EN_Lite TX2 NX Manual

Notice

Please read manual carefully before install, operate, or transport MiiVii device.

- Ensure that the correct power range is being used before powering the device.
- Avoid hot plugging.
- To properly turn off the power, please shut down the Ubuntu system first, and then cut off the power. Due to the particularity of the Ubuntu system, on the Nvidia developer kit, if the power is turned off when the startup is not completed, there will be a 0.03% probability of abnormality, which will cause the device to fail to start. Due to the use of the Ubuntu system, the same problem also exists on the Miivii device.
- Do not use cables or connectors other than described in this manual.
- Do not use MiiVii device near strong magnetic fields.
- Backup your data before transportation or MiiVii device is idle.
- Recommend to transport MiiVii device in its original packaging.

Brief

MiiVii Lite TX2 NX is an embedded AI supercomputer. It delivers massive computing capabilities and essential features to terminal devices. High performance passive cooling design enables Lite TX2 NX working in wide temperature range. With shock resistance and TVS, ESD protection, Lite TX2 NX is suitable for industrial usage. In addition, Lite TX2 NX is equipped with multiple PoE+ port which make it easier for field deployment.

Included in the Box

-Lite TX2 NX x 1

-Power cable x 1

-Fixed plate x 2

-Screws

-Quick start x 1

Specifications

Processor

Processor	NVIDIA Jetson TX2 NX
CPU	Dual-core Denver 2 64-bit CPU and quad-core ARM A57 complex
GPU	256 CUDA cores Pascal™ architecture
Memory	4 GB 64 bit LPDDR4 1600 MHz –51.2GB/s

Storage	16GB eMMC 5.1

I/O

	Interface	Quantity	Note
Function Key	Recovery Button	1	
Network/Camera	Ethernet	1×Gigabit Port 8×PoE+ 100M Port	PoE+ IEEE 802.3at protocol single port maximum output 30W
Video output	HDMI	1×HDMI 2.0 TYPE A	5V 1A
USB	USB	1×USB 3.0 TYPE A 1×USB 2.0 TYPE A	USB 5V, 1A Lower USB as a Flashing Port
I/O	UART	1xRS232 1xRS485	DB9 Terminal
User Expansion	M.2	1×M.2 M Key	2280 SIZE NVME SSD
	Mini PCIe	1	
	Nano SIM Socket	1	For Nano SIM Card

Power Supply

Power Supply	Spec
Input Type	DC
Input Voltage	52V DC
Typical consumption	30W

Mechanical

Mechanical	Spec
Dimensions (W×H×D)	178mm×55mm×110mm (I/O ports and mounting holes excluded)
Weight	1.2Kg

Environmental

Environmental	Spec
Operating Temperature	-20℃-60℃, 0.2~0.3m/s air flow[1]
Storage Temperature	-25℃-80℃
Storage Humidity	10%-90% non-condensing
Vibration	5gn,10Hz~150Hz,3 Axis[2]
Protection	IP4X

ESD	Touch 6KV, Air 8KV[3]
TVS	1KV[4]
Lighting	Power 6KV[5]

Certification

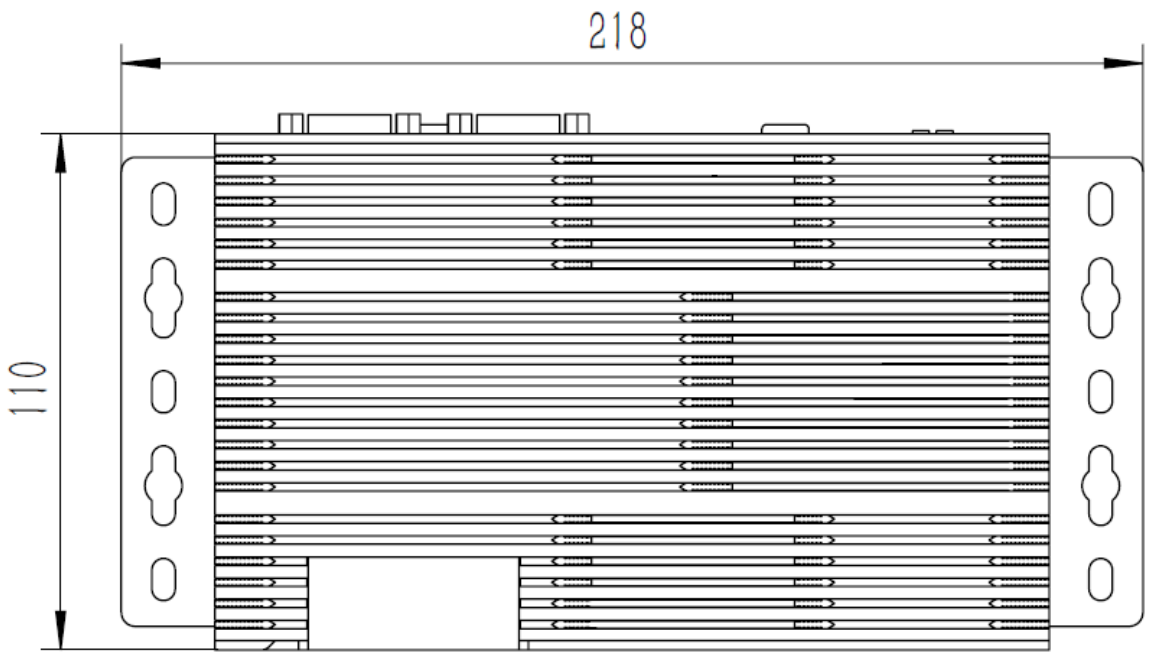
Certification	Status
CCC, CE, FCC, RoHS, SRRC	Processing

[1] According to GB/T 2423-2008
[2] According to GB/T 2423.10-2008
[3] According to IEC 61000-4-2，Level 3
[4] According to IEC 61000-4-5，Level 3
[5] According to GB/T3482-2008

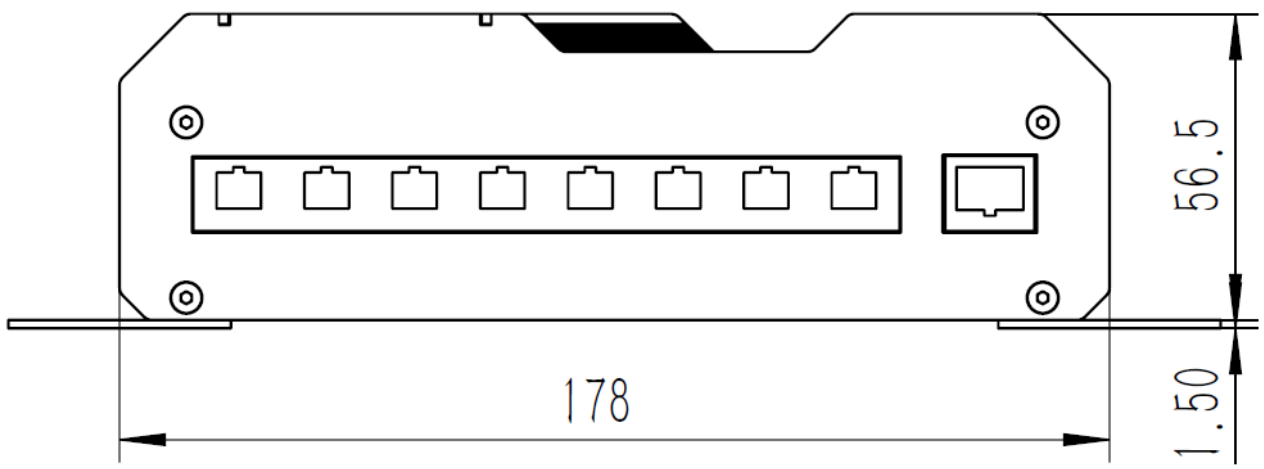
Install Dimension

Dimensions and mounting hole position as below:

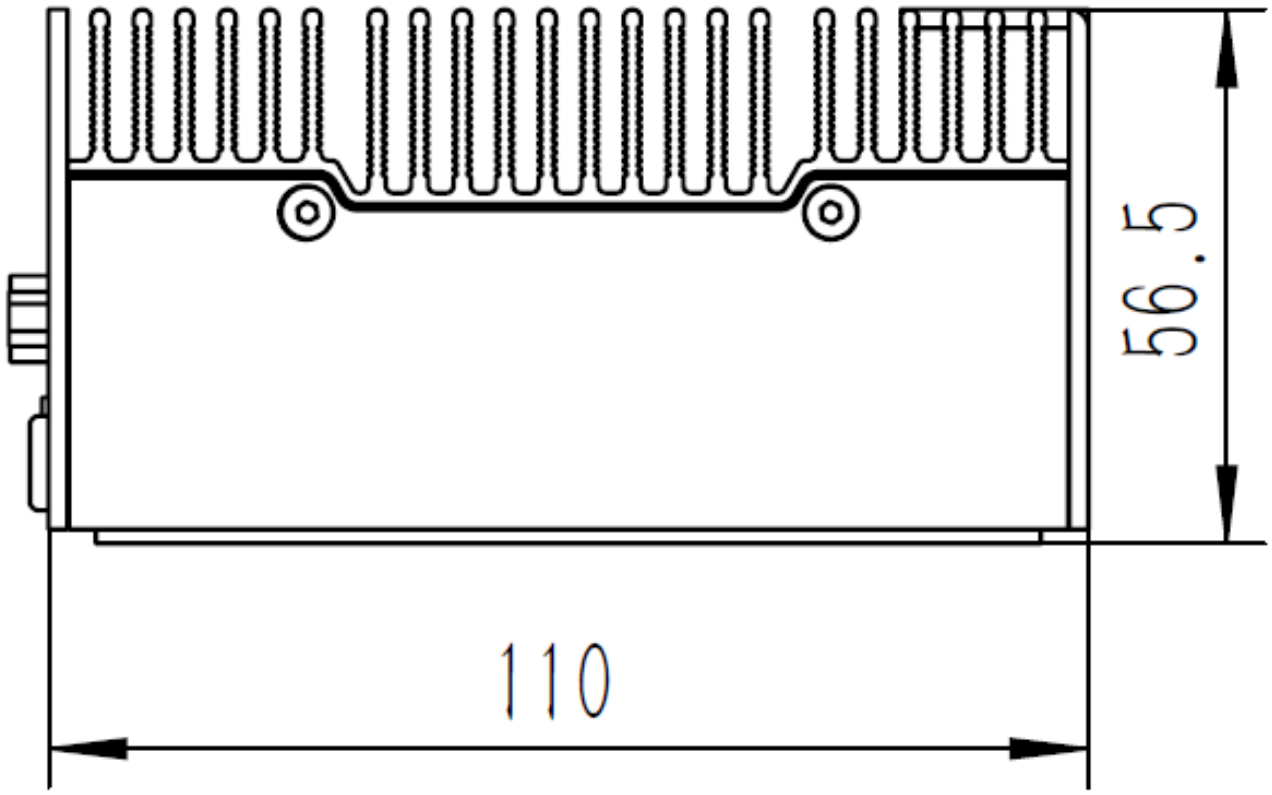
Up view(Unit:mm)



