MS-C903

Industrial Data Machine

User Guide

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Safety Information

- The components included in this package are prone to damage from electrostatic discharge (ESD). Please adhere to the following instructions to ensure successful computer assembly.
- Ensure that all components are securely connected. Loose connections may cause the computer to not recognize a component or fail to start.
- Hold the motherboard by the edges to avoid touching sensitive components.
- It is recommended to wear an electrostatic discharge (ESD) wrist strap when handling the motherboard to prevent electrostatic damage. If an ESD wrist strap is not available, discharge yourself of static electricity by touching another metal object before handling the motherboard.
- Store the motherboard in an electrostatic shielding container or on an anti-static pad whenever the motherboard is not installed.
- Before turning on the computer, ensure that there are no loose screws or metal components on the motherboard or anywhere within the computer case.
- Do not boot the computer before installation is completed. This could cause permanent damage to the components as well as injury to the user.
- If you need help during any installation step, please consult a certified computer technician.
- Always turn off the power supply and unplug the power cord from the power outlet before installing or removing any computer component.
- Keep this user guide for future reference.
- Keep this motherboard away from humidity.
- Make sure that your electrical outlet provides the same voltage as is indicated on the PSU, before connecting the PSU to the electrical outlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- All cautions and warnings on the motherboard should be noted.
- If any of the following situations arises, get the motherboard checked by service personnel:
  - Liquid has penetrated into the computer.
  - The motherboard has been exposed to moisture.
  - The motherboard does not work well or you can not get it work according to user guide.
  - The motherboard has been dropped and damaged.
  - The motherboard has obvious sign of breakage.
- Do not leave this motherboard in an environment above 60°C (140°F), it may damage the motherboard.

Regulatory Notices

CE Conformity

Hereby, Micro-Star International CO., LTD declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.

FCC-A Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2012/19/EU, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:

https://csr.msi.com/global/index

Green Product Features

- Reduced energy consumption during use and stand-by
- Limited use of substances harmful to the environment and health
- Easily dismantled and recycled
- Reduced use of natural resources by encouraging recycling
- Extended product lifetime through easy upgrades
- Reduced solid waste production through take-back policy

Battery Information

Please take special precautions if this product comes with a battery.

- Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- Avoid disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, which can result in an explosion.
- Avoid leaving a battery in an extremely high temperature or extremely low air pressure environment that can result in an explosion or the leakage of flammable liquid or gas.
- Do not ingest battery. If the coin/button cell battery is swallowed, it can cause severe internal burns and can lead to death. Keep new and used batteries away from children.

European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

BSMI:

廢電池請回收
For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.
For further information please visit:
http://www.dtsc.ca.gov/hazardouswaste/perchlorate/

Environmental Policy

- The product has been designed to enable proper reuse of parts and recycling and should not be thrown away at its end of life.
- Users should contact the local authorized point of collection for recycling and disposing of their end-of-life products.
- Visit the MSI website and locate a nearby distributor for further recycling information.
- Users may also reach us at gpcontdev@msi.com for information regarding proper disposal, take-back, recycling, and disassembly of MSI products.

Copyright and Trademarks Notice

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HDMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

The terms HDMI™, HDMI™ High-Definition Multimedia Interface, HDMI™ Trade dress and the HDMI™ Logos are trademarks or registered trademarks of HDMI™ Licensing Administrator, Inc.

Technical Support

If a problem arises with your product and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please visit https://www.msi.com/support/ for further guidance.

Specifications

Model	MS-C903
Processor	• Embedded SKUs (**E-Series**) - 11th Gen Intel® IoTG Mobile Tiger Lake-UP3 Core™ i7-1185G7E/ i5-1145G7E, QC, 15W up to 28W - 11th Gen Intel® IoTG Mobile Tiger Lake-UP3 Core™ i3-1115G4E, DC, 15W up to 28W • Industrial SKUs (**W-Series**) - 11th Gen Intel® IoTG Mobile Tiger Lake-UP3 Core™ i5-1145GRE, QC, 15W - 11th Gen Intel® IoTG Mobile Tiger Lake-UP3 Core™ i3-1115GRE, DC, 15W
Chipset	Within processor
iAMT Support	• Supports Intel® AMT 15.0 (Only for Intel® i7/ i5 CPU series at LAN1, not support G3 to S5)
Antenna	• 6 x Openings reserved for antennas - Supports Wi-Fi/ BT/ 4G/ LTE/ 5G
Network	• 2 x Intel® I225-LM 2.5 GbE LAN (for **E-Series**) • 2 x Intel® I225-IT 2.5 GbE LAN (for **W-Series**)
Audio	Realtek® ALC888S High Definition Audio codec
Graphics	• 1 x DP 1.4a up to 7680 x 4320 @60Hz • 1 x HDMI™ 1.4 up to 4096x2160 @30Hz • 2 independent displays supported - HDMI™ - DP
Memory	• 2 x DDR4 SO-DIMM slots - Dual Channel for DDR4, Non-ECC - Up to 3200 MT/s, 64 GB
Storage	• 1 x SATA 3.0 port (6Gb/s) - Hot-plug supported • 1 x M.2 M Key slot (2280) - Supports PCIe Gen 4 x4 NVMe signal - M key, B+M key SSD supported

Continued on next column

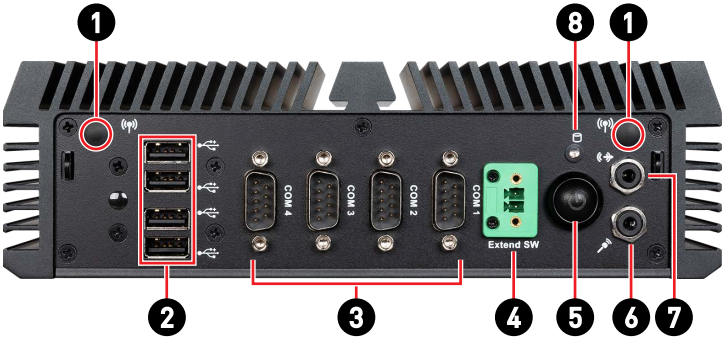
Model	MS-C903
Expansion Slots	• 1 x M.2 B Key slot (2242/ 3042) - Supports PCIe x1, SATA 3.0, USB 2.0 signals - Shared with Nano SIM Holder - 4G/ 5G modules supported • 1 x M.2 E Key slot (2230) - Supports PCIe x1 & USB 2.0 signal - Devices supported: » Intel® Wi-Fi 6E AX210 + BT 5.2 wireless card (vPro® Supported) • 1 x Nano SIM Holder - Shared with M.2 B key (SIM) slot
Front Panel I/O	• 2 x Openings reserved for antennas • 1 x Line-Out jack • 1 x Microphone jack • 4 x RS232/ 422/ 485 Serial ports (COM1~4) - Mode selection by BIOS control. - 0V/ 5V/ 12V, 0.5A each port (Power selection by Jumper, default: 5V) • 4 x USB 2.0 Type-A connectors (5V/0.5A) • 1 x Extend switch header • 1 x Hard disk drive (HDD) LED • 1 x Power button/ LED
Rear Panel I/O	• 4 x Openings reserved for antennas • 1 x DC power jack • 1 x Phoenix DC power connector • 2 x RJ-45 2.5 GbE LAN ports • 1 x HDMI™ connector • 1 x DisplayPort • DIO Port • RS232/422/485 Serial Port (COM6, Optional) • RS232/422/485 Serial Port (COM5, Optional)/ CANBus Port (Optional) • 4 x USB 3.2 Gen 2 Type-A connectors (5V/1.0A) • 1 x Grounding point

Continued on next column

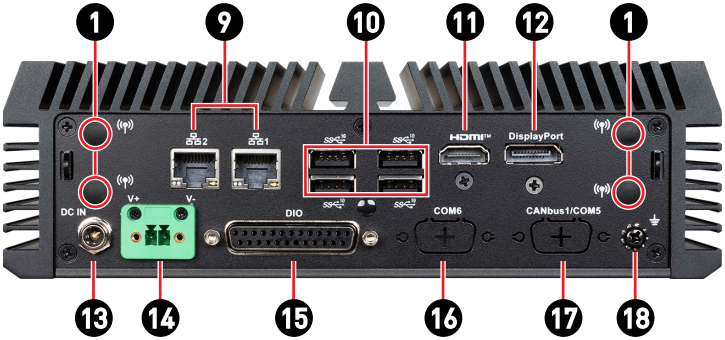
Model	MS-C903
Power Solution	• 19V, 90W Power Adapter - Power Input: 100~240Vac, 50/60Hz, 1.2A - Power Output: 19V , 4.74A
Dimension	215mm (W) x 155mm (D) x 65mm (H)
Weight	2.24kg
Mounting	• Wall mount (STD) • DIN rail mount (STD) • VESA mount (Optional)
Accessories	• 1 x 19V, 90W Power Adapter • 1 x Wall Mount Set • 1 x DIN Rail Mount Set • 1 x VESA Mount Set (Optional) • 2 x Phoenix Contact Plug-in Terminal Blocks • 1 x SATA Power & Signal Cable
OS Support	• Windows 10 IoT Enterprise 2021 LTSC (64-bit, 21H2) • Windows 11 IoT Enterprise (64-bit, 22H2, pre-scan) • Linux Ubuntu 22.04 (64-bit) (by request)
Regulatory Compliance	FCC Class A / CE / RCM / BSMI / VCCI / UKCA / IC / RoHS Compliant/ EN50155 Tx Class (w/ RJ45 shielded cable)
Environment	• Operation Temperature: - E-Series: -10 ~ 50°C (0.7 m/s air flow) - W-Series: -20 ~ 70°C (0.7 m/s air flow) • Operation Humidity: 10 ~ 90%, non-condensing • Storage Temperature: -20 ~ 80°C • Storage Humidity: 10 ~ 90%, non-condensing • Vibration: IEC 61373 Category 1 – Class B • Shock: IEC 61373 Category 1 – Class B

System Overview

Front Panel I/O



Rear Panel I/O



1

Wi-Fi Antenna Connector (Openings reserved for antennas)

These connectors allow you to connect sn external antenna for wireless communication. User may find two on the front side and 4 on the rear side of the system.

2

USB 2.0 Port

This connector is provided for USB peripheral devices.
(Speed up to 480 Mbps)

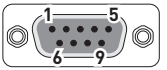
Important

High-speed devices are recommended for USB 3.2 ports whereas low-speed devices, such as mouse or keyboard, are suggested to be plugged into the USB 2.0 ports.

3

RS232/422/485 Serial Port: COM1~4

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS232		
PIN	**SIGNAL**	**DESCRIPTION**
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	0V/5V/12V	Power Pin

RS422		
PIN	**SIGNAL**	**DESCRIPTION**
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

RS485		
PIN	**SIGNAL**	**DESCRIPTION**
1	485 TXD-	Transmit Data, Negative
2	485 TXD+	Transmit Data, Positive
3	NC	No Connection
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

Continued on next column

4 **Extend Switch Connector**

This connector is provided for remote power button control.

