SBC4100_NSD41xx_EC41xx

Quick Start Guide

Release Notes

Version	Release Date	Notes
1.0	Jan 2024	Initial release

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1. Precautions

1.1 Safety Precautions

- In order to use this product safely, please take special note of the following precautions.
- Read all product manuals and related documentation before using this product. Use this product correctly and safely. Follow all warnings.
- If operating or extending this product in a manner not described in this manual, please do so at your own risk. Be sure to fully read this manual and other technical information on our website and proceed safely and responsibly.
- Do not install this product in a place with a lot of water, moisture, dust or soot. This could cause product failure, fire, or an electric shock.
- Some parts of this product generate heat and can reach high temperatures. This may cause burns if it is improperly handled. Do not touch the electronic components or surrounding area while powered on or immediately after being turned off.
- Carry out any design and development only after you have thoroughly read and understood this manual and any other related technical materials on the website or in the data sheets. Test your product thoroughly for reliability and safety.
- This product is not intended for applications that require extremely high reliability, safety, functionality and accuracy: including but not limited to medical equipment, traffic control systems, combustion control systems, and safety equipment. This company is not liable for death or injury if used in such systems.
- This product uses semiconductor components designed for generic electronics equipment such as office automation, communications, measurement equipment and machine tools. Foreign noise or a power surge may cause this product to malfunction or fail.
- To ensure there is no risk of bodily harm or property damage, be sure to take all electrical safety precautions such as protection circuits, limit switches, fuse breakers, or redundant systems. Only use the device after sufficient reliability and safety measures are in place.

1.2 Write Prohibited Regions

Data stored by the EEPROM/NOR is used by the software contained in this product. Do not write to these regions as this may cause the product stop working correctly. Purposely writing to these regions voids the product warranty.

1.3 Warrnty

As described in the Product Warranty Policy provided with this product, the product is covered by a one-year warranty starting from the time of purchase. Please note that the other included goods and software are not covered under this warranty. Some knowledge used in this product is provided by third parties, and we make no representation or warranty as to the accuracy of such information.

1.4 FCC Warning

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC RF exposure statement:
The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance between 20cm the radiator your body.

2. Overview

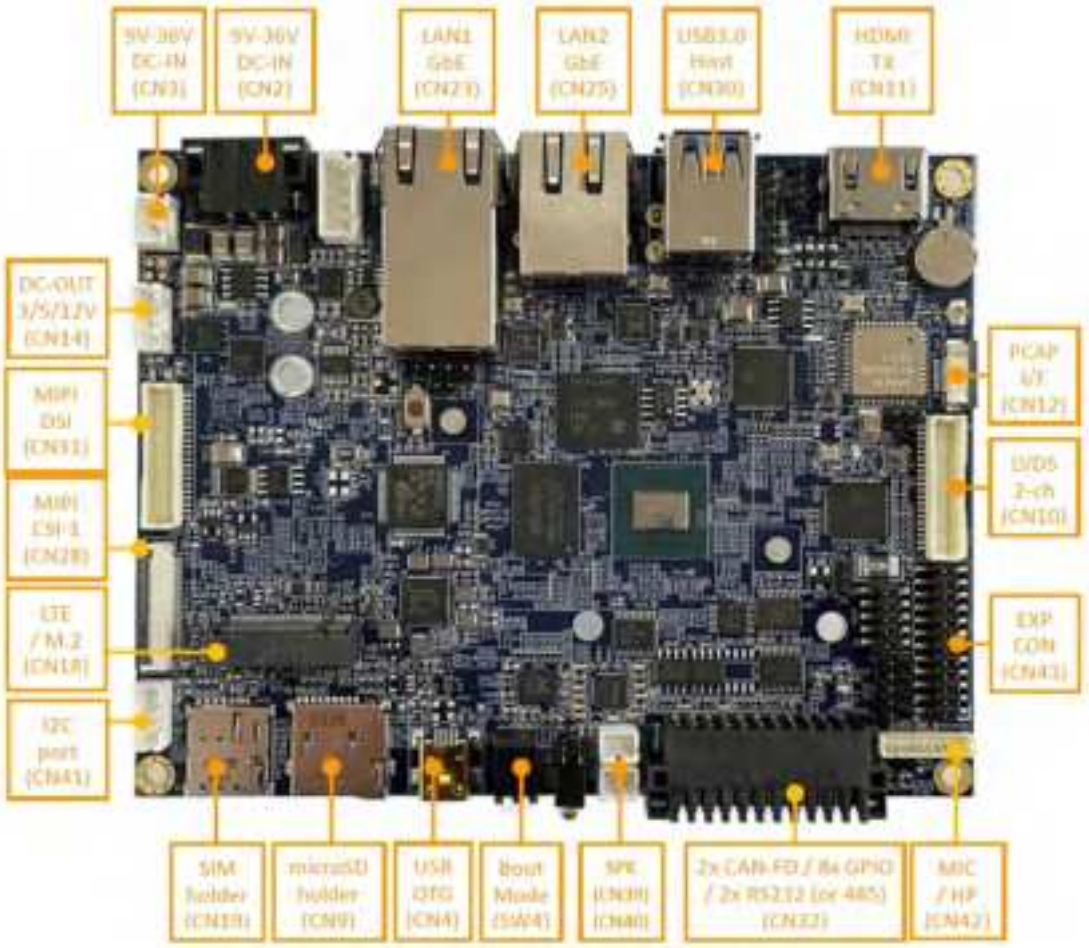
2.1 Overview

The SBC4100 is a compact size (100mmx130mm) single board computer designed for applications such as digital signage, HMI, POS, Gaming, Set top box, KIOSK and other smart devices. The SBC4100 features a quad-core ARM Cortex-A53 processor (NXP i.MX8M plus), 2x 10/100 LAN ports and PoE (Power over Ethernet) for a wide range of commercial and industrial applications.

Each SBC4100 can be installed in advance with Linux or Android for immediate evaluation.

2.2 Interface Specifications

The following photos and diagrams show brief connector positions on the SBC4100 product. See subsequent sections for more detailed connectors and functions descriptions.



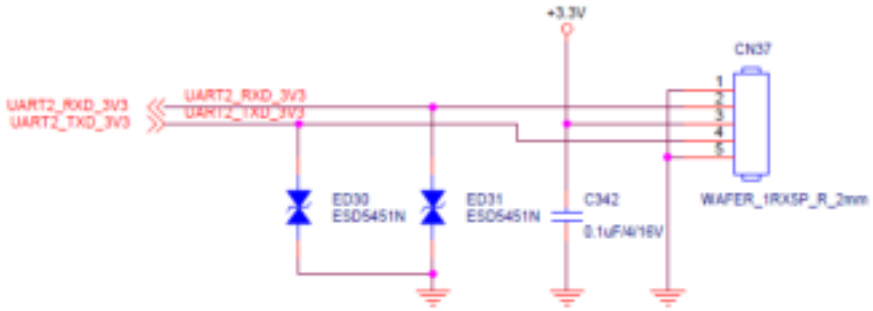
3. Setup

3.1 Console / Debug Port

The console port (or debug port) is located behind a small plate on SBC4100_NSD4100 front panel (CN15 on PCBA).
NOTE: CN15 is dedicated for use as console/debug port. It CANNOT be used for RS232 application. The Linux device name of console/debug port is /dev/ttymxc1.

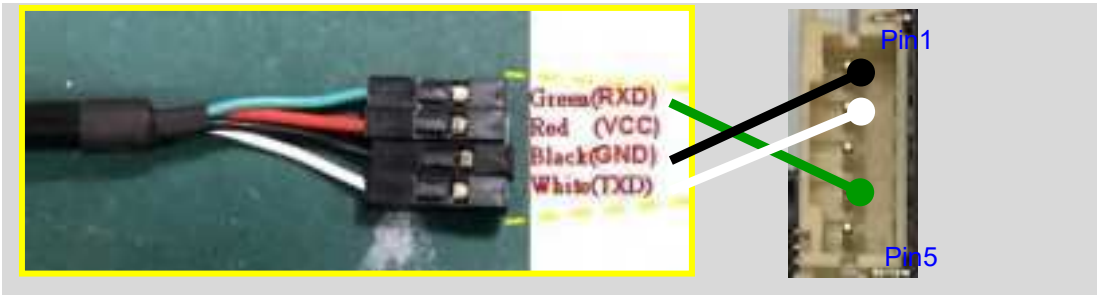
Follow steps below to setup console port:

- Show as below locate the Debug connector.



- Make sure you have purchased a debug cable.

- Connect cable to debug/console connector.



Warning: Do NOT connect Red terminal (VCC) to Debug connector

Debug Cable		VPC450 Debug/Console connector
White (TXD)	→	pin 2 (RXD)
Green (RXD)	→	pin 4 (TXD)
Black (GND)	→	Pin 1 (GND) or pin 5 (GND)

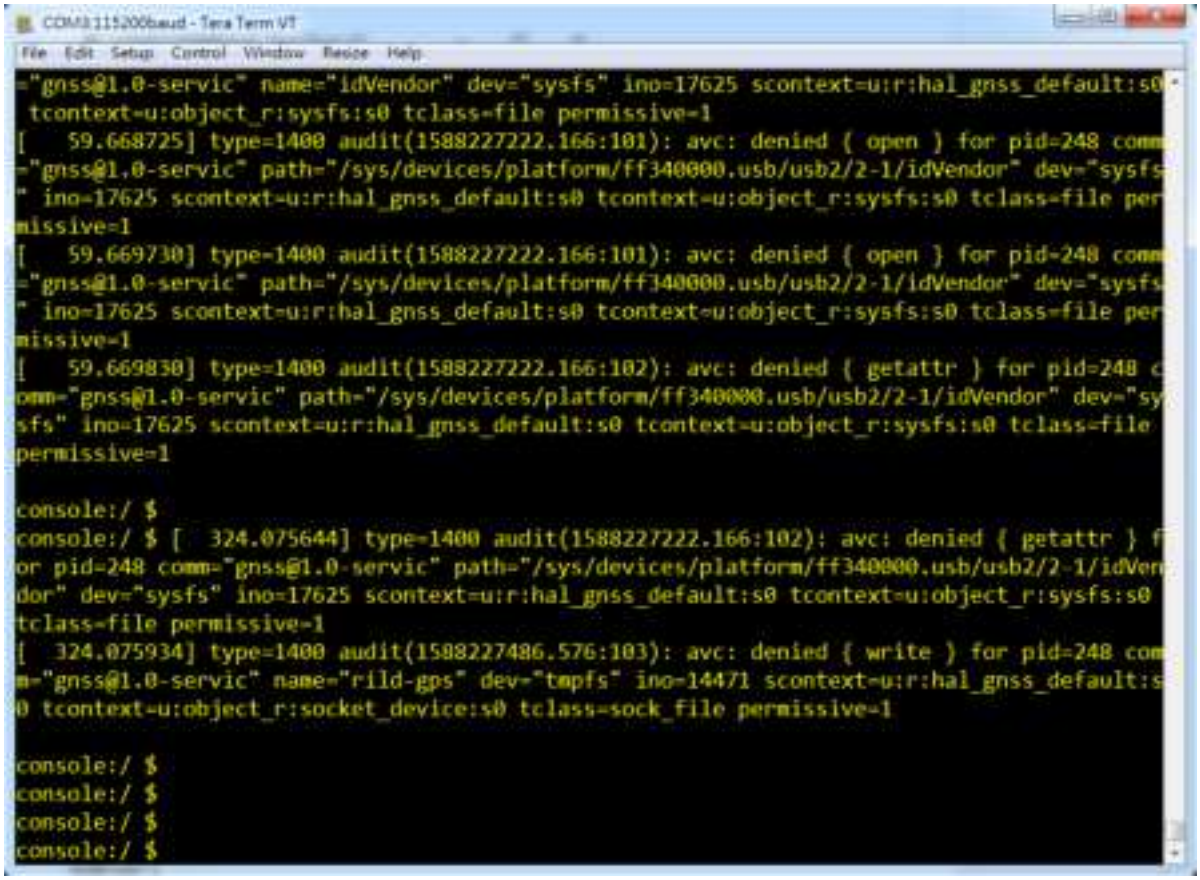
- Connect USB type A connector to PC host port

- The USB UART cable is based on Silicon Lab CP210X chip. You may need to download driver if your Windows PC does not support it. Driver download link is: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

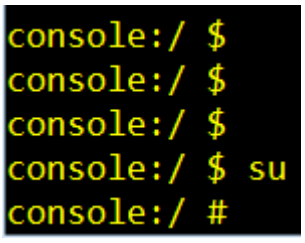
- Run terminal emulation program (e.g. ***TeraTerm***), and open TeraTerm COM port.

- Set TeraTerm COM port at **Baud Rate 115200, 8 data bits, no parity, 1 stop bit and no flow control**.

- After the above connection/setting, you will see Linux console prompt "$" in the PC TeraTerm.



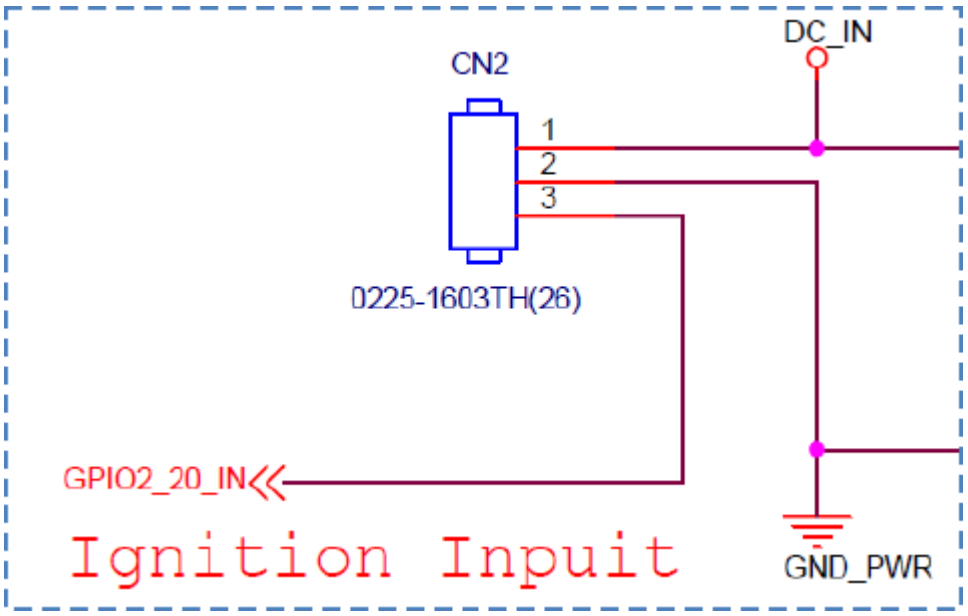
At this point, the device has entered debug mode. Type "su" into the console to enter root mode.



A "#" indicates the system is now in root mode.

3.2 Start Running

9V-36V DC input (3-pin terminal block). Note: Tie pin1 and pin3 together if you do not connect pin3 to “ignition” input. Schematic:



4. Running Software

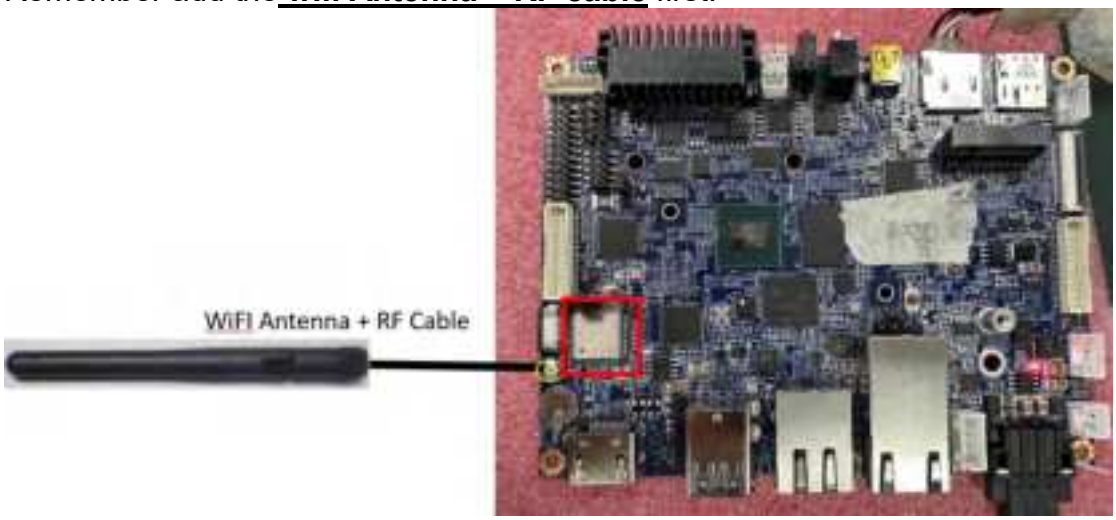
4.1 Yocto

4.1.1 HDMI out (CN11)

At present, you can plug in the HDMI first, and the HDMI minitor will be display after power on.

4.1.2 WiFi/BT test (optional)

The actual location of the WiFi/BT module:
Remember add the **wlfi Antenna + RF cable** first.

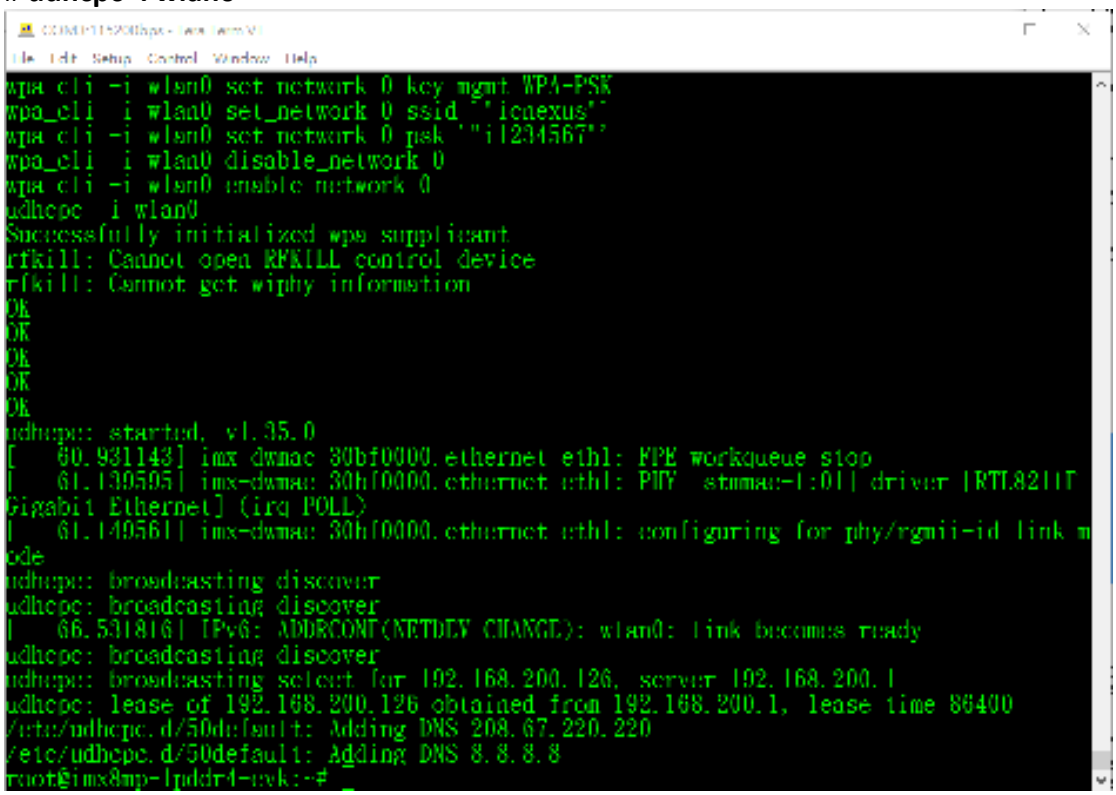


The WiFi test the type commanad:
ifconfig wlan0 up
iw dev wlan0 scan| grep 'SSID\|freq\|signal\|capability'
// Search for nearby WiFi ssid devices

```
root@imx8mp lpddr4 evk:~# ifconfig wlan0 up
iw dev wlan0 scan| grep 'SSID\|freq\|signal\|capability'root@imx8mp-lpddr4-evk:~# iw
 dev wlan0 scan| grep 'SSID\|freq\|signal\|capability'
    41.123955] kauditd printk skb: 12 callbacks suppressed
    41.123965] audit: type 1334 audit(1706601551.994:16): prog-id=0 op=UNLOAD
    41.136200] audit: type=1334 audit(1706601551.994:17): prog-id=0 op=UNLOAD
        freq: 2412
        capability: ESS Privacy ShortSlotTime (0x0411)
        signal:  -55.00 dBm
        SSID: icncxus
        freq: 2412
        capability: ESS Privacy ShortPreamble ShortSlotTime RadioMeasure (0x1431)
        signal:  -80.00 dBm
        SSID: redmi
                * center freq segment 1: 0
                * center freq segment 2: 0
        freq: 2432
        capability: ESS Privacy ShortSlotTime APSD (0x0c11)
        signal:  -44.00 dBm
        SSID: Xiaomi_4125
        freq: 2432
        capability: ESS ShortPreamble ShortSlotTime (0x0421)
        signal:  -74.00 dBm
        SSID: CMCC Wi-Fi(HiNet)
        freq: 2437
        capability: ESS Privacy SpectrumMgmt ShortSlotTime RadioMeasure (0x1511)
```