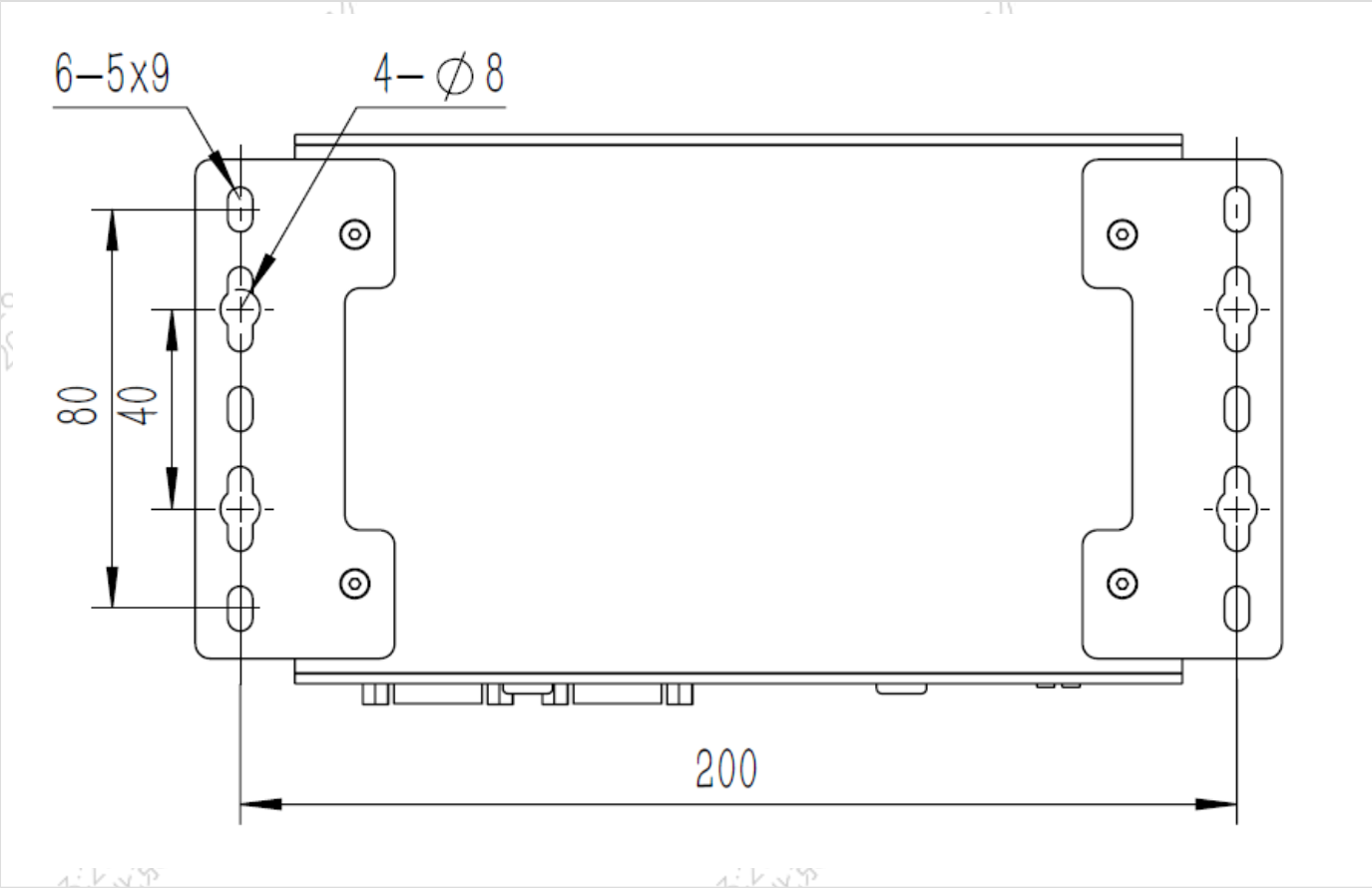
Front view(Unit:mm)



Left view(Unit:mm)



Mounting Hole(Unit:mm)



Service and Support

Support

MiiVii is glad to help you with any questions you may have about our product, or about the use of the technology for your application. The fastest way is sending us an email: helpdesk@miivii.com. Or you could visit our developer forum: http://forum.miivii.com for solutions.

Warranties

Warranty period: One year from the date of delivery.

Warranty content: MiiVii warrants the product manufactured by us to be free from defects in material and workmanship during warranty period. Please contact helpdesk@miivii.com for return material authorization (RMA) prior to returning any items for repair or exchange. The product must be returned in its original packaging to prevent damage during shipping. Before returning any product for repair, it is recommended to back up your data and delete any confidential or personal data.

Interfaces

Interfaces

Front panel

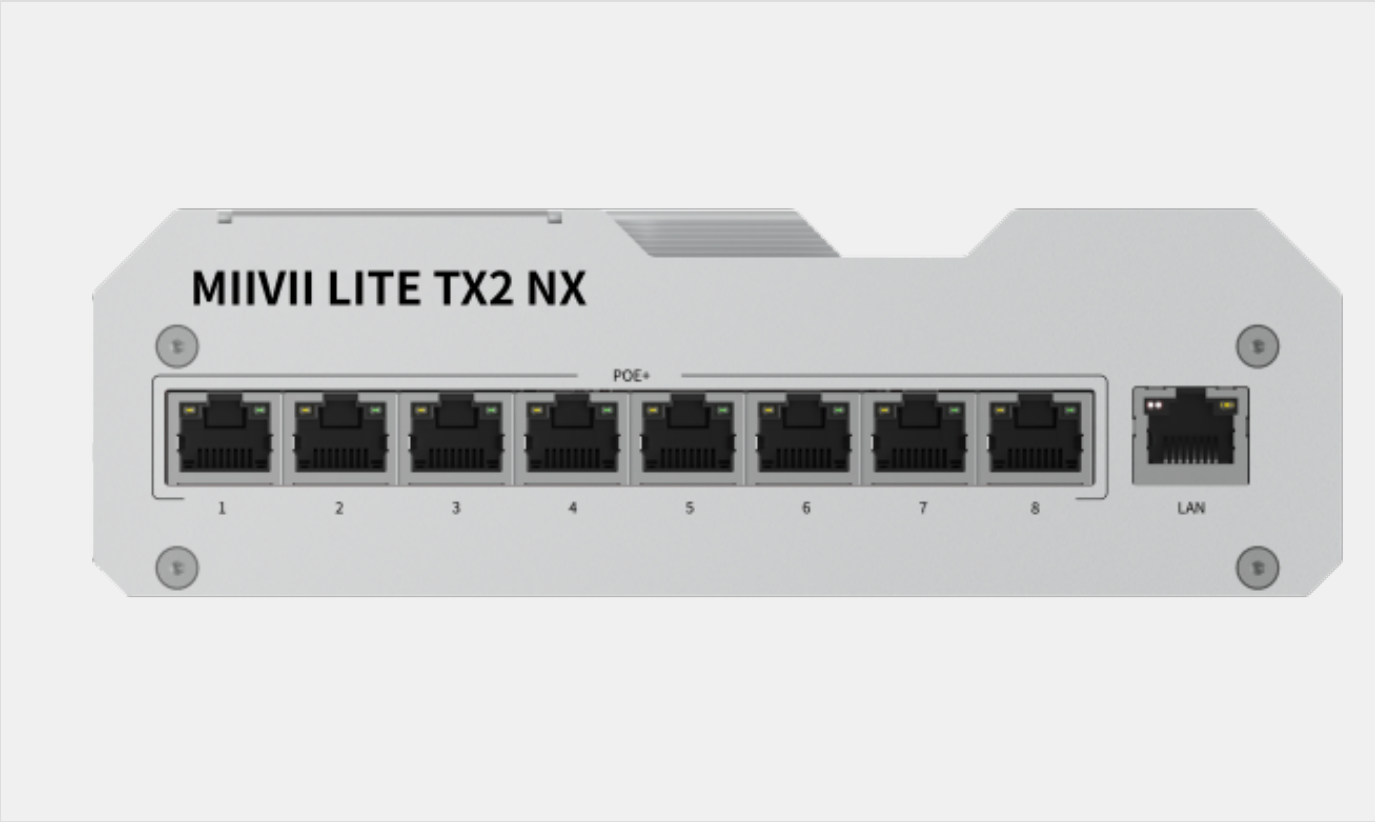


Figure Lite TX2 NX Front view

Interface	Name	Description
PoE+*1-PoE+*8	8×PoE+ 100M Port	8×PoE+ 100M Port with switch function, sharing gigabit bandwidth IEEE 802.3at PoE+ protocol single port maximum output 30W, maximum power 25.5W
LAN_1	1×Gigabit Port	Independent Gigabit Port

Back Panel

Figure Lite TX2 NX Back view

Interface	Name	Description
PWR1	Power interface 1	3Pin Terminal block，52V DC IN
PWR2	Power interface 2	Round socket，52V DC IN
PWR Led	Carrier board status indicator	White light: After power on, the power is normal, First light the white light and the red light flashes: the system start up is unsuccessful, and then the system is restarted. Red light is always on: the system starts up 3 times without success, and the system will not be restarted again. White light is always on: the system starts up normally. Yellow light: in the state of shutdown, the power is switched on
STATUS Led	System status indicator	Light off: the system has not been started Red light: the system is starting B lue light: the system is starting normally Yellow light: the system is in refresh mode
RECOVERY	Recovery Button	Inter Recovery mode while pressing
HDMI	HDMI	HDMI 2.0 TYPE A 5V 1A
USB	2×USB	1×USB 3.0 1×USB 2.0，Flashing Port 5V 1A
RS485_1	RS485 port 1	2.0VDC Min, 1mA Max

RS232_1	RS232 port 1	Logic1: -3V~-12V，Logic0: 3V~12V，1.6 mA Max

RS485 Pin Assignment

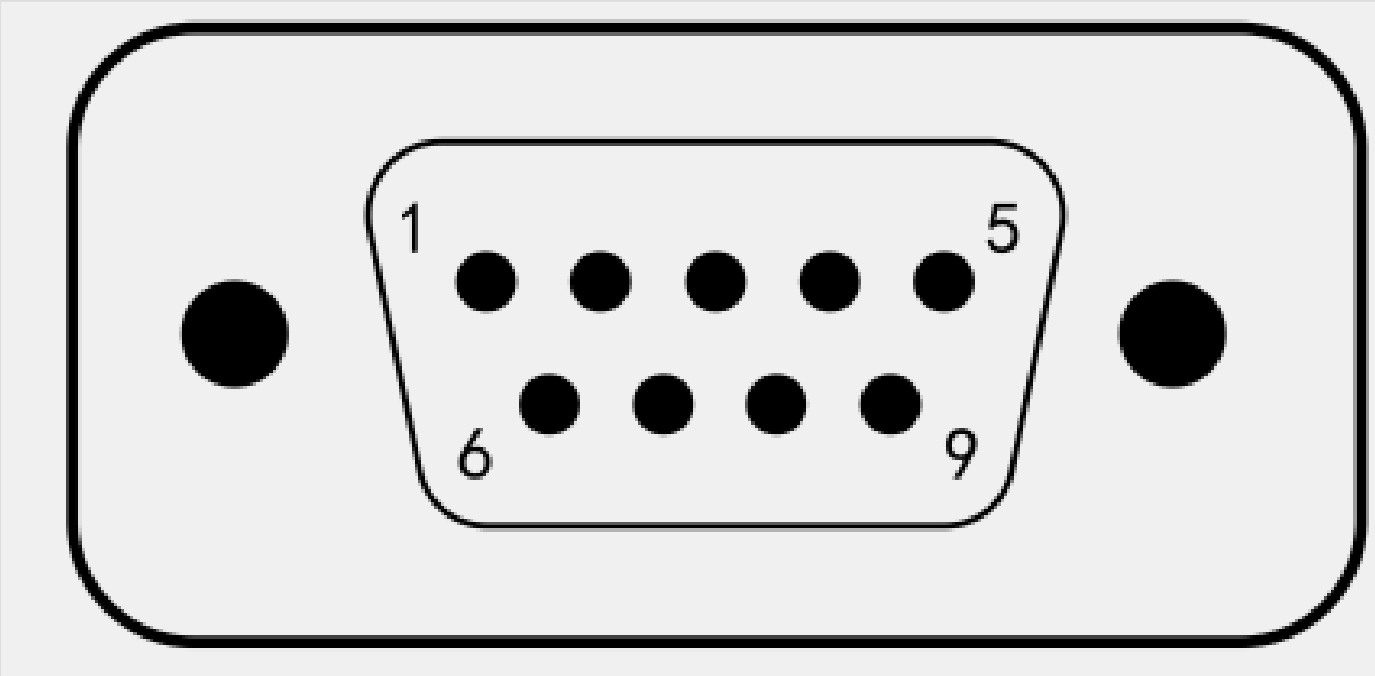


Figure RS485 Pin Assignment

RS232 Pin Assignment

Port Name	Pin	Signal	Description
RS485_1	1	NC	NC
	2	RS_485A	RS485_1 A
	3	RS_485B	RS485_1 B
	4	NC	NC
	5	GND	GND
	6-9	NC	NC

