

# X506-B

# Product Manual

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## Revision History

Revision	Date	Reason for change	Applicable hardware version	Modified by
V1.0	2020.2	Initial release	V1.0	
V2.0	2020.6	Add notes	V1.0	
V2.1	2020.9	Add line package configuration	V1.0	RT0086
V2.2	2022-1-7	Add a description of the software version	V1.0	RT0086



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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 X506-B). 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](http://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](mailto: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](mailto: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](mailto: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](mailto: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](mailto: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 Product 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](http://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.

# Product presentation

## 1 Introduction

X506-B is a new cloud intelligence box <sup>TM</sup> designed based on NVIDIA Jetson<sup>TM</sup> NANO series modules. It is a NANO module with built-in integrated 128-core Maxwell<sup>TM</sup> architecture GPU. It is pre-loaded with Ubuntu 18.04 operating system and has the AI processing capacity of 0.5TFLOP floating-point operation. Using super strong light aluminum alloy material design, cooling fan type, have excellent heat dissipation capacity, the overall size is small and light, good structure of human body engineering, obligate has easy wing structure, installation site 7 x24 hours long MTBF and stable operation ability, can be applied to robots, unmanned delivery vehicles, intelligent brake machine, intelligent selling customized machine, such as container is the edge of the end calculate force deployment AI ideal vehicle for the in-depth study.

The external interface resources provided by X506-B include: 1 X GbE,1 x Mini PCIE, 1 x USB3.0, 1 x USB2.0, 1 x USB OTG,2 x 3.3V UART, 1 x FPD-Link III,1 x MIPI,12 X GPIO(optional),1 X Mini HDMI,1 x Micro SD, 1 x Micro SIM,4G LTE(optional), the products have passed CCC certification and CE certification of EU.

### 1.1 Features

- Compatible with nvidia Jetson NANO module
  - ◆ GPU: NVIDIA Jetson <sup>TM</sup> NANO 128 core with NVIDIA Maxwell <sup>TM</sup> architecture (1 trillion floating-point operations per second),
  - ◆ CPU: ARM Cortex-A57 (quad-core)
  - ◆ Operating system: Linux pre-installed
  - ◆ Memory: 4GB LPDDR4
  - ◆ Storage: Built-in 16GB or expandable TF card slot
- 1 x USB3.0, One USB2.0,One USB2.0 OTG
- 1 x Micro SD port
- 1 x SIM card port
- 2 x Uart prot compliance with 3.3V voltage level
- 1 x Gigabit Ethernet
- 2 x I2C and two SPI
- 1 x Mini-PCIE (expandable: PAL / HD-SDI video capture, GPS / Beidou module, AD / DA module, 4G module, storage module, etc.) interface
- 1 x Mini HDMI 2.0
- Size: 115mm×70mm ×61mm
- Power input: +5V
- Temperature: -25℃~+65℃
- Weight:365g

## 1.2 Ordering Information

Model Options	Functional Description
RTSS-X506-B	NANO Cloud intelligence box air-cooled version, built-in NANO B01 module, pre-installed Ubuntu 18.04, built-in 16GB eMMC; 1 x USB 3.0, 1 x USB 2.0, 1 x Micro USB OTG, 1 x Mini HDMI, 1 x GbE, 1 x Micro SD, 3 x 3.3V UART, 2 x SPI, 2 x I2C, 1 x Mini PCIe, 4G module /mSATA optional; Power indicator light, power switch button, -20 -- +65°C; Including cable package (HDMI, serial port, SPI, I2C); Includes power adapter, provides Ruitai new Era RTSO-6001B Linux4Tegra software support package, passed THE 3C and CE certification
RTS-NANO-AC/DC	Power Adaptor for X506-B, 100-240VAC/5V/4A,20W
RTSV-6911i (optional) Pro Capture Mini SDI (optional) Pro Capture Mini HDMI (optional)	Mini-pcie Video Capture Card ,RTSV-6911i (8-channel D1 NTSC/PAL video input), Pro Capture Mini SDI (single-channel SDI video input), Pro Capture Mini HDMI (single-channel HDMI Video Input)
Me909s-821 (optional)	mini-PCIe Full netcom 4G module

