ARMxy Embedded Computer

BLIIOT®
MAKE IIOT EASIER

BL330
User Manual

Version: V1.0

Date: 2024-6-17

Shenzhen Beilai Technology Co.,Ltd

Website: https://www.bliiot.com

Preface

Thanks for choosing BLIIOT ARM based Embedded Computer. These operating instructions contain all the information you need for operation of BL330.

Copyright

Disclaimer

This document is designed for assisting user to better understand the device. As the described device is under continuous improvement, this manual may be updated or revised from time to time without prior notice. Please follow the instructions in the manual. Any damages caused by wrong operation will be beyond warranty.

Revision History

Revision Date	Version	Description	Owner
2024/6/17	V1.0	Initial Release	LKY

Table of Contents

1 Introduction

1.1 Overview

The ARMxy BL330 is an industrial-grade ARM controller that allows flexible selection of the SOM board and I/O interfaces. It is based on the Allwinner Technology T113-i dual-core ARM Cortex-A7 + XuanTie C906 RISC-V + HiFi4 DSP heterogeneous multi-core processor. This industrial-grade computer features an ARM Cortex-A7 processor with clock speed of up to1.2GHz.

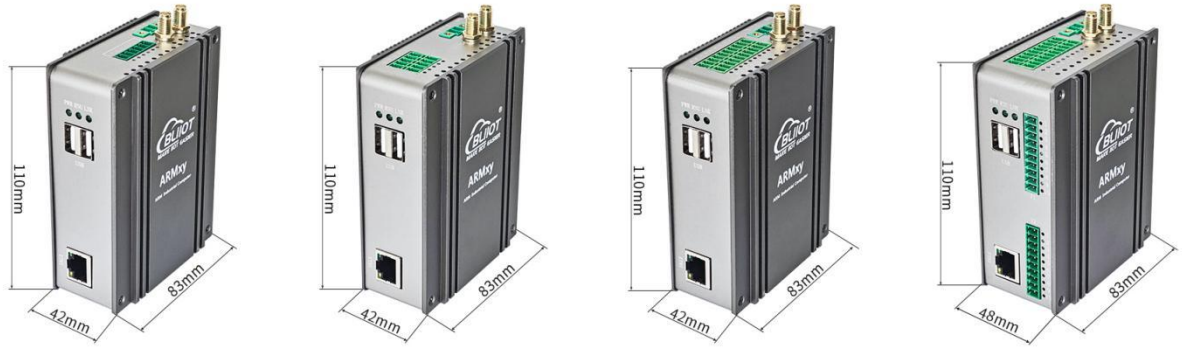
BL330 is compatible with BLIoTLink industrial protocol conversion software for data collection and transformation, and can seamless integration with various mainstream IoT cloud platforms and industrial SCADA software. Users can leverage the BLRAT for remote access and maintenance of the BL330 embedded computer.

BL330 also comes with the QuickConfig tool, enabling quick configuration, system management. Additionally, it supports AI-assisted application development and "what-you-see-is-what-you-get"programming, making the creation of intelligent industrial solutions faster and more intuitive.

The BL330 series ARM embedded computer has undergone rigorous electrical performance design and high-low temperature testing to ensure stability and reliability. It is designed for DIN35 rail mounting, making it suitable for various industrial application environments.

This embedded computer is widely used in industrial IoT, photovoltaic power generation and energy storage systems, automation control, and transportation and rail applications.

1.2 Appearance

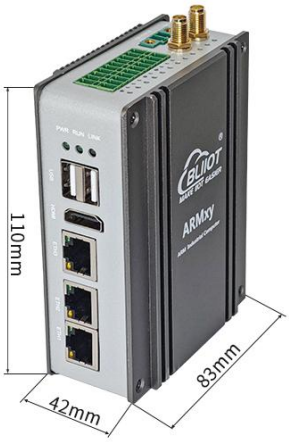


Standard Model

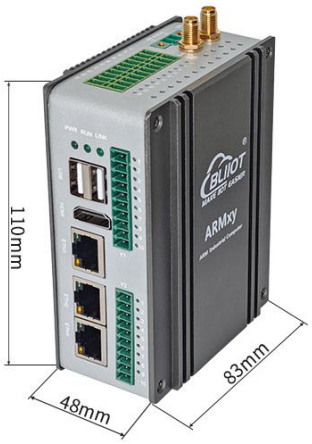
A Model

B Model

Standard Model



A Model



B Model

1.3 Technical Specifications

	Parameter	Description
System	CPU	T113-i: 2xARM Cortex-A7, 1XuanTie C906 RISC-V (64-bit)
	Clock Speed	1.2GHz
	RAM	DDR3 256/512MByte, 1GByte
	Storage	eMMC 4/8G

Power	Input Voltage	DC 12～24V
	Consumption	Normal: 280mA@12V(with 4G module), 220mA@12V (without 4G module) Maximum: 700mA@12V
	Reverse Polarity	Reverse Polarity Protection
Ethernet	Specification	1~3*RJ45, 3x100M, adaptive MDI/MDIX
	Protection	ESD ±2kV (contact), ±8kV (air);
SIM Card	Slot	1
	Type	Drawer interface
USB	Quantity	1*micro USB, 2*USB 2.0 HOST
SD Card	Slot	1
	Type	Support SD, SDHC and SDXC(UHS-I) card
HDMI	Quantity	1
Antenna	Interface	1xWi-Fi/4G, 1xGPS antenna
	Type	SMA
4G Module(Optional)	L-E	GSM/EDGE:900,1800MHz WCDMA:B1,B5,B8 FDD-LTE:B1,B3,B5,B7,B8,B20 TDD-LTE:B38,B40,B41
	L-CE	GSM/EDGE:900,1800MHz WCDMA:B1,B8 TD-SCDMA:B34,B39 FDD-LTE:B1,B3,B8 TDD-LTE:B38,B39,B40,B41
	L-A	WCDMA:B2,B4,B5 FDD-LTE:B2,B4,B12
	L-AU	GSM/EDGE:850,900,1800MHz WCDMA:B1,B2,B5,B8 FDD-LTE:B1,B3,B4,B5,B7,B8,B28 TDD-LTE:B40
	L-AF	WCDMA:B2,B4,B5 FDD-LTE:B2,B4,B5,B12,B13,B14,B66,B71
	CAT-1	GSM:900,1800 FDD-LTE:B1,B3,B5,B8 TDD-LTE:B34,B38,B39,B40,B41
5G(Optional)	Redcap version	5G NR：N1/N3/N5/N8/N28/N41/N78/N79 LTE-FDD：B1/B3/B5/B8 LTE-TD：B34/B38/B39/B40/B41
	FG652 version	NR：N1/28/41/78/79

		LTE：FDD B1/3/5/8 LTE：TDD B34/38/39/40/41 WCDMA：B1/8
Wi-Fi (Optional)	Interface	PCIe
	Protocol	IEEE 802.11b/g/n
	Mode	STA, AP
	Frequency	2.4GHz
	Channels	Ch1 ~ Ch13
	Security	Open, WPA, WPA2
	Encryption	AES, TKIP, TKIPAES
	Number of connections	8 (Max)
	Speed	150Mbps (Max)
	SSID broadcast switch	Support
LED	Quantity	LEDx3
Environment	Working	-40～85°C/-20～70°C, 35～75% RH
	Storage	-40～85°C/-20～70°C, 35 to 75% RH
Others	Housing	Aluminium housing + stainless steel
	Dimensions	110x83x42mm or 110x83x48mm
	Protection Level	IP30
	Installation	DIN35 rail mounted, wall mounting
	System	Ubuntu20.04
Certificates	/	CE, RoHS, FCC

1.4 Model Selection

1.4.1 Main Model Selection

Model	ETH	USB	HDMI	X I/O Board	Y I/O Board	Dimension
BL330	1×100M	2	×	1×6PIN	×	42×83×110mm
BL330A	1×100M	2	×	1×20PIN	×	42×83×110mm
BL330B	1×100M	2	×	1×20PIN	2	48×83×110mm
BL330C	1×100M	2	×	1×10PIN	×	42×83×110mm
BL331	2×100M	2	×	1×6PIN	×	42×83×110mm

BL331A	2×100M	2	×	1×20PIN	×	42×83×110mm
BL331B	2×100M	2	×	1×20PIN	2	48×83×110mm
BL332	3×100M	2	1	1×6PIN	×	42×83×110mm
BL332A	3×100M	2	1	1×20PIN	×	42×83×110mm
BL332B	3×100M	2	1	1×20PIN	2	48×83×110mm

1.4.2 SOM Selection

Model	MCU	Clock Speed	Kernel	DDR3	eMMC	Temperature
SOM332	T113-i	1.2GHz	2 x A7	256MByte	4GByte	Industrial grade -40~85℃
SOM333	T113-i	1.2GHz	2 x A7	512MByte	4GByte	Industrial grade -40~85℃
SOM334	T113-i	1.2GHz	2 x A7	512MByte	8GByte	Industrial grade -40~85℃
SOM335	T113-i	1.2GHz	2 x A7	1GByte	8GByte	Industrial grade -40~85℃
SOM336	T113-i	1.2GHz	2 x A7	256MByte	4GByte	Wide-temperature -20~70℃

1.4.3 X Series I/O Board Selection

You can choose the X-series I/O board based on your needs. The number of pins on the X-series I/O board must match the housing.

