



®

***AXIOMTEK***

## **eBOX800-900-FL Series**

**Embedded System**

**User's Manual**



## **Disclaimers**

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## Safety Precautions

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

1. The eBOX800-900-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 eBOX800-900-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 eBOX800-900-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.

## **Classifications**

1. Degree of protection against electric shock: not classified
2. Degree of protection against ingress of water: IP67
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

## 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 clean up the computer or any components within.
3. Avoid dropping any components inside the computer or getting 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 house hold items accordingly for cleaning. Listed below are items available for cleaning computer 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.
- Absorb 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 swaps moistened with rubbing alcohol or water are applicable to reach areas in 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 customer should shut down the system before start 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 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.

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# CHAPTER 1 INTRODUCTION



This chapter contains general information and detailed specifications of the eBOX800-900-FL. Chapter 1 consists of the following sub-sections:

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

## 1.1 General Descriptions

The eBOX800-900-FL comes with NVIDIA® JETSON™ TX2 Supercomputer on Module (SoM), utilizing a full IP67-rated aluminum die-casting and heavy-duty steel case. It supports Linux Ubuntu 16.04.

The fanless and streamlined enclosure ensures excellent heat dissipation. In addition, this reliable box pc is designed to operate under wide temperature ranges from -30°C to 60°C, under wide range of AC power input from 100 to 240 VAC and under harsh/outdoor applications with M12 lockable connectors.

- **Features**

1. IP67-rated design, specifically for outdoor environments
2. NVIDIA® JETSON™ TX2 w/ Pascal™, 256 CUDA cores GPU
3. High AI computing performance for GPU-accelerated processing
4. -30°C to +60°C wide operating temperature range
5. 100 ~ 240 VAC wide range power input with 10kV surge protection
6. 1 IEEE 802.3at Gigabit PoE (30W)
7. Flexible I/O for customized and mission-critical projects

- **Reliable and Stable Design**  
Powered by onboard quad-core processor, the eBOX800-900-FL is equipped with M12 lockable connectors while supporting wall-mount/vest-mount kit for outdoor applications.
- **O.S. Supported**  
The eBOX800-900-FL supports Linux Ubuntu 16.04.
- **Various Storage devices supported**  
For storage device, the eBOX800-900-FL supports one M.2 2280 M-Key with PCI-Express 2.0 x4 Interface (support NVMe SSD), and an onboard 32GB eMMC (via JETSON™ TX2).

## 1.2 System Specifications

### 1.2.1 Product Specification

- **CPU Board**
  - NVIDIA® JETSON™ TX2
- **CPU**
  - HMP Dual Denver 2/2 MB L2 + Quad ARM® A57/2 MB L2
- **GPU**
  - NVIDIA® Pascal™, 256 CUDA cores
- **Storage**
  - 32GB eMMC onboard
  - One M.2 2280 M-Key with PCI-Express 2.0 x4 Interface to support optional NVMe
- **System Memory**
  - One 8GB 128-bit LPDDR4 @ 1866 MHz onboard
- **WLAN & WWAN**
  - 802.11ac WLAN, Bluetooth onboard
    - ※ **Please be informed that eBOX800-900-FL WLAN Antennas are followed NVIDIA's safety certification, and both of the 5.2GHz and 5.3GHz band are for indoor only, so they would be initially disabled.**
  - 3G/LTE supports through optional Mini PCI-Express module

### 1.2.2 I/O System

- One C3 type HDMI for display (HDMI Full HD Resolution: up to 1920 x 1080)
- One M12 X-Code RJ-45 connectors for 10/100/1000 Base-T Ethernet ports (via NVIDIA® Jetson TX2)
- One M12 X-Code IEEE 802.3at Gigabit PoE (30W, Intel® I210-IT)
- One C3 type USB 2.0 connector
- One full-size PCI Express Mini Card slot (USB + PCI Express signal)
  - ※ PCIe signal is designed by jumper selection, is supports either PCIe of mini PCIe connector or LAN Intel® I210-IT. For more details, please refer to section 3.2.2: PCIe Signal Selection (JP3)
- One SIM slot
- Four Antenna openings N Jack type with water proof design
- One M12 S-Code 4-pos AC in power input

### 1.2.3 System Specification

- Watchdog Timer
  - Support the watchdog timer embedded in NVIDIA® JETSON™ TX2
- Power Supply
  - Input : 100 ~ 240 VAC
- Operation Temperature
  - -30°C ~ 60°C (-22 °F ~ 140°F)
- Storage Temperature
  - -40°C ~ 80°C (-40 °F ~ 176°F)
- Humidity
  - 10% ~ 95% (non-condensation)
- Vibration Endurance
  - 3Grms with M.2 (5-500Hz, X, Y, Z directions)
- Weight
  - 4.31 kg (9.5 lb) without package
  - 5.1 kg (11.24 lb) with package
- Dimensions
  - 210 mm (8.27") (W) x 366.83 mm (14.44") (D) x 83 mm (3.27") (H)