### Order online:

<https://shop340963258.taobao.com>

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

## 1.3 Wiring package configuration

Component	Number	Functional Description
Micro HDMI turn HDMI connector	1	Convert Micro HDMI interface to standard HDMI interface



# Product specifications

## 2 External interface function and location




X506-B FRONT




X506-B BACK

## 2 Connectors Description

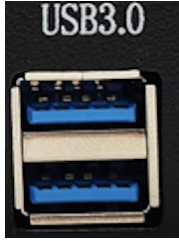
### 2.1 Mini HDMI connector

<b>Function</b>	HDMI output interface	
<b>marking</b>	HDMI	
<b>Type</b>	Mini HDMI connector	


### 2.2 Ethernet connector

<b>Function</b>	Gigabit Ethernet connector	
<b>marking</b>	Ethernet	
<b>Type</b>	RJ45	


### 2.3 USB3.0 connector

<b>Function</b>	USB3.0 connectors	
<b>marking</b>	USB3.0	
<b>Type</b>	USB3.0 Type-A	


### 2.4 SD card connector

<b>Function</b>	SD card interface	
<b>marking</b>	TF CARD	
<b>Type</b>	Micro SD (TF)	


### 2.5 WiFi antenna connector

<b>Function</b>	WiFi antenna interface	
<b>marking</b>	AT1 AT2	
<b>Type</b>	ipex to sma female	


## 2.6 Power input port


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

## 2.7 OTG-USB2.0 connector

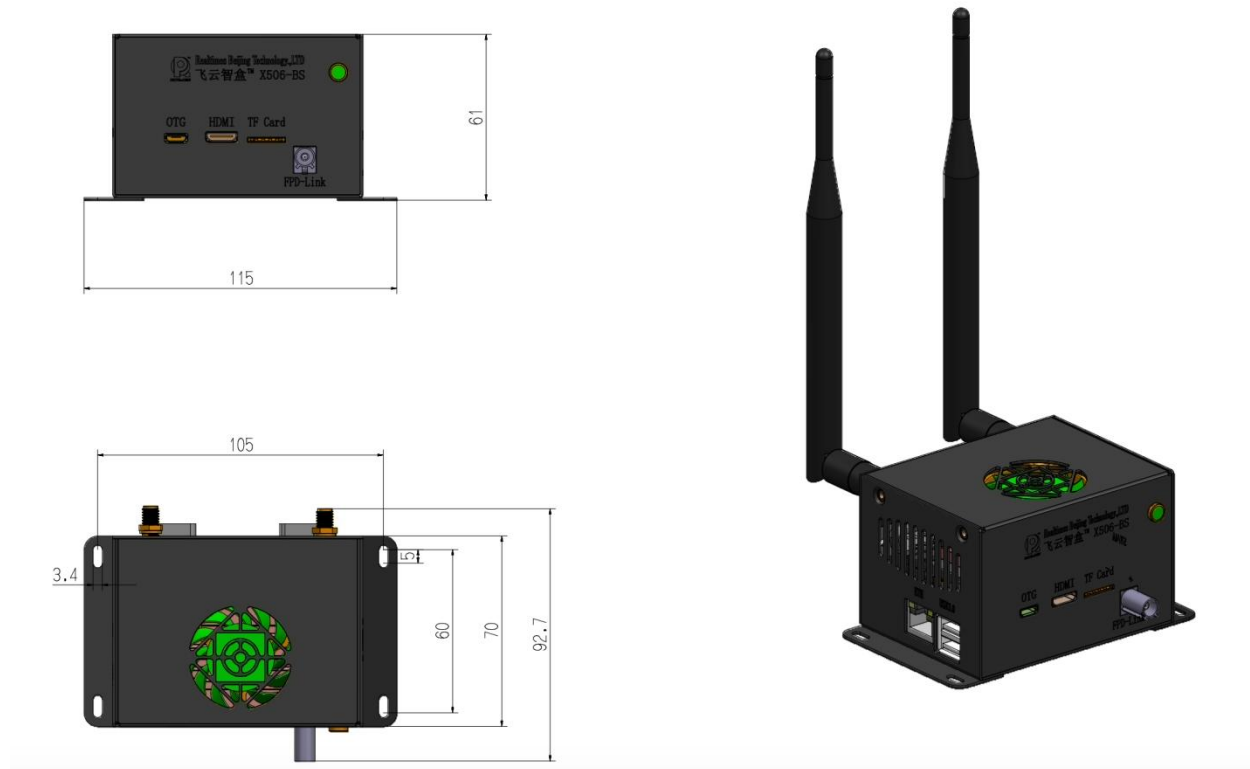
<b>Function</b>	USB2.0 connectors	
<b>marking</b>	USB-OTG	
<b>Type</b>	UBS2.0 Micro Type-B	

