MS-CF27

Industrial Computer Board

User Guide

Contents

Revision

V1.0, 2026/04

Regulatory Notices

CE Conformity

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

FCC-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.

Copyright and Trademarks Notice

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.

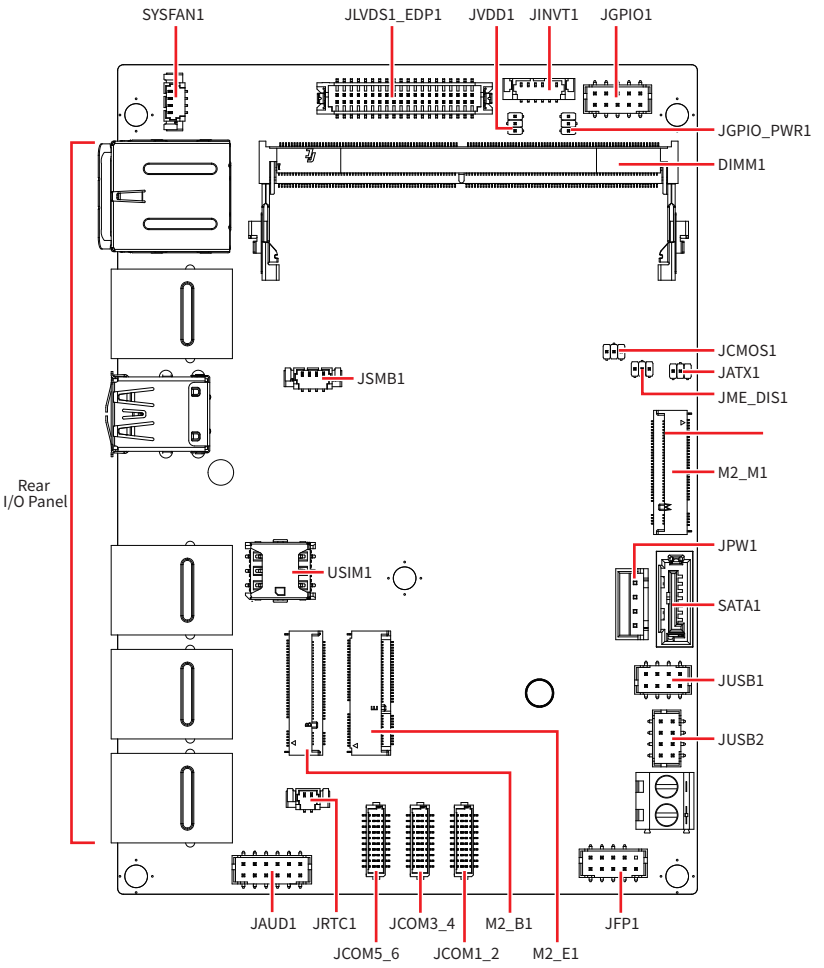
Specifications

Model	MS-CF27
Dimensions	146.0(L)mm x 102.0(W)mm x 39.1(H)mm, 3.5 inch (include heatsink)
Processor	• Intel® IoTG Alder Lake-N Series, 2/4/8 Cores • Intel® IoTG Amston Lake Series, 2/4/8 Cores • Intel® IoTG Twin Lake Series, 2/4/8 Cores
Chipset	Within processor
Memory	• 1 x DDR5 SO-DIMM slot (262-pins) - Single-Channel for DDR5, Non-ECC - Up to 4800 MHz - Up to 16 GB
Network	• 4 x Intel® I226-V 1.0 GbE RJ45 LAN - Co-Lay Intel® I226-LM PCIe 1.0GbE RJ45 LAN
Storage	• 1 x SATA 3.0 6Gb/s port • 1 x M.2 M Key slot (2280) - Supports SATA 3.0 signal
Expansion Slots	• 1 x M.2 E Key slot (2230) - Supports PCIe x1 & USB 2.0 signals - Supports CNVi modules - Supports Intel® AX210 Wi-Fi 6E & BT-5.2 • 1 x M.2 B Key slot (3042) - Supports USB 3.0 signal
Audio	• Realtek® ALC897 High Definition Audio Codec
Graphics	• 1 x DisplayPort, up to 4096×2304 @ 60Hz • 1 x HDMI™ 1.4b up to 3840×2160 @60Hz • 1 x LVDS up to 1920×1200 @60Hz (signals share with eDP) - Supports 18/24-bit dual channel - Connector shared with eDP • 1 x eDP 1.4b up to 1920×1080 @60 Hz (signal shares with LVDS) - Connector shared with LVDS • 3 independent display mode supported in OS - DisplayPort + HDMI™ + eDP/LVDS • 2 independent display modes supported in POST/ BIOS/ UFEI SHELL

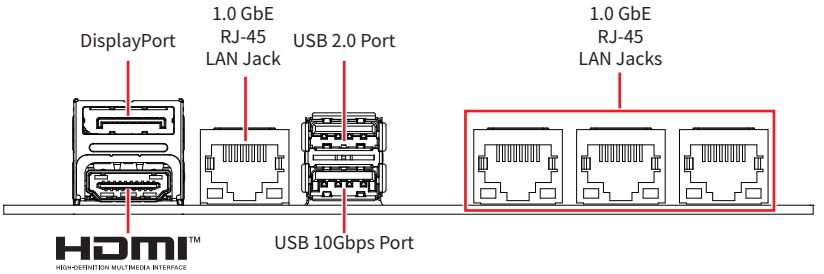
Continued on next column

Model	MS-CF27
Rear I/O	• 1 x DisplayPort • 1 x HDMI™ connector (1.4b) • 4 x RJ-45 1.0 Gbps LAN ports • 1 x USB 10Gbps Type-A port (5V/0.9A) • 1 x USB 2.0 Type-A port (5V/0.5A)
USB	2 x USB 2.0 headers (480 Mbps, for 4 USB ports, 5V/0.5A Each Port)
Power Connector	1 x DC-In power connector (12~24V)
Onboard Connectors	• 1 x 4-pin PWM system fan connector • 1 x LVDS + eDP wafer connector • 1 x LVDS inverter header • 1 x GPIO (DIO) header (8-bit, 8 x GPIO) • 1 x SMBus connector • 1 x SATA power connector (4-pin, 5V/ 12V) • 2 x USB 2.0 box headers (for 4 USB ports, 5V/0.5A each port) • 1 x Battery header • 1 x Audio header • 3 x COM (serial) port headers • 1 x Front panel connector
Jumpers	• 1 x eDP/LVDS VDD power select jumper • 1 x GPIO power select jumper • 1 x Clear CMOS jumper • 1 x ME 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 B, BSMI, RCM, VCCI, UKCA, IC, IEC 62368: CE (LVD) Compliant
Environment	• Operating Temperature: -10 ~ 60°C • Storage Temperature: -20 ~ 80°C • Humidity: 10 ~ 90%, non-condensing

Motherboard Overview



Rear I/O Panel



DisplayPort

DisplayPort is a digital display interface standard. This connector is used to connect a monitor with DisplayPort inputs.

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.

USB 2.0 Port

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

Important

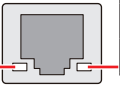
High-speed devices are recommended for USB 10Gbps port whereas low-speed devices, such as mouse or keyboard, are suggested to be plugged into the USB 2.0 port.

USB 10Gbps Port

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.

