MS-C927

Industrial Data Machine

User Guide

Contents

Revision

V1.0, 2026/01

Regulatory Notices

CE Conformity

This product has been tested and found to comply with the harmonized standards for Information Technology Equipment published under Directives of Official Journal of the European Union.

FCC-B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital 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 the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the measures listed below:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

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:

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

WEEE Statement

European Union: This symbol on the product indicates that this product cannot be discarded as municipal waste. Instead, it is your responsibility to dispose of your waste electrical and electronic equipment by handing it over to a designated collection point for recycling. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

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

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 <https://csr.msi.com/global/pevn_ewaste> and locate a nearby distributor for further recycling information.
- Please visit <https://us.msi.com/page/recycling> for information regarding the recycling of your product in the US.

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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.

Safety Information

Please read and follow these safety instructions carefully before installing, operating or performing maintenance on the equipment.

General Safety Instructions

- Always read the safety instructions carefully.
- Keep this User' s Manual for future reference.
- Keep this equipment in a dry, humidity-free environment.
- Ensure that all components are securely connected to prevent issues during operation.
- Do not cover the air openings to prevent overheating.
- Avoid spilling liquids into the equipment to prevent damage or electrical shock.
- Do not leave the equipment in an unconditioned environment. Storage temperatures above 60°C (140°F) may cause damage.

Electrostatic Discharge (ESD) Precautions

The components included in this package are sensitive to electrostatic discharge. Follow these guidelines to prevent ESD-related damage:

- Hold the motherboard by the edges to avoid touching sensitive components.
- Wear an ESD wrist strap. If not available, discharge static electricity by touching a metal object before handling.
- When not installed, store the motherboard in an electrostatic shielding container or place it on an anti-static pad.

Power Safety

- Always turn off the power supply and unplug the power cord from the outlet before installing or removing any component.
- Ensure the electrical outlet provides the same voltage as indicated on the PSU before connecting.
- Arrange the power cord to avoid tripping hazards or damage. Do not place objects over the power cord.
- If the power cord comes with a 3-pin plug, do not disable the protective earth pin from the plug. The device must be connected to an earthed mains socket-outlet.

Installation Instructions

- Lay the equipment on a stable, flat surface before setting it up.
- Before turning on the system, ensure there are no loose screws or metal components on the motherboard or within the system case.
- Do not boot the computer before completing all installations. Premature booting can cause permanent damage to components and pose safety risks.

When to Contact Service Personnel

Immediately consult service personnel if any of the following situations arise:

- The power cord or plug is damaged.
- Liquid has entered the equipment.
- The equipment has been exposed to moisture.
- The equipment does not function as described in the User Guide.
- The equipment has been dropped or physically damaged.
- The equipment shows visible signs of breakage.

ErP (Energy-related Products) Directive

ErP (Energy-related Products) Directive is a European Union regulation that requires energy-related products to minimize power consumption, especially in off-mode and standby mode.

For IPC systems sold in the EU market, ErP compliance typically requires standby or off-mode power consumption to be lower than 1.0W, in order to reduce unnecessary energy loss and improve overall energy efficiency.

Note:

For the C927 design, achieving power consumption below 1.0W requires the use of a 12V power adaptor. Other adaptor configurations may not meet the ErP < 1.0W requirement.

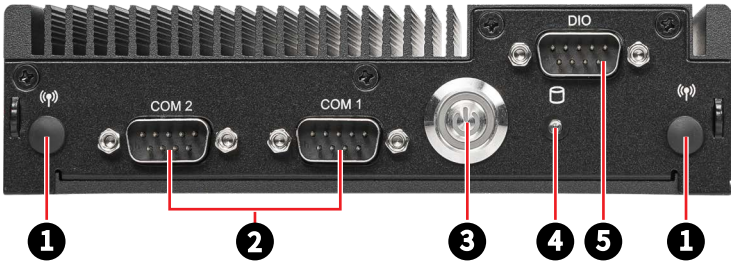
Specifications

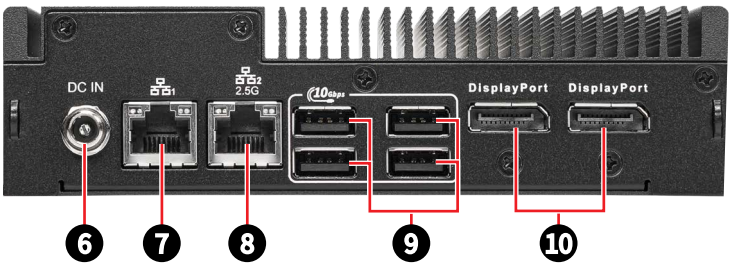
Model	MS-C927
Processor	• Intel® Core Ultra Processors (Series 1) Meteor Lake-U Series • Intel® Core Ultra Processors (Series 2) Arrow Lake-U Series
Chipset	Within processor
Memory	2 x DDR5 SO-DIMM slot (262-pins) - Dual-Channel for DDR5, Non-ECC - Up to 6400 MT/s (Arrow Lake-U) - Up to 5600 MT/s (Meteor Lake-U) - Up to 96GB
Network	• 1 x Intel® I219LM 1.0 GbE LAN • 1 x Intel® I226-V 2.5 GbE LAN
Audio	Realtek® ALC897 High Definition Audio Codec
Graphics	Engine within processor • 2 x DisplayPort 1.4a, up to 4096×2304 @ 60Hz
Storage	• 1 x M.2 M Key slot (2280) - Supports PCIe 4.0 x4 signal - Supports NVMe devices
Expansion Slots	• 1 x M.2 E Key slot (2230) - Supports PCIe x1 & USB 2.0 signals - Supports CNVi modules - Support Intel® Wi-Fi 6E AX210, AX211 (CNVi), and Intel® Wi-Fi 7 BE200 • 1 x M.2 B Key slot (2242/ 3042) - Supports PCIe x1/ SATA 3.0 & USB 2.0 signals
Wireless Connection	2 x Openings reserved for antennas - Supports Wi-Fi/ BT
Power Solution	1 x 12V ~ 24V DC-in power jack
Front Panel I/O	• 2 x Antenna connectors • 2 x RS-232/422/485 serial ports • 1 x Power button/ Power LED • 1 x Hard disk drive (HDD) LED • 1 x DIO Port

Continued on next column

Model	MS-C927
Rear Panel I/O	• 1 x DC power jack • 1 x RJ-45 1.0 GbE LAN port • 1 x RJ-45 2.5 GbE LAN port • 2 x Dual USB 3.2 Gen 1 Type-A connectors (5V/1A) • 2 x DisplayPort (1.4a)
Dimension	130mm (W) x 155mm (D) x 40mm (H)
Weight	1.05 kg
Mounting	Wall mount
Accessories	• 1 x 19V, 90W Power Adapter • 1 x Wall Mounting Bracket
OS Support	• Windows 10 IoT Enterprise 21H2 LTSC (64-Bit) • Windows 11 IoT Enterprise 24H2 LTSC (64-Bit) • Linux (support by request)
Regulatory Compliance	FCC Class B / CE / RCM / BSMI / VCCI / UKCA / IC / RoHS Compliant/ IEC 62368: CE(LVD)
Environment	• Operation Temperature: -20 ~ 60°C (w/ WT devices) • Storage Temperature: -20 ~ 80°C • Operation Humidity: 10 ~ 90%, non-condensing • Storage Humidity: 10 ~ 90%, non-condensing • Vibration: IEC 61373 Category 1 – Class B • Shock: IEC 61373 Category 1 – Class B

System Overview





1

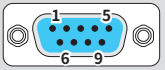
Wi-Fi Antenna Connectors

These connectors allow you to connect an external antenna for wireless communication.

2

RS232/422/485 Serial Ports: COM1, COM2

The serial port is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. You can attach a serial mouse or other serial devices directly to the connector.



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 TXD+	Transmit Data, Positive
3	422 RXD+	Receive 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	0V/5V/12V	Power Pin

RS485		
PIN	SIGNAL	DESCRIPTION
1	D-	Data, Negative
2	D+	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	0V/5V/12V	Power Pin

3

Power Button/ Power 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

4

HDD Activity LED

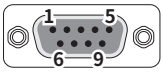
This indicator shows the activity status of the HDD. It flashes when the system is accessing data on the HDD and remains off when no disk activity is detected.

Continued on next column

5

DIO Port

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



PIN	SIGNAL	PIN	SIGNAL
1	GPO0	6	GPI1
2	GPO1	7	GPI2
3	GPO2	8	GPI3
4	GPO3	9	VCC5
5	GPI0	Shell	GND

6

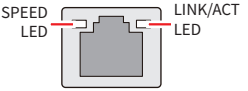
DC Power Jack

Power supplied through this jack supplies power to the system.

7

1.0 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.