Note: The default port for this device is RS485. If you need RS232, please specify this to the sales team.

X Series I/O Board Selection

Model	RS232/RS485	CAN	DI	DO	GPIO	PIN
X10	2	×	×	×	×	6PIN
X11	×	2	×	×	×	6PIN

X12	1	1	×	×	×	6PIN
X13	×	×	2	2	×	6PIN
X14	×	×	4	×	×	6PIN
X15	×	×	×	4	×	6PIN
X16	×	×	×	×	4	6PIN
X20	4	×	×	×	×	10PIN
X21	3	1	×	×	×	10PIN
X22	2	2	×	×	×	10PIN
X23	4	×	4	4	×	20PIN
X24	3	1	4	4	×	20PIN
X25	2	2	4	4	×	20PIN
X26	2	×	8	4	×	20PIN
X27	1	1	8	4	×	20PIN
X28	2	×	12	×	×	20PIN
X29	1	1	12	×	×	20PIN
X30	×	×	×	×	16	20PIN

1.4.4 Y Series I/O Board Selection

You can select the Y-series I/O board based on your needs. Y-series I/O modules are compatible with all Y slots. When the Y63 is selected, you can not choose second Y-series IO board.

Y Series I/O Board Selection

Model	Description		Model	Description
Y01	4xDI+4xDO(NPN)		Y41	4xAO, 0~20mA/4~20mA
Y02	4xDI+4xDO(PNP)		Y43	4xAO, 0~5V/0~10V
Y11	8xDI(NPN)		Y46	4xAO, ±5V/±10V
Y12	8xDI(PNP)		Y51	2xRTD, 3-Wire PT100
Y13	8xDI(Dry Contact)		Y52	2xRTD, 3-Wire PT1000

Y21	8xDO(PNP)		Y53	2xRTD, 4-Wire PT100
Y22	8xDO(NPN)		Y54	2xRTD, 4-Wire PT1000
Y24	4xDO(Relay)		Y56	Resistance Measurement
Y31	4xAI, Single-ended, 0~20mA/4~20mA		Y57	Voltage Measurement
Y33	4xAI, Single-ended, 0~5V/0~10V		Y58	4xTC
Y34	4xAI, Differential, 0~5V/0~10V		Y63	4xRS485 or RS232
Y36	4xAI, Differential, ±5V/±10V		Y95	4xPWM Output(NPN) + 4xPulse Counter Input
Y37	4xIEPE		Y96	4xPWM Output(PNP) + 4xPulse Counter Input

Ordering Notes

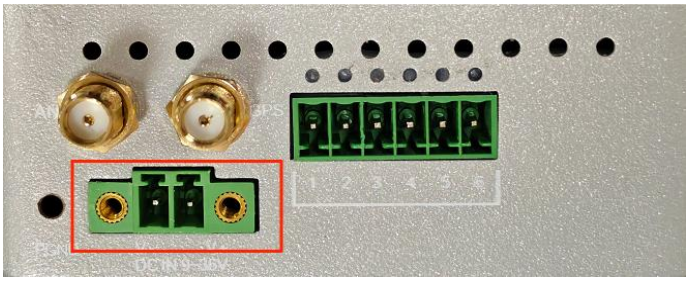
Y01: DI channels support dry contacts or NPN-type wet contact sensors.

Y02: DI channels support dry contacts or PNP-type wet contact sensors.

Y58: Supports thermocouples of types J, K, T, E, R, S, B, and N.

2 Hardware

2.1 Power Interface



Supports 1CH DC12~24V input, with reverse polarity protection.

2.2 I/O Module Port Description

Different X/Y boards offer various serial port options. The currently available board types are as follows.

2.2.1 RS232&RS485 Module

X10 Module

1	2	3	4	5	6
ttyAS3-A	ttyAS3-B	GND	ttyAS2-A	ttyAS2-B	GND

Y63 Module

1	2	3	4	5	6	7	8	9	10
ttywch 0-A	ttywch 0-B	ttywch 1-A	ttywch 1-B	GND	GND	ttywch2-A	ttywch 2-B	ttywch 3-A	ttywch 3-B

2.2.2 DI Module

X14 Module

1	2	3	4	5	6
DI1	DI2	GND	DI3	DI4	COM

Y11/12 Module

1	2	3	4	5	6	7	8	9	10
DI1	DI2	DI3	DI4	COM	COM	DI5	DI6	DI7	DI8

2.2.3 DO Module

X15 Module

1	2	3	4	5	6
DO1	DO2	GND	DO3	DO4	GND

Y22 Module

1	2	3	4	5	6	7	8	9	10
DO1	DO2	DO3	DO4	GND	GND	DO5	DO6	DO7	DO8

2.2.4 AO Module

Y41 Module

1	2	3	4	5	6	7	8	9	10
AO1	GND	AO2	GND	/	/	AO3	GND	AO4	GND

Note: Each AO module requires a fixed current of approximately 100mA.

2.2.5 AI Module

Y31 Module

1	2	3	4	5	6	7	8	9	10
AI1	GND	AI2	GND	/	/	AI3	GND	AI4	GND

2.2.6 RTD Module

Y51 Module

1	2	3	4	5	6	7	8	9	10
/	PT2+	PT2-	PT2-	/	/	/	PT1+	PT1-	PT1-

2.2.7 Multiple Port Combinations

X23 Module

1	3	5	7	9	11	13	15	17	19
DI4	DI3	DI2	DI1	GND	COM	ttyAS3-A	ttyAS2-A	ttyAS5-A	ttyAS4-A
DO4	DO3	DO2	DO1	POWER	GND	ttyAS3-B	ttyAS2-B	ttyAS5-B	ttyAS4-B
2	4	6	8	10	12	14	16	18	20

X25 Module

1	3	5	7	9	11	13	15	17	19
DI4	DI3	DI2	DI1	GND	COM	ttyAS3-A	ttyAS2-A	can1-H	can0-H
DO4	DO3	DO2	DO1	POWER	GND	ttyAS3-B	ttyAS2-B	can1-L	can0-L
2	4	6	8	10	12	14	16	18	20

X26 Module

1	3	5	7	9	11	13	15	17	19
DI6	DI5	DI4	DI3	GND	COM	DI2	DI1	ttyAS5-A	ttyAS4-A
DO4	DO3	D02	DO1	POWER	GND	DI8	DI7	ttyAS5-B	ttyAS4-B
2	4	6	8	10	12	14	16	18	20

X28 Module

1	3	5	7	9	11	13	15	17	19

DI6	DI5	DI4	DI3	GND	COM	DI2	DI1	ttyAS5-A	ttyAS4-A
DI12	DI11	DI10	DI9	POWER	GND	DI8	DI7	ttyAS5-B	ttyAS4-B
2	4	6	8	10	12	14	16	18	20

The COM port is used for dry contact DI, while the GND is used for wet contact DI.

