



ED-AIC2020

AI Camera

User Manual

EDA Technology CO.,LTD

May 2023

Contact Us

Thank you very much for purchasing and using our products, and we will serve you wholeheartedly.

As one of the global design partners of Raspberry Pi, we are committed to providing hardware solutions for IoT, industrial control, automation, green energy resource and artificial intelligence based on Raspberry Pi technology platform.

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Foreword

Related Manuals

All kinds of product documents contained in the product are shown in the following table, and users can choose to view the corresponding documents according to their needs.

Document	Instruction
ED-AIC2020 Datasheet	This document introduces the product form, software and hardware specifications, dimension and ordering codes of ED-AIC2020 to help users understand the overall system parameters of the product.
ED-AIC2020 user manual	This document introduces the appearance, installation, startup and configuration of ED-AIC2020 to help users use the product better.

Users can visit the following website for more information:

<https://www.edatec.cn>




Reader Range

This manual is applicable to the following readers:

- ◆ Mechanical engineer
- ◆ Electrical engineer
- ◆ Software engineer
- ◆ System engineer

Related Agreement

Symbolic Convention

Symbol	Instruction
	Prompt symbols, indicating important features or operations.
	Pay attention symbols, which may cause personal injury, system damage, or signal interruption/loss.
	May cause great harm to people.

Safety Instructions

- ◆ This product should be used in an environment that meets the requirements of design specifications, otherwise it may cause failure, and functional abnormality or component damage caused by non-compliance with relevant regulations are not within the product quality assurance scope.
- ◆ Our company will not bear any legal responsibility for personal safety accidents and property losses caused by illegal operation of products.
- ◆ Please do not modify the equipment without permission, which may cause equipment failure.
- ◆ When installing equipment, it is necessary to fix the equipment to prevent it from falling.
- ◆ If the equipment is equipped with an antenna, please keep a distance of at least 20cm from the equipment during normal use.
- ◆ Do not use liquid cleaning equipment, and keep away from liquids and flammable materials.
- ◆ This product is only supported for indoor use.

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1 Product Description

Introduce the overview, packaging, appearance, interface, indicator and light source of the product.

- ✓ Overview
- ✓ Packing List
- ✓ Appearance
- ✓ Interface
- ✓ Button and Indicator
- ✓ Light Source and Camera Lens

1.1 Overview

ED-AIC2020 is a highly integrated industrial artificial intelligence camera, which is equipped with fixed or liquid lens, LED lighting, industrial image sensor and Raspberry Pi computer module 4 (CM4).

- ◆ ED-AIC2020 is equipped with zoom lens and LED lighting, which greatly reduces the installation and maintenance work.
- ◆ ED-AIC2020 is an integrated, compact and durable industrial artificial intelligence camera, which is very suitable for various AI vision applications.
- ◆ Featuring pre-installed QT, Python, OpenCV SDK and AI algorithm demonstration applications, it can greatly accelerate the development and deployment of AI visual applications.







ED-AIC2020 is mainly used in the following scenarios:

- ◆ Fixed industrial bar code scanner
- ◆ Object position
- ◆ Measure
- ◆ Optical character recognition
- ◆ Object detection based on AI
- ◆ Object segmentation based on AI
- ◆ Defect detection based on AI

