FOORIR

User's Manual

ToF People Counter

FP221

Statement

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Notice

- The parameters used in the screenshots shown in this manual are only used as setting examples for reference and may not be completely consistent with the actual situation. Please set the parameters according to your actual needs.
- The housing is prohibited from being disassembled during operation. Anti-disassembly reminder: Be careful when manually disassembling the housing of the device to avoid damage to the device. This is a Class A product. In a living environment, this product may cause radio interference. In this case, the user may need to take practical measures to deal with the interference.
- Due to different software versions, the screenshots shown in this manual may not be exactly the same as the web interface of the product you purchased. Please configure your product according to the actual web interface.
- If you find that there is a shortage or damage to any accessories, please contact your local dealer in time. The product pictures/screenshots in this manual are for reference only and are intended to help users install and configure the product. Please refer to the actual product/actual interface for details.

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1. Product Introduction

1.1 Product Introduction

The ToF people counter (FP221) is a professional-grade sensor for accurate human flow counting. It uses advanced 3D ToF technology to accurately identify and count people in real time, with an accuracy rate of more than 98%, effectively filtering non-target objects to ensure data accuracy. The device has strong environmental adaptability and can maintain high accuracy in dark or low-light environments. It supports two-way crossing and regional counting of people, and custom drawing of detection lines and areas to achieve all-round accurate statistics.

The product focuses on privacy protection and only collects depth map information to protect personnel privacy. At the same time, it has functions such as employee identification, adult/child differentiation, stay time detection, and wandering filtering, providing valuable information for data analysis. It supports the generation of heat maps to intuitively display the movement and stay distribution of the crowd, helping to optimize data analysis.

The product supports multiple communication protocols, pushes data to the server in real time, and is equipped with a free cloud platform to view data anytime and anywhere. The cloud platform provides a wealth of passenger flow analysis reports and supports export analysis. The product has open docking capabilities to meet the needs of deep customization and secondary development. In addition, the product also has large-capacity data storage and network disconnection data transmission functions to fully ensure data integrity.

With its powerful functions and stylish design, FP221 is widely used in retail stores, shopping malls, supermarkets, buildings, public transportation (subways, high-speed railways, buses) and other occasions.

1.2 Product Features

- **Real-time and accurate statistics:** It adopts advanced 3D ToF technology and the time-of-flight principle to obtain the environmental depth map. It can accurately identify the human body in real time with an accuracy rate of more than 98%, and effectively filter non-target objects such as children and large objects to ensure the accuracy of the data.
- **Strong environmental adaptability:** The performance of the device is not affected by no light or low light environments. Even in a

completely dark scene, it can still maintain high accuracy and demonstrate strong stability.

- **All-round people counting:** Supports two-way counting of people passing through the line, and can draw custom entry and exit detection lines (up to 4 detection lines can be drawn); at the same time, it also supports regional people counting function, and users can draw custom detection areas as needed (up to 4 detection areas can be drawn). In addition, the device can count the number of people entering and leaving multiple lines and the number of people in the area at the same time to achieve all-round and accurate people counting.
- **Good privacy protection:** Only depth map information is collected, and the depth map and grayscale map of the object are obtained directly, rather than the RGB image, which can effectively and thoroughly protect the privacy of personnel.
- **Employee identification function:** By identifying specific tags, it helps filter out invalid data of employees entering and leaving, and obtains more accurate customer flow information.
- **Distinguish between adults and children:** Supports counting adults and children separately, providing more valuable segmentation information for data analysis.
- **Stay time detection (area optimization)** : Multi-dimensional statistics of the stay time of people in a specified area, accurately record the user's waiting time, and the corresponding headcount statistics to achieve digital management.
- **Wandering filtering (cross-line optimization)** : effectively filter targets wandering at the entrance, avoid duplicate counting, and ensure the accuracy of cross-line data.
- **Heat map analysis:** supports the generation of movement heat maps and stay heat maps, using color blocks to intuitively display the density of crowd movement and the distribution of stay time, thereby facilitating rapid data analysis and optimization.
- **Real-time data push:** The device supports multiple communication protocols such as HTTP(S), MQTT and API, and can push data to the server in real time, ensuring that users can obtain and grasp the latest statistical data information at any time.
- **Remote data control** : Equipped with a free cloud platform, you can view real-time and historical data through the cloud platform anytime and anywhere, support multi-dimensional data query, and help make decisions more intelligently. (The cloud platform supports viewing data every 5 minutes, every half hour, every hour, every day, every week, every month, and every year, and supports data query for different architectures, such as single device, single store, multiple stores, regions, etc.)
- **In-depth passenger flow analysis:** The cloud platform provides a

