

# **Venus Industrial Computer**

## **User Manual**

**Model: Venus 20-US-4G-PCIE-M2**

## User Manual

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## Chapter I Product Version List

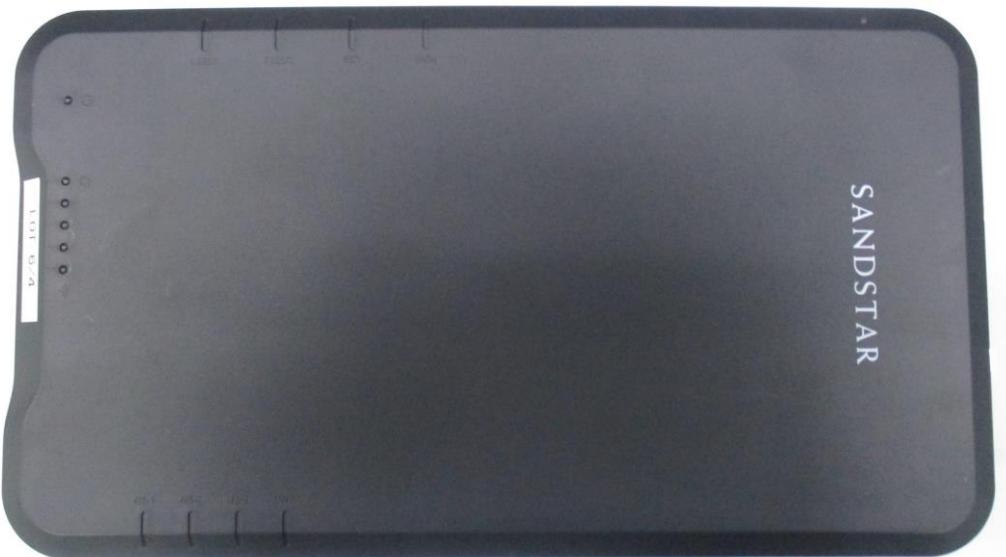
This chapter records all previous version changes.

imprint			
Product version	V1.0	2020.12	Used for the first batch of formal 20 sets of production.
MCU version	R1.0	2020.11	
NX version	R1.0	2020.11	
4G module version	BVE12 Ee_WUS		Xinke domestic version
Shell version	V3.0	/	3D printing

imprint			
Product version	V2.0	2021.1	Used for the second batch of formal production of 180 sets.
MCU version	R1.0	2020.11	
NX version	R1.0	2020.11	
4G module version	BVE12 Ee_WUS		Xinke domestic version
Shell version	V4.0	/	Screen printing content is only SANDSTAR, and S and Shida Chinese characters are cancelled.

## Chapter II Product Appearance Description

### 2.1 Top view of product



### 2.2 Bottom view of product



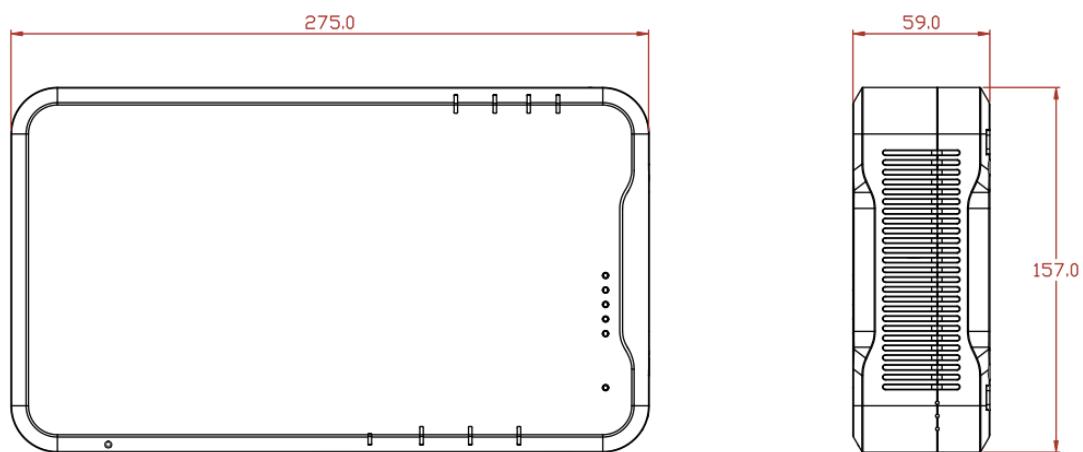
## 2.3 Product Front View



## 2.4 Rear View of Product



## 2.5 Three-Dimensional Product Ruler (Unit | mm)



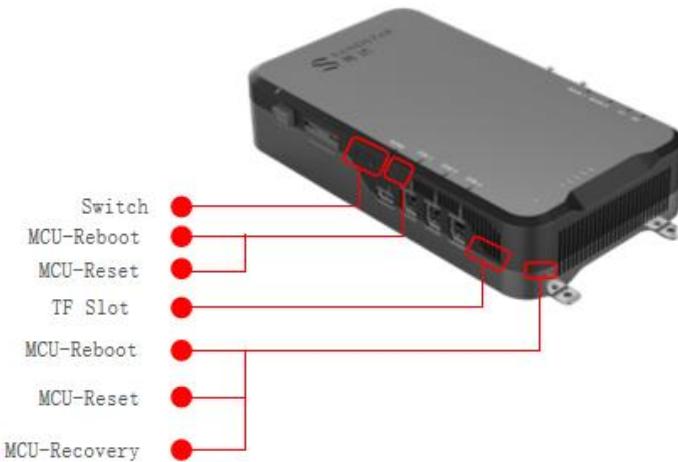
## 2.6 Internal product description



The parts are as follows:

