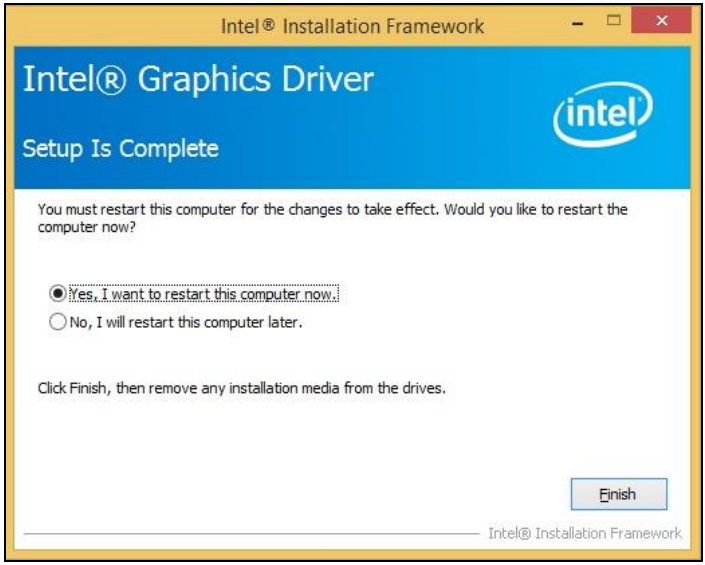


4. Click **Yes** to agree with the license agreement and continue the installation.



5. On the *Windows Security* screen shown below, click **Install** to continue.

6. The driver has been completely installed. Click **Finish** to restart the computer and for changes to take effect.

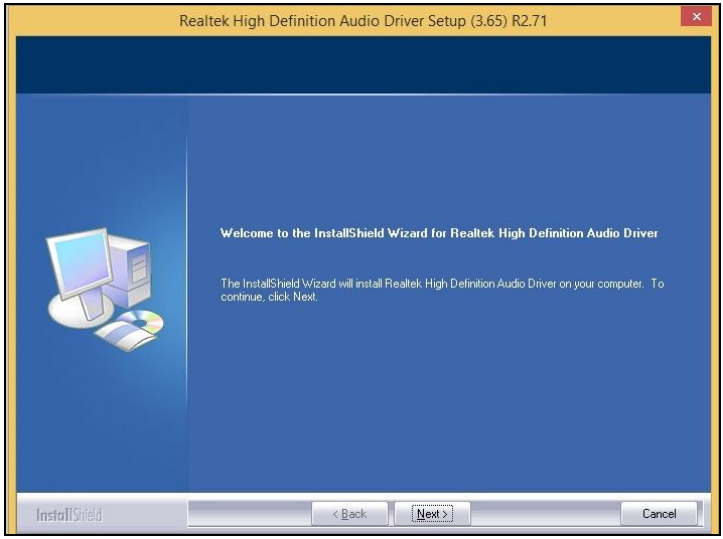


3.4 HD Audio Driver Installation

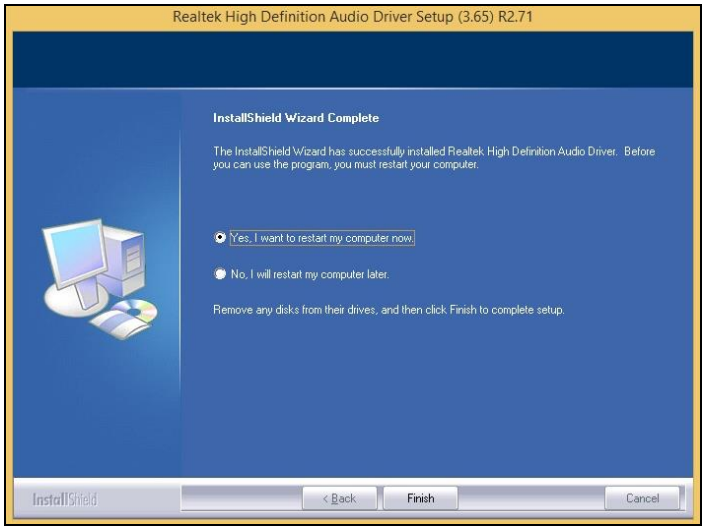
1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. Click **Realtek High Definition Audio Driver**.

3. On the *Welcome* screen of the InstallShield Wizard, click **Next** for installation.



4. The installation is complete. Click **Finish** to restart the computer and for changes to take effect.

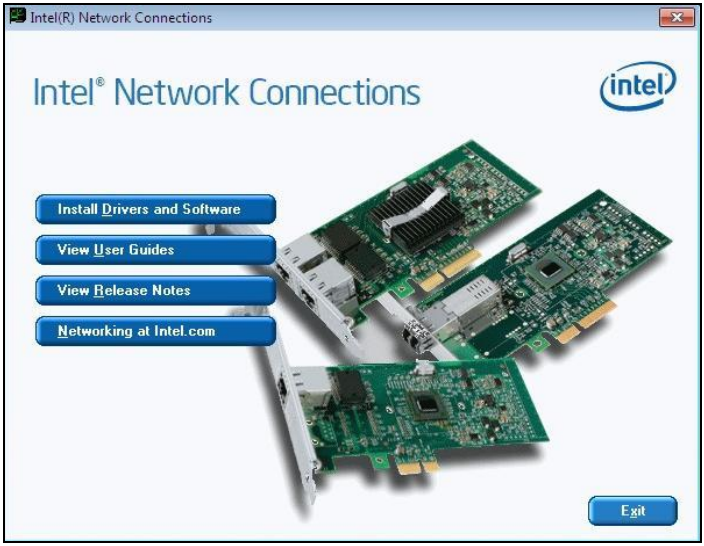


3.5 LAN Driver Installation

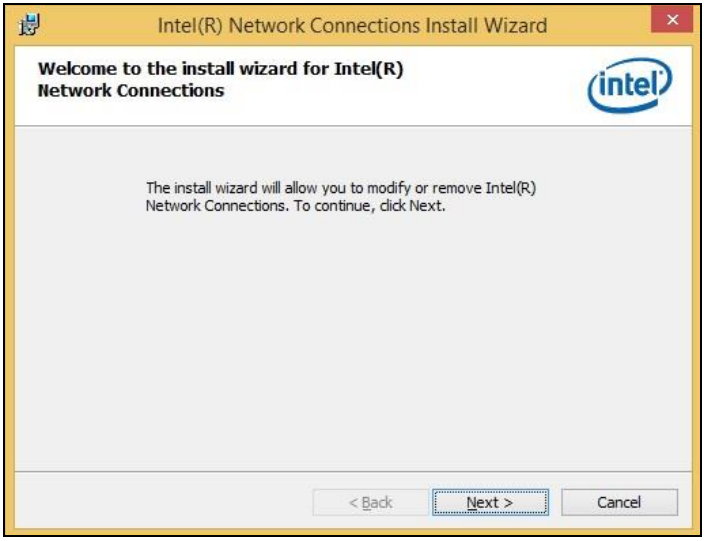
1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. Click **Intel(R) PRO LAN Network Drivers**.

