

**FWA8408
FWA8406**
**1U Rackmount
Network Appliance**

User's Manual

Version 1.1
(June 2018)



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Compliance

CE

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.

FCC

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

WEEE



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

Green IBASE



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

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

Important Safety Information

Carefully read the precautions before using the 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

You are not suggested to 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

1.1 Introduction

FWA8408 & FWA8406 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.

FWA8408 & FWA8406 include the following models:

- **FWA8408** (with a single PSU)
- **FWA8408-RPSU** (with 1+1 redundant PSU)
- **FWA8406** (with a single PSU)
- **FWA8406-RPSU** (with 1+1 redundant PSU)



Photo of FWA8408



Photo of FWA8406

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

- 1U rackmount platform designed with Intel® Xeon® 6th Gen. Core™ i7/i5/i3 processor
- DDR4 DIMM 2133 MHz (ECC supported per CPU SKUs)
- GbE LAN ports with 2 advanced LAN Bypass pairs
- Optional IPMI 2.0 module to output through VGA port for FWA8408
- CF slot and PCIe (x8) expansion slot(s)
- 250W single power supply or 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:

- | | |
|----------------------|-----|
| • FWA8408 / FWA8406 | x 1 |
| • Power Cord | x 1 |
| • CPU Heatsink | x 1 |
| • Rack Mount Bracket | x 2 |

Models with 1+1 redundant PSU:

- | | |
|-------------------------------|-----|
| • FWA8408-RPSU / FWA8406-RPSU | x 1 |
| • Power Cord | x 2 |
| • CPU Heatsink | x 1 |
| • Rack Mount Bracket | x 2 |

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)
- VGA Cable (40 cm, VGA21A)

1.5 Specifications

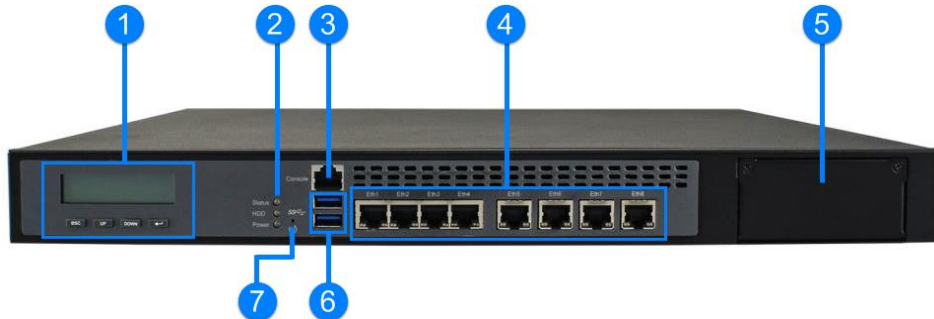
Product Name	FWA8408	FWA8406
System		
Motherboard	MBN800-8L	MBN800-6L
Operating System	<ul style="list-style-type: none"> Windows 10 (64-bit) Linux Ubuntu 16.04.3 	
CPU	Intel® Xeon® / 6 th Gen. Core™ i7/i5/i3 processor LGA1151	Intel® 6 th Gen. Core™ i7/i5/i3 processor LGA1151
Chipset	Intel® C236 PCH	Intel® H110 PCH
Memory	4 x DDR4 DIMM 2133 MHz, expandable to 64 GB * ECC supported per CPU SKUs	2 x DDR4 DIMM 2133 MHz, expandable to 32 GB (non-ECC)
Storage	<ul style="list-style-type: none"> 2 x 2.5" / 3.5" HDD or SSD drive bay On-board CF slot 	
Network	8 x Intel® I210AT GbE	6 x Intel® I211AT GbE
Bypass	2 x segments (LAN1 / LAN2 & LAN3 / LAN4)	
NIC Slot	1 x IBN card series	N/A
Super I/O	Nuvoton NCT5523D	
IPMI	IPMI module compliant with IPMI 2.0 (Optional)	N/A
Power Supply	<ul style="list-style-type: none"> Full range 250W ATX power supply For RPSU type: Full range 300W 1+1 redundant power supply 	
Power Requirement	100 ~ 240V AC	
BIOS	AMI BIOS	
TPM	1.2	
Watchdog	Watchdog Timer 256 segments, 0, 1, 2...255 sec/min	
Chassis	Steel with textured black color paint	
Dimensions (W x H x D)	438 x 44 x 422 mm (17.24" x 1.73" x 16.61")	
Weight	9 kg (19.84 lb)	
Certificate	CE / FCC Class A / LVD	

Product Name	FWA8408		FWA8406
Front I/O Ports			
Console	1 x Console port		
Traffic LAN Port	8 x RJ45 GbE LAN ports	6 x RJ45 GbE LAN ports	
USB	2 x USB 3.0		
Rear I/O Ports			
AC Power Inlet	<ul style="list-style-type: none">1 x AC inlet 100 ~ 240V, full range 250W, single power supply (for FWA8408 & FWA8406)2 x AC inlet 100 ~ 240V, full range 300W, 1+1 redundant power supply (for FWA8408-RPSU & FWA8406-RPSU)		
CF	1 x CF slot		
Display	1 x VGA port (Reserved and optional)		
Fan	3 x system fan module		
Expansion	<ul style="list-style-type: none">1 or 2 x PCIe (x8) slot1 x mini-PCIe slot with PCIe, USB & SATA1 x M.2 M2280	1 x PCIe (x8) slot	
Environment			
Temperature	<ul style="list-style-type: none">Operating: 0 ~ 40 °C (32 ~ 104 °F)Storage: -20~ 70 °C (-4 ~ 158 °F)		
Relative Humidity	5 ~ 90%		
Vibration Protection	<ul style="list-style-type: none">Operating: 0.25 Grms / 3 ~ 500 Hz (Z-axis)Non-operating: 1.0 Grms / 3 ~ 500Hz (Z-axis)		
Shock Protection	Sawtooth wave 40G		

All specifications are subject to change without prior notice.

1.6 Overview

Front View



No.	Name	No.	Name
1	LCM Display with 4 buttons	5	Reserved Area (FWA8408 : for IBN module or HDD FWA8406 : for HDD)
2	LED Indicators (from top to bottom: Status, HDD, Power)	6	USB 3.0 Ports
3	Console Port	7	Factory Default Button (GPIO Signal)
4	GbE LAN Ports		

Oblique View

- **FWA8408 / FWA8408-RPSU**

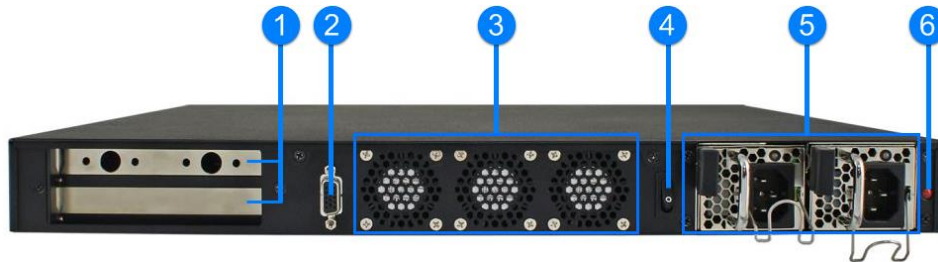


- **FWA8406 / FWA8406-RPSU**



Rear View

- Models with redundant PSUs (FWA8408-RPSU / FWA8406-RPSU)



- Models with a single PSU (FWA8408 / FWA8406)



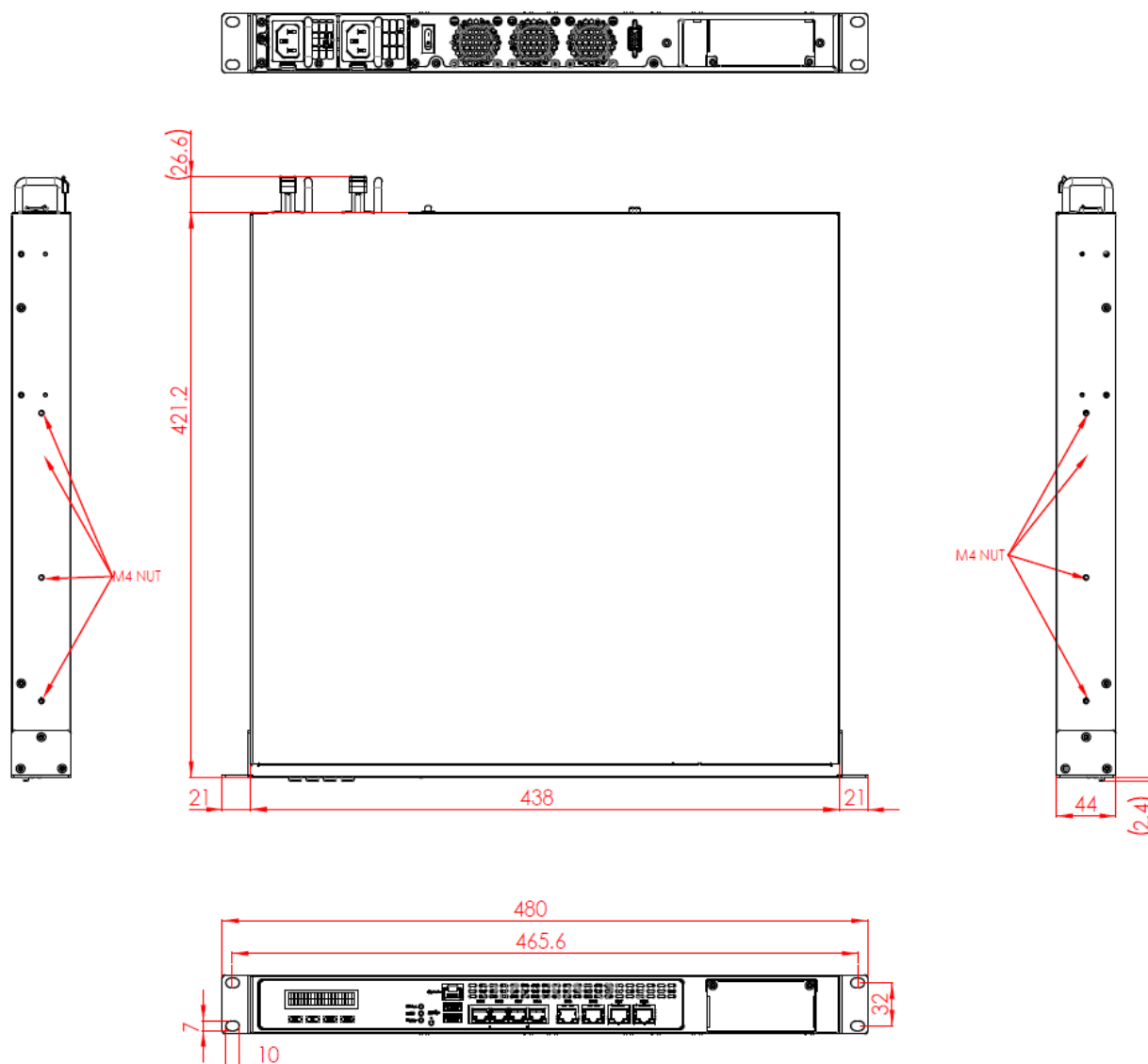
No.	Name	No.	Name
1	Expansion Slots	4	Power Switch
2	VGA Port (Reserved & optional)	5	Single PSU / Reduntant PSU
3	System Fans	6	Alarm Beep Switch*

* The alarm beep switch allows you to turn on or off the alarm beep sound that goes off as one of the redundant power supplies is out of work.

