MS-98L3

(v1.x) Industrial Computer Board

Copyright and Trademarks Notice

Revision History

Revision	Date
V1.1	2020/03

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 Instructions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- The openings on the enclosure are for air convection hence protects the equipment from overheating. DO NOT COVER THE OPENINGS.
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- Always Unplug the Power Cord before inserting any add-on card or module.
- All cautions and warnings on the equipment should be noted.
- Never pour any liquid into the opening that could damage or cause electrical shock.
- If any of the following situations arises, get the equipment checked by service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment does not work well or you can not get it work according to User's Manual.
  - The equipment has dropped and damaged.
  - The equipment has obvious sign of breakage.
- DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C, IT MAY DAMAGE THE EQUIPMENT.

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://www.msi.com/html/popup/csr/evmtprtt_pcm.html

Battery Information

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.

廢電池請回收

Taiwan:

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:

https://www.dtsc.ca.gov/hazardouswaste/perchlorate/

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

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

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.

CONTENTS

1 Overview

Thank you for choosing the MS-98L3, an excellent industrial computer board.

With low power and low profile design, the MS-98L3 accommodates the Intel® Whiskey Lake-U Series Processor and supports up to single channel DDR4 2666 MHz SO-DIMM slot to provide the maximum of 32GB memory capacity.

In the entry-level and mid-range market segment, the MS-98L3 provides a high-performance solution for today's front-end and general purpose workstation, as well as in the future.

Mainboard Specifications

Processor

- Intel® Whiskey Lake-U i7-8665UE/i5-8365UE/i3-8145UE/Celeron 4305UE Processor

Memory

- 1 x DDR4 2666 MHz SO-DIMM slot
- Up to 32GB

LAN

- LAN1: Intel® I219LM GbE-PHY LAN
- LAN2~4: Intel® I210-AT GbE LAN

SATA

- 2 x SATA 6Gb/s ports

Audio

- Realtek® ALC887-VD2-CG (Co-lay ALC888S)

Graphics

- HD Graphics integrated in Intel® processor
- LVDS up to 1920 x 1200 @60Hz
- HDMI support HDMI1.4 for up to 4096 x 2160 @24Hz
- DisplayPort up to 4096x 2160 @60Hz (DP++ supported)
- Supports three independent displays:
  -DisplayPort + HDMI + LVDS

Rear Panel I/O

- 4 x USB 3.2 Gen 2 ports
- 4 x Gigabit LAN jacks
- 1 x DisplayPort
- 1 x HDMI port

Onboard Headers/ Connectors/ Jumpers

- 2* SATA 6Gb/s Ports
- 2* SATA Power Connectors
- 2* USB2.0 Headers
- 2* COM Port Headers
- 2* COM Port Power Select Headers
- 1* Front Panel Connector
- 1* RTC Connector
- 1* SPI Debug Port Connector
- 1* LPC Debug Port Connector
- 1* SO-DIMM Socket
- 1* M.2 M Key Slot
- 1* M.2 B Key Slot
- 1* M.2 E Key Slot
- 1* Nano-SIM Card Socket
- 1* Micro SD Card Socket
- 1* GPIO Connector
- 1* LVDS Connector
- 1* LVDS Inverter Connector
- 1* Audio & Amplifier & SMBus Connector
- 1* DC IN Connector
- 1* System Fan Connector
- 1* AT/ATX Mode Jumper
- 1* ME Disable Jumper

Expansion Slot

- 1 x M.2 M key (2242, SATA)
- 1 x M.2 B key (2242/3042, with SIM-Holder, PCIe x1 by auto switch & USB 3.2 Gen 2 & USB 2.0 Signal)
- 1 x M.2 E key (2230, with PCIe x1 & USB 2.0 Signal)

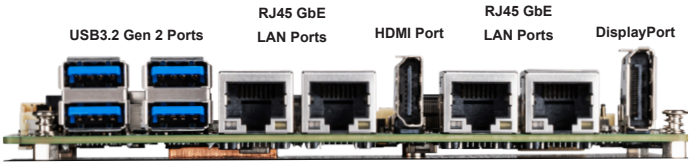
Form Factor

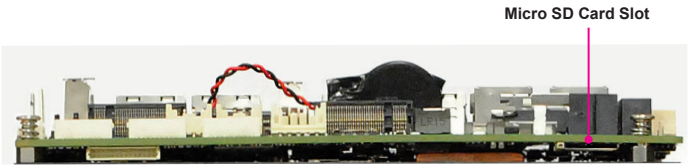
- Form Factor: 146 mm x 102 mm (3.5-inch size)