3. On the screen of *Intel® Network Connections*, click **Install Drivers and Software**.

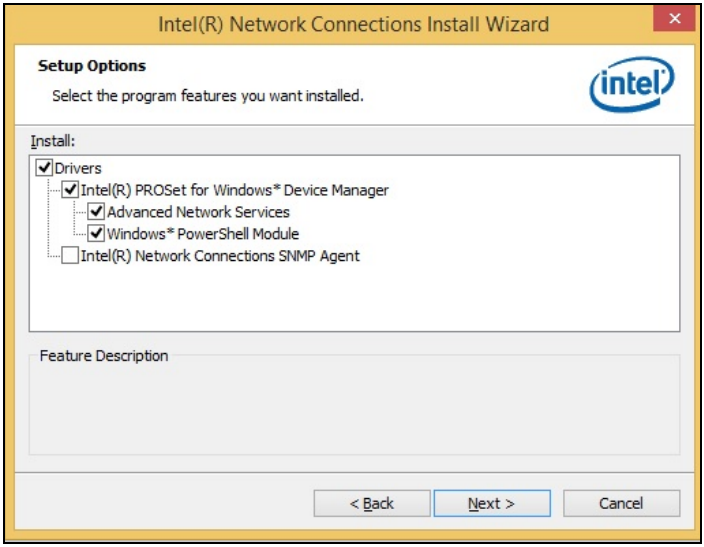


4. When the *Welcome* screen appears, click **Next**.

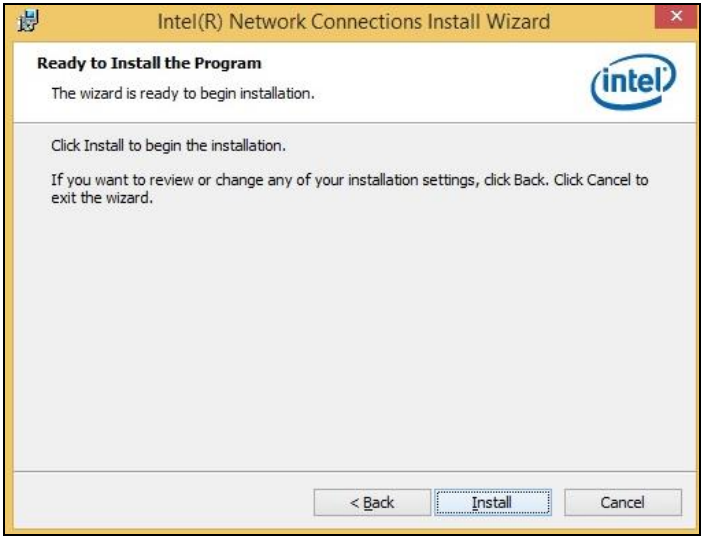


5. Click **Next** to to agree with the license agreement.

6. On the *Setup Options* screen, click the checkbox to select the desired driver(s) for installation. Then click **Next** to continue.



7. The wizard is ready for installation. Click **Install**.

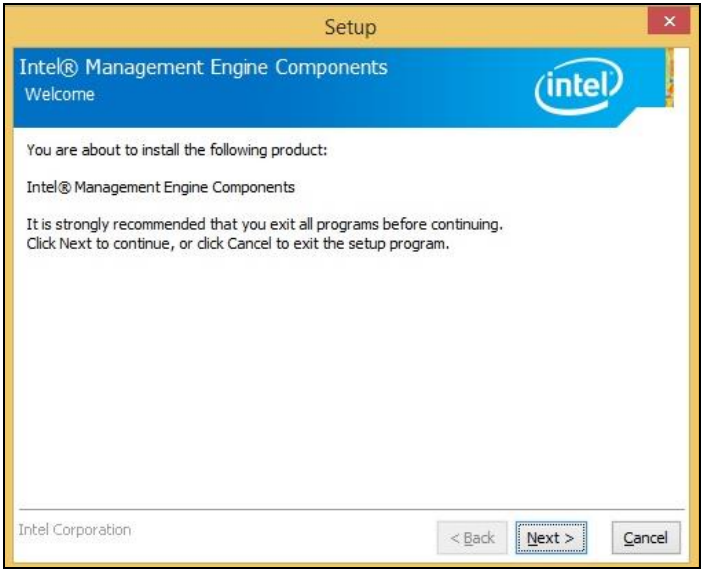


8. As the installation is complete, click **Finish**. Click **Finish** to restart the computer and for changes to take effect.

3.6 Intel® Management Engine Interface

1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. When the *Welcome* screen to the InstallShield Wizard for Intel® Management Engine Components appears, click **Next**.



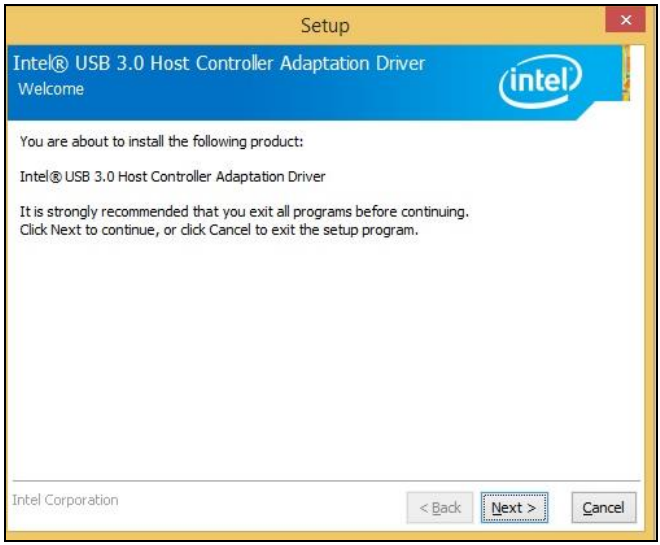
3. Click **Next** to to agree with the license agreement.
4. When the *Setup Progress* screen appears, click **Next**.
5. As the driver has been sccessfully installed, click **Finish**. Click **Finish** to restart the computer and for changes to take effect.

