MS-CF17

Industrial Computer Board

User Guide

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V1.7, 2026/09

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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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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.

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.

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.

Specifications

Model	MS-CF17
Dimensions	146(L)mm x 102(W)mm, 3.5 inch

Processor	• 13th Gen Intel® Raptor Lake-P U Series
	• Embedded SKUs
	  • i7-1365UE (vPRO)/i5-1345UE (vPRO)/i5-1335UE/i3-1315UE/U300E, Max 28W
	• Industrial SKUs
	  • i7-1365URE (vPRO)/i5-1345URE (vPRO)/i3-1315URE, Max 28W

Chipset	Within processor
iAMT Support	• AMT 17.x (Only for Intel® i7/ i5 CPU series)

Memory	• 1 x DDR5 SO-DIMM slot (262-pins)
	  • Single-Channel for DDR5, Non-ECC
	  • Up to 5200 MT/s
	  • Up to 32GB

Network	• Embedded SKUs
	  • 4 x Intel® I226-LM 2.5 GbE LAN
	• Industrial SKUs
	  • 4 x Intel® I226-IT 2.5 GbE LAN

Storage	• 1 x SATA 3.0 6Gb/s port
	• 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
	• 1 x M.2 B Key slot (2242/ 3042)
	  • Supports PCIe x1 & USB 2.0 signals
	  • Shared with Nano SIM Holder
	• 1 x Nano SIM Holder
	  • Shared with M.2 B key slot

Audio	• Realtek® ALC897 High Definition Audio Codec

Continued on next column

Model	MS-CF17

Graphics	• 4 x HDMI™ 2.0b up to 4096x2304 @60Hz
	• 1 x LVDS up to 1920x1200 @60Hz (signal shares with eDP)
	  • Supports 18/24-bit dual channel
	  • Supports auto switch between eDP & LVDS
	  • Connector shared with eDP
	• 1 x eDP up to 4096×2304 @60 Hz (signal shares with LVDS)
	  • Supports auto switch between eDP & LVDS
	  • Connector shared with LVDS
	• Supports 4 independent display modes
	  • 4 x HDMI™
	  • 3 x HDMI™ + 1 x eDP/LVDS

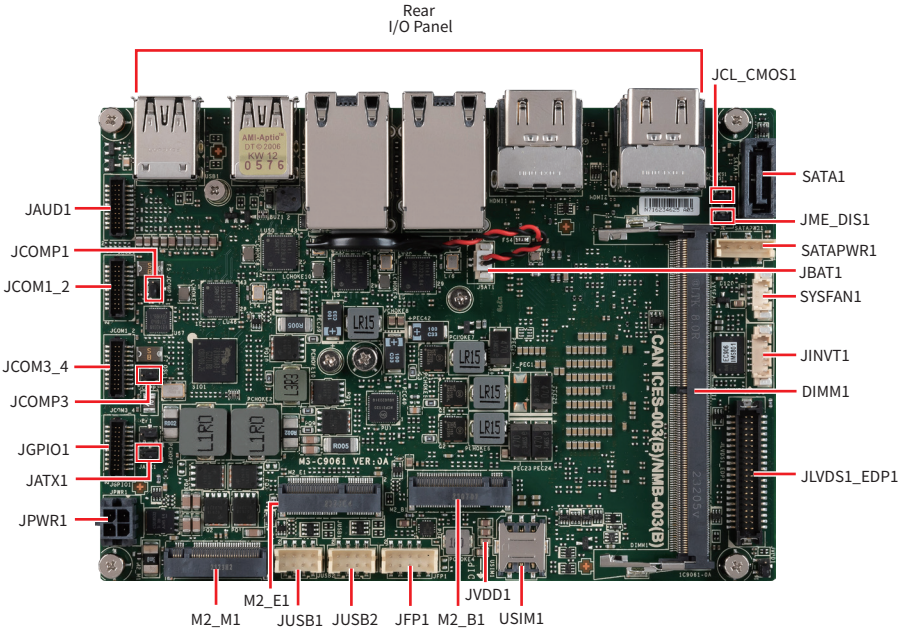
Rear I/O	• 4 x HDMI™ connector • 4 x RJ-45 2.5 Gbps LAN ports • 4 x USB 10Gbps Type-A connectors (5V/0.9A)
USB	• 2 x USB 2.0 header (480 Mbps, for 4 USB ports, 5V/0.5A Each Port)
Power Connectors	1 x 4-pin DC-In power connector (12~24V) *The power adapter you use should provide at least 90W.
Onboard Connectors	• 1 x SATA power connector • 1 x LVDS inverter header • 1 x LVDS + eDP wafer connector • 1 x 4-pin PWM system fan connector • 1 x audio/ amplifier/ SMbus connector • 1 x front panel connector • 1 x GPIO (DIO) header (16-bit, 8 x GPI, 8 x GPO) • 2 x Dual COM port box headers (RS232/ 422/ 485, for 4 COM ports) • 1 x battery header
Jumpers	• 1 x Clear CMOS jumper • 1 x ME jumper • 2 x COM voltage select jumpers • 1 x eDP/LVDS VDD power select jumper • 1 x AT/ ATX mode select jumper
OS Support	• Windows 10 IoT Enterprise 21H2 LTSC (64-Bit) • Windows 11 IoT Enterprise 24H2 LTSC (64-Bit) • Linux (support by request)
Regulatory Compliance	CE, FCC Class A, BSMI, RCM, VCCI, UKCA, IC, IEC 62368: CE (LVD) Compliant

Continued on next column

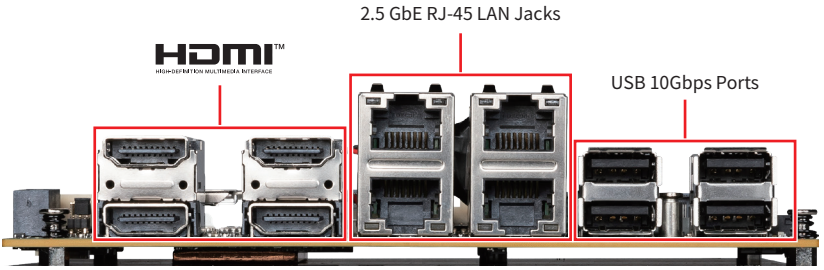
Model	MS-CF17

Environment	• Operation Temperature
	  • Embedded SKUs: 0 ~ 60°C
	  • Thermal Test w/ Airflow: 0.7m/s
	  • The standard thermal solution only supports TDP up to 15W.
	  • Industrial SKUs: -40 ~ 70°C
	  • Thermal Test w/ Airflow: 0.7m/s
	  • The standard thermal solution only supports TDP up to 15W.
	  • -40 ~ 85°C by request
	• Storage Temperature
	  • Embedded SKUs: -20 ~ 80°C
	  • Industrial SKUs: -40 ~ 85°C
	• Relative Humidity: 10 ~ 90%, non-condensing

Motherboard Overview



Rear I/O Panel



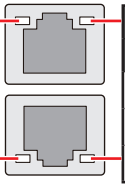
HDMI™ Connector

HDMI™ is an all-digital interface for uncompressed audio/video streams, supporting standard, enhanced, or high-definition video, and multi-channel digital audio on a single cable.

2.5 GbE RJ-45 LAN Jack

The standard RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.