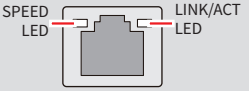


LED	Status	Description
Link/ Activity LED	Off	No link
	Yellow	Linked
	Blinking	Data activity
Speed LED	Off	10 Mbps
	Green	100 Mbps
	Orange	1.0 Gbps

8

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

9

USB 3.2 Gen 1 Port

These connectors are provided for USB peripheral devices. (Speed up to 10 Gbps)

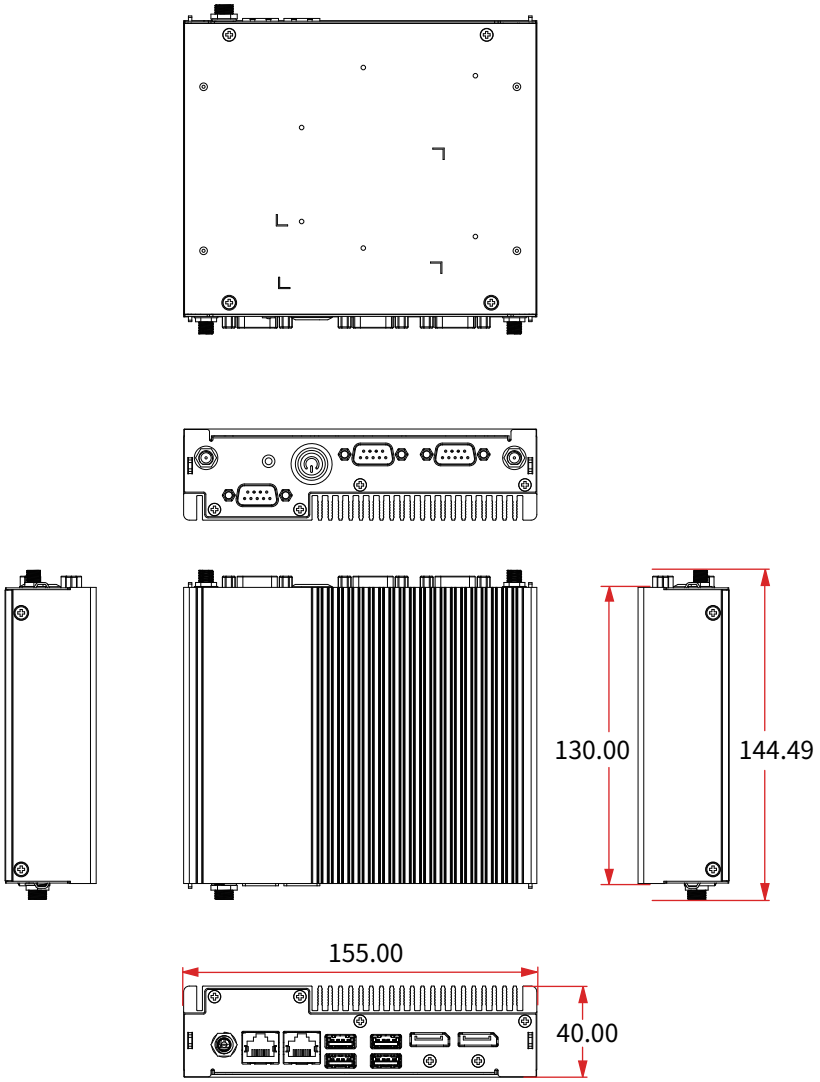
10

DisplayPort 1.4

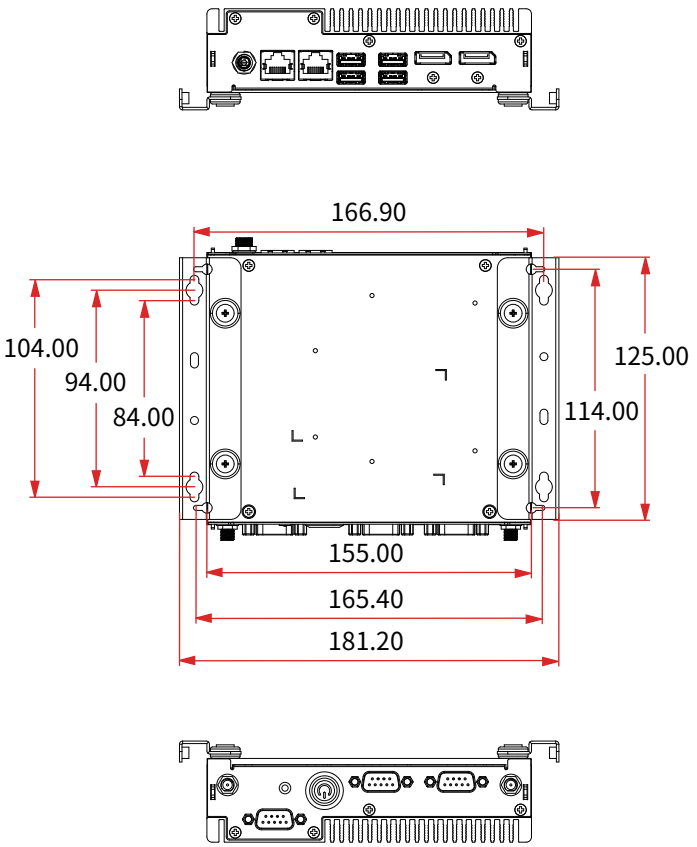
Support a maximum resolution of 4096x2304 at 60Hz.

ME Overview

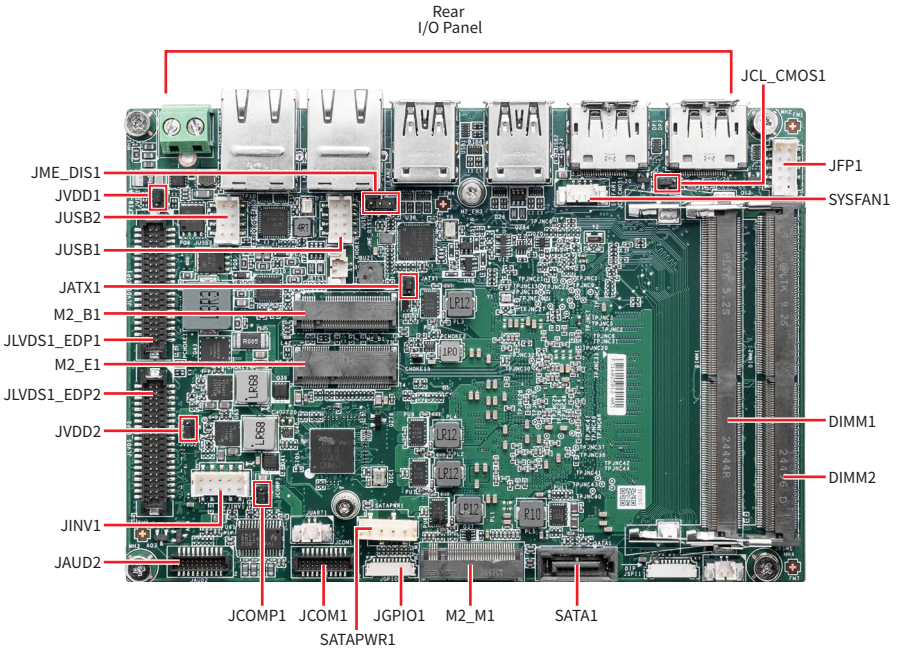
System Dimensions



System Dimensions with Wall Mount



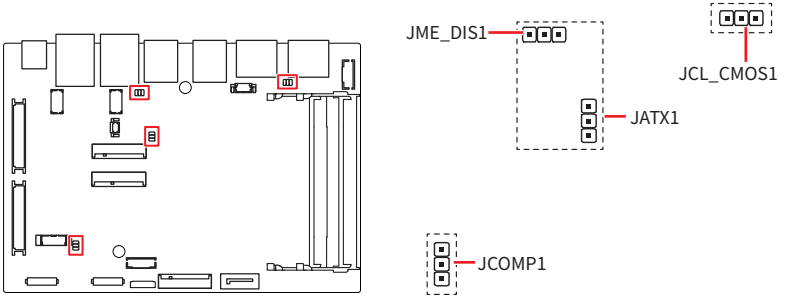
Motherboard Overview



Jumpers

Important

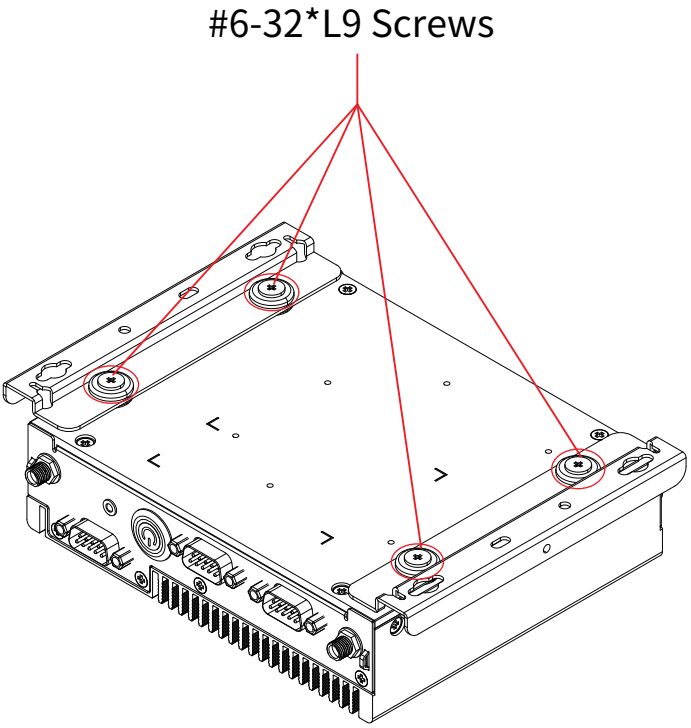
Avoid adjusting jumpers when the system is on; it will damage the motherboard.



