

# RTSO-6002

# Product Manual

**Realtimes Beijing Technology Co., LTD.**

**Fax:** +86 010-84284669 / 84280996

**Email:** [info@realtimes.cn](mailto: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	Editor
V1.2	2021-01-20	Initial release	V1.2	RT0086
V1.3	2021-06-08	Mini PCIe base raised	V1.2	RT0086
V1.4	2021-08-24	Modify document content	V1.2	RT0086
V1.5	2021-11-17	Added NANO module support	V1.2	RT0086
V1.6	2022-03-08	Add software version supporting instructions	V1.2	RT0086



## Catalogue

<b>Product presentation</b> .....	<b>7</b>
1 INTRODUCTION .....	7
1.1 Features .....	7
1.2 Ordering Information .....	8
<b>PRODUCT SPECIFICATIONS</b> .....	<b>9</b>
1 EXTERNAL INTERFACE FUNCTION AND LOCATION .....	9
1.1 Functional connector .....	10
1.2 Button .....	10
2 CONNECTORS DESCRIPTION .....	11
2.1 module interface .....	11
2.2 Fan interface .....	11
2.3 Micro SIM & Micro SD card slot .....	12
2.4 MiPi camera interface .....	12
2.5 RTC battery interface .....	13
2.6 Mini PCIE slot .....	13
2.7 Power interface .....	14
2.8 Mini HDMI .....	14
2.9 Ethernet .....	15
2.10 USB .....	15
2.11 OTG-USB2.0 .....	16
2.12 Function pin .....	16
2.13 UART & I2C .....	16
2.14 Serial port .....	17
2.15 SPI .....	17
2.16 Dip Switch .....	18
3 PRODUCT SIZE .....	19
4 HARDWARE UPDATE HISTORY .....	19
<b>SOFTWARE VERSION SUPPORTING INSTRUCTIONS</b> .....	<b>20</b>
1 INSTALLATION AND USE .....	20
1.1 picture of products .....	20
1.2 How to use the board .....	20
1.3 Recovery Mode .....	21
2 L4T (LINUX FOR TEGRA ABBREVIATION“L4T”) .....	21
3 OTHER RELATED INTRODUCTIONS .....	22
3.1 Jetpack .....	22
3.1.1 Jetpack Component summary .....	22
3.1.2 How to install Jetpack .....	22
3.2 Developer tools .....	23
3.3 Documentation .....	24
<b>TERMS OF WARRANTY</b> .....	<b>25</b>



---

**COPYRIGHT NOTICE..... 26**



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 RTSO-6002). 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):  
<http://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 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](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

The NVIDIA Jetson Xavier NX/TX2 NX/Nano module is a processor suitable for machine deep learning launched by NVIDIA. It has powerful computing power and the module area is only the size of a credit card. It is mainly aimed at the fast-developing artificial intelligence market in recent years, such as unmanned aerial vehicles, automatic driving systems, etc., and has relatively broad application prospects. RTSO-6002 is an industrial-grade carrier board for Xavier NX/TX2 NX/Nano, with an operating temperature of -40°C—+80°C, low power consumption, high security level, and can meet various harsh conditions.

### 1.1 Features

Model distinction:

Difference	6002	6002E
Onboard eMMC	Without	Have

Interface comparison:

Type Interface	6002	6002E
AI core	Xavier NX/TX2 NX/Nano	
USB	1 x USB Type A port, support usb2.0, usb3.0 signal, provide 1A output current; 1 x USB Type A port, only supports usb2.0 signal, providing 1A output current; 1 x Micro USB port, support usb host and usb device mode, provide 1A output current.	
HDMI	1 x Mini-HDMI 2.0 interface (maximum 6Gbps, 24bpp, 4096x2160@60Hz)	
Network Port	1 x Gigabit Ethernet (10/100/1000Mbps auto-sensing; half-duplex/full-duplex auto-sensing)	
UART&I2C	2 x 3.3V function port UART, 1 x Debug UART, 2 x I2C, 1 x SPI and GPIO multiplexing	
CAN	2 x CAN 2.0 (Nano has no CAN function)	
Camera Interface	2 x MIPI interfaces	
PCIe Interface	1 x Mini-PCIe interface	
RTC Interface	1 x RTC battery interface	
SD/EMMC	1 x Micro SD	1 x 128G EMMC
SIM Interface	1x Micro SIM interface	
FAN Interface	1 x FAN fan connector	
Size	87mm*57mm*26.37mm	
Power input	+12V	
Temperature	-40~+80°C	
Weight	About 56g	