Link/ Activity LED	
Status	**Description**
Off	No link
Yellow	Linked
Blinking	Data activity



Off	10/100 Mbps
Green	1000 Mbps
Orange	2.5 Gbps

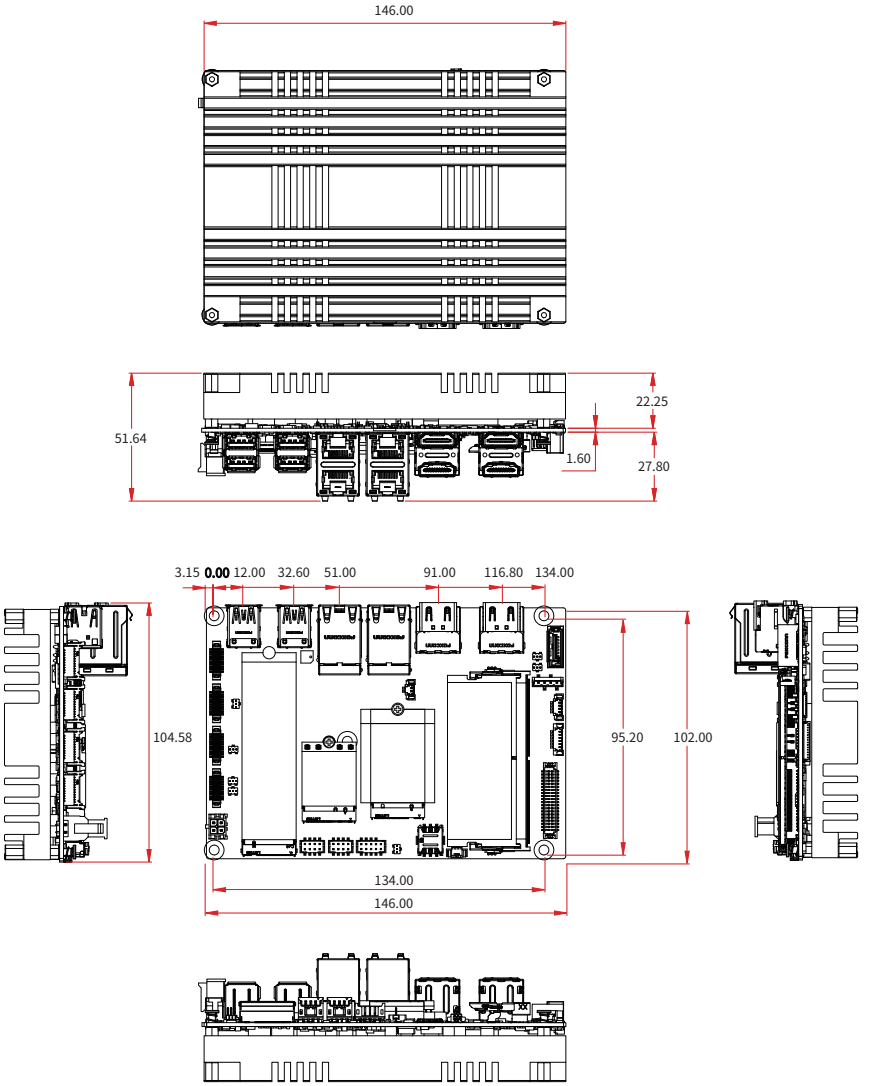
USB 10Gbps Ports

This connector delivers high-speed data transfer for various devices, such as storage devices, hard drives, video cameras, etc.It supports data transfer rates up to 10 Gbps.

ME Overview

Board Dimensions

Unit of measurement: mm



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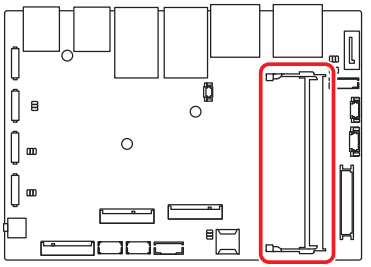
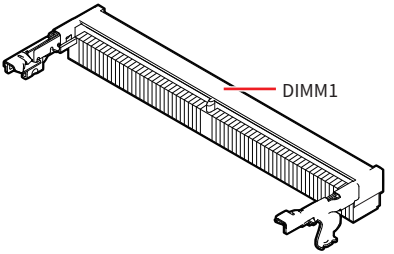
Memory

DIMM1: DDR5 SO DIMM Slots

The DIMM slot is intended for memory modules.





Installing DDR5 SO DIMM Memory Module

1. Locate the SO-DIMM slot. Align the notch on the DIMM with the key on the slot and insert the DIMM into the slot.
2. Push the DIMM gently downwards until the slot levers click and lock the DIMM in place.

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

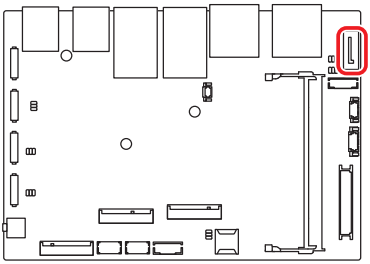
Important

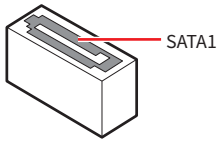
- *You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.*
- *To ensure system stability for Dual channel mode, memory modules must be of the same type, number and density.*

Storage

SATA1: SATA 3.0 6Gb/s Port

The connector is a SATA 6Gb/s interface port, and can connect to one SATA device.



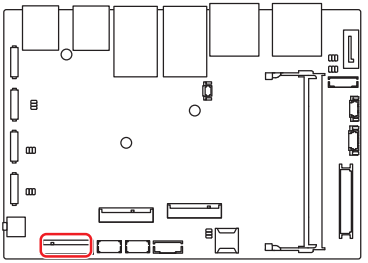


Important

- *The SATA connector supports hot plug.*
- *Please do not fold the SATA cable at a 90-degree angle. Data loss may result during transmission otherwise.*
- *SATA cables have identical plugs on either sides of the cable. However, it is recommended that the flat connector be connected to the motherboard for space saving purposes.*

M2_M1: M.2 Slot (M Key, 2280)

Please install the M.2 solid-state drive (SSD) into the M.2 slot as shown below.



Features

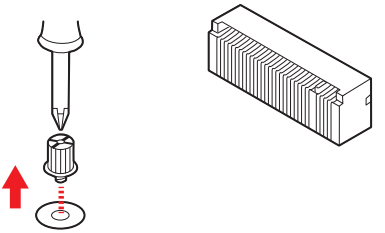
- Supports PCIe 4.0 x4 signal
- Supports NVMe devices

Video Demonstration

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

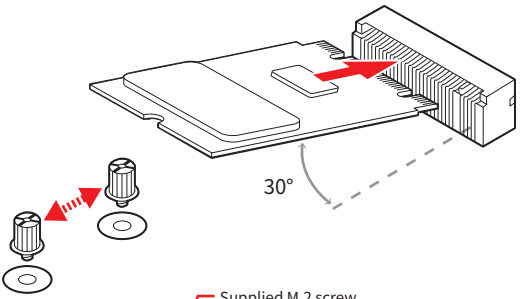
Installing M.2 SSD

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

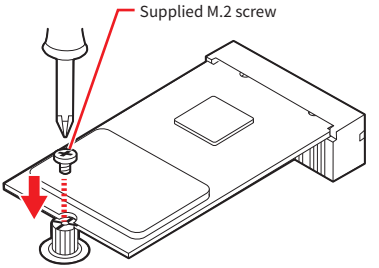


2. Set the M.2 riser screw at the appropriate location based on the length of your M.2 SSD.

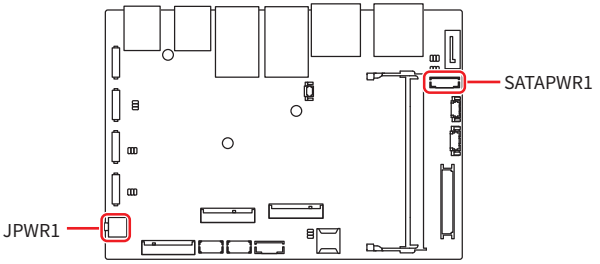
3. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.



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

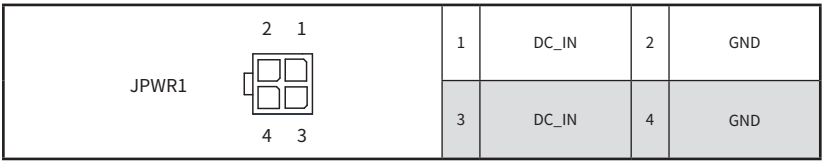


Power Connectors



JPWR1: 4-pin DC-in Power Connector (12V~24V)

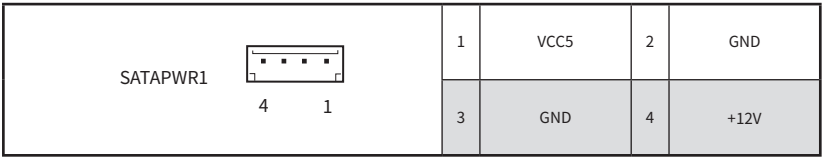
This connector allows you to connect a power supply. To connect to the power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.