3.7 Intel® USB 3.0 Driver

1. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

2. Click **Intel(R) USB 3.0 Drivers**.

3. When the *Welcome* screen to the InstallShield Wizard for Intel® USB 3.0 Host Controller Driver appears, click **Next**.



4. Click **Next** to to agree with the license agreement.
5. On the *Readme File Information* screen, click **Next** for installation.
6. The driver has been successfully installed. Click **Finish** to restart the computer and for changes to take effect.

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Chapter 4
BIOS Setup

This chapter describes the different settings available in the AMI BIOS that comes with the board. The topics covered in this chapter are as follows:

- Main Settings
- Advanced Settings
- Chipset Settings
- Security Settings
- Book Settings
- Save & Exit

4.1 Introduction

The BIOS (Basic Input/Output System) installed in the ROM of your computer system supports Intel® processors. The BIOS provides critical low-level support for standard devices such as disk drives, serial ports and parallel ports. It also provides password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

4.2 BIOS Setup

The BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the BIOS is immediately activated. Press the <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup.

If you still need to enter Setup, restart the system by pressing the ”Reset” button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys.

You can also restart by turning the system Off and back On again.

The following message will appear on the screen:

```
Press  <DEL>  to  Enter  Setup
```

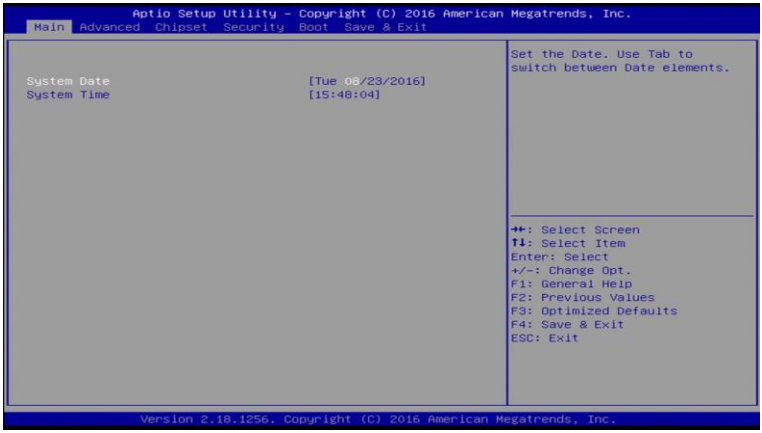
In general, press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help, and <Esc> to quit.

When you enter the BIOS Setup utility, the *Main Menu* screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

Warning: It is strongly recommended that you avoid making any changes to the chipset defaults.

These defaults have been carefully chosen by both AMI and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could make the system unstable and crash in some cases.

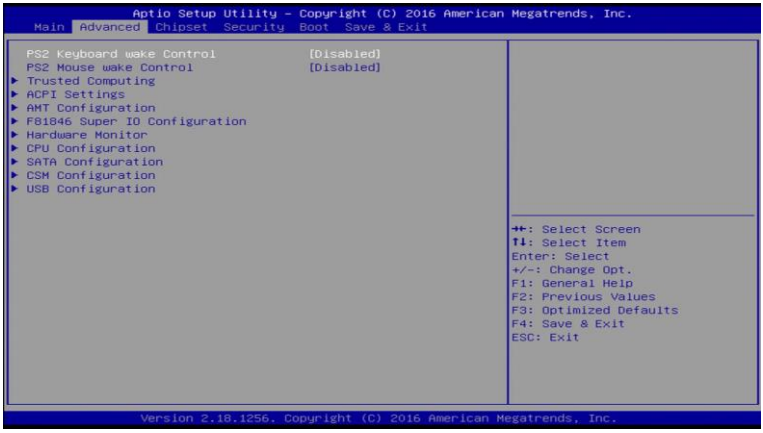
4.3 Main Settings



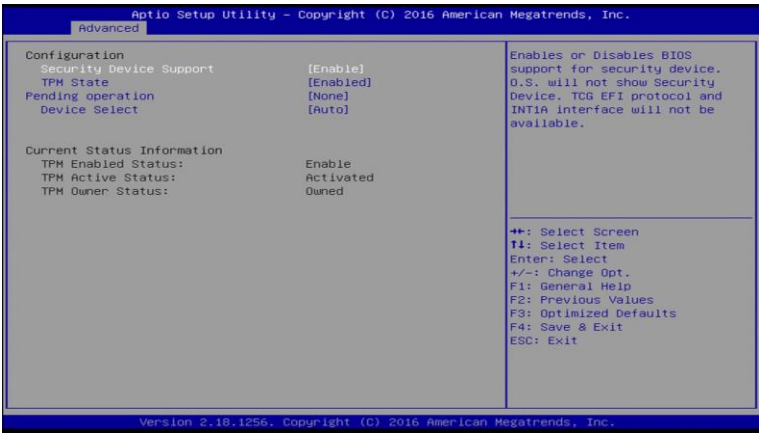
BIOS Setting	Description
System Date	Sets the date. Use the <Tab> key to switch between the date elements.
System Time	Set the time. Use the <Tab> key to switch between the time elements.

4.4 Advanced Settings

This section allows you to configure, improve your system and allows you to set up some system features according to your preference.