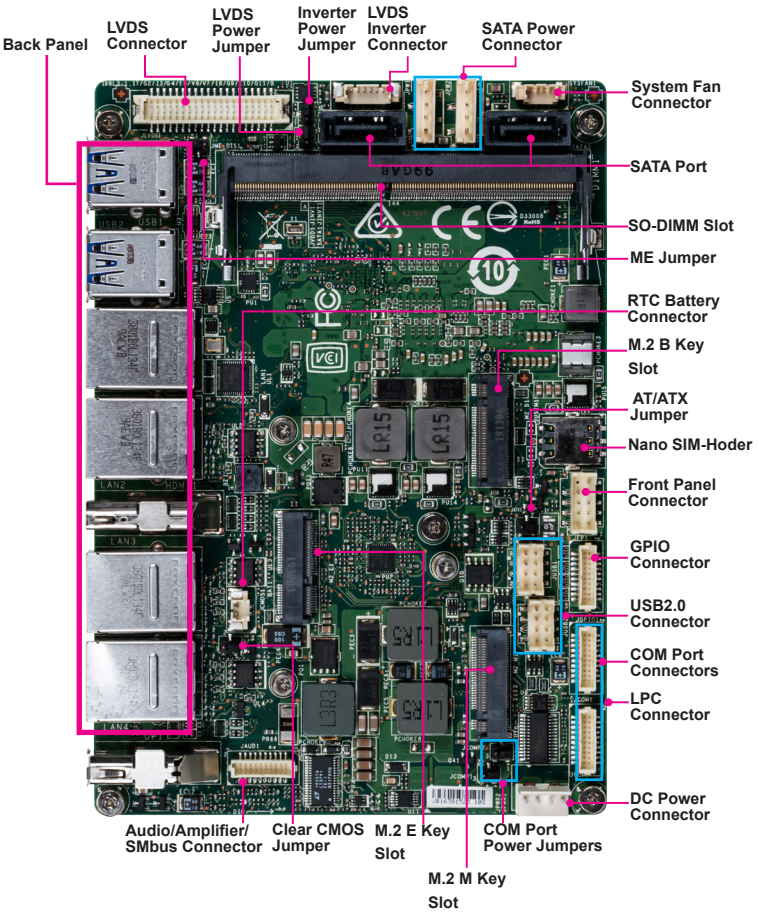
Environmental

- Operating Temperature: -10 ~ 60°C
- Storage Temperature: -20 ~ 80°C
- Humidity: 10 ~ 90% RH, non-condensing

Mainboard Layout






Back Panel
LVDS Connector
LVDS Power Jumper
Inverter Power Jumper
LVDS Inverter Connector
SATA Power Connector
System Fan Connector
SATA Port
SO-DIMM Slot
ME Jumper
RTC Battery Connector
M.2 B Key Slot
AT/ATX Jumper
Nano SIM-Hoder
Front Panel Connector
GPIO Connector
USB2.0 Connector
COM Port Connectors
LPC Connector
DC Power Connector
Audio/Amplifier/ SMbus Connector
Clear CMOS Jumper
M.2 E Key Slot
COM Port Power Jumpers
M.2 M Key Slot

2 Hardware Setup

This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.

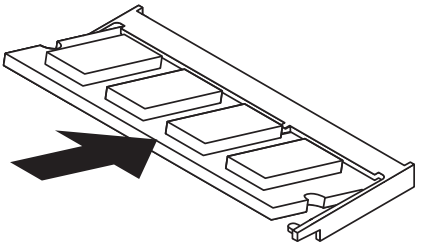
Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

Components Reference Guide

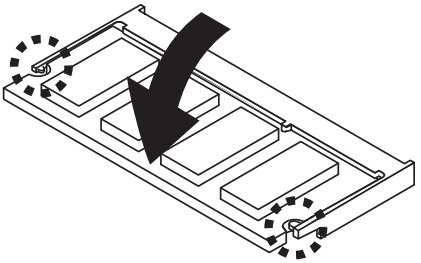
Memory

The SO-DIMM slot is intended for memory modules.

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.



3. 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.

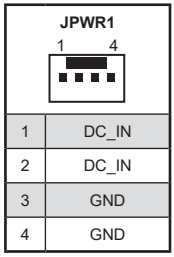
Power Supply

DC Power Connector: JPWR1 / JPWR2(By Request)

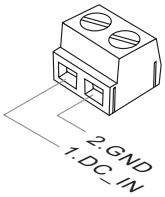
This connector allows you to connect a 12V~24V DC power adapter.

DC-in 12V~24V ±10% (OCP & OVP Supported).

DC source minimum load: 75W (for i3/Celeron SKUs) / 90W (for i7/i5 SKUs).

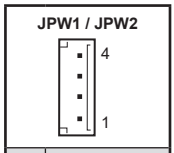


1	DC_IN
2	DC_IN
3	GND
4	GND



SATA Power Connector: JPW1 / JPW2

This connector is used to provide power to SATA devices.

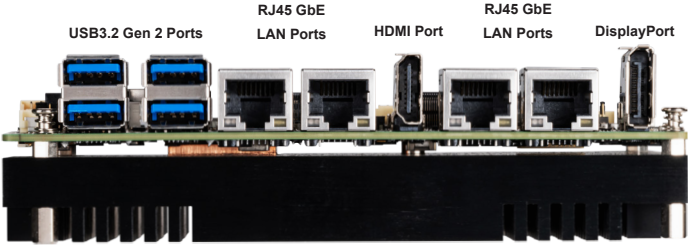


1	5V
2	GND
3	GND
4	12V

Important

Make sure that all power connectors are connected to the power supply to ensure stable operation of the motherboard.

Rear Panel I/O

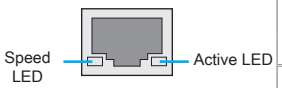


➤ USB 3.2 Gen 2 Port

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.

➤ RJ45 GbE LAN Port

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



LED	LED Status	Description
Active LED	Off	No link
	Yellow	Linked
	Blinking	Data activity
Speed LED	Off	10 Mbps connection
	Green	100 Mbps connection
	Orange	1 Gbps connection

➤ HDMI Port

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.

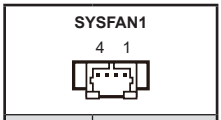
➤ DisplayPort

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

Connector

Fan Power Connector: SYSFAN1

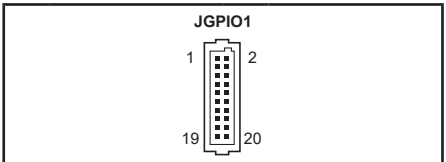
The fan power connector supports system cooling fans with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND. If the motherboard has a System Hardware Monitor chipset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



1	GND
2	FAN_PWR
3	FAN_SENSE
4	FAN_CTL

GPIO Connector: JGPIO1

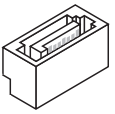
This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.