## 1.2 Ordering Information

Model Options	Description
RTSO-6002	Supports Jetson Xavier NX/TX2 NX/Nano modules, 1 x GbE, 1 x mini-PCIe, 1 x mini-HDMI, 2 x MIPI CSI-2/2 Lane, 1 x USB OTG, 1 x USB 2.0, 1 x USB 3.1, 2 x CAN, 2 x I2C, 1x SPI, 1 x Debug UART, 2 x UART, 12 x GPIOs(optional), 4G LTE(optional), 1 x Micro SIM, 1 x Micro SD, RoHS Compliant, Provide Rite-Hite New Era RTS Linux4Tegra Software Support Package
RTSO-6002E	Supports Jetson Xavier NX/TX2 NX/Nano modules, 1 x GbE, 1 x mini-PCIe, 1 x mini-HDMI, 2 x MIPI CSI-2/2 Lane, 1 x USB OTG, 1 x USB 2.0, 1 x USB 3.1, 2 x CAN, 2 x I2C, 1x SPI, 1 x Debug UART, 2 x UART, 12 x GPIOs(optional), 4G LTE(optional), 1 x Micro SIM, 1 x eMMC(128GB), provide RTS Linux4Tegra Software Support Package
RTSO-6001B-cables(optional)	1 x miniHDMI to HDMI cable; 1 x USB OTG; 4 x multi-function double row pin extension cables (UART, I2C, UART, SPI); 1 x RTC battery
RTS-XavierNX-HS03(optional)	Active Heatsinks for Xavier NX Modules
RPI Camera V2 (optional)	Raspberry Pi MIPI camera, 8MP, Sony IMX219 module
FAW-1233-03 (optional)	MIPI Camera Cable, Micro Coax I-PEX Cable, 300mm
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)
miniPCIe to M.2.M (optional )	mini-PCIe to M.2 Key M interface card
Eco Capture Dual SDI M.2 (optional) Eco Capture Quad SDI M.2(optional)	M.2 Video capture card,Eco Capture Dual SDI M.2 (dual-channel SDI video input), Eco Capture Quad SDI M.2(four-channel SDI Video input)
ME909S-821(optional)	mini-PCIe Full netcom 4G module

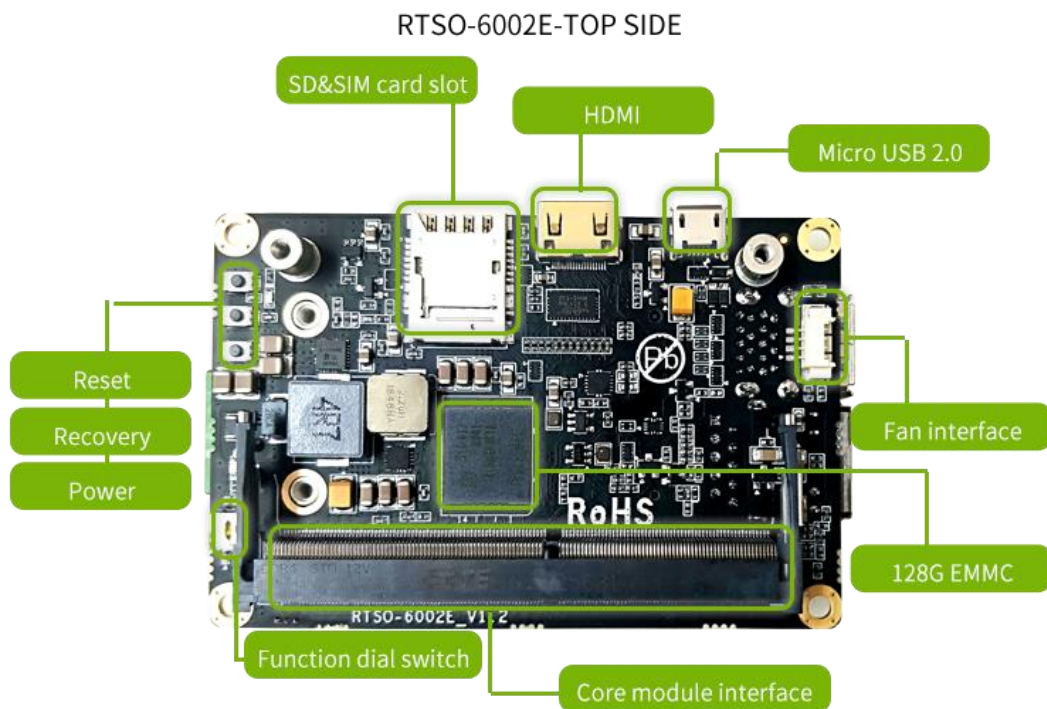
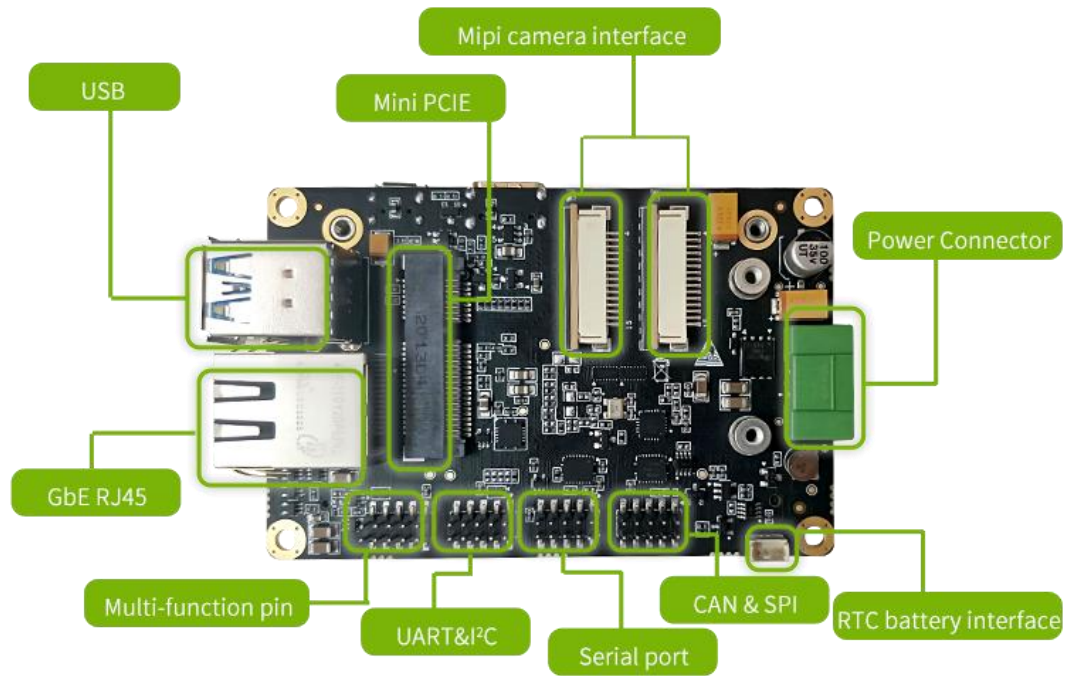
### Order online