wealth of passenger flow analysis reports, including festivals, KPIs, peaks and low peaks and other key indicators, presented in visual charts and supported by EXCEL export for further analysis.

- **Efficient and convenient configuration:** Supports convenient configuration (detection range, communication configuration, etc.) through Wi-Fi or Ethernet interface, and is equipped with an intuitive and friendly user interface (UI) to make operation easier.
- **Open docking capability:** Provides SDK development packages for HTTP protocol and MQTT protocol, easily realizes the docking of device data with various servers, and supports deep customization and secondary development.
- **Resume data transmission after network disconnection:** It has large-capacity data storage capacity and can store up to 10 years of data locally. It also has the function of resuming data transmission after network disconnection, which supports 180 days of resuming data transmission after network disconnection, effectively preventing data loss and fully ensuring data integrity.
- **Diverse industrial serial ports:** Provides various types of interfaces such as I/O and RS485 to meet diverse data transmission application requirements.

2. Product Structure

2.1 Packing List

ToF people counter*1

Quick guide*1

IO& 485 terminal block*1
Power terminal block*1

Mounting bracket*1

Employee label *6

Power adapter (12V/2A)*1

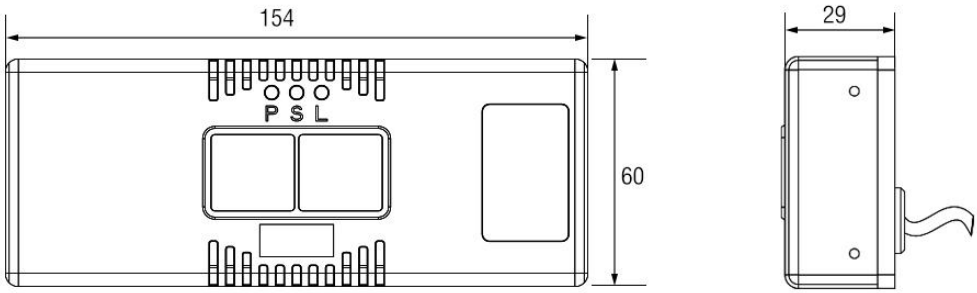
304 cylindrical head combination screw * 4
Hexagon wrench*1