Jumper Name	Default Setting	Description
JCL_CMOS1	1	**Clear CMOS Jumper** 1-2: Normal (Default) 2-3: Clear CMOS
JME_DIS1	1	**ME Jumper** 1-2: Normal (Default) 2-3: ME disabled
JCOMP1	1	**COM Voltage Select Jumper** 1-2: 5V Power (Default) 2-3: 12V Power
JATX1	1	**AT/ ATX Mode Select Jumper** 1-2: ATX (Default) 2-3: AT

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.

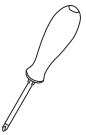


Getting Started

Important

- *All information is subject to change without prior notice.*
- *Before you remove or install any components, make sure the system is not turned on or connected to the power.*
- *The illustrations are provided for demonstrative purposes only. The appearance and internal view 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.

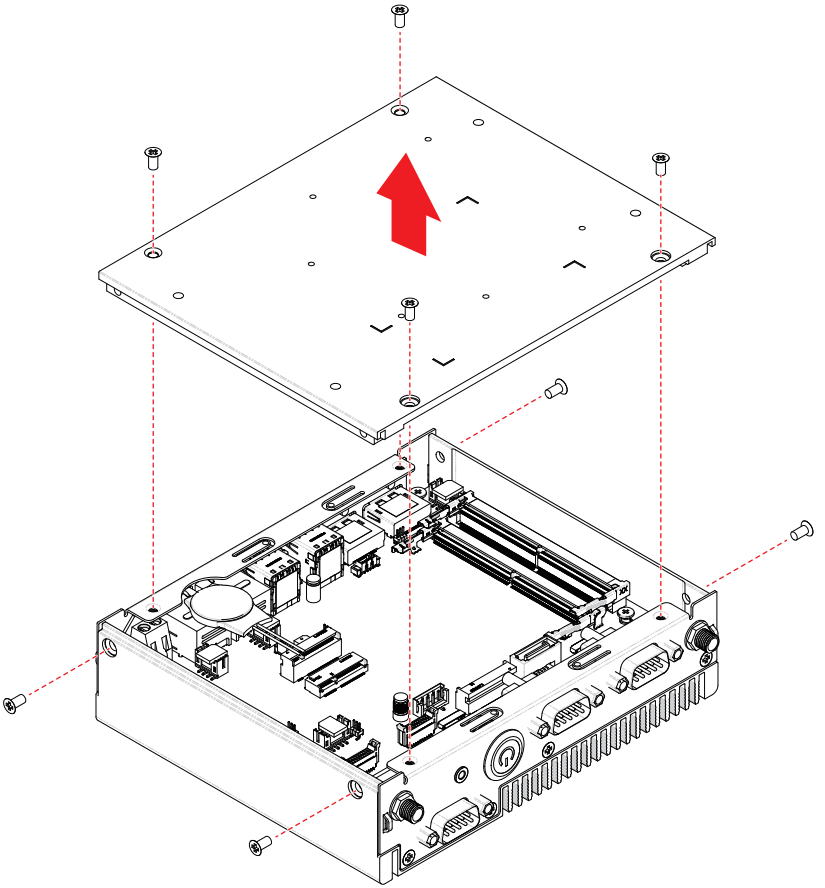
Removing System Cover

Important

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

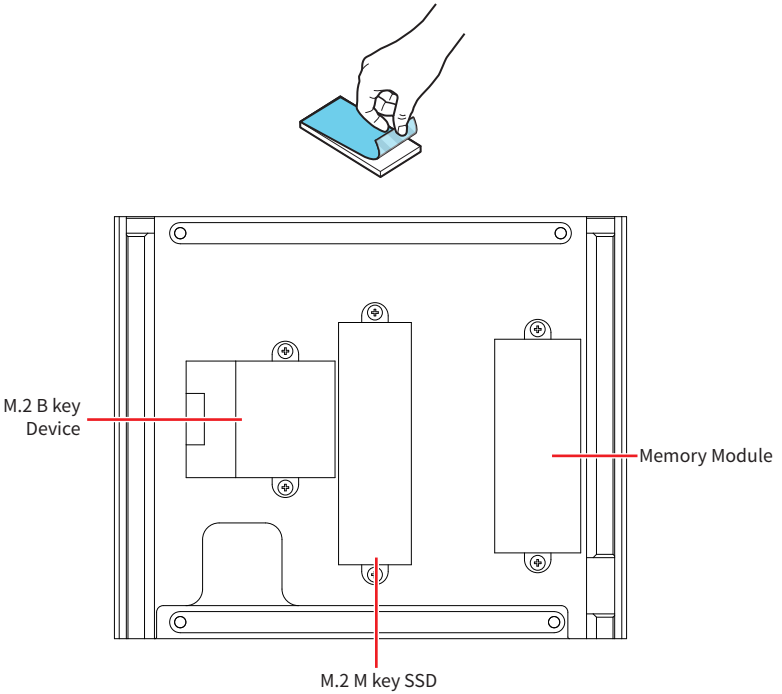
1. Place the system on a flat and steady surface. Locate and remove the screw on the back side.
2. Carefully remove the cover and set the cover and screw aside for later use.

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

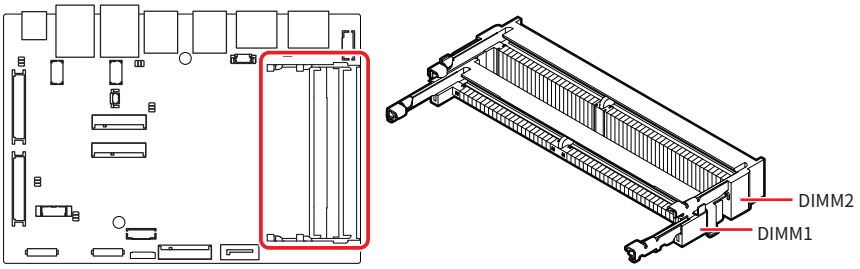


Installing System Cover

1. Locate the thermal pads on the **backside** of the system cover.
2. Remove the protective films of thermal pads if the corresponding components are installed.
3. Install the system cover.



Installing Memory Module



DDR5 DIMM Thermal Pad Thickness Recommendations

Location (Thermal Pad)	Thermal Pad Thickness	MSI PN
Closest to motherboard	1.75mm	E26-C927010-Z36
In the middle of two DIMMs	1.25mm	E26-C910051-Z36

Installing Memory Module

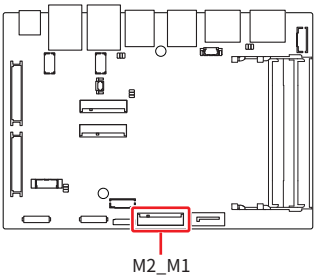
1. Align the notch on the memory module with the key on the slot and insert the memory module into the slot at a 45-degree angle.
2. Push the memory module gently downwards until the slot clips click and lock the memory module in place.
3. Install more DIMMs if necessary.

- *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.*

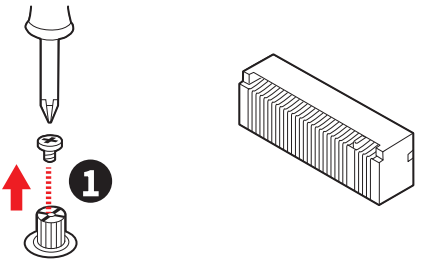
Installing M.2 SSD (M-Key)



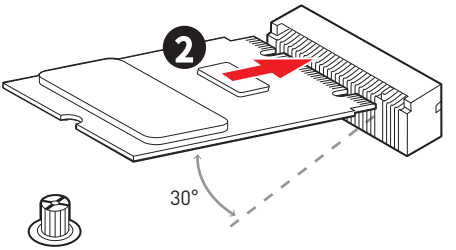
Video Demonstration

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

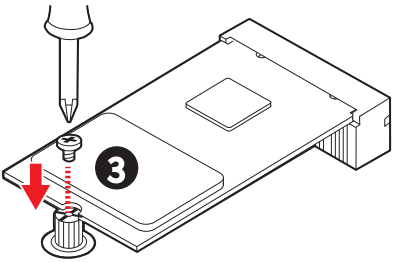
1. Loosen the M.2 screw from the motherboard.



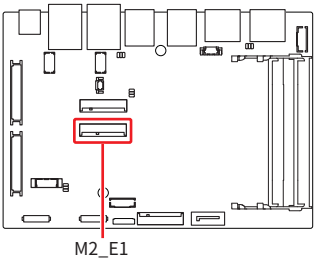
2. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.



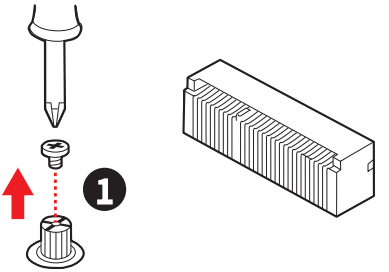
3. Secure the M.2 SSD in place with the supplied M.2 screw.



