EMA40i Android System Development Guide

V3

Boardcon Embedded Design

www.boardcon.com

1. Introduction

1.1. About this Manual

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

1.2. Feedback and Update to this Manual

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website (www.boardcon.com , www.armdesigner.com).

These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new!

When we are prioritizing work on these updated resources, feedback from customers is the number one influence, If you have questions, comments, or concerns about your product or project, please no hesitate to contact us at support@armdesigner.com.

1.3. Limited Warranty

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon. This limited warranty does not cover damages resulting from lighting or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit. In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this product.

Repairs make after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.

Revision History

Ver	Description	Author	Date
V1.0	Initial version	Wu Guankang	2019-05-27
V1.1	Description upgrade	Zhou Lijun	2019-10-18
V3	Upgrade Introduction	Boardcon Team	2023-01-30

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1 EMA40i Introduction

1.1 Summary

EMA40I is a single board computer featuring an Allwinner A40i Processor, comes with 1GB DDR3 RAM, 4GB eMMC, and other rich interfaces specifically designed for intelligent industrial control applications such as industrial control, communications and measurement.

EMA40i provides a standard Gigabit Ethernet port and a 10-pin Extra GbE port. Supports HDMI 1.4, RGB, MIPI SDI and dual-LVDS output. The SBC is equipped with a microSD slot and a M.2 slot with NAME SSD support. A mini-PCIe slot supports 4G module and is accompanied by a Nano-SIM slot. Other features include USB 2.0 host ports, as well as a USB2.0 OTG. There's also a RS232 DB9 port, as well as 4x 4-pin headers for RS232, UART(TTL) and USB host.

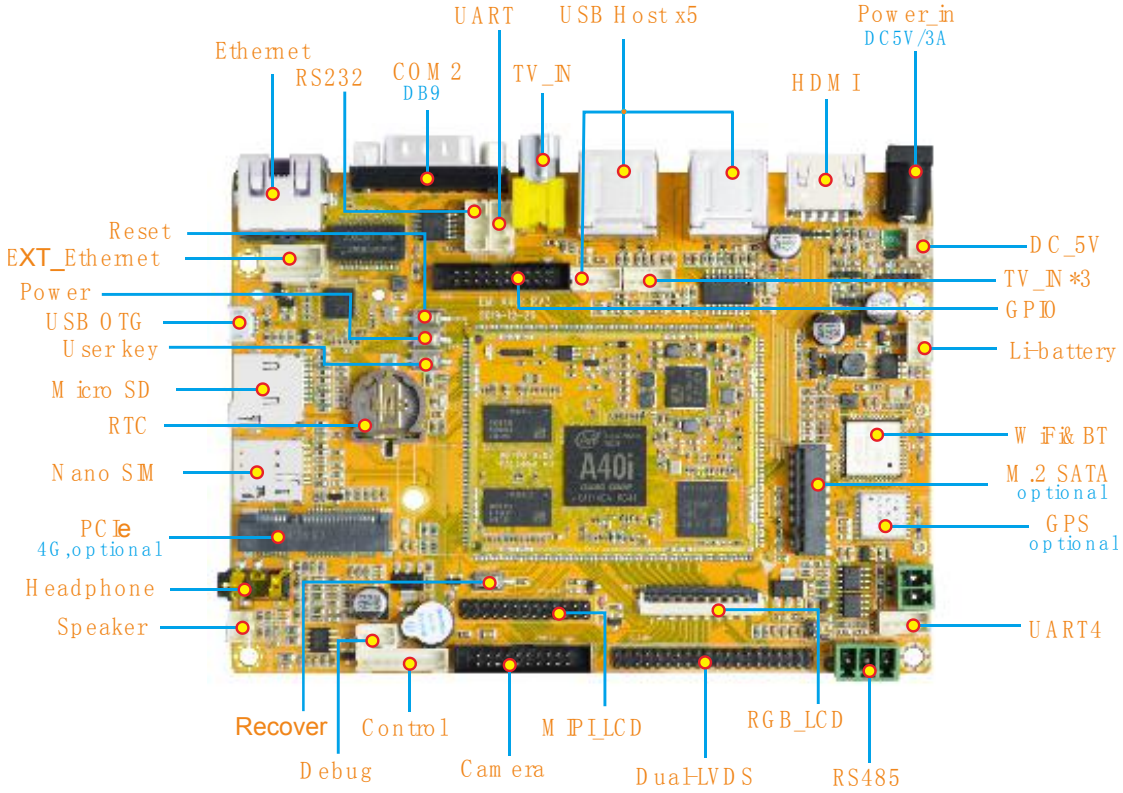
EMA40I is equipped with WiFi 802.11ac and Bluetooth 4.0, as well as optional support for GPS, 4G LTE connectivity.

1.2 Processor Features

- **CPU**
  Quad-core ARM Cortex-A7 CPU Architecture, the most power efficient CPU core ARM's ever developed.
- **GPU**
  Mali400 MP2
- **Video Engine**
  Supports mainstream high-definition video decoding including H.264, H.263, MPEG1/2/4, xvid, Sorenson Spark, VP6/8, AVS/AVS+, WMV7, WMV8 by 1080p@60fps. In the aspect of video encoding, the A40i supports 1080p@45fps H.264 encoding ability.
- **Camera**
  Supports dual COMS sensor parallel interfaces and 4-channel TVIN, which can easily finish multi-channel video recording.
- **Display**
  Content can be display on 4-lane MIPI DSI display, or RGB panel, or LVDS panel.TV-out on HDMI V1.4 is also supported.
- **Audio**
  Integrated audio codec with 24 bit/192kHz DAC playback, and supports I2S/PCM interface for connecting to an external audio codec. I2C/PCM interface includes eight channels of TDM with sampling precision up to 32 bit/192kHz.
- **Memory**
  Supports external memory interface to NAND Flash, SD/EMMC, Nor Flash and SDRAM port. SDRAM port can be configured to support LPDDR2, LPDDR3, DDR2, DDR3, and DDR3L.

1.3 EMA40i specifications

* **Processor** – Allwinner A40i Quad-core ARM Cortex-A7 MPCore Processor @ 1.2 GHz
* **RAM** – 1GB DDR3
* **eMMC Flash** – 4GB
* **Interfaces** – Ethernet, 5x UART, TV-IN, 3x USB Host, USB OTG, HDMI, M.2 SATA, PCI-E, RS485, LCD(RGB, LVDS, MIPI), Camera, GPIO, Audio I/O, SD, SIM, etc.
* **Operating system**: Linux3.10, Android7.1.1
* **Application** – Industrial control, communications and measurement, etc.
* **Dimension** – 140mm x 100mm



2. Compiler Environment

2.1 Vmware10.0+ubuntu16.04

Install Vmware10.0 in windows OS, and then install ubuntu16.04 in VMware to compile. There is no longer describes how to install Ubuntu system, please visit the official website of Ubuntu, the operating system is also available for free download at the official website. http://www.ubuntu.com/

Note: Linux should be complied by ubuntu 64-bit OS.

2.2 Install Tools

```
# sudo apt-get install build-essential
# sudo apt-get install zlib1g-dev
# sudo apt-get install flex
# sudo apt-get install libx11-dev
# sudo apt-get install gperf
# sudo apt-get install libncurses5-dev
# sudo apt-get install bison
# sudo apt-get install lsb-core
# sudo apt-get install lib32z1-dev
# sudo apt-get install g++-multilib
# sudo apt-get install lib32ncurses5-dev
# sudo apt-get install uboot-mkimage
# sudo apt-get install g++-4.4-multilib
```

If the compilation encountered error, please according to the error message, the installation of the corresponding software package

3. Automatic Compilation

The steps for automatic compilation are as follows:

Step 1, unzip the source.

```
#tar zxvf a40i-android7.1.tar.gz
```

Step 2, Execute automatic compilation scripts in the source directory.

```
#./build_img.sh
./build.sh: line 47: cd: u-boot-2014.07/: No such file or directory
Welcome to mkscript setup progress
All available chips:
    0. sun8iw11p1
Choice: 0
All available platforms:
    0. android
    1. androidm
    2. dragonboard
    3. linux
    4. camdroid
Choice: 1
All available kernel:
    0. linux-3.10
Choice: 0
```

All available boards:

0. a40-boardcon
1. a40-ococci
2. a40-p1
3. t3-mp1
4. t3-mp3
5. t3-p1
6. t3-p2
7. t3-p3

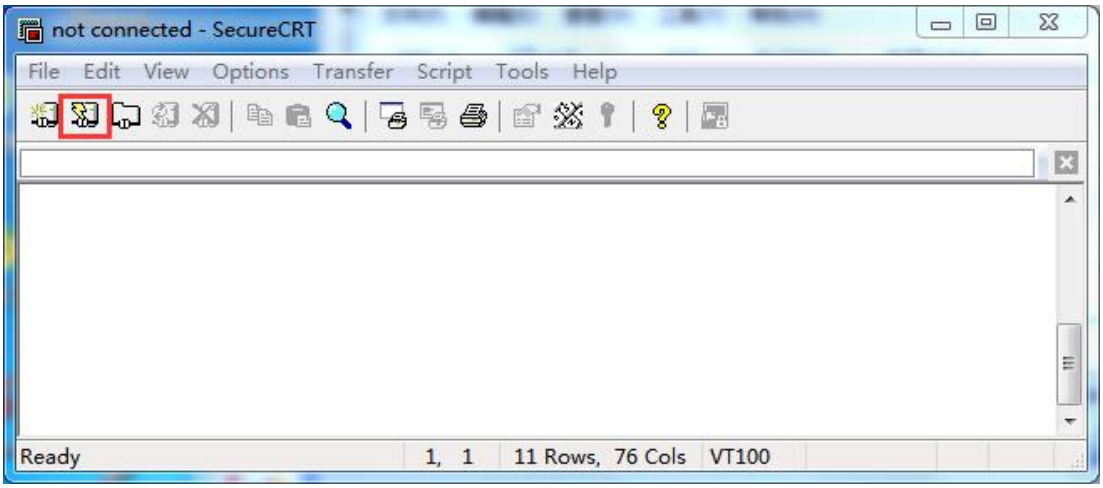
Choice: 0

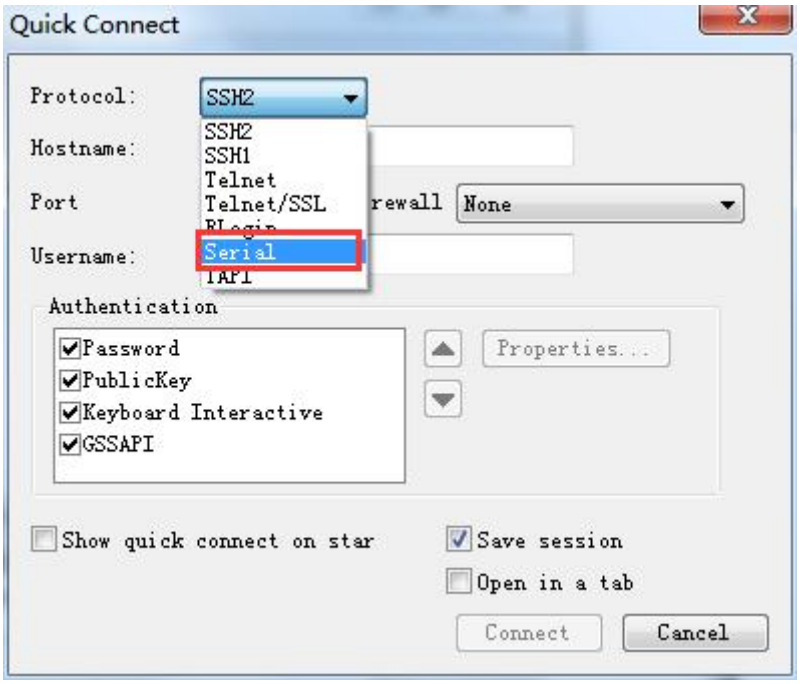
The final burnable image is **sun8iw11p1_androidm_a40-boardcon_uart0.img,** which is in the directory of a40i-android7.1\lichee\tools\pack.

4 Install Serial Terminal Tool

The serial terminal SecureCRT is used for debugging. It can be used directly after decompression.

Open SecureCRT.exe after copy to PC (path: tools\windows\SecureCRT.exe), then click the icon **Quick Connect** to config.





Set the parameters as follow.

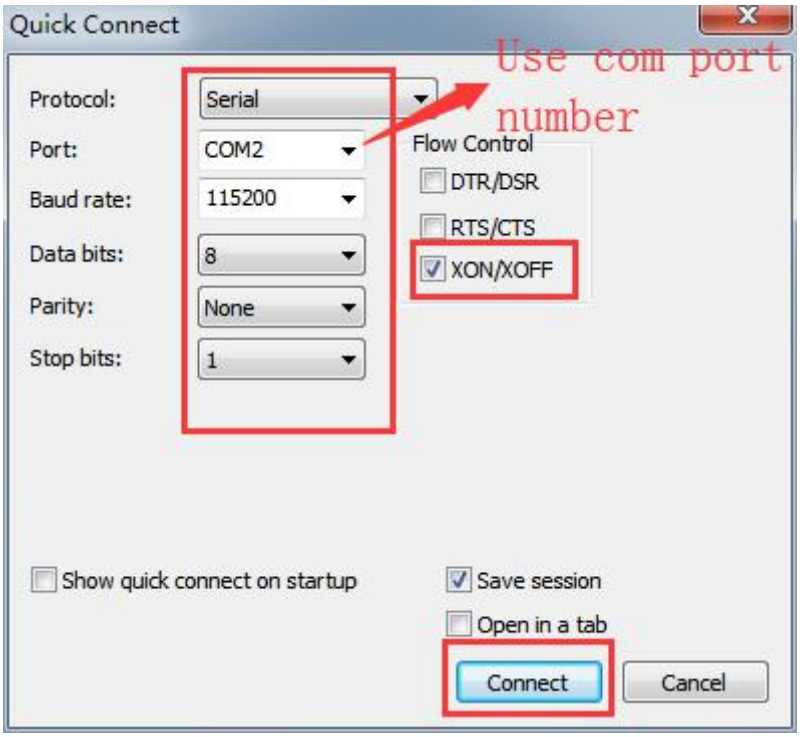
Protocol: Serial

Port: To be specified by user PC

Baud rate: 115200

Please check XON/XOFF but not RTS/CTS

Check Save session



Click ***connect***

Illusion1: If open more than one serial terminal tools, and they use the same serial port, there will be

reported **the port is busy**.

Solution: Turn off the serial tool that unnecessary.

