

X509

Product Manual

Realtimes Beijing Technology Co., LTD.

Fax: +86 010-84284669 / 84280996

Email: info@realtimes.cn

Web Page: <https://www.realtimesai.com>

Address: 11th Floor, Block B, 20th Heping Xiyuan, Pingxi Street,
Chaoyang District, Beijing 100013, P.R.China



Revision History

Revision	Date	Reason for change	Applicable hardware version
V1.0	2020.2	Initial release	V2.0
V2.0	2020.6	Add notes	V2.0
V2.1	2021.8	Add sub-model	V2.0



Electronic components and circuits are very sensitive to electrostatic discharge. Although our company designs anti-static protection for the main interfaces on the card when designing circuit board products, it is difficult to achieve anti-static safety protection for all components and circuits. Therefore, it is recommended to observe anti-static safety precautions when handling any circuit board component (including X509). Anti-static safety protection measures include, but are not limited to the following:

- a) The smart box should be placed in an anti-static bag during transportation and storage, and then the board should not be taken out during installation and deployment.
- b) Before touching the smart box, discharge the static electricity stored in the body: wear a discharge grounding wrist strap.
- c) Operate the smart box only within the safe area of the electrostatic discharge point.
- d) Avoid moving smart boxes in carpeted areas.

Precautions and after-sales maintenance

matters needing attention

Before using the product, please read this manual carefully and keep it for future reference;

- Please pay attention to and follow all warning and guidance information marked on the product;
- Please use matching power adapter to ensure the stability of voltage and current;
- Please use this product in a cool, dry and clean place;
- Do not use this product in cold and hot alternate environment to avoid condensation damage components;
- Do not splash any liquid on the product. Do not use organic solvent or corrosive liquid to clean the product;
- Do not use the product in dusty and messy environment. If it is not used for a long time, please pack the product;
- Do not use in the environment with excessive vibration, any dropping or knocking may damage the circuit and components;
- Do not plug and unplug the core board and peripheral modules when power is on;
- Please do not repair or disassemble the product by yourself. In case of any fault, please contact our company in time for maintenance;



- Do not modify or use unauthorized accessories by yourself, and the damage caused will not be warranted;

After sales maintenance

1) Warranty period

- Base plate, core plate : 3 year (non-human damage)
- Other peripherals sold by the company: 1 year (non-human damage)

2) Warranty description

- Within 7 days: the product (base plate, core module) is not damaged by human, our company will replace / repair it free of charge, and bear the return freight; (because the core module needs NVIDIA to confirm that it can meet the requirements of repair, it will take a long time, we will coordinate as soon as possible, please forgive for the inconvenience)
- From 7 days to 36 months: the product (base plate, core module) is not damaged by human, our company will repair it free of charge, and bear the return freight; (because the core module needs NVIDIA to confirm that it can meet the requirements of repair, it will take a long time, we will coordinate as soon as possible, please forgive for the inconvenience)
- Artificial damage in more than 3 year or 3 year: the product (carrier plate) shall be tested after it is sent to the customer, and the customer shall be informed of whether it can be repaired and the maintenance cost in detail. After reaching an agreement, the product shall be repaired and returned to the customer, and the company shall bear the return freight;
- The starting time shall be subject to the date of express delivery receipt;

3) Contact information

Official website: www.realtimesai.com

Taobao website: <https://shop340963258.taobao.com/>

Address: 11, block B, Heping Xiyuan, Heping West Street, Chaoyang District, Beijing

Attention: RMA

Tel: 010-84284669

Mailing notice: contact with the company's sales department in advance, arrange technical support personnel to check and eliminate errors caused by misoperation as soon as possible, fill in the product after-sale return to factory maintenance form after verification, and send it to rma@realtimes.cn Mail box, please attach the list of items to facilitate verification, so as to avoid loss and loss in the process of express delivery. The company does not receive any delivery

Technical support and development customization

1. Scope of technical support

- 1) The company releases the electrical characteristics and use of industrial carrier boards and modules;
- 2) Physical dimension of hardware, relevant structure diagram and line sequence definition of specific interface;
- 3) Burn in verification of all BSP support packages provided by the company;
- 4) The company released burn environment construction, entry-level use. ;
- 5) Various peripheral module drivers released by the company;
- 6) The company's product fault diagnosis and after-sales maintenance services;

2. Scope of technical discussion



Due to the wide range of embedded system knowledge and various types of involvement, we can not guarantee that all kinds of questions can be answered one by one. The following content is not available for technical support, only suggestions can be provided.