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



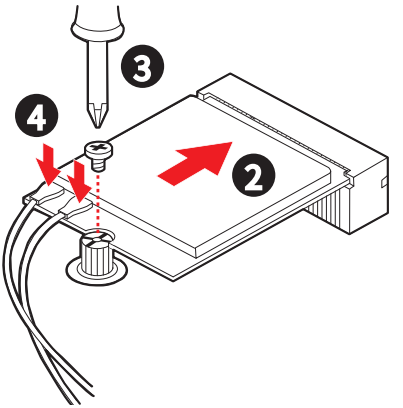
1. Loosen the M.2 screw from the motherboard.



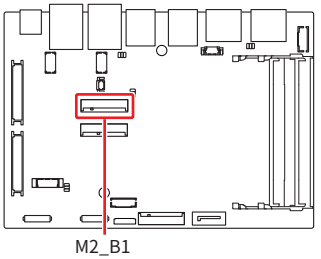
2. Insert your M.2 Wi-Fi card into the M.2 slot at a 30-degree angle.

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

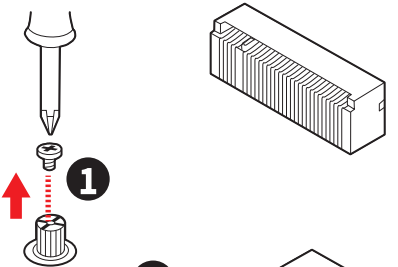
4. Locate the antenna cables and gently connect them to the Wi-Fi card.



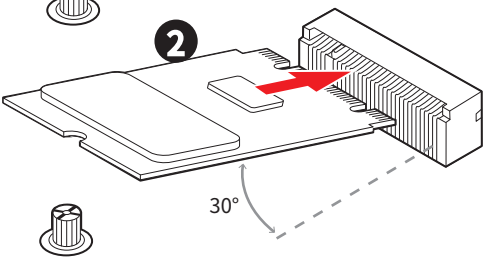
Installing M.2 Expansion Card (B-Key)



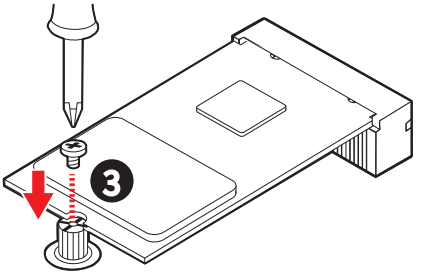
1. Loosen the M.2 screw from the motherboard.



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.



Important

When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

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, **<F11>** to Boot Order Menu.

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
F8	Search setup items
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.

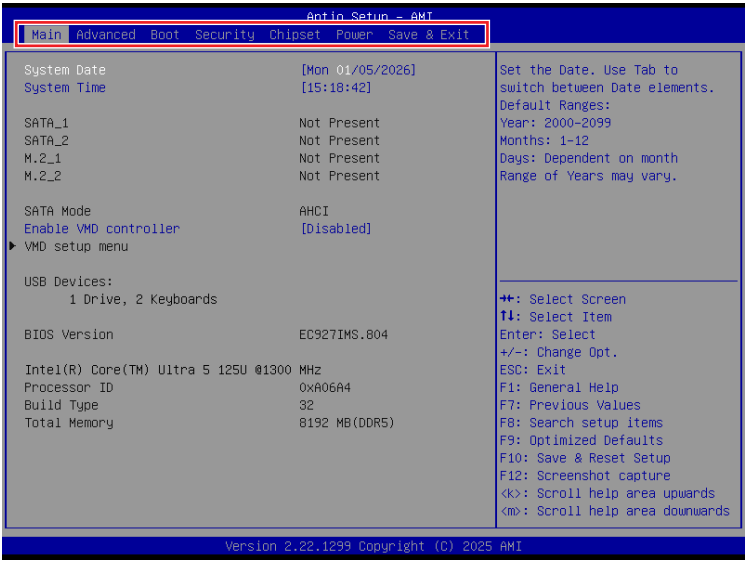
Sub-Menu

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 on-board chipsets.

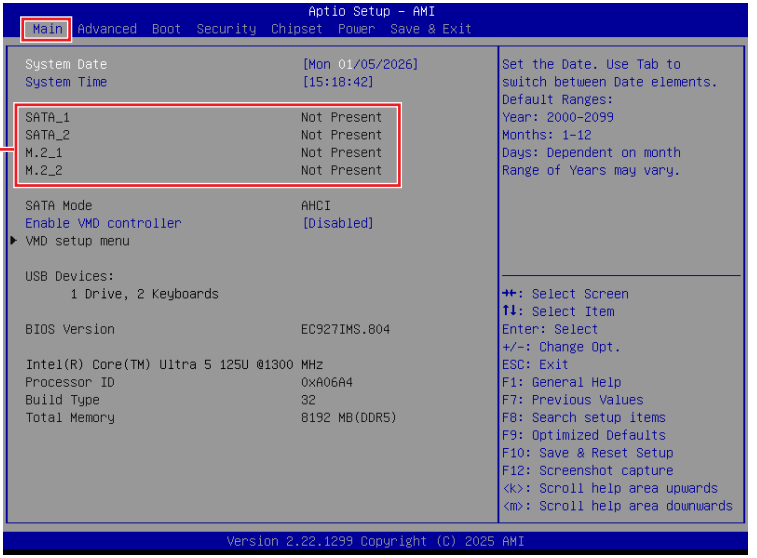
- **Power**

  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



*__SATA_2__ is for M.2 B key (SATA signal)

► **System Date**

This setting allows you to set the system date. Use <Tab> key to switch between Date elements.

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

► **System Time**

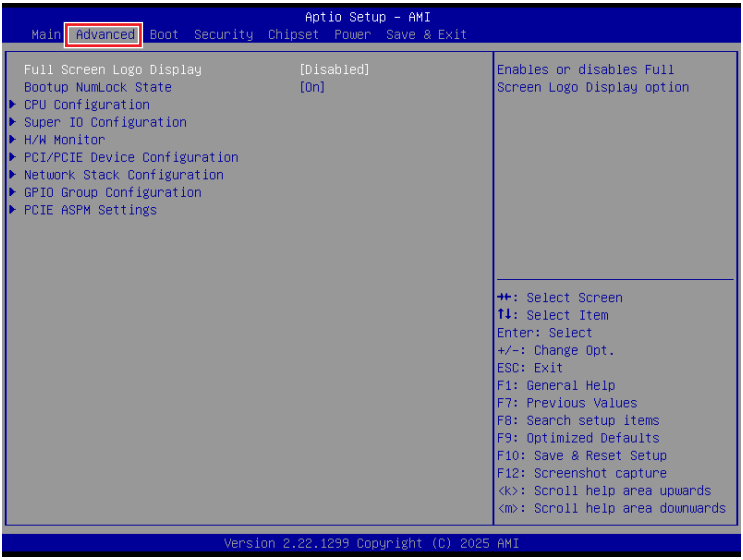
This setting allows you to set the system time. Use <Tab> key to switch between Time elements.

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

► **Enable VMD controler**

Enables or disables VMD (RAID) controler.

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.

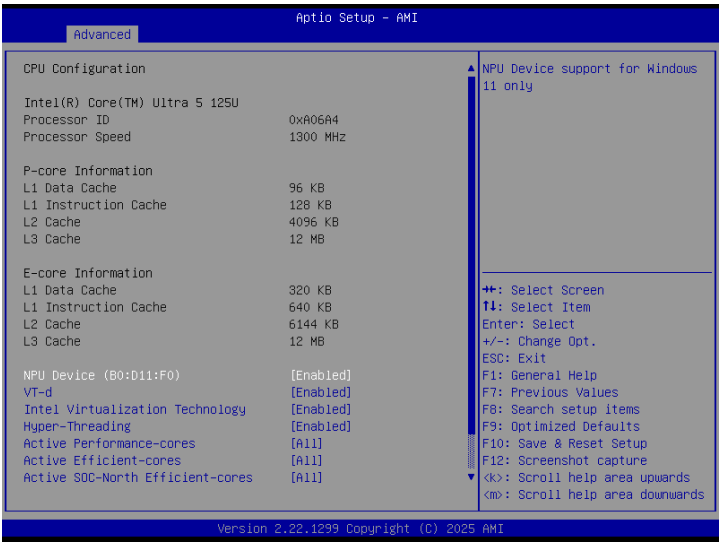
Please note that enabling this BIOS feature often adds 2-3 seconds to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, **it is recommended to disable this BIOS feature for faster boot-up.**

► Bootup NumLock State

This setting is to set the state of the Num Lock key on the keyboard 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.

► CPU Configuration



Important

The following items are displayed based on the supported CPU.

- **NPU Device**

  Enables or disables the Neural Processing Unit (NPU) for AI workload acceleration.

- **VT-d**

  Enables or disables Intel VT-D (Intel Virtualization for Directed I/O) technology.

- **Intel Virtualization Technology (VT-x)**

  Enables or disables Intel Virtualization technology.

  [Enabled] Enables Intel Virtualization technology and allows a platform to run multiple operating systems in independent partitions. The system can function as multiple systems virtually.

