mSi®

SKU1 (Intel® R680E)
SKU2 (Intel® Q670E)

MS-CF05

Industrial Computer Board

User Guide

Contents

Revision

V1.1, 2023/11

Regulatory Notices

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 radiates radio frequency energy, and, if not installed and used in accordance with the instructions, 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 following measures:

• 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.

NOTE

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

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

FCC Conditions

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

• This device may not cause harmful interference.

• This device must accept any interference received, including interference that may cause undesired operation.

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.

WEEE Statement

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

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/

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

Environmental Policy

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

Green Product Features

• Reduced energy consumption during use and stand-by

• Limited use of substances harmful to the environment and health

• Easily dismantled and recycled

• Reduced use of natural resources by encouraging recycling

• Extended product lifetime through easy upgrades

• Reduced solid waste production through take-back policy

Copyright and Trademarks Notice

Copyright © Micro-Star Int'l Co., Ltd. All rights reserved. The MSI logo used is a registered trademark of Micro-Star Int'l Co., Ltd. All other marks and names mentioned may be trademarks of their respective owners. No warranty as to accuracy or completeness is expressed or implied. MSI reserves the right to make changes to this document without prior notice.

HƏMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

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

Technical Support

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

Safety Information

- The components included in this package are prone to damage from electrostatic discharge (ESD). Please adhere to the following instructions to ensure successful computer assembly.

- Ensure that all components are securely connected. Loose connections may cause the computer to not recognize a component or fail to start.

- Hold the motherboard by the edges to avoid touching sensitive components.

- It is recommended to wear an electrostatic discharge (ESD) wrist strap when handling the motherboard to prevent electrostatic damage. If an ESD wrist strap is not available, discharge yourself of static electricity by touching another metal object before handling the motherboard.

- Store the motherboard in an electrostatic shielding container or on an anti-static pad whenever the motherboard is not installed.

- Before turning on the computer, ensure that there are no loose screws or metal components on the motherboard or anywhere within the computer case.

- Do not boot the computer before installation is completed. This could cause permanent damage to the components as well as injury to the user.

- If you need help during any installation step, please consult a certified computer technician.

- Always turn off the power supply and unplug the power cord from the power outlet before installing or removing any computer component.

- Keep this user guide for future reference.

- Keep this motherboard away from humidity.

- Make sure that your electrical outlet provides the same voltage as is indicated on the PSU, before connecting the PSU to the electrical outlet.

- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.

- All cautions and warnings on the motherboard should be noted.

- If any of the following situations arises, get the motherboard checked by service personnel:
    - Liquid has penetrated into the computer.
    - The motherboard has been exposed to moisture.
    - The motherboard does not work well or you can not get it work according to user guide.
    - The motherboard has been dropped and damaged.
    - The motherboard has obvious sign of breakage.

- Do not leave this motherboard in an environment above 60°C (140°F), it may damage the motherboard.

Specifications

Model	MS-CF05-SKU1	MS-CF05-SKU2
Dimensions	305(L)mm x 244(W)mm x 1.6(H)mm, ATX-Size	
Processor	• Intel® IOTG **Raptor** Lake-S Processor Core™ i9/i7/i5/i3, Pentium®, Celeron® - i9-13900 (65W) / i9-13900E (65W) / i9-13900TE (35W) - i7-13700 (65W) / i7-13700E (65W) / i7-13700T (35W) / i7-13700TE (35W) - i5-13500 & i5-13400 (65W) / i5-13500E & i5-13400E (65W) / i5-13500T (35W) / i5-13500TE (35W) - i3-13100 (65W) / i3-13100E (65W) / i3-13100T (35W) / i3-13100TE (35W) - Pentium® G7400E / Celeron® G6900E (46W) - Pentium® G7400TE / Celeron® G6900TE (35W) • Intel® IOTG **Alder** Lake-S Processor Core™ i9/i7/i5/i3, Pentium®, Celeron® - i9-12900 (65W) / i9-12900E (65W) / i9-12900TE (35W) - i7-12700 (65W) / i7-12700E (65W) / i7-12700TE (35W) - i5-12500 & i5-12400 (65W) / i5-12500E (65W) / i5-12500TE (35W) - i3-12100 (65W) / i3-12100E (65W) / i3-12100TE (35W) - Pentium® G7400E / Celeron® G6900E (46W) - Pentium® G7400TE / Celeron® G6900TE (35W)	
Chipset	Intel® R680E	Intel® Q670E
Memory	• 4 x DDR5 UDIMM slots (288-pin, vertical) - Up to 4400 MT/s - Up to 128GB	
	- Dual-Channel DDR5, **ECC/ Non-ECC**	- Dual-Channel DDR5, **Non-ECC**
Network	• **4** x Intel® I225-LM PCIe 2.5GbE LAN - LAN1: Supports iAMT 16.X	• **2** x Intel® I225-LM PCIe 2.5GbE LAN - LAN1: Supports iAMT 16.X
Storage	• 4 x SATA 3.0 6Gb/s connectors - Support RAID 0/1/5 - Support AHCI mode	
Audio	• Realtek® ALC897 High Definition Audio Codec	
Graphics	• 1 x DP 1.4a, up to 4096×2304 @60Hz • 1 x HDMI™ 2.0b, up to 4096x2160 @60Hz • 1 x VGA, up to 1920x1200 @60Hz • 3 independent display modes supported - DP - HDMI™ - VGA	

Continued on next column

Model	MS-CF05-SKU1	MS-CF05-SKU2
Expansion Slots	• 2 x PCIe 5.0 x16 slots (PCIE1, 4*) • 1 x PCIe 4.0 x4 slot (PCIE5**) • 3 x PCIe 3.0 x4 slots (PCIE3, 6, 7) • **1 x PCIe 3.0 x1 slot (PCIE2)** • 1 x M.2 M Key slot (M2_M1, 2280/ 22110) 　- Supports PCIe 4.0 x4 NVMe signal 　- Supports B+M Key module • 1 x M.2 M Key slot (M2_M2, 2242/ 2280) 　- Supports PCIe 4.0 x4/x2/x1 NVMe signal 　- Signal shared by PCIE5 　- Supports B+M Key module • **1 x M.2 B Key slot (2242/ 2280)** 　- Supports PCIe 3.0 x1 signal 　- Supports Innodisk devices: EGP2-X401-W1, EGPL-G202-W1, EGPL-G2S1 　- Supports PCIe 3.0 x2 NVMe SSD*** (Optional by request) • **1 x M.2 E Key slot (2230)** 　- Supports PCIe x1 signal 　- Supports Intel® AX210 Wi-Fi 6E, Intel® Wireless-AC 9260. CNVI devices are not supported.	• 2 x PCIe 5.0 x16 slots (PCIE1, 4*) • 1 x PCIe 4.0 x4 slot (PCIE5**) • 3 x PCIe 3.0 x4 slots (PCIE3, 6, 7) • 1 x M.2 M Key slot (M2_M1, 2280/ 22110) 　- Supports PCIe 4.0 x4 NVMe signal 　- Supports B+M Key module • 1 x M.2 M Key slot (M2_M2, 2242/ 2280) 　- Supports PCIe 4.0 x4/x2/x1 NVMe signal 　- Signal shared by PCIE5 　- Supports B+M Key module
	*PCIE1 and PCIE4 are designated for discrete graphics and storage devices. When the PCIE1 slot is in use, it operates at 5.0 x16 speed, while the PCIE4 slot becomes unavailable. If both PCIE1 and PCIE4 slots are occupied, they both run at 5.0 x8 speed. ** It is necessary to remove the M.2 screw when installing a PCIe x8 or x16 card in PCIE5. *** The HDD LED cannot be enabled when installing PCIe 3.0 x2 NVMe SSD in M2_B1.	
Rear I/O	• 1 x DisplayPort (1.4a) • 1 x HDMI™ connector (2.0b) • 1 x VGA port • 1 x DB-9 RS-232/422/485 serial port 　- COM1: Ring/0V/5V/12V (default set to Ring), Auto-flow Control supported • 1 x Line-out jack • 1 x Mic-in jack • **8** x USB 3.2 Gen 2 Type-A ports (10 Gbps)	
	• **4** x 2.5 GbE RJ-45 LAN ports	• **2** x 2.5 GbE RJ-45 LAN ports

Continued on next column

Model	MS-CF05-SKU1	MS-CF05-SKU2
Onboard Connector	• 1 x 4-pin PWM CPU fan connector • 3 x 4-pin PWM system fan connectors • 1 x Front Audio connector (Line-out & Mic-in) • 1 x S/PDIF connector • 1 x USB 3.2 Gen 1 connector (JUSB2) • 1 x USB 2.0 connector (JUSB1) • 1 x USB 2.0 Type-A connector (USB1) • 1 x Front panel connector • 1 x GPI connector • 1 x GPO connector • 1 x PMBus connector • 1 x I2C connector • 1 x SMBus connector • 5 x Serial port connectors • 1 x LAN LED connector • 1 x PS/2® Keyboard & Mouse connector • 6 x COM voltage select jumpers • 1 x AT/ ATX mode select jumper • 1 x ME jumper • 1 x Clear CMOS jumper • 1 x Chassis Intrusion jumper	
Power	• 1 x 24-pin ATX power connector • 1 x 4-pin 12V ATX power connector	
OS Support	• Windows 10 IoT Enterprise 2021 LTSC (64-bit) • Windows 11 IoT Enterprise 22H2 LTSC (64-bit) • Linux Kernel 5.xx, Ubuntu 22.04 LTS Pre-scan	
Certification	CE, FCC Class B, BSMI, RCM, VCCI, UKCA	
Environment	• Operating Temperature: 0 ~ 60°C • Storage Temperature: -20 ~ 80°C • Relative Humidity: 10 ~ 90%, non-condensing	