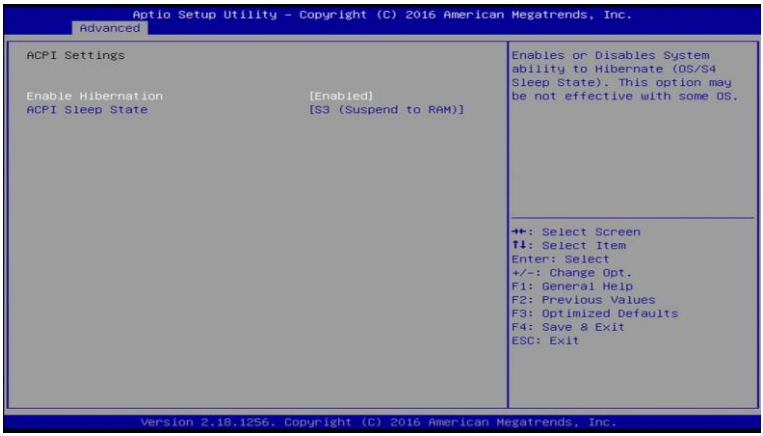


4.4.1 Trusted Computing



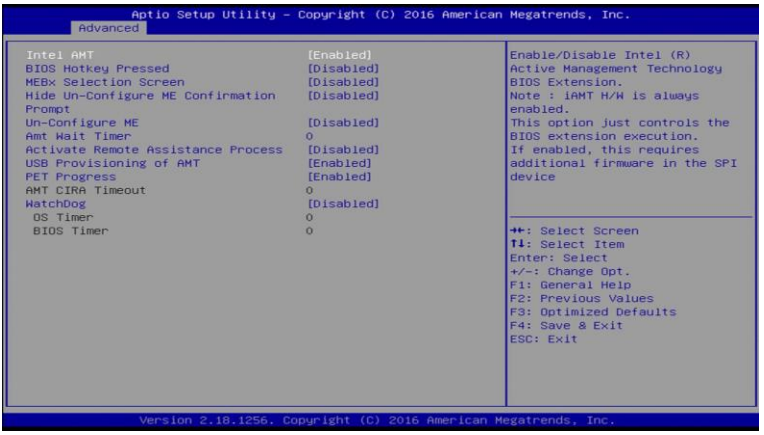
BIOS Setting	Description
Security Device Support	Enables / Disables TPM support. O.S. will not show TPM. Reset of platform is required. **Note:** This feature is not supported on IB990AF-C236.

4.4.2 ACPI Settings



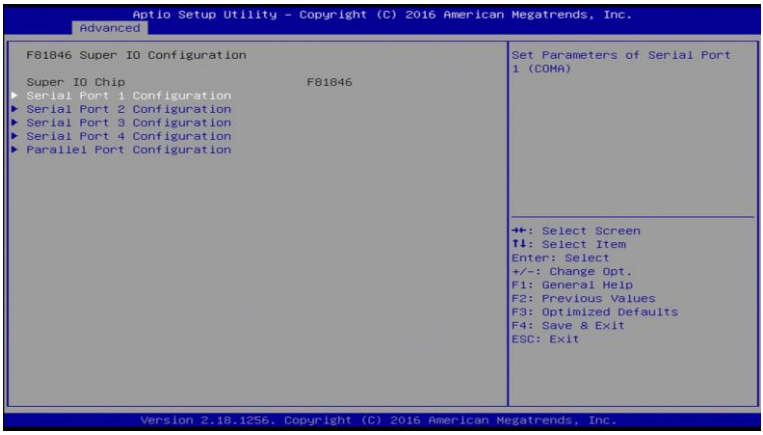
BIOS Setting	Description
Enable Hibernation	Enables / Disables the system ability to hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Selects an ACPI sleep state where the system will enter when the Suspend button is pressed.

4.4.3 AMT Configuration



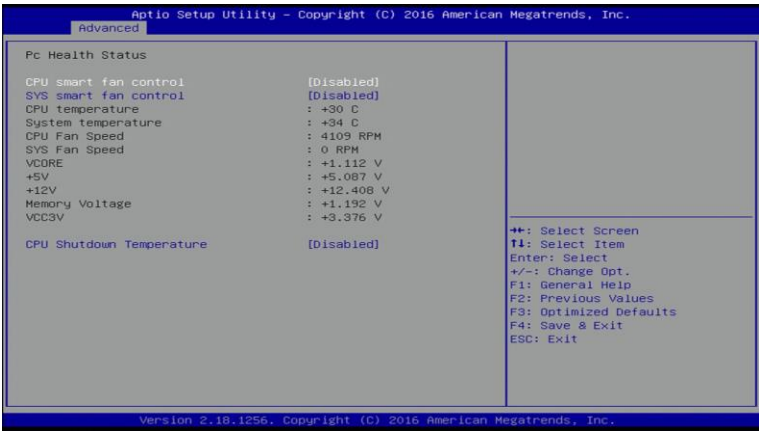
BIOS Setting	Description
AMT Configuration	Enables / Disables AMT configuration. **Note:** iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device.
Unconfigure ME	Unconfigures AMT/ME without password operation.
Amt Wait Timer	Sets timer to wait before sending ASF_GET_BOOT_OPTIONS.
Activate Remote Assistance Process	Triggers CIRA boot.
PET Progress	Enables / Disables PET events progress to receive PET events.
Watchdog Timer	Enables / Disables Watchdog Timer.

4.4.4 F81846 Super IO Configuration



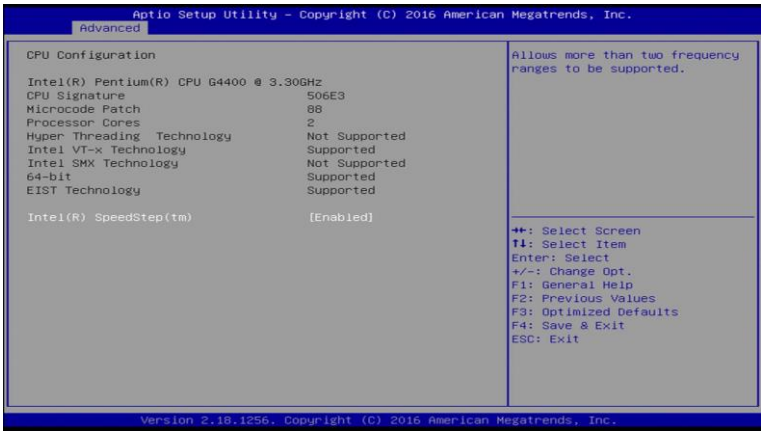
BIOS Setting	Description
Serial Port Configuration	Sets parameters of Serial Ports. Enables / Disables the serial port and select an optimal setting for the Super IO device.
Parallel Port Configuration	Set parameters of Parallel ports. (LPT/LPTE)

