Technical Manual

Of

Intel Bay Trail Series CPU

Based SBC

NO.G03-NU91-F

Revision: 4.0

Release date: October 1, 2019

Trademark:

* Specifications and Information contained in this documentation are furnished for information use only, and are
  subject to change at any time without notice, and should not be construed as a commitment by manufacturer.

Environmental Protection Announcement

Do not dispose this electronic device into the trash while discarding. To minimize pollution and ensure environment protection of mother earth, please recycle.

TABLE OF CONTENT

⚠️ **CAUTION** Environmental Safety Instruction

- Avoid the dusty, humidity and temperature extremes. Do not place the product in any area where it may become wet.

- 0 to 60 centigrade is the suitable temperature. (The figure comes from the request of the main chipset)

- Generally speaking, dramatic changes in temperature may lead to contact malfunction and crackles due to constant thermal expansion and contraction from the welding spots' that connect components and PCB. Computer should go through an adaptive phase before it boots when it is moved from a cold environment to a warmer one to avoid condensation phenomenon. These water drops attached on PCB or the surface of the components can bring about phenomena as minor as computer instability resulted from corrosion and oxidation from components and PCB or as major as short circuit that can burn the components. Suggest starting the computer until the temperature goes up.

- The increasing temperature of the capacitor may decrease the life of computer. Using the close case may decrease the life of other device because the higher temperature in the inner of the case.

- Attention to the heat sink when you over-clocking. The higher temperature may decrease the life of the device and burned the capacitor.

USER'S NOTICE

Manual Revision Information

Reversion	Revision History	Date
4.0	Fourth Edition	October 1, 2019

Item Checklist

- ☑ Motherboard
- ☑ Cable(s)

Chapter 1
Introduction of the Motherboard

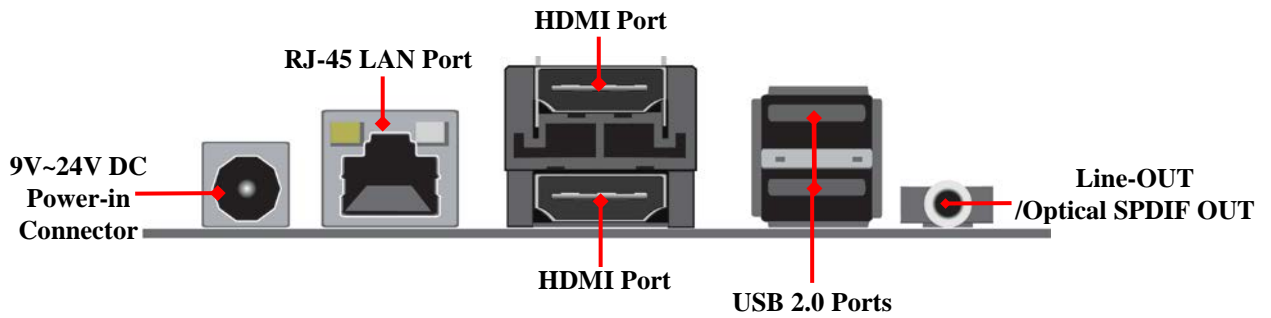## 1-1   Feature of Motherboard

■ Onboard Intel® Bay Trail Series Processor, with low power consumption never denies high performance

■ Onboard 1* mSATA slot

■ Onboard 1* half-size Mini-PCIE slot

■ Onboard 1 * RJ-45 gigabit Ethernet LAN port

■ Support dual HDMI outputs

■ Support USB 3.0 data transport demand

■ Support CPU Smart FAN

■ Compliance with ErP standard

■ Support Watchdog function

1-2   Specification

Spec	Description
Design	● 8-layer SBC; PCB size: 10.1 cm x 10.1 cm
Embedded CPU	● Integrated with Intel® Bay Trail-D/M/I series CPU
Memory Slot	● 1 * DDR3L SODIMM Slot for un-buffered Single Channel DDR3L 1066/1333* MHz SDRAM, expandable to 8GB *DDR3L 1333 Mhz is optional for model with specific CPU. Please refer to the actual product you purchase and consult your dealer for more information.*
Expansion Slot	● 1* MSATA slot ● 1* Half-size Mini-PCIE slot
LAN Chip	● Integrated with Intel 82574L PCI-E Gigabit LAN chip ● Support Fast Ethernet LAN function of providing 10/100/1000Mbps Ethernet data transfer rate
Audio Chip	● 2-CH ALC887 HD audio chip
BIOS	● AMI 64MB Flash ROM
Rear Panel I/O	● 1* DC 9V~24V power-in connector ● 1* RJ-45 LAN port ● 2* HDMI port ● 2* USB 2.0 port ● 1* Audio Line-Out / SPDIF-Out jack
Front Panel I/O	● 1* COM port ● 1* USB 3.0 port
Internal I/O	● 1* Internal DC 9V~24V power-in connector ● 1* Serial port header ● 1* CPU FAN header ● 1* Front panel header

1-3   Layout Diagram

Rear IO Panel Diagram:

HDMI Port

RJ-45 LAN Port

9V~24V DC Power-in Connector

Line-OUT /Optical SPDIF OUT

HDMI Port

USB 2.0 Ports

Front IO Panel Diagram:

COM Port

USB 3.0 Port

Remote Control Sensor
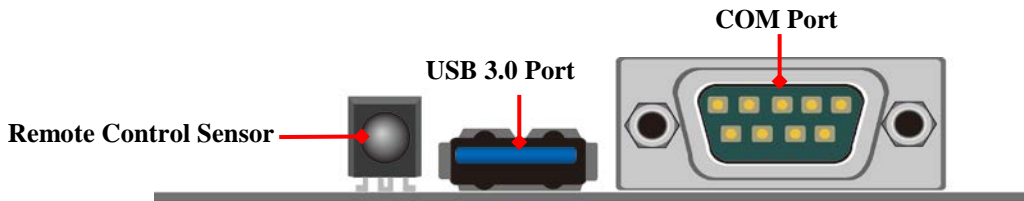
Internal Diagram-Front Side:

MSATA Slot

Internal Power Connector

Serial Port Header (COM2)

9V ~24V DC Power-in Connector

Half-size Mini-PCIE Slot

Serial Port (COM1)