1.0 GbE RJ-45 LAN Jack

Speed LED	
Status	**Description**
Off	10 Mbps
Green	100 Mbps
Orange	1.0 Gbps

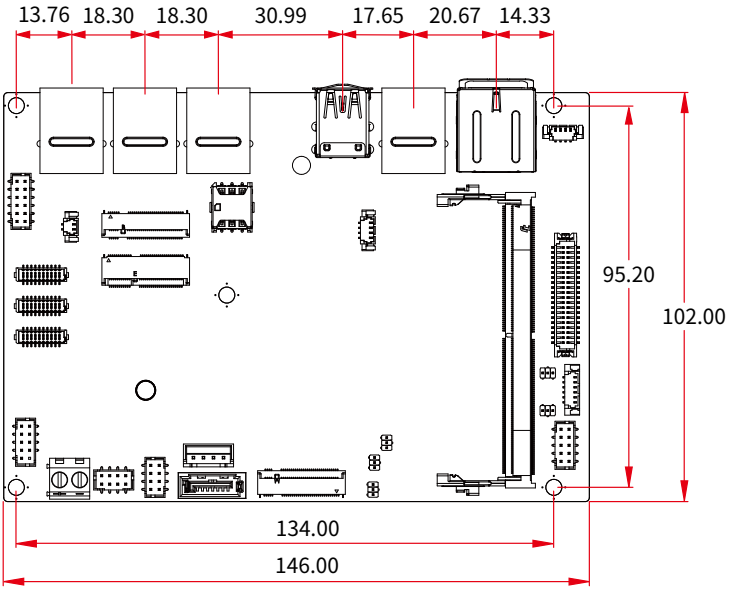


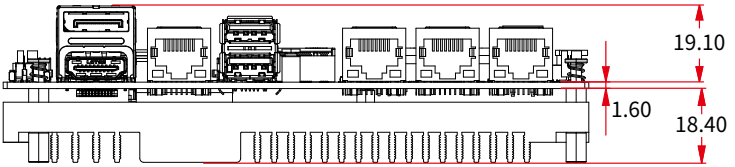
Link/ Activity LED	
Status	**Description**
Off	No link
Yellow	Linked
Blinking	Data activity

ME Overview

Board Dimensions

Unit of measurement: mm



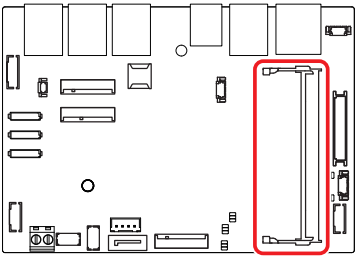


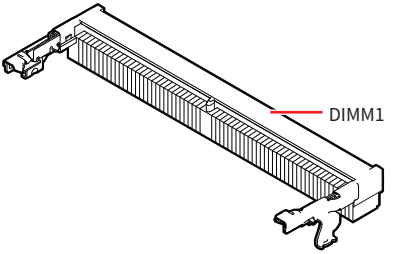
Component Contents

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.*

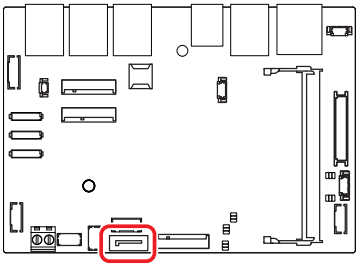
Important

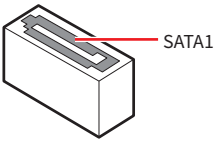
- *You can barely see the golden finger if the DIMM is properly inserted in the DIMM slot.*

Storage

SATA1: SATA 3.0 6Gb/s Port

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



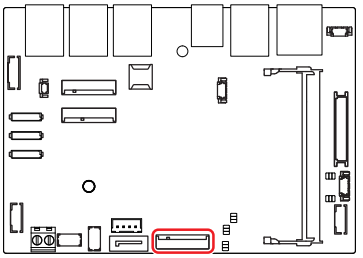


Important

- *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

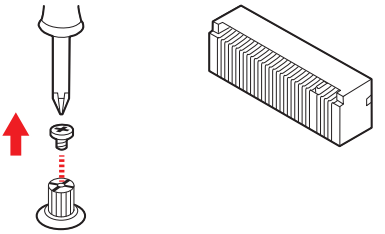
- Supports SATA 3.0 signal

Video Demonstration

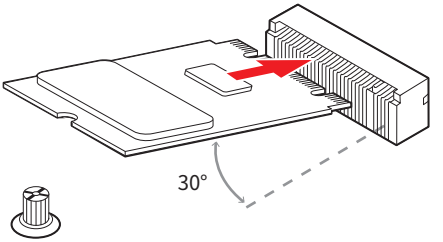
Watch the video to learn how to Install M.2 SSD.

Installing M.2 SSD

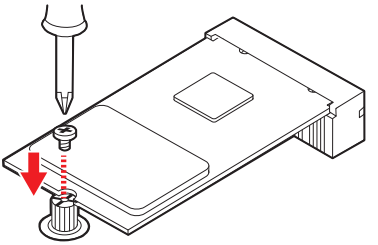
1. Loosen the M.2 screw from the motherboard.



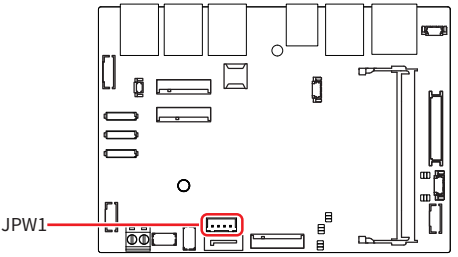
2. Insert your M.2 SSD into the M.2 slot at a 30-degree angle.



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



Power Connector



JPW1: SATA Power Connector

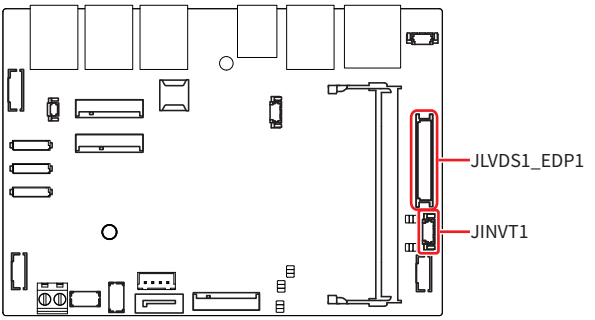
This connector is used to provide power to SATA devices.

JPW1  1 4	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.

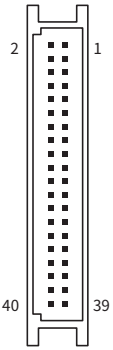
JINVT1 	1	VCC5	2	+12V
	3	INV_ON1_1	4	L_BKLT_CTRL#1_1
	5	GND	6	GND

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.

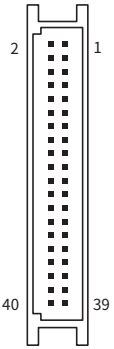
Important

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.