## 2.8 Function connector

<b>Function</b>	Function port																									
<b>marking</b>	URT/I2C																									
<b>Type</b>	DB9																									
<b>Pin define</b>	<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		
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9	UART3_CTS																									

<b>Function</b>	Function port																									
<b>marking</b>	Button																									
<b>Type</b>	DB9																									
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9	FORCE_RECOVER Y																									

### 3 Product size diagram



### 4 Hardware update history

X506-B hardware update history

edition	Updata description
V1.0	Initial release

# Software version supporting instructions

X506-B is a complete product with Jetson Nano module as the core. Provide developers with one-stop terminal equipment to assist developers in application development.

X506-B Feiyun Smart Box supporting software includes:

- L4T (Linux for Tegra): L4T provides "OS" for your Feiyun Smart Box, including Linux kernel, boot loader, board support package (BSP) and sample file system. (By default, the pure system has been installed for the device, Jetpack needs to be installed by itself)
- Jetpack: Jetpack sdk is the most comprehensive solution for building AI applications. It includes software libraries and apis, examples, developer tools and documentation for the latest and previous versions of Jetson products.

## 1 use

### 1.1 Smart box power on and start

- 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 X506-B, the system will start working after power on.

### 1.2 Recovery Mode

Jetson NANO 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 Micro USB(OTG) port of the X506-B 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.

## 2 L4T (Linux for Tegra Abbreviation“L4T”)

L4T provides "OS" for your Feiyun Smart Box, including Linux kernel, boot loader, board support package (BSP) and sample file system.

X506-B Smart Box is working 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, M.2, USB3.0, fan interface, etc. cannot work normally.

For all support of X506-B smart box interface, the supporting driver patch (BSP: Board Support Package) needs to be loaded. Use the flash method to program the system. SDK Manager to install all other JetPack components except L4T to make your Feiyun Smart Box up and running quickly.

For system programming documentation, please refer to "[Nano system programming instruction manual](#)"

L4T and BSP can be downloaded from [Ruitai Cloud Space](#), and L4T can also be downloaded directly from the L4T main page on the Jetson developer site.

Please contact sales for the user and password of Ruitai Cloud Space.

## 3 Jetpack

Nvidia jetpack sdk is the most comprehensive solution for building AI applications. It includes software libraries and apis, examples, developer tools and documentation for the latest and previous versions of Jetson products.

### 3.1 Jetpack Component summary

This section briefly introduces each component of JetPack. For more detailed information about these components, please refer to JetPack's online documentation.

#### OS Image

JetPack includes a reference file system derived from Ubuntu. (Development kit system, no need to install)

#### Libraries and APIs

JetPack library and API include:

- TensorRT and cuDNN for high-performance deep learning applications
- CUDA for multi-domain GPU accelerated applications
- NVIDIA Container Runtime for containerized GPU accelerated applications
- Multimedia API package for camera application and sensor driver development
- VisionWorks, OpenCV and VPI for visual computing applications
- Sample application

### 3.2 How to install Jetpack

#### Overview of process steps

Installing JetPack to your Jetson device requires you to perform the following steps:

1. Download and install the NVIDIA SDK Manager on the Linux host.
2. Connect your jetson device to the Linux host (Micro USB or network (same network segment)).
3. Test your device can connect via ssh.
4. Use SDK Manager to select and install the required components.

