WINSYSTEMS®

# SYS-480

## Fanless Industrial PC with Intel® Amston Lake, Featuring 4 x PoE+ 2.5GbE Ports

# Product Manual




CE

RoHS VERIFIED

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# Revision History

| Document Version | Last Updated Date | Brief Description of Change |
|---|---|---|
| v1.0 | 06/24/2026 | Initial release |
| v1.1 | 11/11/2026 | Added a SIM Control & Operation section |

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# Declaration of Conformity

**CE**

The CE symbol on the computer indicates that it is in compliance with the directives of the European Union (EU). A Certificate of Compliance is available by contacting WINSYSTEMS.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables.

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# 1. Before You Begin

Review the warnings in this section and the best practice recommendations (see “Best Practices” on page 82) when using and handling the WINSYSTEMS SYS-480 module. Following these recommendations provides an optimal user experience and prevents damage. Read through this document and become familiar with the SYS-480 before proceeding.




APPLYING CONFORMAL COATING AFTER PURCHASE WILL VOID YOUR WARRANTY. FAILING TO COMPLY WITH THESE BEST PRACTICES MAY DAMAGE THE PRODUCT AND VOID YOUR WARRANTY.

## 1.1 Warnings

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Only qualified personnel should configure and install the SYS-480. While observing best practices, pay particular attention to the following:.



**WARNING!**

**ESD-Sensitive Electronic Equipment**

Observe ESD-safe handling procedures when working with this product.
Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.
Always store this product in ESD-protective packaging when not in use.

The Box PC and its components contain very delicately Integrated Circuits (IC). To protect the Box PC and its components against damage caused by static electricity, you should always follow the precautions below when handling it:

1. Disconnect your Box PC from the power source when you want to work on the inside.
2. Use a grounded wrist strap when handling computer components.
3. Place components on a grounded antistatic pad or on the bag that came with the Box PC, whenever components are separated from the system.

## 1.2 Replacing Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion. The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.
Do not throw lithium batteries into the trash can. It must be disposed of in accordance with local regulations concerning special waste.



**Product Heat**

The computer generates heat during operation. Contact the computer's chassis with your body could cause discomfort or even a skin burn.

## 1.3 FCC Class A

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.

NOTE This equipment has been tested and found to comply with the limits for a Class A 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 commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

## 1.4 RoHS

WINSYSTEMS certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

WINSYSTEMS hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

## 1.5 SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, WINSYSTEMS hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1% by weight (1000 ppm).

# 2. Introduction

This manual provides configuration and usage information for the SYS-480. If you still have questions, contact Technical Support at +1-817-274-7553, Monday through Friday, between 8 AM and 5 PM Central Time.

## 2.1 Product Highlights

- Intel Atom® Amston Lake x7433RE processor
- Rugged - 40°C to 70°C fanless operation
- Supports single DDR5 slot 8GB and 16GB
- 4x PoE+ 2.5GbE ports via RJ45 w/ 60W power budget
- 2 x Isolated CAN2.0(A/B), Isolated 2KV 4-DI/4-DO, 2 x COM
- 1 x M.2 B Key (USB3.0+USB2.0) w/SIM slot for 4G/5G/LTE module
- 1 x M.2 B Key (SATA+USB2.0) for storage or GNSS module
- 1 x full-size mini-PCIe (PCIe x1+USB 2.0) w/SIM for Wi-Fi/BT/LTE module
- Outside accessible 1x 2.5” HDD tray and 1x SD card slot
- Dual-Display for 2 x HDMI
- E-Mark compliant & MIL-STD-810H Shock / Vibration certified
- Discrete TPM 2.0
- Supports Windows® 11

## 2.2 About this Manual

This manual is meant for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about the description herein, consult your vendor before further handling.

We recommend that you keep one copy of this manual for quick reference for any necessary maintenance in the future. Thank you for choosing WINSYSTEMS products.

The SYS-480 series includes the following models:

| Part Number | Description |
|---|---|
| SYS-480-7433RE-8-0 | Intel Atom® Processor x7433RE<br>w/ 4 x PoE+ 2.5GbE LAN ports via RJ45<br>8GB DDR5 SO-DIMM, 4800 MT/s |
| SYS-480-7433RE-16-0 | Intel Atom® Processor x7433RE<br>w/ 4 x PoE+ 2.5GbE LAN ports via RJ45<br>16GB DDR5 SO-DIMM, 4800 MT/s |

# 3. Features and Specifications

| Features and Specifications | |
|---|---|
| **SYSTEM** | |
| **Processor** | Intel Atom® Amston Lake x7433RE Processor<br>Cores: 4; Speed: 1.5 (3.4) GHz; Cache: 6 MB of L3; Base Power: 9W; Cache: 2 MB L2 |
| **RAM** | 8GB or 16GB DDR5 SO-DIMM, 4800 MT/s, with 1 memory channel (single socket) |
| **OPERATING SYSTEM** | Support for Windows 10/11 IoT, Ubuntu Linux, and other x86 real-time OS |
| **SOFTWARE** | Configurable UEFI-based AMI BIOS |
| **SECURITY** | On-board discrete TPM 2.0 hardware |
| **WATCHDOG TIMER** | 1~255 levels reset |
| **STORAGE** | 1x external 2.5" SATA SSD/HDD (SATA 3) slot, (up to 9.5mm)<br>1x external SD card slot<br>1x M.2 B-Key 2242/2280 (SATA+USB 2.0) for storage or GNSS |
| **I/O** | |
| **NETWORK** | 4x PoE+ 2.5GbE (Intel i266) with PoE LEDs (RJ45) |
| **EXTERNAL I/O** | 1x non-isolated RS-232/422/485 (DB-9)<br>1x non-isolated RS-485 (DB-9)<br>2x isolated CAN 2.0 A/B (DB-9)<br>4x DI / 4x DO 2kV isolation (DB-15)<br>4x USB 2.0 (USB-A)<br>2x USB 3.2 Gen2 (10Gbps) (USB-C)<br>Supports Accelerometer (G-Sensor) and Gyroscope |
| **EXPANSION** | 1x M.2 B-Key 2242/3052 socket (USB 3.0 + USB 2.0) for 4G/5G/LTE module; external SIM slot<br>1x Mini PCIe / mSATA socket (full length, PCIe and USB) for Wi-Fi/BT/LTE module; external SIM slot<br>1x M.2 B-Key 2242/2280 socket (SATA + USB 2.0) for storage or GNSS |
| **DISPLAY** | 2x HDMI 2.0, up to 3840x2160 at 60Hz<br>Dual Display support |
| **AUDIO** | 1x Mic-in (3.5mm jack)<br>1x Line-out (3.5mm jack) |
| **POWER** | Variable Input: +9V to +36V<br>Power Connector: 3-pin Terminal Block with IGN PWR control (V+, V-, IGN)<br>Max Power Use: 100W<br>PoE: 4x 802.3af or 2x 802.3at; 60W power budget<br>See Power Consumption section for PassMark details.* |

| Features and Specifications | |
|---|---|
| **MECHANICAL** | Buttons: Power Button with dual color LED (Red/Green) and recessed Reset button<br>LED indicators: 1x Green LED (WWAN and WLAN); 1x Red LED (SATA SSD)<br>5x Antenna Holes<br>Dimensions (W x D x H): 210 mm x 190 mm x 58 mm (8.3" x 7.5" x 2.3")<br>Weight: 2.4 kg / 5.3 lb<br>Case Material: Aluminum alloy<br>Mounting: Desktop (default) / Wall-mount (optional) |
| **ENVIRONMENTAL** | Operating Temperature: -40°C to +70°C (-40ºF to +158°F)<br>Storage Temperature: -40°C to +85°C (-40ºF to +185°F)<br>Humidity: 10% to 95% non-condensing at 70°C<br>Certifications: CE, FCC Class A, E-Mark<br>Compliance: MIL-STD-810H - Vibration Method 514.8, Category 4 and Shock Method 516.8, Procedure I, functional shock=20g; RoHS |
| **Warranty and Support** | Limited two-year Warranty and Free Technical Support |

# 4. Power Consumption Details

## 4.1 Power Input Ratings

Below are the power input ratings for the SYS-480.

| Power Input Ratings | |
|---|---|
| **Power** | Input: Variable of +9V to +36V (With reverse power protection.)<br>Average power use under a standard load.* |
| **Typical Power Use** | Intel Atom® x7433RE 8GB<br>**TPU:** 22.5W*<br>**TDP:** 22W - 27W* |
| See Passmark® test results starting on page 14.* | |

## 4.2 PassMark Information

**What is PassMark®?**

PassMark refers to both a software company and its popular benchmarking software, Performance Test, which is used to evaluate a computer's performance. The company is known for its benchmark tests that measure the performance of a computer's CPU, graphics, hard drive, and memory. The benchmark scores allow users to compare their PC's performance against millions of other computers worldwide.

PassMark (https://www.passmark.com/) has offered industry standard PC benchmarking and diagnostic solutions since 1998 and as such provides an industry accepted standardized way to measure and compare the power consumption of computers.

WINSYSTEMS uses a PassMark Performance Test that is a comprehensive benchmarking tool that evaluates the power performance of the SYS-480. Below in Section 6 you can view the PassMark Test Results table which includes the SBC Setup showing you how the SBC was set up for the test. It also includes the Burn-In Features used and the BIOS Idle, OS Idle and the Load test results.

Contact an engineer if you have additional questions about the PassMark test results at https://winsystems.com/support/.

## 4.3 PassMark Test Setup and Results

Here is the PassMark Test Results table which includes the SYS Test Setup and the load test results for various standard PassMark setups.

| PassMark® Test Setup and Results<br>SYS-480-7433RE-8-0 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CPU:** Intel Atom x7433RE<br>**RAM:** 8GB<br>**OS:** Windows 11 IOT<br>**SW:** PassMark, HWInfo<br>**Thermal:** Enclosure | | SYS Test Setup | | | | | | | |
| | | **DC IN** | **BIOS PL1-PL2** | **Burn-In Feature** | **Idle (BIOS)** | **Idle (OS)** | **Setup 1 50% Load** | **Setup 2 50% Load** | **Setup 3 50% Load** |
| | | 12V | 9W-25W | | 19.0W* | 22.0W* | 24.0W* | 22.5W* | 27.0W* |
| **CPU** | **Intel Atom x7433RE** | | | | X | X | X | X | X |
| **RAM** | **D5SS1G161 SH56A-BC 8GB** | | | | X | X | X | X | X |
| **eMMC** | **NA** | | | | X | X | X | X | X |
| **HDMI** | **ASUS 1K** | | | | X | X | X | X | X |
| **mSATA** | **NA** | | | | | | | | X |
| **SATA** | **2.5" SATA SSD 3TE7 (120GB)** | | | | | | | | X |
| **USB2_1** | **Keyboard** | | | | X | X | X | X | X |
| **USB2_2** | **Mouse** | | | | X | X | X | X | X |
| **USB2_3** | **Innodisk 32GB USB3** | | | | | | | | X |
| **USB2_4** | **Innodisk 32GB USB3** | | | | | | | | X |
| **USB3.2_1** | **Innodisk 32GB USB3** | | | | | | | | X |
| **USB3.2_2** | **Innodisk 32GB USB3** | | | | | | | | X |
| **ENET_1** | **Connect to 2.5Gps hub** | | | | | | | X | X |
| **ENET_2** | **Connect to 2.5Gps hub** | | | | | | | X | X |
| **ENET_3** | **Connect to 2.5Gps hub** | | | | | | | X | X |
| **ENET_4** | **Connect to 2.5Gps hub** | | | | | | | X | X |
| **SOUND (J4)** | **NA** | | | | | | | | X |
| | | | | **CPU** | | | X | X | X |
| | | | | **RAM** | | | | X | X |
| | | | | **Video** | | | | X | X |
| | | | | **2D Graphic** | | | | | X |
| | | | | **3D Graphic 1x1920x1080** | | | X | | X |
| | | | | **Disk** | | | | | X |
| | | | | **Sound** | | | | | X |
| | | | | **Network** | | | | X | X |
| | | | | **GPGPU** | | | | | X |

Instantaneous power draw can be higher.*

# 5. Inside the Package

Upon opening the package, carefully inspect the contents. If any of the items is missing or appears damaged, contact your local dealer or distributor. The package should contain the following items.



Fanless In-Vehicle Box PC:
**SYS-480-7433RE-8-0** or **SYS-480-7433RE-16-0**

SYS-480 Series



Accessory Box that contains the following items:

- 1 x Cable-Lock Bracket
- 1 x 3-pin plug for terminal block

## 5.1 Ordering Information

| Part Number | Description |
|---|---|
| **SYS-480-7433RE-8-0** | 8GB version |
| **SYS-480-7433RE-16-0** | 16GB version |

### 5.1.1 Optional Accessories

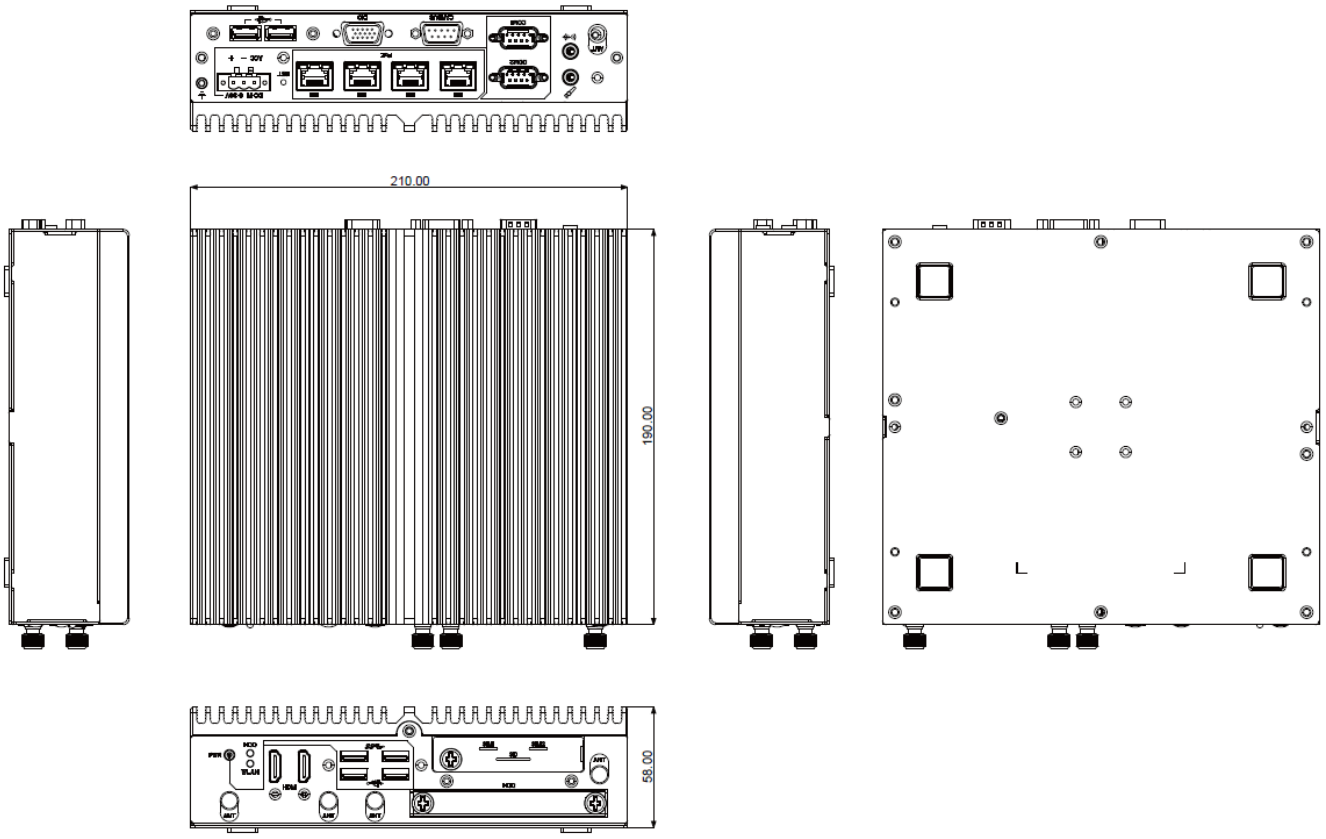
Contact Sales about available options.

# 6. Getting Started

## 6.1 Dimensions

The following illustration shows the dimensions of the computer, with the measurements in width, depth, and height called out. (Unit: mm)

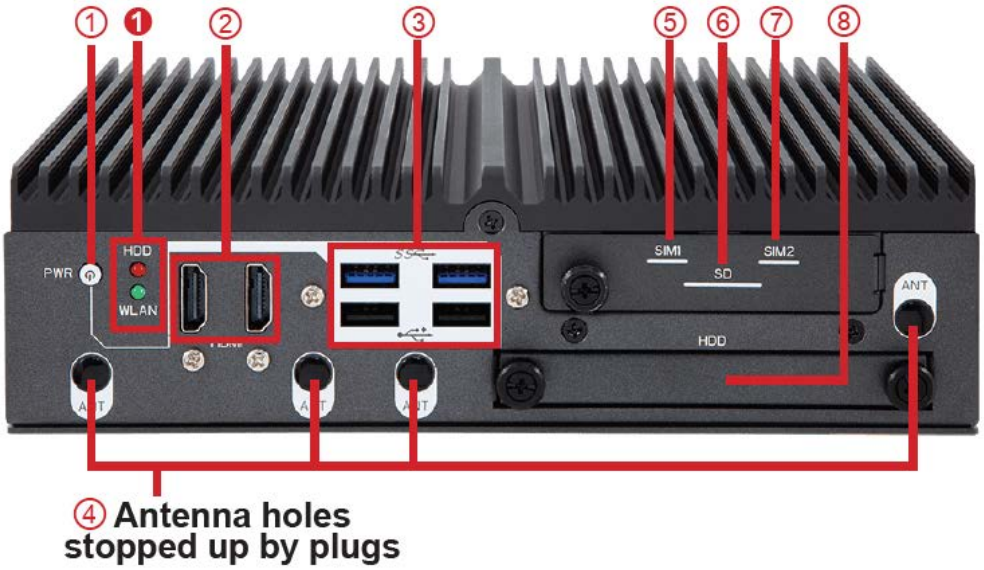
**SYS-480**



## 6.2 Take A Tour

The computer has some I/O ports, status LED light and controls on the front and rear panel. The following illustrations show all the components called out.

**Front View**



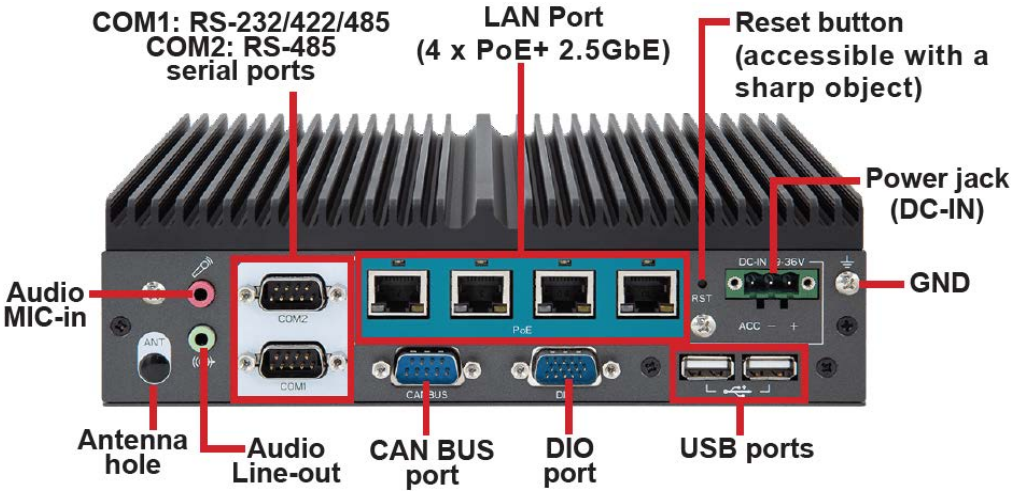

- **I/O**

| No. | Description | No. | Description |
|---|---|---|---|
| **1** | Power button | 5 | SIM1 card slots (accessible by opening the cover plate) |
| 2 | HDMI ports | 6 | SD card slot (accessible by opening the cover plate) |
| **3** | USB 2.0/3.0 ports (Blue: 3.0 port / Black: 2.0 port) | 7 | SIM2 card slots (accessible by opening the cover plate) |
| **4** | Antenna holes stopped up by plugs | 8 | HDD/SSD slot (accessible by opening the HDD drawer) |

- **Status LED Lamps:**

| No. | LED Color | Description |
|---|---|---|
| **1** | Red | This LED flashes red when SSD/HDD is being accessed. |
| | Green | This LED lights/flashes green when WiFi is on/communicating. |

**Rear View**




## 6.3 Driver Installation Notes

To install additional drivers as needed, please visit our website at https://www.winsystems.com/.

