FWA8800

1U Rackmount
Network Appliance

User's Manual

Version 1.0
(Oct. 2018)

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Disclaimer

Trademarks

Compliance

This product has passed CE tests for environmental specifications and limits. This product is in accordance with the directives of the Union European (EU). If users modify and/or install other devices in this equipment, the CE conformity declaration may no longer apply.

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

WEEE

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

Green IBASE

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

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

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Important Safety Information

Carefully read the precautions before using the device.

Environmental conditions:

- Lay the device horizontally on a stable and solid surface in case the device may fall, causing serious damage.
- Slots and openings on the chassis are for ventilation. Do not block or cover these openings. Make sure you leave plenty of space around the device for ventilation. NEVER INSERT OBJECTS OF ANY KIND INTO THE VENTILATION OPENINGS.
- Use this product in environments at ambient temperatures 0˚C ~ 40˚.
- DO NOT LEAVE THIS DEVICE IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20˚C OR ABOVE 70˚C. This could damage the device. The device must be used in a controlled environment.

Care for your IBASE products:

- Before cleaning the device, turn it off and unplug all cables such as power in case a small amount of electrical current may still flow.
- Use neutral cleaning agents or diluted alcohol to clean the device chassis with a cloth. Then wipe the chassis with a dry cloth.
- Vacuum the dust with a computer vacuum cleaner to prevent the air vent or slots from being clogged.

 WARNING

Attention during use:

- Do not use this product near water.
- Do not spill water or any other liquids on your device.
- Do not place heavy objects on the top of the device.
- Operate this device from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your distributor or local power company.
- Do not walk on the power cord or allow anything to rest on it.
- If you use an extension cord, make sure that the total ampere rating of the product plugged into the extension cord does not exceed its limits.
- When handling processor chips or memory modules, avoid touching their pins or gold fingers. Put modules or peripherals back into antistatic bags when they are not in use or not installed in the chassis.

Avoid Disassembly

Do not disassemble, repair or make any modification to the device. Disassembly, modification, or any attempt at repair could generate hazards and cause damage to the device, even bodily injury or property damage, and will void any warranty.

⚠ CAUTION

Danger of explosion if internal lithium-ion battery is replaced by an incorrect type. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Under no circumstances should the Lithium battery cell be shorted; otherwise the battery cell may heat up or cause potential burn hazards.

Warranty Policy

- **IBASE standard products:**

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

- **3rd-party parts:**

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

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

Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you need any further assistance from your distributor or sales representative, prepare the following information of your product and elaborate upon the problem.

   - Product model name
   - Product serial number
   - Detailed description of the problem
   - The error messages in text or in screenshots if there is any
   - The arrangement of the peripherals
   - Software in use (such as OS and application software, including the version numbers)

3. If repair service is required, you can download the RMA form at http://www.ibase.com.tw/english/Supports/RMAService/. Fill out the form and contact your distributor or sales representative.

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Chapter 1
General Information

The information provided in this chapter includes:

- Features
- Packing List
- Optional Accessories
- Specifications
- Overview
- Dimensions

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1.1 Introduction

FWA8800 series are specifically designed for the network security and management market. There are plenty of applications adopting network security or network management as listed below.

- **FWA8800-SHD**

- **FWA8800-NIC**

Network Security Applications:
- Firewall
- Unified Threat Management (UTM)
- Virtual Private Network (VPN)
- Proxy Server
- Caching Server

Network Management Applications:
- Load balancing
- Quality of Service
- Remote Access Service

The FWA networking appliance product line covers the spectrum from offering platforms designed for:
- SOHO
- SMB
- Enterprise

Each product is designed to address the distinctive requirements of its respective market segment from cost effective entry-level solutions to high throughput and performance-bound systems for the enterprise level.

1.2   Features

- AMD EPYC™ Embedded 3201 processor
- 4 x DDR4 DIMM up to 2667 MHz; max. 64 GB UDIMM (ECC or non-ECC) or 128 GB RDIMM
- 2 x network modules with up to 16 GbE ports
- Optional 2 x hot-swappable 2.5" drive bays
- Optional IPMI 2.0 module
- 1 x M.2 M2280 slot and 1 x PCIe (x8) expansion slot
- 300W 1+1 redundant power supply

1.3   Packing List

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

Models with a single PSU:

• FWA8800	x 1
• Full Range 250W ATX Power Supply	x 1
• Power Cord (180 cm)	x 1
• Rack Mount Bracket	x 2

Models with 1+1 redundant PSU:

• FWA8800	x 1
• 300W 1+1 Redundant Power Supply Unit	x 1
• Power Cord (180 cm)	x 2
• Rack Mount Bracket	x 2

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1.4 Optional Accessories

IBASE provide optional accessories as follows. Please contact us or your dealer if you need any.

- Console Cable (160 cm, PK1-51)
- IPMI Module (IDN100)
- VGA Cable (40 cm, VGA21A)
- NIC Modules:
    IBN-R420BN (4 x RJ45 GbE, Non-Bypass)
    IBN-R420B (4 x RJ45 GbE, 2 Bypass Segment)
    IBN-R840N (8 x RJ45 GbE, Non-Bypass)
    IBN-R840 (8 x RJ45 GbE, 4 Bypass Segment)
    IBN-S400 (4 x GbE SFP, Non-Bypass)
    IBN-S800 (8 x GbE SFP, Non-Bypass)
    IBN-P400D (2 x 10GbE SFP+, Non-Bypass)
    IBN-P400Q (4 x 10GbE SFP+, Non-Bypass)
    IBN-F200 (2 x 25GbE SFP28, Non-Bypass)

1.5 Specifications

Product Name	FWA8800-SHD	FWA8800-NIC
System		
Motherboard	MBN806	
Operating System	- Linux Ubuntu 16.04 / 17.04 / 17.10 - Linux Kernel 4.9	
CPU	AMD EPYC™ Embedded 3201 processor	
Memory	4 x DDR4 DIMM up to 2667 MHz; max. 64 GB UDIMM (ECC or non-ECC) or 128 GB RDIMM	
Storage	2 x 2.5" hot-swappable HDD	2 x 2.5" or 1 x 3.5" internal HDD (Optional)
Network	1 x Intel® I210AT GbE controller 2 x IBN card for up to 16 GbE ports	
Super I/O	Nuvoton NCT5523D	
IPMI	IPMI module compliant with IPMI 2.0 (Optional)	
Power Supply	- **Single PSU:** Full range 250W ATX power supply unit - **1+1 RPSU:** 300W 1+1 redundant power supply unit	

Product Name	FWA8800-SHD	FWA8800-NIC
Power Requirement	100 ~ 240V AC	
BIOS	AMI BIOS	
Watchdog	Watchdog Timer 256 segments, 0, 1, 2…255 sec/min	
Chassis	Steel with textured black paint	
Dimensions (W x H x D)	438 x 44 x 500 mm (17.24" x 1.73" x 19.68")	
Weight	12 kg (26.4 lb)	
Certificate	CE / FCC Class A	
Front I/O Ports		
LCM	1 x LCM 16x2 dots with 4 keypads	
Console	1 x Console port	
Management Port (MGMT)	1 x MGMT ports	
Ethernet Port	Up to 16 x RJ45 GbE LAN ports (2 x network module slots)	
USB	2 x USB 2.0	
HDD	2 x 2.5" hot-swappable drive bay	2 x 2.5" or 1 x 3.5" internal driver bay (Optional)
Rear I/O Ports		
AC Inlet	**Single PSU:** 1 x 100 ~ 240V AC Inlet **1+1 RPSU:** 2 x 100 ~ 240V AC Inlet with 2 hot-swappable power supply modules	
Display	1 x VGA port (based on the optional IPMI module)	
Fan	3 x system fan	
Expansion	1 x PCIe (x8) slot	
Environment		
Temperature	**Operating:** 0 ~ 40 °C (32 ~ 104 °F) **Storage:** -20~ 70 °C (-4 ~ 158 °F)	
Relative Humidity	5 ~ 90% at 45 °C (non-condensing)	
Vibration Protection	**Operating:** 0.25 Grms / 3 ~ 500 Hz (Z-axis) **Non-operating:** 1.0 Grms / 3 ~ 500Hz (Z-axis)	
Shock Protection	Sawtooth wave 40G (non-operating)	

All specifications are subject to change without prior notice.

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1.6 Overview

Front View

- **FWA8800-SHD**
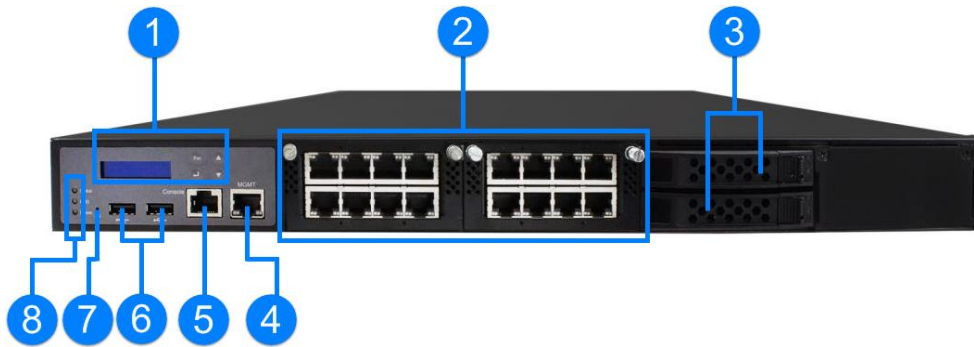
- **FWA8800-NIC**
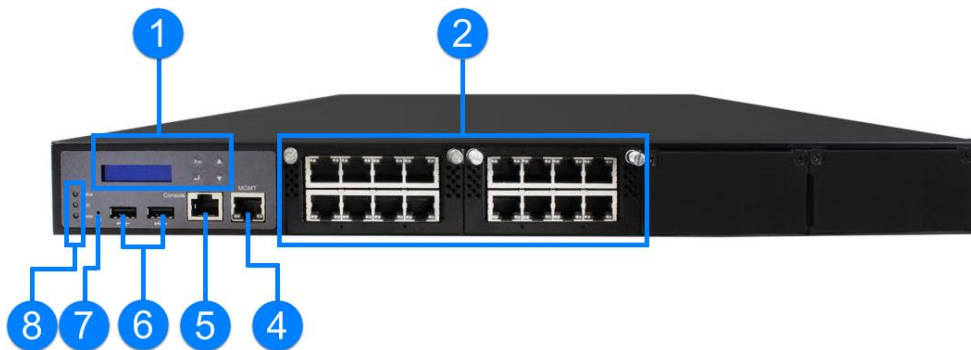
No.	Name	No.	Name
1	LCM Display with 4 buttons	5	Console Port
2	Network Module Slots	6	USB 2.0 Ports
3	2.5" Hot-Swappable Drive Bay (for FWA8800-SHD only)	7	User Self-Defined GPIO Button
4	Management Port	8	LED Indicators (From top to bottom: Status, HDD, Power)

Rear View

- **Single Power Supply Unit**
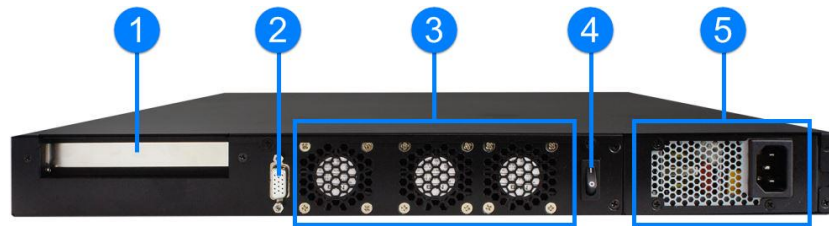
- **Redundant Power Supply Unit**
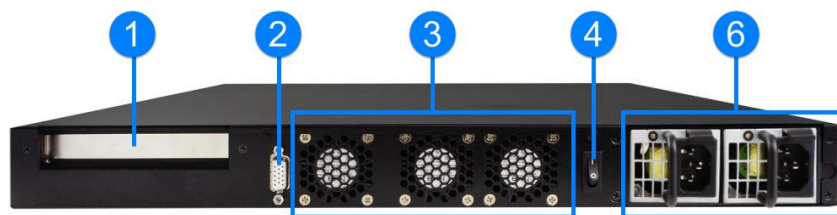
No.	Name	No.	Name
1	PCIe (x8) Expansion Card Slot	4	Power Switch
2	VGA Port (via the optional IPMI module)	5	Single Power Supply Unit
3	System Fan Modules	6	Reduntant Power Supply