1.2 Packing List

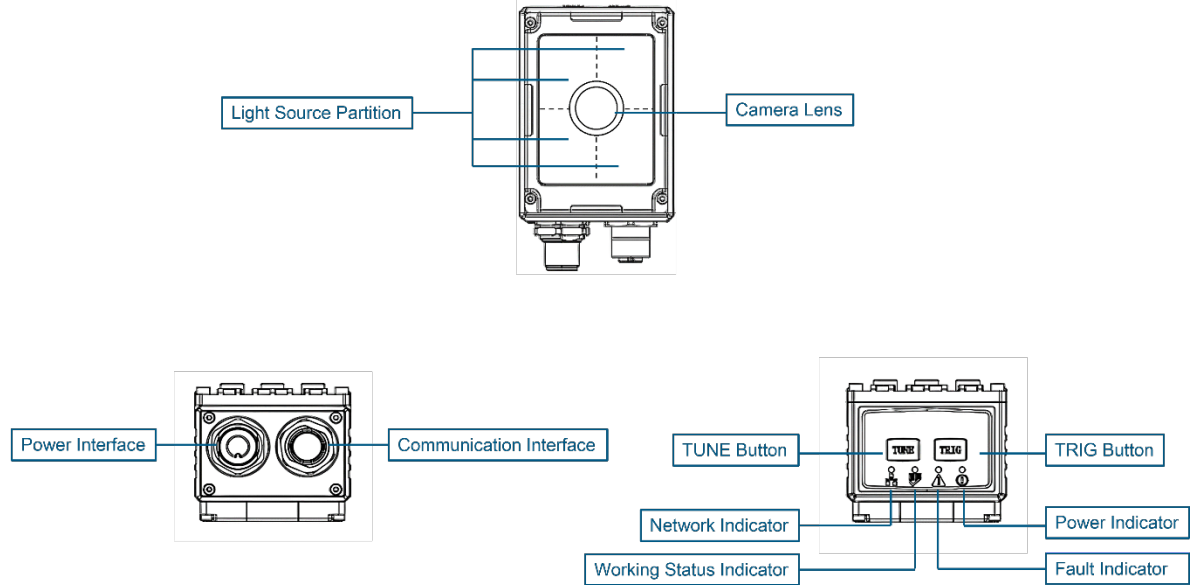
1 x ED-AIC2020 AI camera

Optional accessories

Figure	Order code	Description
	ED-ACC-AIC-ETH-A-03 ED-ACC-AIC-ETH-A-05 ED-ACC-AIC-ETH-A-10	M12 8-pin Gigabit Network port to RJ45 cable
	ED-ACC-AIC-PWR-A-03 ED-ACC-AIC-PWR-A-05 ED-ACC-AIC-PWR-A-10	M12 12-pin power supply IO cable
	ED-ACC-AIC-DW-FIX001	The bracket is use for fixing between that product and the profile.
	ED-ACC-AIC-DW-FIX002	1 x screw M4* 8 3 x spacer 1 x screw M6*10 1 x T nut (Connecting profile)

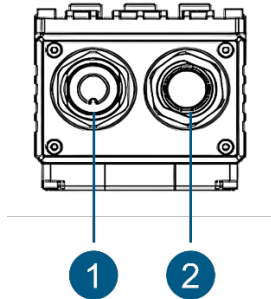
1.3 Appearance

Introduce the distribution of product interfaces, buttons and indicators.



1.4 Interface

ED-AIC2020 includes communication and power supply interfaces, both of which adopt M12 aviation connectors and support IP65 waterproof grade.



NO.	Definition	Descriptions
1	Communication interface	Gigabit Ethernet interface, M12 8-pin A-code aviation connector
2	Power interface	Power interface, IO interface and RS232 serial port, M12 12-pin aviation connector.

1.4.1 Power supply interface

The power interface adopts M12 12-pin aviation connector, including 1 power interface, 1 serial port and 6 general GPIO. The pins are defined as follows.

	PIN ID	Line Color	PIN Name
<p>The diagram shows a top-down view of the M12 12-pin connector. The pins are numbered 1 through 12 around the perimeter. Pin 1 is at the top, pin 2 is at the top-right, pin 3 is at the right, pin 4 is at the bottom-right, pin 5 is at the bottom, pin 6 is at the bottom-left, pin 7 is at the left, pin 8 is at the top-left, pin 9 is at the top, pin 10 is at the top-right, pin 11 is at the right, and pin 12 is at the bottom-left.</p>	1	Yellow	DC-
	2	White/Yellow	DC+
	3	Brown	COMMON_IN
	4	White/Brown	DI1
	5	Purple	Trigger
	6	White/Purple	COMMON_OUT
	7	Red	External Strobe
	8	Green	DO1
	9	Black	DO2
	10	Orange	RS232_GND
	11	Blue	RS232_TX
	12	Gray	RS232_RX

DI and DO pins are defined as follows.