# 7. System Configuration

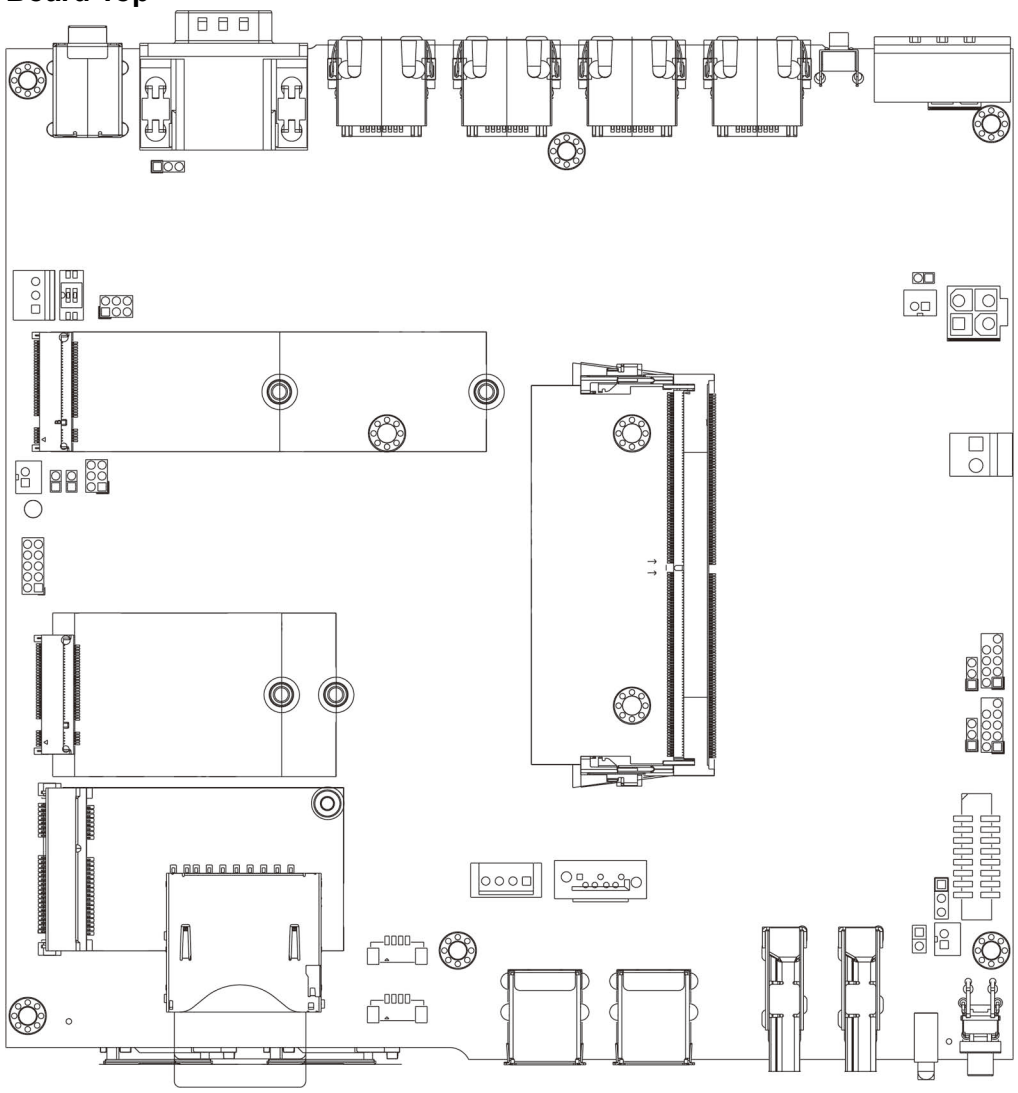
## 7.1 Board Layout

The engine of the computer is constructed by a main board.

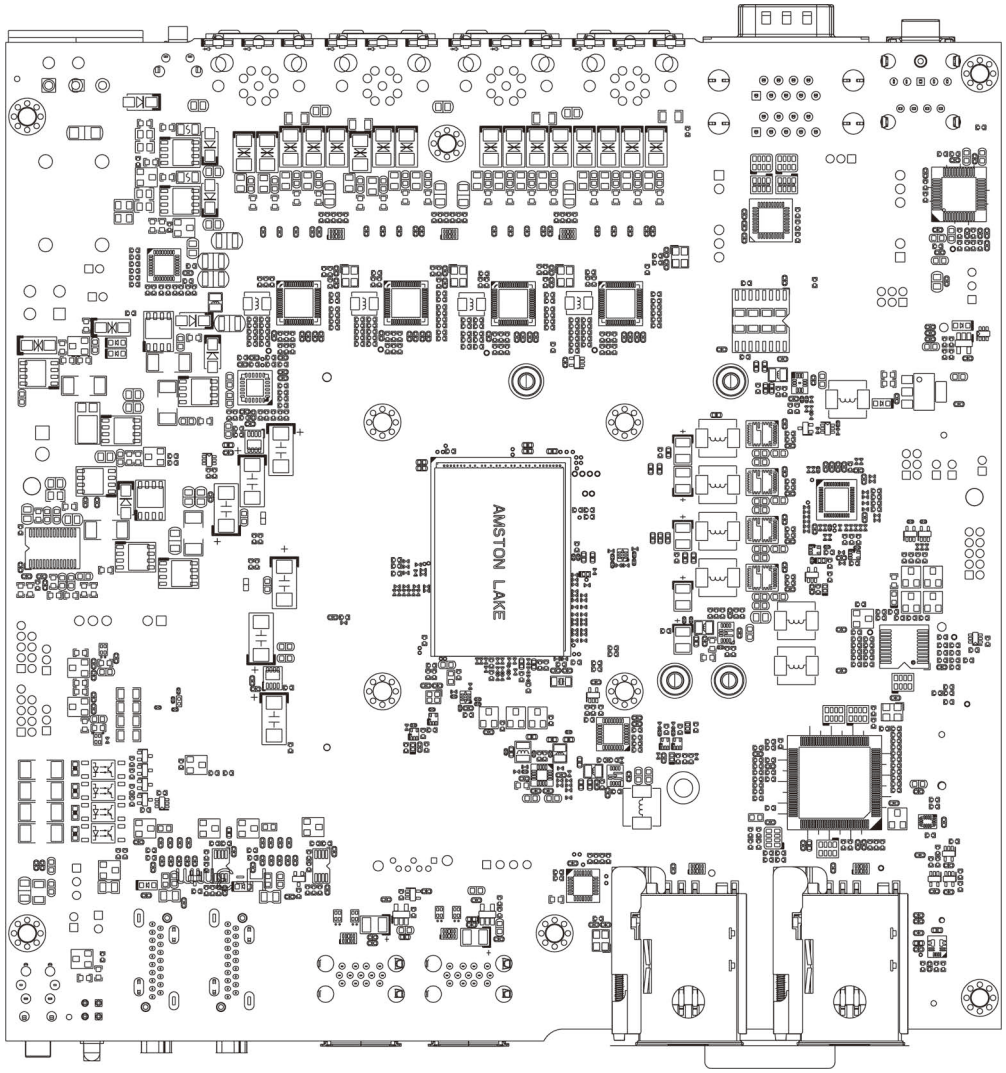
### 7.1.1 Main Boards

The main computer board for the SYS-480-7433RE-8-0 and SYS-480-7433RE-16-0 series appears as shown in these mechanical drawings. Components are identified in the following sections.

**Board Top**



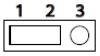
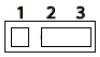
## Board Bottom



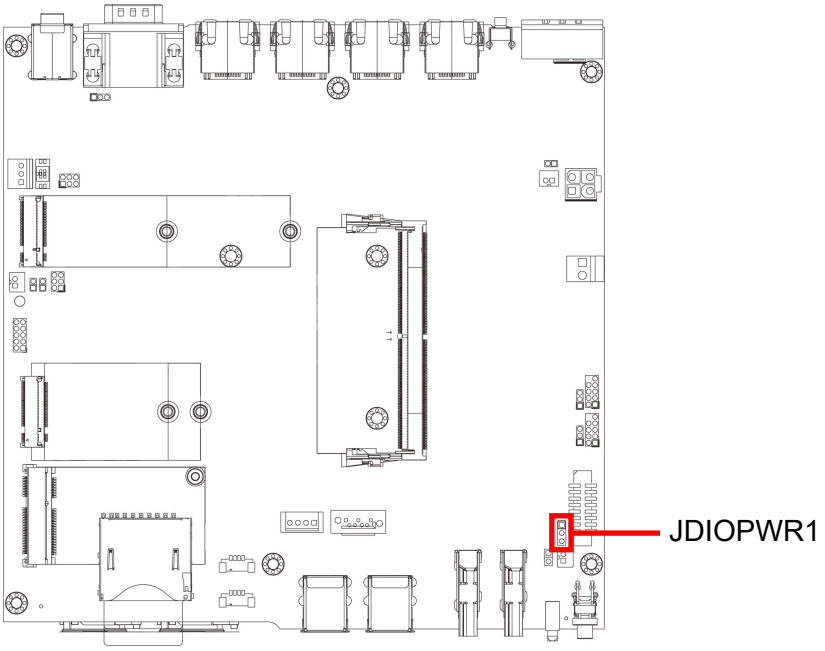
## 7.2 Jumpers and Switches

The main board comes with some connectors to join devices and some jumpers to alter the computer's hardware configuration. This chapter will explain these components.

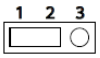
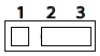
### 7.2.1 DIO Jumpers

| JDIOPWR1 | | |
|---|---|---|
| **Function:** | DIO power output selector |  |
| **Jumper Type:** | On board 2.54mm-pitch 1x3-pin header | |
| **Setting:** | Short pin 1 and pin 2 for 5V power output. (The default setting.) |  |
| | Short pin 2 and pin 3 for 12V power output. |  |

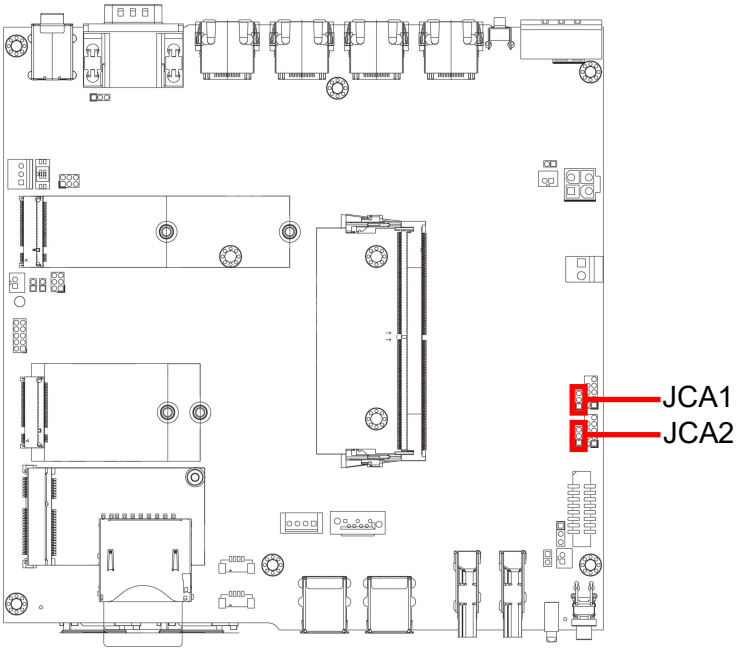
**Board Top**



### 7.2.2 CAN BUS Jumpers

| JCA1/2 | | |
|---|---|---|
| **Function:** | CAN BUS 1/2 Terminator Selector |  |
| **Jumper Type:** | On board 2.00mm-pitch 1x3-pin header | |
| **Setting:** | 1-2 CAN BUS1/2 no terminator |  |
| | 2-3 CAN BUS1/2 with 120 ohm terminator (Default) |  |

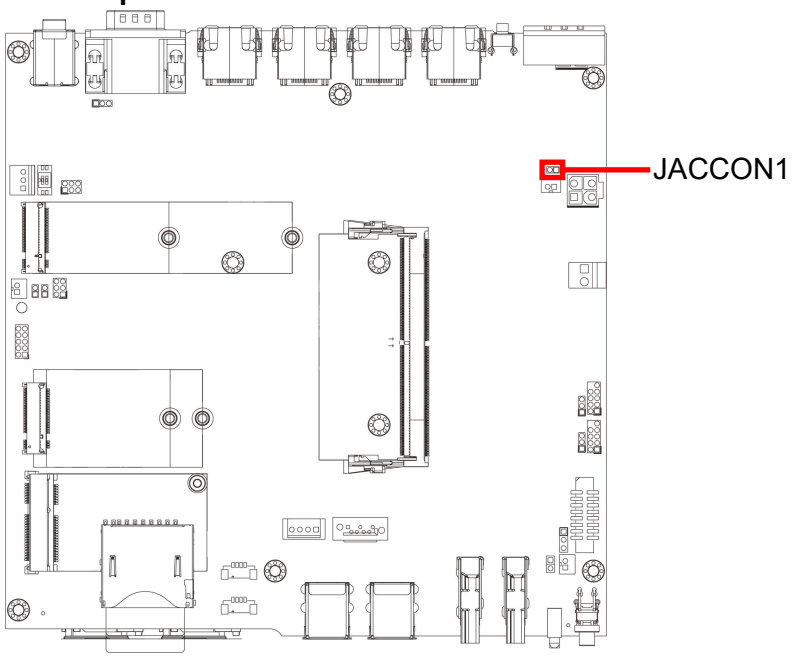
**Board Top**



### 7.2.3 ACC Jumper

| JACCON1 | | |
|---|---|---|
| **Function:** | Vehicle ACC_ON mode selection | 1 |
| **Jumper Type:** | On board 2.00mm-pitch 2-pin header | |
| **Setting:** | Open: External ACC_ON input for vehicle (without jumper) | |
| | Close: Internal ACC_ON for Automation (with jumper) (Default) | |

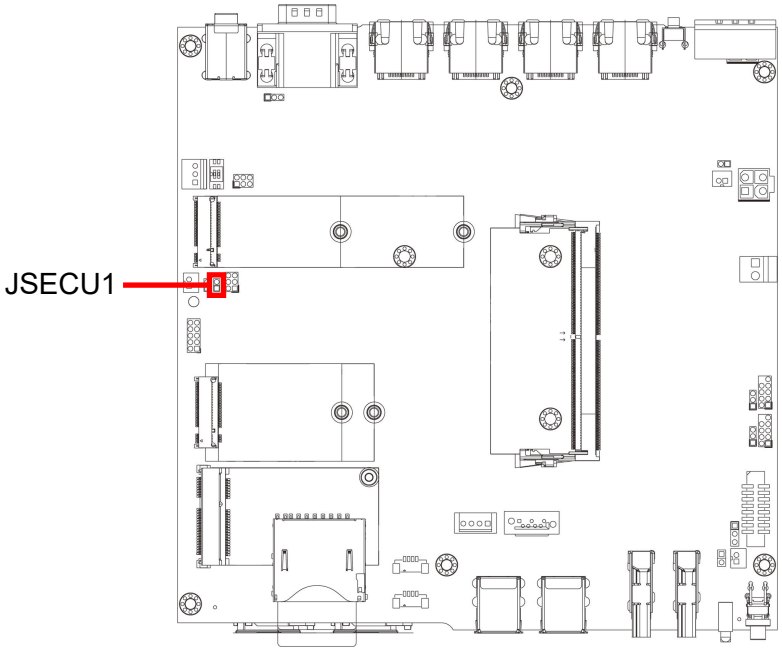
**Board Top**



### 7.2.4 Security Override Jumper

| JSECU1 | | |
|---|---|---|
| **Function:** | Security overridden Selector | 1 |
| **Jumper Type:** | On board 2.00mm-pitch 2-pin header | |
| **Setting:** | Open: Security not overridden (Default) | |
| | Close: Security overridden | |

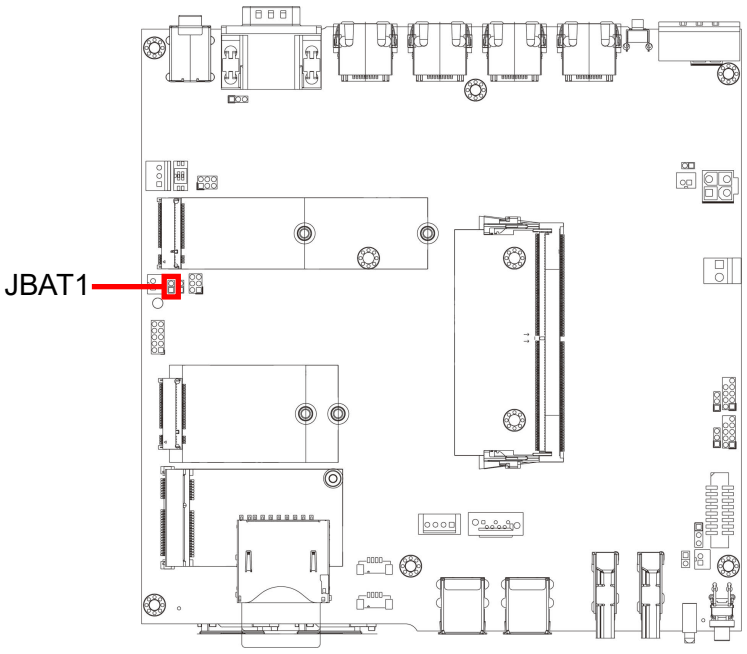
**Board Top**



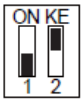
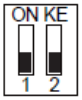
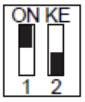
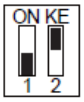
### 7.2.5 Battery Jumper

| JBAT1 | | |
|---|---|---|
| **Function:** | COMS Setting | 1 |
| **Jumper Type:** | On board 2.00mm-pitch 2-pin header | |
| **Setting:** | Open: Normal operation (Default) | |
| | Close: Clear CMOS | |

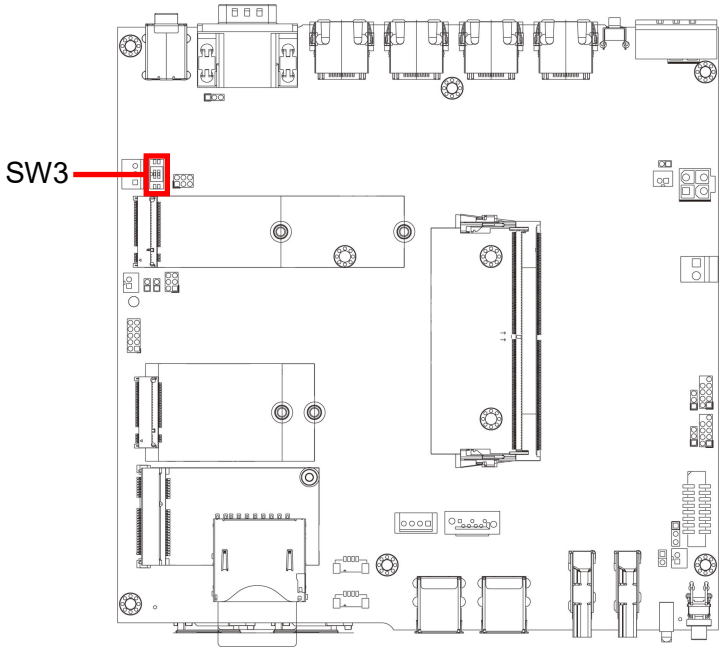
**Board Top**



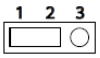
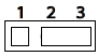
### 7.2.6 SW3 Switch

| SW3 | | |
|---|---|---|
| **Function:** | External input voltage low alarm selector |  |
| **Switch Type:** | | |
| **Setting:** | 1 OFF<br>2 OFF<br>No voltage detection (Default) |  |
| | 1 ON<br>2 OFF<br>Lower Than 22V will Alarm |  |
| | 2 ON<br>1 OFF<br>Lower Than 11V will Alarm |  |