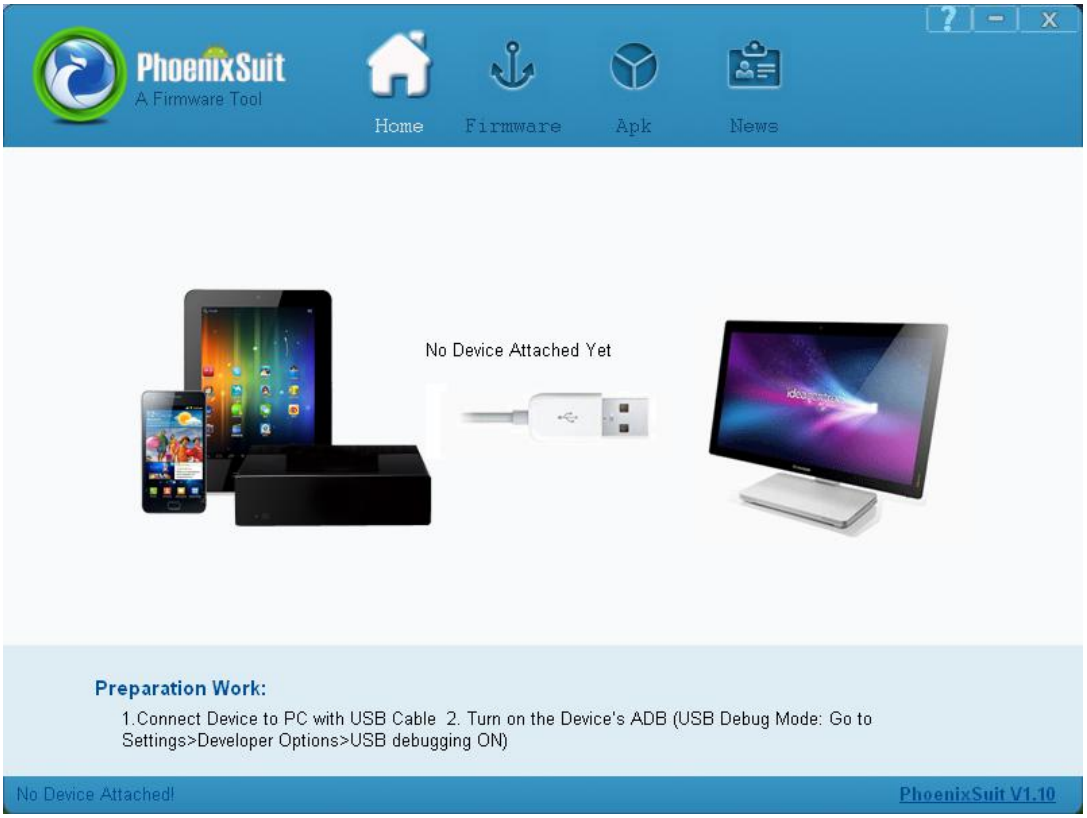
5. Burning Guide

5.1 Install Firmware Tool

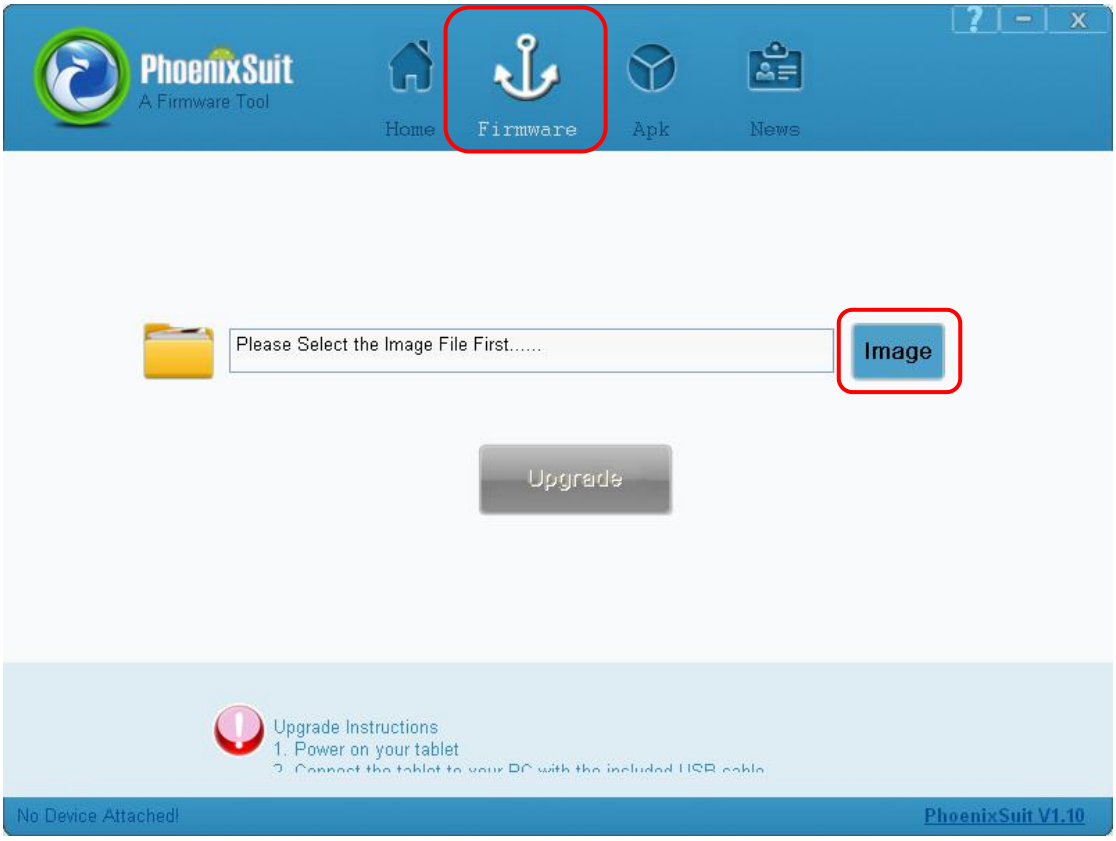
Please install **PhoenixSuit1.0.6** (*Path: CD\Tools\PhoenixSuit1.0.6*) according to the PC system.

5.2 Burning Steps

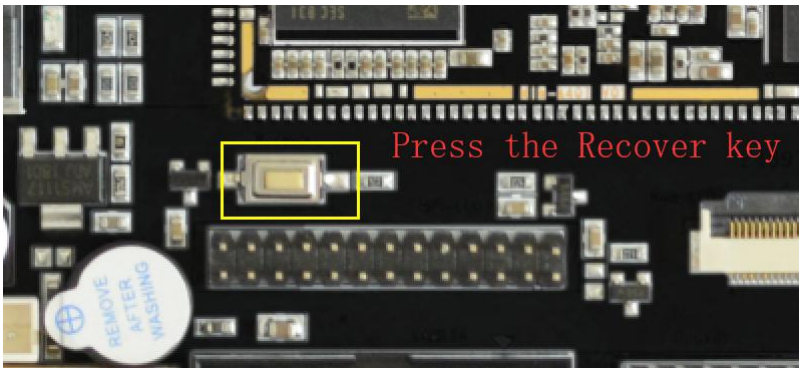
Step 1, open the tool **PhoenixSuit.**

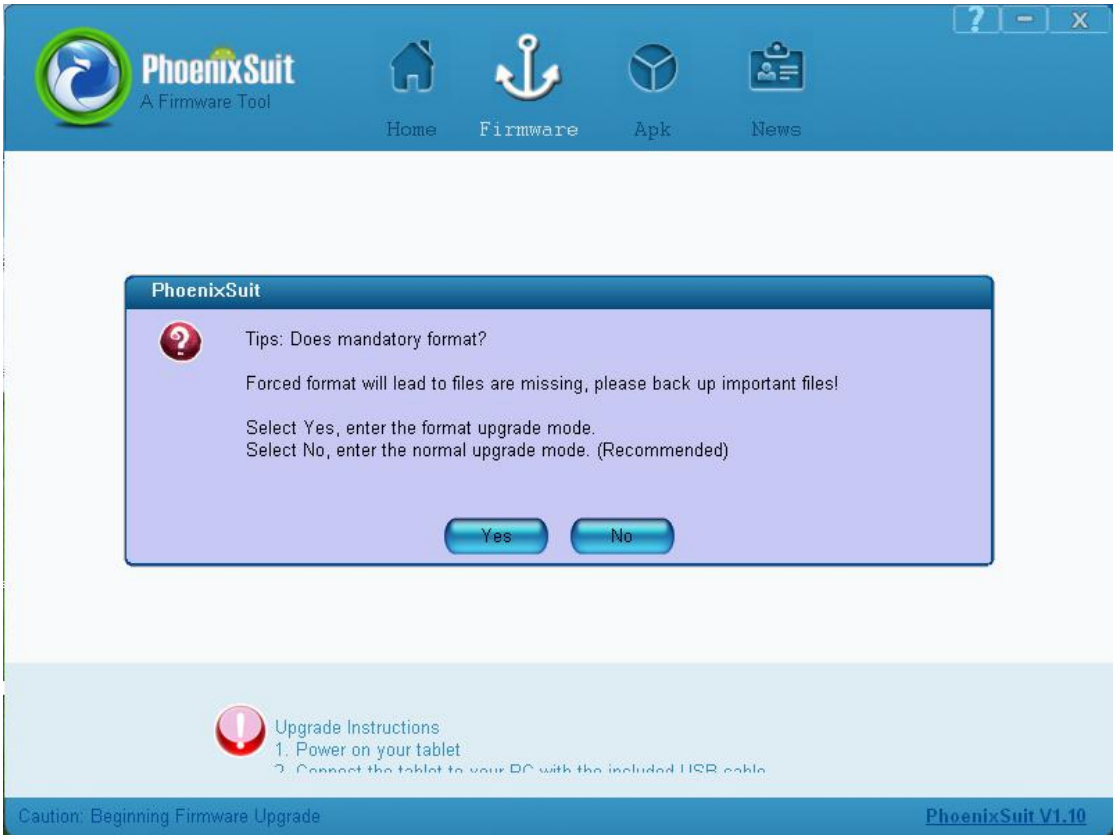


Step 2, select “Firmware”, then click “Image” and select the image (***Path***: CD\image).

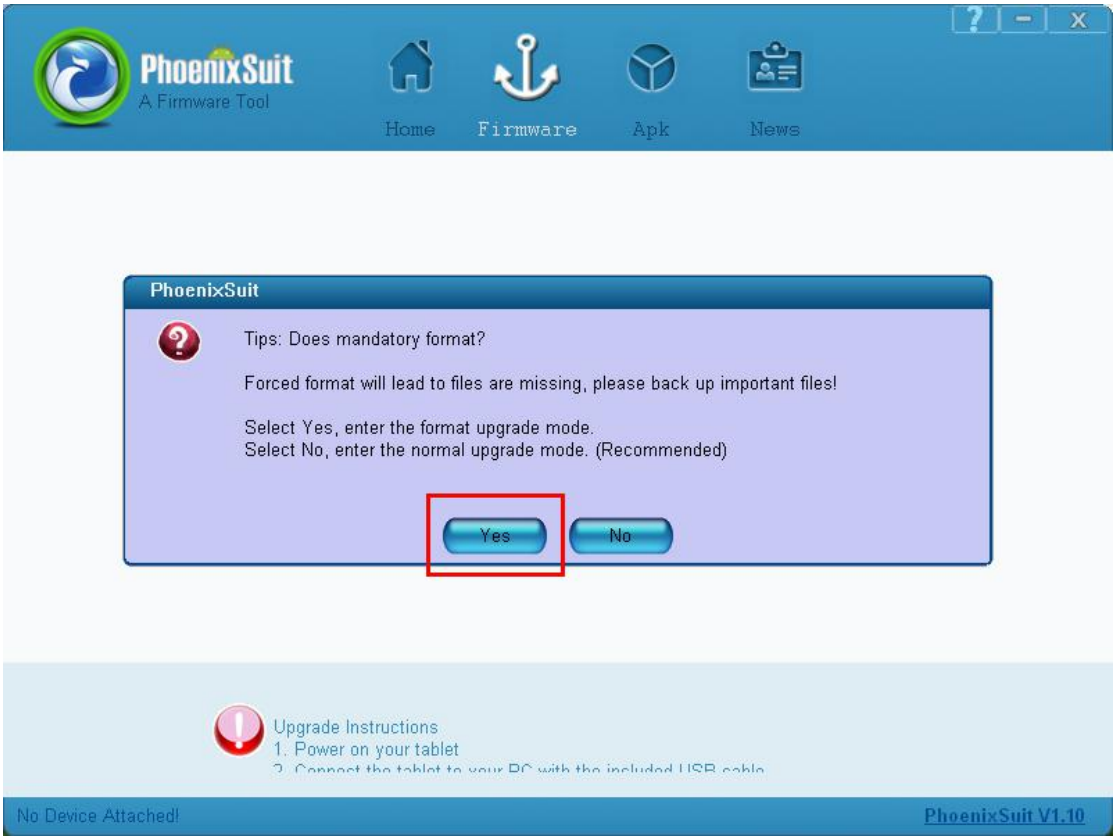


Step 3, connect PC and board with Micro USB cable, keep pressing the **Recover Key** and power on until the windows PC pops up dialogue box.