  [Disabled] Disables this function.

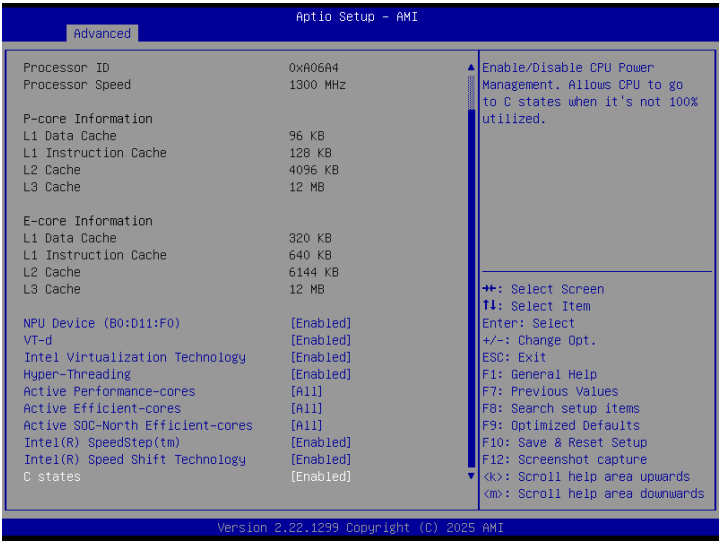
- **Hyper-Threading (HT Function)**

  Enables or disables Intel Hyper-Threading technology.

  The processor uses Hyper-Threading technology to improve utilization of the CPU resources and potentially increasing overall performance by allowing it to handle multiple threads simultaneously. If you disable the function, it will restricts the CPU to operate as a single-threaded processor, with only one logical core per physical core. Please disable this item if your operating system does not support HT Function or unreliability and instability may occur.

- **Active Performance-cores**

  Select the number of active Performance-cores (P-cores).



▸ **Active Efficient-cores**

Select the number of active Efficient-cores (E-cores).

▸ **Active SOC-North Efficient-cores**

Select the number of active Low Power Efficient-cores (LP E-cores).

▸ **Intel(R) SpeedStep(TM)**

Enhanced Intel SpeedStep® Technology enables the OS to control and activate performance states (P-States) of the processor.

[Enabled] When enabled, Intel SpeedStep® technology is activated. This technology allows the processor to manage its power consumption via performance state (P-State) transitions.

[Disabled] Disables this function

▸ **Intel(R) Speed Shift Technology**

Intel® Speed Shift Technology is an energy-efficient method that allows frequency control by hardware rather than the OS.

[Enabled] When enabled, Intel® Speed Shift Technology is activated. The technology enables the management of processor power consumption via hardware performance state (P-State) transitions.

[Disabled] Disable this function.

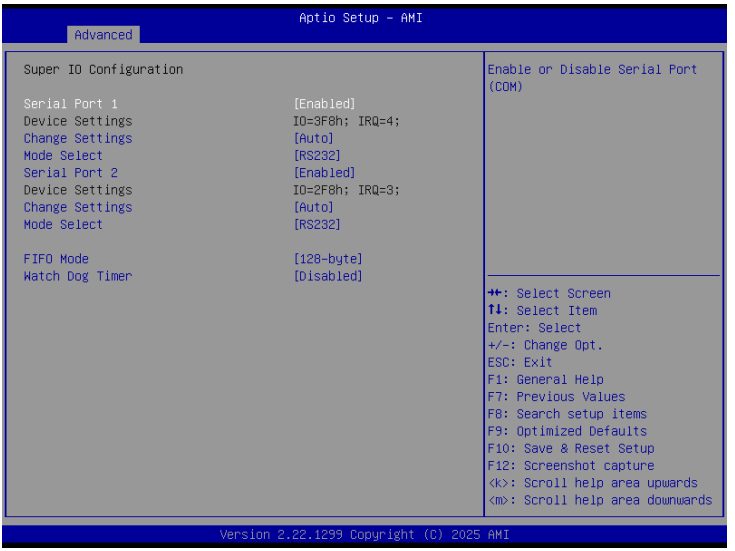
▸ **C States**

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.

► Super IO Configuration



▸ Serial Port 1/ 2

These settings enable or disable 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.

▸ FIFO Mode

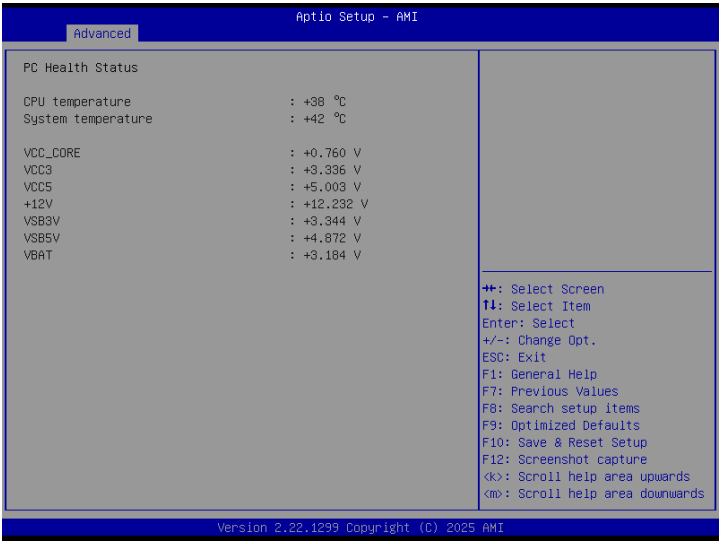
This setting controls the FIFO (First In First Out) data transfer mode.

▸ Watch Dog Timer

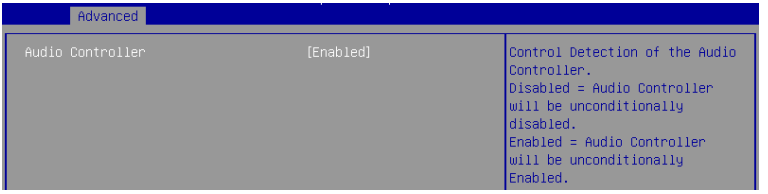
You can enable the system watchdog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watchdog polls it.

► 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.



► PCI/PCIE Device Configuration

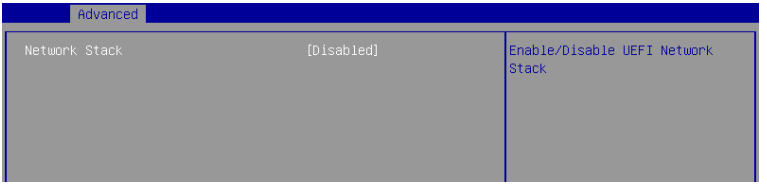


▸ Audio Controller

This setting enables or disables the detection of the onboard audio controller.

► 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 or disable the network stack function, which allows the system to boot from a network device using protocols such as PXE (Preboot Execution Environment) and HTTP. The following items will display when "**Network Stack**" is enabled.

» **IPV4 PXE Support**

Enables or disables support for IPv4-based PXE booting.

» **IPV4 HTTP Support**

Enables or disables for IPv4-based HTTP booting.

» **IPV6 PXE Support**

Enables or disables for IPv6-based PXE booting.

» **IPV6 HTTP Support**

Enables or disables for IPv6-based HTTP booting.

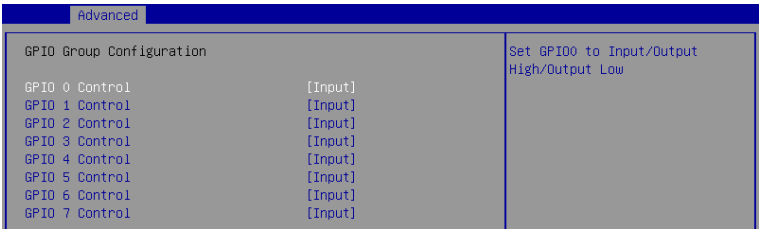
» **PXE boot wait time**

Use this option to specify the wait time to press the **<ESC>** key to abort the PXE boot. Press **<+>** or **<->** on your keyboard to change the value. The default setting is 0.

» **Media detect count**

Use this option to specify the number of times media will be checked. Press **<+>** or **<->** on your keyboard to change the value. The default setting is 1.

► GPIO Group Configuration

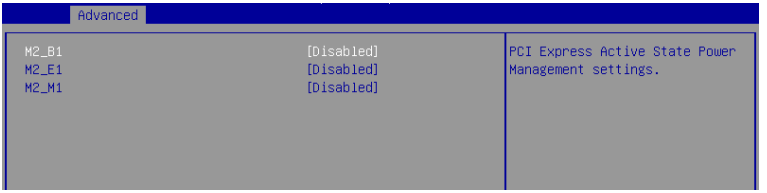


▸ GPO 0 ~ 7 Control

These settings control the operation mode of the specified GPIO.

► PCIE ASPM Settings

This menu provide settings for PCIe ASPM (Active State Power Management) level for different installed devices.