LVDS Panel (P1)	CF27 Motherboard (P2)				LVDS Panel (P1)
	JLVDS1_EDP1 				
	EDP_LINE3_DP	1	2	EDP_LINE2_DP	
	EDP_LINE3_DN	3	4	EDP_LINE2_DN	
	DDC0_CLK_7513_R	5	6	DDC0_DATA_7513_R	
VCC	LCD_VDD	7	8	LCD_VDD	VCC
VCC	LCD_VDD	9	10	VCC3	
	BKLT_EN	11	12	LVDS_DETECT#	GND
RXO1+	LVDSA_DATA1+	13	14	EHPDET/ LVDSA_DATA0+	RXO0+
RXO1-	LVDSA_DATA1-	15	16	LVDSA_DATA0-	RXO0-
GND	GND	17	18	GND	GND
RXO3+	LVDSA_DATA3+	19	20	LVDSA_DATA2+	RXO2+
RXO3-	LVDSA_DATA3-	21	22	LVDSA_DATA2-	RXO2-
GND	GND	23	24	GND	GND
RXE1+	LVDSB_DATA1+	25	26	LVDSB_DATA0+	RXE0+
RXE1-	LVDSB_DATA1-	27	28	LVDSB_DATA0-	RXE0-
GND	GND	29	30	GND	GND
RXE3+	LVDSB_DATA3+	31	32	LVDSB_DATA2+	RXE2+
RXE3-	LVDSB_DATA3-	33	34	LVDSB_DATA2-	RXE2-
	NA	35	36	GND	GND
RXEC+	LVDSB_CLK+	37	38	LVDSA_CLK+	RXOC+
RXEC-	LVDSB_CLK-	39	40	LVDSA_CLK-	RXOC-

Important

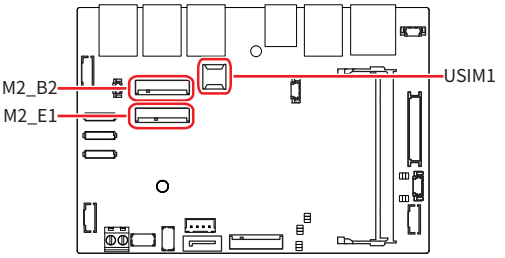
Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

eDP Panel (P1)	CF27 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	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

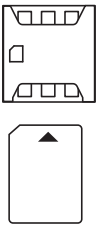
Pin 12 is a detect pin. When using a customized LVDS cable, pin 12 should be a signal ground with a low impedance. Otherwise, LVDS will not function.

Expansion Slots



USIM1: Nano SIM Holder

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



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.

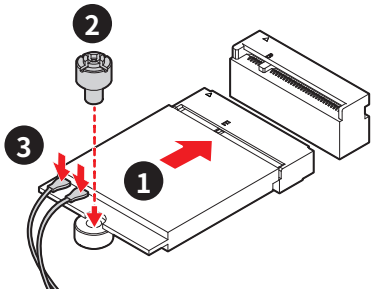
M2_E1: M.2 Slot (E Key, 2230)

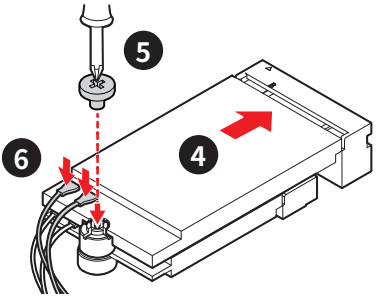
Please install the Wi-Fi/ Bluetooth card into the M.2 slot as shown below.

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

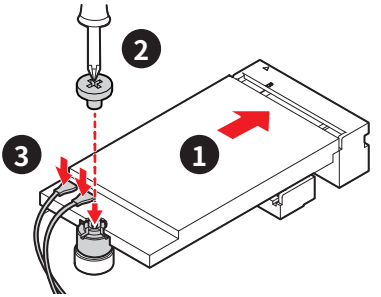
Please install the WWAN Card/ solid-state drive (SSD) into the M.2 slot as shown below.

Installing Expansion Cards (E+B Key)



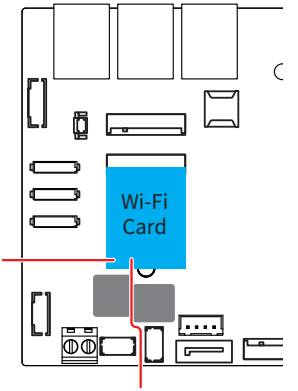


Installing Expansion Card (B Key only)



Important

For optimal signal strength, route the Wi-Fi card cables as shown below.



Important

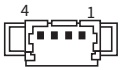
When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

Other Connectors

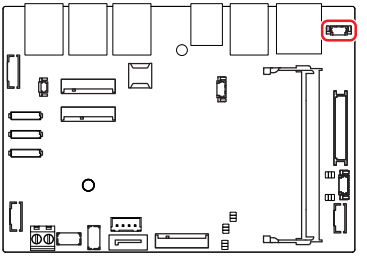
SYSFAN1: 4-pin PWM System Fan Connector

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

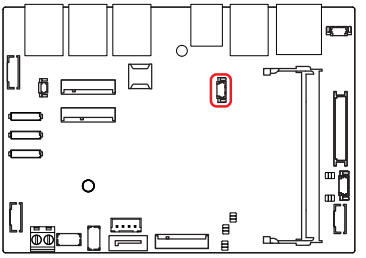


JSMB1: SMBus Header

This header is provided for users to connect to System Management Bus (SMBus) interface.

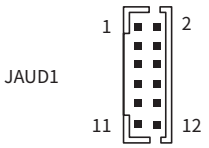
JSMB1

1	5VSB
2	SMBCLK
3	SMBDATA
4	GND

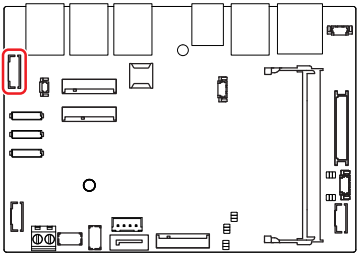


JAUD1: Front Audio Header

This connector allows you to connect front panel audio.

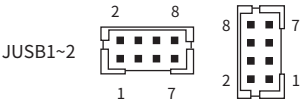


1	LINE_IN_RA	2	MIC1_RA
3	LINE_IN_LA	4	MIC1_LA
5	LOUT_RA	6	MIC1_JD
7	LOUT_LA	8	LINE1_JD
9	FRONT_JD	10	AGND
11	AGND	12	AGND

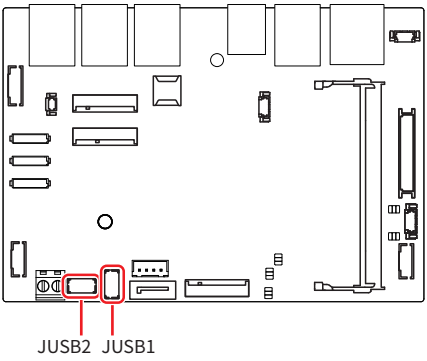


JUSB1~2: USB 2.0 Headers

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

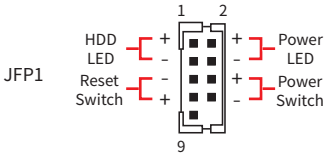


1	5V	2	GND
3	USB1-	4	USB2+
5	USB1+	6	USB2-
7	GND	8	5V



JFP1: Front Panel Connector

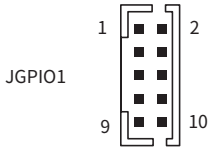
This front-panel header is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.



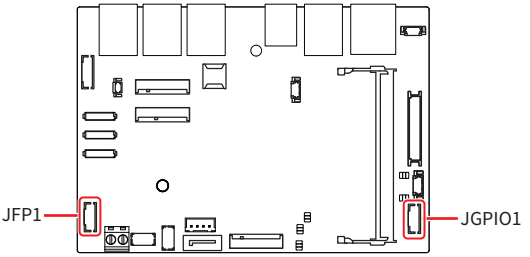
1	HDD+	2	Power_LED
3	HDDLED-	4	SUS_LED
5	GND	6	PSIN#_R
7	FP_RST#	8	GND
9	NC		

JGPIO1: GPIO (DIO) Box Header

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module. Be sure to check the GPIO_PWR1 jumper to proper power voltage.



