

USER MANUAL

BE-0996

**3.5" SBC Intel® Core™ i5-7300U /
i3-7100U / Pentium® 4415U Series SoC**

BE-0996 M1

BE-0996
3.5" SBC Intel[®] Core[™] i5-7300U /
i3-7100U / Pentium[®] 4415U Series SoC

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DISCLAIMER

This user's manual is meant to assist users in installing and setting up the system. The information contained in this document is subject to change without any notice.


CE NOTICE


This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A 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 commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any change or modifications to the equipment not expressly approve by the party responsible for compliance could void your authority to operate such equipment.

| | |
|---|---|
|  | <p>CAUTION: Danger of explosion may occur when the battery is incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.</p> |
|---|---|

| | |
|--|---|
|  | <p>WARNING: Some internal parts of the system may have high electrical voltage. We strongly recommend that only qualified engineers are allowed to service and disassemble the system. If any damages should occur on the system and are caused by unauthorized servicing, it will not be covered by the product warranty.</p> |
|--|---|

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Revision History

The revision history of BE-0996 User Manual is described below:

| Version No. | Revision History | Page No. | Date |
|-------------|------------------|----------|---------|
| M1 | Initial Release | - | 2019/01 |

1 Introduction

This chapter provides the introduction for BE-0996 as well as the framework of the user manual.

The following topic is included:

- About This Manual

1.1 About This Manual

Thank you for purchasing our BE-0996 3.5" SBC Intel® Core™ i5-7300U / i3-7100U / Pentium® 4415U Series SoC. The BE-0996 provides faster processing speed, greater expandability and can handle more tasks than before. This manual contains 5 chapters and 1 appendix. Users can configure BE-0996 according to their own needs. This user manual is intended for service personnel with strong hardware background. It is not intended for general users.

The following section outlines the structure of this user manual.

Chapter 1 Introduction

This chapter provides the introduction for BE-0996 as well as the framework of the user manual.

Chapter 2 Getting Started

This chapter describes the package contents and outlines BE-0996 specifications. Read the safety reminders carefully on how to take care of BE-0996 motherboard properly.

Chapter 3 Hardware Configuration

This chapter outlines the locations of BE-0996 motherboard components and their respective functions. You will learn how to set the jumpers and configure BE-0996 to meet your own needs.

Chapter 4 Software Utilities

This chapter contains helpful information for proper installations of the Intel Chipset Software Installation Utility, Intel® Management Engine Components Installer, USB 3.0 eXtensible Host Controller Utility, Graphics Driver Utility, LAN Driver Utility, Sound Driver Utility and Hotfix Driver Utility.

Chapter 5 BIOS Setup

This chapter indicates you how to change the BIOS configurations.

Appendix A Technical Summary

This appendix provides the information about the allocation maps for BE-0996 block diagram, BE-0996 motherboard resources, Watchdog Timer Configuration and Flash BIOS Update.

2 Getting Started

This chapter provides the information for BE-0996 motherboard. It describes the package contents and outlines the motherboard specifications.

The following topics are included:

- Package List
- BE-0996 Specification
- Safety Precautions

Experienced users can go to Chapter 3 Hardware Configuration on page 3-1 for a quick start.

2.1 Packing List

If you discover any of the items listed below are damaged or list, please contact your local distributor immediately.

| Item | Q'ty |
|---------------------------------|-------------|
| BE-0996 | 1 |
| Quick Reference Guide | 1 |
| Manual / Driver DVD | 1 |
| Mini Jumper (2.0 mm) | 6 |
| SATA & SATA Power Cable (150mm) | 1 |

2.2 BE-0996 Specifications

| Main Board | |
|-----------------------|--|
| | Intel® Kabylake U Series |
| CPU Support | <ul style="list-style-type: none"> ➤ Intel® Core® i5-7300U ➤ Intel® Core® i3-7100U ➤ Intel® Pentium® 4415U |
| Memory Support | ➤ 1 x DDR4 SO-DIMM sockets (up to 16GB) |
| Power Supply | ➤ 4-pin ATX Power Input Connector (12V / 24V) |
| Expansion Slots | <ul style="list-style-type: none"> ➤ 1 x full-sized mSATA slot ➤ 1 x full-sized mPCIe |
| SATA | ➤ 1 x SATAIII (6.0Gb/s) |
| Operating System | ➤ Windows 10 64bit / Ubuntu 16.04 64bit |
| Dimensions | ➤ 102 x 145mm (3.5" SBC) |
| Certificate | ➤ FCC / CE |
| I/O Ports | |
| Display | <ul style="list-style-type: none"> ➤ 1 x DP (rear I/O) ➤ 1 x HDMI (rear I/O) ➤ 1 x LVDS (internal I/O) |
| USB | For Core-i5 / i3 SKU: <ul style="list-style-type: none"> ➤ 2 x USB 2.0 (internal wafer) ➤ 2 x USB 3.0 (rear I/O), 4 x USB 2.0 (rear I/O) For Pentium SKU: <ul style="list-style-type: none"> ➤ 1 x USB 2.0 (internal wafer) ➤ 2 x USB 3.0 (rear I/O), 4 x USB 2.0 (rear I/O) |
| Audio | <ul style="list-style-type: none"> ➤ Line In, Line Out, Mic In (pin header) ➤ 2 x CH Audio AMP (L&R), 2W |
| LAN | <ul style="list-style-type: none"> ➤ 2 x GbE LANs, Wake-on-LAN ➤ LAN1: Intel® I219 LM / LAN2: Intel® I211 AT |
| Serial Ports | Onboard pin header: <ul style="list-style-type: none"> ➤ COM1 for RS-232 ➤ COM2 for RS-232/422/485 selectable under BIOS (default: RS-232) |
| DIO Port | ➤ 1 x DIO (8 in / 8 out) (pin header) |
| Expansion Slots | For Core-i5 / i3 SKU: <ul style="list-style-type: none"> ➤ 1 x full-sized mSATA slot (with USB signal) ➤ 1 x full-sized mPCIe slot (with SATA / USB signal) For Pentium SKU: <ul style="list-style-type: none"> ➤ 1 x full-sized mSATA slot (with SATA signal only) ➤ 1 x full-sized mPCIe slot (with PCIe / USB signal) |
| I ² C Port | ➤ 1 x I ² C port |

Environment

| | |
|-----------------------|-------------------------------|
| Operating Temperature | ➤ 0°C ~ 60°C (32°F~ 140°F) |
| Storage Temperature | ➤ -40°C ~ 80°C (-40°F~ 185°F) |
| Humidity | ➤ 20%~ 95% |

2.3 Safety Precautions

Follow the instructions below to avoid your system from damages:

1. Keep your system away from static electricity on all occasions.
2. Prevent electric shock. Do not touch any components of this board when it is powered on. Always disconnect power when the system is not in use.
3. Disconnect power source when you change any hardware devices.
For instance, when you connect a jumper or install any cards, a surge of power may damage the electronic components or the whole system.

3 **Hardware Configuration**

This chapter contains helpful information about the jumper & connector settings, and component locations.

The following sections are included:

- Jumper & Connector Quick Reference Table
- Component Locations
- Connector Configuration and Jumper Settings
- Connector Pin Assignments

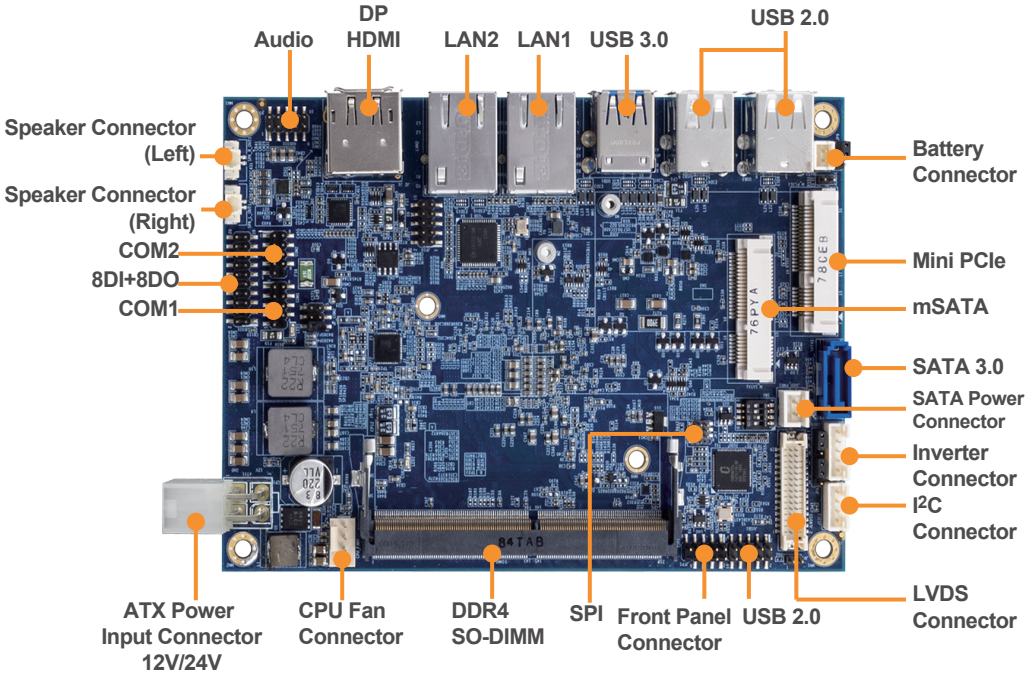
3.1 JUMPER & CONNECTOR QUICK REFERENCE TABLE




| JUMPER Description | NAME |
|--|---------|
| COM2 Pin9 RI/5V/12V Selection | JP_COM2 |
| Clear CMOS Data Selection | JCMOS1 |
| SPI Override Protection Selection | JP1 |
| LVDS VCC Selection | JP5 |
| Backlight PWM Level Selection | JP6 |
| V3P3 MPCIE Selection | JP9 |
| Slide Switch For LVDS Resolution Selection | SW1 |

| CONNECTOR Description | NAME |
|-------------------------------------|------------------------|
| COM Connectors (Onboard Pin Header) | COM1, COM2 |
| Dual USB 2.0 Port | USB2, USB3 |
| Dual USB 3.0 Ports | USB1 |
| 2 x LAN Ports | LAN1, LAN2 |
| Internal USB 2.0 Connector | JUSB1 |
| DP and HDMI Port | J1 |
| HD Audio Connector | AUDIO1 |
| ATX Power Input Connector | ATX1 |
| Speaker Connectors | SPK_L_OUT1, SPK_R_OUT1 |
| Digital Input / Output Connector | JDIO1 |
| Front Panel Connector | JFP1 |
| CPU Fan Connector | CPU_FAN1 |
| SATA 3.0 Connector | SATA1 |
| SATA Power Connector | JHDD_PWR1 |
| LVDS Connector | JLVDS1 |
| Panel Inverter Connector | JINV1 |
| Mini PCI Express Slot | M_PCIE1 |
| mSATA Connector | M_SATA1 |
| I2C Wafer | JI2C1 |
| Battery Wafer | JBAT1 |
| SPI Connector | JP7 |
| DDR4 SO-DIMM Memory Socket 1 | DIMM1 |

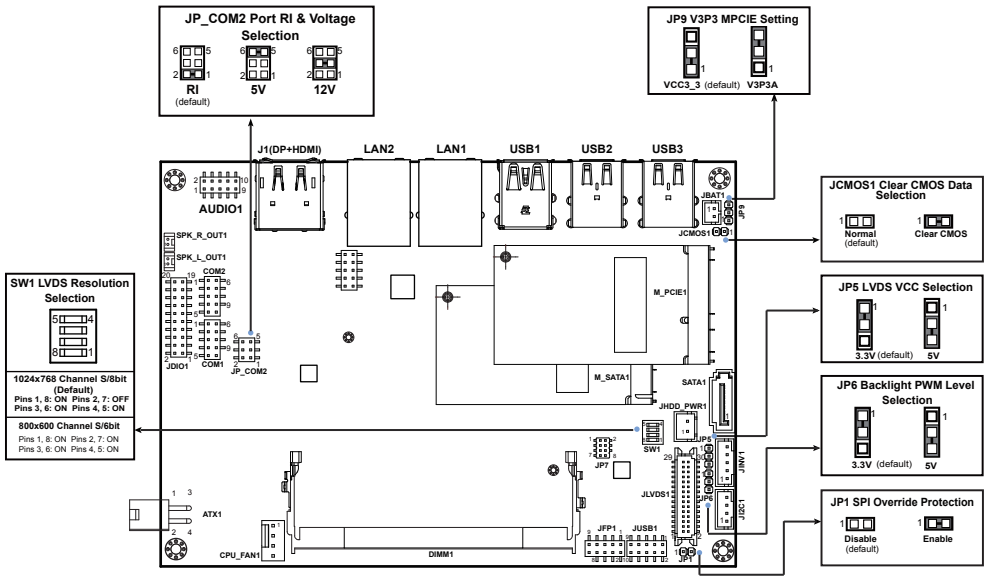
3.2 COMPONENT LOCATIONS

3.2.1 Top View of BE-0996RA-**N

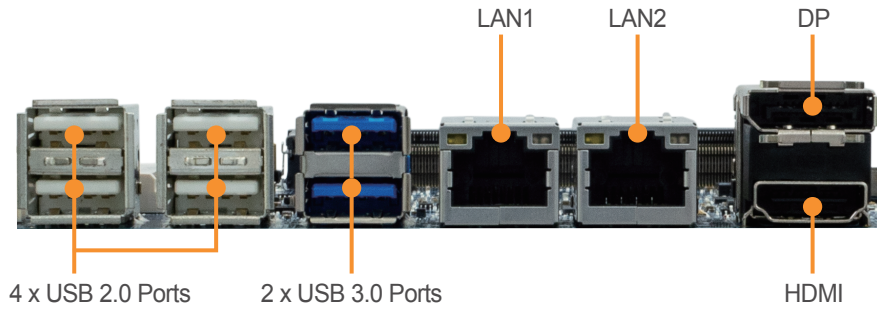


| | |
|---|--|
|  | <p>WARNING: Always disconnect the power cord when you are working with connectors and jumpers on BE-0996. Make sure both the system and peripheral devices are turned OFF as sudden surge of power could damage sensitive components. Make sure BE-0996 is properly grounded.</p> |
|  | <p>CAUTION: Observe precautions while handling electrostatic sensitive components. Make sure to ground yourself to prevent static charge while you are working on the connectors and jumpers. Use a grounding wrist strap and place all electronic components in any static-shielded devices.</p> |
|  | <p>CAUTION: Always touch BE-0996 components by the edges. Never touch components such as the processor by its pins. Take special cares while you are holding electronic circuit boards by the edges only. Do not touch BE-0996 components.</p> |

3.2.2 Jumper Setting of BE-0996RA-**-N



3.2.4 I/O View of BE-0996RA-**N

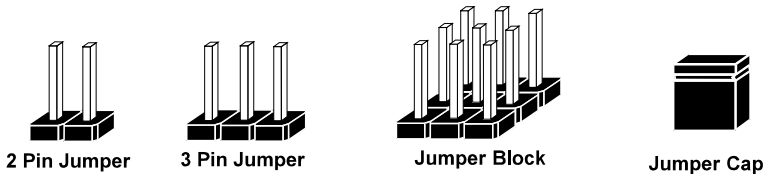


3.3 HOW TO SET JUMPERS

You can configure your board by setting jumpers. Jumper is consists of two or three metal pins with a plastic base mounted on the card, and by using a small plastic "cap", Also known as the jumper cap (with a metal contact inside), you are able to connect the pins. So you can set-up your hardware configuration by "open" or "close" pins.

The jumper can be combined into sets that called jumper blocks. When the jumpers are all in the block, you have to put them together to set up the hardware configuration. The figure below shows how this looks like.

JUMPERS AND CAPS

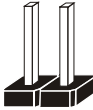


If a jumper has three pins (for examples, labelled PIN1, PIN2, and PIN3), you can connect PIN1 & PIN2 to create one setting by shorting. You can either connect PIN2 & PIN3 to create another setting. The same jumper diagrams are applied all through this manual. The figure below shows what the manual diagrams look and what they represent.

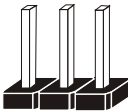
Jumper Diagrams



Jumper Cap
looks like this



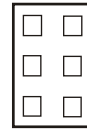
2 pin Jumper
looks like this



3 pin Jumper
looks like this



Jumper Block
looks like this



Jumper Settings

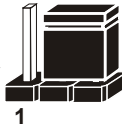


2 pin Jumper close(enabled)
Looks like this



1

1



3 pin Jumper
2-3 pin close(enabled)
Looks like this

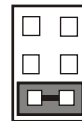


1

1



Jumper Block
1-2 pin close(enabled)
Looks like this



1 2

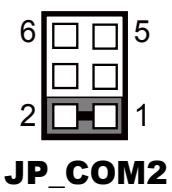
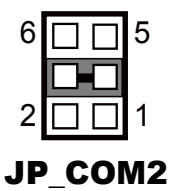
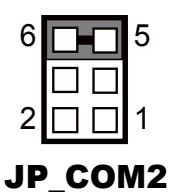
1 2

3.4 Setting Connectors and Jumpers

3.4.1 COM2 Connector Pin9 Definition Selection Guide (JP_COM2)

Jumper Location: JP_COM2

Description: COM2 Port pin9 RI/+5V/+12V Selection

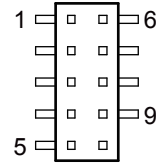
| SELECTION | JUMPER SETTING | JUMPER ILLUSTRATION |
|-----------|--------------------------|---|
| RI | 1-2 (Default Setting) |  <p>The diagram shows a 2x3 grid of pins labeled 1, 2, 5, and 6. Pins 1 and 2 are connected by a jumper. The label JP_COM2 is centered below the grid.</p> |
| 12V | 3-4 |  <p>The diagram shows a 2x3 grid of pins labeled 1, 2, 5, and 6. Pins 3 and 4 are connected by a jumper. The label JP_COM2 is centered below the grid.</p> |
| 5V | 5-6 |  <p>The diagram shows a 2x3 grid of pins labeled 1, 2, 5, and 6. Pins 5 and 6 are connected by a jumper. The label JP_COM2 is centered below the grid.</p> |

3.4.2 COM Connector (COM1, COM2)

COM1 (fixed as RS-232) Connector (onboard pin header)

COM1 Connector Pin Assignment:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | DCD# | 6 | DSR# |
| 2 | RX | 7 | RTS# |
| 3 | TX | 8 | CTS# |
| 4 | DTR# | 9 | RI# |
| 5 | GND | - | - |



COM1/
COM2

COM2 (selectable as RS-232/422/485) Connector (onboard pin header):

COM2 Connector Pin Assignment:

| PIN | ASSIGNMENT | | |
|-----|------------|--------|---------|
| | RS-232 | RS-422 | RS-485 |
| 1 | DCD# | TX- | RS-485- |
| 2 | RX | TX+ | RS-485+ |
| 3 | TX | RX+ | NC |
| 4 | DTR# | RX- | NC |
| 5 | GND | GND | GND |
| 6 | DSR# | NC | NC |
| 7 | RTS# | NC | NC |
| 8 | CTS# | NC | NC |
| 9 | RI# | NC | NC |

Note:

COM2: Pin 9 is selectable for RI, +5V or +12V by **JP_COM2** jumper setting. Default setting is RI. Please see “**COM2 PIN9 Definition Selection Guide**” for selection details.