Actually connect to internet by WiFi test command:

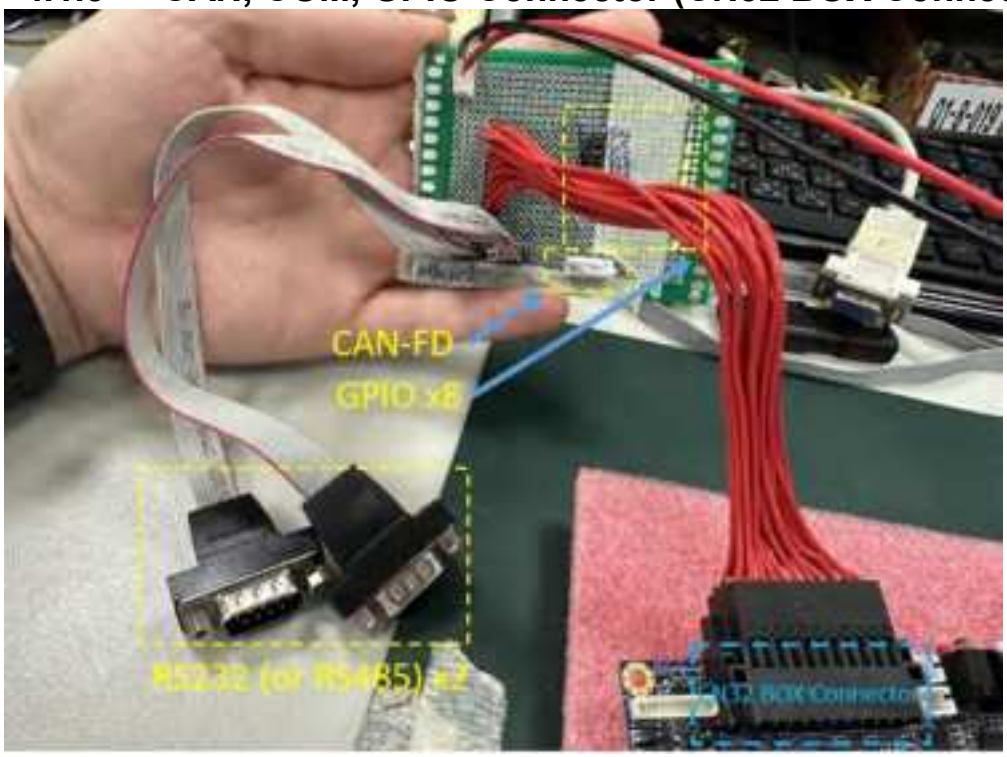
 # wpa_supplicant -Dnl80211 -iwlan0 -c/etc/wpa_supplicant.conf -B
 # ifconfig wlan0 up
 # wpa_cli -i wlan0 set_network 0 key_mgmt WPA-PSK
 # wpa_cli -i wlan0 set_network 0 ssid '"icnexus"'
 # wpa_cli -i wlan0 set_network 0 psk '"i1234567"'
 # wpa_cli -i wlan0 disable_network 0
 # wpa_cli -i wlan0 enable_network 0
 # udhcpc -i wlan0



The BT test the type commanad:

 # /usr/bin/hciattach /dev/ttymxc0 bcm43xx 3000000 flow -t 20
 # hciconfig hci0 up
 # hcitool scan

4.1.3 CAN, COM, GPIO Connector (CN32 BOX Connector)



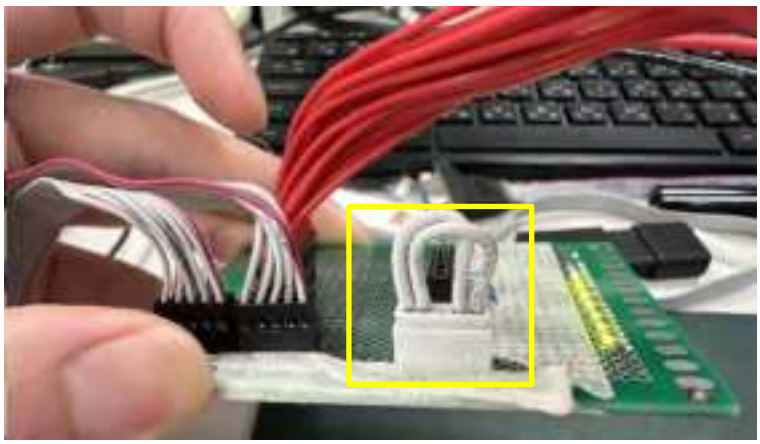
- CAN bus test

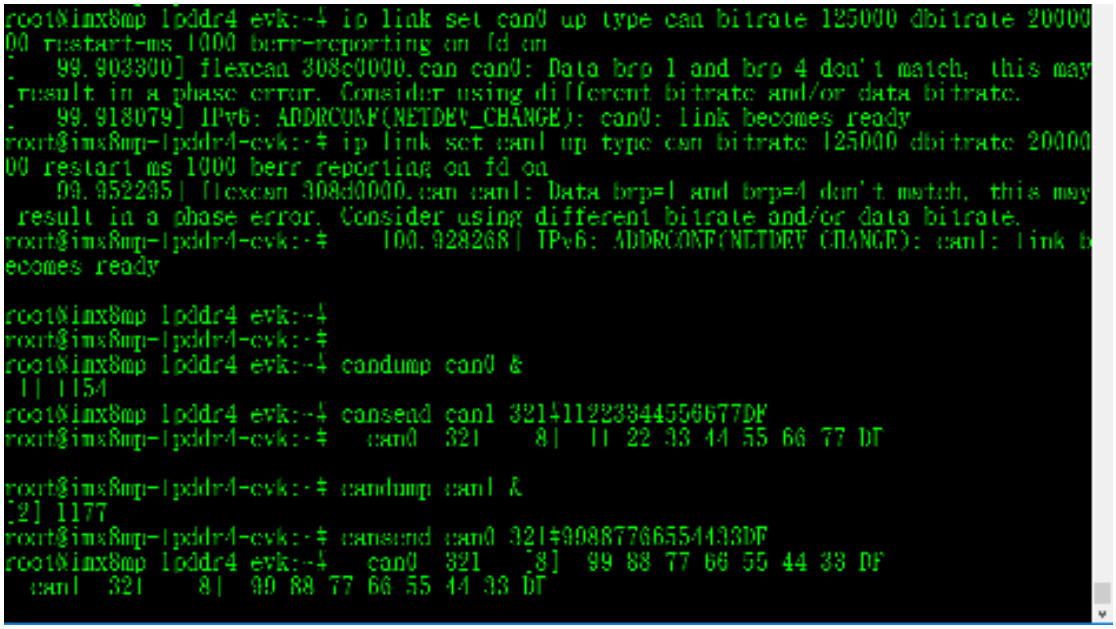
The can bus short circuit togeter, type command:

 # ip link set can0 up type can bitrate 125000 dbitrate 2000000 restart-ms 1000 berr-reporting on fd on
 # ip link set can1 up type can bitrate 125000 dbitrate 2000000 restart-ms 1000 berr-reporting on fd on

###CAN 0
candump can0 &
cansend can1 321#11223344556677DF

###CAN 1
candump can1 &
cansend can0 321#99887766554433DF





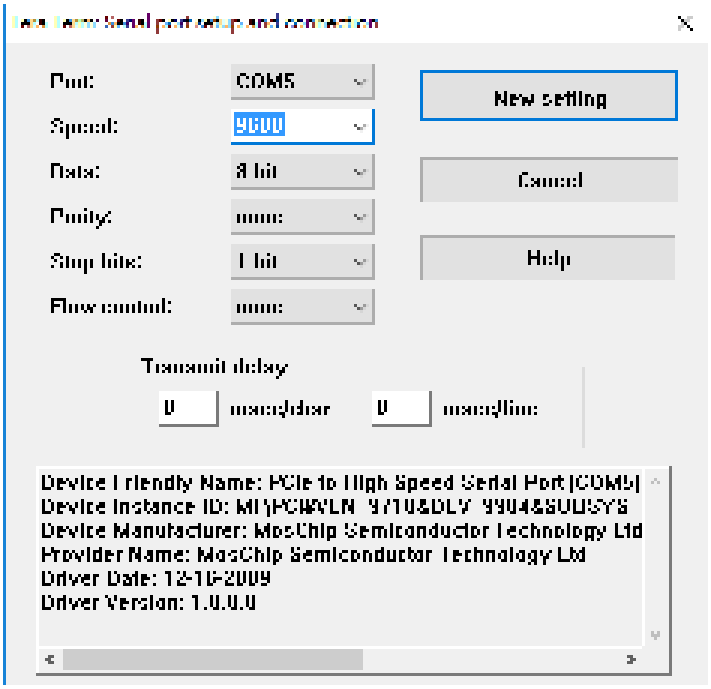
- RS232 (or RS485) test

COM3: /dev/ttymxc2
COM4: /dev/ttymxc3

1. Connect to RS232 port and run the two hyper terminal on PC (such as TeraTerm).
   One open COM5 for RS232
   One open COM3 for debug port

When you open the RS232 Terminal window, you have to do some serial port setup (see below pic).

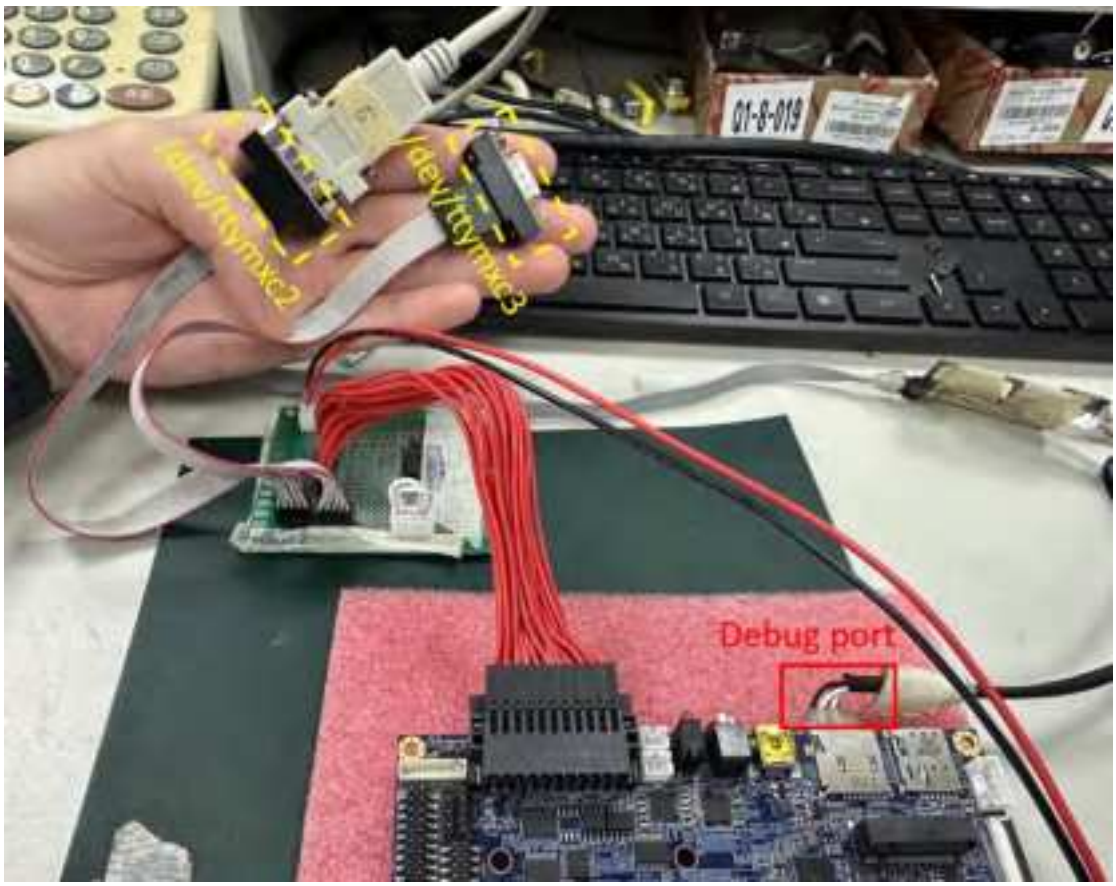
(1) Port : Select the COM which your device connected.
(2) Baud rate : 9600
(3) Date : 8 bit

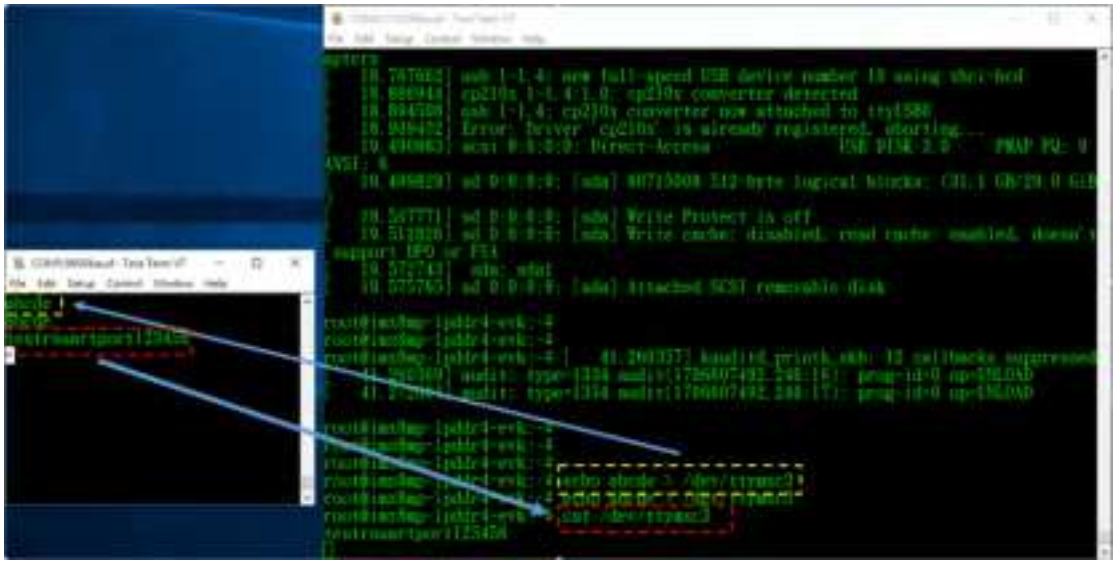


2. execute following commands in console window:
   # **echo abcde > /dev/ttymxc2**
   # **cat /dev/ttymxc2**

   Receiving:
   Type any number or sentence in terminal window (COM5) on your PC desktop and you should see the same output appears in the console window (CON3).
   # **cat /dev/ttymxc2**

   Sending:
   Type any number or sentence in the console window(CON3) and you should see the same output appears in terminal window (CON5).
   # **echo abcde > /dev/ttymxc2**





After the test is complete, Ctrl + C jumps out of the background,
Other RS232 ports are also tested in the same way, change COM5 to other RS232 ports (ttymxc3)

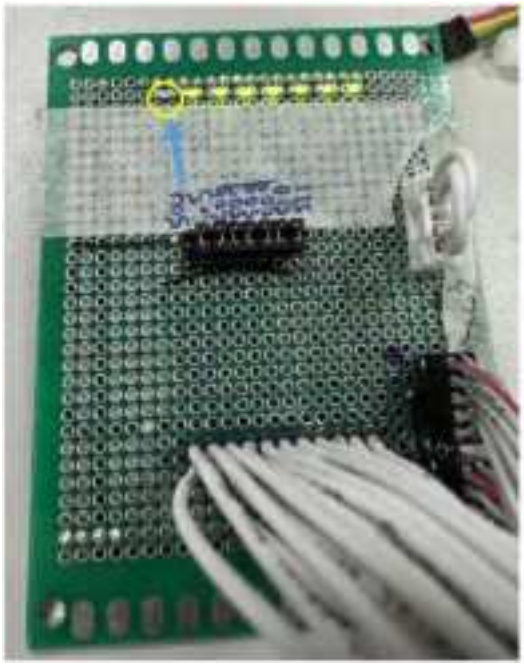
- GPIO test

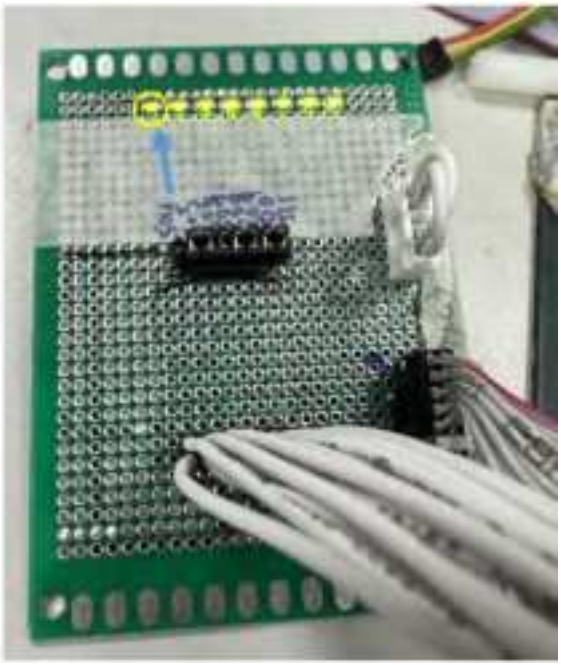
Paste the following commands into the console window and press Enter

GPIO504 ~ GPIO511

For example, **GPO504** (to test other GPO# please replace the red numbers by yourself)， you can using a LED test board to control LED light on-off .

cd /sys/class/gpio/
echo 504 > export
cd gpio504
echo out > direction
echo 1 > value ← LED OFF
echo 0 > value ← LED ON