2.2.8 X board Serial Port Usage

Enter the /sys/class/beilai/ directory and type ls to view the controllable I/O.

```
root@bliiot:/sys/class/beilai# ls
DI1    DI2    DI3    DI4    DO1    DO2    DO3    DO4
```

Taking the DI1 (dry contact) in the X22 module as an example, the DI status is as follows:

1 means open (0~3V),

0 means close (10~30V).

```
root@bliiot:/sys/class/beilai/DI1# ls
cfg    data    device    drv    power    pull    subsystem    uevent
```

By checking the value of the data, it can be determined that the DI1 status is open.

```
root@bliiot:/sys/class/beilai/DI1# cat data
1
```

For DO, the state of the DO can be changed by modifying the value of the data. For example, when writing 0, DO1 will be connected to GND.

```
root@bliiot:/sys/class/beilai/DO1# echo    0    > data
```

For CAN port transmission, taking CAN0 as an example, configure the CAN bus bitrate to 1Mbps and then start the CAN bus.

```
root@bliiot:~# ifconfig can0 down
root@bliiot:~# ip link set can0 type can bitrate 1000000
root@bliiot:~# ifconfig can0 up
```

To send data via CAN0

```
root@bliiot:~# cansend can0 123#1122334455667788
```

CAN0 is waiting to receive data.

```
root@bliiot:~# candump can0
```

If CAN0 is receiving normally, it should receive the data when sent from another device.

```
root@bliiot:~# candump can0
  can0  123   [8]  11 22 33 44 55 66 77 88
```

For RS232/485 transmission, when using the RS232/485 serial port, connect the RS232/485 cable to the port, such as the RS485-1 port, whose device file is /dev/ttyAS4. Set the baud rate to 115200, with 8 data bits, no parity (8N1), and no parity bit.

```
stty -F /dev/ttyAS4 ispeed 115200 ospeed 115200 cs8
echo 12345 > /dev/ttyAS4          //To send data through the RS485-1 port
cat /dev/ttyAS4                   //To wait and view the received data
```

Press "Ctrl+C" to stop.

2.2.9 Y Board Serial Port Usage

(1) Software Installation

The corresponding file location is /io. The actual name should be verified based on the file. Execute chmod +x iolib_v1.1.0_install.bin on BEILAI_IOy_ARMV8_V1.0.bin. then install the software.

```
root@bliiot:/# chmod +x BEILAI_IOy_ARMV8_V1.0.bin
root@bliiot:/# ./BEILAI_IOy_ARMV8_V1.0.bin
Md5 verify pass!
tar: ./iolib: time stamp 2024-05-29 09:16:25 is 1716973791.042311023 s in the future
tar: ./ioy: time stamp 2024-06-25 03:05:22 is 1719284328.036465231 s in the future
tar: ./S90iolib: time stamp 2024-05-27 07:47:16 is 1716795642.036139981 s in the future
Install complete!
Restarting iolib:
Stopping iolib: stopped iolib (pid 1568)
OK
Starting iolib: OK
```

(2) Serial Port Usage

Execute . /etc/init.d/S90iolib start to start iolib. ioy show to view IO board information. ioy help to view command help.

```
root@bliiot:/# /etc/init.d/S90iolib start
```

Type ioy help to see command help:

```
Usage: ioy <command> [<arguments>]

Commands:
        show
        get             <address>|<slot>.<channel>
        set             <address>|<slot>.<channel> <value>
        config          <address>|<slot>.<channel> mode <mode>,
                        <address>|<slot>.<channel> min <min-value> max <max-value>

config mode:
        ai|ao           4t20(4~20mA),0t20(0~20mA),0t5(0~5V),0t10(0~10V),
                        -5t5(-5~5V),-10t10(-10~10V)
        rtd             pt100-3(pt100 3wire),pt100-4(pt100 4wire),
                        pt1000-3(pt1000 3wire),pt1000-4(pt1000 4wire)
        tc              k,j,e,t,s,r,b,n
```

Taking the DI module as an example, short the DI2 input, then use the ioy show command to view the information.

slot	name	channel	address	mode	value	min	max
2	Y12	1	2000	*	0	0.0000	0.0000
2	Y12	2	2001	*	1	0.0000	0.0000
2	Y12	3	2002	*	0	0.0000	0.0000
2	Y12	4	2003	*	0	0.0000	0.0000
2	Y12	5	2004	*	0	0.0000	0.0000
2	Y12	6	2005	*	0	0.0000	0.0000
2	Y12	7	2006	*	0	0.0000	0.0000
2	Y12	8	2007	*	0	0.0000	0.0000

You can also use the get command to retrieve the channel value.

```
root@bliiot:/# ioy get 2004       //View by address
address 2004 value 1
root@bliiot:/# ioy get 2.5        //View by <slot>.<channel>.
slot 2 channel 5 value 1
```

Taking the AO module as an example, enter the ioy show command to view the information.

slot	name	channel	address	mode	value	min	max
2	Y41	1	4000	4t20	4.0000	4.0000	20.0000
2	Y41	2	4002	4t20	4.0000	4.0000	20.0000
2	Y41	3	4004	4t20	4.0000	4.0000	20.0000
2	Y41	4	4006	4t20	4.0000	4.0000	20.0000
2	Y41	5	4008	4t20	4.0000	4.0000	20.0000
2	Y41	6	4010	4t20	4.0000	4.0000	20.0000
2	Y41	7	4012	4t20	4.0000	4.0000	20.0000
2	Y41	8	4014	4t20	4.0000	4.0000	20.0000

The mode type is displayed as 4t20, which corresponds to the 4~20mA current output in the config mode of ioy help.

Use the set command to set the channel value:

```
root@bliiot:/# ioy set 4000 10      //Output 10mA by address setting
root@bliiot:/# ioy set 2.1 10       //Setting via <slot>. <channel>
root@bliiot:~# ioy get 4000
address 4000 value 10.000000
```

2.3 LED

LED	Description
PWR	Power LED: It remains constantly on when the power is connected. This LED light cannot be programmed by the user.
RUN	Default Settings: The LED blinks when the CPU usage is below 90% and remains on continuously when the CPU usage exceeds 90% This LED light can be programmed by the user.
LINK	Default Settings: The LED remains on when there is an internet connection and turns off when there is no internet connection. This LED light can be programmed by the user.

The LED indicators are as follows:

LED2 (POWER): Stays on when the power is normal after startup.

LED1 (RUN): Blinks when the system is running normally.

LED0 (LINK): Remains on when connected to the internet via a wired network; blinks when using 4G or Wi-Fi.

The configuration file for these settings is /etc/beilai_led.sh

To view the trigger conditions: cat /sys/class/leds/user-led0/trigger

```
root@bliiot:~# cat /sys/class/leds/user-led0/trigger
[none] rc-feedback mmc0 mmc1 mmc2 timer oneshot heartbeat backlight gpio cpu0 cpu1 cpu2 cpu3 default-on transient
```

Where [none] means the current trigger condition of led0 is none. Write the above string to trigger to modify the trigger condition.

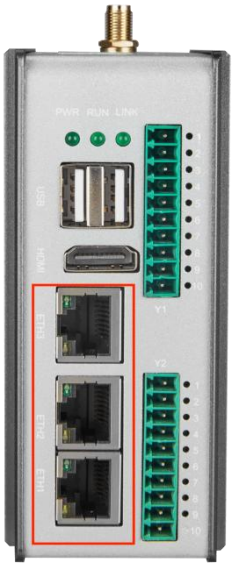
When the led trigger condition is set to none, the user can control the led light on or off by commands

To control LED0 to be on: echo 1 >/sys/class/leds/user-led0/brightness

```
root@bliiot:~# echo none >/sys/class/leds/user-led0/brightness
root@bliiot:~# echo 1 >/sys/class/leds/user-led0/brightness
```

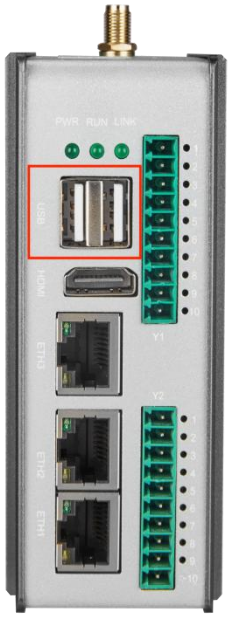
To control LED1 to be off: echo 0 >/sys/class/leds/user-led1/brightness

2.4 Ethernet Port



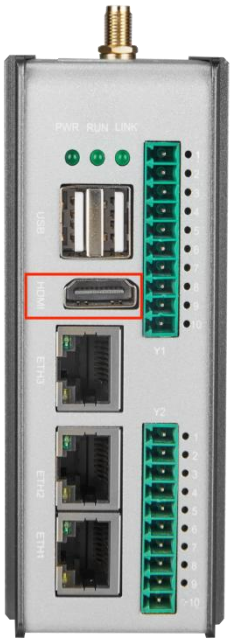
The device is equipped with 3x100M Ethernet ports

2.5 USB Port



The device has 2 USB 2.0 HOST interfaces, supporting FAT32 formatted USB drives. When reading or writing data to the USB drive, use the sync command to ensure data is properly saved and prevent data loss.

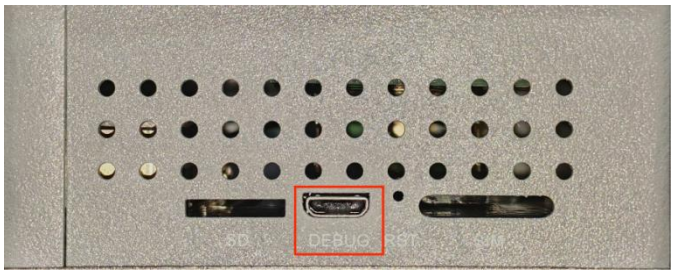
2.6 HDMI



The HDMI as shown in the image, HDMI 1.4 and HDMI 2.0 standards are supported.