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

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

# Product specifications

## 1 External interface function and location



## 1.1 Functional connector


指示标识	功能描述
U1	260 Pin,Connect to the NVIDIA Jetson Xavier NX/TX2 NX/Nano core module
J14	Connect external cooling fans
J4	Micro SIM &Micro SD card slot
J8/J21	MiPi Camera interface
J16	RTC The battery pin
J6	Mini PCIE slot
J18	Power input terminal
J13	Ethernet connector
J2	USB connector
J7	Mini HDMI interface
J1	OTG USB 2.0 Micro Type-B interface
J20	Function button pin insertion
J11	UART && I2C
J12	Serial port pin
J10	SPI port pin
J3	Dial switch

## 1.2 Button


Marking	Function description
K1	POWER button is used for system shutdown and POWER on after soft shutdown
K2	RECOVERY button is used to put the core module into recovery mode
K3	RESET button is used to restart the core module

## 2 Connectors Description

### 2.1 module interface


<b>Function</b>	Connect NVIDIA Jetson Xavier NX/TX2 NX/Nano core module	
<b>Marking</b>	U1	
<b>Type</b>	260 Pin DDR4 SO-DIMM	
<b>Pin define</b>	Refer to the pin definition instructions in the NVIDIA Jetson Xavier NX/TX2 NX/Nano core module data book.	

### 2.2 Fan interface

<b>Function</b>	Connect external cooling fan												
<b>Marking</b>	J14												
<b>Type</b>	Molex PicoBlade Header												
<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>GND</td> <td>2</td> <td>+5V</td> </tr> <tr> <td>3</td> <td>TACH</td> <td>4</td> <td>PWM</td> </tr> </tbody> </table>		Pin	Signal	Pin	Signal	1	GND	2	+5V	3	TACH	4
Pin	Signal	Pin	Signal										
1	GND	2	+5V										
3	TACH	4	PWM										


### 2.3 Micro SIM & Micro SD card slot

<b>Function</b>	Micro SIM & Micro SD card slot																										
<b>Marking</b>	J4																										
<b>Type</b>	Micro SIM & Micro SD																										
<b>Pin define</b>	Micro SIM card slot (substratum)																										
	<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>SDIO_DATA2</td> <td>2</td> <td>SDIO_DATA3</td> </tr> <tr> <td>3</td> <td>SDIO_CMD</td> <td>4</td> <td>SDIO_VCC</td> </tr> <tr> <td>5</td> <td>SDIO_CLK</td> <td>6</td> <td>GND</td> </tr> <tr> <td>7</td> <td>SDIO_DATA0</td> <td>8</td> <td>SDIO_DATA1</td> </tr> <tr> <td>9</td> <td>GND</td> <td>10</td> <td>SDIO_CD</td> </tr> </tbody> </table>	Pin	Signal	Pin	Signal	1	SDIO_DATA2	2	SDIO_DATA3	3	SDIO_CMD	4	SDIO_VCC	5	SDIO_CLK	6	GND	7	SDIO_DATA0	8	SDIO_DATA1	9	GND	10	SDIO_CD		
Pin	Signal	Pin	Signal																								
1	SDIO_DATA2	2	SDIO_DATA3																								
3	SDIO_CMD	4	SDIO_VCC																								
5	SDIO_CLK	6	GND																								
7	SDIO_DATA0	8	SDIO_DATA1																								
9	GND	10	SDIO_CD																								
	Micro SD card slot (superstratum)																										
	<table border="1"> <thead> <tr> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>T1</td> <td>SDIO_DATA2</td> <td>T2</td> <td>SDIO_DATA3</td> </tr> <tr> <td>T3</td> <td>SDIO_CMD</td> <td>T4</td> <td>SDIO_VCC</td> </tr> <tr> <td>T5</td> <td>SDIO_CLK</td> <td>T6</td> <td>GND</td> </tr> <tr> <td>T7</td> <td>SDIO_DATA0</td> <td>T8</td> <td>SDIO_DATA1</td> </tr> <tr> <td>T9</td> <td>SDIO_CD</td> <td></td> <td></td> </tr> </tbody> </table>	Pin	Signal	Pin	Signal	T1	SDIO_DATA2	T2	SDIO_DATA3	T3	SDIO_CMD	T4	SDIO_VCC	T5	SDIO_CLK	T6	GND	T7	SDIO_DATA0	T8	SDIO_DATA1	T9	SDIO_CD				
Pin	Signal	Pin	Signal																								
T1	SDIO_DATA2	T2	SDIO_DATA3																								
T3	SDIO_CMD	T4	SDIO_VCC																								
T5	SDIO_CLK	T6	GND																								
T7	SDIO_DATA0	T8	SDIO_DATA1																								
T9	SDIO_CD																										
	SIM card facing: notch facing inward																										