Signal	CM4 Pin
DI1	GPIO17
DO1	GPIO22
DO2	GPIO27

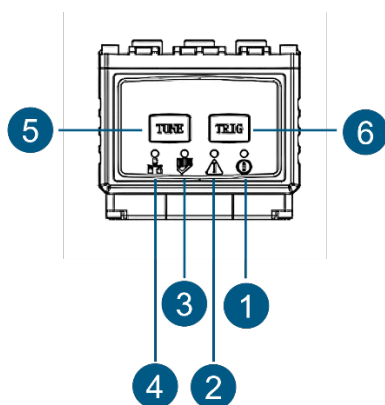
1.4.2 Communication interface

The communication interface adopts M12 8-pin aviation connector, and the pins are defined as follows.

PIN ID	PIN Name
1	TRD0+
2	TRD0-
3	TRD1+
4	TRD2+
5	TRD2-
6	TRD1-
7	TRD3+
8	TRD3-

1.5 Button and Indicator

ED-AIC2020 contains 2 buttons and 4 indicators.



No.	Description
1	Power indicator <ul style="list-style-type: none"> ● Always on: the device is powered on. ● Off: the device is not powered on.
2	System fault indicator
3	Working status indicator
4	Network connection indicator
5	Adjustment button, one-touch autofocus button or user-defined button.
6	Trigger button, used for camera trigger or user-defined one-touch button.

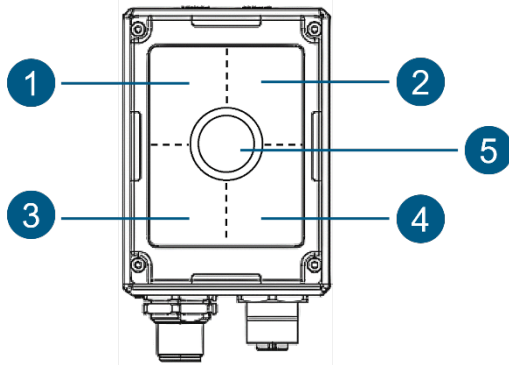
Button pin definition

Key	CM4 Pin
Adjusting button	GPIO20
Trigger button	GPIO12

Indicator pin definition

Indicator light	CM4 Pin
Power indicator	N/A
Fault indicator	GPIO21
Working status indicator	GPIO7(abnormal) GPIO16(normal)
Network indicator	N/A

1.6 Light Source and Camera Lens



No.	Description
1	Light source part 1, which supports enabling and disabling individually.
2	Light source part 2, which supports enabling and disabling individually.
3	Light source part 3, which supports enabling and disabling individually.
4	Light source part 4, which supports enabling and disabling individually.
5	Lens, supporting fixed lens and liquid lens.

Light source control command

Signal	CM4 Pin (GPIO 8/9, /dev/ttyAMA2)
Controlling the light source part 1	RS232 command <ul style="list-style-type: none"> ● enable: 1-1 ● disable: 1-0
Controlling the light source part 2	RS232 command <ul style="list-style-type: none"> ● enable: 2-1 ● disable: 2-0
Controlling the light source part 3	RS232 command <ul style="list-style-type: none"> ● enable: 3-1 ● disable: 3-0
Controlling the light source part 4	RS232 command <ul style="list-style-type: none"> ● enable: 4-1 ● disable: 4-0

2 Install the Device

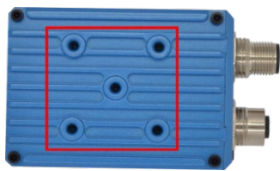
Introduce the operation steps of installing equipment.

Preparation:

- ◆ Ready to install bracket and mounting screws (M4*8 with spacer, M6*10 with spacer)
- ◆ M4 and M6 allen head screwdrivers have been prepared.

Steps:

1. Determine the position of the mounting hole on the camera, as shown in the figure below. Generally, it can be fixed with a central screw and a peripheral screw.



2. Place the mounting bracket above the camera mounting hole, so that the bracket (the side with M4 screw hole) is aligned with the central screw hole of the camera, and use a screwdriver to fix the bracket on the camera with M4 screw with spacer, as shown in the following figure.



3. Rotate the bracket, adjust the installation direction, and choose top installation or side installation as required. The effect is as follows:

Top mounting



Side mounting



4. Use M6 screw to fix the bracket and other equipment. It is recommended to use a central screw and a peripheral screw for fixing.



