Thundercomm
AIOT ENABLER

Thundercomm EB2 Edge AI Box

Hardware User Manual

Rev. V1.0
April 28, 2022

Revision History

Revision	Date	Description
1.0	April 26, 2022	Initial release

Table List

About This Document

- Illustrations in this documentation might look different from your product.
- Depending on the model, some optional accessories, features, and software programs might not be available on your device.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your device.
- Documentation content is subject to change without notice. Thundercomm makes constant improvements on the documentation of your computer, including this guidebook.
- Button, tool, and key names appear in bold font, for example, click **Save** or press **Enter**.
- Folders and files are formatted in italic, for example, *turbox_flash_flat.sh*.

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Chapter 1. Safety

Read this chapter first before installing, operating, or maintaining equipment developed by Thundercomm.

1.1. General safety precautions

- To ensure the safety of person and equipment, follow all the safety precautions on the device identification and in this manual when installing, operating, and maintaining equipment.
- Notes, warnings, and hazards in the manual do not represent all safety matters that should be observed. It is intended only as a supplement to all safety considerations.

1.1.1. Local laws and regulations

When you operate the device, please comply with local laws and regulations. Safety precautions in this manual are intended only as a supplement to local safety regulations.

1.1.2. Basic installation requirements

The person responsible for installing and maintaining Thundercomm equipment must first be trained strictly and know all kinds of safety precautions. He must also master the correct operating methods before he can install, operate, and maintain the equipment.

- Only qualified and trained personnel are allowed to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and repair equipment.
- Replacing and changing equipment or parts, including software, must be done by a person certified or authorized by Thundercomm.
- The operator shall promptly report to the person in charge any failure or error that may cause a safety problem.

1.1.3. Grounding requirements

The following requirements apply only to equipment requiring grounding:

- When installing equipment, it is necessary to first ground; When removing the equipment, remove the ground wire last.
- Do not destroy the ground conductor.
- Do not operate equipment without a grounded conductor installed.
- The equipment shall be permanently attached to the protected area. Check electrical connections before operating equipment. Please ensure that the equipment is reliably grounded.

1.1.4. On operator

- Do not operate equipment and cables during thunderstorms.
- When thunderstorm weather, you should unplug the AC power connector, prohibit the use of fixed terminals, do not touch the terminal and antenna connector.
  Instructions: The above two requirements apply to wireless fixed station terminals.
- To avoid shock hazards, do not connect safety extra low Voltage (SELV) circuit terminals to communication network voltage (TNV) circuit terminals.
- It is forbidden to look directly at the fiber outlet with the open eye to prevent the laser beam from burning the eye.
- Before operating the equipment, you should wear antistatic work clothes and anti-static gloves or wristbands. Remove conductive objects such as jewelry and watches to avoid being shocked or burned.
- If there is a fire, you should evacuate the building or equipment area and press the fire alarm bell, or call the fire

alarm number. No re-entry into the burning building is allowed under any circumstances.

1.1.5. On equipment

- Before operation, the equipment should be reliably fixed on the floor or other stable objects, such as walls or mounting frames.
- Do not block the vent when the system is running.
- When installing the panel, if the screws need to be tightened, you must use tools.
- After installing the equipment, please clear the empty packing materials in the equipment area.

1.1.6. Marks on equipment

Refer to the table below to comprehend safety signs.

Table 1-1. Safety sign list

Graphic	Name	Instructions
	Warning signs	The logo indicates that improper operation may result in equipment damage or personal injury.
	External ground marking	This mark is the grounding mark outside the equipment. The two ends of the grounding cable are connected to different equipment, which means that the equipment must be earthed at the connecting point, so as to ensure the normal operation of the equipment and the personal safety of operators.
	Internal ground mark	This mark is the grounding mark inside the equipment. Both ends of the grounding cable are connected to different components of the same equipment, which means that the equipment must be grounded through the connecting point to ensure the normal operation of the equipment and the personal safety of operators.
	Antistatic mark	This mark indicates an electrostatic sensitive area. Do not touch the device with your bare hands. When operating in this area, take strict anti-static measures, such as wearing anti-static wrist bands or anti-static gloves.