### 2.4 MiPi camera interface

<b>Function</b>	MiPi camera																																						
<b>Marking</b>	J8/J21																																						
<b>Type</b>	FPC connector																																						
<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>GND</td> <td>2</td> <td>CON_CSI_A_D0_N</td> </tr> <tr> <td>3</td> <td>CON_CSI_A_D0_P</td> <td>4</td> <td>GND</td> </tr> <tr> <td>5</td> <td>CON_CSI_A_D1_N</td> <td>6</td> <td>CON_CSI_A_D1_P</td> </tr> <tr> <td>7</td> <td>GND</td> <td>8</td> <td>CON_CSI_A_CLK_N</td> </tr> <tr> <td>9</td> <td>CON_CSI_A_CLK_P</td> <td>10</td> <td>GND</td> </tr> <tr> <td>11</td> <td>CON_CAM1_PWDN</td> <td>12</td> <td>CON_CAMA_MCLK</td> </tr> <tr> <td>13</td> <td>CAM_I2C_SCL</td> <td>14</td> <td>CAM_I2C_SDA</td> </tr> <tr> <td>15</td> <td>VDD_3V3</td> <td>16</td> <td></td> </tr> </tbody> </table>	Pin	Signal	Pin	Signal	1	GND	2	CON_CSI_A_D0_N	3	CON_CSI_A_D0_P	4	GND	5	CON_CSI_A_D1_N	6	CON_CSI_A_D1_P	7	GND	8	CON_CSI_A_CLK_N	9	CON_CSI_A_CLK_P	10	GND	11	CON_CAM1_PWDN	12	CON_CAMA_MCLK	13	CAM_I2C_SCL	14	CAM_I2C_SDA	15	VDD_3V3	16			
Pin	Signal	Pin	Signal																																				
1	GND	2	CON_CSI_A_D0_N																																				
3	CON_CSI_A_D0_P	4	GND																																				
5	CON_CSI_A_D1_N	6	CON_CSI_A_D1_P																																				
7	GND	8	CON_CSI_A_CLK_N																																				
9	CON_CSI_A_CLK_P	10	GND																																				
11	CON_CAM1_PWDN	12	CON_CAMA_MCLK																																				
13	CAM_I2C_SCL	14	CAM_I2C_SDA																																				
15	VDD_3V3	16																																					



## 2.5 RTC battery interface


<b>Function</b>	RTC battery pin			
<b>Marking</b>	J16			
<b>Type</b>	1.27mm Pitch 1x3Pin SIP			
<b>Pin define</b>	<b>Pin</b>		<b>Signal</b>	
	1	GND	2	NC
	3	+3V	4	
	Pin-1: The green box on the right .			
				

## 2.6 Mini PCIE slot


<b>Function</b>	Mini PCIE slot			
<b>Marking</b>	J6			
<b>Type</b>	Mini PCIE			
<b>Pin define</b>	<b>Pin</b>		<b>Signal</b>	
	1	WAKE	2	3.3V
	3	NC	4	GND
	5	NC	6	1.5V
	7	PCIE_CLKREQ	8	UIM_PWR
	9	GND	10	UIM_DATA
	11	PCIE_REFCLK-	12	UIM_CLK
	13	PCIE_REFCLK+	14	UIM_RESET
	15	GND	16	UIM_VPP
	17	NC	18	GND
	19	NC	20	W_DISABLE
	21	GND	22	PCIE_REST
	23	PCIE_RX-	24	3.3V
	25	PCIE_RX+	26	GND
	27	GND	28	1.5V
	29	GND	30	SMB_CLK
	31	PCIE_TX-	32	SMB_DAT
	33	PCIE_TX+	34	GND
	35	GND	36	CON_USB2_D-
	37	GND	38	CON_USB2_D+
	39	VCC_3V3_PCIE	40	GND
	41	VCC_3V3_PCIE	42	NC
	43	GND	44	NC
45	NC	46	NC	
				