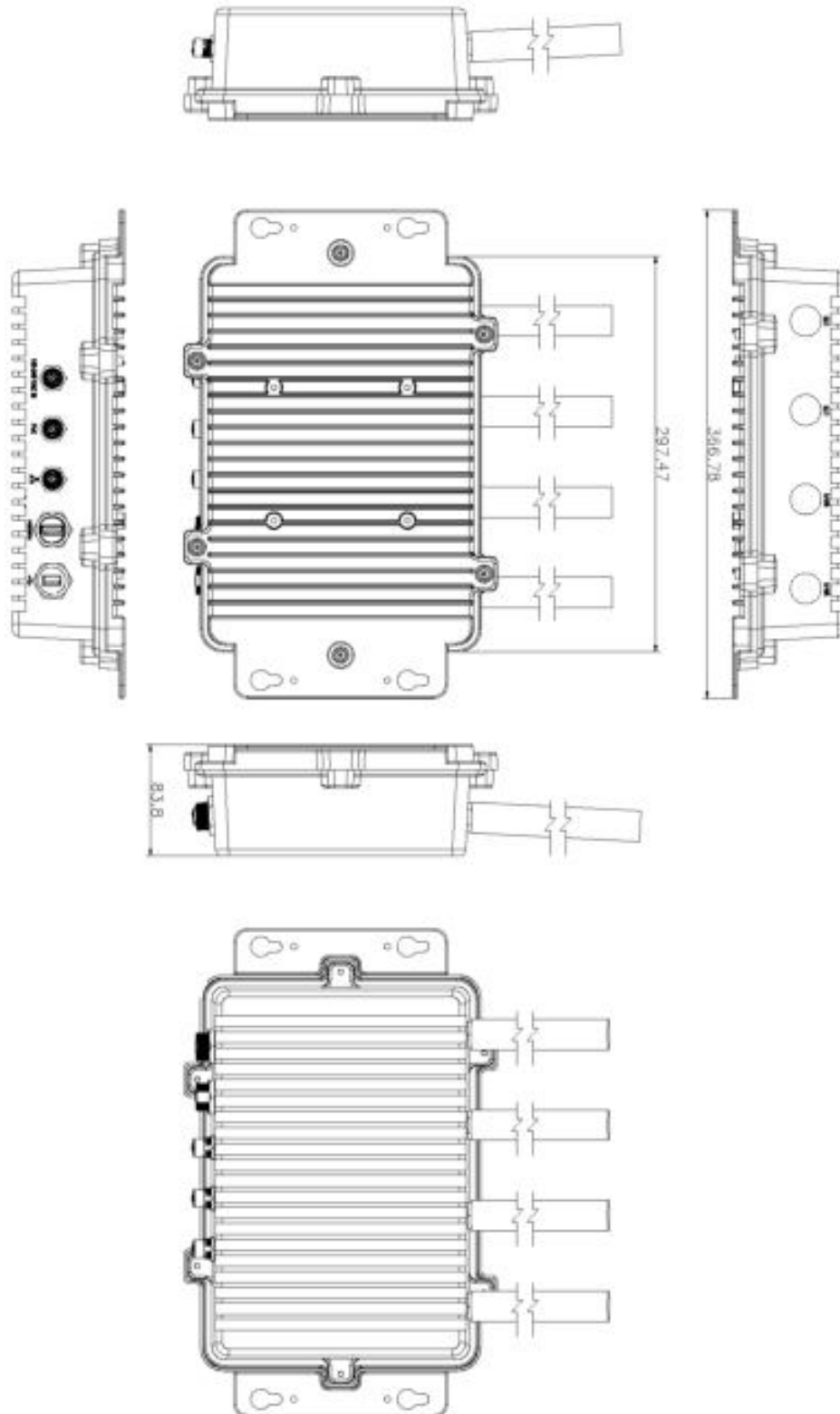


**Note:** All specifications and images are subject to change without notice.

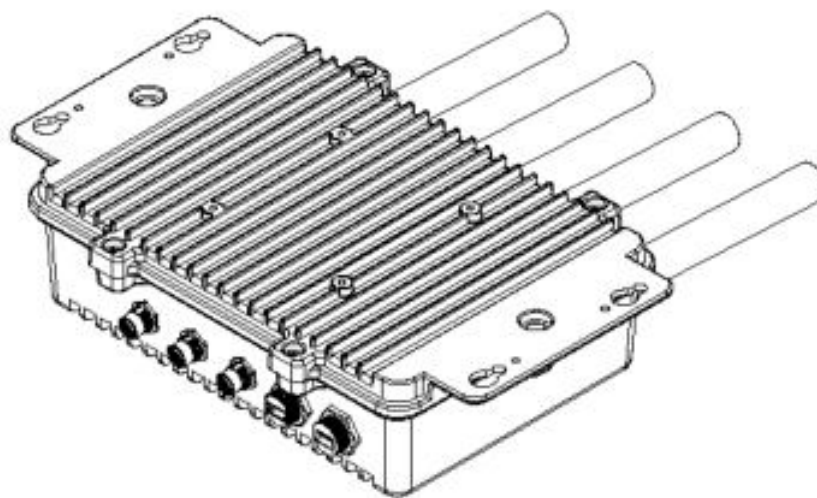
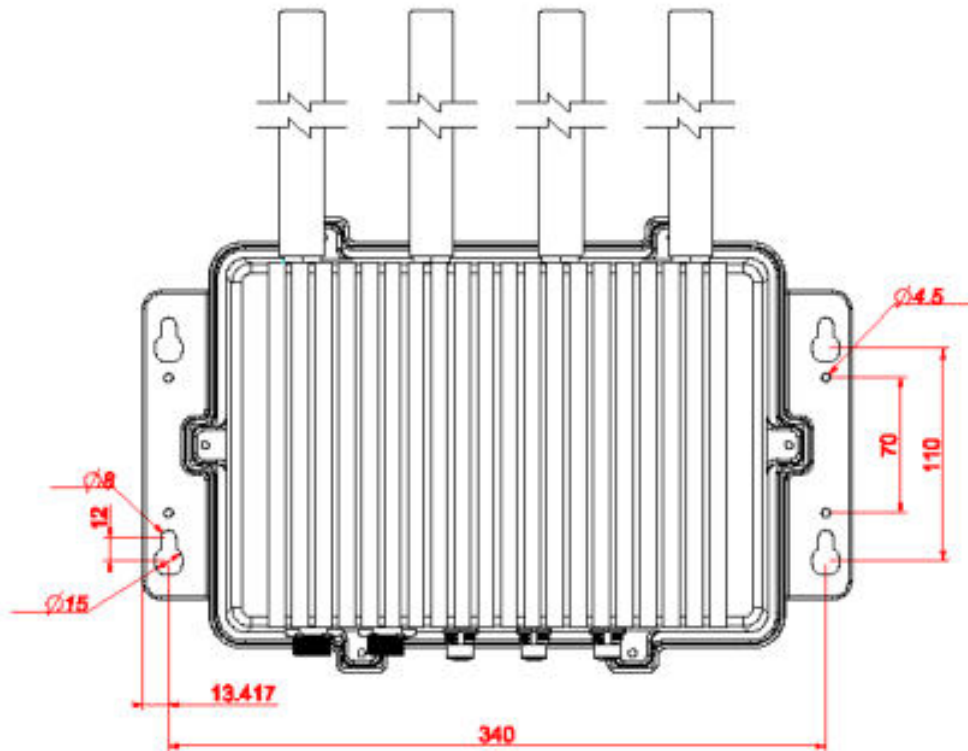
## 1.3 Dimensions