4.4.5 Hardware Monitor



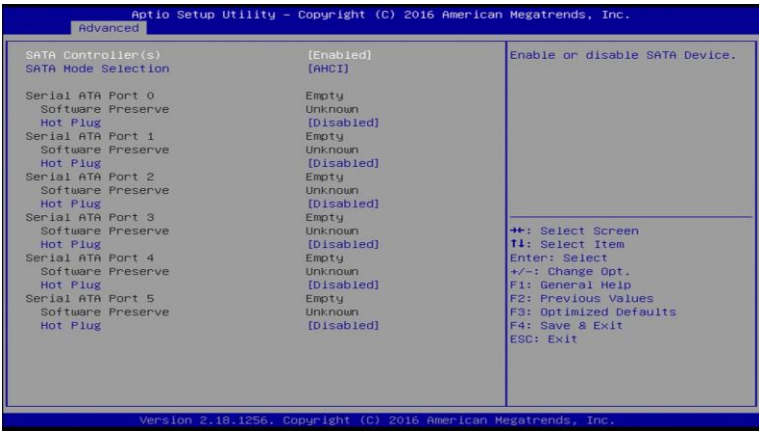
BIOS Setting	Description
CPU / System smart fan control	Enables / Disables the smart fan feature. • Disabled (default) • 50 ℃ • 60 ℃ • 70 ℃ • 80 ℃ • 90 ℃
Temperatures/Voltages	These fields are the parameters of the hardware monitoring function feature of the motherboard. The values are read-only values as monitored by the system and show the PC health status.

4.4.6 CPU Configuration



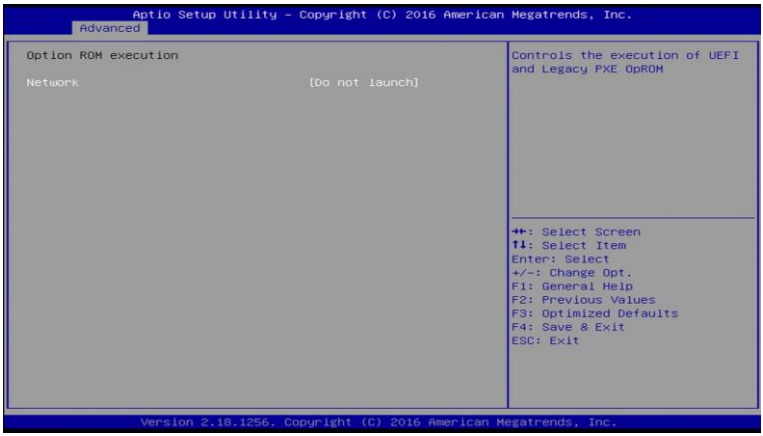
BIOS Setting	Description
Intel(R) SpeedStep(tm)	Allows more than two frequency ranges to be supported.

4.4.7 SATA Configuration



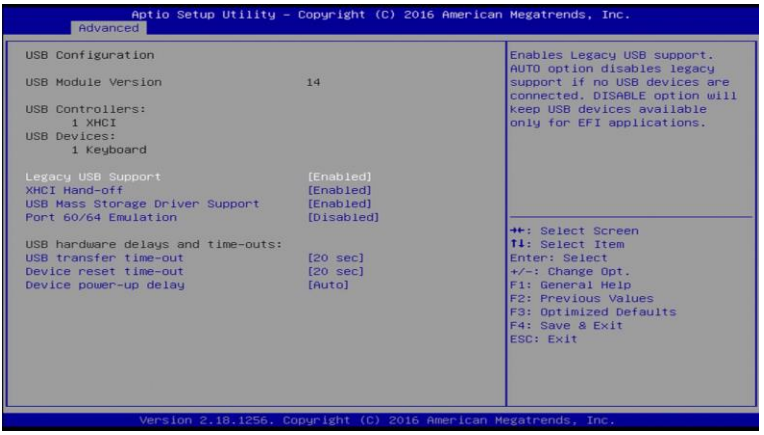
BIOS Setting	Description
SATA Controller(s)	Enables / Disables SATA devices.
SATA Mode Selection	Determines how the SATA controller(s) operate. • AHCI Mode • RAID Mode
Hot Plug	Designates this port as Hot Pluggable.
External SATA	Supports external SATA.
Spin Up Device	On an edge detection from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.
SATA Device Type	Identifies whether SATA port is connected to a solid state drive or a hard disk drive.
Topology	Identifies the SATA Topology that whether it is Default, ISATA, Flex, DirectConnect or M2.
Device sleep	mSata for RTD3
SATA DEVSLEP Idle Timeout Config	Enables / Disables SATA DTIO configuration.

4.4.8 CSM Configuration



BIOS Setting	Description
Network SATA Controller(s)	Controls the execution of UEFI and legacy PXE OpROM.

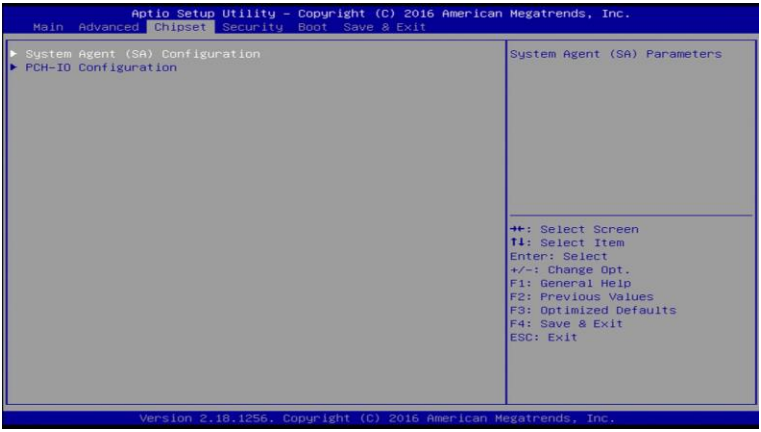
4.4.9 USB Configuration



BIOS Setting	Description
Legacy USB Support	Enables Legacy USB support. “Auto” disables legacy support if there is no USB device connected. “Disable” keeps USB devices available only for EFI applications.
XHCI Hand-off	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Enables / Disables the support for USB mass storage driver.
Port 60/64 Emulation	Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSes.
USB Transfer time-out	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	Seconds of delaying execution of start unit command to USB mass storage device.

