

# CM4 SENSING

AN EMBEDDED COMPUTER DESIGNED FOR IOT AND INDUSTRIAL  
FIELD DATA ACQUISITION APPLICATION

Shanghai EDA Technology Co.,Ltd  
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# 1 Product Overview

CM4 Sensing is an embedded computer based on Raspberry Pi Compute Module 4 (CM4 for short), which is designed for IOT and industrial field data acquisition applications. It makes full use of CM4's structural flexibility to solve the heat dissipation problem of CPU, wireless module and PMU, and improves the reliability of wireless communication through external WIFI/BT antenna.

## 1.1 Target Application

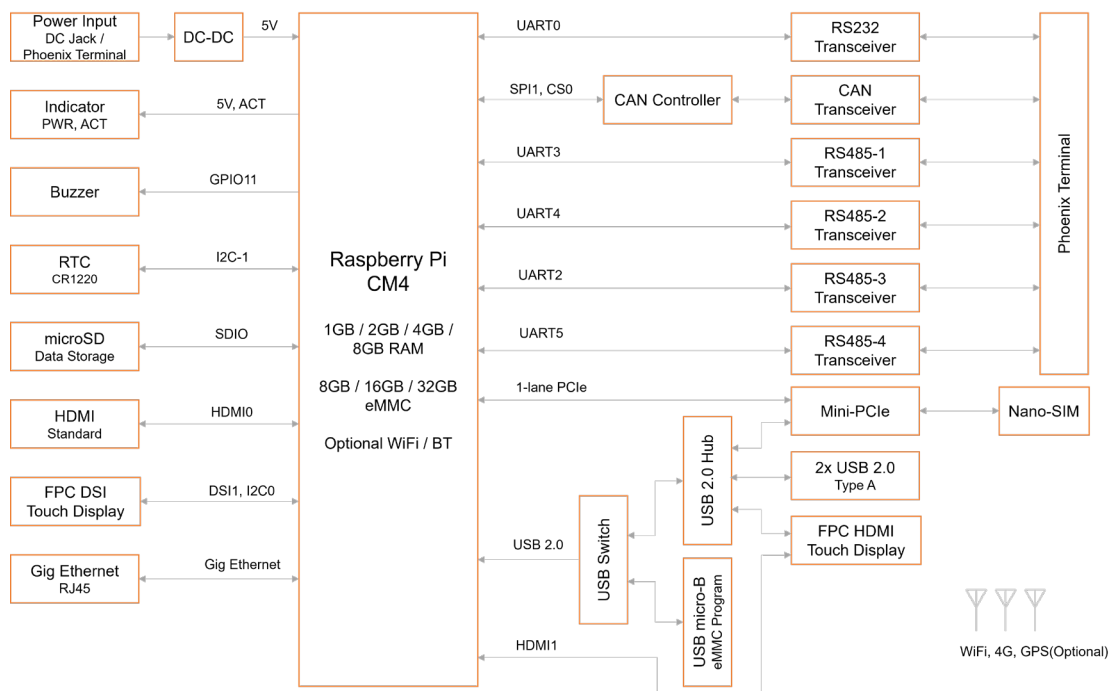
- Industrial control
- IOT gateway
- Intelligent city
- Intelligence industry
- Smart manufacturing

## 1.2 Specifications and Parameters

Function	Parameters
CPU	BCM2711 4 core, ARM Cortex-A72(ARM v8), 1.5GHz, 64bit CPU
Memory	1GB / 2GB / 4GB / 8GB option
eMMC	8GB / 16GB / 32GB option
SD card	eMMC is used for the main file system, and it can also support TF card expansion for data storage.
Ethernet	1x Gigabit Ethernet
WiFi / Bluetooth	2.4G/5.8G dual-band WiFi, Bluetooth 5.0
4G communication	Support Quectel EC20 4G LTE module
HDMI	1x standard HDMI
HDMI FPC touch screen	1x FPC HDMI, support USB touch , PWM Dimming
DSI	1x DSI, Support Raspberry Pi 7-inch official touch screen
USB Host	2x USB 2.0 Type A, 1x USB 2.0 Integrated in Mini PCIe interface, 1x USB micro-B is used for eMMC burning.
RS485	4x RS485
RS232	1x RS232, Can be used in the default console of the system, and supports configuration as a standard serial port.
CAN BUS	1x CAN
Mini PCIe	1-lane PCIe 2.0, Highest support 5Gbps, 1x USB 2.0 Host
Real time clock	1x RTC

Function	Parameters
Buzzer	1x buzzer
DC power supply output	5V@1A, Can be used to support Raspberry Pi 7 inch official touch screen power supply.
LED Indicator	Red (power indicator), green (system status indicator)
Power input	V1.2 version is 8V~28V, V1.1 version is 8V~18V
Dimensions	102(L) x 73(W) x 35(H) mm
Case	Full Metal Jacket, support DIN slide rail installation.
Cooling fin	Full-face CNC aluminum alloy heat sink
Antenna accessory	Support optional WiFi/BT external antenna, which has passed wireless authentication together with Raspberry Pi CM4, and optional 4G external antenna.
Working environment temperature	Running at full speed at ambient temperature of -25 ~ 60 C.
OS	Compatible with official Raspberry Pi OS, provides BSP software support package, and supports online installation and update of APT.

