

# USER'S MANUAL

## **AIE900-902-FL Series**

Edge AI Embedded System

User's Manual



[www.axiomtek.com](http://www.axiomtek.com)

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**June 2021, Version A1**

**Printed in Taiwan**

## Safety Precautions

Before getting started, please read the following important safety precautions.

1. The AIE900-902-FL does not come with an operating system which must be loaded first before installation of any software into the computer.
2. Be sure to ground yourself to prevent static charge when installing any internal components. Use a wrist grounding strap and place all electronic components in any static-shielded devices. Most electronic components are sensitive to static electrical charge.
3. Disconnect the power cord from the AIE900-902-FL prior to making any installation. Be sure both the system and all external devices are turned OFF. Sudden surge of power could ruin sensitive components. Make sure the AIE900-902-FL is properly grounded.
4. Make sure the voltage of the power source is correct before connecting it to any power outlet.
5. Turn OFF system power before cleaning. Clean the system using a cloth only. Do not spray any liquid cleaner directly onto the screen.
6. Do not leave equipment in an uncontrolled environment where the storage temperature is below  $-40^{\circ}\text{C}$  or above  $80^{\circ}\text{C}$  as it may damage the equipment.
7. Do not open the system's back cover. If opening the cover for maintenance is a must, only a trained technician is allowed to do so. Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:
  - Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help discharge any static electricity on human body.
  - When handling boards and components, wear a wrist grounding strap available from most electronic component stores.

## WARNING

AIE900-902-FL can become extremely hot when it is turned on. Do not touch the hot surface of the system unit during operation.

## Classification

1. Degree of protection against electric shock: not classified
2. Degree of protection against ingress of water: IP40
3. Equipment not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide.
4. Mode of operation: Continuous



**Note:** All I/O connectors should be connected with corresponding cables when the system is operating with IP40 rated definition. If some of the I/O ports are not to be used or connected during operation, users must use I/O covers to plug the ports in order to meet the IP40 standard.

## General Cleaning Tips

Please keep the following precautions in mind while understanding the details fully before and during any cleaning of the computer and any components within.

A piece of dry cloth is ideal to clean the device.

1. Be cautious of any tiny removable components when using a vacuum cleaner to absorb dirt on the floor.
2. Turn the system off before cleaning up the computer or any components within.
3. Avoid dropping any components inside the computer or getting the circuit board damp or wet.
4. For cleaning, be cautious of all kinds of cleaning solvents or chemicals which may cause allergy to certain individuals.
5. Keep foods, drinks or cigarettes away from the computer.

### Cleaning Tools:

Although many companies have created products to help improve the process of cleaning computer and peripherals, users can also use household items accordingly for cleaning. Listed below are items available for cleaning computers or computer peripherals.

Pay special attention to components requiring designated products for cleaning as mentioned below.

- Cloth: A piece of cloth is the best tool to use when rubbing up a component. Although paper towels or tissues can be used on most hardware as well, it is recommended to use a piece of cloth.
- Water or rubbing alcohol: A piece of cloth may be somewhat moistened with water or rubbing alcohol before being rubbed on the computer. Unknown solvents may be harmful to plastic parts.
- Vacuuming dust, dirt, hair, cigarette and other particles outside of a computer can be one of the best methods of cleaning a computer. Over time these items may restrict the airflow in a computer and cause circuitry to corrode.
- Cotton swabs: Cotton swabs moistened with rubbing alcohol or water are applicable to reach areas in a keyboard, mouse and other areas.
- Foam swabs: If possible, it is better to use lint free swabs such as foam swabs.



**Note:** It is strongly recommended that the customer should shut down the system before starting to clean any single components.

### Please follow the steps below:

1. Close all application programs;
2. Close operating software;
3. Turn off power switch;
4. Remove all devices;
5. Pull out the power cable.

## **Scrap Computer Recycling**

Please inform the nearest Axiomtek distributor as soon as possible for suitable solutions in case computers require maintenance or repair; or for recycling in case computers are out of order or no longer in use.

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## SECTION 1 INTRODUCTION



This chapter contains general information and detailed specifications of the AIE900-902-FL. Chapter 1 includes the following sections:

- General Description
- System Specifications
- Dimensions
- I/O Outlets
- Packing List
- Model List

### 1.1 General Description

The AIE900-902-FL is an embedded system that comes with the NVIDIA® Jetson AGX Xavier™ Series supercomputer on a module to support Linux Ubuntu 18.04, suitable for the most enduring operation. The system features a fanless design, full feature I/O, as well as one 32GB 256-Bit LPDDR4x memory. It also delivers impressive system dependability enhanced by a built-in Watchdog Timer.

#### ● Features

1. NVIDIA® Jetson AGX Xavier™ with 512-core Volta GPU and 64 Tensor cores
2. High AI computing performance for GPU accelerated processing
3. Ideal for advanced edge intelligence applications, AGV, AMR, and computer vision
4. Supports an M.2 NVMe PCIe 3.0 x4 SSD slot
5. Wide operating temperature range from -30°C to +50°C
6. JetPack supported

- **Reliable and Stable Design**

The AIE900-902-FL adopts an advanced fanless system and supports PCIe4 NVMe through M.2 connector, which makes it perfectly suitable for operation in AI computing environments, best for deploying advanced edge applications, 3D vision guided robot, autonomous mobile robot (AMR), automated guided vehicle (AGV), and computer vision applications.

- **JetPack Supported**

The AIE900-902-FL supports JetPack 4.5.1, a NVIDIA SDK providing the most comprehensive solution for building AI applications. All Jetson modules are supported by the JetPack SDK.

JetPack SDK includes the latest Linux Driver Package (L4T) with Linux operating system and CUDA-X accelerated libraries and APIs for deep learning, computer vision, accelerated computing and multimedia development. It also includes samples, documentation, and developer tools for both host computers and developer kits, and supports higher level SDKs such as DeepStream for streaming video analytics and Isaac for robotics.

- **O.S. Supported**

The AIE900-902-FL supports Linux Ubuntu 18.04.

- **Various Storage devices supported**

For maximum storage capacity, the AIE900-902-FL supports one M.2 2280 Key M with PCI-Express 3.0 x4 connector, one swappable 2.5" SATA storage drive bay, an onboard 32GB eMMC 5.1, and one microSD interface.

## 1.2 System Specifications

### 1.2.1 Product Specification

- **NVIDIA Jetson SoM**

- NVIDIA® Jetson AGX Xavier™ SoM

- **CPU**

- 8-core Carmel ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3

- **GPU**

- 512-core NVIDIA Volta™ GPU with 64 Tensor Cores

- **Storage**

- 32GB eMMC 5.1 onboard
- One M.2 2280 M Key with PCI-Express 3.0 x4 NVMe SSD slot
- One 2.5" swappable SATA HDD/SSD drive bay, up to 9.5mm in height
- One microSD slot to support optional microSD card expansion (UHS-I compatible)

- **System Memory**

- One 32GB 256-Bit LPDDR4x onboard

- **WLAN & WWAN**

- One PCI Express Mini Card module slot to support Wi-Fi/3G/LTE/GPS modules
- One M.2 2230 Key E slot to support a Wi-Fi module

### 1.2.2 I/O System

- **Dual lockable HDMI 2.0 for display (HDMI 2.0 Resolution: up to 4096 x 2160@60Hz)**
- **Two RJ-45 connectors for 10/100/1000 Base-T Ethernet ports**
- **Four RJ-45 connectors for 10/100/1000 Base-T PoE (IEEE 802.3at; PSE), max. up to 60W**



**Note:** AIE900 is a power supply device. Two PSE devices should not be connected together, which may cause the risk of power conflict. Correctly connect PD Device or switch without PoE. If you need PoE switch, please find the switch with uplink port.

- **Two USB 2.0, two USB 3.1 Gen1 and two USB 3.1 Gen2 connectors**
- **Front-access design for ease of updating NVIDIA JetPack SDK**
  - One Micro USB connector for image flash only
  - One recovery switch
- **One microSD slot for extra storage (UHS-I compatible)**
- **One M.2 2280 Key M with PCI-Express 3.0 x4 SSD slot for extra storage**
- **One 2.5" swappable SATA HDD/SSD drive bay for extra storage (up to 9.5mm in height,)**
- **One full-size PCI Express Mini Card slot (USB + PCI Express signal)**
- **One M.2 Key E 2230 slot (USB + PCI Express signal)**
- **One power button, one reset button, and one AT/ATX switch**
- **Two indicator LEDs (System Power, M.2 Storage)**
- **Four SMA type connector openings for antenna installation**
- **One 24VDC Power phoenix type connector**