1.1.7. Electrical safety

- **High Pressure**

Notice:

➢ High voltage power supply provides power for the operation of equipment. Direct contact with high voltage power supply or indirect contact with high voltage power supply through wet object will bring fatal danger.

➢ Improper and incorrect operation of high voltage may cause accidents such as fire or electric shock.

- **Thunderstorm Weather**

  This requirement applies only to wireless base stations or devices with skylines.

  Notice: It is forbidden to operate the tower and mast under the thunderstorm, otherwise there will be danger of life.

- **Big Leakage Current**

  Notice:

  ➢ The equipment must be grounded before the power is switched on, otherwise it will endanger the safety of person and equipment.

  ➢ If there is a "large leakage current" sign pasted near the power terminal of the equipment, the protective grounding terminal of the equipment housing must be grounded before connecting the AC input power to prevent the leakage current of the equipment from causing electric shock to the human body.

- **Power Cord**

  Notice:

  ➢ Do not install or remove the power cord live. The moment the power core touches the conductor, it will produce electric arc or spark, which can lead to fire or eye injury.

  ➢ The power switch must be turned off before the power cord is installed or removed.

  ➢ Before connecting the power cord, make sure that the power cord label is correctly identified before connecting.

- **Fuse**

  Notice: To ensure the safe operation of the equipment, when the fuse on the equipment is blown, the fuse of the same model and specification should be replaced.

- **Electrostatic Discharge**

  Notice:

  ➢ Static electricity generated by the human body will damage electrostatic sensitive components on the single board, such as large-scale integrated circuit (LSI) and so on.

  ➢ In the case of human body movement, clothing friction, shoes and floor friction or holding ordinary plastic products, the human body will generate electrostatic electromagnetic field, not easy to disappear before discharge.

  ➢ Before touching the equipment and holding the single board or special integrated circuit (ASIC) chip, the anti-static wrist band must be worn and the other end of the anti-static wrist band must be well grounded to prevent the body's electrostatic damage to sensitive components.

- **Anti-static wristband:**

Figure 1-1. Anti-static wristband
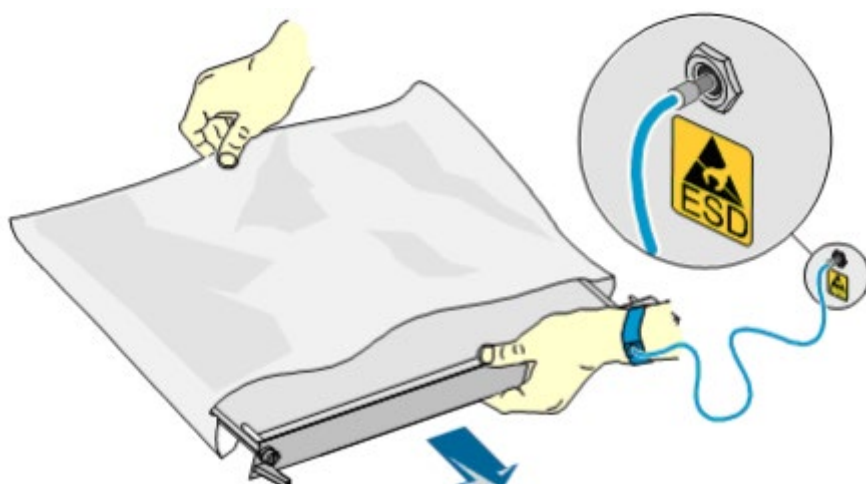
1.2. Safety and caution information

AC Power Adapter: Risk of electric shock, fire, or burn if using an AC adapter other than the one provided with this device, Indoor use only and in dry locations. Device must only be repaired by a professional, do not open enclosure. The rated parameter of the adapter is 12V / 5A, 60W, please use the socket with grounding wire.