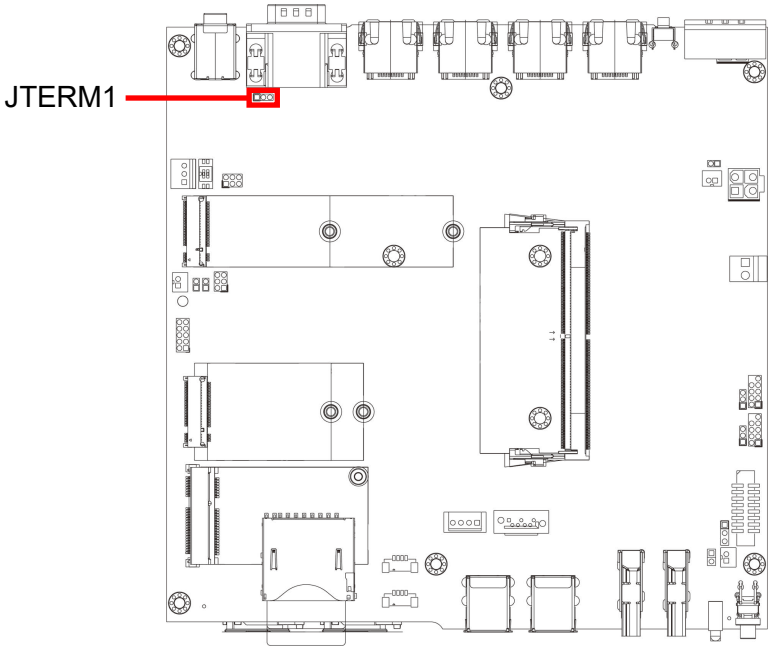
**Board Top**



### 7.2.7 COM2 Terminator Selector Jumper

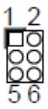
| JTERM1 | | |
|---|---|---|
| **Function:** | COM2 RS485 Terminator Selector |   |
| **Jumper Type:** | On board 2.00mm-pitch 1x3-pin header | |
| **Setting:** | 1-2 Normal Mode (Default) |   |
| | 2-3 120 ohm terminator mode |   |

**Board Top**

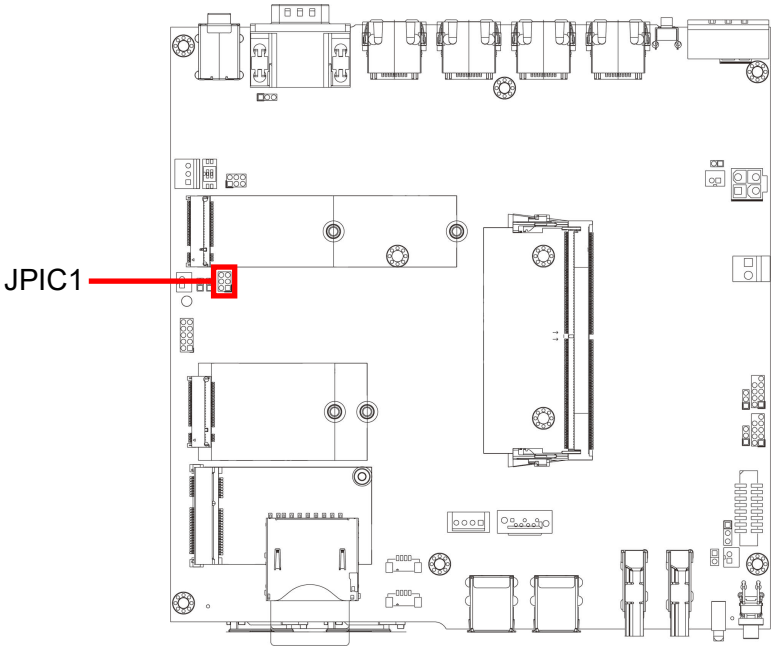


## 7.3 Connectors

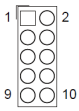
### 7.3.1 External PIC Programming Header

| JPIC1 | | | | |
|---|---|---|---|---|
| **Function:** | External PIC programming pin header | | |  |
| **Connector Type:** | On board 6-pin header | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | PIC_TX | 2 | ICSP-CLK |
| | 3 | ICSP-DAT | 4 | GND |
| | 5 | VCC5_PIC | 6 | MCU_RST |

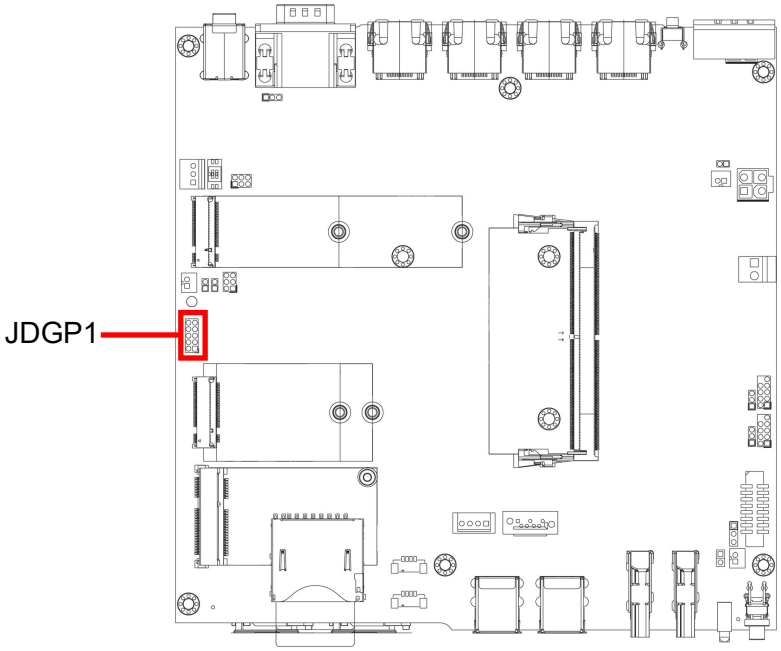
**Board Top**



### 7.3.2 Debug Port Header

| DGP1 | | | | |
|---|---|---|---|---|
| **Function:** | Debug Port | | |  |
| **Connector Type:** | On board 10-pin header | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | ESPI_CLK | 2 | GND |
| | 3 | ESPI_CS0# | 4 | ESPI_IO0 |
| | 5 | ESPI_RST0 | 6 | 3VSB |
| | 7 | ESPI_IO3 | 8 | ESPI_IO2 |
| | 9 | VCC3 | 10 | ESPI_IO1 |

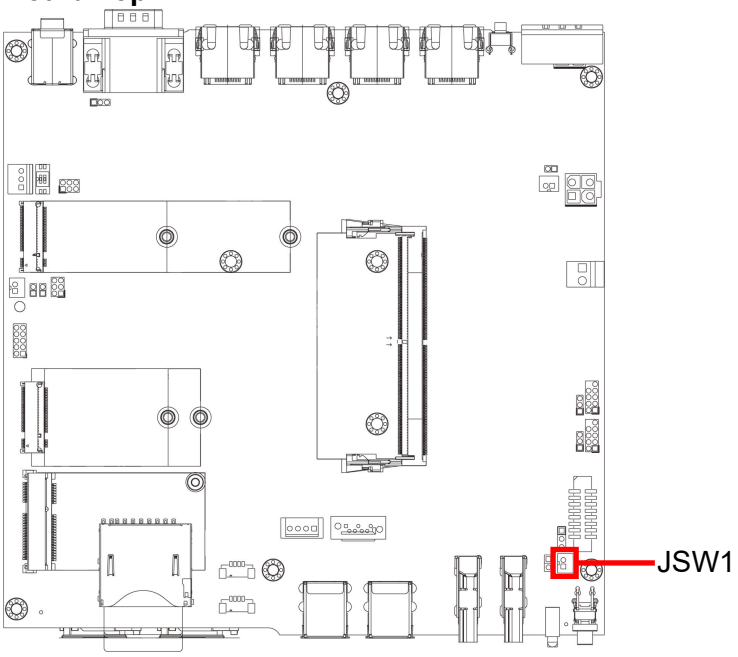
**Board Top**



### 7.3.3 Power button 1

| JSW1 | | | | |
|---|---|---|---|---|
| **Function:** | Power button 1 | | |   |
| **Connector Type:** | On board 2-pin wafer Connector | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | PWR_IN_SW# | 2 | GND |

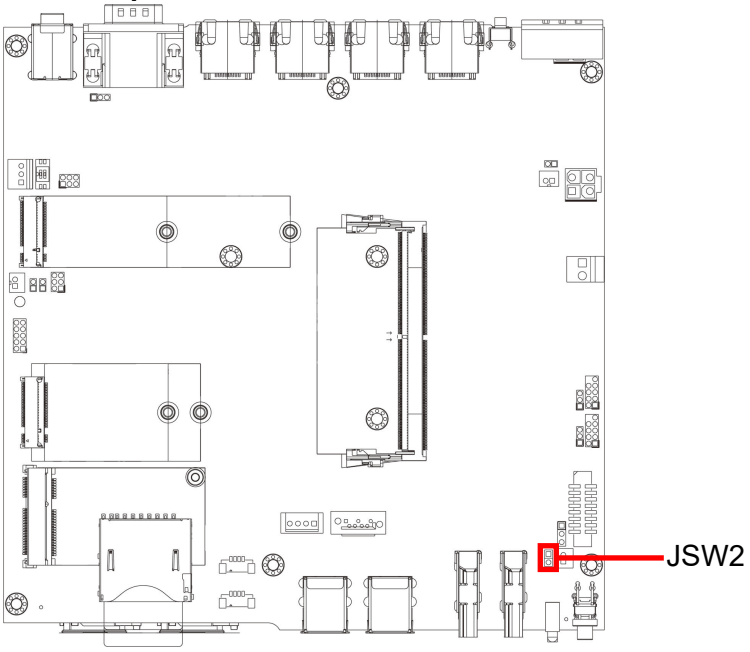
**Board Top**



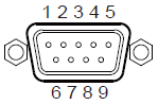
### 7.3.4 Power button 2

| JSW2 | | | | |
|---|---|---|---|---|
| **Function:** | Power button 2 | | | 1  |
| **Connector Type:** | On board 2-pin wafer Header | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | PWR_IN_SW# | 2 | GND |

**Board Top**

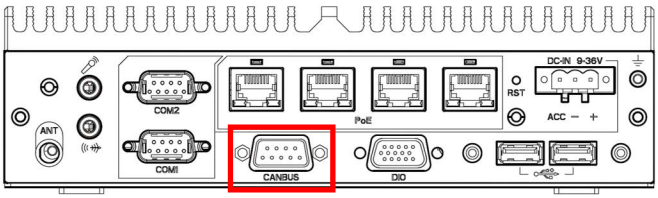


### 7.3.5 CAN BUS Connector

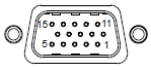
| CAN BUS | | | | |
|---|---|---|---|---|
| **Function:** | CAN BUS | | |  |
| **Connector Type:** | DB-9 Connector (Male) | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | N.C. | 2 | CAN1_L |
| | 3 | GND | 4 | CAN2_L |
| | 5 | GND | 6 | N.C. |
| | 7 | CAN1_H | 8 | N.C. |
| | 9 | CAN2_H | | |



**Rear View**

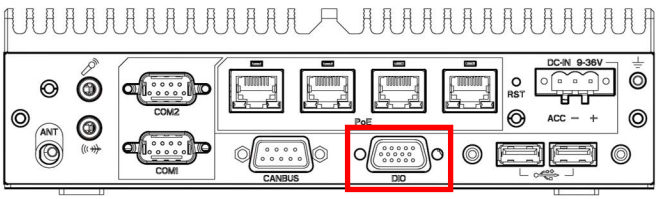



### 7.3.6 DIO Connector

| DIO | | | | | | |
|---|---|---|---|---|---|---|
| **Function:** | Digital Signal Input and Output | | | | |  |
| **Connector Type:** | DB-15 Connector (Male) | | | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | PDI1 | 6 | PDO1 | 11 | VCC |
| | 2 | PDI2 | 7 | PDO2 | 12 | VCC |
| | 3 | PDI3 | 8 | PDO3 | 13 | VCC |
| | 4 | PDI4 | 9 | PDO4 | 14 | GND |
| | 5 | ISO_GND | 10 | ISO_GND | 15 | GND |



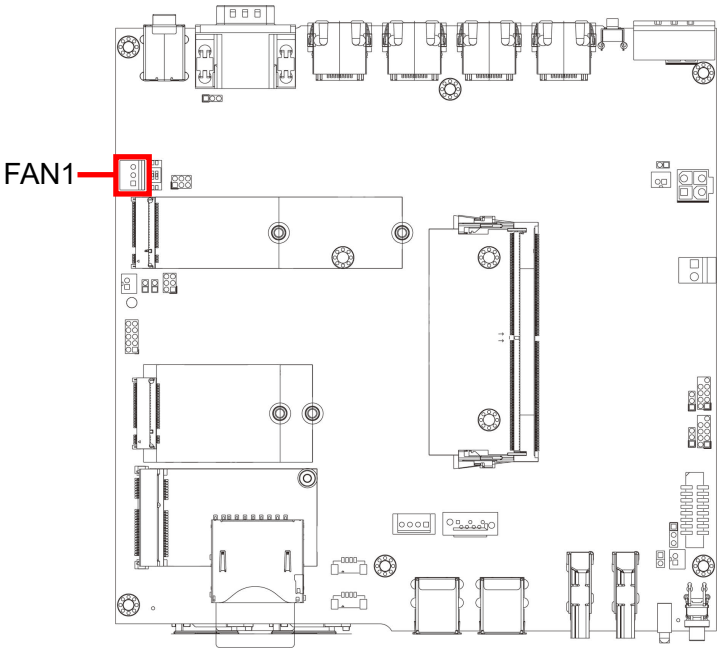
**Rear View**



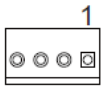
### 7.3.7 FAN1 Connector

| FAN1 | | | |
|---|---|---|---|
| **Function:** | Fan Connector | |   |
| **Connector Type:** | On board 3-pin connector | | |
| **Setting:** | **Pin** | **Description** | |
| | 1 | GND | |
| | 2 | 12V | |
| | 3 | N.C. | |

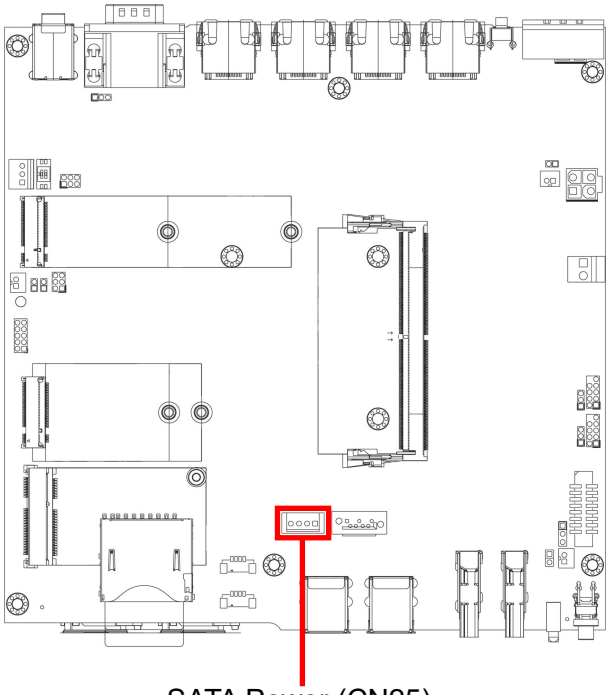
**Board Top**



### 7.3.8 SATA HDD Power Connector

| SATA Power | | |
|---|---|---|
| **Function:** | SATA HDD Power Connector |   |
| **Connector Type:** | On board 4-pin connector | |
| **Setting:** | **Pin** | **Description** |
| | 1 | VCC5 |
| | 2 | GND |
| | 3 | GND |
| | 4 | VCC12 |

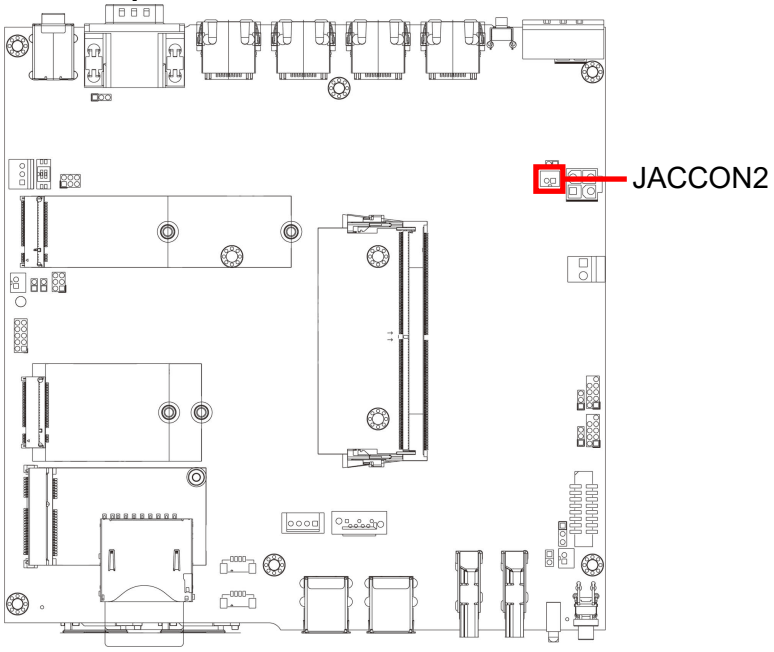
**Board Top**



### 7.3.9 External ACC Connector

| JACCON2 | | | | |
|---|---|---|---|---|
| **Function:** | External ACC_ON Input | | |   |
| **Connector Type:** | On board 2-pin wafer Connector | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | ACC_ON | 2 | GND |

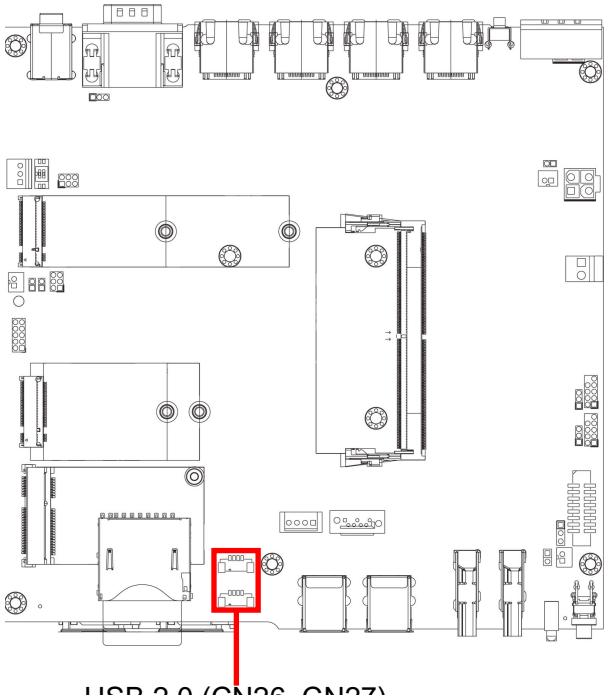
**Board Top**



### 7.3.10 USB 2.0 Connector

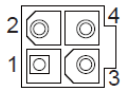
| USB2.0 (CN26, CN27) | | | | |
|---|---|---|---|---|
| **Function:** | USB 2.0 connector | | |  |
| **Connector Type:** | On board 4-pin wafer connector | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | VCC5 | 2 | DATA- |
| | 3 | DATA+ | 4 | GND |