The following diagrams show dimensions and outlines of the eBOX800-900-FL.

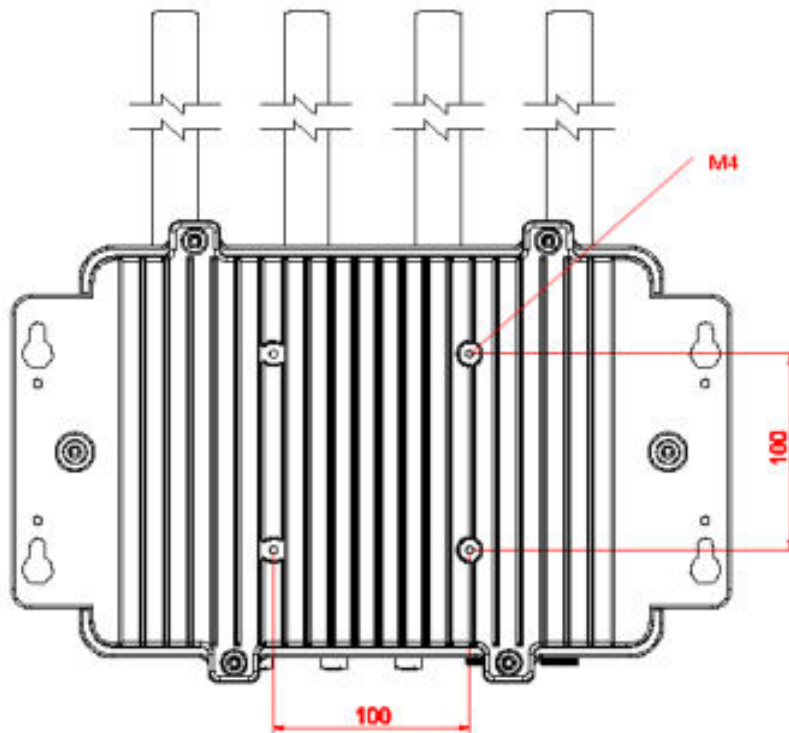
### 1.3.1 System Dimensions



### 1.3.2 Wall-mount Bracket Dimensions



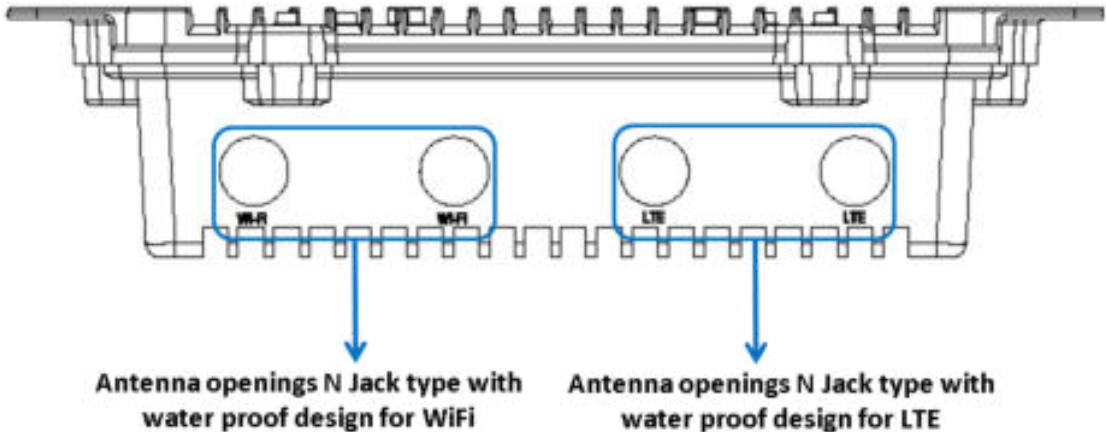
### 1.3.3 VESA-mount Bracket Dimensions



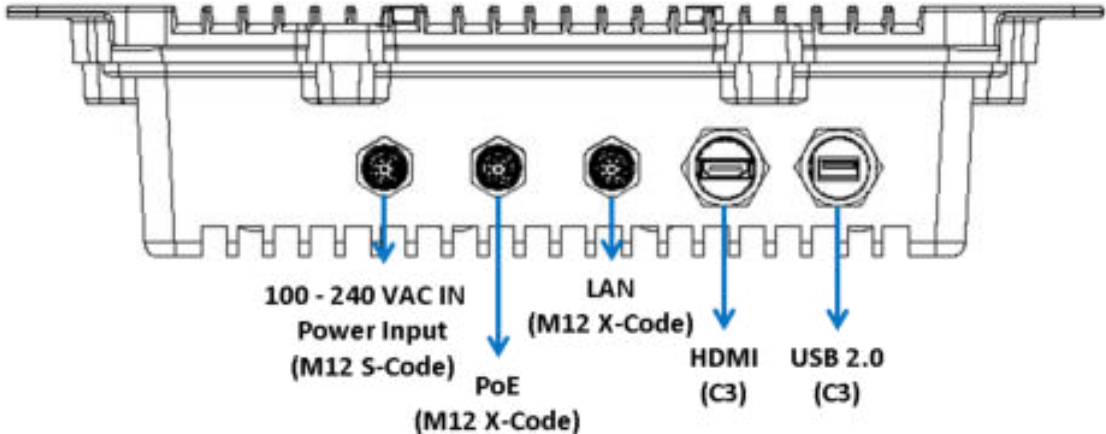
### 1.4 I/O Outlets

The following figures show I/O outlets on front of the eBOX800-900-FL.

#### Top View



#### Bottom View



## 1.5 Packing List

The package bundled with your eBOX800-900-FL should contain the following items:

- eBOX800-900-FL System Unit x 1
- eBOX800-900-FL Quick Installation Guide x 1
- Screws Pack x 1
- Antennas for WLAN x 2

※Regarding the Jetpack 3.3 image & product manual, please download them from Axiomtek official website.

## 1.6 Model List

|                |   |
|----------------|---|
| eBOX800-900-FL | Rugged IP67-rated Fanless Edge System with NVIDIA® JETSON™ TX2, 1 HDMI, 1 GbE LAN, 1-CH PoE, 1 USB 2.0 and 100 to 240 VAC Power Input |
|----------------|---|

Please contact Axiomtek's distributors immediately in case any abovementioned items are missing.



## CHAPTER 2 HARDWARE INSTALLATION

The eBOX800-900-FL is convenient for various hardware configurations, such as SSD (Solid State Drive) and PCI Express Mini card modules. Chapter 2 contains guidelines for hardware installation.

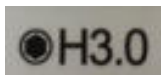