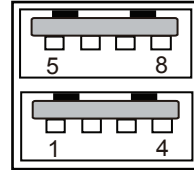
3.4.3 Dual USB 2.0 Port (USB2, USB3)

Port Location: USB2 (rear I/O)

Description: Dual USB 2.0 Port (Type A)

USB 2.0 connector signals:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | +5V | 5 | +5V |
| 2 | USBP3N | 6 | USBP4N |
| 3 | USBP3P | 7 | USBP4P |
| 4 | GND | 8 | GND |



USB2/
USB3

Port Location: USB3 (rear I/O)

Description: Dual USB 2.0 Port (Type A)

USB 2.0 connector signals:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | +5V | 5 | +5V |
| 2 | USBP5N | 6 | USBP6N |
| 3 | USBP5P | 7 | USBP6P |
| 4 | GND | 8 | GND |

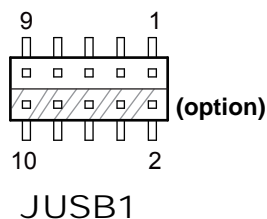
3.4.4 Internal USB 2.0 Connector (JUSB1)

Connector Location: JUSB1

Description: Internal USB 2.0 Connector

USB 2.0 connector signals:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | +5V | 2 | +5V |
| 3 | USBP7N | 4 | USBP10N |
| 5 | USBP7P | 6 | USBP10P |
| 7 | GND | 8 | GND |
| 9 | GND | 10 | GND |



Note: The functions of **JUSB1** option pins are only supported on Core-i5 / i3 SoC boards.

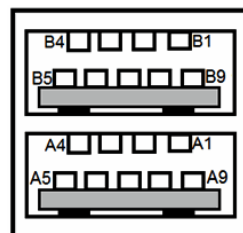
3.4.5 Dual USB 3.0 Ports (USB1)

Port Location: USB1 (rear I/O)

Description: Dual USB 3.0 Port

USB 3.0 connector signals:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| A1 | 5V | A9 | TX1_DP |
| A2 | USBP1N | A8 | TX1_DN |
| A3 | USBP1P | A7 | GND |
| A4 | GND | A6 | RX1_DP |
| - | - | A5 | RX1_DN |
| B1 | 5V | B9 | TX2_DP |
| B2 | USBP2N | B8 | TX2_DN |
| B3 | USBP2P | B7 | GND |
| B4 | GND | B6 | RX2_DP |
| - | - | B5 | RX2_DN |



USB1

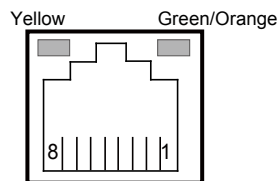
3.4.6 LAN1, LAN2 Ports (LAN1, LAN2)

Port Location: LAN1, LAN2 (rear I/O)

Description: LAN1 & LAN2 Ports

LAN1, LAN2 signals:

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | MDI_0P |
| 2 | MDI_0N |
| 3 | MDI_1P |
| 4 | MDI_2P |
| 5 | MDI_2N |
| 6 | MDI_1N |
| 7 | MDI_3P |
| 8 | MDI_3N |



LAN1/
LAN2

LAN LED Indicator:

Right Side LED

| | |
|-----------------|--------------------------------|
| Green Color On | 10/100Mbps LAN Speed Indicator |
| Orange Color On | Giga LAN Speed Indicator |
| Off | No LAN switch/hub connected |

Left Side LED

| | |
|-----------------------|-----------------------|
| Yellow Color Blinking | LAN Message Active |
| Off | No LAN Message Active |

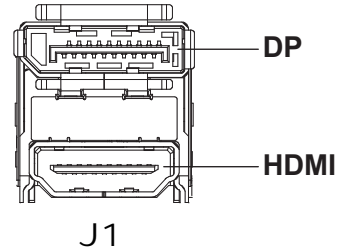
3.4.7 DP and HDMI Port (J1)

Port Location: J1 (rear I/O)

Description: DisplayPort Connector (top side) and HDMI Connector (bottom side)

Pin Assignment for DisplayPort Connector:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|--------------|-----|-------------|
| P1 | DP_C_DATA0+ | P2 | GND |
| P3 | DP_C_DATA0- | P4 | DP_C_DATA1+ |
| P5 | GND | P6 | DP_C_DATA1- |
| P7 | DP_C_DATA2+ | P8 | GND |
| P9 | DP_C_DATA2- | P10 | DP_C_DATA3+ |
| P11 | GND | P12 | DP_C_DATA3- |
| P13 | DP_C_AUX_ENJ | P14 | GND |
| P15 | DP_C_AUX+ | P16 | GND |
| P17 | DP_C_AUX- | P18 | HPD |
| P19 | GND | P20 | DP_VCC3_3 |



Pin Assignment for HDMI Port Connector:

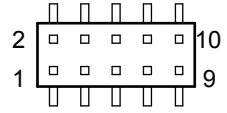
| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|-----------------|-----|---------------|
| 1 | DP0_HDMI_P2 | 2 | GND |
| 3 | DP0_HDMI_N2 | 4 | DP0_HDMI_P1 |
| 5 | GND | 6 | DP0_HDMI_N1 |
| 7 | DP0_HDMI_P0 | 8 | GND |
| 9 | DP0_HDMI_N0 | 10 | DP0_HDMI_CLKP |
| 11 | GND | 12 | DP0_HDMI_CLKN |
| 13 | NC | 14 | NC |
| 15 | DP0_HDMI_SCL | 16 | DP0_HDMI_SDA |
| 17 | GND | 18 | VCC5_HDMI |
| 19 | DP0_HDMI_HPD_IN | - | - |

3.4.8 HD Audio Connector (AUDIO1)

Connector Location: **AUDIO1**

Description: HD Audio Connector for Line In/Line Out/Mic In.

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|----------------|-----|----------------|
| 1 | MIC1-L | 2 | MIC1-R |
| 3 | GND | 4 | GND |
| 5 | HD_LINE-IN-L_L | 6 | HD_LINE-IN-R_L |
| 7 | GND | 8 | GND |
| 9 | LINE-OUT-L | 10 | LINE-OUT-R |



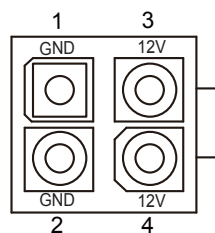
AUDIO1

3.4.9 ATX Power Input Connector (ATX1)

Connector Location: ATX1

Description: ATX Power Input Connector

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|-------------|
| 1 | GND | 3 | +12V / +24V |
| 2 | GND | 4 | +12V / +24V |



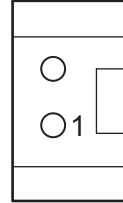
ATX1

3.4.10 Speaker Connectors (SPK_L_OUT1, SPK_R_OUT1)

Connector Location: SPK_L_OUT1

Description: Speaker Out Connector (Left side)

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | AMP_OUTL+ |
| 2 | AMP_OUTL- |

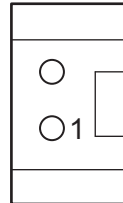


SPK_L_OUT1

Connector Location: SPK_R_OUT1

Description: Speaker Out Connector (Right side)

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | AMP_OUTR+ |
| 2 | AMP_OUTR- |



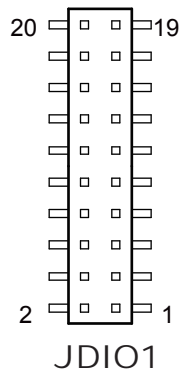
SPK_R_OUT1

3.4.11 Digital Input / Output Connector (JDIO1)

Connector Location: JDIO1

Description: Digital Input / Output Connector

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | 5V | 2 | 5V |
| 3 | GND | 4 | GND |
| 5 | DIN_0 | 6 | DOUT_0 |
| 7 | DIN_1 | 8 | DOUT_1 |
| 9 | DIN_2 | 10 | DOUT_2 |
| 11 | DIN_3 | 12 | DOUT_3 |
| 13 | DIN_4 | 14 | DOUT_4 |
| 15 | DIN_5 | 16 | DOUT_5 |
| 17 | DIN_6 | 18 | DOUT_6 |
| 19 | DIN_7 | 20 | DOUT_7 |

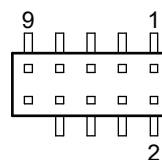


3.4.12 Front Panel Connector (JFP1)

Connector Location: JFP1

Description: Front Panel Connector

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|--------------|-----|--------------|
| 1 | HDD LED+ | 2 | PWR LED+ |
| 3 | HDD LED- | 4 | PWR LED- |
| 5 | GND | 6 | Power Button |
| 7 | Reset Button | 8 | GND |
| 9 | 5V | - | - |



JFP1

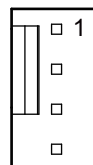
3.4.13 CPU Fan Connector (CPU_FAN1)

Connector Location: CPU_FAN1

Description: CPU Fan Connector

CPU Fan Connector signals:

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | GND |
| 2 | VCC12 |
| 3 | TAC |
| 4 | CTL |

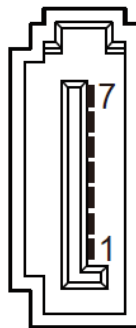


CPU_FAN1

3.4.14 SATA 3.0 Connector (SATA1)

Connector Location: **SATA1**

Description: Serial ATA (SATA) 6GB/s Connector



SATA1

Serial ATA 6GB/s Connector (SATA1) signals:

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | GND |
| 2 | TXPC |
| 3 | TXNC |
| 4 | GND |
| 5 | RXNC |
| 6 | RXPC |
| 7 | GND |

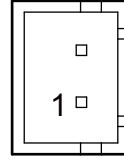
3.4.15 SATA Power Connector (JHDD_PWR1)

Connector Location: JHDD_PWR1

Description: Serial ATA Power Connector

SATA Power Connector signals:

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | 5V |
| 2 | GND |



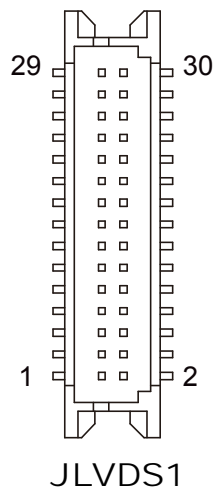
JHDD_PWR1

3.4.16 LVDS Connector (JLVDS1)

Connector Location: JLVDS1

Description: LVDS Connector

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | +3.3V/+5V | 2 | GND |
| 3 | LVDS_CLKBM | 4 | LVDS_CLKBP |
| 5 | GND | 6 | LVDS_YBM2 |
| 7 | LVDS_YBP2 | 8 | GND |
| 9 | LVDS_YBM1 | 10 | LVDS_YBP1 |
| 11 | LVDS_YBP3 | 12 | LVDS_YBM3 |
| 13 | LVDS_YBP0 | 14 | LVDS_YBM0 |
| 15 | GND | 16 | LVDS_CLKAP |
| 17 | LVDS_CLKAM | 18 | GND |
| 19 | LVDS_YAP2 | 20 | LVDS_YAM2 |
| 21 | GND | 22 | LVDS_YAP1 |
| 23 | LVDS_YAM1 | 24 | GND |
| 25 | LVDS_YAP0 | 26 | LVDS_YAM0 |
| 27 | LVDS_YAP3 | 28 | LVDS_YAM3 |
| 29 | +3.3V/+5V | 30 | +3.3V/+5V |

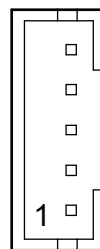


3.4.17 Panel Inverter Connector (JINV1)

Connector Location: JINV1

Description: Panel Inverter Connector

| PIN | ASSIGNMENT |
|-----|------------------|
| 1 | +12V |
| 2 | GND |
| 3 | Backlight PWM |
| 4 | GND |
| 5 | Backlight Enable |



JINV1

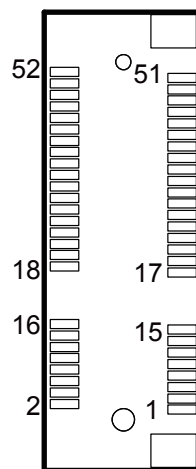
3.4.18 Mini PCI Express Slot (M_PCIE1)

Connector Location: M_PCIE1

Description: Mini-PCI Express Slot

Mini-PCI Express Slot (M_PCIE1) signals:

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|-------------|
| 1 | WAKEJ | 2 | VCC3_3_SB |
| 3 | NC | 4 | GND |
| 5 | NC | 6 | VCC1_5 |
| 7 | CLKREQJ | 8 | NC |
| 9 | GND | 10 | NC |
| 11 | CLK_DN | 12 | NC |
| 13 | CLK_DP | 14 | NC |
| 15 | GND | 16 | NC |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | NC |
| 21 | GND | 22 | PLTRSTJ_BUF |
| 23 | PCIE_RXN | 24 | VCC3_3_SB |
| 25 | PCIE_RXP | 26 | GND |
| 27 | GND | 28 | VCC1_5 |
| 29 | GND | 30 | SMB_CLK |
| 31 | PCIE_TXN | 32 | SMB_DATA |
| 33 | PCIE_TXP | 34 | GND |
| 35 | GND | 36 | USBN |
| 37 | GND | 38 | USBP |
| 39 | VCC3_3_SB | 40 | GND |
| 41 | VCC3_3_SB | 42 | NC |
| 43 | GND | 44 | NC |
| 45 | NC | 46 | NC |
| 47 | NC | 48 | VCC1_5 |
| 49 | NC | 50 | GND |
| 51 | NC | 52 | VCC3_3_SB |

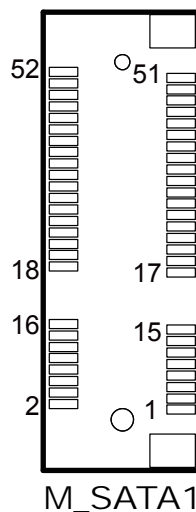


M_PCIE1

Mini PCI Express is the successor of the Mini PCI card and provides an increased data throughput. The cards have a detached network interface and are equipped with one lane. They are used in particular in embedded designs or compact box PCs.

3.4.19 mSATA Connector (M_SATA1)**Connector Location: M_SATA1****Description: mSATA Slot**

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|--------------|-----|------------|
| 1 | NC | 2 | 3.3V |
| 3 | NC | 4 | GND |
| 5 | NC | 6 | NC |
| 7 | NC | 8 | NC |
| 9 | GND | 10 | NC |
| 11 | NC | 12 | NC |
| 13 | NC | 14 | NC |
| 15 | GND | 16 | NC |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | NC |
| 21 | GND | 22 | NC |
| 23 | mSATA1_RX_DP | 24 | 3.3V |
| 25 | mSATA1_RX_DN | 26 | GND |
| 27 | GND | 28 | NC |
| 29 | GND | 30 | NC |
| 31 | mSATA1_TX_DN | 32 | NC |
| 33 | mSATA1_TX_DP | 34 | GND |
| 35 | GND | 36 | USB2_P9_DN |
| 37 | GND | 38 | USB2_P9_DP |
| 39 | 3.3V | 40 | GND |
| 41 | 3.3V | 42 | NC |
| 43 | NC | 44 | NC |
| 45 | NC | 46 | NC |
| 47 | NC | 48 | NC |
| 49 | NC | 50 | GND |
| 51 | NC | 52 | 3.3V |



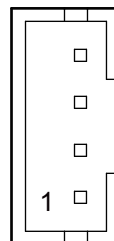
Note: The USB function is only supported on Core-i5 / i3 SoC boards.