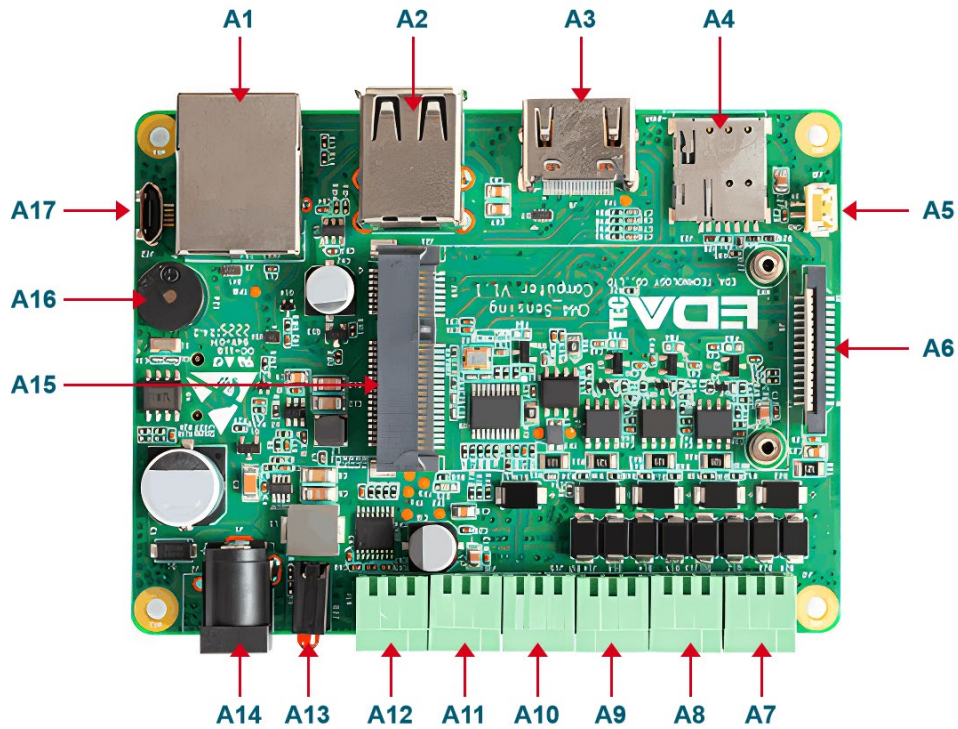
## 1.3 System Diagram



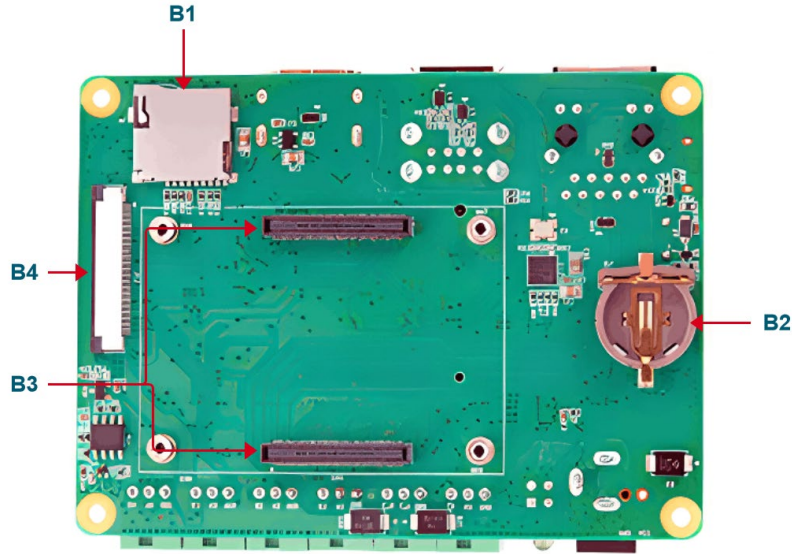
ED-CM4SEN12: EDATEC CM4 Sensing V1.2

**NOTE :** The power input range of V1.2 version is 8V ~ 28V, and that of V1.1 version is 8V ~ 18V.

## 1.4 Functional Layout



Item	Function Description	Item	Function Description
A1	Gigabit Ethernet	A2	USB 2.0
A3	Standard HDMI port	A4	SIM slot
A5	5V 1A output	A6	HDMI DSI
A7	RS485-4	A8	RS485-3
A9	RS485-2	A10	RS485-1
A11	CAN	A12	RS
A13	Indicator	A14	DC power input
A15	Mini PCIe	A16	buzzer
A17	Micro USB flash port		

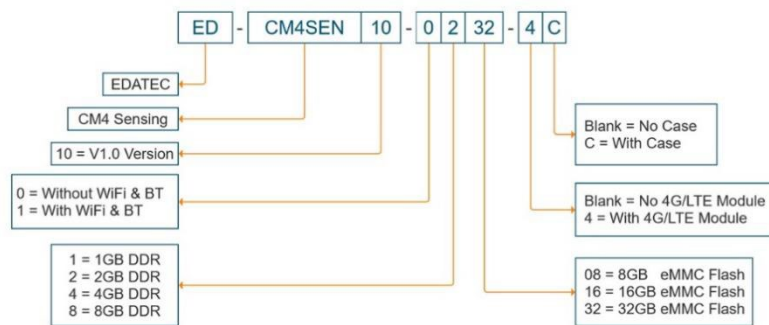


Item	Function Description	Item	Function Description
B1	Micro SD card slot	B2	RC1220 Button cell, RTC power supply
B3	CM4	B4	HDMI FPC

## 1.5 Packing List

- 1x CM4 Sensing host
- [option WiFi/BT version] 1x 2.4GHz/5GHz WiFi/BT antenna
- [option 4G version] 1x 4G/LTE antenna

## 1.6 Order Code



**Example**

**Part#: ED-CM4SEN10-1408-4C**

**Configuration:** CM4 Sensing Computer V1.0 version  
 1PCS Raspberry Pi certified WiFi/Bluetooth Antenna  
 4GB DDR, 8GB eMMC Flash, with 4G/LTE Module  
 With case



## 1.7 Certificate

Support FCC, CE, KC and WPC.

## 2 Quick Start

This chapter introduces the startup of CM4 Sensing and some startup settings.

### 2.1 Equipment List

- 1x CM4 Sensing
- 1x WIFI/BT antenna
- 1x 4G antenna[option]
- 1x mouse
- 1x keyboard
- 1x HDMI display
- 1x net cable
- 1x 12V@2A DC power supply

### 2.2 Hardware Connection

1. Install the antenna to the antenna connector at the top of the equipment.
2. Plug in the network cable, keyboard and mouse.
3. Plug in HDMI and connect the other end to the monitor.
4. Power up the monitor.
5. CM4 Sensing has no power switch. Plug in the power cord and the system will start.
6. Power the 12V@2A power adapter and plug it into the DC power input port of CM4 Sensing (marked with +12V DC).
7. The red LED lights up, which means the power supply is normal.
8. The green light starts flashing, indicating that the system starts normally, and then the logo of Raspberry will appear in the upper left corner of the screen.
9. After the system is started, log in to Desktop. If prompted to log in, please enter the user name: pi and the default password: raspberry.

**WARN: Sensing V1.1 has a power input range of 8 ~ 18V, so it is recommended to use a 12V power adapter. If it exceeds 18V, it may burn out the hardware (version 1.2 has expanded the input range of 8 ~ 28V).**

### 2.3 First Start

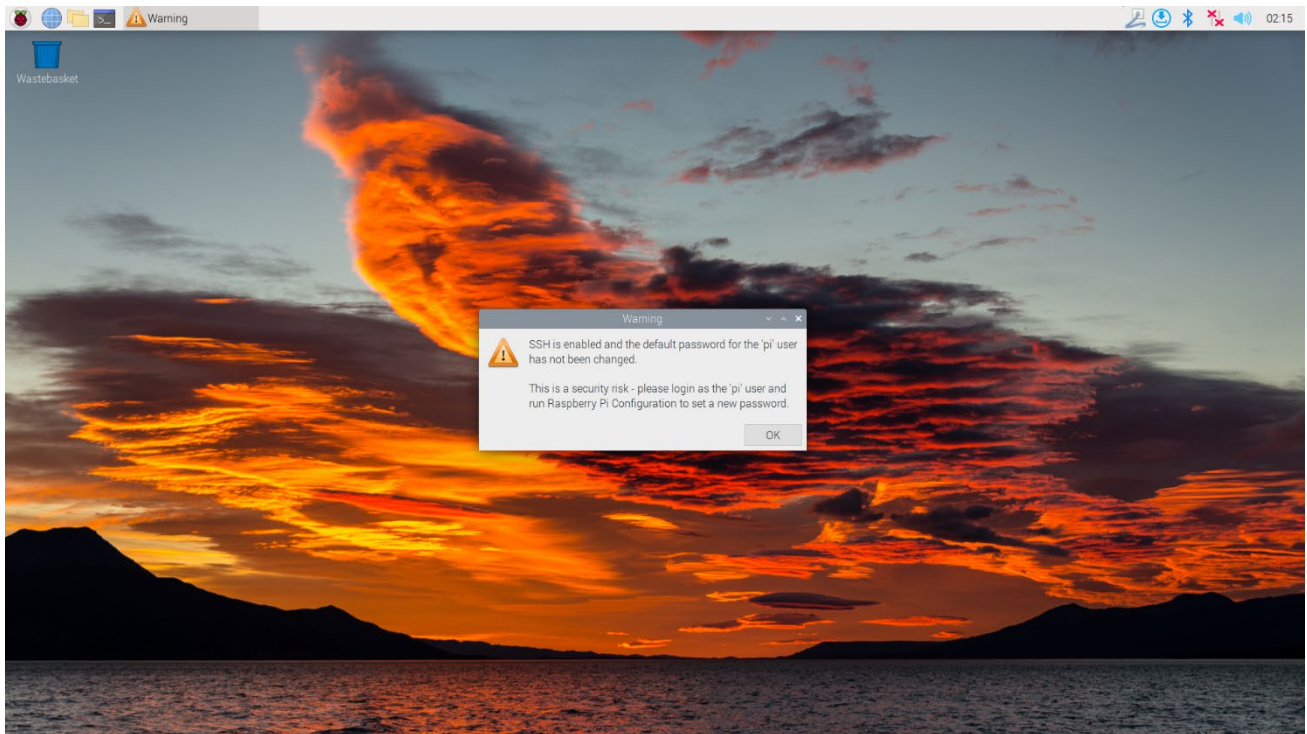
CM4 Sensing has no power switch. Plug in the power cord and the system will start.