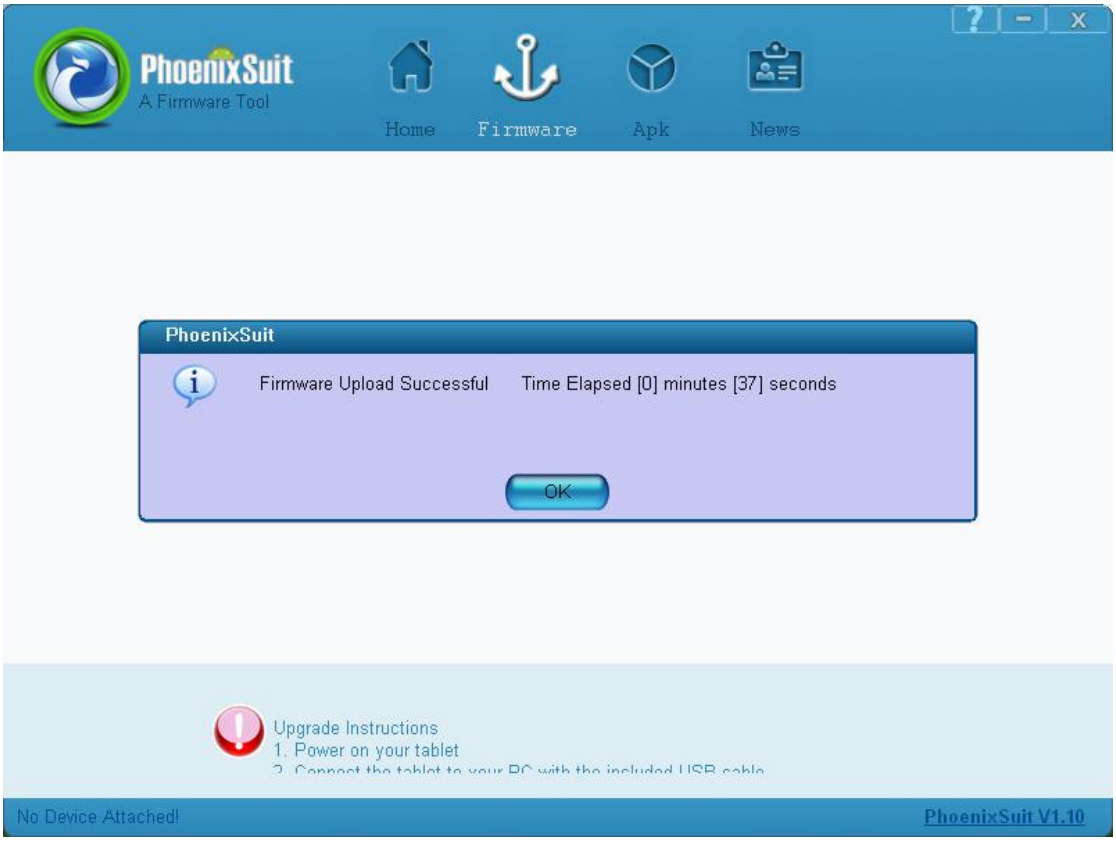




Step 4, select “Yes” to enter the format upgrade mode.



After the system update is completed, it will restart automatically.



6 EMA40i Application Guidance

6.1 Serial Terminal

Connect the board and PC with USB Serial cable, then power on, the terminal will output startup information.

```
[   32.670357] [BT_LPM] bluesleep_hostwake_task: hostwake line change
[   32.682843] [BT_LPM] bluesleep_hostwake_task: hostwake line change
[   32.738469] [BT_LPM] bluesleep_hostwake_task: hostwake line change
[   32.750998] [BT_LPM] bluesleep_hostwake_task: hostwake line change
[   38.300043] [BT_LPM] bluesleep_tx_timer_expire: Tx timer expired
[   38.306668] [BT_LPM] bluesleep_tx_timer_expire: Tx data during last period
[   48.320048] [BT_LPM] bluesleep_tx_timer_expire: Tx timer expired
[   48.326672] [BT_LPM] bluesleep_tx_timer_expire: Tx has been idle
[   48.333680] [BT_LPM] bluesleep_sleep_work: going to sleep...

a40-boardcon:/ #
a40-boardcon:/ #
a40-boardcon:/ #
a40-boardcon:/ #
a40-boardcon:/ #
```

6.2 HDMI Display

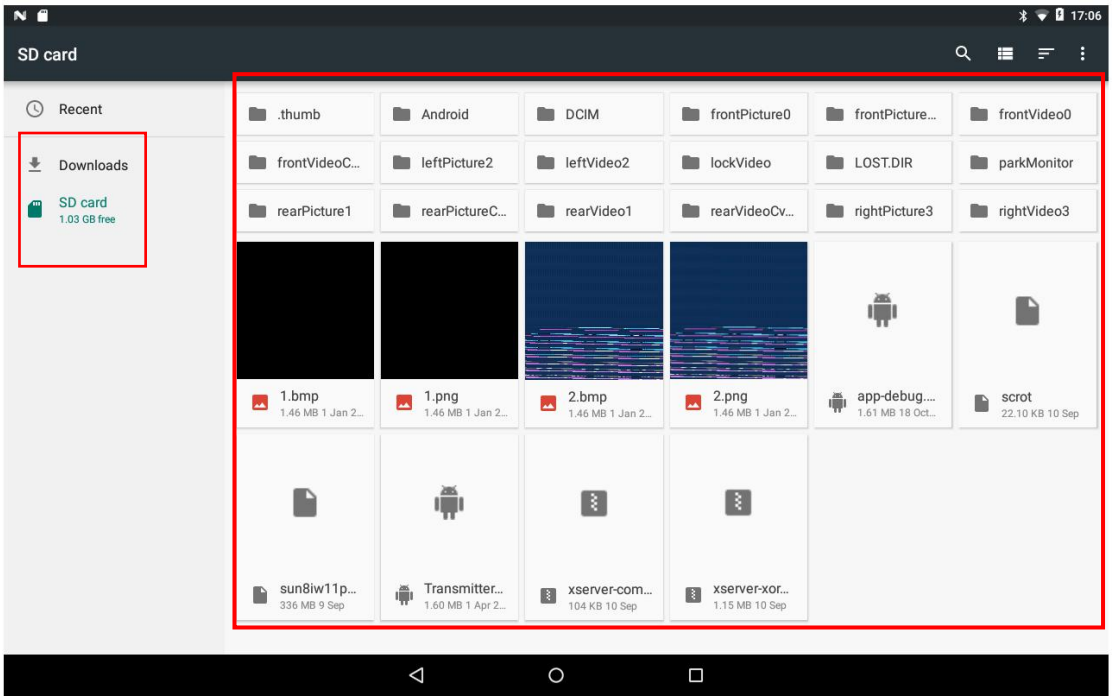
Connect the board and HDMI monitor with a HDMI cable, then power on. After the board boot into Android OS, HDMI monitor will show Android UI.

6.3 LVDS and Touch

Connect 10.1'' LVDS to the board and power on. After the board boot into Android OS, The LVDS will display Android UI.
EMA40i supports HDMI & LVDS display sync.

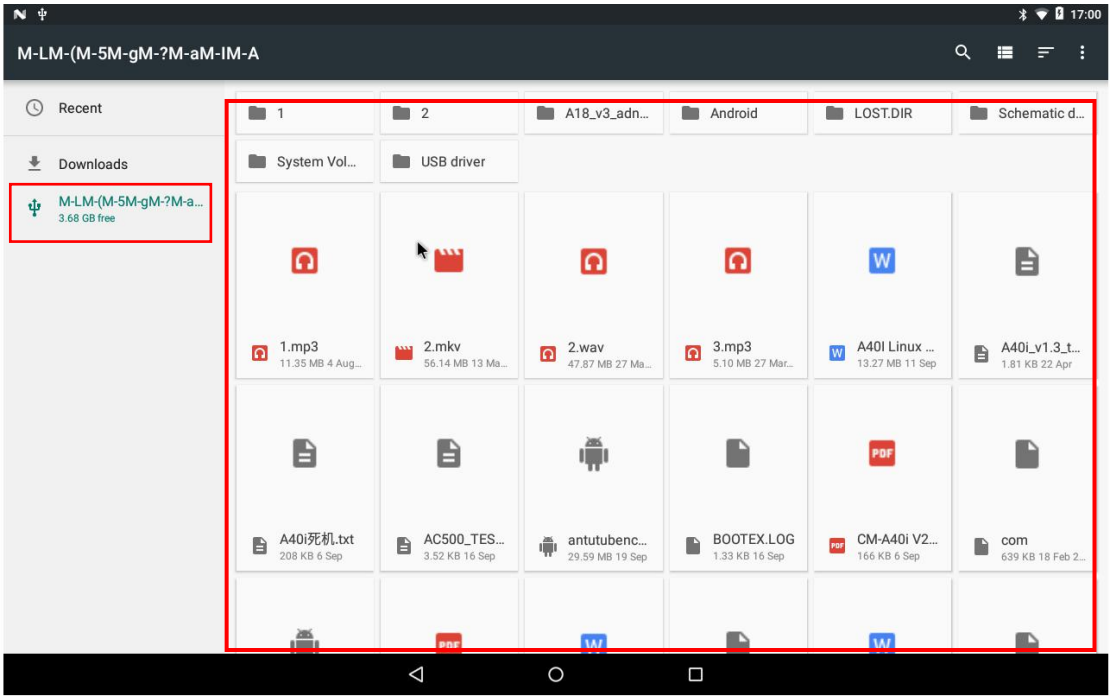
6.4 SD Card

The system will automatically mount the SD card.



6.5 USB Host

Insert USB device (e.g. U-disk) to USB Host，the system will automatically read the contents.



.6 SSD (SATA 2.0)

Note: SSD does not support hot plugging, please insert before power on.

Insert SSD mass storage device to SATA interface， then power the board when system booting execute follow command to mount.

mount /dev/block/sda1 /mnt

ls /mnt/

```
a40-boardcon:/ # mount /dev/block/sda1 /mnt
'/dev/block/sda1' is read-only
[  186.185403] NTFS volume version 3.1.
[  186.189357] NTFS-fs warning (device sda1): load_system_files(): Volume is dirty.  Will not be able to remount read-write.  Run chkdsk and mount in Windows.
a40-boardcon:/ # cd /mnt/
a40-boardcon:/mnt # ls
$RECYCLE.BIN        bin                    bt_load_rtk_firmware test.mp3
S66load_wifi_modules brcm_tools            firmware             test.mp4
alps.tar.gz         bt_load_broadcom_firmware realtek
```

6.7 4G Network

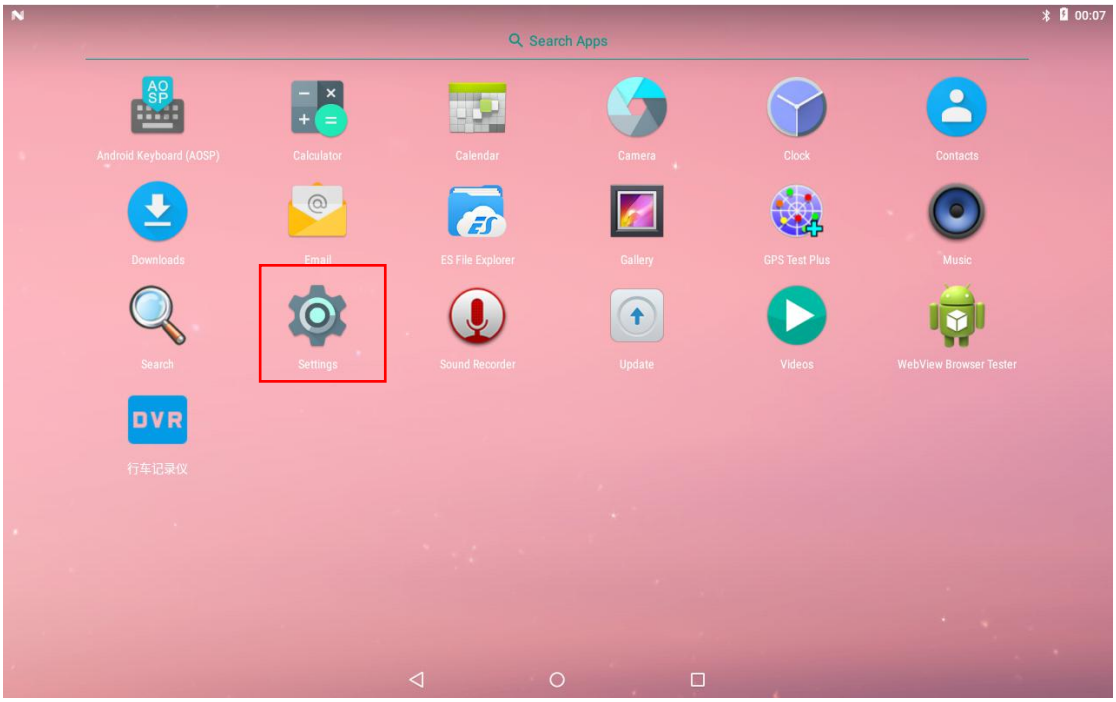
Step 1, Insert 4G module to PCI-E slot (4G model:EC20).

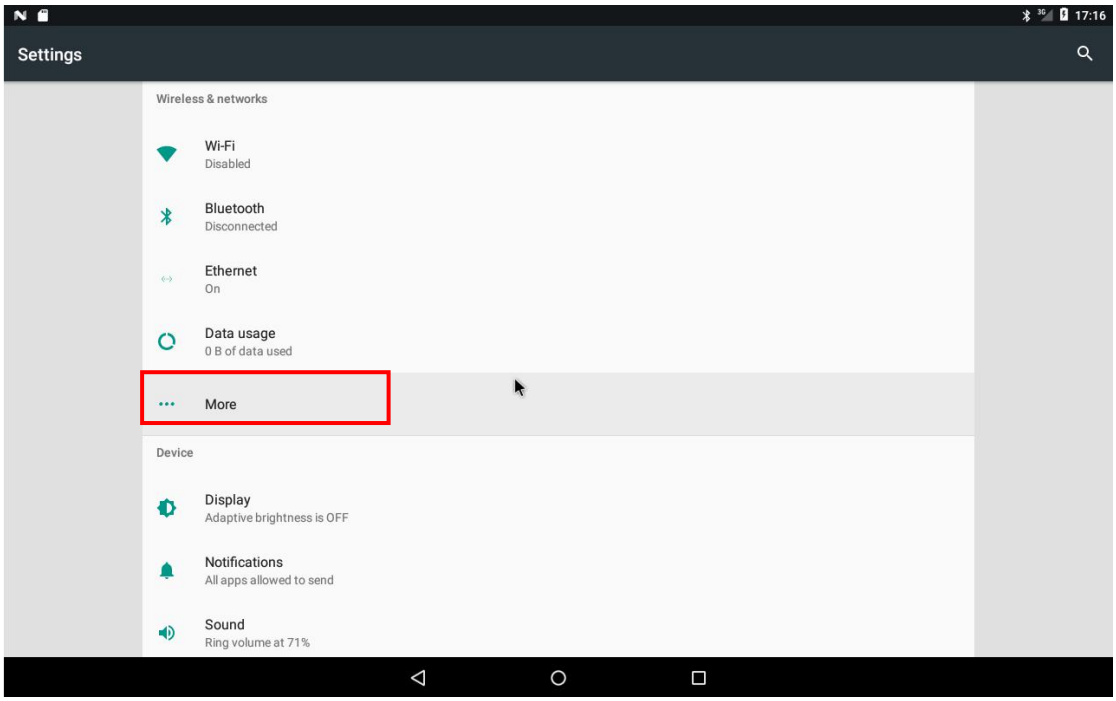
Step 2, Connect antenna and insert SIM card.