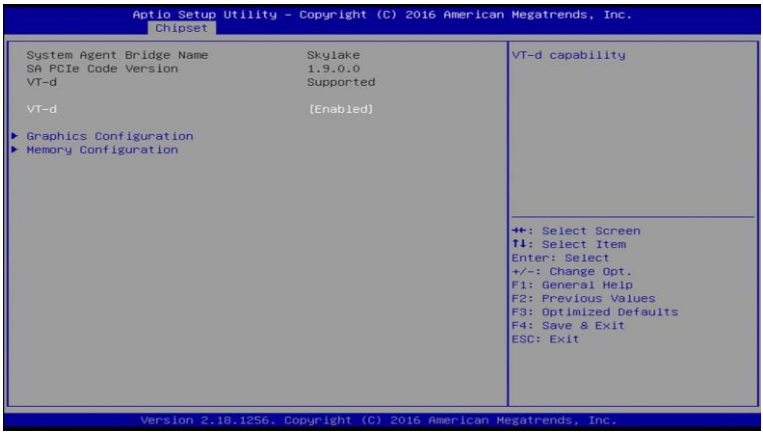
BIOS Setting	Description
Device power-up delay	The maximum time the device will take before it properly reports itself to the Host Controller. “Auto” uses default value for a Root port it is 100ms. But for a Hub port, the delay is taken from Hub descriptor.
EHCI Hand-off	Enabled / Disabled. This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.

4.5 Chipset Settings



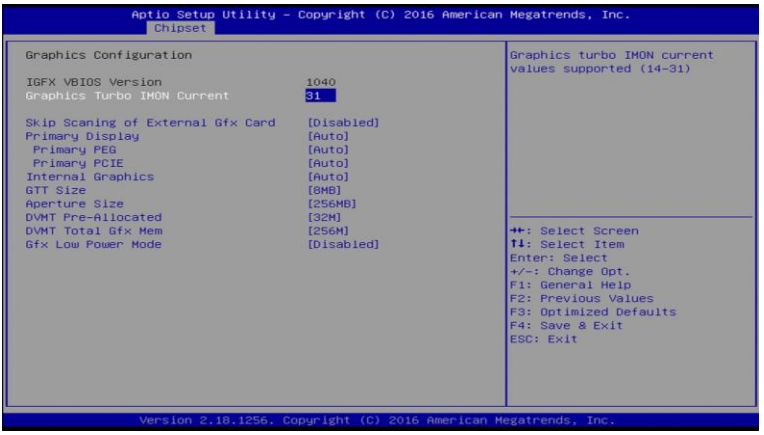
BIOS Setting	Description
System Agent (SA) Configuration	System Agent (SA) parameters
PCH-IO Configuration	PCH parameters

4.5.1 System Agent (SA) Configuration



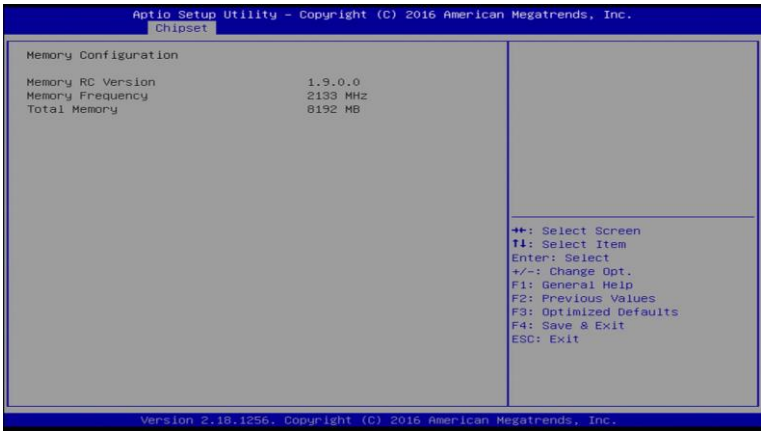
BIOS Setting	Description
VT-d	Checks if VT-d function on MCH is supported.

4.5.2 Graphics Configuration



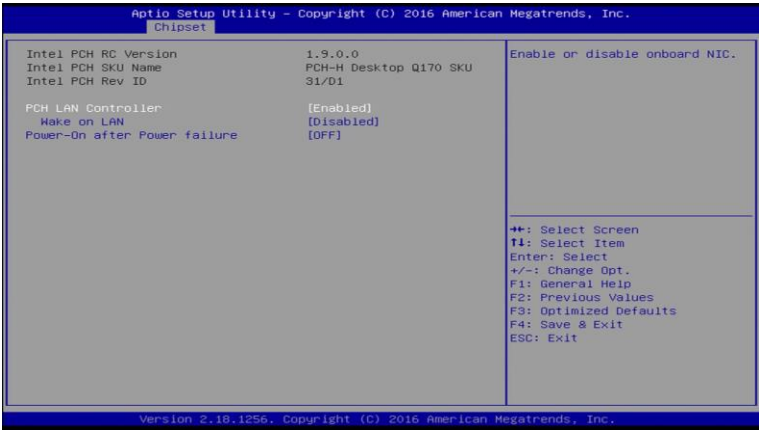
BIOS Setting	Description
Skip Scanning of External Gfx Card	If enabled, it will not scan for external Gfx Card on PEG and PCH PCIE ports.
Primary Display	Selects which of IGFX/PEG/PCI graphics device should be primary display, or selects SG for switchable Gfx.
Primary PEG	Selects PEGO/PEG1/PEG2/PEG3 Graphics device should be Primary PEG.
Primary PCIE	Selects PCIE0 / PCIE1 / PCIE2 / PCIE3 / PCIE4 / PCIE5 / PCIE6 / PCIE7 Graphics device should be primary PCIE.
Internal Graphics	Keeps IGD enabled based on the setup options.