Oblique View

- **FWA8800-SHD**
- **FWA8800-NIC**

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1.7 Dimensions

Unit: mm
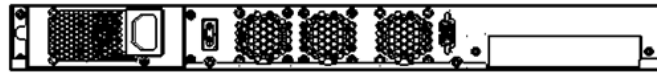
Single PSU

1+1 Redundant PSU

27

500

11

438
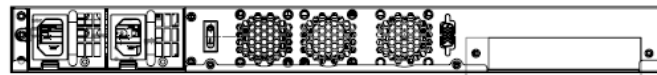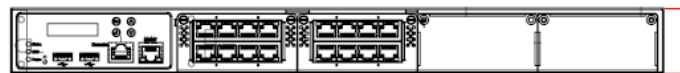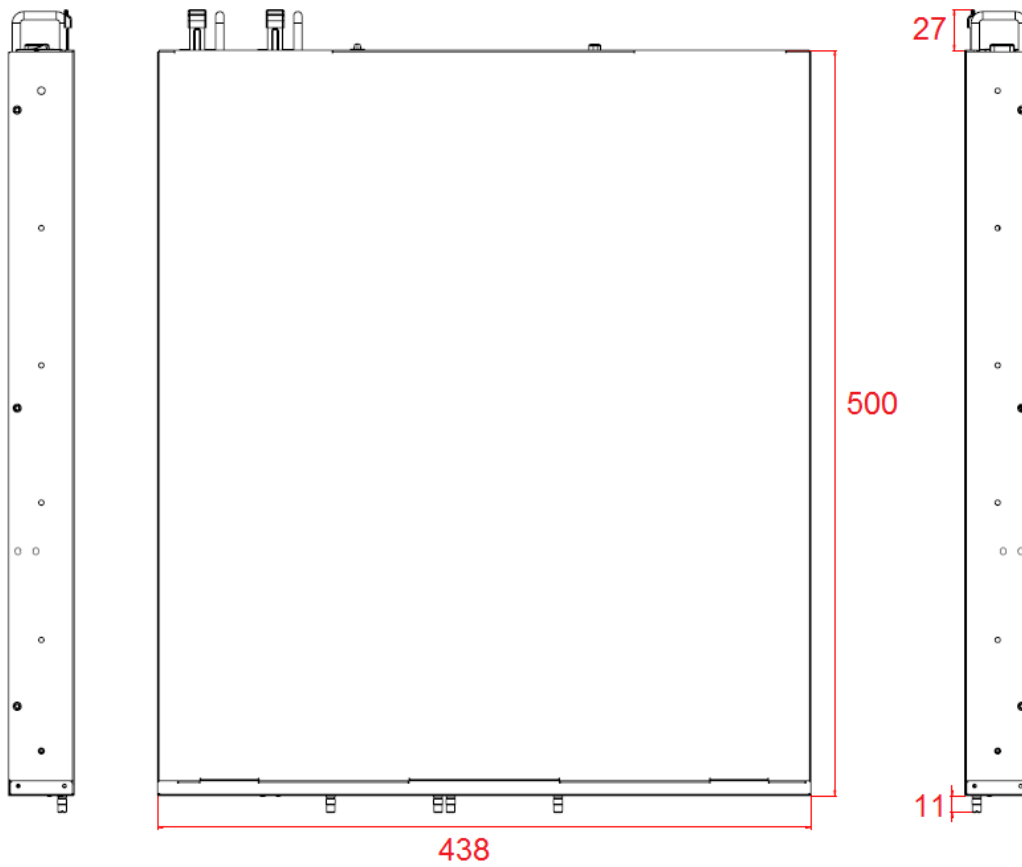
FWA8800-NIC

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FWA8800-SHD

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Chapter 2
Hardware Configuration

The information provided in this chapter includes:

- Installation / Replacement
- Information and locations of connectors

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2.1 Installation / Replacement

For the FWA8800 hot-swappable HDD (only available for FWA8800-SHD), or the IBN Network Interface Modules installations, you can directly install without remove the device cover.

For the memory, M.2, PCIe expansion card or the optional IPMI module, you need to remove 8 screws as shown below to pull out the lid.

This is illustrated by the example of FWA8800-SHD
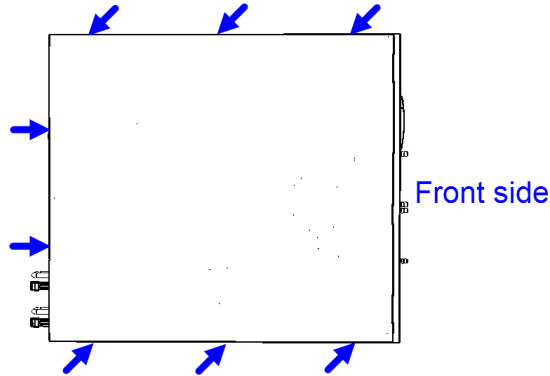
Configuration inside:

Areas A allows for NIC modules and 2.5" how-swappable HDD/SSD. Area B-1 allows for optional internal two 2.5" or one 3.5" HDD/SSD and Area B-2 is for an expansion card installation.
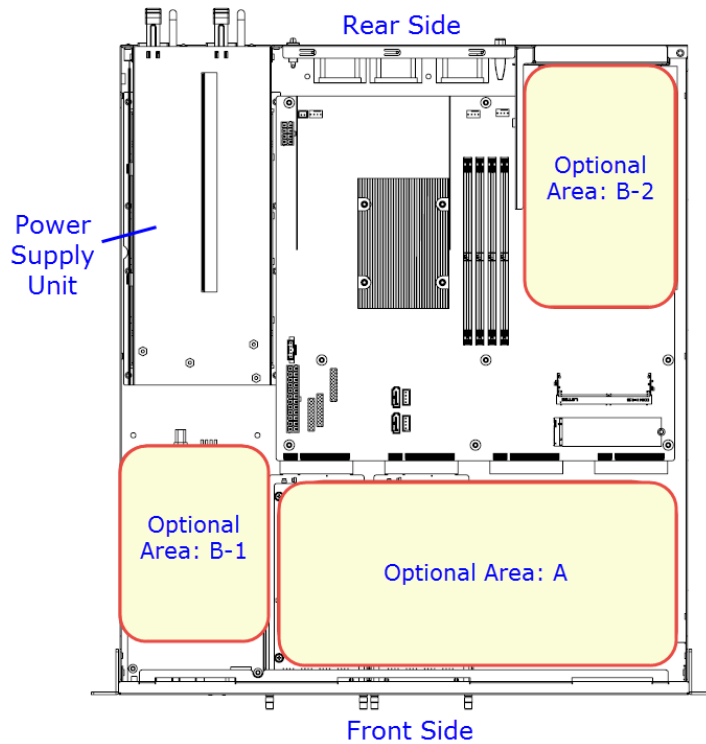
2.1.1   Network Module Installation / Removal

Release two screws of a network module and pull it out carefully as shown below for replacement and installation.

2.1.2   HDD Installation / Removal

FWA8800-SHD hot-swappable HDD:

1. Push the latch outwards to release and take out the HDD tray.

2. Remove 4 screws on both lateral sides of the HDD tray, attach your HDD and tighten the screws.

Note: FWA8800-NIC

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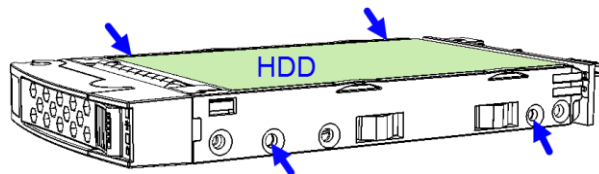
FWA8800-NIC Internal HDD:

1. After you've removed the lid of the system, remove the indicated 4 screws to free up the internal HDD and the bracket.
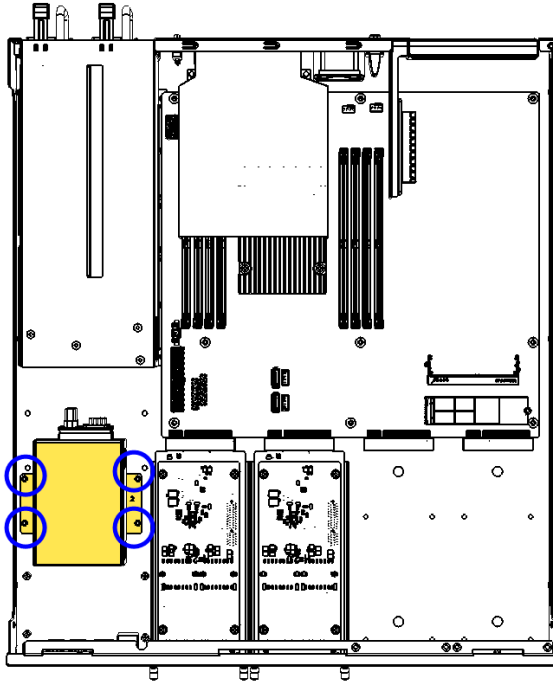
2. Unplug the SATA power and data cable, and remove 4 screws for each HDD for replacement.
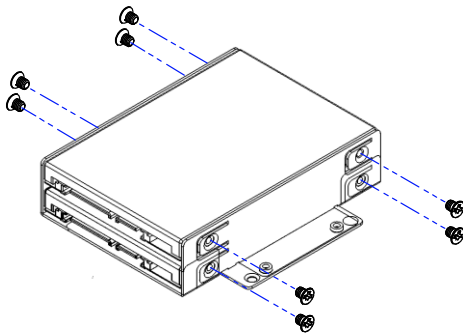
3. Take out the HDD and install a new one onto the tray. Fasten 4 screws back for each HDD.

4. Secure the HDD and the bracket back to the system.

2.1.3   Memory Installation / Replacement

If you need to install or replace a memory module, follow the instructions below for installation after you remove the device cover.

1. Press the ejector tab of the memory slot down and outwards with your fingertips.

2. Hold the memory module and align the key of the module with that on the memory slot.

3. Gently push the module in an upright position until the ejector tabs of the memory slot close to hold the module in place when the module touches the bottom of the slot.
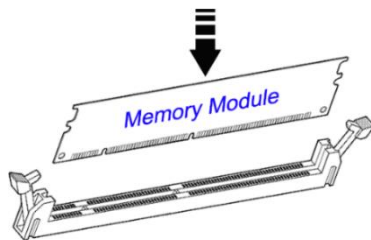
To remove the module, press the ejector tabs outwards with your fingertips to eject the module.

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2.1.4   IPMI Module Installation / Replacement

If you need to install an IPMI module, remove the system lid firstly and then follow the instructions below.

Note: IPMI module is optional for purchase.
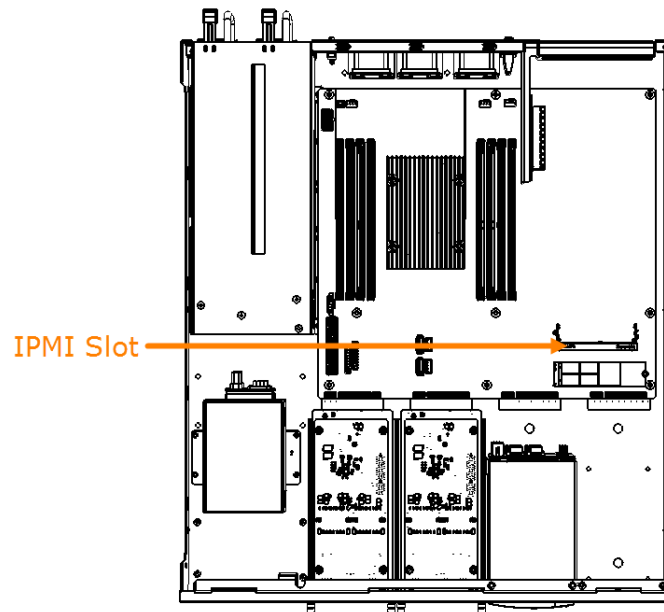
IPMI Slot

1. Locate the IPMI slot and align the key of the module with that on the slot.
2. Insert the module slantwise and gently push the module straight down until the clips of the slot close to hold the module in place when the module touches the bottom of the slot.
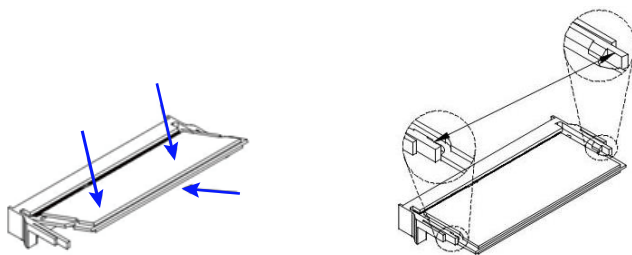
To remove the module, press the clips outwards with your thumb and index finger of both hands.

2.1.5 Fan Module Installation / Removal

If you need to install or replace a fan module, after removing the device cover, release 4 screws of the fan module on the rear side of the device, take out the fan, replace with a new one, and tighten these screws.
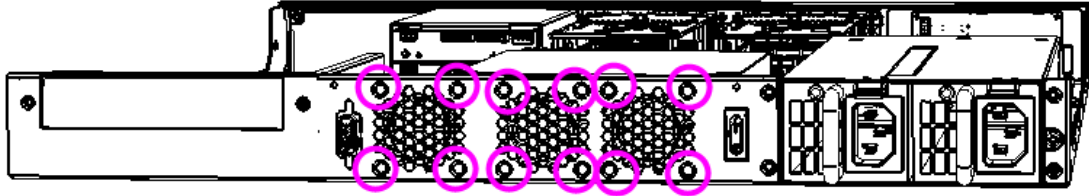
2.1.6 Redundant Power Supply Unit Installation / Replacement

If you need to install or replace a redundant power supply unit, push the latch downwards, grasp the handle, pull the PSU out carefully and replace with a new one.