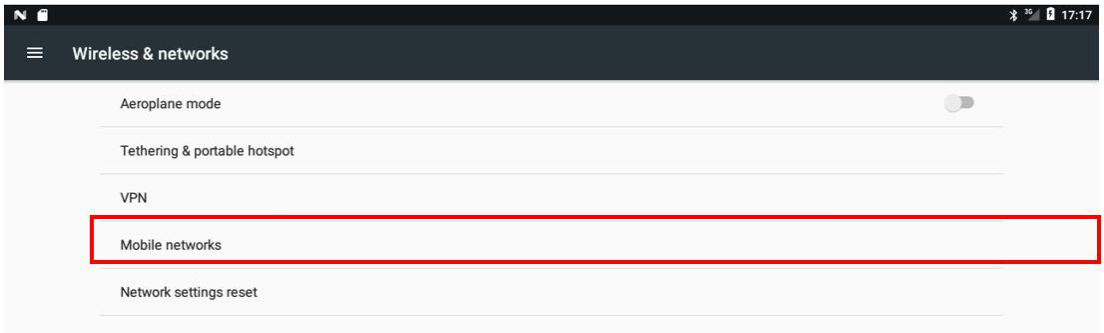
Step 3, The default connection is 3G network after power on.

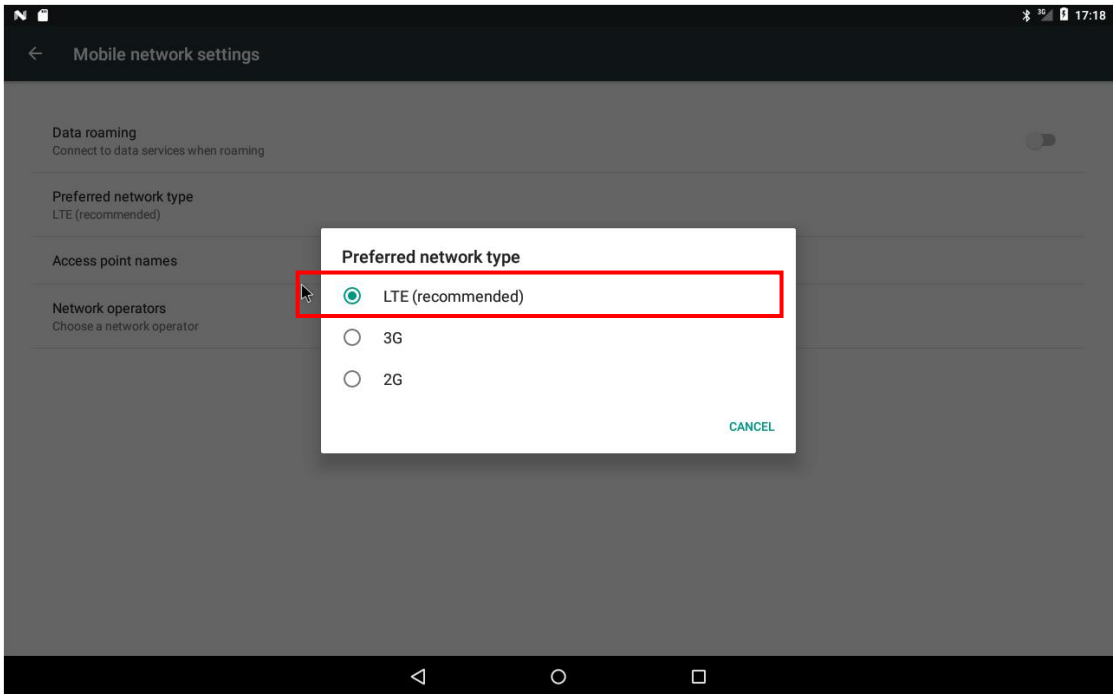
4G network settings:

Settings -> Wireless&networks -> More -> Cellular networks -> Preferred network type -> LTE

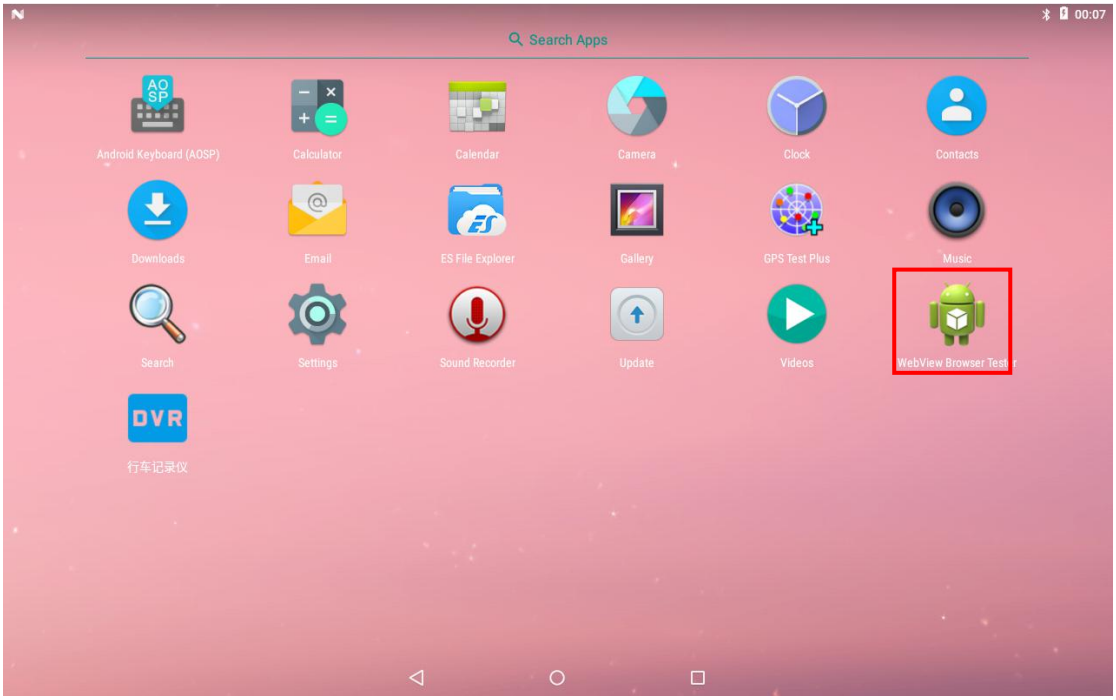

00:07
Search Apps
Android Keyboard (AOSP)
Calculator
Calendar
Camera
Clock
Contacts
Downloads
Email
ES File Explorer
Gallery
GPS Test Plus
Music
Search
Settings
Sound Recorder
Update
Videos
WebView Browser Tester
DVR
行车记录仪

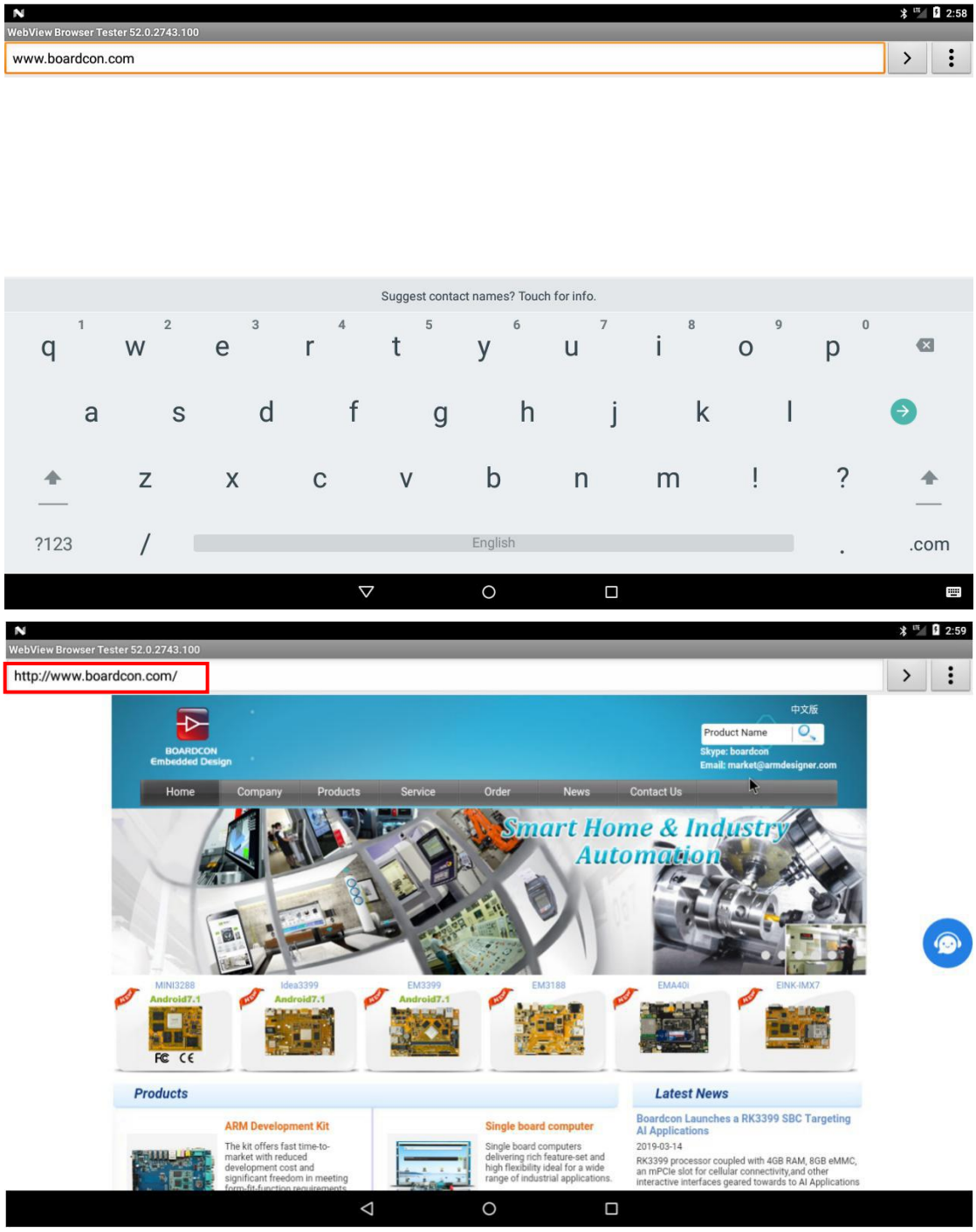

17:16
Settings
Wireless & networks
Wi-Fi
Disabled
Bluetooth
Disconnected
Ethernet
On
Data usage
0 B of data used
More
Device
Display
Adaptive brightness is OFF
Notifications
All apps allowed to send
Sound
Ring volume at 71%


17:17
Wireless & networks
Aeroplane mode
Tethering & portable hotspot
VPN
Mobile networks
Network settings reset



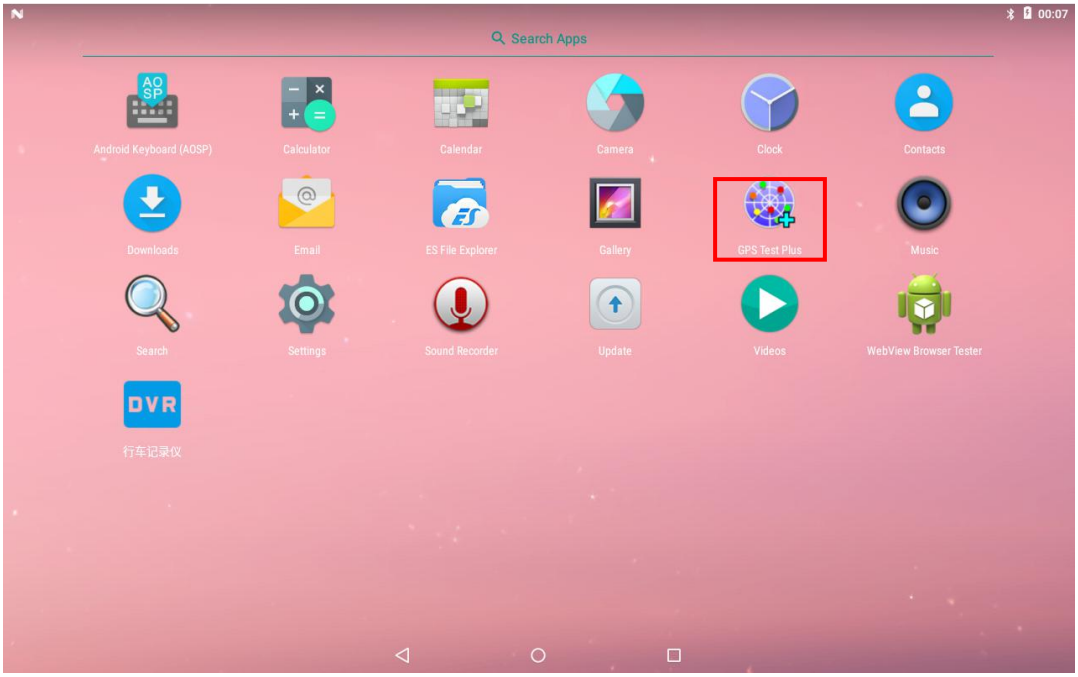
Open the browser to test.