RJ-45 LAN Port

JP1

JBAT1

ME-RTC

USB 3.0 Port

HDMI Ports

Remote Control Sensor

USB 2.0 Ports

Line-Out /Optical SPDIF Out

DDR3L SODIMM Slot
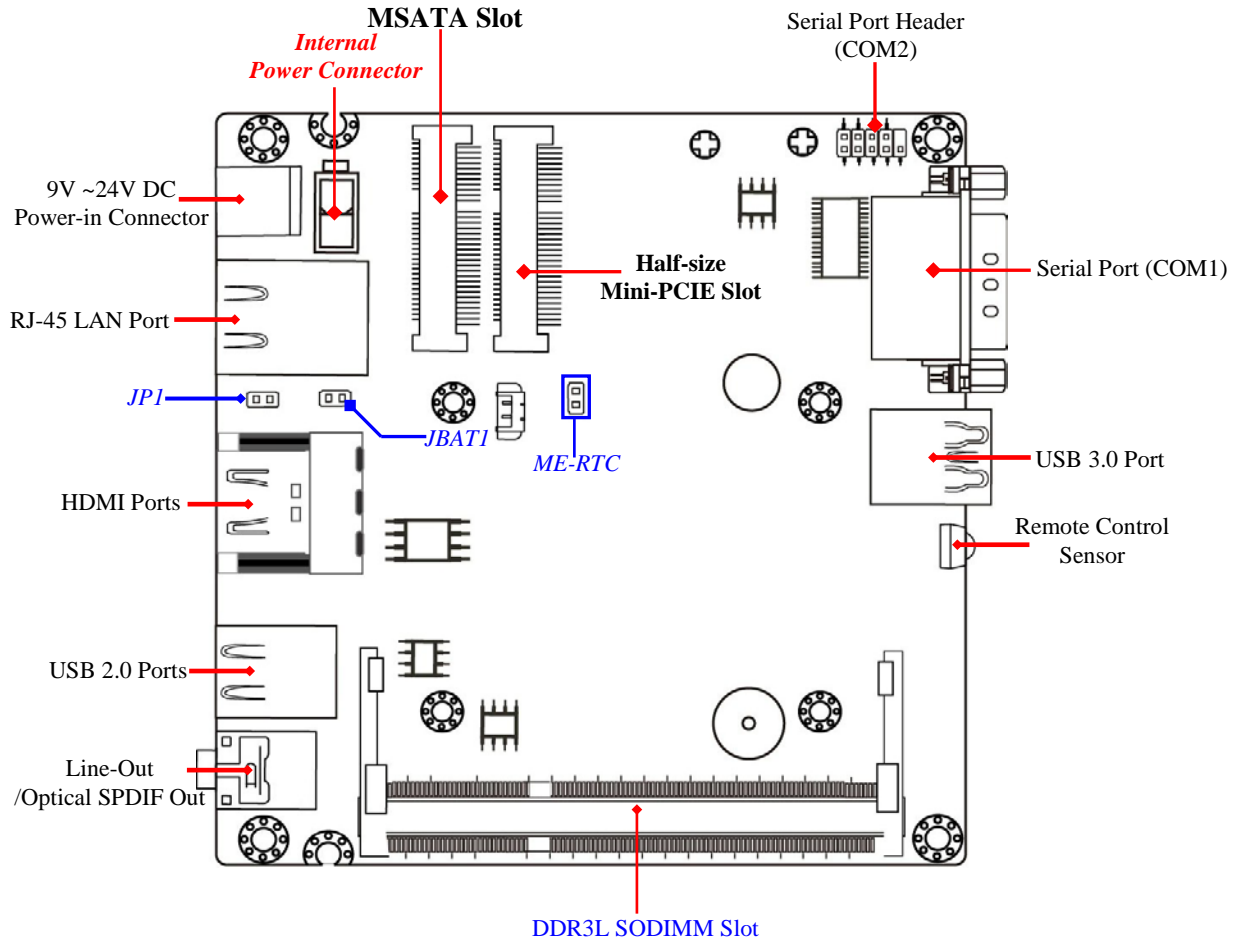
Internal Diagram-Back Side:

Front Panel Header

Intel CPU

CPUFAN Header
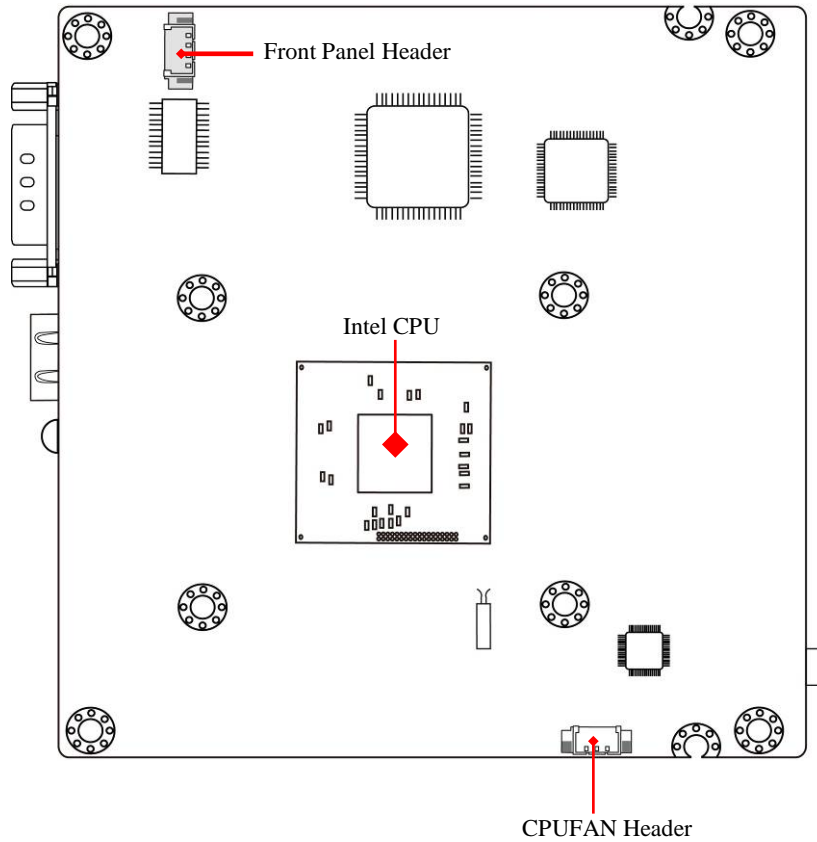
Jumper

Jumper	Name	Description
JP1	Security Measure Function Select	2-Pin Block
JBAT	CMOS RAM Clear Function Setting	2-Pin Block
ME_RTC	Clear ME RTC Function Setting	2-Pin Block