Tip:

Adjust the appropriate installation position and angle according to different engineering requirements on site.

3 Boot the Device

Introduces the steps of connecting cables and starting the device.

- ✓ Connecting Cables
- ✓ First Start to Device

3.1 Connecting Cables

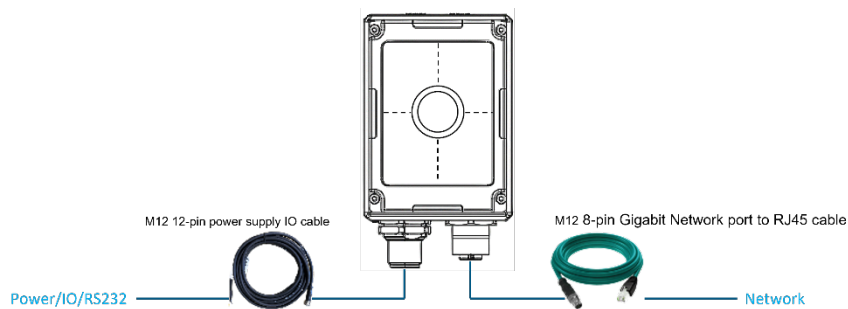
Introduces the connection method of cables.

Preparation:

- ◆ The camera to be connected, 8-pin Gigabit network port to RJ45 cable and 12-pin power supply IO cable have been obtained.
- ◆ DC 12V 2A power adapter and auxiliary wiring connector have been prepared.
- ◆ Because one end of the 12-pin power supply IO cable is a 12-pin bare wire, prepare connectors and wiring tools as needed.

Connecting cables

Please refer to [1.4 Interface](#) for the pin definition and wiring method of each interface.



3.2 First Start to Device

ED-AIC2020 has no switching power supply. After the power supply is connected, the system will start.

- ◆ The power indicator lights up, indicating that the equipment has been powered normally.
- ◆ The working status indicator flashes, indicating that the system is started normally.

Using 64-bit Raspberry Pi OS, after the system is started, you need to log in with the default user name and password. Because the camera can't connect to the monitor, you need to log in to the system remotely through a PC. Please refer to [5.3 Remote Login](#) for specific operations.

4 Install OS

Introduces the steps of downloading OS, opening/closing device case and flashing eMMC.

- ✓ Download OS File
- ✓ Open Device Case
- ✓ Flashing eMMC
- ✓ Close Device Case

4.1 Download OS File

The latest version of the 64-bit Raspberry Pi OS (Desktop) can be downloaded from [ED-AIC2020 Raspberry Pi OS\(64-bit\)](#).

4.2 Open Device Case

The eMMC burning needs to be carried out through the internal Micro USB, so the case needs to be opened before burning.

Preparation:

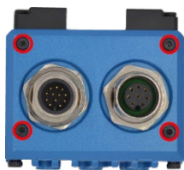
- ◆ A M1.5 allen head screwdriver has been prepared.
- ◆ A M2 allen head screwdriver has been prepared.

Steps:

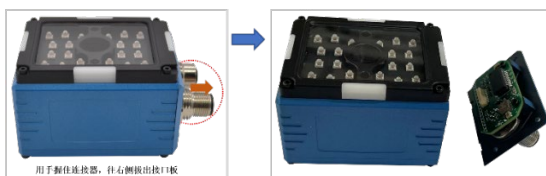
1. Loosen the four screws of the rear panel counterclockwise with the M2 allen head screwdriver, as shown in the red mark in the figure below.



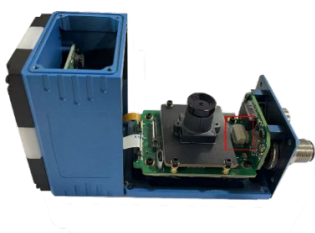
2. Loosen the four screws at the bottom counterclockwise with the M1.5 allen head screwdriver, as shown in the red mark below.



3. Hold the connector and pull out the interface board to the right, as shown in the figure below.



4. Open the upper cover upwards, hold the connector of the interface board, align the interfaces (ports marked by red) at both ends, and then insert the interface board, as shown in the figure below.