➢ Risk of explosion if the battery is replaced with an incorrect type. Batteries should be recycled where possible. Disposal of used batteries must be in accordance with local environmental regulations.

➢ Failure to use the included power adapter shall violate regulatory compliance requirements and may expose the user to safety hazards.

Medical: This device may interfere with the operation of some pacemakers, hearing aids or other medical devices. To reduce the risk, maintain a separation distanceof20cm(8inches) between the device and the medical device. Refer to the medical device for additional information.

Modify: Modification of the wireless solution, thermal solution, device components or enclosure shall violate regulatory compliance requirements and may induce safety hazards.

Chapter 2. Introduction

2.1. Overview

EB2 Edge AI box is a lightweight edge device, featuring powerful AI and video decode capabilities. It supports device-edge-cloud synergy, remote algorithm and application deployment, FOTA and DM. It can be widely used in complex environments such as industrial park, urban residential areas and shopping mall.

EB2 is Thundercomm lightweight edge device for a wide range of edge applications, featuring strong AI computing performance, flexible configuration, wide temperature range support, environmental adaptability, and easy maintenance and management. EB2 is mainly used as edge gateway and edge intelligent analysis device to deploy in various edge application scenarios such as smart building, smart car, smart retail etc.
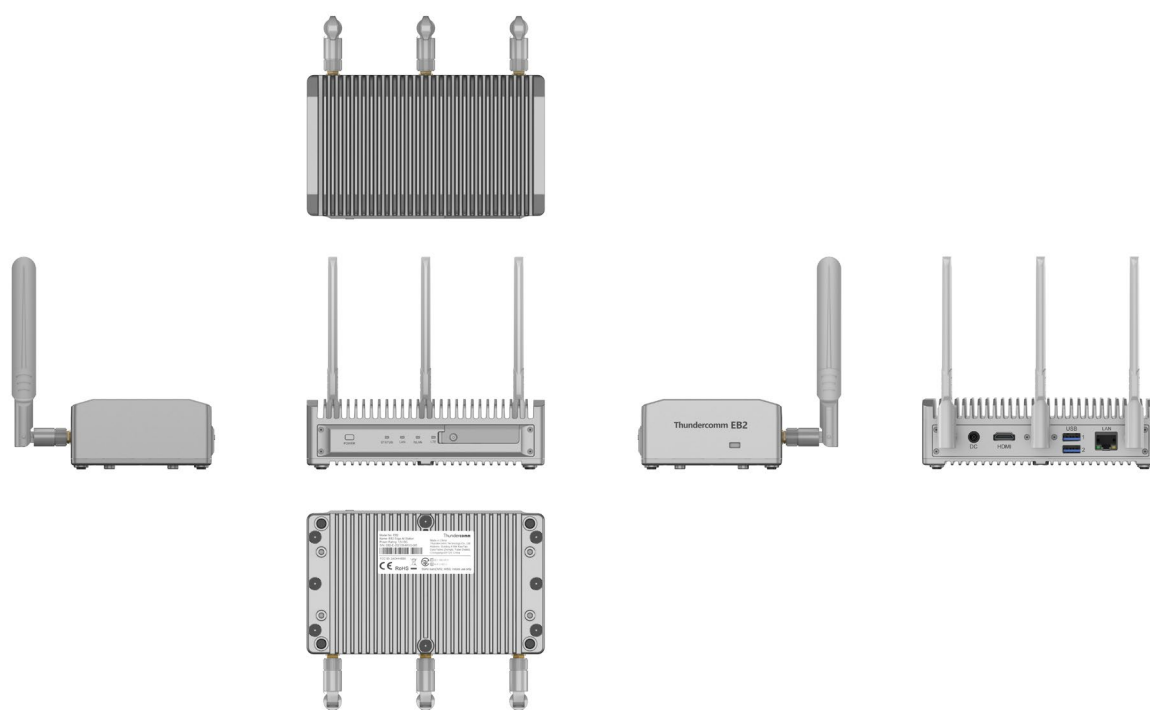
Figure 2-1. Six face View

2.2. Key features

Easy to use for edge scenes

➢ Real-time: EB2 can deal with the data locally and provide real-time response.
➢ Low bandwidth: EB2 can only transfer necessary information to the cloud.
➢ Privacy protection: you can decide to save your information either to the cloud or to local directories. All information sent to the cloud can be encrypted.
➢ Support standard containers engine.
➢ Support rapid deployment of algorithms and applications.