5 **Power Button/ LED**

Press the button to turn the system on or off.

LED Status	Description
Off	ACPI S4/ S5/ Deep S5, Power Off
Blinking	ACPI S3
Green	ACPI S0

6 **Mic-In Jack**

This connector is provided for microphones.

7 **Line-Out Jack**

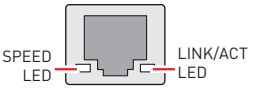
This connector is provided for headphones or speakers.

8 **HDD Activity LED**

This indicator shows the activity status of the HDD. It flashes when the system is accessing data on the HDD and remains off when no disk activity is detected.

9 **2.5 Gbps LAN Jack**

The standard RJ-45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.



LED	Status	Description
Link/ Activity LED	Off	No link
	Yellow	Linked
	Blinking	Data activity
Speed LED	Off	10/100 Mbps
	Green	1 Gbps
	Orange	2.5 Gbps

10 **USB 3.2 Gen 2 Port**

This connector is provided for USB peripheral devices.
(Speed up to 10 Gbps)

Continued on next column

⓫ HDMI™ Connector

Supports 4096x2160@30Hz as specified in HDMI™ 1.4.

⓬ DisplayPort

Supports 7680x4320@60Hz as specified in DisplayPort 1.4a.

⓭ DC Power Jack

Power supplied through this jack supplies power to the system.

⓮ Phoenix DC Power Connector

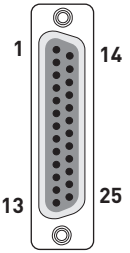
The system is designed with a Phoenix connector that carries DC input.

Important

Your power source can either be connected to the Power Jack or the Phoenix DC Power Connector. ***Avoid connecting to both simultaneously****.*

⓯ DIO Port

This port is provided for the Digital Input/Output (DIO) peripheral module.



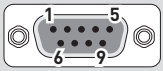
PIN	SIGNAL	PIN	SIGNAL
1	GND	14	GND
2	GPO0	15	GPI0
3	GPO1	16	GPI1
4	GPO2	17	GPI2
5	GPO3	18	GPI3
6	GPO4	19	GPI4
7	GPO5	20	GPI5
8	GPO6	21	GPI6
9	GPO7	22	GPI7
10	VCC5	23	VCC5
11	NC	24	NC
12	NC	25	NC
13	NC		

Continued on next column

16

RS232/422/485 Serial Port: COM6 (Optional)

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS232		
PIN	**SIGNAL**	**DESCRIPTION**
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	0V/5V/12V	Power Pin

RS422		
PIN	**SIGNAL**	**DESCRIPTION**
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

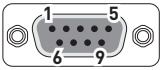
RS485		
PIN	**SIGNAL**	**DESCRIPTION**
1	485 TXD-	Transmit Data, Negative
2	485 TXD+	Transmit Data, Positive
3	NC	No Connection
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

Continued on next column

⑰

RS232/422/485 Serial Port: COM5 / CANBus Port (Optional)

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



RS232		
PIN	**SIGNAL**	**DESCRIPTION**
1	NDCD	Data Carrier Detect
2	NSIN	Signal In
3	NSOUT	Signal Out
4	NDTR	Data Terminal Ready
5	GND	Signal Ground
6	NDSR	Data Set Ready
7	NRTS	Request To Send
8	NCTS	Clear To Send
9	0V/5V/12V	Power Pin

RS422		
PIN	**SIGNAL**	**DESCRIPTION**
1	422 TXD-	Transmit Data, Negative
2	422 RXD+	Receive Data, Positive
3	422 TXD+	Transmit Data, Positive
4	422 RXD-	Receive Data, Negative
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

RS485		
PIN	**SIGNAL**	**DESCRIPTION**
1	485 TXD-	Transmit Data, Negative
2	485 TXD+	Transmit Data, Positive
3	NC	No Connection
4	NC	No Connection
5	GND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

This port can also work as an Controller Area Network (CANbus) port to allow microcontrollers and devices to communicate with each other in applications without a host computer.

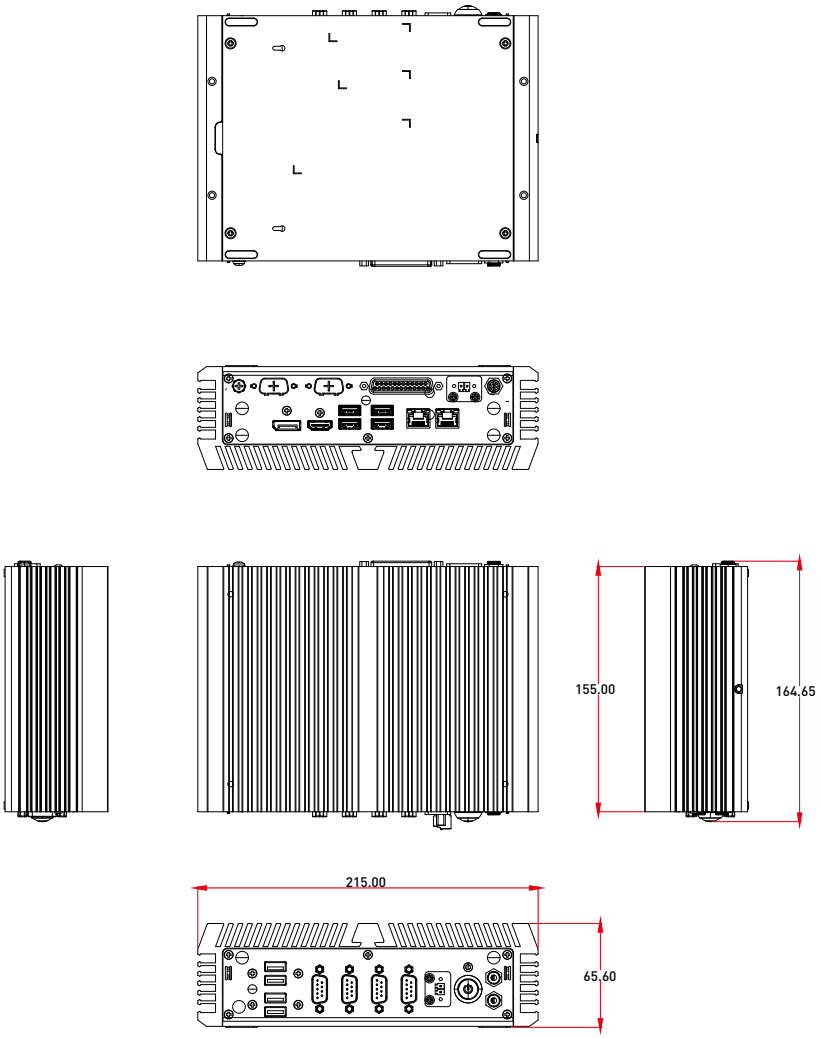
⑱

Grounding Point

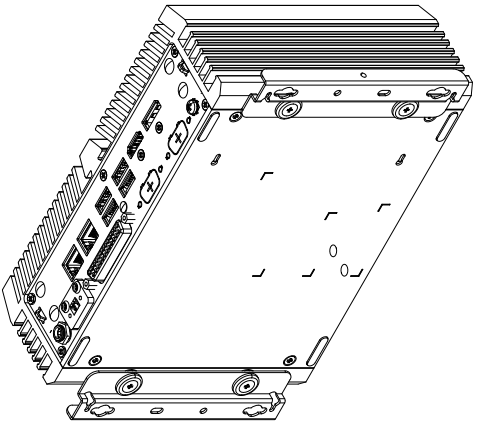
The Grounding Point is provided to connect a grounding wire.