Connectors

Connector	Name
DCIN	DC 9V~24V Power–in Connector
ATX2P	Internal 9V~24V Power–in Connector
LAN	RJ-45 LAN Port Connector
HDMI1	HDMI Connector x2
USB1	USB 2.0 Port Connector x2
HP_SPDIF1	Line Out Connector /SPDIF Out Connector
COM1	Serial Port Connector
USB3	USB 3.0 Port Connector

Headers

Header	Name	Description
COM2	Serial Port Header	9-pin Block
CPUFAN1	CPUFAN Header	3-pin Block
FP_CON1	Front Panel Header	4-pin Block

Chapter 2
Hardware Installation

2-1 Jumper Setting

JP1 (2-pin): Security Measure Function Select

JP1
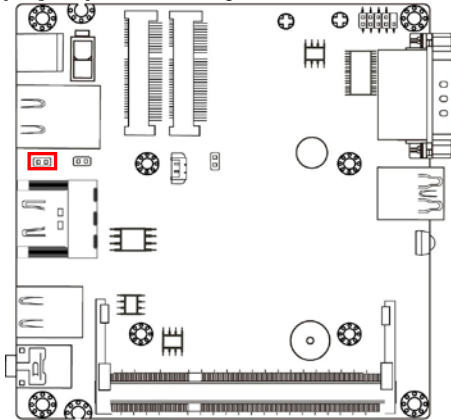
1 ■●

1-2 Open:Enable Security Measures
in the Flash Descriptor(Default);

1 ■●

1-2 Closed: Disable Security Measures
in the Flash Descriptor(Override).

JBAT1 (2-pin): Clear CMOS Setting

JBAT1

1 ■●   1 ■●
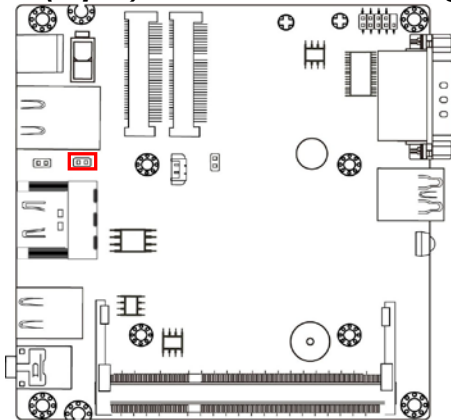
1-2 Open: Normal；   1-2 Closed：Clear CMOS

CMOS Clear Setting

(2)ME_RTC (2-pin): Clear ME_RTC Function Setting
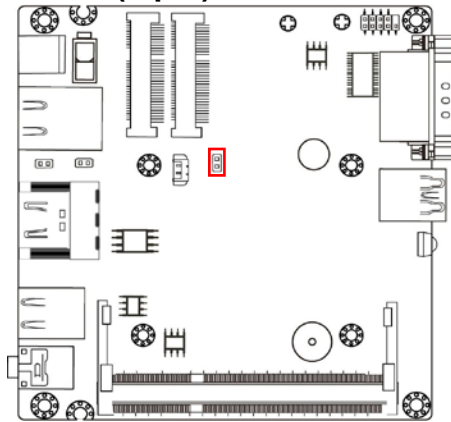
ME_RTC

1

1-2 Open: Normal；

1-2 Closed：Clear ME_RTC.

2-2   Connectors and Headers
2-2-1 Connectors

Rear IO Panel Diagram:

HDMI Port

RJ-45 LAN Port

9V~24V DC Power-in Connector

Line-OUT /Optical SPDIF OUT

HDMI Port   **USB 2.0 Ports**

Front IO Panel Diagram:

COM Port

USB 3.0 Port

Remote Control Sensor
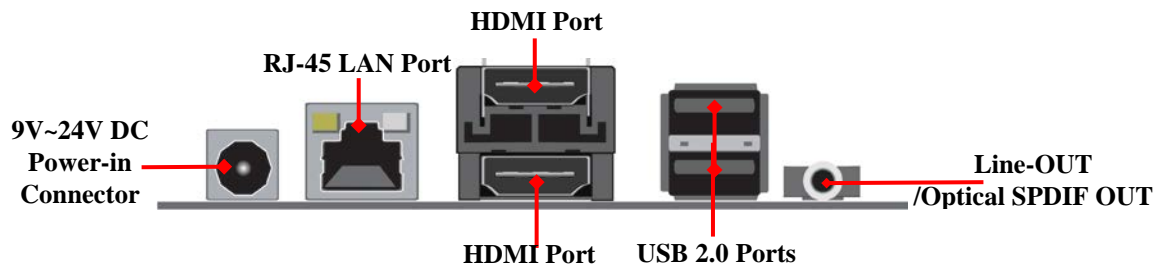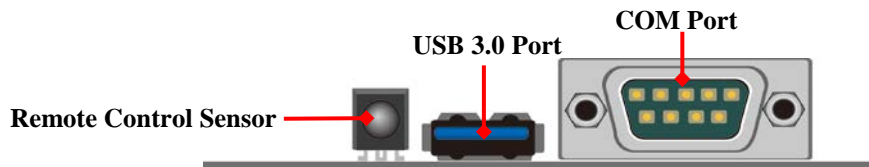
Icon	Name	Function
	DC-in Power Connector	For user to connect compatible power adapter to provide power supply for the system.
	RJ-45 LAN Port	This connector is standard RJ-45 LAN jack for Network connection.
	HDMI Port	To connect display device that support HDMI specification.
	USB 2.0 Port	To connect USB keyboard, mouse or other devices compatible with USB specification.
	Line-Out Connector /Optical SPDIF-Out Connector	For user to connect external speaker, earphones, etc to transfer system audio output. This connector can function as optical SPDIF-Out jack with compatible cables & devices.
	Remote Control Sensor	To receiver signals from a remote control.
	COM Port	Mainly for user to connect external MODEM or other devices that supports Serial Communications Interface.
	USB 3.0 Port	To connect USB keyboard, mouse or other devices compatible with USB specification. USB 3.0 ports supports up tp 5Gbps data transfer rate.