	47	NC	48	1.5V
	49	NC	50	GND
	51	NC	52	3.3V


## 2.7 Power interface

<b>Function</b>	Power IN											
<b>Marking</b>	J18											
<b>Type</b>	3.5 mm											
Pin define	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>VCC (+)</td> <td>2</td> <td>GND (-)</td> </tr> </tbody> </table> <p>Pin-1: The green box on the right .</p> <p>Max in: <b>single +12V</b>  <b>Cable connection is strictly prohibited!</b></p>				Pin	Signal	Pin	Signal	1	VCC (+)	2	GND (-)
Pin	Signal	Pin	Signal									
1	VCC (+)	2	GND (-)									
												

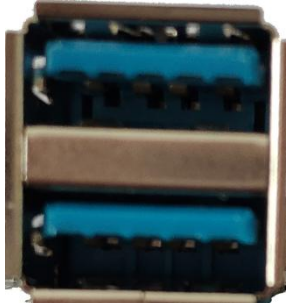
## 2.8 Mini HDMI

<b>Function</b>	HDMI																																															
<b>Marking</b>	J7																																															
<b>Type</b>	Mini HDMI																																															
Pin define	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>TMDS Data2+</td> <td>2</td> <td>TMDS Data2 GND</td> </tr> <tr> <td>3</td> <td>TMDS Data2-</td> <td>4</td> <td>TMDS Data1+</td> </tr> <tr> <td>5</td> <td>TMDS Data1 GND</td> <td>6</td> <td>TMDS Data1-</td> </tr> <tr> <td>7</td> <td>TMDS Data0+</td> <td>8</td> <td>TMDS Data0 GND</td> </tr> <tr> <td>9</td> <td>TMDS Data0-</td> <td>10</td> <td>TMDS Clock+</td> </tr> <tr> <td>11</td> <td>TMDS Clock GND</td> <td>12</td> <td>TMDS Clock-</td> </tr> <tr> <td>13</td> <td>CEC</td> <td>14</td> <td>No Connect</td> </tr> <tr> <td>15</td> <td>DDC clock</td> <td>16</td> <td>DDC data</td> </tr> <tr> <td>17</td> <td>DDC GND</td> <td>18</td> <td>+5V Power</td> </tr> <tr> <td>19</td> <td>Hot Plug Detect</td> <td></td> <td></td> </tr> </tbody> </table>				Pin	Signal	Pin	Signal	1	TMDS Data2+	2	TMDS Data2 GND	3	TMDS Data2-	4	TMDS Data1+	5	TMDS Data1 GND	6	TMDS Data1-	7	TMDS Data0+	8	TMDS Data0 GND	9	TMDS Data0-	10	TMDS Clock+	11	TMDS Clock GND	12	TMDS Clock-	13	CEC	14	No Connect	15	DDC clock	16	DDC data	17	DDC GND	18	+5V Power	19	Hot Plug Detect		
Pin	Signal	Pin	Signal																																													
1	TMDS Data2+	2	TMDS Data2 GND																																													
3	TMDS Data2-	4	TMDS Data1+																																													
5	TMDS Data1 GND	6	TMDS Data1-																																													
7	TMDS Data0+	8	TMDS Data0 GND																																													
9	TMDS Data0-	10	TMDS Clock+																																													
11	TMDS Clock GND	12	TMDS Clock-																																													
13	CEC	14	No Connect																																													
15	DDC clock	16	DDC data																																													
17	DDC GND	18	+5V Power																																													
19	Hot Plug Detect																																															
																																																

## 2.9 Ethernet

<b>Function</b>	Gigabit Ethernet			
<b>Marking</b>	J13			
<b>Type</b>	RJ45			
<b>Pin define</b>	<b>Pin</b>		<b>Signal</b>	
	1	TP0+	2	TP0-
	3	TP1+	4	TP2+
	5	TP2-	6	TP1-
	7	TP3+	8	TP3-
				

## 2.10 USB

<b>Function</b>	USB			
<b>Marking</b>	J2			
<b>Type</b>	Double USB Type-A			
<b>Pin define</b>	<b>layer</b>		<b>top</b>	
	<b>Type</b> USB 3.0			
	<b>Pin</b>		<b>Signal</b>	
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	GND
	5	SSRX-	6	SSRX+
	7	GND	8	SSTX-
	9	SSTX+		
	<b>layer</b>		<b>bottom</b>	
	<b>Type</b> USB 2.0			
	<b>Pin</b>		<b>Signal</b>	
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	GND
	5	SSRX-	6	SSRX+
	7	GND	8	SSTX-
	9	SSTX+		
	<p>USB2.0 enable depends on the dialing switch 1 located at the OFF position</p>			
				



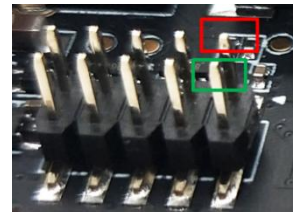
## 2.11 OTG-USB2.0

<b>Function</b>	USB2.0			
<b>J1</b>				
<b>Type</b>	USB 2.0 MicroType-B			
<b>Pin define</b>	<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	USB ID
	5	GND		
	When usb-otg is in host mode, the USB ID Pin needs to float. When usb-otg is slave mode, USB ID Pin needs to be grounded.			