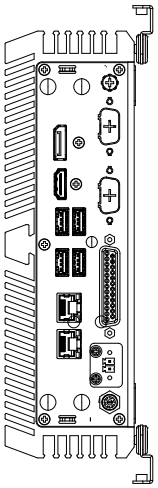
ME Overview

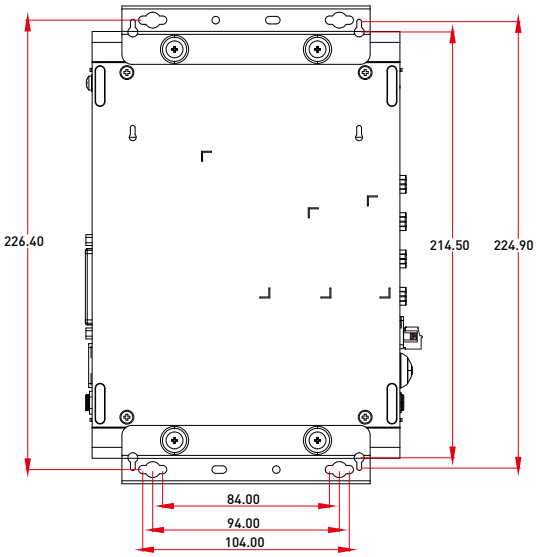
System Dimensions



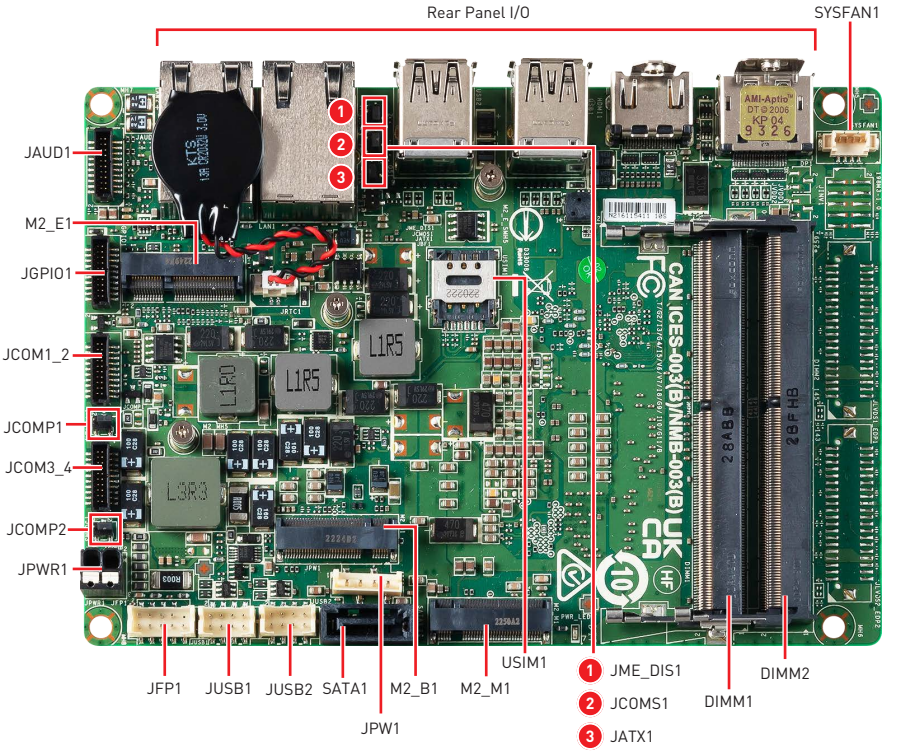
System Dimensions with Wall Mount







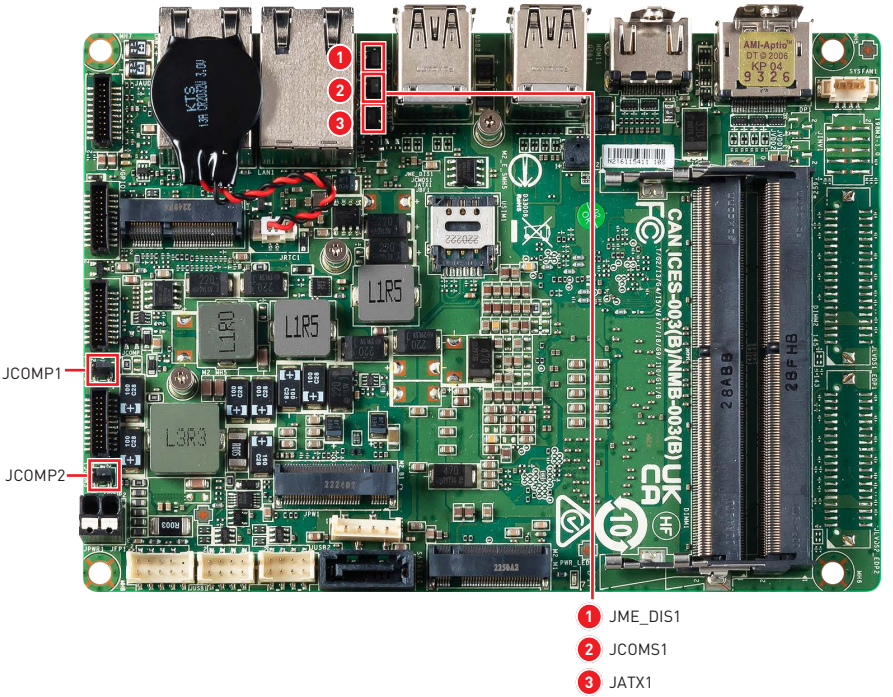
Motherboard Overview



Motherboard Jumpers

Important

Avoid adjusting jumpers when the system is on; it will damage the motherboard.



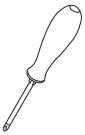
Jumper Name	Default Setting	Description	
JME_DIS1	1	1-2: Normal	2-3: ME Disable
JCMOS1	1	1-2: Normal	2-3: Clear CMOS
JATX1	1	1-2: ATX	2-3: AT
JCOMP1 JCOMP2	1	1-2: 5V	2-3: 12V

Getting Started

Important

- *All information is subject to change without prior notice.*
- *The system photos are provided for **demonstration of system assembly only**. The components of your system may differ based on the model you have purchased.*

Necessary Tools



Screwdriver

Pliers

Tweezers

Anti-Static Gloves

Safety Precautions

The following precautions should be observed while handling the system:

- Place the system on a flat and stable surface.
- Do not place the system in environments subject to mist, smoke, vibration, excessive dust, salty or greasy air, or other corrosive gases and fumes.
- Do not drop or jolt the system.
- Do not use another power adapter other than the one enclosed with the system.
- Disconnect the power cord before performing any installation procedures on the system.
- Do not perform any maintenance with wet hands.
- Prevent foreign substances, such as water, other liquids or chemicals, from entering the system while performing installation procedures on the system.
- Use a grounded wrist strap before handling system components such as CPU, Memory, HDD, expansion cards, etc.
- Place system components on a grounded antistatic pad or on the bed that came with the components whenever the components are separated from the system.

Removing System Cover

Important

Before you remove or install any components, make sure the system is not turned on or connected to the AC power.

1. Place the system on a flat and steady surface. Locate and remove the screw on the back side.

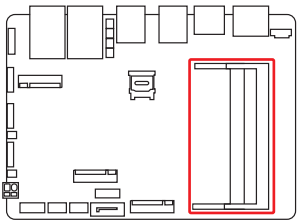
2. Carefully remove the cover sidewards, and set the cover and screw aside for later use.

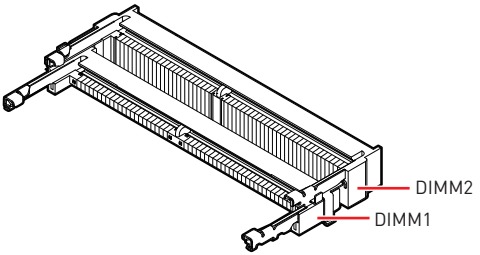
- *Follow the above procedures in reverse order to install the cover.*

Installing Memory Module

1. Align the notch on the memory module with the key on the slot and insert the memory module into the slot at a 45-degree angle.
2. Push the memory module gently downwards until the slot clips click and lock the memory module in place.
3. Install more DIMMs if necessary.

- *To uninstall the DIMM, flip the slot levers outwards and the DIMM will be released instantly.*

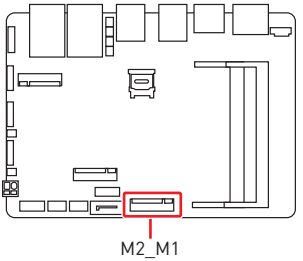




Important

- *You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.*
- *Always insert memory modules in the lower slot first.*
- *To ensure system stability for Dual channel mode, memory modules must be of the same type, number and density.*

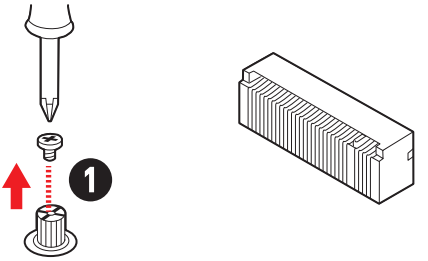
Installing M.2 SSD (M-Key)



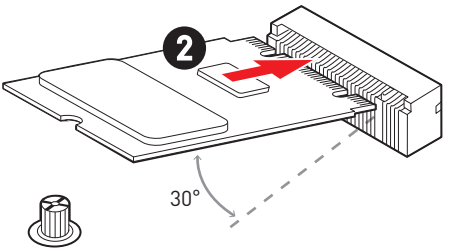
Video Demonstration

Watch the video to learn how to Install M.2 SSD.

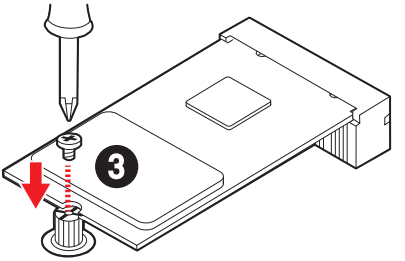
1. Loosen the M.2 screw from the motherboard.



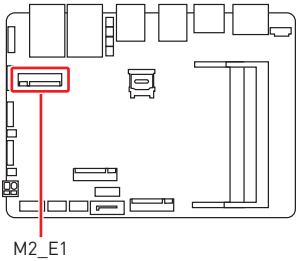
2. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.



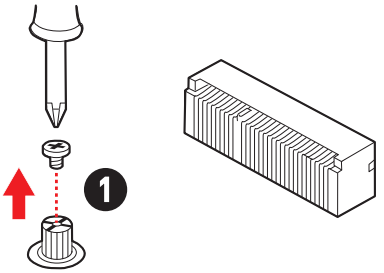
3. Secure the M.2 SSD in place with the supplied M.2 screw.



Installing M.2 Wi-Fi Card (E-Key)



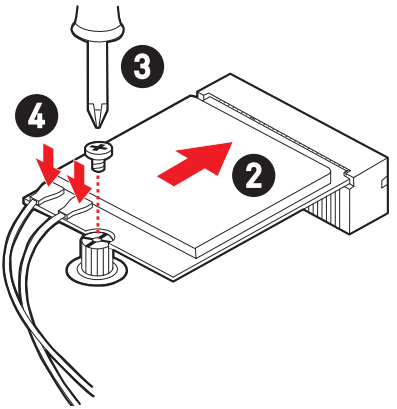
1. Loosen the M.2 screw from the motherboard.



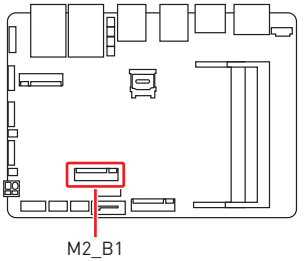
2. Insert your M.2 Wi-Fi card into the M.2 slot at a 30-degree angle.

3. Secure the M.2 Wi-Fi card in place with the supplied M.2 screw.

4. Locate the antenna cables and gently connect them to the Wi-Fi card.



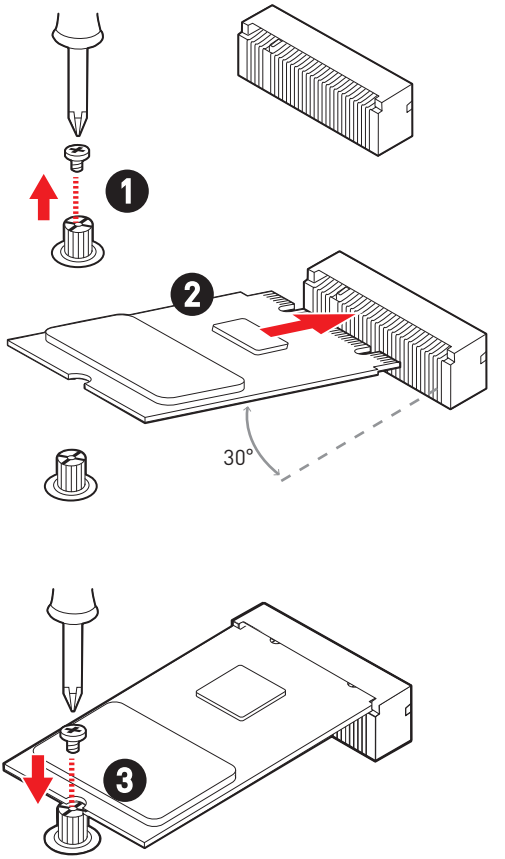
Installing M.2 Expansion Card (B-Key)



1. Loosen the M.2 screw from the motherboard.

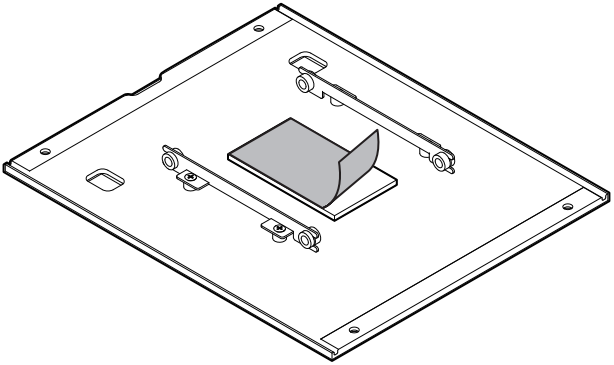
2. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.