1	GND	2	VCC_GPIO
3	N_GPIO4	4	N_GPIO0
5	N_GPIO5	6	N_GPIO1
7	N_GPIO6	8	N_GPIO2
9	N_GPIO7	10	N_GPIO3

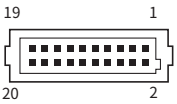


JCOM1_2: COM Port Box Header (RS-232/ 422/ 485)

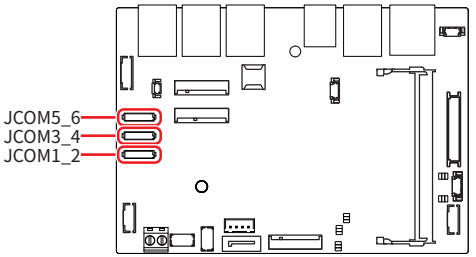
JCOM3_4, 5_6: COM Port Box Header (RS-232)

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

JCOM1



RS232			RS422 (for JCOM1_2)			RS485 (for JCOM1_2)		
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	NC	17	18	NC	17	18	NC
19	20	NC	19	20	NC	19	20	NC



Important

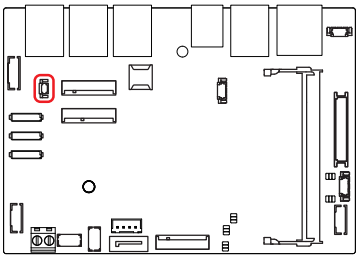
After connect COM port headers to printer, garbage can' t be printed when power on/ off.

Features

- Support True RS-232
- Support Auto flow control
- RS-422/ 485 support TR 1000+ Meter (for JCOM1_2)
- RS-232/ 422/ 485, selection by BIOS control (for JCOM1_2)

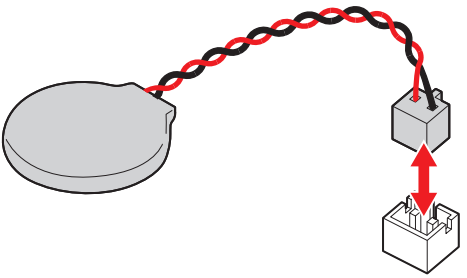
JRTC1: CMOS Battery

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 JRTC1 connector and remove the battery.
2. Connect the new CR2032 battery with wire to the JRTC1 connector.



WARNING

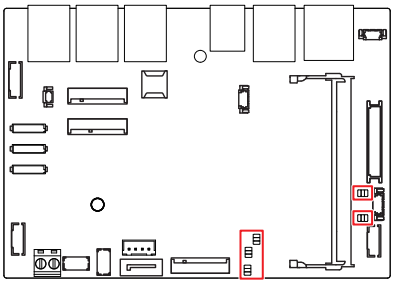
KEEP OUT OF REACH OF CHILDREN

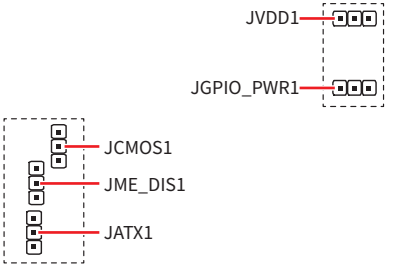
- *Swallowing can lead to chemical burns, perforation of soft tissue, can death.*
- *Severe burns can occur within 2 hours of ingestion.*
- *If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.*

Jumpers

Important

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





Jumper Name	Default Setting	Description
JVDD1	1	**eDP/LVDS VDD Power Select Jumper**
		1-2: 3V Power (Default)
		2-3: 5V
JGPIO_PWR1	1	**GPIO Power Select Jumper**
		1-2: 5V Power (Default)
		2-3: 3.3V
JCMOS1	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
JATX1	1	**AT/ ATX Mode Select Jumper**
		1-2: ATX (Default)
		2-3: AT

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
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.

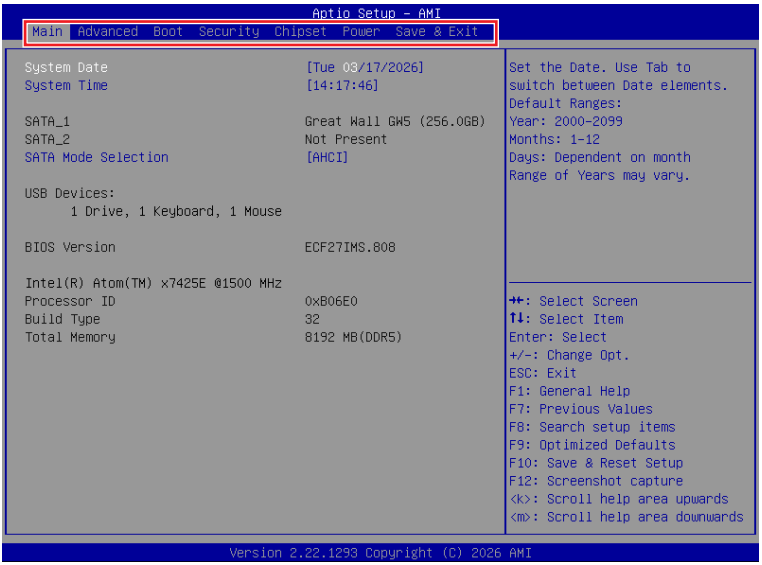
Sub-Menu

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 onboard chipsets.

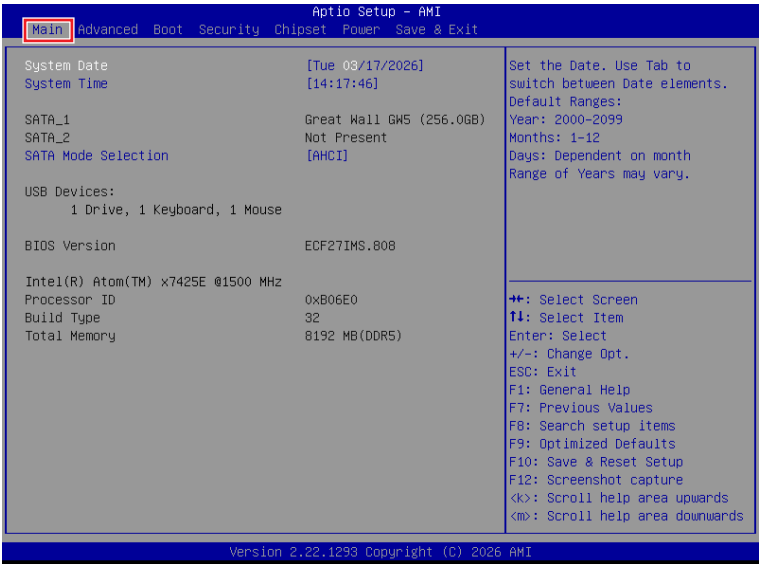
▶Power

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.

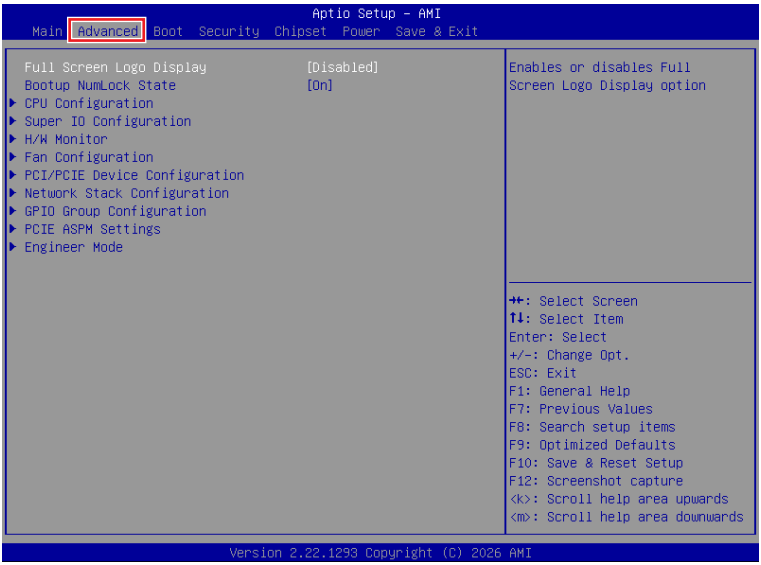
Format: <Hour> <Minute> <Second>.