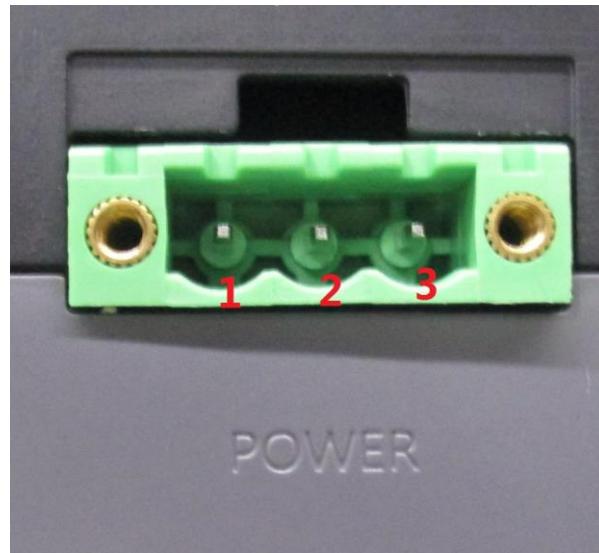
1. MCU control board
2. NX control board
3. NX core board with fan
4. 4G module

## 2.7 Description of Product Keys and Indicator Lights



## Chapter III Interface Description

### 3.1 Power Supply



Interface name	Pin serial number	Interface definition	Interface description
POWER	1	12V_MAIN	PWR
	2	GND	GND
	3	PGND	PGND

### 3.2 MFP



Interface name	Pin serial number	Interface definition	Interface description
MFP	1	12V	3A, controllable 12V
	2	GND	land
	3	5V	3A, controllable 5V
	4	GND	land
	5	GPIO1	5V level
	6	GPIO2	5V level
	7	GPIO3	5V level
	8	GPIO4	5V level
	9	12V	1.5A peak,12V controllable
	10	GND	land
	11	LOCK3_TRI	12V level, dip switch can select high and low trigger.
	12	DOOR3_DTEC	Gate state detection pin
	13	DOOR3_LOCK	Lock state detection pin
	14	COM3	land
	15	12V	1A
	16	RED1_CTL	Driving RGB decorative lamp cathode
	17	GREEN1_CTL	Driving RGB decorative lamp cathode
	18	BLUE1_CTL	Driving RGB decorative lamp cathode
	19	12V	1A
	20	RED2_CTL	Driving RGB decorative lamp cathode
	21	GREEN2_CTL	Driving RGB decorative lamp cathode
	22	BLUE2_CTL	Driving RGB decorative lamp cathode
	23	12V	LED lamp power supply, max 30W
	24	PWM2_CTL	PWM control LED negative terminal
	25	GND	land
	26	GND	land
	27	MCU_SWDIO	I/o pin data line
	28	RS232_TX_DEBUG_CON	DEBUG
	29	MCU_SWCLK	Clock pin clock line
	30	RS232_RX_DEBUG_CON	DEBUG

### 3.3 RELAY



Interface name	Pin serial number	Interface definition	Interface description
Relay1	1	SW1_1	1-2 normally open
	2	SW1_2	2-3 normally closed
	3	SW1_3	2-3 normally closed
Relay2	1	SW2_1	1-2 normally open
	2	SW2_2	2-3 normally closed
	3	SW2_3	2-3 normally closed

### 3.4 RS485



Interface name	Pin serial number	Interface definition	Interface description
485(12V)@MCU	1	12V_RS485	4A
	2	GND	land
	3	A/TX+/RX+	I/O
	4	B/TX-/RX-	I/O
485(5V)@MCU	1	5V_RS485	4A

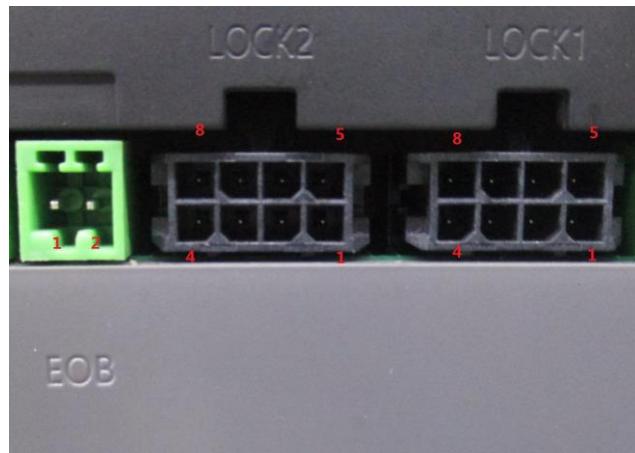
	2	GND	land
	3	A/TX+/RX+	I/O
	4	B/TX-/RX-	I/O
485-1@NX	1	5V_RS485	4A
	2	GND	land
	3	A/TX+/RX+	The terminal can be twisted.
	4	B/TX-/RX-	
485-2@NX	1	12V_RS485	4A
	2	GND	land
	3	A/TX+/RX+	The terminal can be twisted.
	4	B/TX-/RX-	

Remarks:

In the current software protocol, 485-1 of MCU corresponds to 12v of hardware and 485-2 corresponds to 5V of hardware.