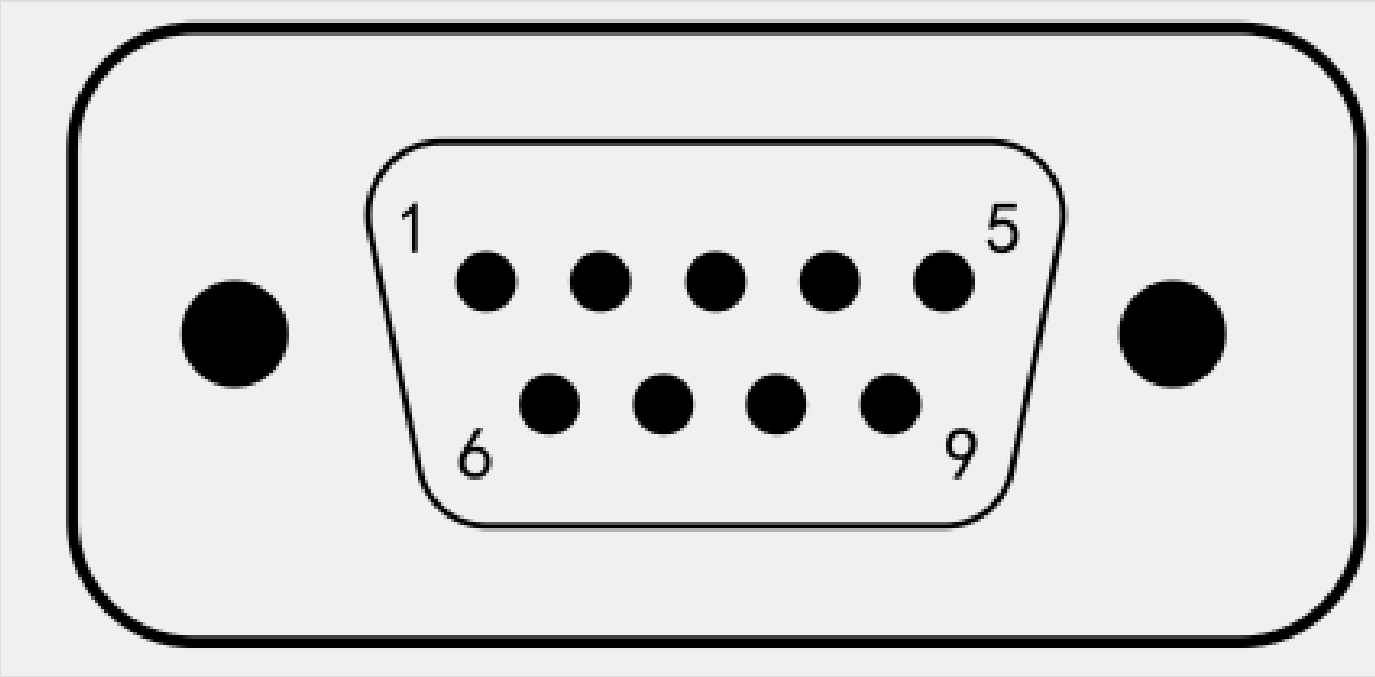


Figure RS232 Pin Assignment

Port Name	Pin	Signal	Description
RS232_1	1	NC	NC
	2	UART0_RXD	RS232_1 recieve
	3	UART0_TXD	RS232_1 transmit
	4	NC	NC
	5	GND	GND
	6-9	NC	NC

UART Port Device Node

Relation of UART Port and device node as follow:

UART Port Name	Device Node
RS232_1	ttyUART_232_1
RS485_1	ttyUART_485_1

Debug Port

The Debug Port(RS232) of Lite NX located on the PCBA, please refer to the folowing figure. PIN 8 RX, PIN 10 TX

Figure Debug Port

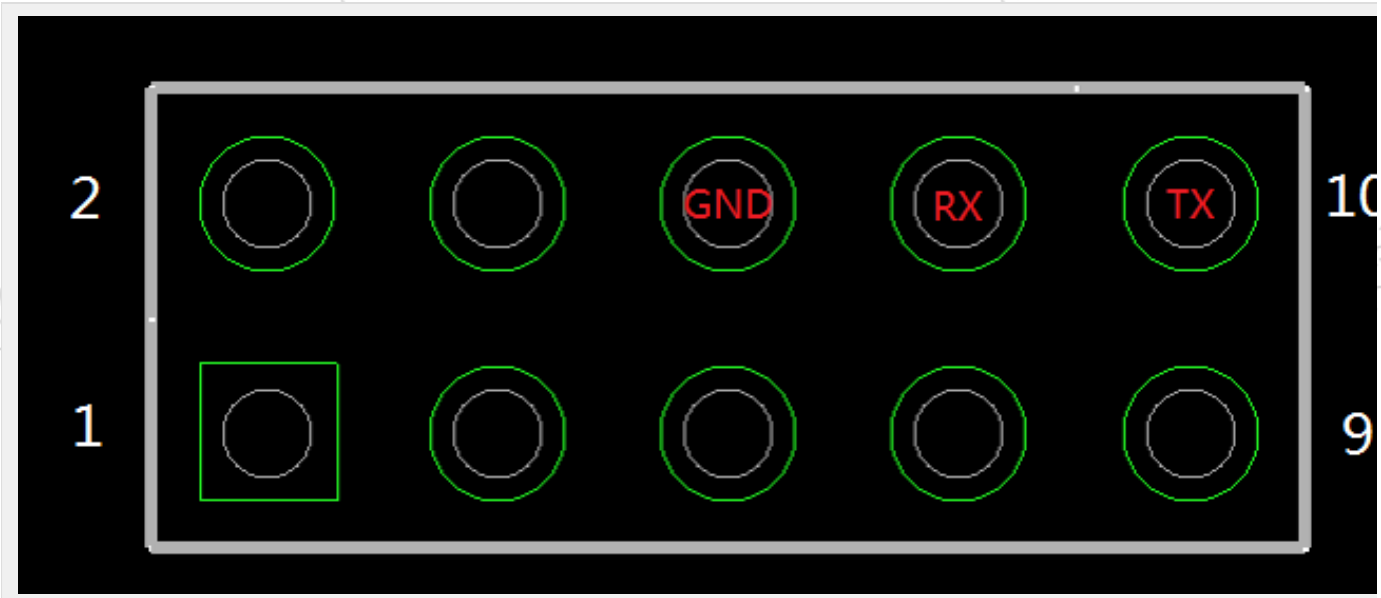


Figure Debug Port Signal

Expansion

Expansion device installation

Lite TX2 NX provides M.2 M Key, mini PCIe port for storage and communication expansion

Unscrew 8 screws and take off bottom cover of Lite TX2 NX while installation expansion device:

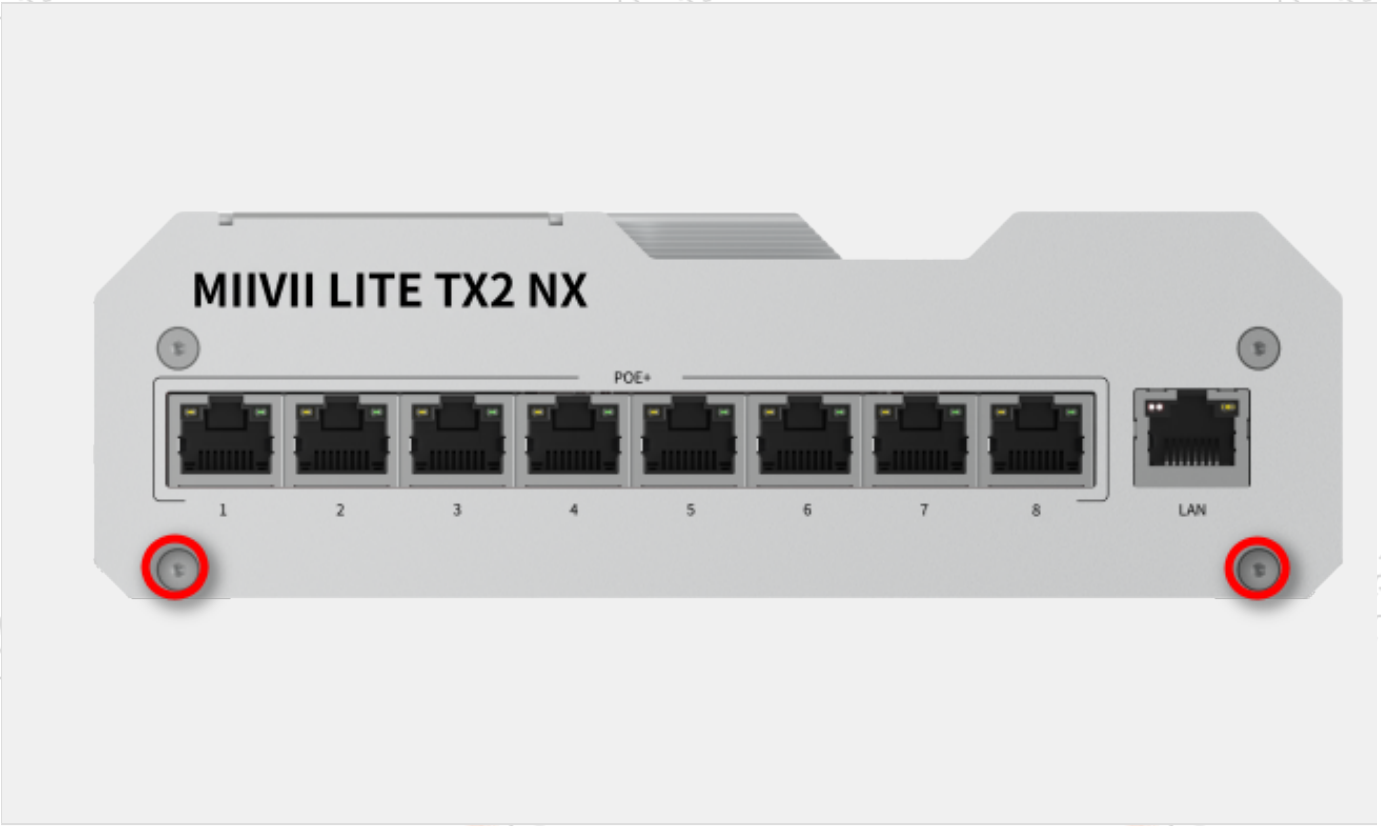


Figure Lite TX2 NX Screw Position1

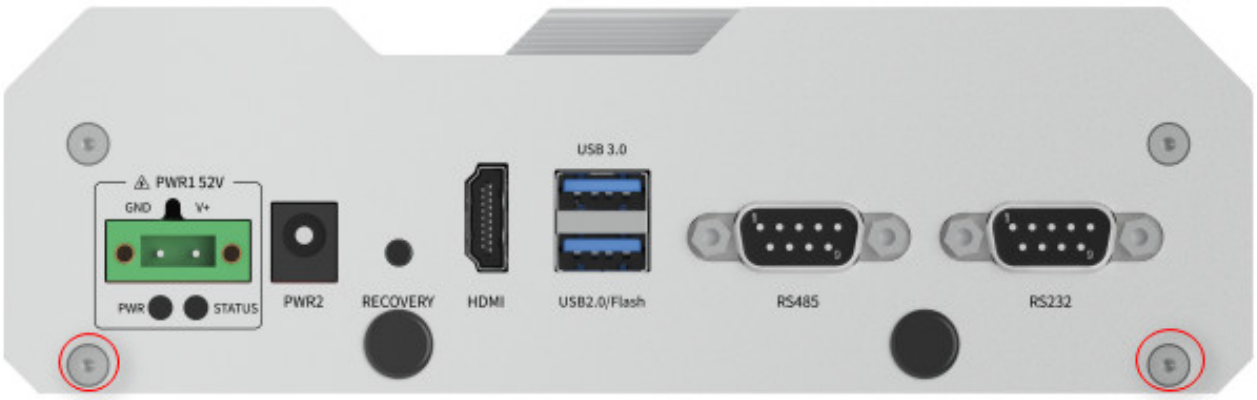


Figure Lite TX2 NX Screw Position2

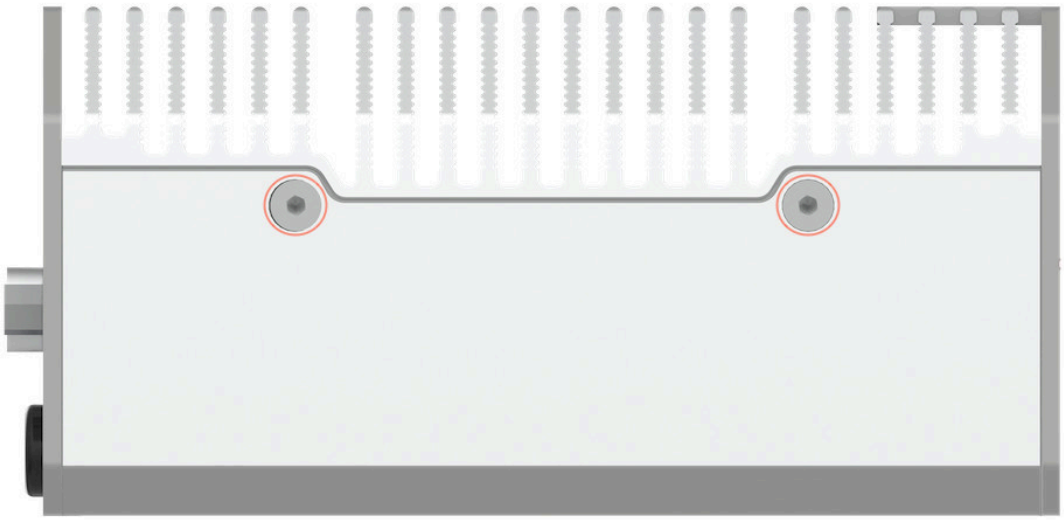


Figure Lite TX2 NX Screw Position3

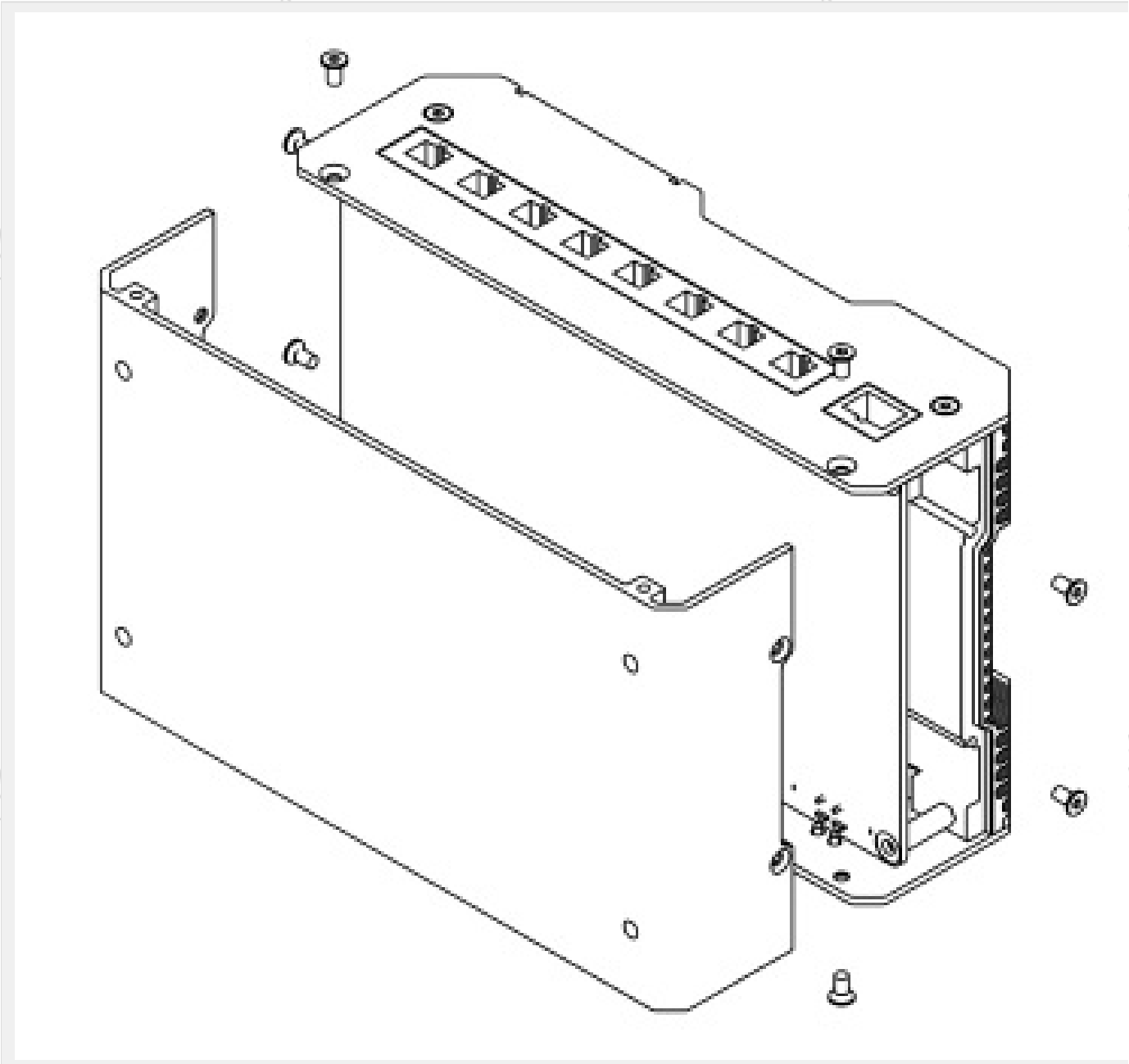


Figure Remove Bottom Cover

Expansion port position as follow:

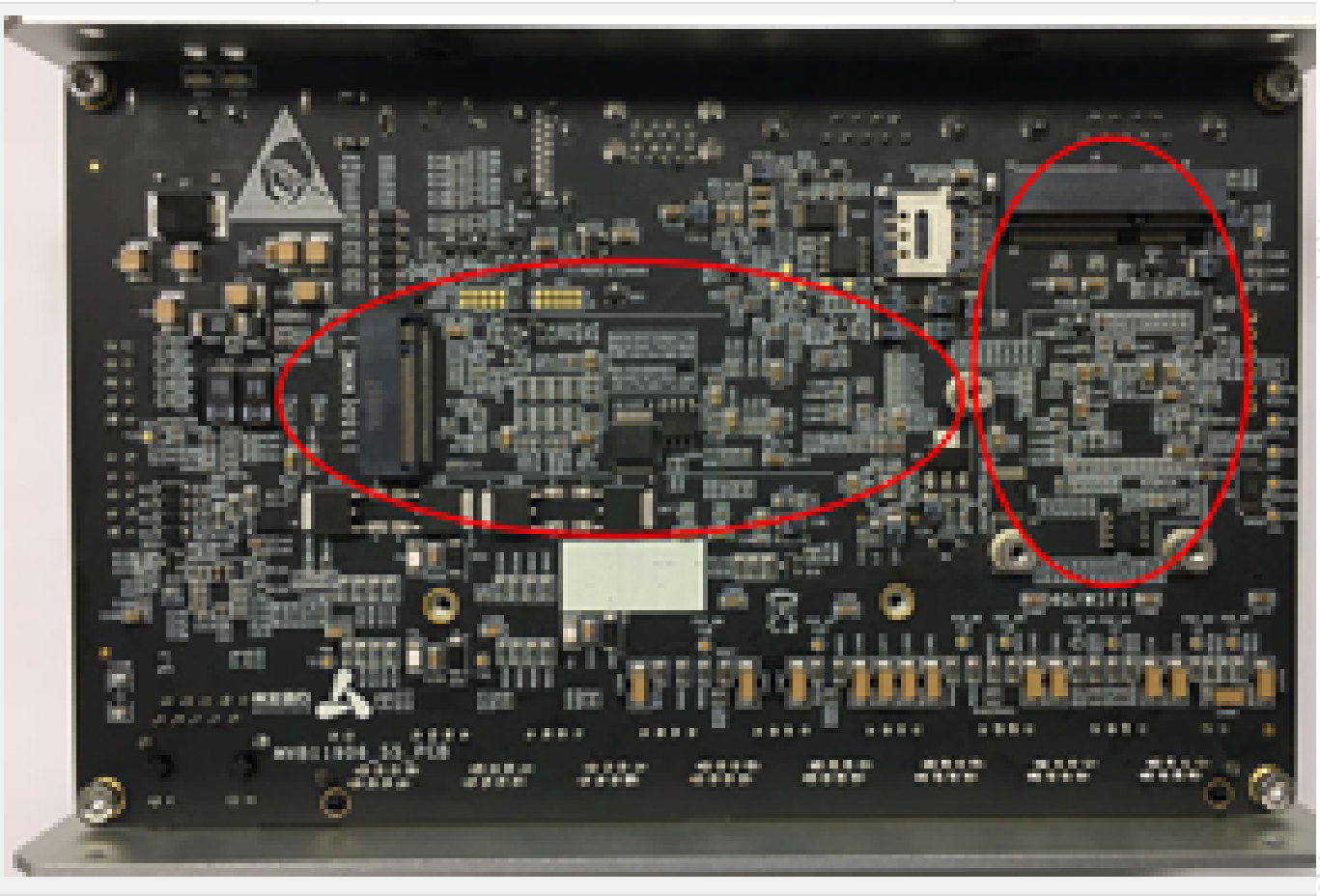


Figure Expansion Port Position

Install expansion device based on demand. Please note that if you need 4G module, insert nano SIM card into nano SIM socket before install 4G module.