1.7 Dimensions

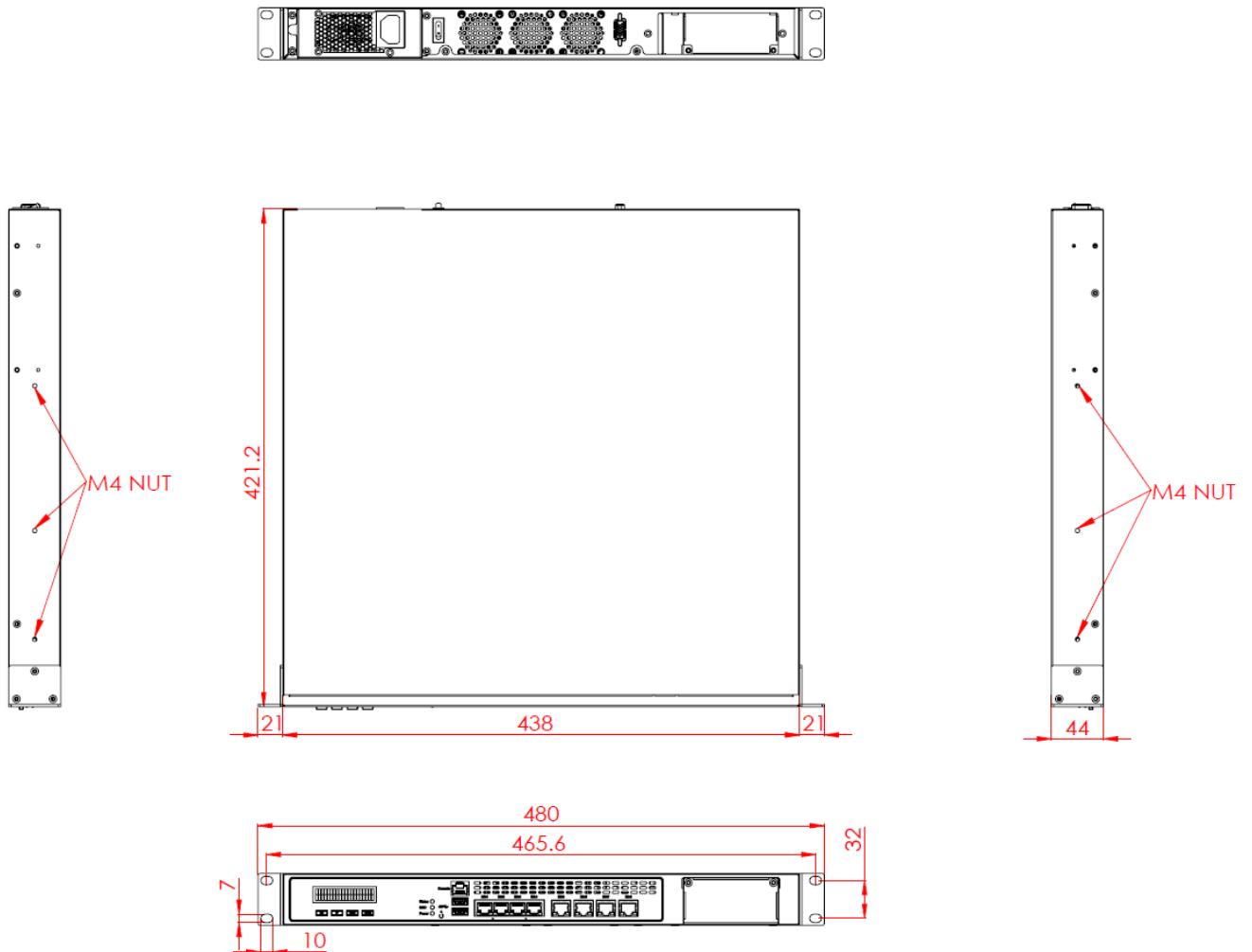
Unit: mm

- FWA8408-RPSU

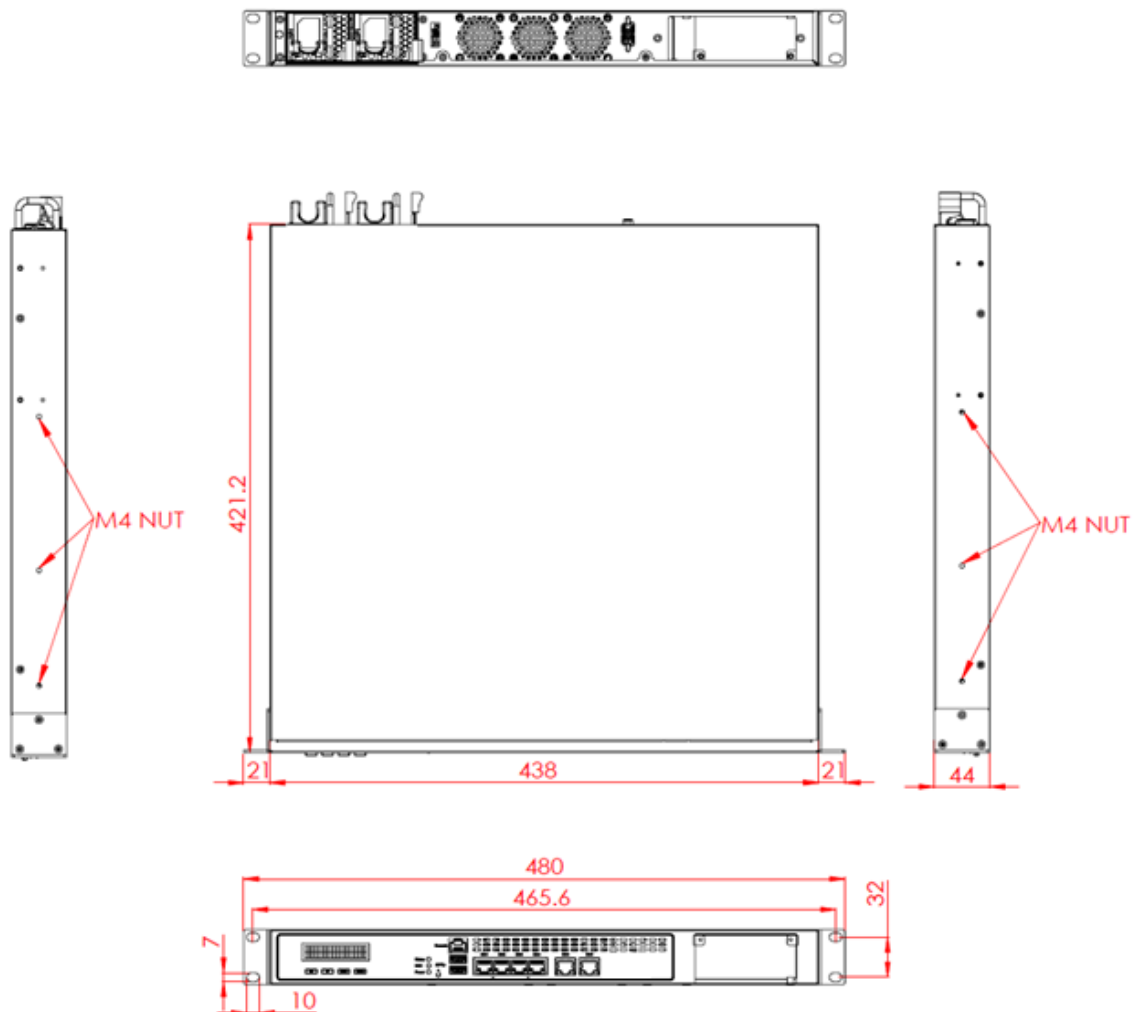


Unit: mm

- FWA8408

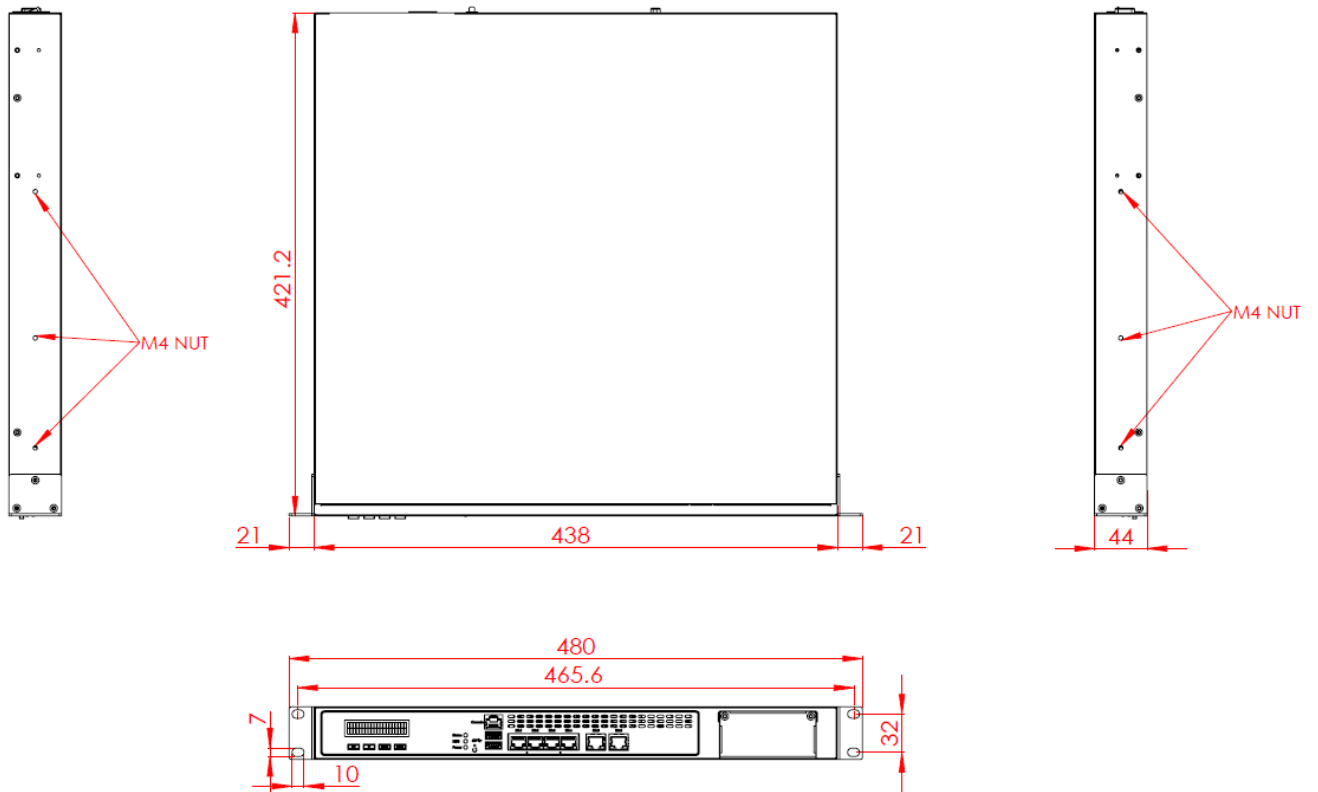
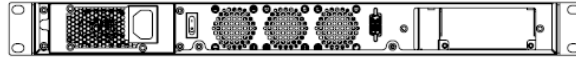


- FWA8406-RPSU



Unit: mm

- FWA8406



Chapter 2

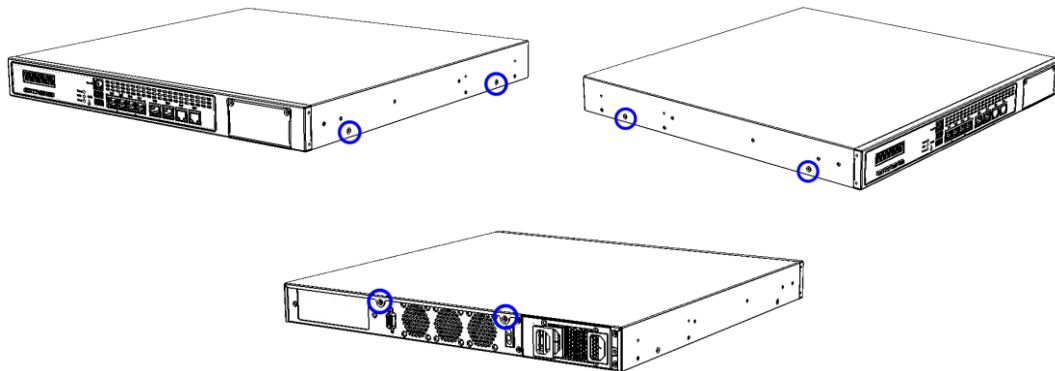
Hardware Configuration

The information provided in this chapter includes:

- Essential installations before you begin
- Information and locations of connectors

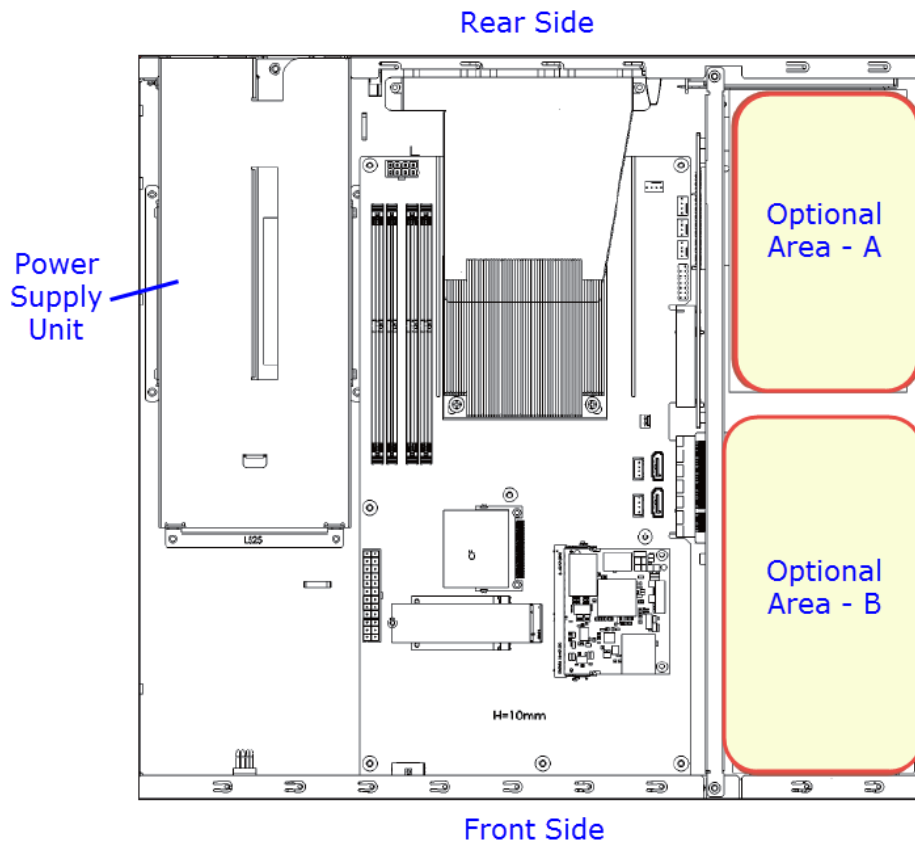
2.1 Essential Installations Before You Begin

For installation or replacement of CPU, memory modules, HDD/SSD, CF card, IPMI card & mini-PCle card (IPMI & mini-PCle slots are both available for FWA8408 only), fans, you need to disassemble the device cover first by loosening 6 screws. This is illustrated by the example of FWA8408 as below.