4.3 Flashing eMMC

It is recommended to use the official Raspberry Pi flashing tool, and the download path is as follows:

- ◆ **Raspberry Pi Imager** : 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

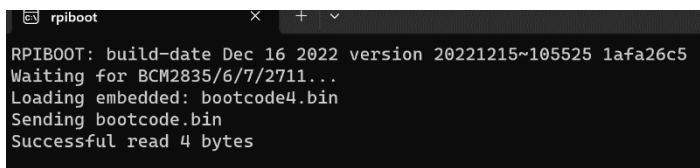
Preparation:

- The download and installation of the write tool to the computer has been completed.
- A Micro USB to USB-A cable has been prepared.
- The device case has been opened. For details, please refer to [4.2 Open the device case](#).
- The OS file has been obtained.

Steps:

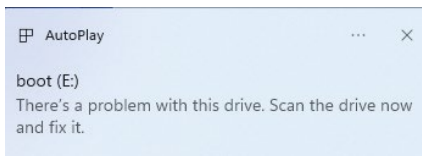
The steps are illustrated with Windows system as an example.

1. Connect the power cable and USB cable(connect the Micro USB end to the Micro USB port inside the ED-AIC2020, and connect the other end to PC).
2. Disconnect the power supply of ED-AIC2020, and then power it on again.
3. Open **Rpiboot tool**, and automatically carry out drive symbolization.

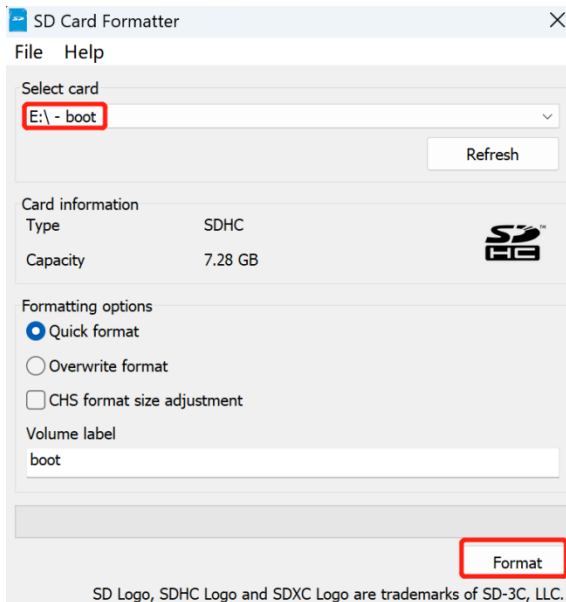


```
rpiboot
RPiB00T: build-date Dec 16 2022 version 20221215~105525 1afa26c5
Waiting for BCM2835/6/7/2711...
Loading embedded: bootcode4.bin
Sending bootcode.bin
Successful read 4 bytes
```

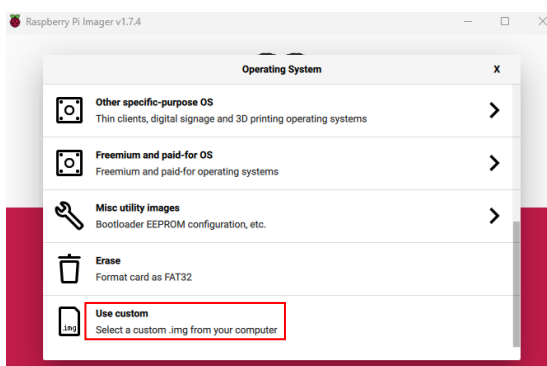
4. After the drive symbolization is completed, the drive symbol will pop up in the lower right corner of the computer.



- Open **SD Card Formatter**, select the formatted drive symbol, and click "Format".



- In the pop-up prompt box, select "Yes".
- After formatting, click "OK" in the prompt box.
- Close **SD Card Formatter**.
- Open **Raspberry Pi Imager**, select "CHOOSE OS" and select "Use Custom " in the pop-up pane.



- According to the prompt, select the downloaded OS file under the user-defined path and return to the main interface.