ATX2P (2-pin Block): DC 9V~24V Power-in Connector

Pin 1 →
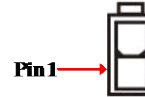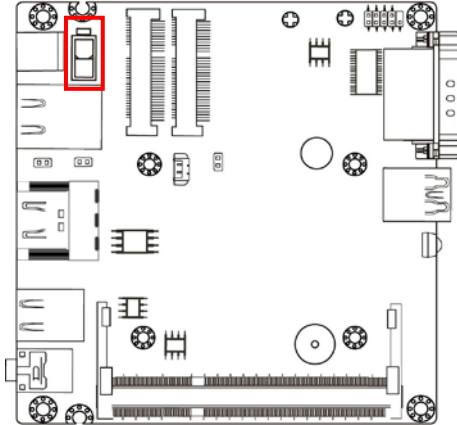
Pin.	Definition
1	GND
2	+9V~+24V DC_IN

2-2-2 Header
COM2 (9-pin): Serial Port Headers

DSR RTS CTS RI

Pin6 →
Pin1 →

DCD SIN SOUT DTR GND
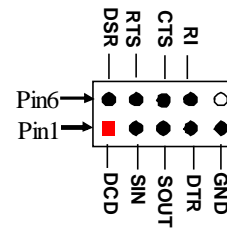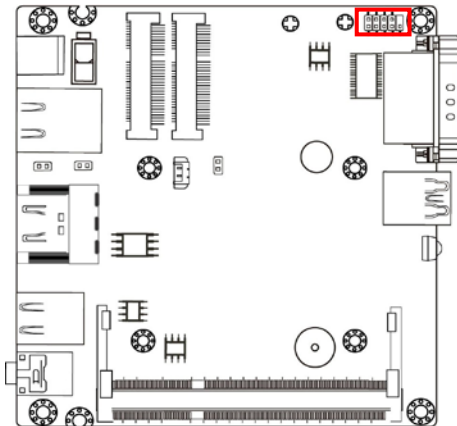
CPUFAN1 (4-pin): CPUFAN Connector

Pin1
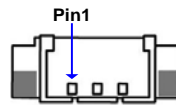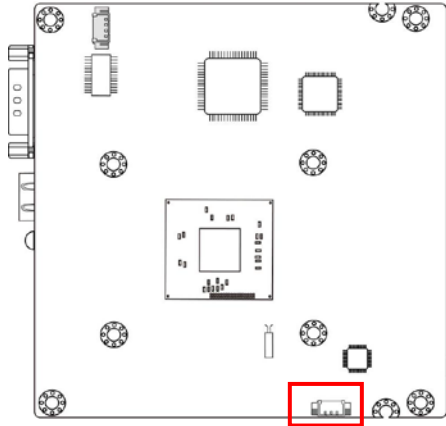
Pin No.	Definition
1	VCC
2	GND
3	Fan Detect

FP_CON1 (4-pin): Front Panel Connector

← **Pin1**
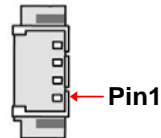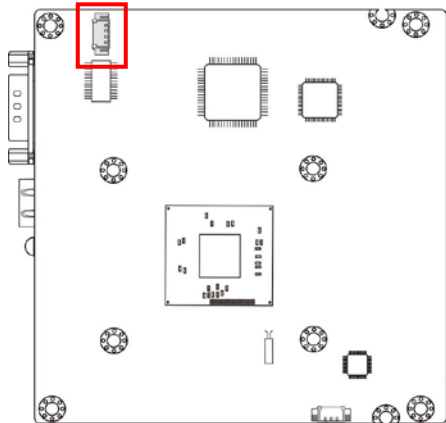
Pin No.	Definition
1	Power_SW
2	GND
3	PWRLED -
4	PWRLED+

Chapter 3
Introducing BIOS

Notice!	The BIOS options in this manual are for reference only. Different configurations may lead to difference in BIOS screen and BIOS screens in manuals are usually the first BIOS version when the board is released and may be different from your purchased motherboard. Users are welcome to download the latest BIOS version form our official website.

The BIOS is a program located on a Flash Memory on the motherboard. This program is a bridge between motherboard and operating system. When you start the computer, the BIOS program will gain control. The BIOS first operates an auto-diagnostic test called POST (power on self test) for all the necessary hardware, it detects the entire hardware device and configures the parameters of the hardware synchronization. Only when these tasks are completed done it gives up control of the computer to operating system (OS). Since the BIOS is the only channel for hardware and software to communicate, it is the key factor for system stability, and in ensuring that your system performance as its best.

3-1   Entering Setup

Power on the computer and by pressing <Del> immediately allows you to enter Setup. If the message disappears before your respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt> and <Delete> keys.   If you do not press the keys at the correct time and the system does not boot, an error message will be displayed and you will again be asked to

Press   **<Del>** to enter Setup

3-2 BIOS Menu Screen

The following diagram show a general BIOS menu screen:
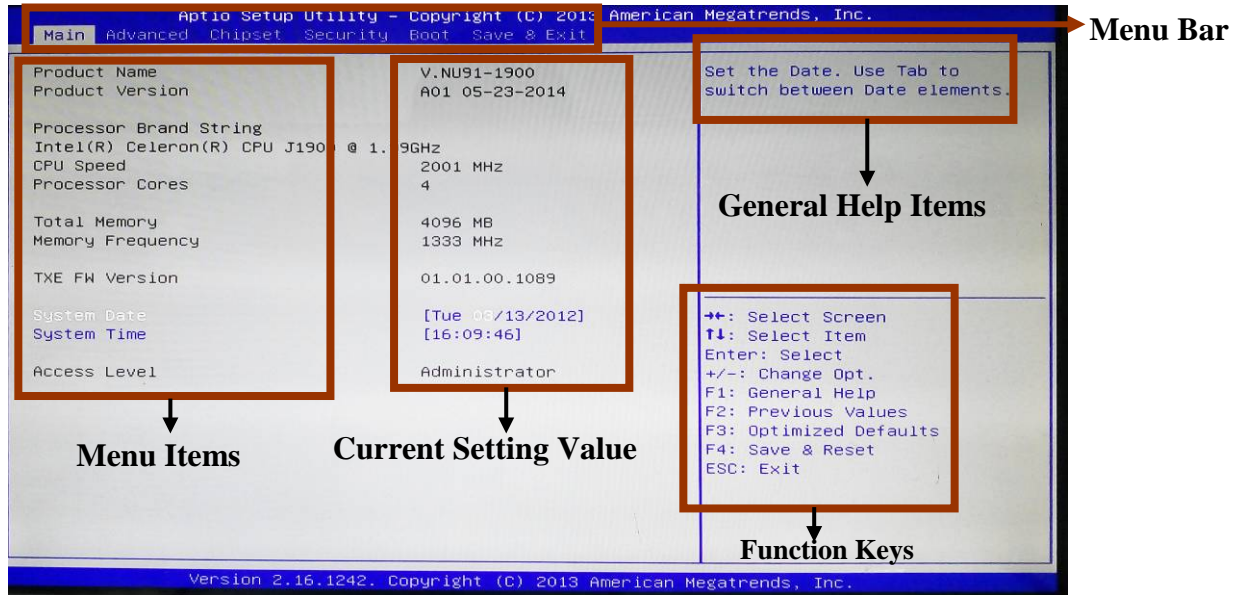
BIOS Menu Screen