3.4.20 I2C Wafer (JI2C1)

Connector Location: JI2C1

Description: I2C Wafer

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | 5V |
| 2 | GND |
| 3 | I2C0_SCL |
| 4 | I2C0_SDA |



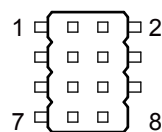
JI2C1

3.4.21 SPI Connector (JP7)

Connector Location: JP7

Description: SPI Connector

| PIN | ASSIGNMENT | PIN | ASSIGNMENT |
|-----|------------|-----|------------|
| 1 | 3.3V | 2 | GND |
| 3 | CSJ | 4 | CLK |
| 5 | MISO | 6 | MOSI |
| 7 | NC | 8 | NC |





JP7

3.4.22 SPI Override Protection Selection (JP1)

Jumper Location: JP1

Description: SPI Override Protection Selection

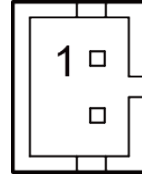
| SELECTION | JUMPER SETTING | JUMPER ILLUSTRATION |
|-----------|-----------------------------------|---|
| Disable | <i>Open (Default Setting)</i> |  <p>JP1</p> |
| Enable | Close |  <p>JP1</p> |

3.4.23 Battery Wafer (JBAT1)

Connector Location: JBAT1

Description: Battery Wafer

| PIN | ASSIGNMENT |
|-----|------------|
| 1 | VBAT+ |
| 2 | GND |

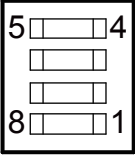
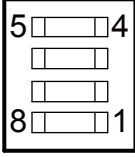
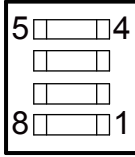
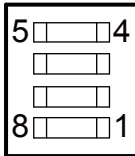
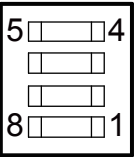


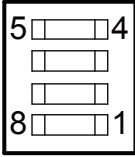
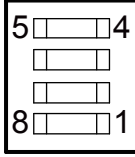
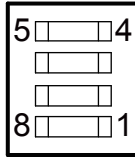
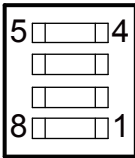
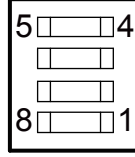
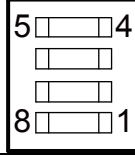
JBAT1

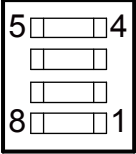
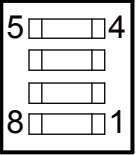
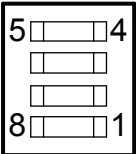
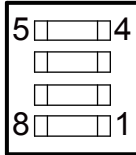
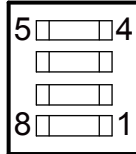
3.4.24 Slide Switch For LVDS Resolution Selection (SW1)

Jumper Location: SW1

Description: LVDS Resolution/Channel/Color Bit Selection

| SELECTION | SW1 | PIN | SETTING |
|--|---|------------|------------|
| 1024 x 768 Channel S/8bit (Default Setting) |  | 1-8 | ON |
| | | 2-7 | OFF |
| | | 3-6 | ON |
| | | 4-5 | ON |
| 800 x 600 Channel S/6bit |  | 1-8 | ON |
| | | 2-7 | ON |
| | | 3-6 | ON |
| | | 4-5 | ON |
| 1024 x 768 Channel S/6bit |  | 1-8 | OFF |
| | | 2-7 | ON |
| | | 3-6 | ON |
| | | 4-5 | ON |
| 1280 x 768 Channel S/6bit |  | 1-8 | OFF |
| | | 2-7 | OFF |
| | | 3-6 | ON |
| | | 4-5 | ON |
| 1280 x 800 Channel S/6bit |  | 1-8 | ON |
| | | 2-7 | ON |
| | | 3-6 | OFF |
| | | 4-5 | ON |

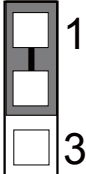
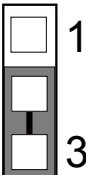
| SELECTION | SW1 | PIN | SETTING |
|-------------------------------|---|-----|---------|
| 1280 x 960 Channel S/6bit |  | 1-8 | OFF |
| | | 2-7 | ON |
| | | 3-6 | OFF |
| | | 4-5 | ON |
| 1280 x 1024 Channel D/8bit |  | 1-8 | ON |
| | | 2-7 | OFF |
| | | 3-6 | OFF |
| | | 4-5 | ON |
| 1366 x 768 Channel S/6bit |  | 1-8 | OFF |
| | | 2-7 | OFF |
| | | 3-6 | OFF |
| | | 4-5 | ON |
| 1366 x 768 Channel S/8bit |  | 1-8 | ON |
| | | 2-7 | ON |
| | | 3-6 | ON |
| | | 4-5 | OFF |
| 1440 x 900 Channel D/8bit |  | 1-8 | OFF |
| | | 2-7 | ON |
| | | 3-6 | ON |
| | | 4-5 | OFF |
| 1400 x 1050 Channel D/8bit |  | 1-8 | ON |
| | | 2-7 | OFF |
| | | 3-6 | ON |

| SELECTION | SW1 | PIN | SETTING |
|-------------------------------|---|-----|---------|
| | | 4-5 | OFF |
| 1600 x 900 Channel D/8bit |  | 1-8 | OFF |
| | | 2-7 | OFF |
| | | 3-6 | ON |
| | | 4-5 | OFF |
| 1680 x 1050 Channel D/8bit |  | 1-8 | ON |
| | | 2-7 | ON |
| | | 3-6 | OFF |
| | | 4-5 | OFF |
| 1600 x 1200 Channel D/8bit |  | 1-8 | OFF |
| | | 2-7 | ON |
| | | 3-6 | OFF |
| | | 4-5 | OFF |
| 1920 x 1080 Channel D/8bit |  | 1-8 | ON |
| | | 2-7 | OFF |
| | | 3-6 | OFF |
| | | 4-5 | OFF |
| 1920 x 1200 Channel D/8bit |  | 1-8 | OFF |
| | | 2-7 | OFF |
| | | 3-6 | OFF |
| | | 4-5 | OFF |

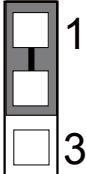
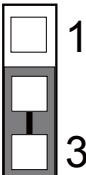
3.4.25 LVDS VCC Selection (JP5)

Jumper Location: JP5

Description: LVDS VCC Selection

| SELECTION | JUMPER SETTING | JUMPER ILLUSTRATION |
|-----------|----------------------------------|---|
| 3.3V | <i>1-2 (Default Setting)</i> |  <p>JP5</p> |
| 5V | 2-3 |  <p>JP5</p> |

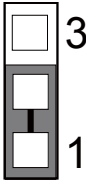
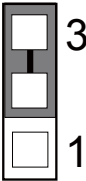
3.4.26 Backlight PWM Level Selection (JP6)**Jumper Location: JP6****Description:** Backlight PWM Level Selection

| SELECTION | JUMPER SETTING | JUMPER ILLUSTRATION |
|-----------|----------------------------------|---|
| 3.3V | <i>1-2 (Default Setting)</i> |  JP6 |
| 5V | 2-3 |  JP6 |

3.4.27 V3P3 MPCIE Selection (JP9)

Jumper Location: JP9

Description: V3P3 MPCIE Selection

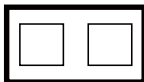

| SELECTION | JUMPER SETTING | JUMPER ILLUSTRATION |
|-----------|----------------------------------|---|
| VCC3_3 | <i>1-2 (Default Setting)</i> |  <p>JP9</p> |
| V3P3A | 2-3 |  <p>JP9</p> |

3.4.28 Clear CMOS Data Selection (JCMOS1)

Jumper Location: JCMOS1

Description: Clear CMOS Data Selection

- Step 1.** Remove the main power of the PC.
- Step 2.** Close **JCMOS1** (pins 1-2) for 6 seconds by a cap.
- Step 3.** Remove the cap which is just used on **JCMOS1** (1-2), so that **JCMOS1** returns to “OPEN”.
- Step 4.** Power on the PC and the PC will then auto-reboot for once in order to set SoC’s register.
- Step 5.** Done!

| SELECTION | JUMPER SETTINGS | JUMPER ILLUSTRATION |
|-----------------|-----------------------------------|---|
| Normal | <i>Open (Default Setting)</i> |  JCMOS1 |
| Clear CMOS Data | Close |  JCMOS1 |

Note: Please make sure the main power is off before you clear CMOS.

4 Software Utilities

This chapter provides the detailed information that guides users to install driver utilities for the system. The following topics are included:

- Installing Intel[®] Chipset Software Installation Utility
- Installing Graphics Driver Utility
- Installing LAN Driver Utility
- Installing Sound Driver Utility
- Installing Intel[®] Management Engine Components Installer
- Installing Intel[®] Serial I/O Driver Utility

4.1 Introduction

Enclosed with the BE-0996 Series package is our driver utilities contained in a DVD-ROM disk. Refer to the following table for driver locations:

| Filename (Assume that DVD-ROM drive is D:) | Purpose |
|--|---|
| D:\BE-0996_V1.0\Platform\ 1_Main Chip\Win10(64Bit) | Intel® Chipset Device Software installer |
| D:\BE-0996_V1.0\Platform\ 2_Graphics\Win10(64Bit) | Intel® HD Graphics Family For Graphics driver installation |
| D:\BE-0996_V1.0\Platform\ 3_Sound\Win10(64Bit) | Realtek ALC888S-VD2-GR HD Audio codec System Software |
| D:\BE-0996_V1.0\Platform\ 4_ME\ Win10 (64Bit)\ | Intel® Management Engine Components Installer for Intel Kaby Lake chipset |
| D:\BE-0996_V1.0\Platform\ 5_LAN Chip\ Win10 (64Bit) | Intel® I219-V & Intel® I211 For LAN Driver installation |
| D:\BE-0996_V1.0\Platform\ 6_Serial IO\Win10 (64Bit) | Intel® Serial I/O Driver |

X : Not support

✓: Support

Note: Install the driver utilities immediately after the OS installation is completed.

For more details on the installation sequence, refer to the Readme.txt file.

4.2 Installing Intel® Chipset Software Installation Utility

Introduction

The Intel® Chipset Software Installation Utility installs the Windows *.INF files to the target system. These files outline to the operating system how to configure the Intel chipset components in order to ensure that the following functions work properly:

- Core PCI and ISAPNP Services
- PCI-e Support
- SATA Storage Support
- USB Support
- Identification of Intel® Chipset Components in the Device Manager

Intel® Chipset Software Installation Utility

The utility pack is to be installed only for Windows 10 (64-bit), and it should be installed immediately after the OS installation is finished. Please follow the steps below:

- 1** Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2** Enter the **Main Chip** folder where the Chipset driver is located (depending on your OS platform).
- 3** Click **Setup.exe** file for driver installation.
- 4** Follow the on-screen instructions to install the driver.
- 5** Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

4.3 Installing Graphics Driver Utility

The Graphics interface embedded in BE-0996 can support dual displays via DP and HDMI interfaces and make the system work simultaneously.

To install the Graphics driver utility, follow the steps below:

- 1** Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2** Enter the **Graphics** folder where the driver is located (depending on your OS platform).
- 3** Click the **Setup.exe** file for driver installation.
- 4** Follow the on-screen instructions to complete the installation.
- 5** Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

4.4 Installing LAN Driver Utility

Enhanced with LAN function, BE-0996 supports various network adapters. To install the LAN Driver, follow the steps below:

- 1** Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2** Enter the **LAN** folder where the driver is located (depending on your OS platform).
- 3** Click **Autorun.exe** file for driver installation.
- 4** Follow the on-screen instructions to complete the installation.
- 5** Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

4.5 Installing Sound Driver Utility

To install the Sound Driver, follow the steps below:

- 1** Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2** Open the **Sound** folder where the driver is located (depending on your OS platform).
- 3** Click the **Setup.exe** file for driver installation.
- 4** Follow the on-screen instructions to complete the installation.
- 5** Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

4.6 Intel® Management Engine Components Installer Installation

Installation Instructions for Intel® Management Engine Components Installer

- 1 Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2 Enter the **ME** folder where the driver is located.
- 3 Select Windows 10 (64-bit) for your OS platform.
- 4 Click **Setup.exe** file for ME driver installation.
- 5 Follow the on-screen instructions to complete the installation.
- 6 Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

4.7 Installing Intel® Serial I/O Driver Utility

To install the Serial I/O Driver, follow the steps below:

- 1** Connect the USB DVD-ROM device to BE-0996 and insert the driver disk.
- 2** Open the **Serial I/O** folder where the driver is located.
- 3** Select Windows 10 (64-bit) for your OS platform.
- 4** Click the **Setup.exe** file for driver installation.
- 5** Follow the on-screen instructions to complete the installation.
- 6** Once the installation is completed, shut down the system and restart BE-0996 for the changes to take effect.

5 BIOS SETUP

This chapter guides users how to configure the basic system configurations via the BIOS Setup Utilities. The information of the system configuration is saved in BIOS NVRAM so that the Setup information is retained when the system is powered off. The BIOS Setup Utilities consist of the following menu items:

- Main Menu
- Advanced Menu
- Chipset Menu
- Security Menu
- Boot Menu
- Save & Exit Menu

5.1 Introduction

The BE-0996 uses an AMI (American Megatrends Incorporated) Aptio BIOS that is stored in the Serial Peripheral Interface Flash Memory (SPI Flash) and can be updated. The SPI Flash contains the built-in BIOS setup program, Power-On Self-Test (POST), PCI auto-configuration utility, LAN EEPROM information, and Plug and Play support.

Aptio is AMI's BIOS firmware based on the UEFI (Unified Extensible Firmware Interface) specifications and the Intel Platform Innovation Framework for EFI. The UEFI specification defines an interface between the operating system and platform firmware. The interface consists of data tables that contain platform-related information, boot service calls, and runtime service calls that are available to the operating system and its loader. These elements have combined to provide a standard environment for booting the operating system and running pre-boot applications.

The diagram below shows the Extensible Firmware Interface's location in the software stack.

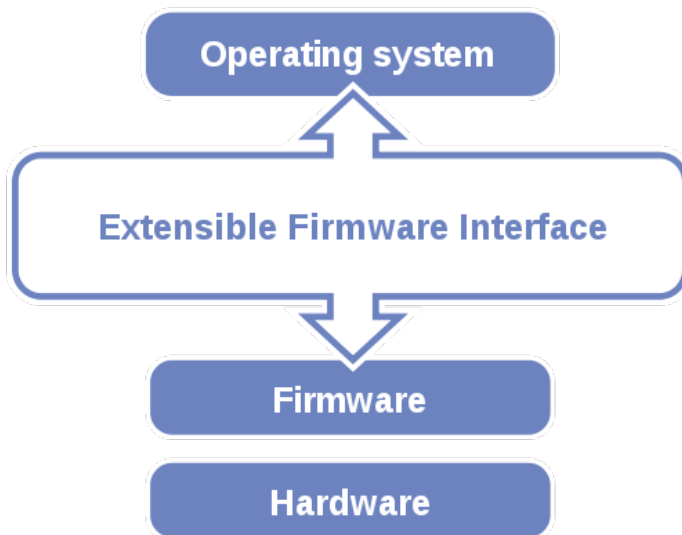


Figure 5-1. Extensible Firmware Interface Diagram

EFI BIOS provides an user interface that allows you to modify hardware configuration, e.g. change the system date and time, enable/disable a system component, determine bootable device priority, set up personal password, etc., which is convenient for engineers to perform modifications and customize the computer

system and allows technicians to troubleshoot the occurred errors when the hardware is faulty.

The BIOS setup menu allows users to view and modify the BIOS settings for the computer. After the system is powered on, users can access the BIOS setup menu by pressing or <Esc> immediately while the POST message is running before the operating system is loading.

5.2 Accessing Setup Utility

After the system is powered on, BIOS will enter the Power-On Self-Test (POST) routines and the POST message will be displayed:



Figure 5-2. POST Screen with AMI Logo

Press or <Esc> to access the Setup Utility program and the **Main** menu of the Aptio Setup Utility will appear on the screen as below:



BIOS Setup Menu Initialization Screen

You may move the cursor by <↑> and <↓> keys to highlight the individual menu items. As you highlight each item, a brief description of the highlighted selection will appear on the right side of the screen.

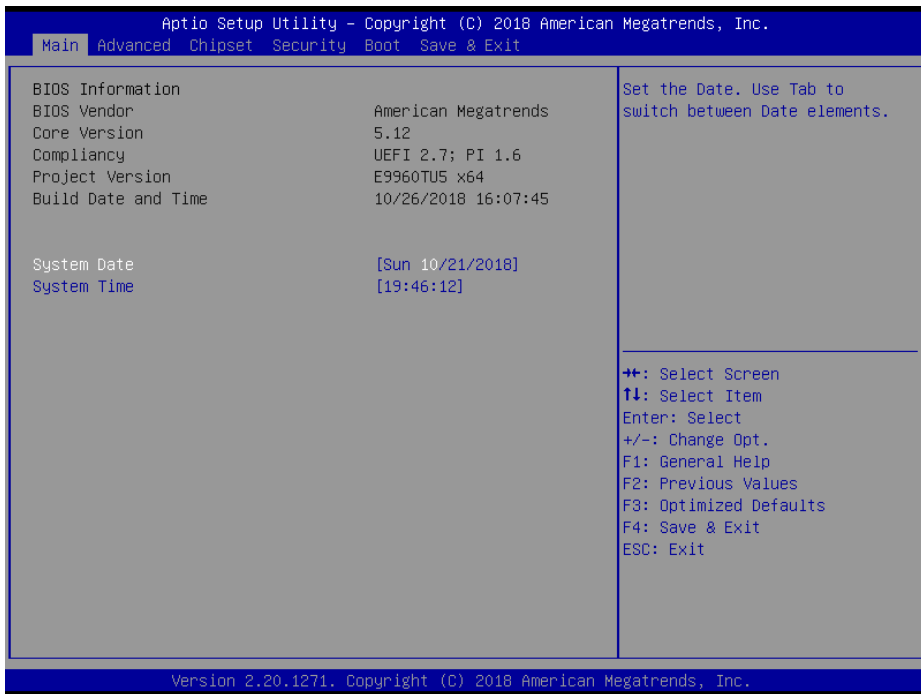
The language of the BIOS setup menu interface and help messages are shown in US English. You may use <↑> or <↓> key to select among the items and press <Enter> to confirm and enter the sub-menu. The following table provides the list of the navigation keys that you can use while operating the BIOS setup menu.

| BIOS Setup Navigation Key | Description |
|--------------------------------------|---|
| <←> and <→> | Select a different menu screen (move the cursor from the selected menu to the left or right). |
| <↑> and <↓> | Select a different item (move the cursor from the selected item upwards or downwards) |
| <Enter> | Execute the command or select the sub-menu. |
| <F2> | Load the previous configuration values. |
| <F3> | Load the default configuration values. |
| <F4> | Save the current values and exit the BIOS setup menu. |
| <Esc> | Close the sub-menu. Trigger the confirmation to exit BIOS setup menu. |

5.3 Main

Menu Path *Main*

The **Main** menu allows you to view the BIOS Information, change the system date and time, and view the user access privilege level. Use tab to switch between date elements. Use <↑> or <↓> arrow keys to highlight the item and enter the value you want in each item. This screen also displays the BIOS version (project) and BIOS Build Date and Time.