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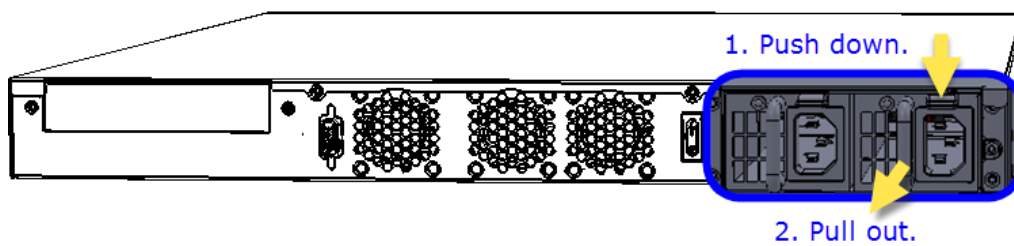
2.2 Setting the Jumper

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

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

A 3-pin jumper   A jumper cap
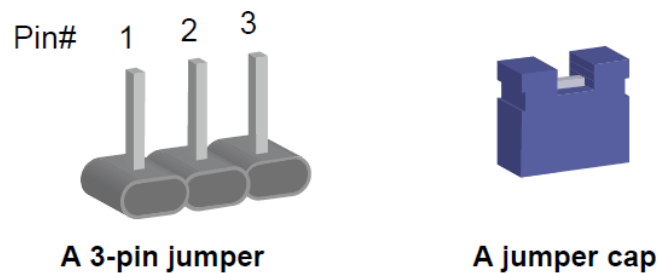
Refer to the illustration below to set jumpers.

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

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

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

2.3   Jumper & Connector Locations on Motherboard

Motherboard: MBN806

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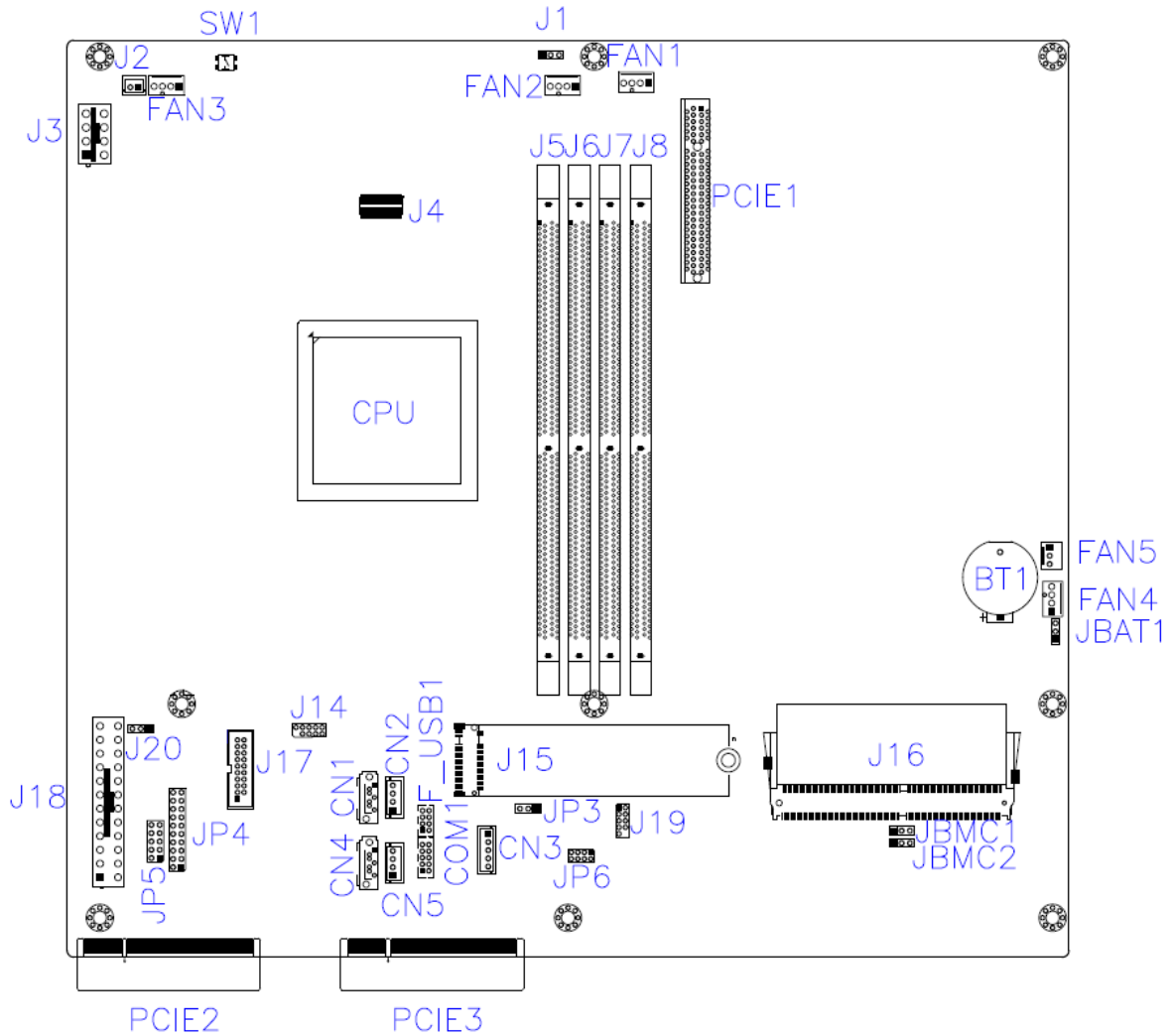
2.4 Jumper Quick Reference

Function	Connector Name	Page
AT & ATX Mode	JP3	18
Clearing CMOS Data	JBAT1	19
Factory Use Only	JBMC1, JBMC2	--

2.4.1 AT & ATX Mode (JP3)
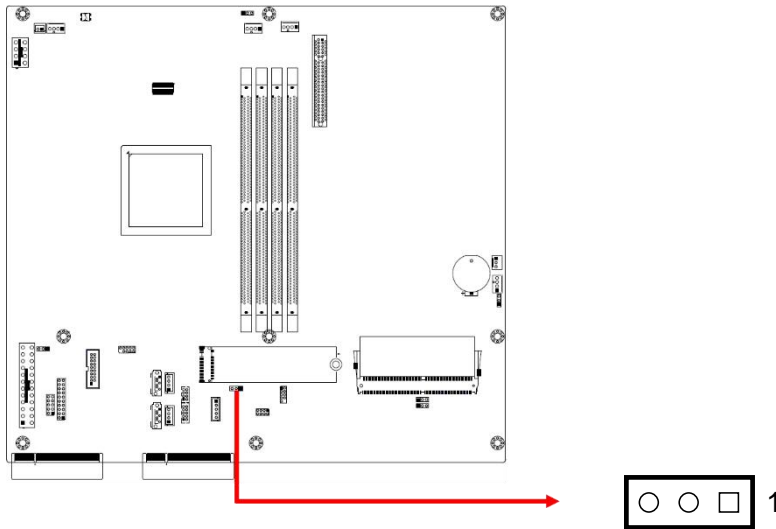
Function	Pin closed	Illustration
AT Mode (Default)	1-2	
ATX Mode	2-3	

2.4.2 Clearing CMOS Data (JBAT1)
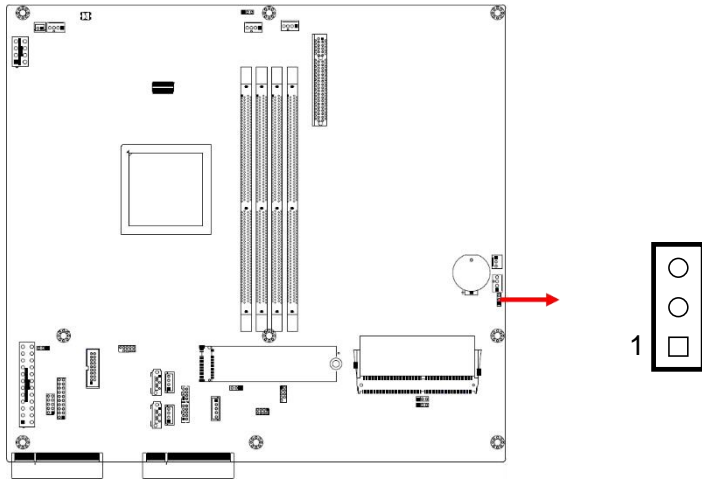
Function	Pin closed	Illustration
Normal (Default)	1-2	
Clearing CMOS	2-3	

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2.5 Connectors Quick Reference

Function	Connector Name	Page
External Power Switch Connector	J2	21
LPC Port	J19	21
System Function Connector	JP5	22
Digital I/O Connector	JP6	22
External SATA Power Connector	CN2, CN5	23
LCM Connector	CN3	23
Fan Connector	**PWM:** FAN1, FAN2, FAN3, FAN4 **Normal:** FAN5	24
Front I/O Connector	JP4	25
UISB 2.0 Connector	F_USB1	26
Console Connector	COM1	26
ATX Power Connector	J3, J18	27
USB 3.0 Port	J17	--
IPMI Connector	J16	--
M.2 M2280 Slot	J15	--
DDR4 UDIMM/RDIMM/LRDIMM Slot	J5, J6, J7, J8	--
SATA III Port	CN1, CN4	--
PCIe (x8) Slot	**Standard:** PCIE1 **For IBN Card only:** PCIE2, PCIE3	--
Factory Use Only	J14,	--

2.5.1   External Power Switch Connector   (J2)
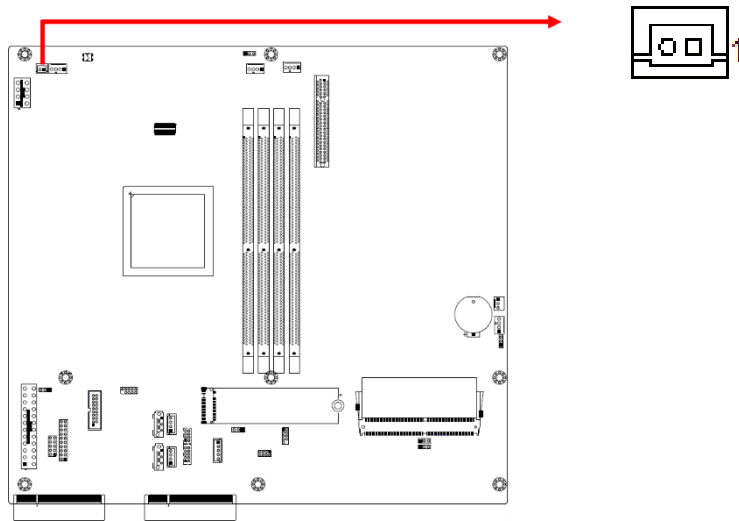
Pin	Signal Name	Pin	Signal Name
1	ATX_PSON#_EN	2	GND

2.5.2   LPC Port   (J19)
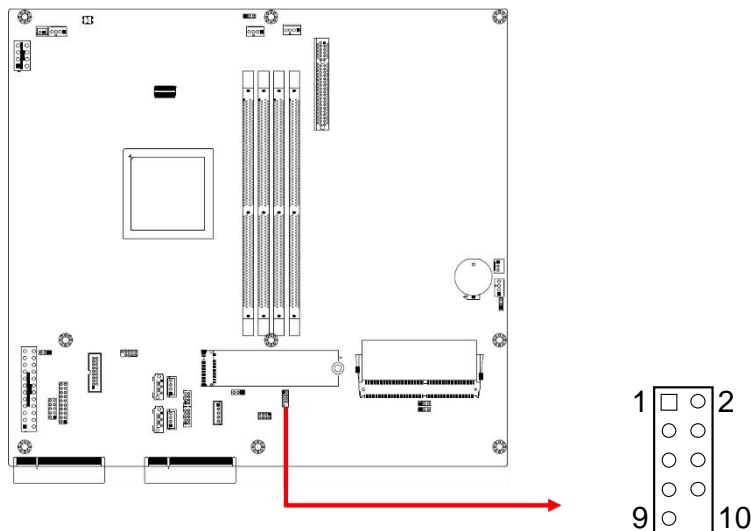
Pin	Signal Name	Pin	Signal Name
1	LPC_LAD_0	2	LPC_RST_L
3	LPC_LAD_1	4	LPC_LFRAME#
5	LPC_LAD_2	6	VCC3_3
7	LPC_LAD_3	8	GND
9	LPC24MB_BF_LAD		

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2.5.3 System Function Connector (JP5)
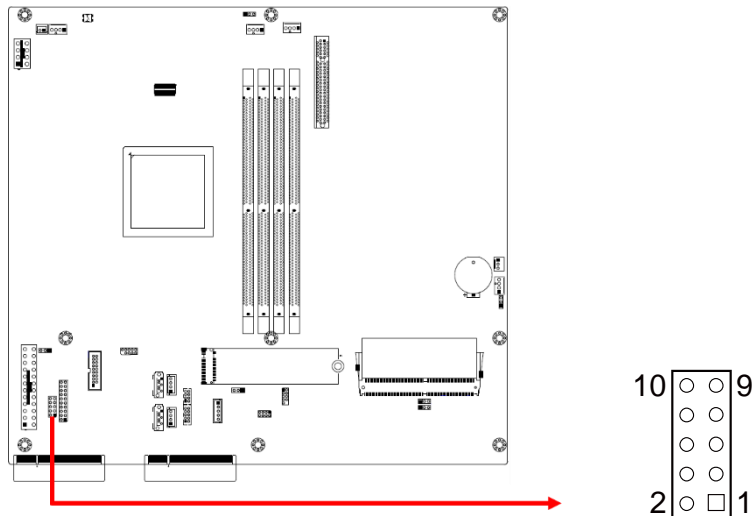
Pin	Signal Name	Pin	Signal Name
1	ATXPWR_BTN#	2	GND
3	FRST_OUT	4	GND
5	VCC5	6	GND
7	VCC3_3	8	-HDD_LED
9	NC	10	NC