Configuration inside FWA8408 & FWA8406:

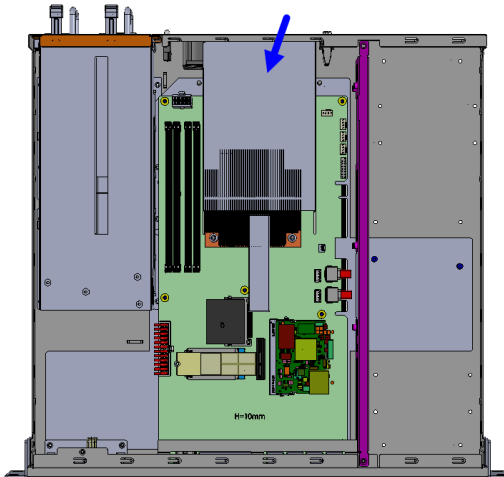
Areas A and B allow for optional HDD/SSD and expansion cards installation.



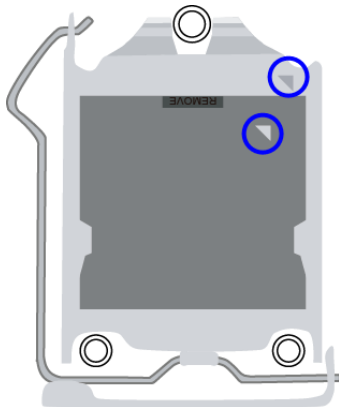
2.1.1 CPU Installation / Replacement

Follow the instructions below to install or replace the CPU if necessary.

1. Take away the wind scooper as marked below. Then remove the CPU heatsink.



2. Unlock the CPU socket by pressing the lever sideways, then lift up the lever and the metal lid.
3. Position the CPU above the socket such that the CPU corner aligns with the gold triangle matching the socket corner with a small triangle.



4. Carefully insert the CPU into the socket and push down the lever to secure the CPU.

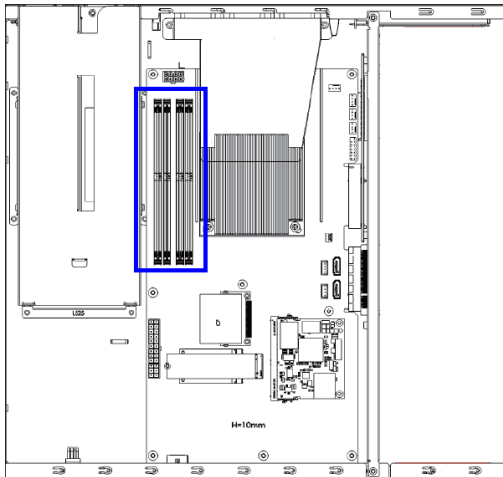
Then you can install the CPU cooler and fan back.

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

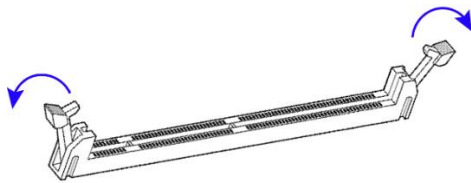
2.1.2 Memory Installation / Replacement

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

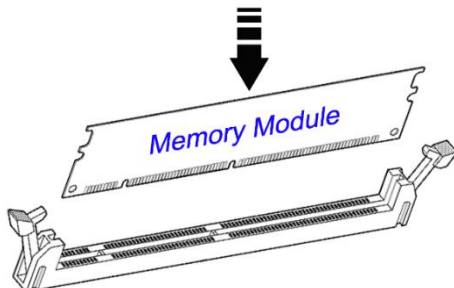
1. Locate the memory slots in the device.



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



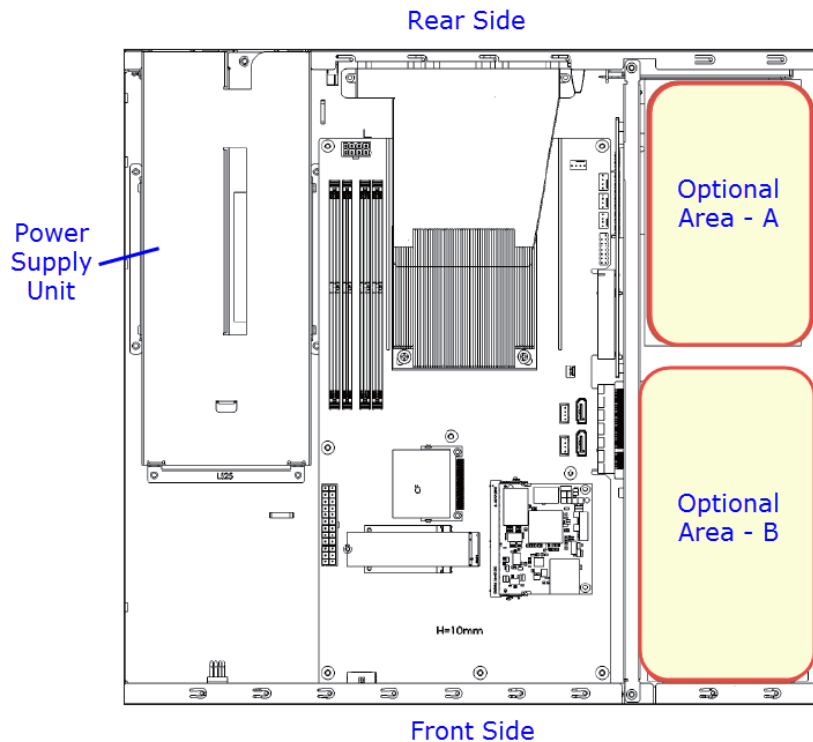
3. Hold the memory module and align the key of the module with that on the memory slot.
4. Gently push the module in an upright position until the ejector tabs of the memory slot close to hold the module in place when the module touches the bottom of the slot.



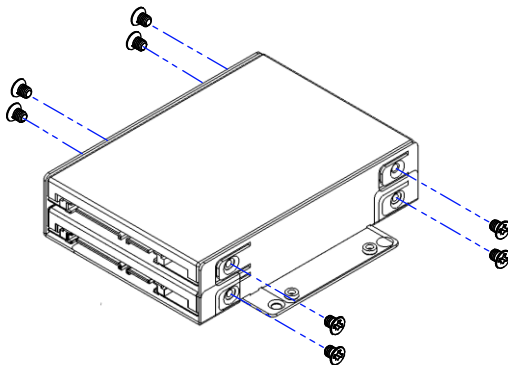
To remove the module, press the ejector tabs outwards with your fingertips to eject the module.

2.1.3 HDD Installation / Replacement

After you disassemble the device cover, you can see the optional areas A and B as shown below allow for optional HDD/SSD and expansion cards installation. If you need to install or replace an HDD/SDD, follow the instructions below for installation.

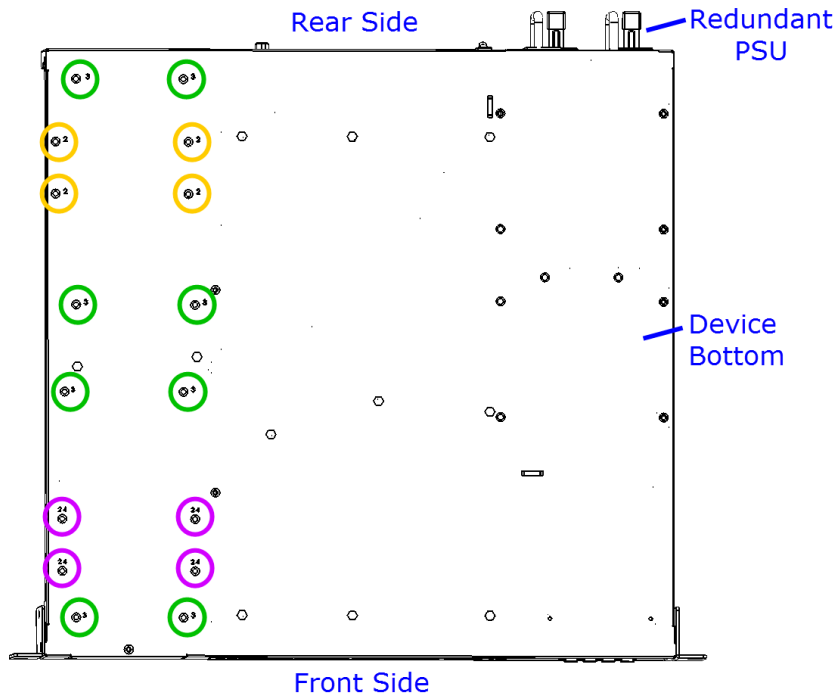


1. Remove 4 screws for each HDD/SSD (8 screws for two HDD/SSD) and take out from the tray.



2. Install a new HDD/SDD onto the tray and fasten 4 screws for each HDD/SDD.

- Secure the tray with HDD from the bottom of the device. Note the screw holes for different sizes of HDD/SSD as illustrated below.

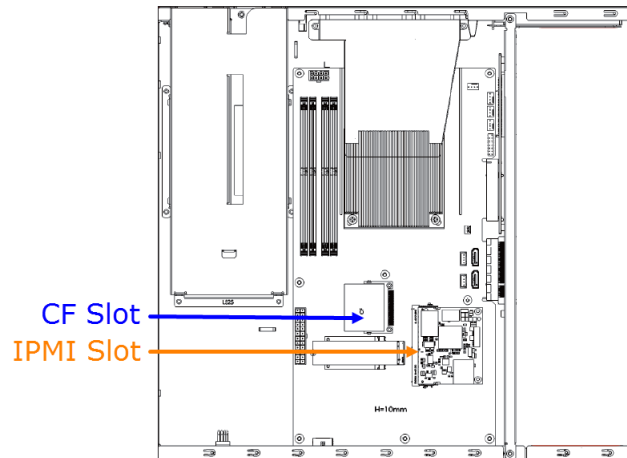


- For 3.5" HDD/SSD
- For 2.5" HDD/SSD
- For 2.5" HDD/SSD & IBN rail bracket

2.1.4 CF Card & IPMI Module Installation / Replacement

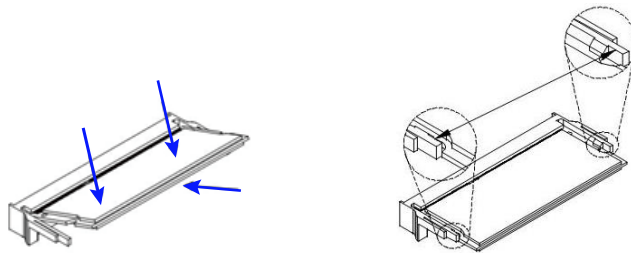
If you need to install a CF card or an IPMI module, remove the device cover firstly and then follow the instructions below.

Note: IPMI module is optional for purchase.



IPMI module:

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.

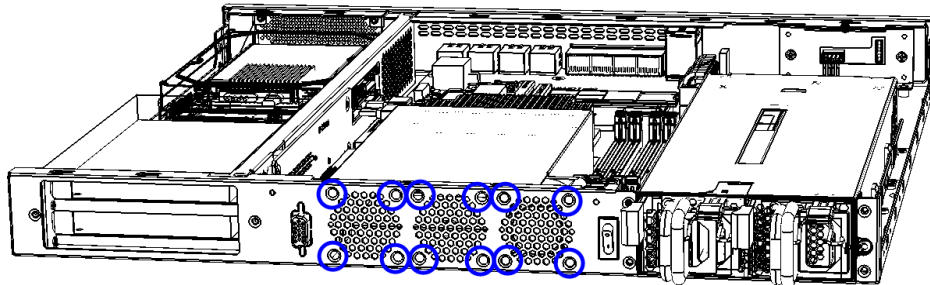
CF card:

Locate the CF slot and Insert the CF card to the slot.

To remove the CF card or IPMI module, pull it out with your thumb and index finger directly.