Main Screen

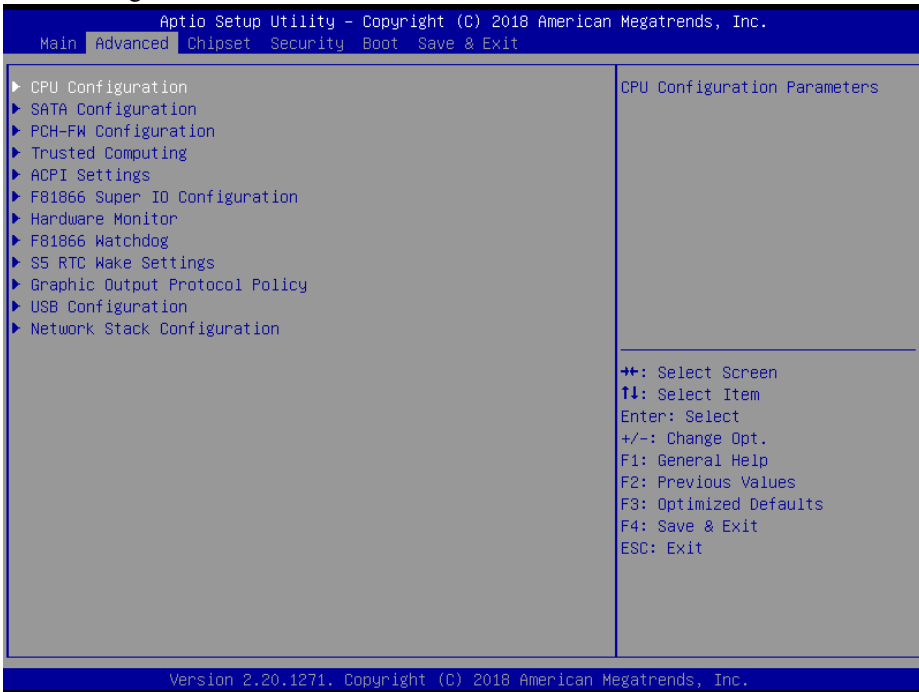
| BIOS Setting | Options | Description/Purpose |
|-----------------|-----------------------|---|
| BIOS Vendor | No changeable options | Displays the name of the BIOS vendor. |
| Core Version | No changeable options | Displays the current BIOS core version. |
| Compliancy | No changeable options | Displays the current UEFI version. |
| Project Version | No changeable options | Displays the version of the BIOS currently installed on the platform. |
| System Date | Month, day, year | Sets the system date. The format is [Day Month/ Date/ Year]. Users can directly enter values or use <+> or <-> arrow keys to increase/decrease it. The “Day” is |

| BIOS Setting | Options | Description/Purpose |
|---------------------|----------------------|---|
| | | automatically changed. |
| System Time | Hour, minute, second | Sets the system time. The format is [Hour: Minute: Second]. Users can directly enter values or use <+> or <-> arrow keys to increase/decrease it. |

5.4 Advanced

Menu Path *Advanced*

This menu provides advanced configurations such as CPU Configuration, SATA Configuration, PCH-FW Configuration, Trusted Computing, ACPI Settings, F81866 Super IO Configuration, Hardware Monitor, F81866 Watchdog, S5 RTC Wake Settings, Graphic Output Protocol Policy, USB Configuration and Network Stack Configuration.



Advanced Menu Screen

| BIOS Setting | Options | Description/Purpose |
|-------------------------------|----------|---|
| CPU Configuration | Sub-Menu | CPU Configuration Parameters. |
| SATA Configuration | Sub-Menu | SATA Device Options Settings. |
| PCH-FW Configuration | Sub-Menu | Management Engine Technology Parameters. |
| Trusted Computing | Sub-Menu | Trusted Computing Settings. |
| ACPI Settings | Sub-Menu | System ACPI Parameters. |
| F81866 Super IO Configuration | Sub-Menu | System Super IO Chip Parameters |
| Hardware Monitor | Sub-Menu | Monitor hardware status |
| F81866 Watchdog | Sub-Menu | F81866 Watchdog Parameters. |
| S5 RTC Wake Settings | Sub-Menu | Enables the system to wake from S5 using RTC alarm. |

| BIOS Setting | Options | Description/Purpose |
|--------------------------------|----------|---|
| Graphic Output Protocol Policy | Sub-Menu | User selects Monitor Output by Graphic Output Protocol. |
| USB Configuration | Sub-Menu | USB Configuration Parameters. |
| Network Stack Configuration | Sub-Menu | Network Stack Settings. |

5.4.1 Advanced – CPU Configuration

Menu Path *Advanced > CPU Configuration*

The **CPU Configuration** provides advanced CPU settings and some information about CPU.



CPU Configuration Screen

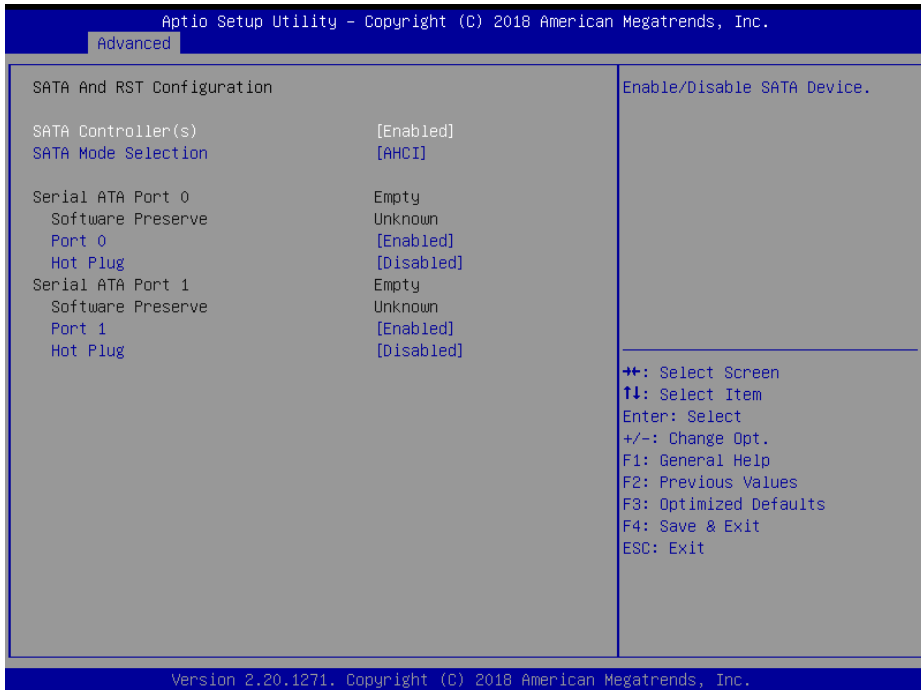
| BIOS Setting | Options | Description/Purpose |
|----------------------|-----------------------|--------------------------------------|
| Type | No changeable options | Displays CPU type. |
| ID | No changeable options | Displays CPU ID number. |
| Microcode Revision | No changeable options | Displays the CPU Microcode Revision. |
| Speed | No changeable options | Displays the CPU speed. |
| Number of Processors | No changeable options | Displays the CPU number of the |

| BIOS Setting | Options | Description/Purpose |
|---------------------------------------|-------------------------|---|
| | | processor. |
| VMX | No changeable options | CPU VMX hardware support for virtual machines. |
| SMX/TXT | No changeable options | Reports if Intel Secure Mode Extensions Technology (SMX) /Trusted Execution Technology (TXT) is supported by the processor. |
| L1 Data Cache | No changeable options | Displays L1 Data Cache size. |
| L1 Instruction Cache | No changeable options | Displays L1 Instruction Cache size. |
| L2 Cache | No changeable options | Displays L2 Cache size. |
| L3 Cache | No changeable options | Displays L3 Cache size. |
| L4 Cache | No changeable options | Displays L4 Cache size. |
| Hyper-Threading | - Disabled - Enabled | When disabled, only one thread per enabled core is enabled. Hyper Threading is Intel's term for its simultaneous multithreading implementation in their CPUs. Enabling this function will improve parallelization of computation performed on PC microprocessor. For each processor core that is physically present, the operating system addresses two virtual processors, and shares the workload between them when possible. |
| Intel (VMX) Virtualization Technology | - Disabled - Enabled | When enabled, VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. |

5.4.2 Advanced – SATA Configuration

Menu Path *Advanced > SATA Configuration*

The **SATA Configuration** allows users to enable / disable the SATA controller as well as the operational mode after the SATA controller is enabled. The following screen indicates the functions available when the SATA hard drive is set to work in AHCI mode.



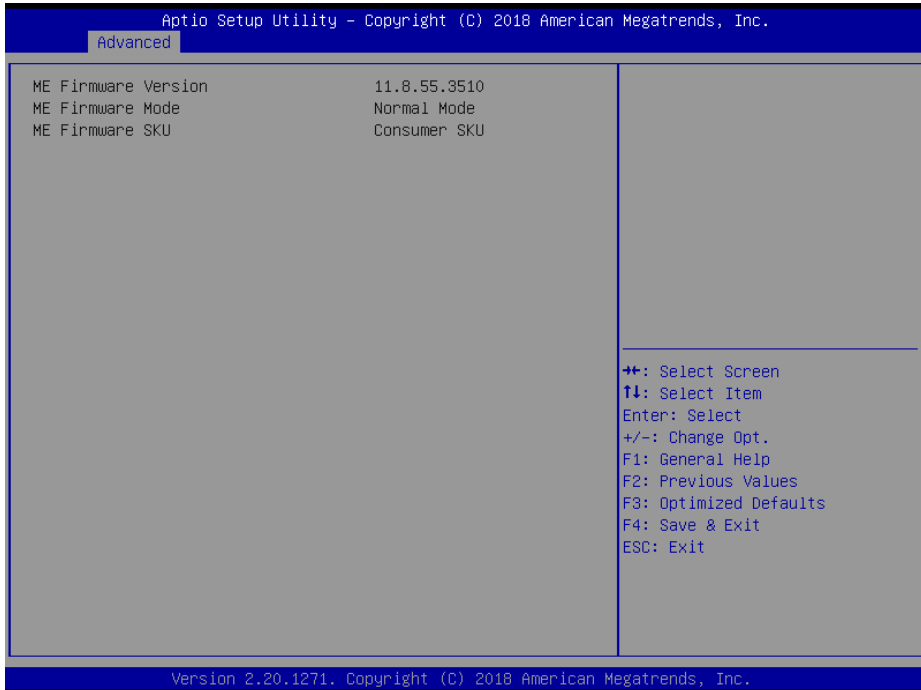
SATA Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|-----------------------|-------------------------|---|
| SATA Controller(s) | - Disabled - Enabled | Enables or Disables the on-chip SATA Device. Default: Enabled. |
| SATA Mode Selection | - AHCI | Determines how SATA controller(s) operate. |
| Serial ATA Port 0 – 1 | No changeable options | Displays the SATA device's name. |
| Software Preserve | No changeable options | Indicates whether the connected SATA device supports Software Setting Preservation (SSP). |
| Port 0 - 1 | - Disabled - Enabled | Enables or Disables SATA Port Device. |
| Hot Plug | - Disabled - Enabled | Enables or Disables Hot Plug function to designate a SATA port device as hot-pluggable. |

5.4.3 Advanced – PCH-FW Configuration

Menu Path *Advanced > PCH-FW Configuration*

The **PCH-FW** allows users to view the information about ME (Management Engine) firmware information, such as ME firmware version, firmware mode and firmware SKU.



PCH-FW Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------|-----------------------|-----------------------------------|
| ME Firmware Version | No changeable options | Displays the ME Firmware Version. |
| ME Firmware Mode | No changeable options | Displays the ME Firmware Mode. |
| ME Firmware SKU | No changeable options | Displays the ME Firmware SKU. |

5.4.4 Advanced – Trusted Computing

Menu Path *Advanced > Trusted Computing*



Trusted Computing Screen

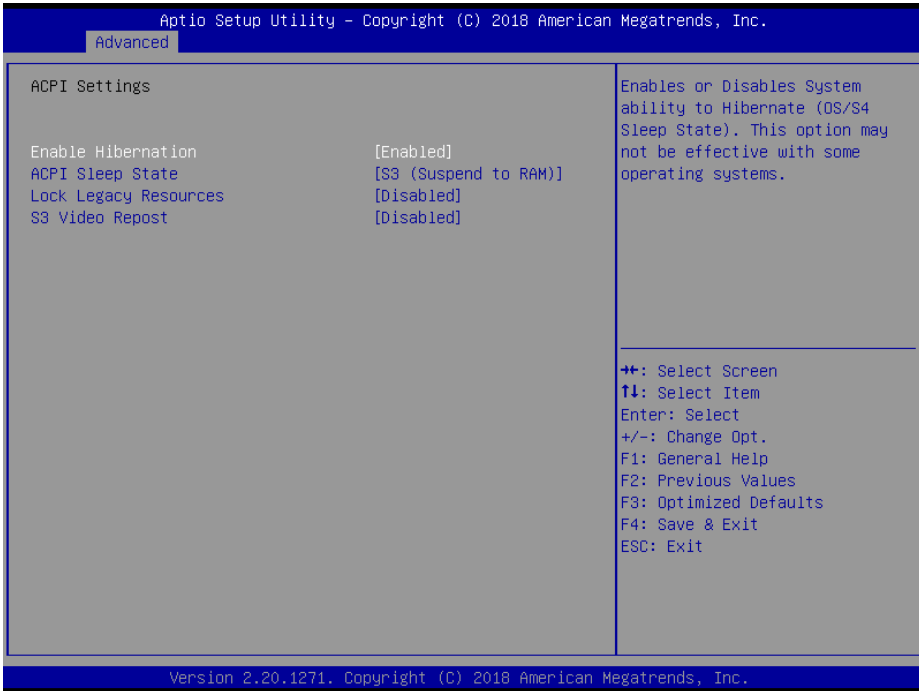
| BIOS Setting | Options | Description/Purpose |
|-------------------------|-------------------------|---|
| Firmware Version | No changeable options | Displays the Firmware Version. |
| Vendor | No changeable options | Displays the Vendor. |
| Security Device Support | - Disabled - Enabled | Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available. |
| Active PCR banks | No changeable options | Displays the Active PCR banks. |
| Available PCR banks | No changeable options | Displays the Available PCR banks. |
| SHA-1 PCR Bank | - Disabled - Enabled | Enables or Disables SHA-1 PCR Bank. |
| SHA256 PCR Bank | - Disabled - Enabled | Enables or Disables SHA256 PCR Bank. |
| Pending operation | - None - TPM Clear | Schedules an operation for the Security Device. Note: Your computer will reboot during restart in |

| BIOS Setting | Options | Description/Purpose |
|--------------------------------|----------------------------------|--|
| | | order to change the State of Security Device. |
| Platform Hierarchy | - Disabled - Enabled | Enables or Disables the Platform Hierarchy. |
| Storage Hierarchy | - Disabled - Enabled | Enables or Disables the Storage Hierarchy. |
| Endorsement Hierarchy | - Disabled - Enabled | Enables or Disables the Endorsement Hierarchy. |
| TPM2.0 UEFI Spec Version | - TCG_1_2 - TCG_2 | Selects the TCG2 Spec Version Support. <ul style="list-style-type: none"> • TCG_1_2: The Compatible mode for Win8/Win10. • TCG_2: Supports new TCG2 protocol and event format for Win10 or later. |
| Physical Presence Spec Version | - 1.2 - 1.3 | Selects to tell O.S. to support PPI Spec. version 1.2 or 1.3. Note some HCK tests might not support version 1.3. |
| TPM 20 Interface Type | No changeable options | Displays the TPM 20 Interface Type. |
| Device Select | - TPM 1.2 - TPM 2.0 - Auto | <ul style="list-style-type: none"> • TPM 1.2: Restricts support to TPM 1.2 devices. • TPM 2.0: Restricts support to TPM 2.0 devices. • Auto: Supports both TPM 1.2 and TPM 2.0 with the default set to TPM 2.0 devices if not found. TPM 1.2 devices will be enumerated. |

5.4.5 Advanced – ACPI Settings

Menu Path *Advanced > ACPI Settings*

The **ACPI Settings** allows users to configure relevant ACPI (Advanced Configuration and Power Management Interface) settings, such as Enable/Disable Hibernation, ACPI sleep state, lock legacy resources and S3 Video Repost.



ACPI Settings Screen

| BIOS Setting | Options | Description/Purpose |
|-----------------------|---|---|
| Enable Hibernation | - Disabled - Enabled | Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS. |
| ACPI Sleep State | - Suspend Disabled - S3 (Suspend to RAM) | Selects the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. |
| Lock Legacy Resources | - Disabled - Enabled | Enables or Disables Lock of Legacy Resources. |
| S3 Video Repost | - Disabled - Enabled | Enables or Disables S3 Video Repost. |

5.4.6 Advanced – F81866 Super IO Configuration

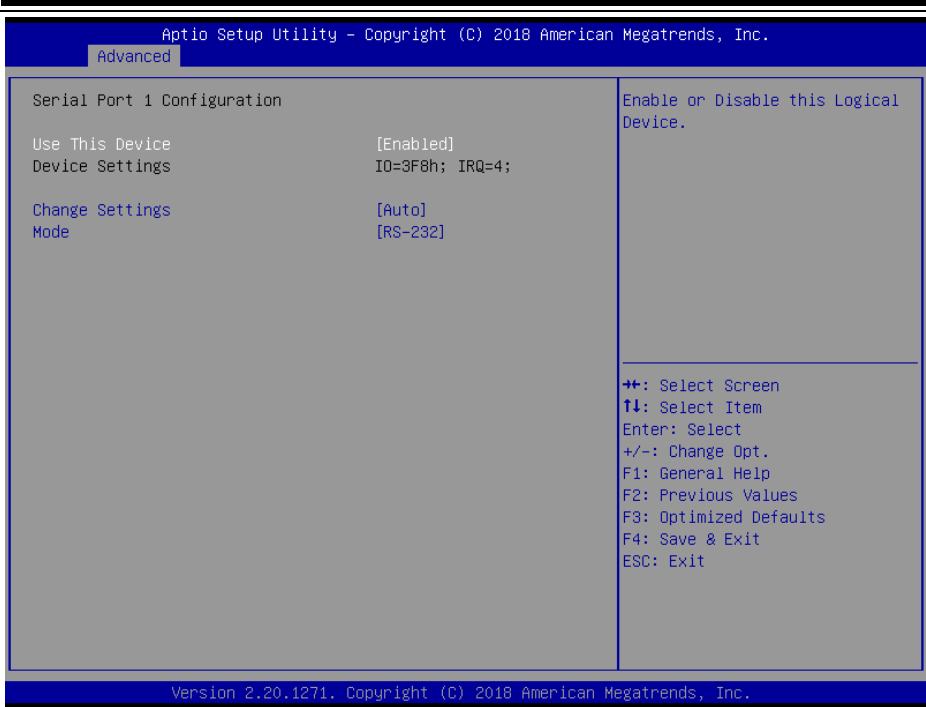
Menu Path *Advanced > F81866 Super IO Configuration*

The **F81866 Super IO Configuration** allows users to configure the serial ports 1-2.