3-3　Function Keys

In the above BIOS Setup main menu of, you can see several options. We will explain these options step by step in the following pages of this chapter, but let us first see a short description of the function keys you may use here:

- Press←→ (left, right) to select screen;
- Press ↑↓ (up, down) to choose, in the main menu, the option you want to confirm or to modify.
- Press **<Enter>** to select.
- Press **<+>/<−>** keys when you want to modify the BIOS parameters for the active option.
- **[F1]:** General help.
- **[F2]:** Previous value.
- **[F3]:** Optimized defaults.
- **[F4]:** Save & Reset.
- Press **<Esc>** to quit the BIOS Setup.

3-4　Getting Help

Main Menu

The on-line description of the highlighted setup function is displayed at the top right corner the screen.

Status Page Setup Menu/Option Page Setup Menu

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window, press <**Esc**>.

3-5 Menu Bars

There are six menu bars on top of BIOS screen:

Main	To change system basic configuration
Advanced	To change system advanced configuration
Chipset	To change chipset configuration
Security	Password settings
Boot	To change boot settings
Save & Exit	Save setting, loading and exit options.

User can press the right or left arrow key on the keyboard to switch from menu bar. The selected one is highlighted.

3-6 Main Menu

Main menu screen includes some basic system information. Highlight the item and then use the <+> or <-> and numerical keyboard keys to select the value you want in each item.
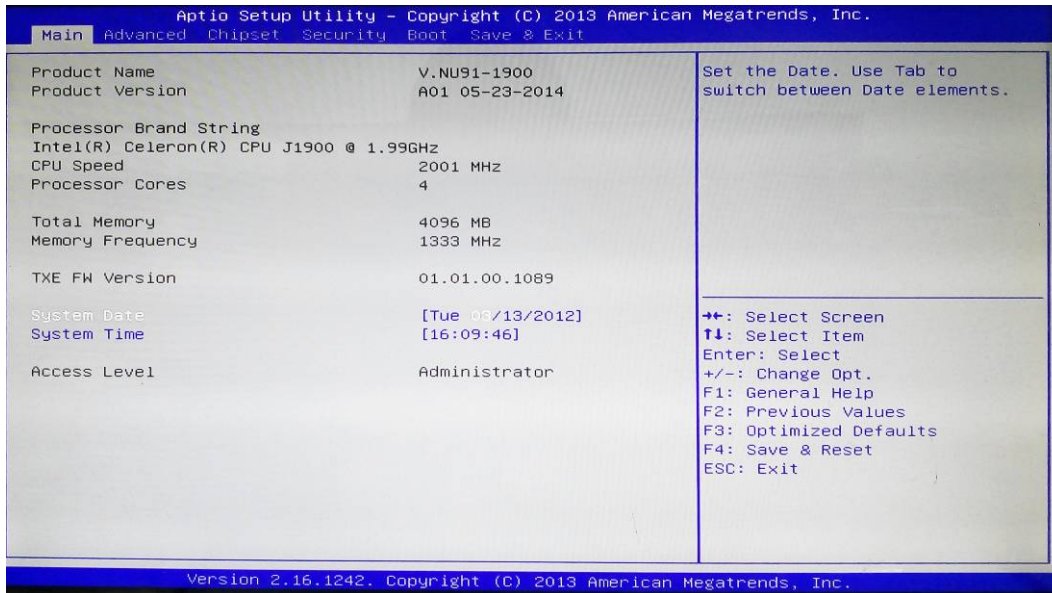
System Date
Set the date. Please use [Tab] to switch between data elements.
System Time
Set the time. Please use [Tab] to switch between time elements.

3-7 Advanced Menu


```
              Aptio Setup Utility - Copyright (C) 2013 American Megatrends, Inc.
  Main  Advanced  Chipset  Security  Boot  Save & Exit

  OS Selection                      [Windows 7]          OS Selection.if Set to
▶ ACPI Settings                                          'Windows 7',XHCI&EHCI mode
▶ Super IO Configuration                                 will auto configuration.
▶ H/W Monitor
▶ CPU Configuration
▶ PPM Configuration
▶ SATA Configuration
▶ CSM Configuration
▶ USB Configuration

                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Reset
                                                         ESC: Exit


              Version 2.16.1242. Copyright (C) 2013 American Megatrends, Inc.
```

OS Selection
The optional settings: [Windows 8.X]; [Windows 7].

▸ **ACPI Settings**
Press [Enter] to make settings for the following sub-item:
ACPI Settings

Enable Hibernation
Use this item to enable or disable system ability to hibernate (OS S4 Sleep State).
This option may be not effective with some OS.
The optional settings: [Disabled]; [Enabled].
ACPI Sleep State
Use this item to select the highest ACPI sleep state the system will enter when the suspend button is pressed.

The optional settings are: [Suspend Disabled]; [S3 (Suspend to RAM)].

EUP Function

The optional settings: [Disabled]; [Enabled].

This item should be set as [**Disabled**] if you wish to have all active wake-up functions.

Wake-Up by PCIE/LAN from S5

The optional settings: [Disabled]; [Enabled].

PWRON After PWR-Fail

The optional settings are: [Former-Sts]; [Always on]; [Always off].

RTC WakeUp

The optional settings: [Disabled]; [Fixed Time]; [Dynamic Time].

Use this item to enable or disable system wake on alarm event.

When set as [Fixed Time], system will wake on the hour/min/sec specified.

When set as [Dynamic Time], system will wake on the current time + increased minute(s).

▸ **Super I/O Configuration**

Press [Enter] to make settings for the following sub-items:

Super IO Configuration

▸ **Serial Port 1 Configuration / Serial Port 2 Configuration**

Press [Enter] to make settings for the following items:

Super IO Configuration

Serial Port

Use this item to enable or disable serial port (COM).

Change Settings

Use this item to select an optimal setting for super IO device.

▸ **CIR Controller Configuration**

Press [Enter] to make settings for the following items:

CIR Controller Configuration

Cir Controller

Use this item to enable or disable CIR controller.