RJ45 waterproof cap * 1

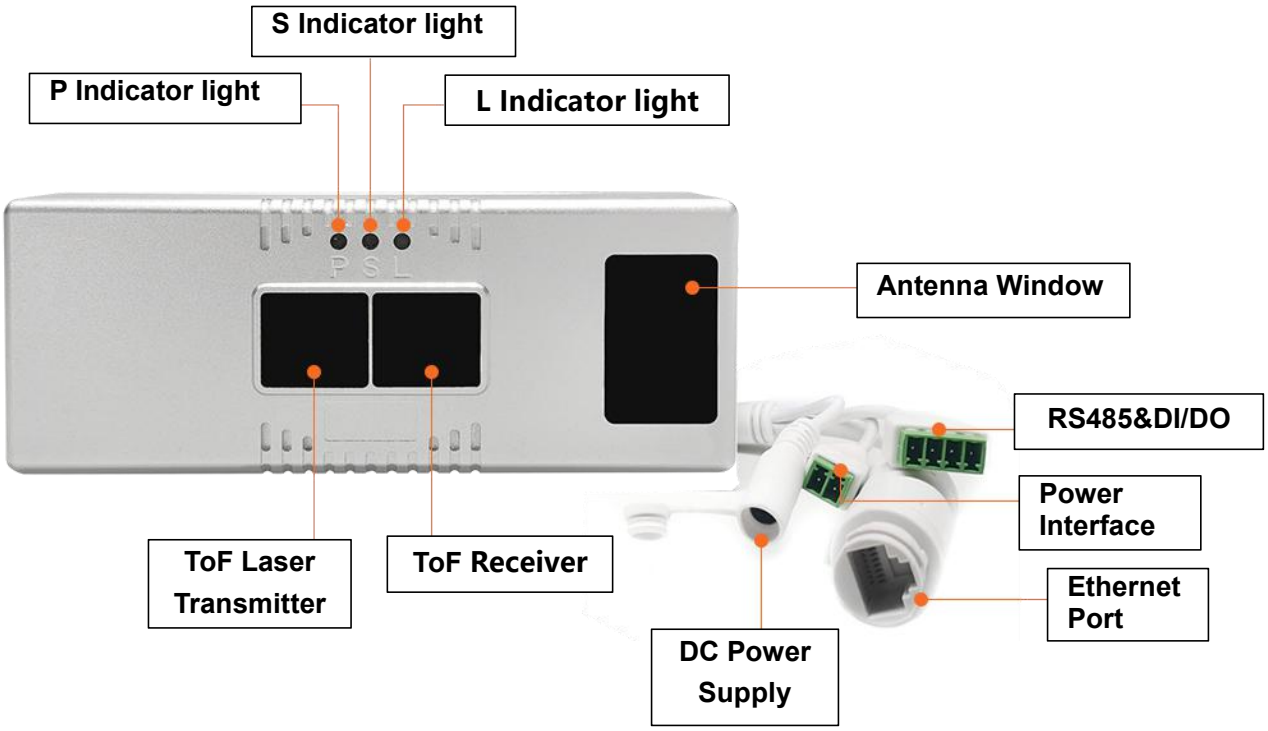
⚠ If any of the above items are damaged or lost, please contact your supplier in time .

2.2 Product size

Unit: mm



2.3 Appearance and Function



Name	Explain
Power Indicator	P Indicator light is always on
Flashing On Startup	PSL three indicator lights flash once
Network Status (Link Light)	① Plug in the network cable : **L indicator light is always on** ② During data communication : **L indicator light flashes** ③ When there is no network cable or communication : **L indicator light is off**
System Operating Status	① The system is not operating normally: **S Indicator light is off** (Problems with the calibration file were detected, etc.) ② The system is running normally and the connection to the server is normal: **S Indicator light is always on** ③ The system is running normally but is not connected or the communication with the configured server is abnormal: **S Indicator light flashes**
Rs485 & DI/Do Port	**1 Port** : 485A, **2 Port** : 485B, **3&4 Ports** : DI and DO interfaces ⚠ **For ports 1234, please refer to the numbers on the device interface.**
Ethernet Port	RJ45 port/PoE port
Power Interface	3.5mm-2Pin power interface (9-36V)
Dc Power Supply	5.5-2.1 power interface (9-36V)

3. Installation Instructions

3.1 Installation Instructions

- When installing, be careful not to get too close to the wall. It is best to keep a distance of 50cm.
- There should be no wiring harnesses or objects near the device, as this may interfere with device detection.
- The device needs to be installed horizontally and does not support tilted installation

3.2 Installation height

⚠ **It is recommended to find an installation location at a suitable height based on the coverage required.**

⚠ **The field of view is the visible range of the screen, not the actual detection range.**

Installation Height(m)	Field Of View (m)	Detection Range(m)
2.0	4.6*3.34	0.69*0.5
2.1	4.83*3.51	0.92*0.67
2.2	5.06*3.67	1.15*0.83
2.3	5.29*3.84	1.38*1
2.4	5.52*4.01	1.61*1.17
2.5	5.76*4.2	1.84*1.34
2.6	5.98*4.36	2.07*1.51
2.7	6.21*4.53	2.3*1.68
2.8	6.44*4.7	2.53*1.85
2.9	6.67*4.87	2.76*2.01
3.0	6.90*5.03	2.99*2.18
3.1	7.13*5.20	3.22*2.35
3.2	7.36*5.37	3.45*2.52
3.3	7.57*5.51	3.68*2.67
3.4	7.82*5.68	3.91*2.84