Need to communicate with customers in the later period, named 485-1 to 485-4.

### 3.5 LOCK、EOB



Interface name	Pin serial number	Interface definition	Interface description
L1	1	COM1	COM
	2	COM1	COM
	3	NC	NC
	4	GND	GND
	5	DOOR1_DTEC	switching value
	6	DOOR1_LOCK	switching value
	7	LOCK1_TRI	12V level, dip switch can select high and low trigger.
	8	12V	1.5A peak,12V controllable

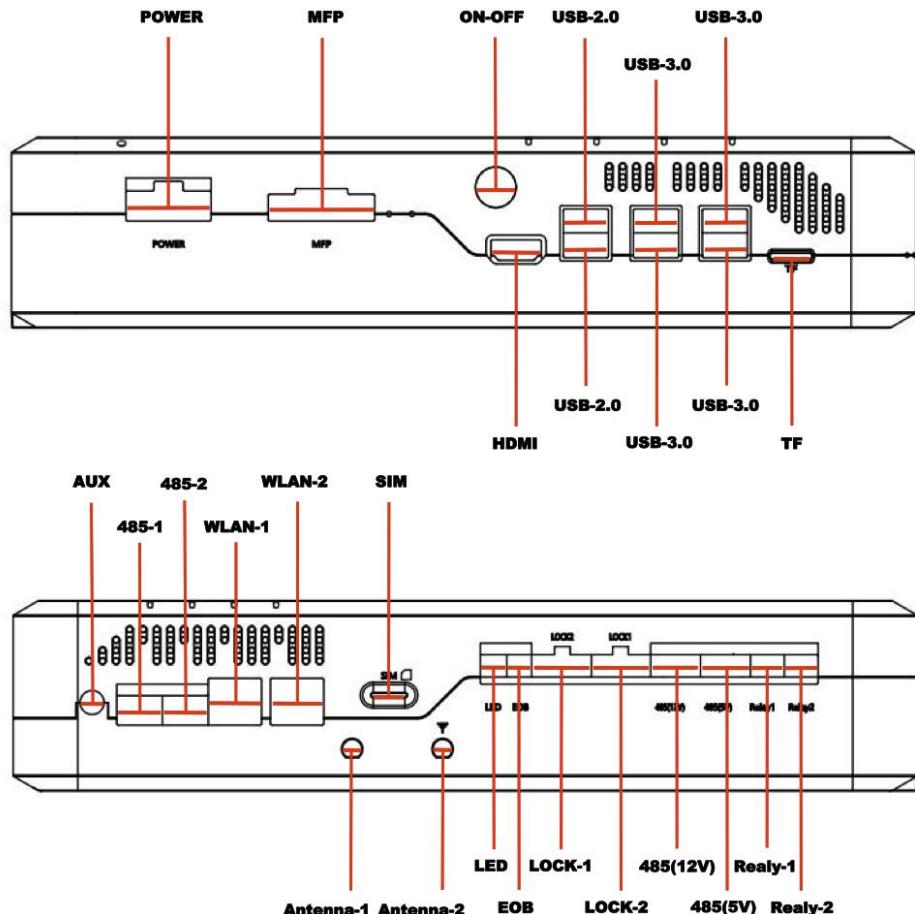
<b>L2</b>	1	COM2	COM
	2	COM2	COM
	3	NC	NC
	4	GND	GND
	5	DOOR2_DTEC	switching value
	6	DOOR2_LOCK	switching value
	7	LOCK2_TRI	12V level, dip switch can select high and low trigger.
	8	12V	1.5A peak,12V controllable
<b>EOB</b>	1	LOCK_CTL#	Emergency button to open 3 locks.
	2	GND	land

### 3.6 LED



Interface name	Pin serial number	Interface definition	Interface description
LED	1	12V	LED positive terminal, 30W
	2	PWM1_CTL	PWM control LED negative terminal

### 3.7 Product External Interface Description



## Chapter IV Function Declaration

### 4.1 System Information

1.1.1 boot into the terminal and enter the command: `cat /proc/version` to check the current system software version.

```
sandstar@sandstar-desktop:~$ cat /proc/version
Linux version 4.9.140-tegra (tztek@build) #2 SMP PREEMPT Mon Dec 7 14:01:53 CST
2020 tztek_version:v1.0.0_T20I_751_release
sandstar@sandstar-desktop:~$ dmesg | grep DTB
[    0.477803] DTB Build time: Dec 7 2020 14:01:45
[    0.758298] DTB Build time: Dec 7 2020 14:01:45
```

The 1-1-1

1.1.2 check the local SN number.