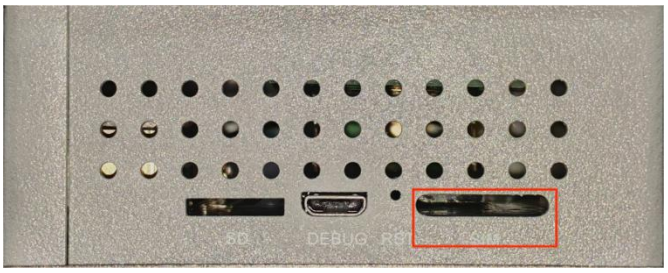
The default resolution supported by the system is 1920x1080@60fps.

2.7 Debugging Serial Port

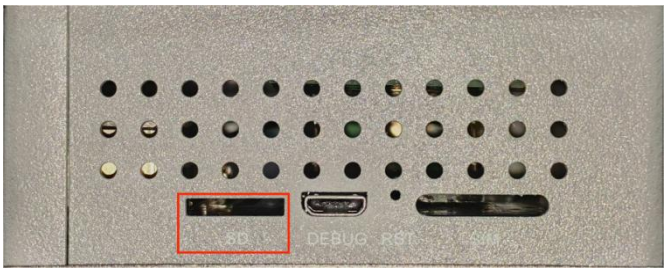


The debugging interface is as shown in the image. You can access the device's system through this port.

2.8 SIM Card Slot

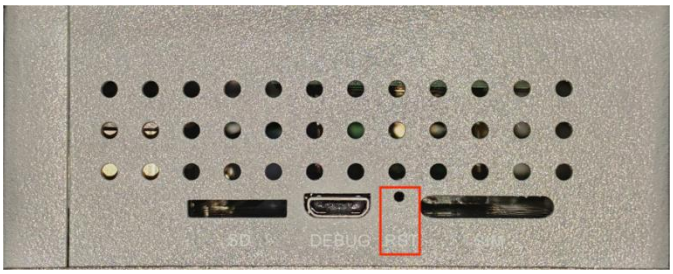


2.9 SD Card Slot



The SD card slot, as shown in the image, supports FAT32 formatted SD cards. After reading or writing data using this slot, use the sync command to ensure data is properly saved and prevent data loss.

2.10 Reset Button



Press the restart button and release it to reboot the device.

2.11 PCIe

The PCIe interface supports both 4G and Wi-Fi.

2.11.1 4G Module

Using the Quectel EC20 module as an example, place the SIM card into the module and connect the

antenna. The test program can be found in the /usr/demo/4G directory.

(1) Network Function

Disable other network connections and keep only the 4G module network active.

```
ifconfig eth1 down
ifconfig eth2 down
ifconfig eth3 down
udhcpc -i usb0
ifconfig
```

At this point, a network node usb0 should be generated. If this node is not present, the module may not have network functionality enabled by default. Try configuring the 4G module with the following commands:

```
microcom -s 115200 /dev/ttyUSB2
AT+QCFG="USBNET",1
```

If using the EC200 module, an additional command may be required to establish a network connection.

```
AT+QNETDEVCTL=3,1,1
```

After executing the command, if the device returns “OK”, it indicates that the configuration is successful and this setup needs to be done only once. After rebooting the device, the usb0 node should be created. Then, you can re-run the network disable and enable commands.

Once the usb0 node is generated, use the following commands to test the network.

```
ping www.baidu.com -I usb0
```

(2) SMS Function

To test the SMS functionality, execute the test command in the program directory.

```
./send_sms <device> <phonenumber> <text>
```

Command Description:

<device>: The 4G module device node.

<phonenumber>: The target phone number for sending the SMS.

<text>: The content of the SMS. There should be no spaces between characters in the SMS content; otherwise, an error will be prompted.

For example: ./send_sms /dev/ttyUSB2 152******** test

At this time, the corresponding number should receive a text message with the content of "test".

(3) Call Function

To test the dialing function, execute the test command in the program directory:

```
./phone_call <device> <phonenumber>
```

Command Description: <device> is the 4G module device node. <phonenumber> is the dialling target mobile phone number.

For example: ./phone_call /dev/ttyUSB2 152********

At this point the corresponding number should receive an incoming call from the device.

(4) GPS Function

The GPS function can be tested by executing the test command in the test program directory:

```
./get_location <device> <timeout>
```

Command Description:

<device>: The device node, determined by the result of the command ls /dev/ttyUSB*. This may change after rebooting the device.

<timeout>: The time to wait for the return of latitude and longitude information (in seconds).

For example: ./get_location /dev/ttyUSB2 1

Obtaining latitude and longitude information may take a few minutes. If the retrieval fails or times out, check if the antenna is properly connected and ensure you are testing in an open area.

2.11.2 Wi-Fi Module

The Wi-Fi module used here is the BL-R8188EU2 (2.4G frequency band). The test program and drivers are located in the /usr/demo/wifi directory. Make sure to connect the antenna properly.
(1) STA Function

Enter the test program directory, disable other networks, keep only the Wi-Fi network, and load the Wi-Fi driver.

```
ifconfig eth1 down
ifconfig eth2 down
ifconfig eth3 down
insmod -f 8188eu.ko                    //Load WiFi driver
```

```
ifconfig wlan0 up                    //Based on the name of the network card shown in ifconfig
```

Execute the following command to connect the device to the specified Wi-Fi network. Use -i followed by the Wi-Fi name and -p followed by the Wi-Fi password.

```
./wifi_setup.sh -i bliiot -p bebetter
```

You can check the obtained IP address using ifconfig. Then, execute the following command to test if the network functionality is working correctly.

```
ping www.baidu.com
```

(2) AP Function

After restarting the system, enter the directory where the test program is located, disable other networks, keep only the Wi-Fi network, and load the Wi-Fi driver.

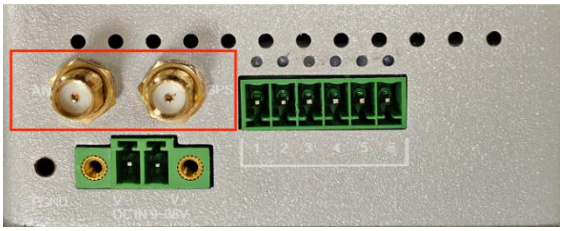
```
ifconfig eth1 down
ifconfig eth2 down
ifconfig eth3 down
insmod -f 8188eu.ko
Ifconfig wlan0 up
```

Execute the following command to set the Wi-Fi module to AP mode:

```
./ap_setup.sh
```

The default Wi-Fi name is rtl8188eu and the password is 88888888. You can modify these settings in the rtl_hostapd_2G.conf configuration file.

2.12 Antenna Interface



The antenna interface includes one W-iFi/4G antenna interface and one GPS antenna interface.

2.13 Hardware Watchdog

Note: The hardware watchdog is disabled by default.

Watchdog Control Pin: PE0. Set this pin to 1 to disable the hardware watchdog.
Watchdog Feed Pin: PG16

Watchdog Timeout: The hardware watchdog timeout is set to 30ms.

2.14 Encryption Chip

The encryption chip model RJGT102 is based on the SHA-256 encryption and authentication algorithm. It also provides a configurable watchdog timer and external reset functionality. The chip communicates with the MCU through an I²C-5 serial interface and supports a low-power mode.
The device uses the encryption chip's demo by writing /proc/sys/kernel/random/uuid to the encryption chip and saving the UUID to /usr/rjgt_unique.json. When used, the data from the encryption chip is compared with the external data. If the external data matches the internal data on the encryption chip, the encryption validation is successful.

Please modify the cross-compiler path in the Makefile and then run make to compile. Alternatively, refer to the "RJGT102 Data Manual" for more details.