3. Secure the M.2 SSD in place with the supplied M.2 screw.

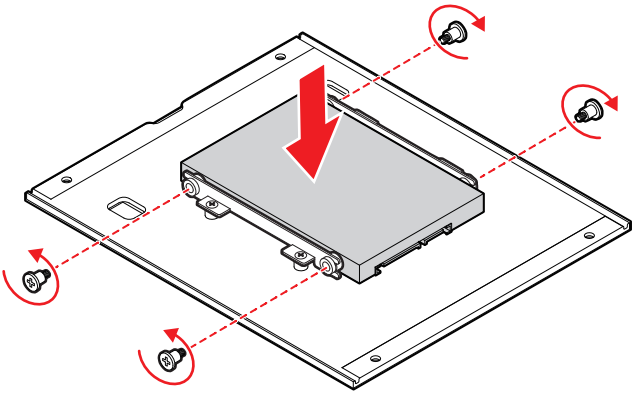


Installing 2.5” HDD/ SSD (9.5mm)

1. Flip over the system cover and locate the HDD/SSD bracket. Remove the **protective film** to uncover the thermal pad.



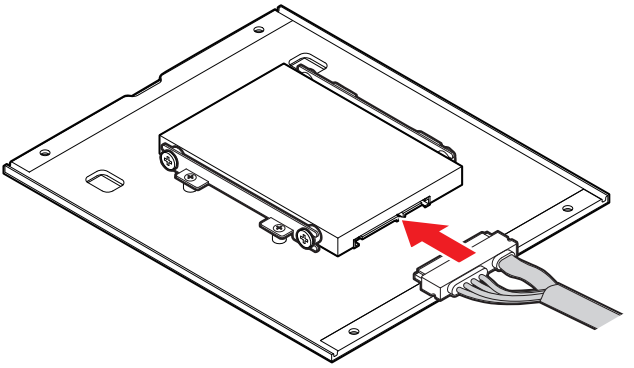
2. To install, first insert the HDD/SSD into the bracket with screw holes aligned. Then tighten the screws to fix the HDD/SSD to the bracket.



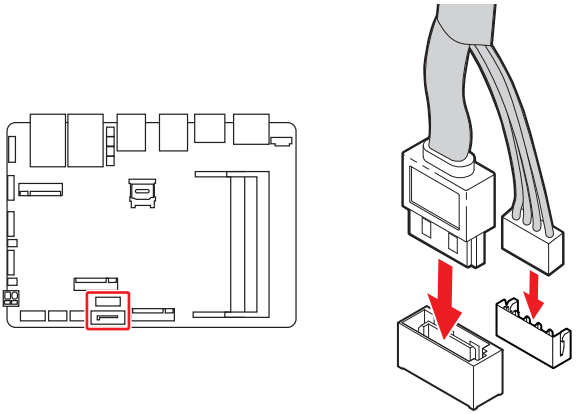
Important

- *Before assembly, please make sure the HDD/SSD is compatible with the bracket.*
- *Please make sure the HDD is properly and completely fixed to the bracket.*

3. Align the SATA data & power connector and connect to the HDD/SSD.



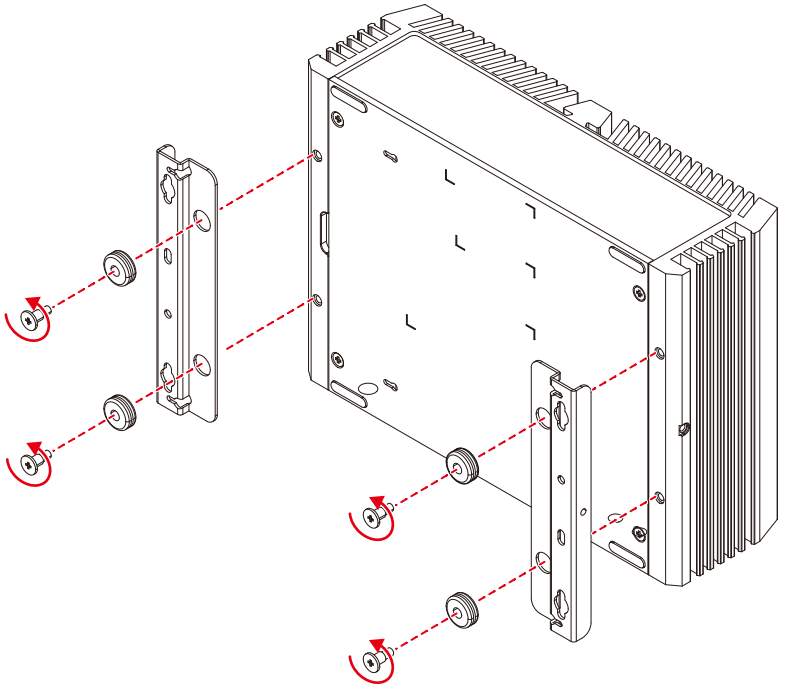
4. Connect the **SATA signal & power connector** to the motherboard to complete the installation.



- *Follow the above procedures in reverse order to replace the* HDD/SSD *if needed.*

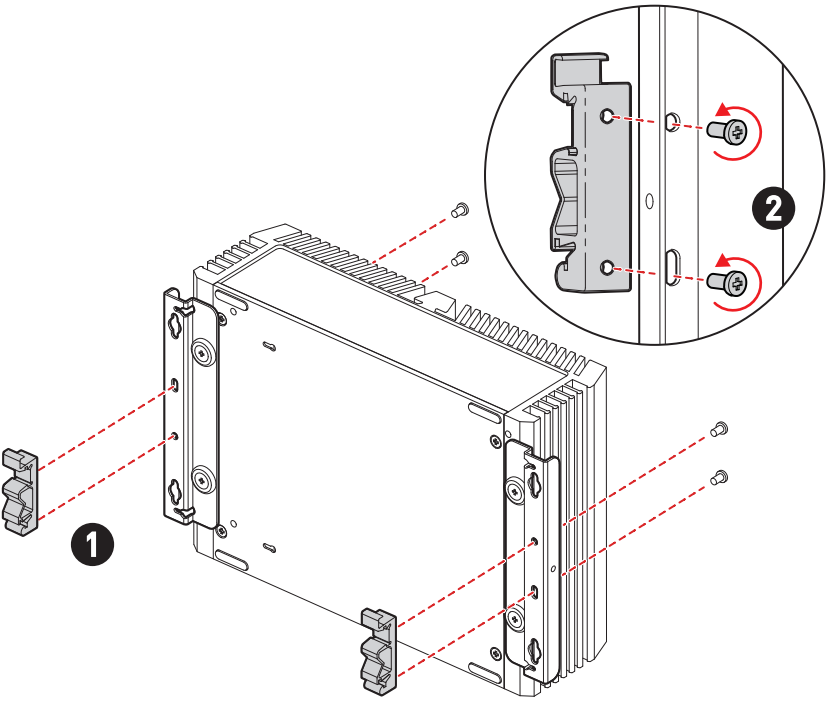
Wall Mount

1. Flip over the system and locate the bracket screw holes.
2. Place the brackets and rubber pads along the sides with screw holes aligned.
3. Fasten the screws to fix the brackets.



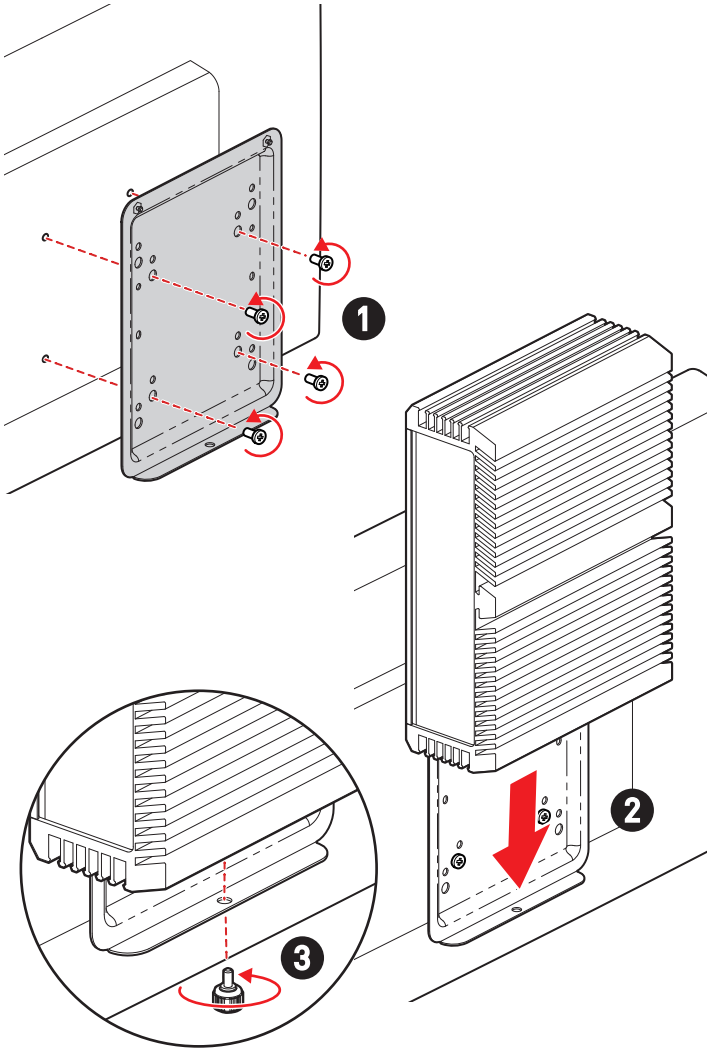
Din Rail Mount

1. Attach the **DIN rail clips** to the wall mount brackets with the hooks aligned.
2. Insert screws through the wall mount brackets into the DIN rail clips and tighten until secure.



VESA Mount (Optional)

1. Fasten the **VESA mount plate** to the monitor with the supplied screws.
2. Mount the system onto the VESA mount plate.
3. Tighten the **thumbscrew** at the bottom of the VESA mount plate to secure the system.



Bios Setup

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use.

Users may need to run the Setup program when:

- An error message appears on the screen at system startup and requests users to run SETUP.
- Users want to change the default settings for customized features.

Important

- *Please note that BIOS update assumes technician-level experience.*
- *As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.*

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> or <F2> key to enter Setup.