Enter the command: `cat /sys/firmware/devicetree/base/serial-number`

```
sandstar@sandstar-desktop:~$ cat /sys/firmware/devicetree/base/serial-number
1422220027040 sandstar@sandstar-desktop:~$
```

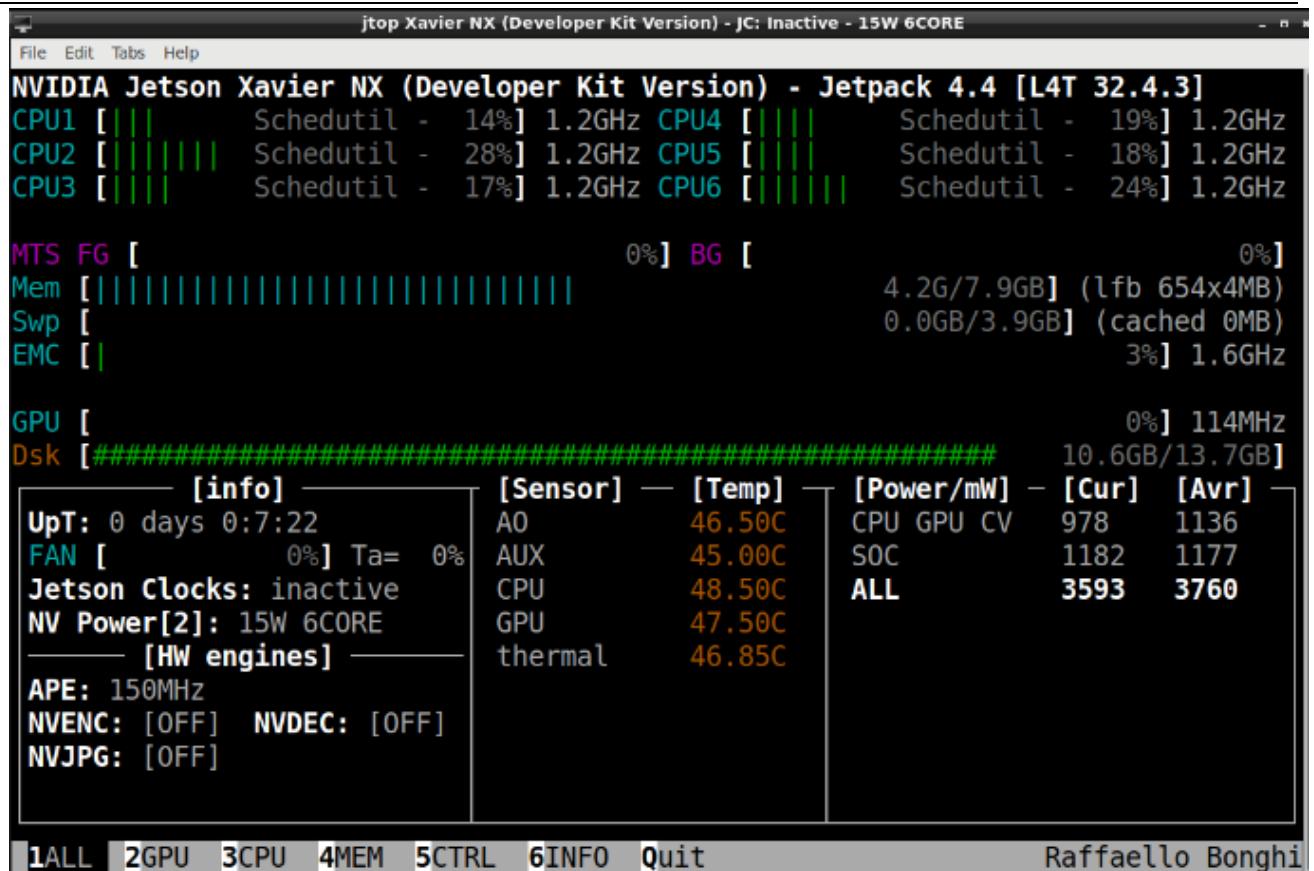
The 1-1-2

## 4.2 System State

Provide the system status check command to check the load information of the current system. The command description is shown in the following table:

order	instruction	Test content
system state	<a href="#">jtop</a>	Current operating frequency and maximum frequency of each CPU core
		GPU current usage rate
		Main board temperature
		CPU temperature

The execution results are shown in the following figure:



The 1-2-1

### 4.3 4G Network

Hardware supports 4G network, uses SINOCK 4G routing module, and supports 4G network services of China Mobile, China Unicom and China Telecom.

Please insert the 4G card before using the 4G network. Check eth0 IP address through ifconfig command after normal power-on:

```
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.150.100 netmask 255.255.255.0 broadcast 192.168.150.255
      inet6 fe80::3989:3df6:e155:a6ca prefixlen 64 scopeid 0x20<link>
        ether 48:b0:2d:07:69:aa txqueuelen 1000 (Ethernet)
          RX packets 1076 bytes 190830 (190.8 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 1922 bytes 197518 (197.5 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
          device interrupt 37
```

The 1-3-1

Note: Under normal circumstances, eth0 gets the IP address of 192.168.150.100 assigned by 4G routing module.

Note: plugging and unplugging the 4G card after power-on, you need to power up again before you can use 4G to access the Internet.