### 1.2.3 System Specification

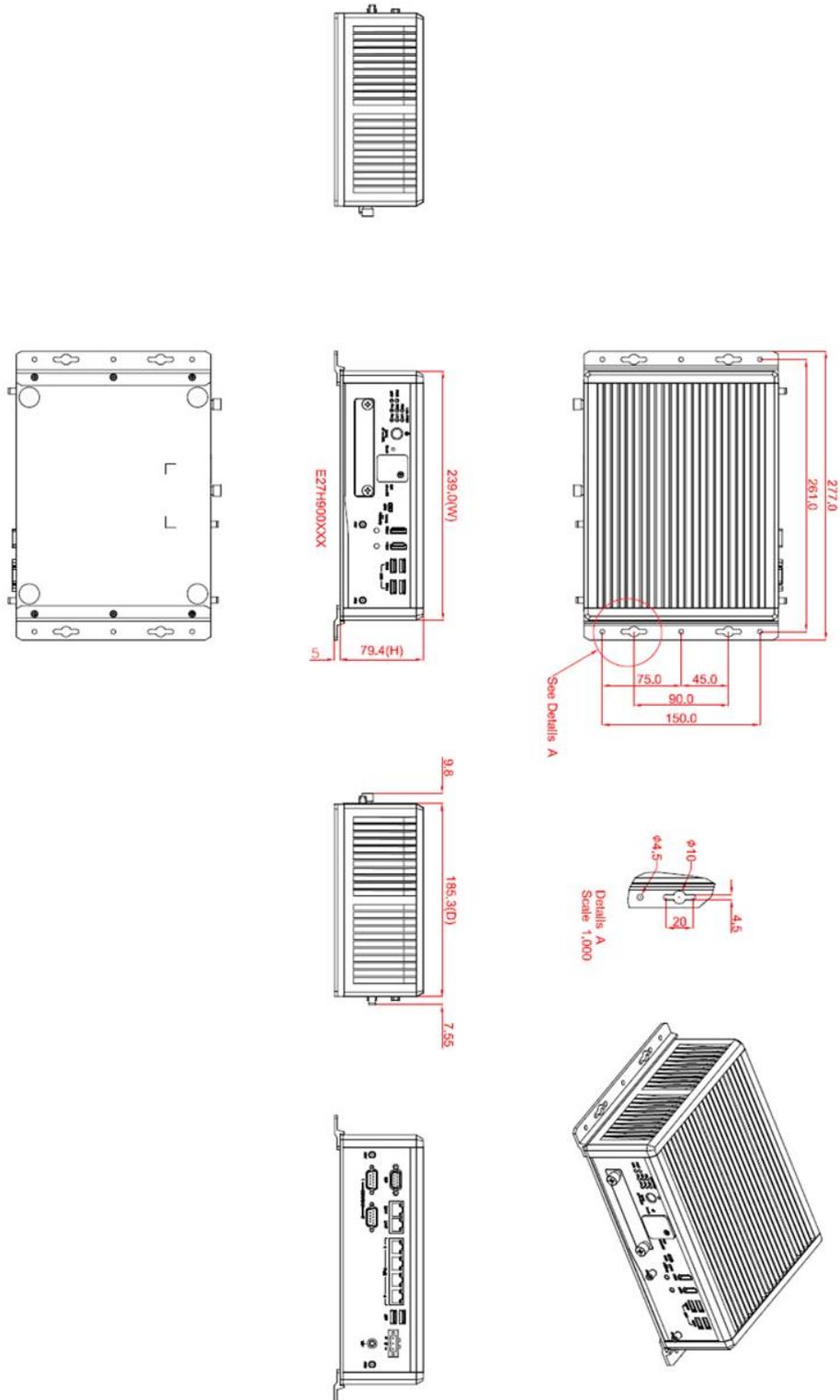
- **Watchdog Timer**
  - Built-in NVIDIA® Jetson AGX Xavier™ Series SoM
- **Power Supply**
  - Input : 24 VDC default
- **Operation Temperature**
  - -30°C to +50°C (-22°F to +122°F)
- **Humidity**
  - 10% ~ 95% (non-condensation)
- **Vibration Endurance**
  - 3Grms w/ M.2 SSD & 2.5" SSD storage (5-500Hz, X, Y, Z directions)
- **Weight**
  - 2.8kg (6.17lb) without package
  - 3.45kg (7.61lb) with package
- **Dimensions**
  - 239 mm (9.41") (W) x 185.3 mm (7.3") (D) x 79.4 mm (3.13") (H)

 **Note:** All specifications and images are subject to change without notice.

## 1.3 Dimensions

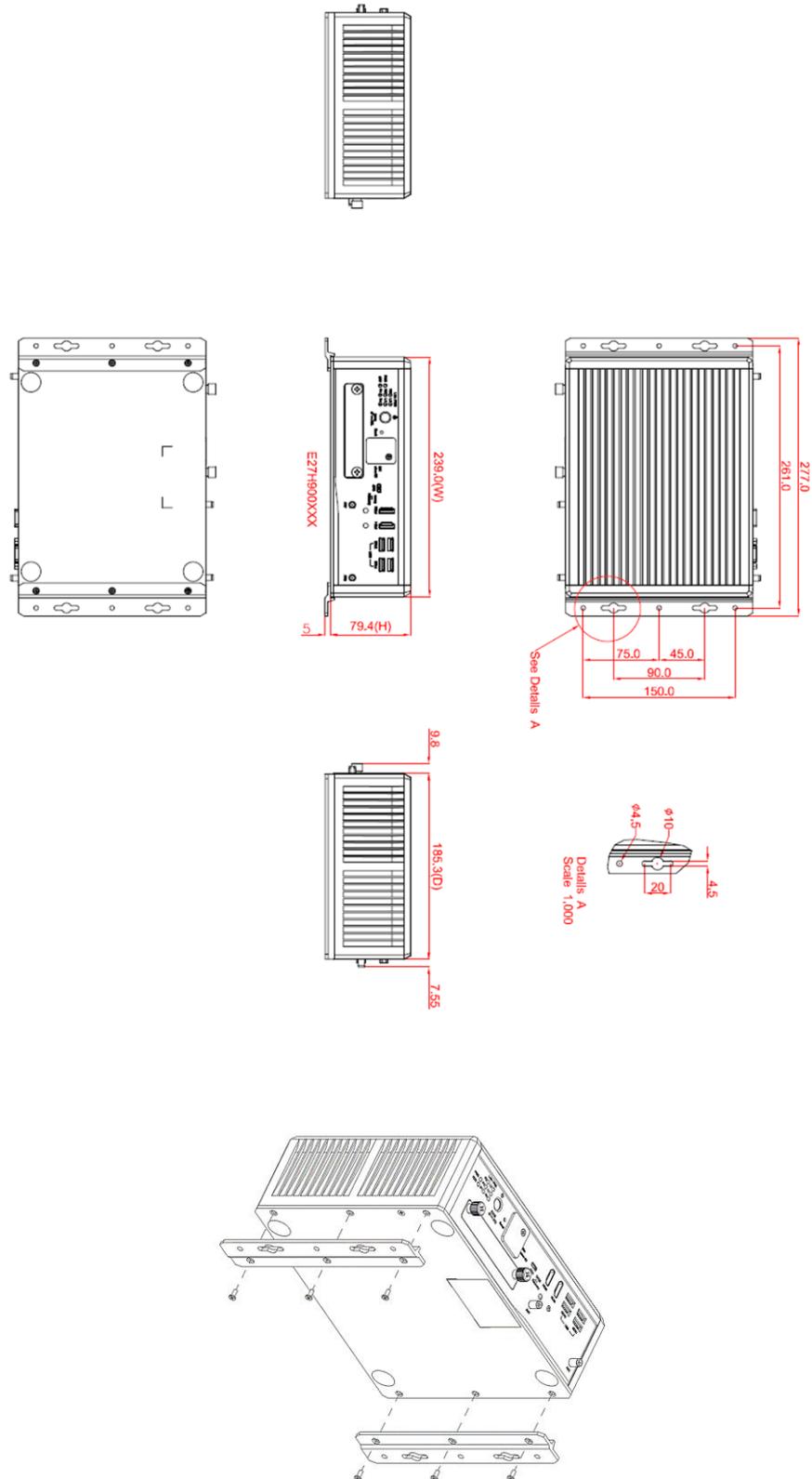
The following diagrams show you the dimensions and outlines of the AIE900-902-FL.