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

Serial ATA Connector: SATA1, SATA2

This connector is a high-speed Serial ATA interface port. Each connector can connect to one Serial ATA device.



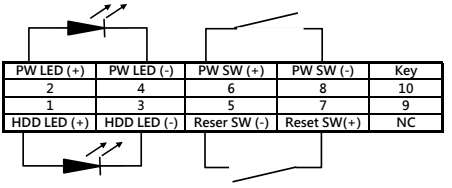
Important

Please do not fold the SATA cable into a 90-degree angle. Otherwise, data loss may occur during transmission.

Front Panel Connector: JFP1

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	Reserved	10	No Pin

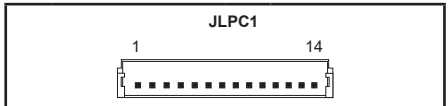


PW LED (+)	PW LED (-)	PW SW (+)	PW SW (-)	Key
2	4	6	8	10
1	3	5	7	9
HDD LED (+)	HDD LED (-)	Reser SW (-)	Reset SW(+)	NC

LED (+)	Voltage (V)	Current (mA)
Power	5	18.51
HDD	5	18.51

LPC Debug Port Connector: JLPC1

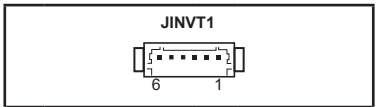
This connector works as LPC debug port.



1	LPC_FRAME#	2	LPC_AD3
3	LPC_AD2	4	LPC_AD1
5	LPC_AD0	6	LPC_LDRQ0#
7	TPM_CLK	8	SERIRQ_R
9	PLTRST_TPM#	10	VCC5
11	VCC3	12	GND
13	NC	14	GND

LVDS Inverter Connector: JINVT1

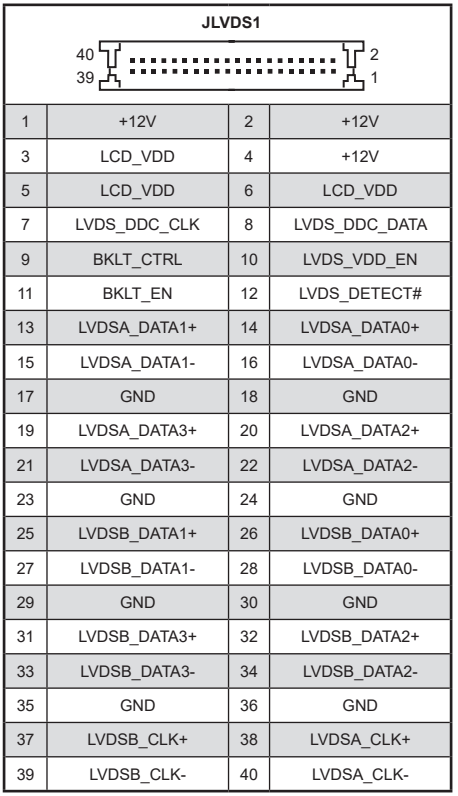
The connector is provided for LCD backlight options.



1	Back Light Power	4	BKLT_CTRL
2	Back Light Power	5	GND
3	BKLT_EN	6	GND

LVDS Connector: JLVDS1

The LVDS (Low Voltage Differential Signal) connector provides a digital interface typically used with flat panels. After connecting an LVDS interface flat panel to the JLVDS1, be sure to check the panel datasheet and set the LVDS jumper to proper power voltage.



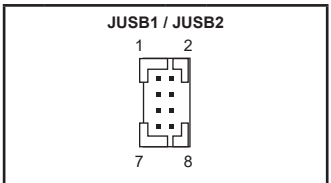
1	+12V	2	+12V
3	LCD_VDD	4	+12V
5	LCD_VDD	6	LCD_VDD
7	LVDS_DDC_CLK	8	LVDS_DDC_DATA
9	BKLT_CTRL	10	LVDS_VDD_EN
11	BKLT_EN	12	LVDS_DETECT#
13	LVDSA_DATA1+	14	LVDSA_DATA0+
15	LVDSA_DATA1-	16	LVDSA_DATA0-
17	GND	18	GND
19	LVDSA_DATA3+	20	LVDSA_DATA2+
21	LVDSA_DATA3-	22	LVDSA_DATA2-
23	GND	24	GND
25	LVDSB_DATA1+	26	LVDSB_DATA0+
27	LVDSB_DATA1-	28	LVDSB_DATA0-
29	GND	30	GND
31	LVDSB_DATA3+	32	LVDSB_DATA2+
33	LVDSB_DATA3-	34	LVDSB_DATA2-
35	GND	36	GND
37	LVDSB_CLK+	38	LVDSA_CLK+
39	LVDSB_CLK-	40	LVDSA_CLK-

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.

USB 2.0 Connector: JUSB1 / JUSB2

This connector, compliant with Intel I/O Connectivity Design Guide, is ideal for connecting high-speed USB interface peripherals such as USB HDD, digital cameras, MP3 players, printers, modems and the like.



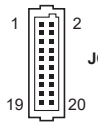
1	5V	2	GND
3	USB_D-	4	USB_D+
5	USB_D+	6	USB_D-
7	GND	8	5V

Important

Note that the pins of VCC and GND must be connected correctly to avoid possible damage.

Serial Port Connector: JCOM1/JCOM2

This connector allows you to connect optional serial ports through brackets.