- 1) Knowledge beyond the course published by our company;
- 2) Specific software program design;
- 3) Technical support for industrial carrier not issued by the company;
- 4) All kinds of driving support for industrial carrier board not issued by the company;
- 5) Hardware principle and drive design of peripheral module not issued by our company;

3. Technical support mode

- 1) Official website or email questions (recommended): <https://www.realtimesai.com/cn/download.html>
techsupport@realtimes.cn
- 2) Official Taobao through Alibaba Wangwang consultation: <https://shop340963258.taobao.com/>
- 3) Wechat group consultation (wechat Group No. consults Taobao customer service or sales, and Taobao purchase order No. needs to be provided for verification);
- 4) Technical support email: techsupport@realtimes.cn
- 5) Tel: 010-84284669

4. Technical support time

Monday to Friday; 8:30-12:00 am; 1:00-17:30 PM;

The company arranges the rest according to the national legal holidays, during which it may not be able to provide technical support, please send the problem to the technical support email. We will reply to you as soon as possible on weekdays.

5. Complaints and suggestions

If you are not satisfied with us or have suggestions, you can send an email to yu.qin@realtimes.cn
For feedback, please call 010-84284669 for further improvement.

6. Customized development services

The company provides the embedded operating system driver based on NVIDIA Jetson series and the paid customized development service of hardware carrier board to shorten your product development cycle.

Please email the request to info@realtimes.cn

Data acquisition and subsequent update

1. Access to information

Download on our website

The company's website contains supporting information of its products, including product user manual, NVIDIA Jetson series module data manual, BSP driver support package for carrier board, supporting peripheral driver files, interface test verification method, FAQ, system burning guide, etc.

get into www.realtimesai.com, select "data download" in the navigation bar, find the data you need, and click download.

2. Subsequent updates

Updates of subsequent documents, BSP, driver files and other official account will be updated in time. We will pay close attention to our developments in order to ensure that your information is up to date. We will push through WeChat public.



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1 Product introduction

X509 is a new Feiyun Smart Box™ based on NVIDIA Jetson™ Xavier NX/TX2 NX series modules. It is pre-installed with Ubuntu 18.04 operating system and equipped with 21TOPS (Xavier NX)/1.33TOPS (TX2 NX) floating point AI processing ability. It adopts super strong and lightweight aluminum alloy material design, fan-type heat dissipation, excellent heat dissipation capacity, small and light overall size, reserved side wing structure for easy on-site installation, and 7x24-hour long MTBF stable operation capability on site. It can be applied to robots, Autonomous machines such as unmanned delivery vehicles, smart gates, and smart vending cabinets are ideal carriers for deploying AI computing power at the edge for deep learning.

1.1 Features

Type	X509	X509 (EMMC)	X509-TX2 NX	X509-TX2 NX (EMMC)
Core	Xavier NX		TX2 NX	
CPU	NVIDIA Carmel ARM v8.2 (6-core) @ 1.4GHz (6MB L2 + 4MB L3)		Dual-core Denver 264-bit CPU and quad-core Arm® Cortex®-A57 MPCore processor	
GPU	384-core NVIDIA Volta™ GPU with 48 Tensor Cores		256-core NVIDIA Pascal™ GPU	
Memory	8GB LPDDR4		4GB LPDDR4	
Storage	Built-in 16GB			
Computing power	21 TFLOPS		1.33 TFLOPS	
System	Ubuntu 18.04			