1. Power the 12V@2A power adapter and plug it into the DC power input port of CM4 Sensing (marked with +12V DC).

- 2.The red LED lights up, which means the power supply is normal.
- 3.The green light starts flashing, indicating that the system starts normally, and then the logo of Raspberry will appear in the upper left corner of the screen.

### 2.3.1 Raspberry Pi OS (Desktop)

After the Desktop version of the system is started, directly enter the desktop.



If you use the official system image, and the image is not configured before burning, the Welcome to Raspberry Pi application will pop up and guide you to complete the initialization setting when you start it for the first time.



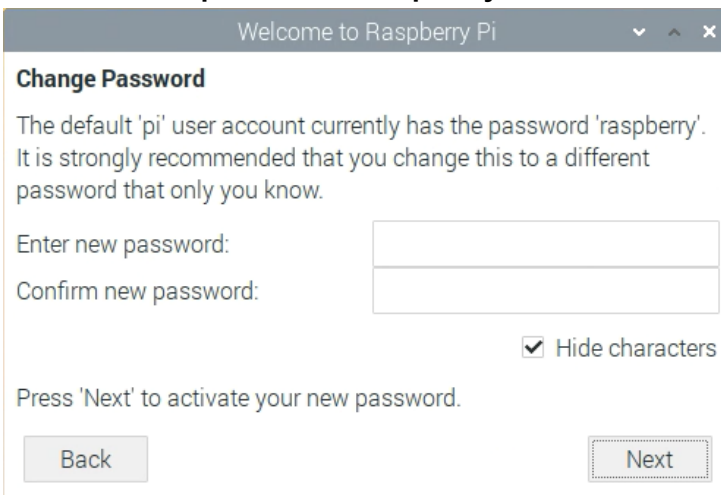
- Click Next to start the setup.
- Setting Country, Language and Timezone, click Next

**NOTE: You need to select a country region, otherwise the default keyboard layout of the system is the English keyboard layout (our domestic keyboards are generally the American keyboard layout), and some special symbols may not be typed.**

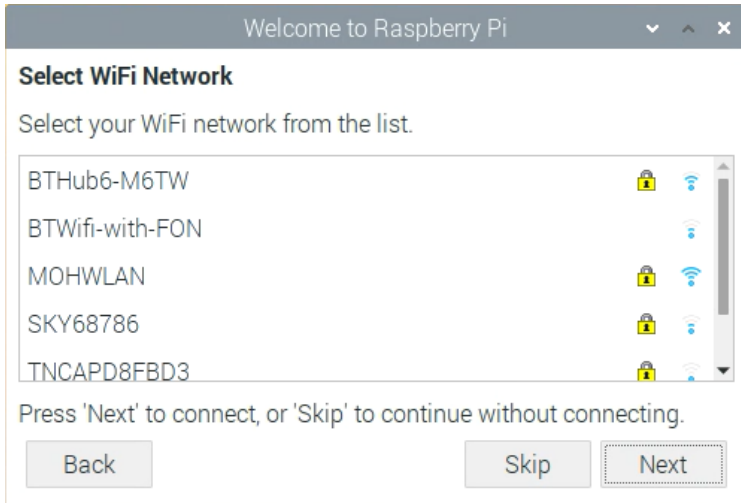


- Input a new password for the default account pi, and click Next.

**NOTE: Default password is raspberry**



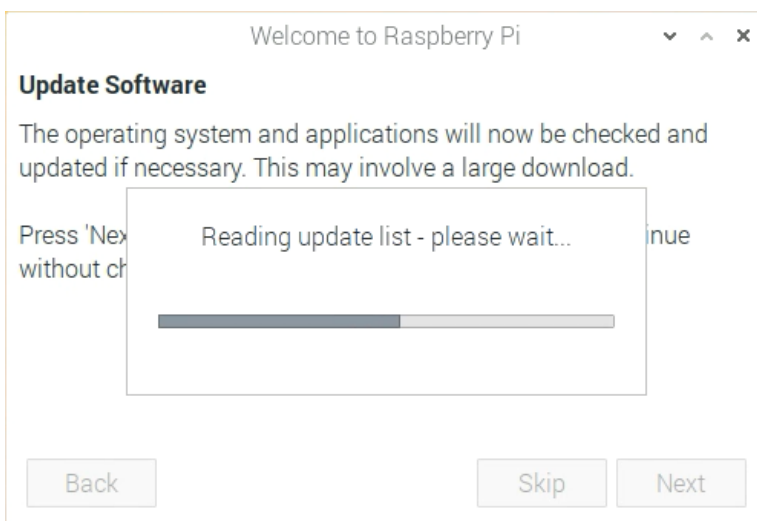
- Select the wireless network you need to connect to, enter the password, and then click Next.



**NOTE: If your CM4 module does not have a WIFI module, there will be no such step.**

**NOTE: Before upgrading the system, you need to wait for the wifi connection to be normal (the wifi icon appears in the upper right corner).**

- Click Next, and the wizard will automatically check and update Raspberry Pi OS.



- Click Restart to complete the system update.



## 2.3.2 Raspberry Pi OS (Lite)

If you use the system image provided by us, after the system starts, you will automatically log in with the user name pi, and the default password is raspberry.

```
[ OK ] Started User Login Management.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Reached target Login Prompts.
[ OK ] Started OpenBSD Secure Shell server.
[ OK ] Started Modem Manager.
[ OK ] Started Hostname Service.
Starting Network Manager Script Dispatcher Service...
[ OK ] Started Network Manager Script Dispatcher Service.
[ OK ] Listening on Load/Save RF Kill Switch Status /dev/rfkill Watch.
Starting Load/Save RF Kill Switch Status...
[ OK ] Started LSB: Switch to on (unless shift key is pressed).
[ OK ] Started Load/Save RF Kill Switch Status.
Starting Save/Restore Sound Card State...
[ OK ] Finished Save/Restore Sound Card State.
[ OK ] Reached target Sound Card.

Debian GNU/Linux 11 raspberrypi tty1
raspberrypi login: pi (automatic login)

Linux raspberrypi 5.15.32-08+ #1538 SMP PREEMPT Thu Mar 31 19:40:39 BST 2022 aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

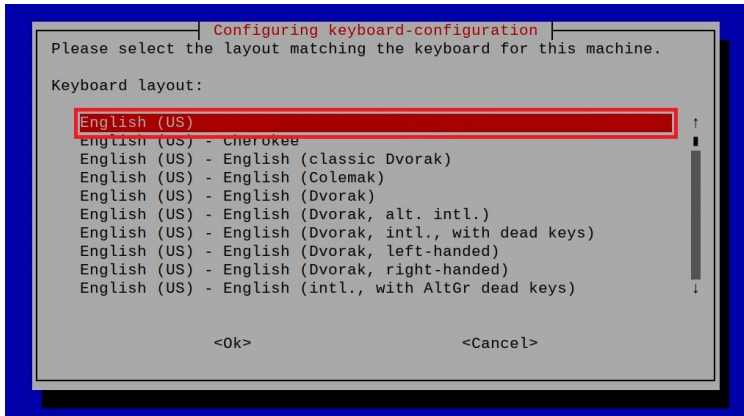
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Jan 31 03:52:21 GMT 2023 from 192.168.168.211 on pts/0

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set a new password.

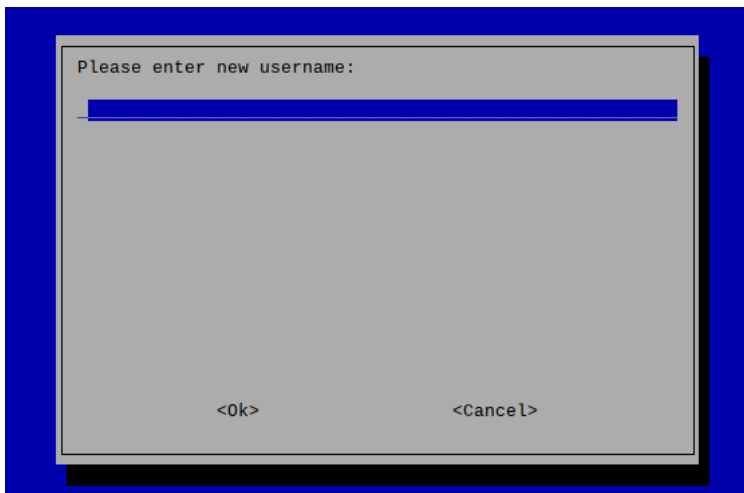
pi@raspberrypi:~$
```

