

GH551

Embedded SBC 3.5" Industrial Motherboard
User's Manual

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FCC and DOC Statement on Class B

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 when the equipment is operated 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 following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the 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 TV 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.
2. Shielded interface cables must be used in order to comply with the emission limits.

Table of Contents

| | |
|--|-----------|
| Chapter 1 - Introduction | 6 |
| Specifications | 6 |
| Features | 7 |
| Chapter 2 - Hardware Installation | 8 |
| Board Layout..... | 8 |
| Standby Power LED..... | 8 |
| System Memory | 9 |
| Installing the SO-DIMM Module | 9 |
| Heatsink and Fan | 10 |
| Installing the Heatsink and Fan..... | 10 |
| Jumper Settings | 11 |
| Front Panel (JP5)..... | 11 |
| Clear CMOS (JP1) | 11 |
| Panel Power Select (JP4)..... | 12 |
| Backlight Power Select (JP2)..... | 12 |
| APU Power (JP9000) | 13 |
| AT/ATX Select (JP6) | 13 |
| Rear I/O Ports..... | 14 |
| Graphics Display..... | 14 |
| USB Ports | 15 |
| RJ45 LAN Ports..... | 15 |
| Internal I/O Connectors | 16 |
| 12V DC-In | 16 |
| COM (Serial) Port | 16 |
| Front Audio..... | 17 |
| USB Ports..... | 17 |
| Speaker..... | 18 |
| SATA (Serial ATA) | 18 |
| Battery | 19 |
| CPU Fan..... | 19 |
| Digital I/O | 20 |
| SMBus | 20 |
| LVDS Panel (Optional)..... | 21 |
| Heater..... | 22 |
| Expansion Slots | 22 |
| Installing the M.2 Module | 23 |
| Installing the Mini PCIe Module | 24 |
| Chapter 3 - BIOS Settings | 25 |
| Overview | 25 |
| Main..... | 26 |
| Advanced | 26 |
| PTN3460 Config | 27 |
| NCT5525D Super IO Configuration | 27 |
| NCT5525D HW Monitor | 28 |
| AMD CHIPSET Setting..... | 29 |
| Trusted Computing..... | 31 |
| ACPI Configuration..... | 32 |
| CPU Configuration..... | 32 |
| Serial Port Console Redirection | 33 |

| | |
|----------------------------------|----|
| USB Configuration | 34 |
| Network Stack Configuration..... | 34 |
| CSM Configuration | 35 |
| Security | 35 |
| Boot | 36 |
| Save & Exit | 36 |
| Updating the BIOS..... | 37 |
| Notice: BIOS SPI ROM..... | 37 |

About this Manual

This manual can be downloaded from the website, or acquired as an electronic file included in the optional CD/DVD. The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

- To avoid damage to the system, use the correct AC input voltage range.
- To reduce the risk of electric shock, unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- 1 GH551 board
- 1 COM cable (2P ports, Length: 250mm) 332-753040-000G
- SATA cable (Length: 500mm) 332-553001-005G
- SATA power cable (Length: 250mm) A81-004041-016G
- Heatsink for -5~65°C (Height: 35.0mm) A71-008136-030G / for -30~80°C (Height: 44.9mm) A71-008136-040G

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Optional Items

- USB 2.0 cable A81-001032-016G 2 ports, Length: 200mm
- Audio cable A81-022007-016G Length: 160mm
- Power adapter 671-106012-000G 60W, 12V, DC Jack
- 4 pin to DC jack cable A81-004051-016G Length: 100mm
- Front panel cable A81-009307-001G Length: 250mm
- Heat Spreader (TBD)

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

When installing the system board in a new system, you will need at least the following internal components.

- Memory module
- Storage device such as hard disk drive, CD-ROM, etc.
- Power adaptor

External system peripherals may also be required for navigation and display, including at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

► Specifications

| | | |
|---------------------|--------------------------|---|
| SYSTEM | Processor | AMD® Ryzen™ Embedded V1605B, 4C/8T, 2MB Cache, 8 CU, 2.0GHz (3.6GHz), 15W AMD® Ryzen™ Embedded V1202B, 2C/4T, 1MB Cache, 3 CU, 2.3 GHz (3.2GHz), 15W AMD® Ryzen™ Embedded V1404I, 4C/8T, 2MB Cache, 8 CU, 2.0GHz (3.6GHz), 15W AMD® Ryzen™ Embedded R1606G, 2C/4T, 3 CU, 2.6GHz (3.5GHz), 15W AMD® Ryzen™ Embedded R1505G, 2C/4T, 3 CU, 2.4GHz(3.3GHz), 15W |
| | | AMD® Ryzen™ Embedded R2514, 4C/8T, 8 CU, 2.1GHz (3.7GHz) AMD® Ryzen™ Embedded R2314, 4C/4T, 6 CU, 2.1GHz (3.5GHz) AMD® Ryzen™ Embedded R2312, 2C/4T, 3 CU, 2.7GHz (3.5GHz) |
| | | Memory 1 x 260-pin SODIMM up to 16GB Single Channel DDR4 up to 2400MHz (ECC/non ECC support) |
| GRAPHICS | BIOS | AMI SPI 64Mbit |
| | Controller | AMD® Radeon™ Vega Graphics |
| | Feature | OpenGL 4.5, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1/WMV9, JPEG/MJPEG, HEVC/H265, VP8, VP9 HW Encode: MPEG2, AVC/H264, JPEG, HEVC/H265, VP8, VP9 |
| | Display | V1000/R2514/R2314: 4xDP++ (1 x LVDS opt.) R2312/R1000: 3 x DP++(1 x LVDS opt.) (DP++ resolution up to 4096x2160 @ 60Hz) (LVDS resolution up to 1920x1200 @ 60Hz) |
| | Multiple Displays | V1000/R2514/R2314: 4xDP++ (1 x LVDS opt.) R2312/R1000: 3 x DP++(1 x LVDS opt.) |
| EXPANSION | Interface | 1 x Full-size mini-PCIe (PCIe/USB 2.0, opt.: USB 3.1 Gen 1) 1 x M.2 2280/2242 M key (Support SATA/PCIe SSD) 1 x Nano SIM slot (opt.) |
| AUDIO | Audio Codec | Realtek ALC888S |
| ETHERNET | Controller | 3 x Realtek® RTL8111HN/RTL8119I (10/100/1000Mbps) |
| REAR I/O | Ethernet | 3 x GbE (RJ-45) |
| | USB | 2 x USB 3.1 Gen2 1 x USB 2.0 |
| | Display | V1000/R2514/R2314: 4 x DP++ R2312/R1000: 3 x DP++ |
| INTERNAL I/O | Serial | 1x RS-232/422/485 (2.0mm pitch) RS485 support auto flow control |
| | USB | 1 x USB 2.0 (2.0mm pitch) |
| | Display | 1 x LVDS LCD Panel Connector 1 x Backlight Power |
| | Audio | 1 x Mic-in 1 x Line-out 1 x Speaker-out (2 x 3W, 8ohm) |
| | SATA | 1 x SATA 3.0 (up to 6Gb/s) 1 x SATA Power |
| | DIO | 1 x 8-bit DIO |
| | SMBus | 1 x SMBus |

| | | |
|-----------------------|------------------------------|---|
| WATCHDOG TIMER | Output & Interval | System Reset, Programmable via Software from 1 to 255 Seconds |
| SECURITY | TPM 2.0 | fTPM2.0 (default) dTPM2.0 (opt.) |
| POWER | Type | Single 12V DC |
| | Connector | 4-pin Right Angle Type Connector (default) DC Jack (available upon request) 4-pin Vertical Type Connector (available upon request) |
| | Consumption | Typical: V1605B:12V @ 1.35A (16.2Watt) Max.: V1605B:12V @ 2.37A (28.44Watt) |
| | RTC Battery | CR2032 coin cell |
| OS SUPPORT | | Windows 10 IoT Enterprise (64-bit) Linux |
| ENVIRONMENT | Temperature | Operating: -5 to 65°C, -30 to 80°C Storage: -40 to 85°C |
| | Humidity | Operating: 10 to 90% RH Storage: 10 to 90% RH |
| | MTBF | R1505: 612,770 hrs @ 25°C; 392,061 hrs @ 45°C ; 229,134 hrs @ 65°C V1605: 622,707 hrs @ 25°C; 408,558 hrs @ 45°C ; 246,634 hrs @ 65°C Calculation Model: Telcordia Issue 4 Environment: GB, GC - Ground Benign, Controlled |
| MECHANICAL | Dimensions | 3.5" SBC Form Factor: 146mm (5.75") x 102mm (4.02") |
| | Height | PCB: 1.6mm Top Side: 15.5mm Bottom Side: 4.0mm |
| COMPLIANCE | | CE, FCC Class B, RoHS |



The specifications listed here may be based on editions that do not resemble your actual products. Please visit the download page at go.dfi.com/GH551, or via the QR code to the right for the latest datasheet.



► Features

Watchdog Timer

The Watchdog Timer function allows your application to regularly “clear” the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

DDR4

DDR4 delivers increased system bandwidth and improves performance. The advantages of DDR4 provide an extended battery life and improve the performance at a lower power than DDR3/DDR2.

Graphics

The integrated AMD® Radeon™ Vega Graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications.

Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s.

Gigabit LAN

The Realtek® RTL8111HN/RTL8119I Gigabit Ethernet Controllers support data transmission at 1Gbps.

Audio

The Realtek ALC262 audio codec provides 4 channel High Definition audio output.

Wake-On-LAN

This feature allows the network to remotely wake up a Soft Power Down (Soft-Off) PC. It is supported via the onboard LAN port or via a PCI LAN card that uses the PCI PME (Power Management Event) signal. However, if your system is in the Suspend mode, you can power-on the system only through an IRQ or DMA interrupt.

Wake-On-USB

This function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

ACPI STR

The system board is designed to meet the ACPI (Advanced Configuration and Power Interface) specification. ACPI has energy saving features that enables PCs to implement Power Management and Plug-and-Play with operating systems that support OS Direct Power Management. ACPI when enabled in the Power Management Setup will allow you to use the Suspend to RAM function.

With the Suspend to RAM function enabled, you can power-off the system at once by pressing the power button or selecting “Standby” when you shut down Windows® without having to go through the sometimes tiresome process of closing files, applications and operating system. This is because the system is capable of storing all programs and data files during the entire operating session into RAM (Random Access Memory) when it powers-off. The operating session will resume exactly where you left off the next time you power-on the system.

Power Failure Recovery

When power returns after an AC power failure, you may choose to either power-on the system manually or let the system power-on automatically.

USB

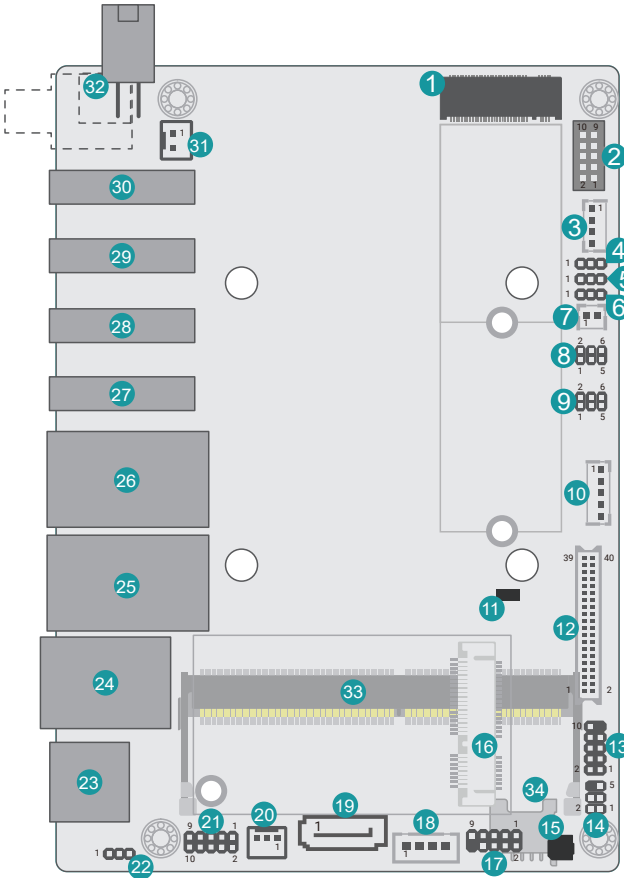
The system board supports the new USB 3.1 Gen 2. It is capable of running at a maximum transmission speed of up to 10 Gbit/s (1.2 GB/s) and is faster than USB 3.1 Gen 1 (5 Gbit/s, or 625 MB/s), USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.1 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

RTC Timer

The Real Time Clock (RTC) installed on the system board allows your system to automatically power-on on the set date and time.

Chapter 2 - Hardware Installation

Board Layout

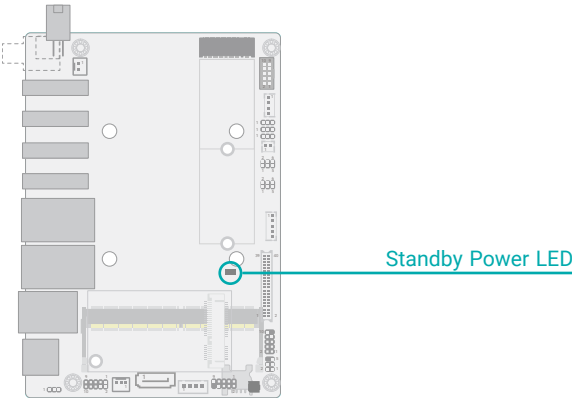


- 1 M.2 M Key
- 2 Front Audio
- 3 Speaker
- 4 JP9000
- 5 JP6
- 6 JP1
- 7 Battery
- 8 JP5
- 9 JP4
- 10 LVDS Backlight
- 11 LED1
- 12 LVDS
- 13 USB 0/3 (USB 2.0)
- 14 SMBus
- 15 Buzzer
- 16 Mini PCIe
- 17 COM1
- 18 SATA Power
- 19 SATA
- 20 CPU Fan
- 21 DIO
- 22 JP2
- 23 USB 5 (USB 2.0)
- 24 LAN3
- 25 LAN2, USB 3.0
- 26 LAN1, USB 3.0
- 27 DP4
- 28 DP3
- 29 DP2
- 30 DP1
- 31 Heater
- 32 12V DC-In
- 33 DDR4 (Bottom)
- 34 Nano SIM (Bottom)

Note: Specifications of these components are model-specific. Please refer to the specifications for detail.

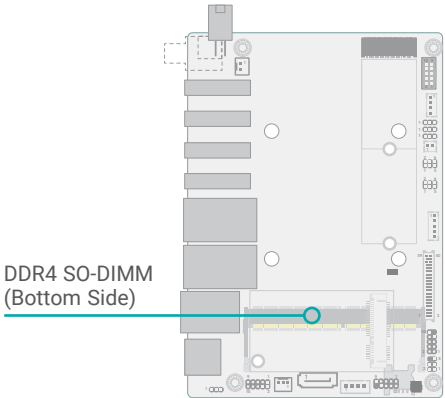
Important: Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Standby Power LED



Important: When the Standby Power LED lights up, it indicates that there is power on the system board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.

► **System Memory**



The system board supports one single channel DDR4 SO-DIMM memory module.

Single Channel (SC)

Data will be accessed in chunks of 64 bits from the memory channels.