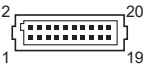
JCOM1 / JCOM2

RS232			RS422			RS485		
1	2	DCD	1	2	TXD-	1	2	TXD-
3	4	RXD	3	4	TXD+	3	4	TXD+
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	RI/POWER	17	18	NC	17	18	NC
19	20	NC	19	20	NC	19	20	NC

Audio/Amplifier/SMbus Connector: JAUD1

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

JAUD1

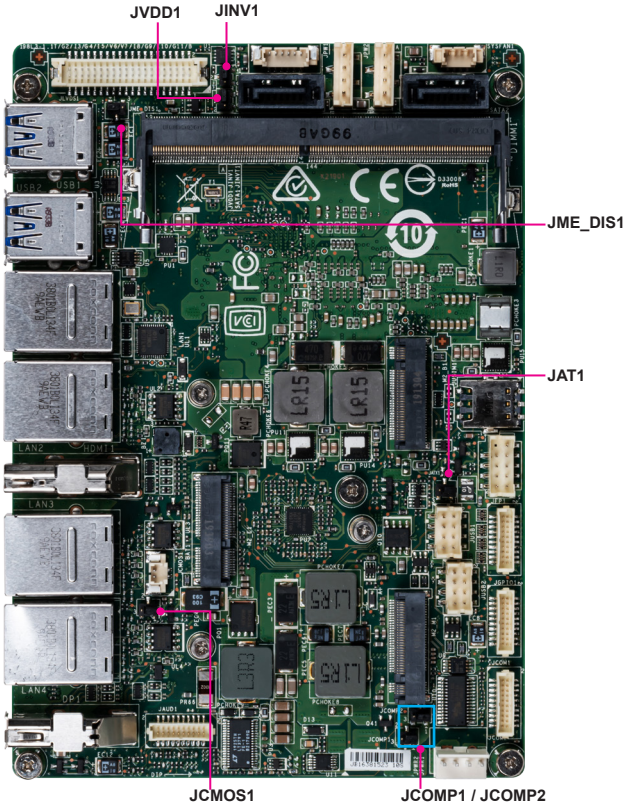


1	LINE_IN_RA	2	MIC1_RA
3	LINE_IN_LA	4	MIC1_LA
5	LOUT_RA	6	MIC1_JD
7	LOUT_LA	8	LINE1_JD
9	FRONT_JD	10	AGND
11	AGND	12	AGND
13	5VSB	14	AMP_L-
15	SMBCLK	16	AMP_L+
17	SMBDATA	18	AMP_R-
19	GND	20	AMP_R+

Jumpers

Important

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

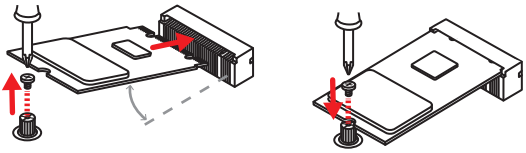


Jumper Name	Default Setting	Description	
JCMOS1		1-2: Normal	2-3: Clear CMOS
JAT1		1-2: ATX	2-3: AT
JME_DIS1		1-2: Normal (enable) (default)	2-3: ME disable
JCOMP1, JCOMP2		1-2: 5V	2-3: 12V
JVDD1		1-2: 3V	2-3: 5V
JINV1		1-2: 5V	2-3: 12V

Slot

M2_M1: M.2 Slot (Key M, 2242) for SSD

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

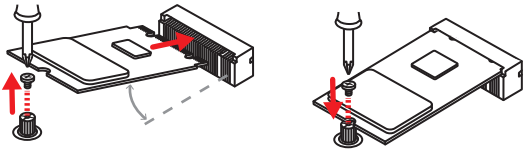


Important

Intel® RST only supports PCIe M.2 SSD with UEFI ROM and does not support Legacy ROM.

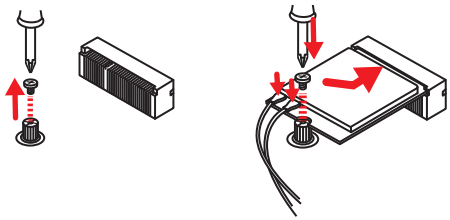
M2_E1: M.2 Slot (Key E, 2230) for WiFi/BT

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



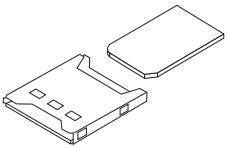
M2_B1: M.2 Slot (Key B, 2242/3042) for WiFi/BT/LTE

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



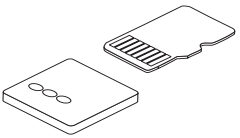
Nano SIM Holder

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



Micro SD Card Slot

This slot is for inseriting the micro SD card.



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.

3 BIOS Setup

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

Users may need to run the Setup program when:

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

Important

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

Entering Setup

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

Press <DEL> or <F2> to enter SETUP

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

Important

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

Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Option
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Reset
Esc	Exit

Getting Help

After entering the Setup menu, the first menu you will see is 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.

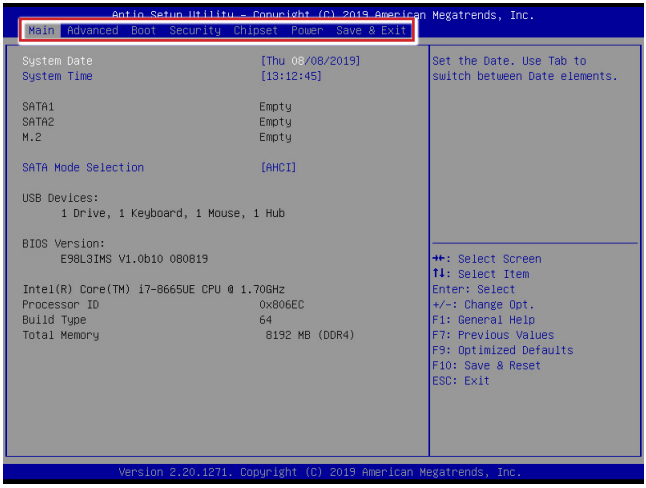
Sub-Menu

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.