▶ SATA Mode Selection

This setting specifies SATA controller mode.

[AHCI]	AHCI (Advanced Host Controller Interface), is a technical standard for an interface that allows the software to communicate with Serial ATA (SATA) devices. It offers advanced SATA features such as Native Command Queuing (NCQ) and hot-plugging.
[RAID]	RAID (Redundant Array of Independent Disks) is a virtual disk storage technology that combines multiple physical disks into one unit for data redundancy, performance improvement, or both.

Advanced



▶Full Screen Logo Display

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

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

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

Please note that enabling this BIOS feature often adds 2-3 seconds 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.**

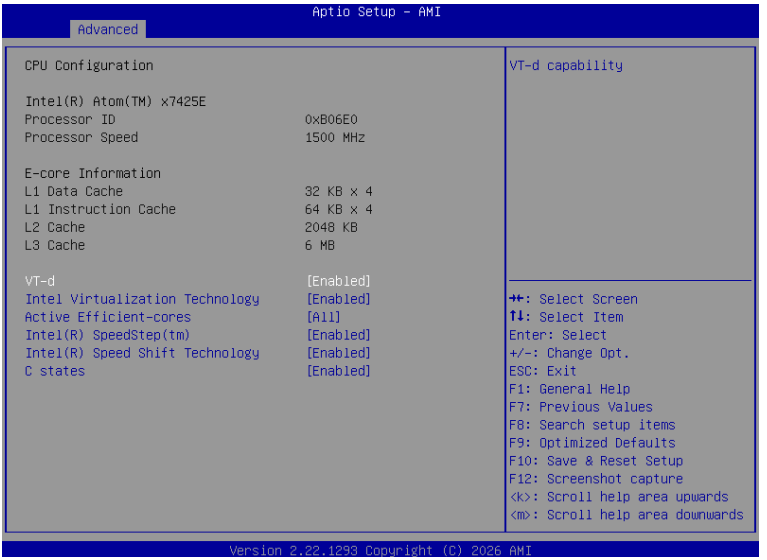
▶Bootup NumLock State

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.

▶CPU Configuration



- **VT-d**

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

- **Intel Virtualization Technology**

  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.

- **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.

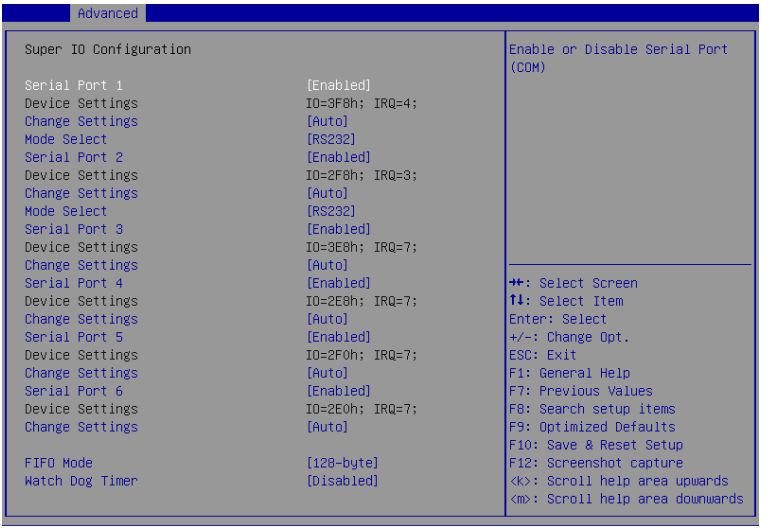
- **C States**

  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 - 6**

  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 - 6.

- **FIFO Mode**

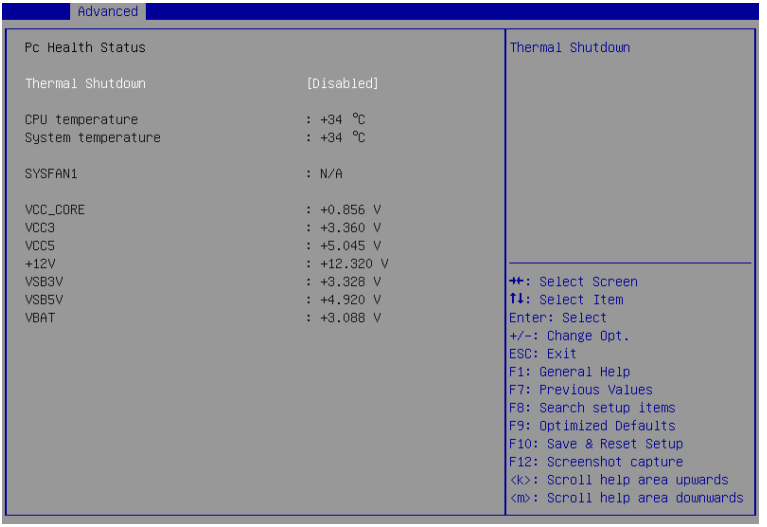
  This setting controls the FIFO (First In First Out) data transfer mode.

- **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.



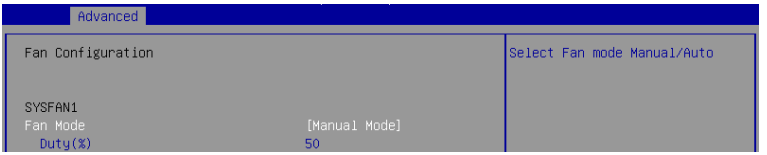
- **Thermal Shutdown**

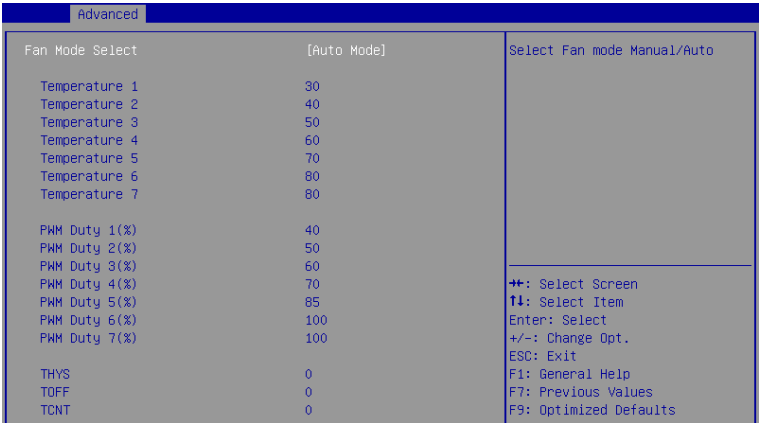
  This setting determines the behavior of the system when the CPU temperature reaches a predefined threshold.

  [Enabled] Initiate an automatic shutdown of the system to protect from potential damage due to overheating.

  [Disabled] Disable this function.

▶Fan Configuration





- **Fan Mode**

  Select [Manual Mode] or [Auto Mode] to control the fan operation.

  [Manual Mode]

  This mode allows you to set a **fixed Duty (%) value**, which directly determines the fan speed. The fan will run continuously at the speed corresponding to the set Duty (%).