Multi-channel video analysis

➢ Support 6-channel 1080p@30FPS decoding.
➢ Support 6-channel 1080p@30FPS video AI analysis.

Strong environmental adaptability (Support for edge environment deployment)

➢ Industrial protection grade: IP40 Level design.

Flexible Ethernet connection selection

➢ Support WiFi5, 1*RJ45(Gigabits-Ethernet) and 4G module.

High reliability

➢ Support software and hardware fault detection and Alarm.

Remote maintenance and upgrade

➢ Remote view of IP cameras surveillance video screen connected to EB2.
➢ Configure the camera parameters of IP cameras remotely.
➢ Remote firmware upgrade for EB2.

2.3. Usage scenario

EB2 can be used in many scenarios, including safe city, smart safety supervision, smart transportation, smart manufacturing, smart retail, smart care, etc. Typical architectures in these application scenarios are as follows:

➢ Terminal: Wirelessly connect to IPC (IP Camera) or other front-end devices.
➢ Edge: Edge implements value information extraction, storage and uploading.
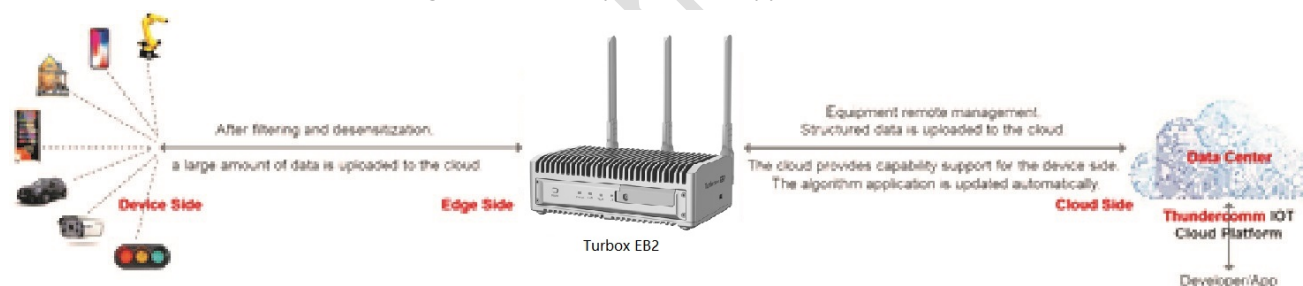➢ Cloud: Data center model management, development, and application.

Figure 2-5. Usage Scenario Diagram

2.4. Product Specification

Table 2-1.EB2 Specifications

Item	Specifications
OS	LU or Android Q
SoC *(Snapdragon™ QCS610, AI performace: 1.7 TOPS for int)*	CPU: 64-bit ARM V-8 compliant applications processor Qualcomm Kryo 460 CPU ＊Kryo Gold: Dual high-performance cores 2.2 GHz ＊Kryo Sllver: Hexa low-power cores 1.8 GHz GPU: Qualcomm® Adreno™ GPU 612 with 64-bit addressing; 845 MHz DSP: Hexagon™ DSP with dual Qualcomm® Hexagon™ Vector eXtensions (HVX), 1.1 GHz Multi-format codec up to 4K30 video encode. Multi-stream codec (4K30 (HEVC) + 720p30 (YUV) + 480p30 (VA -YUV))