11. Click "CHOOSE STORAGE", select the default device in the "Storage" interface, and return to the main interface.



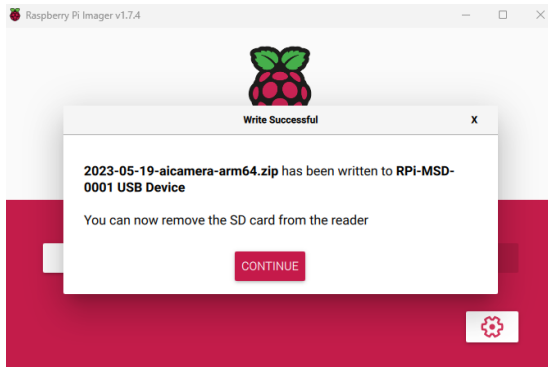
12. Click "WRITE" and select "Yes" in the pop-up prompt box to start writing the OS.



13. After the OS writing is completed, the file will be verified.



14. After the file verifying is completed, the prompt box "Write Successful" pops up, and click "CONTINUE" to finish flashing eMMC.



15. Close **Raspberry Pi Imager**, remove the USB cable and power on the device again.



Tip:

In normal use, the device case needs to be closed. For specific operation, please refer to [4.4 Close the device case](#).

4.4 Close Device Case

After finishing eMMC burning, it is necessary to close the device case to facilitate normal use.

Preparation:

- ◆ A M1.5 allen head screwdriver has been prepared.
- ◆ A M2 allen head screwdriver has been prepared.

Steps:

1. Pull out the interface board and cover the upper cover downward.
2. Hold the connector of the interface board, align the interfaces at both ends (marked by red), and insert the interface board.



3. Insert the interface board until you hear a sound, which means the insertion is successful.
4. Tighten the four screws at the bottom clockwise with the M1.5 allen head screwdriver, as shown in red mark of the figure below.



5. Tighten the four screws of the rear panel clockwise with the M2 allen head screwdriver, as shown in red mark of the figure below.



5 Configure the Device

Introduce the related operations of system configuration.

- ✓ Find Device IP
- ✓ Install BSP (Optional)
- ✓ Remote Login
- ✓ Compile Camera Demo
- ✓ aic.h File
- ✓ libaic.so File

5.1 Find Device IP

Introduces the method of obtaining device IP.

5.1.1 Log in router to inquire

Preparation:

- ◆ The camera is connected to network through the router.
- ◆ The IP and network password of the router in the network have been obtained, and the IP address is 192.168.X.X

Steps:

1. Open a browser, enter the router IP of the network where the camera is located in the address bar: 192.168.x.x, and press Enter to enter the router login interface.
2. According to the interface prompts, enter the network password and enter the router management interface.
3. Find the IP address of the camera in the terminal equipment of the management interface.

5.1.2 Scan with nmap tool

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 steps:

Preparation:

- ◆ The camera is connected to the network through the router.
- ◆ Obtained the IP segment and mask of the router in the network, such as 192.168.X.X/24, where 24 is the mask.

Steps:

1. Open the nmap tool and scan the hosts in the 192.168.X.X/24 network segment.

The nmap tool operates differently in different operating systems, so it can be operated according to the actual interface or the prompt of the command.

2. According to the scanned results, get the camera IP.

5.2 Install BSP (Optional)

If you are using the latest version of the 64-bit Raspberry Pi operating system (Desktop), you do not need to install it.

If you use the factory default 64-bit Raspberry Pi operating system (Lite), you need to install it.

Steps:

1. Download the GPG key and add the source list.

```
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
```

2. Install BSP and SDK packages.

```
sudo apt update  
sudo apt install ed-aic2020-bsp ed-aic2020-sdk
```

3. Install WiringPi

```
git clone https://github.com/WiringPi/WiringPi.git  
cd WiringPi  
./build
```

5.3 Remote Login


Because the camera can't connect to the monitor, you need to log in to the system remotely through a PC.