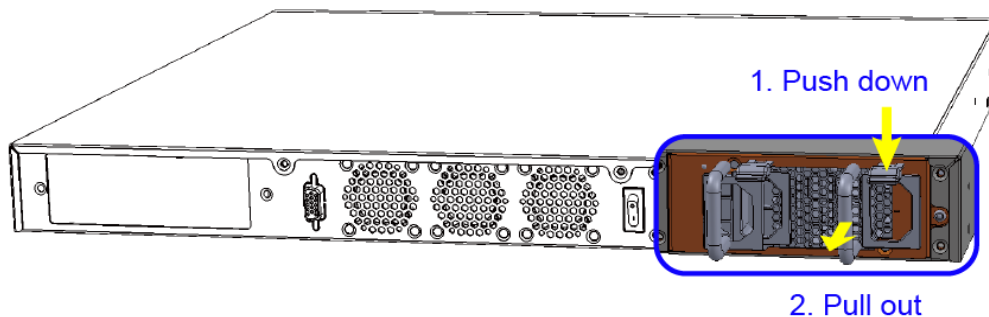
2.1.5 Fan Module Installation / Replacement

If you need to install or replace a fan module, after disassembling 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

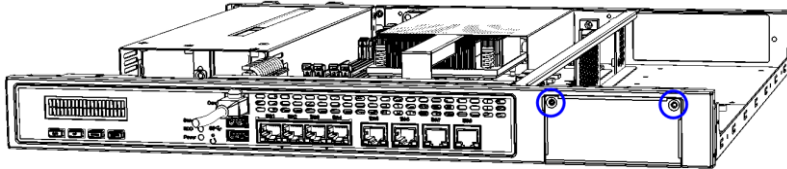
If you need to install or replace a redundant power supply unit, push the latch downwards, grasp the handle, pull the PSU out carefully and replace with a new one.



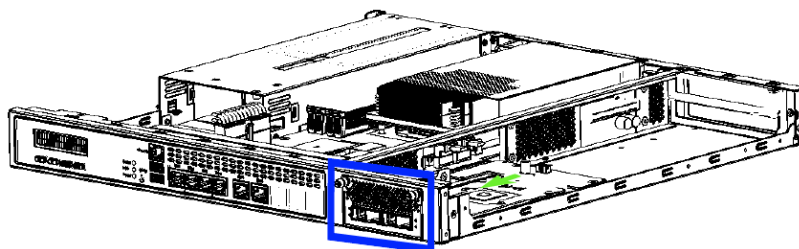
2.1.7 IBN Module Installation / Replacement

IBN module is optional for FWA8408 only. To install or replace an IBN module, follow the steps below.

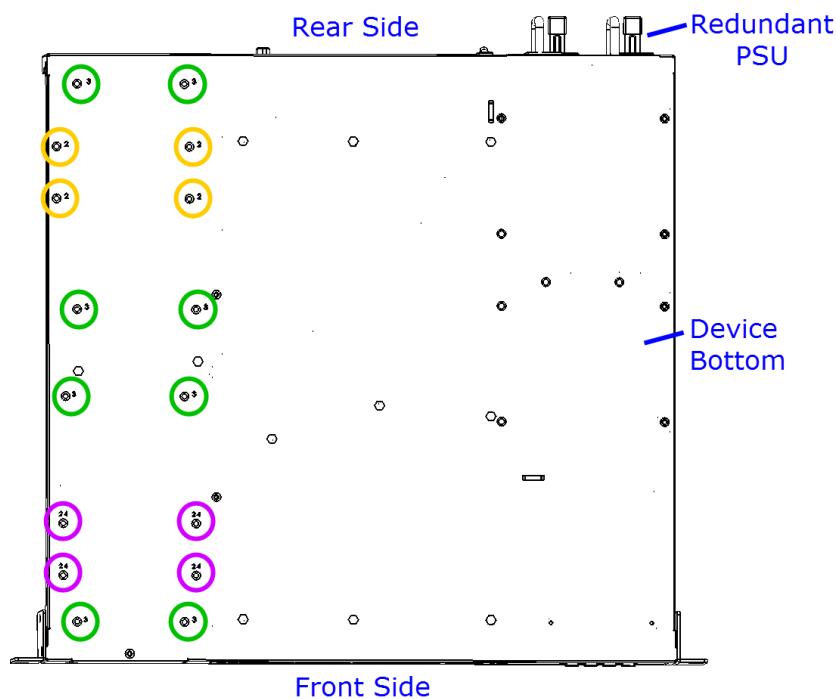
1. Remove the IBN door by releasing two screws as below.



2. Install the module into the device.



3. Note the screw holes for IBN rail bracket as illustrated below.



- For 3.5" HDD/SSD
- For 2.5" HDD/SSD
- For 2.5" HDD/SSD & IBN rail bracket

2.2 Pinout for Console Port



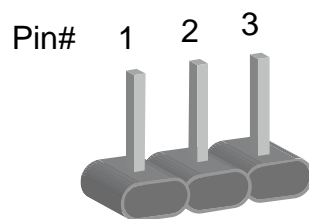
Pin	Signal Name	Pin	Signal Name
1	RTS	5	Ground
2	DTR	6	RXD
3	TXD	7	DSR
4	Ground	8	CTS

2.3 Setting the Jumpers

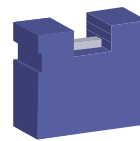
Set up and configure your FWA8408 & FWA8406 by using jumpers for various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your use.

2.3.1 How to Set Jumpers

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

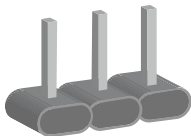
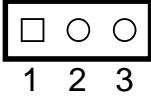
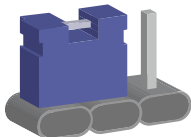
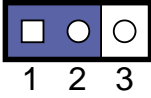
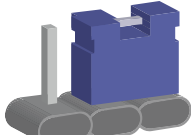
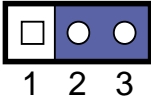


A 3-pin jumper



A jumper cap

Refer to the illustration below to set jumpers.

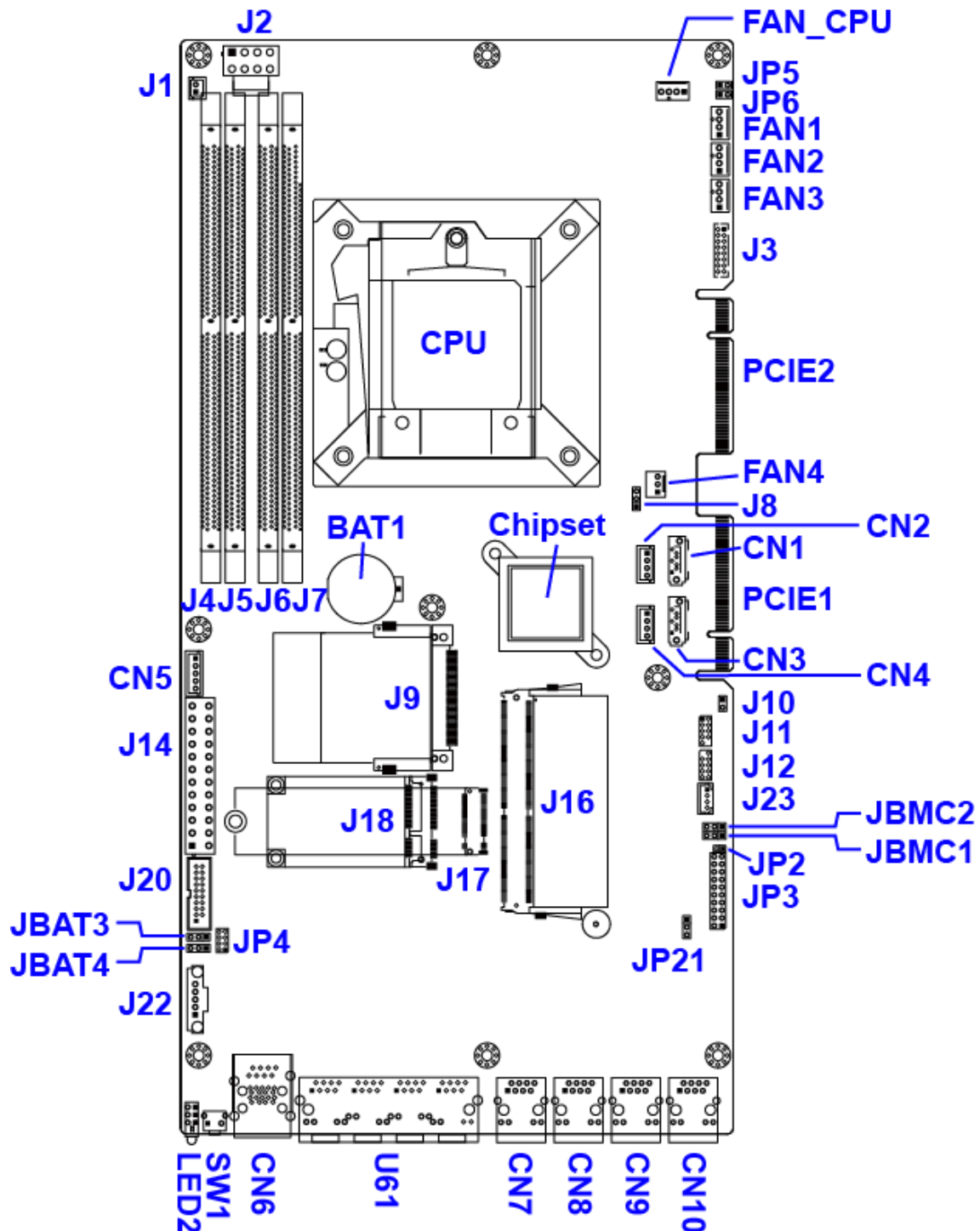
Pin closed	Oblique view	Schematic illustration in the manual
Open		
1-2		
2-3		

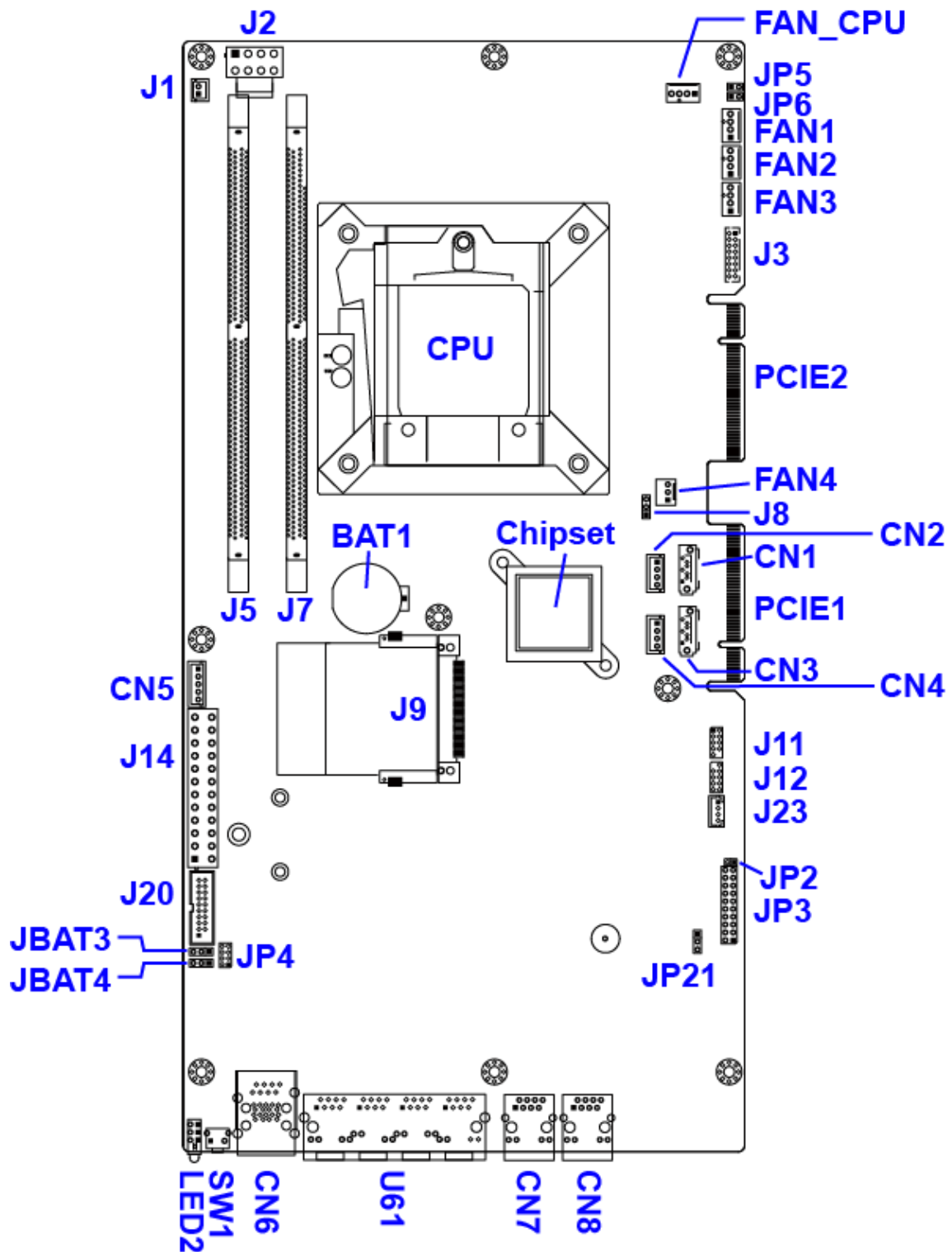
When two pins of a jumper are encased in a jumper cap, this jumper is **closed**, i.e. turned **On**.