Item	Specifications
HDMI Output	1x HDMI out， 1080p@60fps
System Memory	6GB LPDDR4x
Storage	64GB UFS2.1
	SD Card
USB	2x USB 3.0 Type A
Micro SD	1x Micro SD
SIM	1x NanoSIM Card
Ethernet	1xRJ45, Gbits Ethernet support 10/100M/1000M
Wireless connection	WIFI 5(802.11a/b/g/n/ac 2.4G/5GHz)
	4G-LTE support Cat4， 150Mbps (DL)/ 50Mbps (UL)
	Antenna: 3x antenna connector, 2x for 4G-LTE, 1x for WiFi
Debug port	1x USB Type-C (Inside structure)
Button	Power key
Instructor	Power/System status instructor, WiFi status instructor, LAN status instructor, 4G status instructor,
DC Input	12V DC
Mechanical	Waterproof: IP40 level design
	Dimension: 169mm X 110mm X 50mm
	Net weight: 1650g
	Mount: Desktop, Wall mount
Environment	Operating temperature: -20~60℃
	Storage temperature: -20~70℃
	Storage Humidity: 10%~90%, non-condensing
	Vibration: IEC 60068-2-64, IEC 60068-3-8, JIS C 60068-2-64, JIS C 60068-3-8
Certification [noe1]	CE, FCC[note2], JATE/TELEC, CCC/SRRC, RoHS/Reach/WEEE

Note

Note1： Certification is in progress.

Chapter 3. Hardware Description

3.1. Hardware system architecture

EB2 provides a rich IO interface, flexible access to a variety of peripherals. The EB2 design includes DC Power Input (+12V), 1* Ethernet, 1* HDMI video, 2* USB 3.0 Type A, Micro USB Type C (for debug inside structure), Micro SD Card, SIM Card, and Power push button.
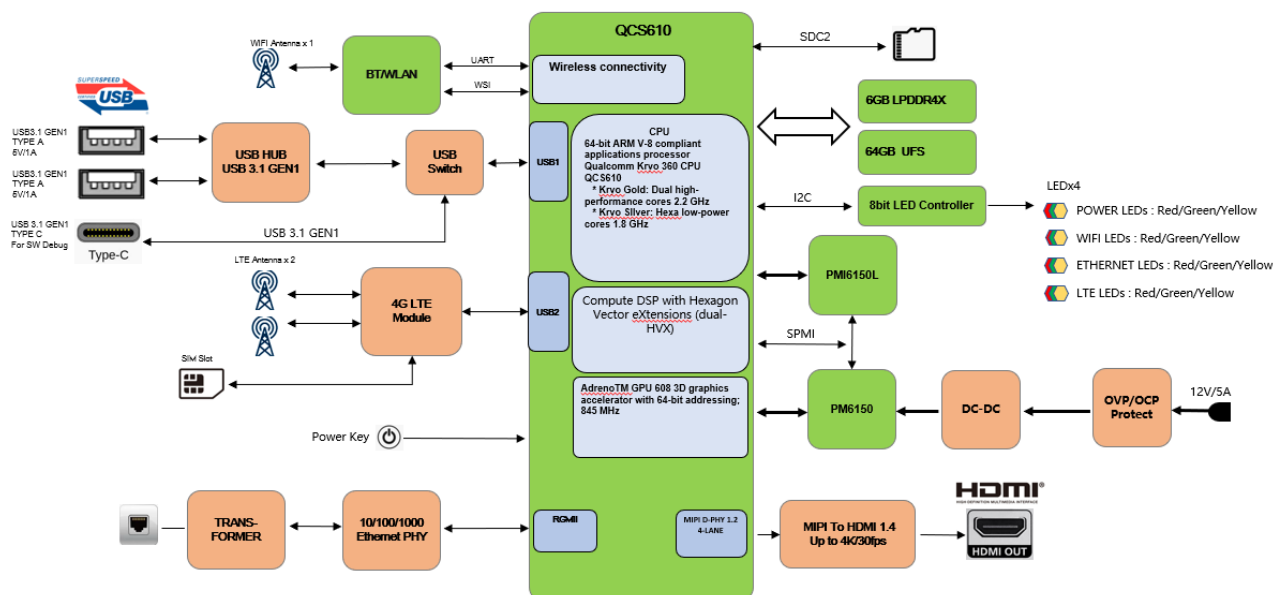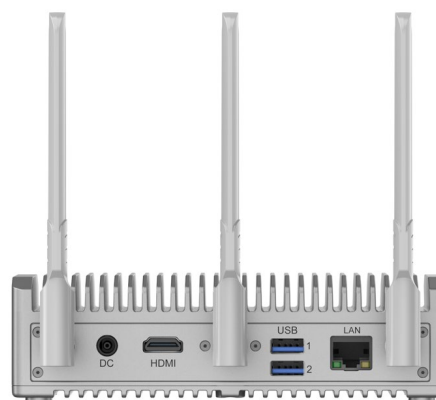