Press <DEL> or <F2> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it **OFF** and **On** or pressing the **RESET** button. You may also restart the system by simultaneously pressing **<Ctrl>, <Alt>, and <Delete>** keys.

Important

The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.

Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Value
Esc	Exit
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Reset*
F12	Screenshot capture
<K>	Scroll help area upwards
<M>	Scroll help area downwards

* When you press **F10**, a confirmation window appears and it provides the modification information. Select between **Yes** or **No** to confirm your choice.

Getting Help

Upon entering setup, you will see the Main Menu.

Main Menu

The main menu lists the setup functions you can make changes to. You can use the **arrow keys (↑↓)** to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

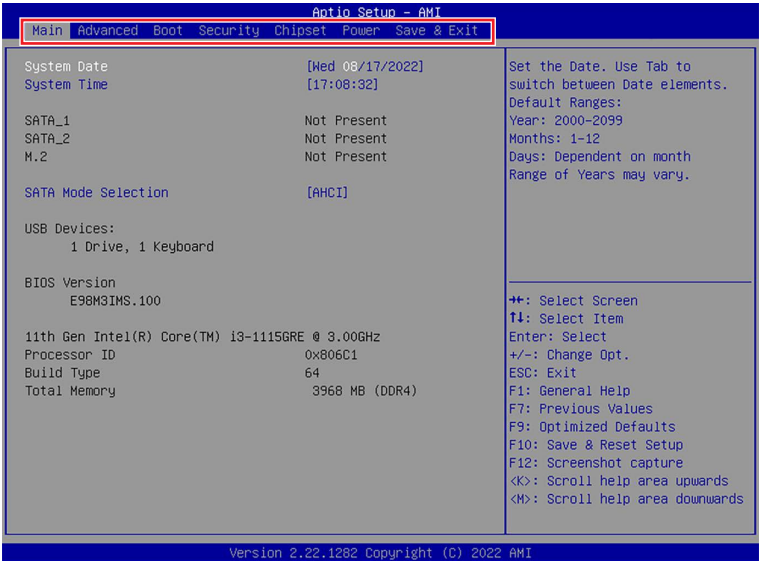
Sub-Menu

If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use **arrow keys (↑↓)** to highlight the field and press **<Enter>** to call up the sub-menu. Then you can use the **control keys** to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the **<Esc>.**

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing **<F1>**. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press **<Esc>** to exit the Help screen.

The Menu Bar



▶ Main

Use this menu for basic system configurations, such as time, date, etc.

▶ Advanced

Use this menu to set up the items of special enhanced features.

▶ Boot

Use this menu to specify the priority of boot devices.

▶ Security

Use this menu to set supervisor and user passwords.

▶ Chipset

This menu controls the advanced features of the onboard chipsets.

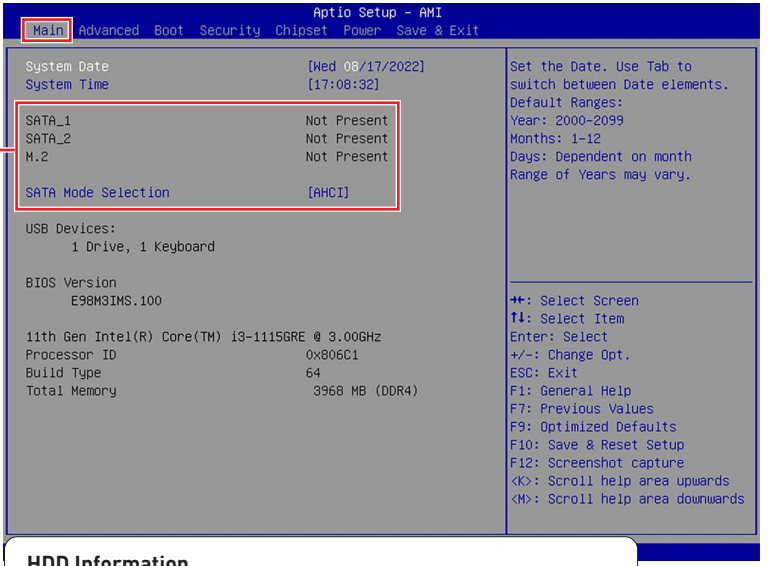
▶ Power

Use this menu to specify your settings for power management.

▶ Save & Exit

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.

Main



HDD Information

- **RAID (VMD) Disabled:** Display HDD information as plugging in status.
- **RAID (VMD) Enabled:** Display "Not Present" only.

▶ System Date

This setting allows you to set the system date.

Format: <Day> <Month> <Date> <Year>.

▶ System Time

This setting allows you to set the system time.

Format: <Hour> <Minute> <Second>.

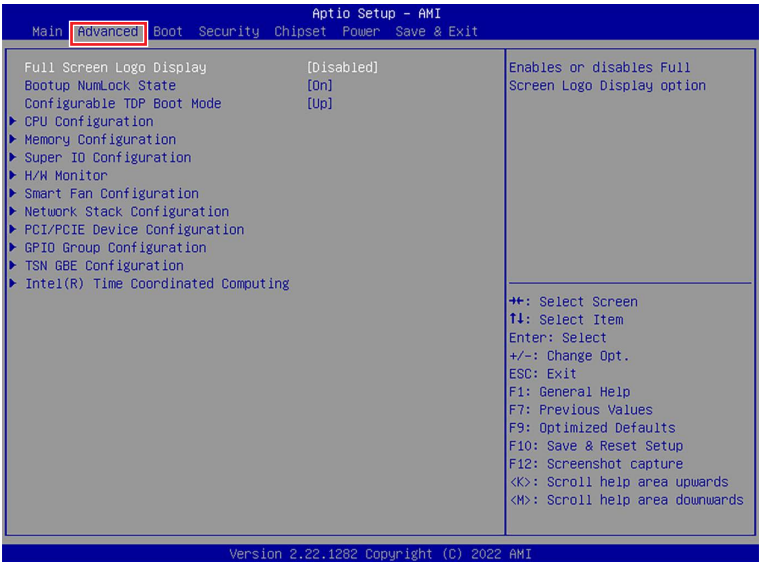
▶ SATA Mode Selection

This setting specifies the SATA controller mode.

[AHCI] AHCI (Advanced Host Controller Interface), is a technical standard for an interface that allows the software to communicate with Serial ATA (SATA) devices. It offers advanced SATA features such as Native Command Queuing (NCQ) and hot-plugging.

[RAID] RAID (Redundant Array of Independent Disks) is a virtual disk storage technology that combines multiple physical disks into one unit for data redundancy, performance improvement, or both.

Advanced



▶ Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

[Enabled] BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

[Disabled] BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

▶ Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on.

[On] Turn on the Num Lock key when the system is powered on.

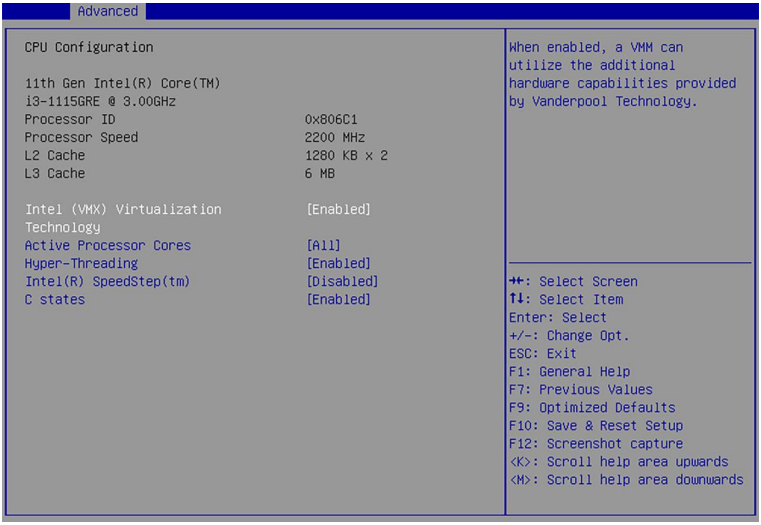
[Off] Allow users to use the arrow keys on the numeric keypad.

▶ Configurable TDP Boot Mode

This feature allows you sets the TDP (Thermal Design Power) Boot mode to either Nominal, Down or Up.

TDP Power Spec			
Processor Family	**Nominal**	**Down**	**Up**
Intel® Core™ Processors	28W	12W	15W
Intel® Celeron® Processors	15W	N/A	N/A

▶ CPU Configuration



▸ Intel (VMX) Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With Virtualization, one computer system can function as multiple "virtual" systems.

▸ Active Processor Cores

This setting specifies the number of active processor cores.

▸ Hyper-Threading

The processor uses Hyper-Threading technology to increase transaction rates and reduces end-user response times. The technology treats the two cores inside the processor as two logical processors that can execute instructions simultaneously. In this way, the system performance is highly improved. If you disable the function, the processor will use only one core to execute the instructions. **Please disable this item if your operating system doesn't support HT Function**, or unreliability and instability may occur.

▸ Intel(R) SpeedStep(TM)

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production.
When disabled, the processor will return the actual maximum CPUID (CPU Identification) input value of the processor when queried.

▸ **Turbo Mode**

Enables or disables the Turbo Mode. This feature only display when **Intel(R) SpeedStep(TM)** is enabled.

[Enabled] Enables this function to boost CPU performance automatically over specification when system request the highest performance state.

[Disabled] Disables this function.

▸ **C States**

This setting controls the C-States (CPU Power states).

[Enabled] Detects the idle state of system and reduce CPU power consumption accordingly.

[Disabled] Disable this function.

▶ Memory Configuration

▸ **In-Band ECC Support**

Enables or disables In-Band ECC(Error-Correcting Code) Support.

[Enabled] When enabled this function, a portion(1/32) of memory space will be reserved to store ECC data.

[Disabled] Disables this function.

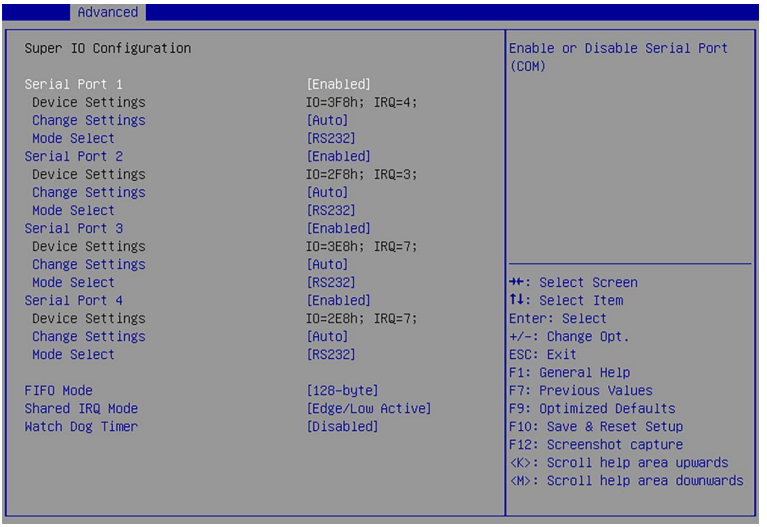
» **In-Band ECC Error Injection**

Enables or disables In-Band ECC Error Injection. This feature only display when **In-Band ECC Support** is enabled.