### 1.3.1 System Dimensions

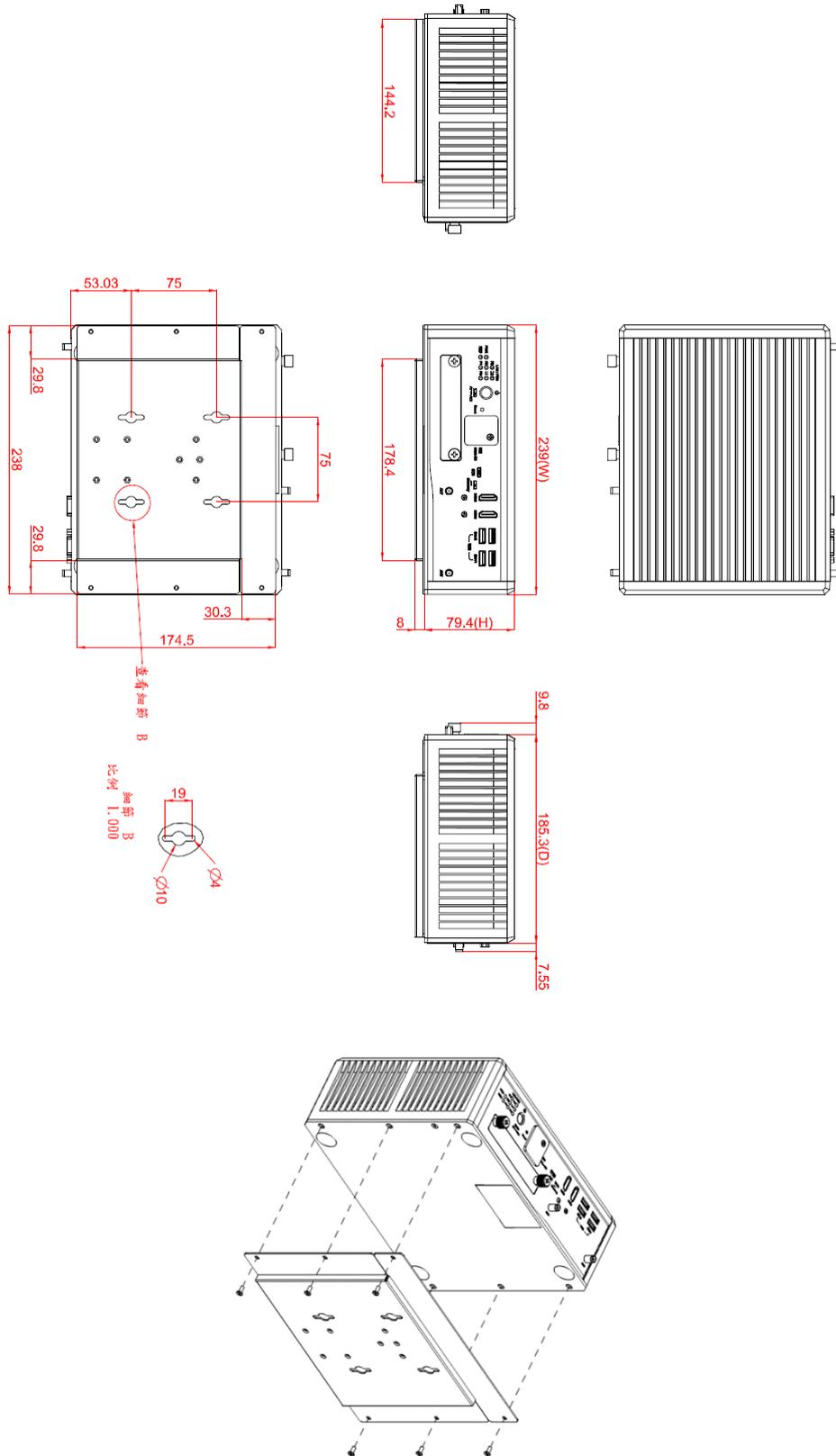


### 1.3.2 Wall Mount Bracket Dimension (Screw: M3 \*6L 6 pcs)

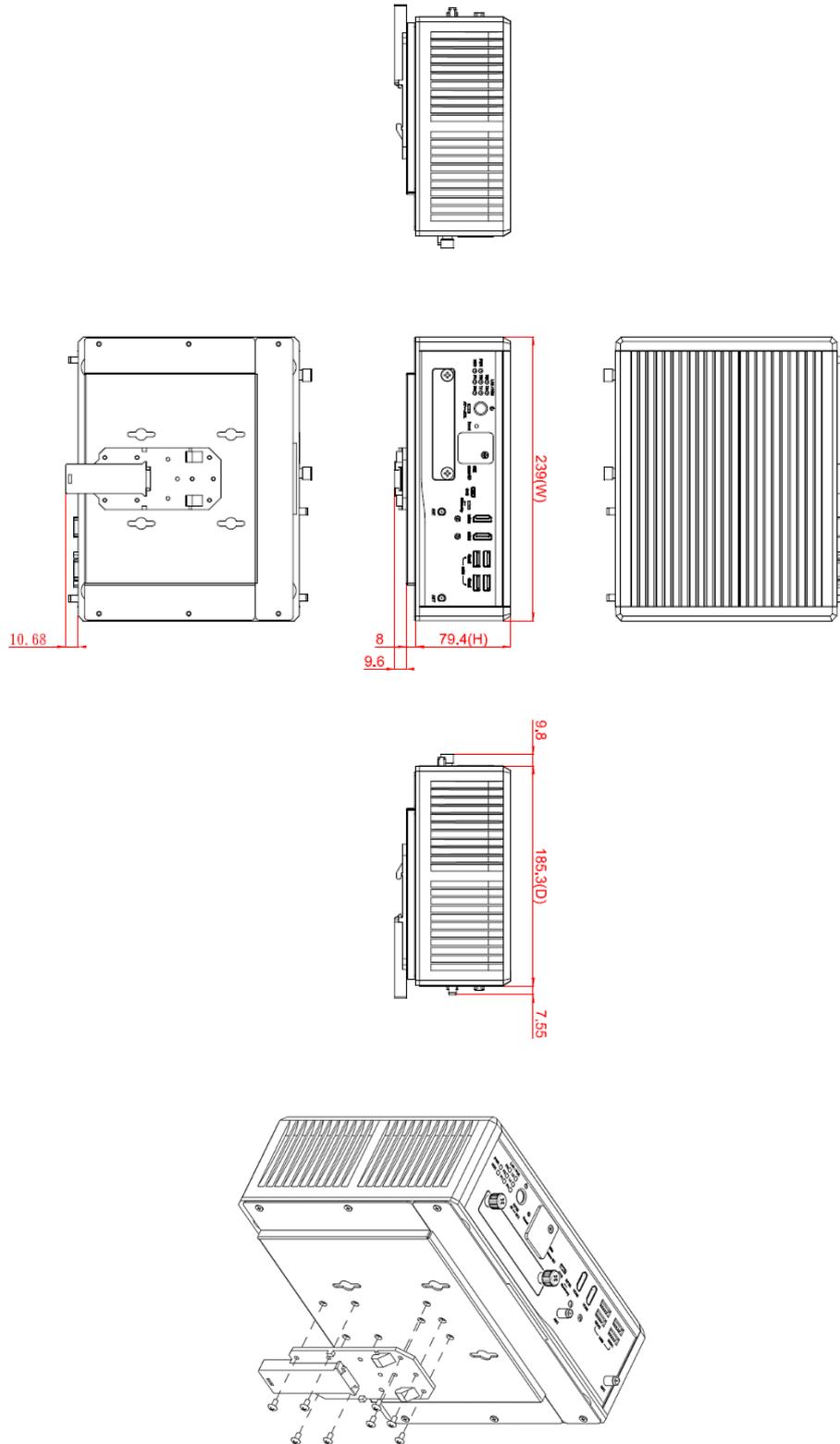
 **Mount AIE on Drywall:** Minimum screw size: M5 x 6L (Depends on the thickness of drywall)



### 1.3.3 VESA Arm Mount Bracket Dimension (Screw: M3 \*6L 6pcs)



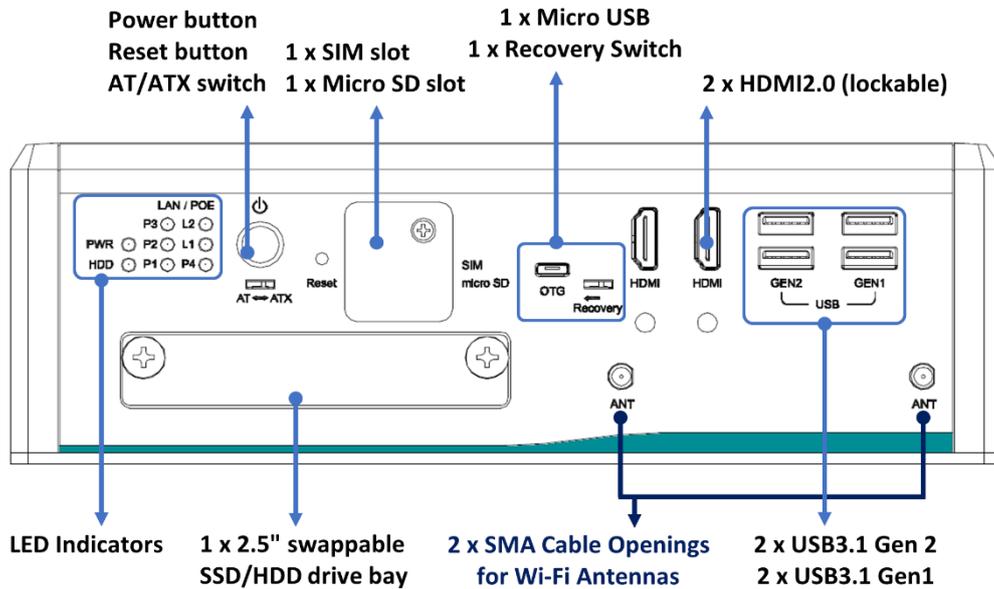
### 1.3.4 DIN-rail Mount Bracket Dimension (Screw: M3 \*6L 12 pcs)



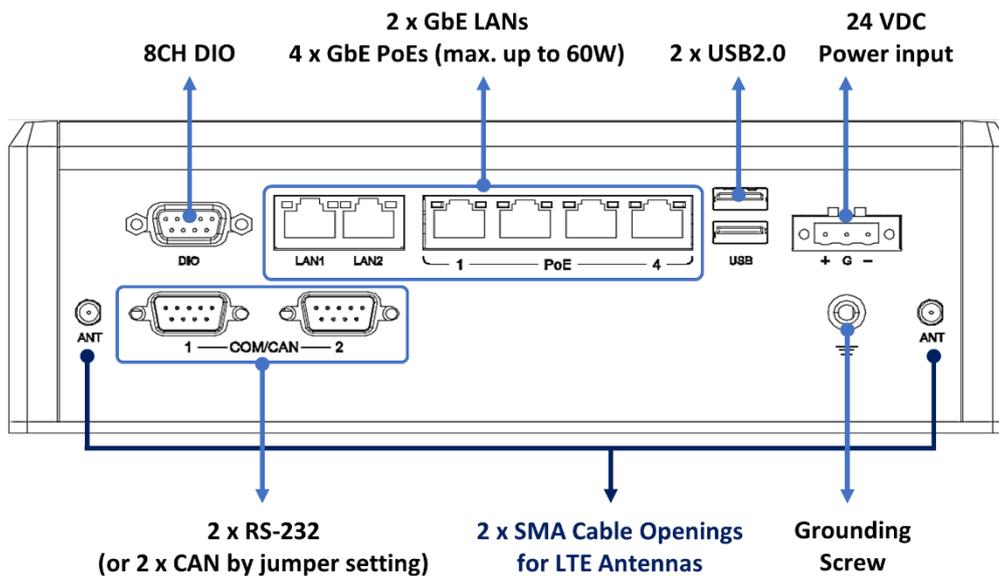
## 1.4 I/O Outlets

The following figures show you the I/O outlets on the front view of the AIE900-902-FL.

- Front View Drawing



- Rear View Drawing



## 1.5 Packing List

The package bundled with your AIE900-902-FL should contain the following items:

- **AIE900-902-FL system unit x 1**
- **Foot pad x 4**
- **Screws pack x 1**
- **Terminal block x 1**
- **M.2 SSD thermal kit x 1 (for M.2 SSD drive)**

※ Please visit Axiomtek's official website to download the latest product manual.

## 1.6 Model List

|                      |  |
|----------------------|--|
| <b>AIE900-902-FL</b> | Fanless edge AI system with NVIDIA® Jetson AGX Xavier™ SoM, 2 HDMI, 2 GbE LAN, 4 GbE PoE, 6 USB, 2 COM or 2 CAN and 8-CH DI/DO |
|----------------------|--|

Please contact Axiomtek's distributors immediately in case any of the abovementioned items is missing.

## SECTION 2 HARDWARE INSTALLATION

The AIE900-902-FL is convenient for your various hardware configurations, such as SSD (Solid State Drive), microSD card, and PCI Express Mini Card modules. Chapter 2 will show you how to install the hardware.

### 2.1 Installing the PCI Express Mini Card

**Step 1** Turn off the system, and unplug the power adaptor.

**Step 2** Turn the system upside down to locate and loosen seven screws at the bottom side, as marked by the red circles in the figure below.



**Step 3** Remove the bottom cover, and locate the PCI Express mini card slot on the board.



- Step 4** While holding the PCI Express mini card at a 45-degree angle up from the horizontal, slowly insert the golden fingers into the mini PCI Express slot, until it is fully inserted in place.



- Step 5** Press the PCI Express mini card down gently, but firmly, and then secure the mini card to the carrier by tightening up one M2 screw to the marked position.



## 2.2 Installing the M.2 Key E 2230 Wi-Fi Module

**Step 1** Turn off the system, and unplug the power adaptor.

**Step 2** Turn the system upside down to locate and loosen seven screws at the bottom side, as marked by the red circles in the figure below.



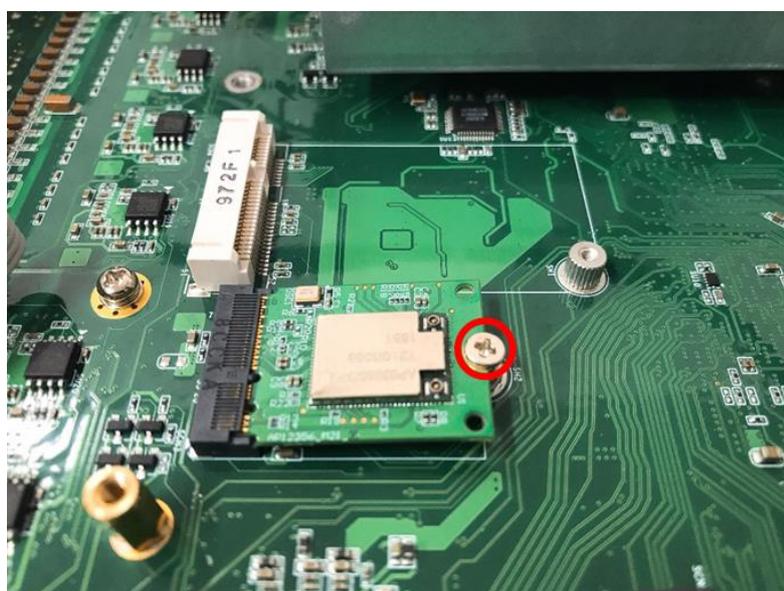
**Step 3** Remove the bottom cover, and locate the M.2 2230 Key E slot on the carrier board.