If you use the official system image, and the image is not configured before burning, the configuration window will appear when you start it for the first time. You need to configure the keyboard layout, set the user name and the corresponding password.

- Set the configuration keyboard layout



- Creat new user name



Then set the password corresponding to the user according to the prompt, and enter the password again for confirmation. At this point, you can log in with the user name and password you just set.

## 2.3.3 Use SSH

All the images we provide have turned on the SSH function. If you use the official image, you need to turn on the SSH function.

### 2.3.3.1 raspi-config

```
sudo raspi-config
```

1. Choose 3 Interface Options
2. Choose I2 SSH
3. Would you like the SSH server to be enabled? Select Yes
4. Choose Finish



### 2.3.3.2 Add Empty File To Enable SSH

Put an empty file named ssh in the boot partition, and the SSH function will be automatically enabled after the device is powered on.

### 2.3.4 Get The Device IP

- If the display screen is connected, you can use the ifconfig command to find the current device IP.
- If there is no display screen, you can view the assigned IP through the router.
- If there is no display screen, you can download the nmap tool to scan the IP under the current network.

Nmap supports Linux, macOS, Windows and other platforms. If you want to use nmap to scan the network segments from 192.168.3.0 to 255, you can use the following command:

```
nmap -sn 192.168.3.0/24
```

After waiting for a period of time, the result will be output.

```
Starting Nmap 7.92 ( https://nmap.org ) at 2022-12-30 21:19 中国标准时间
Nmap scan report for 192.168.3.1 (192.168.3.1)
Host is up (0.0010s latency).
MAC Address: XX:XX:XX:XX:XX:XX (Phicomm (Shanghai))
Nmap scan report for DESKTOP-FGEOUUK.lan (192.168.3.33)
Host is up (0.0029s latency).
MAC Address: XX:XX:XX:XX:XX:XX (Dell)
Nmap scan report for 192.168.3.66 (192.168.3.66)
Host is up.
Nmap done: 256 IP addresses (3 hosts up) scanned in 11.36 seconds
```

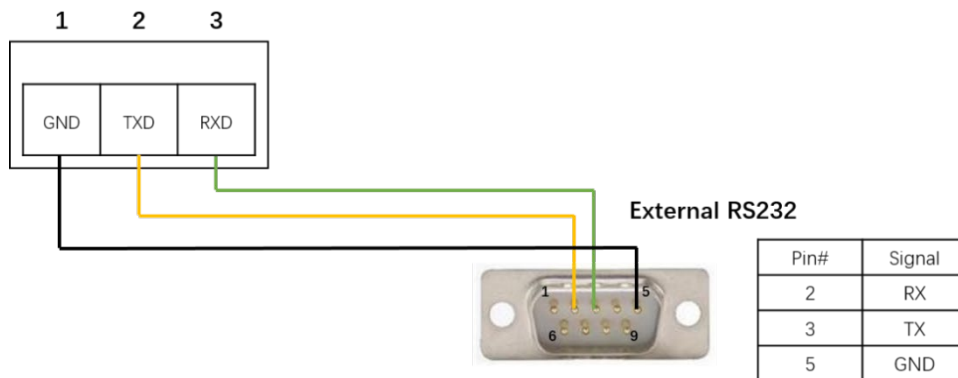


# 3 Wiring Guide

## 3.1 Panel I/O

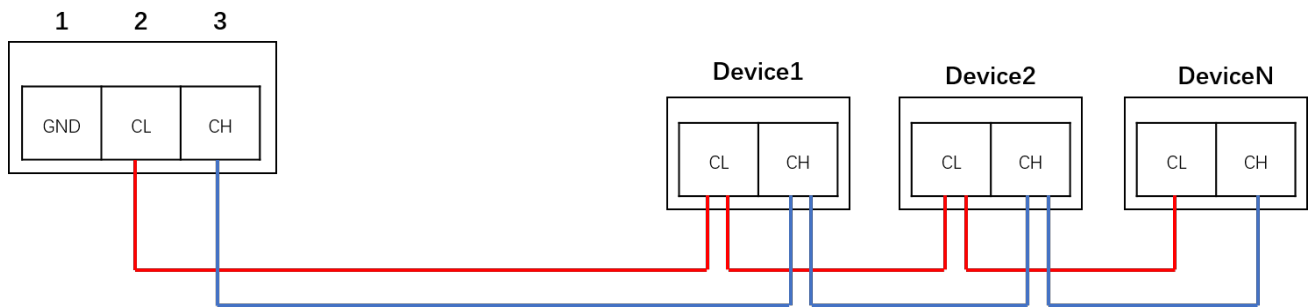
### 3.1.1 RS232

The wiring diagram of RS232 serial port is as follows:



### 3.1.2 CAN

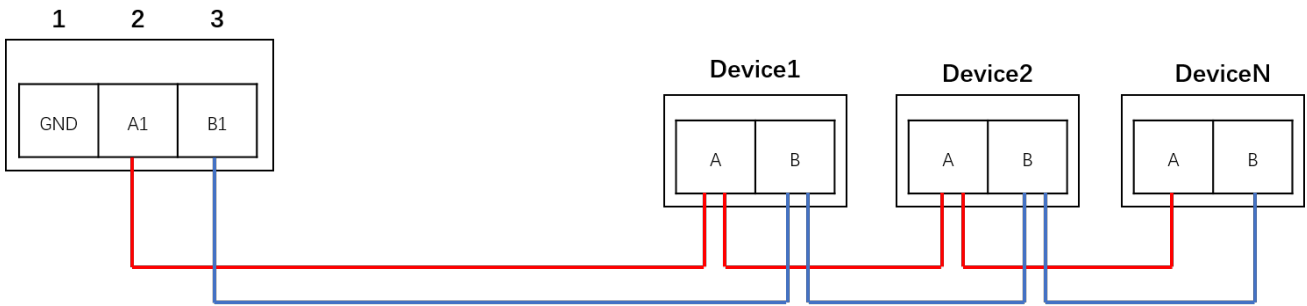
CM4 Sensing has 1 CAN interface. The wiring diagram is as follows:



### 3.1.3 RS485

CM4 Sensing has 4 RS485 channels.

Taking RS485-1 interface as an example, the wiring diagram is as follows:



### 3.1.4 micro-SD Card

There is a micro SD card slot on CM4 Sensing. Please insert the micro SD card face up into the micro SD card slot.