Features

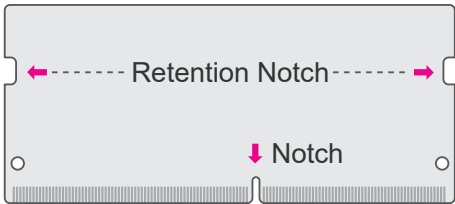
- 1 x 260-pin SODIMM up to 16GB
- Single Channel DDR4 up to 2400MHz

► **System Memory**

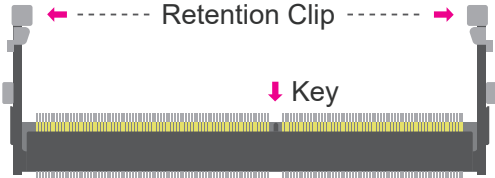
Installing the SO-DIMM Module

Before installing the memory module, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the SO-DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.

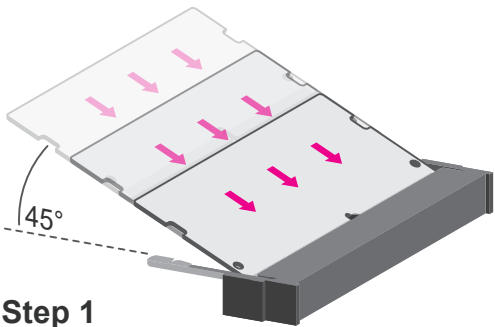


◀◀◀ **DDR4 SO-DIMM**

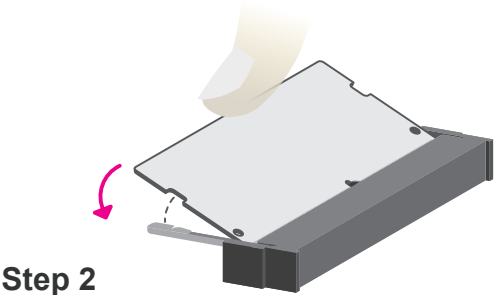


◀◀◀ **Socket Top View**

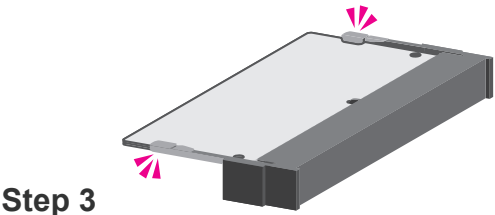
Please follow the steps below to install the memory card into the socket.



Step 1: Insert the memory card into the slot while making sure 1) the notch and the key are aligned, and 2) the non-connector end rises approximately 45 degrees horizontally. Press the card firmly into the socket while applying and maintaining even pressure on both ends.



Step 2: Press the end of the card far from the socket down while making sure the retention notch and the clip align as indicated by the dotted line in the illustration. If the retention notch and the clip do not align, please remove the card and re-insert it. Press the card all the way down.

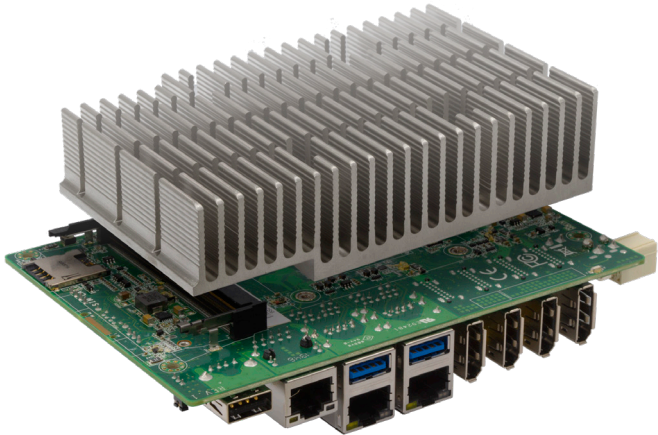


Step 3: The clips snap automatically and abruptly to the retention notches of the card sounding a distinctive click, and lock the card in place. Inspect that the clip sits in the notch. If not, please pull the clips outward, release and remove the card, and mount it again.

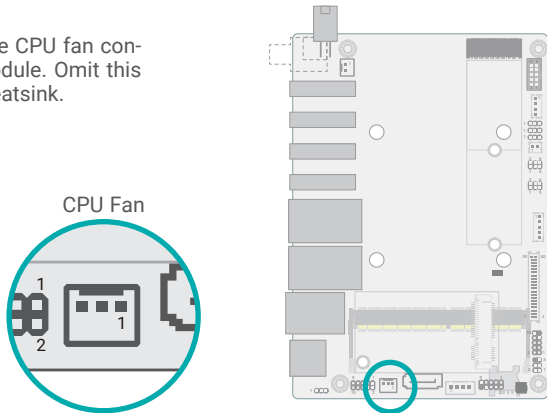
▶ Heatsink and Fan

Installing the Heatsink and Fan

The system board comes with a heatsink with four spring screws. Four stand-offs are already welded onto the system board. Remove any plastic cover on the bottom side of the heatsink. Orient the heatsink so that the interface metal aligns with the APU, the spring screws align with the stand-offs, and the thinner side of the heatsink sits right on top of the memory. Remove any plastic cover on the interface metal and apply thermal paste/adhesive if it is required.

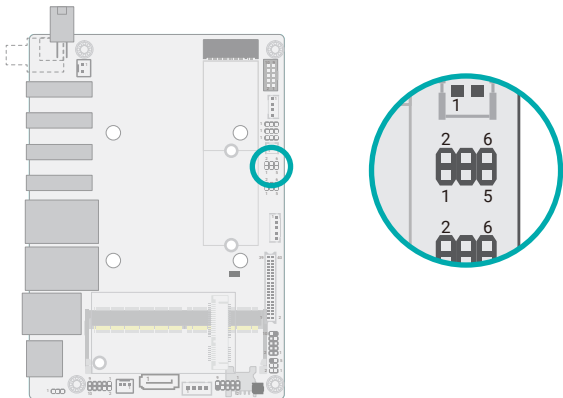


Connect the CPU fan cable to the CPU fan connector on the top side of the module. Omit this step when installing a fanless heatsink.



► Jumper Settings

Front Panel (JP5)



■ Front Panel Pin Assignment

| Pin | Assignment | Pin | Assignment |
|-----|--------------|-----|---------------|
| 1 | Power Button | 2 | Power LED VCC |
| 3 | GND | 4 | Power LED |
| 5 | System Reset | 6 | HDD LED |

HDD-LED - Hard Disk Drive LED

Lighting of the LED indicates that the hard drive is being accessed.

System Reset

This switch allows you to reboot without having to power off the system.

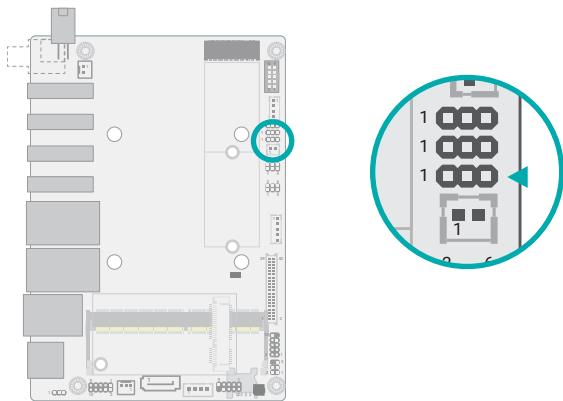
Power/Standby LED

When the system's power is on, this LED will light up. When the system is in the S1 (POS - Power On Suspend) state, it will blink at 1-second intervals. When the system is in the S3 (STR - Suspend To RAM) state, it will blink at 4-second intervals.

Power Button

This switch is used to power on or off the system.

Clear CMOS (JP1)



If any anomaly of the followings is encountered –

- a) CMOS data is corrupted;
- b) you forgot the supervisor or user password;
- c) failure to start the system due to BIOS mis-configuration

– it is suggested that the system be reconfigured with default values stored in the ROM BIOS. To load the default values stored in the ROM BIOS, please follow the steps below.

1. Power-off the system and unplug the power cord.
2. Put a jumper cap on JP1's pin 2 and pin 3. Wait for a few seconds and set JP1 back to its default setting, i.e. jumper cap on pin 1 and pin 2.
3. Plug the power cord and power-on the system.



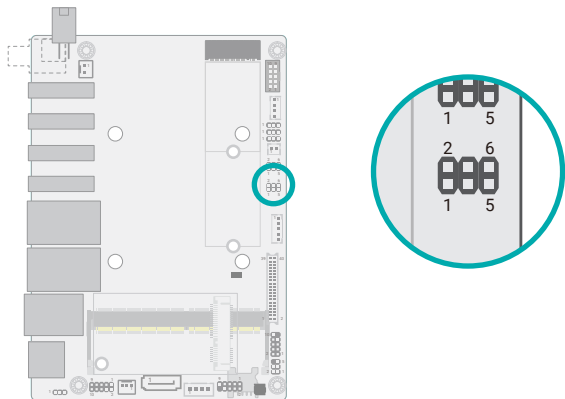
■ 1-2 On: Normal (default)



■ 2-3 On: Clear CMOS

▶ Jumper Settings

Panel Power Select (JP4)



The power level supplied to the LVDS/eDP panel can be switched between +3.3V, +5V or +12V via JP4.



■ 1-2 On: +12V



■ 3-4 On: +5V



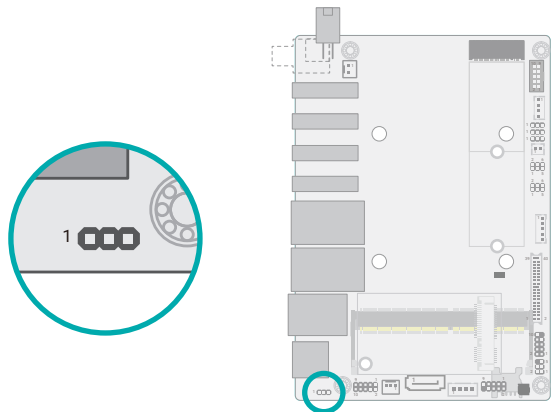
■ 5-6 On: +3.3V (default)



Important: Before powering-on the system, make sure that the setting of the jumper matches the specifications of the LVDS LCD. Incorrect power voltage may cause irreversible damage to your LCD panel.

▶ Jumper Settings

Backlight Power Select (JP2)



The power level supplied to the LCD backlight can be switched between +3.3V or +5V via JP2.



■ 1-2 On: +3.3V (default)



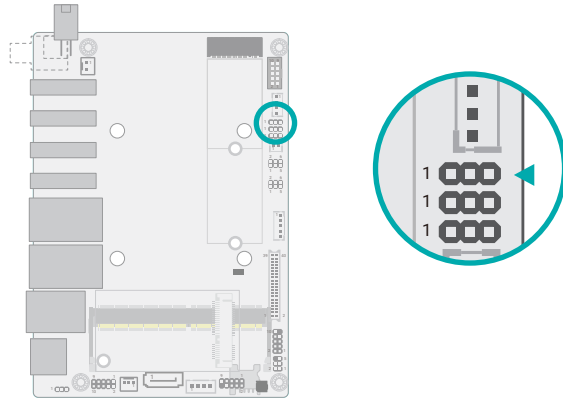
■ 2-3 On: +5V



Important: Before powering-on the system, make sure that the setting of the jumper matches the specifications of the LCD's backlight power. Incorrect power voltage may cause irreversible damage to your LCD's backlight.

► Jumper Settings

APU Power (JP9000)

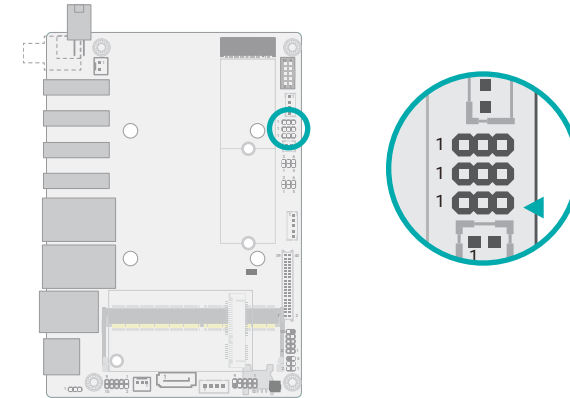


The APU VRM can be monitored via the connector.

| Pin | Assignment |
|-----|----------------|
| 1 | APU_VRM1_SCLK |
| 2 | APU_VRM1_SDATA |
| 3 | GND |

► Jumper Settings

AT/ATX Select (JP6)



The system board can be switched between AT and ATX modes via JP6.

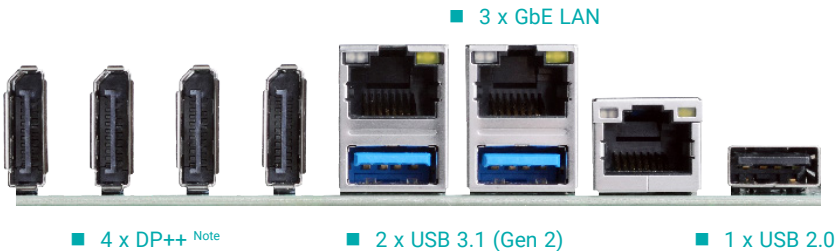


■ 1-2 On: AT Mode (default)



■ 2-3 On: ATX Mode

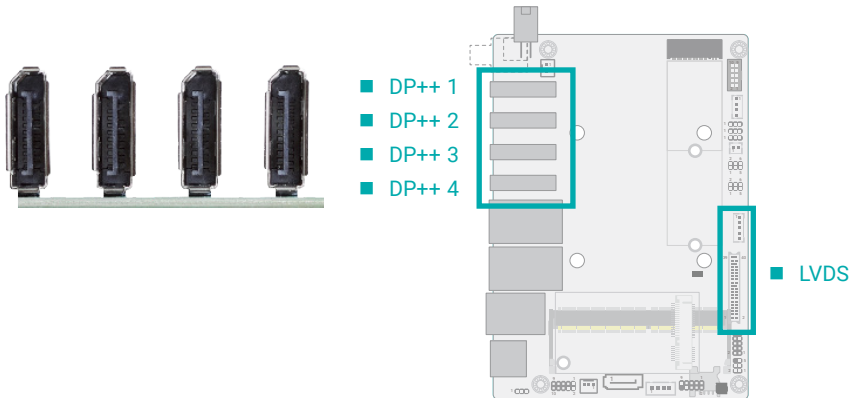
► Rear I/O Ports



Note: The number of DP++ ports depends on your actual model. Please refer to specifications for detail.

► Rear I/O Ports

Graphics Display



The total number of DP++ ports are model-specific as determined by the APU model. One internal LVDS can also be opted for in replacement of DP++ 4 as summarized below:

| APU Model | LVDS | DP++ |
|--------------|------|------|
| V1000 Series | 1 | 3 |
| | 0 | 4 |
| R1000 Series | 1 | 2 |
| | 0 | 3 |

DisplayPort ++

The DisplayPort (DP) is a digital display interface used to connect a display device such as a computer monitor. It is used to transmit audio and video simultaneously. The interface, which is developed by VESA, delivers higher performance features than any other digital interface.