**Step 4** While holding the M.2 Key E 2230 module at a 30 degree angle up from the horizontal, slowly insert the golden fingers into the M.2 Key E 2230 slot, until it is fully inserted in place.

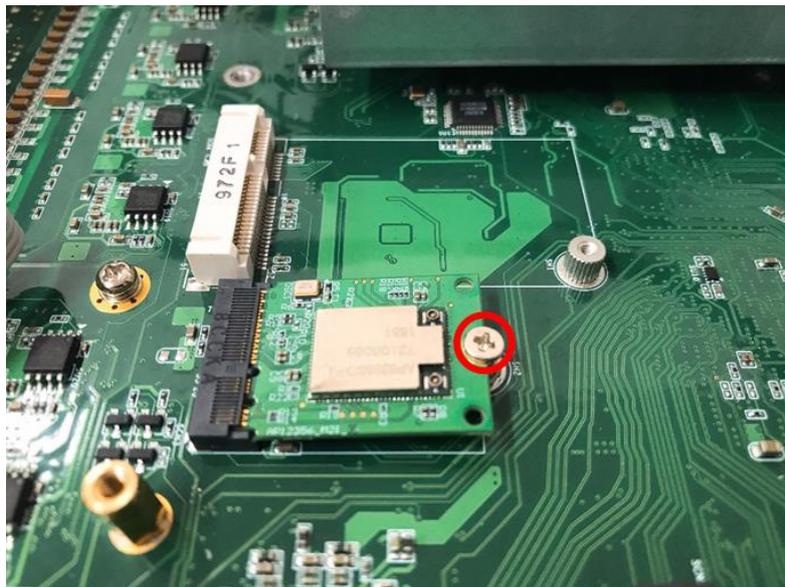


**Step 5** Press the M.2 Key E 2230 module down gently, but firmly, and then secure the module to the carrier by tightening up one M3 screw to the marked position.



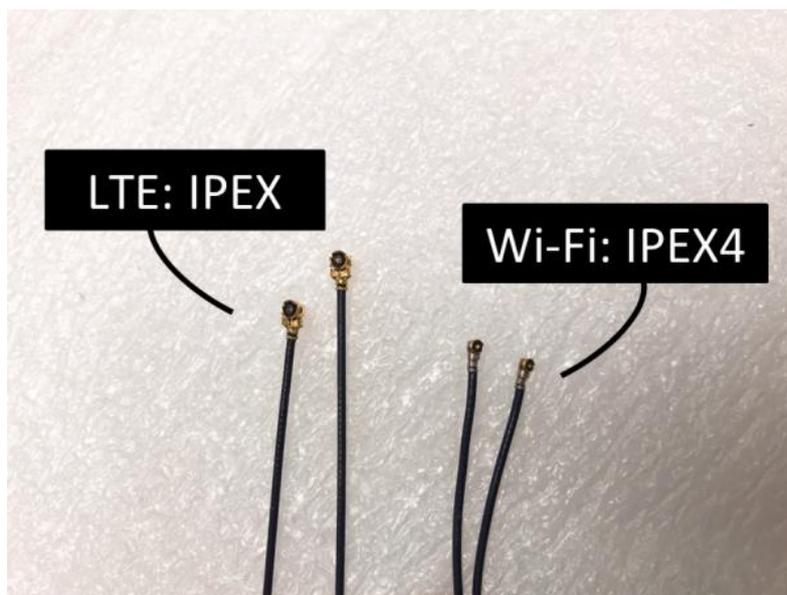
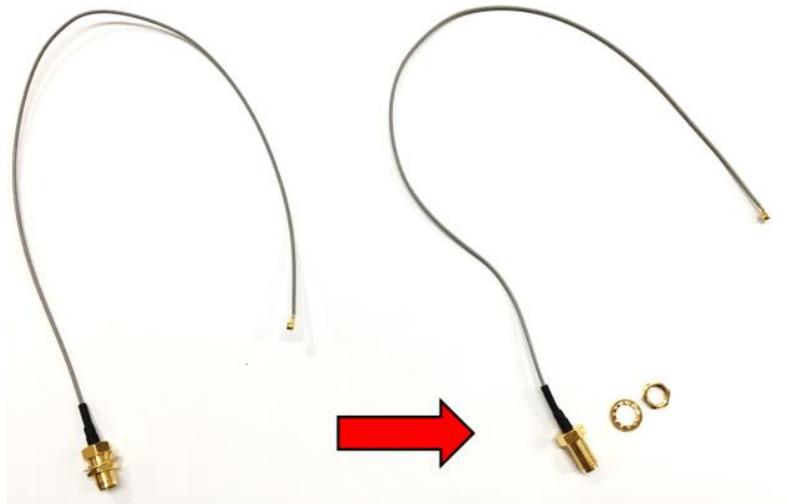
## 2.3 Installing LTE or Wi-Fi Antenna Cable

- Step 1** Install either the Mini PCIe card into the Mini PCIe slot or the M.2 Key E card into the M.2 Key E slot, and affix it with a screw. For more details, please refer to section 2.1: Installing the PCI Express Mini Card / section 2.2: Installing the M.2 Key E 2230 Wi-Fi Module.



**Step 2** Take the antenna kit out of its box, and remove the hex nut and washer from the antenna cable.

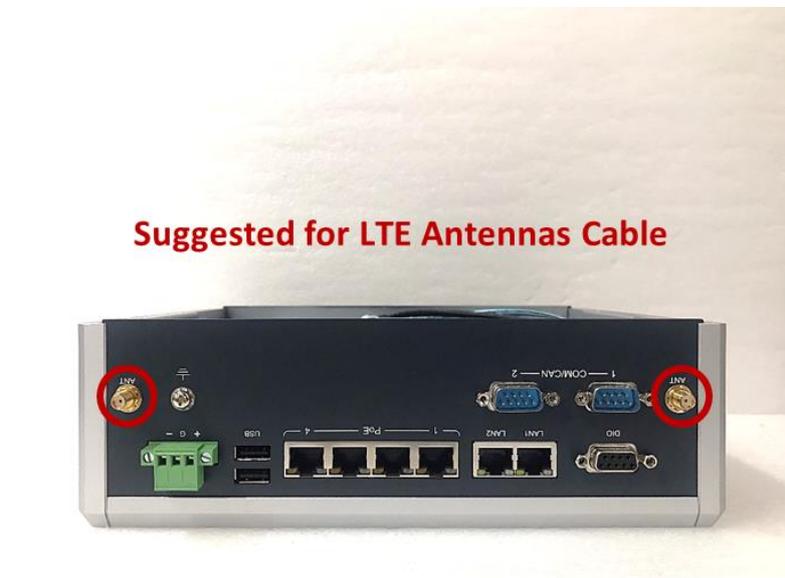
 **Note:** The LTE and Wi-Fi modules come with a different type of SMA cable, one is IPEX, and another one is IPEX4. Please do not mix them up to avoid mismatch.



**Step 3** Install the antenna cable connectors through the openings on the chassis, put the washer and Hex nut into the antenna cable connector, and then tighten them up.

**Note:** If both Wi-Fi and LTE modules are to be installed, we suggest installing the antenna cables through the openings marked in the figure below for better cable management.

- **Wi-Fi:** Through the openings at the front of the chassis
- **LTE:** Through the openings at the rear of the chassis



**Step 4** Connect the antenna cables to the PCI Express mini card or the M.2 Key E module.



## 2.4 Installing the M.2 2280 Key M SSD Drive

**Step 1** Turn off the system, and unplug the power adaptor.

**Step 2** Turn the system upside down to locate and loosen seven screws at the bottom side, as marked by the red circles in the figure below.



**Step 3** Remove the bottom cover, and locate the M.2 2280 Key M slot on the board.



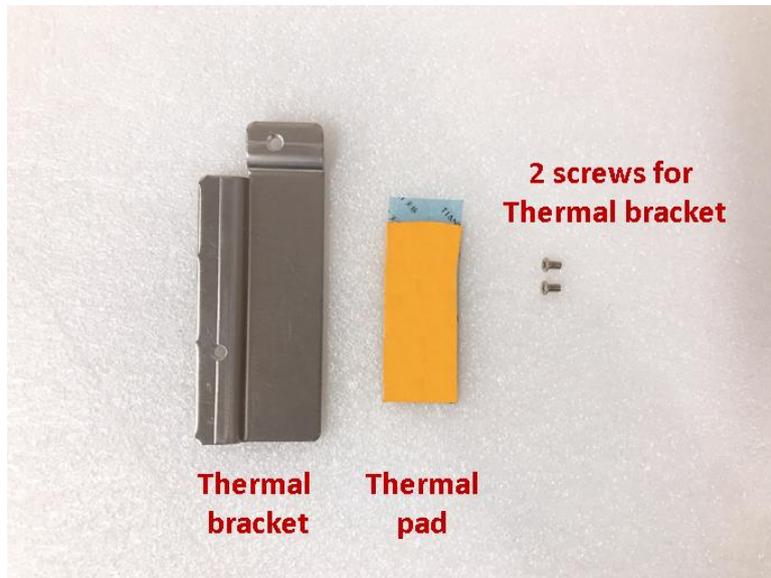
**Step 4** While holding the M.2 2280 Key M SSD drive at a 30-degree angle up from the horizontal, slowly insert the golden fingers into the M.2 2280 Key M slot, until it is fully inserted in place.



**Step 5** Press the M.2 2280 Key M SSD drive down gently, but firmly, and then secure the M.2 2280 Key M SSD drive to the carrier by tightening up one M3 screw to the marked position.

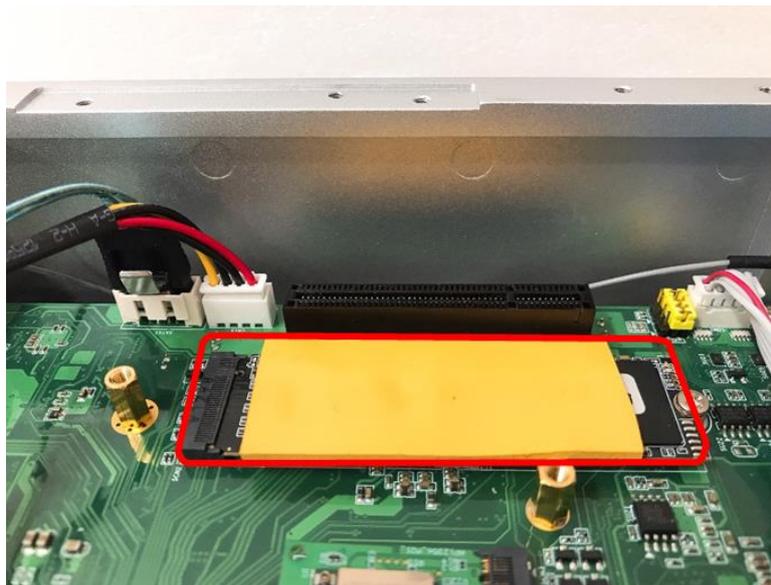


**Step 6** Take the thermal pad, thermal bracket, and two M3 screws out of the package box.



**Step 7** Apply the thermal pad on the M.2 2280 Key M SSD drive.

**Note:** Thermal Pad dimension: 66.6mm (L) x 24.5mm (W) x 2mm (H)



**Step 8** Put the M.2 thermal bracket on the thermal pad, then secure the bracket to the carrier by tightening up the two M3 screws to the marked positions.