Change Settings
Use this item to select an optimal setting for super IO device.

WatchDog Timer
The optional settings: [Disabled]; [Enabled].
Use this item to enable or disable WatchDog Timer Control. When set as [Enabled], the following sub-items shall appear:
WatchDog Timer Value
User can set a value in the range of [4] to [255].
WatchDog Timer Unit
The optional settings are: [Sec.]; [Min.].

► **H/W Monitor**
Press [Enter] to view current PC health status & system working status and make settings for the following sub-items:
CPUFAN Smart Mode
The optional settings are: [Disabled]; [Enabled]. When set as [Enabled], the following sub-items shall appear:
CPUFAN Full-Speed Temperature
Use this item to set CPUFAN full speed temperature. Fan will run at full speed when above the pre-set temperature.
CPUFAN Idle-Speed Temperature
Use this item to set CPUFAN idle speed temperature. Fan will run at idle speed when below the pre-set temperature.
CPUFAN Full-Speed Duty
Use this item to set CPUFAN full speed duty. Fan will run at full speed when above the pre-set duty.
CPUFAN Idle-Speed Duty
Use this item to set CPUFAN idle speed duty. Fan will run at idle speed when below the pre-set duty.

▶ **CPU Configuration**
Press [Enter] to view current CPU configuration and make settings for the following

sub-items:

Active Processor Cores

Use this item to set the number of cores to enable in each processor packages.

Limit CPUID Maximum

The optional settings: [Disabled]; [Enabled].

This item should be set as [Disabled] for Windows XP.

Execute Disable Bit

The optional settings: [Disabled]; [Enabled].

Hardware Prefetcher

The optional settings are: [Disabled]; [Enabled].

Use this item to turn on/off the Mid Level Cache (L2) streamer prefetcher.

Adjacent Cache Line Prefetch

The optional settings are: [Disabled]; [Enabled].

Use this item to turn on/off prefetching of adjacent cache lines.

Intel Virtualization Technology

The optional settings: [Enabled]; [Disabled].

When set as [Enabled], a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Power Technology

The optional settings: [Disabled]; [Energy Efficient]; [Custom].

*When set as [**Custom**], user can make further settings in the following sub-items:*

EIST

The optional settings: [Disabled]; [Enabled].

Use this item to enable or disable Intel SpeedStep.

Turbo Mode

The optional settings: [Disabled]; [Enabled].

P-STATE Coordination

Use this item to change P-STATE coordination type.

The optional settings: [HW_ALL]; [SW_ALL]; [SW_ANY].

CPU C6 report

The optional settings: [Disabled]; [Enabled].

Use this item to enable or disable CPU C6 (ACPI C3) report to OS.
CPU C7 report
The optional settings: [Disabled]; [Enabled].
Use this item to enable or disable CPU C7 (ACPI C3) report to OS.
Package C State Limit
The optional items are: [C0]; [C1]; [C3]; [C6]; [C7]; [No Limit].

▸ **PPM Configuration**
Press [Enter] to make settings for PPM Configuration:
PPM Configuration:
EIST
The optional settings: [Enabled]; [Disabled].
Use this item to enable or disable Intel SpeedStep.
CPU C Status Report
The optional settings: [Disabled]; [Enabled].
Use this item to enable or disable CPU C status report to OS.
*When set as [**Enabled**], the following sub-items shall appear:*
Max CPU C-state
This option controls Max C state that the processor will support.
The optional settings: [C7]; [C6]; [C1].

▸ **SATA Configuration**
Press [Enter] to make settings for the following sub-items:
SATA Configuration
SATA Port
The optional settings: [Disabled]; [Enabled].
Use this item to enable or disable Serial ATA port.
SATA Speed Support
The item is for user to set the maximum speed the SATA controller can support.
The optional settings are: [Gen1]; [Gen2].
SATA ODD Port
The optional settings are: [Port0 ODD]; [No ODD].

SATA Mode
The optional settings are: [IDE Mode]; [AHCI Mode].
MSATA
The optional settings are: [Enabled]; [Disabled].
Use this item to enable or disable support for MSATA HotPlug function.

▸ **CSM Configuration**
Press [Enter] to make settings for the following sub-items:
__Compatibly Support Module Configuration__
Option ROM Message
Use this item to set display mode for option ROM.
The optional settings are: [Force BIOS]; [Keep Current].
INT19 Trap Response
The optional settings are: [Immediate]; [Postponed].
__Option ROM execution order__
Storage
This item controls the execution of UEFI and Legacy Storage OpROM.
The optional settings are: [Do not launch]; [UEFI only]; [Legacy only]; [Legacy first]; [UEFI first].
Video
This item controls the execution of UEFI and Legacy Video OpROM.
The optional settings are: [Do not launch]; [UEFI only]; [Legacy only]; [Legacy first]; [UEFI first].
Other PCI devices
This item determines OpROM execution policy for devices other than Network, storage or video.
The optional settings are: [UEFI first]; [Legacy Only].

▸ **USB Configuration**
Press [Enter] to make settings for the following sub-items:
__USB Configuration__
Legacy USB Support
The optional settings are: [Enabled]; [Disabled]; [Auto].

[Enabled]: To enable legacy USB support.

[Disabled]: To keep USB devices available only for EFI specification,

[Auto]: To disable legacy support if no USB devices are connected.

XHCI Hand-off

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

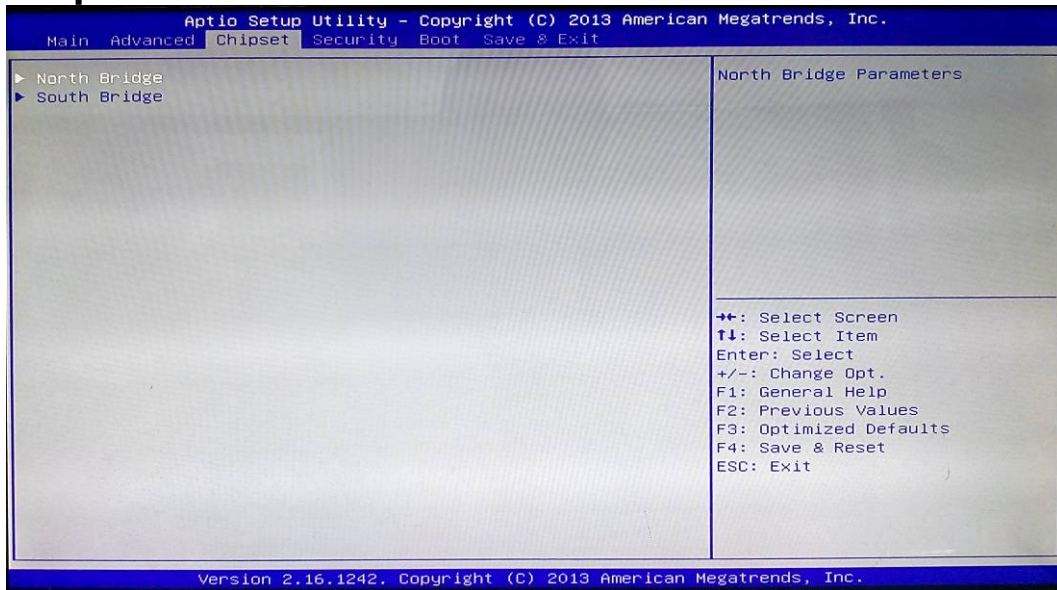The optional settings are: [Enabled]; [Disabled].