### 3.1.5 SIM

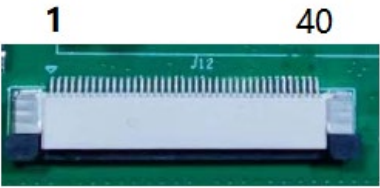
CM4 Sensing uses Nano SIM card, please insert the chip end of the SIM card into the SIM card slot.



## 3.2 Internal I/O

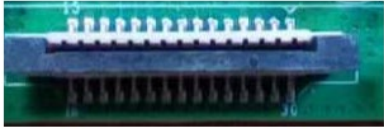
### 3.2.1 HDMI FPC

J12 interface can be used to connect the display screen with touch function.

		Pin	Definition	Pin	Definition
	1	NC	21	GND	
	2	NC	22	HDMI1_CLKP	
	3	NC	23	HDMI1_CLKN	
	4	NC	24	GND	
	5	GND	25	BACKLIGHT_PWM	
	6	USB_DP	26	GND	
	7	USB_DM	27	GND	
	8	GND	28	GND	
	9	HDMI1_HPD	29	GND	
	10	HDMI1_SCL	30	GND	
	11	HDMI1_SDA	31	GND	
	12	GND	32	LCD_PWR_EN	
	13	HDMI1_TX2P	33	GND	
	14	HDMI1_TX2N	34	GND	
	15	GND	35	GND	
	16	HDMI1_TX1P	36	GND	
	17	HDMI1_TX1N	37	GND	
	18	GND	38	GND	
	19	HDMI1_TX0P	39	GND	
	20	HDMI1_TX0N	40	5V	

### 3.2.2 MIPI DSI

J8 is the display interface.

	Pin	Definition	Pin	Definition
	1	GND	9	DSI1_D0_P
	2	DSI1_D1_N	10	GND
	3	DSI1_D1_P	11	SCL0
	4	GND	12	SDA0
	5	DSI1_CLK_N	13	GND
	6	DSI1_CLK_P	14	3V3
	7	GND	15	3V3
	8	DSI1_D0_N		

## 4 Software Operation Guide

### 4.1 USB 2.0

#### 4.1.1 Check USB Device Information

List USB device

```
lsusb
```

The information displayed is as follows:

```
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 1a2c:2d23 China Resource Semico Co., Ltd Keyboard
Bus 001 Device 004: ID 30fa:0300 USB OPTICAL MOUSE
Bus 001 Device 003: ID 0424:9e00 Microchip Technology, Inc. (formerly SMSC)
LAN9500A/LAN9500Ai
Bus 001 Device 002: ID 1a40:0201 Terminus Technology Inc. FE 2.1 7-port Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

#### 4.1.2 USB Storage Device Mounting

You can connect an external hard disk, SSD or USB stick to any USB port on Raspberry Pi and mount the file system to access the data stored on it.

By default, your Raspberry Pi will automatically mount some popular file systems, such as FAT, NTFS and HFS+, in the location of `/media/pi/HARD-DRIVE-LABEL`.

In general, you can directly use the following commands to mount or unmount external storage devices.

```
lsblk

NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda              8:0    1 29.1G  0 disk
└─sda1           8:1    1 29.1G  0 part
mmcblk0         179:0    0 59.5G  0 disk
├─mmcblk0p1    179:1    0 256M  0 part /boot
└─mmcblk0p2    179:2    0 59.2G  0 part /
```

Use the mount command to mount `sda1` to the `/mnt` directory. After the mount is completed, users can directly operate storage devices in the `/mnt` directory.

```
sudo mount /dev/sda1 /mnt
```

After using, use the command `umount` to uninstall the storage device.

```
sudo umount /mnt
```

#### 4.1.2.1 Mount

You can install the storage device in a specific folder location. It is usually done in the `/mnt` folder, such as `/mnt/mydisk`. Please note that the folder must be empty.

1. Insert the storage device into the USB port on the device.
2. Use the following command to list all disk partitions on Raspberry Pi:

```
sudo lsblk -o UUID,NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL,MODEL
```

Raspberry Pi uses mount points/and `/boot`. Your storage device will appear in this list, along with any other connected storage devices.

3. Use the Size, Label and Model columns to identify the name of the disk partition that points to your storage device. For example, `sda1`.
4. The FSTYPE column contains file system types. If your storage device uses the exFAT file system, please install the exFAT driver:

```
sudo apt update
sudo apt install exfat-fuse
```

5. If your storage device uses NTFS file system, you will have read-only access to it. If you want to write to the device, you can install the ntfs-3g driver:

```
sudo apt update
sudo apt install ntfs-3g
```

6. Run the following command to get the location of the disk partition:

```
sudo blkid
```

like, `/dev/sda1`

7. Create a target folder as the mount point of the storage device. The mount point name used in this example is `mydisk`. You can specify a name of your choice:

```
sudo mkdir /mnt/mydisk
```

8. Mount the storage device at the mount point you created:

```
sudo mount /dev/sda1 /mnt/mydisk
```

9. Verify that the storage device has been successfully mounted by listing the following:

```
ls /mnt/mydisk
```

**WARN:** If there is no desktop system, external storage devices will not be automatically mounted.

#### 4.1.2.2 Unmount

When the device is turned off, the system will unmount the storage device so that it can be pulled out safely. If you want to uninstall the device manually, you can use the following command:

```
sudo umount /mnt/mydisk
```

If you receive a "destination busy" error, it means that the storage device has not been unmounted. If no error is displayed, you can safely unplug the device now.

### 4.1.2.3 Set Up Automatic Mount In The Command Line

You can modify the fstab setting to mount automatically.

1. First, you need to get the disk UUID.

```
sudo blkid
```

2. Find the UUID of the mounted device, such as 5C24-1453.
3. Open the fstab file

```
sudo nano /etc/fstab
```

```
UUID=5C24-1453 /mnt/mydisk fstype defaults,auto,users,rw,nofail 0 0
```

Replace fstype with the type of your file system, which you can find in step 2 of "Mounting storage devices" above, for example, ntfs.

4. If the file system type is FAT or NTFS, adding umask = 000 immediately after nofail will allow all users full read/write access to every file on the storage device.

Can use man fstab to learn more information about fstab.

## 4.2 Ethernet Configuration

### 4.2.1 Gigabit Ethernet

There is an adaptive 10/100/1000Mbps Ethernet interface on CM4 Sensing, which is adjacent to the DC power socket. It is recommended to use Cat6 (Category 6) network cable to cooperate with it. By default, the system uses DHCP to automatically obtain IP.

### 4.2.2 Using The Network Manager To Configure

If you use the desktop image, it is recommended to install the NetworkManager plug-in network-manager-gnome. After installation, you can directly configure the network through the desktop icon.