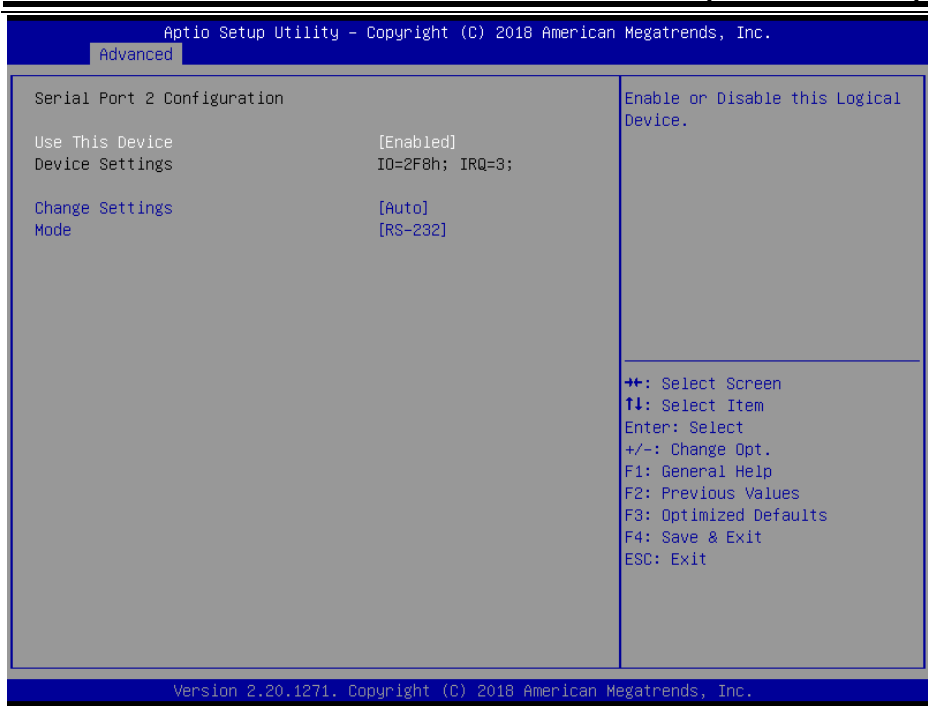
F81866 Super IO Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|-----------------------------|----------|--|
| Serial Port 1 Configuration | Sub-Menu | Sets the parameters of Serial Port 1 (COMA). |
| Serial Port 2 Configuration | Sub-Menu | Sets the parameters of Serial Port 2 (COMB). |



Serial Port 1 Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|-----------------|---|--|
| Use This Device | - Disabled - Enabled | Enables or Disables Serial Port 1. |
| Device Settings | No changeable options | Displays the current settings of Serial Port 1. |
| Change Settings | - Auto - IO=3F8h; IRQ=4; - IO=3F8h; IRQ=3,4,5,7,10,11,12; - IO=2F8h; IRQ=3,4,5,7,10,11,12; - IO=3E8h; IRQ=3,4,5,7,10,11,12; - IO=2E8h; IRQ=3,4,5,7,10,11,12; | Selects IRQ and I/O resource settings for Serial Port 1. |
| Mode | - RS-232 - RS-422 - RS-485 | Selects COM mode. |



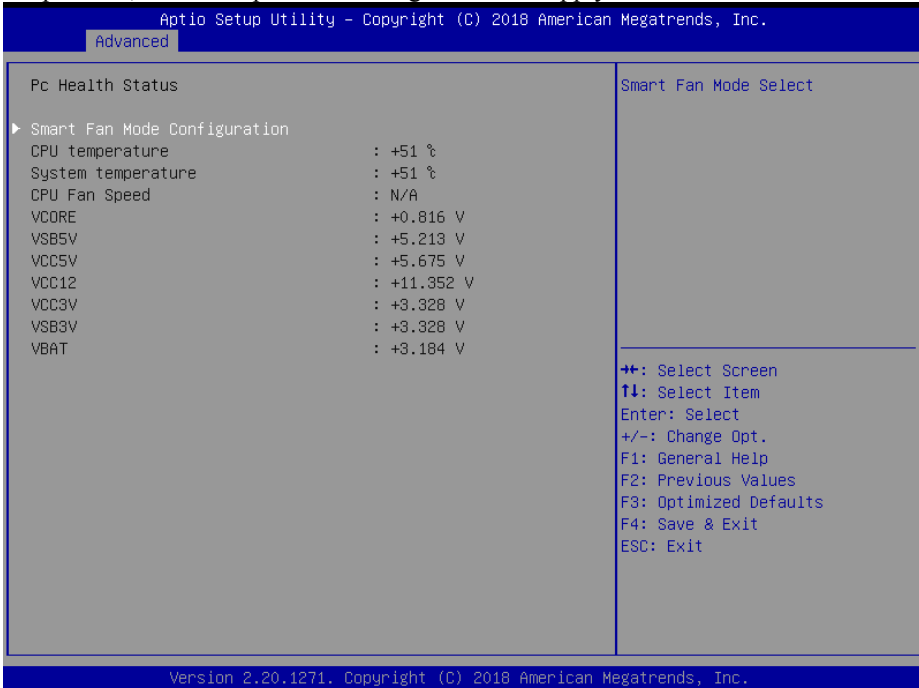
Serial Port 2 Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|-----------------|---|--|
| Use This Device | - Disabled - Enabled | Enables or Disables Serial Port 2. |
| Device Settings | No changeable options | Displays the current settings of Serial Port 2. |
| Change Settings | - Auto - IO=2F8h; IRQ=3; - IO=3F8h; IRQ=3,4,5,7,10,11,12; - IO=2F8h; IRQ=3,4,5,7,10,11,12; - IO=3E8h; IRQ=3,4,5,7,10,11,12; - IO=2E8h; IRQ=3,4,5,7,10,11,12; | Selects IRQ and I/O resource settings for Serial Port 2. |
| Mode | - RS-232 - RS-422 - RS-485 | Selects COM mode. |

5.4.7 Advanced – Hardware Monitor

Menu Path *Advanced > Hardware Monitor*

The **Hardware Monitor** allows users to configure Smart Fan Mode for CPU fan, monitor the health and status of the system such as CPU temperature, system temperature, CPU fan speed and voltage levels in supply.



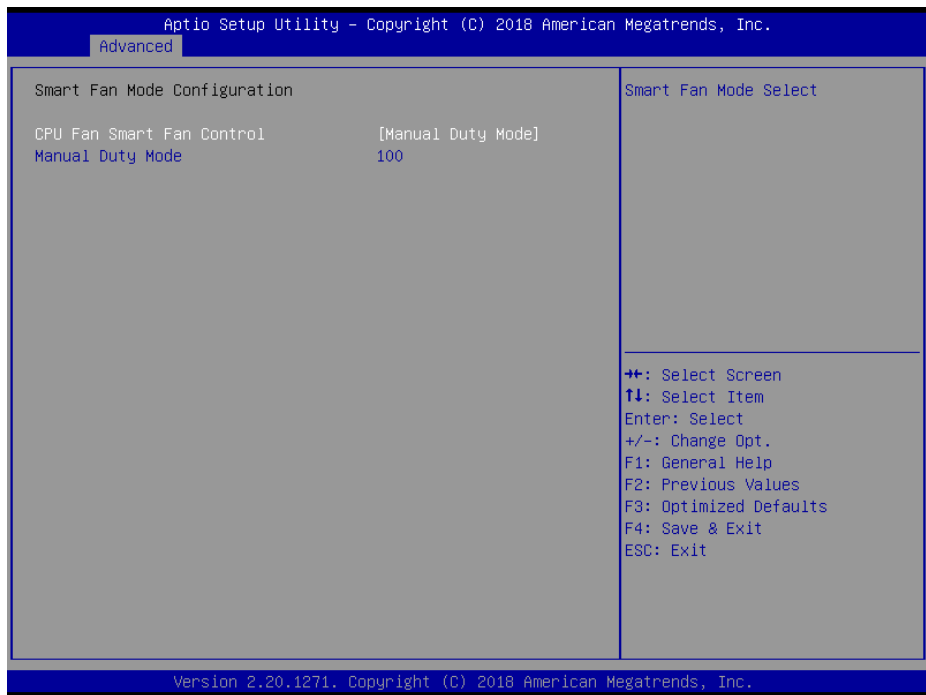
Hardware Monitor Screen

| BIOS Setting | Options | Description/Purpose |
|------------------------------|-----------------------|--|
| Smart Fan Mode Configuration | Sub-Menu | Smart Fan Mode Selection. |
| CPU temperature | No changeable options | Displays the processor's temperature. |
| System temperature | No changeable options | Displays the system's temperature. |
| CPU Fan Speed | No changeable options | Displays CPU Fan speed |
| VCORE | No changeable options | Displays the voltage level of VCORE in supply. |
| VSB5V | No changeable options | Displays the voltage level of VSB5V in supply. |
| VCC5V | No changeable options | Displays the voltage level of VCC5V in supply. |

| BIOS Setting | Options | Description/Purpose |
|--------------|-----------------------|--|
| VCC12 | No changeable options | Displays the voltage level of VCC12 in supply. |
| VCC3V | No changeable options | Displays the voltage level of VCC3V in supply. |
| VSB3V | No changeable options | Displays the voltage level of VSB3V in supply. |
| VBAT | No changeable options | Displays the voltage level of VBAT in supply. |

Smart Fan Mode Configuration

Menu Path *Advanced > Hardware Monitor > Smart Fan Mode Configuration*



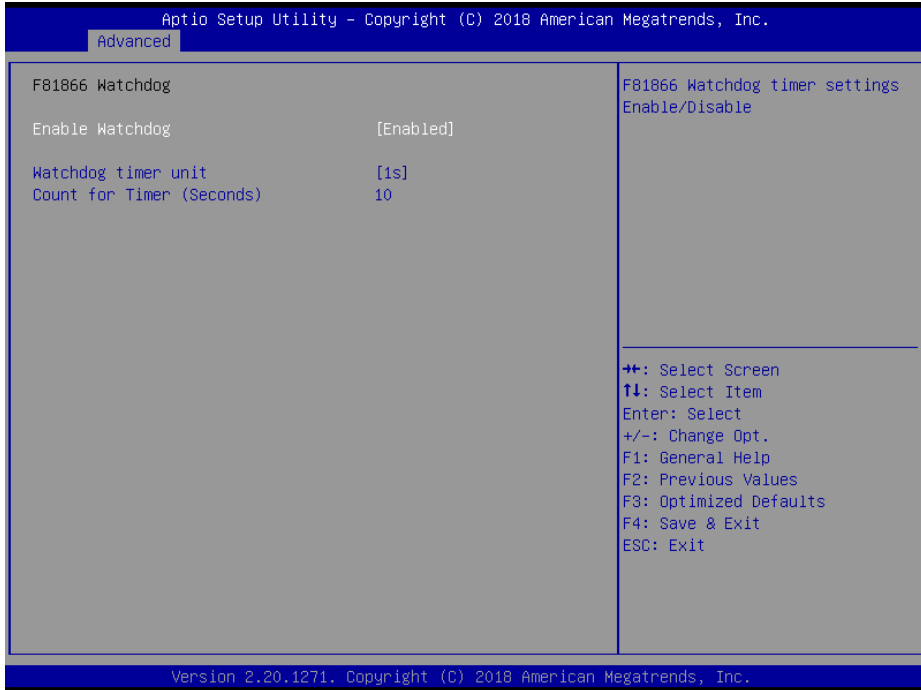
Smart Fan Mode Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------------|--|--|
| CPU Fan Smart Fan Control | - Manual Duty Mode - Auto Duty-Cycle Mode | Smart Fan Mode selection for CPU Fan. |
| Manual Duty Mode | Numeric (from 1 to 100) | Manual mode fan control. Users can write expected duty cycle (PWM fan type) from 1 to 100. |

5.4.8 Advanced – F81866 Watchdog

Menu Path *Advanced > F81866 Watchdog*

If the system hangs or fails to respond, enable the F81866 watchdog function to trigger a system reset via the 255-level watchdog timer.



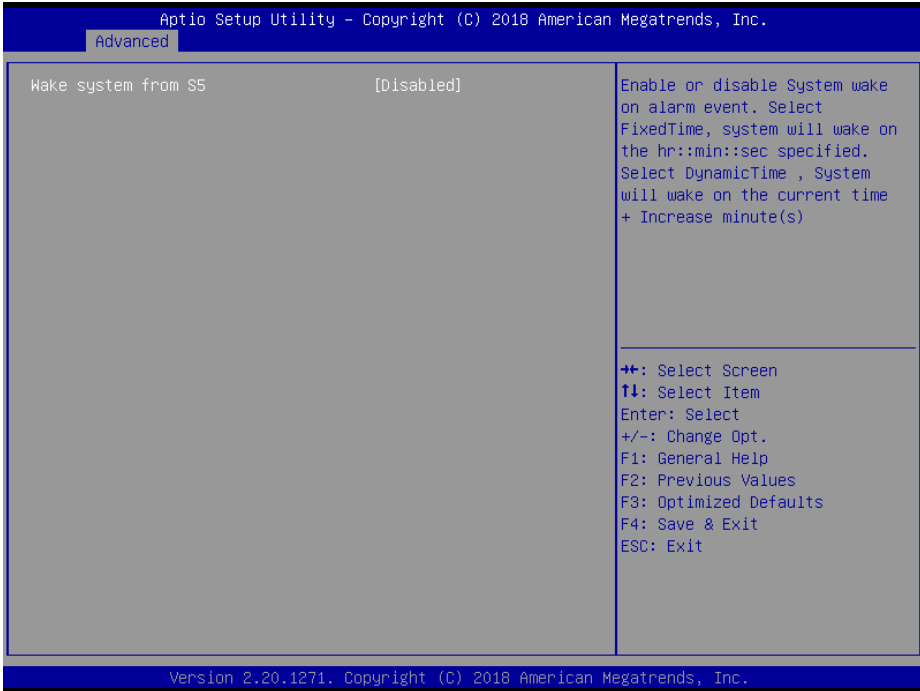
F81866 Watchdog Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------------|-----------------------------------|--|
| Enable Watchdog | - Disabled (default) - Enabled | Enables/Disables F81866 Watchdog timer settings. |
| Watchdog timer unit | - 1s - 60s | Watchdog timer unit. |
| Count for Timer (Seconds) | Numeric (from 10 to 255) | The number of count for Timer. |

5.4.9 Advanced – S5 RTC Wake Settings

Menu Path *Advanced > S5 RTC Wake Settings (Disabled)*

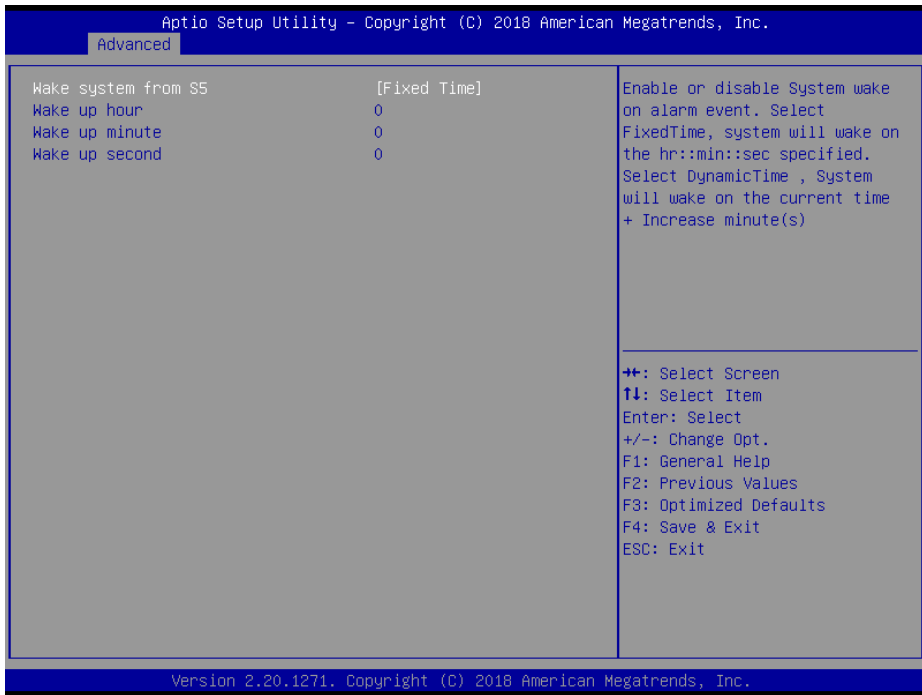
The **S5 RTC Wake Settings** enables/disables the system to wake up at a preset time of a day from S5 State using RTC alarm.