## 2.4 Installation of 2.5" SATA Device

**Step 1** Turn off the system, and unplug the power adaptor.

**Step 2** Loosen two thumbscrews of the hard drive tray and extract the SATA hard drive tray.



**Step 3** Turn the SATA drive tray upside down to install SSD/HDD and then fasten the four black M3 x 4L SSD/HDD screws to secure the SATA drive tray.



**Step 4** Slide the SATA drive tray back into the system and fasten the thumbscrews firmly to complete the installation.

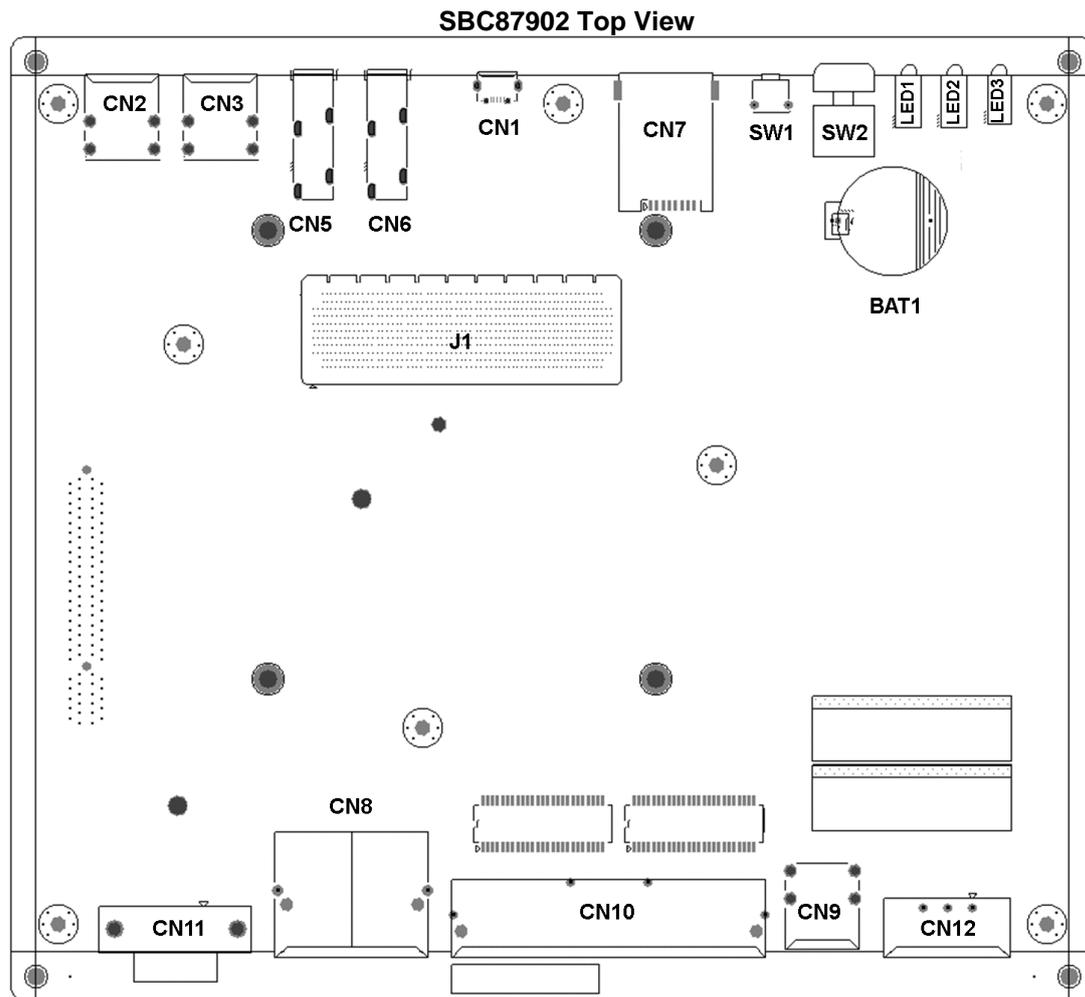


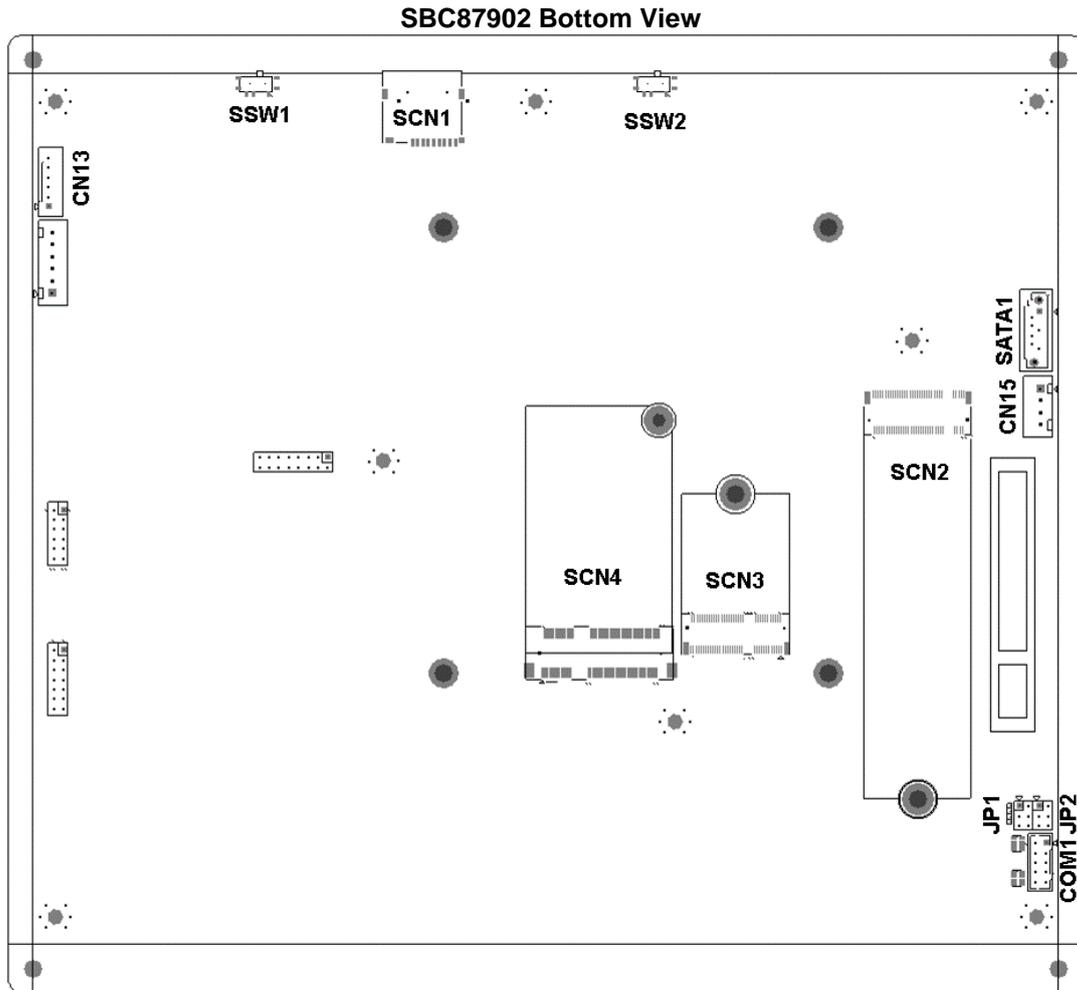
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## SECTION 3 JUMPER SETTING & CONNECTOR

Proper jumper settings configure the **AIE900-902-FL** to meet your application purpose. This section explains all jumpers and connectors as well as their default settings for onboard devices, respectively.

### 3.1 Jumper & Connector Location





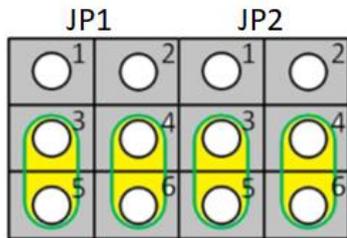
**Note:** We strongly recommended that you should not modify any unmentioned jumper setting without Axiomtek FAE's instruction. Any modification without instruction might cause damage to the system.

### 3.2 Jumper Setting Summary

Proper jumper settings configure the AIE900-902-FL to meet your application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.

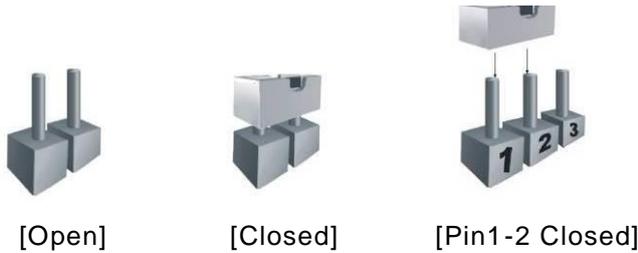
**SBC87902:**

| Jumper   | Functions                     | Settings         |   |
|----------|-------------------------------|------------------|---|
|          |                               | Port 1           | Port 2                                  |
| JP1, JP2 | COM Port or CAN Port Settings | RS-232 (default) | JP2(3-5), JP2(4-6) / JP1(3-5), JP1(4-6) |
|          |                               | CAN              | JP2(1-3), JP2(2-4) / JP1(1-3), JP1(2-4) |



**Note: How to set up Jumpers**

The illustration shows how to set up jumpers. When the jumper cap is placed on pins, the jumper is “closed”; if not, that means the jumper is “open”.