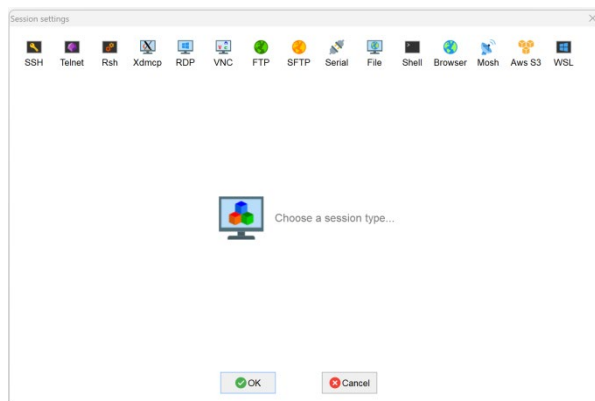
The mode of remote login is determined by the user himself, and the following is an example of logging in through MobaXterm.


Preparation:

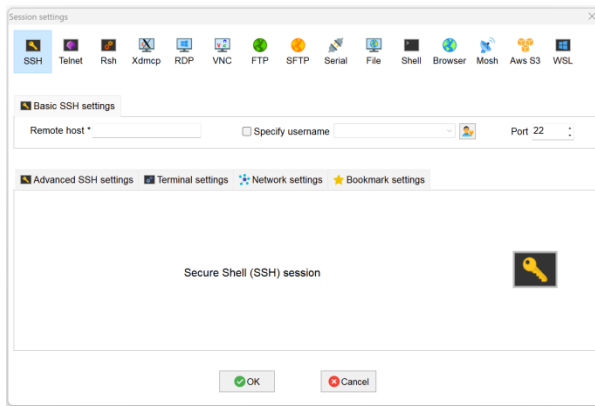
- ◆ The MobaXterm tool has been installed on the PC.
- ◆ The camera has been connected to the network through the router.
- ◆ Obtained the IP address of the camera.

Steps:

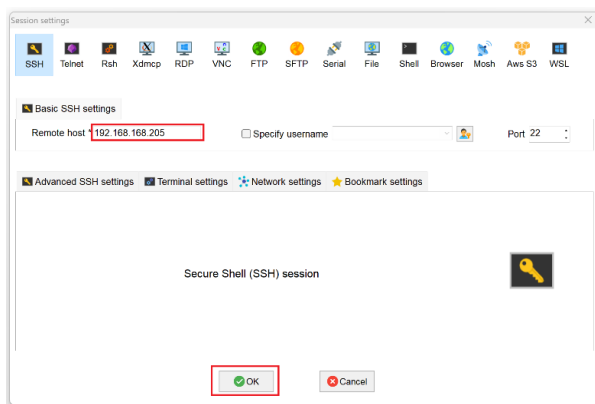
1. Open MobaXterm, click  Session, Open the create connection window, as shown in the figure below.



2. Click  SSH in the upper left corner, open the SSH connection interface.



3. After entering the obtained IP address of the camera, click “OK”.



4. Click "Accept" in the pop-up prompt box to enter the system login interface.
5. Enter the user name and password according to the prompt, and enter the system after logging in.



Tip:

Default user name: pi, Default password: raspberry.

```

login as: pi
pi@192.168.168.205's password:
+ MobaXterm Personal Edition v23.0 +
+ (SSH client, X server and network tools)
+
+ SSH session to pi@192.168.168.205
+ Direct SSH      : ✓
+ SSH compression : ✓
+ SSH-browser    : ✓
+ X11-forwarding  : ✓ (remote display is forwarded through SSH)
+
+ For more info, ctrl+click on help or visit our website.
Linux raspberrypi 5.10.92-v8+ #1514 SMP PREEMPT Mon Jan 17 17:39:38 GMT 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: Sat May  6 10:07:19 2023 from 192.168.168.227
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:~$

```

5.4 Compile Camera Demo

How to compile the startup test Camera example.

```
cd /usr/share/ed-aic2020-sdk/example/cd WiringPi

sudo make all

sudo /usr/share/ed-aic2020-sdk/example/build/test_camera
# -h help
sudo /usr/share/ed-aic2020-sdk/example/build/test_camera -h
```

5.5 aic.h File

The file "aic.h" provides an interface for how to operate the camera, and the storage path of this file is "/usr/lib/include/aic.h".

5.6 libaic.so File

The storage path of "libaic.so" library file is "/usr/lib/libaic.so".