» **In-Band ECC Error Operation Mode**

Select an operation mode from 0-2. This feature only display when **In-Band ECC Support** is enabled.

▶ Super IO Configuration



▸ Serial Port 1/ 2/ 3/ 4

This setting enables/disables the specified serial port.

» **Change Settings**

This setting is used to change the address & IRQ settings of the specified serial port.

» **Mode Select**

Select an operation mode for Serial Port 1/ 2/ 3/ 4.

▸ FIFO Mode

This setting controls the FIFO data transfer mode.

▸ Shared IRQ Mode

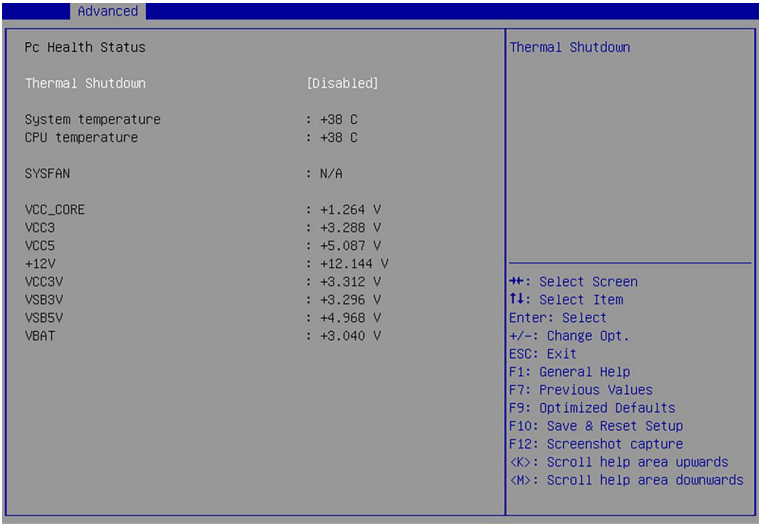
This setting provides the system with the ability to share interrupts among its serial ports.

▸ Watch Dog Timer

You can enable the system watchdog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watchdog polls it.

▶ H/W Monitor (PC Health Status)

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



▸ Thermal Shutdown

This setting enables/disables the Thermal Shutdown function. It will automatically shuts down when the internal temperature reaches the critical level.

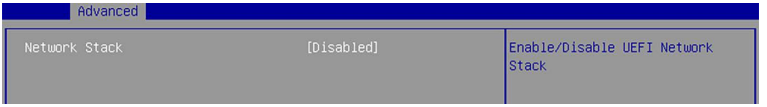
▶ Smart Fan Configuration

▸ SYSFAN

This setting enables/ disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the System fan speed automatically depending on the current system temperature, avoiding the overheating to damage your system.

▶ Network Stack Configuration

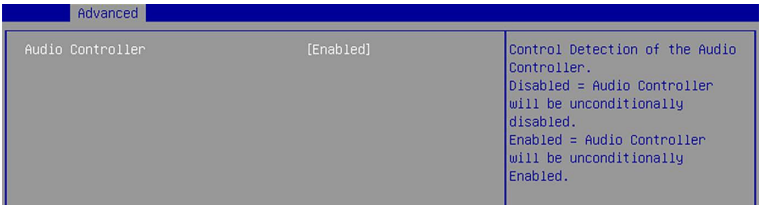
This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS.



▸ Network Stack

This menu provides Network Stack settings for users to enable network boot (PXE) from BIOS. The following items will display when **Network Stak** is enabled.

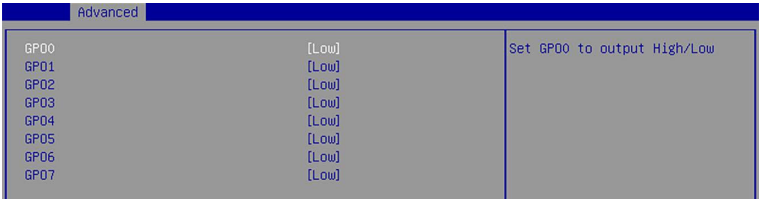
▶ PCI/ PCIE Device Configuration



▸ Audio Controller

This setting enables/disables the onboard audio controller.

▶ GPIO Group Configuration



▸ GPO0 ~ GPO7

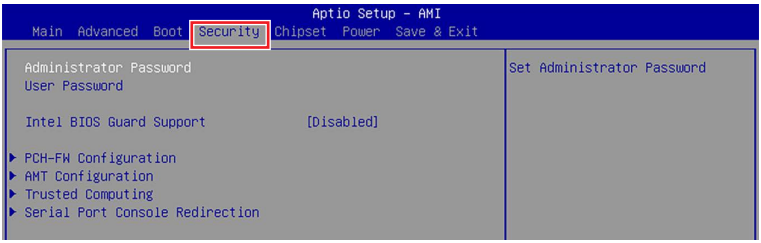
These settings control the operation mode of the specified GPIO.

Boot

▶ Boot Option Priorities

This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

Security



▶ Administrator Password

Administrator Password controls access to the BIOS Setup utility.

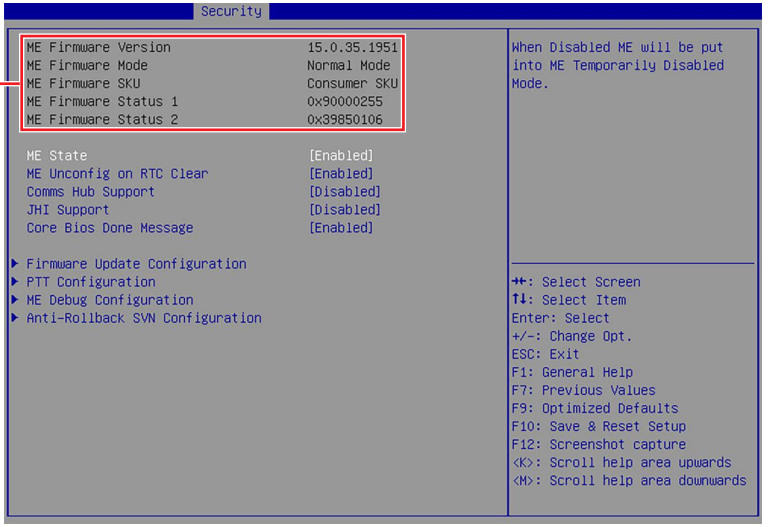
▶ User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

▶ Intel BIOS Guard Support

Intel BIOS Guard Support ensures that updates to system BIOS flash are secure.

▶ PCH-FW Configuration



Firmware Information

ME Firmware Version	System Integrity Value	These settings show the firmware information of the Intel ME (Management Engine).
ME Firmware Mode	ME Firmware Status 1	
ME Firmware SKU	ME Firmware Status 2	

▸ **ME State**

This setting specifies the Intel Management Engine state.

▸ **ME Unconfig on RTC Clear**

This setting enables/disables ME firmware unconfigure on RTC clear.

▸ **Comms Hub Support**

This setting enables/disables Communications Hub Support.

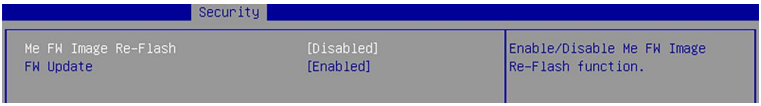
▸ **JHI Support**

This setting enables/disables support for Intel Dynamic Application Loader Host Interface (JHI).

▸ **Core BIOS Done Message**

This setting enables/disables Core BIOS Done Message sent to ME.

▸ Firmware Update Configuration



» **ME FW Image Re-Flash**

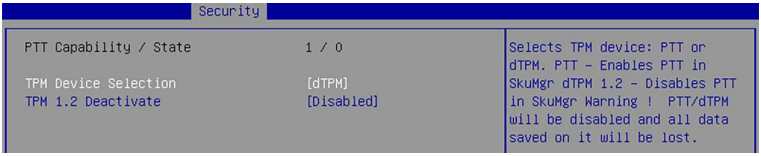
This setting enables/ disables the ME FW (Firmware) image re-flash.

» **FW Update**

This setting enables/ disables the FW (Firmware) update.

▸ PTT Configuration

Intel Platform Trust Technology (PTT) is a platform functionality for credential storage and key management used by Microsoft Windows.

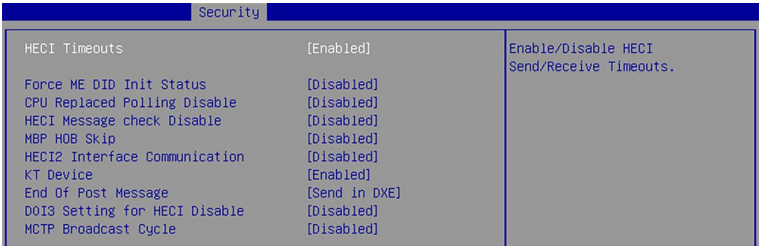


» **TPM Device Selection**

Select TPM (Trusted Platform Module) devices from PTT or dTPM (Discrete TPM).

[PTT]	Enables PTT in SkuMgr.
[dTPM1.2]	Disables PTT in SkuMgr. **Warning! PTT/ Discrete TPM will be disabled and all data saved on it will be lost.**

▸ ME Debug Configuration



» **HECI Timeouts**

This setting enables/ disables the HECI (Host Embedded Controller Interface) send/ receive timeouts.

» **Force ME DID Init Status**

Forces the DID initialization status value.

» **CPU Replaced Polling Disable**

Setting this option disables the CPU replacement polling loop.

» **HECI Message Check Disable**

This setting disables message check for BIOS boot path when sending messages.

» **MBP HOB Skip**

Setting this option will skip MBP HOB.

» **HECI2 Interface Communication**

This setting Adds/ Removes HECI2 device from PCI space.

» **KT Device**

This setting enables/ disables KT Device.

» **End of Post Message**

This setting enables/ disables End of Post Message sent to ME.

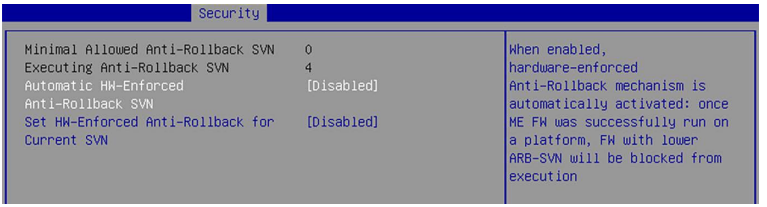
» **DOI3 Setting for HECI Disable**

Setting this option disables setting DOI3 bit for all HECI devices.