BIOS Setting

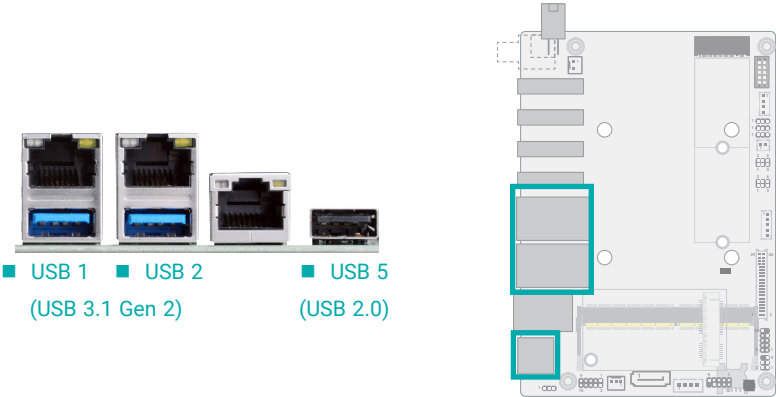
Configure the display devices in the Advanced > AMD CHIPSET Setting > GFX Configuration submenu of the BIOS. Configure the LVDS LCD panel in the Advanced > PTN3460 Config submenu. Refer to the chapter 3 for more information.

Driver Installation

Install the graphics driver. Refer to the chapter 4 for more information.

▶ Rear I/O Ports

USB Ports



USB allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals. The system board is equipped with multiple USB Type A ports at the rear side – two USB 3.1 Gen2 and one USB 2.0. For the internal USB ports, please refer to the next section. Please refer to the next section for internal USB connectors.

Wake-On-USB Keyboard/Mouse

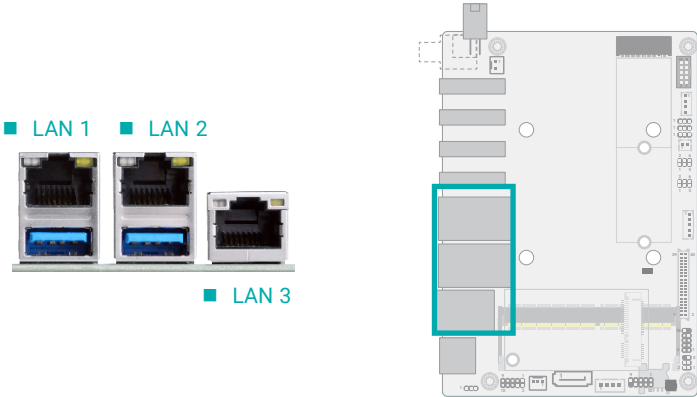
The Wake-On-USB Keyboard/Mouse function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

BIOS Setting

Configure the onboard USB in the Advanced menu (“USB Configuration” submenu) of the BIOS. Refer to chapter 3 for more information.

▶ Rear I/O Ports

RJ45 LAN Ports



The LAN ports allow the system board to connect to a local area network by means of a network hub.

BIOS Setting

Configure wake-on-LAN in the Advanced menu (“ACPI Configuration” submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

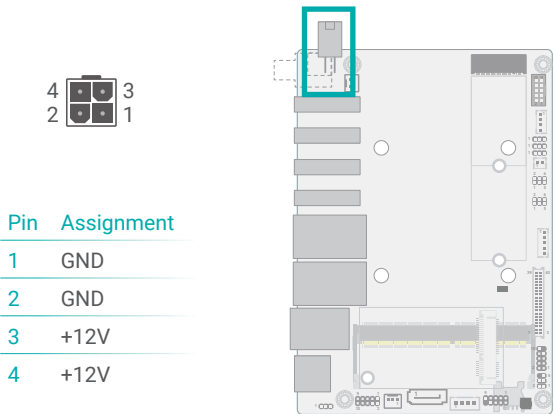
Install the LAN drivers. Refer to the chapter 4 for more information.

Features

- 3 x Realtek® RTL8111HN/RTL8119I (10/100/1000Mbps)

► Internal I/O Connectors

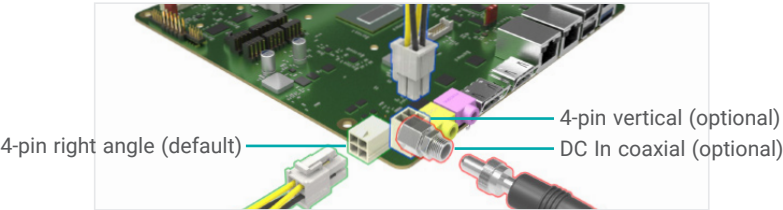
12V DC-In



Connect a 4-pin DC power cord to the power connector for DC supply. The coaxial and 4-pin vertical types are available upon request.

Jumper Setting

The power related configurations are configured via jumper settings as previously instructed in this chapter.



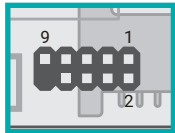
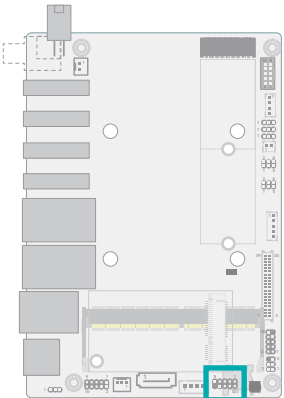
Important:

Using a voltage higher than the recommended range may result in failure in starting and booting the system or causing irreversible damage to the system board. A power adaptor/converter is necessary when the power source on site does not comply with the power specifications of the board.

► Internal I/O Connectors

COM (Serial) Port

| Pin | RS232 | RS422 | RS485 |
|-----|-------|-------|-------|
| 1 | DCD- | TXD- | Data- |
| 2 | RD | TXD+ | Data+ |
| 3 | TD | RXD+ | N.C. |
| 4 | DTR- | RXD- | N.C. |
| 5 | GND | GND | GND |
| 6 | DSR- | N.C. | N.C. |
| 7 | RTS- | N.C. | N.C. |
| 8 | CTS- | N.C. | N.C. |
| 9 | RI- | N.C. | N.C. |



■ COM1

The serial ports are asynchronous communication ports with 16C550A-compatible UARTs that can be used with modems, serial printers, remote display terminals, and other serial devices.

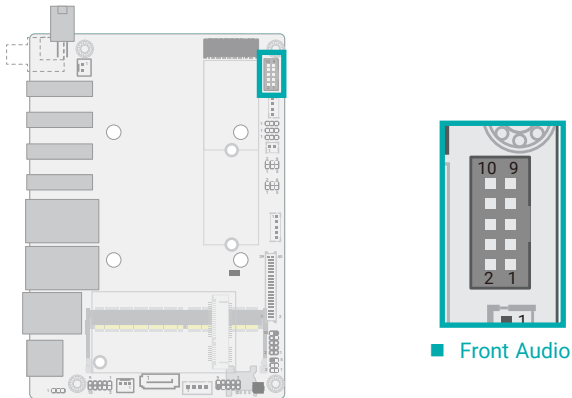
COM 1 supports three serial modes, i.e. RS232, RS422, and RS485.

BIOS Setting

Configure the onboard COM ports in the Advanced menu ("Console Redirection" and "NCT5525D Super IO Configuration" submenus) of the BIOS. Refer to chapter 3 for more information.

Internal I/O Connectors

Front Audio



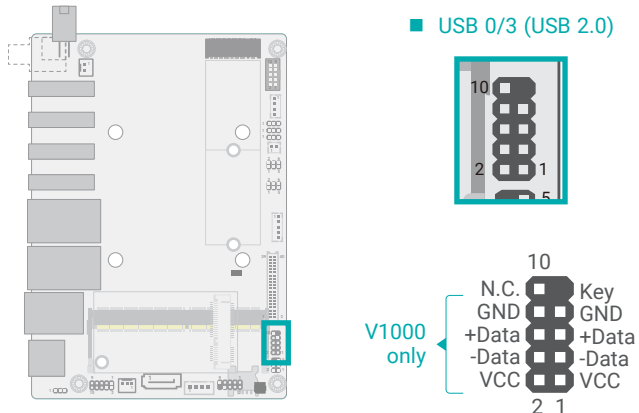
The Front Audio internal box headers allow you to connect to the second line-out and mic-in jacks that are at the front panel of your system.

Front Audio Pin Assignment

| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|-----------------|
| 1 | Mic-L | 2 | GND |
| 3 | Mic-R | 4 | N.C. |
| 5 | Line-Out-R | 6 | Mic-JD (sense) |
| 7 | GND | 8 | N.C. |
| 9 | Line-Out-L | 10 | Line-JD (sense) |

Internal I/O Connectors

USB Ports



The USB device allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

The internal pin headers provide two USB 2.0 ports for V1000 series, and one (pin 1, 3, 5, 7) for R1000 series.

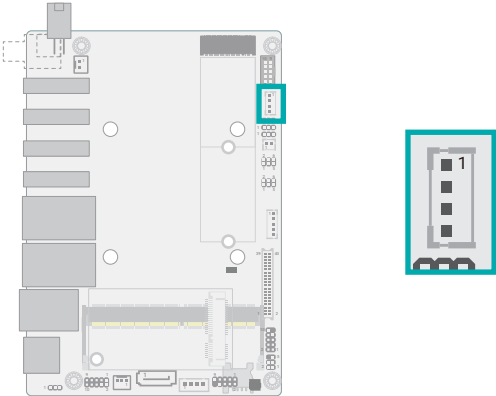
The internal USB pin headers may be connected to a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis and then insert the USB port cables to a connector.

Wake-On-USB Keyboard/Mouse

The Wake-On-USB Keyboard/Mouse function allows you to use a USB keyboard or USB mouse to wake up a system from the S state(s).

Internal I/O Connectors

Speaker



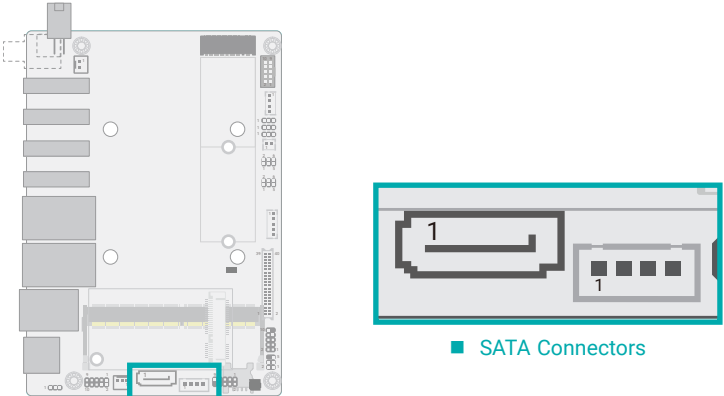
The speaker connector is for audio output and sound amplification via external amplifiers and speakers.

Speaker Pin Assignment

| Pin | Assignment |
|-----|------------|
| 1 | SPK_Out_L+ |
| 2 | SPK_Out_L- |
| 3 | SPK_Out_R- |
| 4 | SPK_Out_R+ |

Internal I/O Connectors

SATA (Serial ATA)

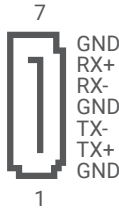


The Serial ATA (SATA) connector is used to connect the Serial ATA device. The system board support one SATA port and provides data rate up to 6Gb/s. Connect one end of the Serial ATA cable to a SATA connector and the other end to your Serial ATA device.

BIOS Setting

Configure the Serial ATA drives in the Advanced > AMD CHIPSET Setting > SATA Configuration Options submenu of the BIOS. Refer to chapter 3 for more information.

SATA Pin Assignment

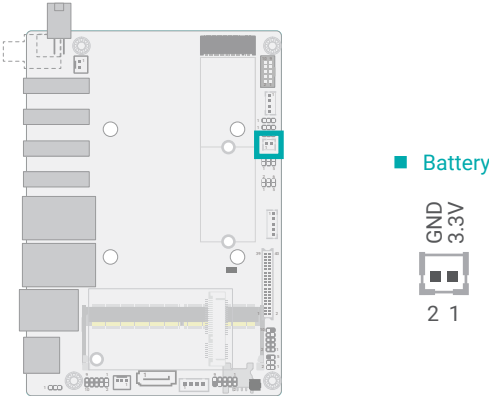


SATA Power Pin Assignment



Internal I/O Connectors

Battery



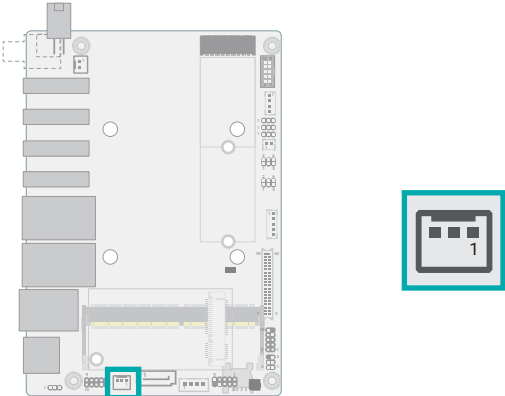
The external lithium ion battery supplies power to the real-time clock and CMOS memory as an auxiliary source of power when the main power is shut off.

Safety Measures

- There exists explosion hazard if the battery is incorrectly installed.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to local ordinances.

Internal I/O Connectors

CPU Fan



These fan connectors are used to connect to cooling fans. Cooling fans provide adequate air circulation throughout the chassis and dissipate heat to prevent overheating of the system board and components. The 3-pin CPU fan modulates fan speed via voltage modulation.

BIOS Setting

Configure the Smart Fans in the Advanced menu ("NCT5525D Super IO Configuration" sub-menu) of the BIOS. Refer to chapter 3 for more information.

3-pin Fan Pin Assignment

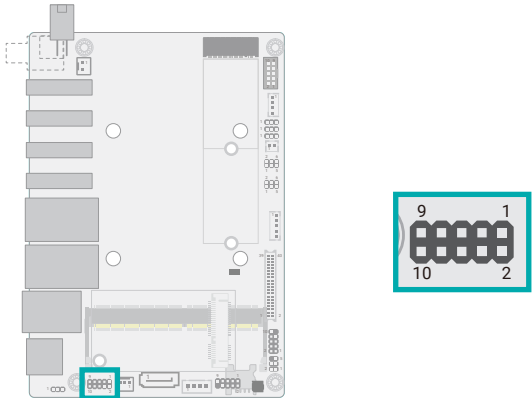
| Pin | Assignment |
|-----|-------------------|
| 1 | Ground |
| 2 | Power (12V PWM) |
| 3 | Sense (Fan speed) |

Fan Pin Assignment Note:

- Pin 1: Ground
- Pin 2: 12V PWM (Fan out for control Fan speed, Min 35% duty ~ Max 100% duty)
- Pin 3: Fan in signal for sense Fan speed

Internal I/O Connectors

Digital I/O



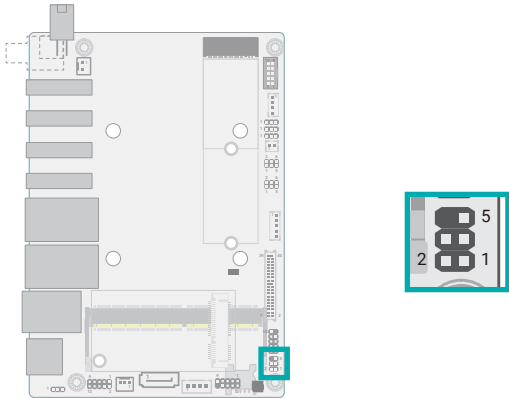
The 8-bit Digital I/O (DIO) connector allows for input/output signals of digital logical states defined by voltage levels.