Motherboard Overview

SKU1

1 JCOMP1	**6** JCOMP4	
2 JCOMP2	**7** JCOMP3	
3 JCOMP6	**8** JATX1	
4 JCOMP5	**9** JME_DIS1	
5 JCASE1	**10** JCOMS1	

SKU2

Rear I/O Panel

JPWR2

DIMMB1
DIMMA2
DIMMA1
DIMMB2
CPUFAN1
JPMBUS1

SYSFAN1
SYSFAN2
JSMB1
JI2C1
JPWR1
JUSB2
M2_M1
SATA3_4
SATA1_2
JLAN_LED
JFP1
M2_M2
JUSB1
USB1
SYSFAN3

PCIE1
PCIE3
PCIE4
PCIE5
JKBMS1
PCIE6
JSPDIF1
PCIE7
JAUD1

JLPT1 COM6 COM5 COM4 COM3 COM2 JAPS1 JGPIO2 JGPIO1

#	Name	#	Name
1	JCOMP1	6	JCOMP4
2	JCOMP2	7	JCOMP3
3	JCOMP6	8	JATX1
4	JCOMP5	9	JME_DIS1
5	JCASE1	10	JCOMS1

Motherboard Overview   13

Rear I/O Panel

SKU1

2.5 GbE
RJ-45 LAN Jacks

RS232/422/485
Serial Port

DisplayPort

LAN1   LAN2   LAN3   LAN4

Line-Out
Jack

HƏMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

VGA Port

USB 3.2 Gen 2 Ports

Mic-in
Jack

SKU2

2.5 GbE
RJ-45 LAN Jacks

RS232/422/485
Serial Port

DisplayPort

LAN1   LAN2

Line-Out
Jack

HƏMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

VGA Port

USB 3.2 Gen 2 Ports

Mic-in
Jack

DisplayPort

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

HDMI™ Connector

The High-Definition Multimedia Interface (HDMI™) is an all-digital audio/ video interface capable of transmitting uncompressed streams. HDMI™ supports all TV format, including standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.

RS232/422/485 Serial Port

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

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

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

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

VGA Port

The VGA port supports monitors and other VGA interface devices.

2.5 GbE RJ-45 LAN Jacks

The standard single RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.
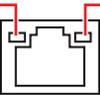
Link/ Activity LED	
Status	**Description**
◯ Off	No link
🟡 Yellow	Linked
🟡 Blinking	Data activity

Speed LED	
Status	**Description**
◯ Off	10/100 Mbps
🟢 Green	1000 Mbps
🟠 Orange	2.5 Gbps

USB 3.2 Gen 2 Ports

USB 3.2 Gen 2, the **SuperSpeed USB 10Gbps**, delivers high-speed data transfer for various devices, such as storage devices, hard drives, video cameras, etc.

Line-Out Jack

This connector is provided for headphones or speakers.

Mic-In Jack

This connector is provided for microphones.

Component Contents

Component	Page
CPU Socket	**18**
Memory	**20**
DIMM1~2: DDR5 DIMM Slots	20
Storage	**22**
SATA1_2, 3_4: SATA 3.0 6Gb/s Connectors	22
Expansion Slots	**23**
PCIE1~7: PCIe Expansion Slots	23
M2_M1: M.2 Slot (M Key, PCIe 4.0 x4, 2280/ 22110)	24
M2_M2: M.2 Slot (M Key, PCIe 4.0 x4/x2/x1, 2242/ 2280)	24
M2_E1: M.2 Slot (E Key, 2230) (SKU1 Only)	25
M2_B1: M.2 Slot (B Key, 2242/ 2280) (SKU1 Only)	25
Connectors	**26**
Power Connectors	**26**
JPWR1: 24-Pin ATX Power Connector	26
JPWR2: 8-Pin ATX 12V Power Connector	26
Cooling Connectors	**27**
CPUFAN1, SYSFAN1~3: CPU/ System Fan Connectors	27
Audio Connectors	**28**
JAUD1: Front Audio Connector (Line-out/ MIC-in)	28
JSPDIF1: S/PDIF Connector	28
USB Connectors	**29**
JUSB2: USB 3.2 Gen 1 Connector	29
JUSB1: USB 2.0 Connector	30
USB1: USB 2.0 Type-A Connector	30
Other Connectors	**31**
JFP1: Front Panel Connector	31
JGPIO1: GPI Connector	31
JGPIO2: GPO Connector	31
JPMBUS1: PMBus Connector	32
JSMB1: I2C Connector	32
JI2C1: SMBus Connector	32
COM2~6: Serial Port Connectors	33
JLAN_LED: LAN LED Connector	35
JKBMS1: PS/2® Keyboard & Mouse Connector	35
JLPT1: Parallel Port Connector	36
Jumpers	**37**

CPU Socket
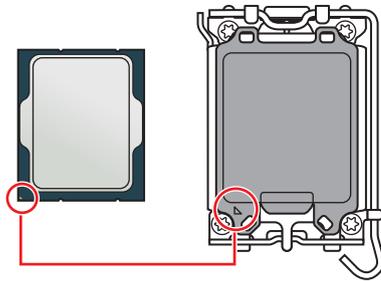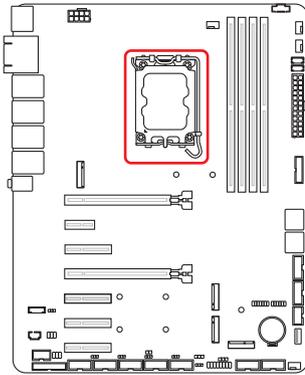
Introduction to the LGA1700 CPU

The surface of the LGA1700 CPU has four notches and a golden triangle to assist in correctly lining up the CPU for motherboard placement. The golden triangle is the Pin 1 indicator.

⚠️ *Important*

• *Always unplug the power cord from the power outlet before installing or removing the CPU.*

• *When **installing a CPU**, always remember to install a CPU heatsink. A CPU heatsink is necessary to prevent overheating and maintain system stability.*

• *Confirm that the CPU heatsink has formed a tight seal with the CPU before booting your system.*

• ***Overheating** can seriously damage the CPU and motherboard. Always make sure the cooling fans work properly to protect the CPU from overheating. Be sure to apply an even layer of thermal paste (or thermal tape) between the CPU and the heatsink to enhance heat dissipation.*

• *Whenever the CPU is not installed, always protect the CPU socket pins by covering the socket with the plastic cap.*

• *If you purchased a separate CPU and heatsink/ cooler, Please refer to the documentation in the heatsink/ cooler package for more details about installation.*

CPU & Heatsink Installation

Use appropriate ground straps, gloves and ESD mats to protect yourself from electrostatic discharge (ESD) while installing the processor.

⚠️ Important

Images are for illustration purposes only; actual parts may vary.