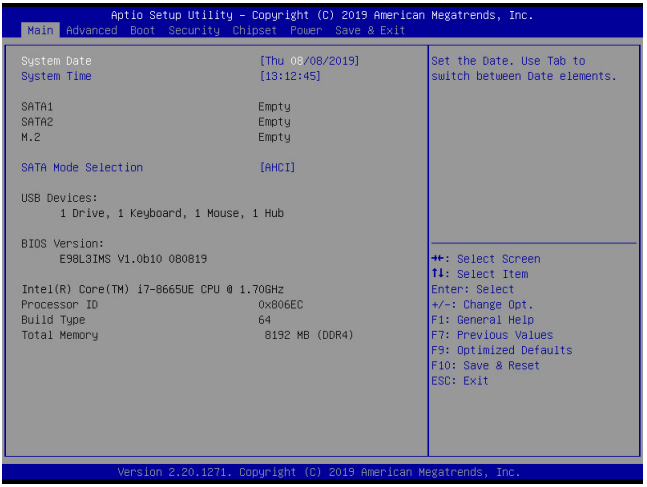
▸Power

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. The date format is <Day>, <Month> <Date> <Year>.

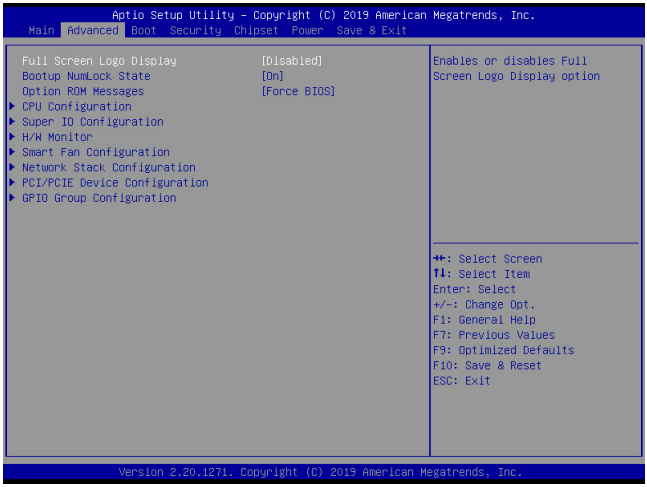
▸System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

▸SATA Mode Selection

This setting specifies the SATA controller mode.

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.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

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

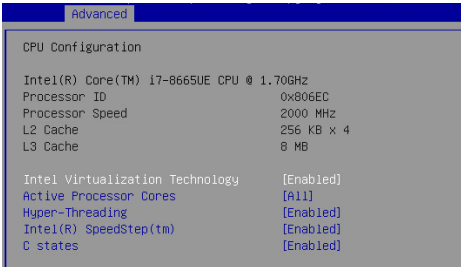
▸Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

▸Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

▸CPU Configuration



▸Intel Virtualization Technology

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

▸Active Processor Cores

This setting specifies the number of active processor cores.

▸Hyper-Threading

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

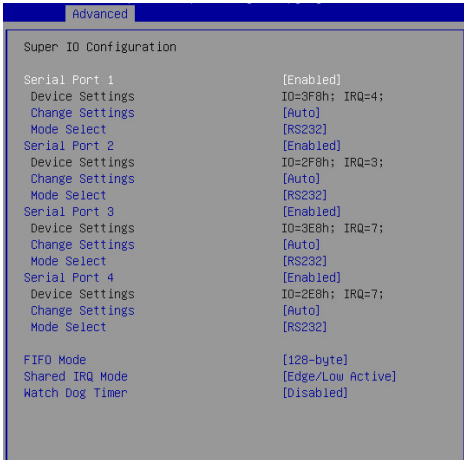
▸Intel SpeedStep

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

▸C-States

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

▸Super IO Configuration



▸Serial Port 1/ 2/ 3/ 4

This setting enables/disables the specified serial port.

▸Change Settings

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

▸Mode Select

Select an operation mode for the specified serial port.

▸FIFO Mode

This setting controls the FIFO data transfer mode.

▸Shared IRQ Mode

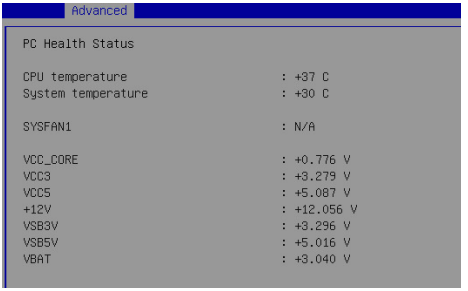
This setting provides the system with the ability to share interrupts among its serial ports.

▸ Watch Dog Timer

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

▸H/W Monitor

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

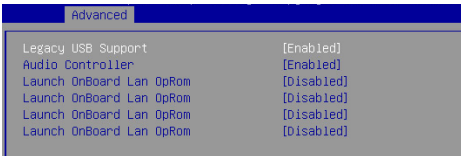


▸Smart Fan Configuration

▸SYSFAN1

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

▸PCI/PCIE Device Configuration



▸Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

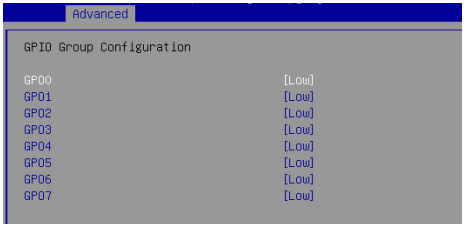
▸Audio Controller

This setting enables/disables the onboard audio controller.