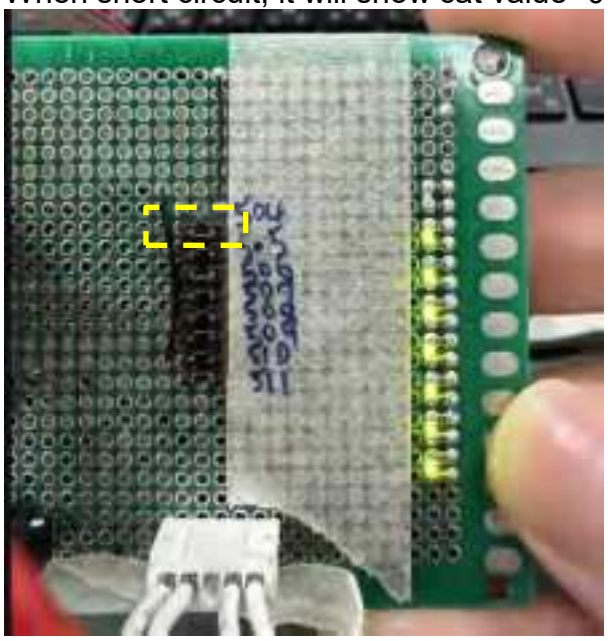




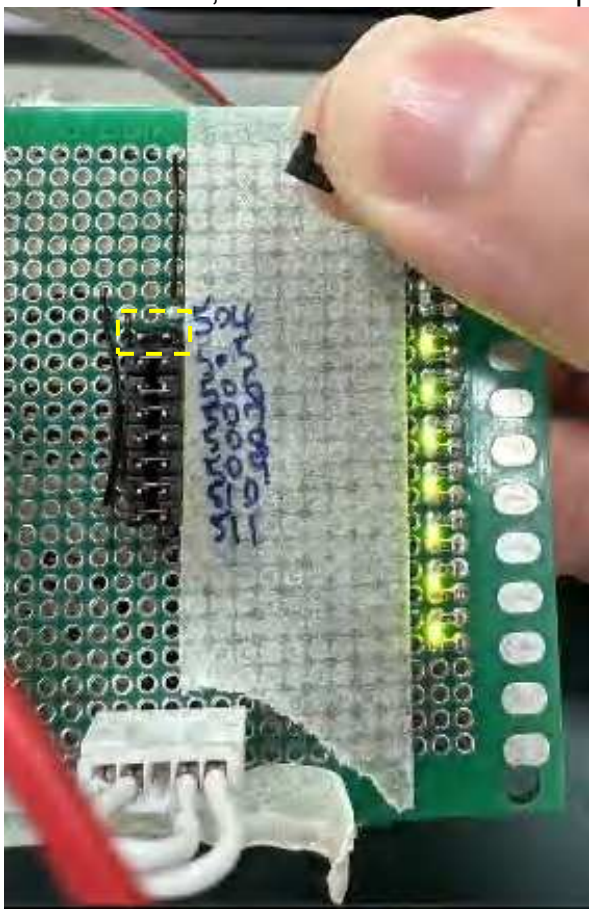
For example, **GPI504** (to test other GPI # please replace the red numbers by yourself)

cd /sys/class/gpio/
echo 504 > export
cd gpio504
cat value

When short circuit, it will show cat value “0” pull-down



When take out, it will show cat value “1” pull-up



```
root@imx8mp-lpddr4-evk:~# cd /sys/class/gpio/
root@imx8mp-lpddr4-evk:/sys/class/gpio# echo 504 > export
root@imx8mp-lpddr4-evk:/sys/class/gpio# cd gpio504
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
0
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
1
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
0
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
1
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504#
```

4.1.4 CN26 GPIO Pin Header

Paste the following commands into the console window and press Enter

GPIO496 ~ GPIO503

For example, **GPO496** (to test other GPO# please replace the red numbers by yourself)， you can using a LED test board to control LED light on-off .

cd /sys/class/gpio/
echo 496 > export
cd gpio496
echo out > direction
echo 1 > value ← LED OFF
echo 0 > value ← LED ON

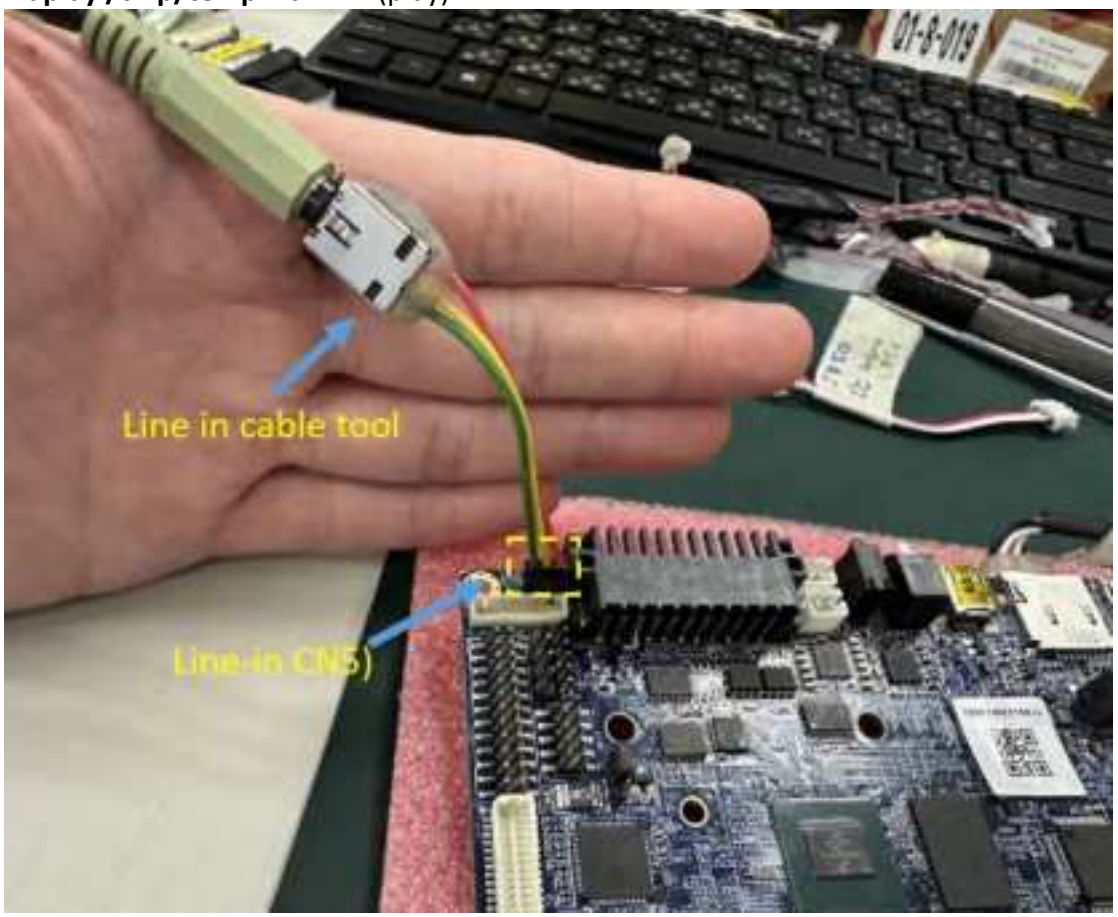
4.1.5 The Line in to recording test

The default is Line in on

PC can play a MP3 music for recording, the Line in cable need to be equipped with audio jig wire, recording test type command:

arecord -f dat /tmp/temp.wav (recording)

aplay /tmp/temp.wav (play)



4.1.6 Speaker test

Paste the following commands into the console window and press Enter

gst-launch-1.0 playbin uri=file:///home/root/xxxx.mp3

// **xxxx** fill in the MP3 file you want to play

4.1.7 Headphone/MIC Pin Header test (CN42)

The audio cable need to be equipped with audio jig wire.

- Headphone

Paste the following commands into the console window and press Enter

 # gst-launch-1.0 playbin uri=file:///home/root/xxxx.mp3

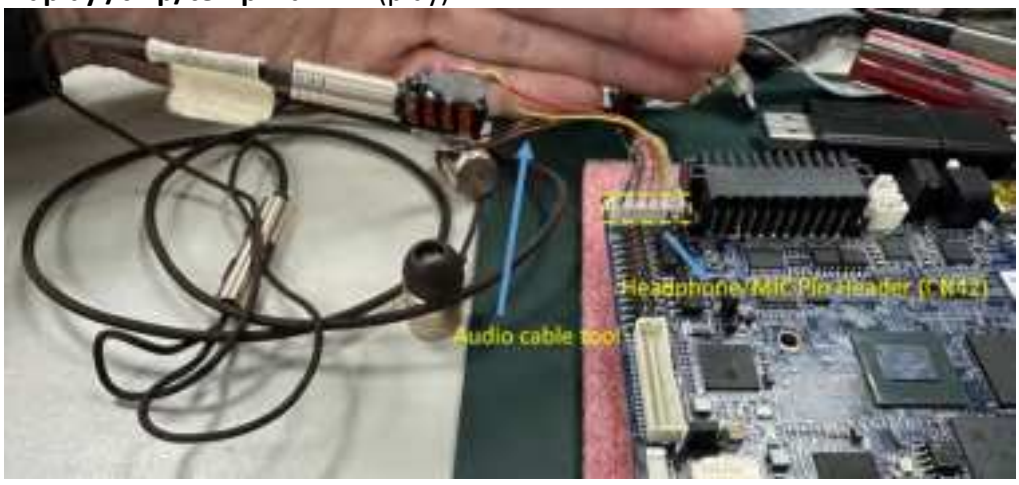
// **xxxx** fill in the MP3 file you want to play

- MIC in

PC can play a MP3 music for recording, recording test type command:

 # arecord -f dat /tmp/temp.wav (recording)

 # aplay /tmp/temp.wav (play)



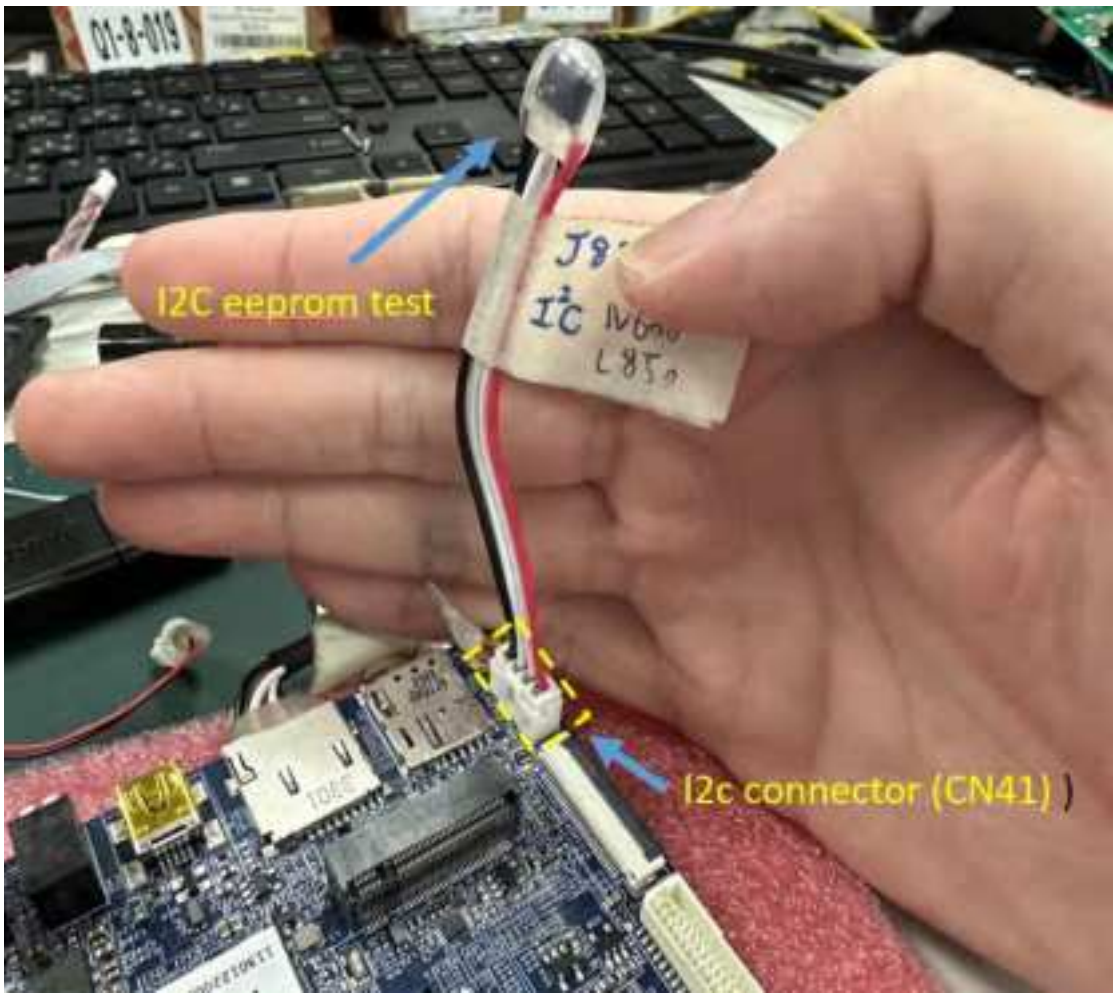
4.1.8 i2c(CN41) Test

Paste the following commands into the console window and press Enter，you can using a i2c eeprom test jig wire to detect .

i2cdetect -y -a 4

it will show 50 nodes

```
root@imx8mp-lpddr4-evk:~# i2cdetect -y -a 2
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00: 00 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- 18 -- -- -- -- -- -- --
20: UU UU -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: 50 51 -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- UU -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
```



4.1.10 The LAN1 & LAN2(optional) test

A. LAN1(CN23) eth0, ok
ping 8.8.8.8

B. LAN2(CN25) eth1, ok
ping 8.8.8.8

4.1.11 SPI test(CN25)

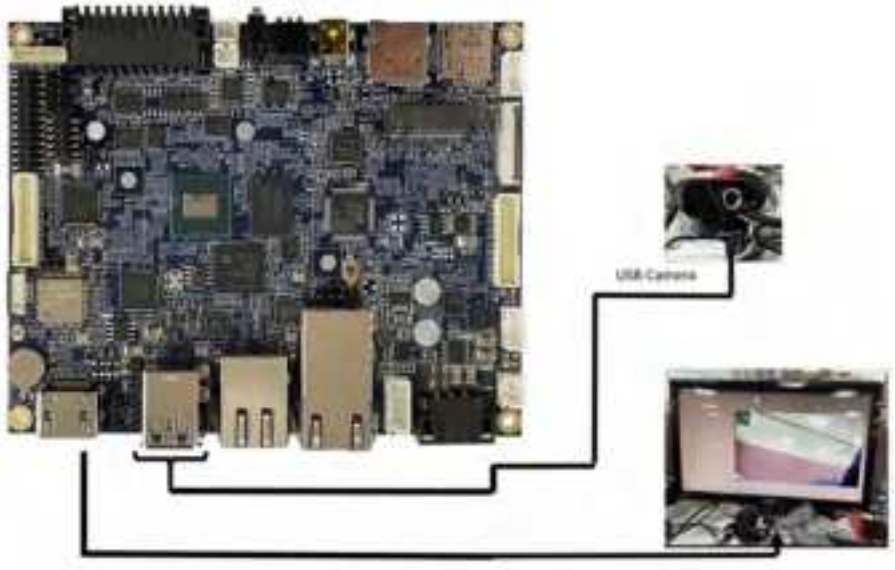
Paste the following commands into the console window and press Enter，
You can using a W25QXX SPI Flash to detect

Copy demo test program (spi-test)
chmod +x spi-test
./spi-test /dev/spidev1.0
//will show response(7): ef 40 18 00 00 00

```
root@imx8mp-lpddr4-evk:~# ./spi-test /dev/spidev1.0
response(7): ef 40 18 00 00 00
```

4.1.12 USB Camera test

Test schematic:



USB camera, command
(PS: , plug in the USB camera theory is /dev/video3 , you need to ls **/dev/video*** to confirm):

gst-launch-1.0 v4l2src device=/dev/video3 ! autovideosink

Actual result: will show present the display of USB camera:

```
root@imx8mp-lpddr4-evk:~# gst-launch-1.0 v4l2src device=/dev/video4 ! autovideosi
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
0:00:32.7 / 99:99:99.
```

4.1.13 MIPI CSI FPC Connector (CN28/CN29) test

First, you need an the ov5640 camera module, then type command:
(PS: plug in the MIPI camera theory is /dev/video3 & /dev/video4 , you need to ls **/dev/video*** to confirm):

The CN29 should be the first camera for **/dev/video3**
The CN28 it should be the second camera as **/dev/video4**

 # gst-launch-1.0 -v v4l2src device=/dev/video4 ! capsfilter caps="video/x-raw, width=640, height=480, framerate=30/1" ! queue ! autovideosink

 # gst-launch-1.0 -v v4l2src device=/dev/video3 ! capsfilter caps="video/x-raw, width=1920, height=1080, framerate=30/1" ! queue ! autovideosink

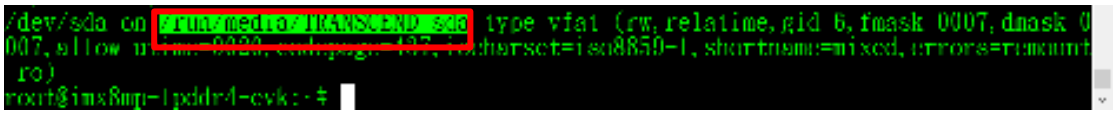
Actual result: will show present the display of MIPI camera:

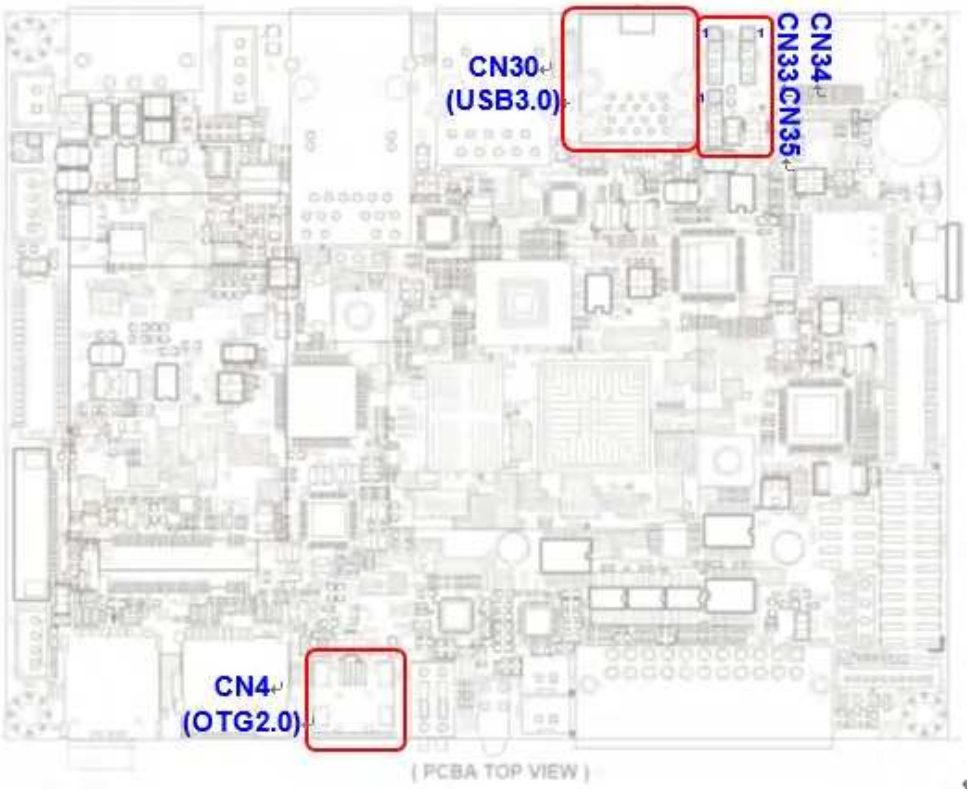
4.1.14 USB & SD Card test

###USB
USB 2.0 pin header Connector(CN33/CN34/CN35) (optional)
USB 3.0 Dual Connector (CN30)

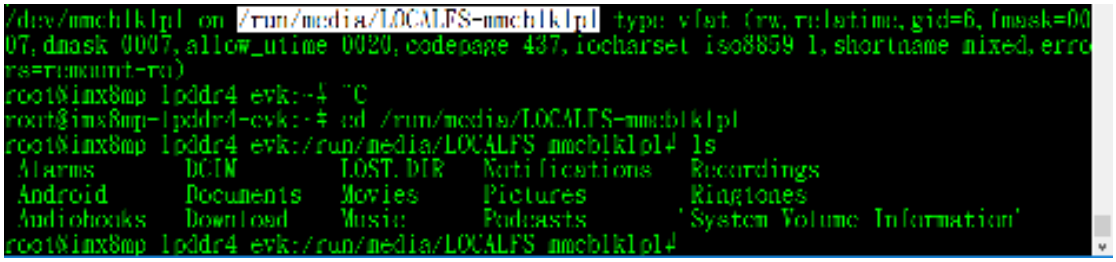
mout
//you will found the name of USB disk: /run/media/xxxxxxxx-sda
ex:
cd /run/media/TRANSCEND-sda
ls

Fill in the name of the USB flash drive currently plugged in in red, which is located in the blue box below:

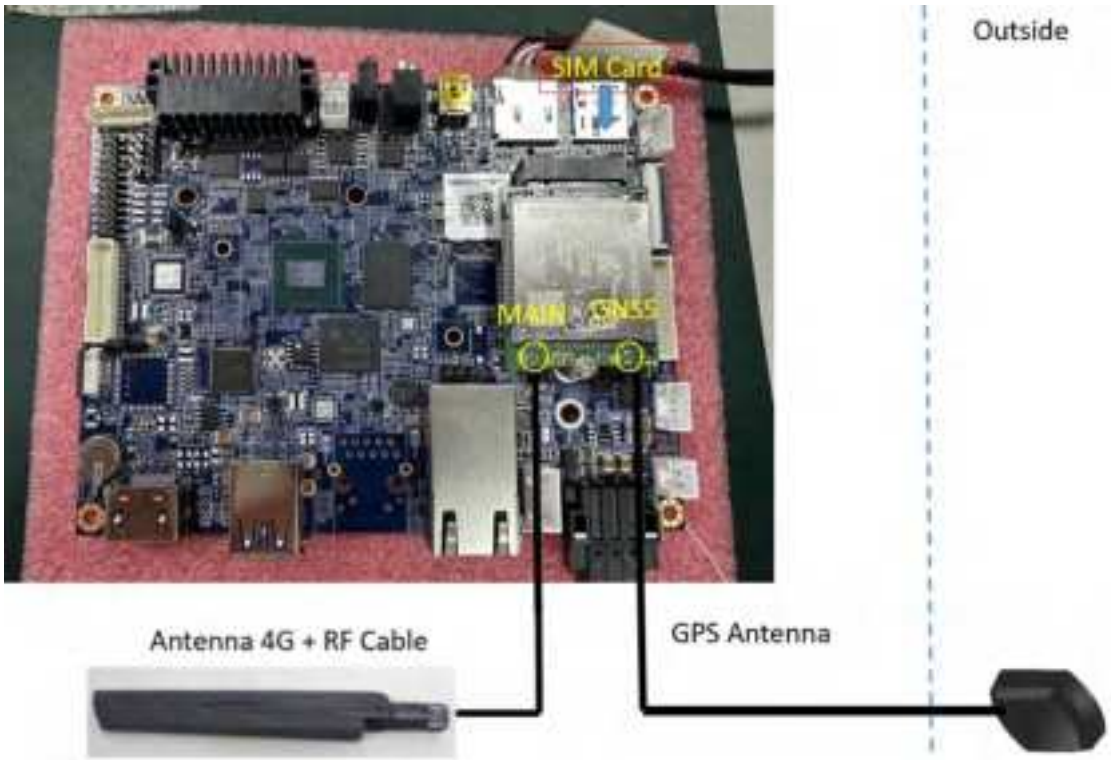




SD Card
###Micro SD Connector(CN9)
mout
cd /run/media/LOCALFS-mmcblk1p1
ls
//Fill in the name of the currently inserted SD card in red letters, located in the yellow box below:



4.1.15 4G LTE/GPS module test



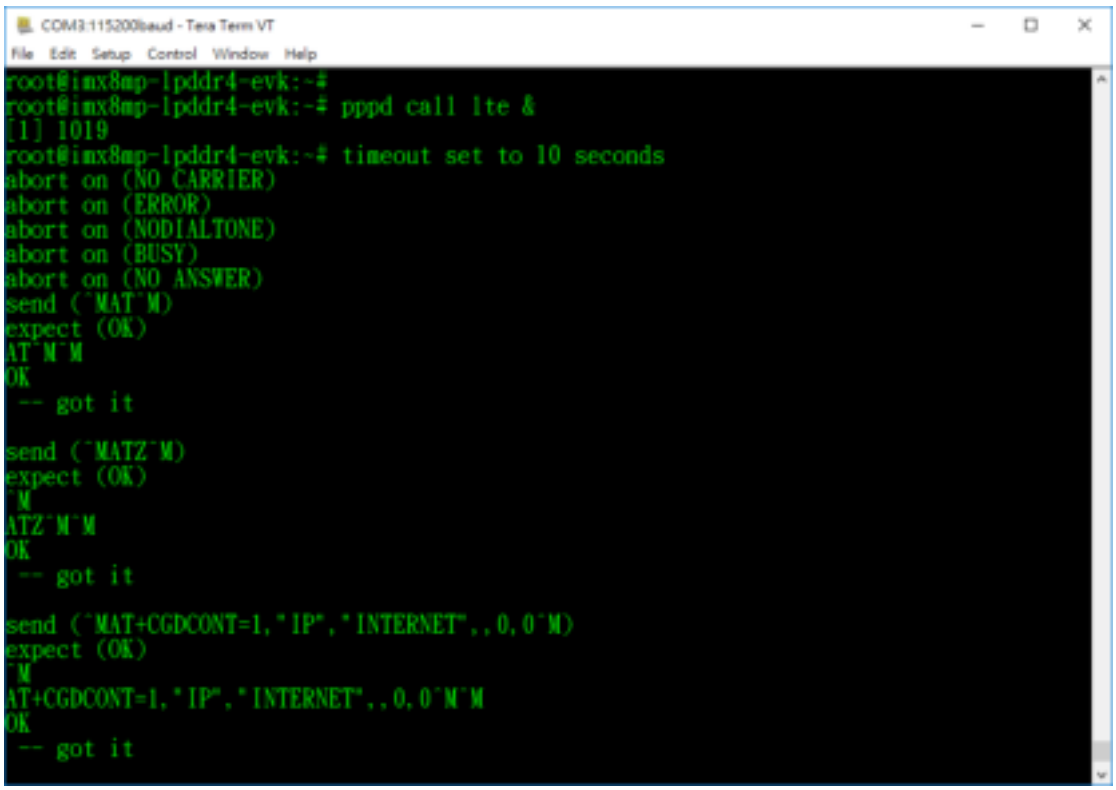
4G LTE test

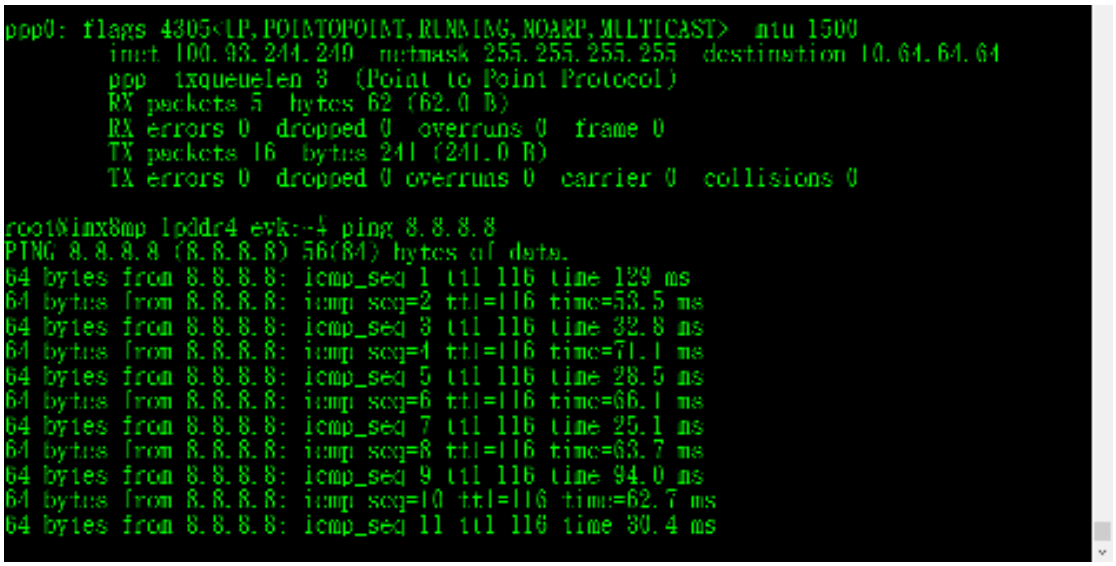
Insert SIM Card, and after waiting for boot, dial the command at the Console port:

pppd call lte &

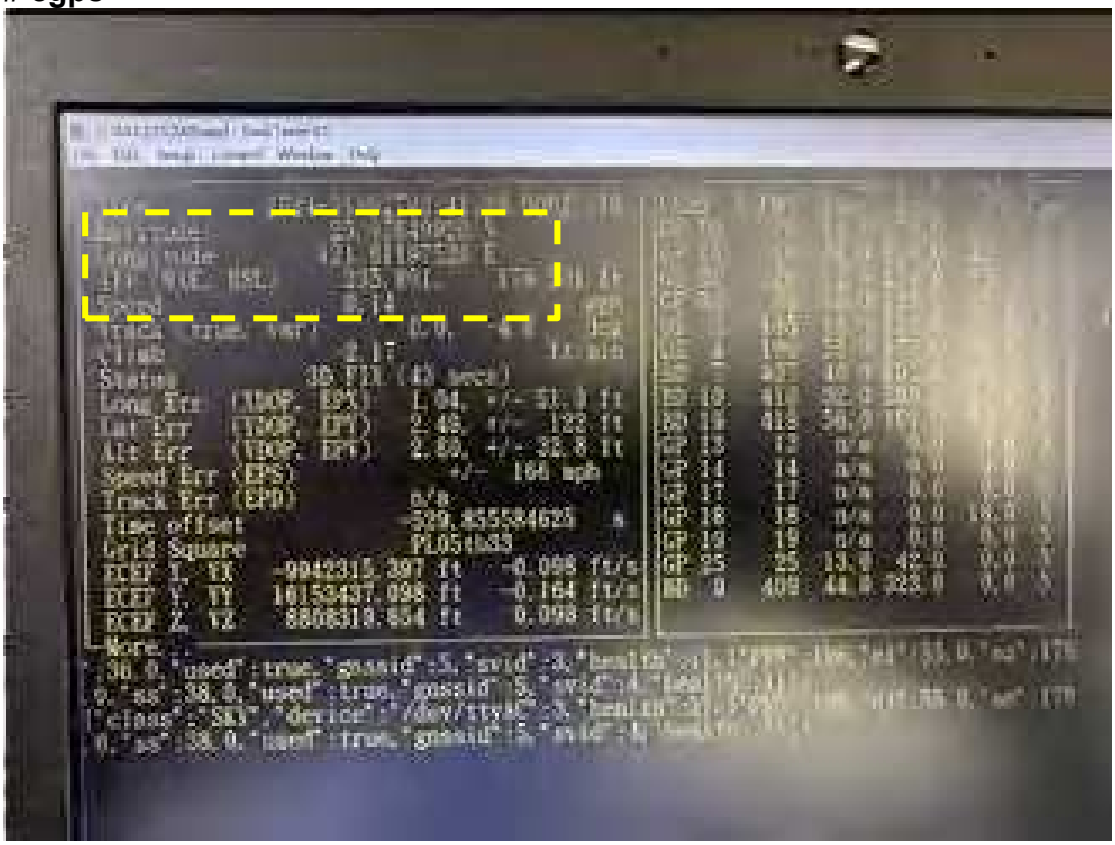
//ifconfig will show ppp0

ping 8.8.8.8



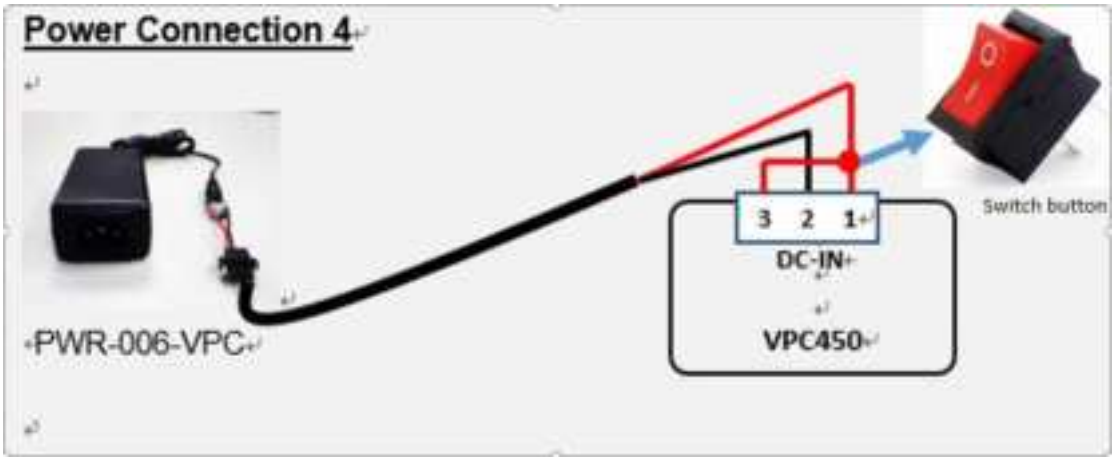


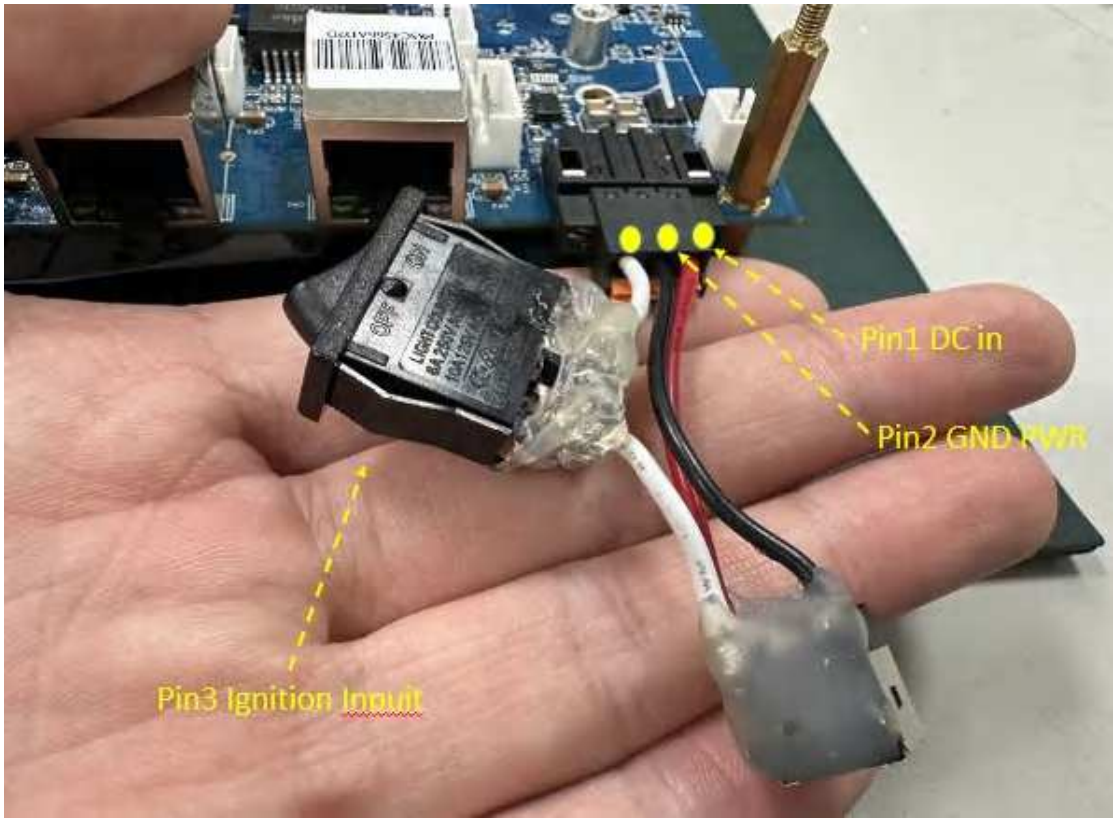
GPS test
Type command:
cgps



4.1.16 MCU-controlled Power ON/OFF Demo Test

Schematic





The MCU will always detect an ignition signal as long as DC adapter is on can be turned on SBC4100_NSD4100.
And if disconnect ignition signal can be turned off SBC4100_NSD4100.

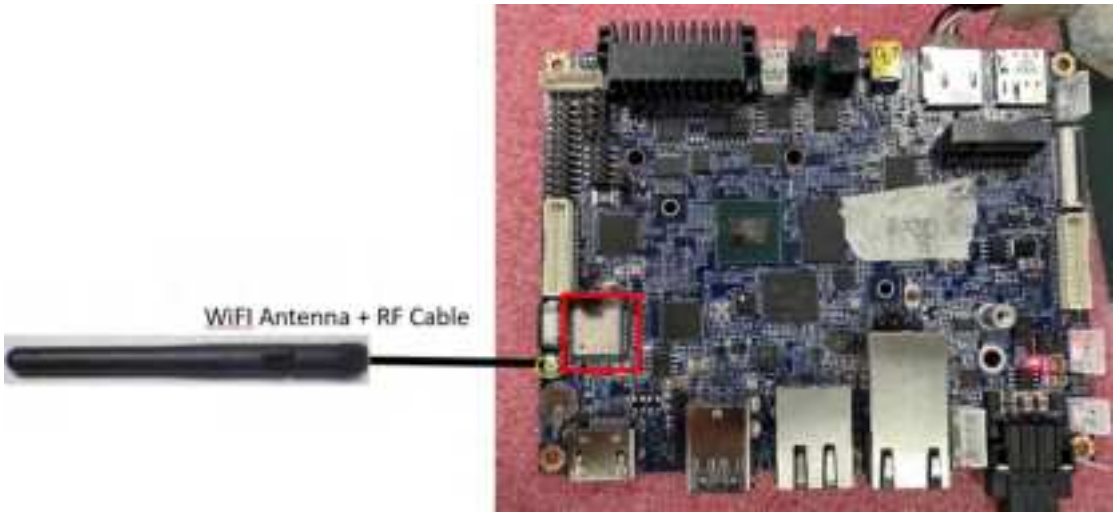
4.2 Android

4.2.1 HDMI out (CN11)

At present, you can plug in the HDMI first, and the HDMI minitor will be display after power on.

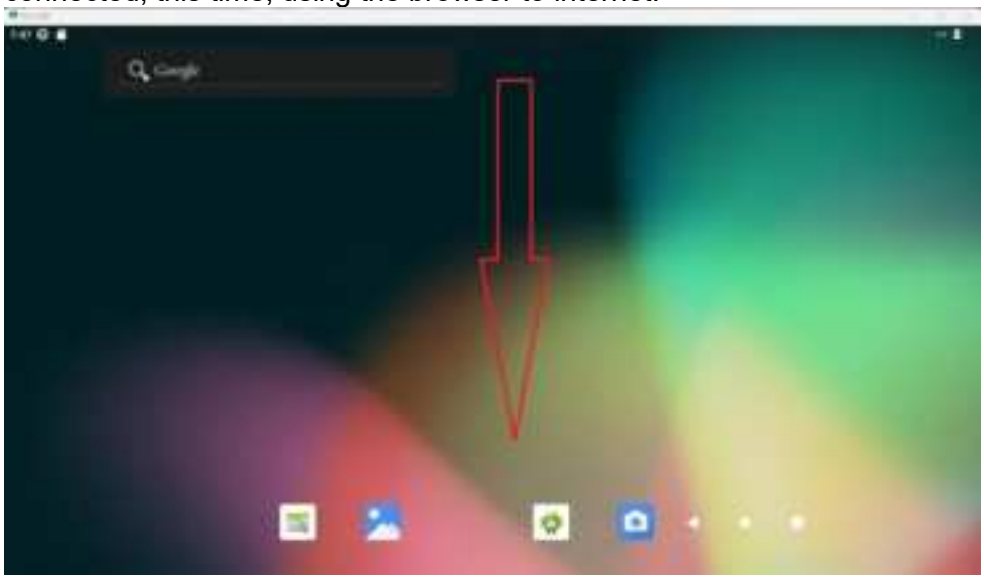
4.2.2 WiFi/BT test (optional)

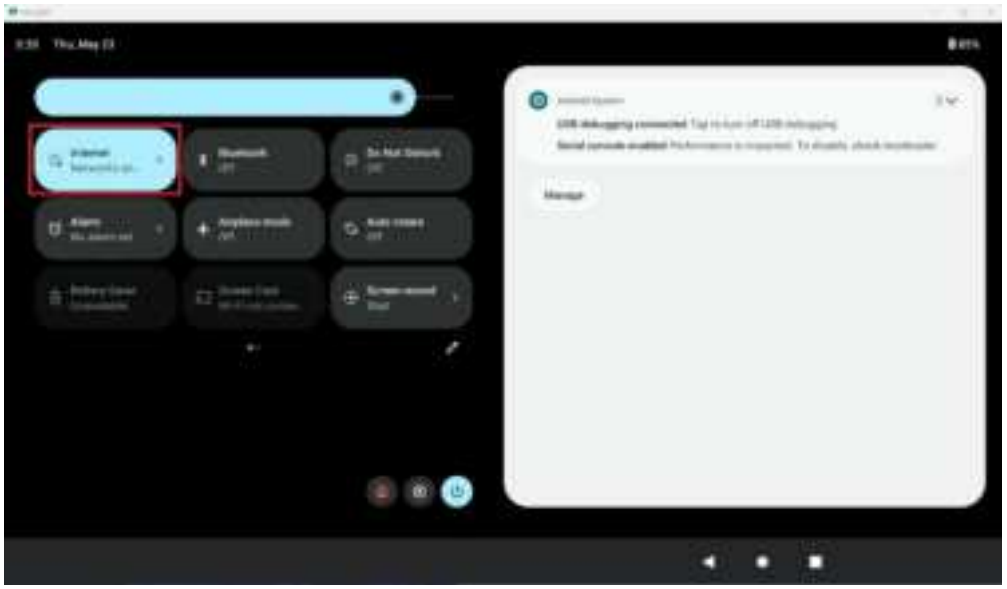
The actual location of the WiFi/BT module:
Remember add the **wlfi Antenna + RF cable** first.