S5 RTC Wake Settings Screen (Disabled)

| BIOS Setting | Options | Description/Purpose |
|---------------------|--|--|
| Wake system from S5 | - Disabled - Fixed Time - Dynamic Time | Allows enabling scheduled S5 to S0 (option enabled). <ul style="list-style-type: none"> • Fixed Time: System will wake on the hr::min::sec specified. • Dynamic Time: System will wake on the current time + Increase minute(s). |

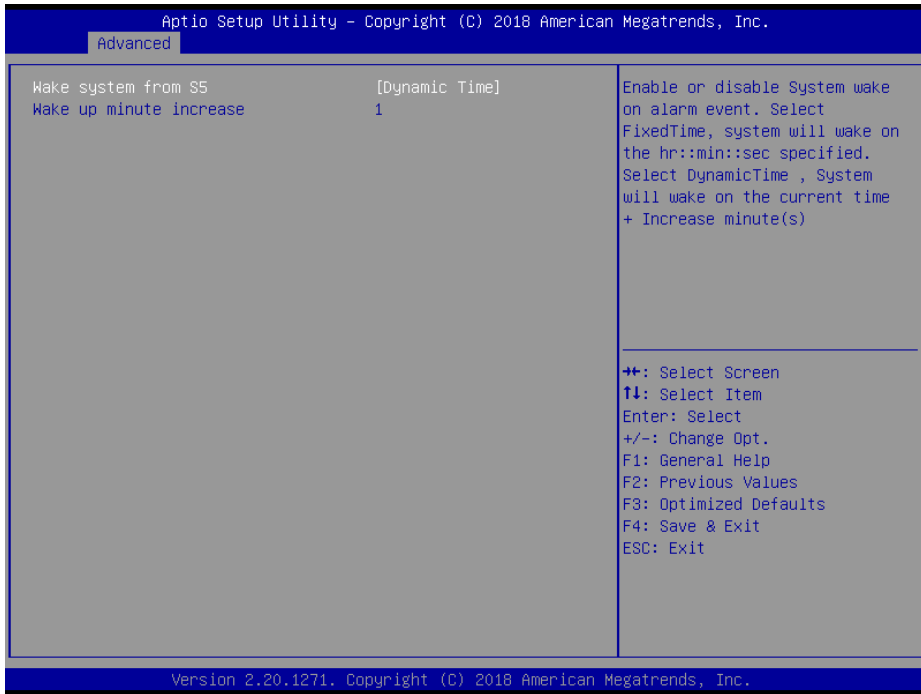
Menu Path *Advanced > S5 RTC Wake Settings (Fixed Time)*



S5 RTC Wake Settings Screen (Fixed Time)

| BIOS Setting | Options | Description/Purpose |
|---------------------|--|--|
| Wake system from S5 | - Disabled - Fixed Time - Dynamic Time | Allows enabling scheduled S5 to S0 (option: enabled). <ul style="list-style-type: none"> • Fixed Time: System will wake on the hr::min::sec specified. • Dynamic Time: System will wake on the current time + Increase minute(s). |
| Wake up hour | Multiple options ranging from 0 to 23 | Sets an hour for scheduled power-on event. |
| Wake up minute | Multiple options ranging from 0 to 59 | Sets a minute for scheduled power-on event. |
| Wake up second | Multiple options ranging from 0 to 59 | Sets a second for scheduled power-on event. |

Menu Path *Advanced > S5 RTC Wake Settings (Dynamic Time)*



S5 RTC Wake Settings Screen (Dynamic Time)

| BIOS Setting | Options | Description/Purpose |
|-------------------------|--|---|
| Wake system from S5 | - Disabled - Fixed Time - Dynamic Time | Allows enabling scheduled S5 to S0 (option: enabled). <ul style="list-style-type: none"> • Fixed Time: System will wake on the hr::min::sec specified. • Dynamic Time: System will wake on the current time + Increase minute(s). |
| Wake up minute increase | Multiple options ranging from 1 to 5 | Sets a period of time (in minutes) after which the board wakes up from S5 state. |

5.4.10 Advanced – Graphic Output Protocol Policy

Menu Path *Advanced > Graphic Output Protocol Policy*

The **Graphic Output Protocol Policy** allows users to configure the monitor output policy.



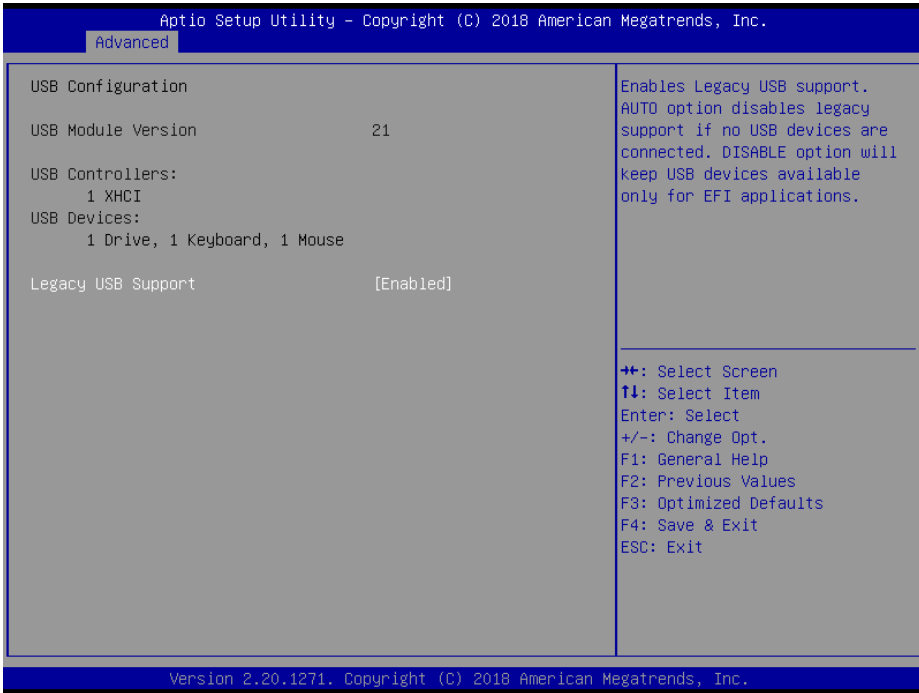
Graphic Output Protocol Policy Screen

| BIOS Setting | Options | Description/Purpose |
|---------------|--------------------------|---------------------|
| Output Select | - Default - DP + HDMI | Output Interface. |

5.4.11 Advanced – USB Configuration

Menu Path *Advanced > USB Configuration*

The **USB Configuration** allows users to enable/disable legacy USB support.



USB Configuration Screen

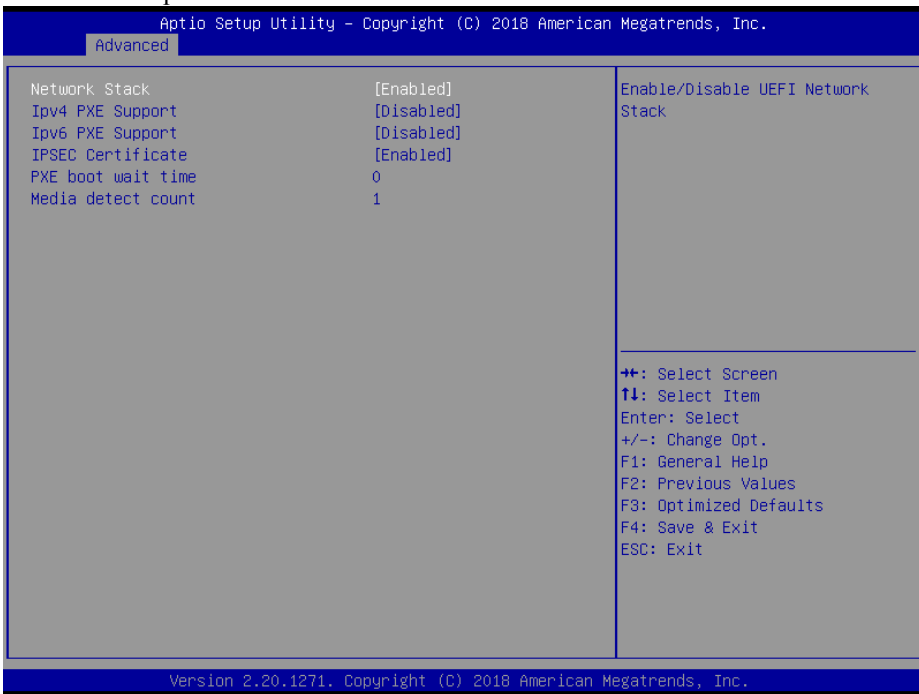
| BIOS Setting | Options | Description/Purpose |
|--------------------|-------------------------|--------------------------------------|
| Legacy USB Support | - Disabled - Enabled | Enables/Disables Legacy USB support. |

5.4.12 Advanced – Network Stack Configuration

Menu Path *Advanced > Network Stack Configuration*

The **Network Stack Configuration** allows users to enable/disable UEFI Network Stack, IPv4/IPv6 PXE (Pre-Boot eXecution Environment) support and configure PXE boot wait time and detects the media presence.

PXE allows a workstation to boot from a server on a network prior to booting the operating system on the local hard drive. A PXE-enabled workstation connects its NIC to the LAN via a jumper, which keeps the workstation connected to the network even when the power is turned off.



Network Stack Configuration Screen

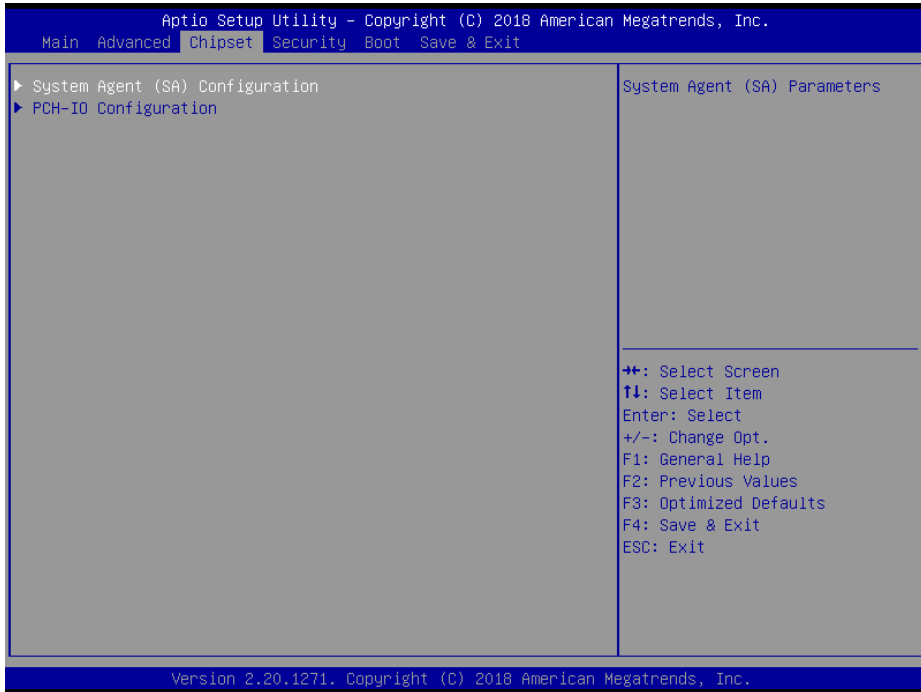
| BIOS Setting | Options | Description/Purpose |
|------------------|-------------------------|---|
| Network Stack | - Disabled - Enabled | Enables or Disables UEFI Network Stack. |
| Ipv4 PXE Support | - Disabled - Enabled | Enables Ipv4 PXE Boot Support. If disabled, Ipv4 PXE boot option will not be created. |
| Ipv6 PXE Support | - Disabled - Enabled | Enables Ipv6 PXE Boot Support. If disabled, Ipv6 PXE boot option will not be created. |

| BIOS Setting | Options | Description/Purpose |
|---------------------|-------------------------|---|
| IPSEC Certificate | - Disabled - Enabled | Support to Enable/Disable IPSEC certificate for Ikev. |
| PXE boot wait time | Numeric (from 0 to 5) | Number of seconds to wait for PXE boot to abort after the Esc key is pressed. |
| Media detect count | Numeric (from 1 to 50) | Number of times that the media presence will be checked. |

5.5 Chipset

Menu Path *Chipset*

This menu allows users to configure advanced Chipset settings such as System Agent (SA) and PCH-IO configuration parameters.



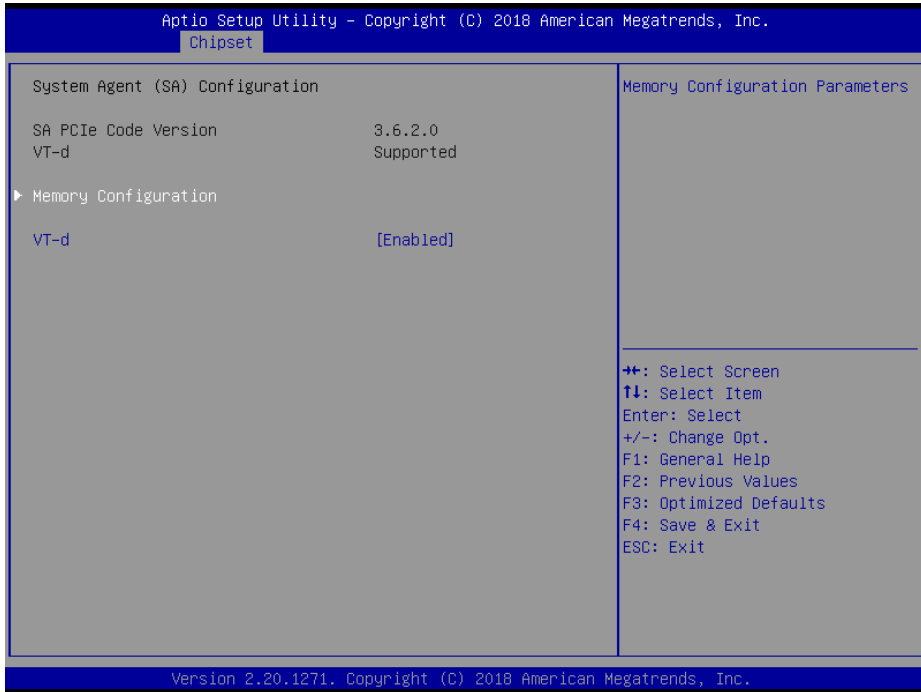
Chipset Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------------------|----------|-------------------------------|
| System Agent (SA) Configuration | Sub-Menu | System Agent (SA) Parameters. |
| PCH-IO Configuration | Sub-Menu | PCH Parameters. |

5.5.1 Chipset – System Agent (SA) Configuration

Menu Path *Chipset > System Agent (SA) Configuration*

The **System Agent Configuration** allows users to display DRAM information on the platform as well as configure graphics and PEG Port settings, and enable/disable VT-d function.



System Agent (SA) Configuration Screen

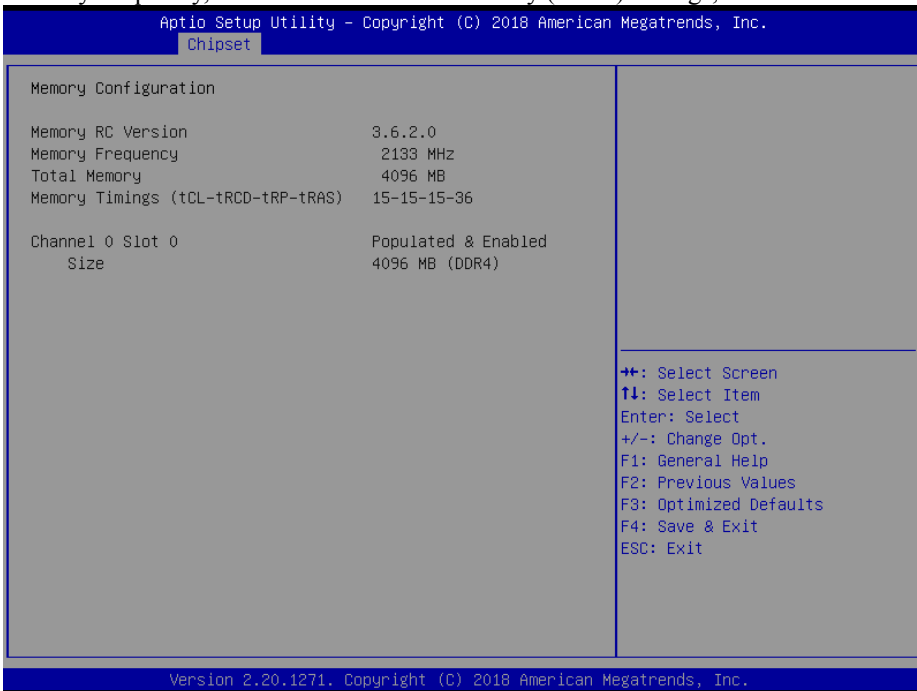
| BIOS Setting | Options | Description/Purpose |
|----------------------|-----------------------|---|
| SA PCIe Code Version | No changeable options | Displays the SA PCIe Code Version. |
| VT-d | No changeable options | Indicates whether Intel's VT-d (Virtualization Technology for Directed I/O) capability is supported. VT-d extends Intel's Virtualization Technology (VT) roadmap by providing hardware assists for virtualization solution, and helps end users improve security and reliability of the systems and also improves performance of I/O devices in virtualized environment. |
| Memory Configuration | Sub-Menu | Displays the DRAM information on the platform. |

| BIOS Setting | Options | Description/Purpose |
|--------------|-------------------------|------------------------------------|
| VT-d | - Disabled - Enabled | Enables or Disables VT-d function. |

Chipset – SA Configuration – Memory Configuration

Menu Path *Chipset > System Agent (SA) Configuration > Memory Configuration*

The **Memory Configuration** allows users to check for the information about the memory frequency, total DRAM size and memory (RAM) timings, etc.