2.5.4 Digital I/O Connector (JP6)
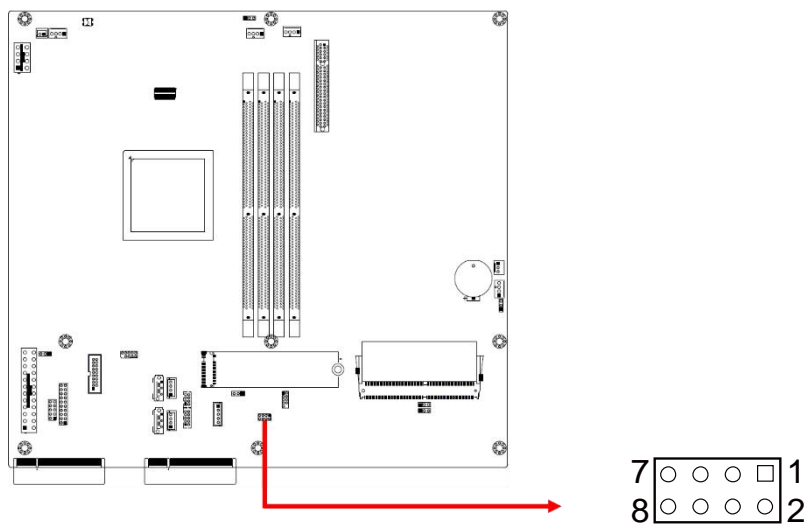
Pin	Signal Name	Pin	Signal Name
1	GND	2	VCC5
3	INT0_SIOGP22	4	INT0_SIOGP25
5	INT0_SIOGP23	6	INT0_SIOGP26
7	INT0_SIOGP24	8	INT0_SIOGP27

2.5.5   External SATA Power Connector   (CN2, CN5)

CN2:

CN5:
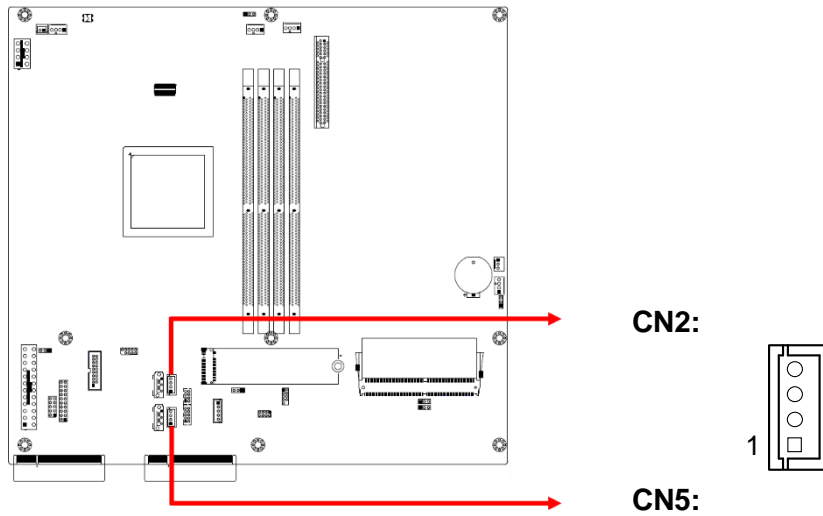
Pin	Signal Name	Pin	Signal Name
1	VCC5	3	GND
2	GND	4	VCC12

2.5.6   LCM Connector   (CN3)

(with RS-232 signal)
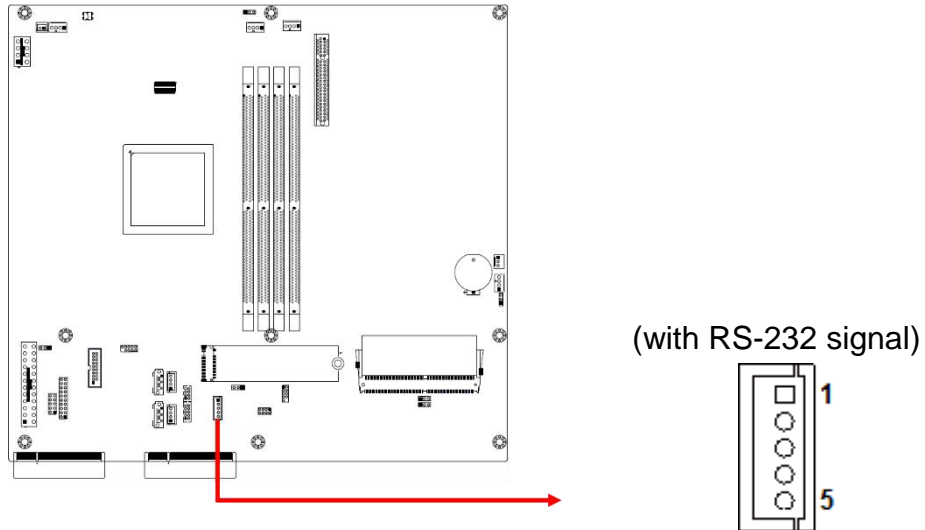
Pin	Signal Name	Pin	Signal Name
1	LCM_RD1	3	GND
2	LCM_TD1	4	VCC5

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2.5.7   Fan Connector   (FAN1, FAN2, FAN3, FAN4, FAN5)

FAN1:
FAN2:
FAN3:
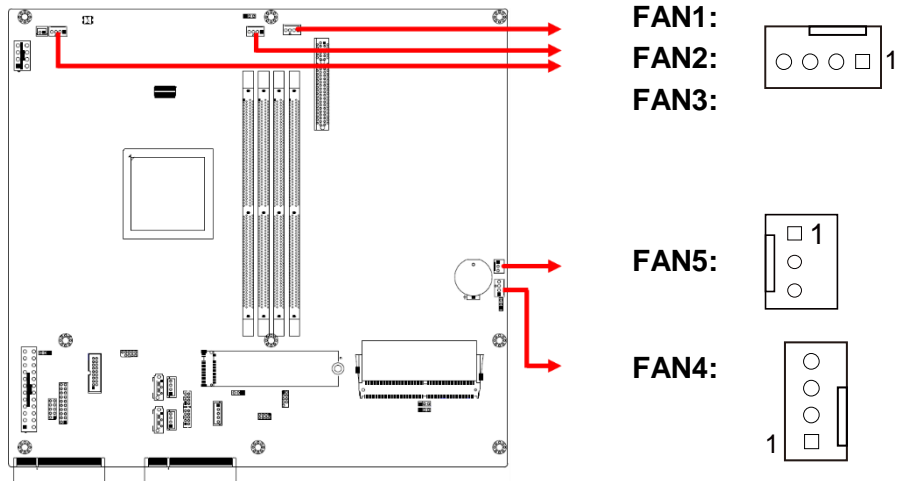
FAN5:

FAN4:

FAN1, FAN2, FAN3, FAN4: PWM fan connectors

Pin	Signal Name	Pin	Signal Name
1	GND	3	FAN_TACH
2	VCC12	4	FAN_PWM

FAN5: Normal fan connector

Pin	Signal Name	Pin	Signal Name
1	GND	3	FAN_TACH
2	VCC12		

2.5.8 Front I/O Connector (JP4)
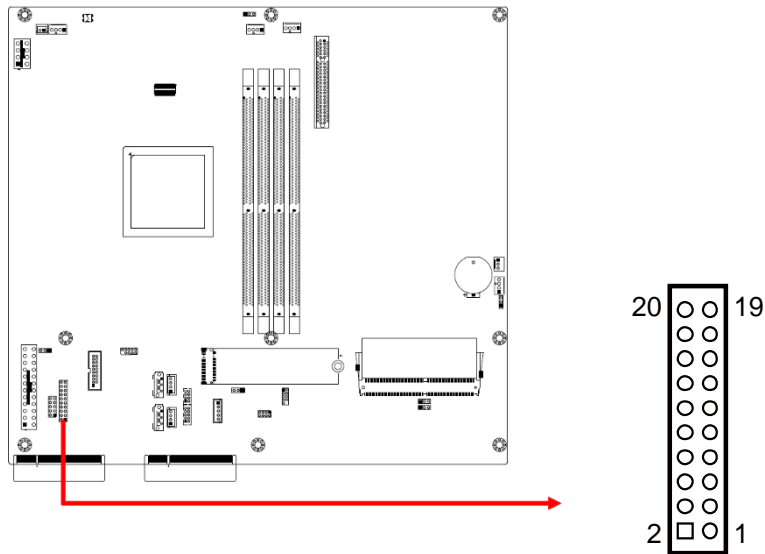
Pin	Signal Name	Pin	Signal Name
1	GPIO_BTN#	2	RJ45-MDI8_P0
3	NC	4	RJ45-MDI8_N0
5	VAUX33_LAN8	6	RJ45-MDI8_P1
7	GND	8	RJ45-MDI8_N1
9	LAN8_LED2	10	RJ45-MDI8_P2
11	LAN8_LED0	12	RJ45-MDI8_N2
13	LAN8_LED1	14	RJ45-MDI8_P3
15	SATA_LED#	16	RJ45-MDI8_N3
17	LED_SIOGP20	18	VCC5
19	LED_SIOGP21	20	GND

iBASE

2.5.9   UISB 2.0 Connector   (F_USB1)
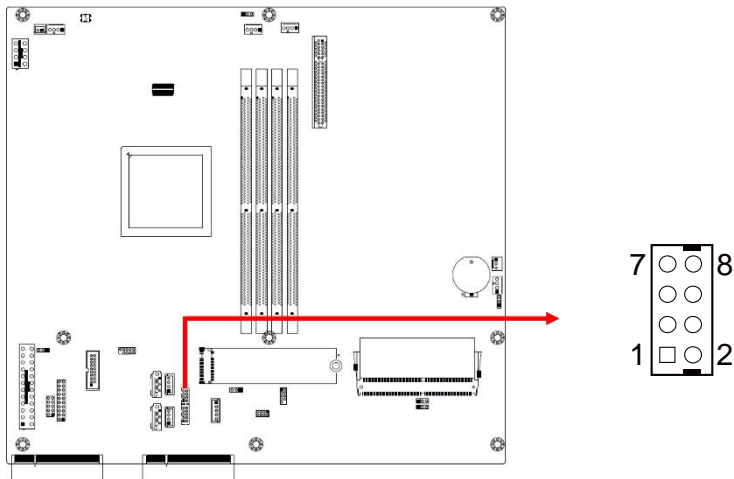
Pin	Signal Name	Pin	Signal Name
1	HUB_FUSEVCC1	2	GND
3	USB_PE_DP2_L	4	USB_PE_DP1_L
5	USB_PE_DM2_L	6	USB_PE_DM1_L
7	GND	8	HUB_FUSEVCC1

2.5.10   Console Connector   (COM1)
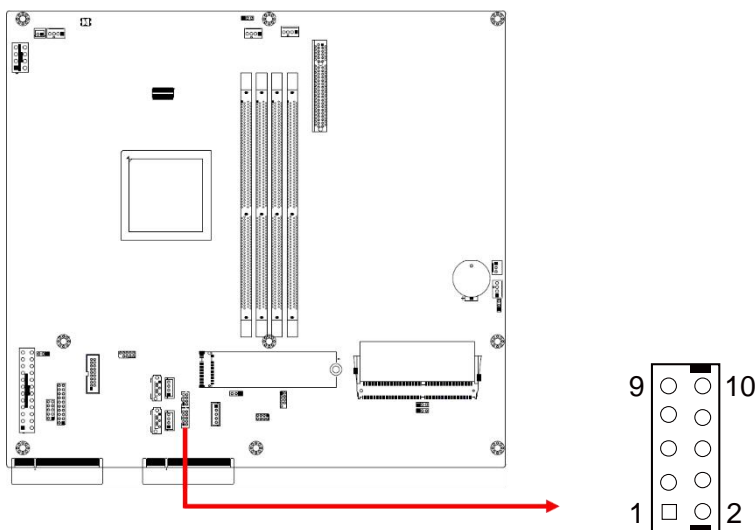
Pin	Signal Name	Pin	Signal Name
1	232_DCD1#	2	232_RD1
3	232_TD1	4	232_DTR1#
5	GND	6	232_DSR1#
7	232_RTS1#	8	232_CTS1#
9	232_RI1#	10	NC

2.5.11 ATX Power Connector (J3, J18)
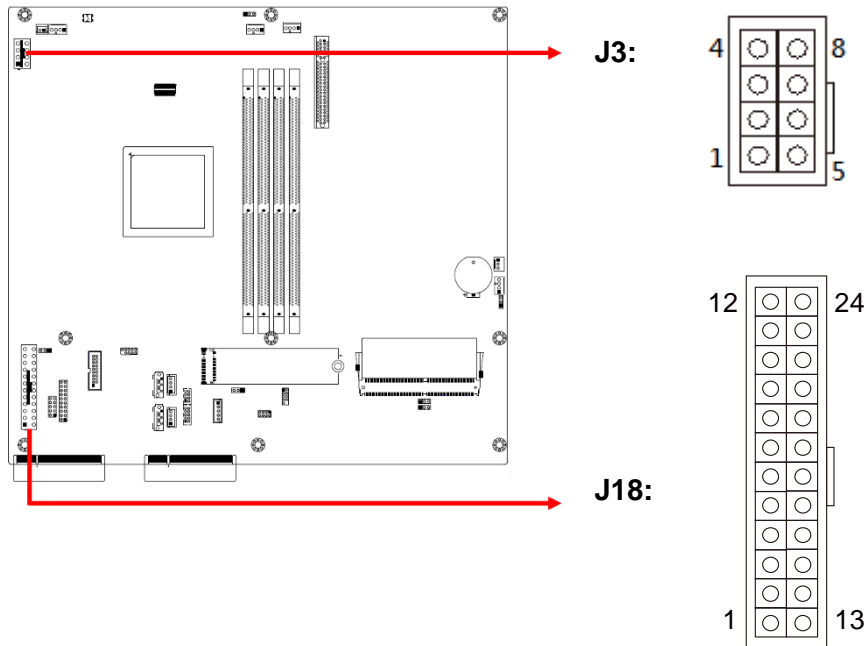
J3:

Pin	Assignment	Pin	Assignment
1	Ground	5	+12V
2	Ground	6	+12V
3	Ground	7	+12V
4	Ground	8	+12V

J18:

Pin	Assignment	Pin	Assignment
1	3.3V	13	3.3V
2	3.3V	14	-12V
3	Ground	15	Ground
4	+5V	16	PS-ON
5	Ground	17	Ground
6	+5V	18	Ground
7	Ground	19	Ground
8	Power good	20	-5V
9	5VSB	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	+3.3V	24	Ground

Chapter 3
BIOS Setup

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

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

IBASE

3.1   Introduction

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

3.2   BIOS Setup

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

If you still need to enter Setup, restart the system by pressing the "Reset" button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again.