### 3.3 Connectors

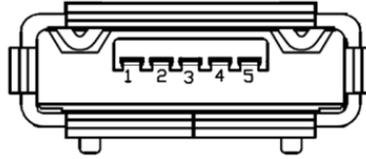
Connectors connect the board with other parts of the system. Loose or improper connection might cause problems. Make sure all connectors are properly and firmly connected. Here is a summary table showing you all connectors and buttons on the **AIE900-902-FL** Series.

| External Connectors / Buttons                       | PCB Location                | Section |
|---|-----------------------------|---------|
| Micro USB 2.0 Connector<br>(For Jetpack flash only) | CN1                         | 3.3.1   |
| USB3.1 Gen1& Gen2 Connector                         | CN2 & CN3                   | 3.3.2   |
| HDMI Connector                                      | CN5 & CN6                   | 3.3.3   |
| SIM Card Slot                                       | CN7                         | 3.3.4   |
| Ethernet / PoE Ports                                | CN8 & CN10                  | 3.3.5   |
| USB2.0 Connector                                    | CN9                         | 3.3.6   |
| Digital I/O Connector                               | CN11                        | 3.3.7   |
| DC Phoenix Power In Connector                       | CN12                        | 3.3.8   |
| Debug Port Connector                                | CN13                        | 3.3.9   |
| Serial & CAN Port Connector                         | COM / CAN 1,<br>COM / CAN 2 | 3.3.10  |
| MicroSD Slot  | SCN1                        | 3.3.11  |
| M.2 2280 Key M PCIe x4 SSD Slot                     | SCN2                        | 3.3.12  |
| M.2 2230 Key E Slot                                 | SCN3                        | 3.3.13  |
| PCI-Express Mini Card Slot                          | SCN4                        | 3.3.14  |
| Reset Button  | SW1                         | 3.3.15  |
| Power Button  | SW2                         | 3.3.16  |
| AT/ATX Switch                                       | SSW1                        | 3.3.17  |
| Recovery Mode Switch                                | SSW2                        | 3.3.18  |
| CMOS Battery Interface                              | BAT1                        | 3.3.19  |
| LAN and PoE LED Indicator                           | LED1, LED2                  | 3.3.20  |
| Power and Storage LED Indicator                     | LED3                        | 3.3.21  |

### 3.3.1 Micro USB 2.0 Connector (Micro USB) (CN1)

The SCN4 is specifically designed for image flashing only. To flash Jetpack, please switch SSW2 to ON before booting up the system, which would force the system to recovery mode.

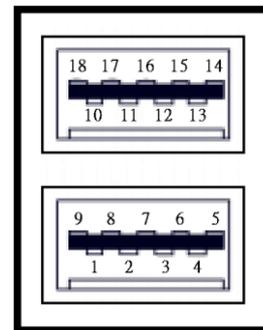
| Pin | Signal  |
|-----|---------|
| 1   | +5V     |
| 2   | USB0 DN |
| 3   | USB0 DP |
| 4   | NC      |
| 5   | GND     |



### 3.3.2 USB3.1 Gen1& Gen2 Connector (CN2, CN3)

The Universal Serial Bus connectors are compliant with USB 3.1 Gen1 (5Gbps) (CN2) and Gen2 (10Gbps) (CN3), ideal for installing USB peripherals such as the keyboard, mouse, scanner, etc.

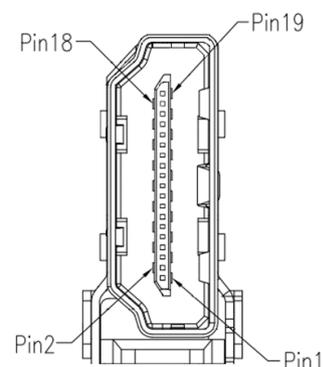
| Pin | Signal      | Pin | Signal      |
|-----|-------------|-----|-------------|
| 1   | 5V_USB1     | 10  | 5V_USB2     |
| 2   | USB1_D-     | 11  | USB2_D-     |
| 3   | USB1_D+     | 12  | USB2_D+     |
| 4   | GND         | 13  | GND         |
| 5   | USB_SS1_RX- | 14  | USB_SS2_RX- |
| 6   | USB_SS1_RX+ | 15  | USB_SS2_RX+ |
| 7   | GND         | 16  | GND         |
| 8   | USB_SS1_TX- | 17  | USB_SS2_TX- |
| 9   | USB_SS1_TX+ | 18  | USB_SS2_TX+ |



### 3.3.3 HDMI Connector (CN5 & CN6)

The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable.

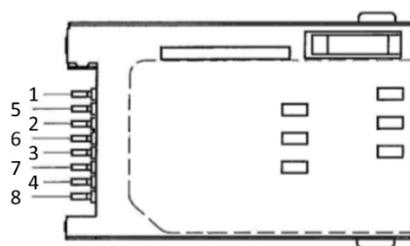
| Pin | Signal       | Pin | Signal       |
|-----|--------------|-----|--------------|
| 1   | HDMI1_DATA2+ | 2   | GND          |
| 3   | HDMI1_DATA2- | 4   | HDMI1_DATA1+ |
| 5   | GND          | 6   | HDMI1_DATA1- |
| 7   | HDMI1_DATA0+ | 8   | GND          |
| 9   | HDMI1_DATA0- | 10  | HDMI1_CLK+   |
| 11  | GND          | 12  | HDMI1_CLK-   |
| 13  | NC           | 14  | NC           |
| 15  | HDMI1_SCL    | 16  | HDMI1_SDA    |
| 17  | GND          | 18  | +5V          |
| 19  | HDMI_HTPLG   |     |              |



### 3.3.4 SIM Card Slot (CN7)

AIE900-902-FL comes with one SIM card slot (CN7) for inserting a SIM card. In order for the system to work properly, the SIM card must be used together with a 3G/LTE module, which would be inserted to the PCI-Express Mini Card connector (SCN4). It is mainly used for 3G/LTE wireless network applications.

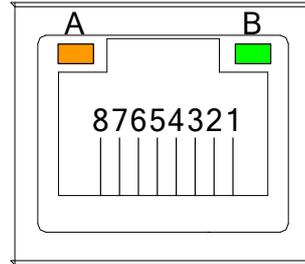
| Pin | Signal  | Pin | Signal   |
|-----|---------|-----|----------|
| 1   | UIM PWR | 5   | GND      |
| 2   | UIM RST | 6   | UIM VPP  |
| 3   | UIM CLK | 7   | UIM DATA |
| 4   | GND     | 8   | GND      |



### 3.3.5 Ethernet / PoE Ports (CN8, CN10)

The AIE900-902-FL comes with six RJ-45 connectors: CN8 (Intel® I210-IT) and CN10 (Intel® I210-IT). Two GbE ports are CN8, and four GbE PoE ports (non-isolated) are CN10, which is compliant with IEEE 802.3at class 4, and the total power budget is 60 Watts for 4 channels PoE maximum.

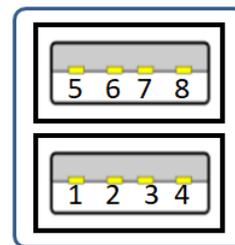
| CN8 |                                 | CN10 (PoE, PSE) |
|-----|---------------------------------|-----------------|
| Pin | Signal                          |                 |
| 1   | Tx+(Data transmission positive) |                 |
| 2   | Tx-(Data transmission negative) |                 |
| 3   | Rx+(Data reception positive)    |                 |
| 4   | RJ-1(For 1000 base T-Only)      |                 |
| 5   | RJ-1(For 1000 base T-Only)      |                 |
| 6   | Rx- (Data reception negative)   |                 |
| 7   | RJ-1(For 1000 base T-Only)      |                 |
| 8   | RJ-1(For 1000 base T-Only)      |                 |
| A   | Active LED                      |                 |
| B   | Speed LED (1000M / 100M)        |                 |



### 3.3.6 USB2.0 Connector (CN9)

The Universal Serial Bus connectors are compliant with USB 2.0 (480Mbps), ideal for installing USB peripherals such as the keyboard, mouse, scanner, etc.

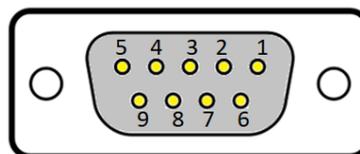
| Pin | Signal  | Pin | Signal  |
|-----|---------|-----|---------|
| 1   | 5V_USB1 | 5   | 5V_USB2 |
| 2   | USB1_D- | 6   | USB2_D- |
| 3   | USB1_D+ | 7   | USB2_D+ |
| 4   | GND     | 8   | GND     |



### 3.3.7 Digital I/O Connector (CN11)

The AIE900-902-FL supports one 8-Channel digital I/O connector. The digital I/O is controlled via software programming.

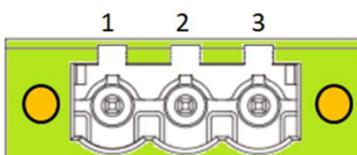
| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | DIO1   | 2   | DIO2   |
| 3   | DIO3   | 4   | DIO4   |
| 5   | DIO5   | 6   | DIO6   |
| 7   | DIO7   | 8   | DIO8   |
| 9   | GND    |     |        |



### 3.3.8 DC Phoenix Power In Connector (CN12)

The system supports a 24V Phoenix DC-in connector for system power input.

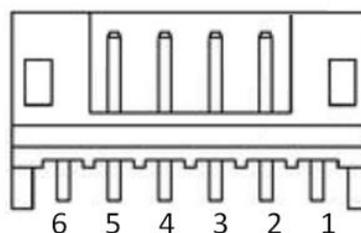
| Pin | Signal |
|-----|--------|
| 1   | DC+    |
| 2   | GND    |
| 3   | DC-    |



### 3.3.9 Debug Port Connector (CN13)

The CN13 is UART interface (UART Port3) for debug port when developing software.

| Pin | Signal         |
|-----|----------------|
| 1   | Reserved       |
| 2   | Reserved       |
| 3   | GND            |
| 4   | GND            |
| 5   | UART3_Debug_RX |
| 6   | UART3_Debug_TX |

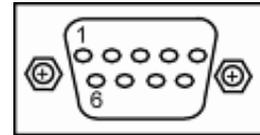


### 3.3.10 Serial & CAN Port Connector (COM/ CAN 1, COM/ CAN 2)

AIE900-902-FL supports two serial ports or two CAN-bus ports, or one serial port and one CAN-bus port, which are shared by the same DB9 ports. Users can select either COM or CAN-bus by configuring the jumper setting: JP1 and JP2. For more details, please refer to 3.2 Jumper Setting Summary.

**Note:** The source of COM signals comes from the UART signals generated by NVIDIA® Jetson AGX Xavier™. According to NVIDIA official definition, the COM device name mapping is as follows: COM1 corresponds to “ttyTHS0”, and COM2 corresponds to “ttyTHS4”.