Digital I/O Pin Assignment

| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1 | D_IOA7_C | 2 | D_IOA6_C |
| 3 | D_IOA5_C | 4 | D_IOA4_C |
| 5 | D_IOA3_C | 6 | D_IOA2_C |
| 7 | D_IOA1_C | 8 | D_IOA0_C |
| 9 | 5VSB | 10 | GND |

Internal I/O Connectors

SMBus



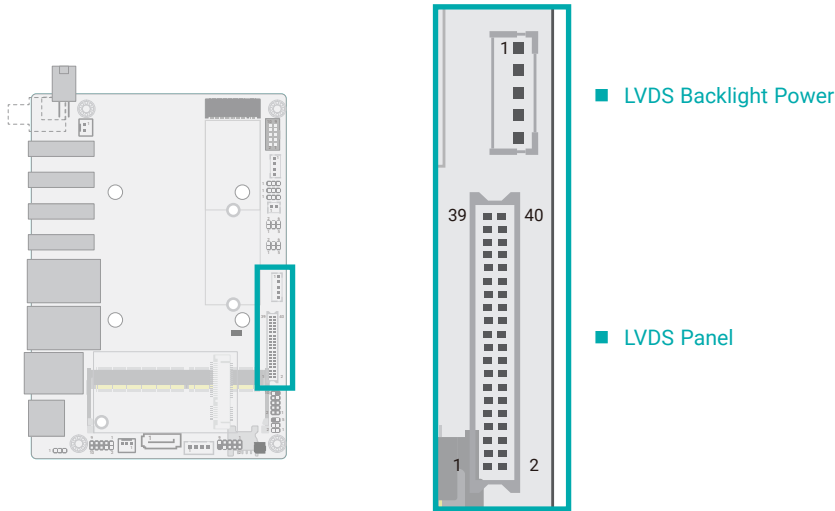
The SMBus (System Management Bus) connector is used to connect the SMBus device. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

SMBus Pin Assignment

| Pin | Assignment | Pin | Assignment |
|-----|-------------|-----|------------|
| 1 | 3V3SB | 2 | GND |
| 3 | SMBus_Clock | 4 | SMBus_DATA |
| 5 | SMBus_Alert | 6 | --- |

Internal I/O Connectors

LVDS Panel (Optional)



The system board allows you to connect a LCD Display Panel by means of the LVDS LCD panel connector and the LCD/Inverter power connector. These connectors transmit video signals and power from the system board to the LCD Display Panel.

Jumper Setting

The power voltage of the LCD panel and backlight power is configured via jumper settings as previously instructed in this chapter.



Note: The LVDS port is only available on certain models. Please refer to specifications for detail.

LVDS LCD Panel Pin Assignment

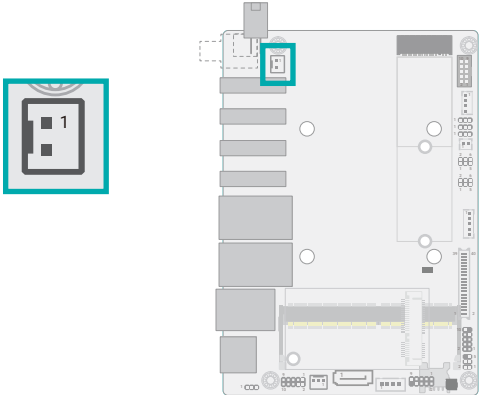
| Pin | Function | Pin | Function |
|-----|---------------|-----|-------------|
| 1 | GND | 2 | GND |
| 3 | LVDSA_Out3+ | 4 | LVDSB_Out3+ |
| 5 | LVDSA_Out3- | 6 | LVDSB_Out3- |
| 7 | GND | 8 | GND |
| 9 | LVDSA_Out2+ | 10 | LVDSB_Out2+ |
| 11 | LVDSA_Out2- | 12 | LVDSB_Out2- |
| 13 | GND | 14 | GND |
| 15 | LVDSA_Out1+ | 16 | LVDSB_Out1+ |
| 17 | LVDSA_Out1- | 18 | LVDSB_Out1- |
| 19 | GND | 20 | GND |
| 21 | LVDSA_Out0+ | 22 | LVDSB_Out0+ |
| 23 | LVDSA_Out0- | 24 | LVDSB_Out0- |
| 25 | GND | 26 | GND |
| 27 | LVDSA_CLK1+ | 28 | LVDSB_CLK1+ |
| 29 | LVDSA_CLK1- | 30 | LVDSB_CLK1- |
| 31 | GND | 32 | GND |
| 33 | LVDS_DDC_CLK | 34 | NC |
| 35 | LVDS_DDC_DATA | 36 | +3.3V |
| 37 | Panel Power | 38 | Panel Power |
| 39 | Panel Power | 40 | Panel Power |

Backlight Power Pin Assignment

| Pin | Function | Pin | Function |
|-----|------------------|-----|------------------------|
| 1 | +12V | 4 | PWM Brightness Control |
| 2 | GND | 5 | 5V |
| 3 | Backlight On/Off | | |

Internal I/O Connectors

Heater



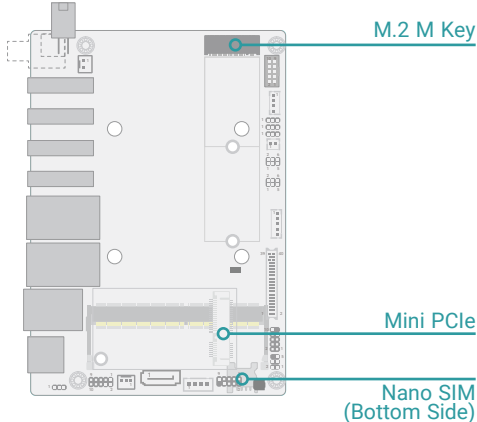
The heater box header provides 12V power to the external heater.

Heater Box Header

| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|-------------|
| 1 | 12V | 2 | 12VSB_PG_SW |

Internal I/O Connectors

Expansion Slots



M.2 Sockets

The M.2 socket is the Next Generation Form Factor (NGFF) which is designed to support multiple modules and make the M.2 more suitable in application for solid-state storage. The board preserves space and two standoffs for the M.2 M Key socket (22mm x 42mm, 22mm x 80mm).

Mini PCIe

The Mini PCIe socket allows for a full-size Mini PCIe module, and supports PCIe and USB signals – one USB 2.0, and one USB 3.0.

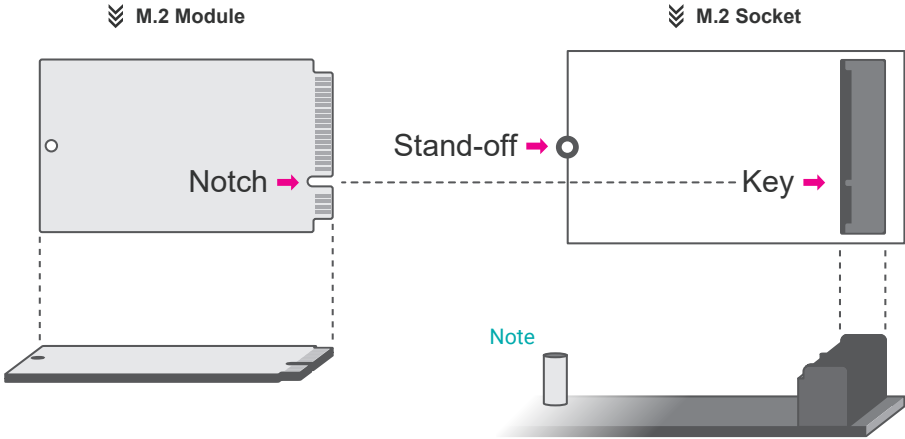
Nano SIM

The Nano SIM socket allows for inserting a Nano SIM card for the system to access the subscribed telecom service.

Installing the M.2 Module

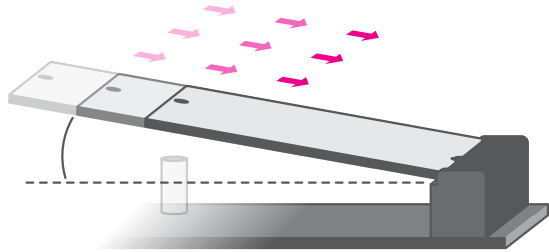
Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.

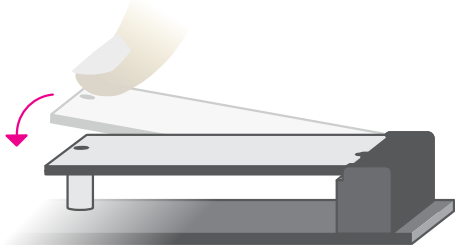


Note:
The M.2 stand-off is detachable and is screwed onto one of the reserved bases for the supported form factors. Please remove and install it into the base of the form factor that matches the M.2 module to be installed.

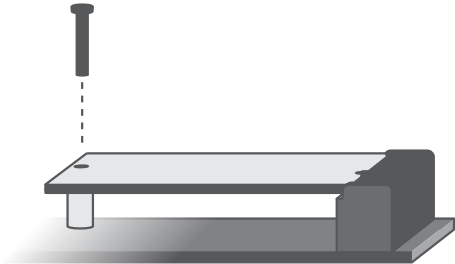
Please follow the steps below to install the card into the socket.



Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



Step 2:
Press the end of the card far from the socket down until the gap between the card and the stand-off closes.

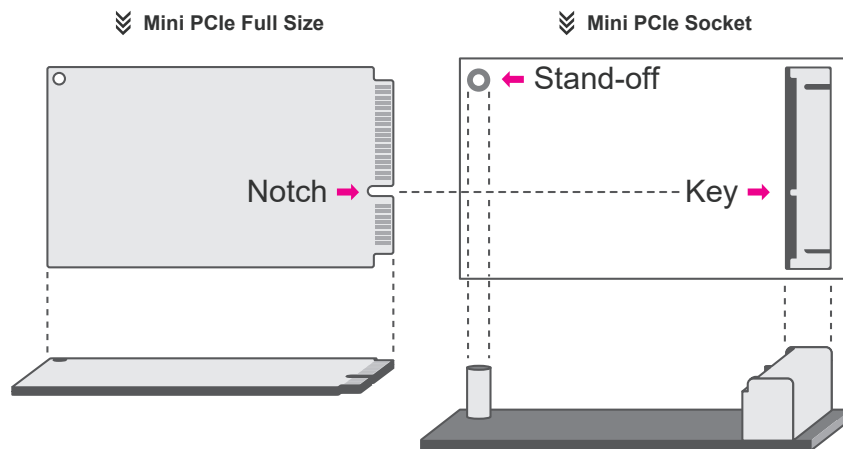


Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes. The card should be lying parallel to the board when it's correctly mounted.

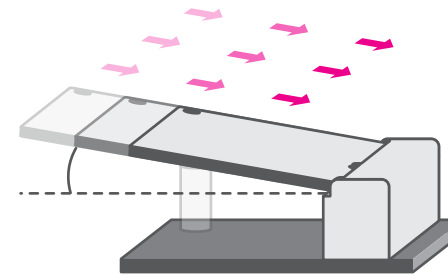
Installing the Mini PCIe Module

Before installing the Mini PCIe module into the Mini PCIe socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the Mini PCIe socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.

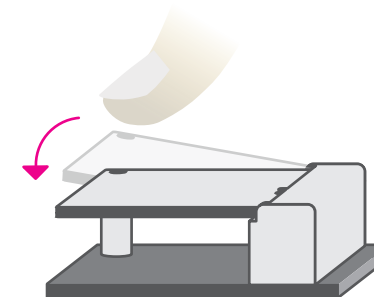


Please follow the steps below to install the card into the socket.



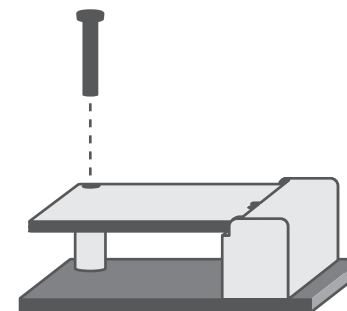
Step 1:

Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



Step 2:

Press the end of the card far from the socket down until against the stand-off.



Step 3:

Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

Chapter 3 - BIOS Settings

► Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added. It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.



Note:

The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen. The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and keys simultaneously.

Legends

| Keys | Function |
|--------------------|--|
| Right / Left arrow | Move the highlight left or right to select a menu |
| Up / Down arrow | Move the highlight up or down between submenus or fields |
| <Enter> | Enter the highlighted submenu |
| + (plus key)/F6 | Scroll forward through the values or options of the highlighted field |
| - (minus key)/F5 | Scroll backward through the values or options of the highlighted field |
| <F1> | Display general help |
| <F2> | Display previous values |
| <F9> | Optimized defaults |
| <F10> | Save and Exit |
| <Esc> | Return to previous menu |

Scroll Bar

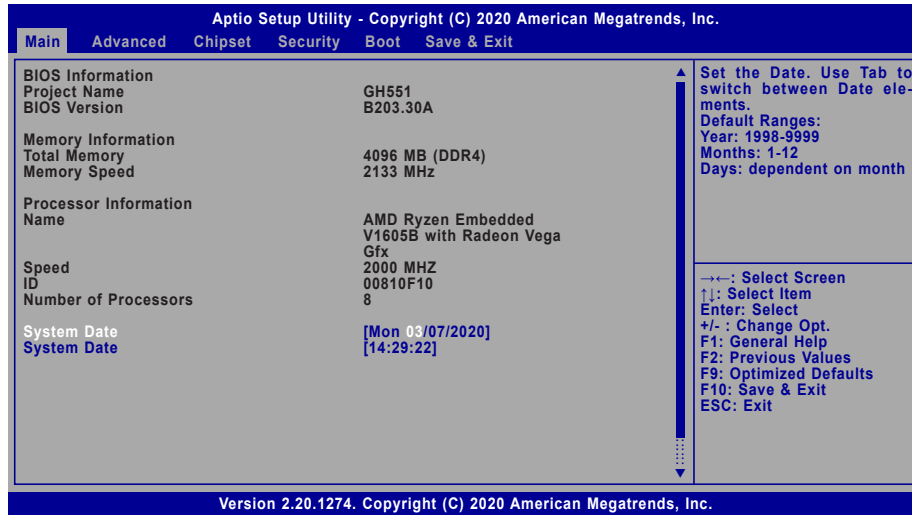
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu

When "►" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

► Main

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



System Date

The date format is <month>, <date>, <year>. Press "Tab" to switch to the next field and press "-" or "+" to modify the value.

System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

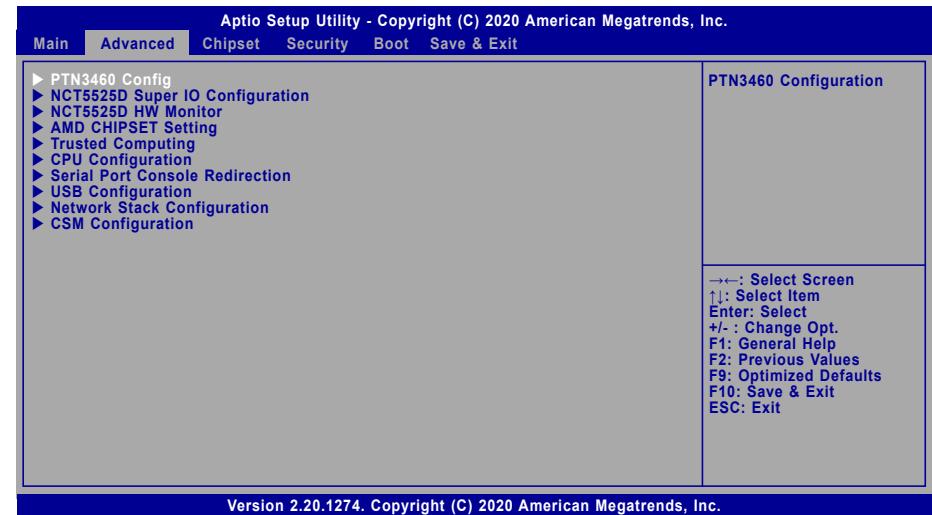
► Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.