EHCI Hand-off

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

The optional settings are: [Disabled]; [Enabled].

USB Mass Storage Driver Support

The optional settings are: [Disabled]; [Enabled].

3-8 Chipset Menu

▸ **North Bridge**
Press [Enter] to view current using memory information and make settings for the following sub-items:
IGD Turbo Enable
The optional settings are: [Enabled]; [Disabled].
DVMT Pre-Allocated
Use this item to select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device.
The optional settings are: [64M]; [96M]; [128M];[160M];[192];[224M]; [256M]; [288M];[320M];[352M];[384M];[416M];[448M];[480M;][512M].
DVMT Total Gfx Mem
Use this item to select DVMT 5.0 total graphics memory size used by the internal graphics device.
The optional settings are: [128M]; [256M]; [MAX].
Spread Spectrum Clock
The optional settings are: [Enabled]; [Disabled].
RC6(Render Standby)
Use this item to enable or disable render standby support.
Primary IGFX Boot Display
Use this item to select the video device which will be activated during POST. This has no effect if external graphics present.
The optional settings are: [VBIOS Default]; [HDMI1]; [HDMI2].

▸ **South Bridge**
Press [Enter] to make settings for the following sub-items:

  ▸ **Azalia HD Audio**
Press [Enter] to further setting USB device configuration.
Mini PCIE
Use this item to enable or disable Mini-PCIE.
The optional settings are: [Disabled]; [Enabled].
When set as [Enabled], user can make settings in '**Speed**' that appears:

Speed

Use this item to select PCIE speed for Mini-PCIE slot.

The optional settings are: [Auto]; [Gen2]; [Gen1].

Onboard PCIE Lan Device

Use this item to control the Onboard PCIE Lan device.

The optional settings are: [Disabled]; [Enabled].

Onboard Lan BootROM

Use this item to enable or disable boot option ROM for onboard network devices.

XHCI Mode

The system will show whether current XHCI support is enabled or disabled.

USB 2.0 (EHCI) Support

The system will show whether current USB 2.0 (EHCI) support is enabled or disabled.

Audio Controller

Use this item to control the detection of the Azalia HD Audio device.

The optional settings are: [Disabled]; [Enabled].

[Disabled]: Azalia will be unconditionally disabled;

[Enabled]: Azalia will be unconditionally enabled;

When set as [Enabled], user can make settings in 'Azalia HDMI Codec
' that appears:

Azalia HDMI Codec

Use this item to enable or disable internal HDMI codec for Azalia.
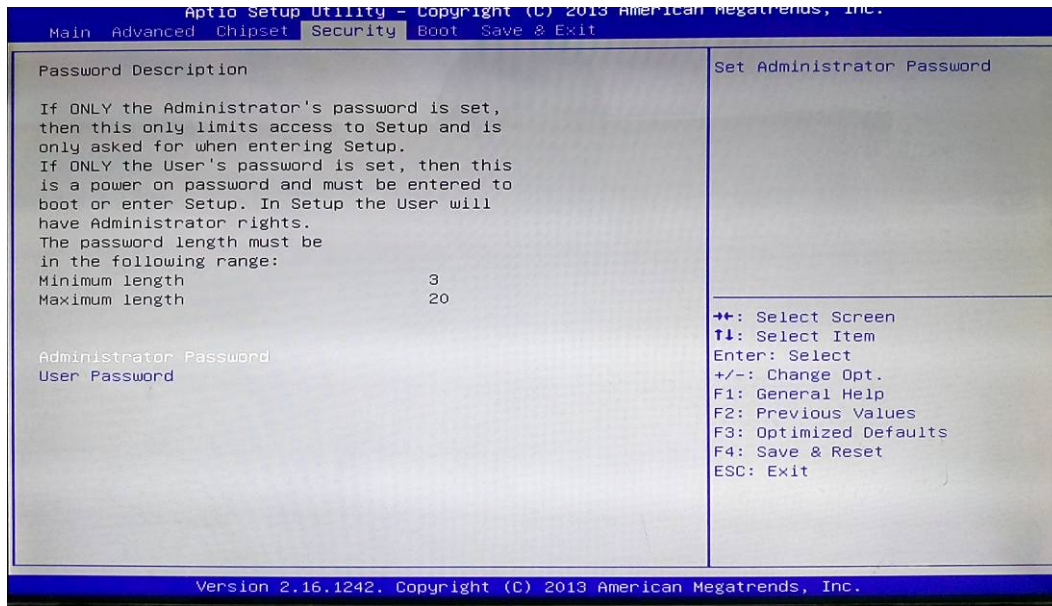
The optional settings are: [Enabled]; [Disabled].