The following message will appear on the screen:

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

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

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

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

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

---

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3.3 Main Settings

```
        Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
        Main  Advanced  Security  Boot  Save & Exit  Event Logs  Server Mgmt

                                                              Set the Date. Use Tab
        Total Memory            Total Memory: 32768 MB        to switch between Date
                                (DDR4)                        elements.
                                                              Default Ranges:
                                                              Year: 2005-2099
        System Date             [Thu 09/27/2018]              Months: 1-12
        System Time             [11:33:30]                    Days: dependent on month

        Access Level            Administrator

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

                Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

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

3.4   Advanced Settings

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

```
          Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
           Main  Advanced  Security  Boot  Save & Exit  Event Logs  Server Mgmt

        ▶ Trusted Computing                          Trusted Computing
        ▶ NCT5523D Super IO Configuration            Settings
        ▶ NCT7904D HW Monitor
        ▶ Serial Port Console Redirection
        ▶ CPU Configuration
        ▶ NVMe Configuration
        ▶ USB Configuration
        ▶ PCIE Slot Configuration
        ▶ LAN Bypass Configuration

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

           Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

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3.4.1   Trusted Computing

```
         Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
          Advanced

 Configuration                                       Enables or Disables
   Security Device      [Disable]                    BIOS support for
 Support                                             security device. O.S.
   NO Security Device                                will not show Security
 Found                                               Device. TCG EFI
                                                     protocol and INT1A
                                                     interface will not be
                                                     available.


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

          Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

BIOS Setting	Description
Security Device Support	Enables / Disables BIOS support for security device. The operating system will not show the security device. TCG EFI protocol and INT1A interface will not be available.

3.4.2   NCT5523D Super IO Configuration

```
Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
 Advanced

 NCT5523D Super IO Configuration                    Set Parameters of
                                                    Serial Port 1 (COMA)
 Super IO Chip            NCT5523D
▶ Serial Port 1 Configuration
▶ Serial Port 2 Configuration

 Restore AC Power Loss    [Power Off]


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

 Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

BIOS Setting	Description
Serial Ports Configuration	Sets Parameters of Serial Ports. You can enable / disable the serial port and select an optimal settings for the Super IO device.
Restore AC Power Loss	Select AC power state when power is re-applied after a power failure. Options: Power Off, Power On, Last State

iBASE

3.4.2.1. Serial Port 1 Configuration
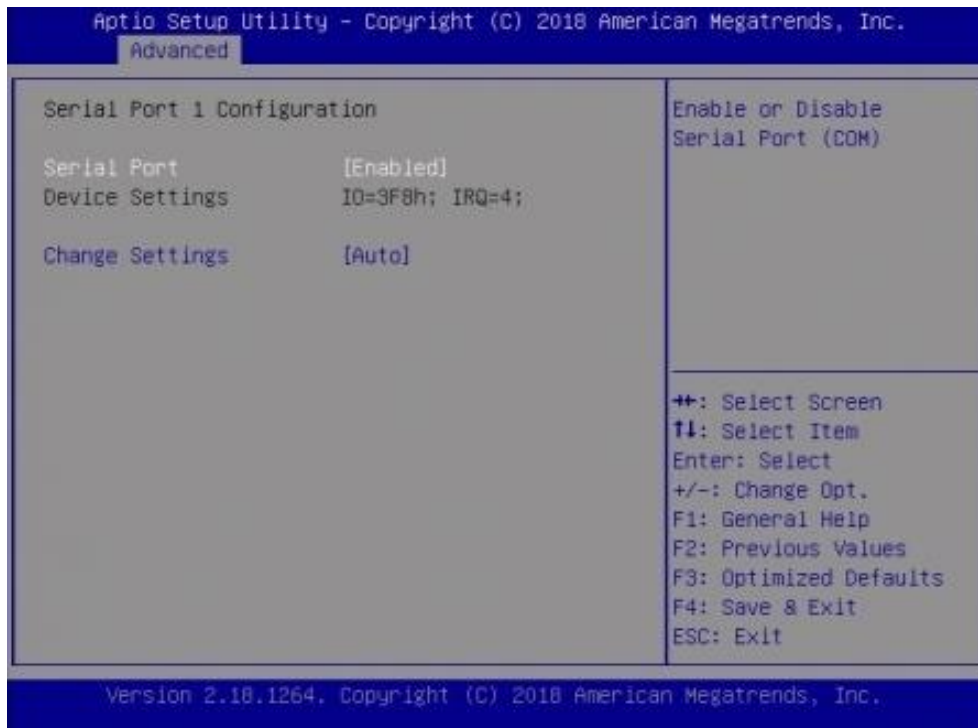
BIOS Setting	Description
Serial Port	Sets parameters of Serial Ports (COM).
Change Settings	Selects an optimal settings for Super I/O device.

3.4.2.2. Serial Port 2 Configuration

```
          Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
            Advanced

 Serial Port 2 Configuration                          Enable or Disable
                                                       Serial Port (COM)
 Serial Port              [Enabled]
 Device Settings          IO=2F8h; IRQ=3;

 Change Settings          [Auto]



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

          Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

BIOS Setting	Description
Serial Port	Sets parameters of Serial Ports (COM).
Change Settings	Selects an optimal settings for Super I/O device.

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3.4.3   NCT7904D HW Monitor

```
Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
 Advanced

Pc Health Status                                Smart fan control of
Smart fan control        [40°C]                 Fans
ACPI Shutdown            [Disabled]             Disable or setting
Temperature                                     smart fan control start
                                                up temperature.
CPU temperature          : +40 °C
System temperature       : +38 °C
Fan1 Speed               : 6923 RPM
Fan2 Speed               : 6852 RPM
Fan3 Speed               : 6958 RPM
Vcore                    : +1.008 V             →←: Select Screen
+12V                     : +12.048 V            ↑↓: Select Item
+5V                      : +4.960 V             Enter: Select
VDDR                     : +1.204 V             +/-: Change Opt.
+3.3V                    : +3.282 V             F1: General Help
                                                F2: Previous Values
                                                F3: Optimized Defaults
                                                F4: Save & Exit
                                                ESC: Exit

        Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

BIOS Setting	Description
Smart Fan Control	This field enables or disables the smart fan control Options: Disabled (default), 50°C, 60°C, 70°C, 80°C
ACPI Shutdown Temperature	Options: Disabled, 70°C, 75°C, 80°C, 85°C, 90 °C, 95°C
Temperatures / Voltages / Fan Speed	These fields are the parameters of the hardware monitoring function feature of the motherboard. The values are read-only as monitored by the system and showing the PC health status

3.4.4   Serial Port Console Configuration

BIOS Setting	Description
Console Redirection	Enables / Disables Console Redirection.
Console Redirection Settings	The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings. Sets parameters of Console Redirection.

iBASE

3.4.4.1. Console Redirection Settings
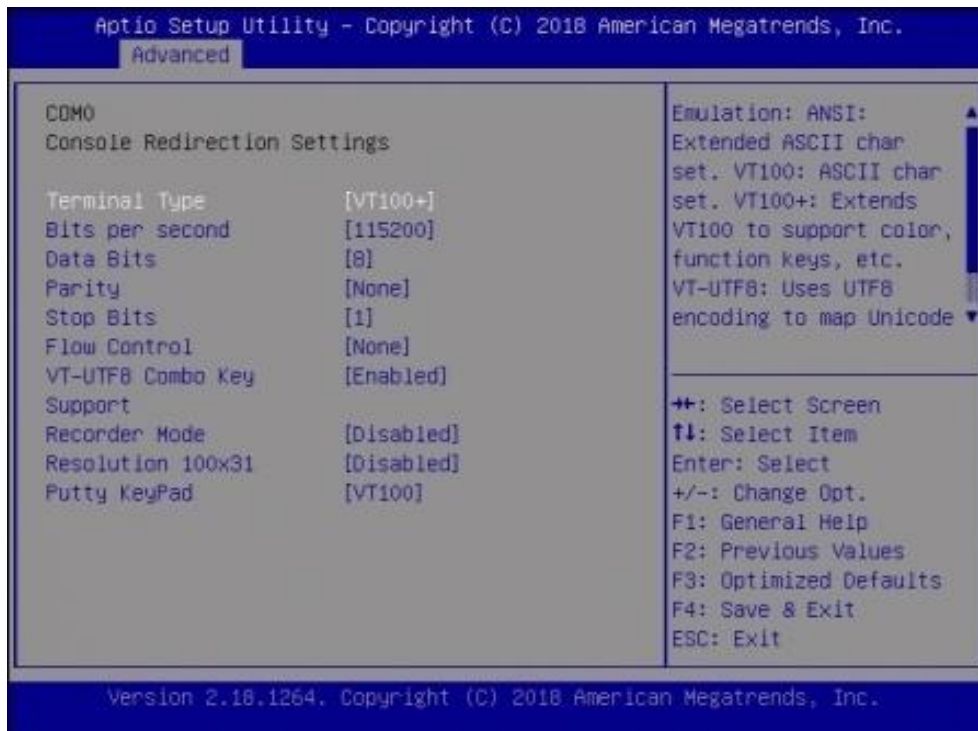
BIOS Setting	Description
Terminal Type	Emulation: **ANSI:** Extended ASCII charset. **VT100:** ASCII charset. **VT100+:** Extends VT100 to support color, function keys, etc. **VT-UTF8:** Uses UTF8 encoding to map Unicode.
Bits per second	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. Options: 9600, 19200, 38400, 57600, 115200
Data Bits	Options: 7, 8
Parity	A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Options: None, Even, Odd, Mark, Space
Stop Bits	Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Options: 1, 2

BIOS Setting	Description
Flow Control	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a "stop" signal can be sent to stop the data flow. Options: None, Hardware RTS/CTS
VT-VTF8 Combo Key Support	Enables / Disables VT-UTFB combination key support for ANSI/VT100 terminals.
Recorder Mode	With this mode enabled, only text will be sent. This is to capture terminal data.
Resolution 100x31	Enables / Disables extended terminal resolution.
Putty Key pad	Select FunctionKey and keyPad on Putty. Options: VT100, LINUX, XTERMR6, SC0, ESCN, VT400

3.4.5   CPU Configuration
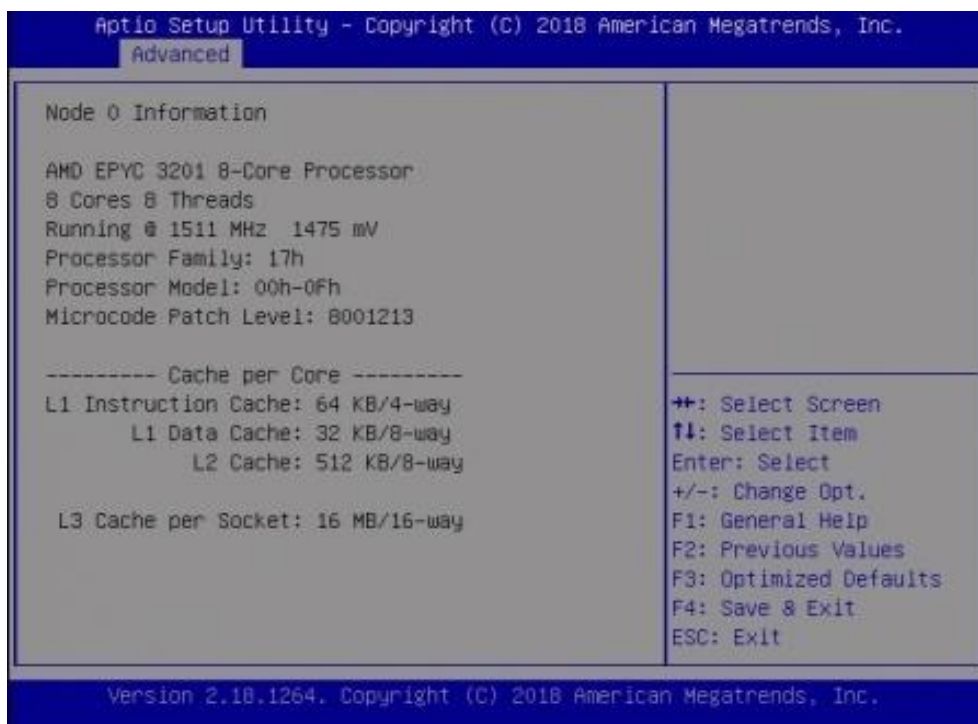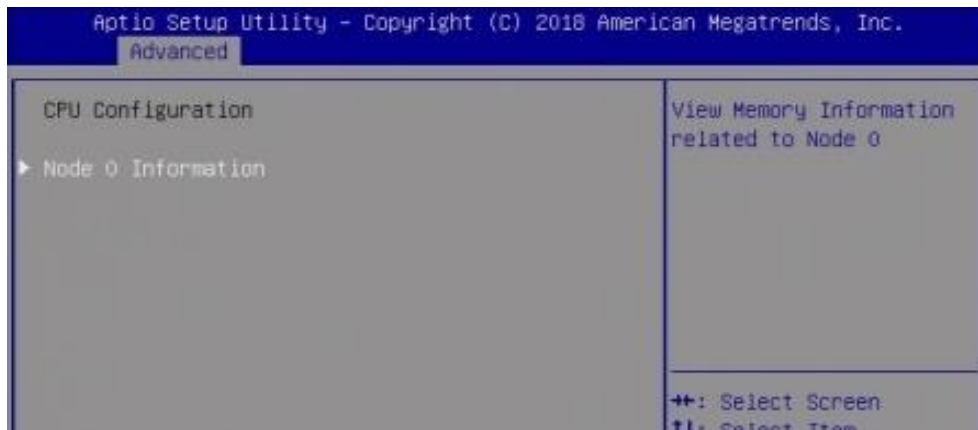
BIOS Setting	Description
Node 0 Information	View memory information related to node 0.