Figure Moudle

Please install WiFi/4G antenna to ensure signal stability.

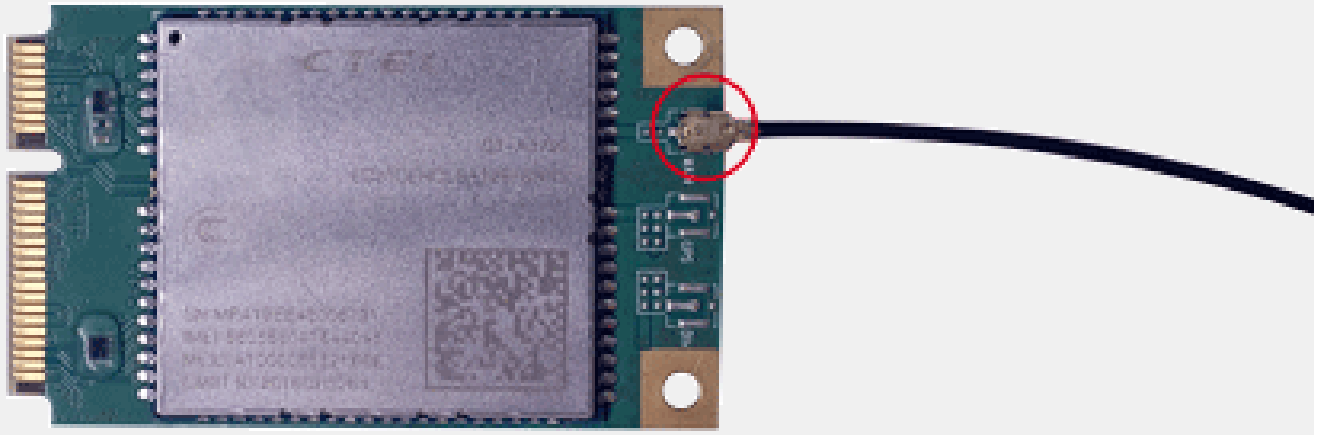


Figure Antenna Installation1

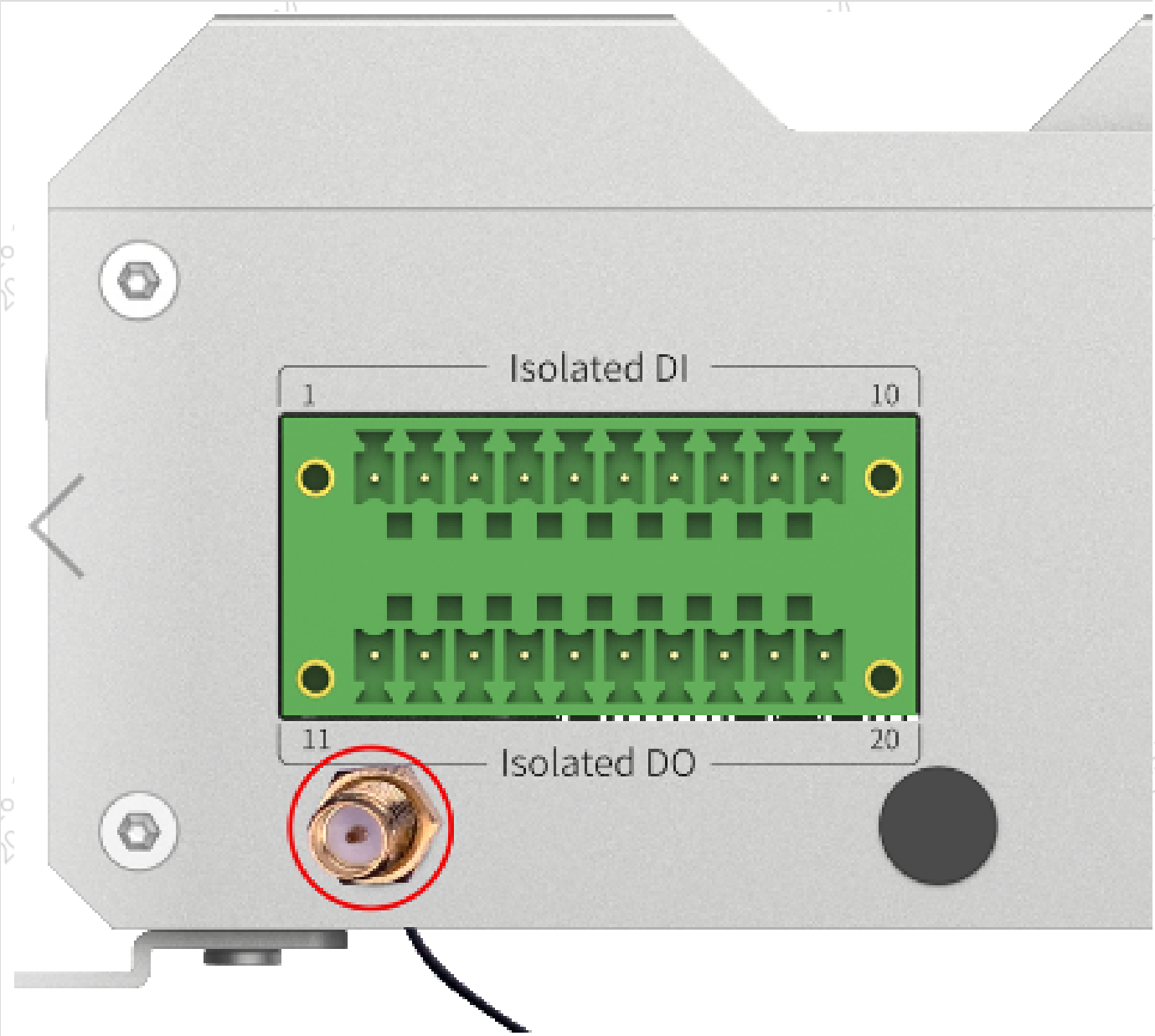


Figure Antenna Installation2

Please refer to the first step, and restore Lite TX2 NX after install expansion device.

Fixed Plate installation

Please install fixed plate first if you need to securing Lite TX2 NX on another system.

Figure Fixed Plate 1

Figure Fixed Plate 2

General Setting

General Setting

System

MiiVii device use Ubuntu system. Default username: nvidia default password: nvidia

System Image and Flashing Tool

Please visit MiiVii developer forum: http://forum.miivii.com/ for flash tool and system image.

Power on

Connect an external HDMI display to MiiVii's HDMI port.

Connect a USB keyboard and mouse.

Connect the included AC adapter to power socket. Plug AC adapter into an appropriately rated electrical outlet.

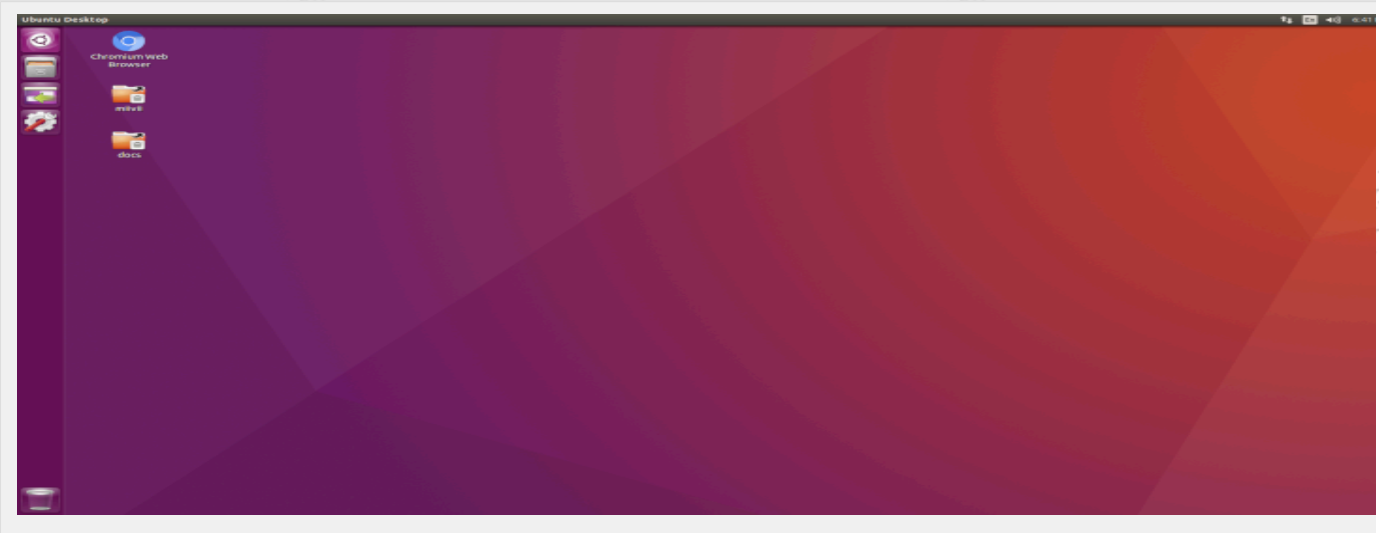


Figure Startup

Power off: Use the following command in terminal.

For MiiVii device with entity PWR button, you can also press and hold PWR button.

```
sudo poweroff
```

Reset: Use the following command in terminal.

For MiiVii device with entity RESET button, you can also press RESET button to reboot.

```
sudo reboot
```

MiiVii Setting

MiiVii Device provides a setting program called MiiVii Setting. You can get access to basic information and settings through MiiVii Setting. Click the icon on upper right corner。In addition, these settings can be set through code, please refer to the section after MiiVii Setting introduction.

Figure Version Info

You can set up GMSL camera here. MiiVii Device Apex has two groups of GMSL camera GMSL_A and GMSL_B, while MiiVii Device S2Pro has only one group GMSL_A.

Figure Set up GMSL Camera

You can set up Sync mode here:

Figure Set Synchronization Mode

Default setting is NTP mode. MiiVii Device accept NTP service while set to this mode.

MiiVii Device accept GPS synchronization while set to GPS mode.

MiiVii Device cannot be synchronized but can synchronize other sensors while set to None mode.

You can also set Sync out frequency here, please note it is not GMSL frequency.

Finish setting and exit

Figure Finish setting

You can also check software version through code

```
cat /etc/miivii_release
APEX 4.2.2-1.5.0
```

Set up GMSL Camera

When accessing GMSL camera for the first time and changing GMSL camera model, you need to change the configuration file and restart the device.Configuration file path：/opt/miivii/config/gmsl_camera/camera.cfg MVGCB-001A ： Entron MVGCB-002A： Calmcar MVGCB-003A：Adayo MVGCB-006A：Sensing The default configuration of GMSL_A and GMSL_B are both MVGCB-001A.

Set up synchronization Mode and Sync out frequency Synchronization Mode and Sync out frequency settings need to modify the configuration file and restart the device.Configuration file path：/opt/miivii/config/sync/sync.cfg Synchronization Mode is achieved by modifying the X value of "sync_type:X". 0：GPS mode 1：NTP mode 2：None mode Sync out frequency is achieved by modifying the XX value of "sync_out_freq:XX". Only integers are supported.\

```
cat /opt/miivii/config/sync/sync.cfg
sync_out_freq:25
sync_type:2
/*
note:
sync_out_freq---the frequency is 25 for sync out time
sync_type---0 is for GPS calibrate time
1 is for SYS calibrate time
2 can not calibrate time
```

Power Mode Setting

MiiVii device has several power modes. You can set up power mode through the green NVIDIA icon on the upper right corner.