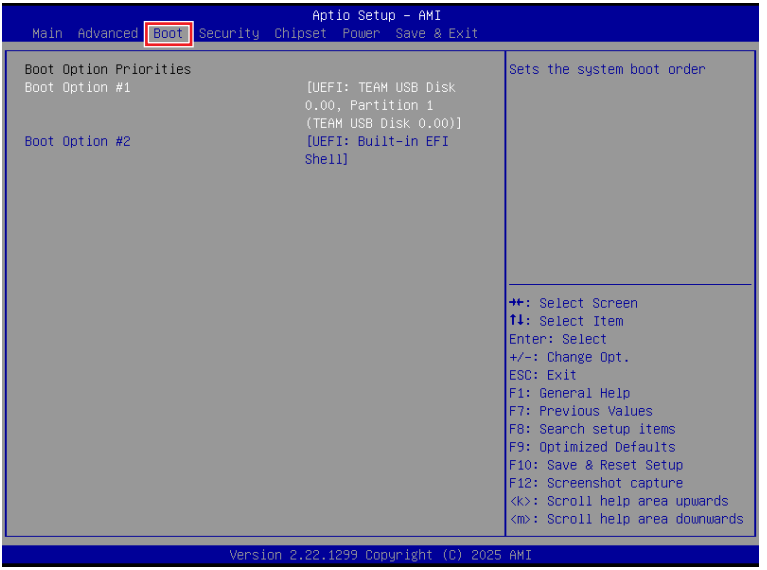


▸ M2_B1/ M2_E1/ M2_M1

Sets PCI Express ASPM (Active State Power Management) state for power saving.

[L0s]	Initiate an automatic shutdown of the system to protect from potential damage due to overheating.
[L1]	Higher latency, lower power "standby" state **(optional)**.
[L0sL1]	Activate both L0s and L1 support.
[Disabled]	Disable this function.

Boot



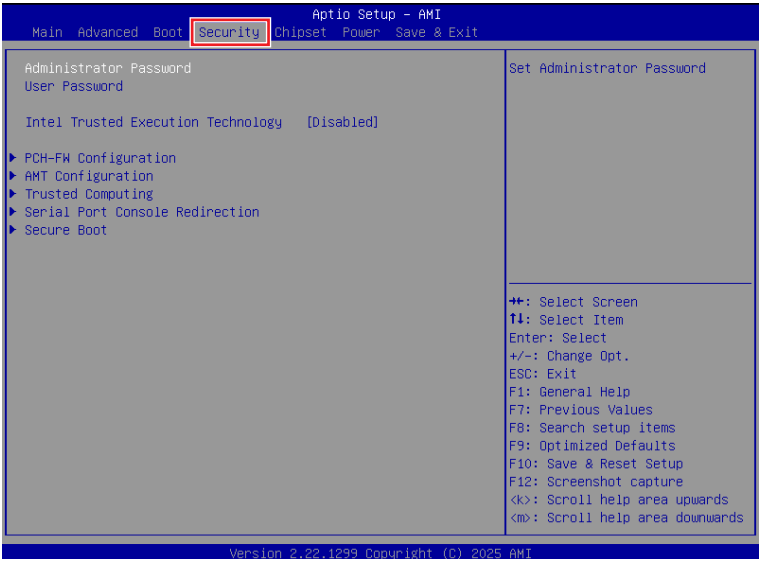
► Boot Option #1-2

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

Important

Disabled all boot option will return BIOS Setup.

Security



► Administrator Password

Sets administrator password for system security. User has full rights to change the BIOS items with administrator password.

► User Password

Sets User Password for system security. User has limited rights to change the BIOS items with user password. This item will be available when administrator password is set.

► Intel Trusted Execution Technology

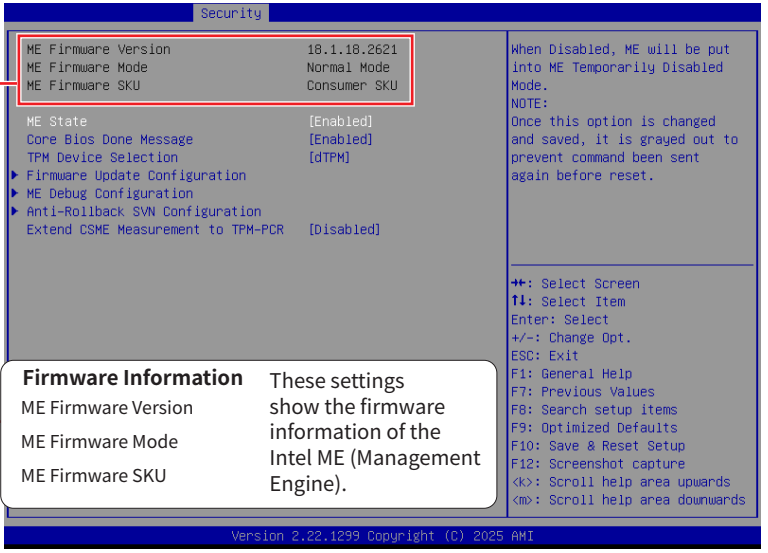
Enables or disables the Intel Trusted Execution Technology. Intel® Trusted Execution Technology (Intel® TXT) is a security feature that provides hardware-based security to protect the system and maintain the confidentiality and integrity of data stored or created on the system.

Important

- *The following items **must be enabled** before **"Intel Trusted Execution Technology"** can be enabled:*
  - All Intel processor cores
  - Hyper-threading
  - Intel Virtualization Technology
  - Trusted Platform Module (TPM)
  - Secure Boot

► PCH-FW Configuration

This menu allows you to configure settings related to the Platform Controller Hub (PCH) Firmware.



▸ ME State

This menu controls the Intel® Management Engine State (ME state) parameters, which provides various management and security capabilities. The following items will display when "**ME State**" is enabled.

▸ Core BIOS Done Message

Enables or disables Core BIOS Done Message sent to ME.

▸ TPM Device Selection

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

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

▸ Firmware Update Configuration

» **ME FW Image Re-Flash**

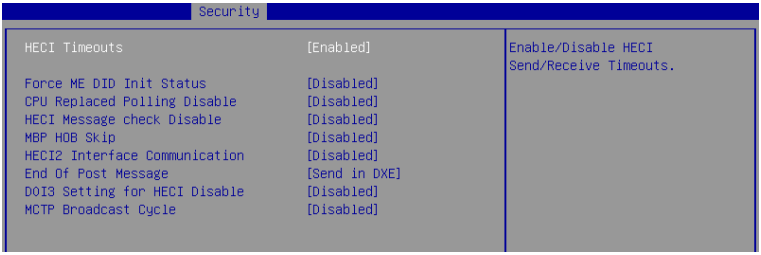
Enables or disables the ME Firmware Image Re-flashing**.**

» **Local FW Update**

Enables or disables the capability to perform a firmware update of the ME locally.

▸ **ME Debug Configuration**

This menu allows you to configure debug-related options for the Intel® Management Engine (ME).



» **HECI Timeouts**

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

» **Force ME DID Init Status**

Forces the ME Device ID (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 ME' s Memory-Based Protection (MBP) H0B region.

» **HECI2 Interface Communication**

This setting Adds/ Removes HECI2 device from PCI space.

» **End of Post Message**

Choose between [disabled] and [Send in DXE] for the display of a message at the end of the Power On Self Test (POST) process. When set to **[disabled],** the end of POST message will not be displayed. However, when set to **[Send in DXE]**, the end of POST message will be displayed after the DXE (Driver Execution Environment) phase starts.

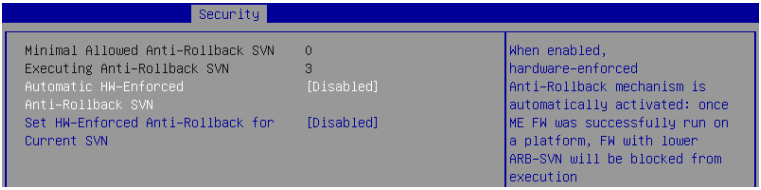
» **DOI3 Setting for HECI Disable**

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

» **MCTP Broadcast Cycle**

Enables or disables Management Component Transport Protocol (MCTP) Broadcast Cycle.

▸ **Anti-Rollback SVN Configuration**



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

Setting this item enables will automatically activate the hardware-enforced anti-rollback protection based on the Secure Version Number (SVN). Once enabled, the hardware will enforce that only firmware updates with an SVN equal to or higher than the current SVN can be installed.

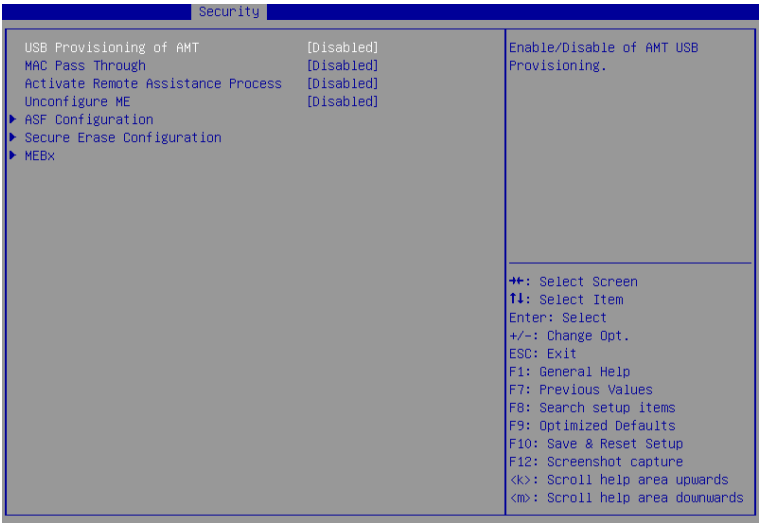
» **Set HW-Enforced Anti-Rollback for Current SVN**

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. This item will display when **Automatic HW-Enforced Anti-Rollback SVN** is enabled.