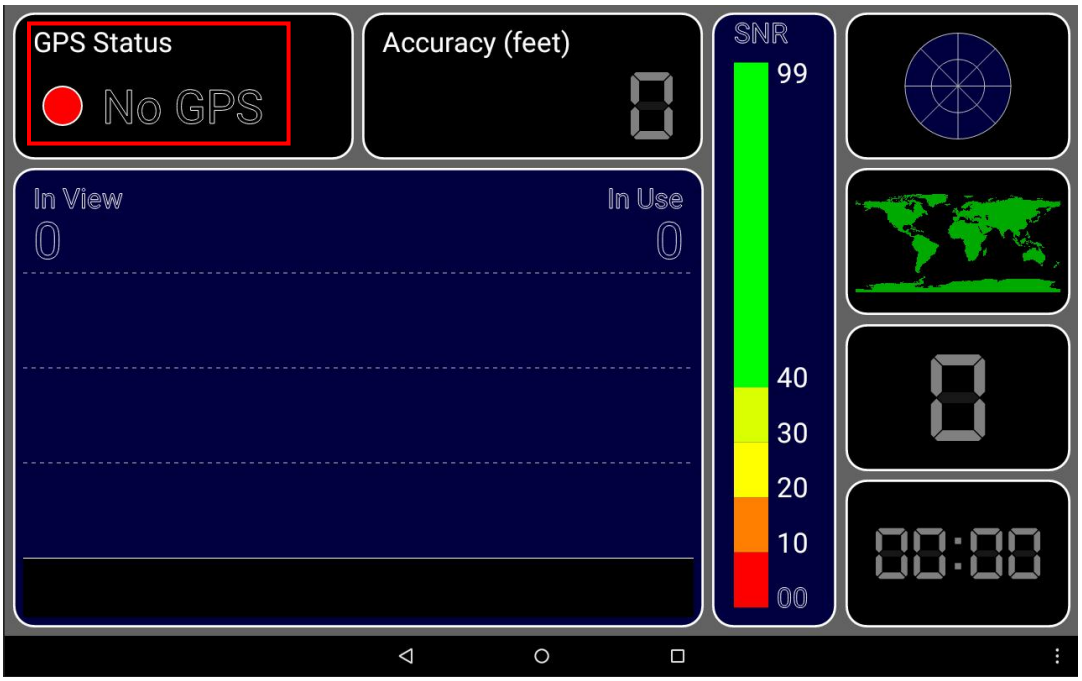


6.8 GPS

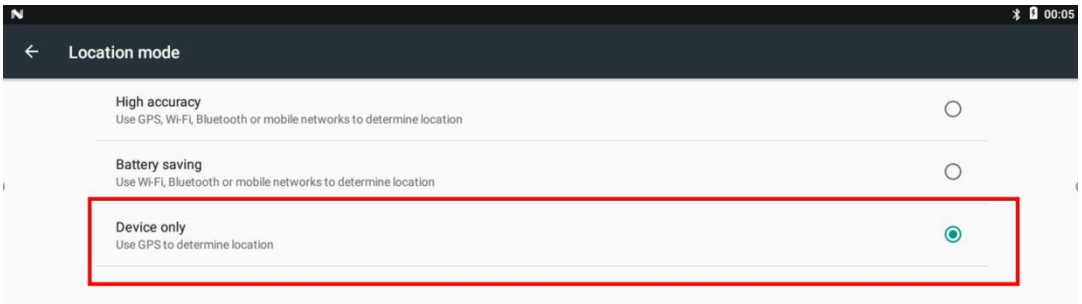
Plug the EC20 module and connect GPS antenna, then power on and and click the “GPS Test Plus” to test.



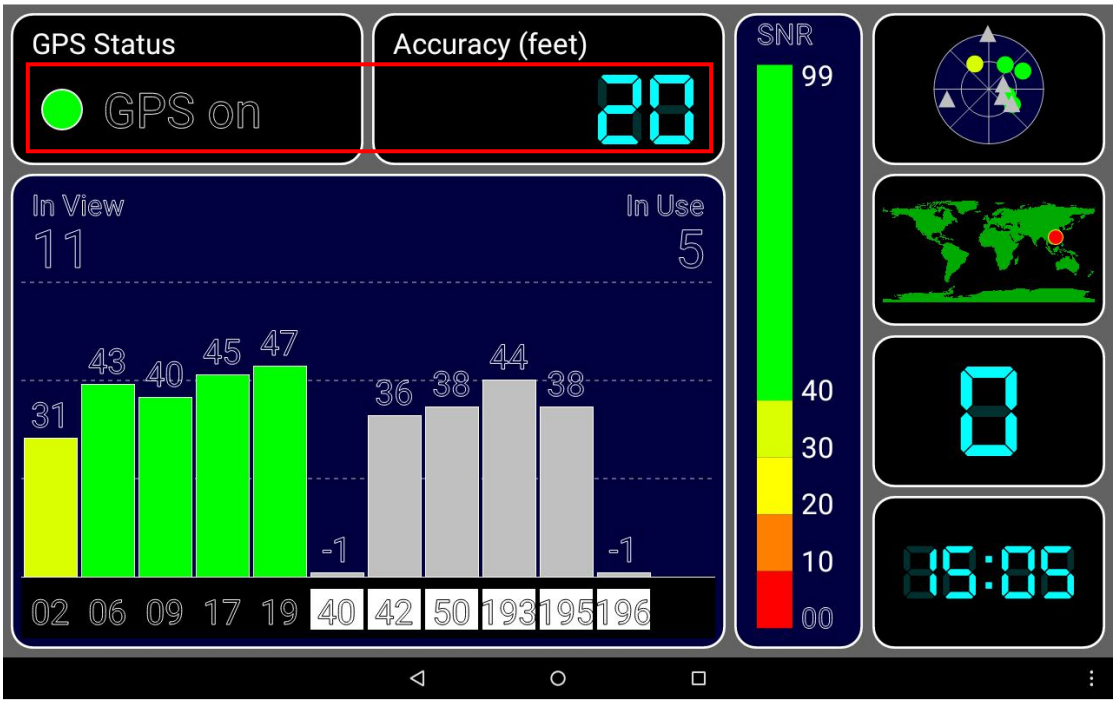
Click “No GPS”



Select “Device only”



Now the GPS module can receive the data.



6.9 RTC (PCF8563)

Execute the follow command to test RTC.

#busybox date -s "2019-07-25 17:04:00"

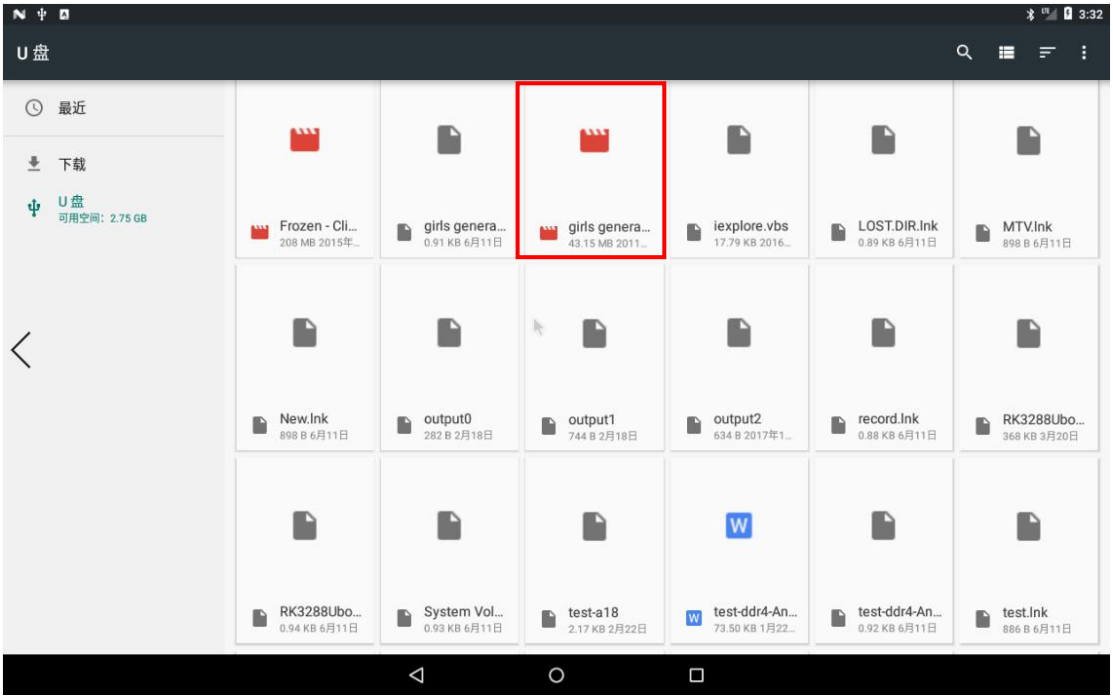
#busybox hwclock -w

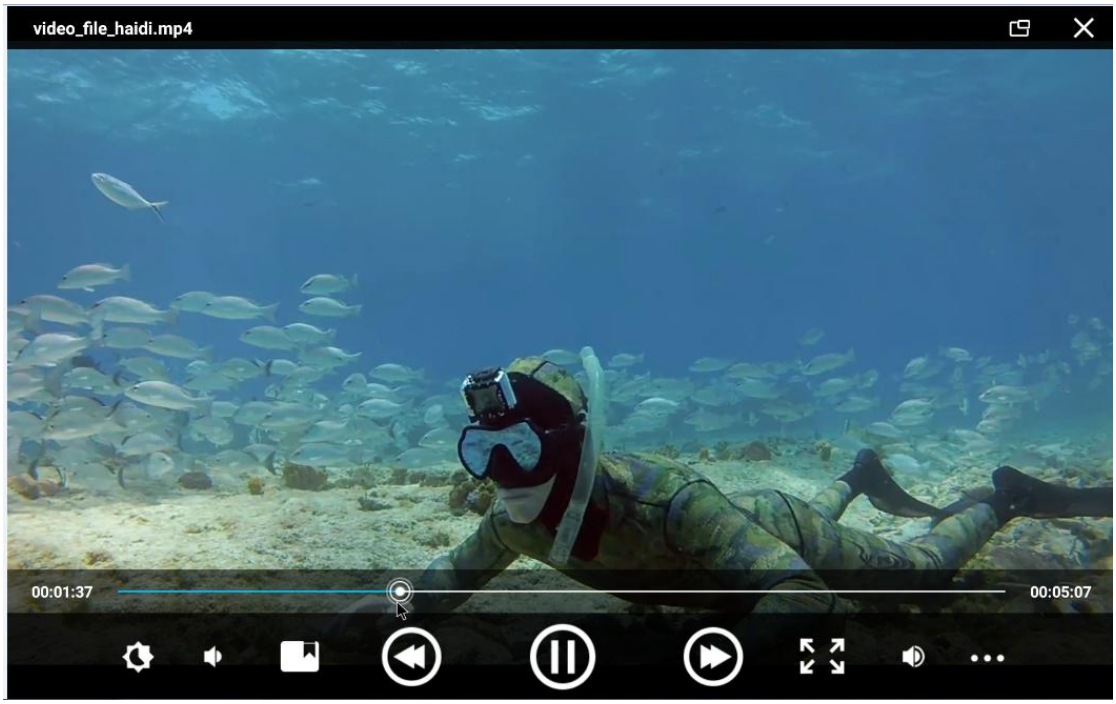
#busybox hwclock

```
1|a40-boardcon:/ # busybox date -s "2019-07-25 17:04:00"
Thu Jul 25 17:04:00 UTC 2019
a40-boardcon:/ # busybox hwclock -w
a40-boardcon:/ # busybox hwclock
Thu Jul 25 17:04:34 2019  0.000000 seconds
a40-boardcon:/ #
```

6.10 Video Player

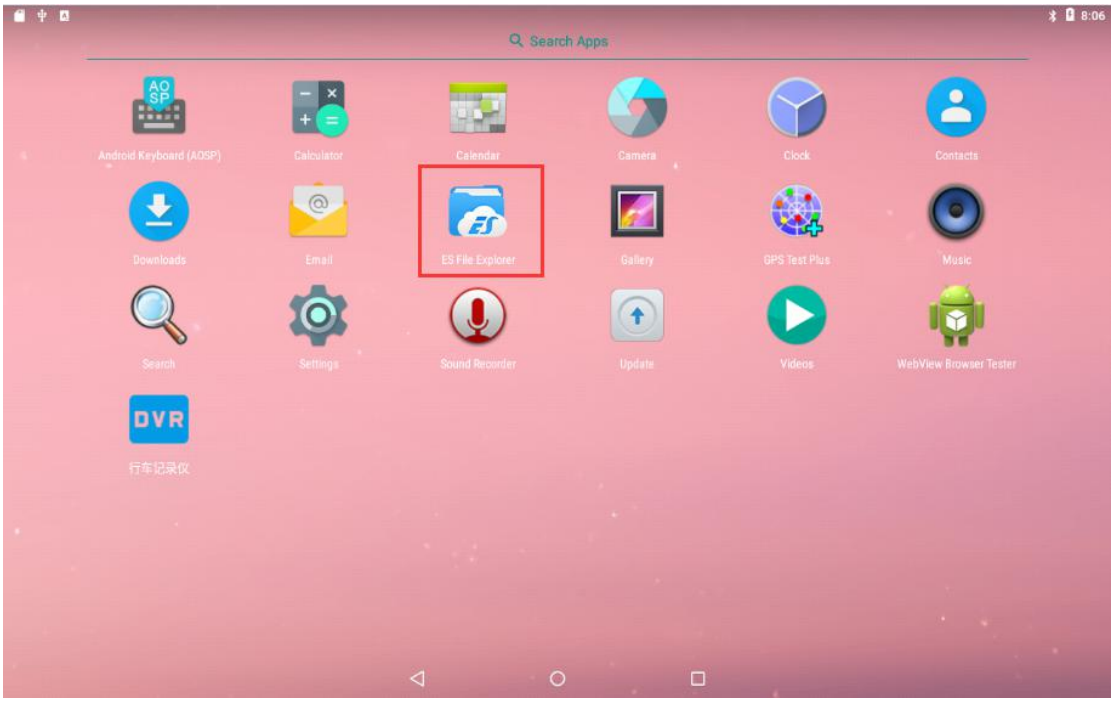
Open the video file and select the player to play.