» **MCTP Broadcast Cycle**

This setting enables/ disables Management Component Transport Protocol (MCTP) Broadcast Cycle.

▸ **Anti-Rollback SVN Configuration**



» **Automatic HW-Enforced Anti-Rollback SVN**

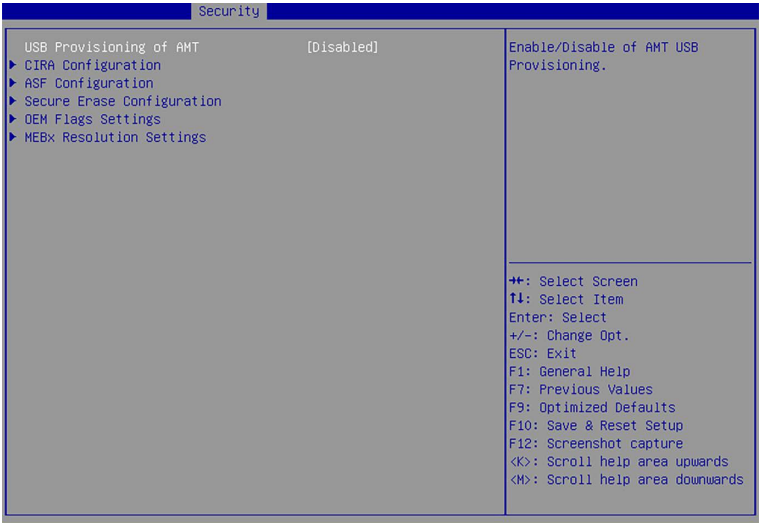
Setting this option enables will automatically activate the hardware-enforced Anti-Rollback security version (HW ERB SVN). Once ME FW was successfully run on a platform, FW with lower ARB-VN will be blocked from execution.

» **Set HW-Enforced Anti-Rollback for Current SVN**

Enable HW ERB mechanism for current ARB SVN value. FW with lower ARB-SVN will be blocked from execution. The value will be restored to disable after the command is sent.

▶ AMT Configuration

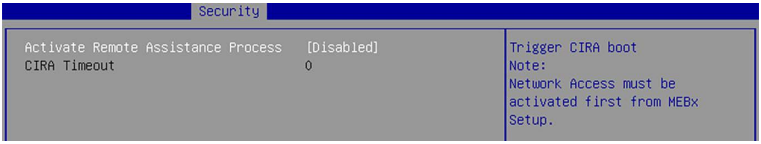
Intel Active Management Technology (AMT) is hardware-based technology for remotely managing and securing PCs out-of-band.



▸ USB Provisioning of AMT

Enables or disable USB Provisioning of AMT.

▸ CIRA Configuration



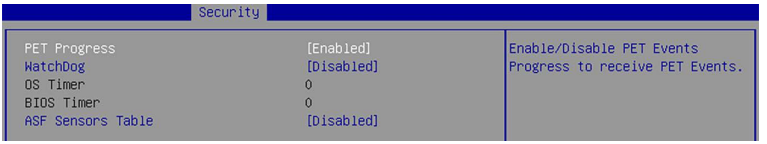
» **Activate Remote Assistance Process**

Setting this option enables will trigger CIRA boot.

» **CIRA Timeout**

This item displays CIRA Timeout.

▸ ASF Configuration



» **PET Progress**

Setting this option enables/ disables to receive PET Events.

» **WatchDog**

This setting enables/ disables the watchdog timer.

» **OS Timer**

This item displays OS Timer.

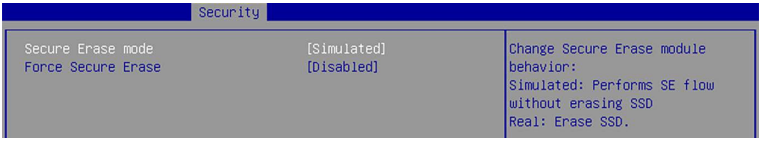
» **BIOS Timer**

This item displays BIOS Timer.

» **ASF Sensor Table**

This setting enables/ disables Alert Standard Format(ASF) Sensor Table.

▸ Secure Erase Configuration



» **Secure Erase Mode**

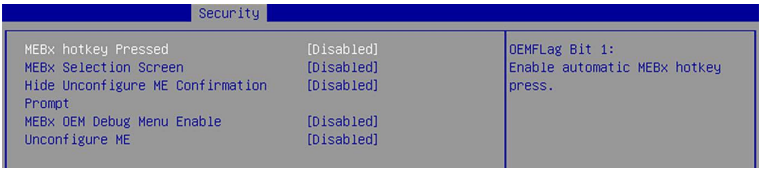
This setting change Secure Erase module behavior.

[Simulated]	Performs SE flow without erasing SSD.
[Real]	Erase SSD.

» **Force Secure Erase**

Setting this option enables/ disables to force Secure Erase on next boot.

▸ **OEM Flag Setting**



» **MEBx hotkey Pressed**

This setting enables/ disables the management Engine BIOS Extension(MEBx) hotkey Pressed.

» **MEBx Selection Screen**

This setting enables/ disables the MEBx Selection Screen.

» **Hide Unconfigure ME Confirmation Prompt**

This setting enables/ disables the Hide Unconfigure ME Confirmation Prompt.

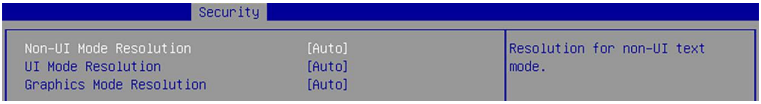
» **MEBx OEM Debug Menu Enable**

This setting enables/ disables the MEBx OEM Debug Menu.

» **Unconfigure ME**

This setting enables/ disables the Unconfigure ME.

▸ **MEBx Resolution Setting**



» **Non-UI Mode Resolution**

Resolution for non-UI text mode.

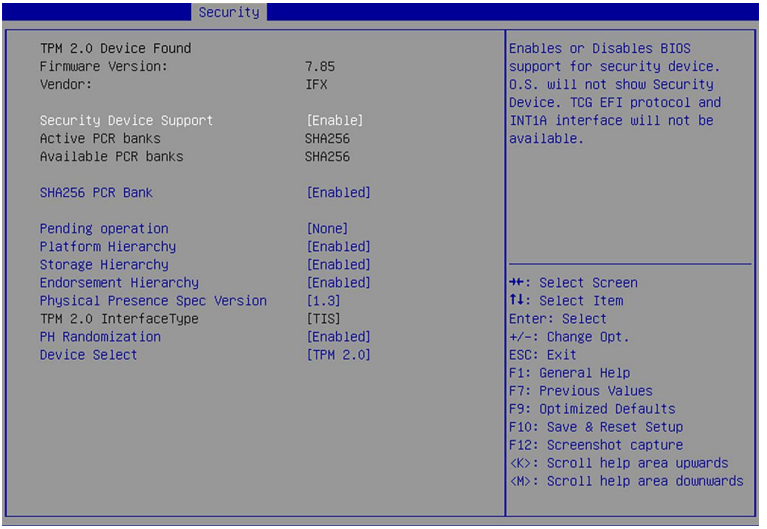
» **UI Mode Resolution**

Resolution for UI text mode.

» **Graphic Mode Resolution**

Resolution for graphics mode.

▶ Trusted Computing



- **Security Device Support**

  This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

- **SHA256 PCR Bank**

  These settings enable/disable the SHA-1 PCR Bank and SHA256 PCR Bank.

- **Pending Operation**

  When **Security Device Support** is set to [Enable], **Pending Operation** will appear. Set this item to [TPM Clear] to clear all data secured by TPM or [None] to discard the selection. It is advised that users should routinely back up their TPM secured data.

- **Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy**

  These settings enable/disable the Platform Hierarchy, Storage Hierarchy and Endorsement Hierarchy.

- **Physical Presence Spec Version**

  This settings show the Physical Presence Spec Version.

- **TPM 2.0 Interface Type**

  This setting shows the TPM 2.0 Interface Type.

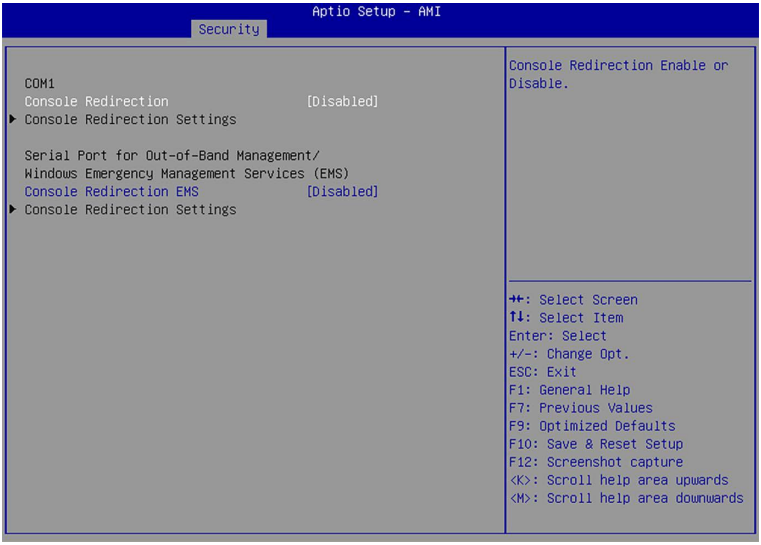
- **PH Randomization**

  This setting enables/disables PH Randomization.

- **Device Select**

  Select your TPM device throgh this setting.

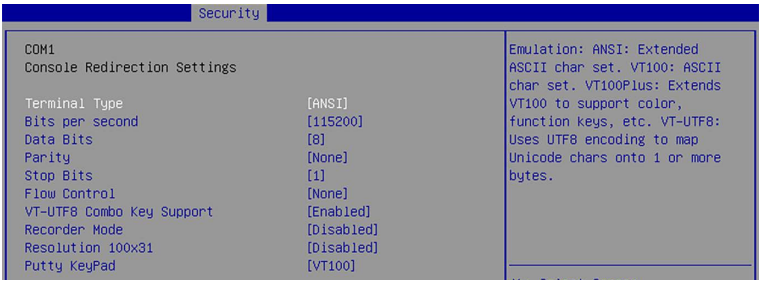
▶ Serial Port Console Redirection



▸ Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

▸ **Console Redirection Settings (COM1)**



» **Terminal Type**

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). You can select emulation for the terminal from this setting.

[ANSI]	Extended ASCII character set.
[VT100]	ASCII character set.
[VT100Plus]	Extends VT100 to support color, function keys, etc.
[VT-UTF8]	Uses UTF8 encoding to map Unicode characters onto one or more bytes.