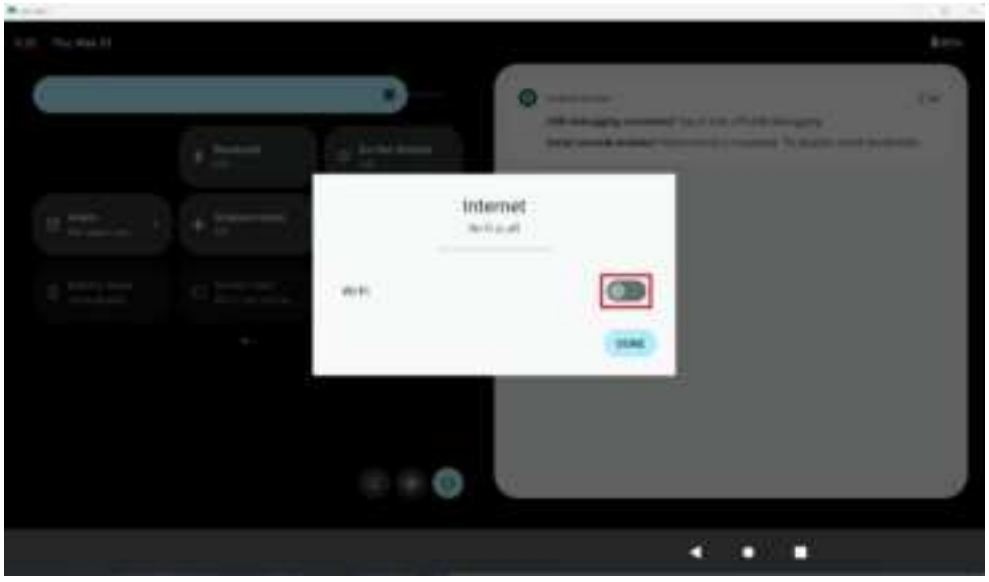


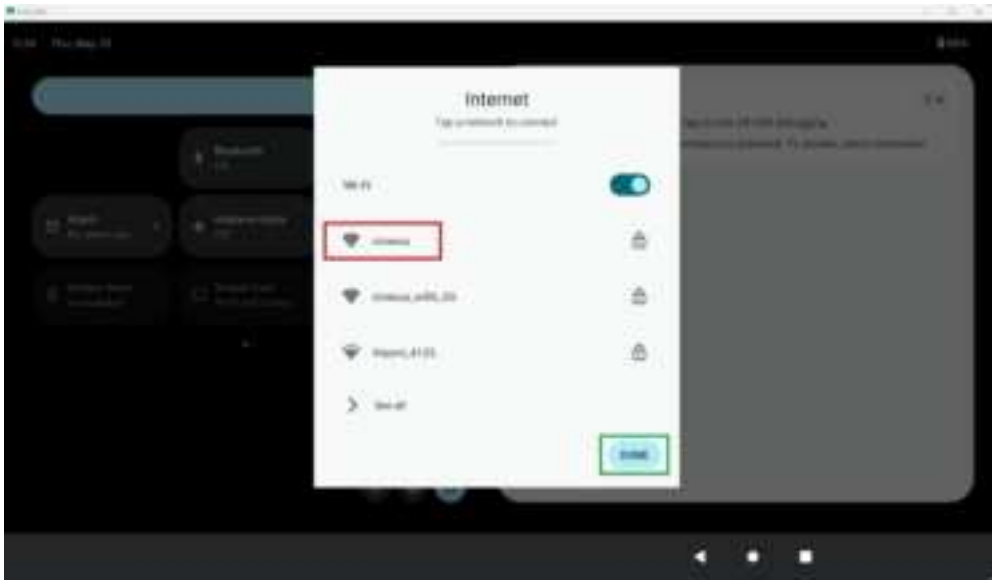
- WiFi

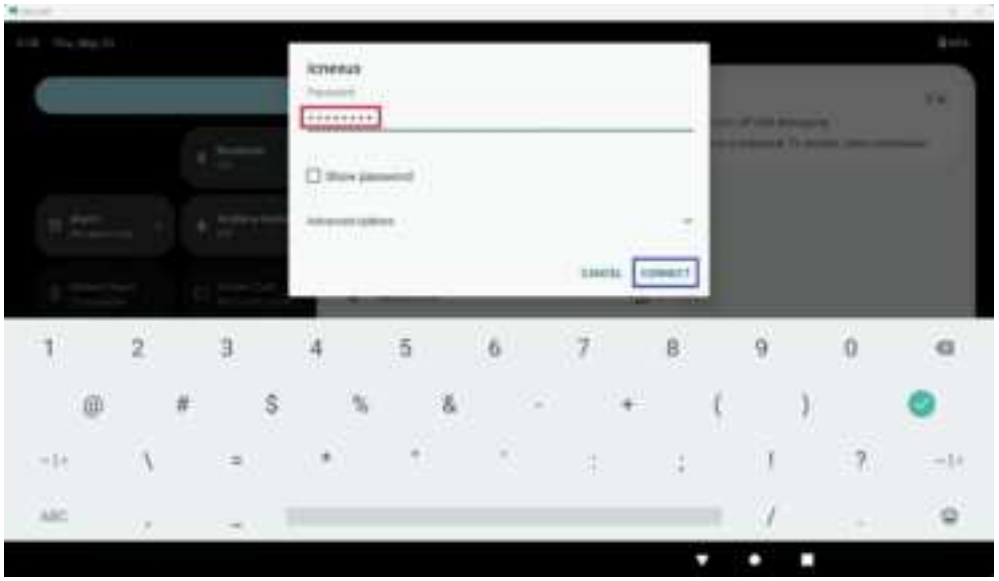
Swipe down on the desktop, and click “**Internet**” → “**Turn on Wifi**” → Choose an SSID device near you & input the password → will show your SSID device connected, this time, using the browser to internet.

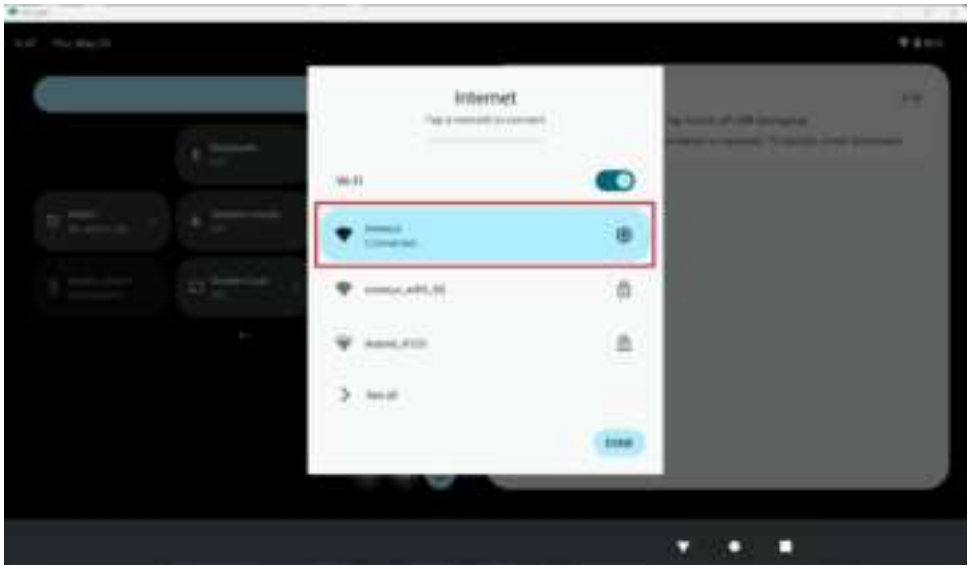





Internet

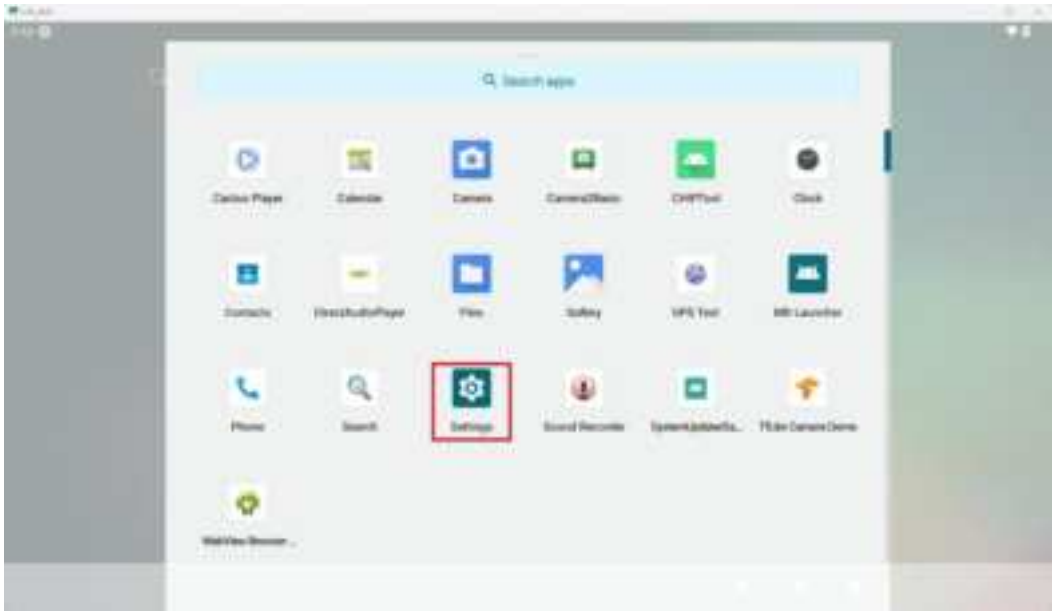

Internet

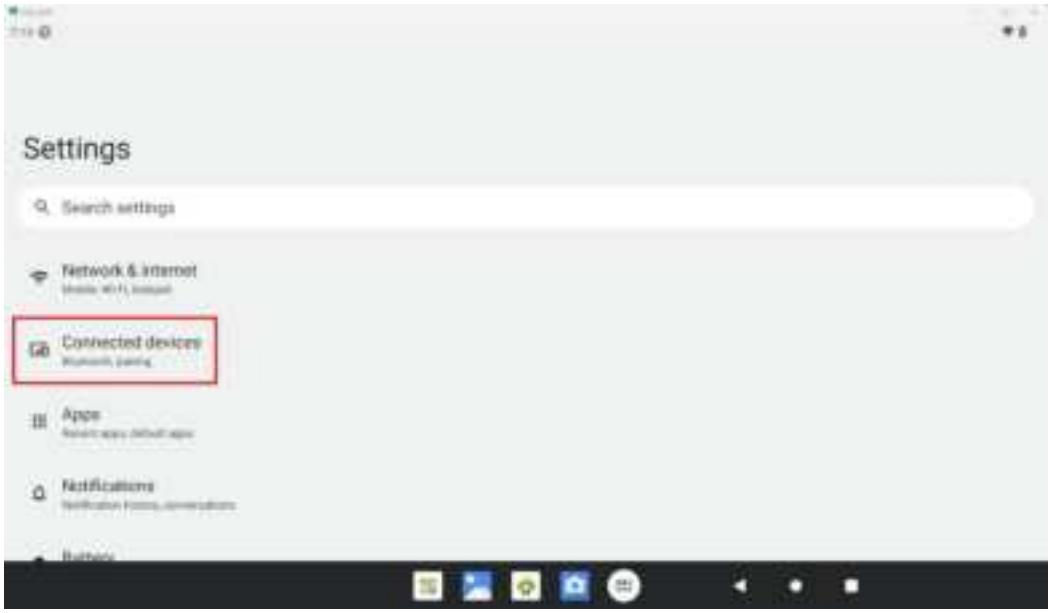


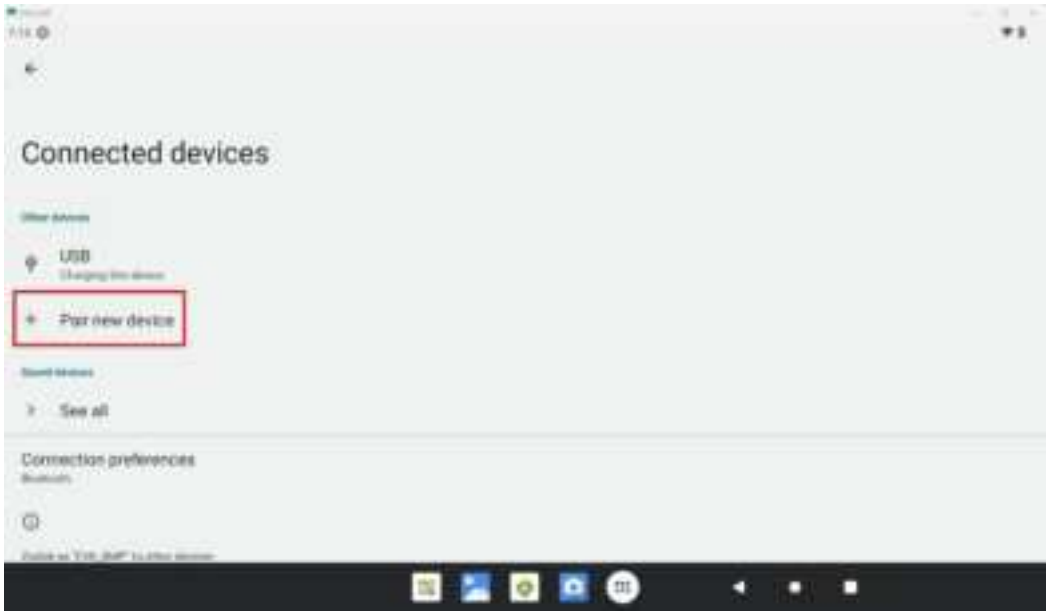


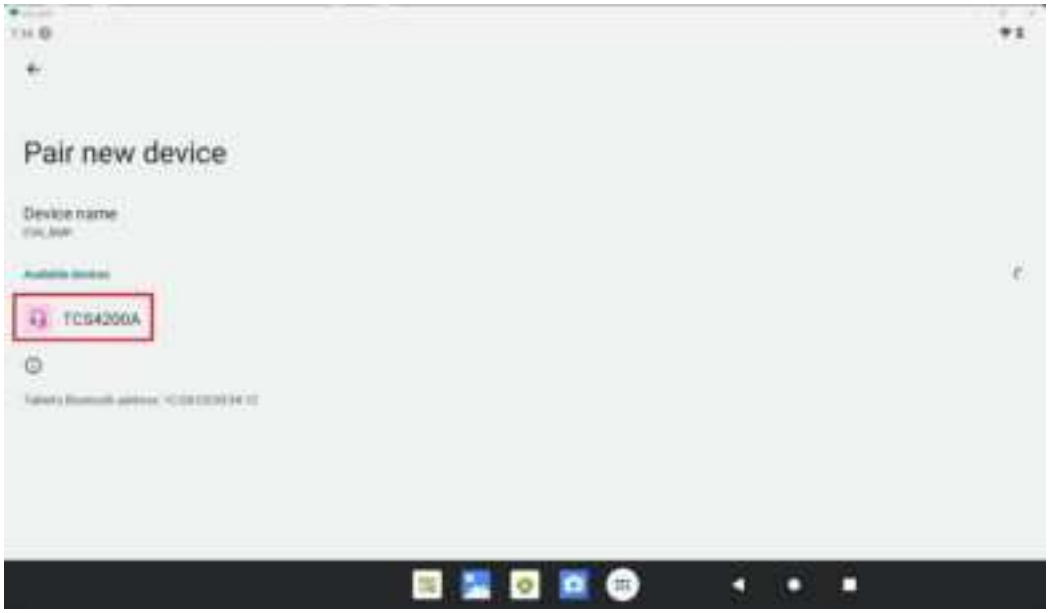
- BT

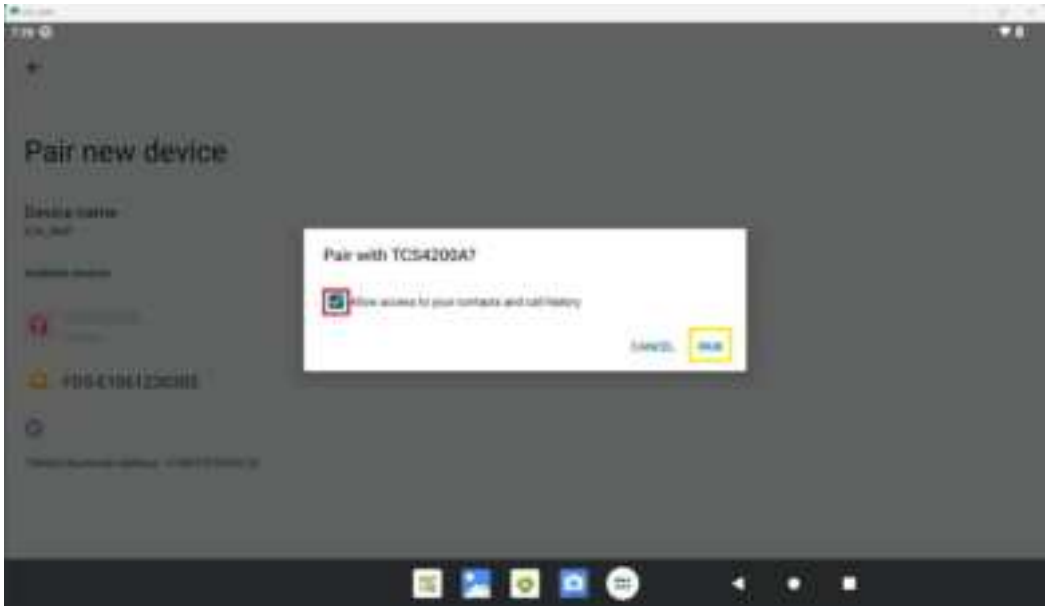
Go to “**Settings**” → “**Connected devices**” → click “Pair new device”, so will see a nearby Bluetooth device, like “TCS4200A” ***This device is a Bluetooth speaker, Choose it and “Allow access to your contacts and call history” to “PAIR”