**Board Top**

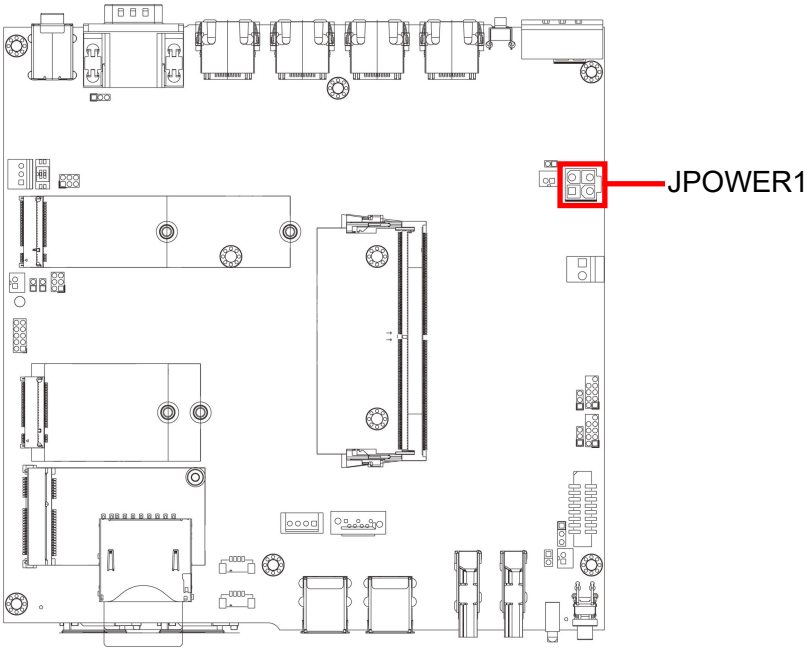


USB 2.0 (CN26, CN27)

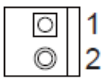
### 7.3.11 Power Charge to Super CAP Connector

| JPOWER1 | | |
|---|---|---|
| **Function:** | Power charge to super CAP connector |   |
| **Connector Type:** | On board 4-pin ATX power connector | |
| **Setting:** | **Pin** | **Description** |
| | 1 | GND |
| | 2 | GND |
| | 3 | DCIN |
| | 4 | DCIN |

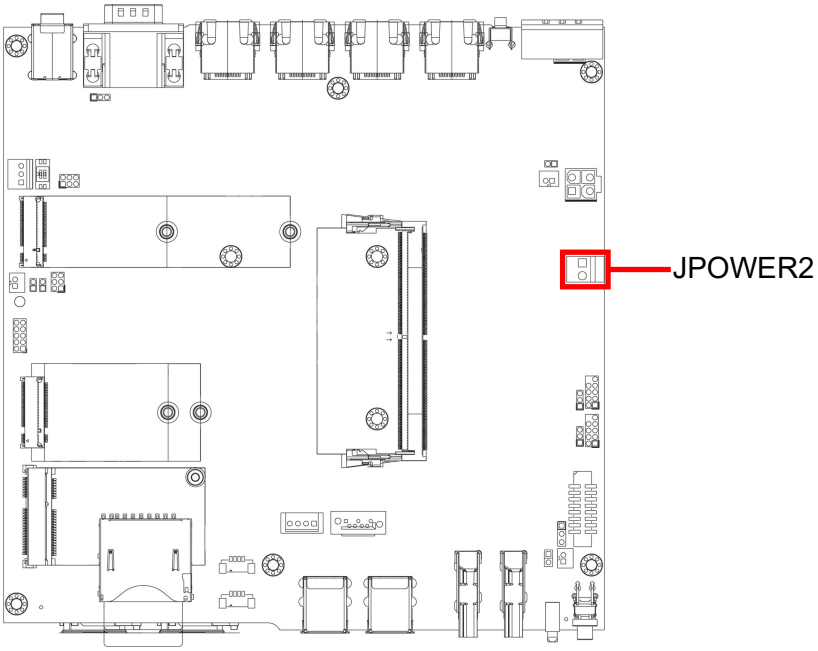
**Board Top**



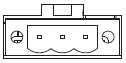
### 7.3.12 Power Input From Super CAP Connector

| JPOWER2 | | | | |
|---|---|---|---|---|
| **Function:** | Power input from super CAP connector | | |   |
| **Connector Type:** | On board 2-pin wafer Connector | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | GND | 2 | DCIN-VCC |

**Board Top**

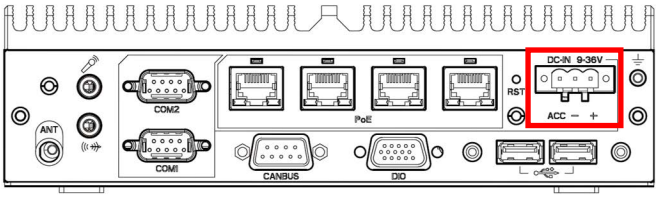


### 7.3.13 Terminal Block Power Input Connector

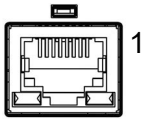
| PWRIN1 | | |
|---|---|---|
| **Function:** | Terminal Block Power Input Connector |  1 2 3 |
| **Connector Type:** | On board 3-pin terminal block | |

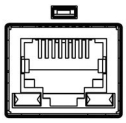
| Setting: | Pin | Description |
|---|---|---|
| | 1 | POWERIN+ |
| | 2 | POWERIN- |
| | 3 | ACC_ON |

**Rear View**

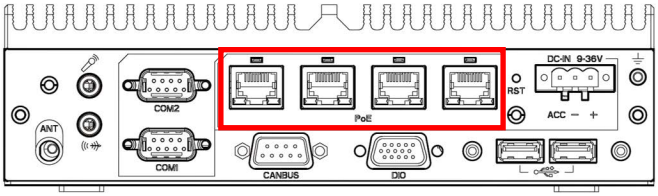



### 7.3.14 PoE+ 2.5GbE RJ45 Connector

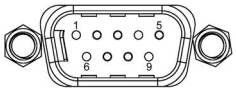
| RJ45 Connector | | | | |
|---|---|---|---|---|
| **Function:** | PoE+ Ethernet Connection | | |  8 1 |
| **Connector Type:** | 4x PoE+ 2.5GbE (Intel i266) with PoE LEDs (RJ45) | | | |
| **Setting:** | **Pin** | **Description** | **Pin** | **Description** |
| | 1 | TX_D1+ | 5 | BI_D3- |
| | 2 | TX_D1- | 6 | RX_D2- |
| | 3 | RX_D2+ | 7 | BI_D4+ |
| | 4 | BI_D3+ | 8 | BI_D4- |

| PoE Indicator | Description | |
|---|---|---|
| Left LED | Steady Orange (2.5 GbE) |  Left Right |
| | Steady Green (1 GbE or below) | |
| Middle LED | Steady Blue (PoE power) | |
| Right LED | Flash Yellow (Active) | |

**Rear View**



### 7.3.15 COM1 & COM2 Connector

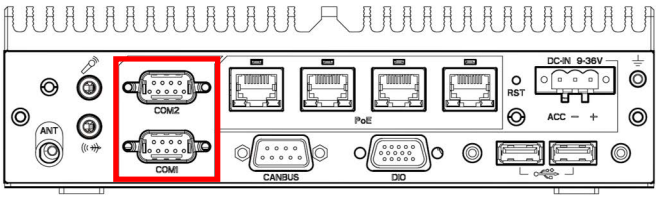
| COM1 & COM2 Connector | | |
|---|---|---|
| **Function:** | RS-232/422/485 Connector (COM1) / RS-485 (COM2) |  |
| **Connector Type:** | DB-9 connector (Male) | |

#### Pin Assignment

| COM1 Pin Assignment: | | | |
|---|---|---|---|
| | **RS-232** | **RS-422** | **RS-485** |
| **Pin** | **Description** | **Description** | **Description** |
| 1 | DCD | RS-422_TX- | RS-485_D- |
| 2 | RXD | RS-422_TX+ | RS-485_D+ |
| 3 | TXD | RS-422_RX+ | N.C. |
| 4 | DTR | RS-422_RX- | 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. |

| COM2 Pin Assignment: | |
|---|---|
| **Pin** | **Description** |
| 1 | RS-485_D- |
| 2 | RS-485_D+ |
| 3 | N.C. |
| 4 | N.C. |
| 5 | GND |
| 6 | N.C. |
| 7 | N.C. |
| 8 | N.C. |
| 9 | N.C. |

#### Rear View



# 8. Installation and Maintenance

## 8.1 Installation Hardware

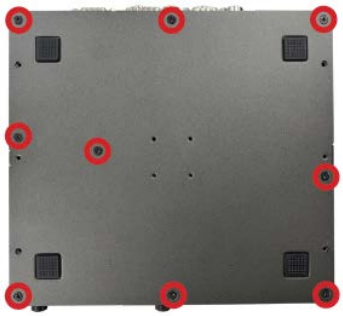
The computer is constructed with a modular design to make it easy for users to add hardware or to maintain the computer. The following sections will guide you to the simple hardware installations for the computer. This section will use SYS-480-7433RE-16-0 as the installation example.

NOTE If you use the Mini PCIe (mPCIe) slot for something as in storage, you will need to use an M.2 form factor for your cellular connectivity.

### 8.1.1 Open the Computer

All jumpers, connectors, M.2 B Key and PCI Express Mini-card sockets are built on the carrier board. To access these components, the computer's bottom cover has to be removed following these steps.

1. Place the computer on a flat surface. Loosen and remove the screws from the bottom cover as marked in the illustration below.



2. Dismount the bottom cover. The inside of the computer comes to view.



To adjust jumpers or connect/disconnect devices to/from the carrier board, see section **7.2.1**, Jumpers on page 21 and **7.3.1**, Connectors on page 28.

### 8.1.2 Install/uninstall SIM Card

The computer supports 2 SIM cards for mobile networking and comes with an outside accessible SIM card slot. Follow through the guide below to install a SIM card to the computer.

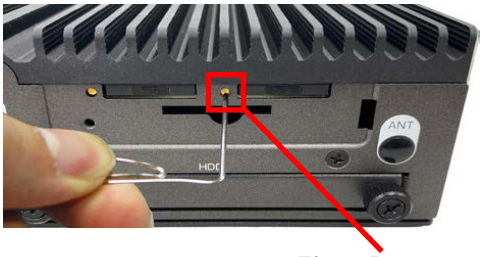
**To install a SIM card:**

1. On the front panel of the computer, find the SIM card slot door. Loosen the screw to open it.





2. Use a paperclip or similar tool to press the eject button in the SIM card slot, and the SIM card jacket will be ejected. Pull the jacket out of the slot.






3. Put the SIM card into the slot jacket as directed in the illustration below. Push-insert the SIM card into the slot.







**To uninstall the SIM card:**

1. Use a paperclip to press the eject button to eject the SIM card.
2. Pull out the SIM card.
3. Remove the SIM card jacket.
4. Insert the card jacket into the slot.

### 8.1.3 Install SATA SSD or HDD

The SYS-480 supports one 2.5-inch SSD or HDD storage device. To install a 2.5" SSD or HDD to the computer, follow the guide below:

1. Loosen the 2 screws counterclockwise to open the accessible drive tray, and then pull out the tray.



2. Slide the SSD or HDD storage device into the tray bracket.



3. Fasten the SSD/HDD with 4 screws (4 x M3*4).



4. Push the tray bracket with SSD/HDD back into the computer and rotate the two screws clockwise to lock into the position.



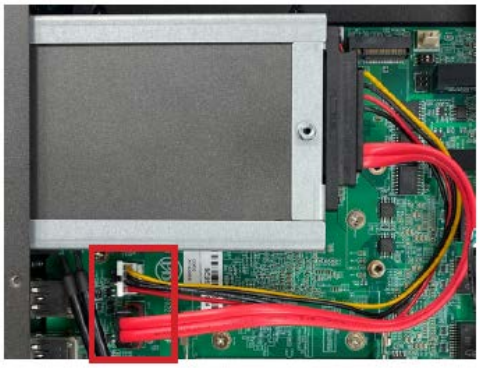
### 8.1.4 Disassemble SSD bracket

Before M.2 and Mini PCIe module Installation, please remove the 2.5 SSD/HDD bracket.

1. Loosen the two SSD/HDD bracket screws and then open the Computer bottom cover as instruction of 8.1.1. Open the Computer on page 41.



2. Unplug the SSD/HDD cables and remove the SSD/HDD bracket.

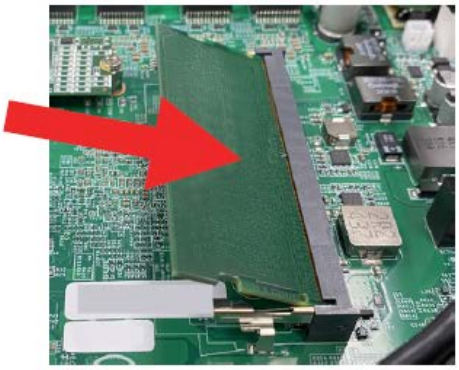


NOTE To reinstall the SSD/HDD bracket, reverse the steps described above to secure it back in place.

### 8.1.5 Install Memory Module on CPU Module

1. Open the computer as **8.1.1**, on page 41.
2. Locate the Memory module slot and insert the memory module.







3. Assemble the bottom cover when needed.

### 8.1.6 Insert a SD card

1. On the front panel of the computer, find the SIM card slot door. Loose the screw to open it.



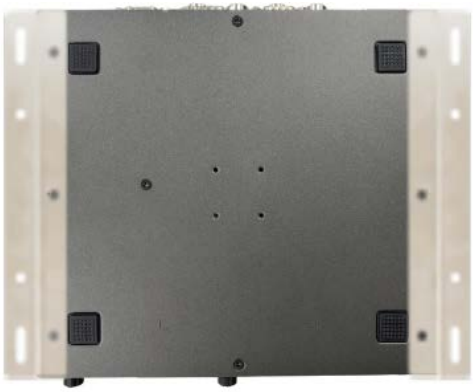
2. Slide the SD card into the slot. You can hear a slight clicking noise, which means it has locked into place.



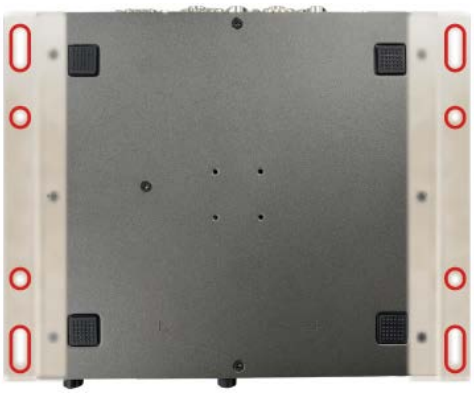
## 8.2 Mounting the Computer

Follow through the guide below to mount the computer to a wall.:

1. Using the optional wall mounting brackets (not included), tighten the wall mounting brackets on the bottom cover as shown in the figure below:



2. Using the cutouts as marked in the illustration below, mount the computer to a wall by the said cutouts with appropriate screws.



## 8.3 Wire DC-in Power Source

**WARNING!**

Only trained and qualified personnel are allowed to install or replace this equipment.

Follow the instructions below for connecting the computer to a DC-input power source.

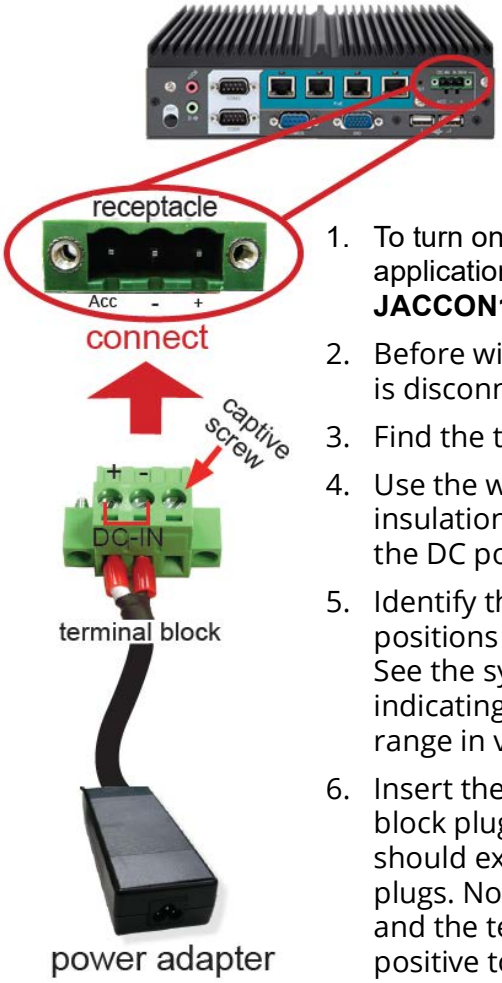
### 8.3.1 Vehicle Application

**For Vehicle Application**, DC power Input wiring pin definition is as follows.




1. To turn on the Vehicle Acc for Vehicle application, please refer to Jumper setting of **JACCON1** section **7.2.3**, on page 23.
2. Before wiring, make sure the power source is disconnected.
3. Find the terminal block in the accessory box.
4. Use the wire-stripping tool to strip a short insulation segment from the output wires of the DC power source.
5. Identify the positive and negative feed positions for the terminal block connection. See the symbols printed on the rear panel indicating the polarities and DC-input power range in voltage.
6. Insert the exposed wires into the terminal block plugs. Only wires with insulation should extend from the terminal block plugs. Note the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
7. Connect the Acc pin with your car Acc, and the device will be activated when you turn your ignition key to Acc.
8. Use a slotted screwdriver to tighten the captive screws. Plug the terminal block firmly, which wired, into the receptacle on the rear panel.

### 8.3.2 Automation Application




1. To turn on the Vehicle Acc for Vehicle application, please refer to Jumper setting of **JACCON1** section **7.2.3**, on page 23.
2. Before wiring, make sure the power source is disconnected.
3. Find the terminal block in the accessory box.
4. Use the wire-stripping tool to strip a short insulation segment from the output wires of the DC power source.
5. Identify the positive and negative feed positions for the terminal block connection. See the symbols printed on the rear panel indicating the polarities and DC-input power range in voltage.
6. Insert the exposed wires into the terminal block plugs. Only wires with insulation should extend from the terminal block plugs. Note the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
7. Use a slotted screwdriver to tighten the captive screws. Once wired, plug the terminal block firmly into the receptacle on the rear panel.

## 8.4 Use Cable-Lock Bracket

Using the cable-lock bracket prevents cables from detaching and protects connectors from accidental impacts.

Follow the instructions below to install the cable-lock bracket:

1. Place the computer on a flat surface. Loosen and remove the two indicated screws, keeping them for cable-lock bracket installation.



2. Mount the cable lock bracket as shown in the figure below and re-tighten the two screws that were previously removed.



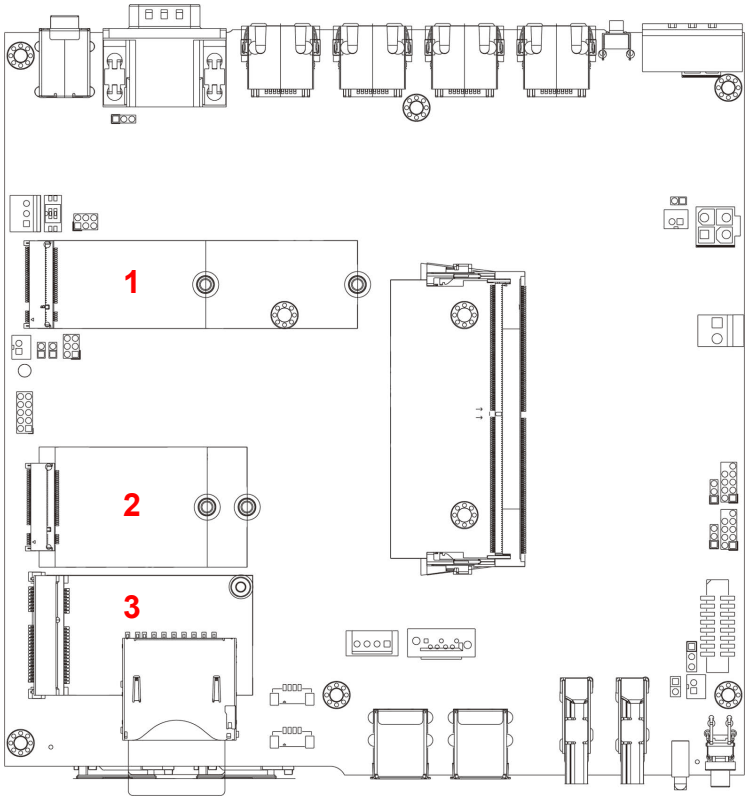
3. Secure and fix cables with straps via cable lock bracket holes.