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

2.4 Jumper & Connector Locations on Motherboard

Motherboard: MBN800-8L

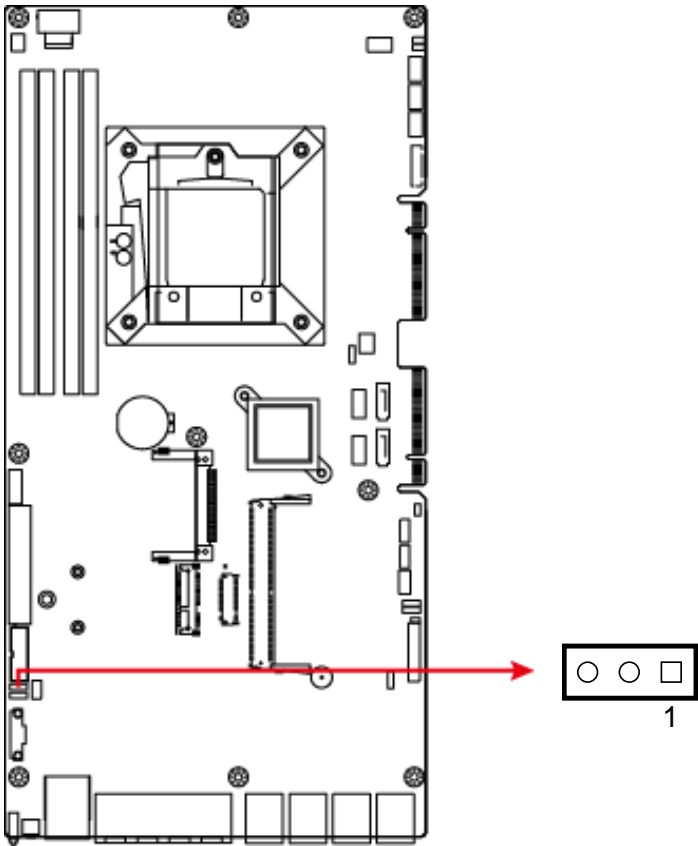






2.5 Jumpers Quick Reference

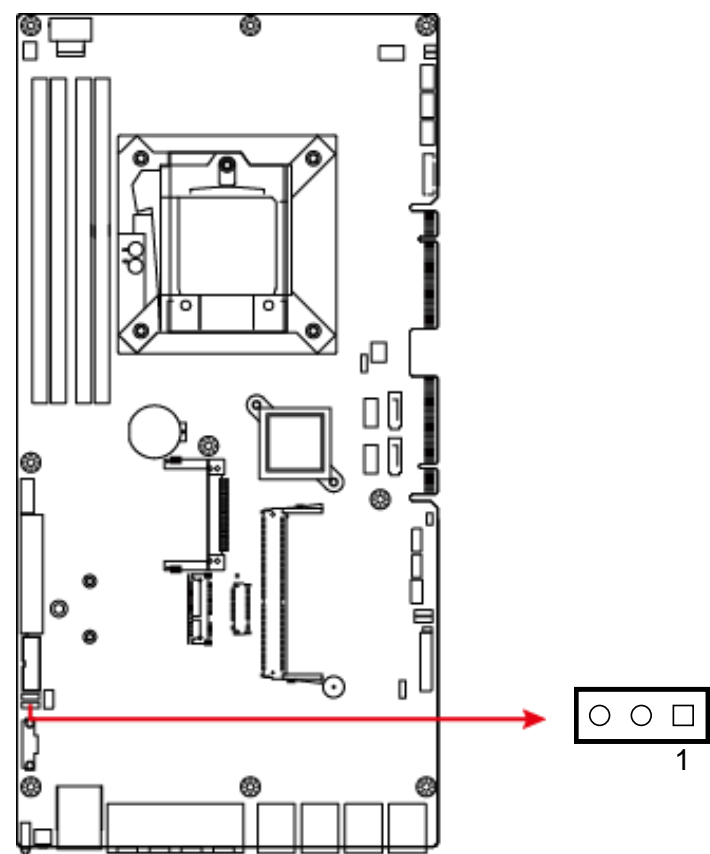
Function	Connector Name	Page
ME Register Clearance	JBAT3	25
CMOS Data Clearance	JBAT4	26


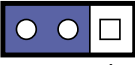
2.5.1 ME Register Clearance (JBAT3)



Function	Pin closed	Illustration
Normal (default)	1-2	 <div>1</div>
Clear ME Register	2-3	 <div>1</div>

2.5.2 CMOS Data Clearance (JBAT4)



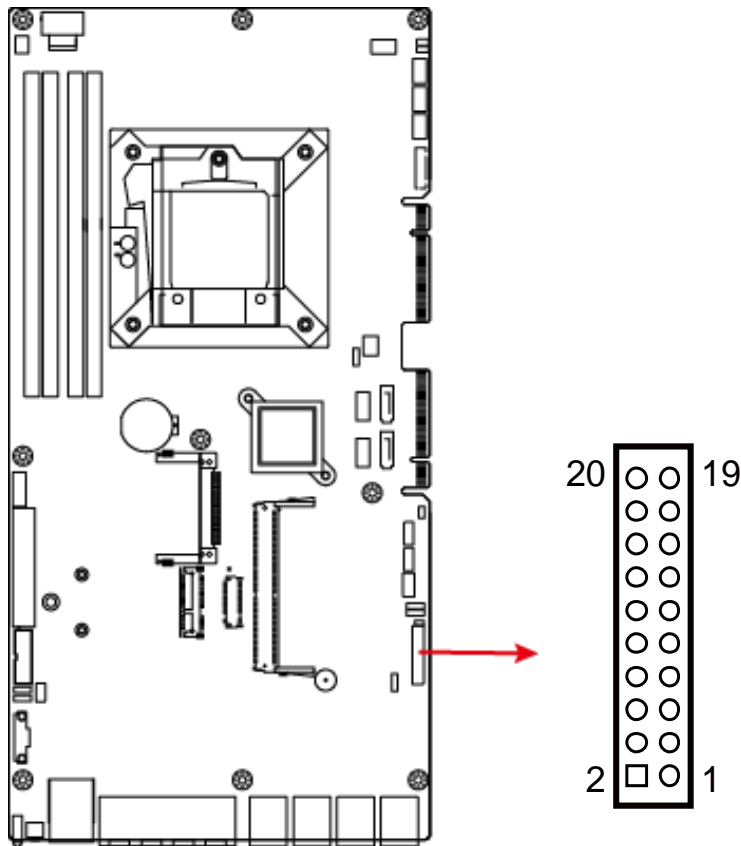
Function	Pin closed	Illustration
Normal (default)	1-2	
Clear CMOS	2-3	

2.6 Connectors Quick Reference

Function	Connector Name	Page
System Function Connector	JP3	27
Digital I/O Port	JP4	30
External SATA Power	CN2, CN4	--
LCM Port	CN5	--
Fan Connector	FAN_CPU, FAN1, FAN2, FAN3, FAN4	--
System Power Switch	J1	--
ATX Power Connector	J2, J14	--
External VGA Port	J3	--
IPMI Connector*	J16	--
M.2 M2280 Slot*	J17	--
Mini-PCIe Slot*	J18	--
USB 3.0 Port	J20	--
DDR4 Slot	FWA8408: J4, J5, J6, J7 FWA8406: J5, J7	--
LAN Port	FWA8408: U61 (quadruple), CN7, CN8, CN9, CN10 (single) FWA8406: U61 (quadruple), CN7, CN8 (single)	--
CF Card Slot	J9	--
SATA 3.0 Port	CN1, CN3	--
Console Port & USB 3.0 Ports	CN6	--
PCIe Gold Finger	FWA8408: PCIE1 (with x8 / x4 / x4 signals) PCIE2 (with x8 signals) FWA8406: PCIE2 (with x8 signals)	--
Factory Use Only	J11, J12, J23	--

* Available only for **FWA8408**

2.6.1 System Function Connector (JP3)



Pin	Assignment	Pin	Assignment
1	VCC5	2	SPEAKER
3	NC	4	NC
5	GND	6	GND
7	NC	8	VCC5
9	5VDUAL	10	BYPASS8_LED-
11	5VDUAL	12	BYPASS9_LED-
13	GND	14	ATXPWR_BTN#
15	NC	16	NC
17	GND	18	FRST_OUT
19	VCC3_3	20	-HDD_LED

JP3 is utilized for system indicators to provide light indication of the computer activities and switches to change the computer status. It provides interfaces for the following functions.

- **ATX Power ON Switch (Pins 13 and 14)**

The 2 pins make an “ATX Power Supply On/Off Switch” for the system that connects to the power switch on the case. When pressed, the power switch will force the system to power on. When pressed again, it will power off the system.

- **Hard Disk Drive LED Connector (Pins 19 and 20)**

This connector connects to the hard drive activity LED on control panel. This LED will flash when the HDD is being accessed.

- **Reset Switch (Pins 17 and 18)**

The reset switch allows you to reset the system without turning the main power switch off and then on again. Orientation is not required when making a connection to this header.

- **Power LED (Pins 1, 3 and 5)**

This connector connects to the system power LED on control panel. This LED will light when the system turns on.

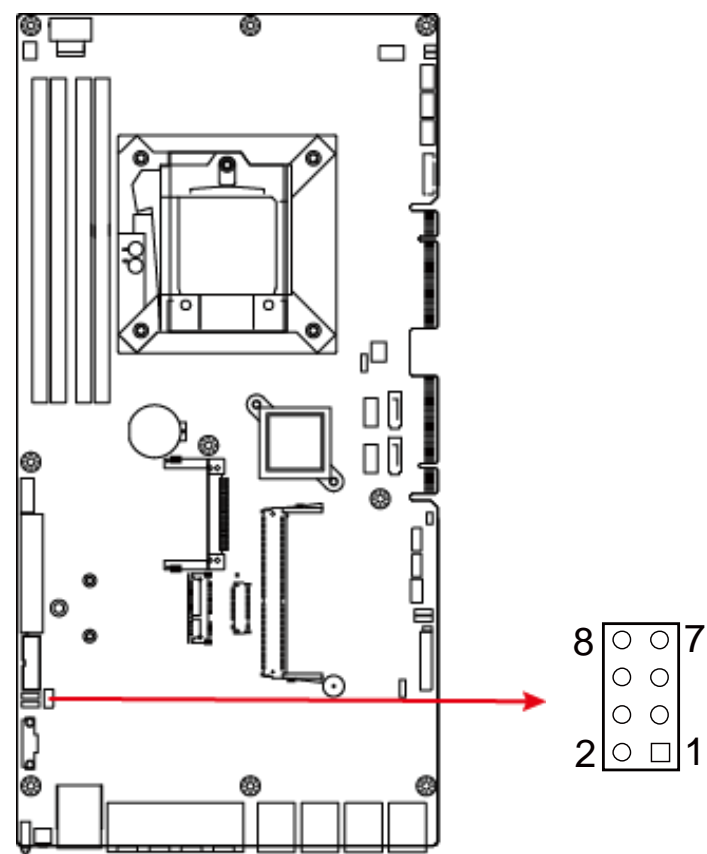
- **Bypass LED1 (Pins 9 and 10)**

The two pins make an external LED connector light for LAN bypass.

- **Bypass LED2 (Pins 11 and 12)**

The two pins make an external LED connector light for LAN bypass.

2.6.2 Digital I/O Port (JP4)



Pin	Assignment	Pin	Assignment
1	GND	2	5VDUAL
3	INT0_SIOGP22	4	INT0_SIOGP25
5	INT0_SIOGP23	6	INT0_SIOGP26
7	INT0_SIOGP24	8	INT0_SIOGP27

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

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 key immediately allows you to enter the Setup utility. If you are a little bit late pressing the 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.

3.3 Main Settings

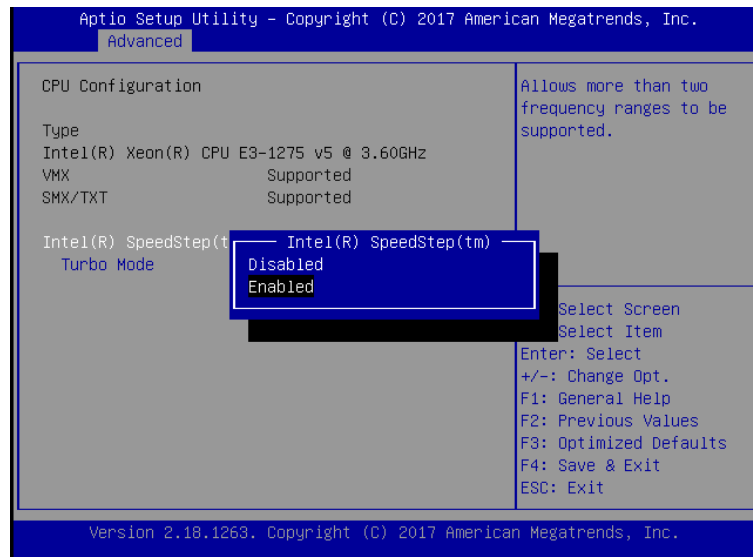


BIOS Setting	Description
System Date	Sets the date. Use the <Tab> key to switch between the data elements.
System Time	Set the time. Use the <Tab> key to switch between the data elements.