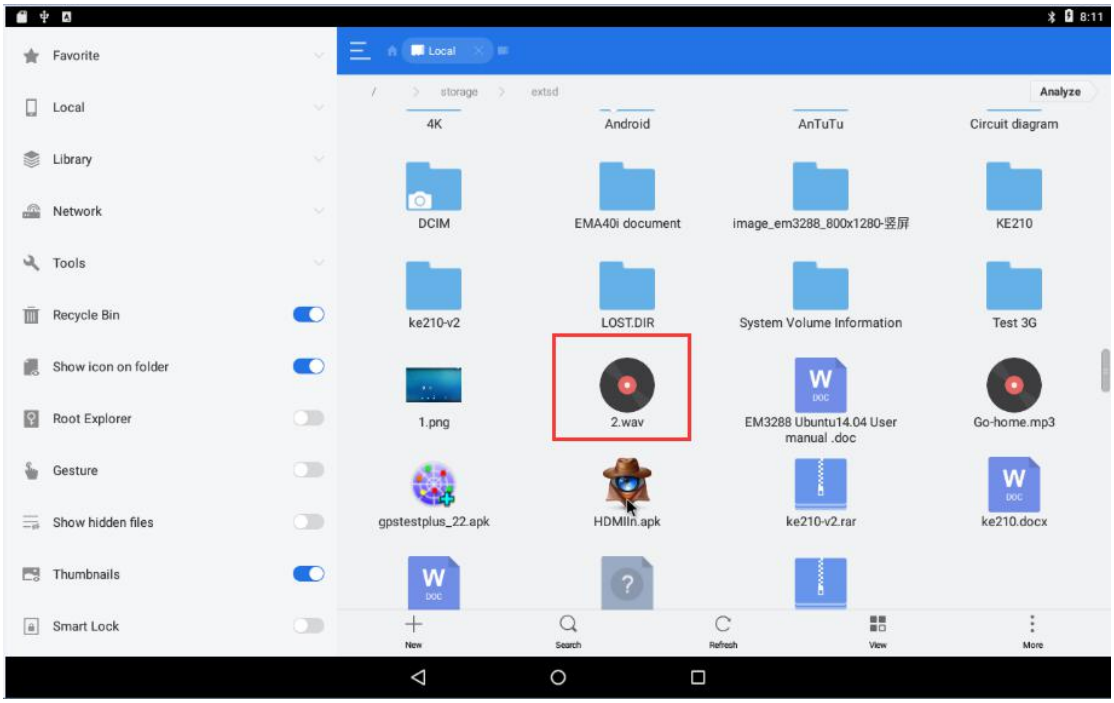




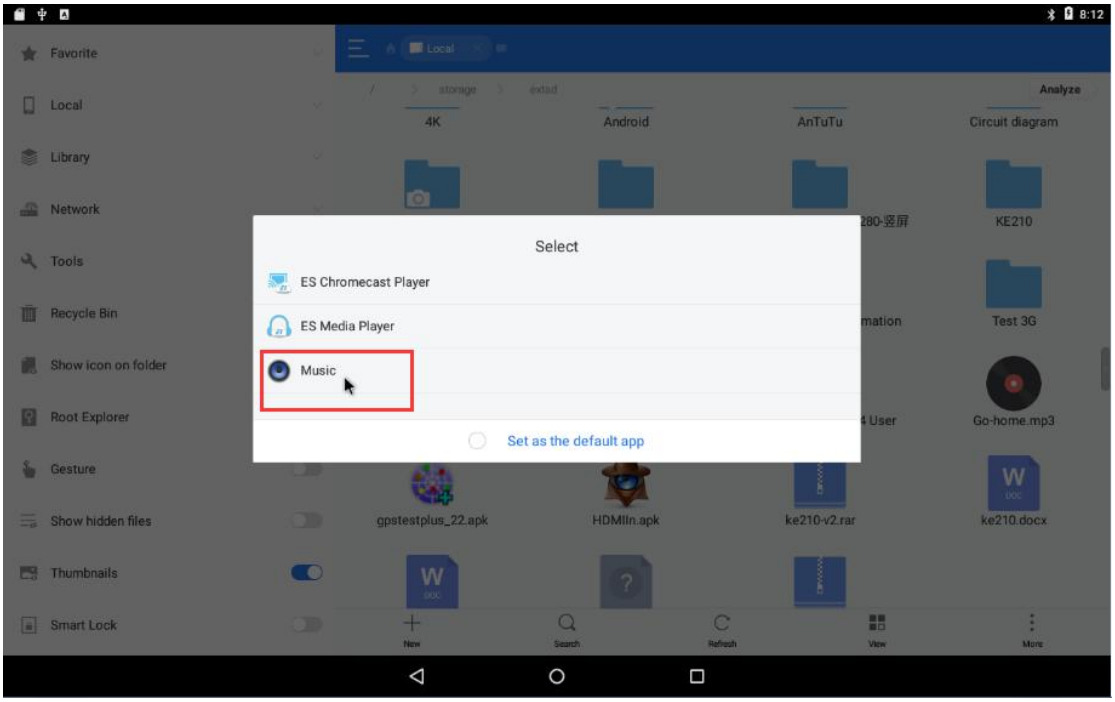
6.11 Audio Player

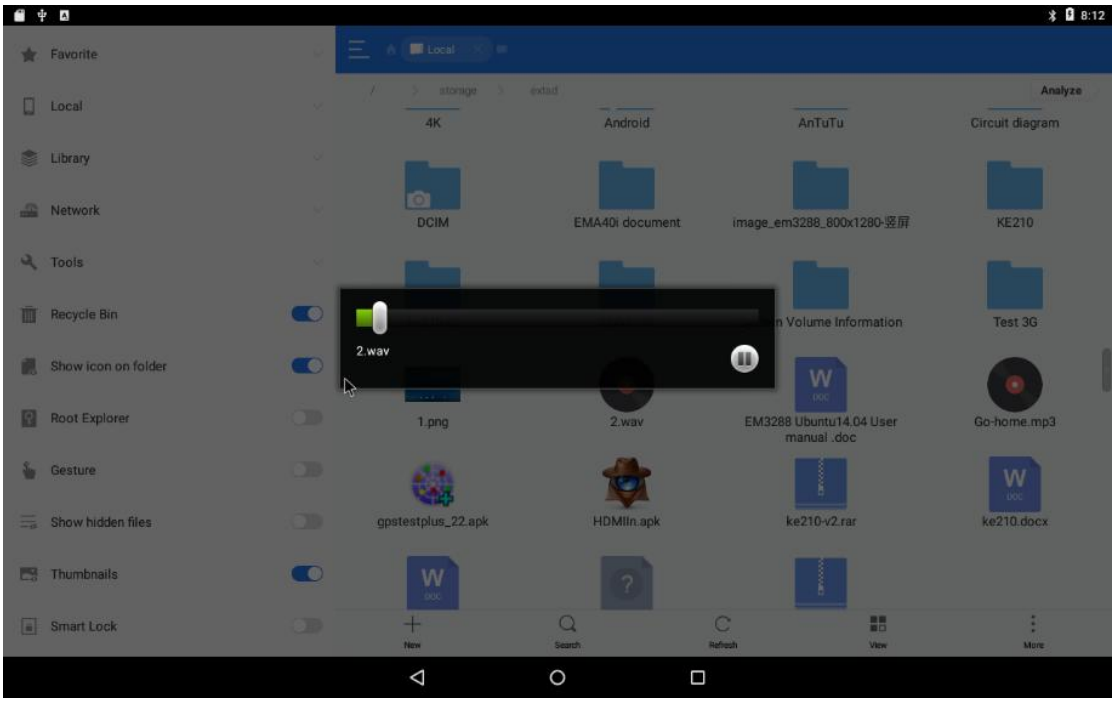
Open **ES File Explorer** to select the Music to play.





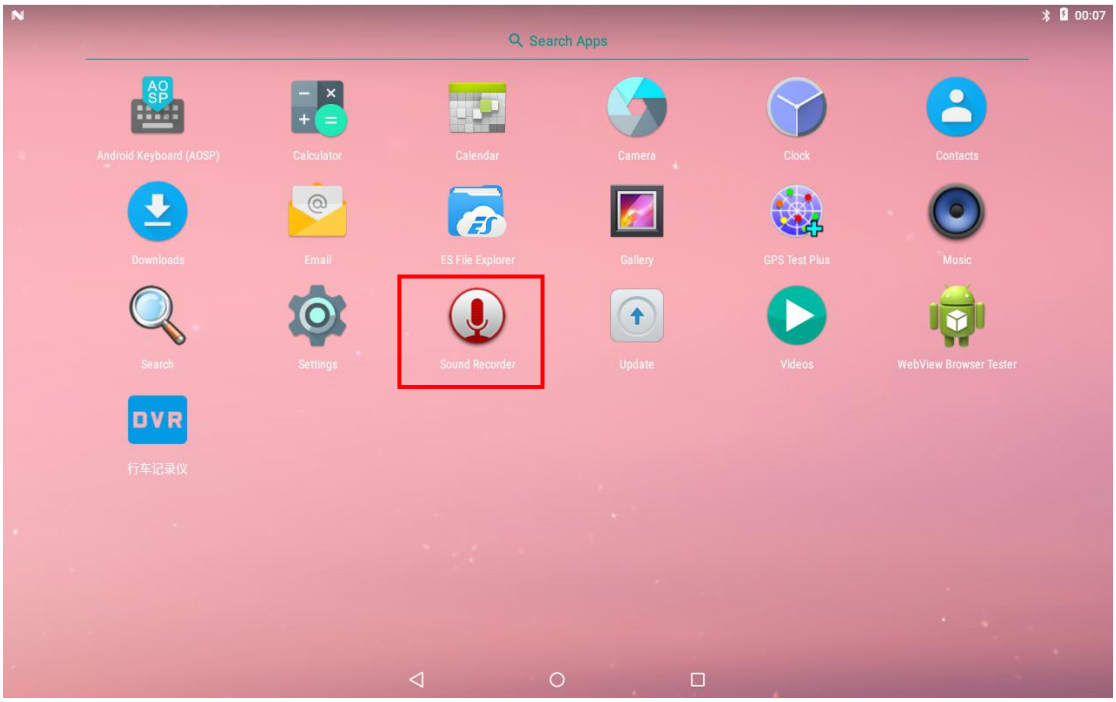
Select audio player.

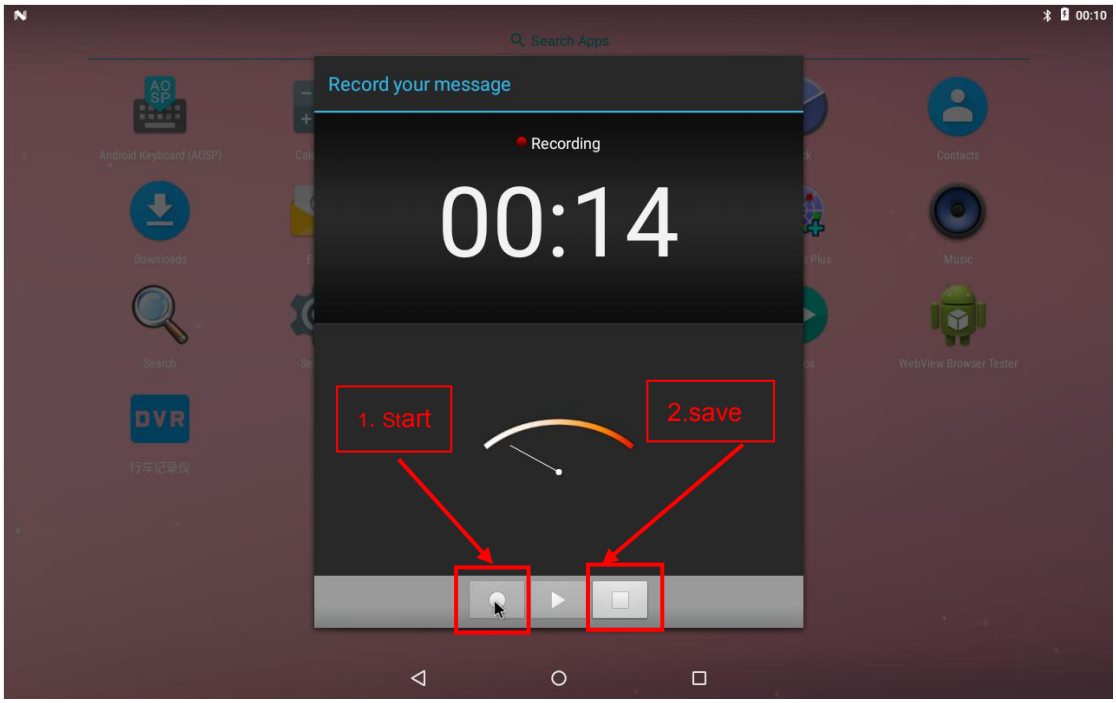




6.12 Recording

Open the recorder app to test recording.



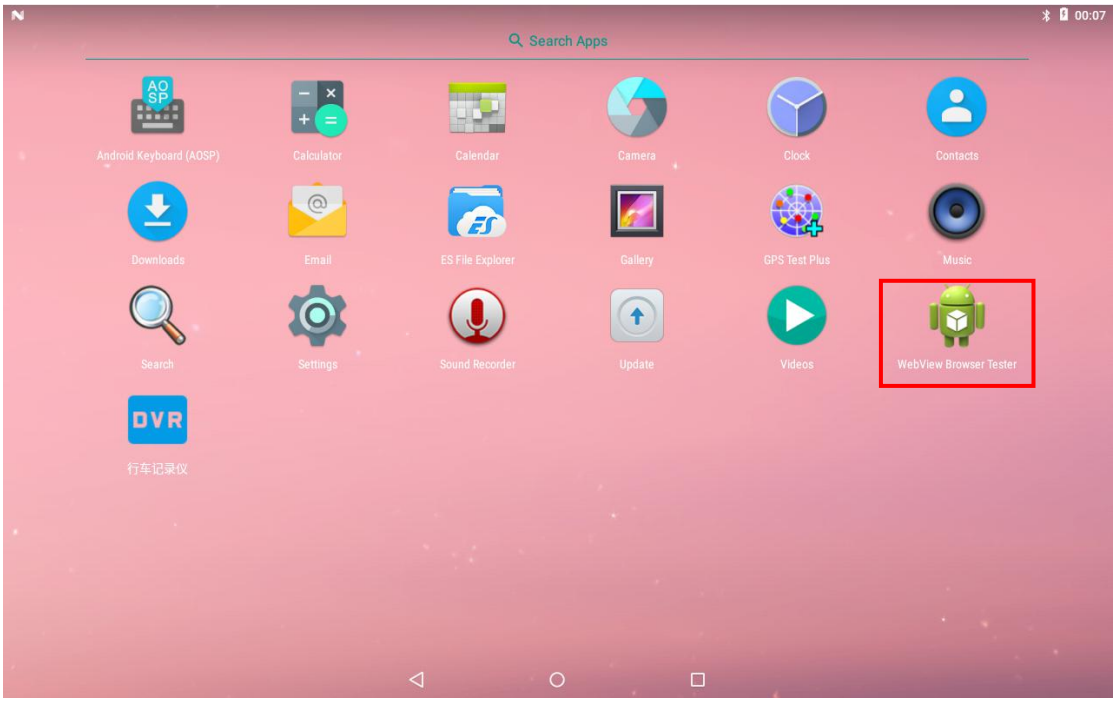


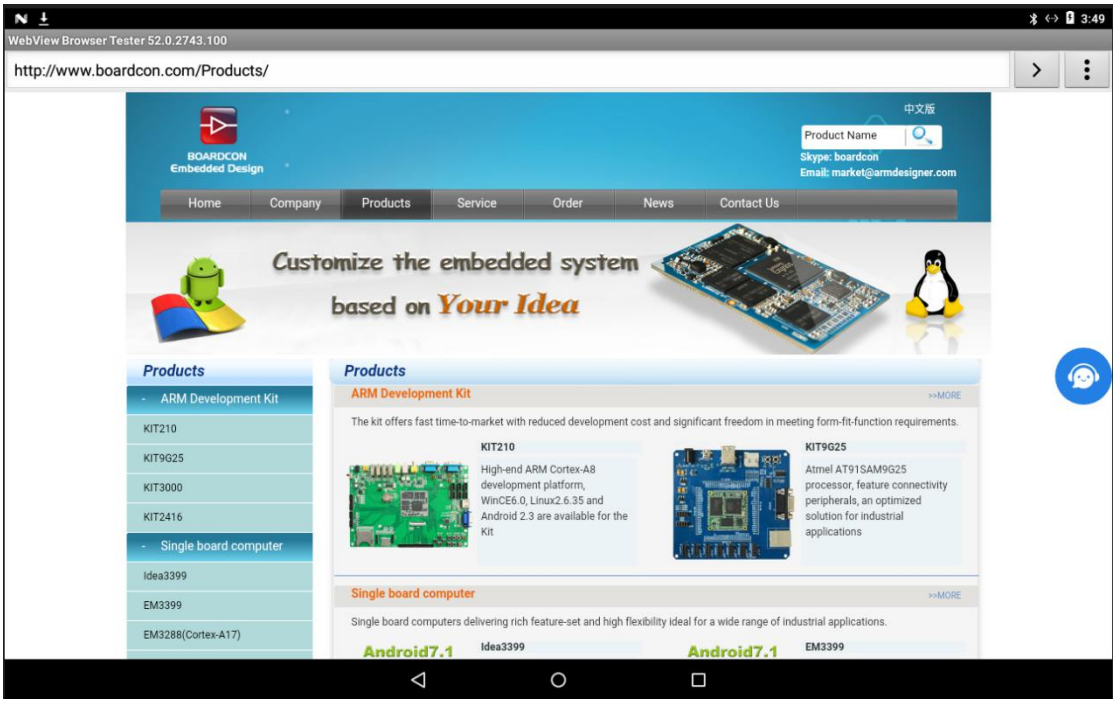
6.13 Ethernet

Connect the Board and router with an Ethernet cable (default DHCP=Yes). User can ping URL/IP at terminal, or open the browser to test Network.