1	DC_IN	2	GND
3	DC_IN	4	GND

SATAPWR1: SATA Power Connector

This connector is used to provide power to SATA devices.

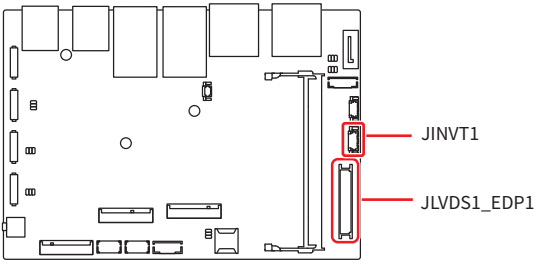


1	VCC5	2	GND
3	GND	4	+12V

Important

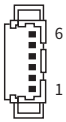
Make sure that all the power cables are securely connected to a proper power supply to ensure stable operation of the system.

Graphics Connectors



JINVT1: LVDS Inverter Header

The connector is provided for LCD backlight options.

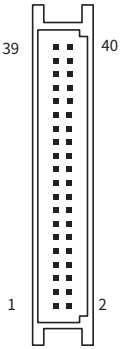
JINVT1 	1	VCC5	2	+12V
	3	INV_ON1_1	4	L_BKLT_CTRL#1_1
	5	GND	6	GND

JLVDS1_EDP1: LVDS + eDP Wafer Connector

The connector is provided for LVDS/eDP interface flat panels. After connecting an LVDS/eDP interface flat panel to this connector, be sure to check the panel datasheet and set the JVDD1 LVDS jumper to proper power voltage.

Important

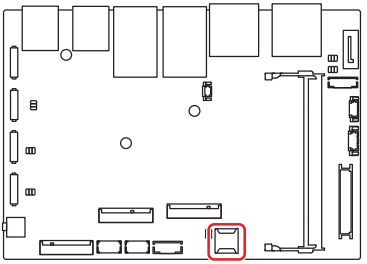
Please refer to the following pages for the pin-out of the LVDS + eDP Wafter Connector and the pin-out for LVDS/eDP interface flat panels.

eDP Panel (P1)	CF17 Motherboard (P2)				eDP Panel (P1)
	JLVDS1_EDP1 				
Lane3_P	EDP_1_LINE3_DP	1	2	EDP_1_LINE2_DP	Lane2_P
Lane3_N	EDP_1_LINE3_DN	3	4	EDP_1_LINE2_DN	Lane2_N
	DDC0_CLK_7513_R_1	5	6	DDC0_DATA_7513_R_1	
LCD_VCC	LCD_VDD_1	7	8	LCD_VDD_1	LCD_VCC
LCD_VCC	LCD_VDD_1	9	10	VCC3	
	LCDEN_1	11	12	LVDS_DETECT#_C_1	LCD_GND
Lane1_P	LVDSA_DATA1_1	13	14	LVDSA_DATA0_1	HPD
Lane1_N	LVDSA_DATA#1_1	15	16	LVDSA_DATA#0_1	
H_GND	GND	17	18	GND	H_GND
	LVDSA_DATA3_1	19	20	LVDSA_DATA2_1	Lane0_P
	LVDSA_DATA#3_1	21	22	LVDSA_DATA#2_1	Lane0_N
H_GND	GND	23	24	GND	H_GND
	LVDSB_DATA1_1	25	26	LVDSB_DATA0_1	
	LVDSB_DATA#1_1	27	28	LVDSB_DATA#0_1	
H_GND	GND	29	30	GND	GND
	LVDSB_DATA3_1	31	32	LVDSB_DATA2_1	
	LVDSB_DATA#3_1	33	34	LVDSB_DATA#2_1	
	CH7513_GPIO5_1	35	36	GND	GND
	LVDSB_CLK_1	37	38	LVDSA_CLK_1	AUX_CH_P
	LVDSB_CLK#_1	39	40	LVDSA_CLK#_1	AUX_CH_N

Important

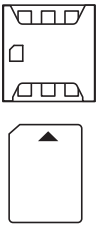
Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

Expansion Slots



USIM1: Nano SIM Holder

This holder is provided for 3G, 4G, LTE, 5G Nano SIM cards.



Feature

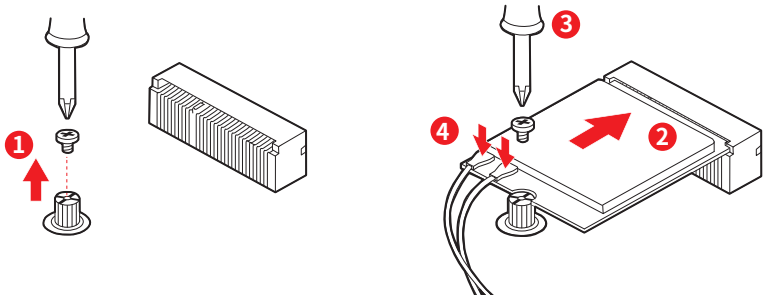
- Shared with M.2 B key slot

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.

M2_E1: M.2 Slot (E Key, 2230)

Please install the Wi-Fi/ Bluetooch card into the M.2 slot as shown below.

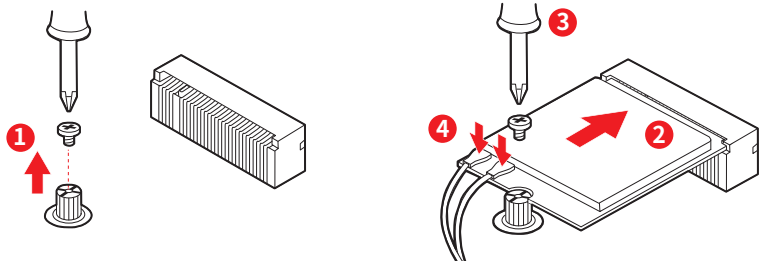


Features

- Supports PCIe x1 & USB 2.0 signals
- Supports CNVi modules

M2_B1: M.2 Slot (B Key, 2242, 3042)

Please install the WWAN Card/ solid-state drive (SSD) into the M.2 slot as shown below.



Features

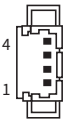
- Supports PCIe x1 & USB 2.0 signals
- Shared with Nano SIM Holder

Other Connectors

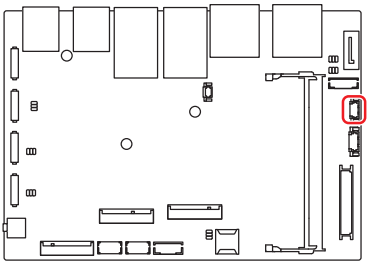
SYSFAN1: 4-pin PWM System Fan Connector

The fan power connector supports system cooling fans with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND. If the motherboard has a System Hardware Monitor chipset onboard, you must use a specially designed fan with speed sensor to take advantage of the fan control.

SYSFAN1



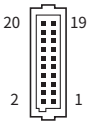
1	GND	2	+12V
3	SYS1_FANTAC	4	SIO_SYS1_FAN



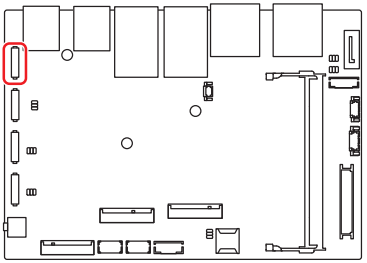
JAUD1: Audio/ Amplifier/ SMBus Connector

This connector allows you to connect audio. It also supports amplifier function to enhance audio performance and SMBus, known as I2C, for connecting System Management Bus (SMBus) interface.