https://youtu.be/KMf9oIDsGes
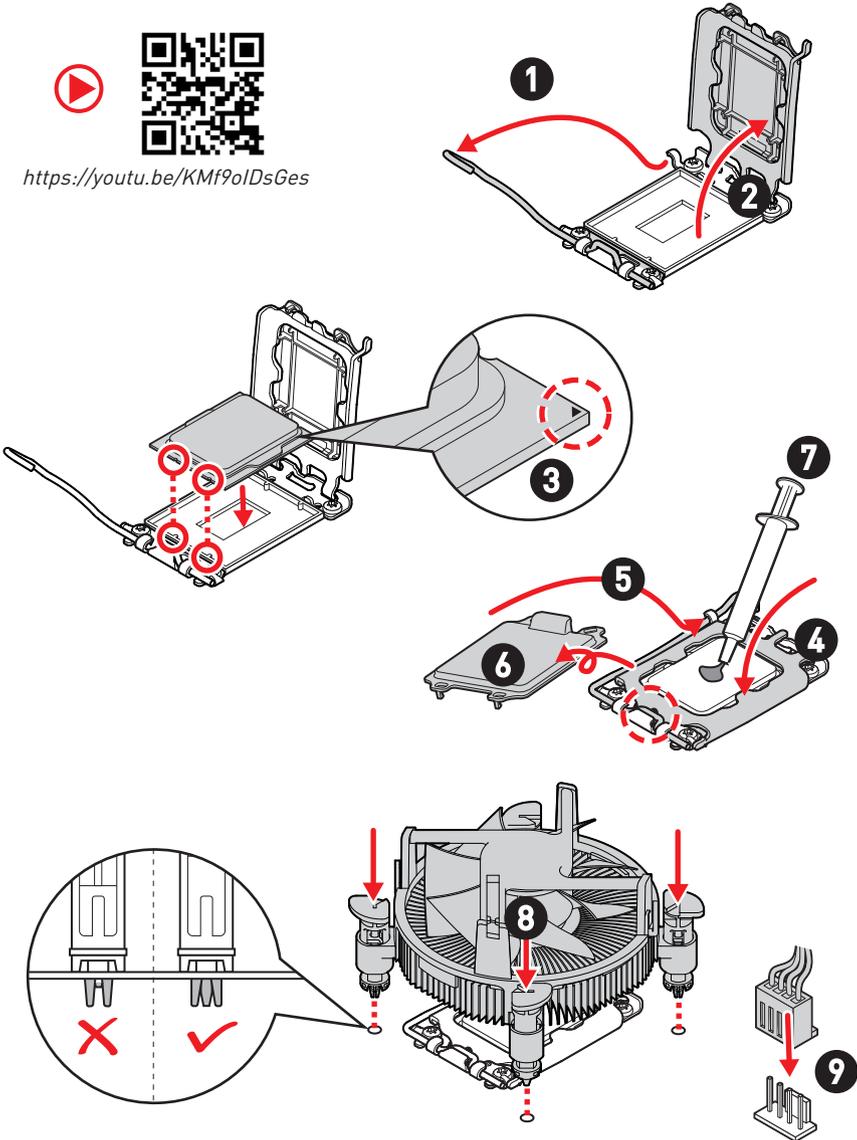
Memory

DIMM1~2: DDR5 DIMM Slots

The DIMM slots are intended for memory modules.
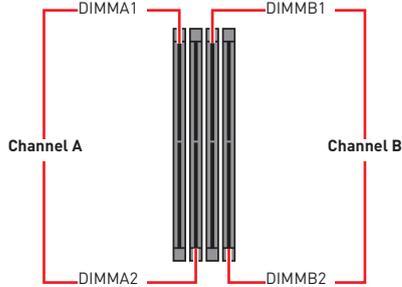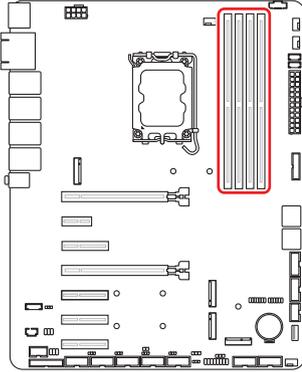
Recommended Memory Population

Quantity of DIMMs		1	2			3		4
Channel A	DIMMA1				V		V	V
	DIMMA2	V	V		V	V	V	V
Channel B	DIMMB1			V		V		V
	DIMMB2		V	V		V	V	V

**"V" indicates a populated DIMM slot. **

> ⚠ *Important*
>
> - *Only support **UDIMM**.*
> - *There should be at least 1 DDR5 DIMM populated.*
> - *Paired memory installation for Max performance.*
> - *If only **1 DIMM** is populated in a channel, then populate it in the **DIMMA2** slot.*
> - *Populate the same DIMM type in each channel, specifically: 1. Use the same DIMM size; 2. Use the same number of ranks per DIMM.*
> - *We don't suggest other memory installation.*

Installing Memory Modules

1. Open the side clips to unlock the DIMM slot.

2. Insert the DIMM vertically into the slot, ensuring that the off-center notch at the bottom aligns with the slot.

3. Push the DIMM firmly into the slot until it clicks and the side clips automatically close.

4. Verify that the side clips have securely locked the DIMM in place.
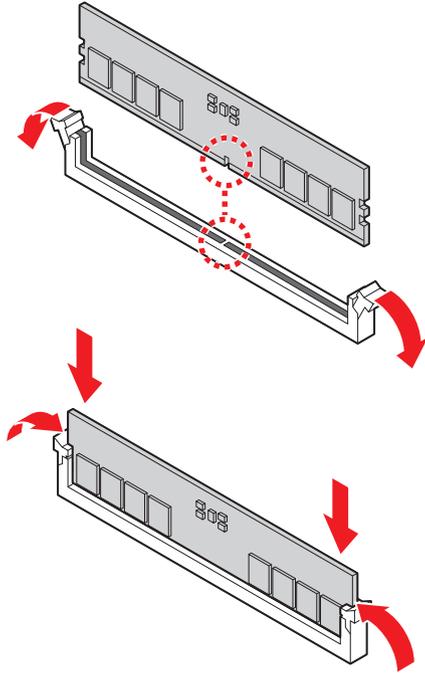
⚠ *Important*

You can barely see the golden finger if the memory module is properly inserted in the DIMM slot.

Storage

SATA1_2, 3_4: SATA 3.0 6Gb/s Connectors

These connectors are SATA 6Gb/s interface port, it can connect to one SATA device.

SATA3_4

SATA1_2
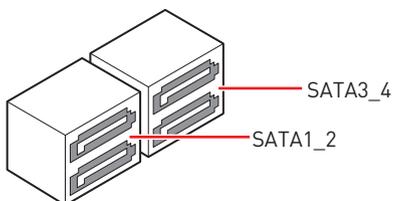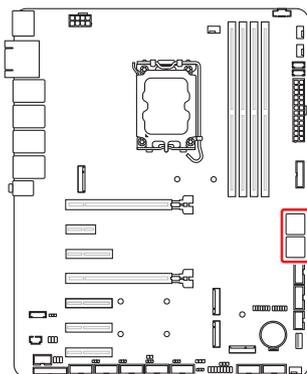
⚠️ *Important*

- *These SATA connectors support 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.*

Expansion Slots

PCIe Slots

PCIE1: PCIe 5.0 x16
PCIE2: PCIe 4.0 x4 (**SKU1** Only)
PCIE3: PCIe 3.0 x4
PCIE4: PCIe 5.0 x16 (Signal share with **PCIE1**)
PCIE5: PCIe 4.0 x4 (Signal share with **M2_M2**)
PCIE6: PCIe 3.0 x4
PCIE7: PCIe 3.0 x4
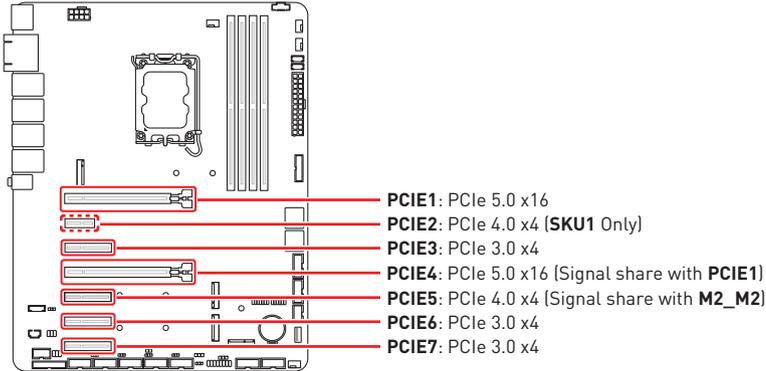
PCIE1~7: PCIe Expansion Slots

The PCI Express (Peripheral Component Interconnect Express) slots support PCIe interface expansion cards.

⚠ *Important*

• **PCIE1** and **PCIE4** are designated for discrete graphics and storage devices.

• When the **PCIE1** slot is occupied, it will operate at 5.0 x16 speed, while the **PCIE4** slot will not be available. Both **PCIE1,4** slots will run at 5.0 x8 speed when occupied.

• It is necessary to **remove the M.2 screw** when installing a PCIe x8 or x16 card in **PCIE5**.

• 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.

M.2 Slots

M2_M1

M2_M2
M2_B1 (**SKU1** Only)
M2_E1 (**SKU1** Only)
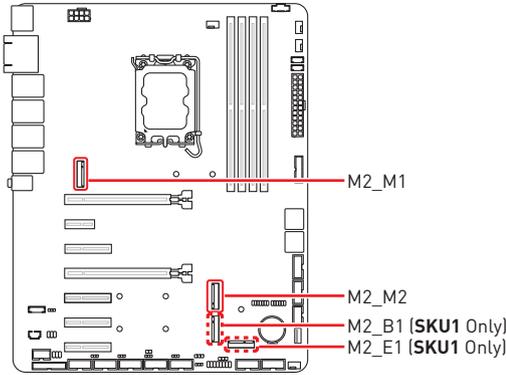
M2_M1: M.2 Slot (M Key, PCIe 4.0 x4, 2280/ 22110)

M2_M2: M.2 Slot (M Key, PCIe 4.0 x4/x2/x1, 2242/ 2280)