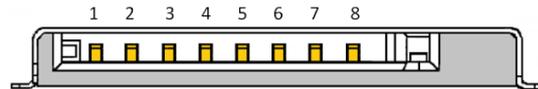
| Pin | Signal                    | Pin | Signal                       |
|-----|---------------------------|-----|------------------------------|
| 1   | NC                        | 5   | GND, ground                  |
| 2   | RXD, Receive data / CAN_L | 6   | NC                           |
| 3   | TXD, Transmit data        | 7   | RTS, Request to send / CAN_H |
| 4   | NC                        | 8   | CTS, Clear to send           |
| 9   | NC                        |     |                              |



### 3.3.11 MicroSD Slot (SCN1)

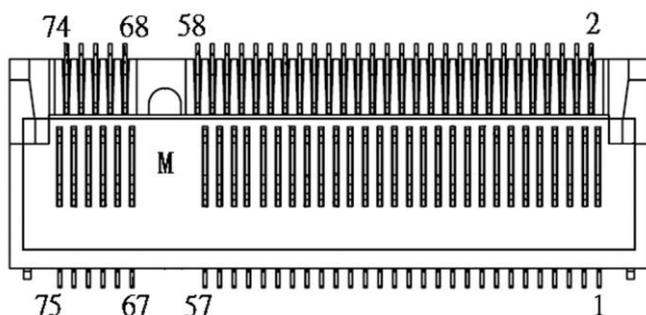
The Micro Secure Digital (SD) is a flash memory card format used in portable devices including notebooks and digital cameras.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1   | DATA1  | 5   | +3.3VS |
| 2   | DATA0  | 6   | CMD    |
| 3   | GND    | 7   | DATA3  |
| 4   | CLK    | 8   | DATA2  |



### 3.3.12 M.2 2280 Key M PCIe x4 SSD slot (SCN2)

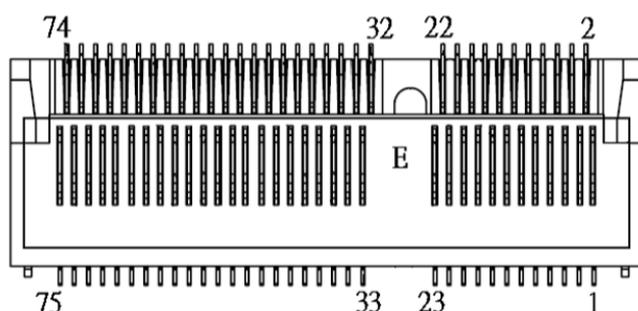
The AIE900-902-FL comes with one M.2 2280 Key M PCI-Express 3.0 x4 NVMe SSD slot for storage.



| Pin | Signal          | Pin | Signal          | Pin | Signal          | Pin | Signal          |
|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|
| 1   | GND             | 2   | +3.3V           | 3   | GND             | 4   | +3.3V           |
| 5   | PEX3_RX-        | 6   | NC              | 7   | PEX3_RX+        | 8   | NC              |
| 9   | GND             | 10  | LED_1#          | 11  | PEX3_TX-        | 12  | +3.3V           |
| 13  | PEX3_TX+        | 14  | +3.3V           | 15  | GND             | 16  | +3.3V           |
| 17  | PEX2_RX-        | 18  | +3.3V           | 19  | PEX2_RX+        | 20  | NC              |
| 21  | GND             | 22  | NC              | 23  | PEX2_TX-        | 24  | NC              |
| 25  | PEX2_TX+        | 26  | NC              | 27  | GND             | 28  | NC              |
| 29  | PEX1_RX-        | 30  | NC              | 31  | PEX1_RX+        | 32  | NC              |
| 33  | GND             | 34  | NC              | 35  | PEX1_TX-        | 36  | NC              |
| 37  | PEX1_TX+        | 38  | NC              | 39  | GND             | 40  | NC              |
| 41  | PEX0_RX-        | 42  | NC              | 43  | PEX0_RX+        | 44  | NC              |
| 45  | GND             | 46  | NC              | 47  | PEX0_TX-        | 48  | NC              |
| 49  | PEX0_TX+        | 50  | PERST#          | 51  | GND             | 52  | CLKREQ#         |
| 53  | PEX0_REFCLKn    | 54  | PEWAKE#         | 55  | PEX0_REFCLKp    | 56  | NC              |
| 57  | GND             | 58  | NC              | 59  | CONNECTOR Key M | 60  | CONNECTOR Key M |
| 61  | CONNECTOR Key M | 62  | CONNECTOR Key M | 63  | CONNECTOR Key M | 64  | CONNECTOR Key M |
| 65  | CONNECTOR Key M | 66  | CONNECTOR Key M | 67  | NC              | 68  | NC              |
| 69  | NC              | 70  | +3.3V           | 71  | GND             | 72  | +3.3V           |
| 73  | GND             | 74  | +3.3V           | 75  | GND             |     |                 |

### 3.3.13 M.2 2230 Key E slot (SCN3)

The AIE900-902-FL comes with one M.2 2230 Key E slot for installing a wireless module.



| Pin | Signal          | Pin | Signal          | Pin | Signal          | Pin | Signal          |
|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|
| 1   | GND             | 2   | +3.3V           | 3   | USB_D+          | 4   | +3.3V           |
| 5   | USB_D-          | 6   | NC              | 7   | GND             | 8   | NC              |
| 9   | NC              | 10  | NC              | 11  | NC              | 12  | NC              |
| 13  | NC              | 14  | NC              | 15  | NC              | 16  | NC              |
| 17  | NC              | 18  | GND             | 19  | NC              | 20  | NC              |
| 21  | NC              | 22  | NC              | 23  | NC              | 24  | CONNECTOR KEY E |
| 25  | CONNECTOR KEY E | 26  | CONNECTOR KEY E | 27  | CONNECTOR KEY E | 28  | CONNECTOR KEY E |
| 29  | CONNECTOR KEY E | 30  | CONNECTOR KEY E | 31  | CONNECTOR KEY E | 32  | NC              |
| 33  | GND             | 34  | NC              | 35  | PETp0           | 36  | NC              |
| 37  | PETn0           | 38  | NC              | 39  | GND             | 40  | NC              |
| 41  | PERp0           | 42  | NC              | 43  | PERn0           | 44  | NC              |
| 45  | GND             | 46  | NC              | 47  | REFCLKp0        | 48  | NC              |
| 49  | REFCLKn0        | 50  | NC              | 51  | GND             | 52  | PERST0#         |
| 53  | CLKREQ0#        | 54  | W_DISABLE2#     | 55  | PEWAKE0#        | 56  | W_DISABLE1#     |
| 57  | GND             | 58  | I2C_DATA        | 59  | NC              | 60  | I2C_CLK         |
| 61  | NC              | 62  | ALERT#          | 63  | GND             | 64  | NC              |
| 65  | NC              | 66  | NC              | 67  | NC              | 68  | NC              |
| 69  | GND             | 70  | NC              | 71  | NC              | 72  | +3.3V           |
| 73  | NC              | 74  | +3.3V           | 75  | GND             |     |                 |

\* W\_DISABLE2# is controlled by GPIO26 (Pin.H51) of AGX Xavier.

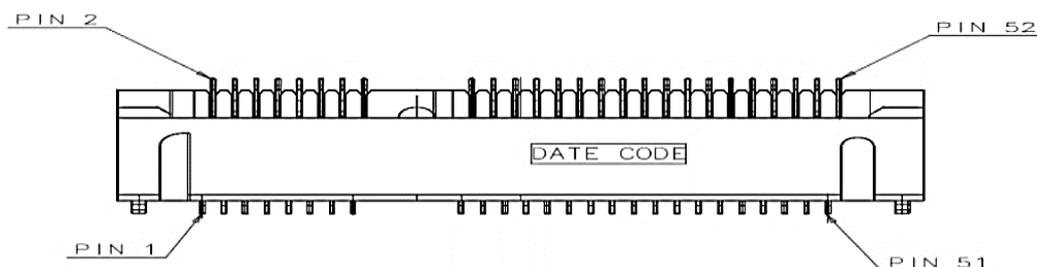
\* W\_DISABLE1# is controlled by GPIO01 (Pin.J4) of AGX Xavier.

\* PEWAKE0# is connected to SPI3\_CLK (Pin.F55) of AGX Xavier.

\* ALERT# is controlled by GPIO30 (Pin.B55) of AGX Xavier.

### 3.3.14 PCI-Express Mini Card Slot (SCN4)

The AIE900-902-FL supports a full-size PCI-Express Mini Card slot. SCN4 is applying to either PCI-Express or USB 2.0 signal, and complies with PCI-Express Mini Card Spec. V1.2.



| Pin | Signal   | Pin | Signal    | Pin | Signal   | Pin | Signal           |
|-----|----------|-----|-----------|-----|----------|-----|------------------|
| 1   | WAKE#    | 2   | +3.3V     | 3   | NC       | 4   | GND              |
| 5   | NC       | 6   | +1.5V     | 7   | CLKREQ#  | 8   | UIM_PWR          |
| 9   | GND      | 10  | UIM_DATA  | 11  | REFCLK-  | 12  | UIM_CLK          |
| 13  | REFCLK+  | 14  | UIM_RESET | 15  | GND      | 16  | UIM_VPP          |
| 17  | NC       | 18  | GND       | 19  | NC       | 20  | Pull up to +3.3V |
| 21  | GND      | 22  | PERST#    | 23  | PEX2_RX- | 24  | +3.3V            |
| 25  | PEX2_RX+ | 26  | GND       | 27  | GND      | 28  | +1.5V            |
| 29  | GND      | 30  | NC        | 31  | PEX2_TX- | 32  | NC               |
| 33  | PEX2_TX+ | 34  | GND       | 35  | GND      | 36  | USB2.0_D-        |
| 37  | GND      | 38  | USB2.0_D+ | 39  | +3.3V    | 40  | GND              |
| 41  | +3.3V    | 42  | LED_WWAN# | 43  | GND      | 44  | NC               |
| 45  | NC       | 46  | NC        | 47  | NC       | 48  | +1.5V            |
| 49  | NC       | 50  | GND       | 51  | NC       | 52  | +3.3V            |

### 3.3.15 Reset Button (SW1)

The reset button can allow users to reset AIE900-902-FL if the system experiences a problem that prevents it from working properly.

| Function | Description        |
|----------|--------------------|
| ON       | Reset System       |
| OFF      | Keep system status |



### 3.3.16 Power Button (SW2)

The power button can allow users to either turn on the AIE900-902-FL or forcibly shut down the system.

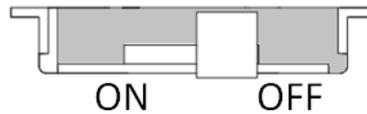
| Function | Description                   |
|----------|-------------------------------|
| ON       | Turn on system                |
| OFF      | Forcibly shut down the system |



### 3.3.17 AT/ATX Switch (SSW1)

If you turn OFF the SSW1, the system will be automatically power on without pressing the soft power button during power input. We can use this switch to achieve auto power on demand.