▸ **Extend CSME Measurement to TPM-PCR**

This setting enables or disables Intel® Converged Security and Management Engine (CSME) measurement extend to TPM-PCR.

► AMT Configuration



- **USB Provisioning of AMT**

  Enables or disables the ability to provision AMT using a USB device.

- **MAC Pass Through**

  Enables or disables the ability of AMT to pass through network traffic without altering the original MAC (Media Access Control) addresses of the network interface. Enabling Mac PASS Through ensures that the network traffic appears to originate from the original MAC address of the system.

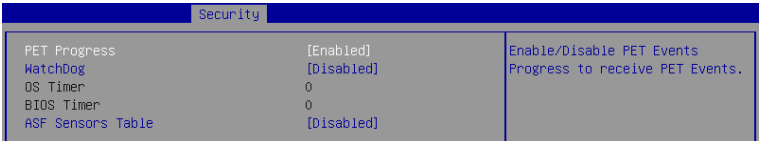
- **Activate Remote Assistance Process**

  Enables or disables remote assistance sessions to be initiated on systems with AMT support.

- **Unconfigure ME**

  Enables or disables the Unconfigure ME.

▸ **ASF Configuration**



» **PET Progress**

Enables or disable the this item to receive PET Events.

» **WatchDog**

Enables or disable the watchdog timer.

» **OS Timer**

This item displays OS Timer.

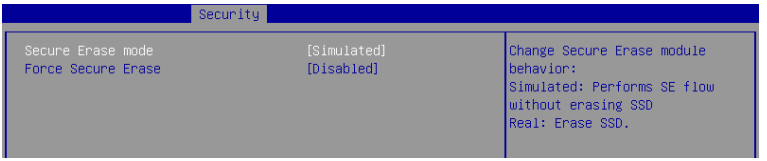
» **BIOS Timer**

This item displays BIOS Timer.

» **ASF Sensor Table**

Enables or disable the 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**

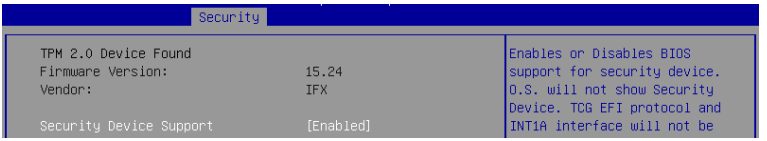
Enables or disables to force Secure Erase on next boot.

▸ **MEBx**

» **Intel(R) ME Password**

Set the Intel® ME Password for securing access to the ME configuration through the MEBx menu. Upon setting up Intel® ME Password for the first time, type **“admin”** as the default password, then enter your own.

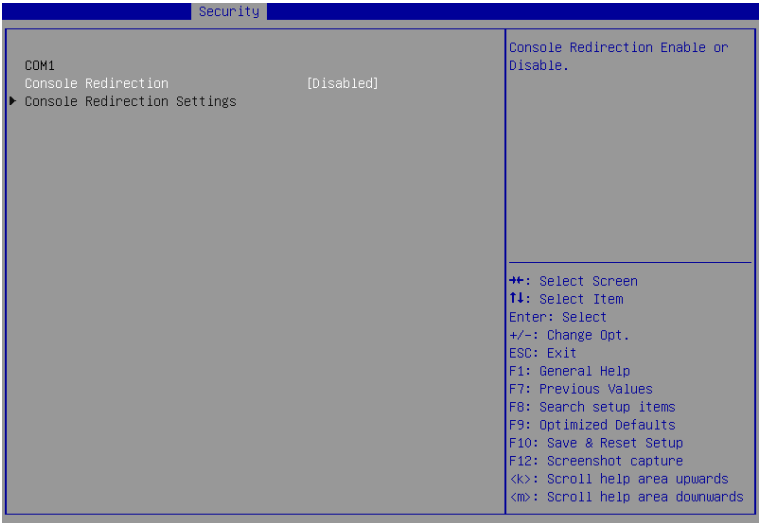
► Trusted Computing



▸ Security Device Support

This item enables or disables BIOS support for security device. When set to [Disable], the OS will not show security device.

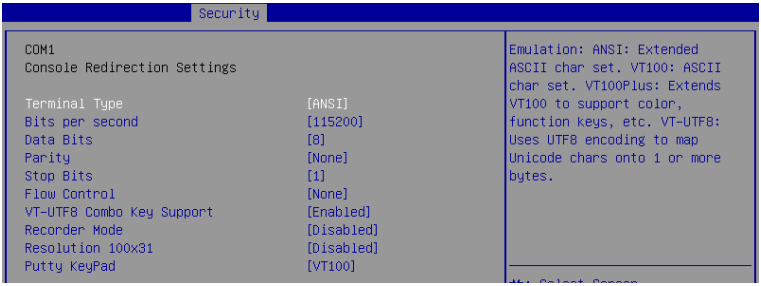
► Serial Port Console Redirection



▸ Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables or 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 is 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 or disables the VT-UTF8 combination key support for ANSI/ VT100 terminals.

» **Recorder Mode**

This setting enables or disables the recorder mode.

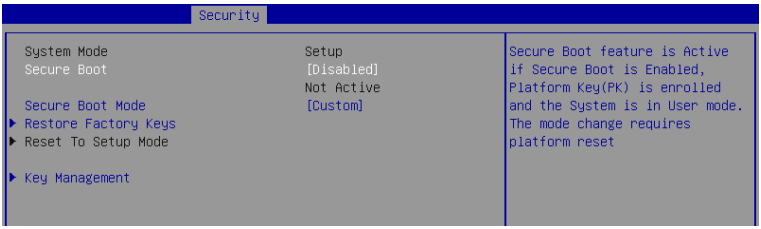
» **Resolution 100x31**

This setting enables or disables the resolution 100x31.

» **Putty KeyPad**

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

► Secure Boot



▸ **Secure Boot**

Secure Boot function can be enabled only when the **Platform Key (PK)** is enrolled and running accordingly.

▸ **Secure Boot Mode**

Selects the secure boot mode. This item is to select how the secure boot keys be loaded. This item appears when "**Secure Boot**" is enabled.

[Standard]	The system will automatically load the secure keys from BIOS.
[Custom]	Allows user to configure the secure boot settings and manually load the secure keys.

▸ **Restore Factory Keys**

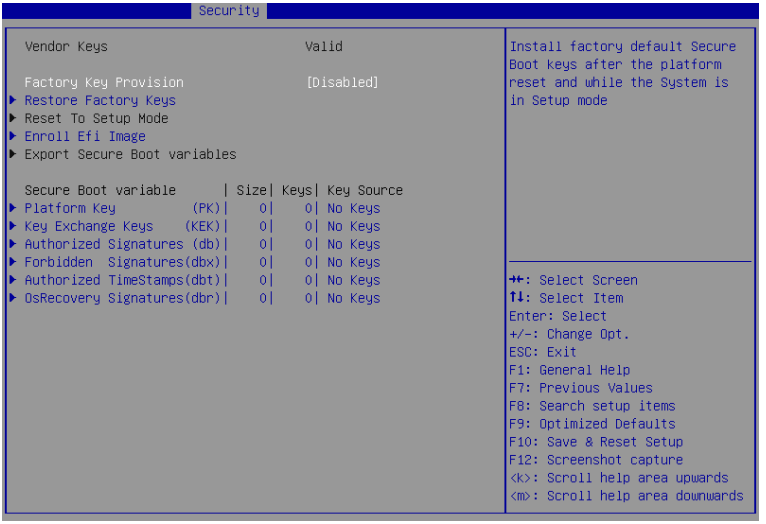
Allows you to restore all factory default keys. The settings will be applied after reboot or at the next reboot. This item appears when "**Secure Boot Mode**" sets to **[Custom]**.

▸ **Reset to Setup Mode**

Allows you to delete all the Secure Boot keys (PK,KEK,db,dbt,dbx). The settings will be applied after reboot or at the next reboot. This item appears when "**Secure Boot Mode**" sets to **[Custom]**.

▸ **Key Management**

Press **Enter** key to enter the sub-menu. Manage the secure boot keys. This item appears when "**Secure Boot Mode**" sets to **[Custom]**.



» **Platform Key (PK):**

The Platform Key (PK) can protect the firmware from any un-authenticated changes. The system will verify the PK before your system enters the OS. Platform Key (PK) is used for updating KEK.

» **Set New Key**

Sets a new PK to your system.

» **Delete Key**

Deletes the PK from your system.

» **Key Exchange Keys (KEK):**

Key Exchange Key (KEK) is used for updating DB or DBX.

» **Set New Key**

Sets a new KEK to your system.