▸Launch OnBoard LAN OpROM

These settings enable/disable the initialization of the onboard/onchip LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

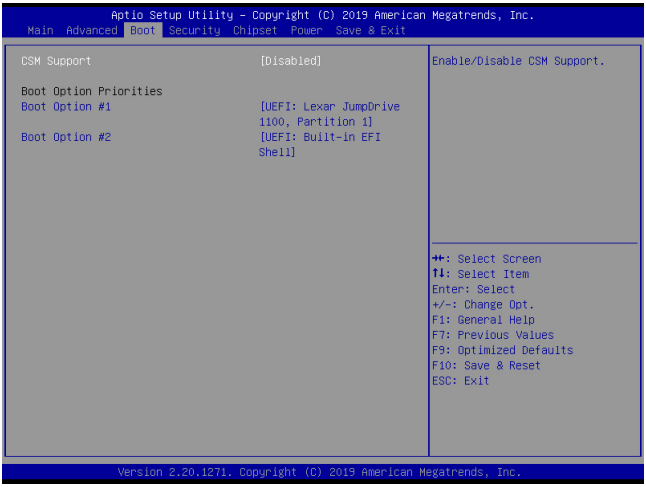
▸GPIO Group Configuration



▸GPO0 ~ GPO7

These settings control the operation mode of the specified GPIO.

Boot



▸CSM Support

This setting enables/disables the support for Compatibility Support Module, a part of the Intel Platform Innovation Framework for EFI providing the capability to support legacy BIOS interfaces.

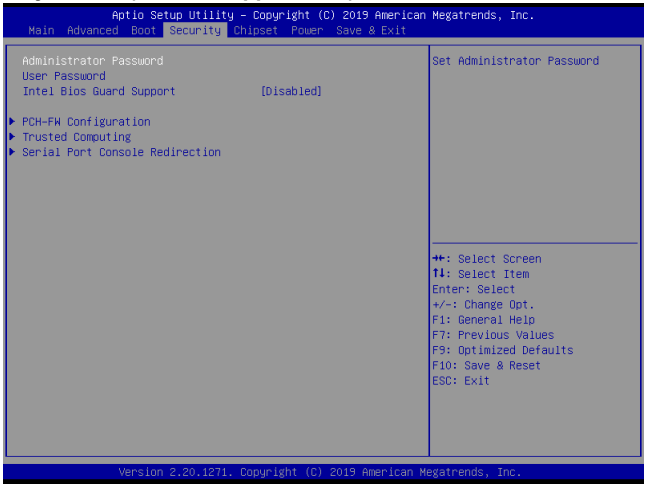
▸Boot Option Priorities

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

Security

▸**For Whiskey Lake U (MB, Support AMT) with Intel i7 / i5 CPU**

▸**Whiskey Lake U (MB, No Support AMT) with Intel i3 / Celeron CPU**



▸**Administrator Password**

Administrator Password controls access to the BIOS Setup utility.

▸**User Password**

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

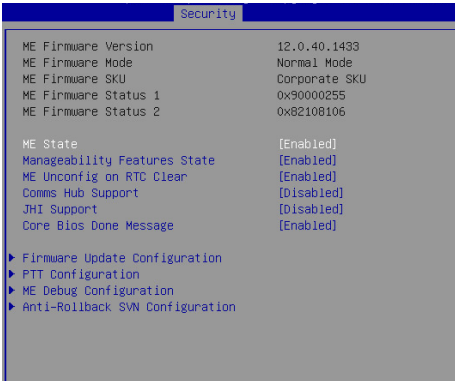
▸**Intel BIOS Guard Support**

Enable/Disable Intel BIOS Guard Support.

▸**Intel Trusted Execution Technology**

Intel Trusted Execution Technology provides highly scalable platform security in physical and virtual infrastructures.

▸**PCH-FW Configuration**



▸**ME Firmware Version, ME Firmware Mode, ME Firmware SKU, ME Firmware Status 1, ME Firmware Status 2**

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

▸**ME Status**

This setting enables/disables the ME status.

▸**Manageablility Features States**

This setting specifies the Intel ME Manageability Features.

▸**ME Unconfig on RTC Clear**

This setting enables/disables ME Firmware Un-configure on RTC clear state.

▸**Comms Hub Support**

This setting enables/disables Comms Hub Support.

▸**JHI Support**

This setting enables/disables JHI Support.

▸**Core BIOS Done Message**

This setting enables/disables the Core BIOS Done Message.

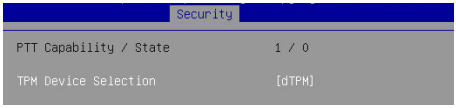
▸Firmware Update Configuration

▸ME FW Image Re-Flash

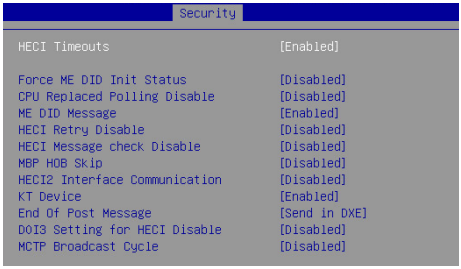
This setting enables/disables the ME FW image reflash.

▸PTT Configuration

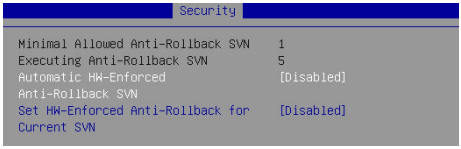
Intel Platform Trust Technology (PTT) is a platform functionality for credential storage and key management used by Microsoft Windows.