3.4.6   NVMe Configuration

3.4.7   USB Configuration

```
Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
  Advanced

USB Configuration                              Enables Legacy USB
                                               support. AUTO option
USB Module Version     20                      disables legacy support
                                               if no USB devices are
USB Controllers:                               connected. DISABLE
    1 XHCI                                     option will keep USB
USB Devices:                                   devices available only
    6 Drives, 2 Keyboards, 1 Mouse, 2 Hubs     for EFI applications.

Legacy USB Support       [Enabled]
XHCI Hand-off            [Enabled]             ↔: Select Screen
USB Mass Storage         [Enabled]             ↑↓: Select Item
Driver Support                                 Enter: Select
                                               +/-: Change Opt.
USB hardware delays                            F1: General Help
and time-outs:                                 F2: Previous Values
USB transfer time-out    [20 sec]              F3: Optimized Defaults
Device reset time-out    [20 sec]              F4: Save & Exit
                                               ESC: Exit

         Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

BIOS Setting	Description
Legacy USB Support	Enables / Disables Legacy USB support. • **Auto** disables legacy support if there is no USB device connected. • **Disable** keeps USB devices available only for EFI applications.
XHCI Hand-off	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Enables / Disables USB mass storage driver support.
USB Transfer time-out	Sets the time-out value 1, 5, 10 or 20 sec(s) for Control, Bulk, and Interrupt transfers.
Device reset time-out	Sets the seconds (10, 20, 30, 40 secs) of delaying execution of start unit command to USB mass storage device.

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3.4.8   PCIE Slot Configuration
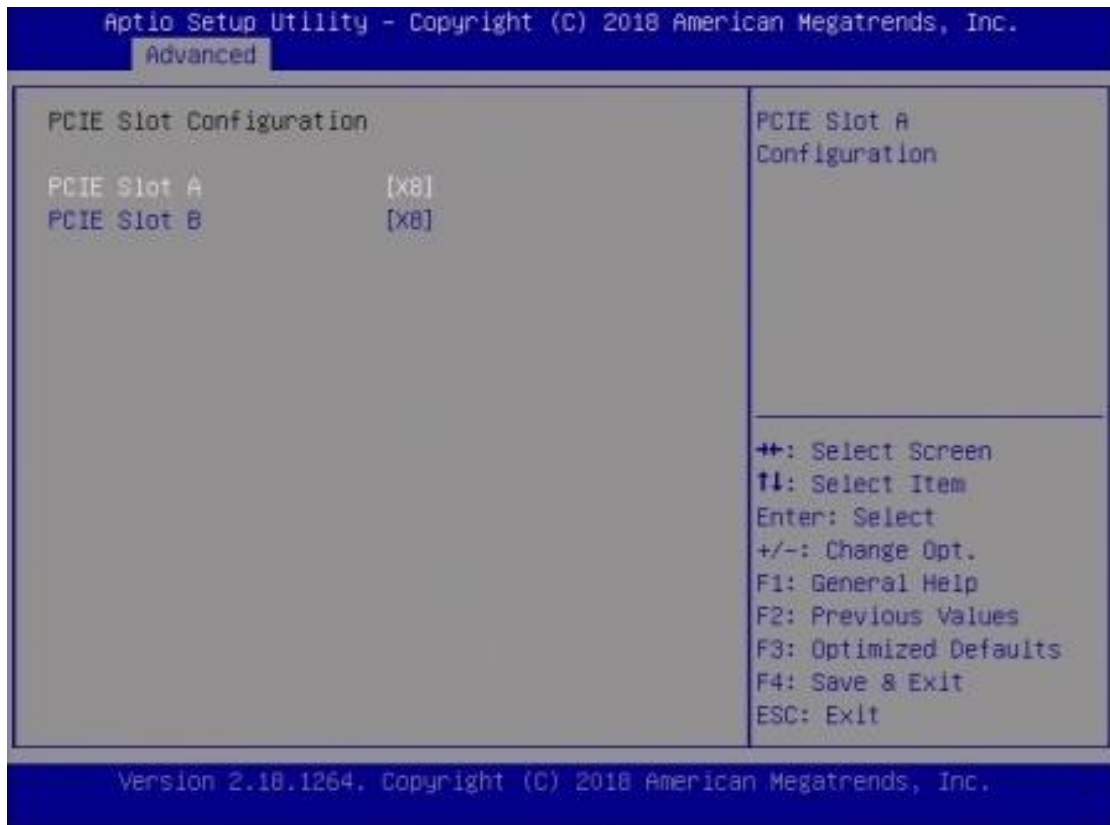
BIOS Setting	Description
PCIE Slot A / B	Configures the PCIe slot as x8 or x4/x4

3.4.9 LAN Bypass Configuration

BIOS Setting	Description
Bypass Quick Setting	• Normal Mode: All LAN ports in normal mode. WDT monitor system hang & initiates a reboot.
	• Bypass Mode: All LAN ports with bypass function in Bypass mode during power-off or WDT initiates bypass. System will not reboot.
	• Firewall Mode: All LAN ports in bypass until OS has control ability to change LAN ports in normal.
	• Custom Mode: All LAN ports can be configured independently.

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3.5　Security Settings

```
       Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
  Main  Advanced  Security  Boot  Save & Exit  Event Logs  Server Mgmt

  Password Description                        ▲ Set Administrator
                                                Password
  If ONLY the Administrator's password is set,
  then this only limits access to Setup and is
  only asked for when entering Setup.
  If ONLY the User's password is set, then this
  is a power on password and must be entered to
  boot or enter Setup. In Setup the User will
  have Administrator rights.
  The password length must be
  in the following range:                       ⇥⇤: Select Screen
  Minimum length          3                     ↑↓: Select Item
  Maximum length          20                    Enter: Select
                                                +/-: Change Opt.
                                                F1: General Help
  Administrator Password                        F2: Previous Values
  User Password                                 F3: Optimized Defaults
                                              ▼ F4: Save & Exit
                                                ESC: Exit

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```

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

3.6 Boot Settings
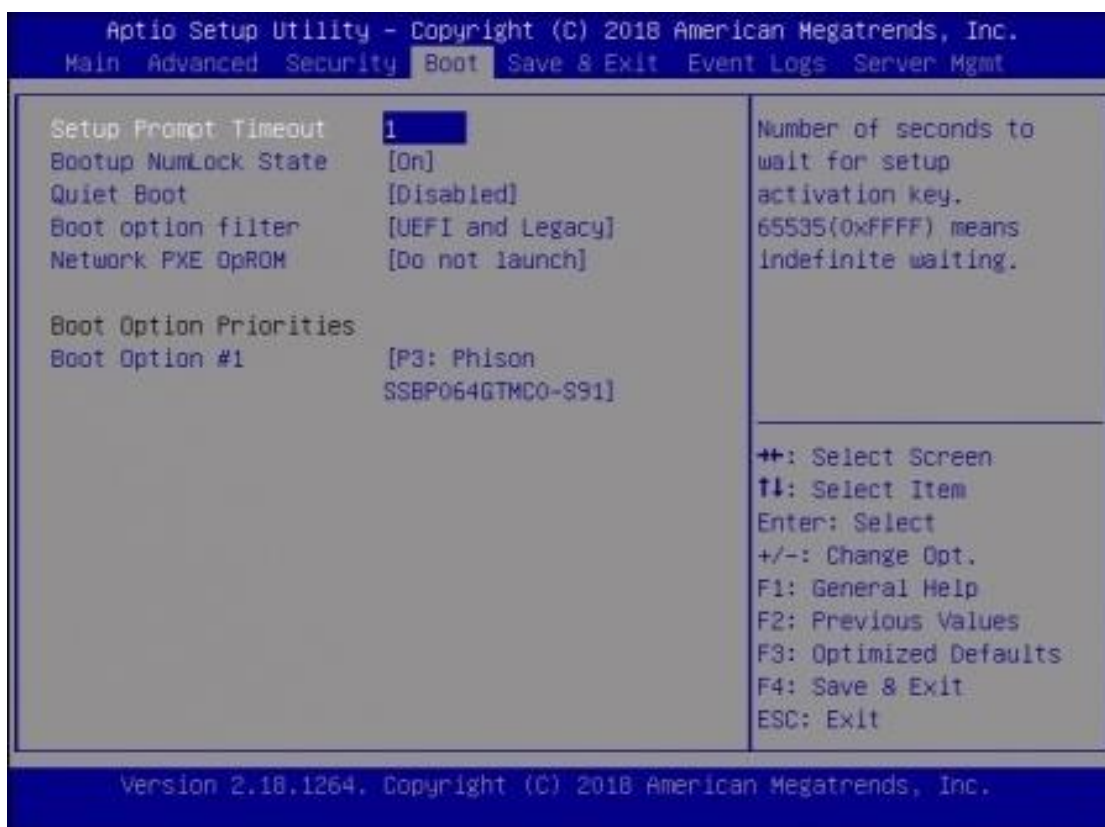
BIOS Setting	Description
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	Selects the keyboard NumLock state.
Quiet Boot	Enables / Disables Quiet Boot option.
Boot Option Filter	This option controls Legacy/UEFI ROMs priority. Options: UEFI and Legacy, Legacy only, UEFI only
Network PXE OpROM	Controls the execution of UEFI and Legacy PXE OpROM. Options: Do not launch, UEFI, Legacy
Boot Option Priorities	Sets the system boot order.