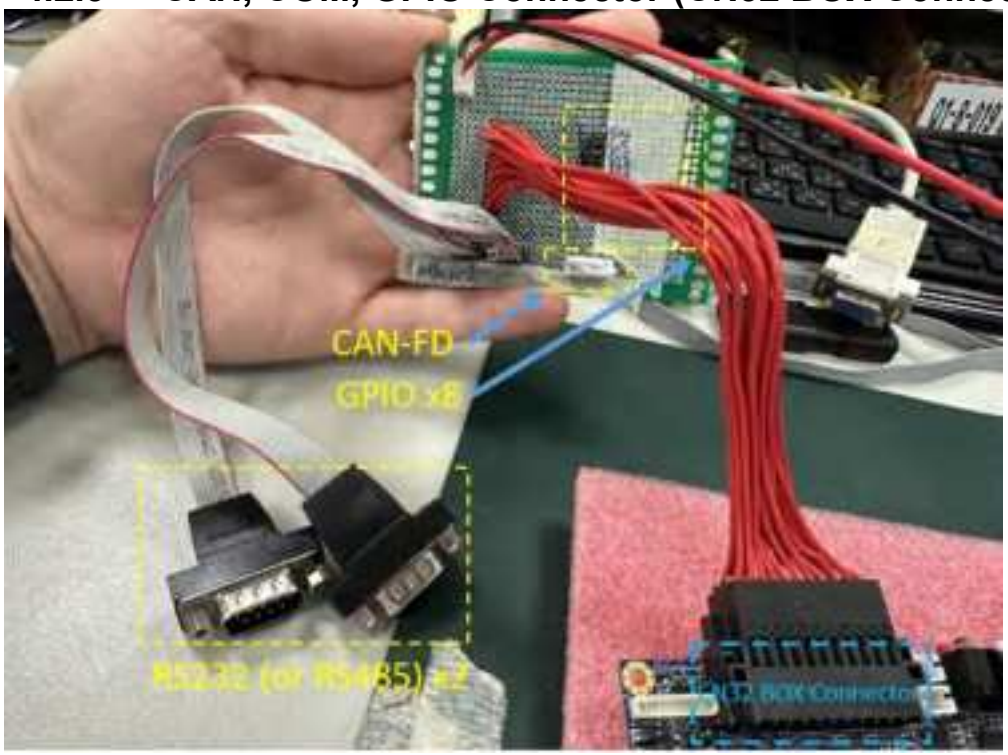

Settings
Search settings
Network & internet
Connected devices
Apps
Notifications


Connected devices
USB
Pair new device
See all
Connection preferences


Pair new device
Device name
TCS4200A



4.2.3 CAN, COM, GPIO Connector (CN32 BOX Connector)



- CAN bus test

The can bus short circuit togeter, type command:

 # ip link set can0 up type can bitrate 125000 dbitrate 2000000 restart-ms 1000 berr-reporting on fd on

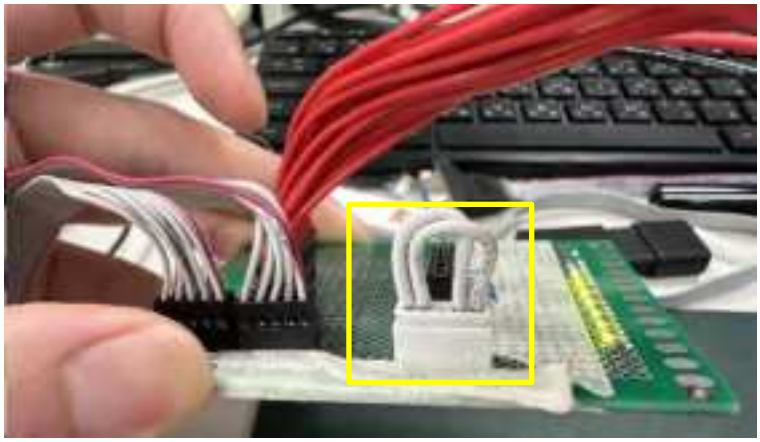
 # ip link set can1 up type can bitrate 125000 dbitrate 2000000 restart-ms 1000 berr-reporting on fd on

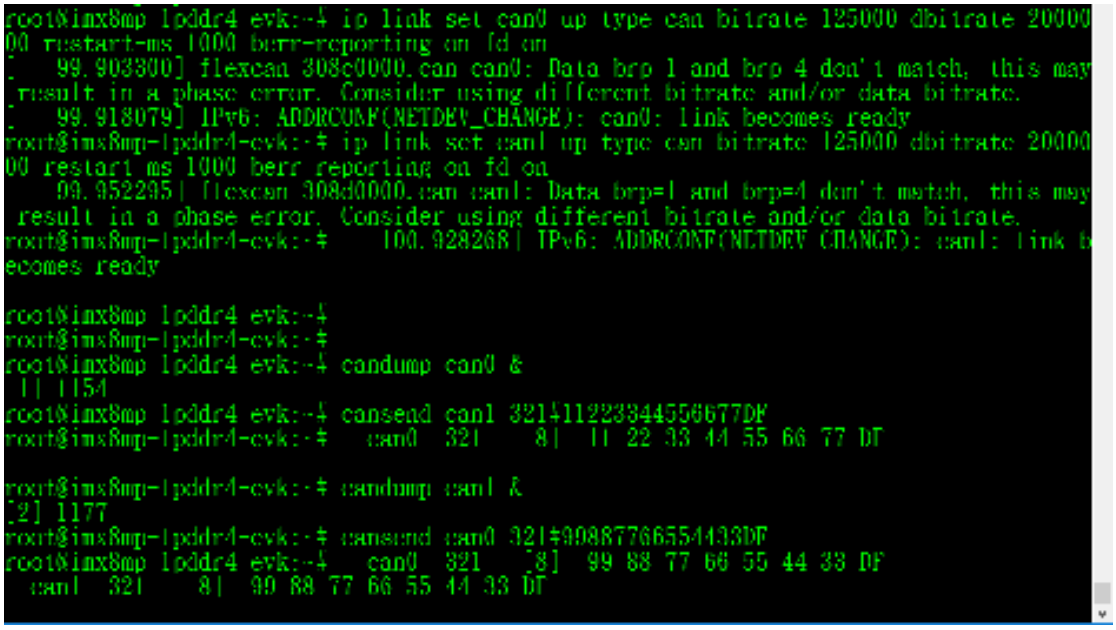
###CAN 0

candump can0 &

cansend can1 321#11223344556677DF

###CAN 1
candump can1 &
cansend can0 321#99887766554433DF





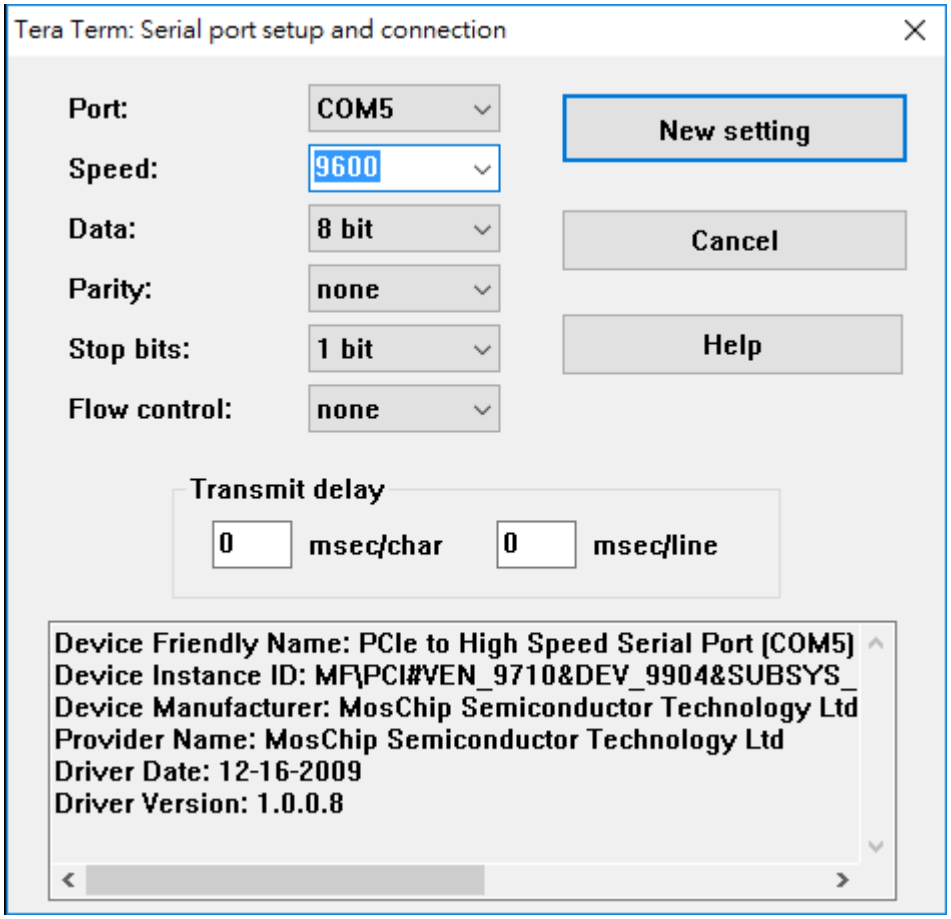
- RS232 (or RS485) test

COM3: /dev/ttymxc2
COM4: /dev/ttymxc3

3. Connect to RS232 port and run the two hyper terminal on PC (such as TeraTerm).
   One open COM5 for RS232
   One open COM3 for debug port

When you open the RS232 Terminal window, you have to do some serial port setup (see below pic).

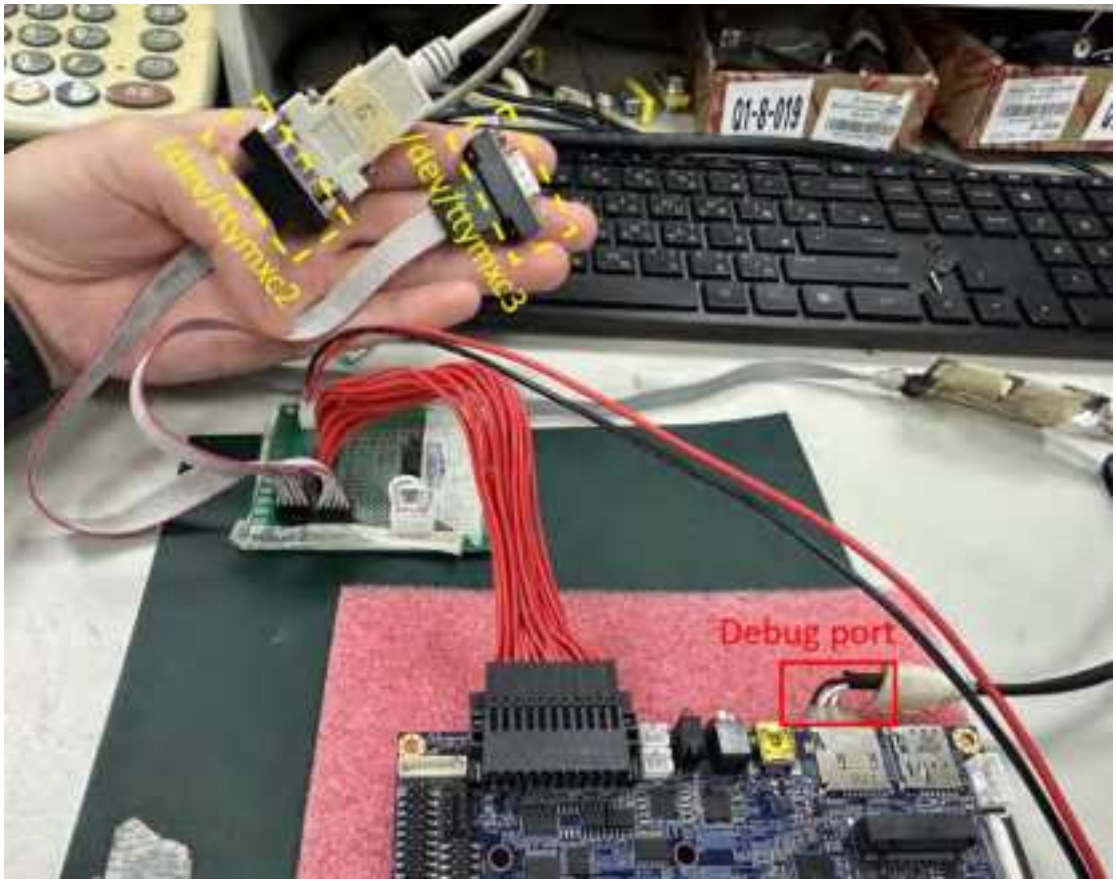
(4) Port: Select the COM which your device connected.
(5) Baud rate : 9600
(6) Date : 8 bit

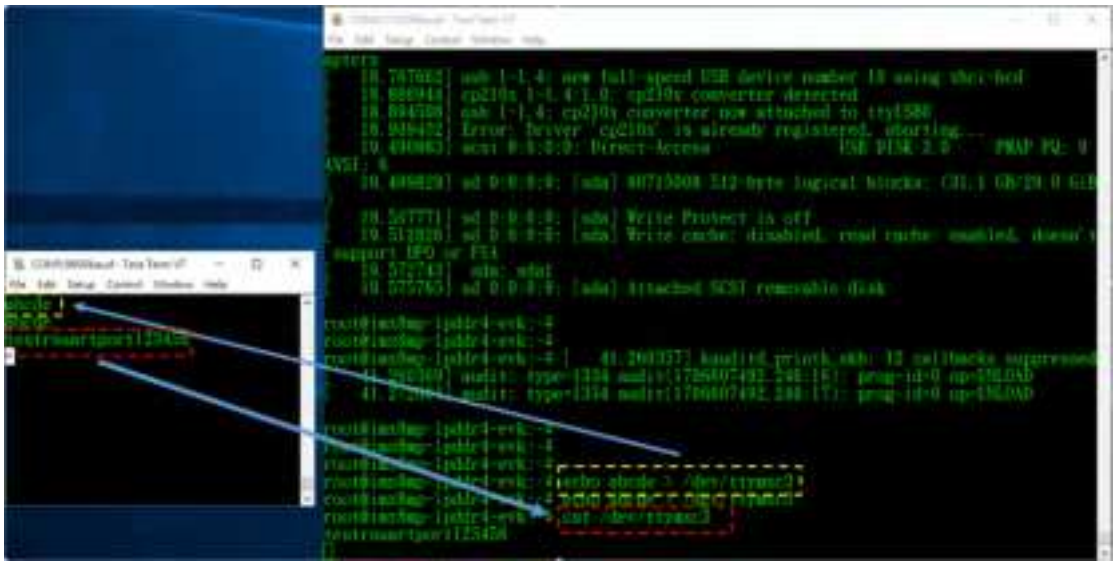


4. execute following commands in console window:
   # echo abcde > /dev/ttymxc2
   # cat /dev/ttymxc2

   Receiving:
   Type any number or sentence in terminal window (COM5) on your PC desktop and you should see the same output appears in the console window (CON3).
   # cat /dev/ttymxc2

   Sending:
   Type any number or sentence in the console window(CON3) and you should see the same output appears in terminal window (CON5).
   # echo abcde > /dev/ttymxc2





After the test is complete, Ctrl + C jumps out of the background,
Other RS232 ports are also tested in the same way, change COM5 to other RS232 ports (ttymxc3)

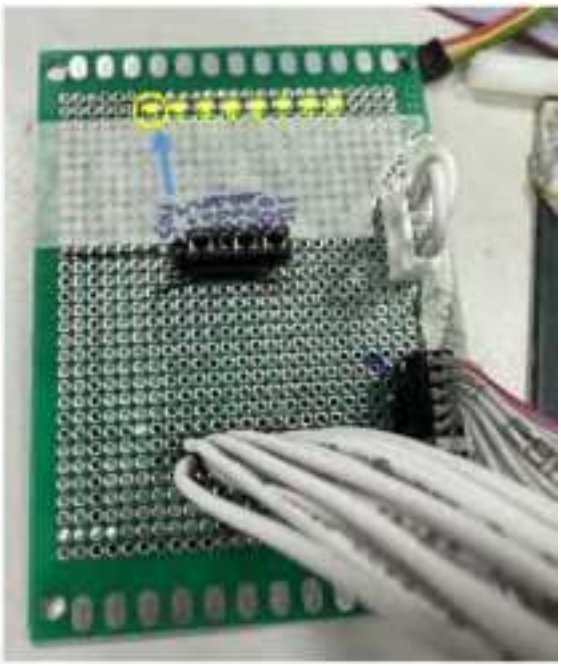
- GPIO test

Paste the following commands into the console window and press Enter

GPIO504 ~ GPIO511

For example, **GPO504** (to test other GPO# please replace the red numbers by yourself)， you can using a LED test board to control LED light on-off .

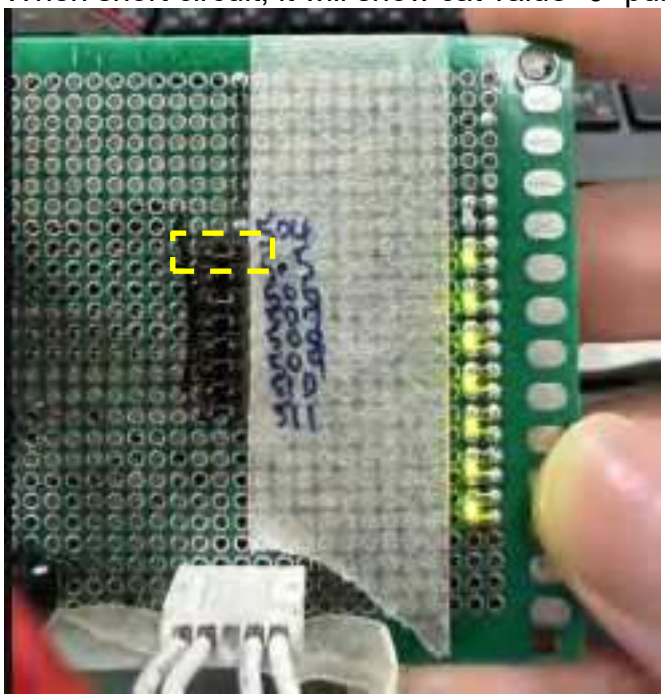
cd /sys/class/gpio/
echo 504 > export
cd gpio504
echo out > direction
echo 1 > value ← LED OFF
echo 0 > value ← LED ON



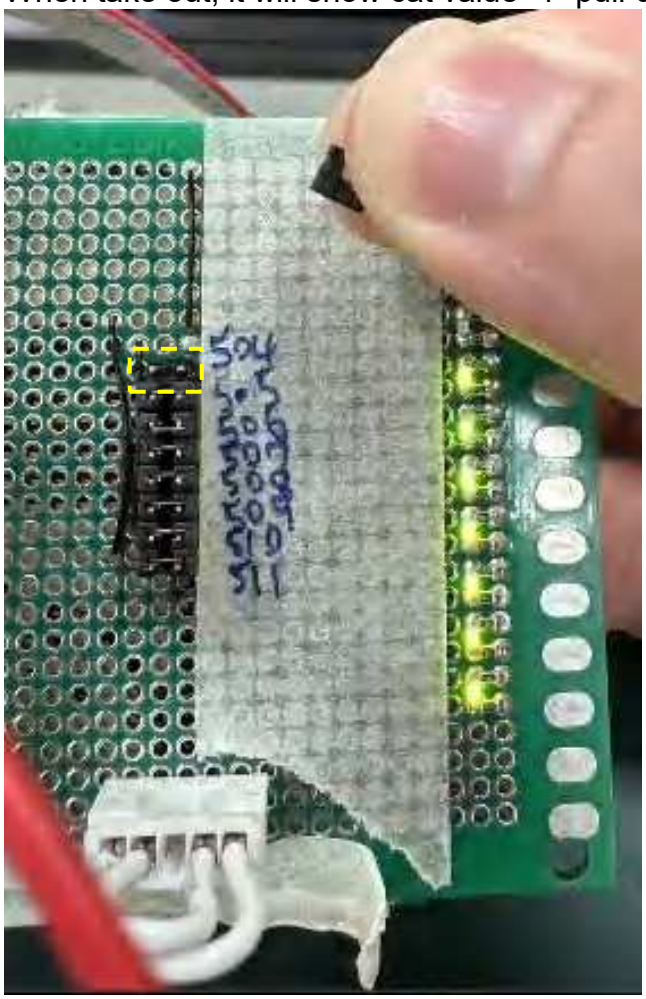
For example, **GPI504** (to test other GPI # please replace the red numbers by yourself)

cd /sys/class/gpio/
echo 504 > export
cd gpio504
cat value

When short circuit, it will show cat value “0” pull-down



When take out, it will show cat value “1” pull-up



```
root@imx8mp-lpddr4-evk:~# cd /sys/class/gpio/
root@imx8mp-lpddr4-evk:/sys/class/gpio# echo 504 > export
root@imx8mp-lpddr4-evk:/sys/class/gpio# cd gpio504
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
0
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
1
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
0
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504# cat value
1
root@imx8mp-lpddr4-evk:/sys/class/gpio/gpio504#
```

4.2.4 CN26 GPIO Pin Header

Paste the following commands into the console window and press Enter

GPIO496 ~ GPIO503

For example, **GPO496** (to test other GPO# please replace the red numbers by yourself)， you can using a LED test board to control LED light on-off .