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

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

2. Move and fasten the M.2 riser screw to the appropriate location according your M.2 SSD size.

30°

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

Supplied M.2 screw

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

⚠ *Important*
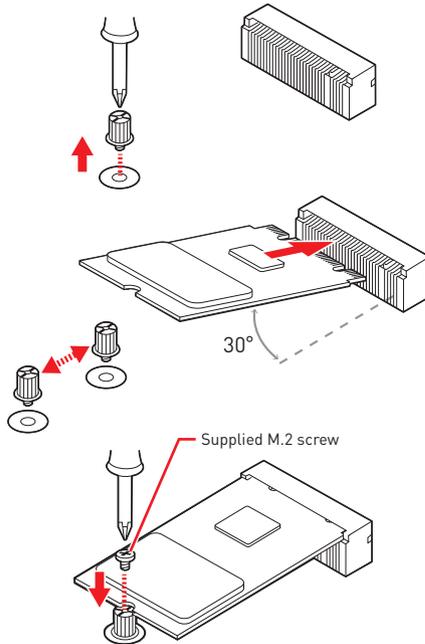
*The **M2_M1, M2_M2** slots supports B+M Key module.*

M2_E1: M.2 Slot (E Key, 2230) (SKU1 Only)

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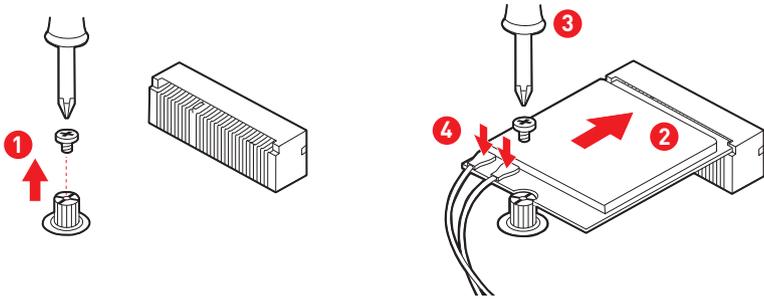
Feature

• Supports PCIe x1 signal.

• Supports Intel® AX210 Wi-Fi 6E, Intel® Wireless-AC 9260. CNVI devices are not supported.

M2_B1: M.2 Slot (B Key, 2242/ 2280) (SKU1 Only)

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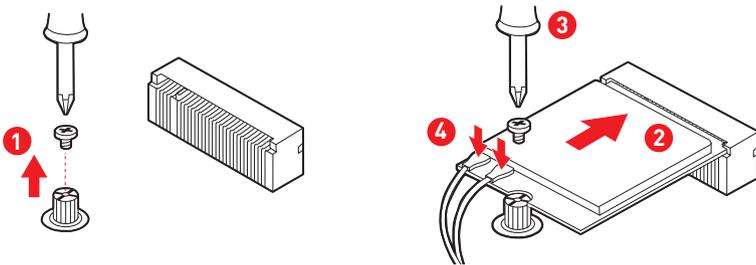
Feature

• Supports PCIe 3.0 x1 signal.

• Supports Innodisk devices: EGP2-X401-W1, EGPL-G202-W1, EGPL-G2S1.

• Supports PCIe 3.0 x2 NVMe SSD

⚠ *Important*

*The HDD LED cannot be enabled when installing PCIe 3.0 x2 NVMe SSD in **M2_B1**.*

Connectors

Power Connectors
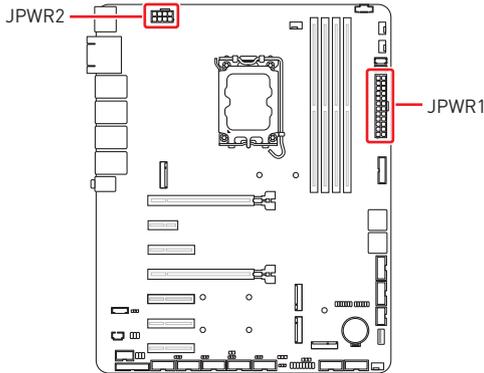
JPWR1: 24-Pin ATX Power Connector

This connector allows you to connect an ATX power supply.

1	+3.3V		13	+3.3V
2	+3.3V		14	-12V
3	GND		15	GND
4	+5V		16	PS-ON#
5	GND		17	GND
6	+5V		18	GND
7	GND		19	GND
8	PWR OK		20	Res
9	5VSB		21	+5V
10	+12V		22	+5V
11	+12V		23	+5V
12	+3.3V		24	GND

JPWR2: 8-Pin ATX 12V Power Connector

This connector is used to provide power to SATA devices.

1	GND	5	P12V
2	GND	6	P12V
3	GND	7	P12V
4	GND	8	P12V

⚠️ *Important*

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

Cooling Connectors
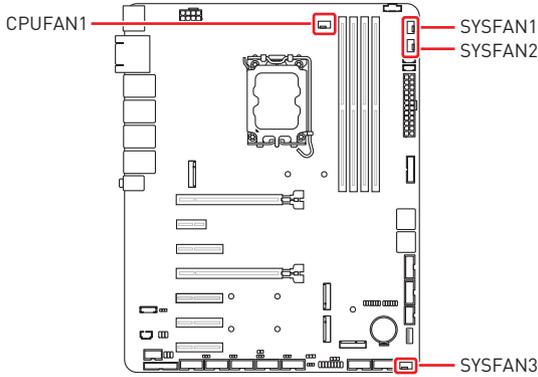
CPUFAN1, SYSFAN1~3: CPU/ System Fan Connectors

The fan power connector supports CPU/ 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.

CPUFAN1 SYSFAN1~3	1	GND	2	FAN POWER
	3	FAN SENSE	4	FAN_PWM

⚠️ *Important*

Please refer to the recommended CPU fans at processor's official website or consult the vendors for proper CPU cooling fan.

Audio Connectors
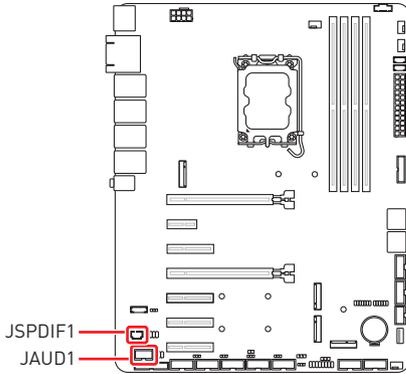
JAUD1：Front Audio Connector (Line-out/ MIC-in)

This connector allows you to connect front panel audio.

1	MIC_L	2	GND
3	MIC_R	4	NC
5	LINE_OUT_R	6	MIC_JD
7	HP_ON	8	No pin
9	LINE_OUT_L	10	LINE_OUT_JD

JAUD1 — 2 ... 10 / 1 ... 9

JSPDIF1: S/PDIF Connector

This pinheader is used to connect S/PDIF (Sony & Philips Digital Interconnect Format) interface for digital audio transmission.

1	5V
2	SPDIF0
3	GND

JSPDIF — 1 ... 3
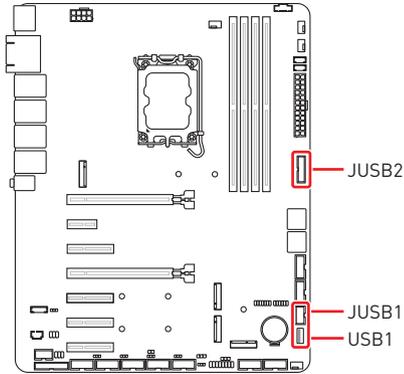
USB Connectors

JUSB2: USB 3.2 Gen 1 Connector

This port is backward-compatible with USB 2.0 devices and supports data transfer rate up to 5 Gbps (SuperSpeed).

	1	5V	11	USB_D+
	2	USB 3.2 RX-	12	USB_D-
	3	USB 3.2 RX+	13	GND
	4	GND	14	USB3_ESD_DN8
	5	USB 3.2 TX-	15	USB 3.2 TX-
	6	USB 3.2 TX+	16	GND
	7	GND	17	USB 3.2 RX+
	8	USB_D-	18	USB 3.2 RX-
	9	USB_D+	19	5V
	10	USB_VCC2	20	No Pin

JUSB1: USB 2.0 Connector

This header is ideal for connecting USB devices such as keyboard, mouse, or other USB-compatible devices.
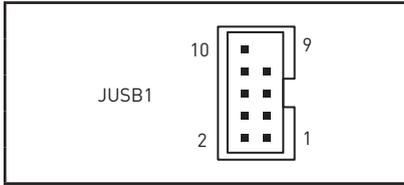
1	5V	2	5V
3	USB_D-	4	USB_D-
5	USB_D+	6	USB_D+
7	GND	8	GND
9	No Pin	10	NC

USB1: USB 2.0 Type-A Connector

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboard, mouse, or other USB-compatible devices. It supports speed up to **480 Mbps** data transfer rate.