Memory Configuration Screen

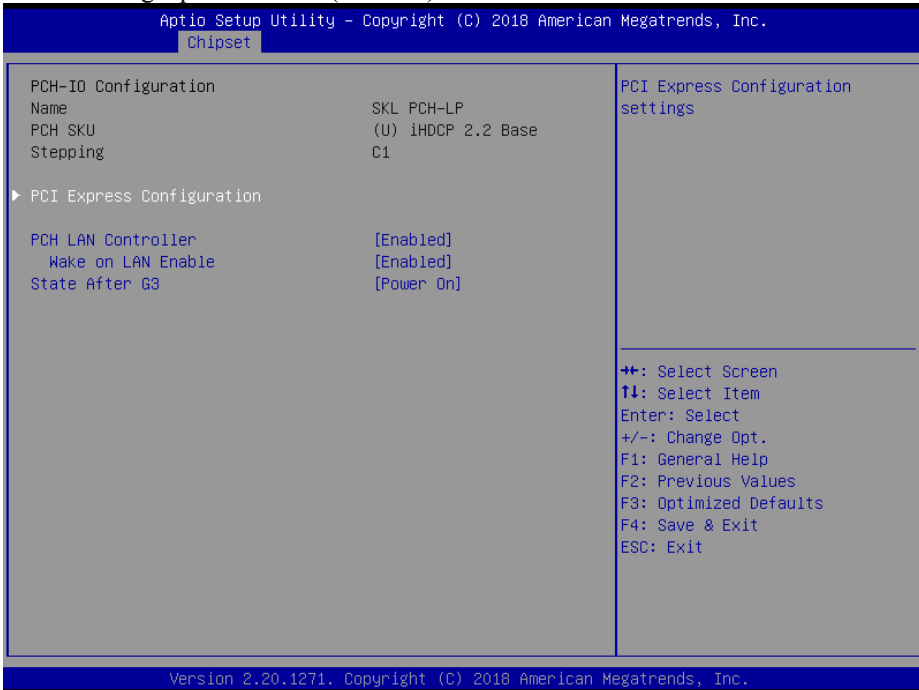
| BIOS Setting | Options | Description/Purpose |
|------------------------------------|-----------------------|--|
| Memory RC Version | No changeable options | Displays the Memory RC Version. |
| Memory Frequency | No changeable options | Displays the Frequency of Memory. |
| Total Memory | No changeable options | Displays the total memory. |
| Memory Timings (tCL-tRCD-tRP-tRAS) | No changeable options | Displays the Memory (RAM) timings and latency. <ul style="list-style-type: none"> • CAS Latency (tCL) - This is the most important memory timing. CAS stands |

| BIOS Setting | Options | Description/Purpose |
|------------------|-----------------------|---|
| | | <p>for Column Address Strobe. If a row has already been selected, it tells us how many clock cycles we'll have to wait for a result (after sending a column address to the RAM controller).</p> <ul style="list-style-type: none"> • Row Address (RAS) to Column Address (CAS) Delay (tRCD) - Once we send the memory controller a row address, we'll have to wait this many cycles before accessing one of the row's columns. So, if a row hasn't been selected, this means we'll have to wait tRCD + tCL cycles to get our result from the RAM. • Row Precharge Time (tRP) - If we already have a row selected, we'll have to wait this number of cycles before selecting a different row. This means it will take tRP + tRCD + tCL cycles to access the data in a different row. • Row Active Time (tRAS) - This is the minimum number of cycles that a row has to be active for to ensure we'll have enough time to access the information that's in it. This usually needs to be greater than or equal to the sum of the previous three latencies (tRAS = tCL + tRCD + tRP). |
| Channel 0 Slot 0 | No changeable options | Displays if Channel 0 Slot 0 socket is populated/enabled or not. |
| Size | No changeable options | Displays the total memory size. |

5.5.2 Chipset – PCH-IO Configuration

Menu Path *Chipset > PCH-IO Configuration*

The **PCH-IO Configuration** allows users to enable/disable PCH LAN Controller and Wake-On-LAN function and determine the power on/off state that the system will go into following a power failure (G3 state).

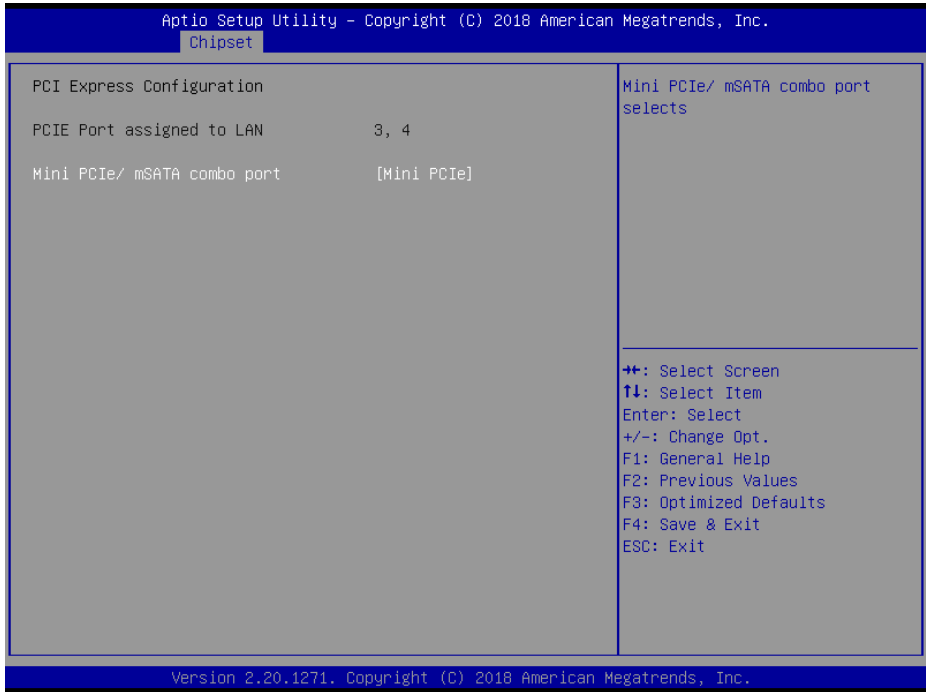


PCH-IO Configuration Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------------|---------------------------|--|
| Name | No changeable options | Displays the Intel PCH Name. |
| PCH SKU | No changeable options | Displays the Intel PCH SKU. |
| Stepping | No changeable options | Displays the Intel PCH Stepping. |
| PCI Express Configuration | Sub-Menu | PCI Express Configuration settings. |
| PCH LAN Controller | - Disabled - Enabled | Enables or Disables onboard NIC. |
| Wake on LAN Enable | - Disabled - Enabled | Enables or Disables integrated LAN to wake up the system. Default: Enabled. |
| State After G3 | - Power On - Power Off | Specifies the Power On/Off state that the system will go into when the power is re-applied following a power failure (G3 state). |

Chipset – PCH-IO Configuration – PCI Express Configuration

Menu Path *Chipset > PCH-IO Configuration > PCI Express Configuration*



PCI Express Configuration Screen

* Mini PCIe/ mSATA combo port function is for "CPU i5-7300U" SKU only.

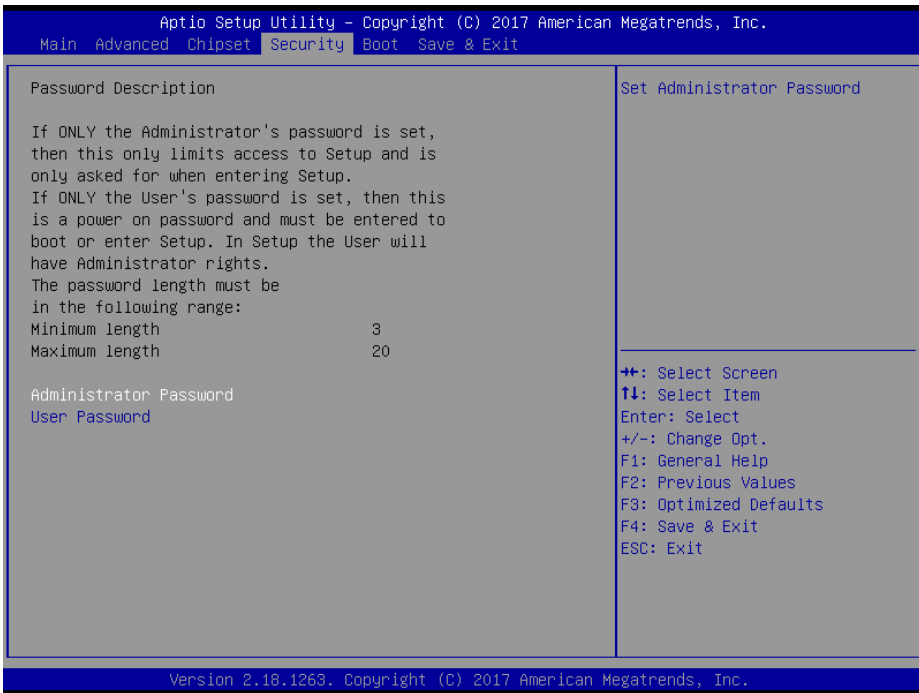
| BIOS Setting | Options | Description/Purpose |
|-----------------------------|------------------------|--|
| PCIE Port assigned to LAN | No changeable options | Displays the LAN assigned PCIE Port. |
| Mini PCIe/ mSATA combo port | - Mini PCIe - mSATA | Mini PCIe/ mSATA combo port selection. |

5.6 Security

Menu Path *Security*

From the **Security** menu, you are allowed to create, change or clear the administrator password. You will be asked to enter the configured administrator password before you can access the Setup Utility.

By setting an administrator password, you will prevent other users from changing your BIOS settings. You can configure an Administrator password and then configure a user password. An administrator has much more privileges over the settings in the Setup utility than a user. Heed that a user password does not provide access to most of the features in the Setup utility.



Security Screen

| BIOS Setting | Options | Description/Purpose |
|------------------------|---|---------------------------------------|
| Administrator Password | Password can be 3-20 alphanumeric characters. | Specifies the administrator password. |
| User Password | Password can be 3-20 alphanumeric characters. | Specifies the user password. |

Create an Administrator or User Password

1. Select the **Administrator Password / User Password** option from the Security menu and press <Enter>, and the password dialog entry box appears.
2. Enter the password you want to create. A password can be 3-20 alphanumeric characters. After you have configured the password, press <Enter> to confirm.
3. Type the new password again and press <Enter>.

Change an Administrator or User Password

1. Select the **Administrator Password / User Password** option from the Security menu and press <Enter>, and the password dialog entry box appears.
2. Select the Administrator Password or User Password that you want to change. A password can be 3-20 alphanumeric characters. After you have changed the password, press <Enter> to confirm.
3. Type the changed password again and press <Enter>.

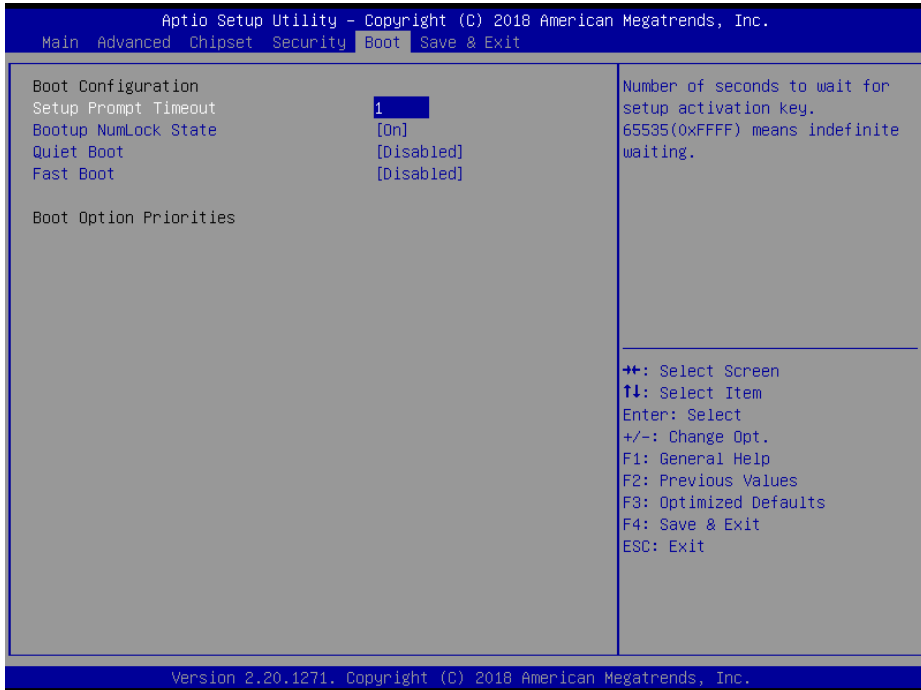
Remove an Administrator or User Password

1. Select the **Administrator Password / User Password** option from the Security menu and press <Enter>, and the password dialog entry box appears.
2. Select the configured Administrator Password or User Password that you want to delete. Leave the dialog box blank and press <Enter>.
3. Press <Enter> again when the password confirmation box appears.

5.7 Boot

Menu Path *Boot*

This menu provides control items for system boot configuration such as setting setup prompt timeout, specifying the NumLock state after the system is powered on, enabling/disabling quiet boot and fast boot and changing the boot order from the available bootable device(s).



Boot Screen

| BIOS Setting | Options | Description/Purpose |
|----------------------|------------------------------|--|
| Setup Prompt Timeout | Numeric (from 1 to 65535) | Number of seconds to wait for setup activation key. |
| Bootup NumLock State | - On - Off | Selects the NumLock state after the system is powered on. <ul style="list-style-type: none"> • On: Enables the NumLock function automatically after the system is powered on. • Off: Disables the NumLock function after the system is powered on. |

| BIOS Setting | Options | Description/Purpose |
|---------------------|----------------------------|---|
| Quiet Boot | - Disabled - Enabled | Enables or Disables Quiet Boot options. When this option is set to “Disabled”, BIOS will display normal POST messages. |
| Fast Boot | - Disabled - Enabled | Enables or Disables Fast Boot options. |
| Boot Option #1~#n | - [Drive(s)] - Disabled | Allows users to set the system boot order. Note that in the menu displayed, you will only see the device with the highest priority for a specific boot device type. |

5.8 Save & Exit

Menu Path *Save & Exit*

The **Save & Exit** allows users to save or discard changed BIOS settings as well as load factory default settings.

Save Changed BIOS Settings

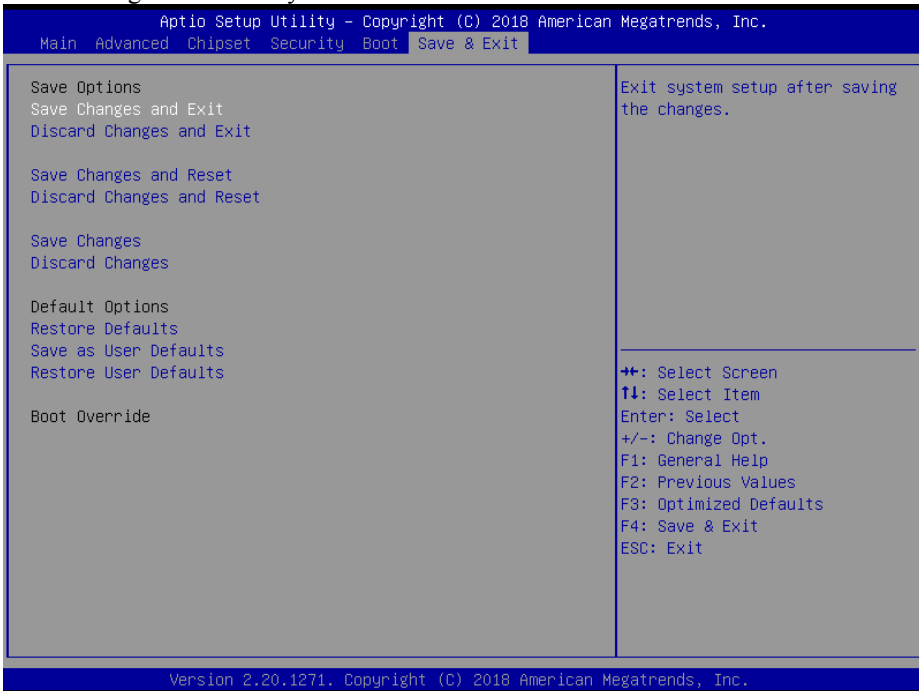
To save and validate the changed BIOS settings, select **Save Changes** from the **Save & Exit** menu, or you can select **Save Changes and Exit** (or press **F4**) to validate the changes and then exit the system. Select **Save Changes and Reset** to validate the changed BIOS settings and then restart the system

Discard Changed BIOS Settings

To cancel the BIOS settings you have previously configured, select **Discard Changes and Exit** from this menu, or simply press **Esc** to exit the BIOS setup. You can also select **Discard Changes and Reset** to discard any changes you have made and restore the factory BIOS defaults.

Load User Defaults

You may simply press **F3** at any time to load the **Optimized Values** which resets all BIOS settings to the factory defaults.



Save & Exit Screen

| BIOS Setting | Options | Description/Purpose |
|---------------------------|-----------------------|---|
| Save Changes and Exit | No changeable options | Exits the system and saves the changes in NVRAM. |
| Discard Changes and Exit | No changeable options | Exits the system without saving any changes configured in BIOS settings. |
| Save Changes and Reset | No changeable options | Saves the changes in NVRAM and resets the system. |
| Discard Changes and Reset | No changeable options | Resets the system without saving any changes configured in BIOS settings. |
| Save Changes | No changeable options | Saves the changes done so far to any of the setup options. |
| Discard Changes | No changeable options | Discards the changes done so far to any of the setup options. |
| Restore Defaults | No changeable options | Loads the optimized defaults for BIOS settings. |
| Save as User Defaults | No changeable options | Saves the changes done so far as User Defaults. |
| Restore User Defaults | No changeable options | Restores the User Defaults to all the BIOS settings. |
| Boot Override | - [Drive(s)] | Forces to boot from selected [drive(s)]. |

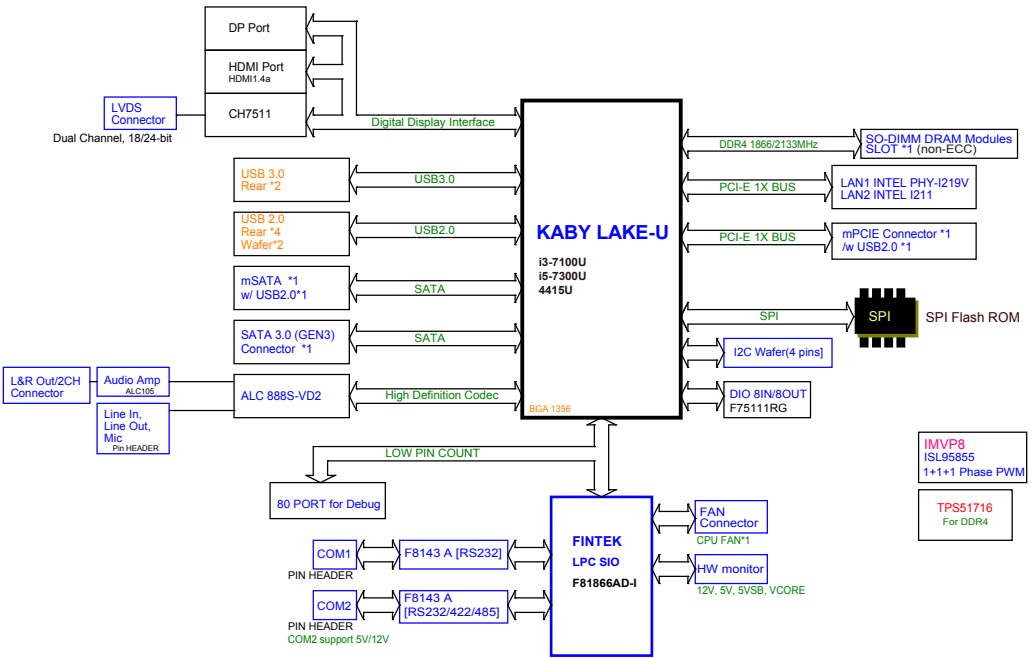
Appendix A Technical Summary

This appendix will give you a brief introduction of the allocation maps for BE-0996 resources.