High Precision Timer

Use this item to enable or disable the high precision event timer.
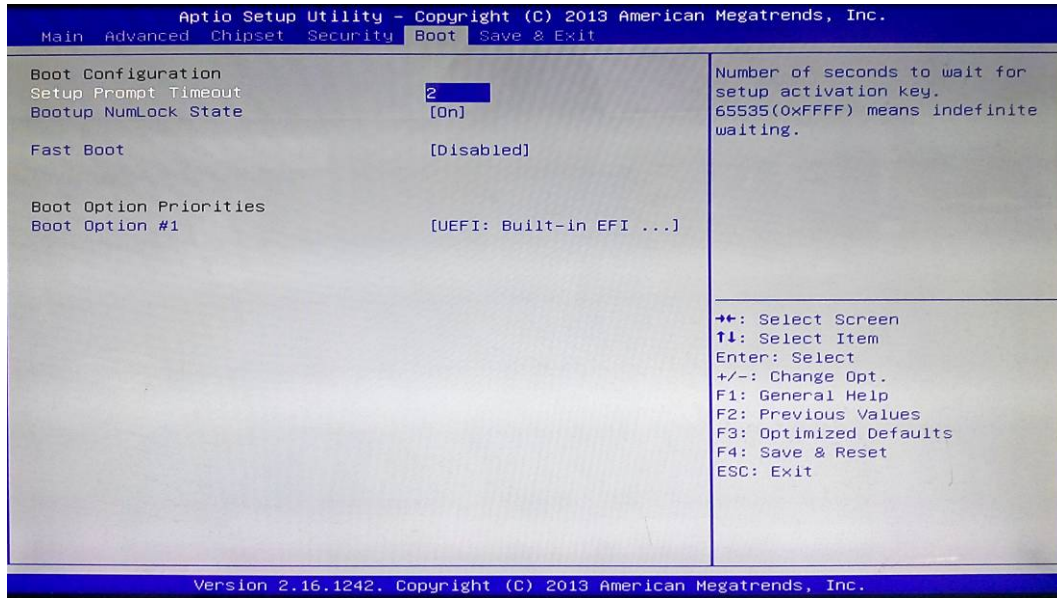
The optional settings are: [Enabled]; [Disabled].

3-9 Security Menu

Security menu allow users to change administrator password and user password settings.

3-10 Boot Menu

```
            Aptio Setup Utility - Copyright (C) 2013 American Megatrends, Inc.
   Main  Advanced  Chipset  Security  Boot  Save & Exit

   Boot Configuration                                    Number of seconds to wait for
   Setup Prompt Timeout            2                     setup activation key.
   Bootup NumLock State            [On]                  65535(0xFFFF) means indefinite
                                                         waiting.
   Fast Boot                       [Disabled]


   Boot Option Priorities
   Boot Option #1                  [UEFI: Built-in EFI ...]


                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Reset
                                                         ESC: Exit


            Version 2.16.1242. Copyright (C) 2013 American Megatrends, Inc.
```

Boot Configuration

Setup Prompt Timeout
Use this item to set number of seconds to wait for setup activation key.
Bootup Numlock State
Use this item to select keyboard numlock state.
The optional settings are: [On]; [Off].
Fast Boot
The optional settings are: [Enabled]; [Disabled].
When set as [Enabled], user can make settings in the following items that appear:
>   **VGA Support**
>   The optional settings are: [Auto]; [EFI Driver].
>   *When set as [Enabled], it will only install Legacy OpROM with Legacy OS and
>   logo will not be shown during POST. EFI driver will still be installed with EFI OS.

USB Support

The optional settings are: [Disabled]; [Full Initial]; [Partial Initial].

[Disabled]: All USB devices will NOT be available until after OS boot;

[Partial Initial]: USB mass storage and specific USB port/device will NOT be available before OS boot;

[Full Initial]: All USB devices will NOT be available in OS and POST.

PS2 Device Support

The optional settings are: [Disabled]; [Enabled].

The PS2 devices will be skipped if this is set as [Disabled].

Network Stack Driver Support

The optional settings are: [Disabled]; [Enabled].

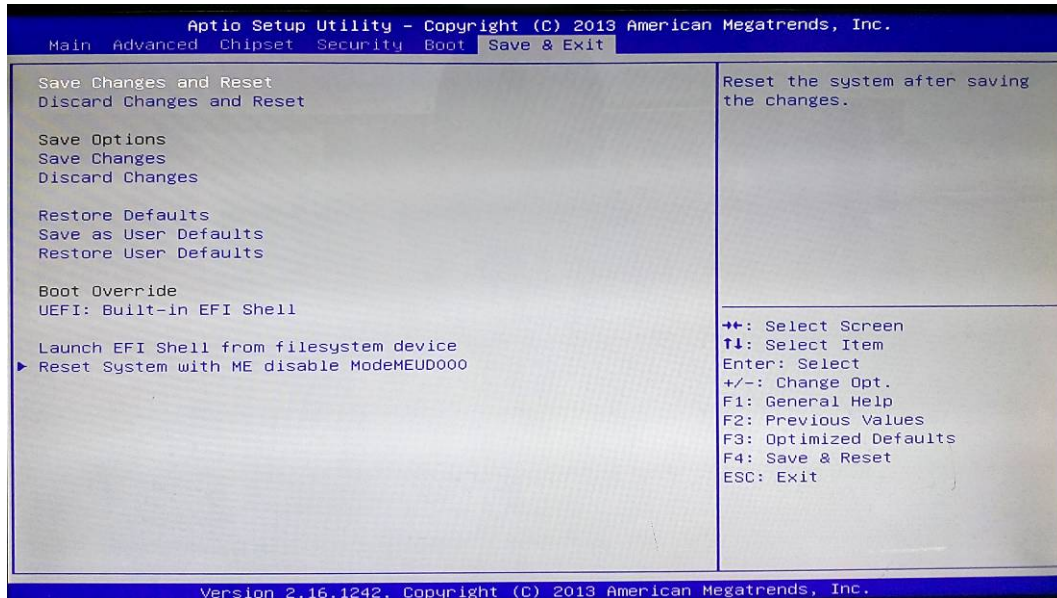**Network Stack Driver** will be skipped if this is set as [Disabled].

Boot Option Priorities

Boot Option # 1

Use this item to set system boot order.

The optional settings are: [UEFI: Built-in EFI Shell]; [Disabled].

3-11 Save & Exit Menu

Save Changes and Reset

This item allows user to reset the system after saving the changes.

Discard Changes and Reset

This item allows user to reset the system without saving any changes.

Save Options

Save Changes

This item allows user to save changes done so far to any of the setup options.

Discard Changes

This item allows user to discard changes done so far to any of the setup options.

Restore Defaults

Use this item to restore /load default values for all the setup options.

Save as User Defaults

Use this item to save the changes done so far as user defaults.

Restore User Defaults
Use this item to restore defaults to all the setup options.
__Boot Oerride__

UEFI: Built-in EFI Shell
Press this item and a dialogue box shall appear to ask if user wish to save configuration and reset.
Lauch EFI Shell from filesystem device
Use this item to launch EFI shell application (shell.efi) from one of the available filesystem device.
Reset System with ME disable Mode MEUD000
Press [Enter] for ME to run into the temporary disable mode. Ignore if ME Ignition EWMEUD001.