## 4.4 Wired Network Configuration Method

Hardware supports access to external wired networks. If the 4G network needs to be turned off, the following methods are provided:

1. use nx\_4G\_power\_enable interface in tz\_gpio operation instruction in the next chapter to disconnect the power supply of 4g module, and then connect the external network cable;

Usage instruction: sudo ifconfig eth0 down

```
sudo ifconfig eth0 up
```

Re-acquire the IP address of eth0 port. Note that this IP address is the IP address dynamically allocated by the superior route of the network cable to which the equipment is connected, and the IP address is no longer 192.168.150.100.

```
sandstar@sandstar-desktop:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
      inet 192.168.34.30  netmask 255.255.255.0  broadcast 192.168.34.255
      inet6 fe80::3989:3df6:e155:a6ca  prefixlen 64  scopeid 0x20<link>
        ether 48:b0:2d:07:69:aa  txqueuelen 1000  (Ethernet)
          RX packets 297  bytes 80584 (80.5 KB)
          RX errors 0  dropped 0  overruns 0  frame 0
          TX packets 332  bytes 50667 (50.6 KB)
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
        device interrupt 37
```

The 1-4-1

## Chapter V Tz\_gpio Operating Instructions

After the machine is started, find the tz\_gpio directory in the file system /sys/class/ directory, which is the control interface of each module function provided by the bottom layer to the application layer, as follows:

```
sandstar@sandstar-desktop:/sys/class/tz_gpio$ ls
4g_led_1          nx_heartb_rx      rs485_ctrl1      usb3_1_enable
4g_led_2          nx_heartb_tx      rs485_ctrl2      usb3_2_enable
4g_led_3          nx_recovery_mcu  sdcard_enable    usb3_3_enable
4g_led_4          nx_reset_mcu     spi_uart_reset  usb3_4_enable
mcu_power_enable  nx_transfor_enable usb2_1_enable
nx_4g_power_enable power led       usb2_2_enable
```

Figure 2-1

### 5.1 4G Function Module

As shown in the above figure: 4G\_LED\_1 \ 4G\_LED\_2 \ 4G\_LED\_3 \ 4G\_LED\_4 are the signal indicator control interfaces of 4G module respectively. If you need to control each LED separately, please refer to the following operation steps:

1. switch to 4g\_led\_1 directory: cd 4g\_led\_1/;
2. direction and value respectively correspond to the input and output direction and level of the GPIO at the back end of the LED (high level lighting);
3. Considering the security of user layer, it is necessary to change the permissions of direction and value before using the corresponding control interface, such as:
 

```
sudo chmod 777 direction
sudo chmod 777 value
```
4. After the permission is changed, it can be controlled by the echo command. For the LED lamp control in this example, the direction is output by default, and there is no need to change it.

Sudo echo 1 > value can light LED lamp 1;

```
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ ls
dev  direction  power  subsystem  uevent  value
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ sudo chmod 777 direction
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ cat direction
output
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ sudo chmod 777 value
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ cat value
0
sandstar@sandstar-desktop:/sys/class/tz_gpio/4g_led_1$ sudo echo 1 > value
```

The 2-1-1

5. Nx\_4g\_power\_enable is the power control interface of 4G module, which can be used to power up and down 4G module! Operation mode can refer to figure 2-1-2:

```

sandstar@sandstar-desktop:/sys/class/tz_gpio$ cd nx_4g_power_enable
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_4g_power_enable$ ls
dev direction power subsystem uevent value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_4g_power_enable$ sudo chmod 777
value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_4g_power_enable$ cat value
0
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_4g_power_enable$ sudo echo 1>val
ue

```

The 2-1-2

After the 4g module is turned off, it can be observed that the 4G module power indicator lamp and the network signal lamp are off and the module is powered off.



The 2-1-3

Power up the 4g module again as follows:

```

sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_4g_power_enable$ sudo echo 0 > v
alue

```

The 2-1-4

It can be observed that the power indicator lights up (Figure 2-1-5). After waiting for a period of time, the 4g module successfully dials in the network, and the blue indicator lights up (Figure 2-1-6)



The 2-1-5



The 2-1-6

6.Venus 20-US-4G-PCIE-M2, Venus 20-CN-4G-NA-M2, Venus 20-CN-NA-NA-M2 and Venus 20-US-4G-NA-M2 are Engineering control equipments in the GSM/UMTS/LTE system. The GSM frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. but only GSM850/1900 test data included in this report. The UMTS frequency band are band I /II /IV/V/VI/VIII/XVIII, but only band II and Band IV and Band V test data included in this report. The LTE frequency band is Band I/II/III/IV /V/VII/VIII/XII/XIII/XVIII/XX/XXV/XXVI/XXVIII/XXXVIII/XXXX/XXXXI, but only Band II/IV /V/VII/XII/XIII/XXV/XXVI/XXXVIII/XXXXI test data included in this report. The Engineering control equipments implements such functions as RF signal receiving/transmitting, LTE/UMTS and GPRS/EDGE protocol. Externally it provides micro SD card interface and USIM card interface. The EUT is powered by DC 12V/12.5A. For more detailed features description, please refer to the user's manual.

## 5.2 USB Function Module

As shown in Figure 2-1, USB2\_1\_enable\ USB2\_2\_enable\ USB3\_1\_enable\ USB3\_2\_enable\ USB3\_3\_enable\ USB3\_4\_enable is the power control interface of two USB2.0 and four USB3.0 terminals respectively.

The control mode can refer to 4g module function control in 2.1, and the default value of USB terminal is 1(USB port is available). The operation example diagram is as follows:

```
sandstar@sandstar-desktop:/sys/class/tz_gpio$ cd usb2_1_enable
sandstar@sandstar-desktop:/sys/class/tz_gpio/usb2_1_enable$ ls
dev direction power subsystem uevent value
sandstar@sandstar-desktop:/sys/class/tz_gpio/usb2_1_enable$ sudo chmod 777 value
[sudo] password for sandstar:
sandstar@sandstar-desktop:/sys/class/tz_gpio/usb2_1_enable$ cat value
1
sandstar@sandstar-desktop:/sys/class/tz_gpio/usb2_1_enable$ sudo echo 0 > value
```

The 2-2-1

## 5.3 Communication Control Link Master Control

Nx\_transfor\_enable: It involves the control with MCU, as shown below:

- MCU power control: mcu\_power\_enable;
- MCU reset: nx\_reset\_mcu;
- MCU rollback: nx\_recovery\_mcu;
- Heartbeat MCU-> NX: NX\_heartbeat\_rx;
- Heartbeat NX-> MCU: NX\_heartbeat\_tx;

Only when NX\_transmit\_enable is turned on can the control signal to MCU be received by MCU.