**【Note】 :**

**Waterproof capability may be affected if a system is disassembled; under such circumstances Axiomtek shall not be liable for any quality deterioration.**

**【Note】 : Please refer to tightening torque below for all system screws:**

⊙ HEX socket set screw: 7.5 kgf

HEX KEY specifications are shown below



⊙ N jack connector: 10 kgf



## 2.1 M.2 SSD Installation

- Step 1** Turn off the system and unplug the power cord.
- Step 2** Turn the system upside down to locate screws at the bottom as red marked and loosen six screws, then remove the bottom cover.



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



- Step 4** Holding the M.2 2280 Key M SSD card at a 30 degree angle up from horizontal, slowly insert the golden fingers into the M.2 2280 Key M slot until it is fully inserted in. And secure the M.2 2280 Key M SSD card to the carrier by tightening up the one M3\*4L screw to the marked position.



## 2.2 Installation of LTE Mini PCIe Module (half-size)

- Step 1** Turn off the system and unplug the power cord.
- Step 2** Turn the system upside down to locate screws at the bottom as red marked and loosen six screws, then remove the bottom cover.



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



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



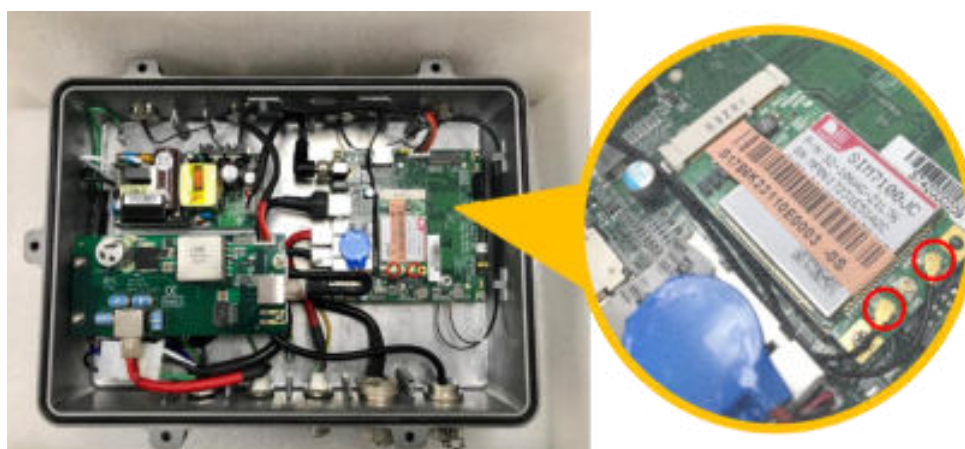
**Step 5** Press it down gently, but firmly, and then secure the PCI Express mini card to the carrier by tightening up the one M2\*5L screw to the marked position.