Figure 3-1 Hardware logic architecture

3.2. Device appearance

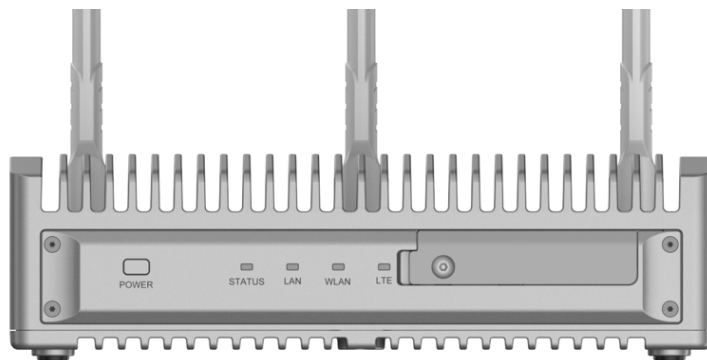*3-2. Front view*

3-3. Rear view

3.3. Hardware specifications

Figure 3-4. Front View Light Location

Table 3-1. Front view light location and specification

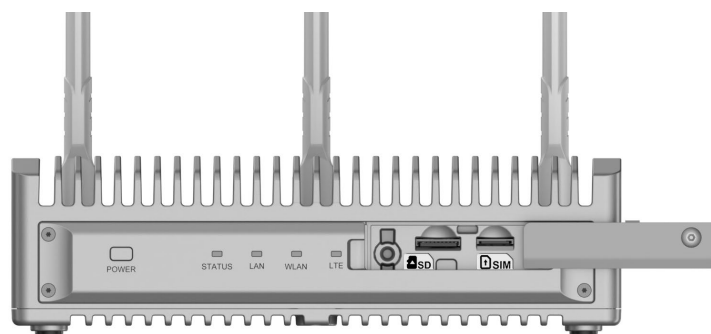| No.	Name	Instruction
1	Device Status Light	STATUS Light: During the operation of the equipment, the indicator light must be illuminated to indicate the status of the equipment ● Power off: Light extinguished; ● Starting up：Yellow (flashing)（On 500ms/Off 500ms）； ● Power on: Green; ● Firmware installing: Red(Flashing)（On 500ms/Off 500ms）；
2	Ethernet Status Light	LAN(Ethernet) communication status Light： ● Function off: Light extinguished; ● Network connecting: Yellow (flashing)（On 500ms/Off 500ms）； ● Network not connected: Yellow; ● Network not connected: Green； ● Network in transmit: Green(flashing)（On 500ms/Off 500ms）；
3	Wireless network status Light	WLAN(WiFi) Status Light: ● Function off: Light extinguished; ● Network connecting: Yellow (flashing)（On 500ms/Off 500ms）； ● Network not connected: Yellow; ● Network not connected: Green； ● Network in transmit: Green(flashing)（On 500ms/Off 500ms）；
4	4G-LTE Status Light	4G(LTE) Status Light: ● Function off: Light extinguished; ● Network connecting: Yellow (flashing)（On 500ms/Off 500ms）； ● Network not connected: Yellow; ● Network not connected: Green； ● Network in transmit: Green(flashing)（On 500ms/Off 500ms）；