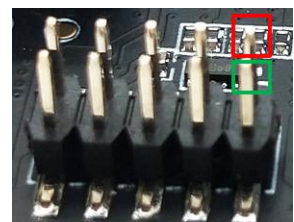
## 2.12 Function pin

<b>Function</b>	Function pin			
<b>Marking</b>	J20			
<b>Type</b>	2.0mm pitch 2x5Pin Dip			
<b>Pin define</b>	<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>
	1	DEV_3V3	2	GND
	3	DEV_3V3	4	GND
	5	BUTTON_PWR_ON	6	GND
	7	FORCE_RECOVERY	8	GND
	9	PMIC_SYS_RST	10	GND
Pin-1: the mark in the red box on the right side of the picture. Pin-2: the mark in the green box of the picture on the right.  Pin location: marked by the blue box on the right.				



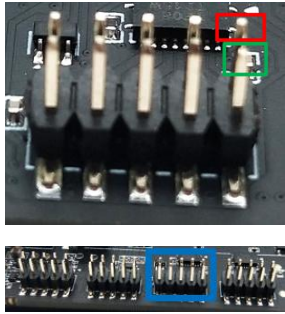
## 2.13 UART & I2C

<b>Function</b>	UART & I2C			
<b>Marking</b>	J11			
<b>Type</b>	2.0mm pitch 2x5Pin Dip			
<b>Pin define</b>	<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>
	1	GEN1_I2C_SCL	2	GEN2_I2C_SCL
	3	GEN1_I2C_SDA	4	GEN2_I2C_SDA
	5	DEV_3V3	6	DEV_3V3
	7	UART1_TXD_DBG	8	UART1_RXD_DBG
	9	GND	10	GND

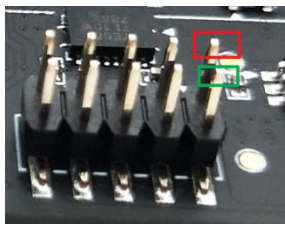



	<p>Pin-1: the mark in the red box on the right side of the picture. Pin-2: the mark in the green box of the picture on the right.</p> <p>Pin location: marked by the blue box on the right.</p> <p>UART1 Debug serial port, 3.3V TTL logic level The mapping file on the Linux system is ttyS0 in the /dev directory.</p> <p>The derived GEN1_I2C and GEN2_I2C buses correspond to the iic-1 and iic-0 buses in the Linux system.</p>	
--	---	--

## 2.14 Serial port


<b>Function</b>	Serial port				
<b>Marking</b>	J12				
<b>Type</b>	2.0mm pitch 2x5Pin Dip				
<b>Pin define</b>	<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>	
	1	UART2_RXD	2	UART2_TXD	
	3	UART2_CTS	4	UART2_RTS	
	5	UART3_RXD	6	UART3_TXD	
	7	UART3_CTS	8	UART3_RTS	
	9	DEV_3V3	10	GND	
	<p>Pin-1: the mark in the red box on the right side of the picture. Pin-2: the mark in the green box of the picture on the right.</p> <p>Pin location: marked by the blue box on the right.</p> <p>The two serial ports, UART2~ UART3, are both 3.3v TTL logic level. The mapping files for UART2 and UART3 on the Linux system are ttyTHS1 and ttyTHS2 in the /dev directory.</p>				

## 2.15 SPI

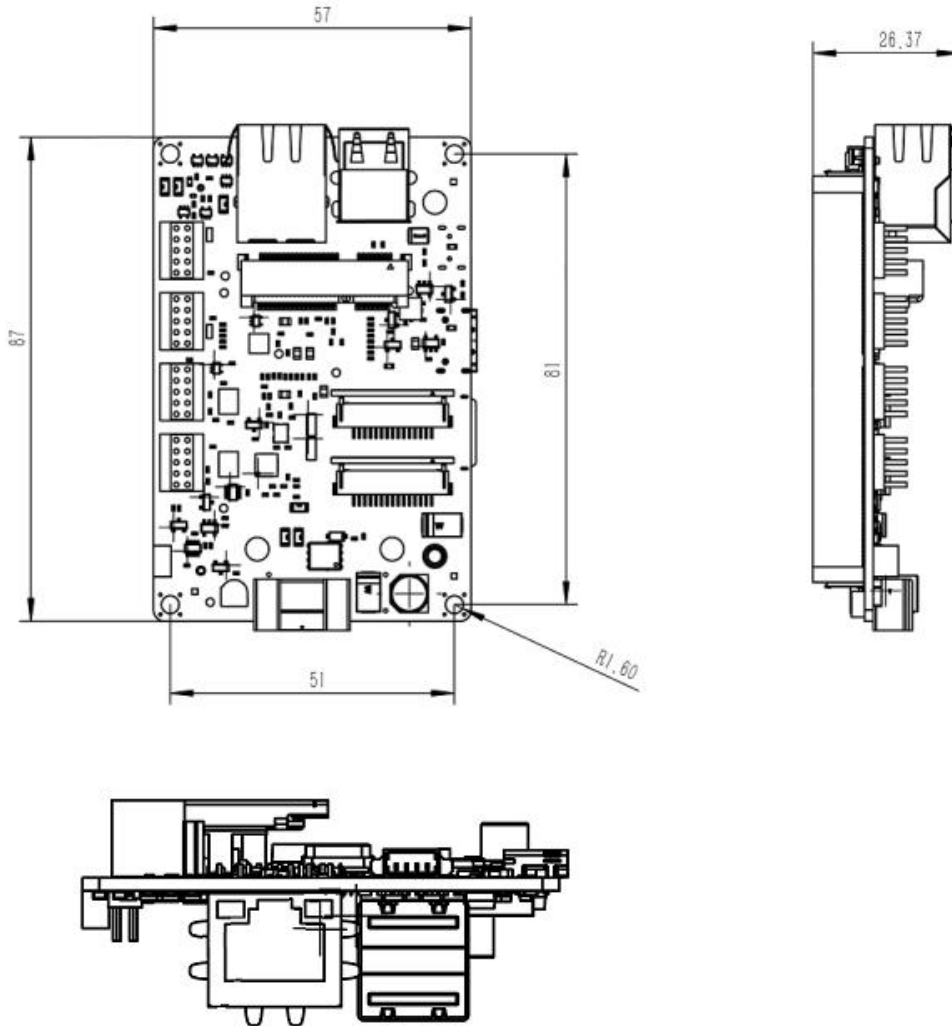
<b>Function</b>	SPI				
<b>Marking</b>	J10				
<b>Type</b>	2.0mm pitch 2x5Pin Dip				
<b>Pin define</b>	<b>Pin</b>	<b>Signal</b>	<b>Pin</b>	<b>Signal</b>	
	1	CAN1_H	2	CAN0_H	
	3	CAN1_L	4	CAN0_L	