JAUD1

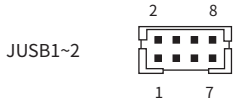


1	LINE_IN_RA	2	MIC1_RA
3	LINE_IN_LA	4	MIC1_LA
5	LINE_OUT_R_F_J	6	MIC1_JD
7	LINE_OUT_L_F_J	8	LINE1_JD
9	FRONT_JD	10	AGND
11	AGND	12	AGND
13	5VSB	14	AMP_L-
15	SMBCLK_MAIN	16	AMP_L+
17	SMBDATA_MAIN	18	AMP_R-
19	GND	20	AMP_R+

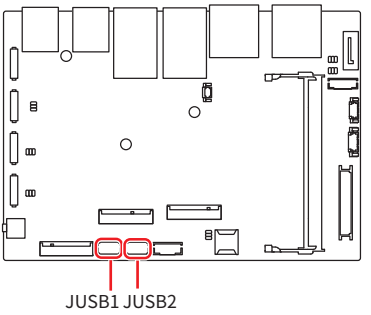


JUSB1~2: USB 2.0 Headers

These headers is ideal for connecting USB devices such as keyboard, mouse, or other USB-compatible devices. It supports data transfer rate up to 480 Mbps.

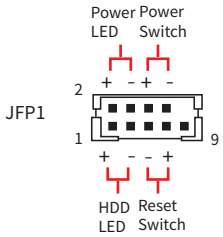


	1	5V	2	GND
	3	USB1-	4	USB2+
	5	USB1+	6	USB2-
	7	GND	8	5V



JFP1: Front Panel Connector

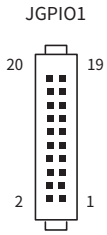
This front-panel header is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.



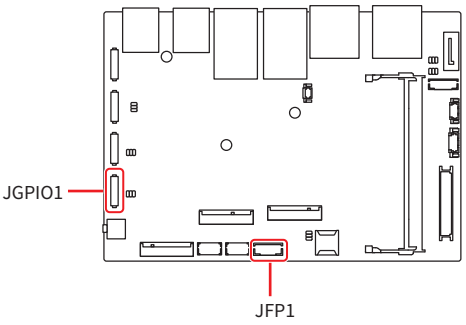
1	HDD LED+	2	Power LED+
3	HDD LED-	4	Power LED-
5	Reset Switch-	6	Power Switch+
7	Reset Switch+	8	Reset Switch+
9	NC		

JGPIO1: GPIO (DIO) Header

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.



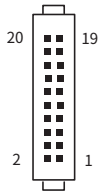
1	GND	2	GND
3	N_GPO0	4	N_GPI0
5	N_GPO1	6	N_GPI1
7	N_GPO2	8	N_GPI2
9	N_GPO3	10	N_GPI3
11	N_GPO4	12	N_GPI4
13	N_GPO5	14	N_GPI5
15	N_GPO6	16	N_GPI6
17	N_GPO7	18	N_GPI7
19	VCC5F	20	VCC5F



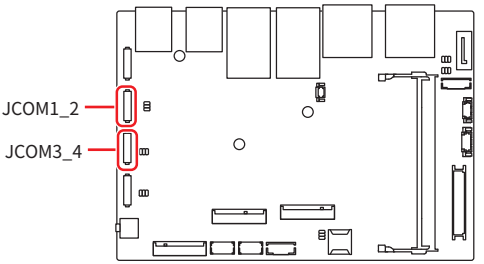
JCOM1_2, 3_4: COM Port Box Headers (RS232/ 422/ 485)

These headers are 16550A high speed communications port that sends/ receives 16 bytes FIFOs. You can attach a serial device to it.

JCOM1_2 / JCOM3_4



RS232			RS422			RS485		
1	2	DCD	1	2	TXD-	1	2	D-
3	4	RXD	3	4	TXD+	3	4	D+
5	6	TXD	5	6	RXD+	5	6	NC
7	8	DTR	7	8	RXD-	7	8	NC
9	10	GND	9	10	GND	9	10	GND
11	12	DSR	11	12	NC	11	12	NC
13	14	RTS	13	14	NC	13	14	NC
15	16	CTS	15	16	NC	15	16	NC
17	18	POWER	17	18	NC	17	18	NC
19	20	NC	19	20	NC	19	20	NC



Important

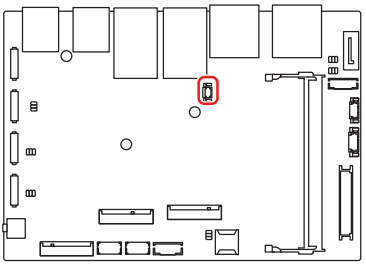
After connect COM port headers to printer, garbage can' t be printed when power on/ off.

Features

- Support True RS-232
- Support Auto flow control
- RS- 422/ 485 support TR 1000+ Meter
- RS- 232/ 422/ 485, selection by BIOS control

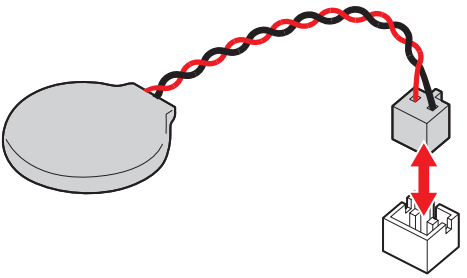
JBAT1: CMOS Battery

If the CMOS battery is out of charge, the time in the BIOS will be reset and the data of system configuration will be lost. In this case, you need to replace the CMOS battery.



Replacing CMOS battery

1. Unplug the battery wire from the BAT1 connector and remove the battery.
2. Connect the new CR2032 battery with wire to the BAT1 connector.



WARNING

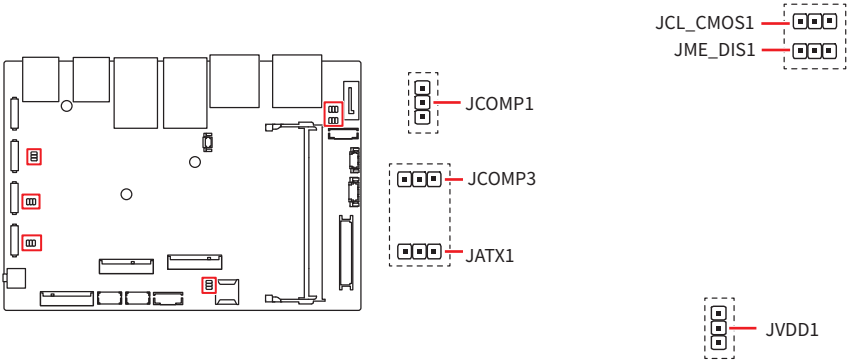
KEEP OUT OF REACH OF CHILDREN

- *Swallowing can lead to chemical burns, perforation of soft tissue, can death.*
- *Severe burns can occur within 2 hours of ingestion.*
- *If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.*

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 JCOMP3	1 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
JVDD1	1	**eDP/LVDS VDD Power Select Jumper** 1-2: 3.3 V Power (Default) 2-3: 5V

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>** key to Boot Menu, **<F12>** key to PXE Boot .

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.

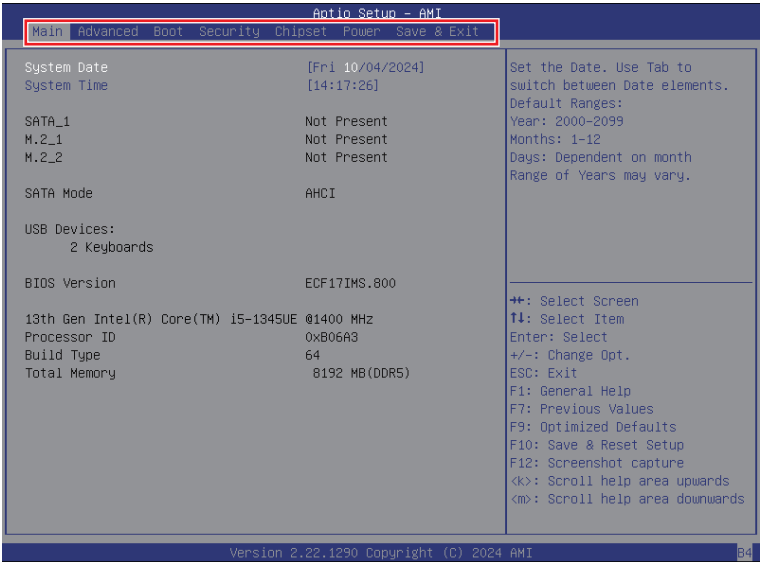
Sub-Menu

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



► **System Date**

This setting allows you to set the system date.