## 8.5 Module Installation

This computer includes three expansion sockets to accommodate modules:

1. **M.2 B-Key 2242/2280 socket** (SATA + USB 2.0).
2. **M.2 B-Key 2242/3052 socket** (USB 3.0 + USB 2.0). It has an associated external SIM slot to accommodate cellular modules.
3. **Mini PCIe / mSATA socket** (full length, PCIe and USB). It has an associated external SIM slot to accommodate cellular modules.

**Board Top**




Modules are made for storage, GNSS, Wi-Fi/Bluetooth connectivity, cellular connectivity, AI acceleration, and other features. These instructions are general in nature to assist in module installation for any of the three sockets.

### 8.5.1 SIM Control & Operation Functions

#### SIM Control

The M.2 B-Key slots supports Dual SIM functionality through BIOS configurations.

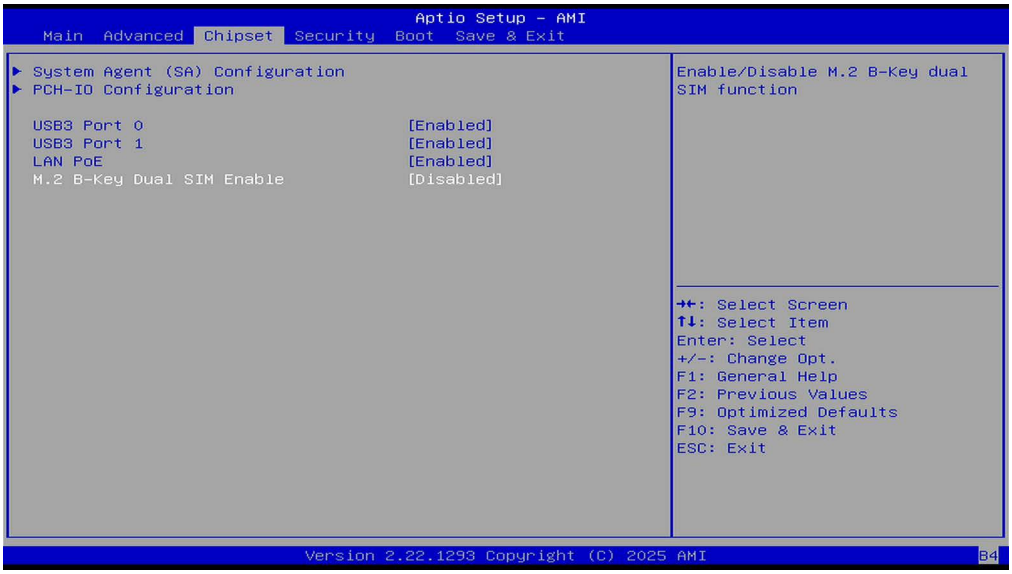
SIM-1 and SIM-2 are controlled by the same cellular modem, and the active SIM can be switched via AT commands.

#### SIM Operation

The current implementation supports Dual SIM Single Standby, meaning that only one SIM card is active at a time. Switching between SIM-1 and SIM-2 is currently performed via AT commands.

#### BIOS SIM Control Settings

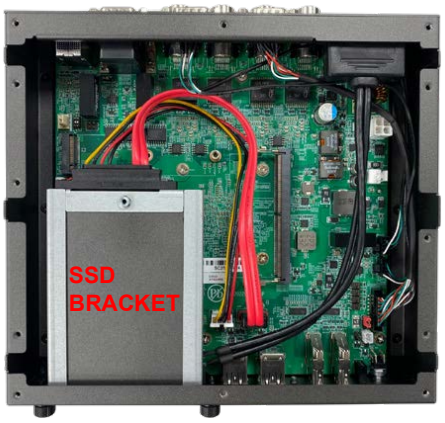
Below is a BIOS screenshot showing where the M.2 B-Key Dual SIM setting can be Enabled or Disabled. Disabled is the default setting.



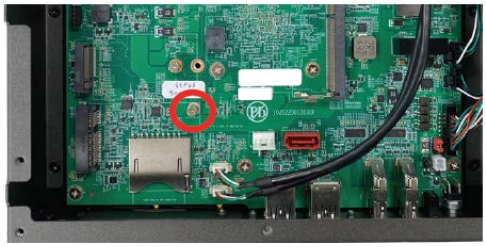

NOTE An automatic SIM-switching application is not currently available and would require a software development team.

### 8.5.2 Module Installation Steps

1. Dismount the bottom cover per Section 8.1 on page 41. The inside of the computer comes to view.

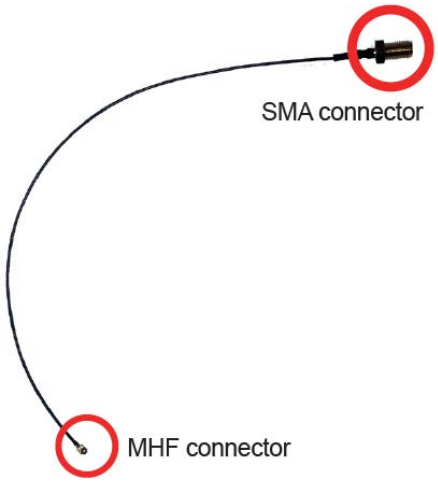



2. Disassemble the SSD bracket per Section 8.1.4 on page 44, as needed per socket location.
3. Confirm the module type is compatible with the socket type for your module.
4. Remove the screw on the module standoff for that module. Here's an example.

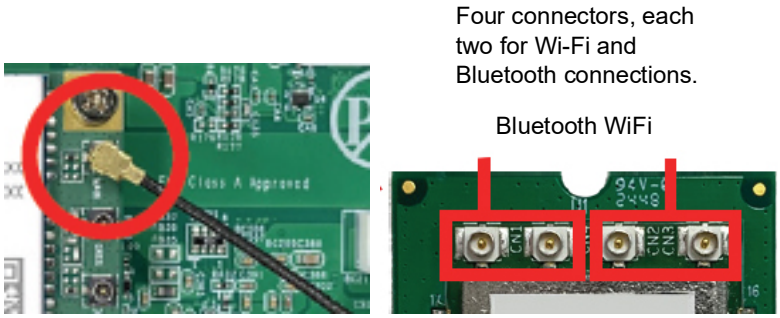


5. Carefully insert the module into the appropriate socket and fix it in place using the stand-off screw.

6. If the module is for cellular or Wi-Fi/Bluetooth functionality, find the antenna connector cable(s). The cable(s) should have an SMA connector on one end and an MHF connector on the other.



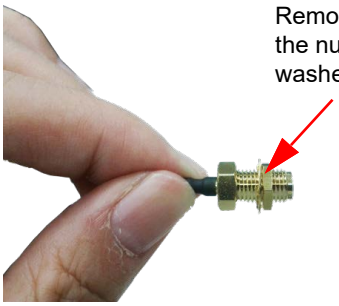

7. Connect the RF antenna's MHF connector to the cellular module's "MAIN" connector. Or follow a Wi-Fi module's instructions to connect multiple connectors as needed.

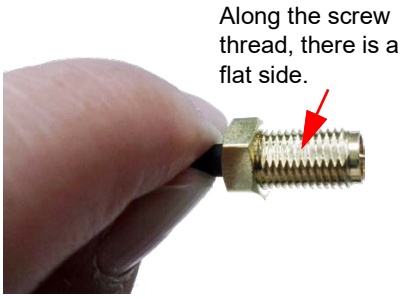



8. Remove one or two plastic plugs from the computer's panel near the module to make an antenna hole(s). Keep the plastic plug for any possible restoration in the future.

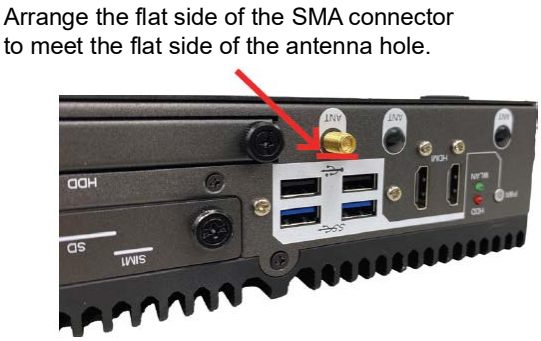


9. From the other end of the RF antenna, which is an SMA connector, remove the washer and the nut. Save the washer and nut for later use. Note the SMA connector has the form of a threaded bolt, with one flattened side.




10. Pull the SMA connector through the antenna hole. Align the flattened side of the threaded bolt with the antenna hole's flat side.




11. Mount the washer first and then the nut to the SMA connector. Make sure the nut is tightened.



12. Have an external antenna(s) depending on the module functionality. Screw and tightly fasten the antenna to the SMA connector.



13. If installing a cellular module, depending on the module design, insert the SIM card into the SIM card socket on the module or in the corresponding externally accessible SIM card slot as described in section 8.1.6 on page 46.

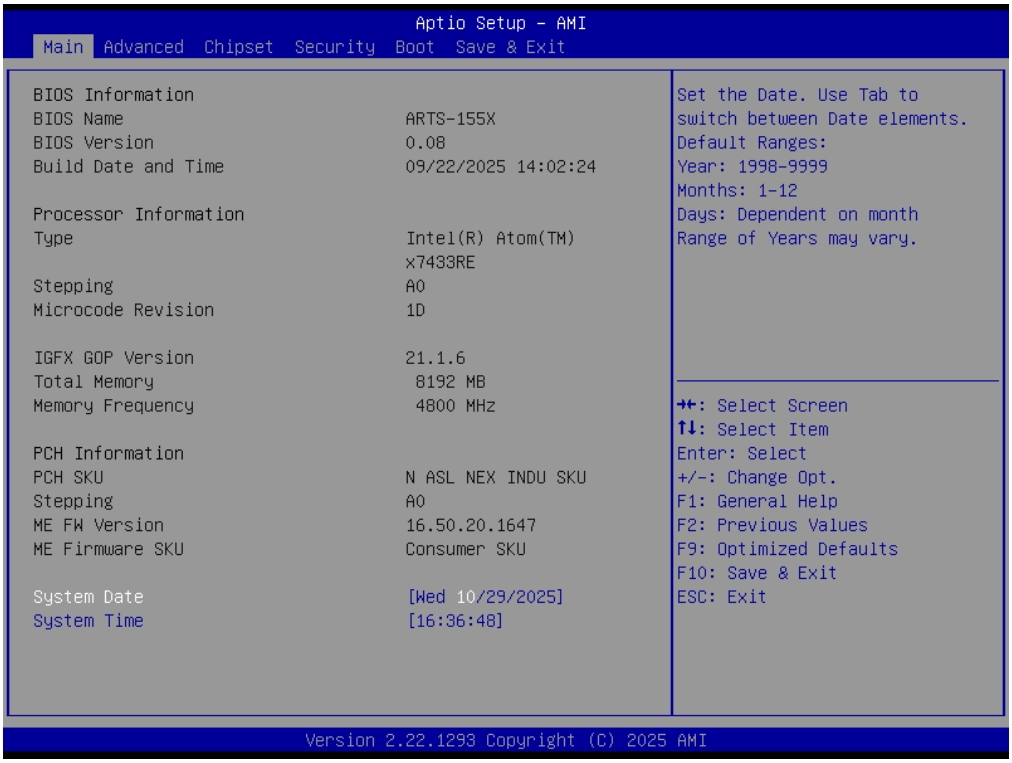
14. Reassemble the computer's bottom cover.

# 9. BIOS

## 9.1 BIOS Setup utility

The BIOS Setup utility for the computer is based on American Megatrends Inc (AMI) to configure the system settings stored in the system's BIOS ROM. The BIOS is activated once the computer powers on. When the computer is off, the battery on the main board supplies power to BIOS RAM.

To enter the BIOS Setup utility, keep hitting the "Delete" key upon powering on the computer.




The BIOS featured menus are:

| Menu | Description |
|---|---|
| Main | See **9.2** Main on page 59 |
| Advanced | See **9.3** Advanced on page 60 |
| Chipset | See **9.4** Chipset on page 72 |
| Security | See **9.5** Security on page 78 |
| Boot | See **9.6** Boot on page 80 |
| Save & Exit | See **9.7** Save & Exit on page 81 |

### 9.1.1 Key Commands

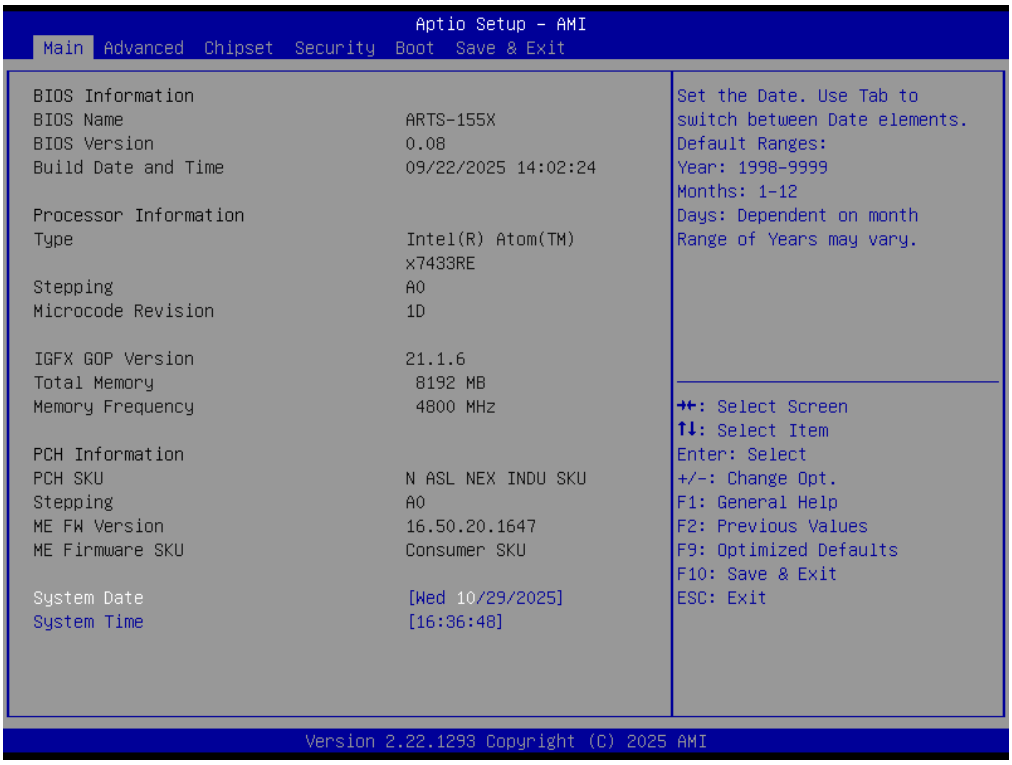
The BIOS Setup utility relies on a keyboard to receive user's instructions. Hit the following keys to navigate within the utility and configure the utility.

| Keystroke | Description |
|---|---|
| ← → | Moves left/right between the top menus. |
| ↓ ↑ | Moves up/down between highlight items. |
| Enter | Selects an highlighted item/field. |
| Esc | > On the top menus:<br>Use **Esc** to quit the utility without saving changes to CMOS. (The screen will prompt a message asking you to select **OK** or **Cancel** to exit discarding changes.)<br>> On the sub-menus:<br>Use **Esc** to quit current screen and return to the top menu. |
| Page Up / + | Increases current value to the next higher value or switches between available options. |
| Page Down / - | Decreases current value to the next lower value or switches between available options. |
| F1 | Opens the **Help** of the BIOS Setup utility. |
| F2 | Previous values. |
| F9 | Load Optimized Defaults (The screen then prompts a message asking you to select **Yes** or **No** to restore to default.) |
| F10 | Exits the utility saving the changes that have been made. (The screen then prompts a message asking you to select **Yes** or **No** to exit saving changes.) |

NOTE This BIOS Setup utility is updated from time to time to improve system performance and hence the screenshots hereinafter may not fully comply with what you actually have on-screen.

## 9.2 Main

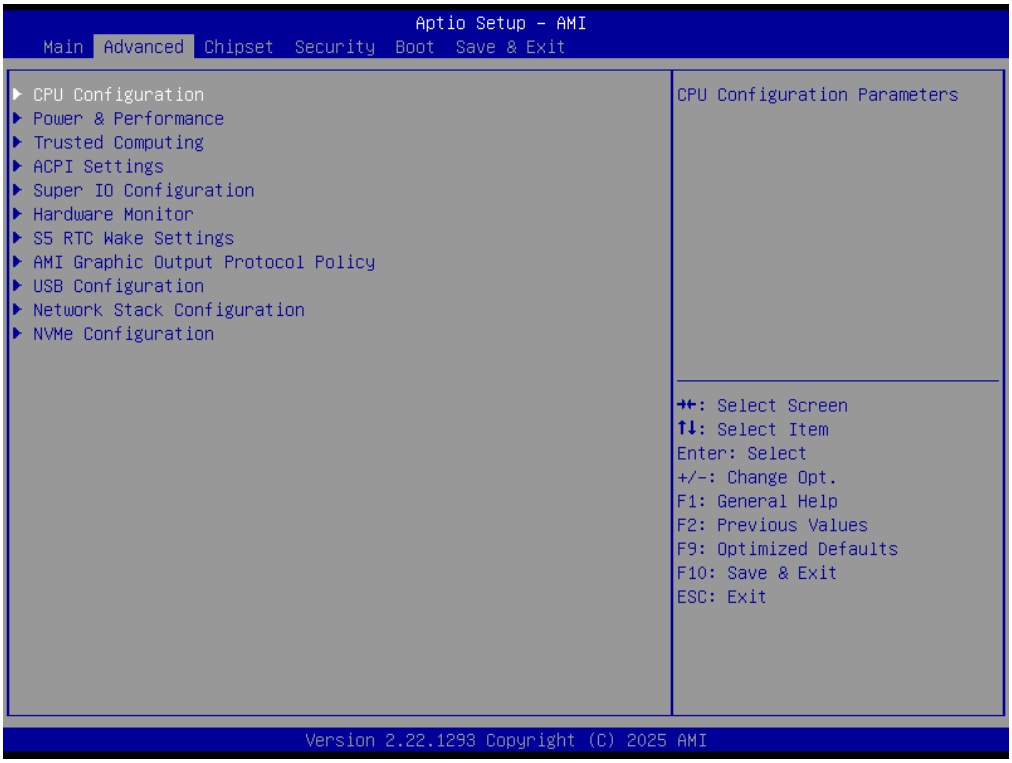
The **Main** menu features the settings of **System Date** and **System Time** and displays some BIOS and system information.