Figure Power mode Icon

For MiiVii device equipped with NVIDIA Jetson Xavier NX, the following table shows details of each power mode . The default mode is 3: MODE 10W 2CORE.

Property	Mode				
	15W	15W	15W	10W *	10W
Power budget	15W	15W	15W	10W	10W
Mode ID	0	1	2	3	4
Online CPU	2	4	6	2	4
CPU maximal frequency (MHz)	1900	1400	1400	1500	1200
GPU TPC	3	3	3	3	3
GPU maximal frequency (MHz)	1100	1100	1100	800	800
DLA cores	2	2	2	2	2
DLA maximal frequency (MHz)	1100	1100	1100	900	900
PVA cores	1	1	1	1	1
PVA maximal frequency (MHz)	600	600	600	400	400
Memory maximal frequency (MHz)	1600	1600	1600	1600	1600

You can also set up through code:

```
#check current mode
sudo nvpmodel -q verbose
# set to a certain mode
sudo nvpmodel -m [MODE ID]
#achieve best performance of current mode
sudo jetson_clocks
#check more info
sudo jetson_clocks --show
```

IO

GPIO

Please change the code in <> to your GPIO export value

```
#switch to root
sudo su -
#set GPIO to high
echo 1 > /sys/class/gpio/<gpio339>/vlaue
#set GPIO to low
echo 0 > /sys/class/gpio/<gpio339>/vlaue
```

For auto config, write above commands to file `/etc/rc.local`.

Note: Description of GPIO external connection

DO is on/off output (on/off output is no output voltage, control output low voltage, pin grounding in normal time, control output high voltage, pin neither output high level nor low level, high resistance state.If the external pull-up resistor is connected, the voltage will be drawn to the power supply voltage of the pull-up resistor at the time of high output voltage.)

Set to high voltage, DO foot and external voltage are the same (0V~40V); Set to low level, DO feet for the ground.

UART

Open device node in /dev/. Then use stty command to set parameters. See stty command manual for details, please change the code in <> to your UART device node.

```
#config UART
$ sudo stty -F /dev/<ttyTHS1> speed 115200 cs8 -parenb -cstopb -echo
#send data through UART
$ sudo echo “miivii tty debug” > /dev/<ttyTHS1>
#receive data from UART
$ sudo cat /dev/<ttyTHS1>
```

Use GPS To Give Time To The Device

Advantages of GPS timing function: The device obtains local standard time signal from GPS satellite through GPS device, so as to accurately locate the device time

GPS Support Model

The serial port supports modifying baud rate. The default baud rate is 9600 GPS brand supported: all GPS devices that conform to GPRMC data standard format output and must have PPS second pulse output

Connection Mode

`Refer to the "Interface Description" in the manual.`

Timing Function Configuration

When the GPS is connected for the first time, the system configuration should be conducted in MiiVii Setting configuration software. Configure the Sync Mode option to GPS Mode and restart the system.Please refer to the section of "MiiVii Setting" for specific methods.

Check Whether The Timing Was Successful

Modify the system time, enter the command

```
sudo date -s "2018-10-1"
```

Wait for 2~3s, check the current time, and enter the command

```
data
```

If the display time is: "2018-10-1", it means the timing failed If the display time is: "current time", the timing is successful

Troubleshooting

If the timing fails, fault troubleshooting shall be carried out

1. Check If The GPS Has Output

Type the command

```
cat /dev/ttyTHS1
```

The terminal receives output with a GPRMC field, such as: GPRMC,014600.00,A,2237.496474,N,11356.089515,E,0.0,225.5,310518,2.3,W,A*23

2. Check The OUTPUT of THE GPS PPS Signal

Type the command

```
hexdump /dev/miivii-sync-in-a
```

The terminal has hexadecimal data output, such as: 0000400 02fe 9f40 490e 562d 1647 004e 0000 0000

3. Identify Methods

If the above "1"&"2" has no output, indicating that the GPS is not working properly, you can put the GPS out of the window or go outside for testing, or change the GPS for testing

If the output of "1"&"2" is normal, check whether the MiiVii Setting configuration is in GPS mode. If not, change the mode and restart it

After the above operation, GPS timing is still unsuccessful, enter the command

```
hexdump /dev/miivii-sync-out
```

The terminal has hexadecimal data output, such as: 0000400 02fe 9f40 490e 562d 1647 004e 0000 0000

If there is no data output, it may be that there is no matching brush tool and mirror brush. It is recommended to check the mirror and the brush tool to re-brush

If there is data output, it may be a hardware problem,it is recommended to contact after-sales maintenance treatment

CAN

Please check cansend.c and candump.c from https://github.com/linux-can/can-utils for instructions.

Test command:

```
sudo modprobe can
sudo modprobe can_raw
sudo modprobe mttcan
sudo ip link set can0 type can bitrate 500000 berr-reporting on loopback
off
sudo ip link set up can0
sudo cansend can0 123#abcdabcd
sudo candump can0
sudo ip -details -statistics link show can0
sudo ifconfig can0 down
```

CAN fd:

```
sudo modprobe can
sudo modprobe can_raw
sudo modprobe mttcan
sudo ip link set can0 type can bitrate 500000 dbitrate 2000000 berr-
reporting on fd on
sudo ip link set up can0
sudo cansend can0 213##011
```

Expansion Setting

SSD Setting

```
#check ssd information:
```

```
sudo fdisk -lu
```

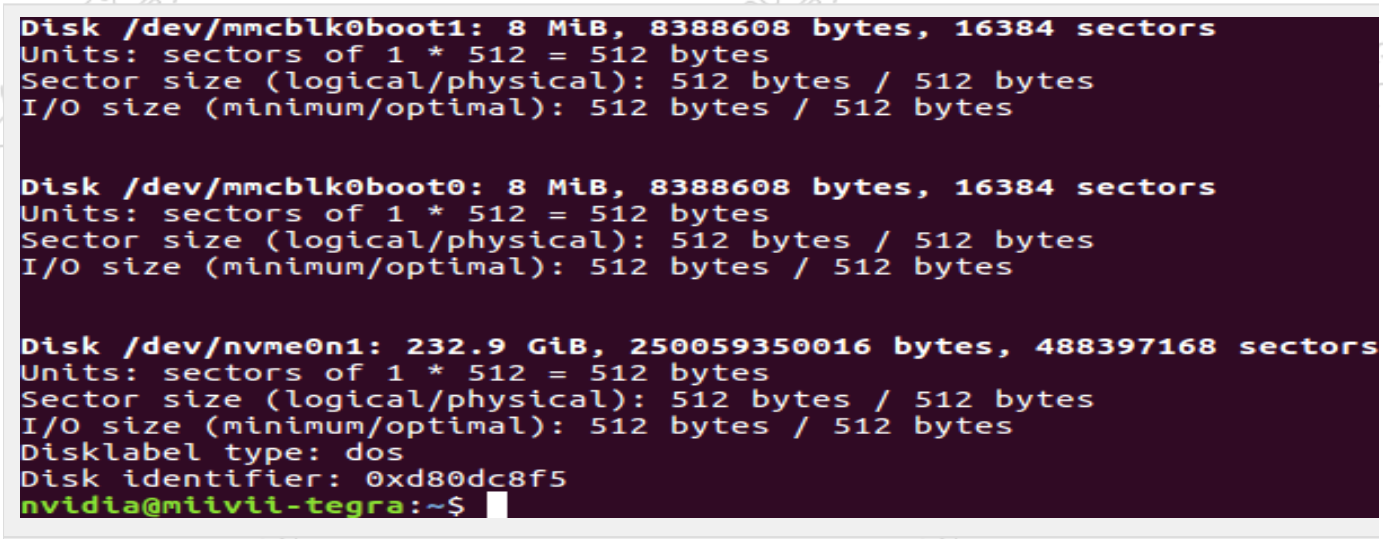


Figure SSD Information

#Format SSD:

```
sudo mkfs -t ext4 /dev/nvme0n1
```

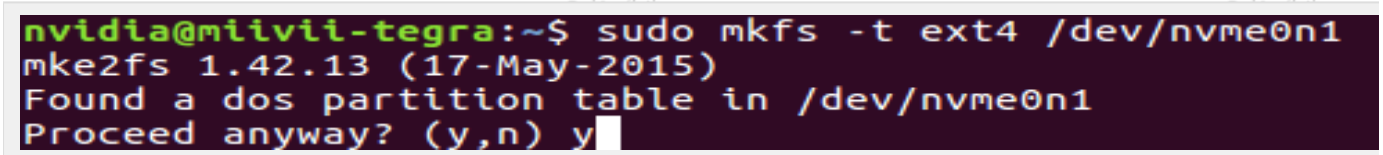


Figure Formatting SSD

#Check UUID:

```
sudo blkid /dev/nvme0n1
```

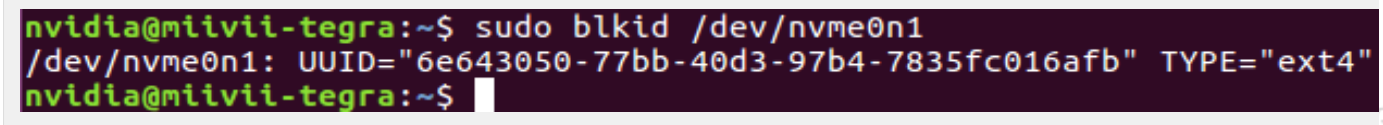


Figure SSD UUID

Setting method of automatic mounting SSD: Create a systemd service in the /etc/systemd/system path to automatically mount the SSD when booting, such as: miivii_mount_ssd.service

```
#Create miivii_mount_ssd.service
vim miivii_mount_ssd.service
[Unit]
Description=MIIVII specific script
After=udev.service

[Service]
ExecStart=/etc/systemd/miivii_mount_ssd.sh

[Install]
WantedBy=multi-user.target
```

Create a script in the /etc/systemd/ path to mount the SSD, such as: miivii_mount_ssd.sh

```
#Create miivii_mount_ssd.sh
vim miivii_mount_ssd.sh
#!/bin/bash
mount -o rw /dev/nvme0n1 /home/nvidia/workspace
```

change mode for this script

```
sudo chmod +x miivii_mount_ssd.sh
```

Set the mounted SSD service to start at boot

```
sudo systemctl enable miivii_mount_ssd.service
```

Wireless Setting

WiFi Setting

MiiVii S2, S2Pro and EVO TX2， EVO TX2 GMSL2 has WiFi function.While Apex Xavier MiiVii EVO Xavier, Lite NX and Lite Nano provides WiFi function via a expansion module. Please refer to the information in [Expansion] to intall WiFi module. Click the network icon in upper-right corner of the desktop. Find the name of your WiFi network and click on it. Enter your password and click 'Connect'.