**Step 6** Find the SMA cables from the adhesive backed cord clip attached at the chassis as picture below.



**Step 7** Connect the SMA cables to I-PEX connector of LTE Module and install LTE Antennas. And please do not place antenna cables on the top of PCI Express mini card, in case the SMA cables would loose.

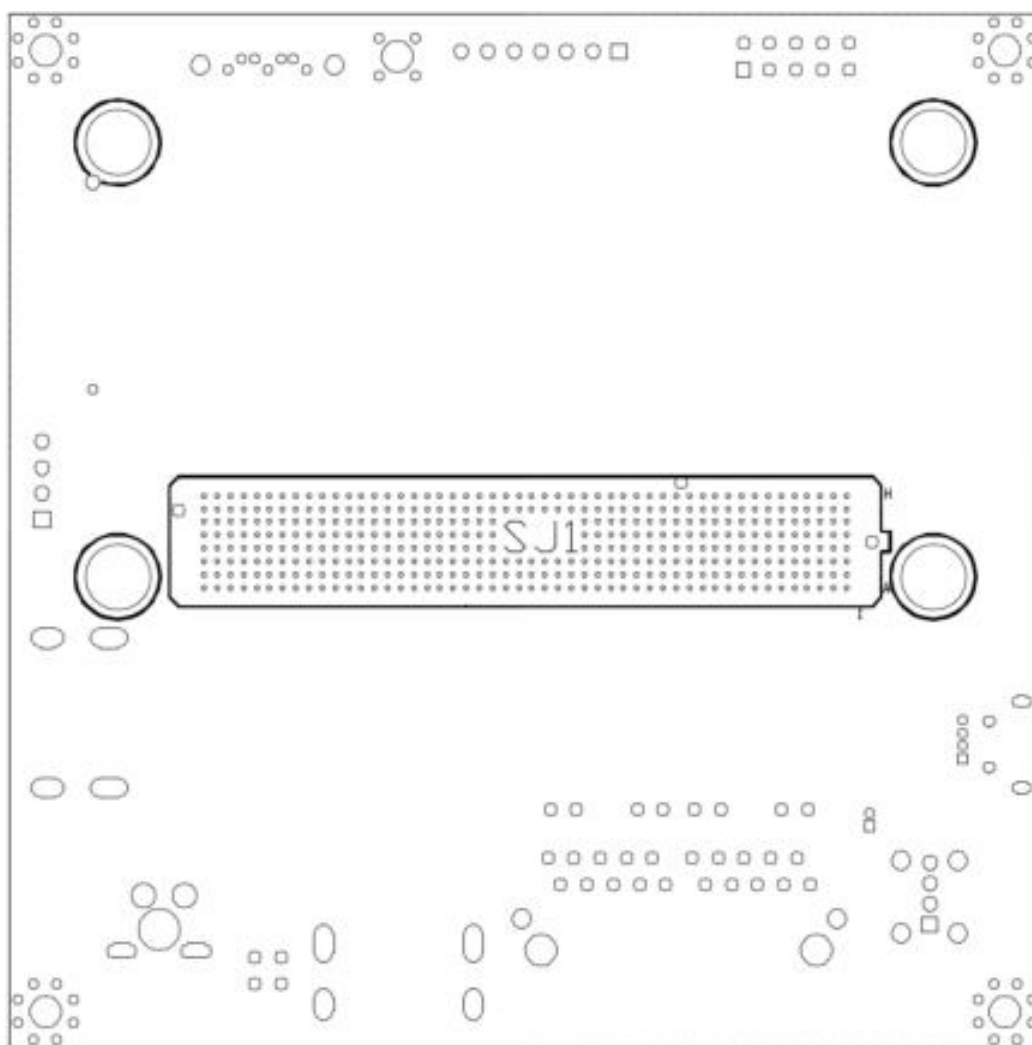


## CHAPTER 3 JUMPER SETTING & CONNECTOR

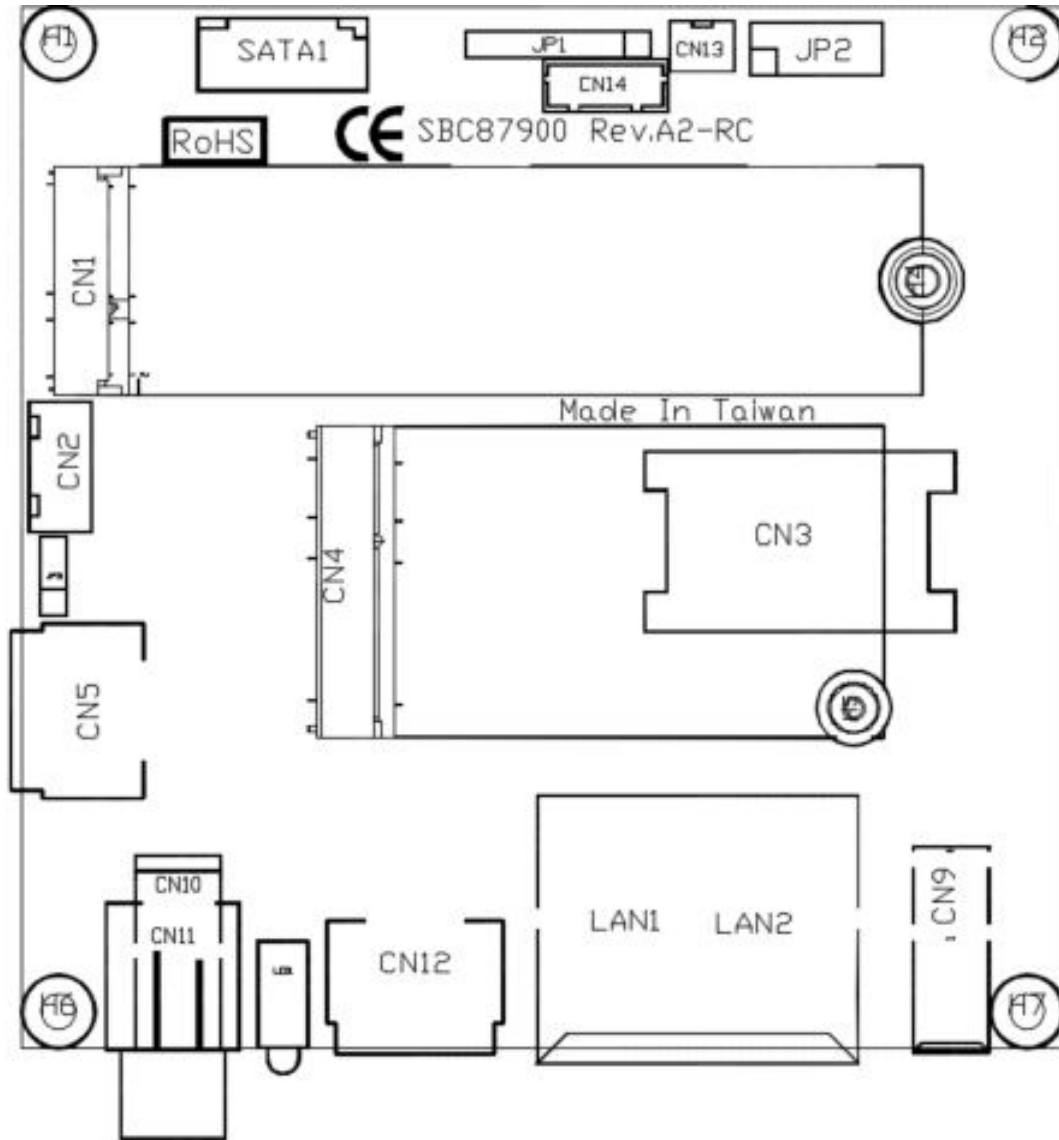
Proper jumper settings configure the eBOX800-900-FL to meet your application purpose. We are here with listing a summary table of all jumpers and default settings for onboard devices, respectively.

### 3.1 Jumper & Connector Location

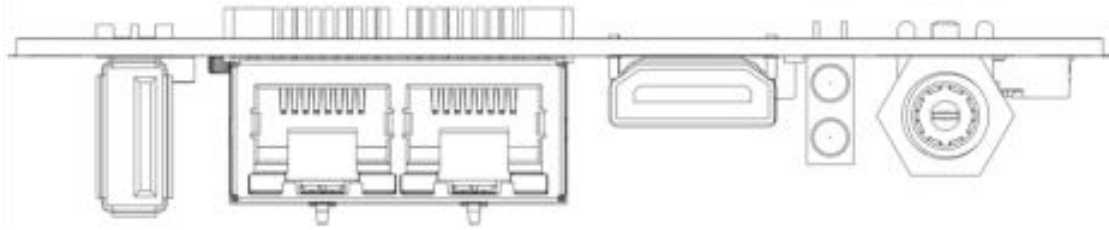
SBC87900 Top View



SBC87900 Bottom View



### SBC87900 Rear View



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

## 3.2 Jumper Setting Summary

Proper jumper settings configure the eBOX800-900-FL to meet your application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.

### SBC87900:

| Jumper & Switch | Descriptions  | Settings   |
|-----------------|---|------------|
| JP2             | Sleep   | 1-2 Close  |
|                 | Force Recovery  | 3-4 Close  |
|                 | Auto Power On   | 5-6 Close  |