4.5.3 Memory Configuration



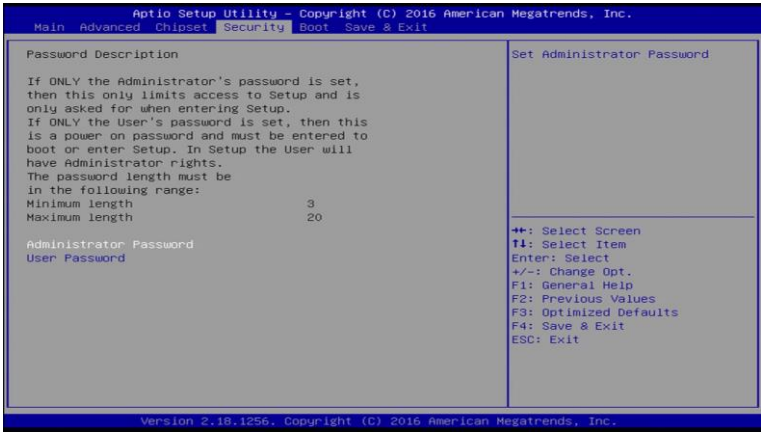
4.5.4 PCH-IO Configuration

This section allows you to configure the North Bridge Chipset.



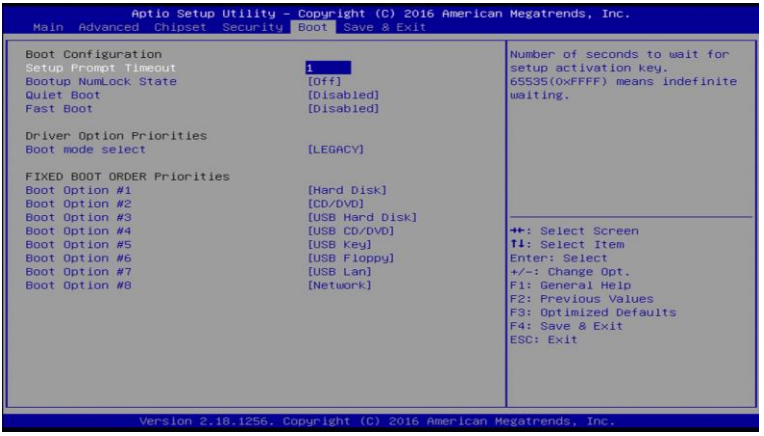
BIOS Setting	Description
PCH LAN Controller	Enables / Disables the onboard NIC.
Wake on LAN	Enables / Disables the integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)
SLP_LAN# Low on DC Power	Enables / Disables the SLP_LAN# Low on DC Power

4.6 Security Settings



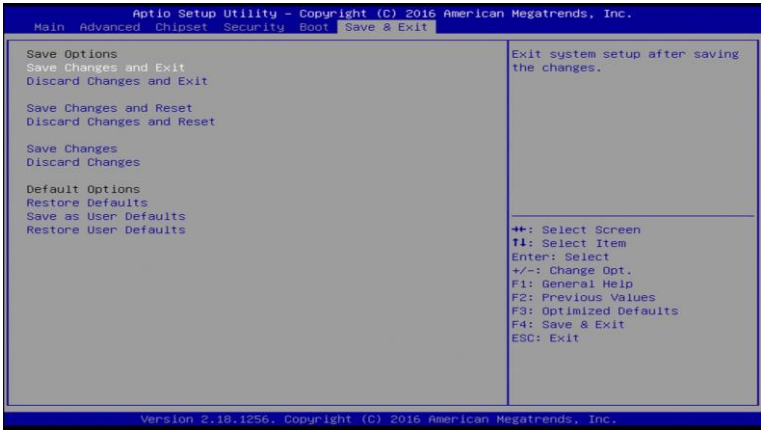
BIOS Setting	Description
Administrator Password	Sets an administrator password for the setup utility.
User Password	Sets a user password.

4.7 Boot Settings



BIOS Setting	Description
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	Selects the keyboard NumLock state.
Quiet Boot	Enables / Disables Quiet Boot option.
Fast Boot	Enables / Disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
New Boot Option Policy	Controls the placement of newly detected UEFI boot option.
FIXED BOOT ORDER Priorities	Sets the system boot order.

4.8 Save & Exit Settings



BIOS Setting	Description
Save Changes and Exit	Exits system setup after saving the changes.
Discard Changes and Exit	Exits system setup without saving any changes.
Save Changes and Reset	Resets the system after saving the changes.
Discard Changes and Reset	Resets system setup without saving any changes.
Save Changes	Saves changes done so far to any of the setup options.
Discard Changes	Discards changes done so far to any of the setup options.
Restore Defaults	Restores / Loads defaults values for all the setup options.
Save as User Defaults	Saves the changes done so far as User Defaults.
Restore User Defaults	Restores the user defaults to all the setup options.

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Appendix

This section provides the mapping addresses of peripheral devices and the sample code of watchdog timer configuration.

A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

Address	Device Description
0000h-0CF7h	PCI Express Root Complex
0040h-0043h	System timer
0050h-0053h	System timer
0070h-0070h	System CMOS/real time clock
00F0h-00F0h	Numeric data processor
02E8h-02EFh	Communications Port (COM4)
02F8h-02FFh	Communications Port (COM2)
03B0h-03BBh	Intel(R) HD Graphics 530
03C0h-03DFh	Intel(R) HD Graphics 530
03E8h-03EFh	Communications Port (COM3)
03F8h-03FFh	Communications Port (COM1)
0D00h-FFFFh	PCI Express Root Complex
E000h-0E01h	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115
F000h-F03Fh	Intel(R) HD Graphics 530
F040h-F05Fh	Intel(R) 100 Series/C230 Series Chipset SMBus - A123
F060h-F07Fh	Standard SATA AHCI Controller
F080h-F083h	Standard SATA AHCI Controller
F090h-F097h	Standard SATA AHCI Controller
F0A0h-F0A7h	Intel(R) Active Management Technology - SOL (COM5)

B. Interrupt Request Lines (IRQ)

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

Level	Function
IRQ0	System Timer
IRQ3	Serial Port #2
IRQ4	Serial Port #1
IRQ5	Serial Port #3
IRQ7	Serial Port #4
IRQ8	Real Time Clock
IRQ 11	Intel(R) 100 Series/C230 Series Chipset Family Integrated Sensor Hub - A135
IRQ 11	Intel(R) 100 Series/C230 Series Chipset SMBus - A123
IRQ 11	Intel(R) 100 Series/C230 Series Chipset Thermal subsystem - A131
IRQ 13	Numeric data processor
IRQ 16	High Definition Audio Controller
IRQ 16	Standard SATA AHCI Controller
IRQ 19	Intel(R) Active Management Technology - SOL (COM5)

C. Watchdog Timer Configuration

The Watchdog Timer (WDT) is used to generate a variety of output signals after a user programmable count. The WDT is suitable for use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven.