1	POWER
2	USB_D-
3	USB_D+
4	GND

Other Connectors

JFP1: Front Panel Connector

This front-panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.
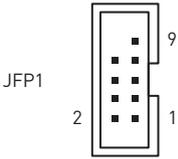
1	HDD LED+	2	POWER LED
3	HDD LED-	4	POWER LED
5	RESET SWITCH-	6	POWER SWITCH+
7	RESET SWITCH+	8	POWER SWITCH-
9	NC	10	No pin

JGPIO1: GPI Connector

These connectors are provided for the General-Purpose Input (GPI) peripheral module.
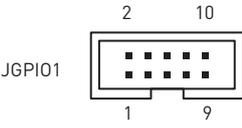
1	GND	2	N_GPIO_VCC (VCC5)
3	N_GPI0	4	N_GPI4
5	N_GPI1	6	N_GPI5
7	N_GPI2	8	N_GPI6
9	N_GPI3	10	N_GPI7

JGPIO2: GPO Connector

These connectors are provided for the General-Purpose Output (GPO) peripheral module.
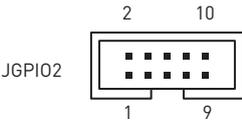
1	GND	2	N_GPIO_VCC (VCC5)
3	N_GPO0	4	N_GPO4
5	N_GPO1	6	N_GPO5
7	N_GPO2	8	N_GPO6
9	N_GPO3	10	N_GPO7
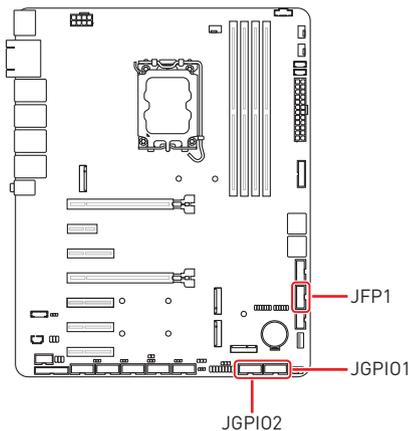
JPMBUS1: PMBus Connector

Power Management Bus (PMBus) is a variant of the System Management Bus (SMBus) which is targeted at digital management of power supplies.

1	SMBCLK
2	SMBDATA
3	SMBALERT#
4	GND
5	3V

JPMBUS1   5 [. . . . .] 1

JSMB1: I2C Connector

This connector is provided for users to connect I²C (Inter-Integrated Circuit) interface.

1	5V
2	SMBCLK
3	SMBDATA
4	GND

JSMB1   4 [. . . .] 1

JI2C1: SMBus Connector

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

1	NC
2	I2C_CLK
3	I2C_DATA
4	GND

JI2C1   4 [. . . .] 1

JPMBUS1

JSMB1
JI2C1
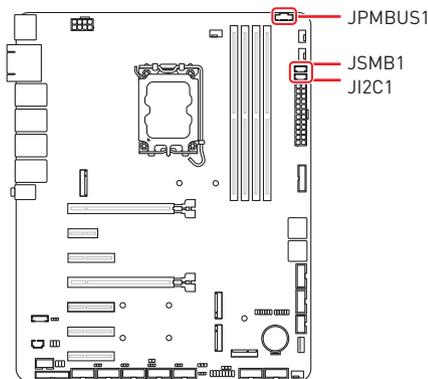
COM2~6: Serial Port Connectors

This connector is a 16550A high speed communications port that sends/ receives 16 bytes FIFOs. You can attach a serial device to it.
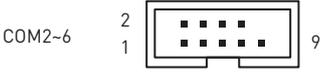
COM2~6		1	DCD	2	SIN
		3	SOUT	4	DTR
		5	GND	6	DSR#
		7	RTSD	8	CTS#
		9	VCC_COM	10	No Pin

COM6
COM5
COM4
COM3
COM2
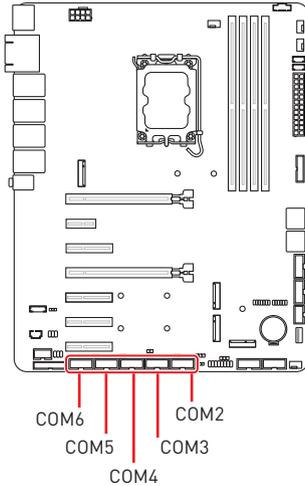
⚠ *Important*

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

Feature

• Supports True RS-232

• Supports TTL RS-232

• Supports Auto flow control

• RS- 422/ 485 support TR 1000+ Meter

SKU1 (Intel® R680E)

• COM2

Supports RS-232/ 422/ 485, With Ring/ 0V/ 5V/ 12V (Default set to Ring).

• COM3~6

Supports RS-232/ 422/ 485, With 5V/ 12V (Default set to 5V).

SKU2 (Intel® Q670E)

• COM2

Supports RS-232/ 422/ 485, With Ring/ 0V/ 5V/ 12V (Default set to Ring).

• COM3~6

Supports RS-232, With 5V/ 12V (Default set to 5V)

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

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

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

JLAN_LED: LAN LED Connector

This connector is provided for rear panel LAN LEDs.
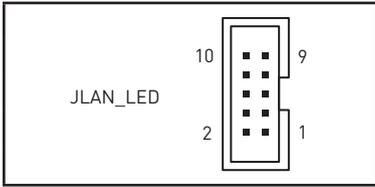
		1	I225_ACT_LINK_1	2	I225_LED2_LINK#_1
10	9	3	I225_ACT_LINK_2	4	I225_LED2_LINK#_2
JLAN_LED		5	I225_ACT_LINK_3	6	I225_LED2_LINK#_3
2	1	7	I225_ACT_LINK_4	8	I225_LED2_LINK#_4
		9	NC	10	NC

JKBMS1: PS/2® Keyboard & Mouse Connector

This connector is provided to connect a keyboard and a mouse.
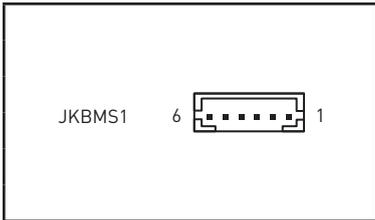
1	KBDAT
2	GND
3	MSDAT
4	KBCLK
5	5V
6	MSCLK

JKBMS1   6 [........] 1

JLAN_LED

JKBMS1
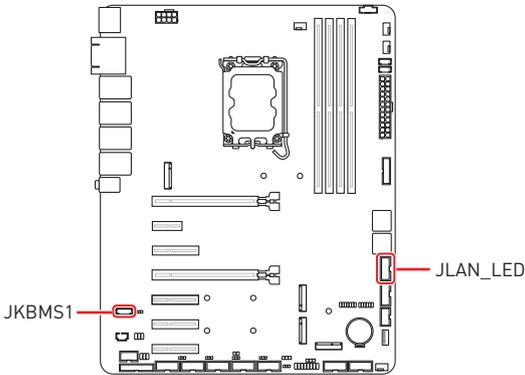
JLPT1: Parallel Port Connector

The mainboard provides a 26-pin header for connection to an optional parallel port bracket. The parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.

JLPT1

2   26

1   25
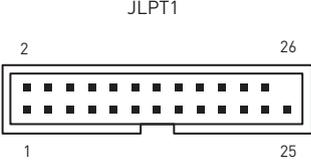
1	RSTB#	2	AFD#
3	PRND0	4	ERR#
5	PRND1	6	PINIT#
7	PRND2	8	LPT_SLIN#
9	PRND3	10	GND
11	PRND4	12	GND
13	PRND5	14	GND
15	PRND6	16	GND
17	PRND7	18	GND
19	ACK#	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	NC

JLPT1
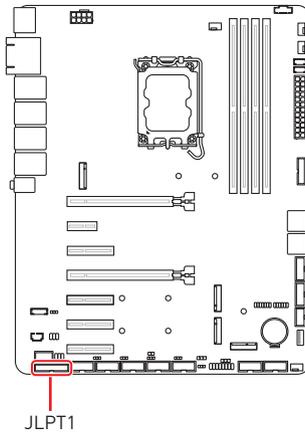
Jumpers

⚠ **Important**

Avoid adjusting jumpers when the system is on; it will damage the motherboard.
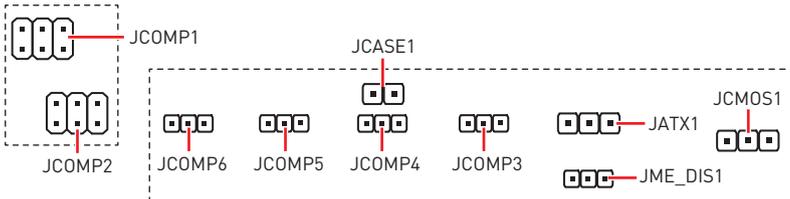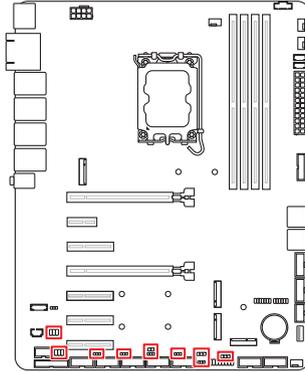
Jumper Name	Default Setting	Description
JCOMP1~2	2 6 1 5	**COM Voltage Select Jumper**
		1-2: 5V
		3-4: 12V
		5-6: NRI (Default)
JCOMP3~6	1	**COM Voltage Select Jumper**
		1-2: 5V
		2-3: 12V
JATX1	1	**AT/ ATX Mode Select Jumper**
		1-2: ATX (Default)
		2-3: AT

Jumper Name	Default Setting	Description
JME_DIS1	1 ▮ ▪	**ME Jumper**
		1-2: ME enabled (Default)
		2-3: ME disabled
JCMOS1	1 ▮ ▪	**Clear CMOS Jumper**
		1-2: Normal (Default)
		2-3: Clear CMOS
JCASE1	▪ ▪ Normal (default)	**Chassis Intrusion Jumper**
		This connector connects to the chassis intrusion switch cable. If the chassis is opened, the chassis intrusion mechanism will be activated. The system will record this status and show a warning message on the screen. To clear the warning, you must enter the BIOS utility and clear the record.