Figure 3-5. Front View Connector Location

Table 3-2. Front view connector location and specification

No.	Name	Instruction
1	Micro SD	Behind the baffle, support TF card used for storage extension.
2	SIM Card	Behind the baffle, used for 4G-LTE function.
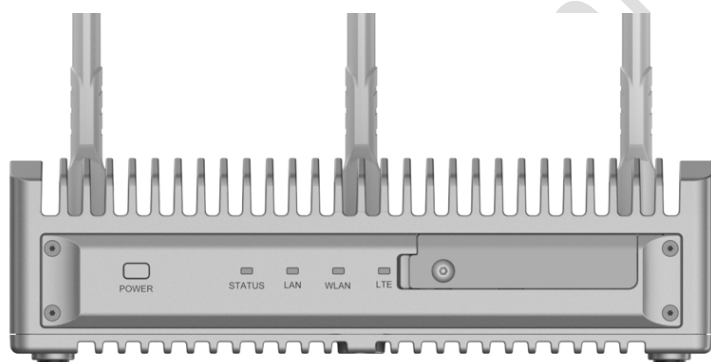
Figure 3-6. Front View Button Location

Table 3-3. Front view button location and specification

No.	Name	Instruction
1	POWER Button	1. When the power is plugged in, it will start automatically. 2. Press the power button (10s) to forcibly turn off the power. 3. If a power failure occurs when the equipment is turned on, the equipment starts automatically when the power supply is restored.

Figure 3-7. Rear View Ethernet Light Location

Table 3-4. Rear view Ethernet light location and specification

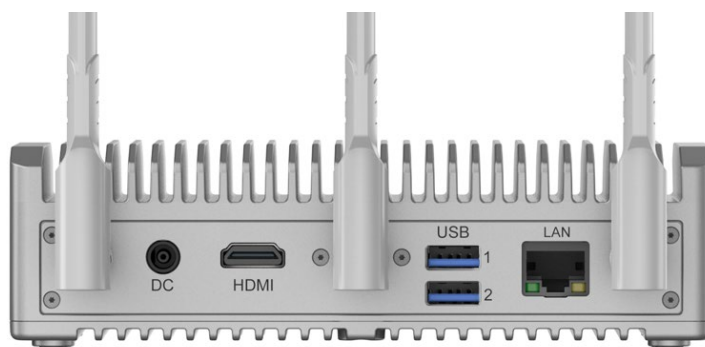| No.	Name	Instruction
1	Gigabit Ethernet Connector Connection Status Light	➢ Light extinguished: Network not connected ➢ Green (bright)：Network connected
2	Gigabit Ethernet Connector Data Transmission Status Light	➢ Light extinguished: No data transfer ➢ Yellow (flashing): Data in transit
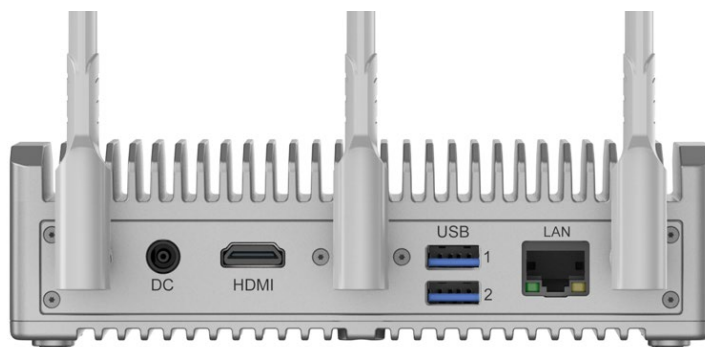
Figure 3-8. Rear View Connector Location

Table 3-5. Rear view connector location and specification

No.	Name	Instruction
1	POWER Connector	The Edge box implements a DC JACK+12V DC power
2	HDMI Connector	The EB2 module will output video via the Edge box vertical HDMI connector that is HDMI 1.4 capable.
3	Type-A USB 3.0 Connector	The EB2 incorporates 2 vertical USB 3.0 Type-A connectors with a 1A current limit per connector. All USB 3.0 Type-A ports are 5Gbps capable.
4	GE Connector	The EB2 implements 2 x RJ-45 ethernet connectors for internet communication. Connector A and Connector B are connected through a PCIe Gigabit Ethernet PHY to a PCIe switch.