  » **Duty (%)**

  Adjust the Duty (%) value to increase or decrease the fan speed.

  [Auto Mode]

  This mode allows you to define a **fan curve**, which is **a set of segment that map temperature values to corresponding PWM Duty (%) values**. This allows the fan speed to automatically adjust based on the monitored temperature (CPU or System).

  » **Temperature 1 - 7**

  Set the temperature thresholds for each segment on your fan curve. Each segment represents a temperature threshold at which the fan speed will adjust.

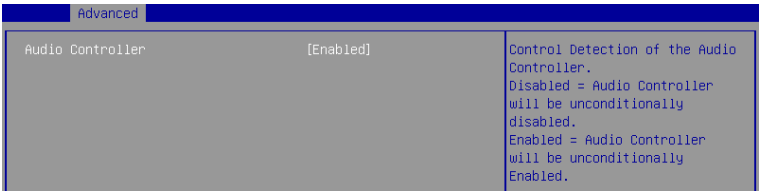
  » **PWM Duty 1 - 7 (%)**

  Set the PWM Duty (%) value for each segment on your fan curve.

Important

It's recommended to create a fan curve that gradually increases fan speed as the temperature rises.

▶PCI/PCIE Device Configuration

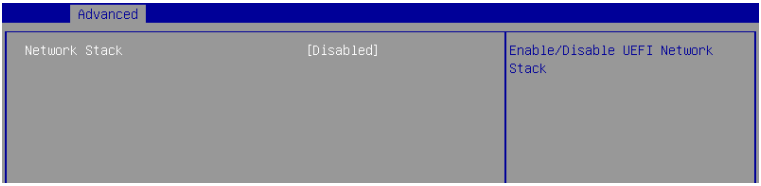


- **Audio Controller**

  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 Stack is enabled.

  - **IPV4 PXE Support**

    Enables or disables IPv4 PXE boot support.

  - **IPV4 HTTP/S Support**

    Enables or disables Ipv4 HTTP/S Support.

  - **IPV6 PXE Support**

    Enables or disables Ipv6 PXE Support.

  - **IPV6 HTTP/S Support**

    Enables or disables Ipv6 HTTP/S Support.

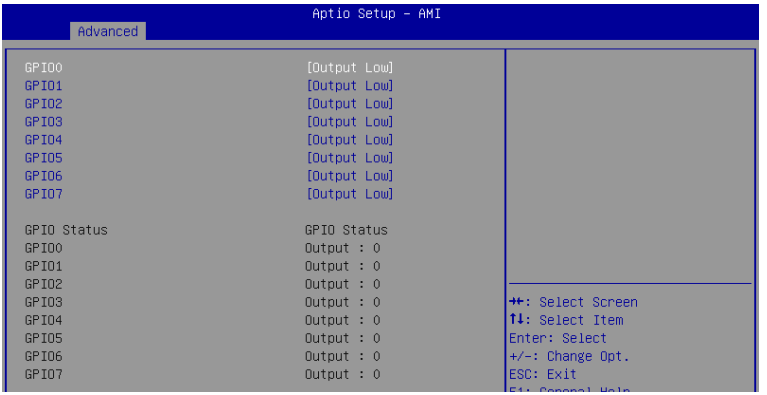
  - **PXE boot wait time**

    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

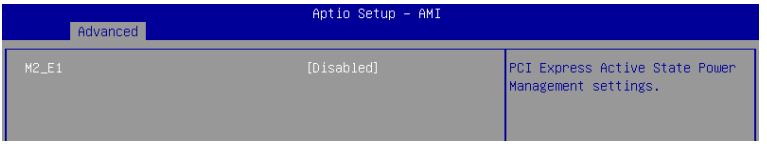


- **GPIO 0 - 7**

  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.

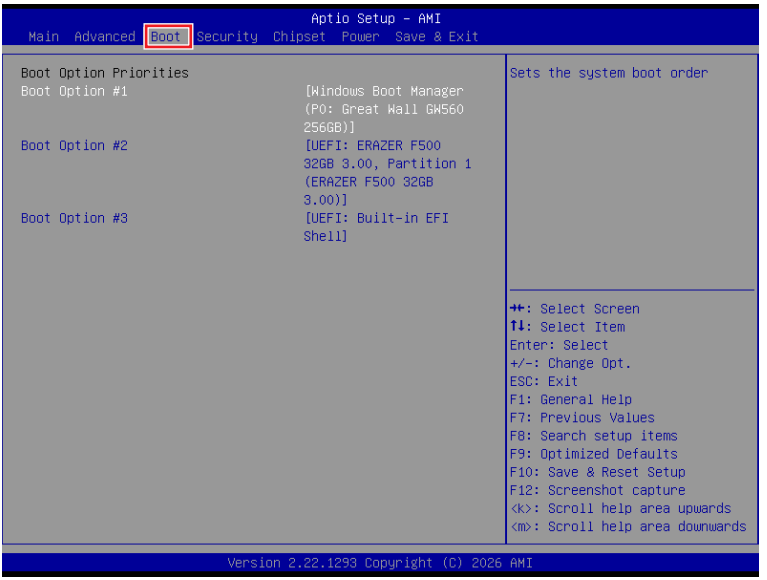


- **M2_E1**

  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.

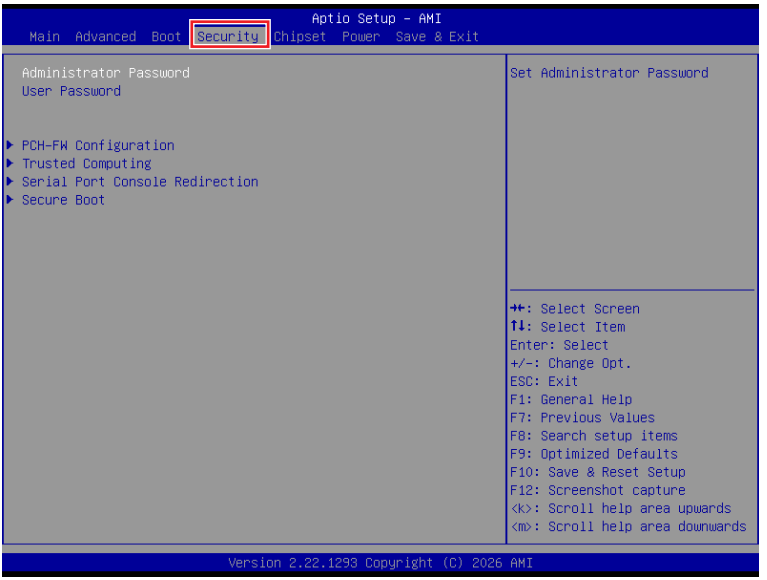
Boot



▶Boot Option #1 - #3

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

Security



▶Administrator Password

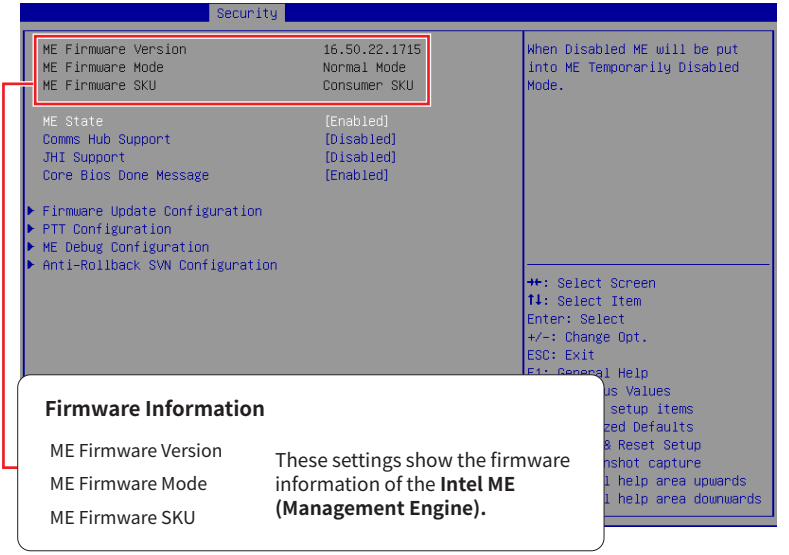
Administrator Password controls access to the BIOS Setup utility.