Type Interface	X509	X509(EMMC)	X509-TX2 NX	X509-TX2 NX(EMMC)
USB	1 x USB3.0 interface, 1 x USB2.0, 1 x USB2.0 OTG			
HDMI	1 x Mini HDMI 2.0 interface			
Network Port	1 x GbE (10/100/1000 BASE-T)			
Camera	2 x MIPI CSI-2/2 Lane interface			
PCIe interface	1 x Mini-PCIe interface			
SD/EMMC	1 x Micro SD	1 x 128GB eMMC	1 x Micro SD	1 x 128GB eMMC
UART/I2C	1 x UART/I2C interface			
Button	1 x Button interface			
Dimensions	115mm×70mm×61mm			
Cooling method	Air-cooled heat dissipation (built-in fan)			
Power	+12V			
Temperature	-20℃--+65℃	-20℃--+60℃	-20℃--+65℃	-20℃--+60℃
Humidity	95% humidity without condensation			
Weight	About 365g			

1.2 Ordering Information

Model Options	Functional Description
X509	Xavier NX Feiyun Smart Box Air-cooled Edition (V2.0), built-in Xavier NX module, pre-installed Ubuntu 18.04, built-in 16GB eMMC; 1 x USB 3.0, 1 x USB 2.0, 1 x USB OTG, 1 x miniHDMI, 1 x GbE, 1x Micro SD, 3x 3.3V UART, 2 x SPI, 2 x I2C, 1 x MiniPCIe, SSD optional, WIFI and Bluetooth optional; power indicator, power switch button, -20——+65℃ ;Include cable package (HDMI, serial port, SPI, I2C);Include power adapter, provide Realties-Linux4Tegra software support package, pass 3C and CE certification
X509(EMMC)	Xavier NX Feiyun Smart Box Air-cooled Edition (V2.0), built-in Xavier NX module, pre-installed Ubuntu 18.04, built-in 16GB eMMC; 1 x USB 3.0, 1 x USB 2.0, 1 x USB OTG, 1 x miniHDMI, 1 x GbE, 3x 3.3V UART, 2 x SPI, 2 x I2C, 1 x eMMC(128GB), 1 x MiniPCIe, SSD optional, WIFI and Bluetooth optional; power indicator, power switch button, -20——+60℃ ; including cable package (HDMI, serial port, SPI, I2C); including power adapter, providing Realties Linux4Tegra software support package, passing 3C and CE certification
X509-TX2 NX	TX2 NX Feiyun Smart Box air-cooled version (V2.0), built-in TX2 NX module, pre-installed Ubuntu 18.04, built-in 16GB eMMC; 1 x USB 3.0, 1 x USB 2.0, 1 x USB OTG, 1 x miniHDMI, 1 x GbE, 1x Micro SD, 3x 3.3V UART, 2 x SPI, 2 x I2C, 1 x MiniPCIe, SSD optional, WIFI and Bluetooth optional; power indicator, power switch button, -20——+65℃ ;Include cable package (HDMI, serial port, SPI, I2C);Include power adapter, provide Realties-Linux4Tegra software support package, pass 3C and CE certification
X509-TX2 NX(EMMC)	TX2 NX Feiyun Smart Box air-cooled version (V2.0), built-in TX2 NX module, pre-installed Ubuntu 18.04, built-in 16GB eMMC; 1 x USB 3.0, 1 x USB 2.0, 1 x USB OTG, 1 x miniHDMI, 1 x GbE, 2 x MIPI CSI-2/2 Lane, 3x 3.3V UART, 2 x SPI, 2 x I2C, 1 x eMMC(128GB), 1 x MiniPCIe, SSD optional, WIFI and Bluetooth optional ; Power indicator light, power switch button, -20——+60℃ ; including cable package (HDMI, serial port, SPI, I2C); including power adapter, providing Realties Linux4Tegra software support package, passing 3C and CE certification
RTSV-6911i(optional) RTSV-6901(optional) RTSV-6941(optional)	Mini-pcie Video Capture Card ,RTSV-6911i (8-channel D1 NTSC/PAL video input), RTSV-6901 (single-channel SDI video input), RTSV-6941 (single-channel HDMI Video Input)
ME909S-821(optional)	mini-PCIe All network 4G module