#### Download and install the NVIDIA SDK Manager on the Linux host.

You must have a Linux host with internet access to run SDK Manager and refresh the developer kit. The supported host operating systems are:

Ubuntu Linux x64 Version 18.04 or 16.04

#### Download and install NVIDIA SDK Manager.

**sdkmanager** Installation package: **sdkmanager-[version].[build#].deb**

The current version is: **sdkmanager\_1.2.0**

**sdkmanager** install

**\$ sudo apt install ./sdkmanager-[version].[build#].deb**

## Connect your jetson device to the Linux host

Prepare your Jetson device for the following settings. (If the equipment system is not initialized, the system user needs to initialize after power-on)

- Connect the monitor, keyboard and mouse to the Jetson Feiyun smart box device (please refer to the interface description above).
- Use Micro USB cable to connect Linux host and Jetson Feiyun Smart Box (or network (same network segment))
- During the setup process, SDK Manager will provide Internet connection for your jetson Feiyun Smart Box via USB or network connection.
- Connect the supplied power adapter to the DC jack of the Feiyun Smart Box, and plug the AC interface into an AC power outlet.

## Test that your device can connect via ssh.

If connected via Micro USB, enter lsusb under the Linux host terminal to see the nvidia crop

The device can be accessed through ping or ssh commands

```
$ ping 192.168.55.1
```

or

```
$ ssh <jetson_user>@192.168.55.1
```

If connected via a network, check whether the device ip address is in the same network segment as the Linux host on the Feiyun Smart Box, and the Feiyun Smart Box device can be accessed through the ping or ssh command.

```
$ ping <jetson_ip>
```

or

```
$ ssh <jetson_user>@<jetson_device_ip>
```

## Use SDK Manager to select and install the required components

NVIDIA SDK Manager supports installing software to Jetson core (Flying Cloud Smart Box). For complete instructions, please refer to Chapter 5 of "[Nano System Programming Manual](#)".

### 3.3 Sample application

JetPack includes several examples that demonstrate the use of JetPack components. They are stored in the reference file system and can be compiled in the developer toolkit.

Component	Location
<a href="#">TensorRT</a>	/usr/src/tensorrt/samples/
<a href="#">cuDNN</a>	/usr/src/cudnn_samples_/
<a href="#">CUDA</a>	/usr/local/cuda-/samples/
<a href="#">Multimedia API</a>	/usr/src/tegra_multimedia_api/
<a href="#">VisionWorks</a>	/usr/share/visionworks/sources/samples/ /usr/share/visionworks-tracking/sources/samples/ /usr/share/visionworks-sfm/sources/samples/
<a href="#">OpenCV</a>	/usr/share/OpenCV/samples/
<a href="#">VPI</a>	/opt/nvidia/vpi/vpi-/samples

### 3.4 Developer tools

JetPack includes the following development tools. Some are used directly on the Jetson system, and some run on a Linux host connected to the Jetson system.

#### •Application development and debugging tools

- [NSight Eclipse](#) version for GPU accelerated application development: runs on a Linux host. Support all Jetson products.
- [CUDA-GDB](#) for application debugging: Run on Jetson system or Linux host. Support all Jetson products.
- [CUDA-MEMCHECK](#) debug application memory error: run on Jetson system. Support all Jetson products.

#### •Application analysis and optimization tools

- [NSight Systems](#) for application multi-core CPU evaluation: run on a Linux host. Helps you improve application performance by identifying the slower parts of the code. Support all Jetson products.
- [NVIDIA@Nsight™ compute](#) Kernel Analyzer: An interactive analysis tool for CUDA applications. It provides detailed performance indicators and API debugging through user interface and command line tools.
- [NSight Graphics](#) for graphics application debugging and evaluation: a consolegrade tool for debugging and optimizing OpenGL and OpenGL ES programs. Run on the Linux host. Support all Jetson products.



### 3.5 Documentation

Documents related to developers using JetPack include:

- [JetPack Documentation](#)
- [VisionWorks Documentation](#)
- [Nsight Eclipse Edition Documentation](#)
- [CUDA-GDB Documentation](#)
- [CUDA-MEMCHECK Documentation](#)
- [TensorRT Documentation](#)
- [cuDNN Documentation](#)
- [CUDA Toolkit](#)
- [NVIDIA Container Runtime](#)
- [OpenCV Documentation](#)
- [Jetson Linux Multimedia API Reference](#)
- [Nsight Systems](#)
- [nvprof](#)
- [Visual Profiler](#)
- [Nsight Graphics](#)
- [Nsight Compute CLI](#)
- [VPI-Vision Programming Interface](#)

## 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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