Examples: such as controlling mcu reset

```

sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_transfor_enable$ cat value
1
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_transfor_enable$ cd ../
sandstar@sandstar-desktop:/sys/class/tz_gpio$ ls
4g_led_1          nx_hearbt_rx      rs485_ctrl1    usb3_1_enable
4g_led_2          nx_hearbt_tx      rs485_ctrl2    usb3_2_enable
4g_led_3          nx_recovery_mcu  sdcard_enable  usb3_3_enable
4g_led_4          nx_reset_mcu    spi_uart_reset  usb3_4_enable
mcu_power_enable  nx_transfor_enable  usb2_1_enable
nx_4g_power_enable power_led      usb2_2_enable
sandstar@sandstar-desktop:/sys/class/tz_gpios$ cd nx_reset_mcu
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ ls
dev direction power subsystem uevent value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ sudo chmod 777 value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ cat value
0
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ echo 1 > value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ echo 0 > value
sandstar@sandstar-desktop:/sys/class/tz_gpio/nx_reset_mcu$ ■

```

The 2-3-1

## 5.4 NX System Operation Lamp Module:

When you enter the system, the LED light will always be on. If you need to control at the system level, you can control it according to the 4g module LED control mode. For details, please refer to the control of 4G signal lamp in 2.1.

## 5.5 RS485 Peripheral Power Supply Control:

Rs485\_ctrl1\ rs485\_ctrl2 are the transceiver control interfaces of two RS485 peripheral sensors respectively. If it is necessary to control the transceiver of peripheral 485. Reference can be made as follows:

```

sandstar@sandstar-desktop:/sys/class/tz_gpio/rs485_ctrl1$ ls
dev direction power subsystem uevent value
sandstar@sandstar-desktop:/sys/class/tz_gpio/rs485_ctrl1$ sudo chmod 777 value
sandstar@sandstar-desktop:/sys/class/tz_gpio/rs485_ctrl1$ cat value
0
sandstar@sandstar-desktop:/sys/class/tz_gpio/rs485_ctrl1$ echo 1 > value
sandstar@sandstar-desktop:/sys/class/tz_gpio/rs485_ctrl1$ cat value
1

```

The 2-5-1

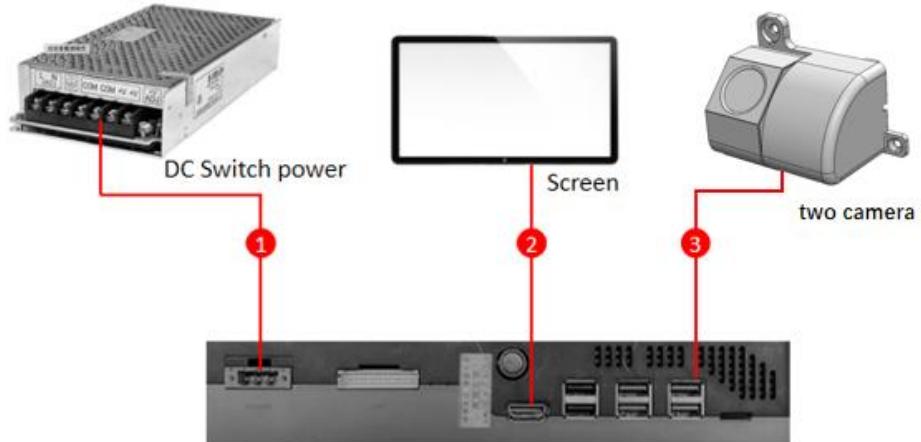
## Chapter VI Usage Scenarios and Precautions

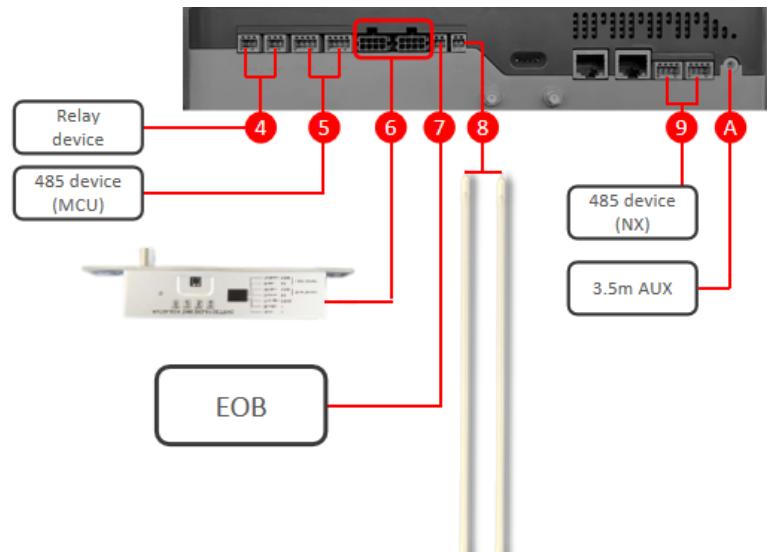
### 6.1 Usage Scenario

As the terminal brain of the intelligent container, the device is mainly installed on commercial containers of various models and different functions. The device, together with other peripherals such as cameras and plug locks, forms an intelligent container with the cabinet body. Based on the solution of visual deep learning, the device realizes the quick identification of goods at the edge of the device, and combines the confidential payment or POS payment system. Bring customers a minimalist shopping experience.