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

```
                        Aptio Setup - AMI
    Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

    System Date                   [Mon 08/21/2023]    Set the Date. Use Tab to
    System Time                   [13:48:18]          switch between Date elements.
                                                      Default Ranges:
    SATA_1                        Not Present          Year: 2000-2099
    SATA_2                        Not Present          Months: 1-12
    SATA_3                        Not Present          Days: Dependent on month
    SATA_4                        Not Present          Range of Years may vary.
    M.2_1                         Not Present
    M.2_2                         Not Present

    SATA Mode                     AHCI
    Enable VMD controller         [Disabled]
  ▶ VMD setup menu

    USB Devices:                                     �: Select Screen
          1 Drive, 1 Keyboard                        ↑↓: Select Item
                                                     Enter: Select
    BIOS Version                  ECF05IMS.800       +/-: Change Opt.
                                                     ESC: Exit
    Intel(R) Pentium(R) Gold G7400TE @3000 MHz       F1: General Help
    Processor ID                  0x90675            F7: Previous Values
    Build Type                    64                 F9: Optimized Defaults
    Total Memory                  8192 MB(DDR5)      F10: Save & Reset Setup
                                                     F12: Screenshot capture
                                                     <k>: Scroll help area upwards
                                                     <m>: Scroll help area downwards

                  Version 2.22.1288 Copyright (C) 2023 AMI
```

▶ **Main**

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

▶ **Advanced**

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

▶ **Boot**

Use this menu to specify the priority of boot devices.

▶ **Security**

Use this menu to set supervisor and user passwords.

▶ **Chipset**

This menu controls the advanced features of the on-board chipsets.

▶ **Power**

Use this menu to specify your settings for power management.

▶ **Save & Exit**

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

Main

```
                          Aptio Setup - AMI
 Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

 System Date                    [Mon 08/21/2023]    Set the Date. Use Tab to
 System Time                    [13:48:18]          switch between Date elements.
                                                    Default Ranges:
 SATA_1                         Not Present         Year: 2000-2099
 SATA_2                         Not Present         Months: 1-12
 SATA_3                         Not Present         Days: Dependent on month
 SATA_4                         Not Present         Range of Years may vary.
 M.2_1                          Not Present
 M.2_2                          Not Present

 SATA Mode                      AHCI
 Enable VMD controller          [Disabled]
 ▶ VMD setup menu
                                                    ↔: Select Screen
 USB Devices:                                       ↑↓: Select Item
       1 Drive, 1 Keyboard                          Enter: Select
                                                    +/-: Change Opt.
 BIOS Version                   ECF05IMS.800        ESC: Exit
                                                    F1: General Help
 Intel(R) Pentium(R) Gold G7400TE @3000 MHz         F7: Previous Values
 Processor ID                   0x90675             F9: Optimized Defaults
 Build Type                     64                  F10: Save & Reset Setup
 Total Memory                   8192 MB(DDR5)       F12: Screenshot capture
                                                    <k>: Scroll help area upwards
                                                         area downwards
```

HDD Information

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

▶ **System Date**

This setting allows you to set the system date.

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

▶ **System Time**

This setting allows you to set the system time.

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

▶ **Enable VMD controler**

Enables or disables VMD (RAID) controler.

Advanced

```
                              Aptio Setup - AMI
       Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

      Full Screen Logo Display          [Disabled]          Enables or disables Full
      Bootup NumLock State              [On]                Screen Logo Display option
    ▶ CPU Configuration
    ▶ Super IO Configuration
    ▶ H/W Monitor
    ▶ Smart Fan Configuration
    ▶ PCI/PCIE Device Configuration
    ▶ Network Stack Configuration
    ▶ GPIO Group Configuration
    ▶ PCIE ASPM Settings


                                                            ↔: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            ESC: Exit
                                                            F1: General Help
                                                            F7: Previous Values
                                                            F9: Optimized Defaults
                                                            F10: Save & Reset Setup
                                                            F12: Screenshot capture
                                                            <k>: Scroll help area upwards
                                                            <m>: Scroll help area downwards

                      Version 2.22.1288 Copyright (C) 2023 AMI
```

▶ **Full Screen Logo Display**

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

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

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

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

▶ **Bootup NumLock State**

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

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

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

▶ **CPU Configuration**

```
                              Aptio Setup – AMI
      Advanced

    CPU Configuration                              When enabled, a VMM can
                                                   utilize the additional
    Intel(R) Pentium(R) Gold G7400TE              hardware capabilities provided
    Processor ID              0x90675              by Vanderpool Technology.
    Processor Speed           3000 MHz

    P-core Information
    L1 Data Cache             48 KB × 2
    L1 Instruction Cache      32 KB × 2
    L2 Cache                  1280 KB × 2
    L3 Cache                  6 MB

    Intel Virtualization Technology    [Enabled]   ►←: Select Screen
    Hyper-Threading                    [Enabled]   ↑↓: Select Item
    Active Performance-cores           [All]       Enter: Select
    Intel(R) SpeedStep(tm)             [Enabled]   +/-: Change Opt.
    Intel(R) Speed Shift Technology    [Enabled]   ESC: Exit
    C states                           [Enabled]   F1: General Help
                                                   F7: Previous Values
                                                   F9: Optimized Defaults
                                                   F10: Save & Reset Setup
                                                   F12: Screenshot capture
                                                   <k>: Scroll help area upwards
                                                   <m>: Scroll help area downwards
```

▶ **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.

▶ **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).

▶ **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**

```
         Advanced

 Super IO Configuration                              ▲  Enable or Disable Serial Port
                                                        (COM)
 Serial Port 1               [Enabled]
 Device Settings             IO=3F8h; IRQ=4;
 Change Settings             [Auto]
 Mode Select                 [RS232]
 Serial Port 2               [Enabled]
 Device Settings             IO=2F8h; IRQ=3;
 Change Settings             [Auto]
 Mode Select                 [RS232]
 Serial Port 3               [Enabled]
 Device Settings             IO=3E8h; IRQ=7;
 Change Settings             [Auto]
 Mode Select                 [RS232]          ↔: Select Screen
 Serial Port 4               [Enabled]        ↕: Select Item
 Device Settings             IO=2E8h; IRQ=7;  Enter: Select
 Change Settings             [Auto]           +/-: Change Opt.
 Mode Select                 [RS232]          ESC: Exit
 Serial Port 5               [Enabled]        F1: General Help
 Device Settings             IO=2F0h; IRQ=7;  F7: Previous Values
 Change Settings             [Auto]           F9: Optimized Defaults
 Mode Select                 [RS232]          F10: Save & Reset Setup
 Serial Port 6               [Enabled]        F12: Screenshot capture
 Device Settings             IO=2E0h; IRQ=7;  <k>: Scroll help area upwards
 Change Settings             [Auto]        ▼  <m>: Scroll help area downwards
```

▶ **Serial Port 1/ 2/ 3/ 4/ 5/ 6, Parallel Port**

This setting enables or disables the specified serial port.

  » **Change Settings**

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

  » **Mode Select**

  Select an operation mode for Serial Port 1/ 2/ 3/ 4/ 5/ 6, Parallel Port.

▶ **FIFO Mode**

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

▶ **Shared IRQ Mode**

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

▶ **Watch Dog Timer**

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

▶ H/W Monitor (PC Health Status)

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

```
     Advanced

 PC Health Status                                  Thermal Shutdown

 Thermal Shutdown              [Disabled]

 CPU temperature              : +29 C
 System temperature1          : +29 C
 System temperature2          : +27 C
 System temperature3          : +28 C

 CPUFAN                       : 3856 RPM
 SYSFAN1                      : N/A
 SYSFAN2                      : N/A
 SYSFAN3                      : N/A
                                                  ←→: Select Screen
 VCC_CORE                     : +0.784 V          ↑↓: Select Item
 VCC3                         : +3.312 V          Enter: Select
 VCC5                         : +5.003 V          +/-: Change Opt.
 +12V                         : +12.144 V         ESC: Exit
 VCC3V                        : +3.296 V          F1: General Help
 VSB3V                        : +3.280 V          F7: Previous Values
 VSB5V                        : +4.896 V          F9: Optimized Defaults
 VBAT                         : +3.136 V          F10: Save & Reset Setup
                                                  F12: Screenshot capture
                                                  <k>: Scroll help area upwards
                                                  <m>: Scroll help area downwards
```

▸ 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.