Order online:

<https://shop340963258.taobao.com>

<https://mall.jd.com/index-824786.html>

2 External interface function and location



X509 FRONT



X509 BACK

3 Installation and use

3.1 Drive

The X509 carrier board works on a system burned with the official original version of NVIDIA Linux For Tegra (L4T). HDMI, Gigabit Ethernet, USB2.0, serial port, GPIO, SD card, I2C bus can all be supported. But Mini-PCIE, USB3.0, fan interface, etc. cannot work normally.

X509 carrier board interface is fully supported, and the supporting driver patch needs to be loaded.

The original NVIDIA LT4 software package ([for system programming](#)) can be downloaded from the link below:

<https://developer.nvidia.com/embedded/linux-tegra>

X509 driver patch support package ([for system programming](#)) download link:

[http:// www.realtimes.cn/download/](http://www.realtimes.cn/download/)

System burning method ([help document](#)):

<https://www.realtimes.cn/cn/help.html>

Note: The account password of Ruitai Cloud Space must be obtained by contacting technical support.

3.2 How to use Smart Box

- a) Ensure that the voltage of all external systems is turned off
- b) Install necessary external cables. (Such as: the display cable connected to the HDMI display, the power input cable to power the system, the USB cable connecting the keyboard and mouse ...)
- c) Connect the power cord to a power source.
- d) Connect to the power supply of X509, the system will start working after power on.

3.3 Recovery MODE


Jetson Xavier NX core modules can work in normal mode and Recovery mode. In Recovery mode, you can perform file system update, kernel update, boot loader update, BCT update and other operations.

To enter Recovery mode:


- a) Turn off the system power supply.
- b) Use a USB cable to connect the OTG port of the X509 and the USB port of the Jetson development host.
- c) Short-circuit the 1 and 9 pins of the Button connector to power the system. Keep the power supply for more than 3 seconds, and then disconnect the 1 and 9 pins of the Button connector.
- d) The system enters Recovery mode, and you can perform subsequent operations at this time.

4 Connectors Description

4.1 Mini HDMI connector

Function	HDMI output interface	
marking	HDMI	
Type	Mini HDMI connector	

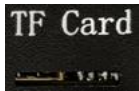
4.2 Ethernet connector

Function	Gigabit Ethernet connector	
marking	Ethernet	
Type	RJ45	


4.3 USB3.0 connector

Function	USB3.0 connectors	
marking	USB3.0	
Type	UBS3.0 Type-A	

4.4 SD card connector

Function	SD card interface	
marking	TF CARD	
Type	Micro SD (TF)	


4.5 WiFi antenna connector

Function	WiFi antenna interface	
marking	AT1 AT2	
Type	ipex to sma female	


4.6 Power input port

Function	Power input port	
marking	Power Input	
Type	2Pin interface	
Pin define	Input voltage: +5V	