Chapter 4. Hardware Operation

Power On

Please check that EB2 and the power adapter in the package are in good condition. Perform boot operation according to our operation guide. EB2 starts automatically when it is plugged in.

Step 1. Plug the power adapter into the power socket.

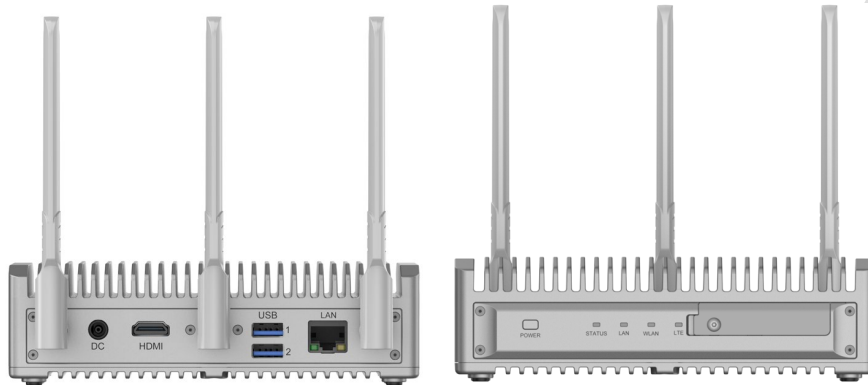Step 2. Check the working status of the power indicator.

Figure 4-1. Power Button Location Instruction

Step 3.

　　　　➲ **NOTE**: System STATUS indicator:
- LED light (green): EB2 is working
- LED light (off): EB2 is powered off

Remarks:

Press the power button for more than 10 seconds to force the system to shut down.

EB2 can be powered off by unplugging the power cord.

Chapter 5. Warranty & Product Support Service

5.1. Customer support have two methods:

E-mail support: customer can get support from writing to: service@thundercomm.com

Customer service platform: customers can report bugs on platform directly and our engineers will give feedback on platform (It will be opened in August this year)

5.2. Fix broken device

Warranty Period: one year

The period of warranty shall start from the date of purchase of the product and shall cover a period of one (1) year.

5.3. Scope of Warranties:

Our products are manufactured under a thorough quality control system, but in any case, in which our products failed under proper operating conditions within the warranty period, we will repair the product or deliver an alternate product without charge.

Please note that the warranty mentioned here means the warranty for the individual product, and does not include any damage resulting from a fault in our product (damages and loss incurred to products other than our products, lost profits, lost business opportunities, transportation costs, construction costs, etc.).

- EB2 is limited warranty, the guarantee does not include:

  Defects caused by inappropriate transport, bad usage inconsistent with manuals, neglect as well as some dirt or items which have got through the appliances.

- Mechanical, thermal and chemical damages caused by external forces (lightning, surges) as well as corrosion.

Appendix 1.Warnings

A1.1. Product powered by external power adapter

The equipment is supplied by external power adapter which is considered to be Pluggable Equipment Type-A. The socket outlets shall be installed near the equipment and be easily accessible.

A1.2. Product with built-in button battery

- Risk of fire or explosion or defeat the safeguard of equipment if the battery is replaced by an incorrect type. Replace only with the same or equivalent type.

- Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, that can result in an explosion.

- High or low extreme temperatures or low air pressure at high altitude that the battery can be subjected to during use, storage or transportation.

Leaving the battery in an extremely high temperature and/or low air pressure surrounding environment that can result in an explosion or the leakage of flammable liquid or gas.

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