3.4 Advanced Settings

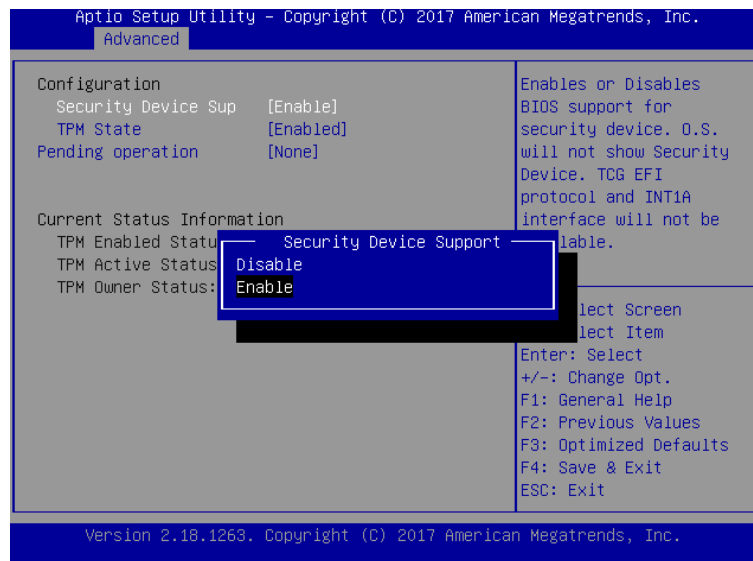
This section allows you to configure, improve your system and allows you to set up some system features according to your preference.

3.4.1 CPU Configuration



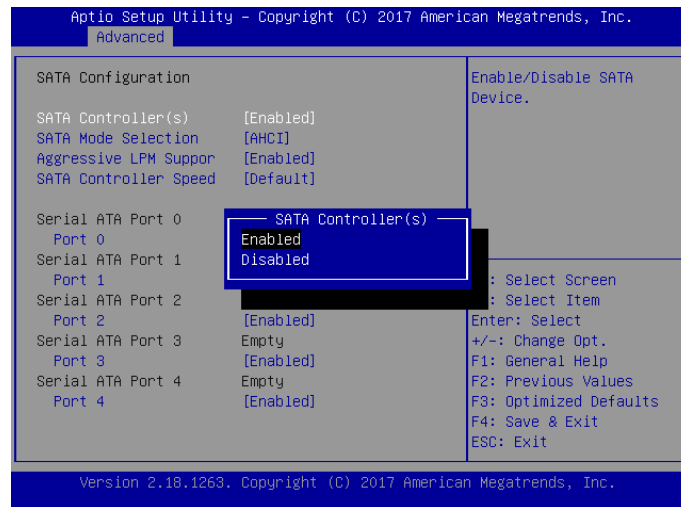
BIOS Setting	Description
Intel(R) SpeedStep (tm)	Enables / Disables the function to allow more than two frequency ranges to be supported.
Turbo Mode	Enables / Disables Turbo Mode.

3.4.2 Trusted Computing



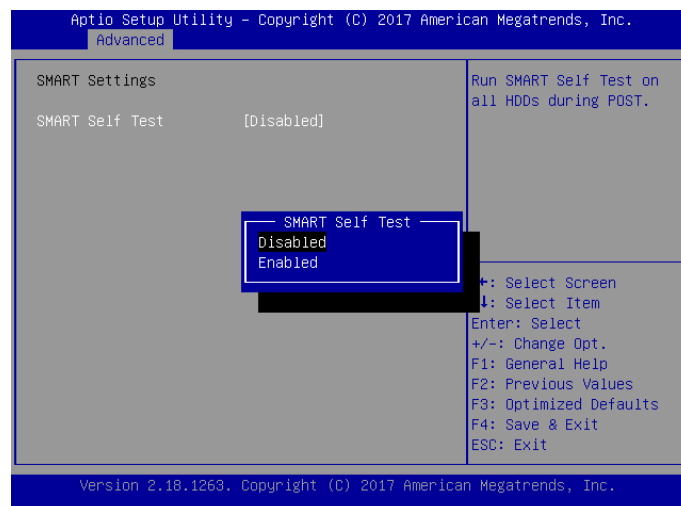
BIOS Setting	Description
Security Device Support	Enables / Disables TPM support. O.S. will not show TPM. Reset of platform is required.
Pending operation	Schedule an operation for the security device. Note: Your computer will reboot during restart in order to change the state of security device.

3.4.3 SATA Configuration



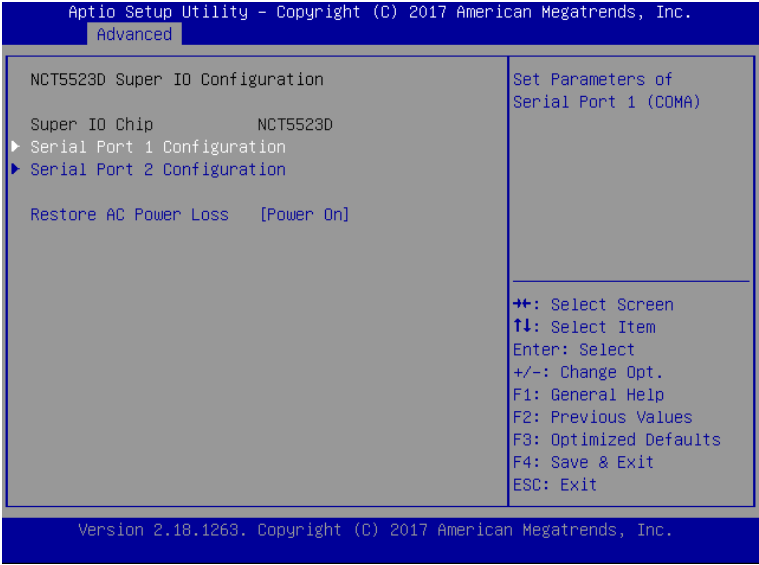
BIOS Setting	Description
SATA Controller(s)	Enables / Disables SATA device.
SATA Mode Selection	Selects AHCI / Intel RST Premium Mode.
SATA Controller Speed	Selects the SATA controller speed as Default / Gen1 / Gen2 / Gen3.
Serial ATA Port 0~4	Enables / Disables Serial Port 0 ~ 5.

3.4.4 SMART Setting



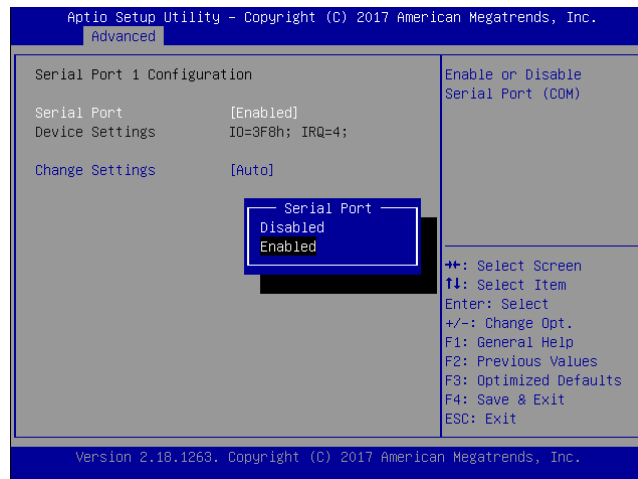
BIOS Setting	Description
SMART Selft Test	Enables / Disables SMART selft test on all HDDs during POST.

3.4.5 NCT5523D Super IO Configuration



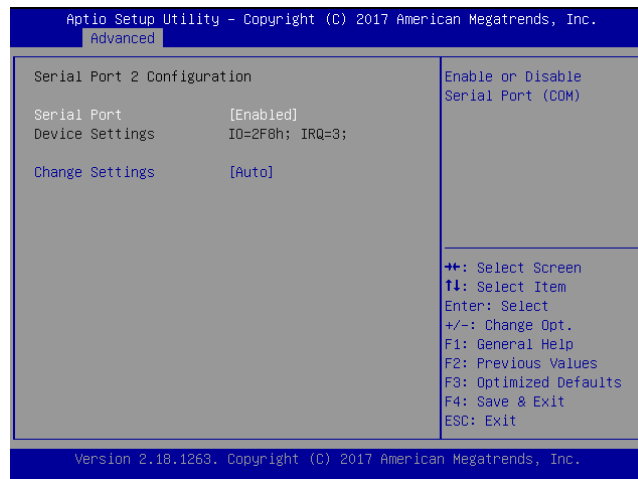
BIOS Setting	Description
Serial Port Configuration	Sets Parameters of Serial Ports. You can enable / disable the serial port and select an optimal settings for the Super IO device.
Restore AC Power Loss	Chooses an AC power state to apply after a power failure. Options: Power On, Power Off, Last State

3.4.5.1. Serial Port 1 Configuration



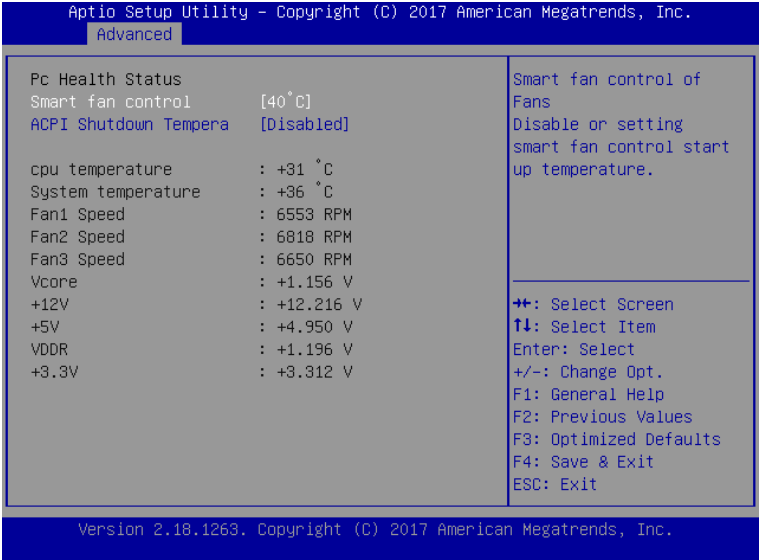
BIOS Setting	Description
Change Settings	<p>Selects an optimal settings for the Super I/O device. Options:</p> <ul style="list-style-type: none"> • Auto • IO=3F8h ; IRQ=4 • IO=3F8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=2F8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=3E8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=2E8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12

3.4.5.2. Serial Port 2 Configuration



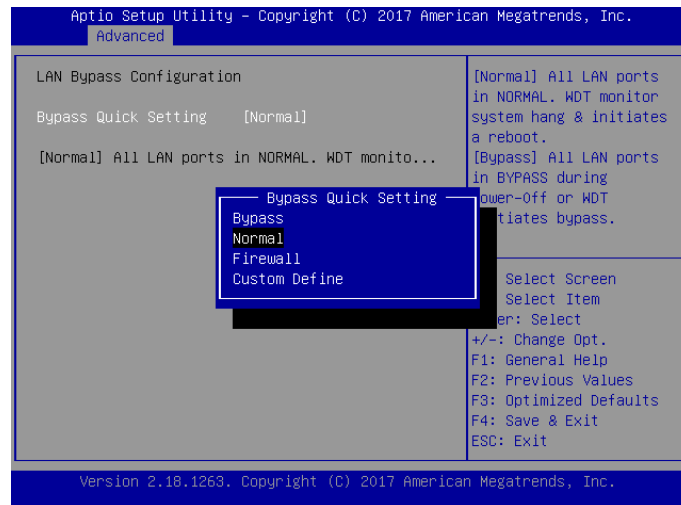
BIOS Setting	Description
Change Settings	<p>Selects an optimal settings for the Super I/O device. Options:</p> <ul style="list-style-type: none"> • Auto • IO=2F8h ; IRQ=3 • IO=3F8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=2F8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=3E8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 • IO=2E8h ; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12

3.4.6 Hardware Monitor



BIOS Setting	Description
Smart Fan Control	Sets up or disable the fan control for start-up temperature. Options: Disabled, 40°C, 45°C, 50°C, 55°C, 60°C
Shutdown Temperature	This field enables or disables the Shutdown Temperature Options: Disabled (default),. 70°C, 75°C, 80°C, 85°C, 90°C, 95°C
Temperatures / Voltages	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

3.4.7 LAN Bypass Configuration

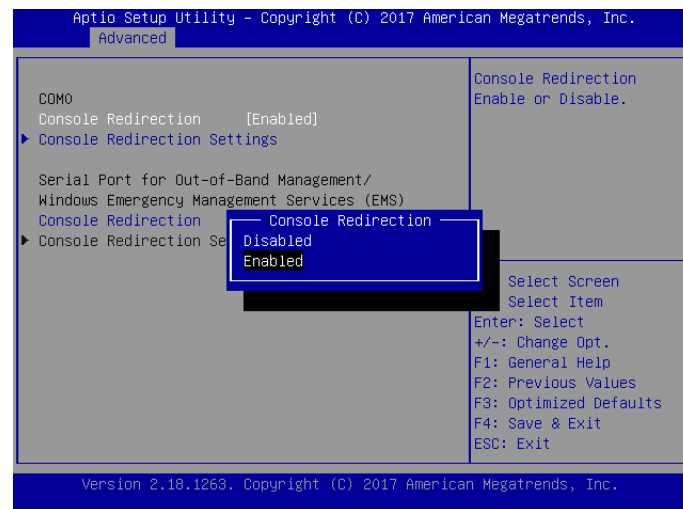


BIOS Setting	Description
Bypass Quick Setting	<p>Normal: All LAN ports are in a normal state. WDT monitor system hang and initiates a reboot.</p> <p>Bypass: The paired LAN ports in Bypass during power-off or WDT initiates bypass.</p> <p>Options: Bypass, Normal, Firewall, Custom Define</p>

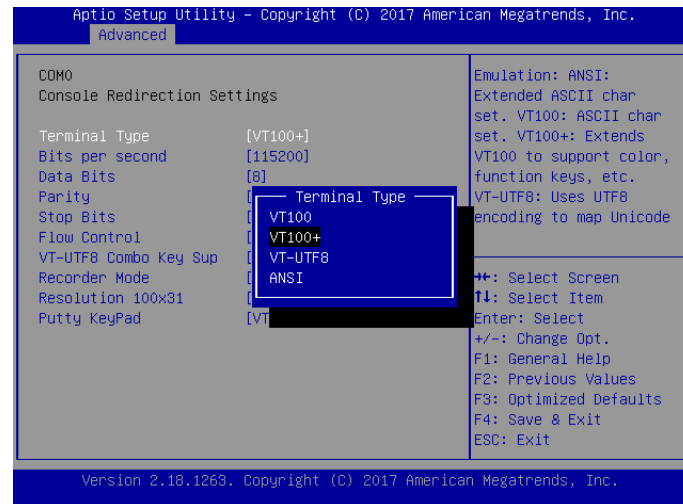
You can verify the LAN bypass function via BIOS by referring to the steps below.