▸ME Debug Configuration

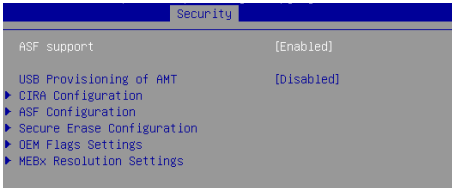


▸Anti-Rollback SVN Configuration

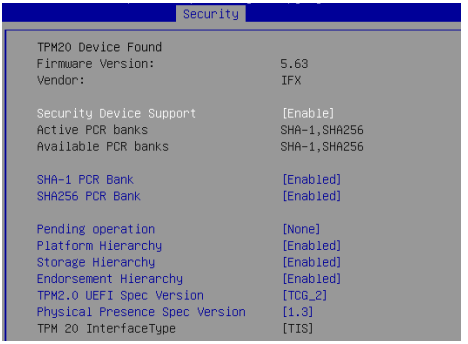


▸AMT Configuration (For Intel i7 / i5 CPU)

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



▸Trust Computing



▸Security Device Support

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

▸SHA-1 PCR Bank, SHA256 PCR Bank

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

▸Pending Operation

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

▸Platform Hierarchy, Storage Hierarchy, Endorsement Hierarchy

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

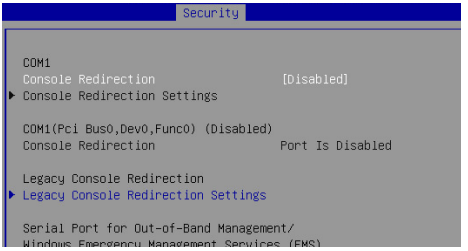
▸TPM2.0 UEFI Spec Version, Physical Presence Spec Version

This settings show the TPM2.0 UEFI Spec Version and Physical Presence Spec Version.

▸TPM2.0 Interface Type

This setting shows the TPM2.0 Interface Type.

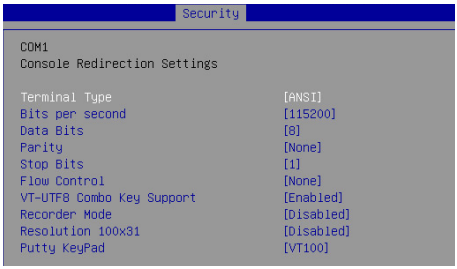
▸Serial Port Console Redirection



▸Console Redirection

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

▸Console Redirection Settings (COM1)



▸Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

▸Bits per second, Data Bits, Parity, Stop Bits

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

▸Flow Control

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

▸VT-UTF8 Combo Key Support

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

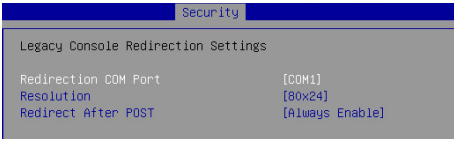
▸Recorder Mode, Resolution 100x31

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

▸Putty Keypad

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

▸Legacy Console Redirection



▸**Redirection COM Port**

Select a COM port to display redicrection of Legacy OS and Legacy OPROM Messages.

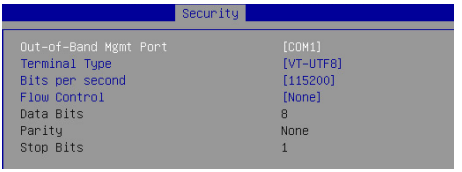
▸**Resolution**

In Legacy OS, the Number of Rows and Columns supported redirection.

▸**Redirection After POST**

When Bootloader is selected, then Lagacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, the Legacy Console Redirection is enabled for legacy OS.

▸**Console Redirection (Serial Port for Out-of-Band Management/ Windows Emergency Management Services)**



▸**Out-of-Band Mgmt Port**

Microsoft Windows Emergency Management Service (EMS) allows for remote management of a Windows Server OS through a serial port.

▸**Terminal Type**

VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. Read Console redirection Settings page, for more help with Terminal Type/Emulation.

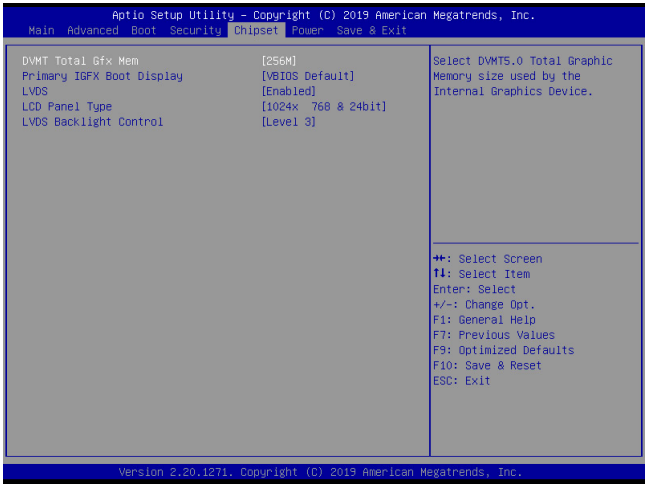
▸**Bits per second**

This setting specifies the transfer rate (bits per second) 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.

Chipset



▸DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

▸Primary IGFX Boot Display

Use the field to select the type of device you want to use as the displays of the system.

▸LVDS

This setting enables/disables LVDS.