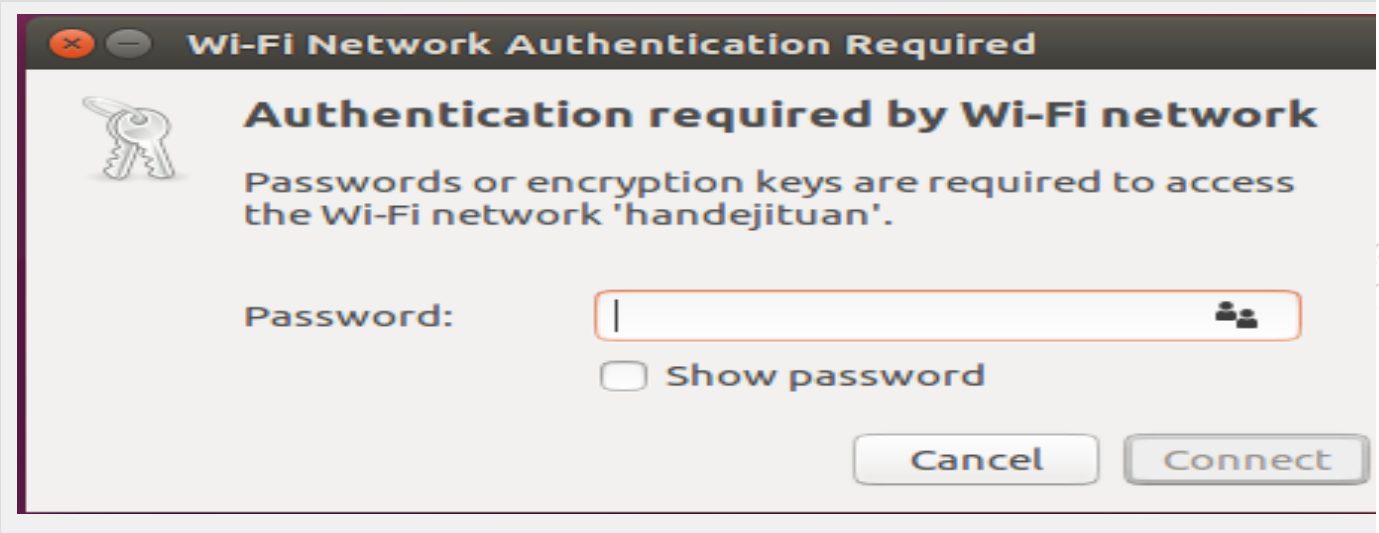


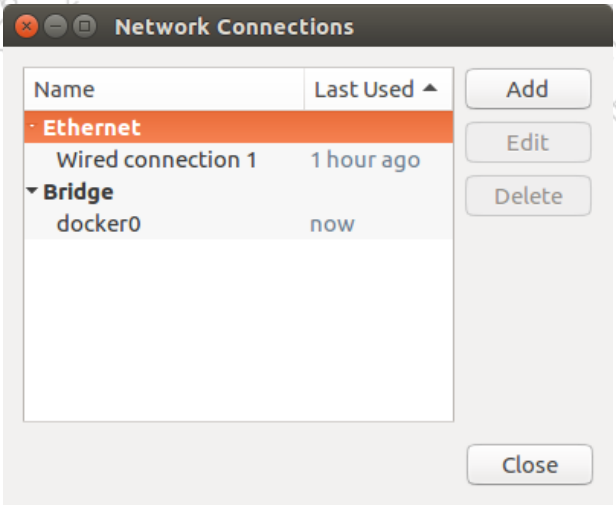
Figure WiFi Connection

4G Setting

4G module is not included in MiiVii device package. Please refer to the information in [Expansion] to intall 4G module. Instructions for 4G module configuration are shown as below, using QUECTEL EM05 as an example. EM05 4G driver is included in MiiVii system. This SIM card could be detected automatically. There should be 4 devices under /dev/ttyUSB0~/dev/ttyUSB3.

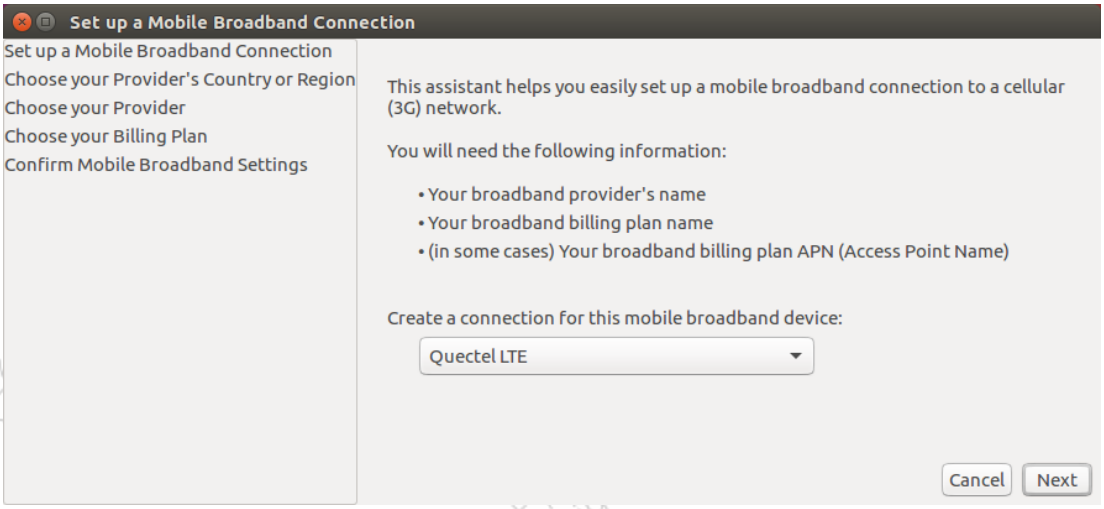
Users need to choose their own 4G LTE SIM card(note that mobile phone sim card and IOT sim card is supported, but IOT sim card is hardware-binding, please consult your carrier for more information). Before getting started, please insert SIM card into sim socket.

Click the network icon in upper-right corner of the desktop. Find 'Edit Connections', then click 'add'.

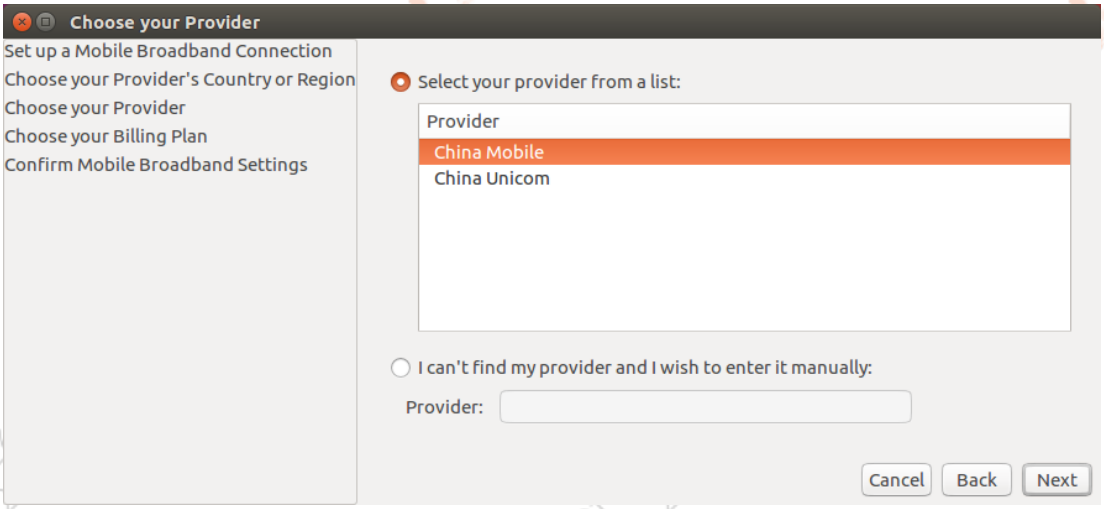


Change connection type to 'Mobile Broadband'

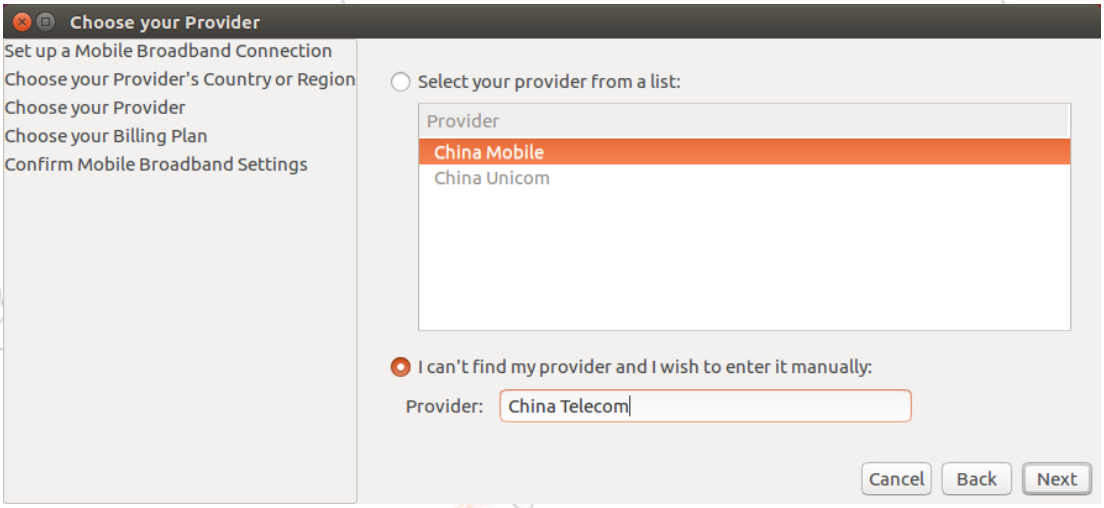
Next



Change country to 'China'. Then choose network provider.



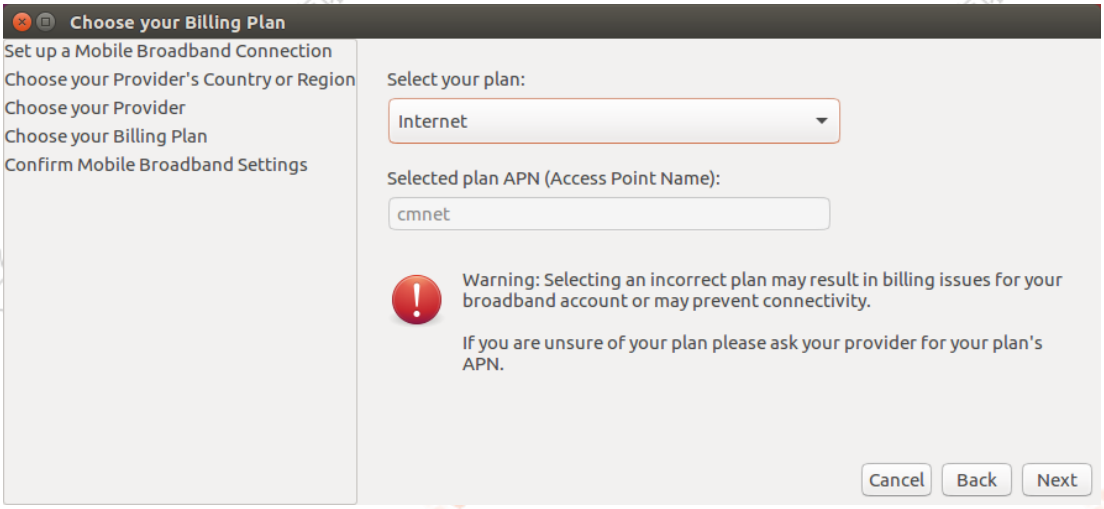
If your network provider is not included in the list, then enter it manually.