1. Select **Bypass** mode for the above LAN Bypass Configuration in BIOS.
2. Save the setting and exit.
3. Run your test program under MS-DOS.
4. The lit Bypass LED indicates the bypass function runs properly.

3.4.8 Console Port Configuration

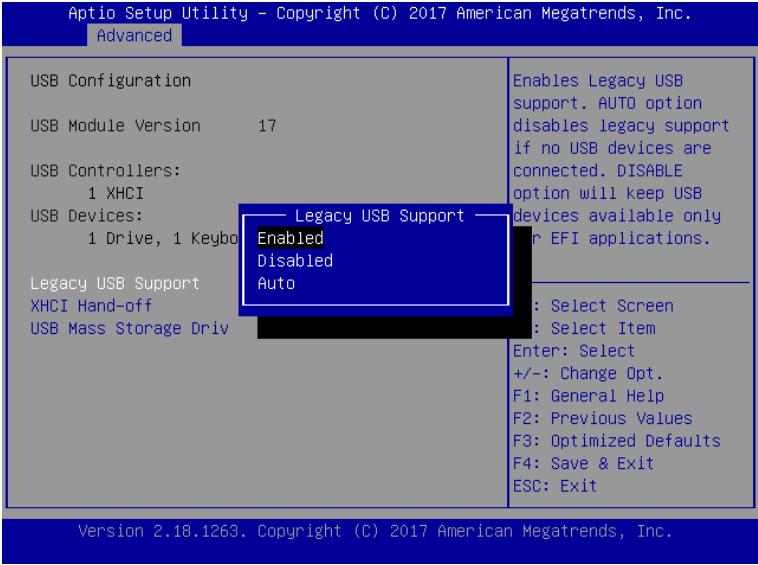


BIOS Setting	Description
Console Redirection	Enables / Disables console redirection.
Console Redirection Settings	Sets up the terminal type, bits, parity, flow control, combo key, recorder mode, resolution and putty keypad.



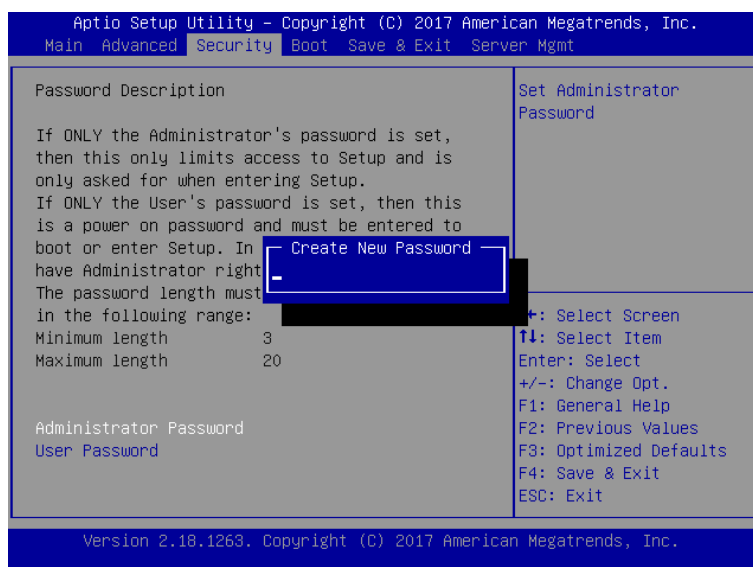
BIOS Setting	Description
Terminal Type	Sets the terminal type as VT100, VT100+, VT-UTF8, or ANSI.
Bits per second	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. Options: 9600 19200, 38400, 57600, 115200
Data Bits	Options: 7, 8
Parity	A parity bit can be sent with the data bits to detect some transmission errors. 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
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-UTFB Combo Key Support	Enables / Disables VT-UTFB combination key support for ANSI/VT100 terminals.
Recorder Mode	Enabling this mode allows only text to be sent. This is to capture terminal data.
Resolution 100x31	Enables / Disables extended terminal resolution.
Putty Keypad	Selects function key and keypad on Putty. Options: VT100, Linux, XTERMR6, SC0, ESCN, VT400

3.4.9 USB Configuration



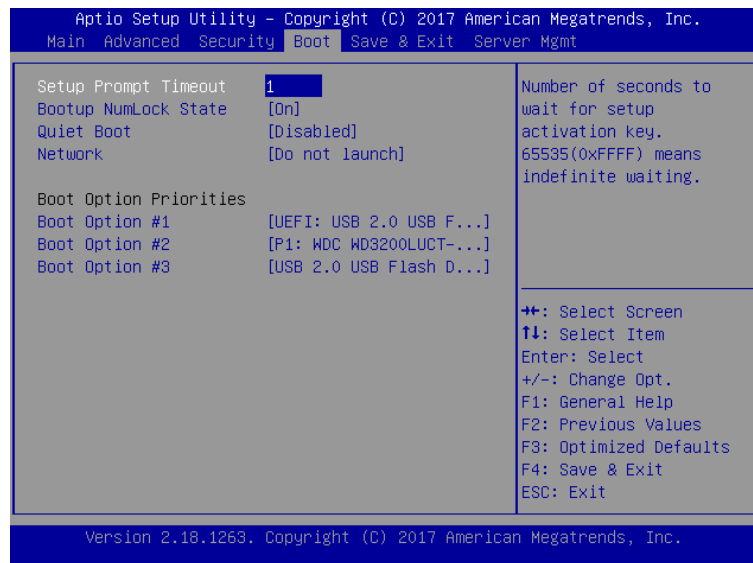
BIOS Setting	Description
Legacy USB Support	<p>Enables / Disables Legacy USB support.</p> <ul style="list-style-type: none"> Auto disables legacy support if there is no USB device connected. Disable keeps USB devices available only for EFI applications.
XHCI Hand-pff	<p>This is a workaround for OSES without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.</p>
USB Mass Storage Driver Support	<p>Enables / Disables USB mass storage driver support.</p>

3.5 Security Settings



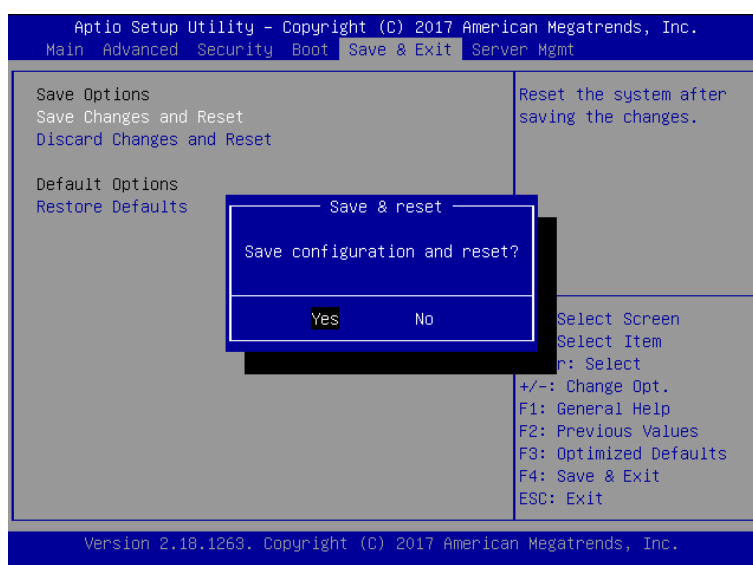
BIOS Setting	Description
Administrator Password	Sets an administrator password for the setup utility.
User Password	Sets a user password.

3.6 Boot Settings



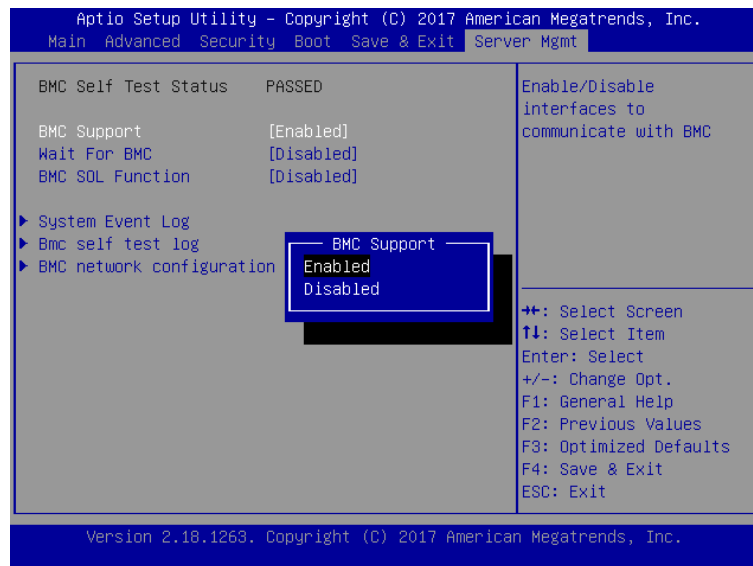
BIOS Setting	Description
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	Selects the keyboard NumLock state.
Quiet Boot	Enables / Disables Quiet Boot option.
Network	Controls the execution of UEFI and Legacy PXE OpROM.
Boot Option Priorities	Sets the system boot order priorities for hard disk, CD/DVD, USB, Network.

3.7 Save & Exit Settings



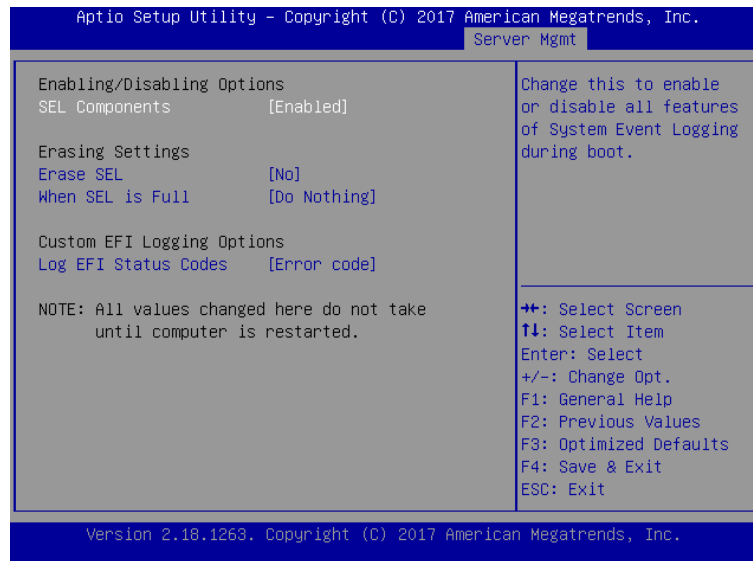
BIOS Setting	Description
Save Changes and Reset	Resets the system after saving the changes.
Discard Changes and Reset	Resets system setup without saving any changes.
Restore Defaults	Restores / Loads defaults values for all the setup options.