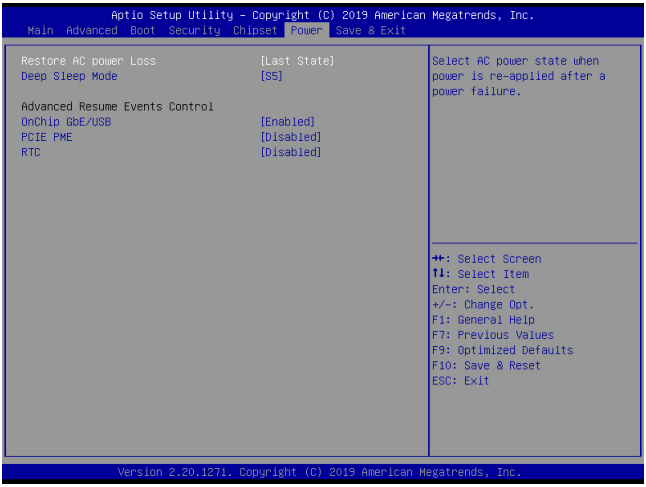
▸LCD Panel Type

This setting specifies the LCD panel type.

▸LCD Backlight Control

This setting controls the LVDS backlight.

Power



▸Restore AC Power Loss

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

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

▸Deep Sleep Mode

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

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

▸Onchip GbE / USB

The item allows the activity of the OnChip GbE/USB device to wake up the system from S3/S4 sleep state.

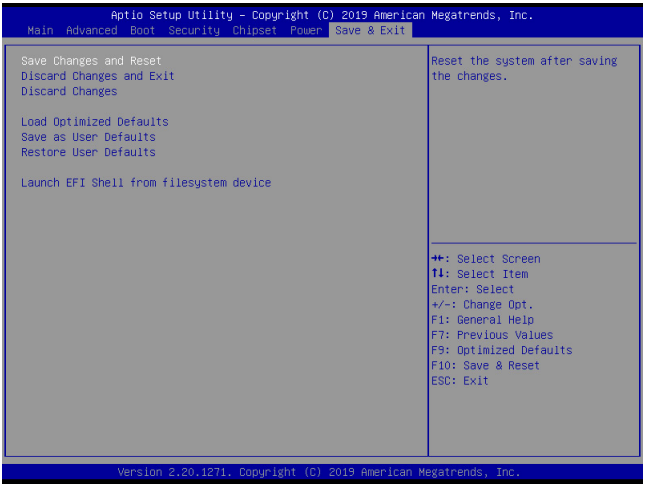
▸PCIE PME

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

▸RTC

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

Save & Exit



▸Save Changes and Reset

Save changes to CMOS and reset the system.

▸Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

▸Discard Changes

Abandon all changes.

▸Load Optimized Defaults

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

▸Save as User Defaults

Save changes as the user's default profile.

▸Restore User Defaults

Restore the user's default profile.

▸Launch EFI Shell from filesystem device

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

Appendix
GPIO WDT BKL Programming

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

Abstract

In this document, code examples based on C programming language are 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 Purposed 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	0xA05	Bit 3	**N_GPO0**	0xA04	Bit 0
N_GPI1	0xA05	Bit 4	**N_GPO1**	0xA04	Bit 1
N_GPI2	0xA05	Bit 5	**N_GPO2**	0xA04	Bit 2
N_GPI3	0xA05	Bit 6	**N_GPO3**	0xA04	Bit 3
N_GPI4	0xA05	Bit 0	**N_GPO4**	0xA06	Bit 7
N_GPI5	0xA05	Bit 7	**N_GPO5**	0xA04	Bit 4
N_GPI6	0xA05	Bit 2	**N_GPO6**	0xA06	Bit 5
N_GPI7	0xA05	Bit 1	**N_GPO7**	0xA06	Bit 6

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 = Inportb (0xA04);          // Read value from N_GPO0 port.
val = val | (1<<0);             // Set N_GPO0 address (bit 0) to 1 (output “high”).
Outportb (0xA04, val);          // Write back to N_GPO0 port.
```

Example: Set **N_GPO1** output “low”

```
val = Inportb (0xA04);          // Read value from N_GPO1 port.
val = val & (~(1<<1));          // Set N_GPO1 address (bit 1) to 0 (output “low”).
Outportb (0xA04, val);          // Write back to N_GPO1 port.
```

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 = Inportb (0xA05);                  // Read value from N_GPI2 port.
val = val & (1<<5);                     // Read N_GPI2 address (bit 5).
if (val)    printf (“Input of  N_GPI2  is High”);
else        printf (“Input of  N_GPI2  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
```

LVDS Backlight Brightness Control

3. LVDS Backlight Brightness Control

The LVDS controller support 17 level of backlight brightness value from 0 (30%) to 16 (100%) and it is accessible through SMBus. The associated access method (**SMBus_ReadByte**, **SMBus_WriteByte**) are provided in part 4.

3.1 Set the Level of LVDS Backlight

1. Write **0xED** into address **0x7F** on SMBus device **0x42**.
2. Write desired backlight level from 0x0 (30%) to 0x10 (100%) into address **0x6E** on SMBus device **0x42**.

Example: Set LVDS backlight level to 0x10 (100%)

```
SMBus_WriteByte (0x42, 0x7F, 0xED);
SMBus_WriteByte (0x42, 0x6E, 0x10); // Set brightness to 100%
```

3.2 Read the Level of LVDS Backlight

1. Write **0xED** into address **0x7F** on SMBus device **0x42**.
2. Read current backlight level from address **0x6E** on SMBus device **0x42**.

Example: Get LVDS backlight level

```
SMBus_WriteByte (0x42, 0x7F, 0xED);
BKL_Value = SMBus_ReadByte (0x42, 0x6E);
```

SMBus Access

4. SMBus Access

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

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

4.1 Get SMBus Base Address

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

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

4.2 SMBus_ReadByte (char DEVID, char offset)

Read the value of OFFSET from SMBus device DEVID.

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

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

Write DATA to OFFSET on SMBus device DEVID.

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