Run the sample programme rigt102 and if the uuid is correct, the following reply will appear.

```
root@bliiot: ./rigt102
open unique file failed, create unique file!
random uuid would write rjgt102 : b6275e22-4928-4828-88fb-54a6fd8!
Contrast success
root@bliiot:./rigt102
Contrast success
```

2.15 External RTC

This device includes an external RTC clock.
To view the external RTC device node:

```
root@bliiot:~# ls /dev/rtc*
/dev/rtc      /dev/rtc0
root@bliiot:~# dmesg | grep rtc0
[       4.319167] rtc-isl1208 5-006f: rtc core: registered rtc-isl1208 as rtc0
```

To view the system clock:

```
root@bliiot:~# date
Tue Jul 05 01:22:15 UTC 2024
```

To set the system time:

```
root@bliiot:~# date -s "2024-7-05 09:24:00" && hwclock -w -f /dev/rtc0
root@bliiot:~# hwclock -f /dev/rtc0
```

To synchronize the system clock to the RTC:

```
root@bliiot:~# hwclock --systohc -u
root@bliiot:~# hwclock -u
```

To synchronize both the system clock and the RTC

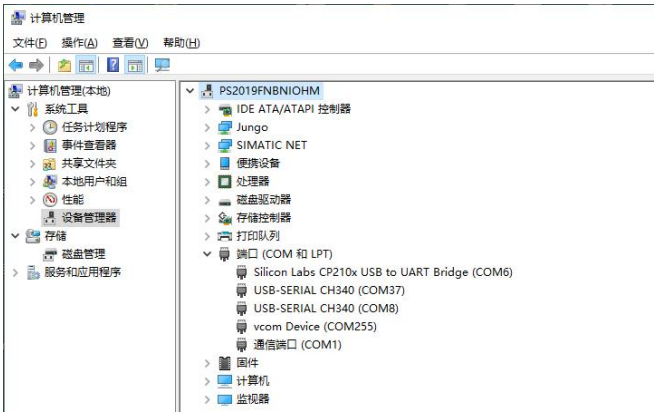
```
root@bliiot:~# hwclock --hctosys -u
```

After executing the command, the system will synchronize the RTC clock to be the system clock.

3 Device Login

3.1 USB Login

To access this on a computer, navigate to "This PC" → "Manage" → "Device Manager". Open the Ports section, then insert the USB cable. The refreshed port indicates the connected device port.



Here's an example using SecureCRT:

1. Open SecureCRT and create a new connection.
2. Choose "Serial" for the connection type.
3. Select the corresponding port.
4. Set the following parameters:
    1. Baud rate: 115200
    2. Data bits: 8
    3. Parity: None

4. Stop bits: 1

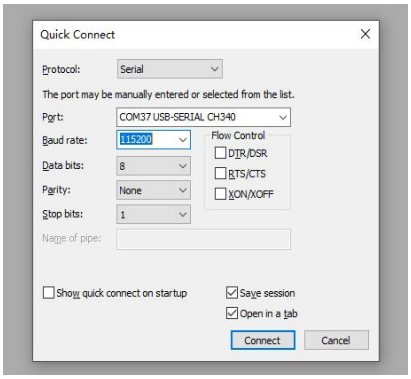
5. Click "Connect" to access the device.

Linux systems do not have a default login password set.

For Ubuntu systems:

Default Login Account: root

Password: root

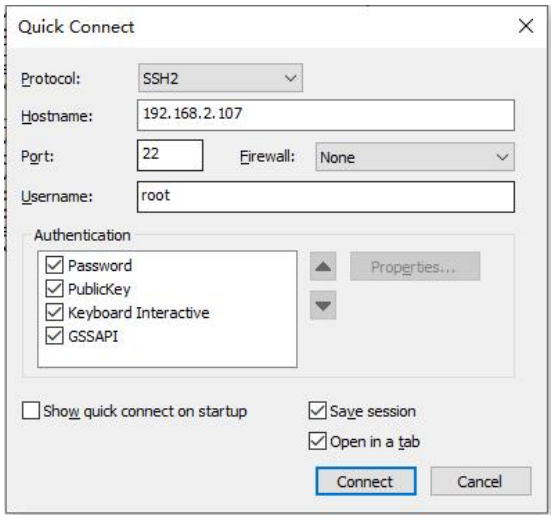


3.2 SSH2 Login

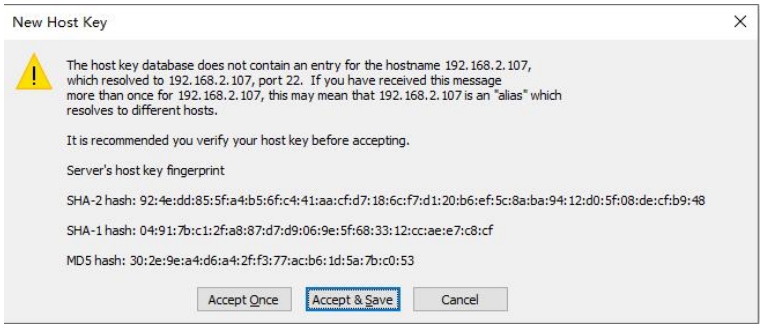
Before logging in via the network port, you need to set the IP address for the corresponding port. For example, ETH2 is connected to the router, and the obtained IP address is 192.168.2.107. The computer IP is on network segment 2.

```
docker0   Link encap:Ethernet  HWaddr 02:42:3D:E2:6F:88
          inet addr:172.17.0.1  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

eth2      Link encap:Ethernet  HWaddr 00:E0:99:CD:55:B9
          inet addr:192.168.2.107  Bcast:192.168.2.255  Mask:255.255.255.0
          inet6 addr: fd5f:4184:3ad4:4:66ee:75b9:2b9:476d/64 Scope:Global
          inet6 addr: fe80::5d2c:48eb:826c:7f6/64 Scope:Link
          inet6 addr: fd5f:4184:3ad4:4::74e/128 Scope:Global
          inet6 addr: fd2f:fd7:7cda::74e/128 Scope:Global
          inet6 addr: fd2f:fd7:7cda:0:15d3:ffef:f05a:3ebf/64 Scope:Global
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:240 errors:0 dropped:18 overruns:0 frame:0
          TX packets:80 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:24541 (23.9 KiB)  TX bytes:8407 (8.2 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:146 errors:0 dropped:0 overruns:0 frame:0
          TX packets:146 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:10796 (10.5 KiB)  TX bytes:10796 (10.5 KiB)
```

Click Create Connection, select the protocol as SSH2, enter the hostname as the device IP: 192.168.2.107, set the port to 22, and use the username root. Then, click Connect to establish the connection.



Select Accept for a successful connection.