▶User Password

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

▶PCH-FW Configuration

This menu allows you to configure settings related to the 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.

- **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.

- **Firmware Update Configuration**

  » **ME FW Image Re-Flash**

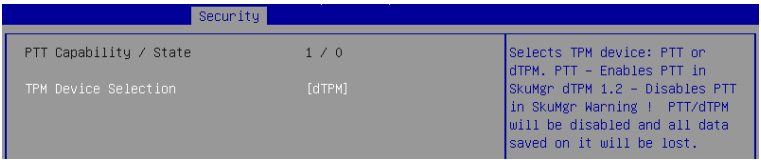
  Enables or disables the ME Firmware Image Re-flashing**.**

  » **FW Update**

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

▸ **PTT Configuration**

Intel® Platform Trust Technology (PTT) is a platform functionality for credential storage and key management used by Microsoft Windows. This menu will display when **ME State** is enabled.



» **TPM Device Selection**

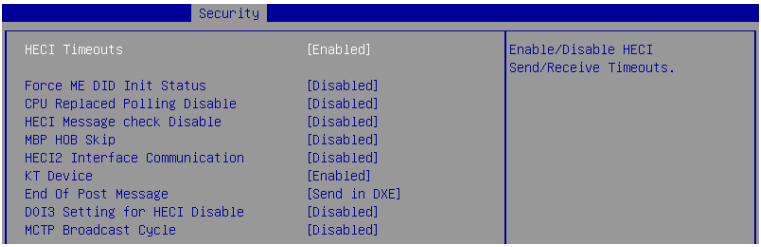
Select TPM (Trusted Platform Module) devices from PTT or dTPM (Discrete TPM).

[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.

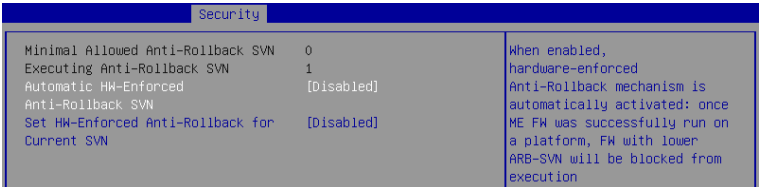
» **DOI3 Setting for HECI Disable**

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**



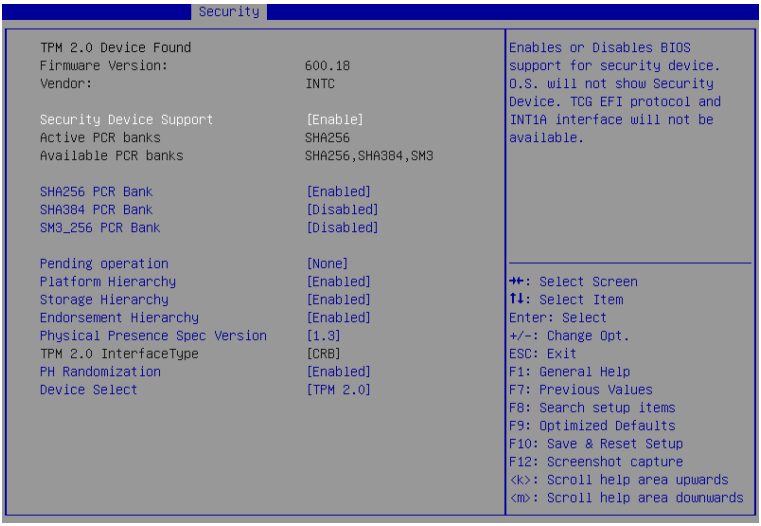
» **Automatic HW-Enforced Anti-Rollback SVN**

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.

▶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/ SM3 PCR Bank**

  These settings enables or disables the SHA256, SHA384 and SM3 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.

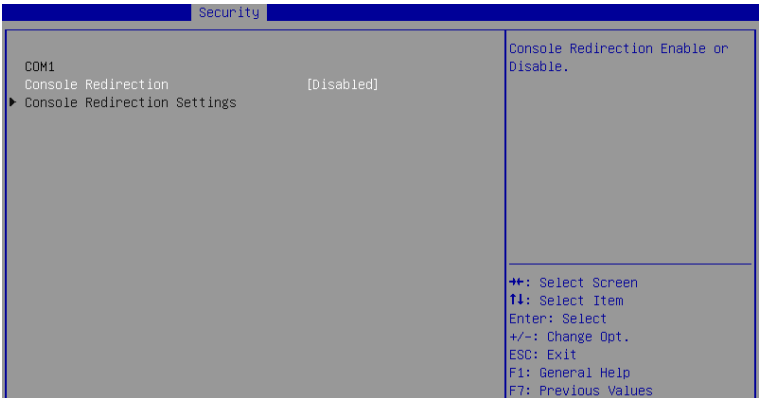
- **PH Randomization**

  Enables or disables Platform Hierarchy (PH) Randomization.

- **Device Select**

  Select your TPM device through this setting.

▶Serial Port Console Redirection

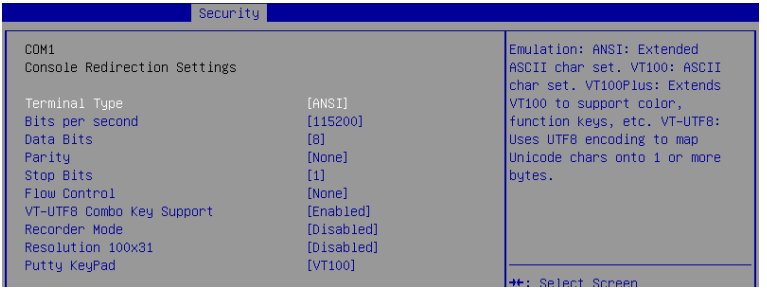


- **Console Redirection**

  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**

  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.

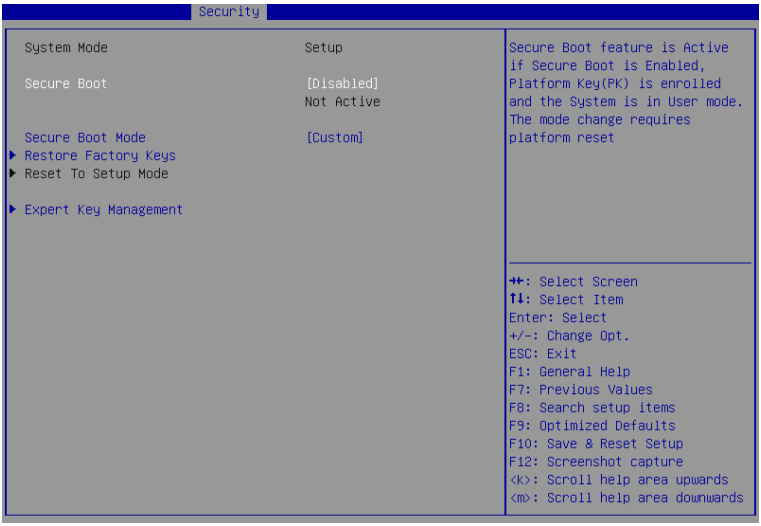
» **Recorder Mode, Resolution 100x31**

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]**.