The feature settings are:

| Setting | Description |
|---|---|
| System Date | Set the system date. Use Tab to switch between Date elements.<br>Note that the 'Day' automatically changes when you set the date.<br>> The date format is: **Day:** Sun to Sat<br>**Month:** 1 to 12<br>**Date:** 1 to 31<br>**Year:** 1998 to 9999 |
| System Time | Set the system time. Use Tab to switch between Time elements.<br>> The time format is: **Hour:** 00 to 23<br>**Minute:** 00 to 59<br>**Second:** 00 to 59 |

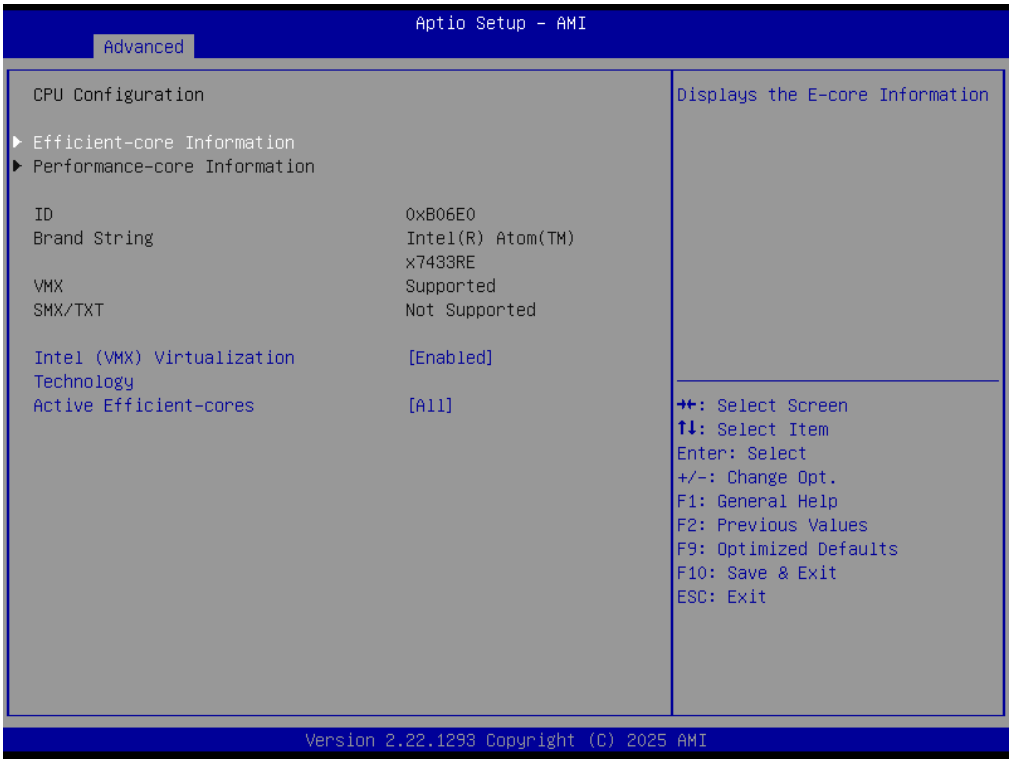
## 9.3 Advanced




The feature settings and sub-menus are:

| Setting | Description |
|---|---|
| CPU Configuration | See **9.3.1** CPU Configuration on page 61 |
| Power & Performance | See **9.3.2** Power & Performance on page 62 |
| Trusted Computing | See **9.3.3** Trusted Computing on page 63 |
| ACPI Settings | See **9.3.4** ACPI Settings on page 64 |
| Super IO Configuration | See **9.3.5** Super IO Configuration on page 65 |
| Hardware Monitor | See **9.3.6** Hardware Monitor on page 66 |
| S5 RTC Wake Settings | See **9.3.7** S5 RTC Wake Settings on page 67 |
| AMI Graphic Output Protocol Policy | See **9.3.8** AMI Graphic Output Protocol Policy on page 68 |
| USB Configuration | See **9.3.9** USB Configuration on page 69 |
| Network Stack Configuration | See **9.3.10** Network Stack Configuration on page 70 |
| NVMe Configuration | See **9.3.11** NVMe Configuration on page 71 |

### 9.3.1 CPU Configuration




The feature settings are:

| Setting | Description |
|---|---|
| Efficient-core Information | Displays the E-core Information. |
| Intel (VMX) Virtualization Technology | When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.<br>> Options: **Enabled** (default) or **Disabled** |
| Active Efficient-Cores | Number of cores to enable in each processor package.<br>> Options: **All** (default), **3, 2, 1, 0** |

### 9.3.2 Power & Performance

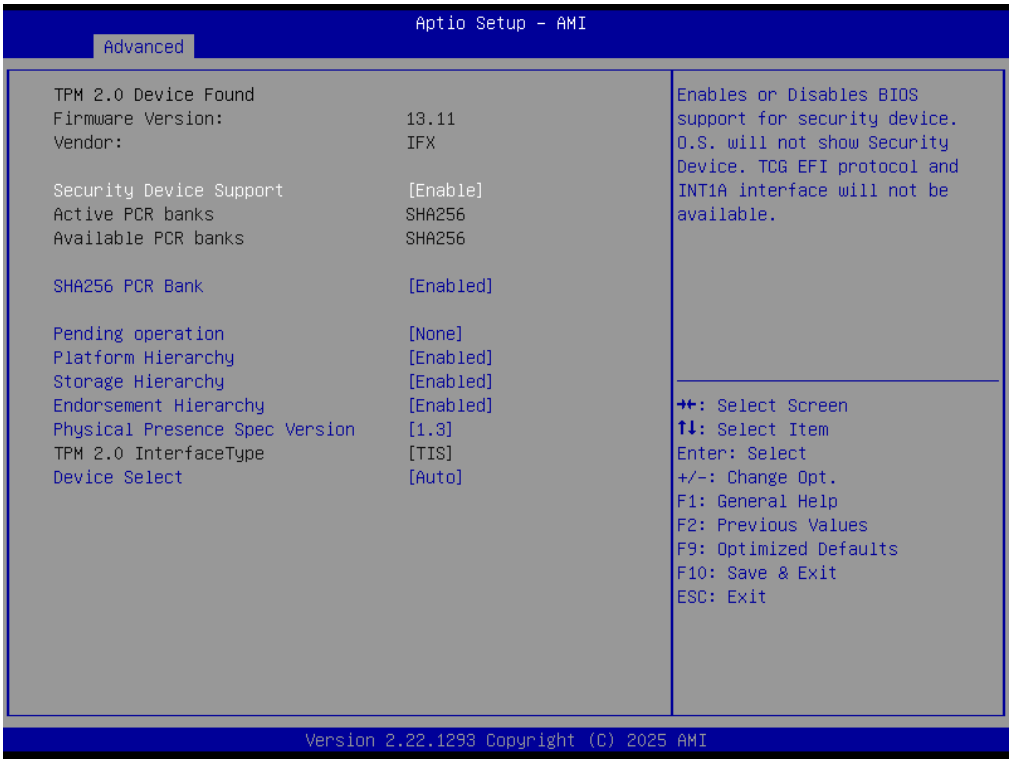



The feature settings are:

| Setting | Description |
|---|---|
| CPU -Power Management Control | CPU - Power Management Control Options<br>Boot performance mode:<br>> Options: Boot performance mode: **Max Battery, Max Non-Turbo Performance, Turbo Performance**<br>Intel(R) SpeedStep(tm):<br>> Options: **Disabled, Enabled**<br>Intel(R) Speed Shift Technology:<br>> Options: **Disabled, Enabled**<br>Per Core P State OS control mode:<br>> Options: **Disabled, Enabled**<br>Turbo Mode:<br>> Options: **Disabled, Enabled**<br>View/Configure Turbo Options:<br>> View/Configure Turbo Ratio Limit Options<br>C States:<br>> Options: **Disabled, Enabled** |

| | |
|---|---|
| GT - Power Management Control | RC6(Render Standby): Check to enable render standby<br>> Options: **Disabled / Enabled**(Default)<br>Maximum GT frequency: Maximum GT frequency limited by the user.<br>> Options: **Default Max Frequency**(Default), **100Mhz~1200Mhz**<br>Disable Turbo GT Frequency: Enabled/Disabled GT Frequency.<br>Options: **Disabled**(Default) / **Enabled** |

### 9.3.3 Trusted Computing

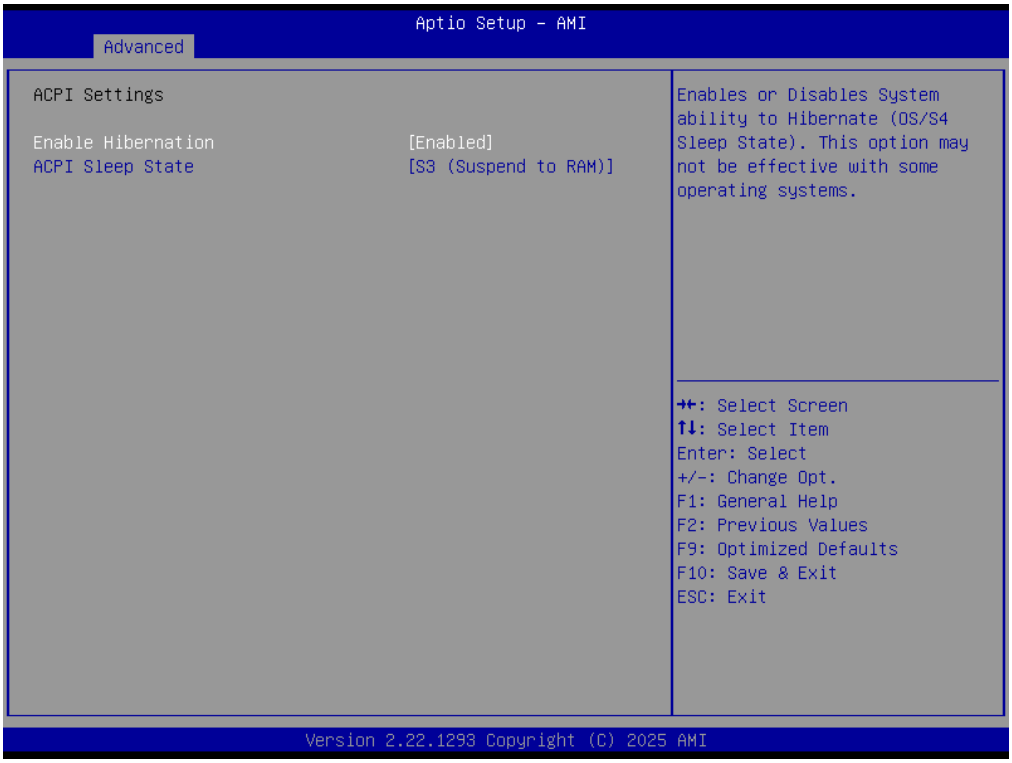



The feature settings are:

| Setting | Description |
|---|---|
| Security Device Support | Enables or disables BIOS support for security device.<br>OS will not show Security Device.<br>> Options: **Enabled** (Default) / **Disabled** |
| SHA256 PCR Bank | Enables or disables SHA256 PCR Bank.<br>> Options: **Enabled** (Default) / **Disabled** |
| Pending operation | Schedule an operation for the security device.<br>> Options: **None** (Default) / **TPM Clear** |
| Platform Hierarchy | Enables or disables Platform Hierarchy.<br>> Options: **Enabled** (Default) / **Disabled** |
| Storage Hierarchy | Enables or disables Storage Hierarchy.<br>> Options: **Enabled** (Default) / **Disabled** |
| Endorsement Hierarchy | Enables or disables Endorsement Hierarchy.<br>> Options: **Enabled** (Default) / **Disabled** |

| | |
|---|---|
| Physical Presence Spec Vision | This item select to tell O.S. to support PPI Spec Version 1.2 or 1.3.<br>> Options: **1.3** (Default) / **1.2** |
| Device Select | TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both TPM 2.0 devices and TPM 1.2 device.<br>> Options: **All** (Default) / **TPM1.2** / **TPM2.0** |

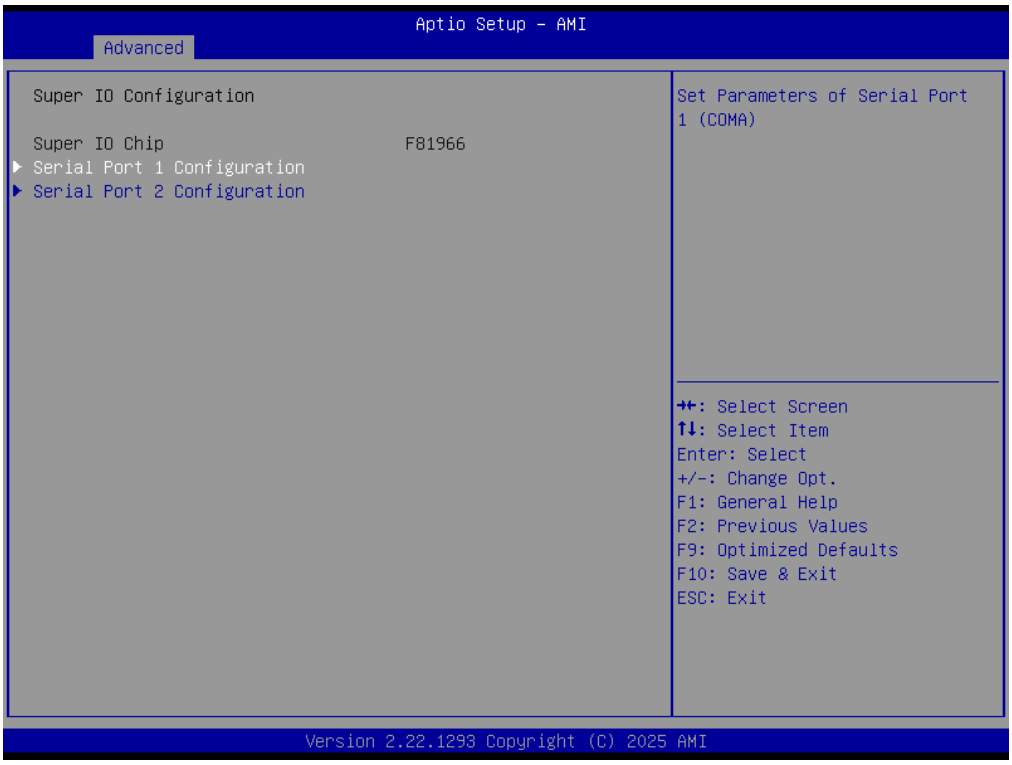
### 9.3.4 ACPI Settings




The feature settings are:

| Setting | Description |
|---|---|
| Enable Hibernation | **Enables** (default) or **Disables** System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS. |
| ACPI Sleep State | Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.<br>. Options: **Suspend Disabled** and **S3** (**Suspend** to **RAM**) (Default) |

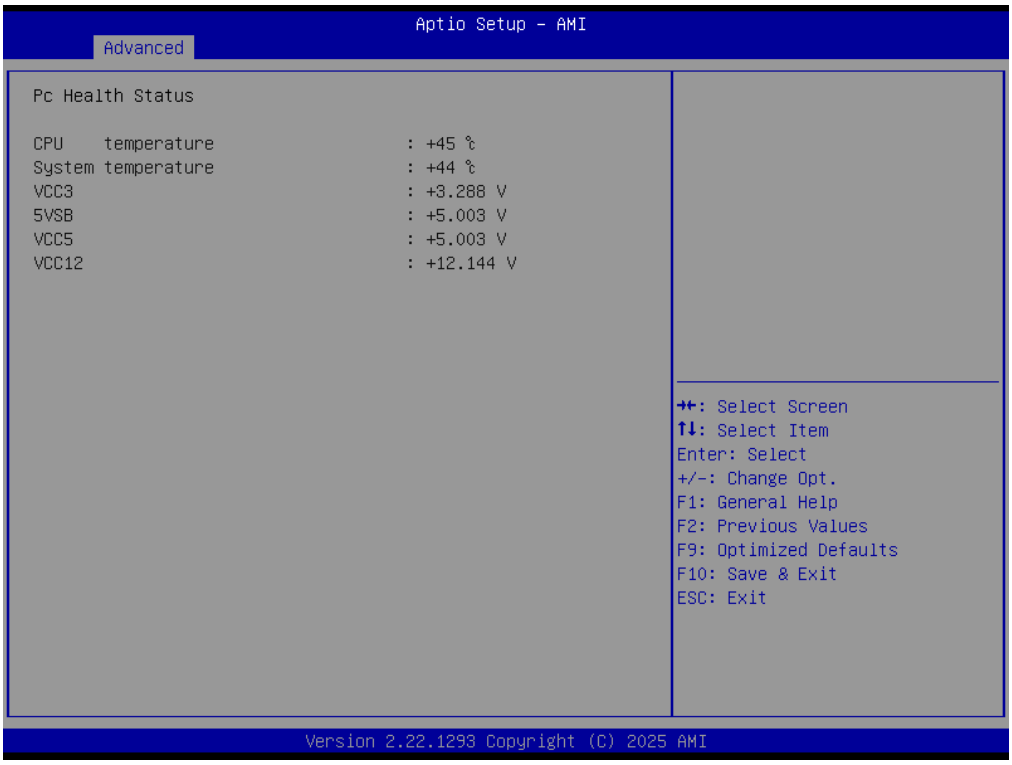
### 9.3.5 Super IO Configuration




The feature settings are:

| Setting | Description |
|---|---|
| Serial Port 1 Configuration | Serial Port: Enable or disable serial port (COM)<br>> Options: **Disabled, Enabled**<br>Mode Select: Select RS232 or RS-422 or RS-485<br>> Options: **RS-232** (Default), **RS-422, RS-422(Termination Resistor), RS-485, RS-485(Termination Resistor)** |
| Serial Port 2 Configuration | Serial Port: Enable or disable serial port (COM)<br>> Options: **Disabled, Enabled** |

### 9.3.6 Hardware Monitor




Access this sub-menu to monitor the hardware status.