4 System Programming

4.1 Micro SD Card Boot

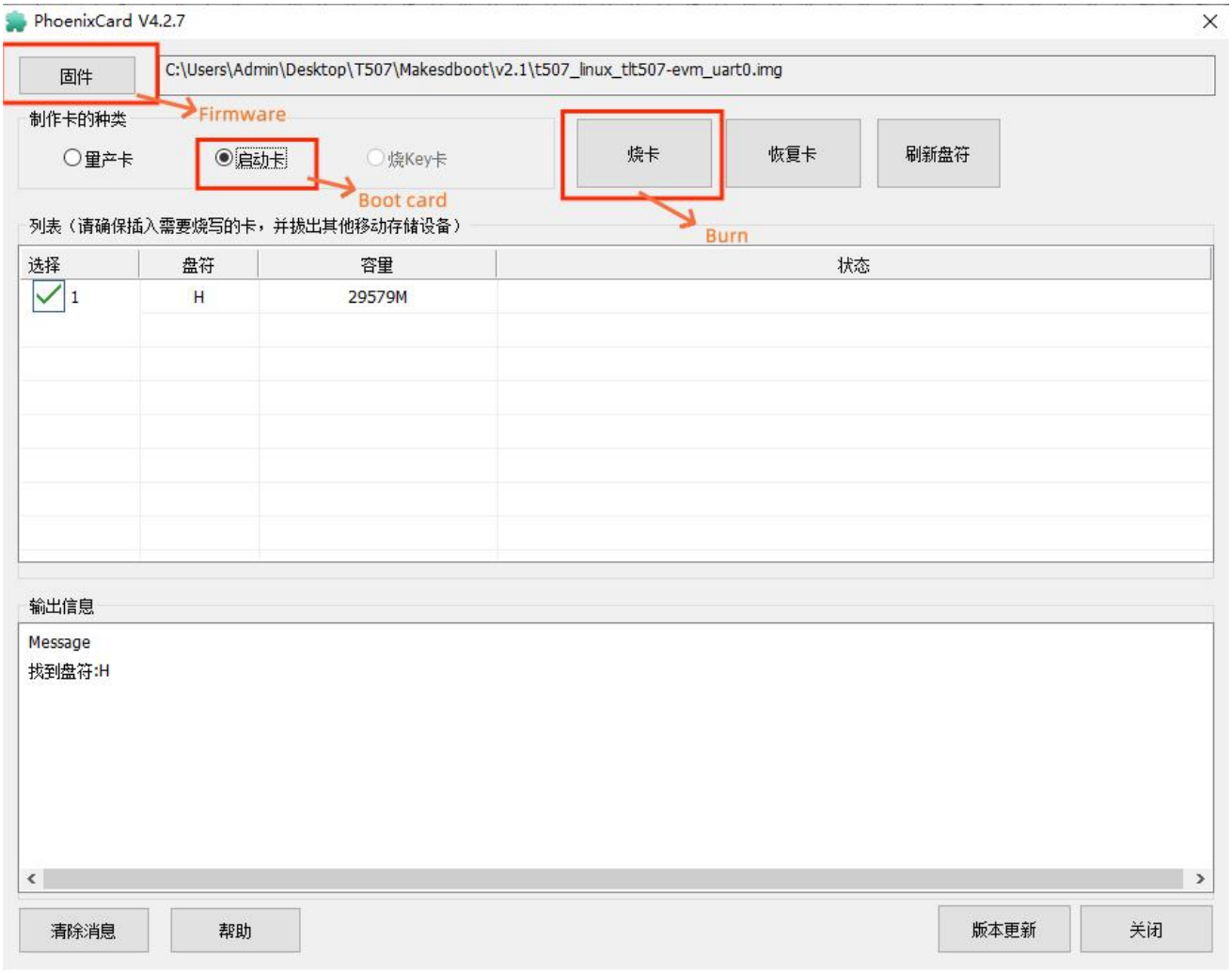
4.1.1 Boot Card Creation

To connect a blank SD card to your computer and open the system burning tool by double-clicking "PhoenixCard.exe".

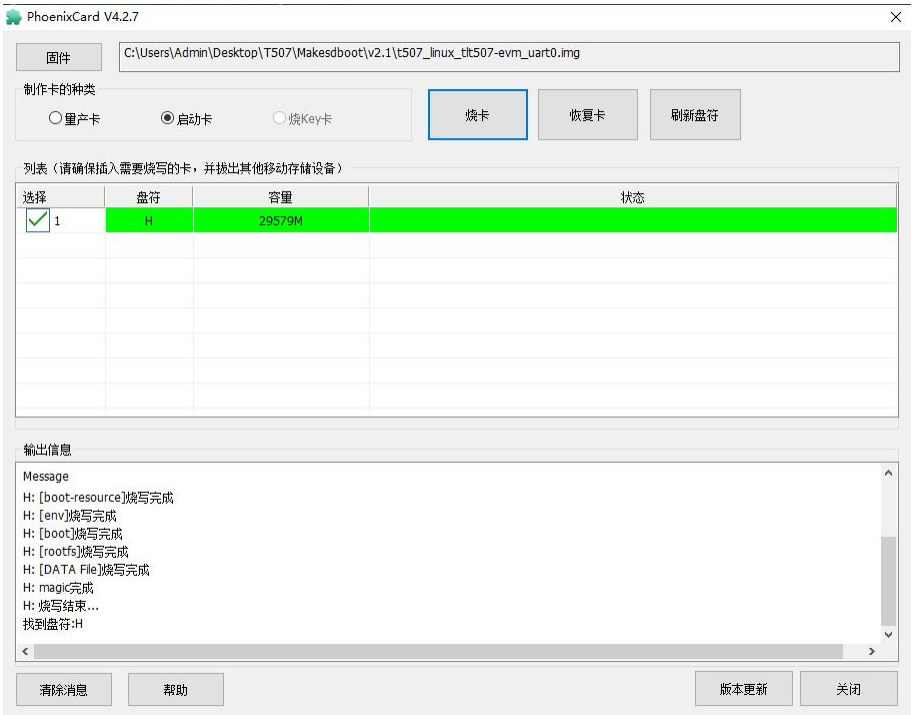
名称	修改日期	类型	大小
ini_fun.lhs	2020/06/15 10:26	LHS 文件	4 KB
IniParasPlg.dll	2020/06/15 10:26	Adobe Acrobat ...	44 KB
Langplg.dll	2020/06/15 10:26	Adobe Acrobat ...	56 KB
LangPlgex.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
LangPlgex_1.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
lua5.1.dll	2020/06/15 10:26	Adobe Acrobat ...	617 KB
luaBase.dll	2020/06/15 10:26	Adobe Acrobat ...	136 KB
luasocket.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
Mbr2Gpt.dll	2021/04/21 15:22	Adobe Acrobat ...	11 KB
option.cfg	2021/07/13 19:52	CFG 文件	1 KB
ParserManager.dll	2020/07/06 18:43	Adobe Acrobat ...	81 KB
PhoenixCard.exe	2021/07/14 16:33	应用程序	1,761 KB
PhoenixCard.lan	2021/07/08 19:20	LAN 文件	4 KB
PhoenixCard_ChangeLog.pdf	2021/07/14 13:54	WPS PDF 文档	67 KB
PhoenixCard_User_Guide.pdf	2021/04/21 15:22	WPS PDF 文档	515 KB
PhoenixCard_使用指南.pdf	2021/04/21 15:22	WPS PDF 文档	4,059 KB
PhoenixCard_使用指南.pdf.10185125	2021/04/21 15:22	10185125 文件	4,059 KB
PhoenixCardFun.dll	2021/07/08 16:57	Adobe Acrobat ...	294 KB
PlgVector.dll	2020/06/15 10:26	Adobe Acrobat ...	70 KB
regbasefun.lhs	2020/06/15 10:26	LHS 文件	1 KB
regsocketfun.lhs	2020/06/15 10:26	LHS 文件	1 KB
reguifun.lhs	2020/06/15 10:26	LHS 文件	1 KB
thisdata.fex	2024/06/12 15:59	FEX 文件	14,460 KB
updatelist.cfg	2020/06/15 10:26	CFG 文件	2 KB
UpdateSelf.ulf	2020/06/15 10:26	ULF 文件	3 KB
UpdateVer.exe	2020/06/15 10:26	应用程序	1,696 KB
updatever.lan	2020/06/15 10:26	LAN 文件	2 KB
UpdateVerEx.exe	2020/06/15 10:26	应用程序	1,707 KB
version.cfg	2020/06/15 10:26	CFG 文件	1 KB
VersionTab.ulf	2020/06/15 10:26	ULF 文件	3 KB

The tool will automatically detect the Micro SD card connected to the PC, as shown in the following image.

To copy the system image to a directory with a non-Chinese path. In PhoenixCard software, click 'Firmware' to select the target image file, then choose 'Boot Card', and finally click 'Burn' to create the 'Boot Card'.



After the system boot card is created, the status bar will display green and print the following information.



4.1.2 Boot from the Boot Card

After inserting the boot card into the device's Micro SD card slot and powering on the device, the system will automatically boot from the boot card and log in as the root user. The serial debug terminal will print similar startup information.

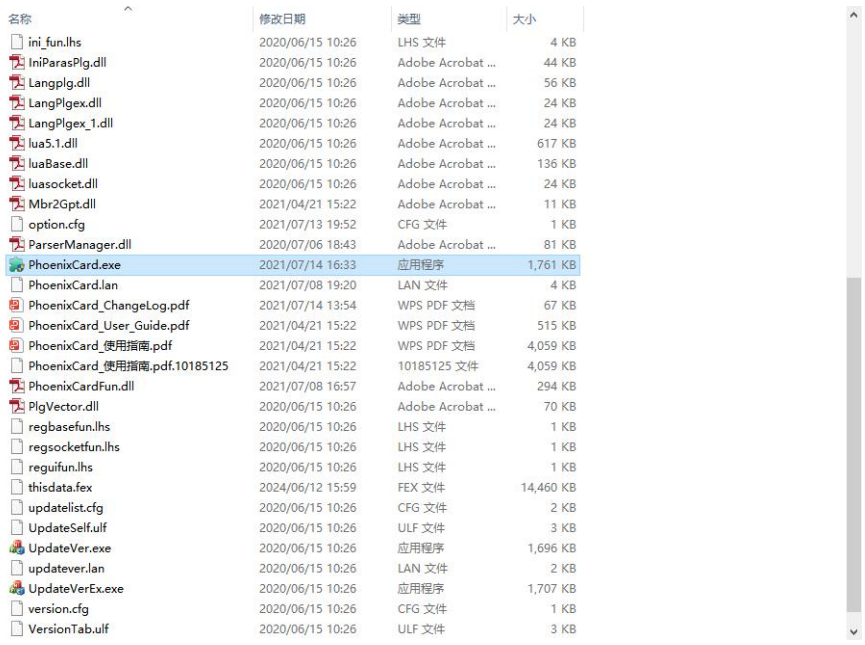
"storage type = 1" indicates Micro SD mode booting, while "storage type = 2" indicates eMMC mode booting.

```
U-Boot 2018.05-g27a1125 (Aug 07 2023 - 09:51:14 +0800) Allwinner Technology

[01.205]CPU:   Allwinner Family
[01.207]Model: TLT507-EVM HDMI
I2C:   ready
[01.212]DRAM:  1 GiB
[01.215]Relocation Offset is: 35f04000
[01.240]secure enable bit: 0
[01.242]pmu_axp152_probe pmic_bus_read fail
[01.247]PMU: AXP858
[01.262][axp][err]: can't find rtcldo_vol from table
[01.266][axp][err]: can't find rtcldo_vol from table
[01.271]CPU=1008 MHz,PLL6=600 Mhz,AHB=200 Mhz, APB1=100Mhz  MBus=400Mhz
[01.278]drv_disp_init
[01.317]drv_disp_init finish
[01.319]gic: sec monitor mode
[01.324]ir_sys_cfg: error:no node for ir boot recovery settings
[01.331]flash init start
[01.333]workmode = 0,storage type = 1
[01.337]MMC:     0
[01.338][mmc]: mmc driver ver uboot2018:2020-5-24 16:54:00-202109221409
```