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3.7 Save & Exit Settings

```
            Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
      Main  Advanced  Security  Boot  Save & Exit  Event Logs  Server Mgmt

      Save Options                                  Exit system setup after
      Save Changes and Exit                         saving the changes.
      Save Changes and Reset
      Discard Changes and Reset

      Default Options
      Restore Defaults


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


            Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

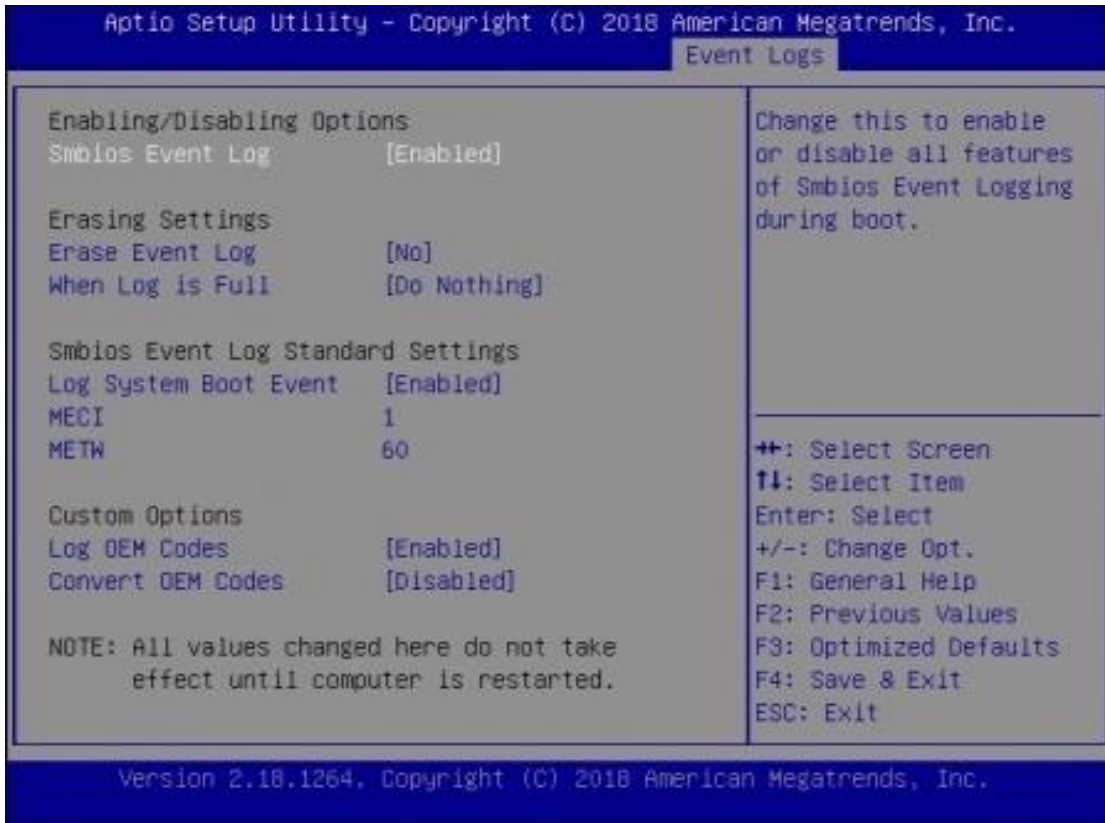| BIOS Setting	Description
Save Changes and Exit	Exits system setup after saving the changes.
Save Changes and Reset	Resets the system after saving the changes.
Discard Changes and Reset	Resets system setup without saving any changes.
Restore Defaults	Restores / Loads defaults values for all the setup options.

3.8 Event Logs

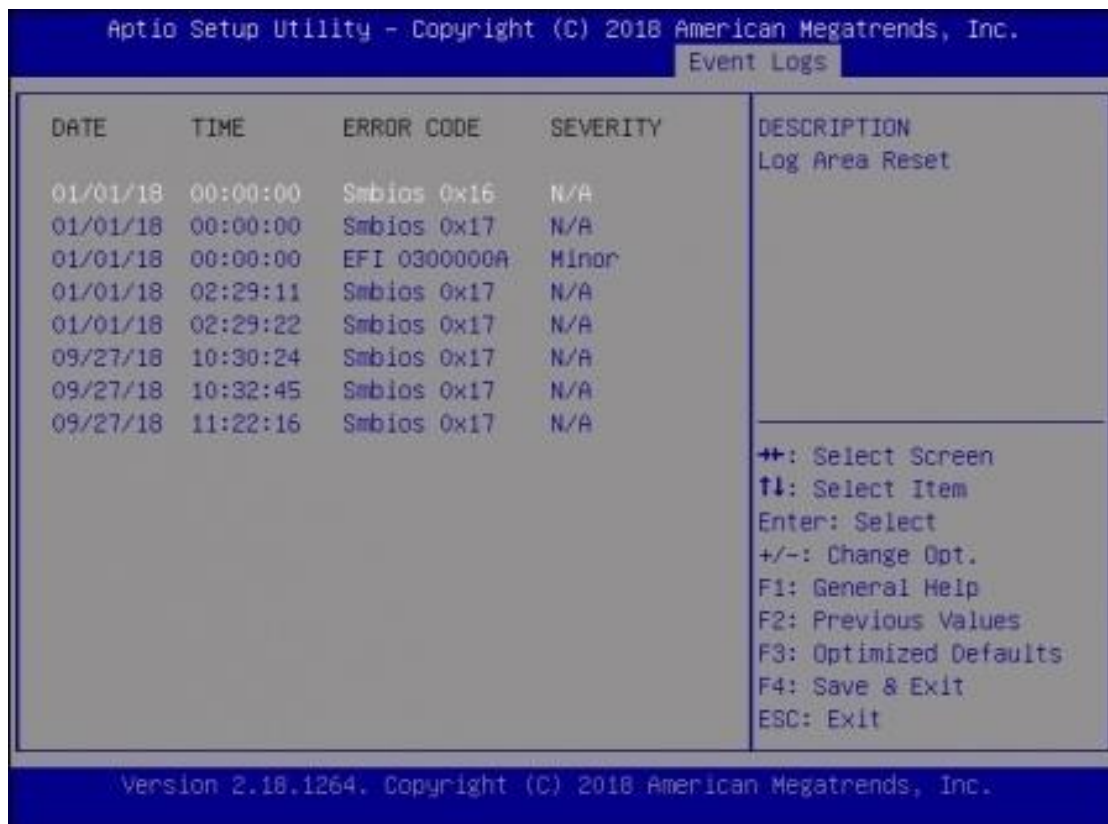| BIOS Setting	Description
Change SMBIOS Event Log Settings	Press Enter to change the SMBIOS event log configuration.
View SMBIOS Event Log	

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3.8.1   Change SMBIOS Event Log Settings

```
         Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
                                               Event Logs

 Enabling/Disabling Options                         Change this to enable
 Smbios Event Log          [Enabled]                or disable all features
                                                    of Smbios Event Logging
                                                    during boot.
 Erasing Settings
 Erase Event Log           [No]
 When Log is Full          [Do Nothing]

 Smbios Event Log Standard Settings
 Log System Boot Event     [Enabled]
 MECI                      1
 METW                      60                       ++: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
 Custom Options                                     +/-: Change Opt.
 Log OEM Codes             [Enabled]                F1: General Help
 Convert OEM Codes         [Disabled]               F2: Previous Values
                                                    F3: Optimized Defaults
 NOTE: All values changed here do not take          F4: Save & Exit
       effect until computer is restarted.          ESC: Exit


         Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

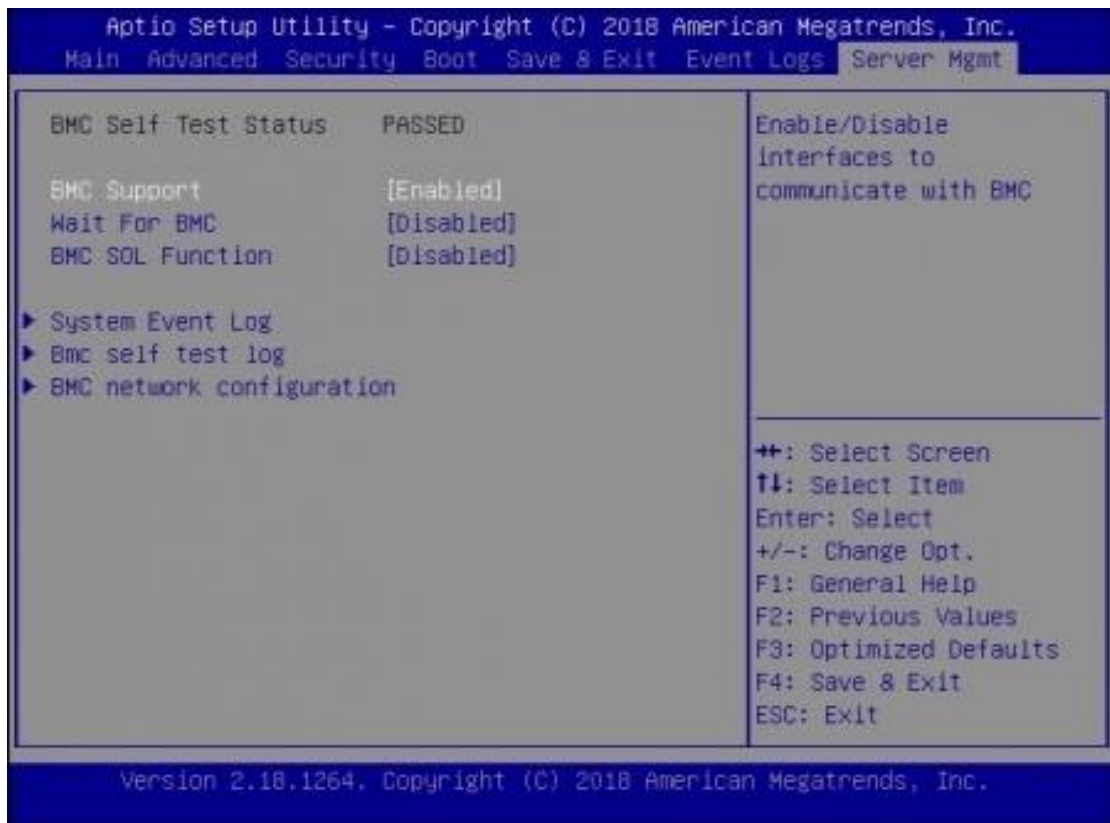| BIOS Setting	Description
SMBIOS Event Log	Change this to enable or disable all features of SMBIOS event logging during boot.
Erase Event Log	Choose options for erasing SMBIOS event log. Erasing is done prior to any logging activation during reset. Options: No, Yes next reset, Yes every reset
When Log is Full	Choose options for reactions to a full SMBIOS event log. Options: Do nothing, Erase immediately
Log System Boot Event	Enables / Disables logging of system boot event.
MECI	Mutiple event count increment: The number of occurrences of a duplicate event that must pass before the multiple-event counter of log entry is updated.
METW	Mutiple event time window: The number of minutes which must pass between duplicate log entries which utilize a multiple-event counter. The value ranges from 0 to 99 minutes.

BIOS Setting	Description
Log OEM Codes	Enables / Disables the logging of EFI status codes as OEM codes (if not already converted to legacy).
Convert OEM Codes	Enables / Disables the converting of EFI status codes to standard SMBIOS types (not all may be translated.).

3.8.2   View SMBIOS Event Log Settings

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3.9   Server Management

BIOS Setting	Description
BMC Support	Enables / Disables interfaces to communicate with BMC.
Wait For BMC	Wait For BMC reponse for specified time out.
BMC SOL Function	Enables / Disables BMC SOL function. **Enable:** will inactive and clear IRQ and IObase of UART1. **Disable:** keep original IRQ, IObase and active UART1
System Event Log	Allows you to configure the settings for system event log.
BMC self test log	Allows you to configure when to erase the log.
BMC Network Configuration	Configures BMC network parameters.

3.9.1 System Event Log
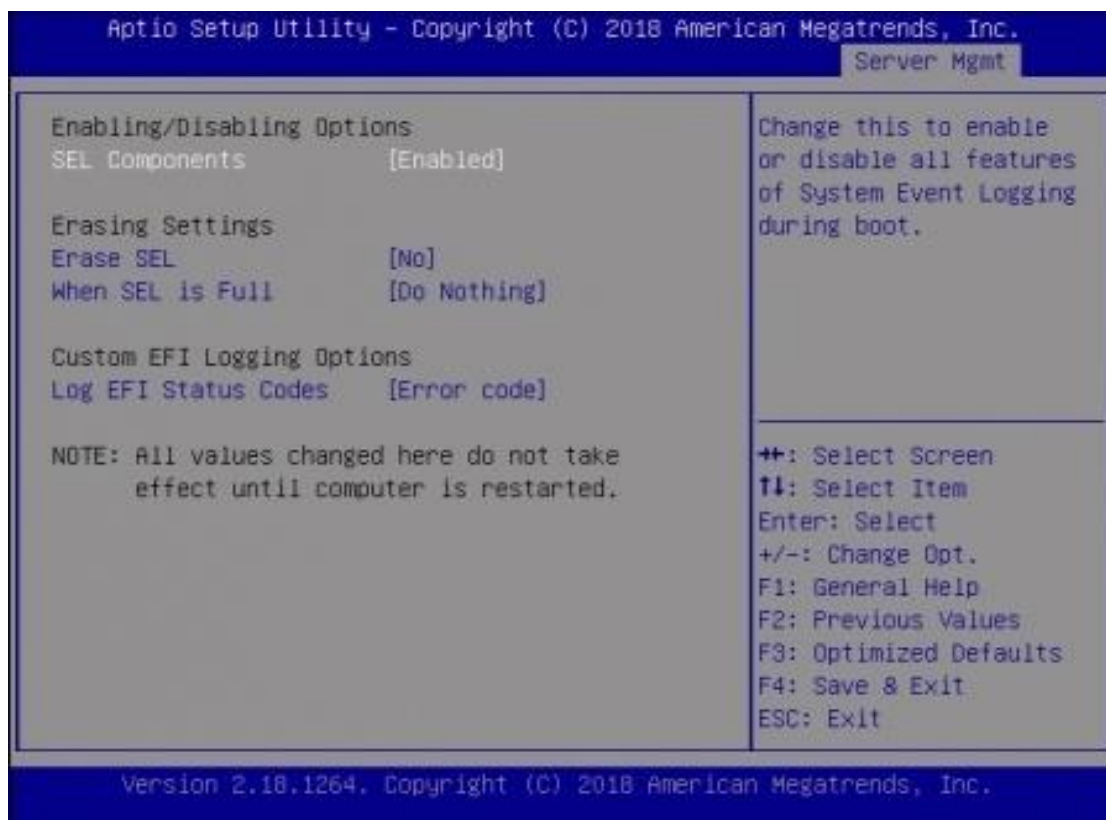
BIOS Setting	Description
SEL Components	Enables / Disables all features of system event logging during boot.
Erase SEL	Allows you to choose options for erasing SEL. Options: No, Yes on next reset, Yes on every reset
When SEL is Full	Allows you to choose options for reactions to a full SEL. Options: Do nothing, Erase immediately
Log EFI Status Codes	Disables the logging of EFI status codes or log only error code or only progress code or both. Options: Disabled, Both, Error code, Progress code