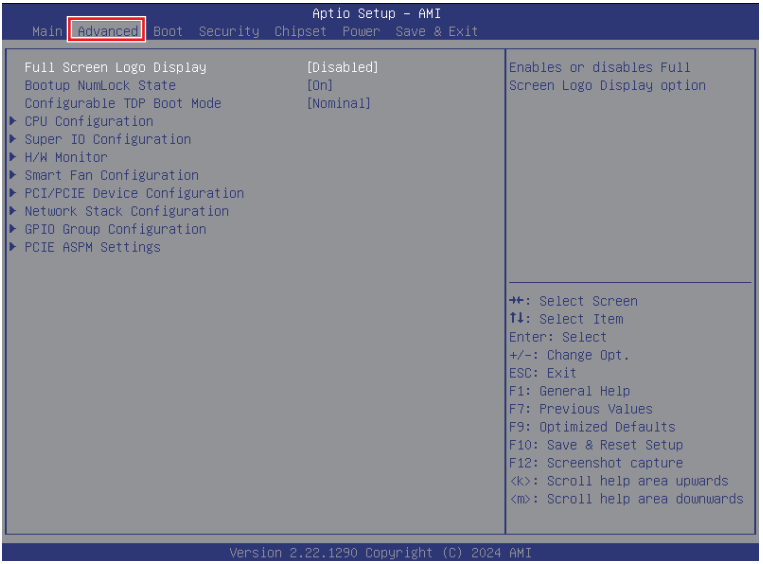
Format: <Day> <Month> <Date> <Year>.

► **System Time**

This setting allows you to set the system time.

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

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.Nominal, Down or Up.

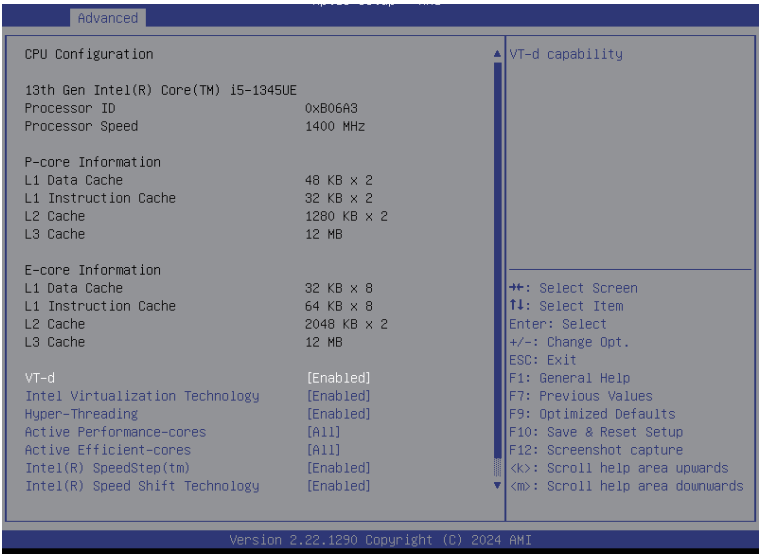
[On]	Turn on the Num Lock key when the system is powered on.
[Off]	Allow users to use the arrow keys on the numeric keypad.

► Confugurable TDP Boot Mode

This feature allows you sets the TDP (Thermal Design Power) Boot mode to either Nominal, Level1 or Level2.

TDP Power Spec			
Processor Family	**Nominal**	**Level1**	**Level2**
Intel® U/P/N-Series	15W (Default)	12W	28W

► CPU Configuration



▸ VT-d

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

Enables or disables Intel® Virtualization technology.

▸ 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).

▸ **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.

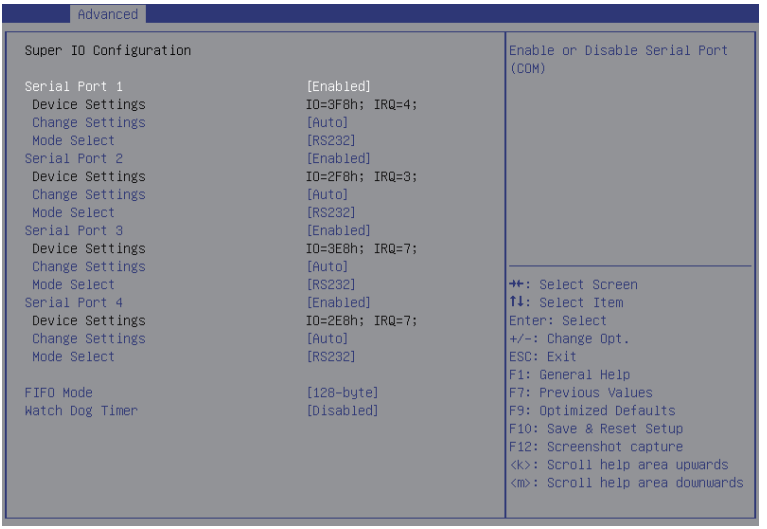
▸ **C States**

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/ 3/ 4**

This setting enables or disables the specified serial port.

» **Device Settings**

This setting shows the address & IRQ of 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**

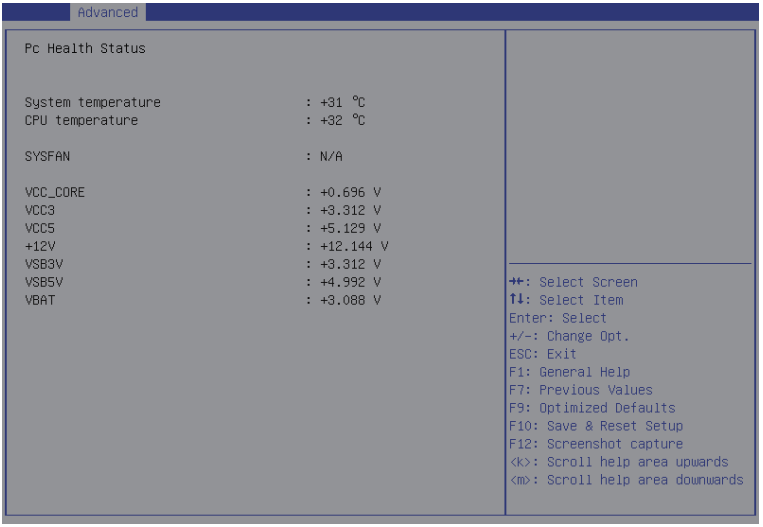
This setting controls the FIFO (First In First Out) data transfer mode.

▸ **Watch Dog Timer**

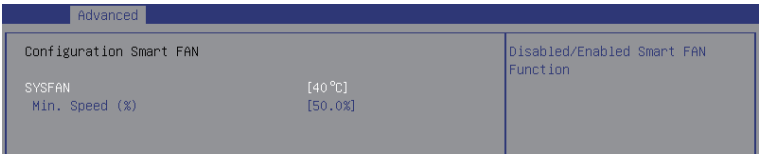
You can enable the system watchdog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watchdog polls it.

► 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.



► Smart Fan Configuration



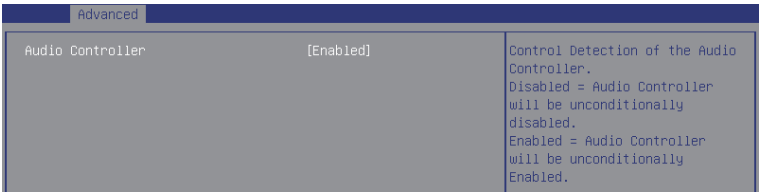
▸ SYSFAN

This setting enables or disables the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system. The following item will display when SYSFAN is enabled.

» **Min. Speed (%)**

The beginning speed of the System fan.

► PCI/PCIE Device Configuration

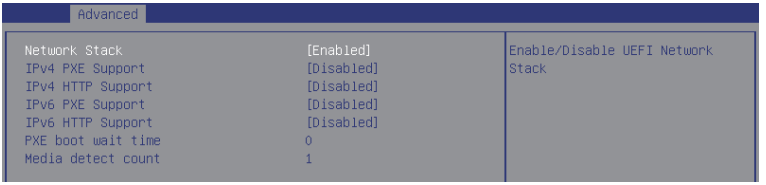


▸ Audio Controller

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 network boot (PXE) from BIOS. The following items will display when Network Stak is enabled.