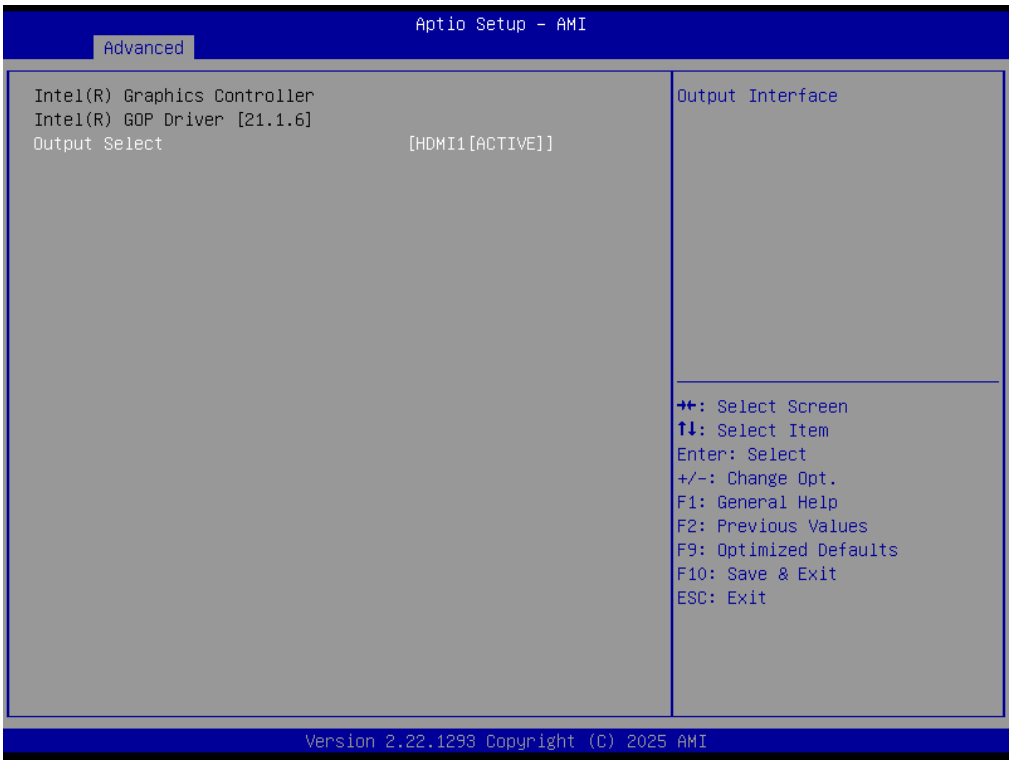
### 9.3.7 S5 RTC Wake Settings




The feature settings are:

| Setting | Description |
|---|---|
| Wake System from S5 | **Enable** or **Disable** (default) system wake on alarm event.<br>> Options available are:<br>**Disabled** (default):<br>**Fixed Time:** System will wake on the hr:min:sec specified.<br>**Dynamic Time:** If selected, you need to set **Wake up minute**<br>**increase** from 1 - 5. System will wake on the current time + increase minute(s). |

### 9.3.8 AMI Graphic Output Protocol Policy




The feature settings are:

| Setting | Description |
|---|---|
| Output Select | Output Interface selection. |

### 9.3.9 USB Configuration

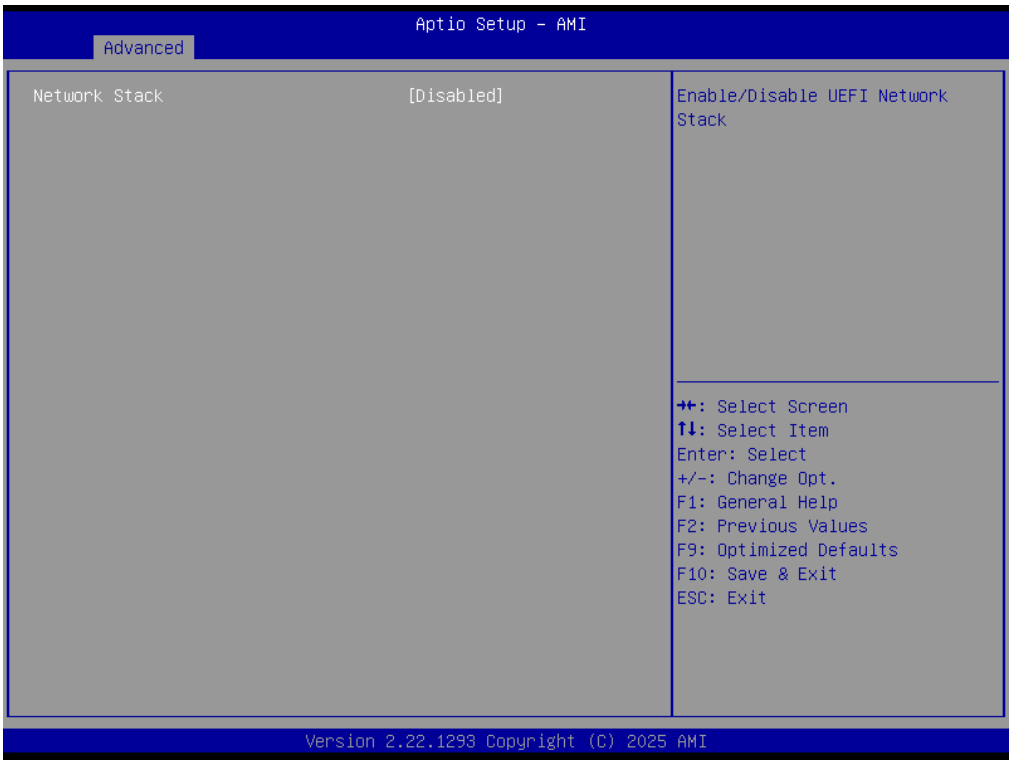



The feature settings are:

| Setting | Description |
|---|---|
| Legacy USB Support | Enables/disables legacy USB support.<br>> Options available are **Enabled** (default), **Disabled** and **Auto**.<br>> Select **Auto** to disable legacy support if no USB device are connected.<br>> Select **Disabled** to keep USB devices available only for EFI applications. |
| XHCI Hand-off | This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.<br>> The optional settings are: **Enabled** (default) / **Disabled** |
| USB Mass Storage Driver Support | Enables/disables USB Mass Storage Driver Support.<br>> The optional settings are: **Enabled** (default) / **Disabled** |
| USB transfer time-out | Use this item to set the time-out value for control, bulk, and interrupt transfers.<br>> Options: **1 sec, 5 sec, 10 sec, 20 sec** (default) |
| Device reset time-out | Use this item to set USB mass storage device start unit command time-out.<br>> Options: **10 sec, 20 sec** (default), **30 sec, 40 sec** |

| | |
|---|---|
| Device power-up delay | Use this item to set maximum time the device will take before it properly reports itself to the host controller. 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor.<br>> Options available are:<br>**Auto:** Default<br>**Manual:** Select **Manual** you can set value for the following sub item: 'Device Power-up delay in seconds', the delay range in from 1 to 40 seconds, in one second increments. |

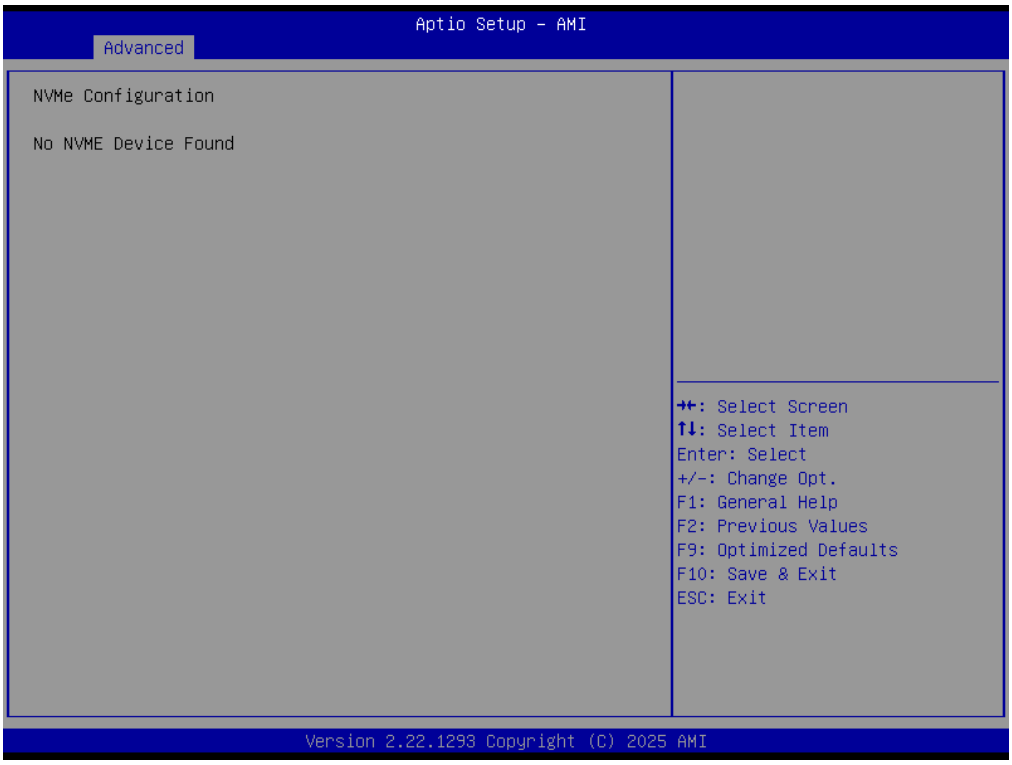
### 9.3.10 Network Stack Configuration




The feature settings are:

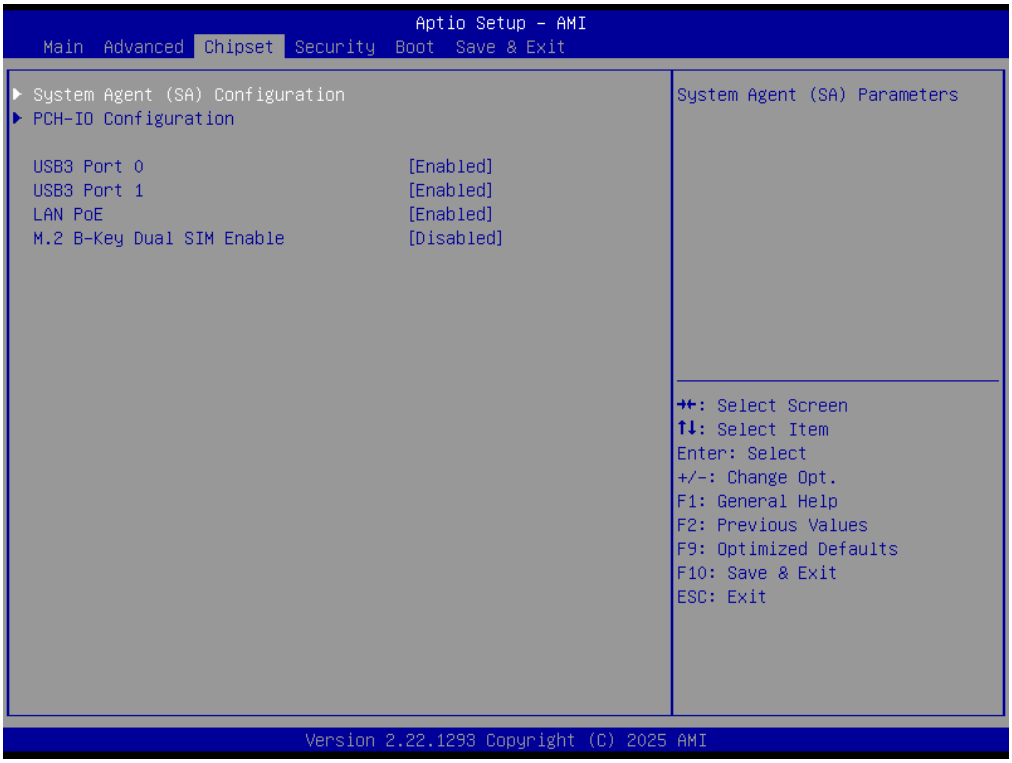
| Setting | Description |
|---|---|
| Network Stack | **Enable** or **Disable** (default) UEFI network stack |

### 9.3.11 NVMe Configuration




Access this sub-menu to view the NVMe controller and driver information.

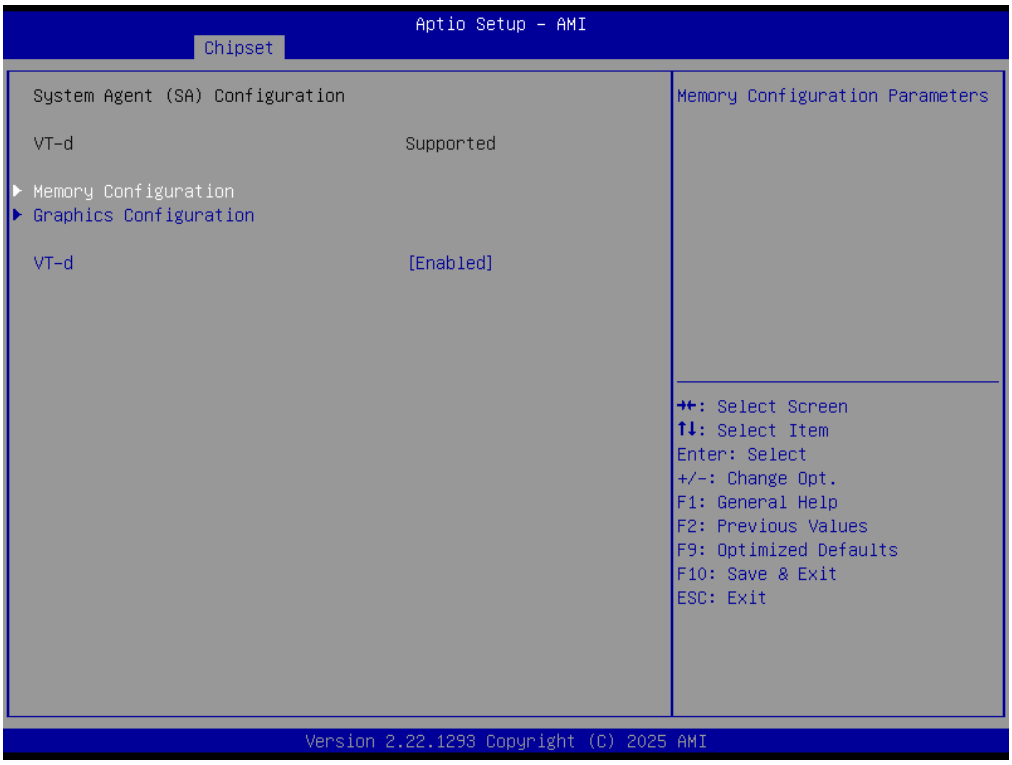
## 9.4 Chipset




The feature settings are:

| Setting | Description |
|---|---|
| System Agent (SA) Configuration | See **9.4.1** System Agent (SA) Configuration on page 73 |
| PCH-IO Configuration | See **9.4.3** PCH-IO Configuration on page 75 |
| USB3 Port 0 | Enables/disables the USB3 port power supply.<br>> Options: **Enabled** (default) / **Disabled** |
| USB3 Port 1 | Enables/disables the USB3 port power supply.<br>> Options: **Enabled** (default) / **Disabled** |
| LAN PoE | Enables/disables the LAN port PoE function.<br>> Options: **Enabled** (default) / **Disabled** |
| M.2 B-Key Dual SIM Enable | Enables/disables M.2 B-Key dual SIM function.<br>> Options: **Enabled** / **Disabled** (default) |

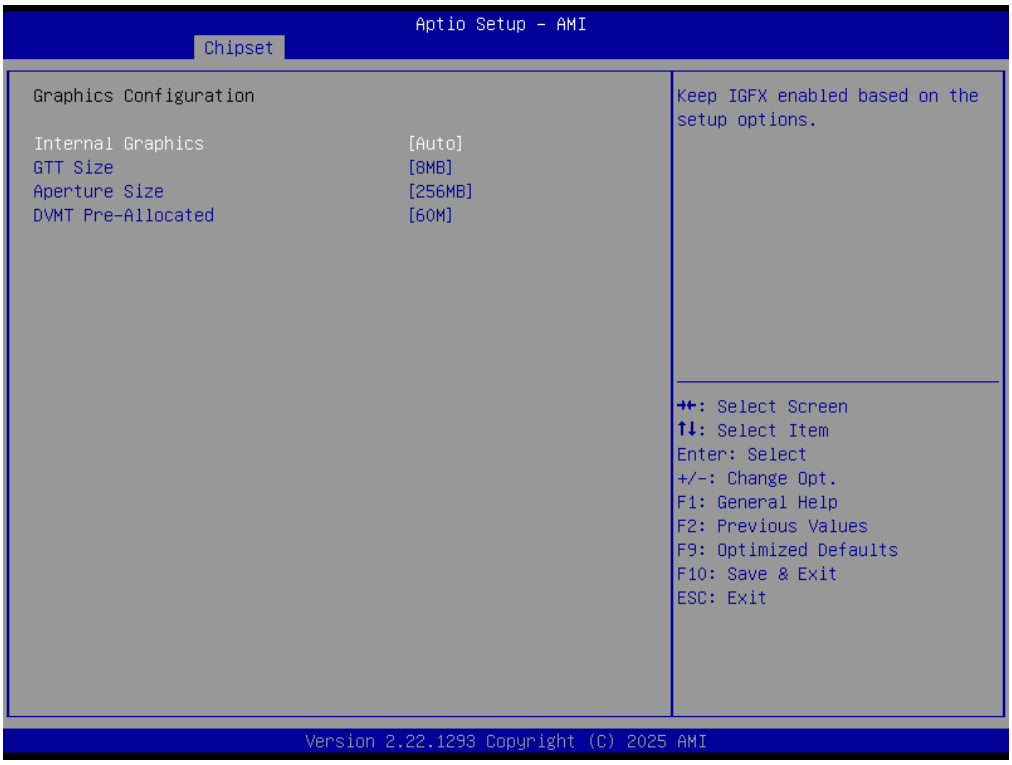
### 9.4.1 System Agent (SA) Configuration




The feature settings are:

| Setting | Description |
|---|---|
| Memory Configuration | Access this sub-menu to view the memory configuration |
| Graphics Configuration | See **9.4.2** Graphics Configuration on page 74 |
| VT-d | **Enable** (default) or **Disable** VT-d capability |

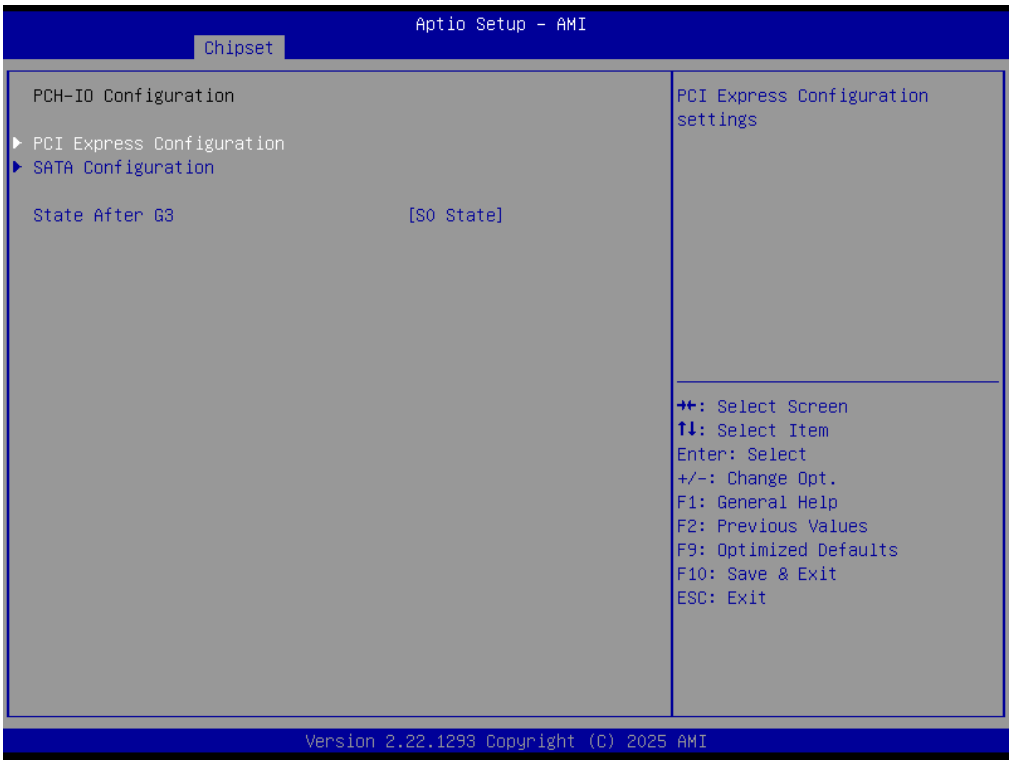
### 9.4.2 Graphics Configuration




The feature settings are:

| Setting | Description |
|---|---|
| Internal Graphics | Keep IGFX enabled based on the setup options.<br>> Options: **Auto** (default) / **Disabled / Enabled** |
| GTT Size | Select the GTT Size.<br>> Options: **2MB / 4MB / 8MB** |
| Aperture Size | Select the Aperture Size.<br>> Options: **128MB / 256MB (default) / 512MB / 1024MB** |
| DVMT Pre-Allocated | Select the DVMT 5.0 Pre-Allocated (Fixed) Graphic Memory size used by the Internal Graphic Device.<br>> Options: **0M to 160M** |

### 9.4.3 PCH-IO Configuration




The feature settings are:

| Setting | Description |
|---|---|
| PCI Express Configuration | See **9.4.4** PCI Express Configuration on page 76 |
| SATA Configuration | See **9.4.5** SATA Configuration on page 77 |
| State After G3 | Specify what state to go to when power is re-applied after a power failure(G3 state).<br>> Options: **S0 State** (default), **S5 State** |