After being combined with the container, the equipment is converted into an unattended intelligent container, which is widely used in retail scenes such as shopping malls, schools, hospitals, office buildings and airports.

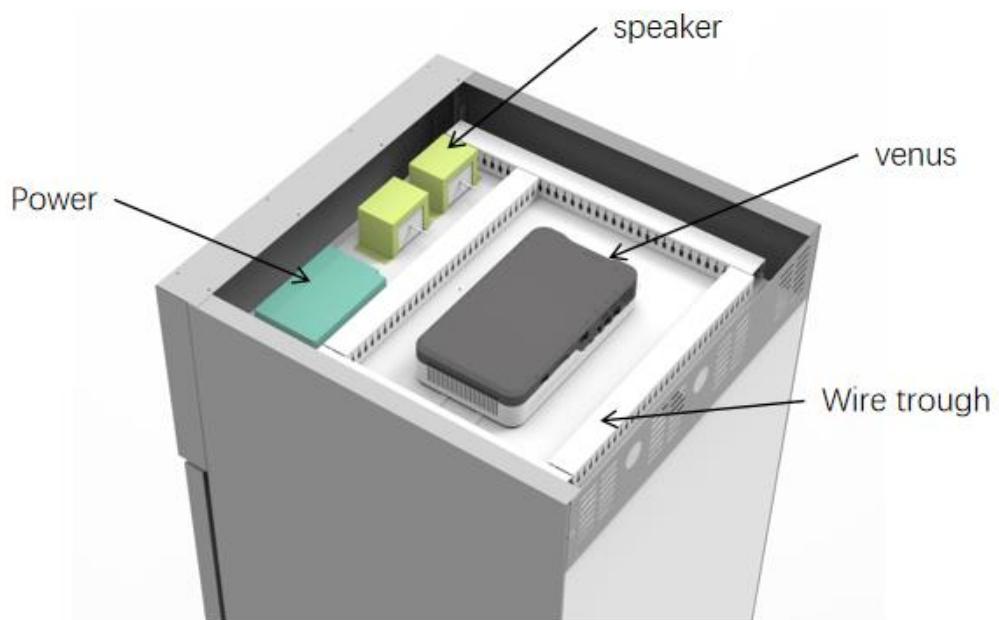
### 6.2 Peripheral Installation Schematic Diagram





### 6.3 Typical Installation Case

(1) Typical location of industrial control computer installed on container



Case cabinet model

(2) Guidance on proper use of SIM card

First, prepare a SIM card, with the side with the chip facing down and the side with the gap facing to the upper left corner. As shown in the figure below, insert the SIM card into the card slot, which will make a "pop" sound, then push it in, and the card will automatically pop up and take it out.



The 3-1-1

(3) SIM card insertion demonstration



The 3-1-2



The 3-1-3



The 3-1-4



The 3-1-5

Remarks:

Figure 3-1-1 Figure 3-1-2: SIM is inserted correctly.

Figure 3-1-3-1-3 SIM card has not been inserted yet, so the illustration is wrong.

Figure 3-1-4 The SIM card should be chip down, so the illustration is wrong.

Figure 3-1-5 The notched side of the SIM card should face the upper left corner, so the illustration is wrong.

## 6.4 TF Card Insertion and Extraction Problem

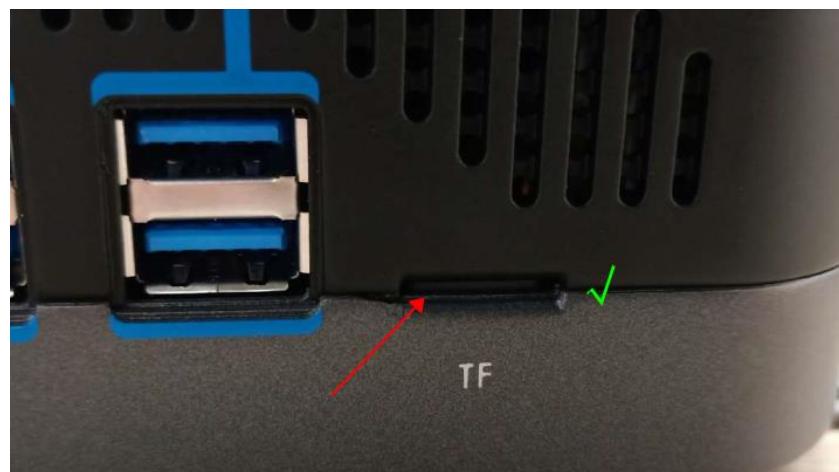
### (1) Guidance on proper use of TF card

First, prepare a TF card, with the side with the chip facing down and the uneven side on the right. As shown in the figure below, insert the TF card into the card slot, which will make a "pop" sound, then push it in, and the card will automatically pop up and take it out.