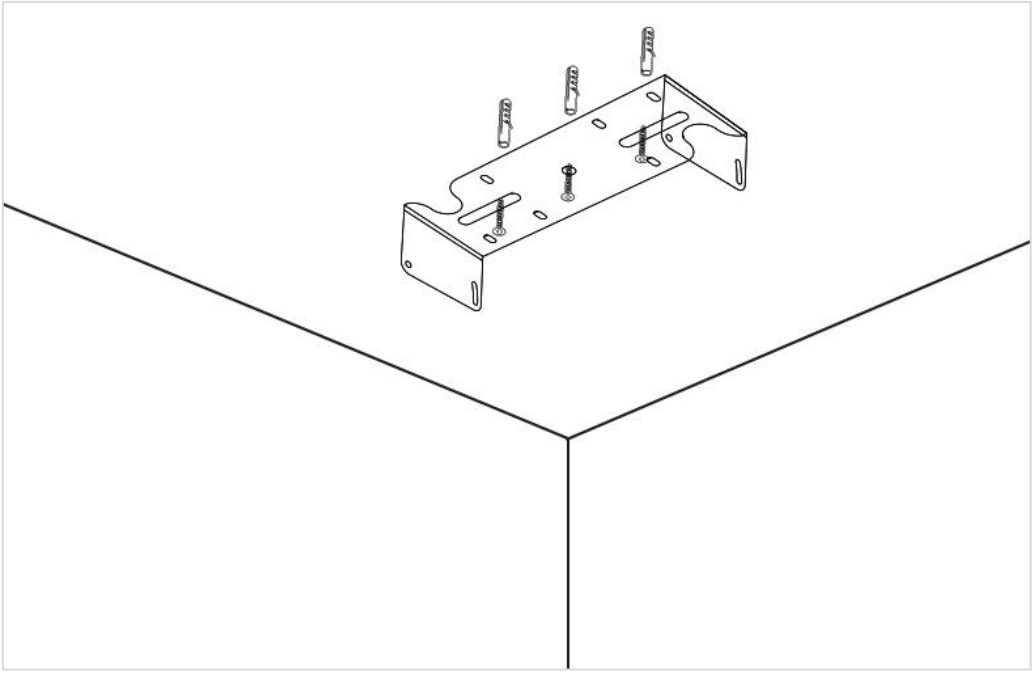
3.3 Factors Affecting Accuracy

- There should be no objects near the device, which may interfere with the device's detection.
- The detection line should only cover the ground, not other higher objects.
- If there are other similar sensor devices nearby, there may be interference.