su

ping www.boardcon.com

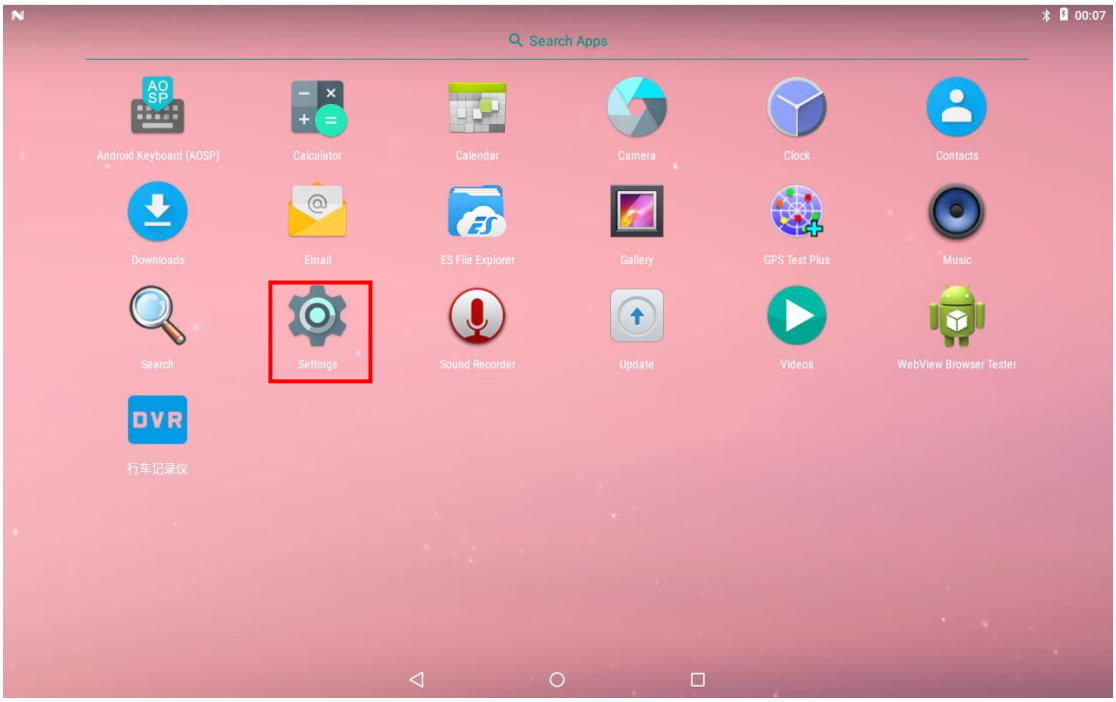


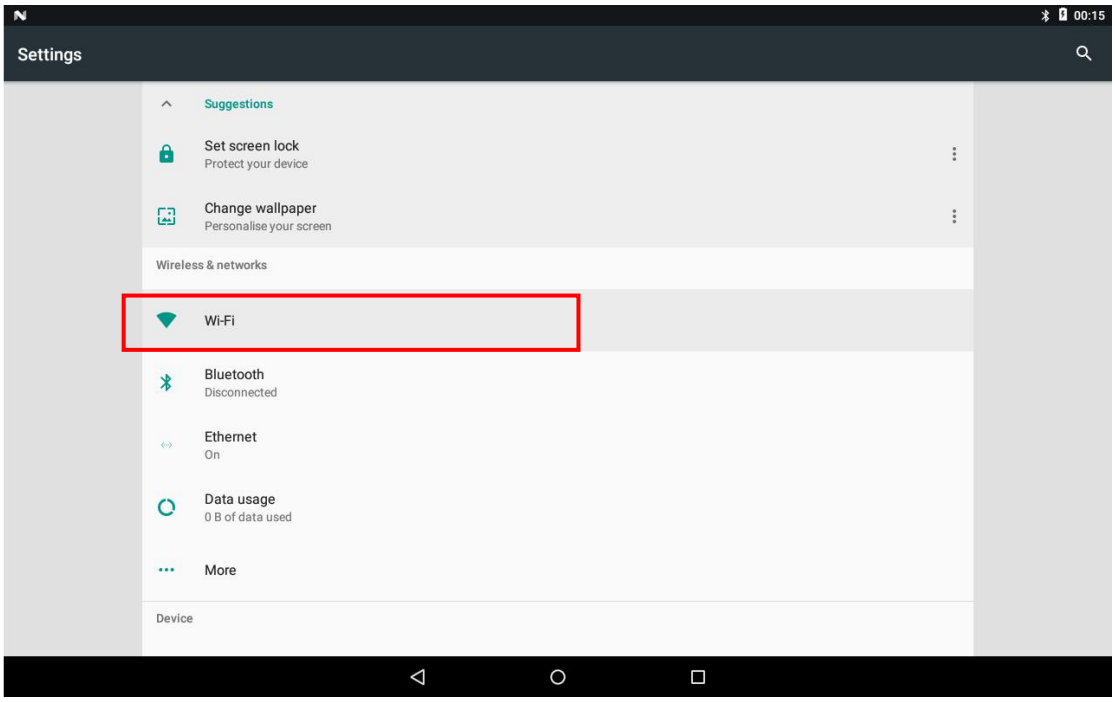


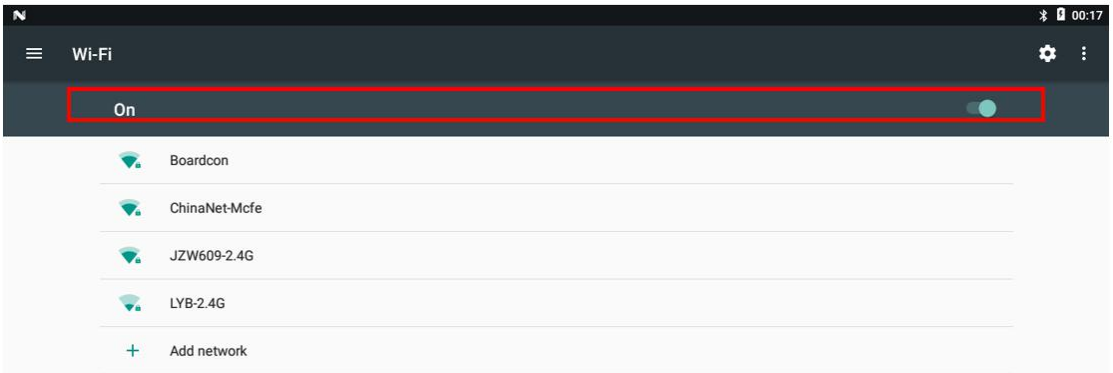
6.14 WiFi

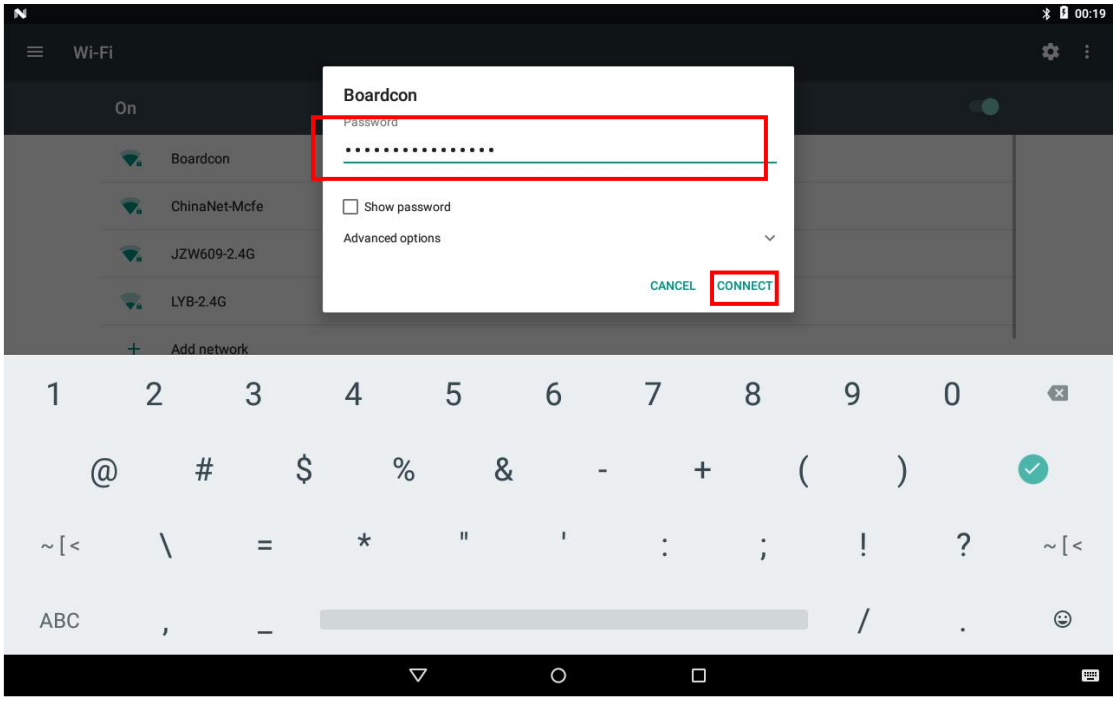
Connect the WiFi antenna, then click **Settings -> WiFi -> turn on**, select the SSID from the list of available networks and enter the password.

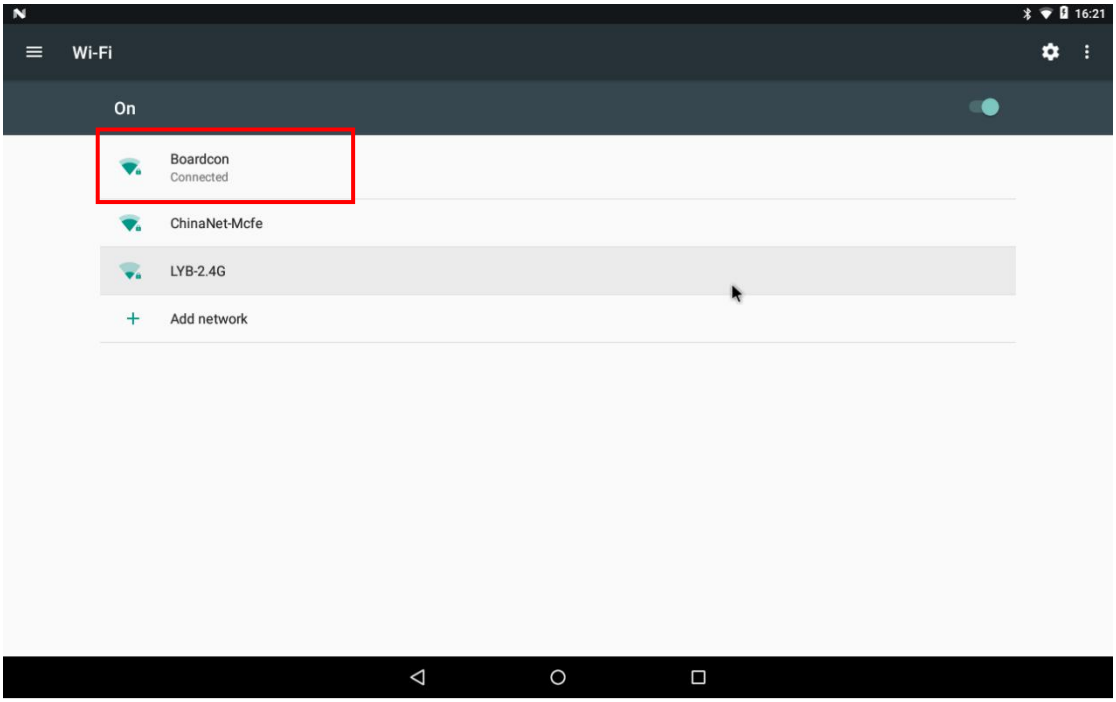
After connected, user can open the browser to browse the web.