The following topics are included:

- BE-0996 Block Diagram
- Interrupt Map
- I/O Map
- Memory Map
- Configuring WatchDog Timer
- Flash BIOS Update

BE-0996 Block Diagram



Interrupt Map

| IRQ | ASSIGNMENT |
|--------|---|
| IRQ 0 | System timer |
| IRQ 3 | Communications Port (COM2) |
| IRQ 4 | Communications Port (COM1) |
| IRQ 8 | System CMOS/real time clock |
| IRQ 11 | Intel(R) 100 Series/C230 Series Chipset Family SMBus - A123 |
| IRQ 11 | Intel(R) 100 Series/C230 Series Chipset Family Thermal subsystem - A131 |
| IRQ 13 | Numeric data processor |
| IRQ 14 | Motherboard resources |
| IRQ 16 | High Definition Audio Controller |
| IRQ 19 | Intel(R) Active Management Technology - SOL (COM3) |
| IRQ 54 | Microsoft ACPI-Compliant System |
| IRQ 55 | Microsoft ACPI-Compliant System |
| IRQ 56 | Microsoft ACPI-Compliant System |
| IRQ 57 | Microsoft ACPI-Compliant System |
| IRQ 58 | Microsoft ACPI-Compliant System |
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| IRQ | ASSIGNMENT |
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| IRQ 318 | Microsoft ACPI-Compliant System |
| IRQ 319 | Microsoft ACPI-Compliant System |
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| IRQ 348 | Microsoft ACPI-Compliant System |

| IRQ | ASSIGNMENT |
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| IRQ 349 | Microsoft ACPI-Compliant System |
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| IRQ | ASSIGNMENT |
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| IRQ 392 | Microsoft ACPI-Compliant System |
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| IRQ | ASSIGNMENT |
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| IRQ 435 | Microsoft ACPI-Compliant System |
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| IRQ | ASSIGNMENT |
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| IRQ 478 | Microsoft ACPI-Compliant System |
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| IRQ 509 | Microsoft ACPI-Compliant System |
| IRQ 510 | Microsoft ACPI-Compliant System |
| IRQ 511 | Microsoft ACPI-Compliant System |
| IRQ 4294967283 | Intel(R) Management Engine Interface |
| IRQ 4294967290 | Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft) |
| IRQ 4294967291 | Intel(R) HD Graphics 630 |
| IRQ 4294967289 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967288 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967287 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967286 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967285 | Intel(R) I211 Gigabit Network Connection |

| IRQ | ASSIGNMENT |
|----------------|--|
| IRQ 4294967284 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967292 | Intel(R) Ethernet Connection (2) I219-LM |
| IRQ 4294967293 | Standard SATA AHCI Controller |
| IRQ 4294967294 | Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115 |

Note: These resource information were gathered using Windows 10 (the IRQ could be assigned differently depending on OS).

I/O Map

| I/O Map | Assignment |
|-----------------------|-----------------------------------|
| 0x00000000-0x00000CF7 | PCI Express Root Complex |
| 0x00000020-0x00000021 | Programmable interrupt controller |
| 0x00000024-0x00000025 | Programmable interrupt controller |
| 0x00000028-0x00000029 | Programmable interrupt controller |
| 0x0000002C-0x0000002D | Programmable interrupt controller |
| 0x0000002E-0x0000002F | Motherboard resources |
| 0x00000030-0x00000031 | Programmable interrupt controller |
| 0x00000034-0x00000035 | Programmable interrupt controller |
| 0x00000038-0x00000039 | Programmable interrupt controller |
| 0x0000003C-0x0000003D | Programmable interrupt controller |
| 0x00000040-0x00000043 | System timer |
| 0x0000004E-0x0000004F | Motherboard resources |
| 0x00000050-0x00000053 | System timer |
| 0x00000061-0x00000061 | Motherboard resources |
| 0x00000063-0x00000063 | Motherboard resources |
| 0x00000065-0x00000065 | Motherboard resources |
| 0x00000067-0x00000067 | Motherboard resources |
| 0x00000070-0x00000070 | Motherboard resources |
| 0x00000070-0x00000070 | System CMOS/real time clock |
| 0x00000080-0x00000080 | Motherboard resources |
| 0x00000092-0x00000092 | Motherboard resources |
| 0x000000A0-0x000000A1 | Programmable interrupt controller |
| 0x000000A4-0x000000A5 | Programmable interrupt controller |
| 0x000000A8-0x000000A9 | Programmable interrupt controller |
| 0x000000AC-0x000000AD | Programmable interrupt controller |
| 0x000000B0-0x000000B1 | Programmable interrupt controller |
| 0x000000B2-0x000000B3 | Motherboard resources |
| 0x000000B4-0x000000B5 | Programmable interrupt controller |
| 0x000000B8-0x000000B9 | Programmable interrupt controller |
| 0x000000BC-0x000000BD | Programmable interrupt controller |
| 0x000002F8-0x000002FF | Communications Port (COM2) |
| 0x000003F8-0x000003FF | Communications Port (COM1) |
| 0x000004D0-0x000004D1 | Programmable interrupt controller |
| 0x00000680-0x0000069F | Motherboard resources |
| 0x00000A00-0x00000A0F | Motherboard resources |
| 0x00000A10-0x00000A1F | Motherboard resources |
| 0x00000A20-0x00000A2F | Motherboard resources |
| 0x00000D00-0x0000FFFF | PCI Express Root Complex |
| 0x0000164E-0x0000164F | Motherboard resources |
| 0x00001800-0x000018FE | Motherboard resources |

| I/O Map | Assignment |
|-----------------------|--|
| 0x00001854-0x00001857 | Motherboard resources |
| 0x0000E000-0x0000EFFF | Mobile Intel(R) Processor Family I/O PCI Express Root Port #4 - 9D13 |
| 0x0000F000-0x0000F03F | Intel(R) HD Graphics 620 |
| 0x0000F040-0x0000F05F | Mobile Intel(R) Processor Family I/O SMBUS - 9D23 |
| 0x0000F060-0x0000F07F | Standard SATA AHCI Controller |
| 0x0000F080-0x0000F083 | Standard SATA AHCI Controller |
| 0x0000F090-0x0000F097 | Standard SATA AHCI Controller |
| 0x0000FF00-0x0000FFFE | Motherboard resources |
| 0x0000FFFF-0x0000FFFF | Motherboard resources |
| 0x0000FFFF-0x0000FFFF | Motherboard resources |
| 0x0000FFFF-0x0000FFFF | Motherboard resources |

Memory Map

| Memory Map | Assignment |
|-------------------------|---|
| 0xDE000000-0xDEFFFFFF | Intel(R) HD Graphics 620 |
| 0xC0000000-0xCFFFFFFF | Intel(R) HD Graphics 620 |
| 0xFF000000-0xFFFFFFFF | Legacy device |
| 0xFF000000-0xFFFFFFFF | Motherboard resources |
| 0xFED10000-0xFED17FFF | Motherboard resources |
| 0xFED18000-0xFED18FFF | Motherboard resources |
| 0xFED19000-0xFED19FFF | Motherboard resources |
| 0xE0000000-0xEFFFFFFF | Motherboard resources |
| 0xFED20000-0xFED3FFFF | Motherboard resources |
| 0xFED90000-0xFED93FFF | Motherboard resources |
| 0xFED45000-0xFED8FFFF | Motherboard resources |
| 0xFEE00000-0xFEEFFFFFFF | Motherboard resources |
| 0xDFFE0000-0xDFFFFFFF | Motherboard resources |
| 0xFE029000-0xFE029FFF | Motherboard resources |
| 0xFE028000-0xFE028FFF | Motherboard resources |
| 0xFDAF0000-0xFDAFFFFFFF | Motherboard resources |
| 0xFDAE0000-0xFDAEFFFF | Motherboard resources |
| 0xFDAC0000-0xFDACFFFF | Motherboard resources |
| 0xFE034000-0xFE034FFF | Intel(R) Serial IO UART Host Controller - 9D27 |
| 0xDFFC0000-0xDFFDFFFF | Intel(R) Ethernet Connection I219-V |
| 0xFED00000-0xFED003FF | High precision event timer |
| 0xFD000000-0xFDABFFFF | Motherboard resources |
| 0xFD000000-0xFDABFFFF | PCI Express Root Complex |
| 0xFDAD0000-0xFDADFFFF | Motherboard resources |
| 0xFDB00000-0xFDFFFFFFF | Motherboard resources |
| 0xFE000000-0xFE01FFFF | Motherboard resources |
| 0xFE036000-0xFE03BFFF | Motherboard resources |
| 0xFE03D000-0xFE3FFFFF | Motherboard resources |
| 0xFE410000-0xFE7FFFFF | Motherboard resources |
| 0xFE03C000-0xFE03CFFF | Intel(R) Serial IO I2C Host Controller - 9D60 |
| 0xFE030000-0xFE033FFF | High Definition Audio Controller |
| 0xFE400000-0xFE40FFFF | High Definition Audio Controller |
| 0x90000000-0xDFFFFFFF | PCI Express Root Complex |
| 0xFE035000-0xFE035FFF | Intel(R) Management Engine Interface |
| 0xFED40000-0xFED44FFF | Trusted Platform Module 2.0 |
| 0xDF130000-0xDF13FFFF | Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft) |
| 0xDF14A000-0xDF14A0FF | Mobile Intel(R) Processor Family I/O SMBUS - 9D23 |

| Memory Map | Assignment |
|-----------------------|--|
| 0xDF000000-0xDF01FFFF | Intel(R) I211 Gigabit Network Connection |
| 0xDF000000-0xDF01FFFF | Mobile Intel(R) Processor Family I/O PCI Express Root Port #4 - 9D13 |
| 0xDF020000-0xDF023FFF | Intel(R) I211 Gigabit Network Connection |
| 0xDF150000-0xDF150FFF | Mobile Intel(R) Processor Family I/O Thermal subsystem - 9D31 |
| 0xDF148000-0xDF149FFF | Standard SATA AHCI Controller |
| 0xDF14D000-0xDF14D0FF | Standard SATA AHCI Controller |
| 0xDF14C000-0xDF14C7FF | Standard SATA AHCI Controller |
| 0xA0000-0xBFFFF | PCI Express Root Complex |
| 0xC0000-0xC3FFF | PCI Express Root Complex |
| 0xC4000-0xC7FFF | PCI Express Root Complex |
| 0xC8000-0xCBFFF | PCI Express Root Complex |
| 0xCC000-0xCFFFF | PCI Express Root Complex |
| 0xD0000-0xD3FFF | PCI Express Root Complex |
| 0xD4000-0xD7FFF | PCI Express Root Complex |
| 0xD8000-0xDBFFF | PCI Express Root Complex |
| 0xDC000-0xDFFFF | PCI Express Root Complex |
| 0xE0000-0xE3FFF | PCI Express Root Complex |
| 0xE4000-0xE7FFF | PCI Express Root Complex |
| 0xE8000-0xEBFFF | PCI Express Root Complex |
| 0xEC000-0xEFFFF | PCI Express Root Complex |
| 0xF0000-0xFFFFF | PCI Express Root Complex |

Configuring WatchDog Timer

The I/O port address of the watchdog timer is 2E (hex) and 2F (hex). 2E (hex) is the address port. 2F (hex) is the data port. User must first assign the address of register by writing address value into address port 2E (hex), then write/read data to/from the assigned register through data port 2F (hex).

Configuration Sequence

To program F81866 configuration registers, the following configuration sequence must be followed:

(1) Enter the extended function mode

To place the chip into the Extended Function Mode, two successive writes of 0x87 must be applied to Extended Function Enable Registers (EFERs, i.e. 2Eh or 4Eh).

(2) Configure the configuration registers

The chip selects the Logical Device and activates the desired Logical Devices through Extended Function Index Register (EFIR) and Extended Function Data Register (EFDR). The EFIR is located at the same address as the EFER, and the EFDR is located at address (EFIR+1). First, write the Logical Device Number (i.e. 0x07) to the EFIR and then write the number of the desired Logical Device to the EFDR. If accessing the Chip (Global) Control Registers, this step is not required. Secondly, write the address of the desired configuration register within the Logical Device to the EFIR and then write (or read) the desired configuration register through the EFDR.

(3) Exit the extended function mode

To exit the Extended Function Mode, writing 0xAA to the EFER is required. Once the chip exits the Extended Function Mode, it is in the normal running mode and is ready to enter the configuration mode.

Code example for watch dog timer

Enable watchdog timer and set timeout interval to 30 seconds.

```
;----- Enter to extended function mode -----  
mov     dx, 2eh  
mov     al, 87h  
out     dx, al  
out     dx, al  
;----- Select Logical Device 7 of watchdog timer -----  
mov     al, 07h  
out     dx, al  
inc     dx  
mov     al, 07h  
out     dx, al  
;----- Enable Watch dog feature -----  
mov     al, 030h  
out     dx, al  
inc     dx  
mov     al, 01h  
out     dx, al  
;----- Set timeout interval as 30 seconds -----  
dec     dx  
mov     al, 0F6h  
out     dx, al  
inc     dx  
mov     al, 1Eh  
out     dx, al  
;----- Enable Watch PME-----  
dec     dx  
mov     al, 0FAh  
out     dx, al  
inc     dx  
in      al, dx  
or      al, 51h  
out     dx, al  
;----- Set second as counting unit and start counting -----  
dec     dx  
mov     al, 0F5h  
out     dx, al  
inc     dx  
in      al, dx  
and     al, 0F7h  
or      al, 20h  
out     dx, al  
;----- Exit the extended function mode -----  
dec     dx  
mov     al, 0AAh  
out     dx, al
```

Flash BIOS Update

I. Prerequisites

- 1** Prepare a bootable media (e.g. USB storage device) which can boot the system to EFI Shell.
- 2** Download and save the BIOS file (e.g. E9960PU1.bin) to the storage device.
- 3** Copy AMI flash utility – AFUEFIx64.exe (v5.09.01) into the storage device. The utility and BIOS file should be saved to the same path.
- 4** Make sure the target system can first boot to the EFI shell environment.
 - (1) Connect the USB storage device.
 - (2) Turn on the computer and press <ESC> or during boot to enter BIOS Setup.
 - (3) The system will go into the BIOS setup menu.
 - (4) Select [**Boot**] menu and set the USB storage device as the 1st boot device.
 - (5) Press <F4> key to save the configuration and restart the system to boot into EFI Shell environment.



II. AFUEFIx64 Command for System BIOS Update

AFUEFIx64.efi is the AMI firmware update utility; the command line is shown as below:

AFUEFIx64 <ROM File Name> [option1] [option2]....

Users can type “AFUEFIx64 /?” to view the definition of each control option. The recommended options for BIOS ROM update include the following parameters:

- /P:** Program main BIOS image.
- /B:** Program Boot Block.
- /N:** Program NVRAM.
- /X:** Don't check ROM ID.

III. BIOS Update Procedure

1 Boot into EFI Shell, change to the path where you put BIOS image and AFUEFIx64.

```
Shell> fs0:  
fs0:\> cd afuefix64
```

2 Type "AFUEFIx64 E9960Pxx.bin /p /b /n /x" and press Enter to start the flash procedure. (xx means the BIOS revision part, e.g. U1...)

3 During the update procedure, you will see the BIOS update process status and its execution percentage. Beware! Do not turn off the system power or reset your computer if the whole procedure are not complete yet, or it may crash the BIOS ROM and the system will be unable to boot up next time.

4 After the BIOS update procedure is completed, the following messages will display:

```
fs0:\afuefix64> AFUEFIx64 E9960PU1.bin /p /b /n /x  
+-----+  
|          AMI Firmware Update Utility v5.09.01.1317          |  
| Copyright (C) 2016 American Megatrends Inc. All Rights Reserved. |  
+-----+  
Reading flash ..... done  
- ME Data Size Checking. ok  
- FFS checksums ..... ok  
- Check RomLayout ..... ok  
Erasing Boot Block ..... done  
Updating Boot Block ..... done  
Verifying Boot Block ..... done  
Erasing Main Block ..... done  
Updating Main Block ..... done  
Verifying Main Block ..... done  
Erasing NVRAM Block ..... done  
Updating NVRAM Block ..... done  
Verifying NVRAM Block ..... done  
fs0:\afuefix64>_
```

5 Restart the system and boot up with the new BIOS configurations.

6 The BIOS Update is completed after the system is restarted.

7 Reboot the system and verify if the BIOS version shown on the initialization screen has been updated.



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Version 2.18.1271. Copyright (C) 2018 American Megatrends, Inc.
BIOS Date: 12/05/2018 16:07:45 Ver: E9960PU1
Press or <ESC> to enter setup.