```
sudo apt update
sudo apt install network-manager-gnome
sudo reboot
```

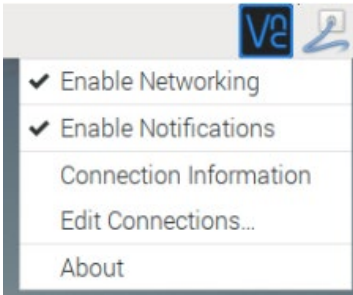
**NOTE: If use our factory image, the network-manager tool and the network-manager-gnome plug-in are installed by default.**

**NOTE: If use our factory image, the NetworkManager service is automatically started and the dhcpcd service is disabled by default.**

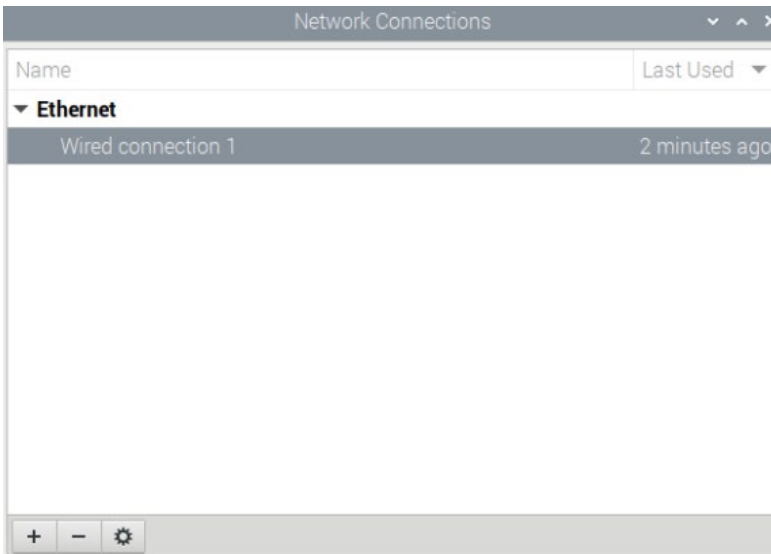
After the installation is completed, you will see the NetworkManager icon in the status bar of the system

desktop. .

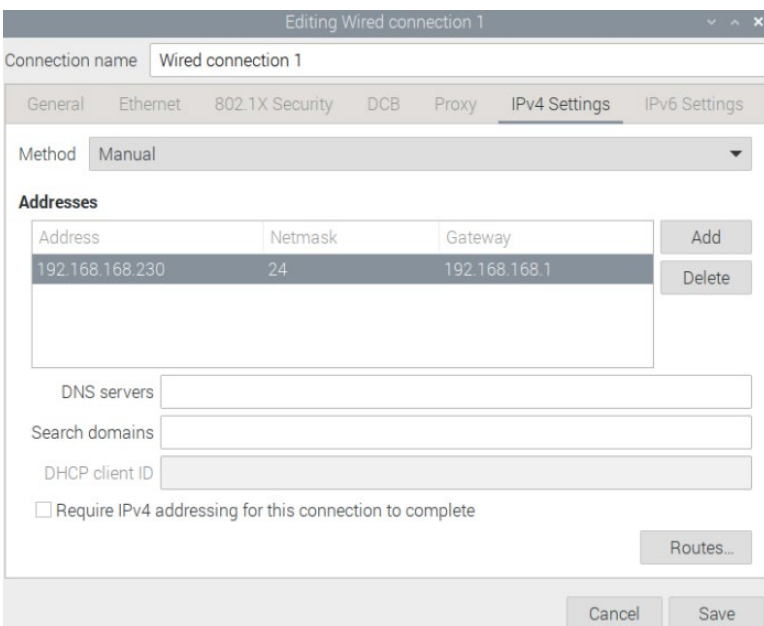
Right-click the NetworkManager icon and select Edit Connections.



Select the connection name to modify, and then click the gear below.



Switch to the configuration page of IPv4 Settings. If you want to set static IP, the Method selects Manual, and Addresses the IP you want to configure. If you want to set it as dynamic IP acquisition, just configure the Method as Automatic(DHCP) and restart the device.





If you use the Lite version of the system, you can configure it through the command line.

If you want to use the command to set the static IP for the device, you can refer to the following methods.

Set the static IP

```
sudo nmcli connection modify <name> ipv4.addresses 192.168.1.101/24 ipv4.method manual
```

Set the gateway

```
sudo nmcli connection modify <name> ipv4.gateway 192.168.1.1
```

Set dynamic IP acquisition

```
sudo nmcli connection modify <name> ipv4.method auto
```

### 4.2.3 Configuration With dhcpd Tool

The official system of Raspberry Pi uses dhcpd as the network management tool by default.

If you use the factory image provided by us and want to switch from NetworkManager to dhcpd network management tool, you need to stop and disable NetworkManager service and enable dhcpd service first.

```
sudo systemctl stop NetworkManager
sudo systemctl disable NetworkManager
sudo systemctl enable dhcpd
sudo reboot
```

The dhcpd tool can be used after the system is restarted.

Static IP can be set by modifying/etc/dhcpd.conf. For example, eth0 can be set, and users can set wlan0 and other network interfaces according to their different needs.

```
interface eth0
static ip_address=192.168.0.10/24
static routers=192.168.0.1
static domain_name_servers=192.168.0.1 8.8.8.8 fd51:42f8:caae:d92e::1
```

## 4.3 WiFi

Customers can purchase CM4 Industrial with WiFi version, which supports 2.4 GHz and 5.0 GHz IEEE 802.11 b/g/n/ac dual-band WiFi. We provide dual-band external antenna, which has passed wireless authentication together with Raspberry Pi CM4.

### 4.3.1 Enable WiFi

The WiFi function is blocked by default, so you need to set the country region before you can use it. If you use the desktop version of the system, please refer to the chapter: Initialization Settings Configure WiFi. If you use the Lite version of the system, please use raspi-config to set the WiFi country area. Please refer to the documentation.: "[Raspberry Pi official documents - Using the Command Line](#)"

#### 4.3.1.1 Configure Using The Network Manager Tool

After installing the desktop plug-in, you can directly connect to the WIFI network through the desktop icon.

You can also use the command line to execute the following commands:

Scan WIFI

```
sudo nmcli device wifi
```

Connect WIFI with password.

```
sudo nmcli device wifi connect <SSID> password <password>
```

Set up WIFI automatic connection

```
sudo nmcli connection modify <name> connection.autoconnect yes
```

#### 4.3.1.2 Configure Using The dhcpcd Tool

The official system of Raspberry Pi uses dhcpcd as the network management tool by default.

```
sudo raspi-config
```

1. Choose 1 System Options
2. Choose S1 Wireless LAN
3. Choose your country in Select the country in which the Pi is to be used , than choose OK, This prompt only appears when setting up WIFI for the first time.
4. Please enter SSID, input WIFI SSID
5. Please enter passphrase. Leave it empty if none, input password than restart the device

### 4.3.2 External Antenna and Internal PCB Antenna

You can switch whether to use an external antenna or a built-in PCB antenna through software configuration. Considering compatibility and widest support, the factory default system is the built-in PCB antenna. If the customer chooses a complete machine with a case and equipped with an external antenna, you can switch by the following operations:

Edit /boot/config.txt

```
sudo nano /boot/config.txt
```

Choose external antenna add

```
dtparam=ant2
```

Then reboot the device.

### 4.3.3 AP and Bridge Mode

WiFi on CM4 Sensing also supports configuration in AP router mode, bridge mode or mixed mode.

Please refer to the open source project [github: garywill/linux-router](https://github.com/garywill/linux-router) to learn how to configure it.

## 4.4 Bluetooth

CM4 Sensing can be selected whether the Bluetooth function is integrated or not. If it is equipped with Bluetooth, this function is turned on by default.

Bluetoothctl can be used to scan, pair and connect Bluetooth devices. Please refer to the [ArchLinux-Wiki-Bluetooth](https://wiki.archlinux.org/wiki/bluetooth) guide to configure and use Bluetooth.

### 4.4.1 Usage

Scan:

```
bluetoothctl scan on/off
```

Find:

```
bluetoothctl discoverable on/off
```

Trust device:

```
bluetoothctl trust [MAC]
```

Connect device:

```
bluetoothctl connect [MAC]
```

Disconnect device:

```
bluetoothctl disconnect [MAC]
```

### 4.4.2 Example

Into bluetooth shell

```
sudo bluetoothctl
```

Enable Bluetooth

```
power on
```

### Scan device

```
scan on

Discovery started
[CHG] Controller B8:27:EB:85:04:8B Discovering: yes
[NEW] Device 4A:39:CF:30:B3:11 4A-39-CF-30-B3-11
```

Find the name of the turned-on Bluetooth device, where the name of the turned-on Bluetooth device is test.