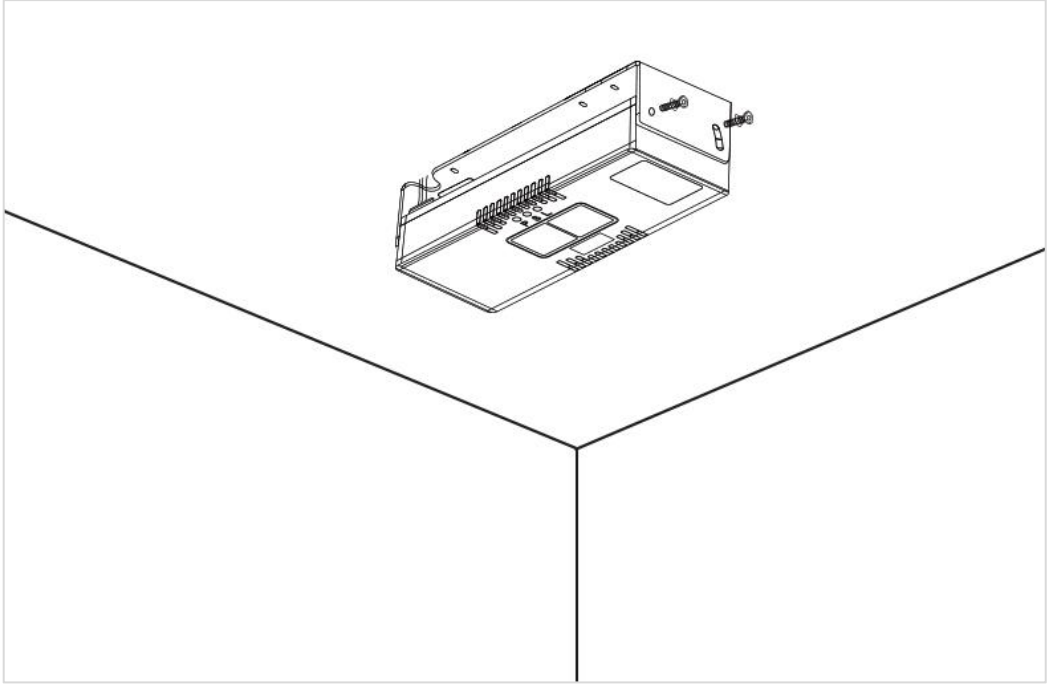
4. Installation Steps

4.1 Ceiling installation

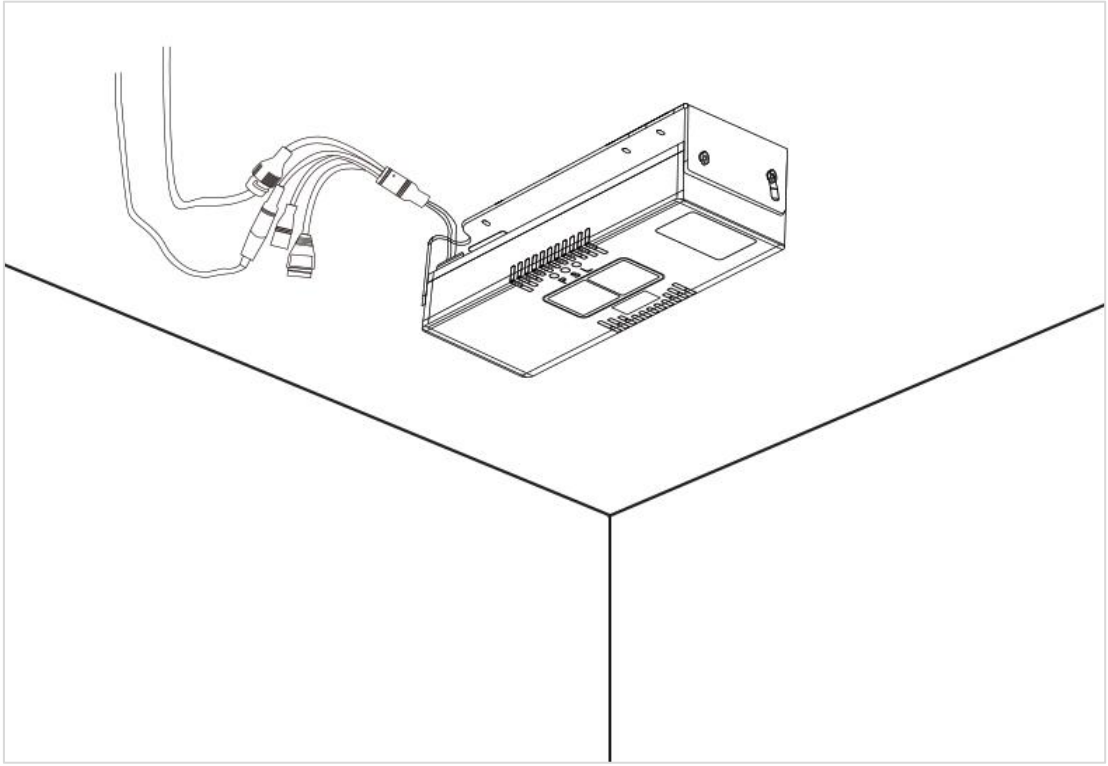
Step 1: Mark the installation position of the bracket with a marker, drill the installation holes with an electric drill, fix the expansion screw slots in the holes on the ceiling, and install the bracket firmly with expansion screws.