▶ Smart Fan Configuration

```
     Advanced

 Configuration Smart FAN                           Disabled/Enabled Smart FAN
                                                   Function
 CPUFAN                        [Disabled]
 SYSFAN1                       [Disabled]
 SYSFAN2                       [Disabled]
 SYSFAN3                       [Disabled]
```

▸ CPUFAN/ SYSFAN1~3

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 **CPUFAN/ SYSFAN1~3** is enabled.

» **Min. Speed (%)**

The beginning speed of the System fan.

▶ PCI/PCIE Device Configuration

```
   Advanced

Audio Controller                [Enabled]              Control Detection of the Audio
                                                       Controller.
                                                       Disabled = Audio Controller
                                                       will be unconditionally
                                                       disabled.
                                                       Enabled = Audio Controller
                                                       will be unconditionally
                                                       Enabled.
```
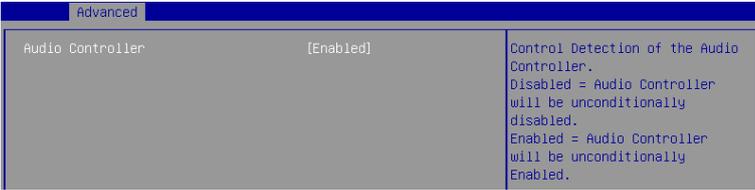
▸ **Audio Controller**

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.

```
     Advanced

Network Stack                   [Disabled]             Enable/Disable UEFI Network
                                                       Stack
```
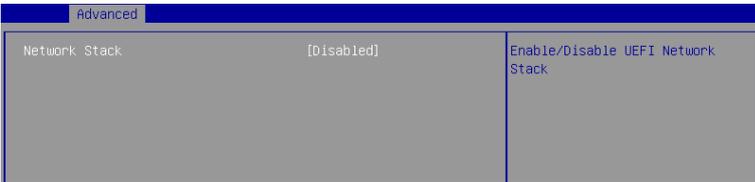
▸ **Network Stack**

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	[Low]	Set GPO0 to output High/Low
GPO1	[Low]	
GPO2	[Low]	
GPO3	[Low]	
GPO4	[Low]	
GPO5	[Low]	
GPO6	[Low]	
GPO7	[Low]	

▸ **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	[Disabled]	PCI Express Active State Power Management settings.
M2_E1	[Disabled]	
M2_M1	[Disabled]	
M2_M2/PCIE5	[Disabled]	
PCIE1	[Disabled]	
PCIE2	[Disabled]	
PCIE3	[Disabled]	
PCIE4	[Disabled]	
PCIE6	[Disabled]	
PCIE7	[Disabled]	

▸ **M2_B1, M2_E1, M2_M1/ PCIE5, PCIE1~4, PCIE6~7**

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

Boot

```
                              Aptio Setup - AMI
        Main   Advanced   Boot   Security   Chipset   Power   Save & Exit

    Boot Option Priorities                               Sets the system boot order
    Boot Option #1                  [UEFI: Sony Storage
                                    Media 0100, Partition
                                    1 (Sony Storage Media
                                    0100)]
    Boot Option #2                  [UEFI: Built-in EFI
                                    Shell]




                                                         ↔←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         ESC: Exit
                                                         F1: General Help
                                                         F7: Previous Values
                                                         F9: Optimized Defaults
                                                         F10: Save & Reset Setup
                                                         F12: Screenshot capture
                                                         <k>: Scroll help area upwards
                                                         <m>: Scroll help area downwards

                        Version 2.22.1288 Copyright (C) 2022 AMI
```

▶ **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

```
                          Aptio Setup - AMI
     Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

     Administrator Password                             Set Administrator Password
     User Password
     Chassis Intrusion                    [Disabled]

   ▶ PCH-FW Configuration
   ▶ Trusted Computing
   ▶ Serial Port Console Redirection
   ▶ Secure Boot


                                                        →←: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        ESC: Exit
                                                        F1: General Help
                                                        F7: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Reset Setup
                                                        F12: Screenshot capture
                                                        <k>: Scroll help area upwards
                                                        <m>: Scroll help area downwards

                     Version 2.22.1288 Copyright (C) 2023 AMI
```

▶ **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.

▶ **Chassis Intrusion**

Enables or disables recording messages while the chassis is opened. This function is ready for the chassis equips a chassis intrusion jumper(switch).

[Enabled]	Once the chassis is **opened**, the system will record and issue a warning message. A beep sound will be emitted before this function is reset.
[Disabled]	Once the chassis is **closed**, the system will record and issue a warning message.
[Reset]	Clear the warning message. After clearing the message, please return to Enabled or Disabled.

▶ **PCH-FW Configuration**

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

```
                    Security
 ┌─────────────────────────────────────────────┐  ┌──────────────────────┐
 │ ME Firmware Version        16.1.25.2020      │  │ When Disabled ME will be put │
 │ ME Firmware Mode           Normal Mode       │  │ into ME Temporarily Disabled │
 │ ME Firmware SKU            Corporate SKU     │  │ Mode.                │
 │ ME Firmware Status 1       0x90000245        │  │                      │
 │ ME Firmware Status 2       0x39858106        │  │                      │
 └─────────────────────────────────────────────┘  │                      │
                                                   │                      │
   ME State                   [Enabled]            │                      │
   Manageability Features State [Enabled]          │                      │
   ME Unconfig on RTC Clear   [Enabled]            │                      │
   Comms Hub Support          [Disabled]           │                      │
   JHI Support                [Disabled]           │                      │
   Core Bios Done Message     [Enabled]            │                      │
                                                   │                      │
 ▶ Firmware Update Configuration                   │ ↔: Select Screen     │
 ▶ PTT Configuration                               │ ↑↓: Select Item      │
 ▶ ME Debug Configuration                          │ Enter: Select        │
 ▶ Anti-Rollback SVN Configuration                 │ +/-: Change Opt.     │
                                                   │ ESC: Exit            │
                                                   │                      │
```

Firmware Information

ME Firmware Version	ME Firmware SKU
ME Firmware Mode	ME Firmware Status 1-2

These settings show the firmware information of the Intel ME (Management Engine).

▸ **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.

▸ **Manageability Feature State**

Enables or disables Manageability Feature State. Enabling this item for remote management capabilities.

▸ **ME Unconfig on RTC Clear**

Enables or disables ME Unconfig on RTC Clear. Enabling this item resets the ME configuration to its default state, removing any customizations or settings applied.

▸ **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**

```
                          Security
─────────────────────────────────────────────────────────────────
 Me FW Image Re-Flash          [Disabled]      Enable/Disable Me FW Image
 FW Update                     [Enabled]        Re-Flash function.
```

» **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 locally.

▸ **PTT Configuration**

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

```
                          Security
─────────────────────────────────────────────────────────────────
 PTT Capability / State        1 / 0           Selects TPM device: PTT or
                                               dTPM. PTT - Enables PTT in
 TPM Device Selection          [dTPM]          SkuMgr dTPM 1.2 - Disables PTT
                                               in SkuMgr Warning ! PTT/dTPM
                                               will be disabled and all data
                                               saved on it will be lost.
```

» **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).

```
                          Security
─────────────────────────────────────────────────────────────────
 HECI Timeouts                 [Enabled]       Enable/Disable HECI
                                               Send/Receive Timeouts.
 Force ME DID Init Status      [Disabled]
 CPU Replaced Polling Disable  [Disabled]
 HECI Message check Disable    [Disabled]
 MBP HOB Skip                  [Disabled]
 HECI2 Interface Communication [Disabled]
 KT Device                     [Enabled]
 End Of Post Message           [Send in DXE]
 DOI3 Setting for HECI Disable [Disabled]
 MCTP Broadcast Cycle          [Disabled]
```

» **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**

```
                              Security

Minimal Allowed Anti-Rollback SVN    0            When enabled,
Executing Anti-Rollback SVN          4            hardware-enforced
Automatic HW-Enforced                [Disabled]   Anti-Rollback mechanism is
Anti-Rollback SVN                                 automatically activated: once
Set HW-Enforced Anti-Rollback for    [Disabled]   ME FW was successfully run on
Current SVN                                       a platform, FW with lower
                                                  ARB-SVN will be blocked from
                                                  execution
```

» **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
    TPM 2.0 Device Found                               Enables or Disables BIOS
    Firmware Version:            15.22                  support for security device.
    Vendor:                     IFX                     O.S. will not show Security
                                                        Device. TCG EFI protocol and
    Security Device Support     [Enable]                INT1A interface will not be
    Active PCR banks            SHA256                  available.
    Available PCR banks         SHA256,SHA384

    SHA256 PCR Bank             [Enabled]
    SHA384 PCR Bank             [Disabled]

    Pending operation           [None]
    Platform Hierarchy          [Enabled]
    Storage Hierarchy           [Enabled]              ↔: Select Screen
    Endorsement Hierarchy       [Enabled]              ↑↓: Select Item
    Physical Presence Spec Version  [1.3]              Enter: Select
    TPM 2.0 InterfaceType       [TIS]                  +/-: Change Opt.
    PH Randomization            [Enabled]              ESC: Exit
    Device Select               [TPM 2.0]              F1: General Help
                                                        F7: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Reset Setup
                                                        F12: Screenshot capture
                                                        <k>: Scroll help area upwards
                                                        <m>: Scroll help area downwards
```

▸ **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, 384 PCR Bank**

These settings enables or disables the SHA-1 PCR Bank and SHA256, 384 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**