» **IPV4 PXE Support**

Enables or disables IPv4 PXE boot support.

» **IPV4 HTTP Support**

Enables or disables Ipv4 HTTP Support.

» **IPV6 PXE Support**

Enables or disables Ipv6 PXE Support.

» **IPV6 HTTP Support**

Enables or disables Ipv6 HTTP Support.

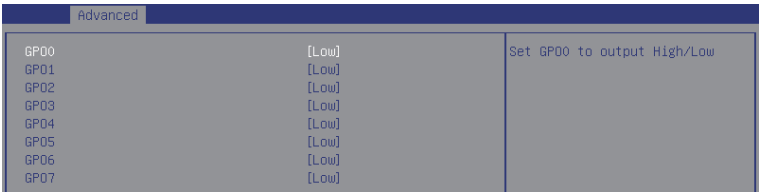
» **PXE boot wait time**

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

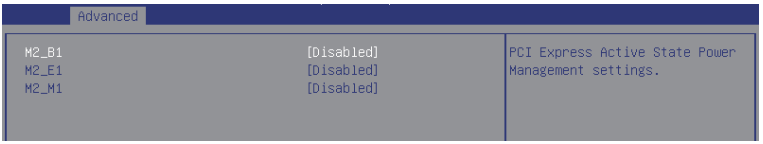


▸ GPO0 ~ GPO7

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.

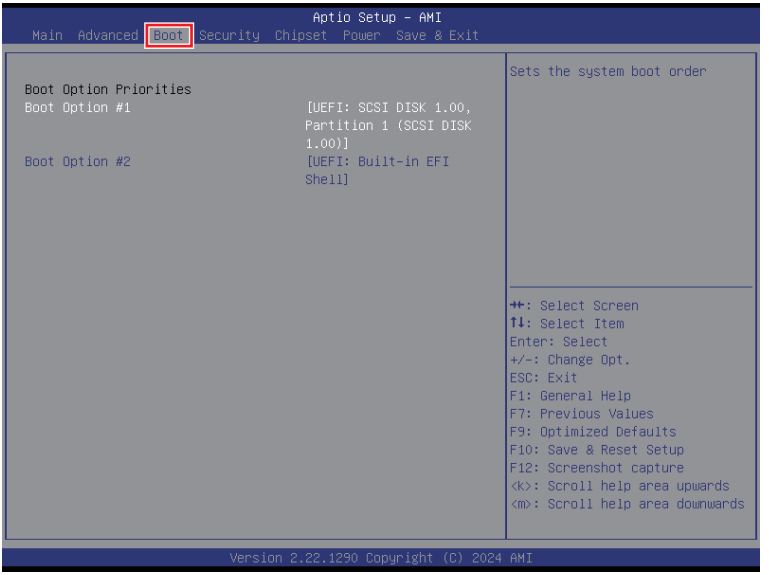


▸ M2_B1, M2_E1, M2_M1

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.

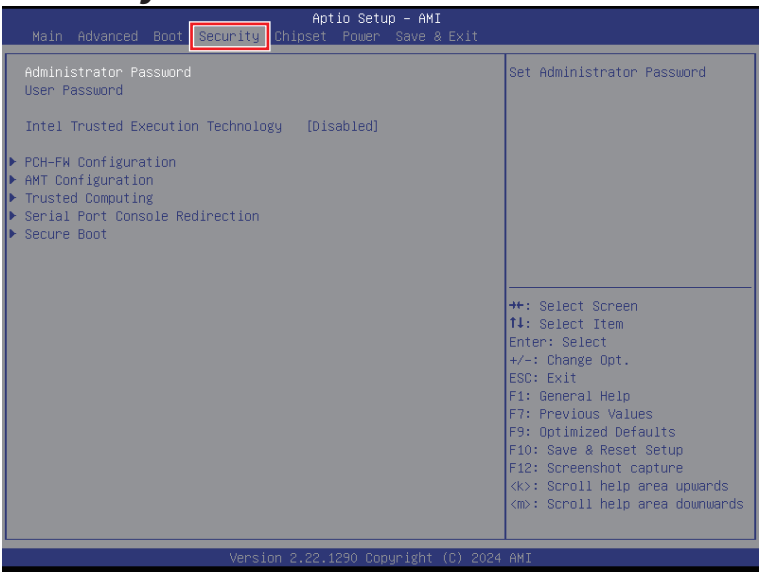
Boot



► Boot Option #1-2

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

Security



► Administrator Password

Administrator Password controls access to the BIOS Setup utility.

► User Password

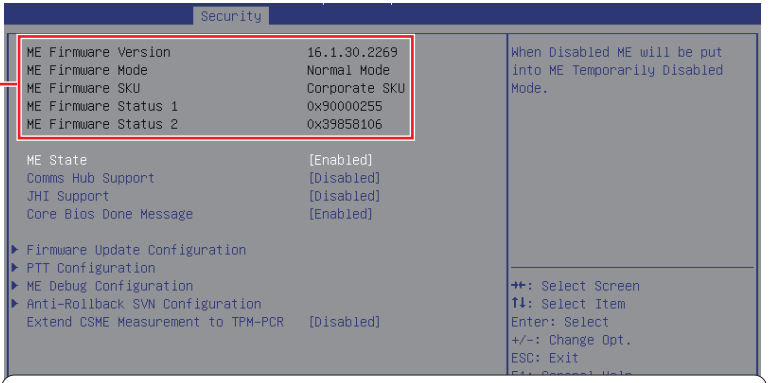
User Password controls access to the system at boot and to the BIOS Setup utility.

► Intel 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.

► PCH-FW Configuration

This menu allows you to configure settings related to the PCH firmware.



Firmware Information

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

▸ 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.

▸ Comms Hub Support

Enables or disables the communications hub support.

▸ JHI Support

Enables or disables JHI Support. JHI stands for Intel® Dynamic Application Loader Host Interface Service (Intel® DAL HIS) and is the engineering name for this feature. Enabling JHI Support in the BIOS settings allows the system to utilize this interface for communication between trusted applications and host-based applications.

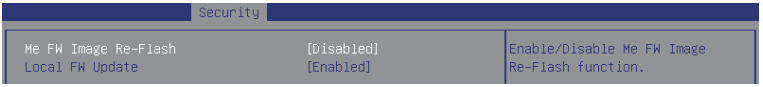
▸ Core Bios Done Message

Enables or disables Core BIOS Done Message sent to ME.

▸ Extend CSME Measurement to TPM-PCR

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

▸ **Firmware Update Configuration**



» **ME FW Image Re-Flash**

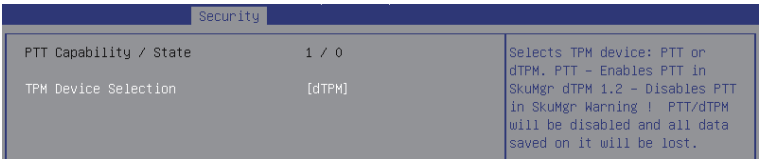
Enables or disables the ME Firmware Image Re-flashing.

» **Local FW Update**

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

▸ **PTT Configuration**

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



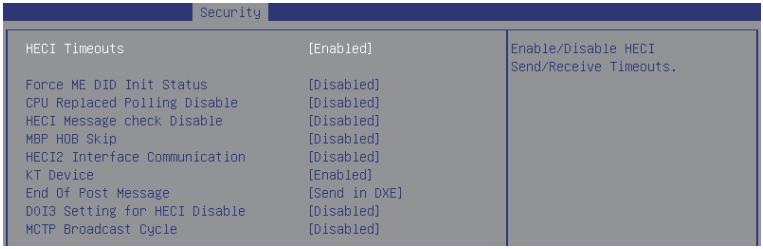
» **TPM Device Selection**

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

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

▸ **ME Debug Configuration**

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



» **HECI Timeouts**

This setting enables/ 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.

» **KT Device**

Enables or disables Key Transfer (KT) Device.

» **End of Post Message**

Enables or disables End of Post Message sent to ME.