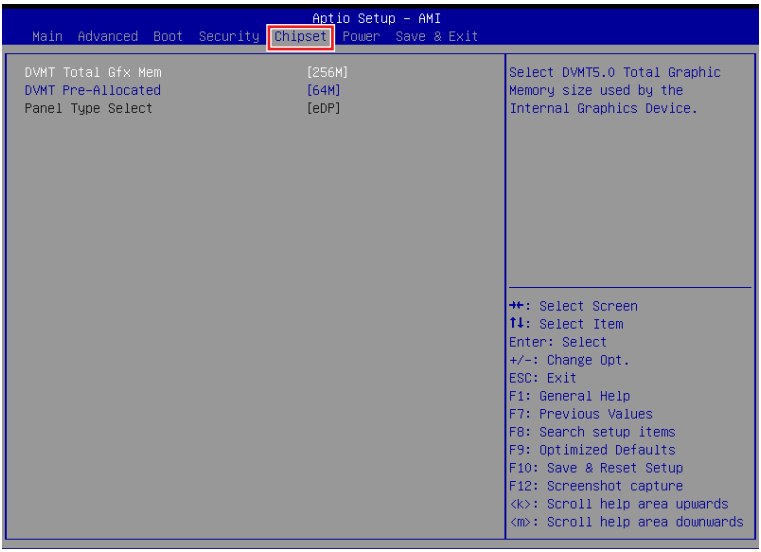
- **Reset to Setup Mode**

  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]**.

- **Expert Key Management**

  Allows advanced users to manually manage Secure Boot keys. This item appears when “**Secure Boot Mode**” sets to **[Custom]**.

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.

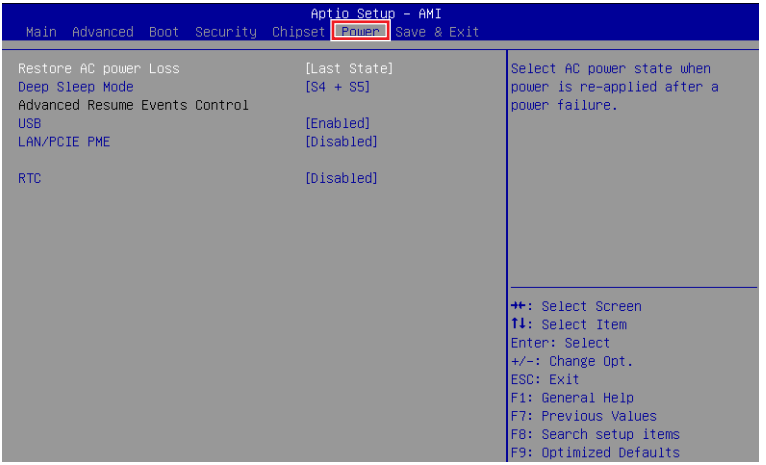
▶ Panel Type Select

Set your video signal interface as LVDs or eDP.

▶ LVDS Panel Type

This setting specifies the LCD Panel’ s resolution and distribution formats. The item will display when **Panel Type is set to LVDS**.

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

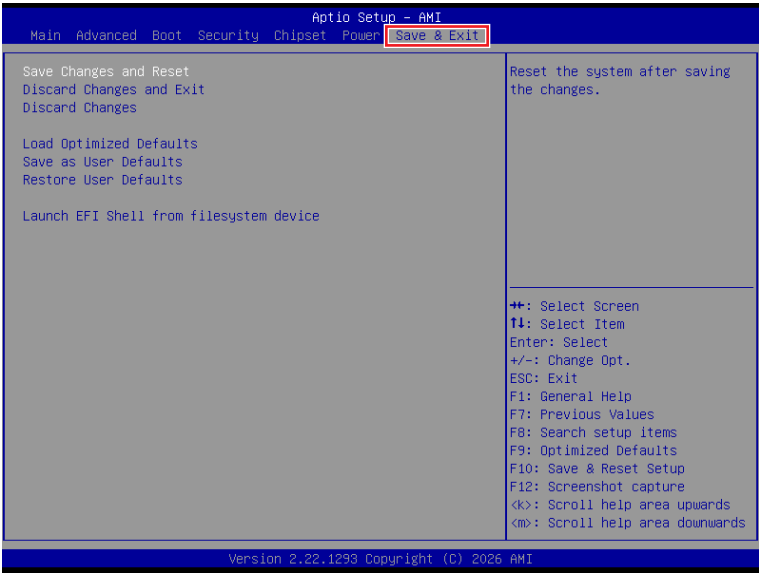
Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel® LAN device and onboard PCIE PME is detected.

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) programming guide.

Abstract

In this section, code examples based on C programming language provided for customer interest.

GetPhysLong, **SetPhysLong** functions used for operate a specific physical address and defined as following.

GetPhysLong: retrieve the value obtained from the physical memory location.

SetPhysLong: write the value to the physical memory location.

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	IO Port	Output State	Input State	Out Disable	In Disable
N_GPIO0	0xFD6D0920	Bit 0	Bit 1	Bit 8	Bit 9
N_GPIO1	0xFD6D0930				
N_GPIO2	0xFD6D0940				
N_GPIO3	0xFD6D0950				
N_GPIO4	0xFD6D0960				
N_GPIO5	0xFD6D0970				
N_GPIO6	0xFD6D0980				
N_GPIO7	0xFD6D0990				

1.1 Set output value of GPIO

1. Read the value from GPIO port.
2. Set the GPIO port Out Disable.
3. Set the GPIO port In Disable.
4. (If set to output mode) Set the value of GPIO Output State.
5. Write the value back to GPIO port.

Example: Set **N_GPIO0** output “high”

```
val = 0;
addr = 0xFD6D0920;
GetPhysLong((PBYTE) addr, &val);     // Read value from N_GPIO0 port.
val = val & (~(DWORD)(1<<8));        // Set N_GPIO0 bit 8 (Out Disable) to 0.
val = val | (DWORD)(1<<9);           // Set N_GPIO0 bit 9 (In Disable) to 1.
val = val | (DWORD)(1<<0);           // Set N_GPIO0 bit 0 to 1. (output “high”).
SetPhysLong((PBYTE)addr, val);       // Write back to N_GPIO0 port.
```

Example: Set **N_GPIO1** to input

```
val = 0;
addr = 0xFD6D0930;
GetPhysLong((PBYTE) addr, &val);     // Read value from N_GPIO1 port.
val = val | (DWORD)(1<<8);           // Set N_GPIO1 bit 8 (Out Disable) to 1.
val = val & (~(DWORD)(1<<9));        // Set N_GPIO1 bit 9 (In Disable) to 0.
SetPhysLong((PBYTE)addr, val);       // Write back to N_GPIO1 port.
```

1.2 Read input value from GPIO

1. Read the value from GPIO port.
2. Check GPIO port is input mode.
3. Get the value of GPIO Input State.

Example: Get **N_GPIO2** input value.

```
val = 0;
addr = 0xFD6D0940;
GetPhysLong((PBYTE) addr, &val);        // Read value from N_GPIO2 port.
If(val & (DWORD) (1<<8)){               // Check N_GPIO2 is input mode. (Out Disable = 1)
    if (val & (DWORD) (1<<1))           // Read N_GPIO2 bit 1 (Input State).
        printf ("Input of N_GPIO2 is High");
    else
        printf ("Input of N_GPIO2 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
```