	5	SPI2_SCK	6	SPI2_MISO	
	7	SPI2_MOSI	8	SPI2_CS0	
	9	DEV_3V3	10	GND	
	<p>Pin-2: the mark in the red box on the right side of the picture.  Pin-1: the mark in the green box of the picture on the right.</p> <p>Pin location: marked by the blue box on the right.</p> <p>The mapping files for SPI2 on Linux systems are spi1.0 in the /dev directory.</p>				

### 2.16 Dip Switch

<b>Function</b>	Dip Switch																
<b>Marking</b>	J3																
<b>Type</b>	2BIT Dip Switch																
<b>Pin define</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>bit</th> <th>status</th> <th>Fun</th> </tr> </thead> <tbody> <tr> <td rowspan="2">BIT1</td> <td>OFF</td> <td>default: enables USB2.0, Mini PCIE disables USB2.0</td> </tr> <tr> <td>ON</td> <td>disables USB2.0, Mini PCIE enables USB2.0</td> </tr> <tr> <td rowspan="2">BIT2</td> <td>OFF</td> <td>default: enables Micro USB2.0 power supplies to carrier board</td> </tr> <tr> <td>ON</td> <td>disables Micro USB2.0 power supplies to carrier board</td> </tr> </tbody> </table>				bit	status	Fun	BIT1	OFF	default: enables USB2.0, Mini PCIE disables USB2.0	ON	disables USB2.0, Mini PCIE enables USB2.0	BIT2	OFF	default: enables Micro USB2.0 power supplies to carrier board	ON	disables Micro USB2.0 power supplies to carrier board
bit	status	Fun															
BIT1	OFF	default: enables USB2.0, Mini PCIE disables USB2.0															
	ON	disables USB2.0, Mini PCIE enables USB2.0															
BIT2	OFF	default: enables Micro USB2.0 power supplies to carrier board															
	ON	disables Micro USB2.0 power supplies to carrier board															
<b>Pin define</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>bit</th> <th>status</th> <th>Fun</th> </tr> </thead> <tbody> <tr> <td rowspan="2">BIT1</td> <td>OFF</td> <td></td> </tr> <tr> <td>ON</td> <td></td> </tr> <tr> <td rowspan="2">BIT2</td> <td>OFF</td> <td>default: Auto-PowerON</td> </tr> <tr> <td>ON</td> <td>Manual-PowerON</td> </tr> </tbody> </table>			bit	status	Fun	BIT1	OFF		ON		BIT2	OFF	default: Auto-PowerON	ON	Manual-PowerON	
bit	status	Fun															
BIT1	OFF																
	ON																
BIT2	OFF	default: Auto-PowerON															
	ON	Manual-PowerON															