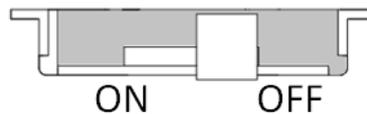
| Function | Description |
|----------|-------------|
| ON       | ATX Mode    |
| OFF      | AT mode     |



### 3.3.18 Recovery Mode Switch (SSW2)

It will make NVIDIA® Jetson AGX Xavier™ enter force recovery mode when switching SSW2 to ON before booting up the system.

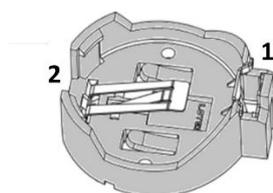
| Function | Description   |
|----------|---------------|
| ON       | Recovery Mode |
| OFF      | Normal        |



### 3.3.19 CMOS Battery Interface (BAT1)

This connector is used for CMOS battery interface.

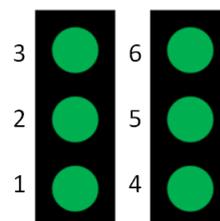
| Pin | Signal |
|-----|--------|
| 1   | +VBAT  |
| 2   | GND    |



### 3.3.20 LAN and PoE LED Indicator (LED1, LED2)

The LED1 and LED2 are linked to two LAN and four PoE ports to receive their activity signals. Both LED1 and LED2 indicate activity, which blink as long as there is activity on the port.

| LED | Description        | LED | Description        |
|-----|--------------------|-----|--------------------|
| 1   | P1 Link Active LED | 4   | P4 Link Active LED |
| 2   | P2 Link Active LED | 5   | L1 Link Active LED |
| 3   | P3 Link Active LED | 6   | L2 Link Active LED |



### 3.3.21 Power and Storage LED Indicator (LED3)

The upper green LED is linked to M.2 2280 solid state drive (SSD) to receive its activity signal. LED flashes every time SSD is accessed. The lower green LED (Power) is linked to power signal which lights up and will remain lsteady while the system is powered on.

| LED Color | Description    |
|-----------|----------------|
| Green     | M.2 SSD        |
| Green     | Power on / off |



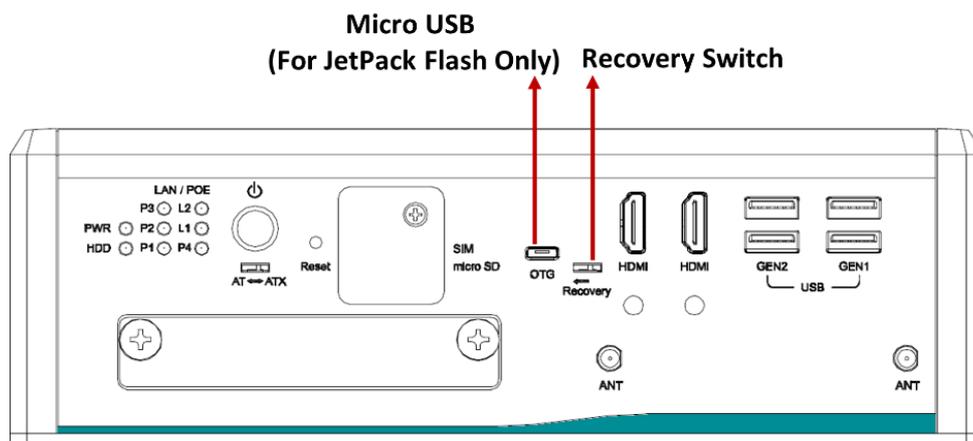
## SECTION 4

# JETPACK SDK Flash Guide

This section provides users with a detailed description of how to flash NVIDIA JetPack SDK for AIE900-902-FL. Users can follow the instructions below to install or reinstall JetPack SDK by themselves.

### 4.1 JETPACK FLASH METHOD

Please use the following instructions to flash the JetPack to the AIE900-902-FL.



Please contact our sales or FAE for the latest Jetpack SDK, and prepare a Linux host system running x86\_64 Ubuntu v16.04

**Note:** If the Linux host system is running x86\_64 Ubuntu v18.04, please follow the instructions below to install Python first.

Step 1. Connect the Linux host system to internet

Step 2. Install Python with the command below:

```
sudo apt-get update
sudo apt-get install python
```

Step1. Set up the AIE900-902-FL connection as follows:

- Connect a USB cable from the Linux host system to the Micro USB port on AIE900-902-FL, and switch the recovery switch to ON. For more details, please refer to 3.2.17 Recovery Mode Switch (SSW2).
- Connect an HDMI monitor to AIE900-902-FL.

Step2. Open the terminal at host system, and change the path to the image file directory with following commands, for example “~/Downloads”

```
$ cd ~/Downloads
$ ls imagefilename
```

 **Note:** Please type your full image name instead of imagefilename, E.g., \$ ls AGX\_Xavier\_JP4.5.1\_for\_902\_ADM\_MF\_V1.0.0.tar.gz

Step3. Untar the image file with the command below:

```
$ tar -zxvf imagefilename
```

 **Note:** Please type your full image name instead of imagefilename, E.g., \$ tar -zxvf AGX\_Xavier\_JP4.5.1\_for\_902\_ADM\_MF\_V1.0.0.tar.gz

```
[~/Downloads] $ ls AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0.tar.gz
AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0.tar.gz
[~/Downloads] $ tar -zxvf AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0.tar.gz
```

Step4. Change the directory to the image package folder with the command below:

```
$ cd imagefilename/
$ cd mfi_jetson-xavier/
```

 **Note:** Please type your full image name instead of imagefilename, E.g., \$ cd AGX\_Xavier\_JP4.5.1\_for\_902\_ADM\_MF\_V1.0.0/

```
[~/Downloads] $ cd AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0/
[~/Downloads/AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0] $ ls
mfi_jetson-xavier
[~/Downloads/AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0] $ cd mfi_jetson-xavier/
```

Step5. Make sure the recovery switch(SSW2) has been switched to ON, and run the command lsusb, then the command line “0955:7019 Nvidia Corp.” should be listed.

```
$ lsusb
```

```
[~/Downloads/AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0/mfi_jetson-xavier] $ lsusb
Bus 002 Device 002: ID 05e3:0612 Genesys Logic, Inc.
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 016: ID 0ac8:3420 Z-Star Microelectronics Corp. Venus USB2.0 Camera
Bus 001 Device 003: ID 05e3:0610 Genesys Logic, Inc. 4-port hub
Bus 001 Device 008: ID 1a40:0101 Terminus Technology Inc. Hub
Bus 001 Device 006: ID 046d:c31d Logitech, Inc. Media Keyboard K200
Bus 001 Device 004: ID 046d:c077 Logitech, Inc. M105 Optical Mouse
Bus 001 Device 002: ID 1a40:0101 Terminus Technology Inc. Hub
Bus 001 Device 025: ID 0955:7019 NVidia Corp.
Bus 001 Device 007: ID 05e3:0608 Genesys Logic, Inc. Hub
Bus 001 Device 005: ID 0bda:c811 Realtek Semiconductor Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Step6. Running the following command to flash the image.

```
$ sudo ./nvmflash.sh
```

```
[~/Downloads/AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0/mfi_jetson-xavier] $ sudo ./nvmflash.sh
Start flashing device: 1-5, PID: 14823
Ongoing processes: 14823
```

Step7. The flashing procedure takes approximately 20 minutes or more. Once finished, you should see “Flash complete (SUCCESS)” as shown below, and AIE900-902-FL will automatically reboot, and please switch the recovery switch(SSW2) to OFF to return to standard mode.

```
Ongoing processes: 14823
Ongoing processes: 14823
Ongoing processes: 14823
Ongoing processes:
Flash complete (SUCCESS)
[~/Downloads/AGX_Xavier_JP4.5.1_for_902_ADM_MF_V1.0.0/mfi_jetson-xavier] $
```

## THE DEFAULT LOGIN CREDENTIALS:

Username: nvidia      Password: nvidia

### ※CAUTION:



Running `$ sudo apt upgrade` command for NVIDIA JetPack OTA may overwrite the BSP of the AIE series platform, which can cause unexpected results including losing I/O ports. For regular JetPack updates or reflashing, please contact our sales or FAE to get the latest AIE Series JetPack image.

## 4.2 Image Information Inquiry Command

Running `axiomtek.sh` command to inquiry the current image information, image version, L4T version, Linux kernel version, and Ubuntu version.

```
nvidia@nvidia-desktop:~$ axiomtek.sh
BUILD_MODEL=Jetson-AGX
BUILD_VERSION=JetPack-4.5.1_Linux
BSP_BUILD_VERSION=V1.0.0
IMAGE_PART_NUMBER=83879022000E
BUILD_DATE=2021/06/09 09:39:14
BUILD_ID=Axiomtek
L4T_VERSION=R32-5.1
LINUX_KERNEL_VERSION=4.9.201
UBUNTU_VERSION=Ubuntu 18.04.5 LTS
```

### 4.3 JTOP — Third-party Jetson Platform Monitor Tool

JTOP is a third-party system monitoring utility that runs on the terminal and see and control realtime the status of the AIE Series Platform. CPU, RAM, GPU status, power mode management, toolkits version and more.

#### Installation Guide:

Please enter the following commands in terminal to install JTOP.

```
$ sudo python3 -m pip install jetson-stats
```

Then, it can be accessed in terminal with the command:

```
$ sudo jtop
```



**Note:** JTOP may require approximately 200 to 300 MB of storage space.

```
File Edit View Search Terminal Help
NVIDIA Jetson Xavier NX (Developer Kit Version) - Jetpack 4.4 [L4T 32.4.3]
CPU1 [||||| Schedutil - 18%] 1.4GHz CPU4 [||||| Schedutil - 17%] 1.4GHz
CPU2 [||||| Schedutil - 22%] 1.4GHz CPU5 [||||| Schedutil - 27%] 1.4GHz
CPU3 [||||| Schedutil - 16%] 1.4GHz CPU6 [||||| Schedutil - 24%] 1.4GHz

MTS FG [ 0%] BG [ 0%]
Mem [||| 0.5G/8.0GB] (lfb 872x4MB)
Swp [ 0.0GB/5.9GB] (cached 0MB)
EMC [ 1%] 1.6GHz

GPU [ 0%] 1.1GHz
Dsk [#####] 15.3GB/58.1GB

[info] [Sensor] [Temp] [Power/mW] [Cur] [Avr]
UpT: 0 days 0:35:37 AO 33.00C CPU GPU CV 1515 1356
FAN [|||||||84%] Tm=100% AUX 34.00C SOC 1063 1063
Jetson Clocks: [running] CPU 35.00C ALL 4997 4872
NV Power[2]: 15W 6CORE GPU 34.00C
[HW engines] thermal 34.30C
APE: 150MHz
NVENC: [OFF] NVDEC: [OFF]
NVJPG: [OFF]

1ALL 2GPU 3CPU 4MEM 5CTRL 6INFO Quit Raffaello Bonghi
```