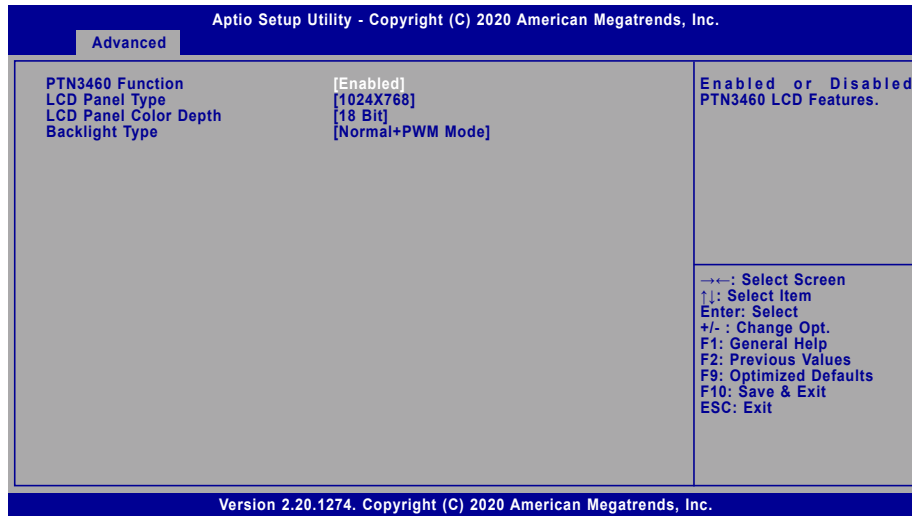
Important:

Setting incorrect field values may cause the system to malfunction.



▶ Advanced

PTN3460 Config



PTN3460 Function

Enable or disable PTN3460 LCD features. The following fields are only configurable when this field is enabled.

LCD Panel Type

Select the resolution of the LCD Panel — 800X480, 800X600, 1024X768, 1366X768, 1280X1024, 1280X768, 1920X1080, or 1600X900.

LCD Panel Color Depth

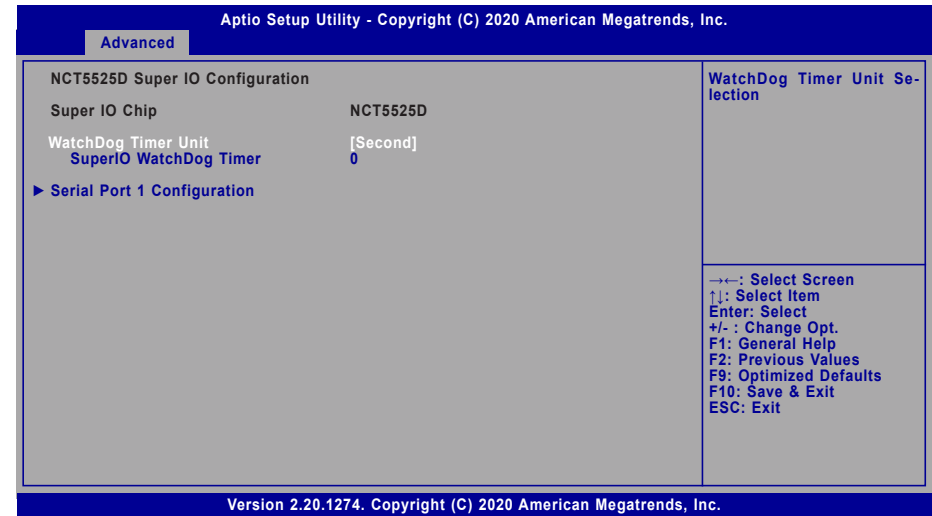
Select the color depth of the LCD Panel — 18 Bit, 24 Bit, 36 Bit, 48 Bit.

Backlight Type

Select the inverter polarity and brightness control — PWM Mdde, DC Mdde.

▶ Advanced

NCT5525D Super IO Configuration



WatchDog Timer Unit

Select WatchDog Timer Unit — Second or Minute.

SuperIO WatchDog Timer

Set SuperIO WatchDog Timer Timeout value. The range is from 0 (disabled) to 255.



Note:
The sub-menus are detailed in following sections.

▶ **Advanced** ▶ **NCT5525D Super IO Configuration**

▶ **Serial Port 1 Configuration**

| Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc. | |
|---|-------------------------------------|
| Advanced | |
| Serial Port 1 Configuration | Enable or Disable Serial Port (COM) |
| Serial Port [Enabled] | |
| Device Settings IO=3F8h; IRQ=4; | |
| Electrical Interface Mode [RS232] | |
| RS485 Auto Flow [Disabled] | |
| →←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit | |
| Version 2.20.1274. Copyright (C) 2020 American Megatrends, Inc. | |

Serial Port

Enable or disable the current serial COM port.

Electrical Interface Mode

Configure the serial mode of the current port – RS232, RS422, RS485.

RS485 Auto Flow

Enable or disable RS485 auto flow.

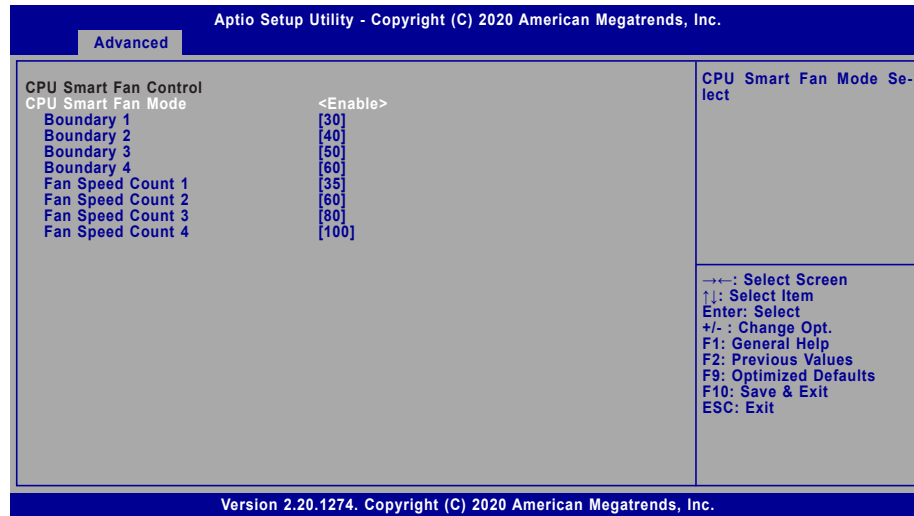
▶ **Advanced**

NCT5525D HW Monitor

| Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc. | |
|---|----------------------------|
| Advanced | |
| ▶ Smart Fan Function | Smart Fan function setting |
| System temperature : +37 °C | |
| CPU temperature : +33 °C | |
| CPU_Fan Speed : N/A | |
| VBAT : +3.040 V | |
| VCORE : +0.996 V | |
| 5V : +5.116 V | |
| 3V3SB : +3.096 V | |
| 3V3 : +3.096 V | |
| →←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit | |
| Version 2.20.1274. Copyright (C) 2020 American Megatrends, Inc. | |

This section displays the system's health information, i.e. voltage readings, CPU and system temperatures, and fan speed readings.

▶ Smart Fan Function



Smart Fan is a fan speed moderation strategy dependent on the current system temperature. When the system temperature goes higher than the Boundary setting, the fan speed will be turned up to the setting of the Fan Speed Count that bears the same index as the Boundary field.

▼ CPU Smart Fan Mode = [Enabled]

Boundary 1 to Boundary 4

Set the boundary temperatures that determine the fan speeds accordingly, the value ranging from 0-127°C. For example, when the system temperature reaches Boundary 1 setting, the fan speed will be turned up to the designated speed of the Fan Speed Count 1 field.

Fan Speed Count 1 to Fan Speed Count 4

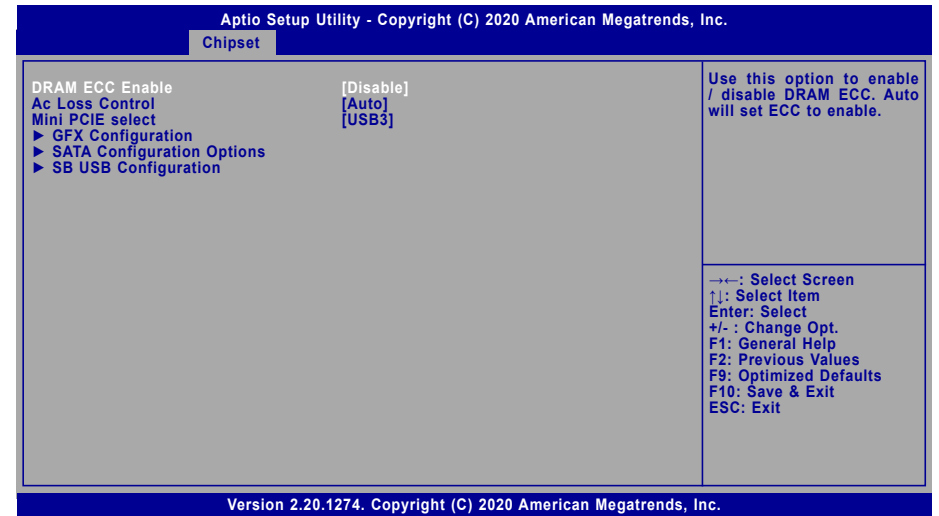
Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will operate according to the specified boundary temperatures above-mentioned.

▼ CPU Smart Fan Mode = [Disabled]

Manual PWM Setting

Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will always operate at the specified speed regardless of gauged temperatures.

AMD CHIPSET Setting



DRAM ECC Enable

Enable or disable the memory's Error-correcting code memory (ECC) function.

Ac Loss Control

Select between Always Off, Always On, and Last State. This field is used to specify what state the system is set to return to when power is re-applied after a power failure (G3 state).

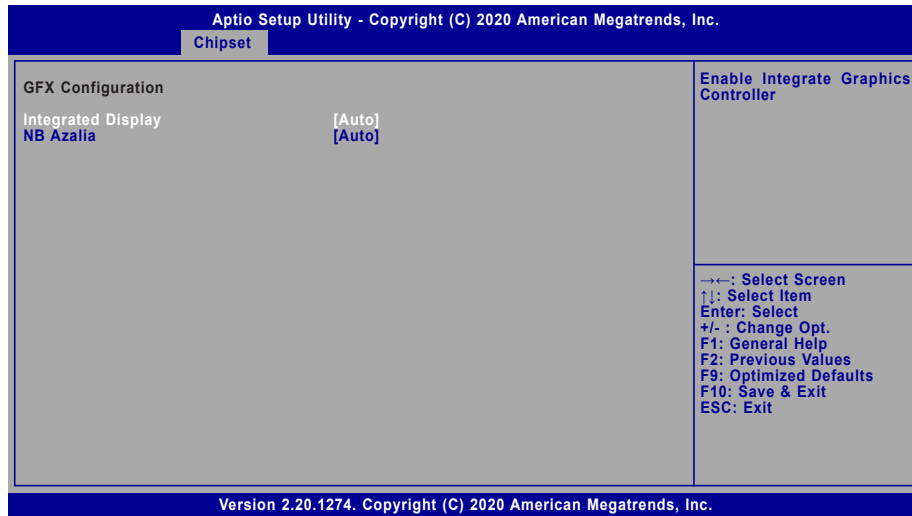
- Always On The system automatically powers on after power failure.
- Always Off The system enter soft-off state after power failure. Power-on signal input is required to power up the system.
- Last State The system returns to the last state right before power failure.

Mini PCIE select

Select the signal type of the Mini PCIe channel – USB3 or PCIE.

▶ Advanced ▶ AMD CHIPSET Setting

▶ **GFX Configuration**



Integrated Graphics

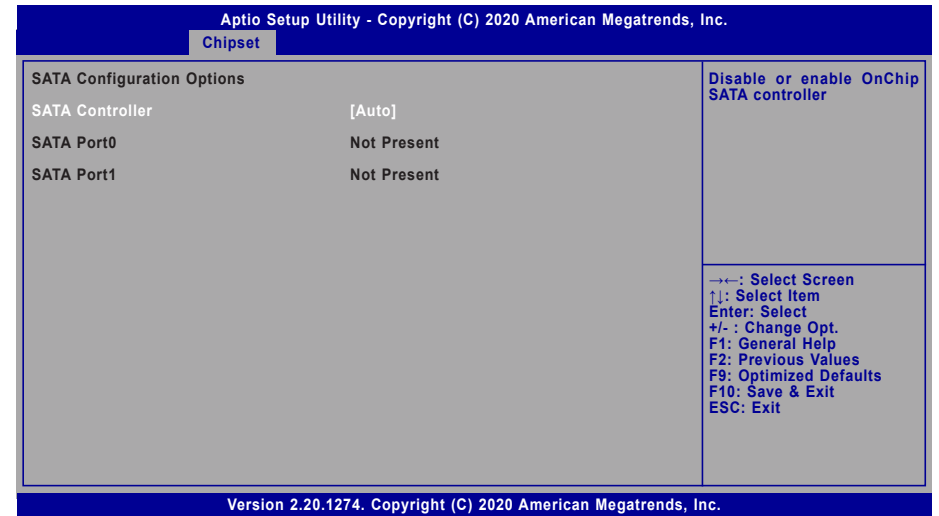
Select how the integrated graphics controller is enabled — Auto, Force, and Disabled.

NB Azalia

Select how the integrated HD Audio controller is enabled — Auto, Enabled, and Disabled.

▶ Advanced ▶ AMD CHIPSET Setting

▶ **SATA Configuration Options**



SATA Controller(s)

This field is used to enable or disable the Serial ATA controller.

SATA Port0

Information about the SATA device connected to the on-board SATA port.

SATA Port1

Information about the SATA device connected to the on-board M.2 port.

▶ Advanced ▶ AMD CHIPSET Setting

▶ SB USB Configuration

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.

Chipset

| | | |
|--------|-----------|-------------------------|
| USB2_0 | [Enabled] | Enabled/Disabled USB2_0 |
| USB3_1 | [Enabled] | |
| USB3_2 | [Enabled] | |
| USB2_3 | [Enabled] | |
| USB2_5 | [Enabled] | |

→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F9: Optimized Defaults
F10: Save & Exit
ESC: Exit

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USB Ports

Enabled or disable the USB ports.



Note:
The actual number of USB ports is model-specific.

▶ Advanced

Trusted Computing

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.

Advanced

| | | |
|-------------------------|----------|--|
| TPM20 Device Found | | Enables or Disables BIOS support for security device. O.S will not show Security Device. TCG EFI protocol and INT1A interface will not be available. |
| Firmware Version | 3.39 | |
| Vendor: | AMD | |
| Security Device Support | [Enable] | |
| Pending operation | [None] | |

→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F9: Optimized Defaults
F10: Save & Exit
ESC: Exit

Version 2.20.1274. Copyright (C) 2020 American Megatrends, Inc.