|                 | Power Button  | 7-8 Close  |
|                 | Reset   | 9-10 Close |
| JP3             | PCIe Signal Selection<br>Default: Enable LAN Intel® I210-IT | 2-3 Close  |



### **Note: How to setup Jumpers**

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



[Open]



[Closed]



[Pin1-2 Closed]



### 3.2.1 Other Settings (JP2)

The JP2 allows you to select the power mode as following table.

| Pin        | Description   |
|------------|---|
| 1-2 Close  | Sleep<br>Pin1-Pin2 Short: Sleep<br>Pin1-Pin2 Open: Normal Operation (Default)                         |
| 3-4 Close  | Force Recovery<br>Pin3-Pin4 Short: Force Recovery<br>Pin3-Pin4 Open: Normal Operation (Default)       |
| 5-6 Close  | Auto Power On<br>Pin5-Pin6 Short: Auto Power on (Default)<br>Pin5-Pin6 Open: Power on by power button |
| 7-8 Close  | Power Button<br>Short Pin7-Pin8 for power on.   |
| 9-10 Close | Reset<br>Short Pin9-Pin10 for system reset.   |

### 3.2.2 PCIe Signal Selection (JP3)

PCIe signal can be selected by JP3 to mini PCIe connector or LAN Intel® I210-IT.

| Pin       | Description                                |
|-----------|--|
| 1-2 Close | Enable PCIe signal for mini PCIe connector |
| 2-3 Close | Enable LAN Intel® I210-IT (Default)        |