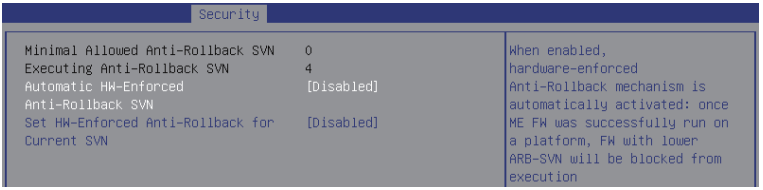
» **DOI3 Setting for HECI Disable**

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

» **MCTP Broadcast Cycle**

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.

► AMT Configuration

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



▸ USB Provisioning of AMT

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

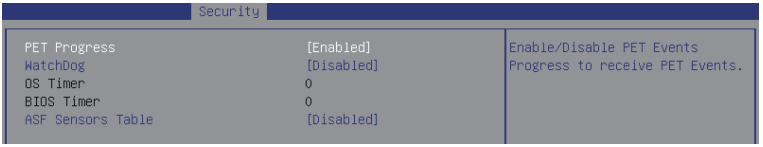
▸ Activate Remote Assistance Process

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.

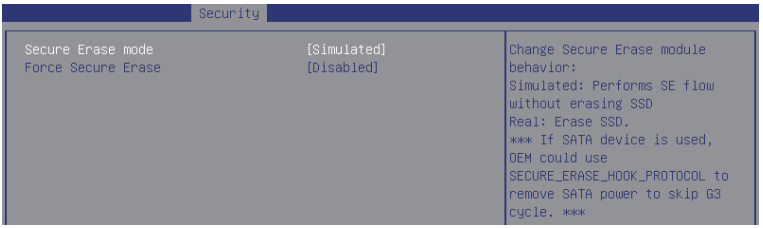
» **WatchDog**
Enables or disable the watchdog timer.

» **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.

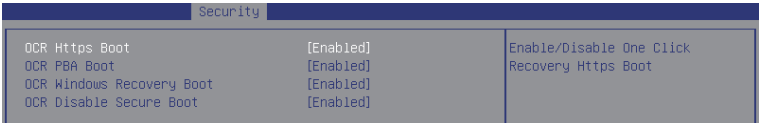
[Simulated]	Performs SE flow without erasing SSD.
[Real]	Erase SSD.

» **Force Secure Erase**
Enables or disables to force Secure Erase on next boot.

▸ MEBx (Management Engine BIOS Extension)



▸ One Click Recovery (OCR) Configuration



» **OCR Https Boot**

Enables or disables the use of HTTPS (Hypertext Transfer Protocol Secure) for the OCR boot process. When enabled, the OCR process will utilize HTTPS for enhanced security during the process of booting up the system.

» **OCR PBA Boot**

Enables or disables the PBA (Pre-Boot Authentication) for the OCR boot process. When enabled, users may be required to authenticate themselves before the OCR boot process begins, adding an extra layer of security.

» **OCR Windows Recovery Boot**

Enables or disables the Windows Recovery Boot for the OCR boot process. When enabled, the OCR boot process will prioritize Windows recovery options, allowing users to restore the system to a previous Windows state or initiate other Windows-specific recovery procedures.

» **OCR Disable Secure Boot**

Enabling this item will disable Secure Boot during the OCR process.

▸ Remote Platform Erase Configuration

Intel® Remote Platform Erase (Intel® RPE) Configuration provides settings for the remote erasure of the platform information or specific storage devices connected to the system.



» **Enable Remote Platform Erase Feature**

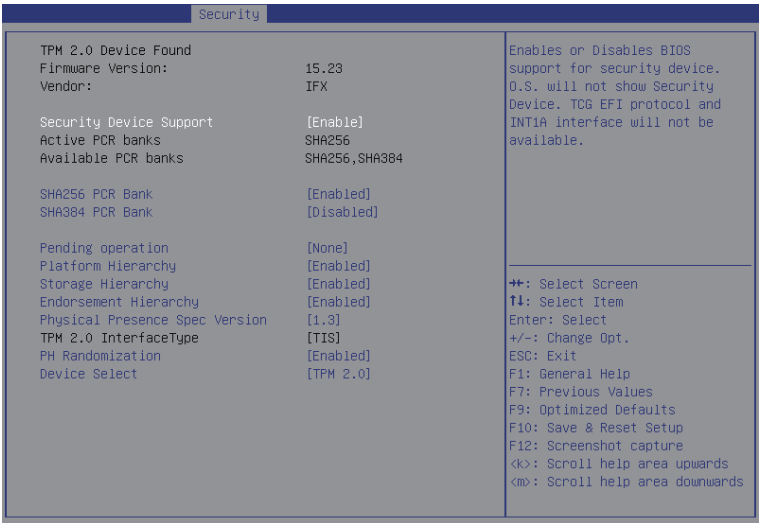
Enables or disables the ability to initiate the remote erasure process for the system or selected storage devices.

» **SSD Erase Mode**

This setting determines the erase mode to be used specifically for solid-state drives (SSDs) during the erasure process.

[Simulated]	Simulates the erasure process without permanently deleting SSD data to estimate the time and resources required.
[Real]	Actual erasure process that permanently deletes the SSD data to ensure that the data is no longer accessible.

► 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.

▸ SHA256 PCR Bank, SHA384 PCR Bank

These settings enables or disables the SHA256 PCR Bank and SHA384 PCR Bank.

▸ Pending Operation

When Security Device Support is set to [Enable], Pending Operation will appear. It is advised that users should routinely back up their TPM secured data.

[TPM Clear]	Clear all data secured by TPM.
[None]	Discard the se lection.

▸ Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy

These settings enables or disables the Platform Hierarchy, Storage Hierarchy and Endorsement Hierarchy.

▸ Physical Presence Spec Version

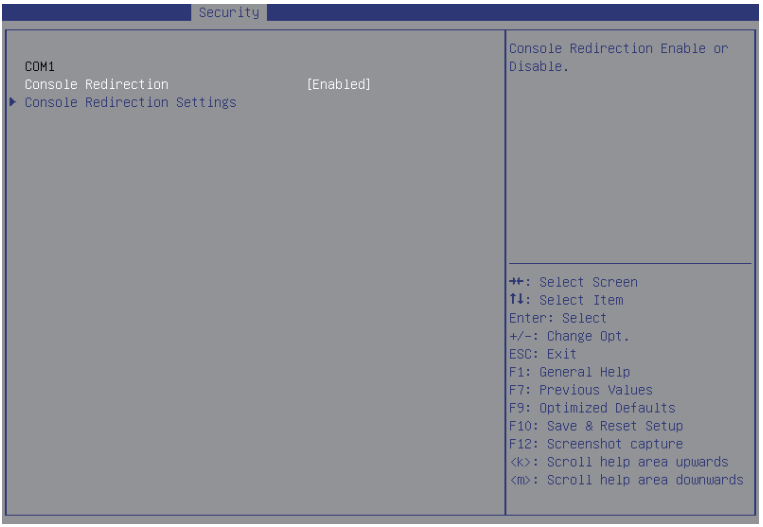
This settings show the Physical Presence Spec Version.

▸ TPM 2.0 Interface Type

This setting shows the TPM 2.0 Interface Type.

- **PH Randomization**
  Enables or disables Platform Hierarchy (PH) Randomization.
- **Device Select**
  Select your TPM device through this setting.

► Serial Port Console Redirection

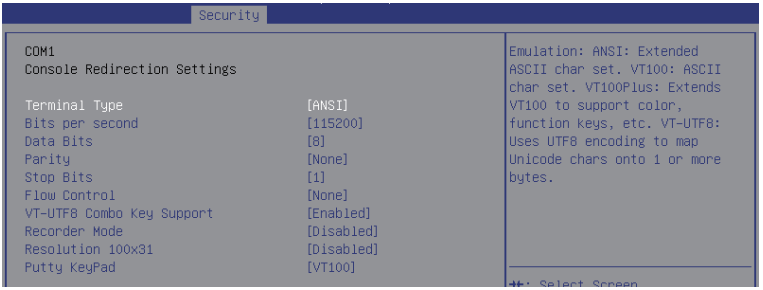


▸ Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables 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)**

This option appears when Console Redirection is enabled.