» **Append Key**

Loads an additional KEK from storage devices to your system.

» **Delete Key**

Deletes the KEK from your system.

» **Authorized Signatures (db) :**

Authorized Signatures (db) lists the signatures that can be loaded.

» **Set New Key**

Sets a new db to your system.

» **Append Key**

Loads an additional db from storage devices to your system.

» **Delete Key**

Deletes the db from your system.

» **Forbidden Signatures (dbx):**

Forbidden Signatures (dbx) lists the forbidden signatures that are not trusted and cannot be loaded.

» **Set New Key**

Sets a new dbx to your system.

» **Append Key**

Loads an additional dbx from storage devices to your system.

» **Delete Key**

Deletes the dbx from your system.

» **Authorized TimeStamps (dbt):**

Authorized TimeStamps (dbt) lists the authentication signatures with authorization time stamps.

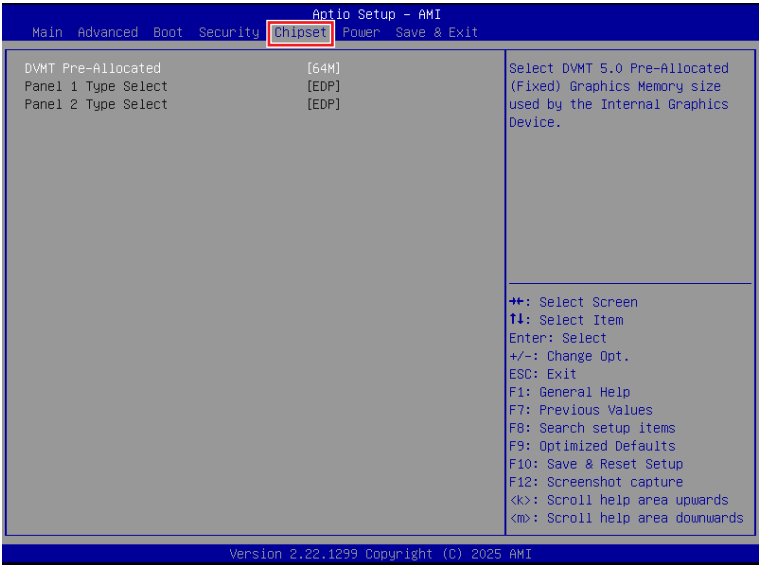
» **Set New Key**

Sets a new DBT to your system.

» **Append Key**

Loads an additional DBT from storage devices to your system.

Chipset



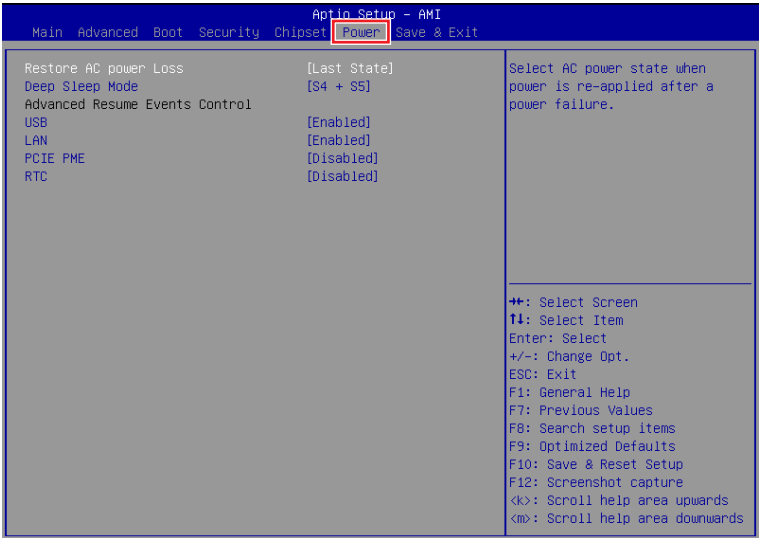
► **DVMT Total Gfx Mem**

This setting specifies the total graphics memory size for Dynamic Video Memory Technology (DVMT).

► **Panel 1/ 2 Type Select**

Set your video signal interface as LVDs or eDP.

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

This setting provides two options: [S4+S5] and [Disabled]. It enables a power-saving mode that reduces energy consumption when the system is off or in a low-power state. Some components remain powered to allow wake-up via the power button or RTC.

► USB

The item allows the activity of the USB device to wake up the system from S3 sleep state.

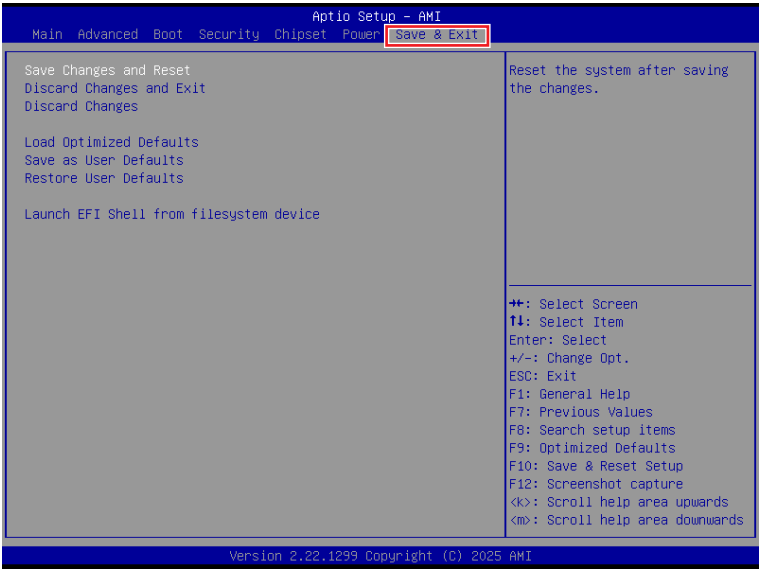
► LAN/ PCIE PME

Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel LAN device and 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 Programming

This chapter provides WDT (Watch Dog Timer), GPIO (General Purpose Input/ Output).

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

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

Name	Output Enable	Output Value	Input Value	Bit
GPIO0	0xB0	0xB1	0xB2	0
GPIO1	0xB0	0xB1	0xB2	1
GPIO2	0xB0	0xB1	0xB2	2
GPIO3	0xB0	0xB1	0xB2	3
GPIO4	0xB0	0xB1	0xB2	4
GPIO5	0xB0	0xB1	0xB2	5
GPIO6	0xB0	0xB1	0xB2	6
GPIO7	0xB0	0xB1	0xB2	7

Note: GPIO control is done via port 0xA00 (index) and 0xA01 (data) for register access. Changes to output value registers are only applied when the GPIO is in output mode.

1.1 Set GPIO Mode (Input or Output):

1. Read the current value from the Output Enable register.
2. Modify the corresponding bit:
   - ✓ Set the bit to 1 for Output mode.
   - ✓ Clear the bit to 0 for Input mode.
3. Write the updated value back to the Output Enable register.

Example: Set **GPIO3** to Input mode

```
Outportb (0xA00, 0xB0);   // Select GPIO3 Output Enable Register (0xB0)
val = Inportb (0xA01);    // Read current value from the register
val = val & (~(1 << 3));  // Clear bit 3 (GPIO3) to 0 (Input mode)
Outportb (0xA01, val);    // Write the updated value back to the register.
```

Example: Set **GPIO7** to Output mode

```
Outportb (0xA00, 0xB0);   // Select GPIO7 Output Enable Register (0xB0)
val = Inportb (0xA01);    // Read current value from the register
val = val | (1<<7);       // Set bit 7 (GPIO7) to 1 (Output mode)
Outportb (0xA01, val);    // Write the updated value back to the register
```

1.2 Set output value of GPIO:

1. Read the current value from the Output value register.
2. Modify the corresponding bit.
   - ✓ Write 1 for logic High.
   - ✓ Write 0 for logic Low.
3. Write the updated value back to the Output value register.

Example: Set **GPIO2** output "high"

```
Outportb (0xA00, 0xB1);   // Select GPIO2 Output value Register (0xB1)
val = Inportb (0xA01);    // Read current value from the register
val = val | (1<<2);       // Set bit 2 (GPIO2) to 1 (output "high")
Outportb (0xA01, val);    // Write the updated value back to the register
```

Example: Set **GPIO6** output "low"

```
Outportb (0xA00, 0xB1);   // Select GPIO6 Output value Register (0xB1)
val = Inportb (0xA01);    // Read current value from the register
val = val & (~(1<<6));    // Clear bit 6 (GPIO6) to 0 (output "low")
Outportb (0xA01, val);    // Write the updated value back to the register
```

1.3 Read input value from GPIO:

1. Read the register value.
2. Mask the corresponding bit to get the pin state:
   - ✓ Bit = 1 : Input is High
   - ✓ Bit = 0 : Input is Low

Example: Get **GPIO1** input value.

```
Outportb (0xA00, 0xB2);   // Select GPIO1 Input value Register (0xB2)
val = Inportb (0xA01);    // Read current value from the register
val = val & (1<<1);       // Read GPIO1 (bit 1).
if (val)    printf ("Input of  GPIO1  is High");
else        printf ("Input of  GPIO1  is Low");
```

Watchdog Timer

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
```