### 3.3 Connectors

The eBOX800-900-FL has one Ethernet, one PoE, one USB, one HDMI and one 100~240 VAC connector. Please refer to pin assignments below:

| <b>External Connectors</b>                           | <b>Sections</b> |
|--|-----------------|
| Ethernet Port (M12 X-Code 8 pos Female)              | 3.3.1           |
| PoE Power Output Connector (M12 X-Code 8 pos Female) | 3.3.2           |
| USB2.0 Connector (C3 Type 4 pos Female)              | 3.3.3           |
| AC Power Jack Connector (M12 S-Code 4 pos Male)      | 3.3.4           |
| HDMI Connector (C3 Type 19 pos Female)               | 3.3.5           |
| <b>Internal Connectors</b>                           | <b>Sections</b> |
| M.2 2280 M-Key NVMe SSD (CN1)                        | 3.3.6           |
| SIM Card Slot (CN3)                                  | 3.3.7           |
| PCI-Express Mini Card Connector (CN4)                | 3.3.8           |
| Debug Port Connector (JP1)                           | 3.3.9           |
| Force Recovery Mode (SW1)                            | 3.3.10          |
| CMOS Battery Interface (BAT1)                        | 3.3.11          |

### 3.3.1 Ethernet Port (M12 X-Code 8 pos Female)

Connectable via a M12 X-CODE LAN connector, the eBOX800-900-FL may be equipped with a high performance Plug and Play Ethernet interface which is fully compliant with IEEE 802.3 standard. Please refer to detailed pin assignment listed below:

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| L1  | MDI0P  | L5  | MDI2P  |
| L2  | MDI0N  | L6  | MDI2N  |
| L3  | MDI1P  | L7  | MDI3P  |
| L4  | MDI1N  | L8  | MDI3N  |



### 3.3.2 PoE Power Output Connector (M12 X-Code 8 pos Female)

It is a power connector for internal PoE board, and complies with IEEE802.3af standard via an internal cable connected to LAN port on a SBC to power an external PoE device.

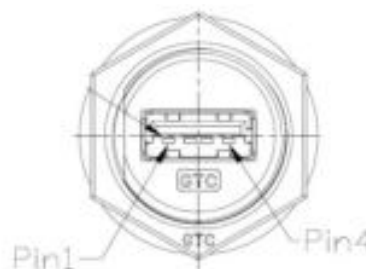
| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| L1  | MDI0P  | L5  | MDI2P  |
| L2  | MDI0N  | L6  | MDI2N  |
| L3  | MDI1P  | L7  | MDI3P  |
| L4  | MDI1N  | L8  | MDI3N  |



### 3.3.3 USB2.0 Connector (C3 Type 4 pos Female)

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

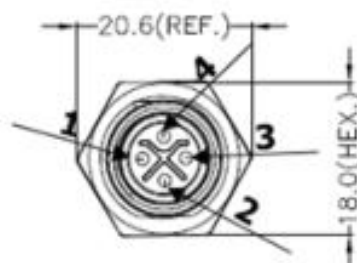
| Pin | Signal   |
|-----|----------|
| 1   | USB_PWR3 |
| 2   | USB_PN6  |
| 3   | USB_PP6  |
| 4   | GND      |



### 3.3.4 AC Power Jack Connector (M12 S-Code 4 pos Male)

This is a AC Power Jack Connector. Firmly insert power cable into this connector. Loose connection may cause system instability and make sure all components / devices are properly installed before connecting.

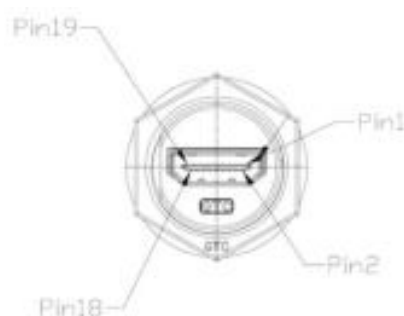
| Pin | Signal  |
|-----|---------|
| 1   | Line    |
| 2   | NC      |
| 3   | Neutral |
| 4   | PE/GND  |



### 3.3.5 HDMI Connector (C3 Type 19 pos Female)

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   | HDMI DATA2+ | 2   | GND         |
| 3   | HDMI DATA2- | 4   | HDMI DATA1+ |
| 5   | GND         | 6   | HDMI DATA1- |
| 7   | HDMI DATA0+ | 8   | GND         |
| 9   | HDMI DATA0- | 10  | HDMI Clock+ |
| 11  | GND         | 12  | HDMI Clock- |
| 13  | N.C.        | 14  | N.C.        |
| 15  | HDMI SCL    | 16  | HDMI SDA    |
| 17  | GND         | 18  | +5V         |
| 19  | HDMI_HTPLG  |     |             |



### 3.3.6 M.2 2280 M-Key NVMe SSD (CN1)

The eBOX800-900-FL comes with one M.2 2280 M-Key NVM Express SSD for storage.