» **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 or disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

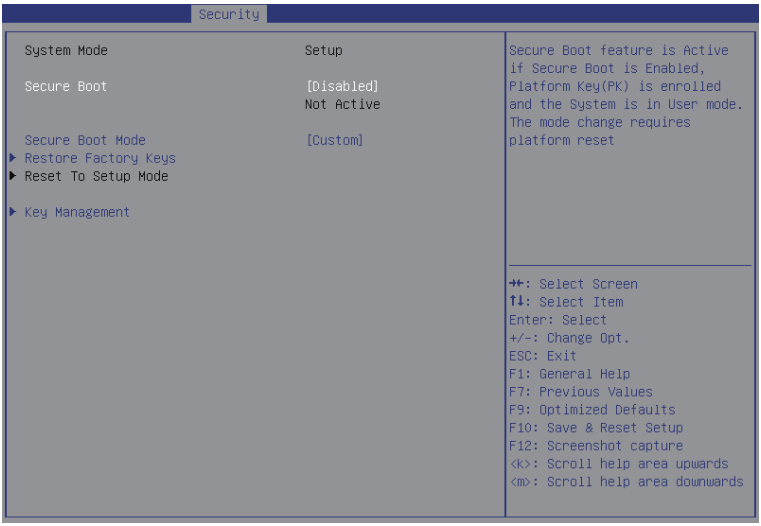
» **Recorder Mode, Resolution 100x31**

These settings enables or disables 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.

► 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 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

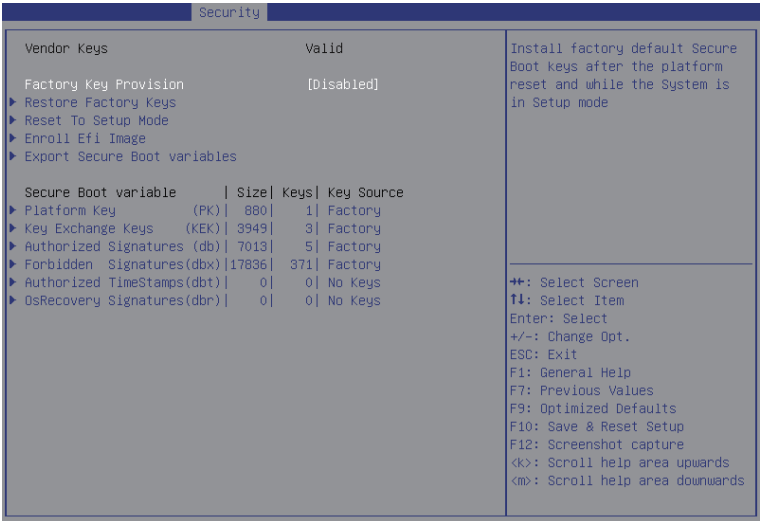
Allows you to restore all factory default keys. The settings will be applied after reboot or at the next reboot. This item appears when "Secure Boot Mode" sets to [Custom].

▸ 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.

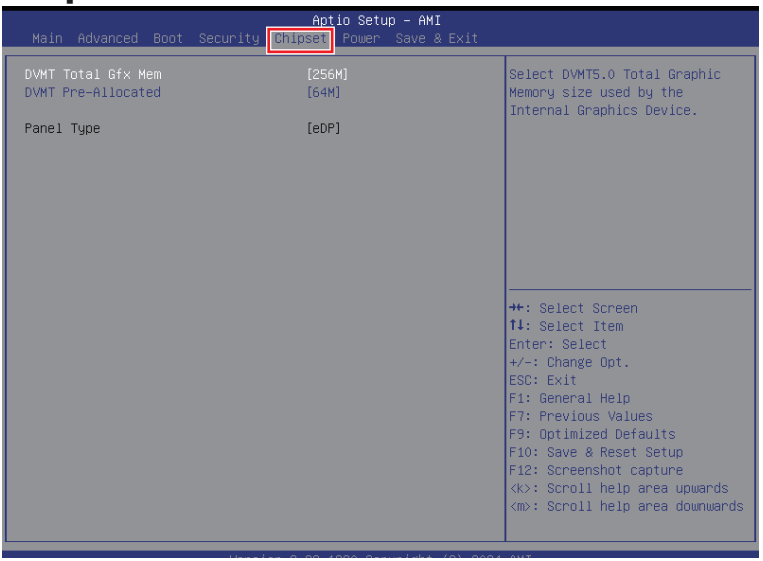
» **Authorized TimeStamps (dbt):**
Authorized TimeStamps (dbt) lists the authentication signatures with authorization time stamps.

» **Set New Key**
Sets a new DBT to your system.

» **Append Key**
Loads an additional DBT from storage devices to your system.

» **OsRecovery Singnatures (dbr):**
Lists the available signatures for OS recovery.

Chipset



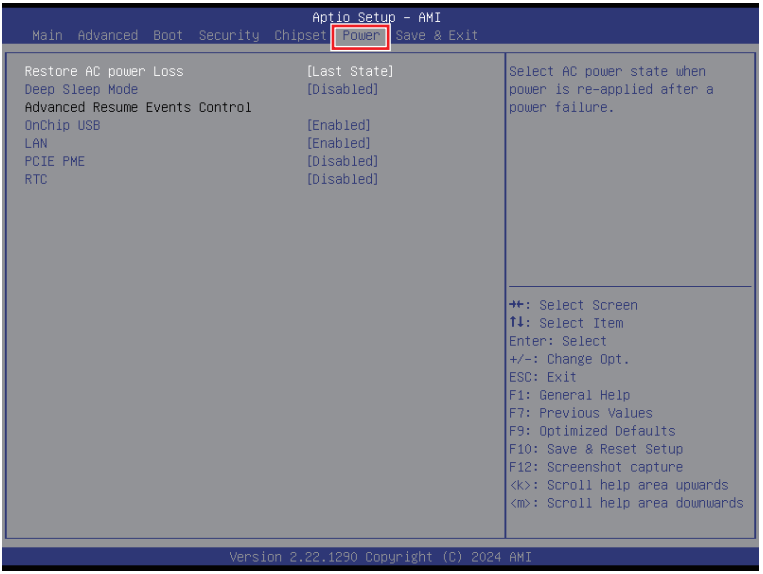
► DVMT Total Gfx Mem

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

► DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is “locked” for video use only and as such, is invisible and unable to be used by the operating system.

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.

► OnChip USB

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

► **LAN/ PCIE PME**

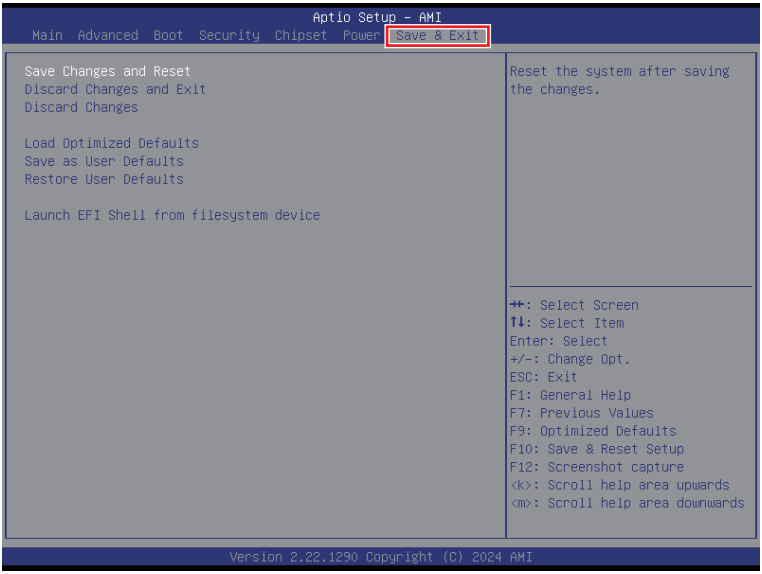
Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel® LAN device and onboard PCIE PME is detected.

The setting allows the activity of the specified device to wake up the system from power saving modes.

► **RTC**

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

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

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	Bit7	**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 3.

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
```

SMBus Access

3. 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
```

3.1 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;
```

3.2 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
```

3.3 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
```