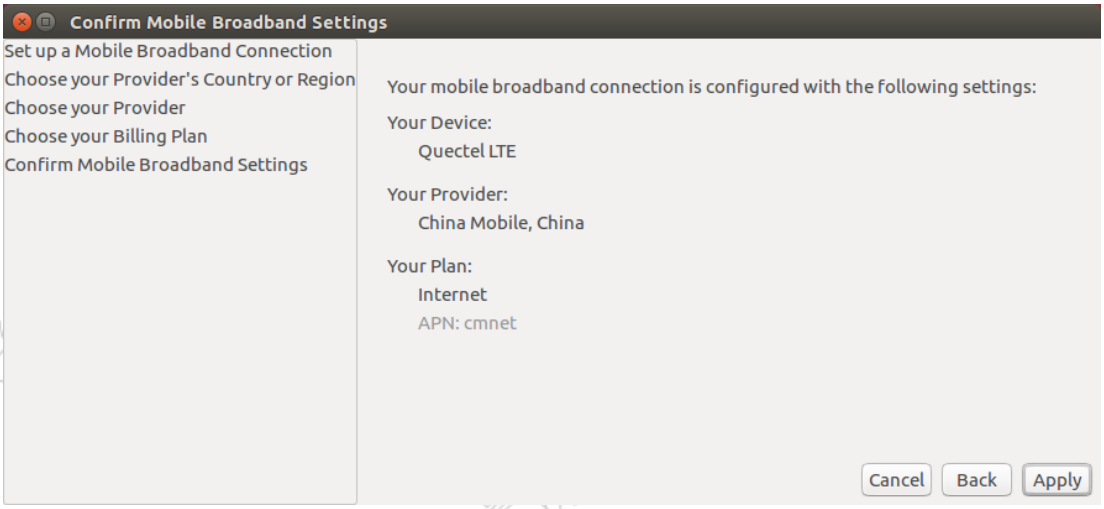
Choose your Plan

China Mobile choose 'Internet', China Unicom and China Telecom choose default

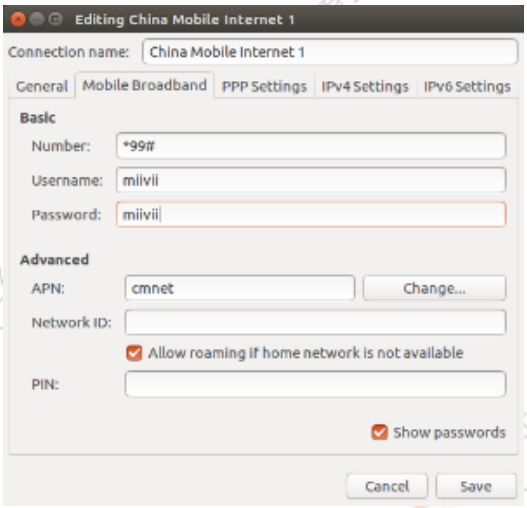
APN settings: China Mobile: cmnet; China Unicom: 3gnet; China Telecom: ctnet



Check entire settings, then click 'Apply'



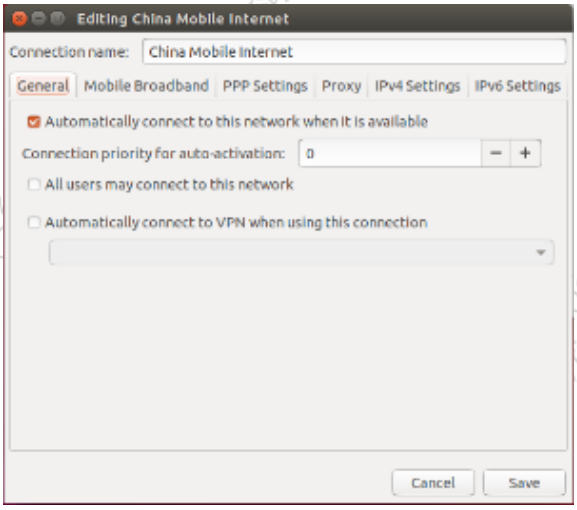
Enter username and password, click 'save'



Click the network icon in upper-right corner of the desktop. Then connect to your network. If you need auto connection, please edit Network connections:

Select 'General', then check 'Automatically connect to this network when it is available'

Reset MiiVii device, you can automatically connect to 4G network



Demo and application

MiiVii offers several demo code:

Algorithm: MiiVii device offers human, vehicle, bicycle detection. Please refer to /opt/miivii/features/algorithm

Acceleration SDK: MiiVii device provides acceleration SDK based on Yolo v3. Please refer to /opt/miivii/features/miivii-accelerator

ROS demo: MiiVii device offers ROS DEMO. Please refer to /opt/miivii/ros_demo

Among them, miivii_msgs is the message rule of ROS. miivii_gmsl is the ROS node of GMSL camer. miivii_detector is the ROS node of object detection.

Besides, MiiVii also open source part of our code in Github. Please visit https://github.com/MiiViiDynamics for more information.

Appendix

Exception Handling

If bug occurs to you while developing, please check DEBUG log first:

Step 1: Find the position of DEBUG port in 'Interfaces'

Step 2: Connect DEBUG port with a PC using a UART-USB cable[1]

Step 3: Download Serial debugging tool in the PC, set Baud to 115200

Step 4: Check DEBUG log

[1]: According to the information in 'Interfaces', select the RS232-USB cable or TTL-USB cable。

Images Burning

1.Function Introduction

Miivii burning tool, suitable for Miivii series products.The tool has two main functions: burn images and clone images. You can burn the official image of Miivii power for Miivii devices using an X86 architecture PC as the burn host. After developing a Miivii device for some time, you can save your progress by cloning an existing device images and burning it to other Miiivii devices.

2.Prepare Software And Hardware

2.1. Burn The Host Ready

It is necessary to connect the writing host to the Miivii device to burn the images. The recommended figuration of the write host is as follows:

- CPU uses Intel core series processors with X86 architecture
- Memory 8GB DDR3 and above
- Spare hard disk capacity 40G and above
- The system is Ubuntu Linux X64 v16.04 or V18.04

2.2. Prepare Miivii Burn Tools And Miivii Device Images

- Low for a link: https://en.miivii.com/index.php?s=index/category/index&id=119
- Download the Miivii burn tool
- Download the Miivii device image and the image MD5 value
- Store the above files in the same path as the burn host
- Supports simultaneous burning of multiple identical devices, but does not support simultaneous burning of multiple different devices

Note: The file storage path cannot contain Chinese characters or special characters

2.3. Prepare The Hardware

- Miivii equipment and power, USB data cable

3. The Operation

3.1 Hardware Connection

● Connect the writing port of Miivii device to the writing host through USB data cable

3.2 Use of Software

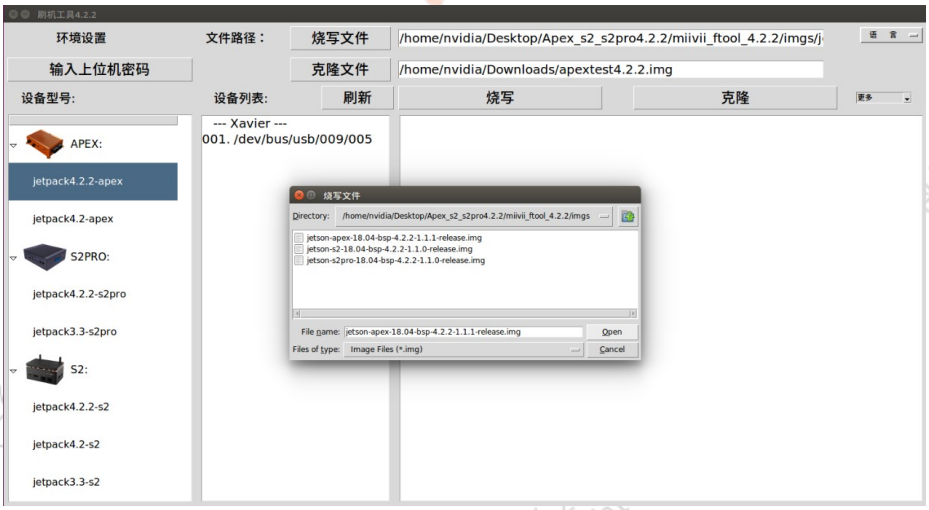
3.2.1. Images Burn

● Copy the images and MD5 values to the imGS folder of the burn tool

● Go to the bin folder of the burn tool and open the Burn tool "MVflasher"

● Click [Enter upper computer password] button, ***enter the current burning host boot password***

● In the device model on the right, select the device you want to burn and the Images version. Click the "Burn file" button to select the specific image for burn



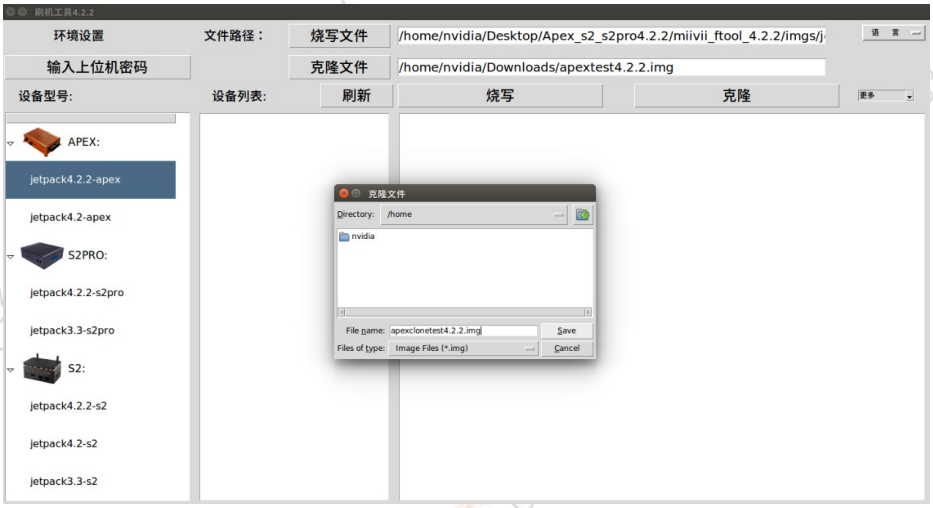
● Click the "burn" button to enter the burn process:

- Images burning usually takes more than 15 minutes to complete. Please be patient:

3.2.2. Images Clone

- Enter the FORCE_Recovery mode of the Miivii device to be cloned according to method 3.1, and open the burn tool
- Click [Enter upper computer password] button,***enter the current burning host boot password***
- Click the "Clone file" button to modify the path and name of the clone file saved in the write host :

Note: The file storage path cannot contain Chinese characters or special characters



● Click the "clone" button to enter the cloning process, as shown in the figure:

● Images cloning usually takes more than 30 minutes to complete:

● Cloning completed, will generate a clone image and MD5 file, please burn again according to step 3.2.1 operation

Note: if you encounter problems in the cloning process, please contact Miivii power for help:

helpdesk@miivii.com

Attached 1. Kernel and DTB burn

Miivii device burn tool can burn system kernel and DTB separately, click [more] in the upper right corner to choose.

Note: before you do this in meters, power after confirmation: helpdesk@miivii.com

Attached 2. Self-test For Burning Problems

If you encounter burning problem, please first conduct self-test according to the following items:

- Check whether the upper computer boot password is entered in the upper left corner of the burn tool
- Check whether to enter the Recovery mode, can be identified by the lsusb command
- Check whether Micro USB cable quality is up to standard and whether it is only a dual-core cable used for charging
- Check upper computer, whether it is x86-64 architecture desktop, notebook.(Server, embedded device, virtual machine and other devices are not supported temporarily)
- Check whether the upper computer system is Linux 1604 /1804
- Check the disk format, the recommended disk format for burning hosts is EXT4
- Check whether the upper computer capacity is enough
- The Images and burn tool storage path cannot have Chinese or other special characters