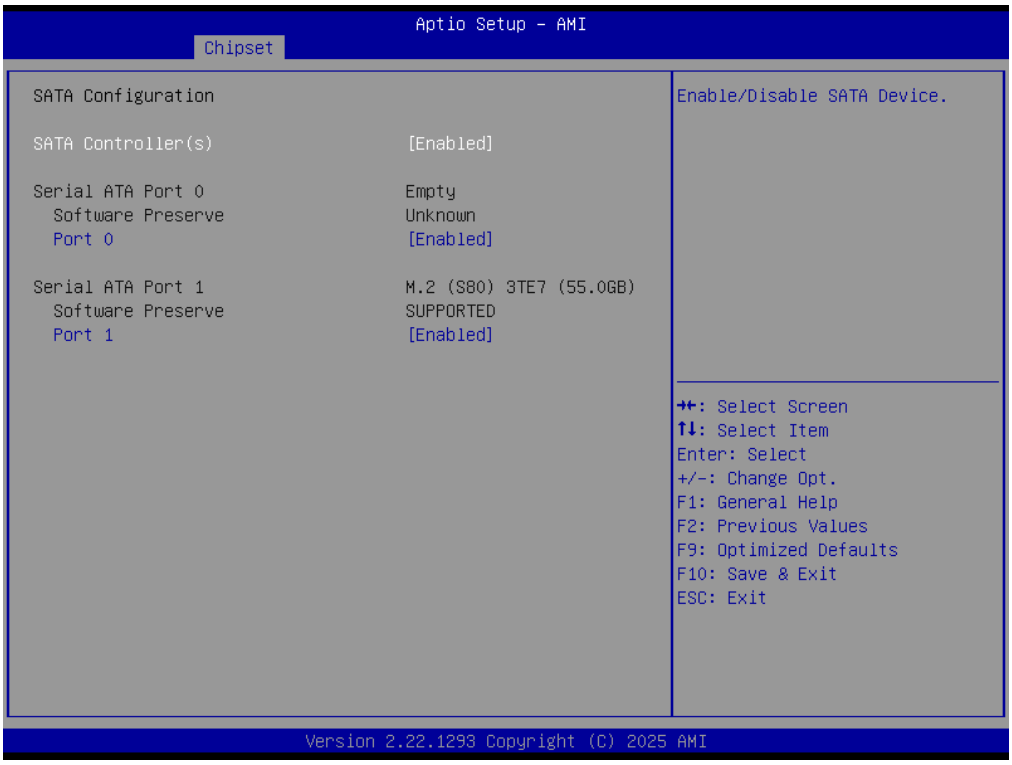
### 9.4.4 PCI Express Configuration




The feature settings are:

| Setting | Description |
|---|---|
| LAN1 - 4 | Control the PCI Express Root Port<br>> Options: **Enabled** (default) / **Disabled** |

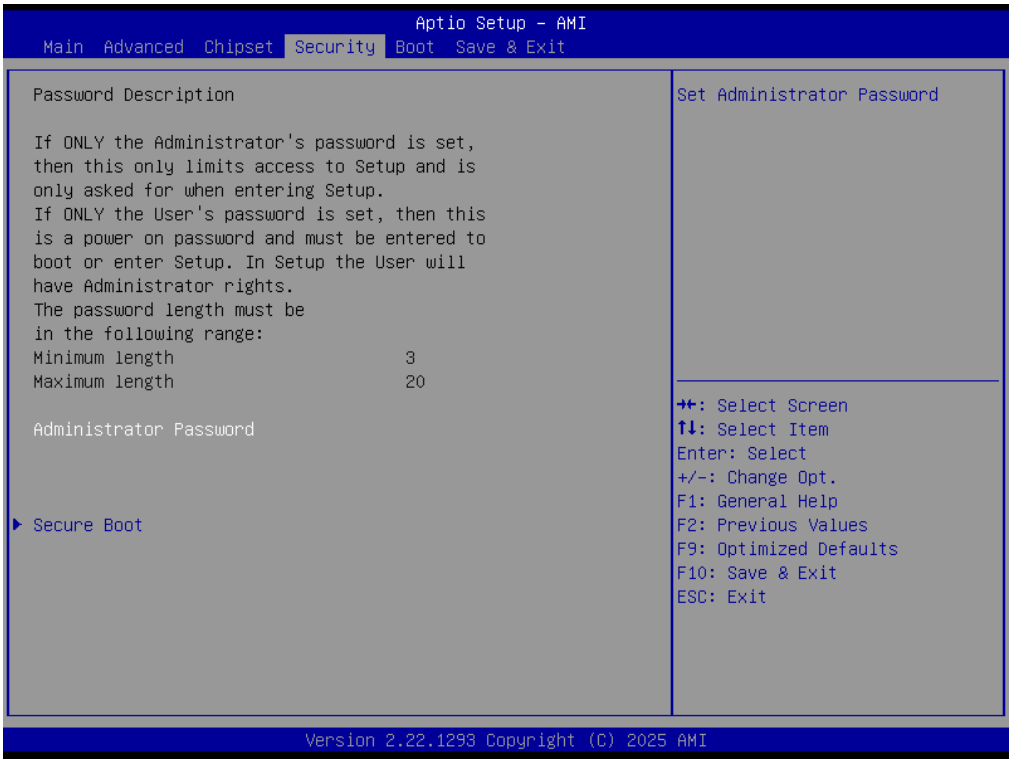
### 9.4.5 SATA Configuration




The feature settings are:

| Setting | Description |
|---|---|
| SATA Controller(s) | **Enables** (default) / **disables** SATA device. |
| Serial ATA Port 0/1 | SATA device information.<br>*Available SATA ports depend on your device. |
| Port 0/1 | **Enables** (default) / **disables** the SATA port. |

## 9.5 Security




The feature settings are:

| Setting | Description |
|---|---|
| Administrator Password | To set up an administrator password:<br>1. Select **Administrator Password**.<br>2. An **Create New Password** dialog then pops up on-screen.<br>3. Enter your desired password that is no less than 3 characters and no more than 20 characters.<br>4. Hit [Enter] key to submit. |
| Secure Boot | See **9.5.1** Secure Boot on page 79 |

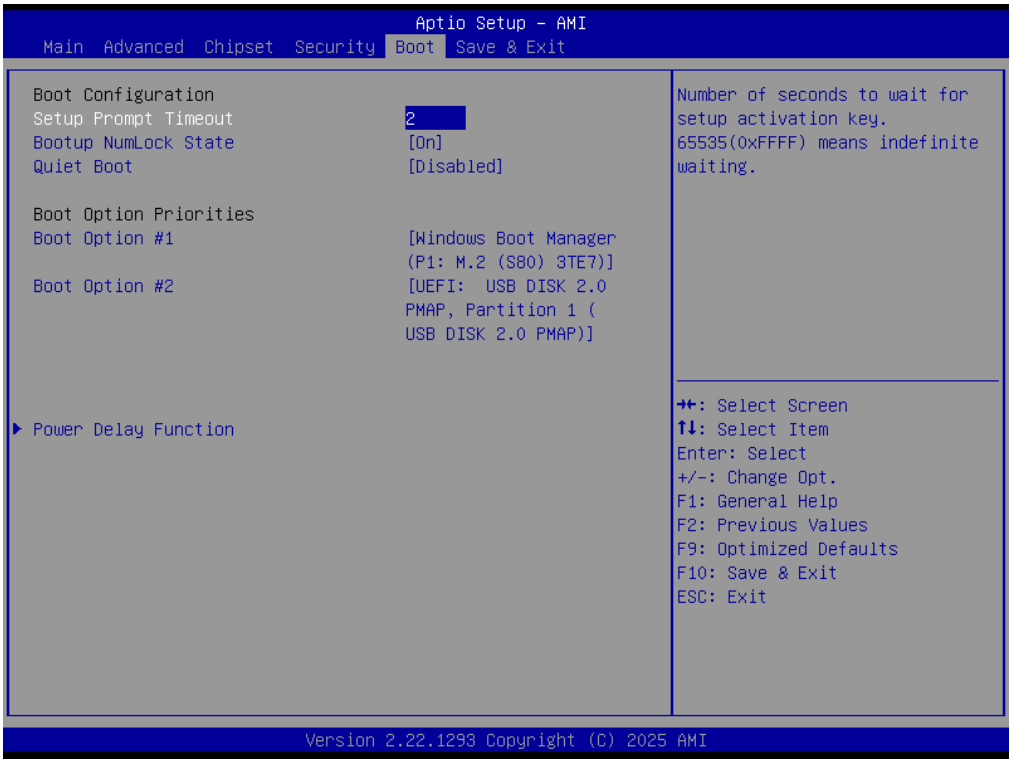
### 9.5.1 Secure Boot




The feature settings are:

| Setting | Description |
|---|---|
| Secure Boot | **Enable/Disable** (default) secure boot. |
| Secure Boot Mode | Allow users to set the secure boot selector.<br>> Options: **Standard** (default) / **Custom** mode. |
| Restore Factory Keys | Force system to restore default secure boot key database. |
| Reset to Setup Mode | Delete all secure boot key databases. |
| Expert Key Management | Allow users to modify secure variables and set key management page. |

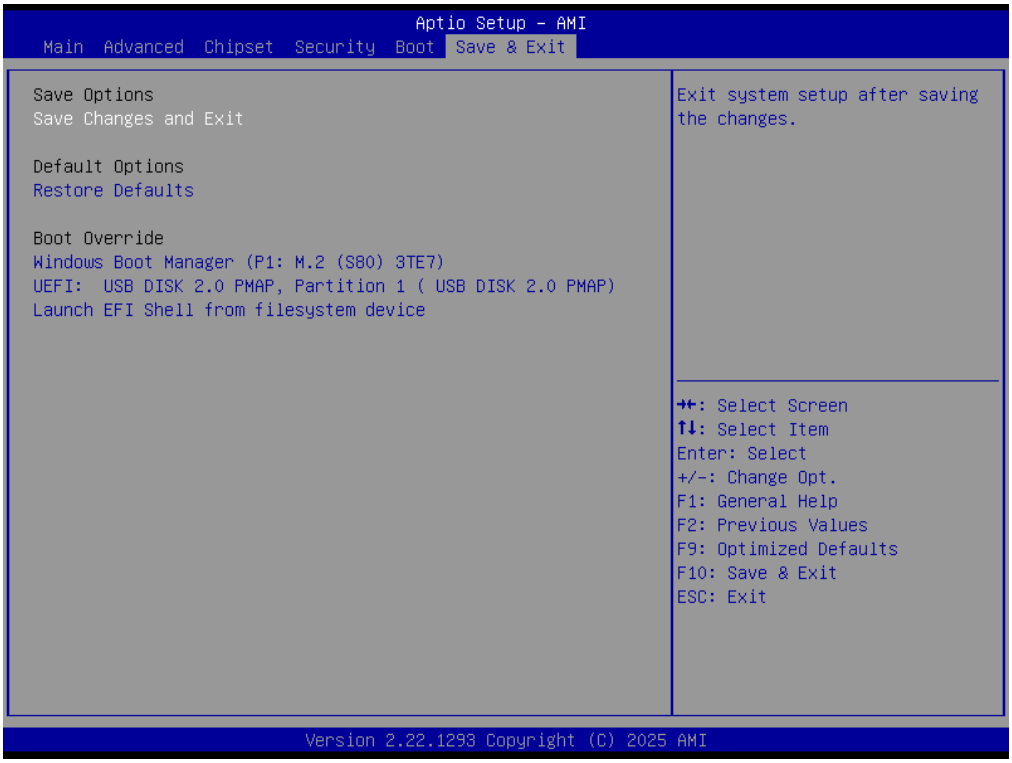
## 9.6 Boot




The feature settings are:

| Setting | Description |
|---|---|
| Setup Prompt Timeout | Set how long to wait for the prompt to show for entering BIOS Setup.<br>> The default setting is **1** (sec).<br>> Set it to **65535** to wait indefinitely. |
| Bootup NumLock State | Sets whether to enable or disable the keyboard's NumLock state when the system starts up.<br>> Options available are **On** (default) and **Off**. |
| Quiet Boot | Sets whether to display the POST (Power-on Self Tests) messages or the system manufacturer's full screen logo during booting.<br>> Select **Disabled** to display the normal POST message, which is the default. |
| Boot Option Priority | Set the system boot priorities. |
| Power Delay Function | Sets the system support power delay function.<br>**Enabled:** Support power delay function.<br>**Disabled:** Power on/off manually operated. |

## 9.7 Save & Exit




The feature settings are:

| Setting | Description |
|---|---|
| Save Changes and Exit | Saves the changes and quits the BIOS Setup utility. |
| Restore Defaults | Restores all settings to defaults.<br>> This is a command to launch an action from the BIOS Setup utility. |
| Boot Override | **Boot Override** presents a list in context with the boot devices in the system.<br>> **P0:** Select the device to boot up the system regardless of the currently configured boot priority.<br>> **Launch EFI Shell from file system device:** Attempts to launch EFI Shell Application (Shell.efi) from one of the<br>available file system devices. |

# Appendix A. Best Practices

The following paragraphs outline the best practices for operating the SYS-480 in a safe, effective manner, that does not damage the board. Read this section carefully.

## Power Supply



**Avoid Electrostatic Discharge (ESD)**
Observe ESD-safe handling procedures when working with this product. Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.
Always store this product in ESD-protective packaging when not in use.

***Safe Handling Precautions***

The SYS-480 contains a high number of I/O connectors with connection to sensitive electronic components. This creates many opportunities for accidental damage during handling, installation and connection to other equipment. The list here describes common causes of failure found in equipment and on boards returned to WINSYSTEMS for repairs. This information is provided as a source of advice to help you prevent damaging your SYS-480 (or any vendor's) equipment and embedded computer boards.

**ESD Damage** – This type of damage is usually almost impossible to detect, because there is no visual sign of failure or damage. The symptom is that the equipment or board eventually simply stops working, because some component becomes defective. Usually the failure can be identified and the chip can be replaced. To prevent ESD damage, always follow proper ESD-prevention practices when handling computer equipment and boards.

**Damage during handling or storage** – In some equipment and on boards we have noticed physical damage from mishandling. A common observation is that a screwdriver slipped while installing circuit boards and or accessories in equipment, causing a gouge in the PCB surface and cutting signal traces or damaging components.

An other common observation is damaged equipment and board corners, indicating the equipment or board was dropped. This may or may not cause damage to the circuitry, depending on what is near the corner. Most of our boards are designed with at least 25 mils clearance between the board edge and any component pad, and ground / power planes are at least 20 mils from the edge to avoid possible shorting from this type of damage. However, these design rules are not sufficient to prevent damage in all situations.

A third cause of failure is when a metal screwdriver tip slips, or a screw drops in the equipment or onto a board while it is powered on, causing a short between a power pin and a signal pin on a component. This can cause over-voltage / power supply problems described below. To avoid this type of failure, only perform assembly operations when the system is powered off.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. However, our boards are generally very dense, and if the board has components very close to the board edge, they can be damaged or even knocked off the board when the board tilts back in the rack. WINSYSTEMS recommends that all our boards be stored only in individual ESD-safe packaging. If multiple boards are stored together, they should be contained in bins with dividers between boards. Do not pile boards on top of each other or cram too many boards into a small location. This can cause damage to connector pins or fragile components.

**Power supply wired backwards** – Some of our power supplies, equipment, and boards are not designed to withstand a reverse power supply connection. This will destroy each IC that is connected to the power supply (i.e. almost all ICs). In this case the equipment or board will most likely will be unrepairable and must be replaced. A chip destroyed by reverse power or by excessive power will often have a visible hole on the top or show some deformation on the top surface due to vaporization inside the package. **Check twice if your power supply, equipment, or board does not reverse power protection before applying power!**

**Bent connector pins** – This type of problem is often only a cosmetic issue and is easily fixed by bending the pins back to their proper shape one at a time with needle-nose pliers. The most common cause of bent connector pins is when a cable or board is pulled off a connector by rocking it back and forth left to right, from one end of the connector to the other. As the board is rocked back and forth it pulls out suddenly, and the pins at the end get bent significantly. The same situation can occur when pulling a ribbon cable off of a pin header. If the pins are bent too severely, bending them back can cause them to weaken unacceptably or even break, and the connector must be replaced.

## Power Supply Budget

Evaluate your power supply budget. It is usually good practice to budget twice the typical power requirement for all of your devices.

### Zero-load Power Supply

Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the SYS-480 typical load is not lower than the power supply's minimum load. If the SYS-480 board does not draw enough power to meet the power supply's minimum load, then the power supply does not regulate properly and can cause damage to the SYS-480.



**Use Proper Power Connections (Voltage)**
When verifying the voltage, measure it at the power connector on the circuit board. Measuring it at the power supply does not account for voltage drop through the wire and connectors.

The SYS-480 requires +9V to +36V input +/- 5% to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

### Power Harness

Minimize the length of the power harness. This reduces the amount of voltage drop between the power supply and the SYS-480.

### Gauge Wire

Use the largest gauge wire that the pin and connector manufacture allows. Most pin and connector manufacturers have a maximum gauge wire they recommend for their pins.

### Contact Points

WINSYSTEMS equipment and boards mostly use connectors with gold finish contacts. Gold finish contacts are used exclusively on high-speed connections. Power and lower speed peripheral connectors may use a tin finish as an alternative contact surface. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion, resulting in unreliable connections.

### Pin Contacts

Often the pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact would include a design similar to Molex or Trifurcon designs, which provide three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

## Power Down

Make sure that power has been removed from the system before making or breaking any connections.



**Power Supply OFF**—Always turn off the power supply before connecting to the embedded system. Do not hot-plug the SYS-480 unit.

**I/O Connections OFF**—Turn off all I/O connections before connecting them to the embedded computer modules or any I/O cards or equipment. Connecting hot signals can cause damage whether the embedded system is powered or not.

## Mounting and Protecting the SYS-480

To avoid damage, mount the SYS-480 properly.

**Do not bend or flex the SYS-480 circuit boards**—Bending or flexing can cause irreparable damage. Embedded computer modules are especially sensitive to flexing or bending around ball grid array (BGA) devices. BGA devices are extremely rigid by design, and flexing or bending the embedded computer module can cause the BGA to tear away from the printed circuit board.

**Mounting holes**—The mounting holes are plated on the top, bottom, and through the barrel of the hole. Traces are often routed in the inner layers right below, above, or around the mounting holes.

- Never use a drill or any other tool in an attempt to make the holes larger.
- Never use screws with oversized heads. The head could come in contact with nearby components causing a short or physical damage.
- Never use self-tapping screws; they compromise the walls of the mounting hole.
- Never use oversized screws that cut into the walls of the mounting holes.
- Always use all of the mounting holes. By using all of the mounting holes, you provide the support the embedded computer module needs to prevent bending or flexing.

**Avoid cutting the SYS-480 circuit boards**—Never use star washers or any fastening hardware that cut into the SYS-480 circuit boards.

**Avoid over-tightening of mounting hardware**—Causing the area around the mounting holes to compress could damage interlayer traces around the mounting holes.

**Use appropriate tools**—Always use tools that are appropriate for working with small hardware. Large tools can damage components around the mounting holes.

**Important Safety Instructions**

Read these safety instructions carefully

1. Read all cautions and warnings on the equipment.
2. Place this equipment on a reliable surface when installing. Dropping it or letting it fall may cause damage
3. Make sure the correct voltage is connected to the equipment.
4. For pluggable equipment, the socket outlet should be near the equipment and should be easily accessible.
5. Keep this equipment away from humidity.
6. The openings on the enclosure are for air convection and protect the equipment from overheating. DO NOT COVER THE OPENINGS.
7. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
8. Never pour any liquid into opening. This may cause fire or electrical shock.
9. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
10. If one of the following situations arises, get the equipment checked by service personnel:

    a. The power cord or plug is damaged.

    b. Liquid has penetrated into the equipment.

    c. The equipment has been exposed to moisture.

    d. The equipment does not work well, or you cannot get it to work according to the user manual.

    e. The equipment has been dropped or damaged.

    f. The equipment has obvious signs of breakage.

11. Keep this User Manual for later reference.

## Conformal Coating

Conformal coating by any source other than WINSYSTEMS voids the product warranty and will not be accepted for repair by WINSYSTEMS. If such a product is sent to WINSYSTEMS for repair, it will be returned at customer expense and no service will be performed. A WINSYSTEMS product conformally coated by WINSYSTEMS will be subject to regular WINSYSTEMS warranty terms and conditions.

## Operations/Product Manuals

Every WINSYSTEMS product has an Operations manual or Product manual.

**Periodic updates**—Operations/product manuals may be updated often. Periodically check the WINSYSTEMS website (https://winsystems.com/product/sys-480) for revisions.

**Check pin-outs**—Always check the pin-out and connector locations in the manual before plugging in a cable. Many I/O modules have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

**Contact an engineer**—If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact a WINSYSTEMS engineer at +1-817-274-7553.

# Appendix B. Warranty Information

Full warranty information is at
https://winsystems.com/company-policies/warranty/.