4.2 EMMC Boot

4.2.1 Programming Card Creation

Connect the blank SD card to your computer, then double-click "PhoenixCard.exe" to open the system firmware tool.

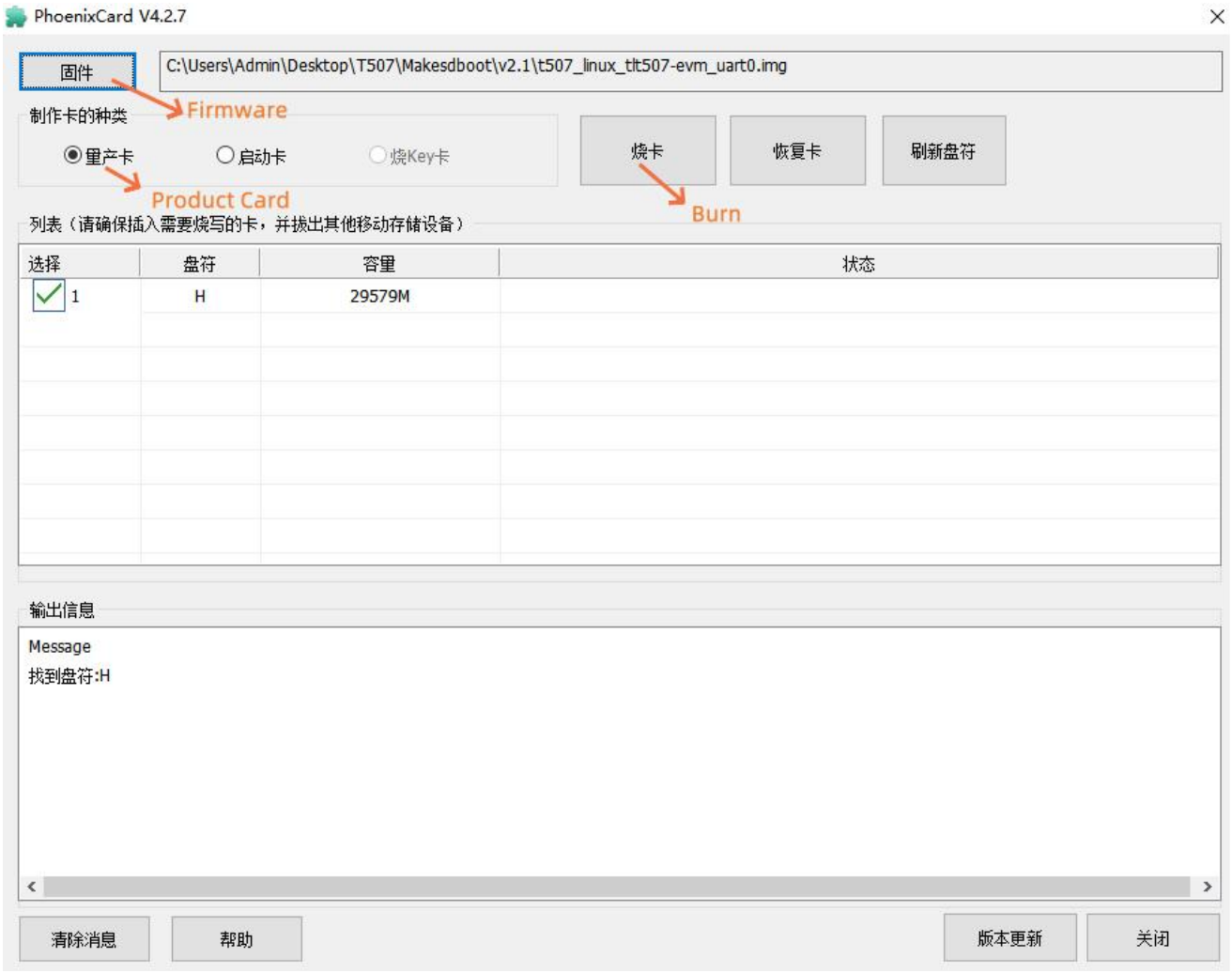


名称	修改日期	类型	大小
ini_fun.lhs	2020/06/15 10:26	LHS 文件	4 KB
IniParasPlg.dll	2020/06/15 10:26	Adobe Acrobat ...	44 KB
Langplg.dll	2020/06/15 10:26	Adobe Acrobat ...	56 KB
LangPlgex.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
LangPlgex_1.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
lua5.1.dll	2020/06/15 10:26	Adobe Acrobat ...	617 KB
luaBase.dll	2020/06/15 10:26	Adobe Acrobat ...	136 KB
luasocket.dll	2020/06/15 10:26	Adobe Acrobat ...	24 KB
Mbr2Gpt.dll	2021/04/21 15:22	Adobe Acrobat ...	11 KB
option.cfg	2021/07/13 19:52	CFG 文件	1 KB
ParserManager.dll	2020/07/06 18:43	Adobe Acrobat ...	81 KB
PhoenixCard.exe	2021/07/14 16:33	应用程序	1,761 KB
PhoenixCard.lan	2021/07/08 19:20	LAN 文件	4 KB
PhoenixCard_ChangeLog.pdf	2021/07/14 13:54	WPS PDF 文档	67 KB
PhoenixCard_User_Guide.pdf	2021/04/21 15:22	WPS PDF 文档	515 KB
PhoenixCard_使用指南.pdf	2021/04/21 15:22	WPS PDF 文档	4,059 KB
PhoenixCard_使用指南.pdf.10185125	2021/04/21 15:22	10185125 文件	4,059 KB
PhoenixCardFun.dll	2021/07/08 16:57	Adobe Acrobat ...	294 KB
PlgVector.dll	2020/06/15 10:26	Adobe Acrobat ...	70 KB
regbasefun.lhs	2020/06/15 10:26	LHS 文件	1 KB
regsocketfun.lhs	2020/06/15 10:26	LHS 文件	1 KB
reguifun.lhs	2020/06/15 10:26	LHS 文件	1 KB
thisdata.fex	2024/06/12 15:59	FEX 文件	14,460 KB
updatelist.cfg	2020/06/15 10:26	CFG 文件	2 KB
UpdateSelf.ulf	2020/06/15 10:26	ULF 文件	3 KB
UpdateVer.exe	2020/06/15 10:26	应用程序	1,696 KB
updatever.lan	2020/06/15 10:26	LAN 文件	2 KB
UpdateVerEx.exe	2020/06/15 10:26	应用程序	1,707 KB
version.cfg	2020/06/15 10:26	CFG 文件	1 KB
VersionTab.ulf	2020/06/15 10:26	ULF 文件	3 KB