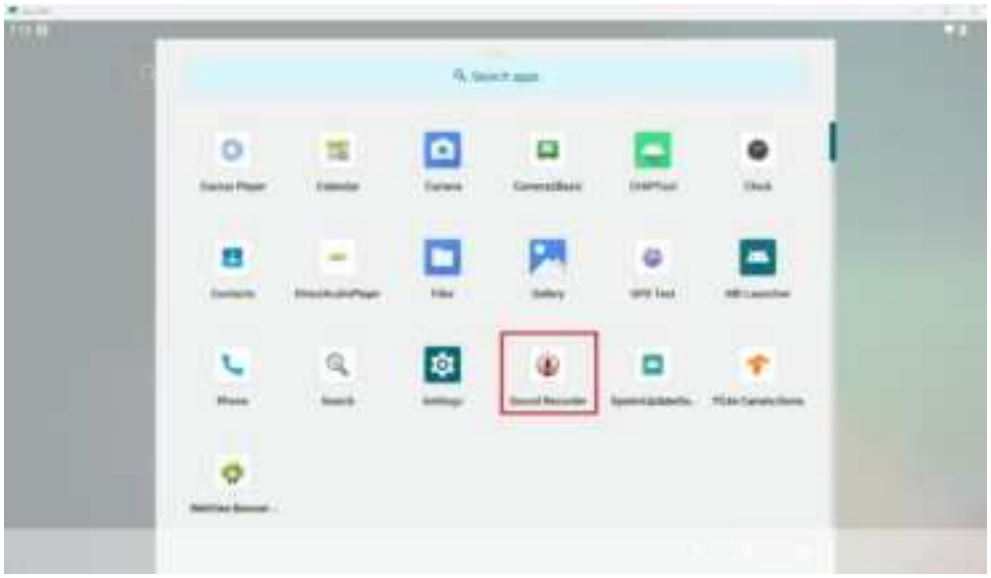
cd /sys/class/gpio/
echo 496 > export
cd gpio496
echo out > direction
echo 1 > value ← LED OFF
echo 0 > value ← LED ON

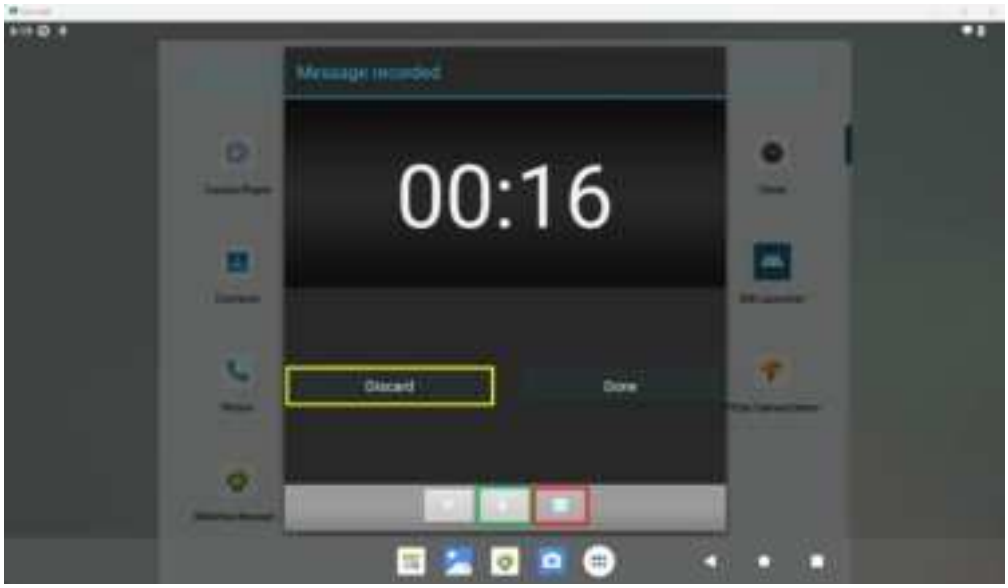
4.2.5 The Line in to recording test

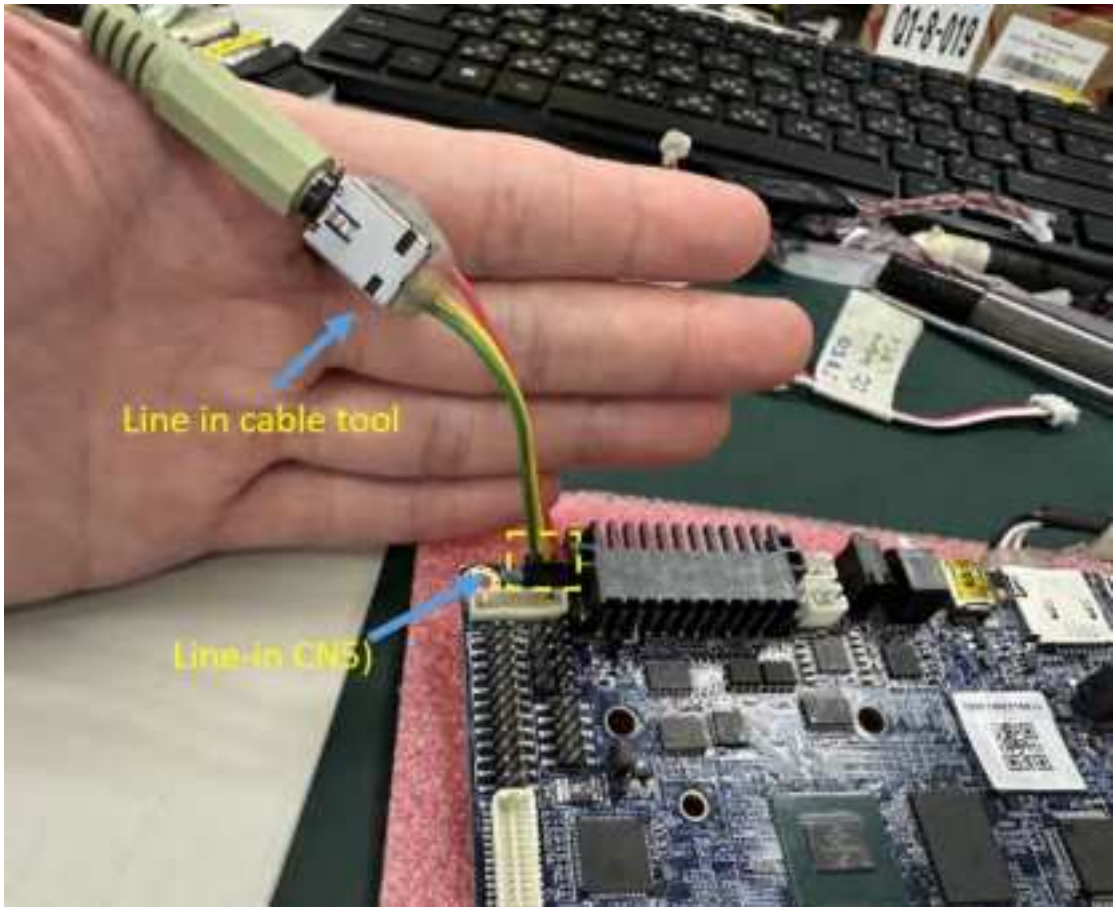
Using the build in Sound Recorder AP → Click "● Record button" → "■ Stop recording" → "▶ Play"

**The default is Line in on

PC can play a MP3 music for recording, the Line in cable need to be equipped with audio jig wire.







4.2.6 Speaker test

Paste the following commands into the console window and press Enter

 # tinyplay /mnt/media_rw/0584-0D0F/audiocheck_L.wav -D 1 -d 0

 # tinyplay /mnt/media_rw/0584-0D0F/audiocheck_R.wav -D 1 -d 0

// Fill in the name of the currently plugged USB flash drive in red

4.2.7 Headphone/MIC Pin Header test (CN42)

Prepare a headset and with audio cable tool, like see as below pic.

- Headphone

Paste the following commands into the console window and press Enter

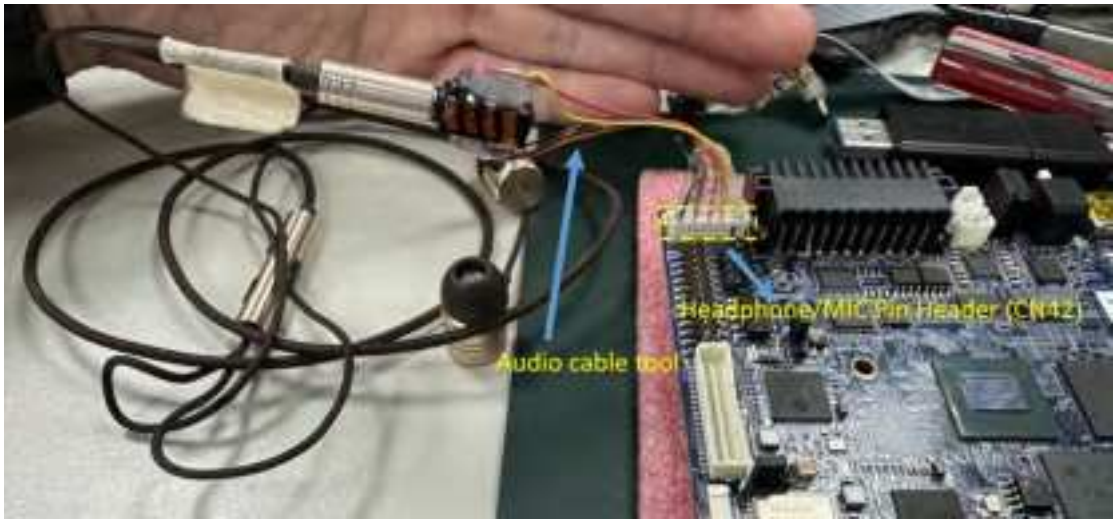
 # tinyplay /mnt/media_rw/0584-0D0F/audiocheck_L.wav -D 1 -d 0

 # tinyplay /mnt/media_rw/0584-0D0F/audiocheck_R.wav -D 1 -d 0

// Fill in the name of the currently plugged USB flash drive in red

- MIC in

Using the build in Sound Recorder AP → Click "● **Record button**" → "■ **Stop recording**" → "▶ **Play**"



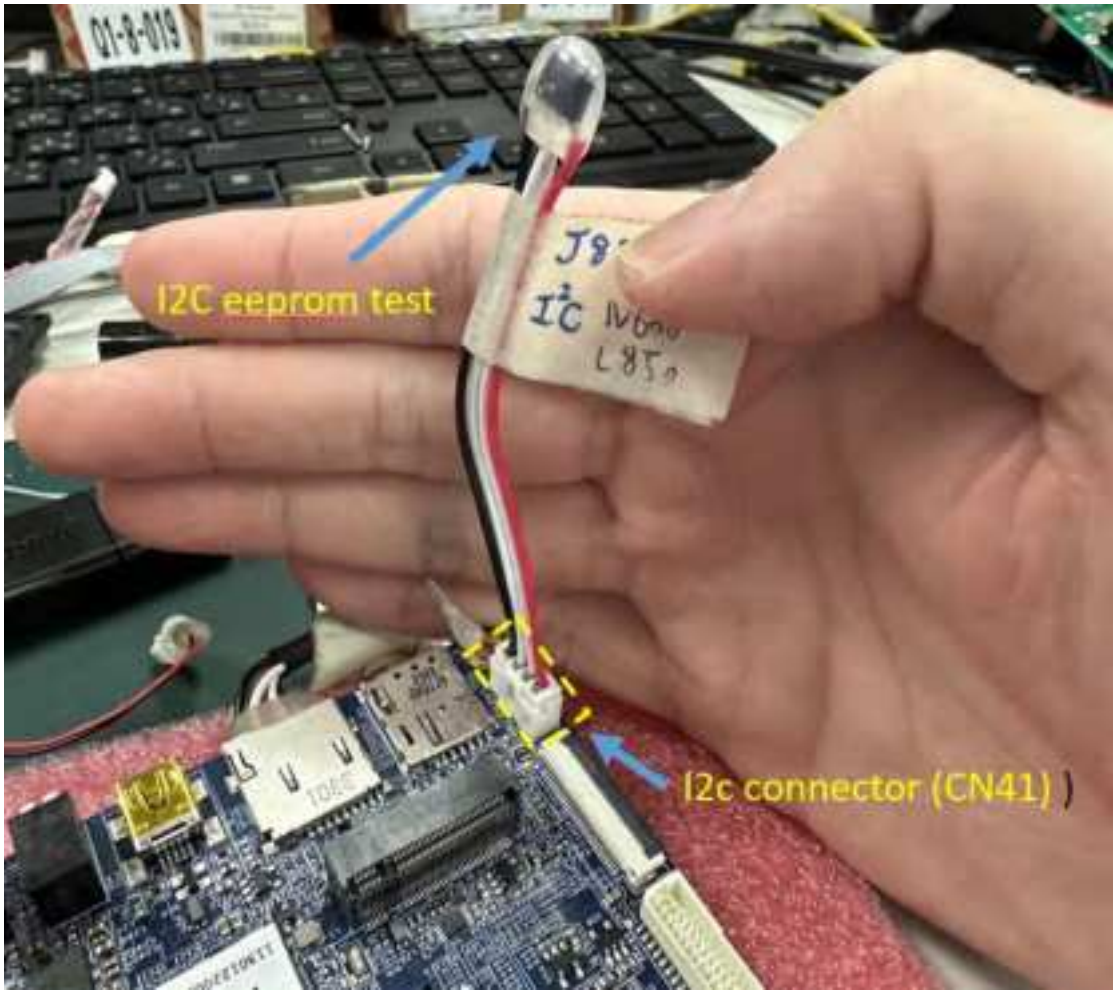
4.2.8 i2c(CN41) Test

Paste the following commands into the console window and press Enter，you can using a i2c eeprom to detect .

i2cdetect -y -a 4

it will show 50 nodes

```
root@imx8mp-lpddr4-evk:~# i2cdetect -y -a 2
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00: 00 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- 18 -- -- -- -- -- -- --
20: UU UU -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: 50 51 -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- UU -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
```



4.2.9 The LAN1 & LAN2(optional) test

C. LAN1(CN23) eth0, ok
ping 8.8.8.8

D. LAN2(CN25) eth1, ok
ping 8.8.8.8

4.2.10 SPI test(CN25)

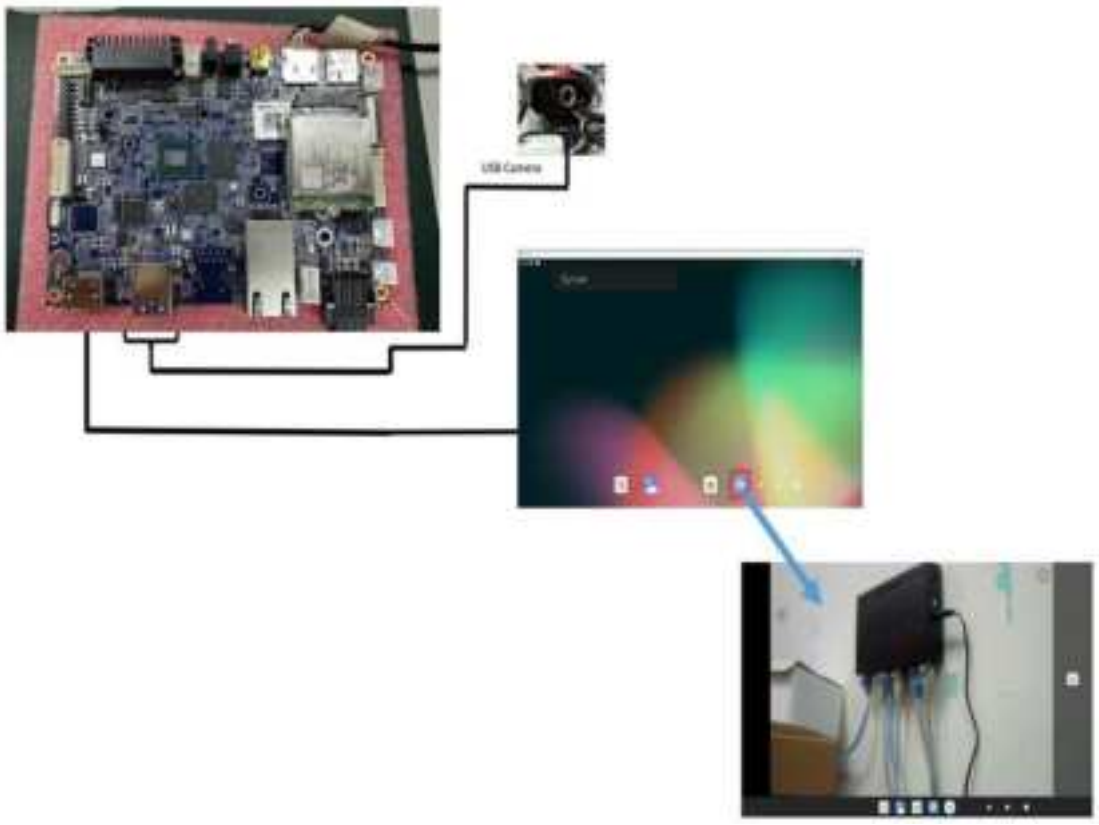
Paste the following commands into the console window and press Enter，
You can using a W25QXX SPI Flash to detect

Copy demo test program (spi-test)
cp /mnt/media_rw/FC45-2BBB/spi-test /data/
cd /data/
chmod +x spi-test
./spi-test /dev/spidev1.0
//will show response(7): ef 40 18 00 00 00

```
evk_8mp:/ # cd /data/
evk_8mp:/data # ./spi-test /dev/spidev1.0
response(7): ef 40 18 00 00 00
evk_8mp:/data #
```

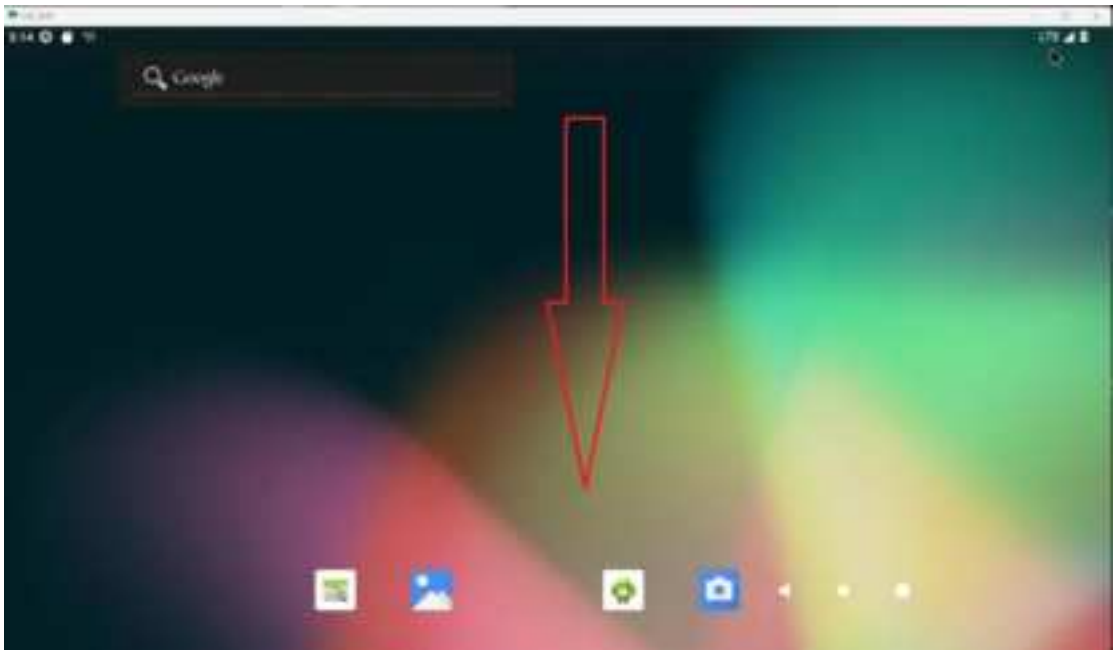
4.2.11 USB Camera test

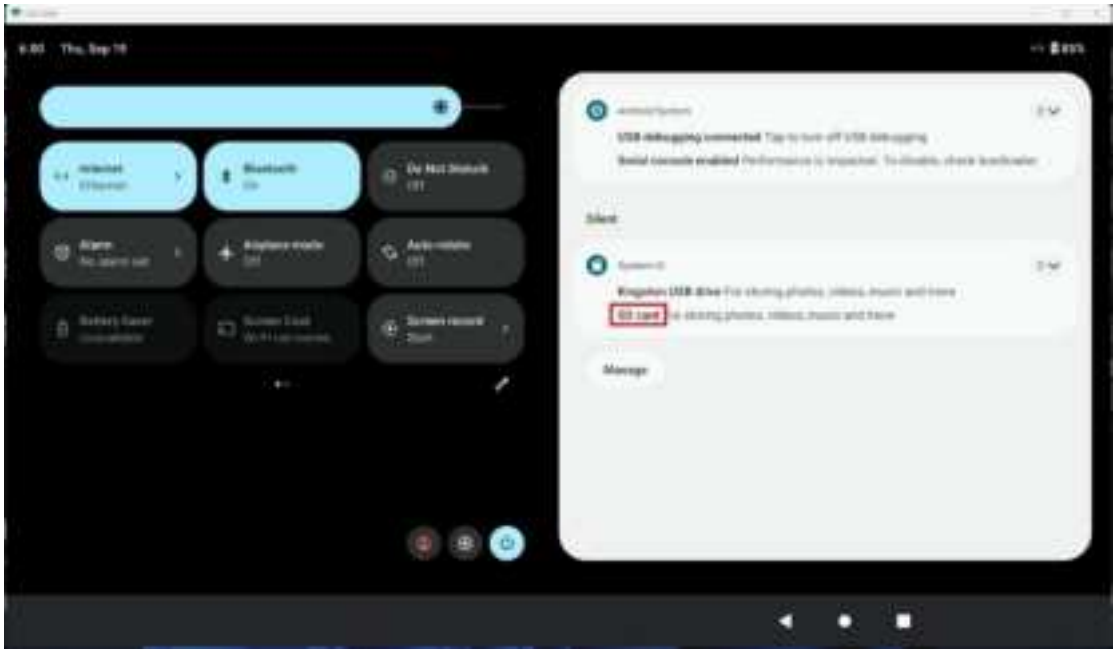
Connected an USB Camera, and run build in Camera APP.
Test schematic:

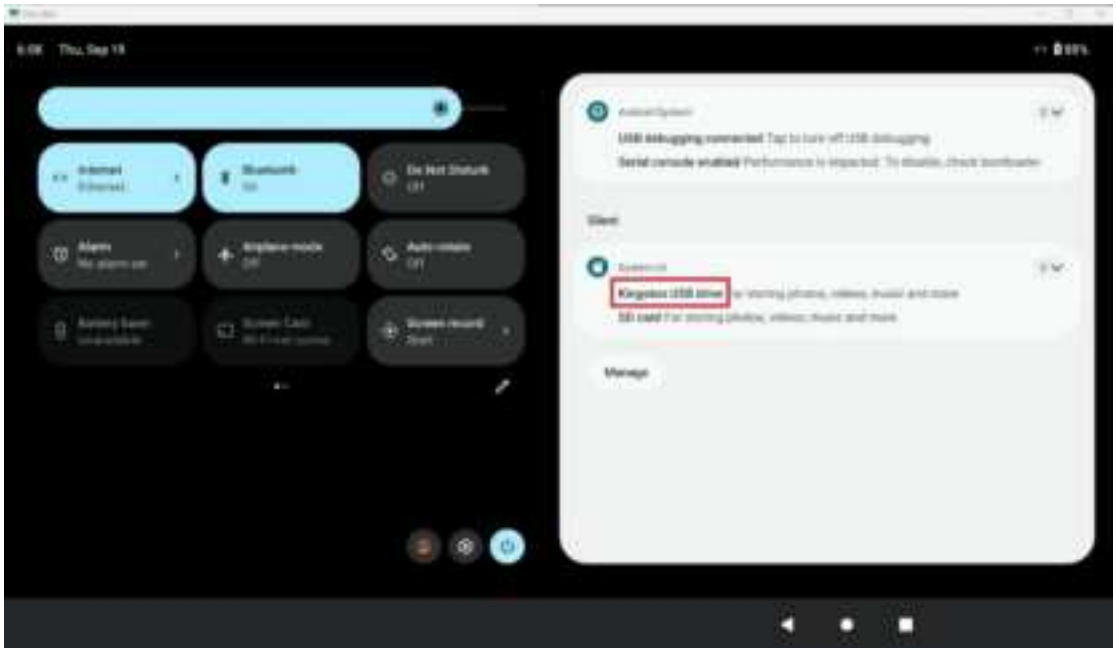


4.2.12 USB & SD Card test

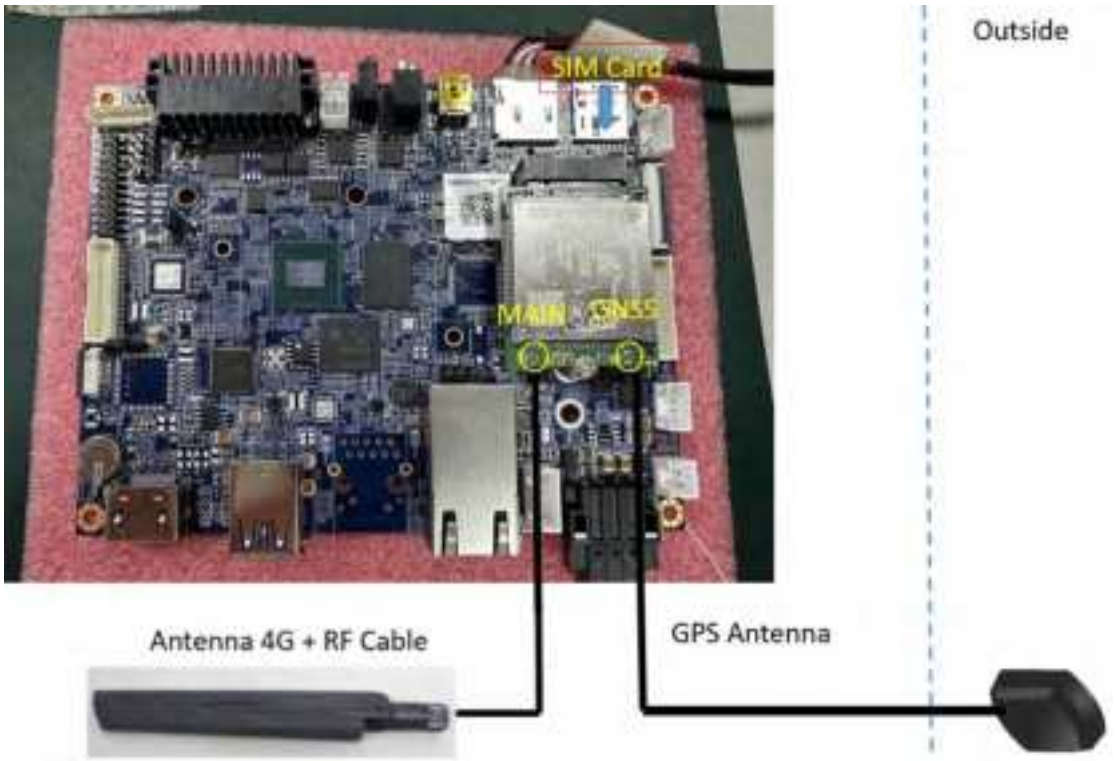
Insert an USB disk & SD card, then swipe down on the desktop, will see a SD card device & Kingston USB drive



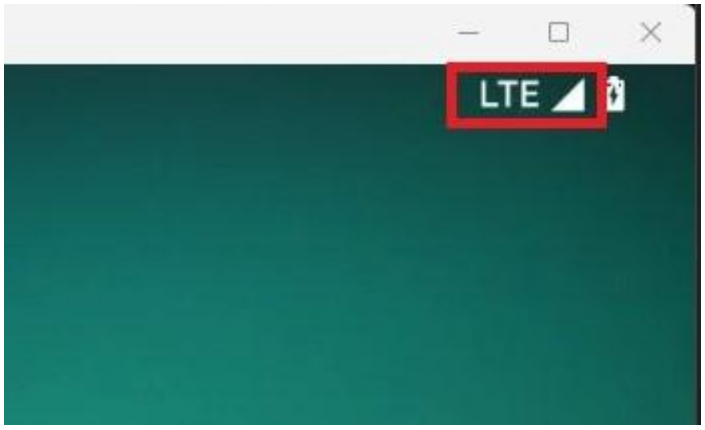


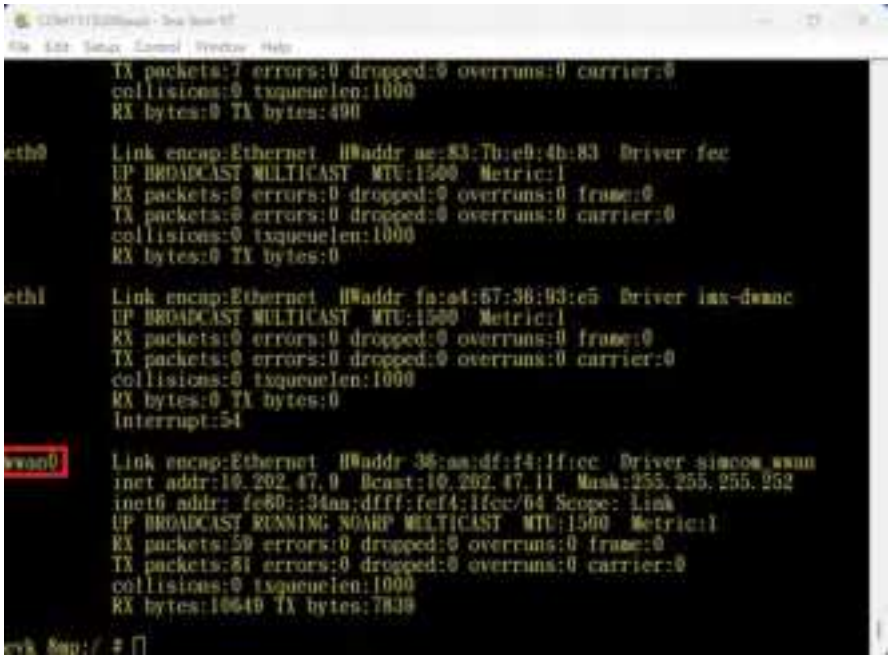


4.2.13 4G LTE/GPS module test

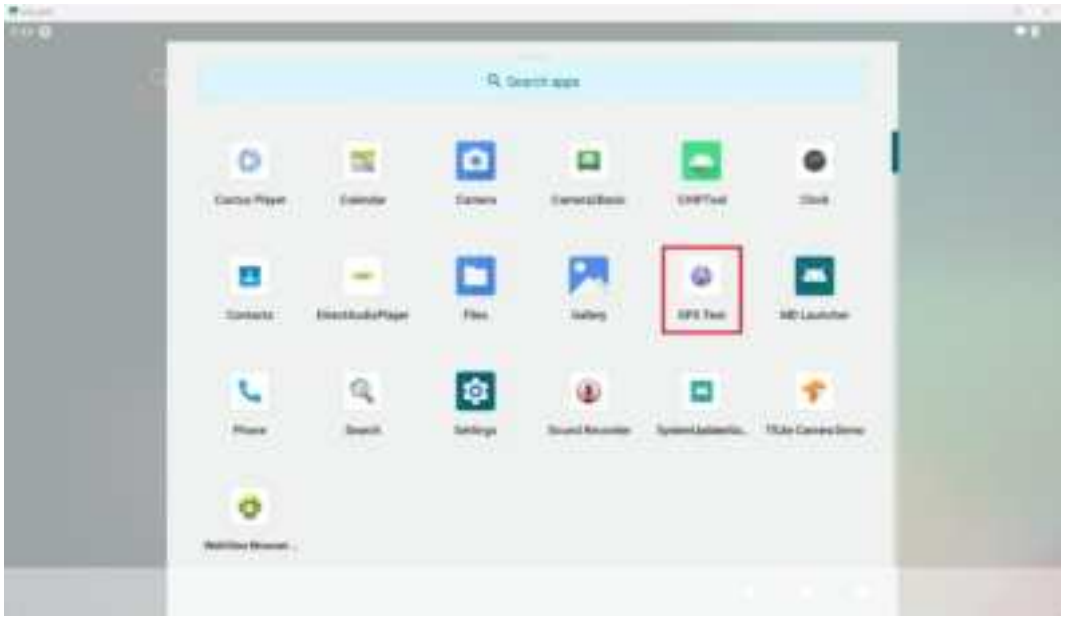


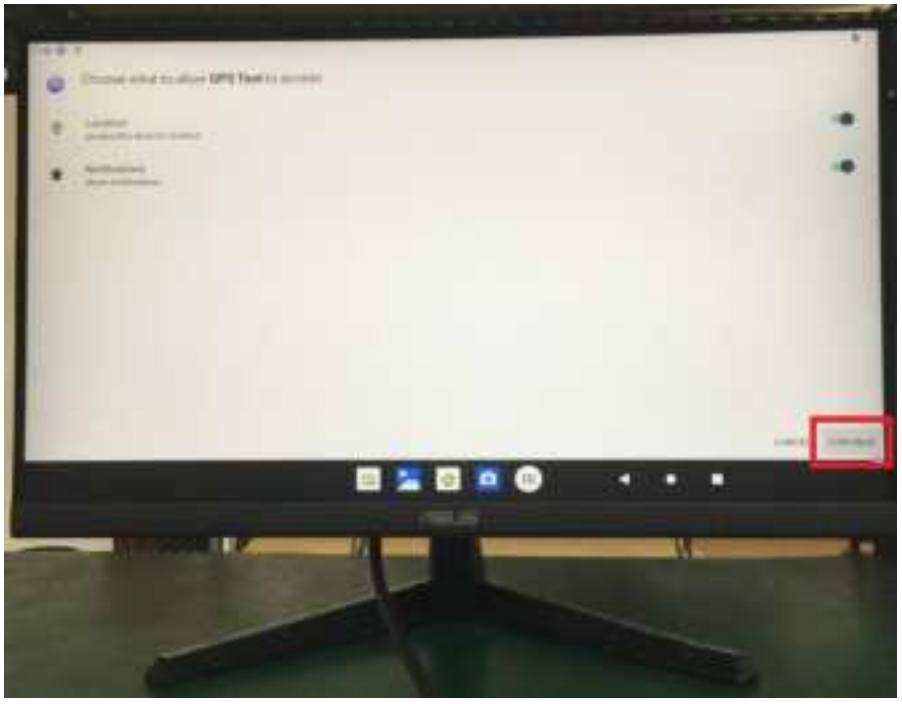
For 4G LTE test, Insert SIM Card, and after waiting for boot, and see LTE/4G signal in the upper right corner of the screen.
In console type command **ifconfig** also will show wwan0 interface





Foe GPS test, you can try install GPS APP, click “**GPS AP**” → “**CONTINUE**” to allow Location access → and waiting for GPS signal



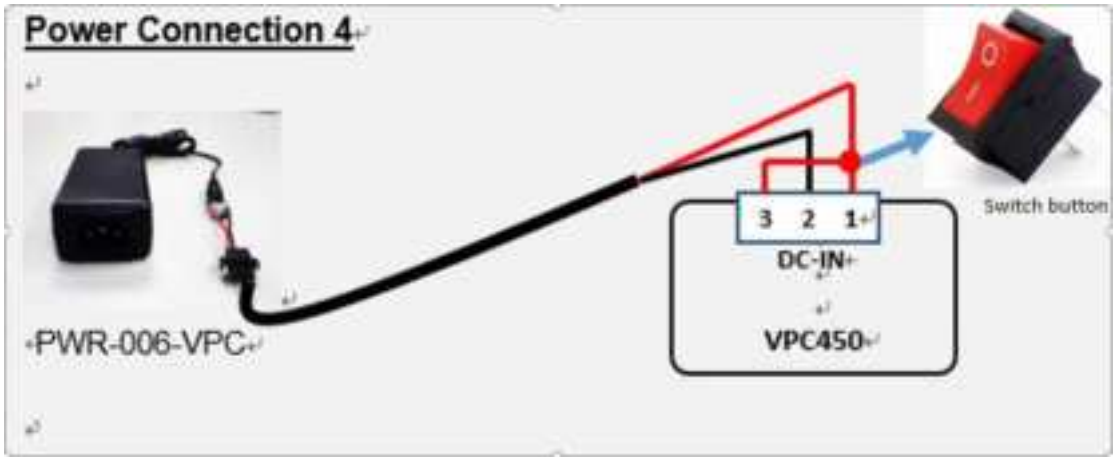


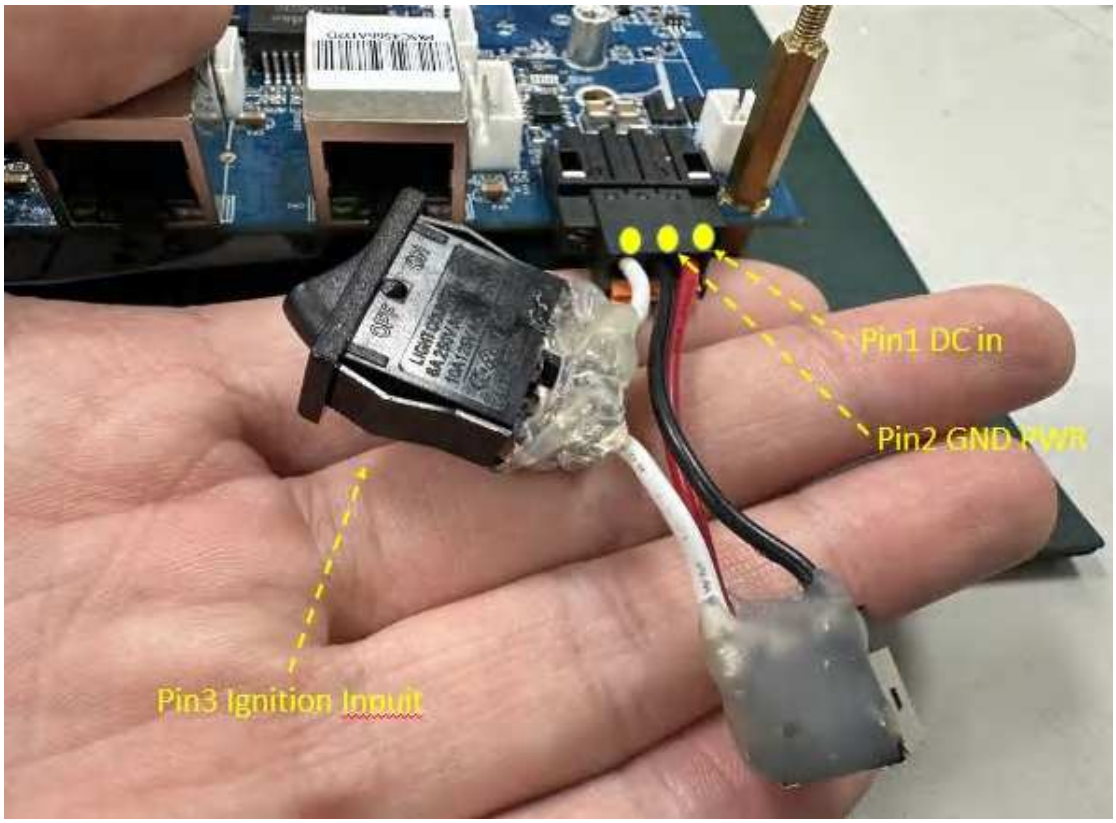
GPS Status
GPS on
Accuracy (feet)
7
In View
17
In Use
3
29 26 32 29 38 00 37 00 26 19 35 21
02 03 05 06 07 08 09 10 13 14 16 17
SNR
99
40
30
20
10
00
0
01:46

此窗戶

4.2.14 MCU-controlled Power ON/OFF Demo Test

Schematic





The MCU will always detect an ignition signal as long as DC adapter is on can be turned on SBC4100_NSD4100.
And if disconnect ignition signal can be turned off SBC4100_NSD4100.

For any further informatin that we do not mention in the manual, please contact us directly.