Security Device Support

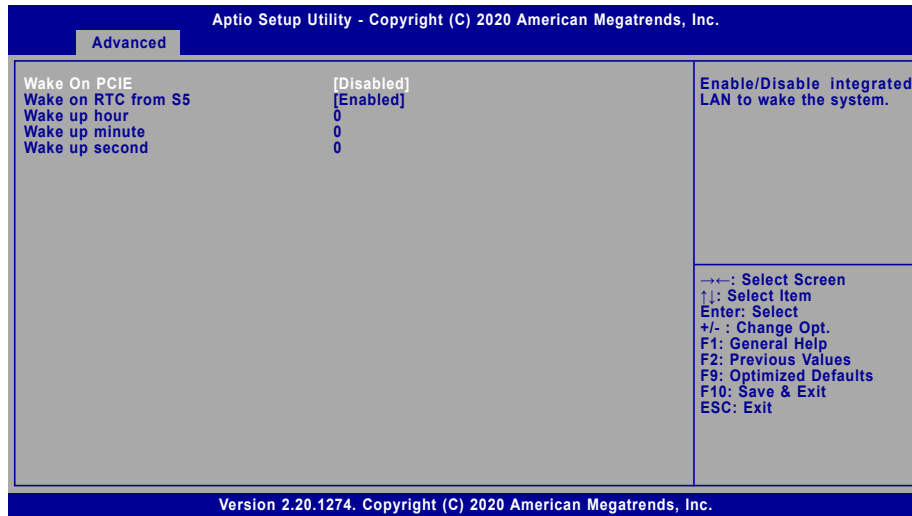
This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

Pending operation

To clear the existing TPM encryption, select "TPM Clear" and restart the system. This field is not available when "Security Device Support" is disabled.

▶ Advanced

ACPI Configuration



Wake On PCIE

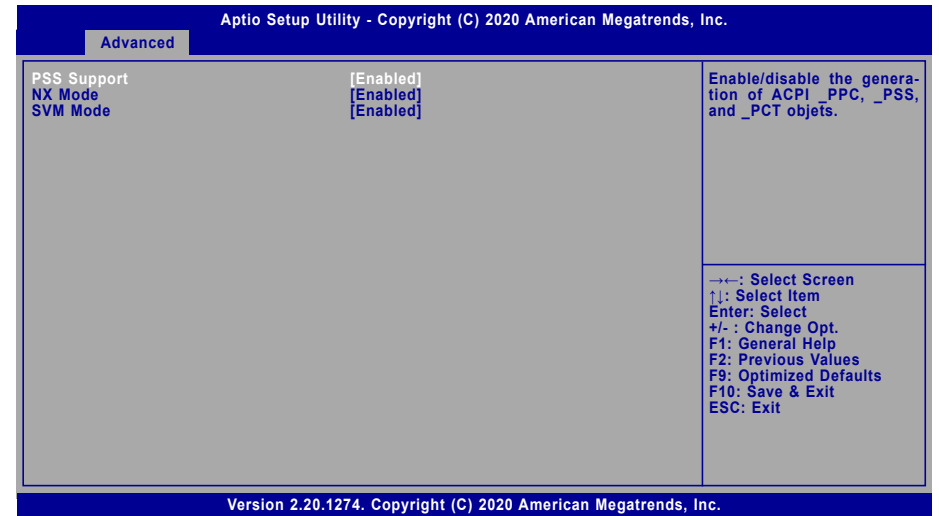
Enable or disable remote wakeup via the onboard LAN port or via a PCI LAN card.

Wake on RTC from S5

When Enabled, the system will automatically power up at a designated time every day. Once it's switched to [Enabled], please set up the time of day — hour, minute, and second — for the system to wake up.

▶ Advanced

CPU Configuration



PSS Support

Enable or disable the power, performance, and speed related ACPI functions of the CPU.

NX Mode

Enable or disable the protection function that keeps no-execute codes from being executed by the CPU.

SVM Mode

Enable or disable Secure Virtual Machine (SVM) for CPU virtualization.

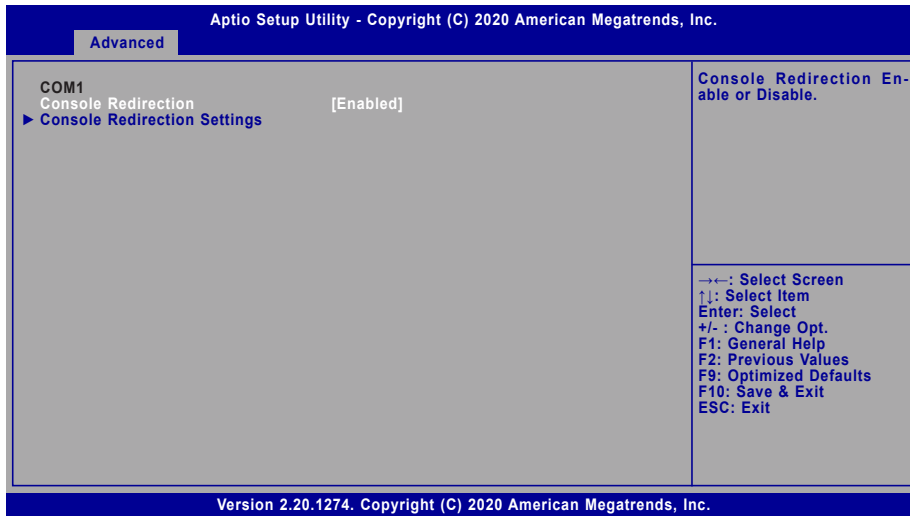


Note:

Some of the fields may not be available when the features are not supported by the equipped CPU.

► Advanced

Serial Port Console Redirection

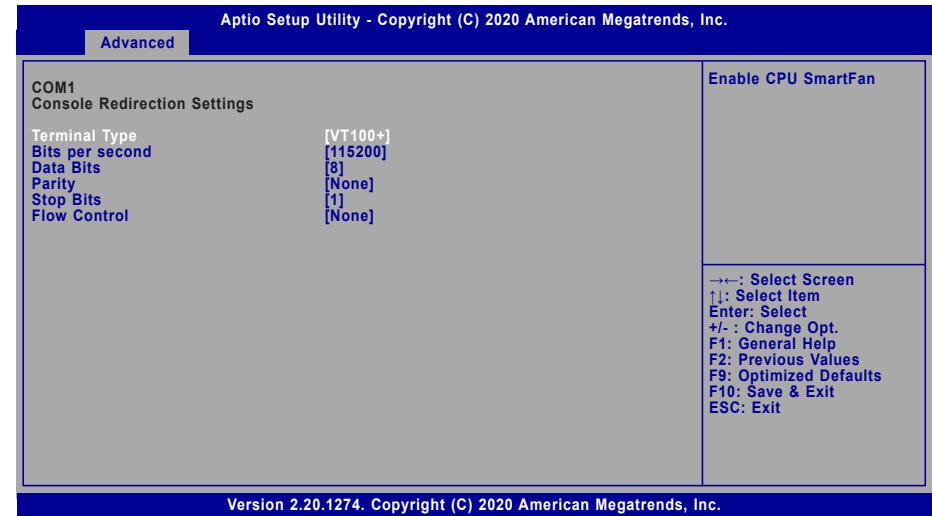


Console Redirection

By enabling Console Redirection of a COM port, the sub-menu of console redirection settings will become available for configuration as detailed in the following.

► Advanced

► Console Redirection Settings



Configure the serial settings of the current COM port.

Terminal Type

Select terminal type: VT100, VT100+, VT-UTF8 or ANSI.

Bits per second

Select serial port transmission speed: 9600, 19200, 38400, 57600 or 115200.

Data Bits

Select data bits: 7 bits or 8 bits.

Parity

Select parity bits: None, Even, Odd, Mark or Space.

Stop Bits

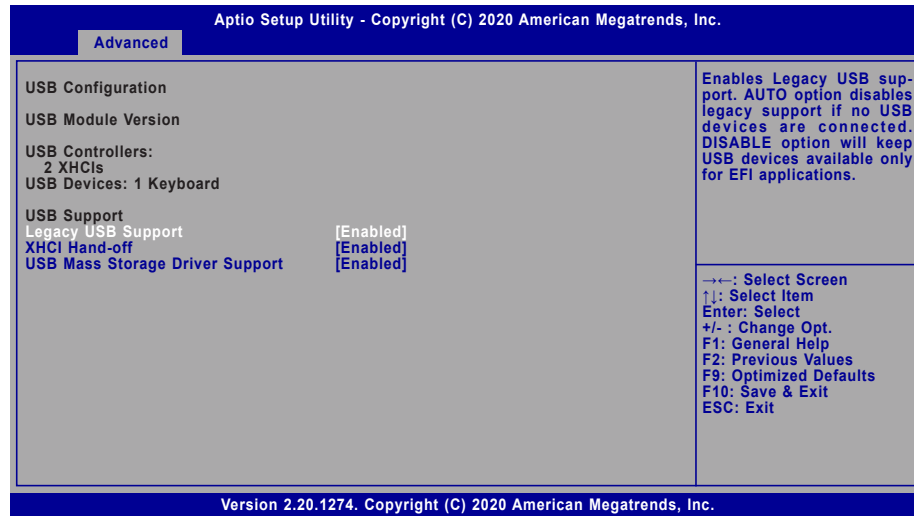
Select stop bits: 1 bit or 2 bits.

Flow Control

Select flow control type: None or Hardware RTS/CTS.

► Advanced

USB Configuration



Legacy USB Support

- Enabled** Enable Legacy USB support.
- Disabled** Keep USB devices available only for EFI applications.
- Auto** Disable Legacy support if no USB devices are connected.

XHCI Hand-off

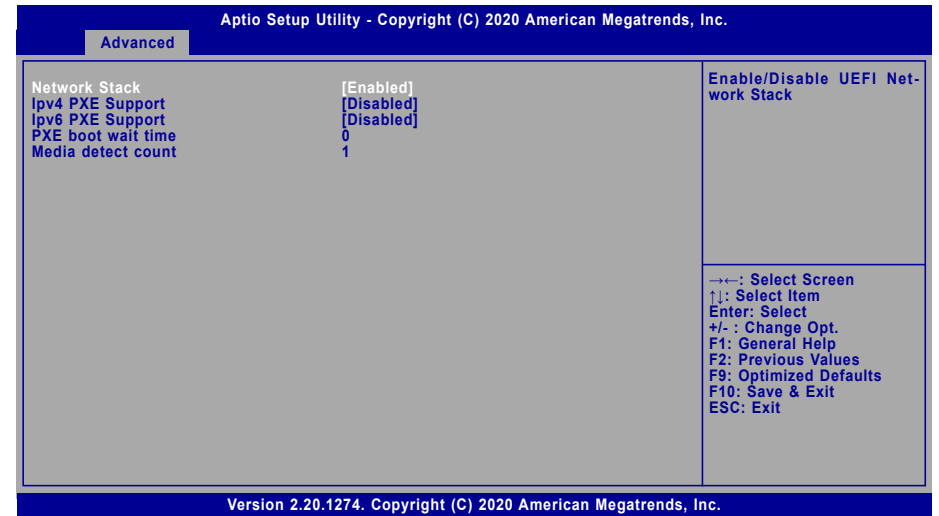
Enable or disable XHCI Hand-off.

USB Mass Storage Driver Support

Enable or disable USB Mass Storage Driver Support.

► Advanced

Network Stack Configuration



Network Stack

Enable or disable UEFI network stack. The following fields will appear when this field is enabled.

Ipv4 PXE Support

Enable or disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

Ipv6 PXE Support

Enable or disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

PXE boot wait time

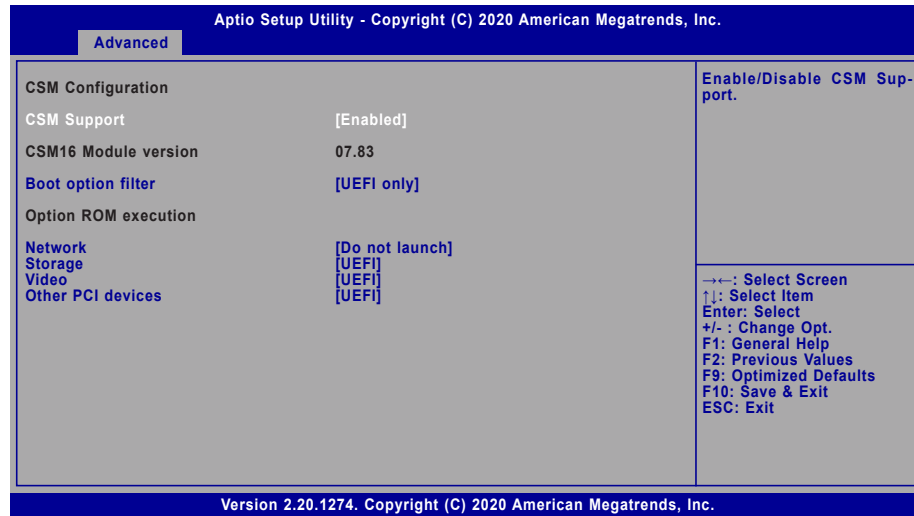
Set the wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

Media detect count

Set the number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

► Advanced

CSM Configuration



CSM Support

This section is used to enable or disable CSM Support. The following fields are only available when "CSM Support" is enabled.

Boot option filter

This field controls Legacy/UEFI ROMs priority.

Network

This field controls the execution of UEFI and Legacy Network OpROM.

Storage

This field controls the execution of UEFI and Legacy Storage OpROM.

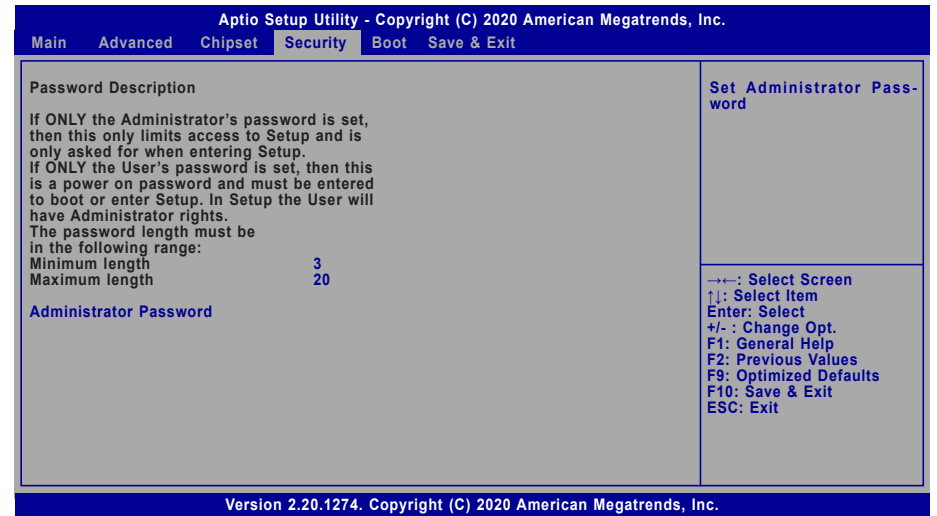
Video

This field controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

This field determines OpROM execution policy for devices other than Network, Storage or Video.