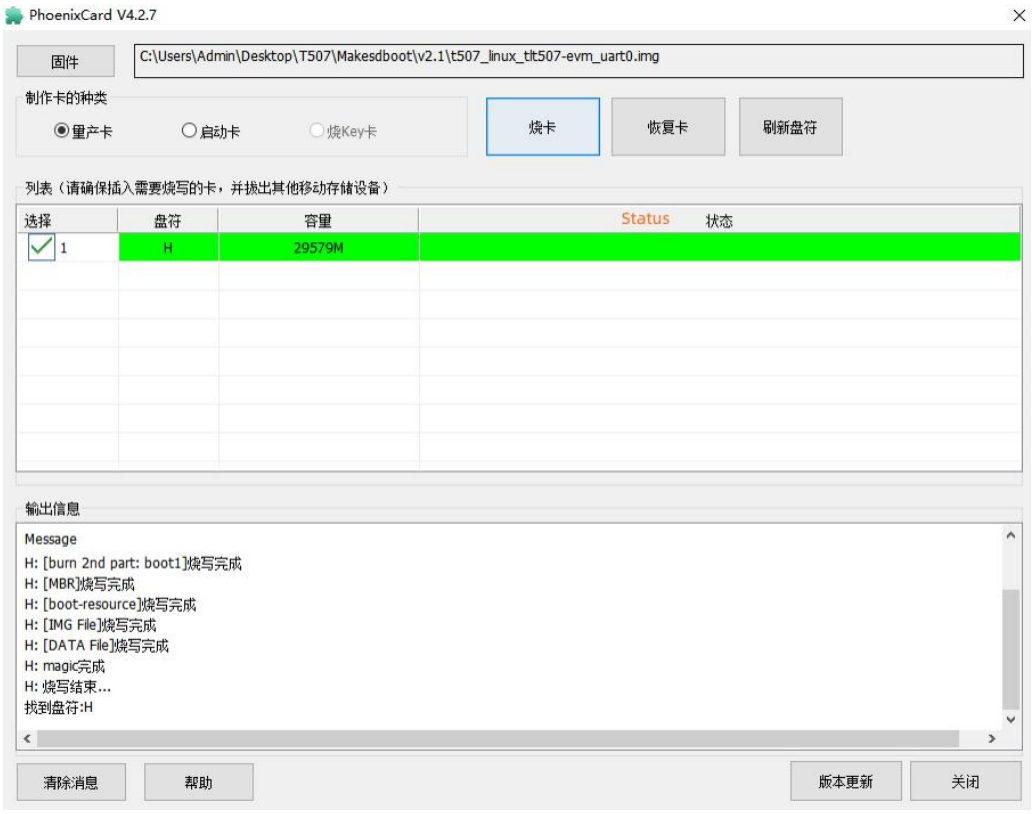
The tool will automatically detect the connected Micro SD card on the PC side.

To flash a system image onto an SD card using PhoenixCard software, follow these steps:

1. Copy the system image to a directory non-Chinese characters in the path.
2. Open PhoenixCard software and click "Firmware" to select the target image file.
3. Select "Product Card" mode.
4. Click "Burn" to create the "Product Card".



After the Product Card creation is completed, the status bar will display the following information.



4.2.2 System Programming

After inserting the prepared SD card into the device's Micro SD card slot and powering it on, the device will boot from the SD card and automatically flash the system to the eMMC. Once the system flashing is complete, the device will shut down automatically. Serial port output will be as follows.

```
dram para[3] = e0e0e0e
dram para[4] = 1919
dram para[5] = dbddaa99
dram para[6] = 60fa
dram para[7] = 4000000
dram para[8] = 520
dram para[9] = 601
dram para[10] = 8
dram para[11] = 0
dram para[12] = 0
dram para[13] = 400
dram para[14] = 813
dram para[15] = 0
dram para[16] = 0
dram para[17] = 0
dram para[18] = 0
dram para[19] = 0
dram para[20] = 0
dram para[21] = 0
dram para[22] = 0
dram para[23] = 80000000
dram para[24] = 0
dram para[25] = 0
dram para[26] = 3380b080
dram para[27] = 402fbb88
dram para[28] = 16131818
dram para[29] = 7070607
dram para[30] = 6c41
dram para[31] = 0
storage type = 2
[105.991]successed in downloading boot0
CARD OK
[105.995]sprite success
sprite_next_work=3
next work 3
SUNXI_UPDATE_NEXT_ACTION_SHUTDOWN
[109.003][mmc]: mmc exit start
[109.021][mmc]: mmc 2 exit ok
```

Please power off the device, remove the SD card, and then power it on again. The device will boot from the eMMC, and upon system startup, it will automatically log in as the root user. The serial debug terminal will print startup information similar to the following:

- "storage type = 1" indicates Micro SD mode boot.
- "storage type = 2" indicates eMMC mode boot.

```
[260]Loading boot-pkg Succeed(index=0).
[264]Entry_name        = u-boot
[271]Entry_name        = monitor
[274]Entry_name        = dtb
[278]tunning data addr:0x4a0003e8
[281]Jump to second Boot.
NOTICE:  BL3-1: v1.0(debug):f0130ea
NOTICE:  BL3-1: Built : 10:23:13, 2022-04-14
NOTICE:  BL3-1 commit: 8
NOTICE:  cpuidle init version v2.0
ERROR:   Error initializing runtime service tspd_fast
NOTICE:  BL3-1: Preparing for EL3 exit to normal world
NOTICE:  BL3-1: Next image address = 0x4a000000
NOTICE:  BL3-1: Next image spsr = 0x1d3

U-Boot 2018.05-g27a1125 (Aug 07 2023 - 09:51:14 +0800) Allwinner Technology

[00.359]CPU:   Allwinner Family
[00.362]Model: TLT507-EVM HDMI
I2C:   ready
[00.367]DRAM:  1 GiB
[00.370]Relocation Offset is: 35f04000
[00.395]secure enable bit: 0
[00.397]pmu_axp152_probe pmic_bus_read fail
[00.402]PMU: AXP858
[00.416][axp][err]: can't find rtcldo_vol from table
[00.421][axp][err]: can't find rtcldo_vol from table
[00.426]CPU=1008 MHz,PLL6=600 Mhz,AHB=200 Mhz, APB1=100Mhz  MBus=400Mhz
[00.433]drv_disp_init
[00.472]drv_disp_init finish
[00.474]gic: sec monitor mode
[00.479]ir_sys_cfg: error:no node for ir boot recovery settings
[00.486]flash init start
[00.488]workmode = 0,storage type = 2
[00.492]MMC:     2
[00.493][mmc]: mmc driver ver uboot2018:2020-5-24 16:54:00-202109221409
[00.500][mmc]: get sdc_type fail and use default host:tm4.
[00.510][mmc]: SUNXI SDMMC Controller Version:0x40502
[00.535][mmc]: Best spd md: 3-HS200/SDR104, freq: 4-150000000, Bus width: 8
[00.541]sunxi flash init ok
```

4.3 System Partition

Device name	Partition	Description
Linux system boot card	/dev/mmcblk1p1	The "boot-resource" partition is used to store resources such as "bootlogo.bmp".
	/dev/mmcblk1p2	The "env" partition stores U-Boot environment variables.
	/dev/mmcblk1p3	The "boot" partition stores the kernel image.
	/dev/mmcblk1p4	The "rootfs" partition stores the root filesystem image.
	/dev/mmcblk1p5	The "private data" partition stores private data.
	/dev/mmcblk1p6	The "user partition" stores user data.
eMMC device	/dev/mmcblk0p1	The "boot-resource" partition stores resources such as "bootlogo.bmp".
	/dev/mmcblk0p2	The "env" partition stores U-Boot environment variables.
	/dev/mmcblk0p3	The "boot" partition stores the kernel image.
	/dev/mmcblk0p4	The "rootfs" partition stores the root filesystem image.
	/dev/mmcblk0p5	The "private data" partition stores private data.

	/dev/mmcblk0p6	The "user partition" stores user data.

After solidifying the Linux system onto the Micro SD or eMMC, the Micro SD or eMMC will be partitioned into 6 partitions. Additionally, a certain amount of space will be reserved in the rootfs partition for quick testing purposes.

To ensure the robustness of the file system, it's generally not recommended to perform frequent data reads and writes on the rootfs partition.

It is recommended to use the user partition "/dev/mmcblk0p6" or "/dev/mmcblk1p6" for daily data storage. Before use, please refer to the following method for formatting. This operation is demonstrated with the partition "/dev/mmcblk1p6" of the boot card of the Linux system as an example.

From the Linux system boot card, enter the device file system and execute the following commands to format the /dev/mmcblk1p6 partition and remount it. After mounting successfully, you can perform file read and write operations in the /mnt/sdcard/mmcblk1p6/ directory.

```
mkfs -t fat /dev/mmcblk1p6
mkdir -p /mnt/sdcard/mmcblk1p6/
mount /dev/mmcblk1p6 /mnt/sdcard/mmcblk1p6/
df -h
```

5 Software

- BLIoTLink
- BLRAT
- QuickConfig
- Node-red
- Docker
- QT
- Codesys
- IgnitionSCADA
- Ubuntu20.04

6 Warranty Terms

1) This equipment will be repaired free of charge for any material or quality problems within one year from the date of purchase.
2) This one-year warranty does not cover any product failure caused by man-made damage, improper operation, etc

7 Technical Support

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