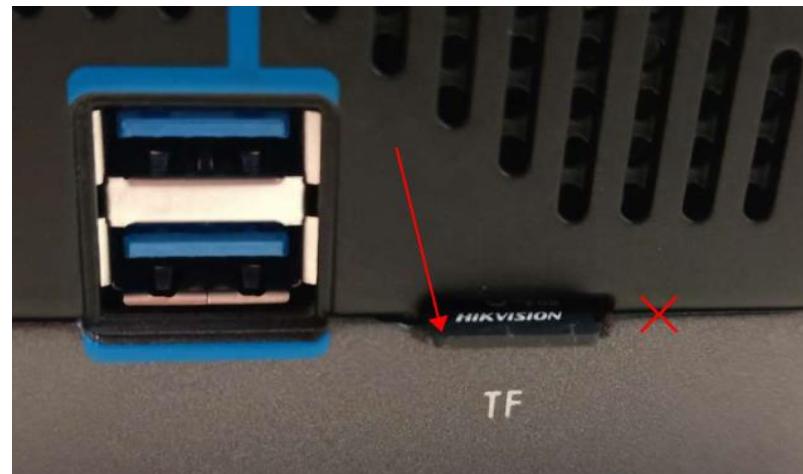


The 3-2-1

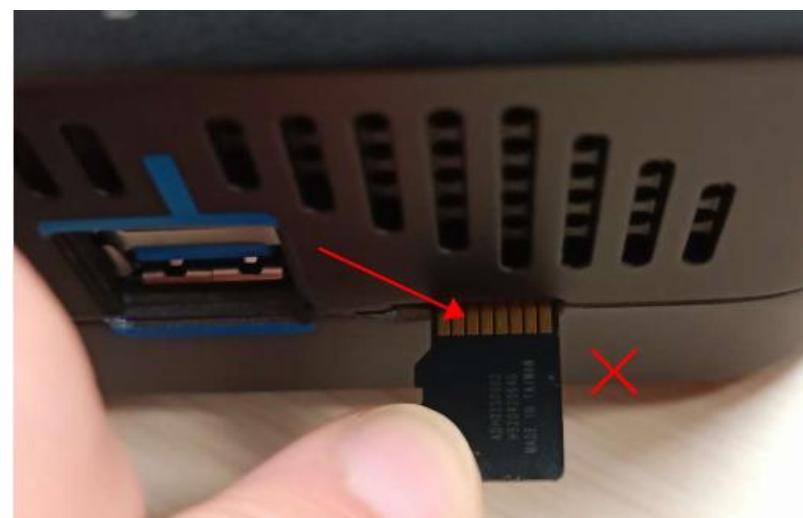
### (2) TF card insertion demonstration



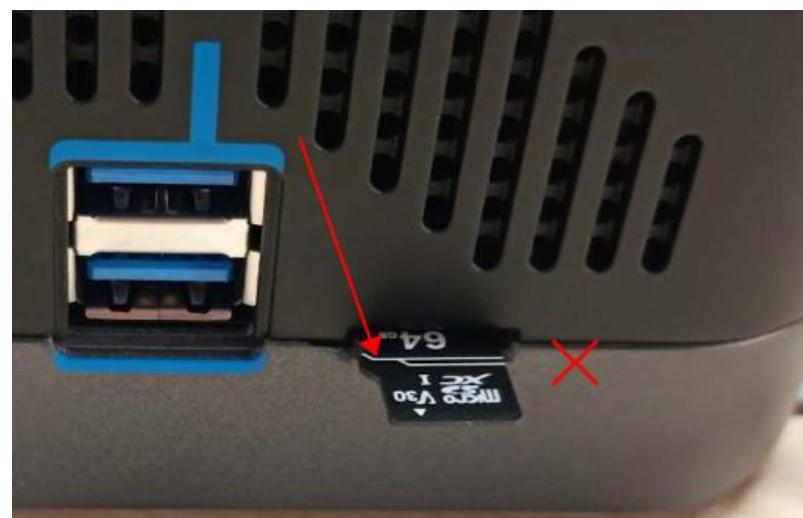
The 3-2-2



The 3-2-3



The 3-2-4



The 3-2-5

**Remarks:**

Figure 3-2-1 3-2-2: TF card is inserted correctly.

Figure 3-2-3 TF card has not been inserted yet, so the illustration is wrong.

Figure 3-2-4 TF card should be chip down, so the illustration is wrong.

Figure 3-2-4 The uneven side of TF card should be on the right side, so the illustration is wrong.

## 6.5 Antenna Specification and Parameters

Note: The installation and after-sales maintenance of this equipment need professional engineers to operate, and ordinary consumers can't touch this product.



Physical Parameters	
Bandwidth	4G/LTE
	698-960MHz, 1710-2700MHz
Gain	6dBi
SWR	≤1.5
Polarization	Vertical
Radiation Direction	Omnidirectional
Input Impedance	50Ω
Power Capacity	20W
Other Parameters	
Height	306mm
Base Diameter	30mm
Total Weight	56g
Cable Length	3m
Cable Material	RG174
Connector	SMA male
Working Temperature	-40°C ~ +85°C
Storage Temperature	-40°C ~ +85°C



Warning: Any Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Warning:

1. 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.
2. 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.

3. RF Exposure Information:

"FCC RF Radiation Exposure Statement Caution: To maintain compliance with the FCC's RF exposure guidelines, place the product at least 20cm from nearby persons."