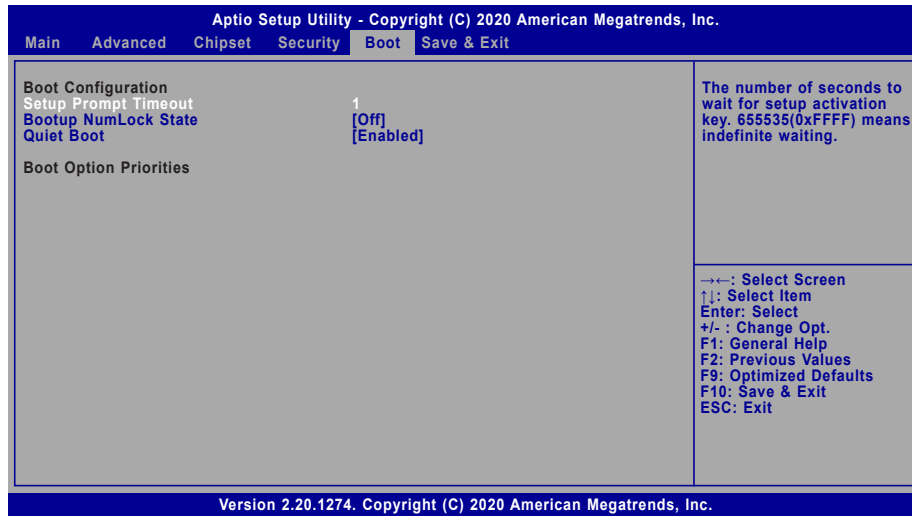
► Security



Administrator Password

Set the administrator password. To clear the password, input nothing and press enter when a new password is asked. Administrator Password will be required when entering the BIOS.

► **Boot**



Setup Prompt Timeout

Set the number of seconds to wait for the setup activation key – 1 to 65535, 65535 (0xFFFF) meaning indefinite waiting.

Bootup NumLock State

Select the keyboard NumLock state – On or Off.

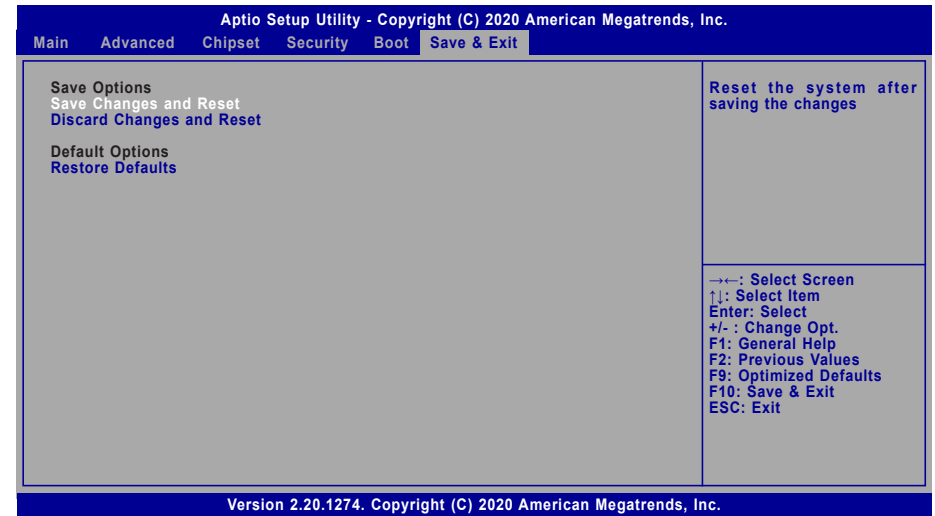
Quiet Boot

This section is used to enable or disable quiet boot option.

Boot Option Priorities

Rearrange the system boot order of available boot devices.

► **Save & Exit**



Save Changes and Reset

To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

Discard Changes and Reset

To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Restore Defaults

To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

► Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility. For updating AMI BIOS in UEFI mode, you may refer to the how-to video at <https://www.dfi.com/Knowledge/Video/5>.

► Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.



Note:

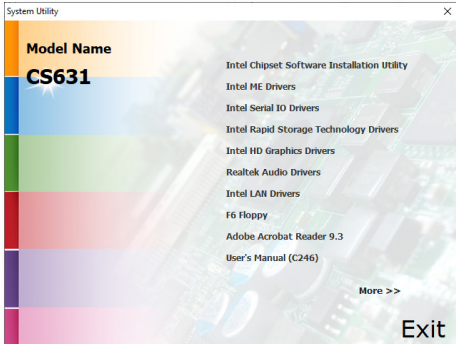
- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

Chapter 4 - Supported Software

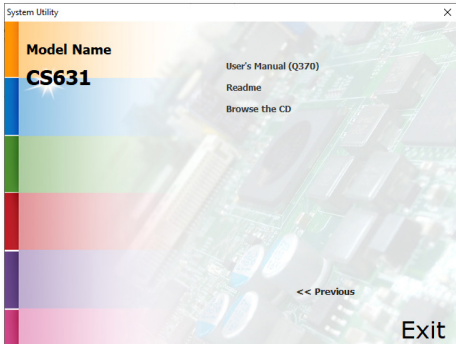
Install drivers, utilities and software applications that are required to facilitate and enhance the performance of the system board. You may acquire the software from your sales representatives, from an optional DVD included in the shipment, or from the website download page at <https://www.dfi.com/DownloadCenter>.

► Auto-run Menu

After inserting your DVD-ROM into your optical drive or executing your DVD image, the System Utility auto-run menu may pop up. Click on the utility or driver that is to be installed on the system. Please refer to the following sections that correspond to your selection for more information.



Click "More >>" on the lower right to go to the next page of the auto-run menu, and click "<< Previous" to return to the previous menu.

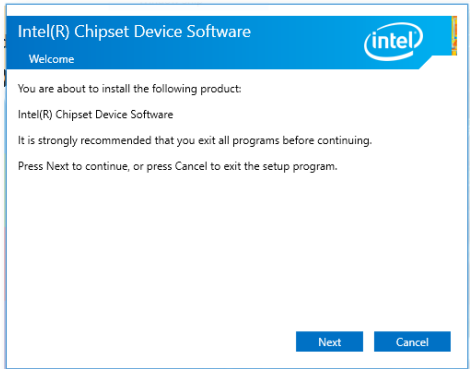


Note:
This step can be ignored if the applications are downloaded standalone files.

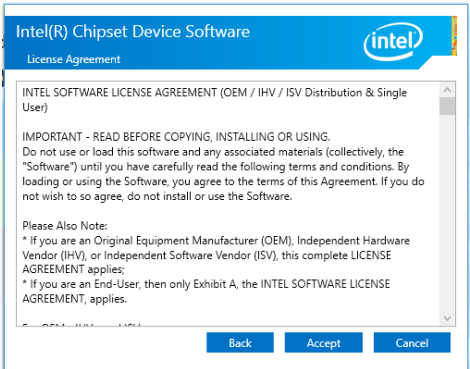
► Intel Chipset Software Installation Utility

The Intel Chipset Software Installation Utility is used for updating Windows® INF files so that the Intel chipset can be recognized and configured properly in the system.

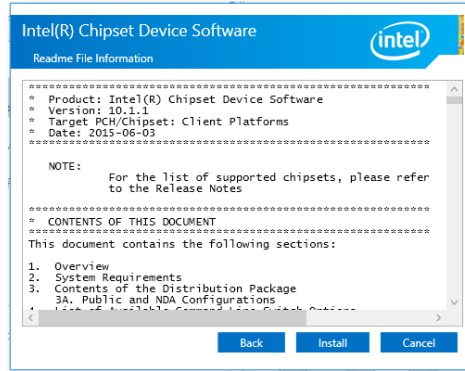
- 1. Setup is ready to install the utility. Click "Next".



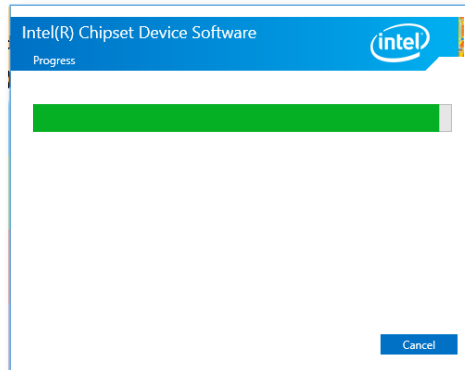
- 2. Read the license agreement then click "Accept".



- Go through the readme document for more installation tips then click "Install".

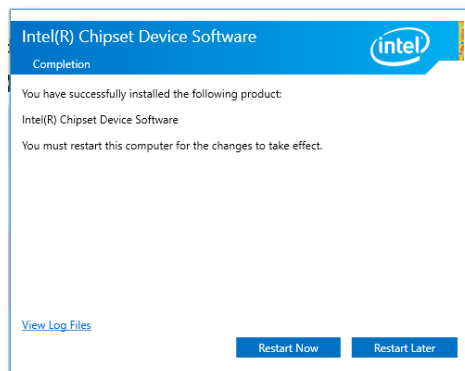


- The step displays the installing status in the progress.



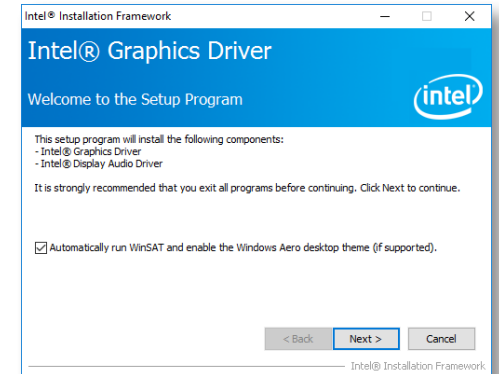
- After completing installation, click "Restart Now" to exit setup.

Restarting the system will allow the new software installation to take effect.



► Intel HD Graphics Drivers

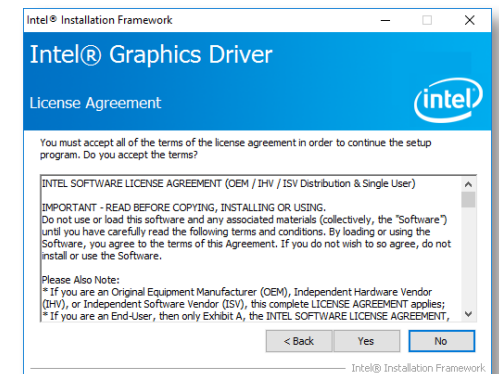
- Setup is now ready to install the graphics driver. Click "Next".



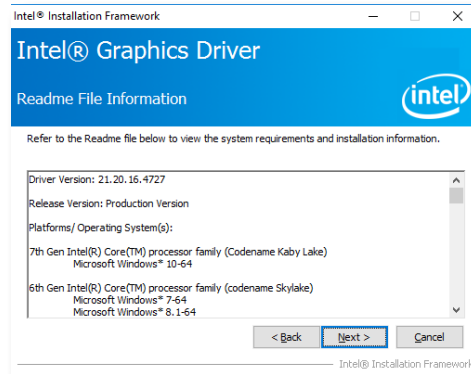
By default, the "Automatically run WinSAT and enable the Windows Aero desktop theme" is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 10 desktop appears. The "blank screen" period is the time Windows is testing the graphics performance.

We recommend that you skip this process by disabling this function then click "Next".

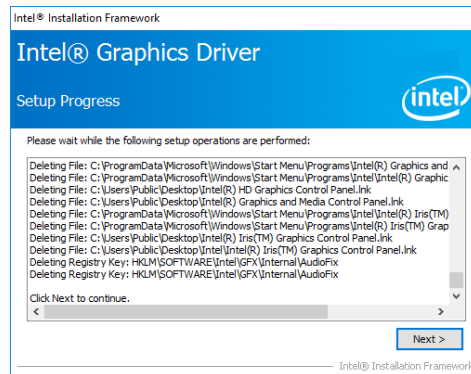
- Read the license agreement then click "Yes".



- Go through the readme document for system requirements and installation tips then click "Next".

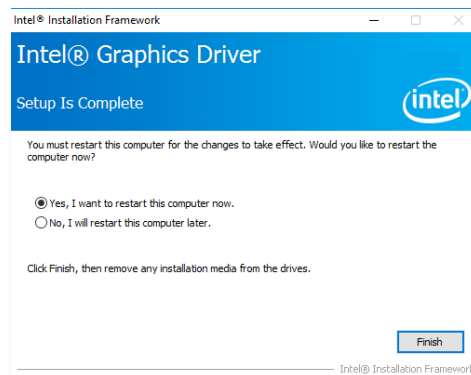


- Setup is now installing the driver. Click "Next" to continue.



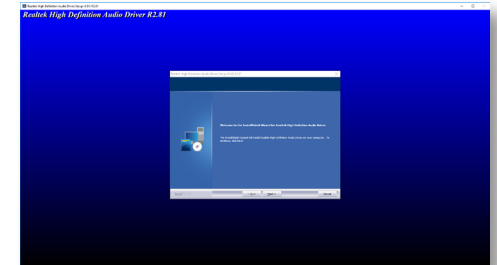
- Click "Yes, I want to restart this computer now" then click "Finish".

Restarting the system will allow the new software installation to take effect.



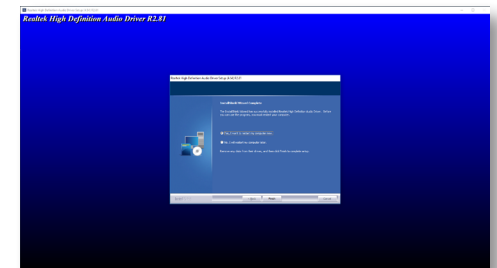
► Realtek Audio Drivers

- Setup is ready to install the driver. Click "Next".



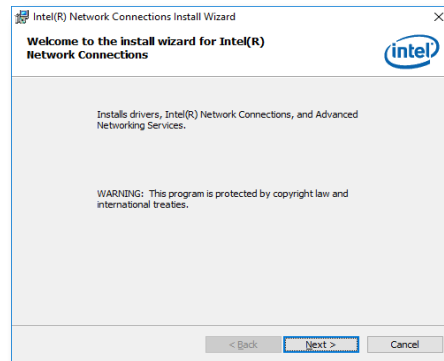
- Click "Yes, I want to restart my computer now" then click "Finish".

Restarting the system will allow the new software installation to take effect.

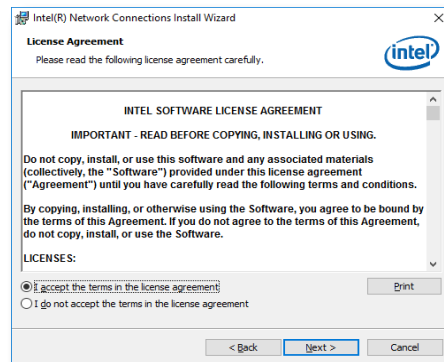


► Intel LAN Driver

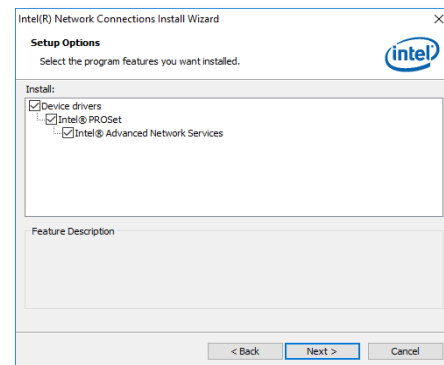
1. Setup is ready to install the driver. Click "Next".