### 3 Product size



### 4 Hardware update history

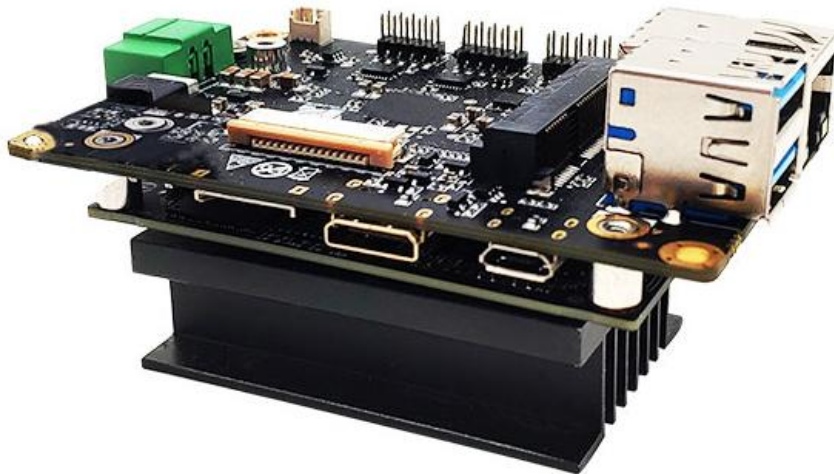
#### RTSO-6002 update history

Version	Reason for change
V1.1	Initial release
V1.2	Change the board

# Software version supporting instructions

## 1 Installation and use

### 1.1 picture of products



### 1.2 How to use the board

The carrier board cannot work alone, it needs to be used in conjunction with the Xavier NX/TX2 NX/Nano module. After aligning the inter-board connector with the module high-speed connector, press evenly with both hands to connect it; and use the screws provided with the product to reinforce and fix it.

Before using the 6002 carrier board, you must confirm that the Xavier NX/TX2 NX/Nano core module has an operating system loaded with realtimes BSP. For the installation of the operating system and jetpack, please refer to the [Xavier NX system instruction manual](#) (Ruitai cloud network disk/help document).

- a) Ensure that all external system voltages are switched off
- b) Install the Xavier NX/TX2 NX/Nano core module on the 260 Pin SO-DImm connector. Pay attention to the alignment between the connectors during the installation, apply even force, and install the fixing screws.
- c) Install necessary external cables. (e.g., the display cable to the HDMI display, the power input cable to power the system, the USB cable to link the keyboard and mouse...)
- d) Connect the power cord to the power supply.
- e) RTSO-6002 adopts automatic/manual power on design, turn on the power and the system starts to work.
- f) For the system without protective enclosure, please avoid moving the whole system after the system is powered on. It is strictly prohibited to use the body to touch the circuit board and its electronic components.

Jetson Xavier NX/TX2 NX/Nano modules are designed to optimize power efficiency and support multiple software-defined power modes. These power modes limit the budget of the module to around 5W or 10W or 15W by limiting the GPU and CPU frequencies and the number of CPU cores online to pre-approved levels. For detailed information and settings of the power mode, you can check the help document [Jetson platform working mode settings and tegrastats status query](#).

### 1.3 Recovery Mode

Jetson Xavier NX/TX2 NX/Nano core module can work in normal mode and Recovery mode, under which file system update, kernel update, Boot Loader update, BCT update and other operations can be performed.

The steps to enter the Recovery mode are as follows:

- a) Power down the device.
- b) use USB cable to connect otg-usb port (P4) of RTSO-6001B with Jetson to develop host USB port.
- c) Press the RECOVERY button without releasing it to power the system. The power supply should be maintained for more than 3 seconds, and then release the RECOVERY button.
- d) After the system enters the Recovery mode, subsequent operations can be carried out.

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

RTSO-6002 boards work on systems that are burned using the official original NVIDIA Linux For Tegra (L4T). HDMI, Gigabit Ethernet, USB2.0, serial port, GPIO, I2C bus, fan interface, upper LAYER USB3.0 can be supported. But the SD card, the lower layer USB3.0 does not work properly.

Rtso-6002 onboard interface full support, need to load the supporting driver patch.

The NVIDIA Original LT4 package can be downloaded from the following link:

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

Rtso-6002 Driver Patch Support Package Download address:

<http://www.realtimesai.com>

For the installation of the operating system and jetpack, please refer to the [Xavier NX system instruction manual](#) (Ruitai Cloud Network Disk/Help Documentation/Jetsonx System Burning and Backup Directory).

RTSO-6002 board level patch support package download jump link:

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

## 3 Other related introductions

### 3.1 Jetpack

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

#### 3.1.1 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

#### 3.1.2 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 "[Xavier NX System Programming Manual](#)".

## 3.2 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. All Jetson products are supported.
- CUDA-GDB for application debugging: Runs on a Jetson system or a Linux host. All Jetson products are supported.





• CUDA-MEMCHECK to debug application memory errors: run on Jetson systems. All Jetson products are supported.

### • **Application analysis and optimization tools**

• NSight Systems for application multi-core CPU profiling: runs on a Linux host. Helps you improve application performance by identifying slow parts of your code. All Jetson products are supported.

• NVIDIA® Nsight™ compute kernel profiler: an interactive profiling tool for CUDA applications. It provides detailed performance metrics and API debugging through the user interface and command line tools.

• NSight Graphics for Graphics Application Debugging and Profiling: A consolegrade tool for debugging and optimizing OpenGL and OpenGL ES programs. Running on a Linux host. All Jetson products are supported.

## 3.3 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.

**Rev.C 6/2020**

## Copyright Notice

**Realtimes Beijing Technology Co.,LTD.**

Realtimes Beijing Technology Co., Ltd. is copyrighted and reserves all rights to this manual and statement.

Without the written permission of the company, no unit or individual may copy, extract, backup, modify, disseminate, translate into other languages, or use all or part of it for commercial purposes in any way or form.