```
devices

Device 6A:7F:60:69:8B:79 6A-7F-60-69-8B-79
Device 67:64:5A:A3:2C:A2 67-64-5A-A3-2C-A2
Device 56:6A:59:B0:1C:D1 Lefun
Device 34:12:F9:91:FF:68 test
```

### Pair device

```
pair 34:12:F9:91:FF:68
Attempting to pair with 34:12:F9:91:FF:68
[CHG] Device 34:12:F9:91:FF:68 ServicesResolved: yes
[CHG] Device 34:12:F9:91:FF:68 Paired: yes
Pairing successful
```

### Add as trusted device

```
trust 34:12:F9:91:FF:68
[CHG] Device 34:12:F9:91:FF:68 Trusted: yes
Changing 34:12:F9:91:FF:68 trust succeeded
```

## 4.5 4G LTE

CM4 Sensing supports 4G networks. If you choose products with 4G modules, we have configured the mobile EC20 full netcom 4G module in China, which supports mobile, Unicom and telecom network standards. The 4G module is extended by USB 2.0, and supports one Nano-SIM card.

### 4.5.1.1 Configure Using The Network Manager Tool

To connect to the 4G network, you need to create a gsm network connection first. The following connections are created according to different configuration requirements.

- There is no need to configure APN and other configurations

```
sudo nmcli connection add type gsm con-name <connection_name>
```

For example, create a gsm network called mobilegsm.

```
sudo nmcli connection add type gsm con-name mobilegsm
```

- APN needs to be configured.

```
sudo nmcli connection add type gsm con-name <connection_name> ifname cdc-wdm0 gsm.apn "cmnet"
```

- Configure username and password

```
sudo nmcli connection add type gsm con-name <connection_name> ifname cdc-wdm0 gsm.number "#777" gsm.username "ctnet@mycdma.cn" gsm.password "vnet.mobi"
```

- Generally, China Mobile Unicom can dial successfully by using the first method. If problems are found, you can also try the following command.

```
# China Mobile
sudo nmcli connection add type gsm con-name "mobile" ifname cdc-wdm0 gsm.number "**98*1#"
gsm.apn "cmnet"
```

```
# China Unicom
sudo nmcli connection add type gsm con-name "Unicom" ifname cdc-wdm0 gsm.number ""99#"
gsm.apn "3gnet"
```

```
# China Telecom
sudo nmcli connection add type gsm con-name "Telecom" ifname cdc-wdm0 gsm.number "#777"
gsm.username "ctnet@mycdma.cn" gsm.password "vnet.mobi"
```

#### 4.5.1.2 Configure Using dhcpcd

Before using 4G, we need to add our APT library first. All the images given by our company have been added with this library, so users don't need to add it manually.

```
sudo apt update
sudo apt install ed-ec20-qmi
```

Automatic dialing is not started by default. If users want to start automatic dialing, they need to enable LTE lte-reconnect.service service.

```
sudo systemctl enable lte-reconnect.service
sudo systemctl start lte-reconnect.service
```

After successful dialing, you can use the ifconfig command to see the wwan0 network port.

If you need to set APN additionally, you need to modify the dialing command in /usr/share/ed-ec20-qmi/LTE-reconnect.sh.\$BSP\_HOME\_PATH/quectel-CM -4 -f \$LOGFILE &

The quectel-CM dialing configuration information is as follows:

```
$BSP_HOME_PATH/quectel-CM -4 -f $LOGFILE -s <APN> &
```

Restart lte-reconnect.service after setting.

```
sudo systemctl restart lte-reconnect.service
```

Reset 4G module

```
raspi-gpio set 10 pd
```

```
raspi-gpio set 10 op dl
sleep 0.5
raspi-gpio set 10 dh
sleep 0.5
raspi-gpio set 10 dl
```

## 4.6 RTC

CM4 Sensing is integrated with RTC. For the version sold in China, we will install CR1220 button cell (RTC backup power supply) by default when shipping. In this way, the system can be guaranteed to have an uninterrupted and reliable clock, which is not affected by factors such as equipment power down.

The default shipping system image will integrate the RTC automatic synchronization service we wrote, so guests can automatically synchronize the clock without setting it, and can use RTC without feeling. The general principle is:

- When the system is turned on, the service automatically reads the saved time from RTC and synchronizes it to the system time.
- If there is an Internet connection, the system will automatically synchronize the time from the NTP server and update the local system time with Internet time.
- When the system is shut down, the service automatically writes the system time into RTC and updates the RTC time.
- Because of the installation of button cell, although CM4 Sensing is powered off, RTC is still working and timing.

In this way, we can ensure that our time is accurate and reliable.

**WARN:** If it is the first time to boot, because there is no effective time in RTC, synchronization may fail, so just restart it directly. When rebooting, the system time will be written into RTC for normal use.

**If you don't want to use this service, you can turn it off manually:**

```
sudo systemctl disable rtc
sudo reboot
```

**Re-enable this service:**

```
sudo systemctl enable rtc
sudo reboot
```

**Read RTC manually:**

```
sudo hwclock -r
```

```
2022-11-09 07:07:30.478488+00:00
```

**Manually synchronize RTC time to the system:**

```
sudo hwclock -s
```

**Write the system time into RTC**

```
sudo hwclock -w
```

**Trouble Shooting**

Please first check whether there is an rtc device (/dev/rtc0) mount:

```
ls /dev/rtc0
```

If not, maybe you used the official standard system, but didn't install our BSP package. Please refer to the chapter [Install BSP Online Based On The Original Raspberry Pi OS](#) to install BSP. In addition, you also need to install ed-rtc package to enable RTC automatic synchronization.

Other possible checkpoints:

- Is CR1220 button cell installed?
- NTP network time protocol, you need to connect to the Internet to synchronize the time automatically, and you need to open the port (UDP, 123), otherwise the synchronization will fail.

## 4.7 LED Indication

CM4 Sensing has two indicator lights, the red LED is connected with the LED\_PI\_nPWR pin of CM4, which is the power indicator light, and the green LED is connected with the LED\_PI\_nACTIVITY pin of CM4, which is the running status indicator light.

## 4.8 Buzzer

The buzzer is controlled by GPIO11.

Open buzzer:

```
raspi-gpio set 11 op dh
```

Close buzzer

```
raspi-gpio set 11 op dl
```

## 4.9 Serial Communication

### 4.9.1 Install picocom Tool

Picocom serial terminal can be debugged conveniently in Linux environment.

First install picocom

```
sudo apt-get install picocom
```

You can type Ctrl+a first, and then Ctrl+h to see the available commands.