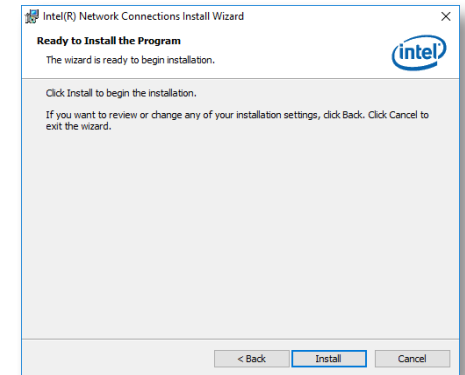
2. Click "I accept the terms in the license agreement" then click "Next".



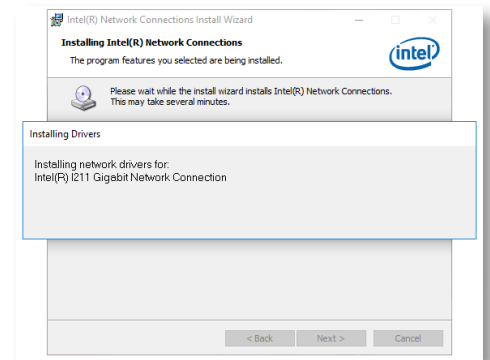
3. Select the program features you want installed then click "Next".



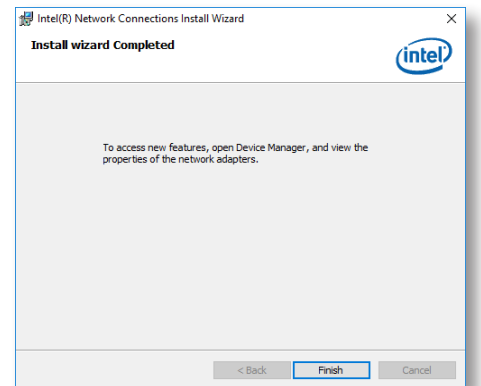
4. Click "Install" to begin the installation.



5. The step displays the installing status in the progress.

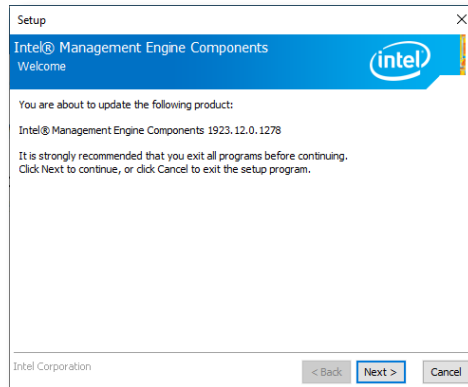


6. After completing installation, click "Finish".

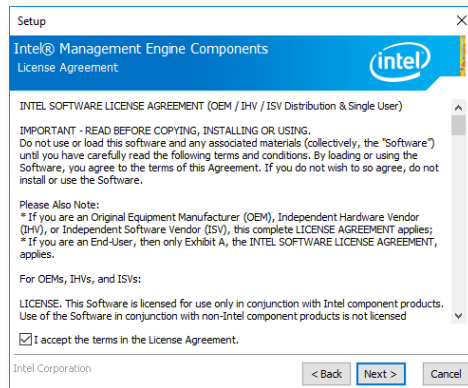


► Intel ME Drivers

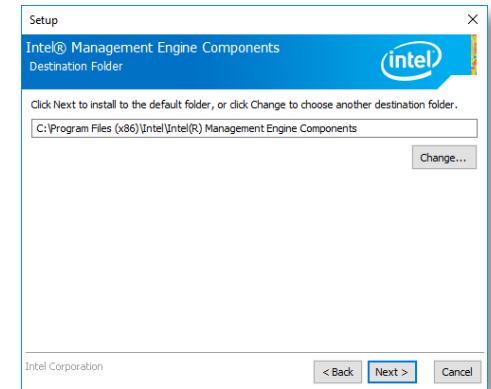
1. Setup is ready to install the driver. Click "Next".



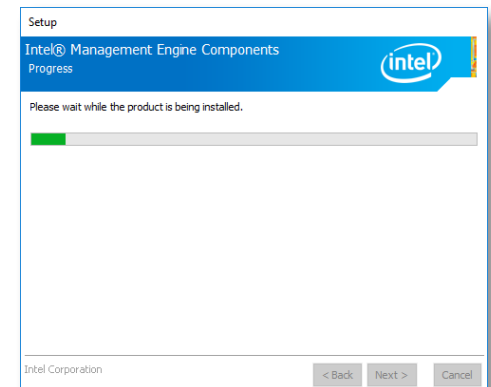
2. Read the license agreement then tick "I accept the terms in the License Agreement". Click "Next".



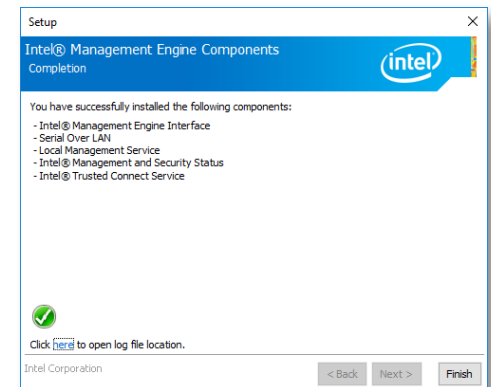
3. Click "Next" to install to the default folder, or click "Change" to choose another destination folder.



4. Please wait while the product is being installed.

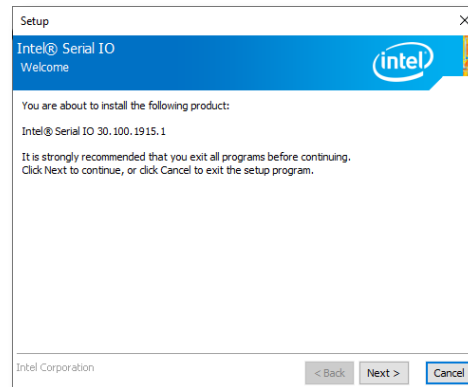


5. After completing installation, click "Finish".

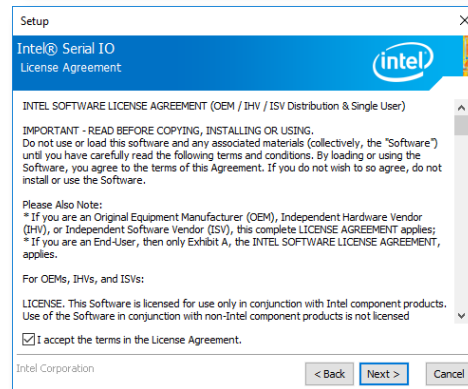


► Intel Serial IO Drivers

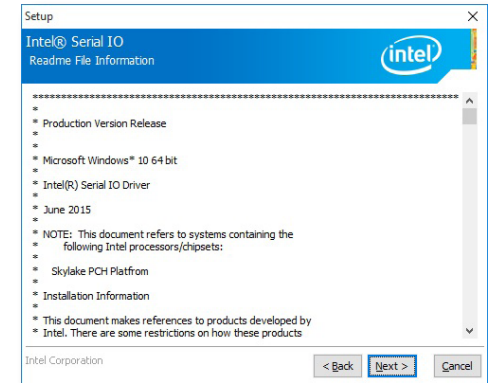
1. Setup is ready to install the driver. Click "Next".



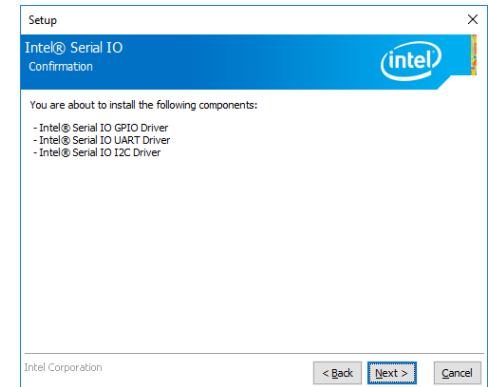
2. Read the license agreement carefully. Tick "I accept the terms in the License Agreement" then click "Next".



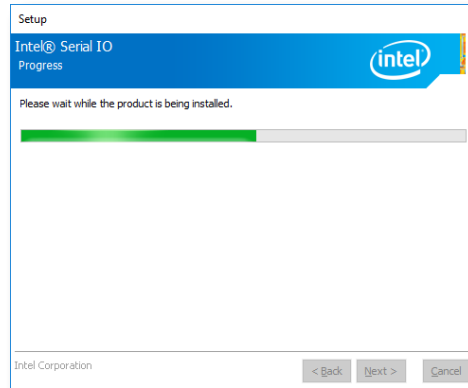
3. Go through the readme document for system requirements and installation tips then click "Next".



4. Setup is ready to install the driver. Click "Next".

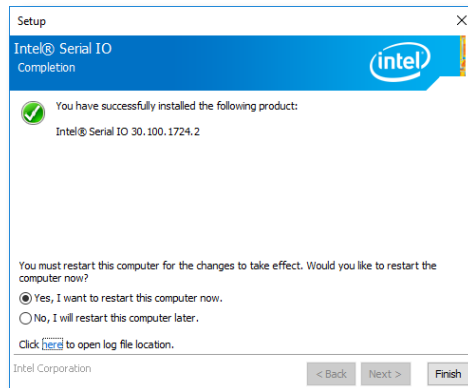


5. Setup is now installing the driver.



6. Click “Yes, I want to restart this computer now” then click “Finish”.

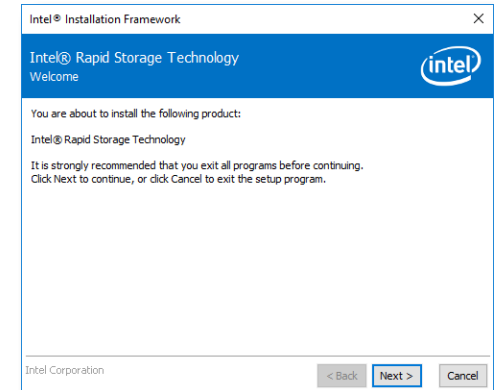
Restarting the system will allow the new software installation to take effect.



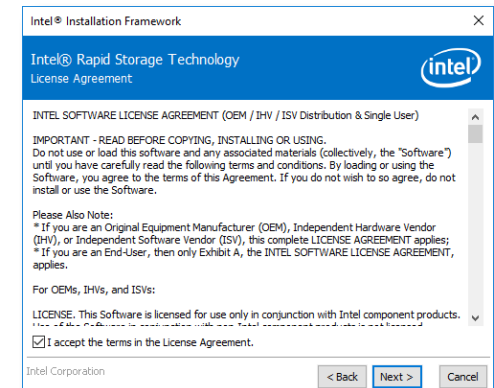
► Intel Rapid Storage Technology

The Intel Rapid Storage Technology is a utility that allows you to monitor the current status of the SATA drives. It enables enhanced performance and power management for the storage subsystem.

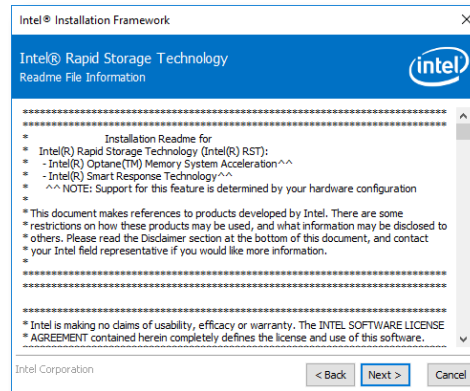
1. Setup is ready to install the utility. Click “Next”.



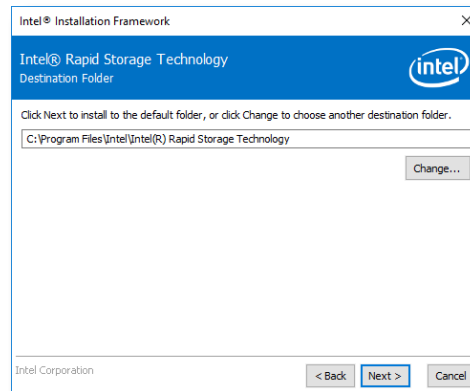
2. Read the license agreement and click “I accept the terms in the License Agreement”. Then, click “Next”.



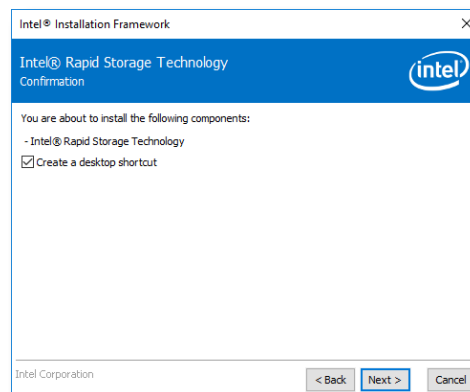
- Go through the readme document to view system requirements and installation information then click "Next".



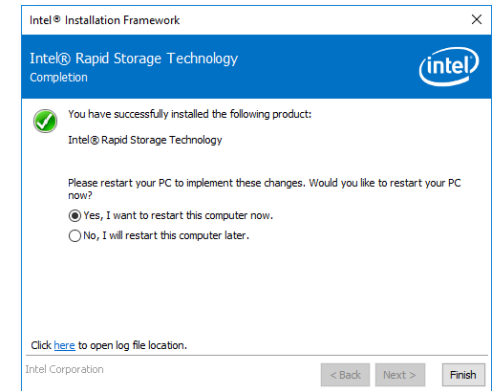
- Click "Next" to install to the default folder or click "Change" to choose another destination folder".



- Confirm the installation and click "Next".

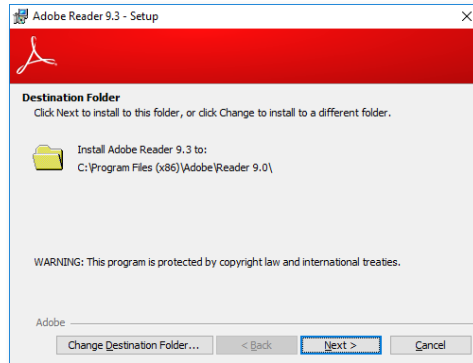


- Click "Yes, I want to restart this computer now" to complete the installation and then click "Finish".

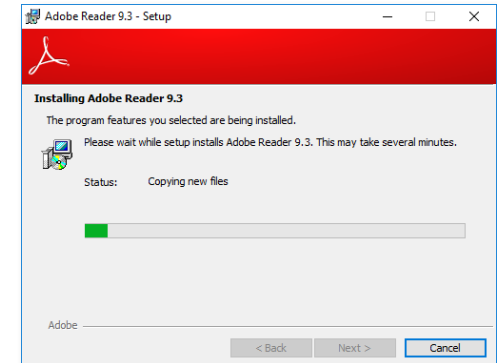


► Adobe Acrobat Reader 9.3

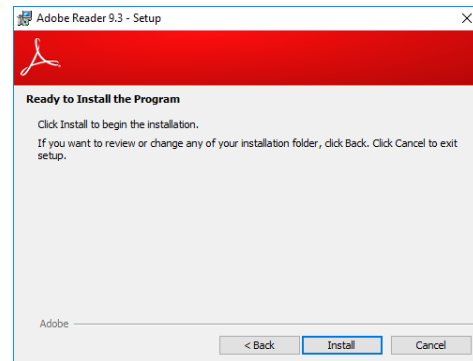
1. Click "Next" to install or click "Change Destination Folder" to select another folder.



3. Setup is now installing the driver.



2. Click "Install" to begin installation.



4. Click "Finish" to exit installation.