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3.9.2　BMC Network Configuration
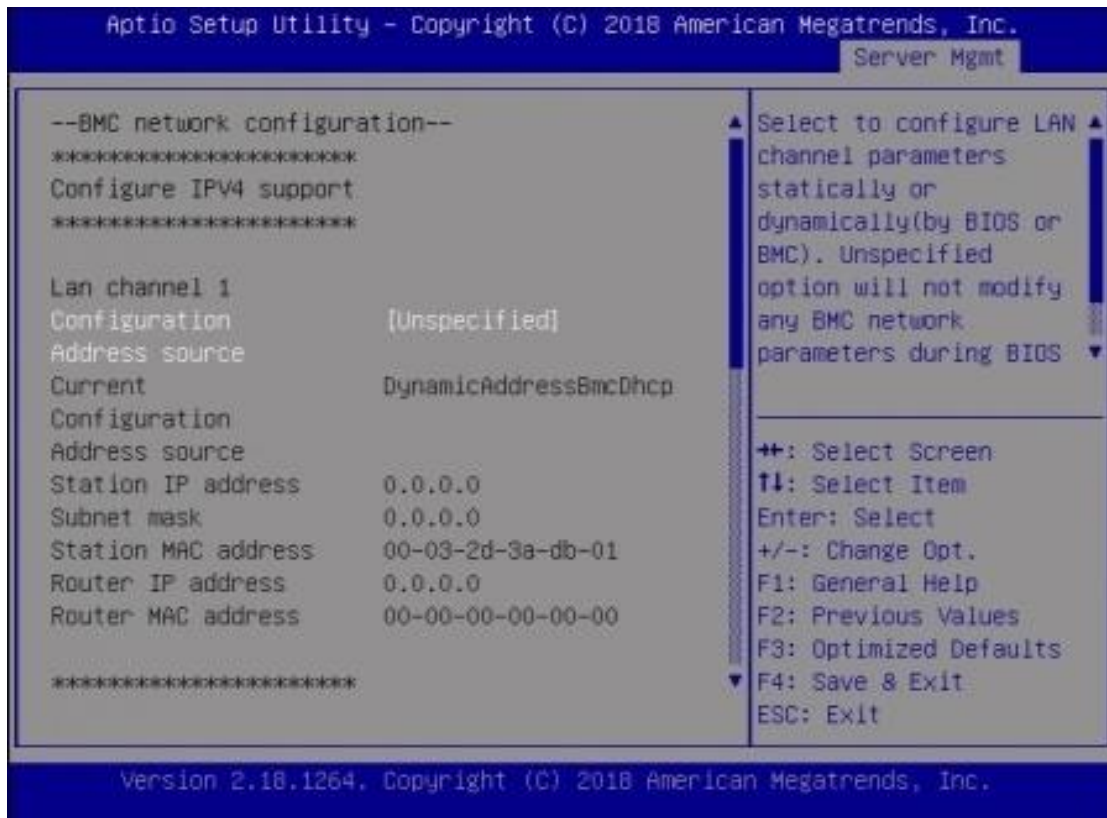
BIOS Setting	Description
Configureation Address Souce	Configures LAN channel parameters statically or dynamically (by BIOS or BMC).
	Options: Unspecified, Static, DynamicBmcDhcp, DynamicBmcNonDhcp

Appendix

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

- I/O Port Address Map
- Interrupt Request Lines (IRQ)
- Watchdog Timer Configuration

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A. I/O Port Address Map

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

Address	Device Description
0x00000A00-0x00000A0F	Motherboard resources
0x00000A10-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	Motherboard resources
0x00000070-0x00000071	System CMOS/real time clock
0x000003F8-0x000003FF	Communications Port (COM1)
0x000003F8-0x000003FF	PCI Express Root Complex
0x000002F8-0x000002FF	Communications Port (COM2)
0x000002F8-0x000002FF	PCI Express Root Complex
0x00000020-0x00000021	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x0000C000-0x0000C01F	Ethernet Controller
0x0000C000-0x0000C01F	PCI Express Root Port
0x00000000-0x000002E7	PCI Express Root Complex
0x00000000-0x000002E7	Direct memory access controller
0x00000300-0x000003AF	PCI Express Root Complex
0x000002E8-0x000002EF	PCI Express Root Complex
0x000003E8-0x000003EF	PCI Express Root Complex
0x00000400-0x00000CF7	PCI Express Root Complex
0x00000400-0x00000CF7	PCI Express Root Complex
0x000003B0-0x000003DF	PCI Express Root Complex
0x000003B0-0x000003DF	PCI Express to PCI/PCI-X Bridge
0x000003B0-0x000003DF	Microsoft Basic Display Adapter
0x000003B0-0x000003DF	PCI Express Root Port
0x0000B000-0x0000BFFF	PCI Express to PCI/PCI-X Bridge
0x0000B000-0x0000BFFF	Microsoft Basic Display Adapter
0x0000B000-0x0000BFFF	PCI Express Root Port
0x000003C0-0x000003DF	PCI Express to PCI/PCI-X Bridge

Address	Device Description
0x000003C0-0x000003DF	Microsoft Basic Display Adapter
0x000003C0-0x000003DF	PCI Express Root Port
0x00000CA2-0x00000CA2	Microsoft Generic IPMI Compliant Device
0x00000CA3-0x00000CA3	Microsoft Generic IPMI Compliant Device
0x00000040-0x00000043	System timer
0x00000010-0x0000001F	Motherboard resources
0x00000022-0x0000003F	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x0000006F	Motherboard resources
0x00000072-0x0000007F	Motherboard resources
0x00000080-0x00000080	Motherboard resources
0x00000084-0x00000086	Motherboard resources
0x00000088-0x00000088	Motherboard resources
0x0000008C-0x0000008E	Motherboard resources
0x00000090-0x0000009F	Motherboard resources
0x000000A2-0x000000BF	Motherboard resources
0x000000B1-0x000000B1	Motherboard resources
0x000000E0-0x000000EF	Motherboard resources
0x000004D0-0x000004D1	Motherboard resources
0x0000040B-0x0000040B	Motherboard resources
0x000004D6-0x000004D6	Motherboard resources
0x00000C00-0x00000C01	Motherboard resources
0x00000C14-0x00000C14	Motherboard resources
0x00000C50-0x00000C51	Motherboard resources
0x00000C52-0x00000C52	Motherboard resources
0x00000C6C-0x00000C6C	Motherboard resources
0x00000C6F-0x00000C6F	Motherboard resources
0x00000CD0-0x00000CD1	Motherboard resources
0x00000CD2-0x00000CD3	Motherboard resources
0x00000CD4-0x00000CD5	Motherboard resources
0x00000CD6-0x00000CD7	Motherboard resources

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Address	Device Description
0x00000CD8-0x00000CDF	Motherboard resources
0x00000800-0x0000089F	Motherboard resources
0x00000B00-0x00000B0F	Motherboard resources
0x00000B20-0x00000B3F	Motherboard resources
0x00000900-0x0000090F	Motherboard resources
0x00000910-0x0000091F	Motherboard resources
0x0000FE00-0x0000FEFE	Motherboard resources
0x00000061-0x00000061	System speaker
0x00000081-0x00000083	Direct memory access controller
0x00000087-0x00000087	Direct memory access controller
0x00000089-0x0000008B	Direct memory access controller
0x0000008F-0x0000008F	Direct memory access controller
0x000000C0-0x000000DF	Direct memory access controller

B. Interrupt Request Lines (IRQ)

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

Level	Function
IRQ 4294967286	Standard SATA AHCI Controller
IRQ 7	AMD GPIO Controller
IRQ 4294967291	PCI Express Root Port
IRQ 4294967292	PCI Express Root Port
IRQ 4	Communications Port (COM1)
IRQ 3	Communications Port (COM2)
IRQ 11	Ethernet Controller
IRQ 54 ~ IRQ 204	Microsoft ACPI-Compliant System
IRQ 256 ~ IRQ 511	Microsoft ACPI-Compliant System
IRQ 0	System timer
IRQ 4294967294	PCI Express Root Port
IRQ 4294967293	PCI Express Root Port
IRQ 4294967290	PCI Express Root Port
IRQ 4294967289	PCI Express Root Port
IRQ 4294967288	PCI Express Root Port
IRQ 4294967287	PCI Express Root Port
IRQ 5	PCI Encryption/Decryption Controller
IRQ 4294967285	AMD PSP 3.0 Device
IRQ 4294967284	AMD PSP 3.0 Device
IRQ 43	High Definition Audio Controller
IRQ 4294967283	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967282	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967281	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967280	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967279	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967278	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967277	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967276	AMD USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)

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C. Watchdog Timer Configuration

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

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

1. Sample Code: The file NCT5523D.H

```
//------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
PARTICULAR
// PURPOSE.
//
//------------------------------------------------------------------------
#ifndef __NCT5523D_H
#define __NCT5523D_H                    1
//------------------------------------------------------------------------
#define    NCT5523D_INDEX_PORT      (NCT5523D_BASE)
#define    NCT5523D_DATA_PORT       (NCT5523D_BASE+1)
//------------------------------------------------------------------------
#define    NCT5523D_REG_LD          0x07
//------------------------------------------------------------------------
#define NCT5523D_UNLOCK             0x87
#define    NCT5523D_LOCK            0xAA
//------------------------------------------------------------------------
unsigned int Init_NCT5523D(void);
void Set_NCT5523D_LD( unsigned char);
void Set_NCT5523D_Reg( unsigned char, unsigned char);
unsigned char Get_NCT5523D_Reg( unsigned char);
//------------------------------------------------------------------------
#endif      //__NCT5523D_H
```

2. **Sample Code: The file MAIN.CPP**

```cpp
//--------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
PARTICULAR
// PURPOSE.
//
//--------------------------------------------------------------------------
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "NCT5523D.H"
//--------------------------------------------------------------------------
int main (void);

void WDTInitial(void);
void WDTEnable(unsigned char);
void WDTDisable(void);

//--------------------------------------------------------------------------
int main (void)
{
      char SIO;

      SIO = Init_NCT5523D();
      if (SIO == 0)
      {
            printf("Can not detect Nuvoton NCT5523D, program abort.\n");
            return(1);
      }

      WDTInitial();

      WDTEnable(10);

      WDTDisable();

      return 0;
}
//--------------------------------------------------------------------------
void WDTInitial(void)
{
      unsigned char bBuf;
      Set_NCT5523D_LD(0x08);                          //switch to logic device 8
      bBuf = Get_NCT5523D_Reg(0x30);
      bBuf &= (~0x01);
      Set_NCT5523D_Reg(0x30, bBuf);                   //Enable WDTO
}
//--------------------------------------------------------------------------
```

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```
void WDTEnable(unsigned char NewInterval)
{
    unsigned char bBuf;

    Set_NCT5523D_LD(0x08);                          //switch to logic device 8
    Set_NCT5523D_Reg(0x30, 0x01);                   //enable timer

    bBuf = Get_NCT5523D_Reg(0xF0);
    bBuf &= (~0x08);
    Set_NCT5523D_Reg(0xF0, bBuf);                   //count mode is second

    Set_NCT5523D_Reg(0xF1, NewInterval);     //set timer
}
//------------------------------------------------------------------------
void WDTDisable(void)
{
    Set_NCT5523D_LD(0x08);                          //switch to logic device 8
    Set_NCT5523D_Reg(0xF1, 0x00);                   //clear watchdog timer
    Set_NCT5523D_Reg(0x30, 0x00);                   //watchdog disabled
}
//------------------------------------------------------------------------
```

3. **Sample Code: The file NCT5523D.CPP**

```cpp
//-------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
PARTICULAR
// PURPOSE.
//
//-------------------------------------------------------------------------
#include "NCT5523D.H"
#include <dos.h>
//-------------------------------------------------------------------------
unsigned int NCT5523D_BASE;
void Unlock_NCT5523D (void);
void Lock_NCT5523D (void);
//-------------------------------------------------------------------------
unsigned int Init_NCT5523D(void)
{
      unsigned int result;
      unsigned char ucDid;

      NCT5523D_BASE = 0x4E;
      result = NCT5523D_BASE;

      ucDid = Get_NCT5523D_Reg(0x20);
      if (ucDid == 0xC4)                          //NCT5523D??
      {      goto Init_Finish; }

      NCT5523D_BASE = 0x2E;
      result = NCT5523D_BASE;

      ucDid = Get_NCT5523D_Reg(0x20);
      if (ucDid == 0xC4)                          //NCT5523D??
      {      goto Init_Finish; }

      NCT5523D_BASE = 0x00;
      result = NCT5523D_BASE;

Init_Finish:
      return (result);
}
//-------------------------------------------------------------------------
void Unlock_NCT5523D (void)
{
      outportb(NCT5523D_INDEX_PORT, NCT5523D_UNLOCK);
      outportb(NCT5523D_INDEX_PORT, NCT5523D_UNLOCK);
}
//-------------------------------------------------------------------------
```

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```c
void Lock_NCT5523D (void)
{
    outportb(NCT5523D_INDEX_PORT, NCT5523D_LOCK);
}
//-------------------------------------------------------------------------
void Set_NCT5523D_LD( unsigned char LD)
{
    Unlock_NCT5523D();
    outportb(NCT5523D_INDEX_PORT, NCT5523D_REG_LD);
    outportb(NCT5523D_DATA_PORT, LD);
    Lock_NCT5523D();
}
//-------------------------------------------------------------------------
void Set_NCT5523D_Reg( unsigned char REG, unsigned char DATA)
{
    Unlock_NCT5523D();
    outportb(NCT5523D_INDEX_PORT, REG);
    outportb(NCT5523D_DATA_PORT, DATA);
    Lock_NCT5523D();
}
//-------------------------------------------------------------------------
unsigned char Get_NCT5523D_Reg(unsigned char REG)
{
    unsigned char Result;
    Unlock_NCT5523D();
    outportb(NCT5523D_INDEX_PORT, REG);
    Result = inportb(NCT5523D_DATA_PORT);
    Lock_NCT5523D();
    return Result;
}
//-------------------------------------------------------------------------
```