4.7 OTG-USB2.0 connector


Function	USB2.0 connectors	
marking	USB-OTG	
Type	UBS2.0 Micro Type-B	

4.8 LED

Marking	Function	State description	
PWR	Power light	Constantly on - Power on	

4.9 Function connector

Function	Function port																										
Marking	UART/I2C																										
Type	DB9																										
Pin define	<table border="1"> <thead> <tr> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>UART2_TXD</td> <td>2</td> <td>UART2_RTS</td> </tr> <tr> <td>3</td> <td>UART3_TXD</td> <td>4</td> <td>UART3_RTS</td> </tr> <tr> <td>5</td> <td>GND</td> <td>6</td> <td>UART2_RXD</td> </tr> <tr> <td>7</td> <td>UART2_CTS</td> <td>8</td> <td>UART3_RXD</td> </tr> <tr> <td>9</td> <td>UART3_CTS</td> <td></td> <td></td> </tr> </tbody> </table>		Pin	Signal	Pin	Signal	1	UART2_TXD	2	UART2_RTS	3	UART3_TXD	4	UART3_RTS	5	GND	6	UART2_RXD	7	UART2_CTS	8	UART3_RXD	9	UART3_CTS			
	Pin		Signal	Pin	Signal																						
	1		UART2_TXD	2	UART2_RTS																						
	3	UART3_TXD	4	UART3_RTS																							
	5	GND	6	UART2_RXD																							
7	UART2_CTS	8	UART3_RXD																								
9	UART3_CTS																										
The two serial ports UART2~UART3 lead out are both 3.3V TTL logic level.																											
The mapping files of UART2 and UART3 in Linux system are ttyTHS0 and ttyTHS1 in the /dev directory.																											

Function	Function port				
marking	Button				
Type	DB9				
Pin define	Pin		Signal		
	1	GND	2	GND	
	3	GND	4	GND	
	5	GND	6	DEV_3V3	
	7	DEV_3V3	8	BUTTON_PWR_ON	
	9	FORCE_RECOVERY			

5 Hardware update history

X509 hardware update history

edition	Updata description
V1.0	Initial release
V2.0	Added Button、 UART/I2C interface

6 Product size diagram



Terms of Warranty

Important note

Each embedded product provided by Realtimes Technology is free from any defects in material and process,fully in line with the specifications officially issued by the original factory.

Realtimes Technology warranty covers the original products,If the parts configured by the dealer are out of order, please consult with the dealer to solve the problem. All the baseplate and core modules provided by Ruitai New Era (Beijing) Technology Co., Ltd. are guaranteed for 3 years, while the other peripherals are guaranteed for 1 year (life-long maintenance service is provided if the warranty period is beyond the warranty period). The warranty period starts from the date of delivery, for the products repaired within the warranty period, the repair parts shall be extended for 12 months.Unless notified by Realtimes Technology, the date of your original invoice shall be the date of shipment.

How do I get warranty services

If the product does not work properly, Please contact Realtimes Technology or dealer for warranty service, please show invoice when product warranty(this is the proof for you getting warranty service).

Warranty solution

When you ask for warranty service, please follow Realtimes Technology warranty process,You will need to receive your first diagnosis from a technical engineer by phone or by email,at that time,we need you to cooperate with us to fill in all the questions on the RMA form provided by us. Once we accurately determine the cause of the fault and the location of the damage ,we will provide the charge list for the out of warranty products,which needs your confirmation.Realtimes Technology keep the right to repair or replace the products. If the product is replaced or repaired, the replaced faulty product or the repaired and replaced faulty parts will be returned to Realtimes Technology.

For products under warranty,the customer shall bear the freight when the product is returned to the manufacturer,Realtimes Technology will bear the ship cost of the products after maintenance.

The following conditions are not covered by the warranty terms

- a) Improper installation, improper use, misuse and abuse of products(Overloading, for example).
- b) Improper maintenance and storage (Such as fire, explosion, etc) or natural disasters (such as lightning stroke,earthquake,typhoon,etc)
- c) Personal unauthorized changing the product(such as changing circuit characteristics, mechanical characteristics, software characteristics,Conformal coating).
- d) Other failures which are clearly due to misuse(such as overvoltage,polarity reversal, the pin bent or broken,the wrong connection,drop damage,transportation damage,damage due to over operating temperature and so on).
- e) The logo and part number on the product have been deleted or removed.
- f) The product is out of warranty.

Special concerns



If the same fault multiple occurrence for the products,in order to find out the reason causing the problem,we will request the users to provide the specific documents or information of peripheral equipment,such as monitor,I/O boards,cables,power supply, diagram and structure of the system,etc.If such documents or information are not available,we have the right to refuse to perform the warranty, the repairsments will be charged accordingly.

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