3.8 Server Management



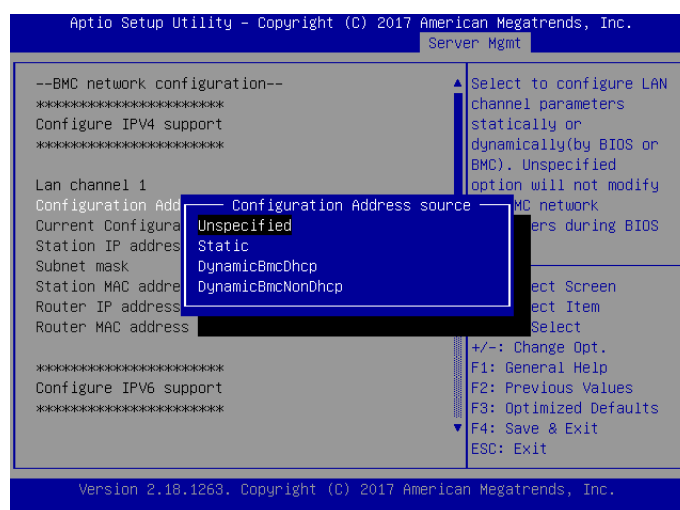
BIOS Setting	Description
BMC Support	Enables / Disables interfaces to communicate with BMC.
Wait for BMC	Wait for BMC response for specified time out. In PILOTII, BMC starts at the same time when BIOS starts during AC power On. It takes around 30 seconds to initialize Host to BMC.
BMC SOL Function	Enables / Disables BMC Sol features.
System Event Log	Erases log options. Options: Yes (on every reset), No
BMC network Configuration	Configures IPV4 and IPV6 support.

3.8.1 System Event Log

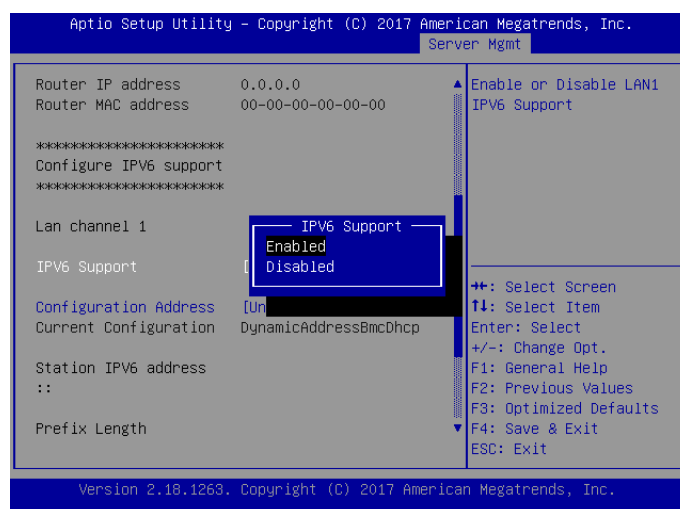


BIOS Setting	Description
SEL Components	Change this to enable or disable all features of system event logging during boot.
Erase SEL	Chooses options for erasing SEL. Options: No, Yes (on next reset), Yes (on every reset)
When SEL is Full	Chooses options for reactions to a full SEL. Options: Do nothing, Erase Immediately
Log EFI Status Codes	Disables the logging of EFI status codes or log only error code or only progress code or both. Option: Disables, Both, Error Code, Progress Code

3.8.2 BMC Network Configuration



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



BIOS Setting	Description
IPv6 Support	Enables / Disables LAN1 IPv6 support.
Configuration Address Source	Configures LAN channel parameters statically or dynamically (by BIOS or BMC). Options: Unspecified, Static, DynamicBmcDhcp

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

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.

FWA8408:

Address	Device Description
0x00000A00-0x00000A0F	Motherboard resources
0x00000A10-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	Motherboard resources
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000070-0x00000070	Motherboard resources
0x00000070-0x00000070	System CMOS/real time clock
0x00000080-0x00000080	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x00001800-0x000018FE	Motherboard resources
0x0000164E-0x0000164F	Motherboard resources
0x0000D000-0x0000DFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #9 - A118
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer
0x00000800-0x0000087F	Motherboard resources
0x0000A000-0x0000AFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115

Address	Device Description
0x0000F090-0x0000F097	Standard SATA AHCI Controller
0x0000F080-0x0000F083	Standard SATA AHCI Controller
0x0000F040-0x0000F05F	Standard SATA AHCI Controller
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x00007000-0x00007FFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #3 - A112
0x0000C000-0x0000CFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #8 - A117
0x00000000-0x00000CF7	PCI Express Root Complex
0x00000D00-0x0000FFFF	PCI Express Root Complex
0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x000004D0-0x000004D1	Programmable interrupt controller
0x00009000-0x00009FFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #5 - A114
0x00001854-0x00001857	Motherboard resources

Address	Device Description
0x0000F000-0x0000F03F	Intel(R) HD Graphics 630
0x000003B0-0x000003BB	Intel(R) HD Graphics 630
0x000003C0-0x000003DF	Intel(R) HD Graphics 630
0x0000FF00-0x0000FFFE	Motherboard resources
0x0000E000-0x0000EFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #10 - A119
0x0000F060-0x0000F07F	Intel(R) 100 Series/C230 Series Chipset Family SMBus - A123
0x0000B000-0x0000BFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #7 - A116
0x000000F0-0x000000F0	Numeric data processor
0x00008000-0x00008FFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #4 - A113

FWA8406:

Address	Device Description
0x00000A00-0x00000A0F	Motherboard resources
0x00000A10-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	Motherboard resources
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000070-0x00000070	Motherboard resources
0x00000070-0x00000070	System CMOS/real time clock
0x00000080-0x00000080	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources

Address	Device Description
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x00001800-0x000018FE	Motherboard resources
0x0000164E-0x0000164F	Motherboard resources
0x0000D000-0x0000DFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #9 - A118
0x00000800-0x0000087F	Motherboard resources
0x0000A000-0x0000AFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115
0x000000F0-0x000000F0	Numeric data processor
0x0000F090-0x0000F097	Standard SATA AHCI Controller
0x0000F080-0x0000F083	Standard SATA AHCI Controller
0x0000F040-0x0000F05F	Standard SATA AHCI Controller
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x0000C000-0x0000CFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #8 - A117
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer
0x00000000-0x00000CF7	PCI Express Root Complex
0x00000D00-0x0000FFFF	PCI Express Root Complex
0x00009000-0x00009FFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #5 - A114
0x0000F000-0x0000F03F	Intel(R) HD Graphics 630
0x000003B0-0x000003BB	Intel(R) HD Graphics 630
0x000003C0-0x000003DF	Intel(R) HD Graphics 630
0x0000FF00-0x0000FFFE	Motherboard resources
0x0000E000-0x0000EFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #10 - A119
0x0000F060-0x0000F07F	Intel(R) 100 Series/C230 Series Chipset Family SMBus - A123

Address	Device Description
0x0000B000-0x0000BFFF	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #7 - A116
0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x000004D0-0x000004D1	Programmable interrupt controller
0x00001854-0x00001857	Motherboard resources

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.

FWA8408:

Level	Function
IRQ 0	System timer
IRQ 3	Communications Port (COM2)
IRQ 4	Communications Port (COM1)
IRQ 8	System CMOS/real time clock
IRQ 9	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) Gaussian Mixture Model - 1911
IRQ 9	Intel(R) 100 Series/C230 Series Chipset Family SMBus - A123
IRQ 11	Intel(R) 100 Series/C230 Series Chipset Family Thermal subsystem - A131
IRQ 13	Numeric data processor
IRQ 14	Motherboard resources
IRQ 54 ~ IRQ 204	Microsoft ACPI-Compliant System
IRQ 256 ~ IRQ 511	Microsoft ACPI-Compliant System
IRQ 4294967232	Intel(R) Management Engine Interface
IRQ 4294967233 ~ IRQ 4294967238	Intel(R) I210 Gigabit Network Connection #8
IRQ 4294967239 ~ IRQ 4294967244	Intel(R) I210 Gigabit Network Connection #7
IRQ 4294967245 ~ IRQ 4294967250	Intel(R) I210 Gigabit Network Connection #6
IRQ 4294967251 ~ IRQ 4294967256	Intel(R) I210 Gigabit Network Connection #5
IRQ 4294967257 ~ IRQ 4294967262	Intel(R) I210 Gigabit Network Connection #4
IRQ 4294967263 ~ IRQ 4294967268	Intel(R) I210 Gigabit Network Connection #3
IRQ 4294967269	Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967270	Intel(R) HD Graphics 630

Level	Function
IRQ 4294967271 ~ IRQ 4294967276	Intel(R) I210 Gigabit Network Connection #2
IRQ 4294967277 ~ IRQ 4294967282	Intel(R) I210 Gigabit Network Connection
IRQ 4294967283	Standard SATA AHCI Controller
IRQ 4294967284	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #10 - A119
IRQ 4294967285	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #9 - A118
IRQ 4294967286	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #8 - A117
IRQ 4294967287	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #7 - A116
IRQ 4294967288	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115
IRQ 4294967289	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #5 - A114
IRQ 4294967290	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #4 - A113
IRQ 4294967291	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #3 - A112
IRQ 4294967292	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) PCIe Controller (x4) - 1909
IRQ 4294967293	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) PCIe Controller (x8) - 1905
IRQ 4294967294	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) PCIe Controller (x16) - 1901

FWA8406:

Address	Device Description
IRQ 0	System timer
IRQ 3	Communications Port (COM2)
IRQ 4	Communications Port (COM1)
IRQ 8	System CMOS/real time clock
IRQ 9	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) Gaussian Mixture Model - 1911
IRQ 9	Intel(R) 100 Series/C230 Series Chipset Family SMBus - A123
IRQ 11	Intel(R) 100 Series/C230 Series Chipset Family Thermal subsystem - A131
IRQ 13	Numeric data processor
IRQ 14	Motherboard resources
IRQ 54 ~ IRQ 204	Microsoft ACPI-Compliant System
IRQ 256 ~ IRQ 511	Microsoft ACPI-Compliant System
IRQ 4294967248	Intel(R) Management Engine Interface
IRQ 4294967249 ~ IRQ 4294967254	Intel(R) I211 Gigabit Network Connection #3
IRQ 4294967255 ~ IRQ 4294967260	Intel(R) I211 Gigabit Network Connection #5
IRQ 4294967261 ~ IRQ 4294967266	Intel(R) I211 Gigabit Network Connection #6
IRQ 4294967267 ~ IRQ 4294967272	Intel(R) I211 Gigabit Network Connection #2
IRQ 4294967273	Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
IRQ 4294967274	Intel(R) HD Graphics 630
IRQ 4294967275 ~ IRQ 4294967280	Intel(R) I211 Gigabit Network Connection #4
IRQ 4294967281 ~ IRQ 4294967286	Intel(R) I211 Gigabit Network Connection
IRQ 4294967287	Standard SATA AHCI Controller
IRQ 4294967288	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #10 - A119

Address	Device Description
IRQ 4294967289	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #9 - A118
IRQ 4294967290	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #8 - A117
IRQ 4294967291	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #7 - A116
IRQ 4294967292	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115
IRQ 4294967293	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #5 - A114
IRQ 4294967294	Intel(R) Xeon(R) E3 - 1200/1500 v5/6th Gen Intel(R) Core(TM) PCIe Controller (x16) - 1901

C. Digital I/O Sample Code

1. DIO 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. DIO Sample Code: The file MAIN.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 Dio5Initial(void);
void Dio5SetOutput(unsigned char);
unsigned char Dio5GetInput(void);
void Dio5SetDirection(unsigned char);
unsigned char Dio5GetDirection(void);
//-----

int main (void)
{
    char SIO;

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

    Dio5Initial();

    //for GPIO20..27
    Dio5SetDirection(0x0F); //GP20..23 = input, GP24..27=output
    printf("Current DIO direction = 0x%X\n", Dio5GetDirection());

    printf("Current DIO status = 0x%X\n", Dio5GetInput());

    printf("Set DIO output to high\n");
    Dio5SetOutput(0x0F);

    printf("Set DIO output to low\n");
    Dio5SetOutput(0x00);

    return 0;
}
//-----
```

```
void Dio5Initial(void)
{
    unsigned char ucBuf;

    ucBuf = Get_NCT5523D_Reg(0x1C);
    ucBuf &= ~0x02;
    Set_NCT5523D_Reg(0x1C, ucBuf);

    Set_NCT5523D_LD(0x07); //switch to logic device 7
    //enable the GP2 group
    ucBuf = Get_NCT5523D_Reg(0x30);
    ucBuf |= 0x04;
    Set_NCT5523D_Reg(0x30, ucBuf);
}
//-----
void Dio5SetOutput(unsigned char NewData)
{
    Set_NCT5523D_LD(0x07); //switch to logic device 7
    Set_NCT5523D_Reg(0xE1, NewData);
}
//-----
unsigned char Dio5GetInput(void)
{
    unsigned char result;

    Set_NCT5523D_LD(0x07); //switch to logic device 7
    result = Get_NCT5523D_Reg(0xE1);
    return (result);
}
//-----
void Dio5SetDirection(unsigned char NewData)
{
    //NewData : 1 for input, 0 for output
    Set_NCT5523D_LD(0x07); //switch to logic device 7
    Set_NCT5523D_Reg(0xE8, NewData);
}
//-----
unsigned char Dio5GetDirection(void)
{
    unsigned char result;

    Set_NCT5523D_LD(0x07); //switch to logic device 7
    result = Get_NCT5523D_Reg(0xE8);
    return (result);
}
//-----
```

3. DIO Sample Code: The file NCT5523D.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);
}
//-----
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;
}
//-----
```

D. 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. WDT 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. WDT Sample Code: The file MAIN.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  
}  
//-----
```

```

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. WDT Sample Code: The file NCT5523D.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);  
}  
//-----
```

```

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;
}
//-----

```