```

*** Picocom commands (all prefixed by [C-a])

*** [C-x] : Exit picocom
*** [C-q] : Exit without resetting serial port
*** [C-b] : Set baudrate
*** [C-u] : Increase baudrate (baud-up)
*** [C-d] : Decrease baudrate (baud-down)
*** [C-i] : Change number of databits
*** [C-j] : Change number of stopbits
*** [C-f] : Change flow-control mode
*** [C-y] : Change parity mode
*** [C-p] : Pulse DTR
*** [C-t] : Toggle DTR
*** [C-g] : Toggle RTS
*** [C-] : Send break
*** [C-c] : Toggle local echo
*** [C-w] : Write hex
*** [C-s] : Send file
*** [C-r] : Receive file
*** [C-v] : Show port settings
*** [C-h] : Show this message
    
```

Type Ctrl+a first, then Ctrl+c to switch the local echo mode.

Type Ctrl+a first, then Ctrl+q to exit picocom.

## 4.9.2 RS485

There are four RS485 channels on CM4 Sensing, all of which correspond to the native serial port on BCM2711, and the level conversion is done by using SP3485 interface chip. Please refer to the table below to see the definition of Linux device node (file) and Pin corresponding to each 485 interface.

Interface	Device
RS485-1	/dev/ttyAMA2
RS485-2	/dev/ttyAMA3
RS485-3	/dev/ttyAMA1



Interface	Device
RS485-4	/dev/ttyAMA4

When RS485 interface is used, A is connected to A, B is connected to B, and GND is connected to GND. Send data can use serial tools, here use picocom to open RS485-1 as an example:

```
picocom -b 115200 /dev/ttyAMA2
```

### 4.9.3 RS232

There is a RS232 on CM4 Sensing, which corresponds to UART1 on BCM2711. Using SP3232 level conversion chip, it directly outputs 232 level at Phoenix terminal. If we use our factory image, this RS232 interface will be used as tty console of Linux system by default. Customers can connect this 232 through the Host (Windows/Linux/Mac) to log in to CM4 Sensing's Linux system and execute commands and other operations.

If you use the official image, you need to follow our BSP package. Please refer to the chapter [Install BSP Online Based On The Original Raspberry Pi OS](#).

In addition to being the system Console, this RS232 can also be configured as an ordinary serial port to communicate with other devices. Please follow the following steps:

1. Open raspi-config: `sudo raspi-config`.
2. Choose option 3 - Interface Options.
3. Choose option P6 - Serial Port.
4. Prompt Would you like a login shell to be accessible over serial? 回答 'No'
5. Prompt Would you like the serial port hardware to be enabled? 回答 'Yes'
6. Exit raspi-config
7. Restart device: `sudo reboot`

Note: If RS232 port is configured as a common serial port, the device node on Linux is `/dev/serail0`.

Send data can use the serial tool, here use picocom to open RS232 as an example:

```
picocom -b 115200 /dev/serial0
```

## 4.10 CAN Bus

There is a CAN bus on CM4 Sensing, which is extended by SPI. The corresponding Linux network device is `can0`.

Customers can use tools such as `cansend` by installing `can-utils`, or visit the home page of open source project: <https://github.com/linux-can/can-utils>, 's own cloning, compilation and specific usage. Please also refer to the home page of open source project.

```
sudo apt update
sudo apt install can-utils
```

```
.ip link set can0 up type can bitrate 600000
```

Set the baud rate of can0 to 600kbps, CAN the maximum baud rate of CAN network is 1Mbps.

```
ip link set can0 up type can bitrate 600000 loopback on
```

Set the loopback mode, which is used to test whether the hardware is normal or not. Loopback may not support it.

```
ip link set can0 up
```

Open can0 network

```
cansend can0 0x11 0x12 0x13 0x14 0x15 0x16 0x17 0x18
```

Send the can standard frame with the default ID of 0x1, and the data is 0x11 12 13 14 15 16 17 18. The maximum number of 8byte can be sent each time.

```
cansend can0 -i 0x800 0x11 0x12 0x13 0x14 0x15 0x16 0x17 0x18 -e
```

-i stands for CAN\_ID -e stands for extended frame, with the maximum CAN\_ID of 29bit and the maximum CAN\_ID of standard frame of 11bit.

```
cansend can0 -i 0x02 0x11 0x12 --loop=20
```

-loop means sending 20 packets.

```
candump can0
```

Receiving CAN0 data

```
ip link set can0 down
```

Close the can0 network

# 5 Operating System Installation

## 5.1 Image Download

We have burned the system in eMMC before leaving the factory. Users can skip this section and use it directly.

We have provided the factory image. If the system is restored to factory settings, please click the following link to download the factory image.

Default login information:

- User name: pi
- Password: raspberry
- SSH: enabled by default, and the port uses the default of 22.

### Raspberry Pi OS with desktop, 32-bit

- Release date: July 08nd 2022
- System: 32-bit
- Kernel version: 5.10
- Debian version: 11 (bullseye)
- Downloads: <https://1drv.ms/f/s!Au060HUAtEYBeH5CrYVZyyhJ5Vk?e=RX8dXf>

### Raspberry Pi OS Lite, 32-bit

- Release date: July 08nd 2022
- System: 32-bit
- Kernel version: 5.10
- Debian version: 11 (bullseye)
- Downloads: <https://1drv.ms/f/s!Au060HUAtEYBeH5CrYVZyyhJ5Vk?e=RX8dXf>

### Raspberry Pi OS with desktop, 64-bit

- Release date: July 08nd 2022
- System: 32-bit
- Kernel version: 5.10
- Debian version: 11 (bullseye)
- Downloads: <https://1drv.ms/f/s!Au060HUAtEYBeH5CrYVZyyhJ5Vk?e=RX8dXf>

### Raspberry Pi OS Lite, 64-bit

- Release date: July 08nd 2022
- System: 32-bit

- Kernel version: 5.10
- Debian version: 11 (bullseye)
- Downloads: <https://1drv.ms/f/s!Au060HUAAtEYBeH5CrYVZyyhJ5Vk?e=RX8dXf>

## 5.2 eMMC Flash

### 5.2.1 Tool Download

It is recommended to use the official burning tool of Raspberry Pi:  
Raspberry Pi Imager ([https://downloads.raspberrypi.org/imager/imager\\_latest.exe](https://downloads.raspberrypi.org/imager/imager_latest.exe))  
SD Card Formatter (<https://www.sdcardformatter.com/download/>)  
rpiboot([https://github.com/raspberrypi/usbboot/raw/master/win32/rpiboot\\_setup.exe](https://github.com/raspberrypi/usbboot/raw/master/win32/rpiboot_setup.exe))

### 5.2.2 Flash

1. Download the image you want to flash.
2. CM4 Sensing is powered off and connects Micro-USB to the computer.



3. Open the rpiboot tool, wait for the completion of the drive symbol, and the drive letter will pop up after completion.
4. Open SD Card Formatter, select the formatted drive letter, and click Format below to format.
5. After formatting, open Raspberry Pi Imager, select the image you want to burn in the first item, select the custom image for the local image, and select the memory card for the second item.
6. Click Burn after setting, and wait for the burn to end.
7. After burning, remove the USB-to-Micro-USB cable and power it on again.

## 5.3 Install BSP Online Based On The Original Raspberry Pi OS

If you use the official image of Raspberry Pi, you need to install BSP to use its unique functions, and you can skip this step by using the image we provide. Add the warehouse and BSP in the following ways:

```
curl -sS https://apt.edatec.cn/pubkey.gpg | sudo apt-key add -  
  
echo "deb https://apt.edatec.cn/raspbian stable main" | sudo tee /etc/apt/sources.list.d/edatec.list
```

Install CM4 Sensing BSP:

```
sudo apt update  
sudo apt install ed-cm4sen-rev1p0-bsp ed-rtc
```

Install NetworkManager Network management tools [optional]

NetworkManager Tools can more easily configure routing rules and set priorities.

```
# If use the Raspberry Pi OS Lite version system.
```

```
sudo apt install ed-networkmanager
```

```
# If use a system with a desktop, we recommend that you install the plug-in ed-networkmanager-gnome.
```

```
sudo apt install ed-networkmanager-gnome
```

## 6 FAQ

### 6.1.1 Default Username and Password

User name: pi

Password: raspberry

## 7 About Us

### 7.1 About EDATEC

EDATEC, located in Shanghai, is one of Raspberry Pi's global design partners. Our vision is to provide hardware solutions for Internet of Things, industrial control, automation, green energy and artificial intelligence based on Raspberry Pi technology platform.

We provide standard hardware solutions, customized design and manufacturing services to speed up the development and time to market of electronic products.

### 7.2 Contact Us

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