» **Bits per second, Data Bits, Parity, Stop Bits**

These setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

» **Flow Control**

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

» **VT-UTF8 Combo Key Support**

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

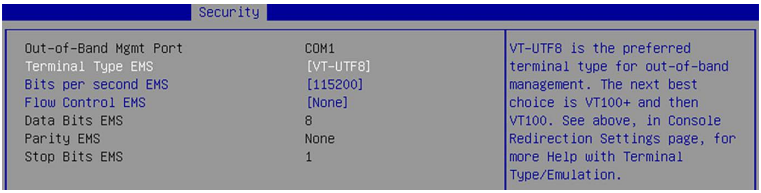
» **Recorder Mode, Resolution 100x31**

These settings enable/disable the recorder mode and the resolution 100x31.

» **Putty Keypad**

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

▸ **Console Redirection Settings (Out-of-Band Management)**



» **Out-of-Band Mgmt Port**

This setting specifies the Out-of-Band Management Port.

» **Terminal Type EMS (Windows Emergency Management Service)**

You can select the type of terminal device for console redirection from this setting. **[VT-UTF8]** is the preferred terminal type for the out-of-band management. The next best choice is **[VT100+]** and then **[VT100]**. See above in **Console Redirection Setting** page for more help with Terminal Type/ Emulation.

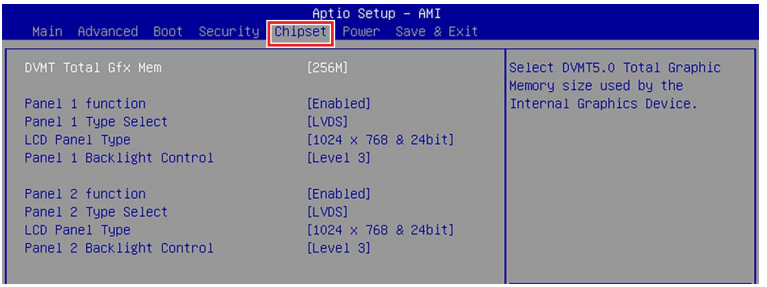
Flow Control EMS (Windows Emergency Management Service)

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

» **Bits per second EMS, Data Bits EMS, Parity EMS, Stop Bits EMS**

This setting specifies the transfer rate of Console Redirection.

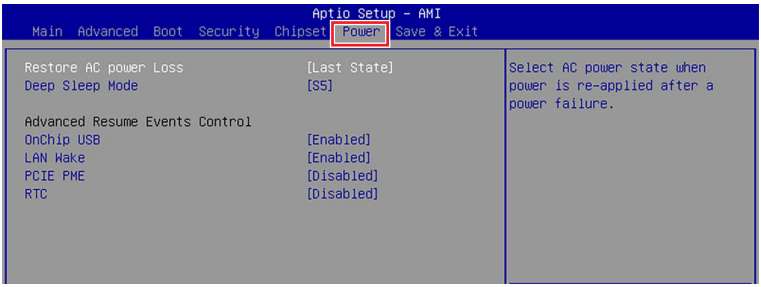
Chipset



▶ DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

Power



▶ Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off] Leaves the computer in the power off state.

[Power On] Leaves the computer in the power on state.

[Last State] Restores the system to the previous status before power failure or interrupt occurred.

▶ Deep Sleep Mode

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can "wake" on input from the keyboard, clock, modem, LAN, or USB device.

**** Advanced Resume Events Control ****

▶ OnChip USB

The item allows the activity of the OnChip USB device to wake up the system from S4/ S5 sleep state.

▶ PCIE PME

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE PME is detected.

▶ RTC

When [Enabled], your can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

Save & Exit

▶ Save Changes and Reset

Save changes to CMOS and reset the system.

▶ Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

▶ Discard Changes

Abandon all changes.

▶ Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

▶ Save as User Defaults

Save changes as the user's default profile.

▶ Restore User Defaults

Restore the user's default profile.

▶ Launch EFI Shell from filesystem device

This setting helps to launch the EFI Shell application from one of the available file system devices.

GPIO WDT BKL SMBus Programming

This chapter provides WDT (Watch Dog Timer), GPIO (General Purpose Input/ Output) LVDS Backlight and SMBus Access programming guide.

Abstract

In this section, code examples based on C programming language provided for customer interest. **Inportb, Outportb, Inportl** and **Outportl** are basic functions used for access IO ports and defined as following.

Inportb: Read a single 8-bit I/O port.

Outportb: Write a single byte to an 8-bit port.

Inportl: Reads a single 32-bit I/O port.

Outportl: Write a single long to a 32-bit port.

General Purpose IO

1. General Purposed IO – GPIO/DIO

The GPIO port configuration addresses are listed in the following table:

Name	IO Port	IO address	Name	IO Port	IO address
N_GPI0	0x22	Bit 4	**N_GPO0**	0x11	Bit 4
N_GPI1	0x22	Bit 5	**N_GPO1**	0x11	Bit 5
N_GPI2	0x22	Bit 6	**N_GPO2**	0x11	Bit 6
N_GPI3	0x22	Bit 7	**N_GPO3**	0x11	Bit 7
N_GPI4	0x42	Bit 0	**N_GPO4**	0x21	Bit 0
N_GPI5	0x42	Bit 1	**N_GPO5**	0x21	Bit 1
N_GPI6	0x42	Bit 2	**N_GPO6**	0x21	Bit 2
N_GPI7	0x42	Bit 3	**N_GPO7**	0x21	Bit 3

Note: GPIO should be accessed through controller device **0x6E** on SMBus. The associated access method in examples (**SMBus_ReadByte**, **SMBus_WriteByte**) are provided in part 4.

1.1 Set output value of GPO

1. Read the value from GPO port.
2. Set the value of GPO address.
3. Write the value back to GPO port.

Example: Set **N_GPO0** output "high"

```
val =SMBus_ReadByte (0x6E, 0x11);      // Read value from N_GPO0 port through SMBus.
val = val | (1<<4);                    // Set N_GPO0address (bit 4) to 1 (output "high").
SMBus_WriteByte (0x6E, 0x11, val);     // Write back to N_GPO0 port through SMBus.
```

Example: Set **N_GPO1** output "low"

```
val = SMBus_ReadByte (0x6E, 0x11);     // Read value from N_GPO1 port through SMBus..
val = val & (~(1<<5));                 // Set N_GPO1 address (bit 5) to 0 (output "low").
SMBus_WriteByte (0x6E, 0x11, val);     // Write back to N_GPO1 port through SMBus.
```

1.2 Read input value from GPI:

1. Read the value from GPI port.
2. Get the value of GPI address.

Example: Get **N_GPI2** input value.

```
val = SMBus_ReadByte (0x6E, 0x22); // Read value from N_GPI2 port through SMBus.
val = val & (1<<6);                // Read N_GPI2 address (bit 6).
if (val)    printf ("Input of  N_GPI2  is High");
else        printf ("Input of  N_GPI2  is Low");
```

Example: Get **N_GPI3** input value.

```
val = SMBus_ReadByte (0x6E, 0x22);   // Read value from N_GPI3 port through SMBus.
val = val & (1<<7);                  // Read N_GPI3 address (bit 7).
if (val)    printf ("Input of  N_GPI3  is High");
else        printf ("Input of  N_GPI3  is Low");
```

Watchdog Timer

2. Watchdog Timer – WDT

The base address (WDT_BASE) of WDT configuration registers is 0xA10.

2.1 Set WDT Time Unit

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x08;                       // minute mode. val = val & 0xF7 if second mode
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting
```

2.2 Set WDT Time

```
Outportb (WDT_BASE + 0x06, Time);       // Write WDT time, value 1 to 255.
```

2.3 Enable WDT

```
val = Inportb (WDT_BASE + 0x0A);        // Read current WDT_PME setting
val = val | 0x01;                       // Enable WDT OUT: WDOUT_EN (bit 0) set to 1.
Outportb (WDT_BASE + 0x0A, val);        // Write back WDT setting.
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val | 0x20;                       // Enable WDT by set WD_EN (bit 5) to 1.
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting.
```

2.4 Disable WDT

```
val = Inportb (WDT_BASE + 0x05);        // Read current WDT setting
val = val & 0xDF;                       // Disable WDT by set WD_EN (bit 5) to 0.
Outportb (WDT_BASE + 0x05, val);        // Write back WDT setting.
```

2.5 Check WDT Reset Flag

If the system has been reset by WDT function, this flag will set to 1.

```
val = Inportb (WDT_BASE + 0x05);          // Read current WDT setting.
val = val & 0x40;                         // Check WDTMOUT_STS (bit 6).
if (val)     printf (“timeout event occurred”);
else         printf (“timeout event not occurred”);
```

2.6 Clear WDT Reset Flag

```
val = Inportb (WDT_BASE + 0x05);          // Read current WDT setting
val = val | 0x40;                         // Set 1 to WDTMOUT_STS (bit 6);
Outportb (WDT_BASE + 0x05, val);          // Write back WDT setting
```

4. SMBus Access

The base address of SMBus must know before access. The relevant bus and device information are as following.

```
#define IO_SC               0xCF8
#define IO_DA               0xCFC
#define PCIBASEADDRESS      0x80000000
#define PCI_BUS_NUM         0
#define PCI_DEV_NUM         31
#define PCI_FUN_NUM         4
```

4.1 Get SMBus Base Address

```
int SMBUS_BASE;
int DATA_ADDR = PCIBASEADDRESS + (PCI_BUS_NUM<<16) +
                                 (PCI_DEV_NUM<<11) +
                                 (PCI_FUN_NUM<<8);

Outportl (DATA_ADDR + 0x20, IO_SC);
SMBUS_BASE = Inportl (IO_DA) & 0xfffffff0;
```

4.2 SMBus_ReadByte (char DEVID, char offset)

Read the value of OFFSET from SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID + 1); //out Base + 04, (DEVID + 1)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);   //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);     //out Base + 02, 48H
mdelay (20);                                     //delay 20ms to let data ready
while ((Inportl (SMBUS_BASE) & 0x01) != 0);      //wait SMBus ready
SMB_DATA = Inportb (LOWORD (SMBUS_BASE) + 0x05); //input Base + 05
```

4.3 SMBus_WriteByte (char DEVID, char offset, char DATA)

Write DATA to OFFSET on SMBus device DEVID.

```
Outportb (LOWORD (SMBUS_BASE), 0xFE);
Outportb (LOWORD (SMBUS_BASE) + 0x04, DEVID);     //out Base + 04, (DEVID)
Outportb (LOWORD (SMBUS_BASE) + 0x03, OFFSET);    //out Base + 03, OFFSET
Outportb (LOWORD (SMBUS_BASE) + 0x05, DATA);      //out Base + 05, DATA
Outportb (LOWORD (SMBUS_BASE) + 0x02, 0x48);      //out Base + 02, 48H
mdelay (20);                                      //wait 20ms
```