```
                           Security

      COM1                                        Console Redirection Enable or
      Console Redirection            [Disabled]   Disable.
    ▶ Console Redirection Settings




                                                  ↔: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  ESC: Exit
                                                  F1: General Help
                                                  F7: Previous Values
                                                  F9: Optimized Defaults
                                                  F10: Save & Reset Setup
                                                  F12: Screenshot capture
                                                  <k>: Scroll help area upwards
                                                  <m>: Scroll help area downwards
```

▸ **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**

```
                              Security
┌─────────────────────────────────────────┬──────────────────────────┐
│  System Mode            Setup            │ Secure Boot feature is Active │
│                                          │ if Secure Boot is Enabled,    │
│  Secure Boot            [Disabled]       │ Platform Key(PK) is enrolled  │
│                         Not Active       │ and the System is in User mode.│
│                                          │ The mode change requires      │
│  Secure Boot Mode       [Custom]         │ platform reset                │
│ ▶ Restore Factory Keys                   │                               │
│ ▶ Reset To Setup Mode                    │                               │
│                                          │                               │
│ ▶ Key Management                         │                               │
│                                          │                               │
│                                          ├──────────────────────────────┤
│                                          │ ⇄: Select Screen              │
│                                          │ ↑↓: Select Item               │
│                                          │ Enter: Select                 │
│                                          │ +/−: Change Opt.              │
│                                          │ ESC: Exit                     │
│                                          │ F1: General Help              │
│                                          │ F7: Previous Values           │
│                                          │ F9: Optimized Defaults        │
│                                          │ F10: Save & Reset Setup       │
│                                          │ F12: Screenshot capture       │
│                                          │ <k>: Scroll help area upwards │
│                                          │ <m>: Scroll help area downwards│
└─────────────────────────────────────────┴──────────────────────────────┘
```

▸ **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**

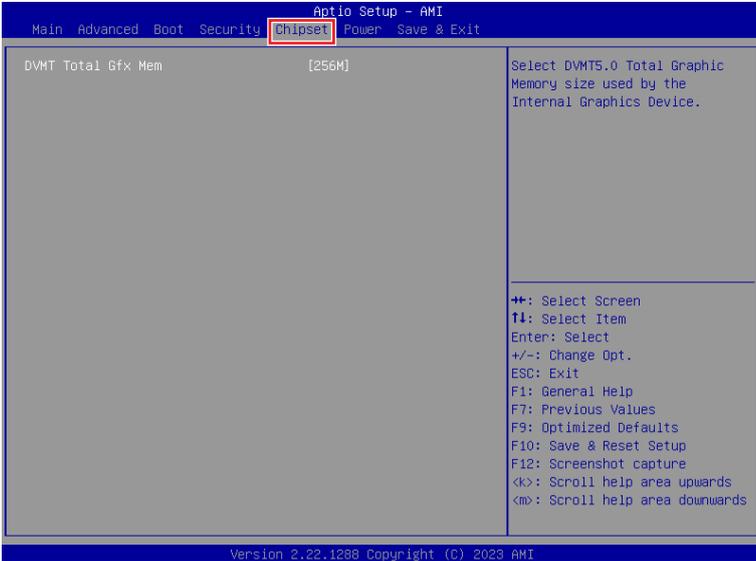Allows you to restore all factory default keys. The settings will be applied after reboot or at the next reboot. This item appears when **"Secure Boot Mode"** sets to **[Custom]**.

▸ **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]**.
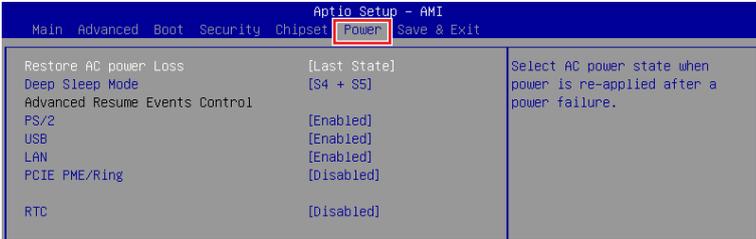
Chipset

```
                          Aptio Setup - AMI
      Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

   DVMT Total Gfx Mem              [256M]           Select DVMT5.0 Total Graphic
                                                    Memory size used by the
                                                    Internal Graphics Device.




                                                    ──────────────────────────

                                                    ↔: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    ESC: Exit
                                                    F1: General Help
                                                    F7: Previous Values
                                                    F9: Optimized Defaults
                                                    F10: Save & Reset Setup
                                                    F12: Screenshot capture
                                                    <k>: Scroll help area upwards
                                                    <m>: Scroll help area downwards

                    Version 2.22.1288 Copyright (C) 2023 AMI
```

▶ **DVMT Total Gfx Mem**

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

Power

```
                        Aptio Setup - AMI
       Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

    Restore AC power Loss              [Last State]        Select AC power state when
    Deep Sleep Mode                    [S4 + S5]           power is re-applied after a
    Advanced Resume Events Control                         power failure.
    PS/2                               [Enabled]
    USB                                [Enabled]
    LAN                                [Enabled]
    PCIE PME/Ring                      [Disabled]

    RTC                                [Disabled]
```

▶ **Restore AC Power Loss**

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

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

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

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

▶ **Deep Sleep Mode**

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

▶ **OnChip USB**

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

▶ **LAN**

Enables or disables the system to be awakened from the power saving modes when activity or input signal of Intel LAN device is detected.
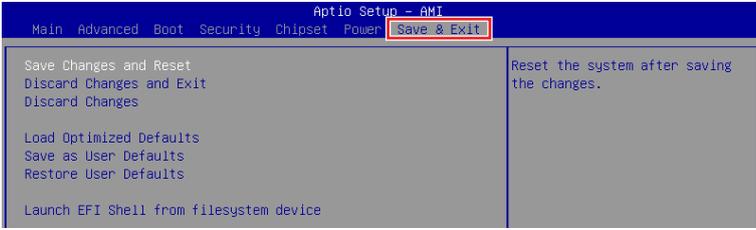
▶ **PCIE PME/Ring**

Enables or disables the system to be awakened from power saving modes when activity or input signal of onboard PCIE PME/Ring is detected.

▶ **RTC**

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

Save & Exit

```
                        Aptio Setup - AMI
    Main  Advanced  Boot  Security  Chipset  Power  Save & Exit

   Save Changes and Reset                 Reset the system after saving
   Discard Changes and Exit               the changes.
   Discard Changes

   Load Optimized Defaults
   Save as User Defaults
   Restore User Defaults

   Launch EFI Shell from filesystem device
```

▶ **Save Changes and Reset**

Save changes to CMOS and reset the system.

▶ **Discard Changes and Exit**

Abandon all changes and exit the Setup Utility.

▶ **Discard Changes**

Abandon all changes.

▶ **Load Optimized Defaults**

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

▶ **Save as User Defaults**

Save changes as the user's default profile.

▶ **Restore User Defaults**

Restore the user's default profile.

▶ **Launch EFI Shell from filesystem device**

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

GPIO WDT BKL Programming

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

Abstract

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

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

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

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

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

General Purpose IO

1. General Purposed IO – GPIO/DIO

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

Name	IO Port	IO address	Name	IO Port	IO address
N_GPI0	0x12	Bit 0	N_GPO0	0x21	Bit 0
N_GPI1	0x12	Bit 1	N_GPO1	0x21	Bit 1
N_GPI2	0x12	Bit 2	N_GPO2	0x21	Bit 2
N_GPI3	0x42	Bit 3	N_GPO3	0x21	Bit 3
N_GPI4	0x12	Bit 4	N_GPO4	0x21	Bit 4
N_GPI5	0x12	Bit 5	N_GPO5	0x21	Bit 5
N_GPI6	0x12	Bit 6	N_GPO6	0x21	Bit 6
N_GPI7	0x12	Bit 7	N_GPO7	0x21	Bit 7

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, 0x21);   // Read value from N_GPO0 port through SMBus.
val = val | (1<<0);                 // Set N_GPO0address (bit 0) to 1 (output "high").
SMBus_WriteByte (0x6E, 0x21, val);  // Write back to N_GPO0 port through SMBus.
```

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

```
val = SMBus_ReadByte (0x6E, 0x21);  // Read value from N_GPO1 port through SMBus..
val = val & (~(1<<1));              // Set N_GPO1 address (bit 1) to 0 (output "low").
SMBus_WriteByte (0x6E, 0x21, 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, 0x12); // Read value from N_GPI2 port through SMBus.
val = val & (1<<2);                // Read N_GPI2 address (bit 2).
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, 0x42);  // Read value from N_GPI3 port through SMBus.
val = val & (1<<3);                 // Read N_GPI3 address (bit 3).
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
```