Under normal circumstance, you will need to restart the WDT at regular intervals before the timer counts to zero.

Sample Code:

```
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//---------------------------------------------------------------------------
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "F81866.H"
//---------------------------------------------------------------------------
int main (int argc, char *argv());
void EnableWDT(int);
void DisableWDT(void);
//---------------------------------------------------------------------------
int main (int argc, char *argv())
{
        unsigned char bBuf;
        unsigned char bTime;
        char **endptr;

        char SIO;

        printf("Fintek 81866 watch dog program\n");

        SIO = Init_F81866();
        if (SIO == 0)
        {
                printf("Can not detect Fintek 81866, program abort.\n");
                return(1);
        }//if (SIO == 0)

        if (argc != 2)
        {
                printf(" Parameter incorrect!!\n");
                return (1);
        }

        bTime = strtol (argv(1), endptr, 10);
        printf("System will reset after %d seconds\n", bTime);

        if (bTime)
        {       EnableWDT(bTime);       }
        else
        {       DisableWDT();}
```

```
		return 0;
}
//---------------------------------------------------------------------------
void EnableWDT(int interval)
{
		unsigned char bBuf;

		bBuf = Get_F81866_Reg(0x2B);
		bBuf &= (~0x20);
		Set_F81866_Reg(0x2B, bBuf);		//Enable WDTO

		Set_F81866_LD(0x07);
		//switch to logic device 7
		Set_F81866_Reg(0x30, 0x01);		//enable timer

		bBuf = Get_F81866_Reg(0xF5);
		bBuf &= (~0x0F);
		bBuf |= 0x52;
		Set_F81866_Reg(0xF5, bBuf);		//count mode is second

		Set_F81866_Reg(0xF6, interval);		//set timer

		bBuf = Get_F81866_Reg(0xFA);
		bBuf |= 0x01;
		Set_F81866_Reg(0xFA, bBuf);		//enable WDTO output

		bBuf = Get_F81866_Reg(0xF5);
		bBuf |= 0x20;
		Set_F81866_Reg(0xF5, bBuf);		//start counting
}
//---------------------------------------------------------------------------
void DisableWDT(void)
{
		unsigned char bBuf;

		Set_F81866_LD(0x07);
		//switch to logic device 7

		bBuf = Get_F81866_Reg(0xFA);
		bBuf &= ~0x01;
		Set_F81866_Reg(0xFA, bBuf);
		//disable WDTO output

		bBuf = Get_F81866_Reg(0xF5);
		bBuf &= ~0x20;
		bBuf |= 0x40;
		Set_F81866_Reg(0xF5, bBuf);
		//disable WDT
}
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//---------------------------------------------------------------------------
#include "F81866.H"
#include <dos.h>
//---------------------------------------------------------------------------
unsigned int F81866_BASE;
void Unlock_F81866 (void);
void Lock_F81866 (void);
```

```
//---------------------------------------------------------------------------
unsigned int Init_F81866(void)
{
	unsigned int result;
	unsigned char ucDid;

	F81866_BASE = 0x4E;
	result = F81866_BASE;

	ucDid = Get_F81866_Reg(0x20);
	if (ucDid == 0x07)
	//Fintek 81866
	{	goto Init_Finish;	}

	F81866_BASE = 0x2E;
	result = F81866_BASE;

	ucDid = Get_F81866_Reg(0x20);
	if (ucDid == 0x07)
	//Fintek 81866
	{	goto Init_Finish;	}

	F81866_BASE = 0x00;
	result = F81866_BASE;

Init_Finish:
	return (result);
}
//---------------------------------------------------------------------------
void Unlock_F81866 (void)
{
	outportb(F81866_INDEX_PORT, F81866_UNLOCK);
	outportb(F81866_INDEX_PORT, F81866_UNLOCK);
}
//---------------------------------------------------------------------------
void Lock_F81866 (void)
{
	outportb(F81866_INDEX_PORT, F81866_LOCK);
}
//---------------------------------------------------------------------------
void Set_F81866_LD( unsigned char LD)
{
	Unlock_F81866();
	outportb(F81866_INDEX_PORT, F81866_REG_LD);
	outportb(F81866_DATA_PORT, LD);
	Lock_F81866();
}
//---------------------------------------------------------------------------
void Set_F81866_Reg( unsigned char REG, unsigned char DATA)
{
	Unlock_F81866();
	outportb(F81866_INDEX_PORT, REG);
	outportb(F81866_DATA_PORT, DATA);
	Lock_F81866();
}
//---------------------------------------------------------------------------
unsigned char Get_F81866_Reg(unsigned char REG)
{
	unsigned char Result;
	Unlock_F81866();
	outportb(F81866_INDEX_PORT, REG);
	Result = inportb(F81866_DATA_PORT);
	Lock_F81866();
	return Result;
}
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
```

```
//---------------------------------------------------------------------------
#ifndef __F81866_H
#define __F81866_H                                          1
//---------------------------------------------------------------------------
#define         F81866_INDEX_PORT                   (F81866_BASE)
#define         F81866_DATA_PORT                    (F81866_BASE+1)
//---------------------------------------------------------------------------
#define         F81866_REG_LD                       0x07
//---------------------------------------------------------------------------
#define F81866_UNLOCK                               0x87
#define         F81866_LOCK                                 0xAA
//---------------------------------------------------------------------------
unsigned int Init_F81866(void);
void Set_F81866_LD( unsigned char);
void Set_F81866_Reg( unsigned char, unsigned char);
unsigned char Get_F81866_Reg( unsigned char);
//---------------------------------------------------------------------------
#endif          //__F81866_H
```