| Pin | Signal        | Pin | Signal        | Pin | Signal        |
|-----|---------------|-----|---------------|-----|---------------|
| 1   | GND           | 2   | +3.3V         | 3   | GND           |
| 4   | +3.3V         | 5   | PERn3         | 6   | NC            |
| 7   | PERp3         | 8   | NC            | 9   | GND           |
| 10  | DAS/DSS#      | 11  | PETn3         | 12  | +3.3V         |
| 13  | PETp3         | 14  | +3.3V         | 15  | GND           |
| 16  | +3.3V         | 17  | PERn2         | 18  | +3.3V         |
| 19  | PERp2         | 20  | NC            | 21  | GND           |
| 22  | NC            | 23  | PETn2         | 24  | NC            |
| 25  | PETp2         | 26  | NC            | 27  | GND           |
| 28  | NC            | 29  | PERn1         | 30  | NC            |
| 31  | PERp1         | 32  | NC            | 33  | GND           |
| 34  | NC            | 35  | PETn1         | 36  | NC            |
| 37  | PETp1         | 38  | DEVSLP        | 39  | GND           |
| 40  | NC            | 41  | PERn0         | 42  | NC            |
| 43  | PERp0         | 44  | NC            | 45  | GND           |
| 46  | NC            | 47  | PETn0         | 48  | NC            |
| 49  | PETp0         | 50  | PERST#        | 51  | GND           |
| 52  | CLKREQ#       | 53  | REFCLKN       | 54  | PEWAKE#       |
| 55  | REFCLKP       | 56  | NC            | 57  | GND           |
| 58  | NC            | 59  | Connector Key | 60  | Connector Key |
| 61  | Connector Key | 62  | Connector Key | 63  | Connector Key |
| 64  | Connector Key | 65  | Connector Key | 66  | Connector Key |
| 67  | NC            | 68  | SUSCLK        | 69  | PEDET         |
| 70  | +3.3V         | 71  | GND           | 72  | +3.3V         |
| 73  | GND           | 74  | +3.3V         | 75  | GND           |



### 3.3.7 SIM Card Slot (CN3)

The eBOX800-900-FL includes one SIM slot on the bottom side of the system for inserting SIM Card. It is mainly used in 3G/LTE wireless network application on CN3.

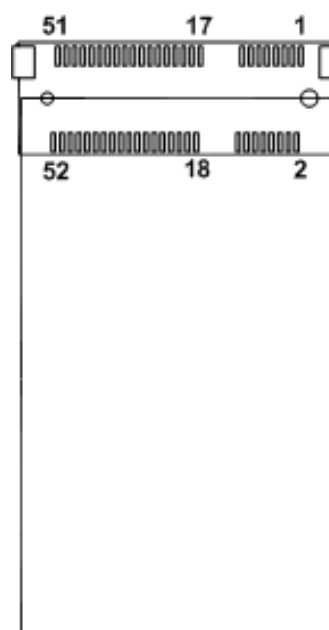
| Pin | Signal |
|-----|--------|
| 1   | PWR    |
| 2   | RST    |
| 3   | CLK    |
| 4   | NC     |
| 5   | GND    |
| 6   | VPP    |
| 7   | I/O    |
| 8   | NC     |



### 3.3.8 PCI-Express Mini Card Connector (CN4)

The eBOX800-900-FL supports a full-size PCI-Express Mini Card slots. CN4 is applying to either PCI-Express or USB 2.0 signal, and complies with PCI-Express Mini Card Spec. V1.2. PCIe signals can be selected by JP3. Please refer to Jumper Setting section.

| Pin | Signal               | Pin | Signal     |
|-----|----------------------|-----|------------|
| 1   | WAKE#                | 2   | +3.3VSB    |
| 3   | No use               | 4   | GND        |
| 5   | No use               | 6   | +1.5V      |
| 7   | CLKREQ#              | 8   | No use     |
| 9   | GND                  | 10  | No use     |
| 11  | REFCLK-              | 12  | No use     |
| 13  | REFCLK+              | 14  | No use     |
| 15  | GND                  | 16  | No use     |
| 17  | No use               | 18  | GND        |
| 19  | No use               | 20  | W_DISABLE# |
| 21  | GND                  | 22  | PERST#     |
| 23  | PE_RXN3/<br>SATA_RXP | 24  | +3.3VSB    |
| 25  | PE_RXP3/<br>SATA_RXN | 26  | GND        |
| 27  | GND                  | 28  | +1.5V      |
| 29  | GND                  | 30  | SMB_CLK    |
| 31  | PE_TXN3/<br>SATA_TXN | 32  | SMB_DATA   |
| 33  | PE_TXP3/<br>SATA_TXP | 34  | GND        |
| 35  | GND                  | 36  | USB_D8-    |
| 37  | GND                  | 38  | USB_D8+    |
| 39  | +3.3VSB              | 40  | GND        |
| 41  | +3.3VSB              | 42  | No use     |
| 43  | GND                  | 44  | No use     |
| 45  | No use               | 46  | No use     |
| 47  | No use               | 48  | +1.5V      |
| 49  | No use               | 50  | GND        |
| 51  | No use               | 52  | +3.3VSB    |



### 3.3.9 Debug Port Connector (JP1)

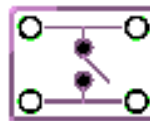
The JP1 is UART interface (UART Port0) for debug port when developing software.

| Pin | Signal |
|-----|--------|
| 1   | +5V    |
| 2   | +3.3V  |
| 3   | TX     |
| 4   | RX     |
| 5   | RTS#   |
| 6   | CTS#   |
| 7   | GND    |

### 3.3.10 Force Recovery Mode (SW1)

It will make NVIDIA® JETSON™ TX2 to force recovery mode when push SW1.

| Push Button | Description         |
|-------------|---------------------|
| SW1         | Force Recovery Mode |



### 3.3.11 CMOS Battery Interface (BAT1)

This connector is for CMOS battery interface..

| Pin | Signal |
|-----|--------|
| 1   | +3.3V  |
| 2   | GND    |