00:07
Search Apps
Android Keyboard (AOSP)
Calculator
Calendar
Camera
Clock
Contacts
Downloads
Email
ES File Explorer
Gallery
GPS Test Plus
Music
Search
Settings
Sound Recorder
Update
Videos
WebView Browser Tester
DVR
行车记录仪


00:15
Settings
Suggestions
Set screen lock
Protect your device
Change wallpaper
Personalise your screen
Wireless & networks
Wi-Fi
Bluetooth
Disconnected
Ethernet
On
Data usage
0 B of data used
More
Device


00:17
Wi-Fi
On
Boardcon
ChinaNet-Mcfe
JZW609-2.4G
LYB-2.4G
Add network

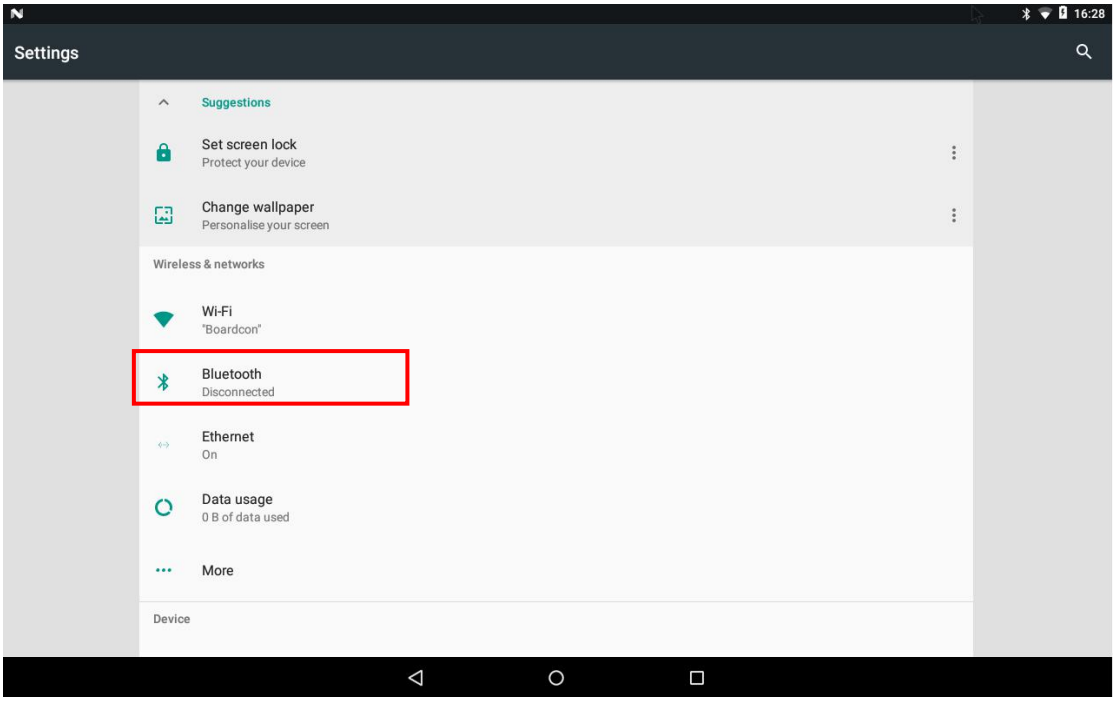


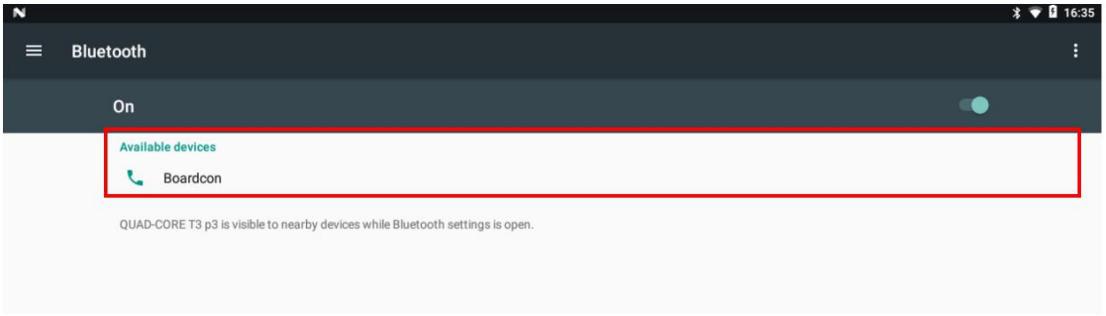


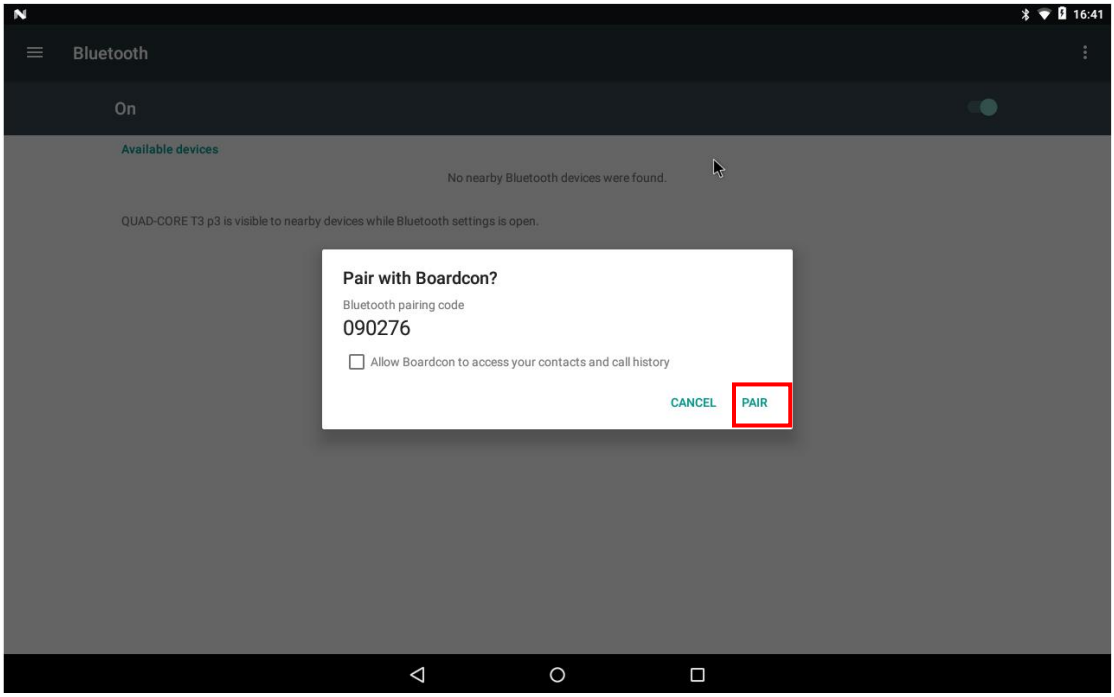
6.15 Bluetooth

Click **Settings -> Bluetooth -> turn on**

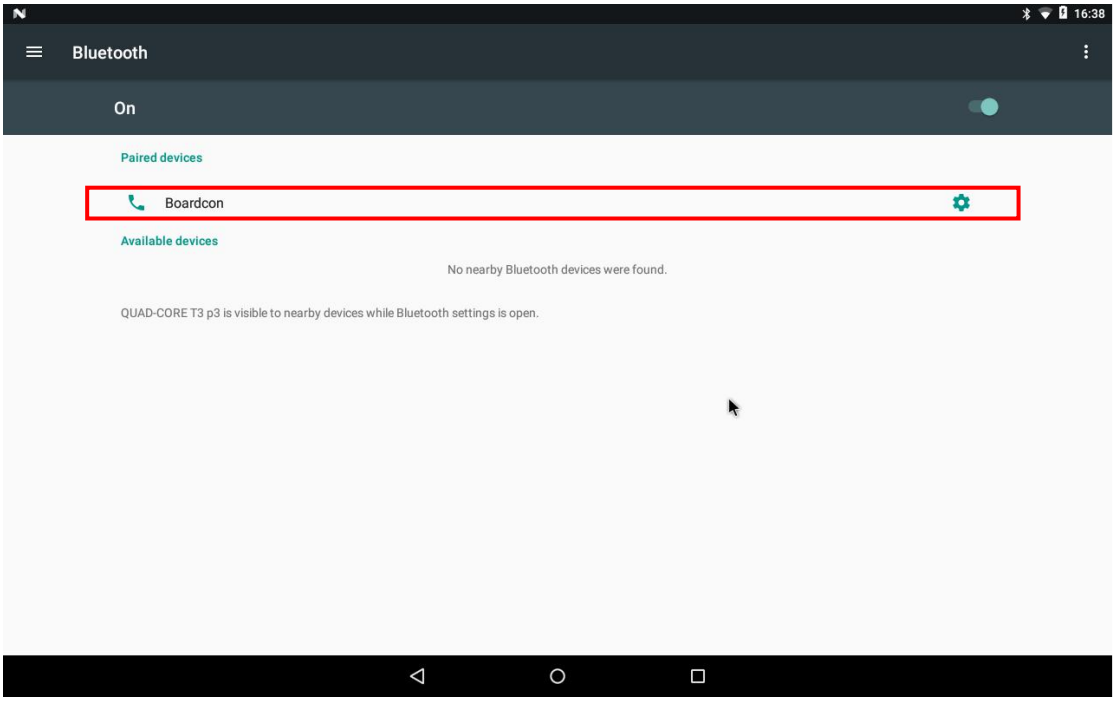
Select the available device in the list to pair.







After pairing, devices can connect with each other automatically



6.16 RS485

Connect RS485 ports of Board A and B with the test line.

For Board A, execute the follow commands to set RS485 as Receiver.

echo 49 > /sys/class/gpio/export

echo out > /sys/class/gpio/gpio49/direction

echo 1 > /sys/class/gpio/gpio49/value (Set high for receiving.)

com /dev/ttyS7 115200 8 0 1 (First use adb push “com” to path: /system/bin)

For Board B, execute the follow commands to set RS485 as Transmitter.

echo 49 > /sys/class/gpio/export

echo out > /sys/class/gpio/gpio49/direction

echo 0 > /sys/class/gpio/gpio49/value (Set low for sending.)

com /dev/ttyS7 115200 8 0 1

The Transmitter and receiver can be converted by execute the command

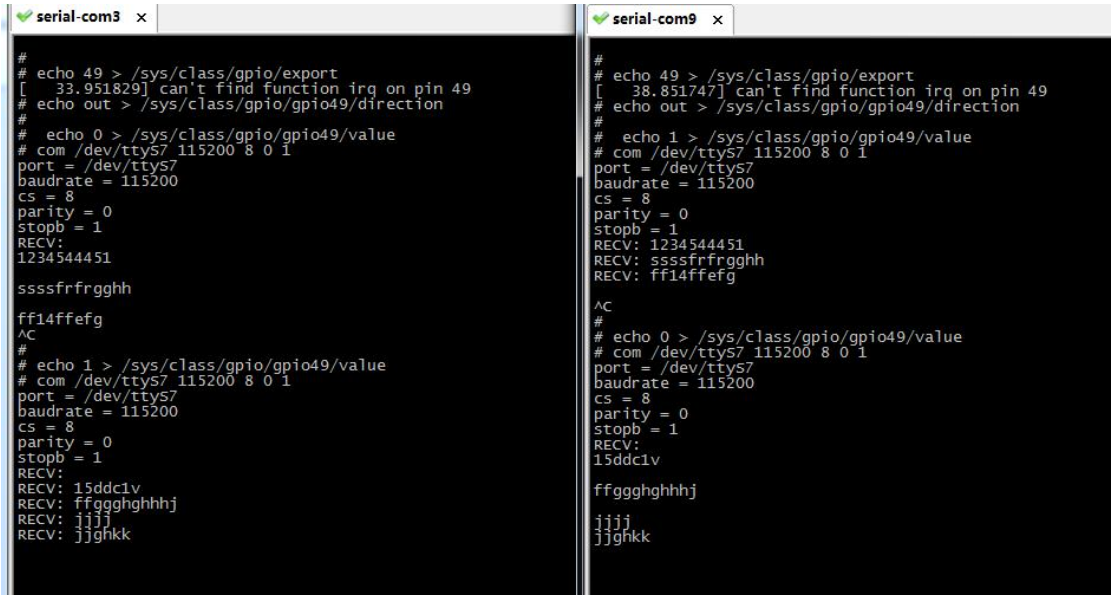
echo 1 > /sys/class/gpio/gpio49/value (Set high for receiving.)

com /dev/ttyS7 115200 8 0 1

or

echo 0 > /sys/class/gpio/gpio49/value (Set low for sending.)

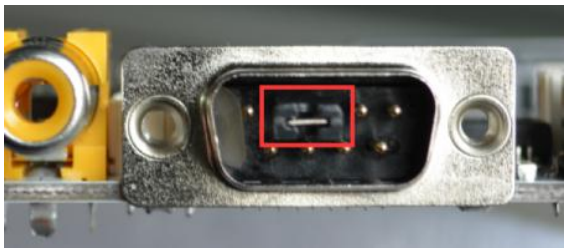
com /dev/ttyS7 115200 8 0 1



Note: If there is only one development board, user can connect the device and computer with RS485-to-USB cable for testing.

6.17 UART (COM2/RS232)

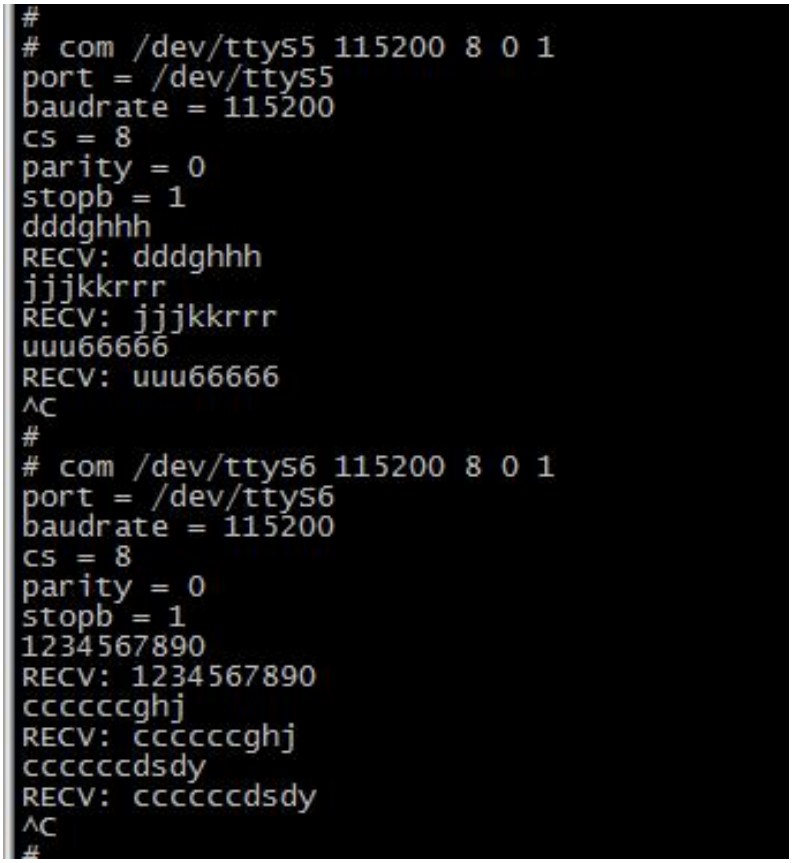
Connect RX and TX of **COM2(DB9),** and the **RS232(J11)** is similar. Then execute the commands to perform a loopback test.



com /dev/ttyS5 115200 8 0 1 （**COM2**: RS232_RX5/TX5）

com /dev/ttyS6 115200 8 0 1 （**J11**: RS232_RX6/TX6）

Type any character and the echoed characters can be displayed on the screen.



Note: UART4 is multiplexed with GPS, and UART7 is multiplexed with RS485