Step 2: Insert the device into the bracket, align the holes on the side of the bracket with the screw holes on the device, and secure it with the standard 304 cylindrical head hexagon screws.



Step 3: Supply power to the device and the grid.



5. Configuration page operations

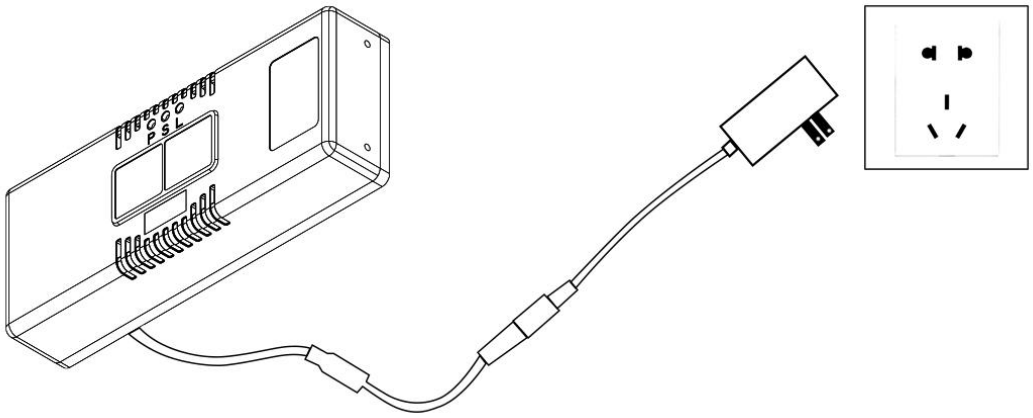
5.1 Configuration Notes

- The device is factory set to a static IP. The device needs to be in the same LAN as the computer, and the computer IP needs to be changed to the same network segment as the device before you can enter the configuration page.
- If you set the device IP to be obtained automatically, you can connect the computer and the device to the same LAN, and use the tool to search for the device in the target network segment to enter the configuration page.
- This configuration page can only be used within the local area network and is used for basic device parameter configuration and local data query.

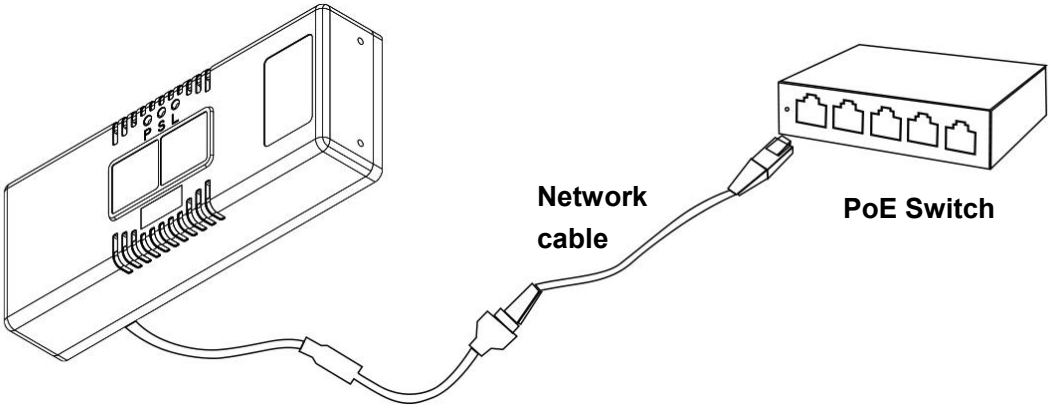
5.2 Power on the device

The ToF passenger flow counting terminal has two power supply modes: power adapter (12V/2A) and PoE power supply (using PoE switch).

(1) DC: 9 ~ 36V power supply: Insert the standard DC 12V power adapter into the 220V power supply, and connect the 12V output harness terminal to the 12V power supply port of the device .



(2) PoE power supply: If the conditions for connecting to a PoE switch are met , the device can be directly connected to the PoE switch for power supply and networking at the same time (no need to connect to a DC power supply).

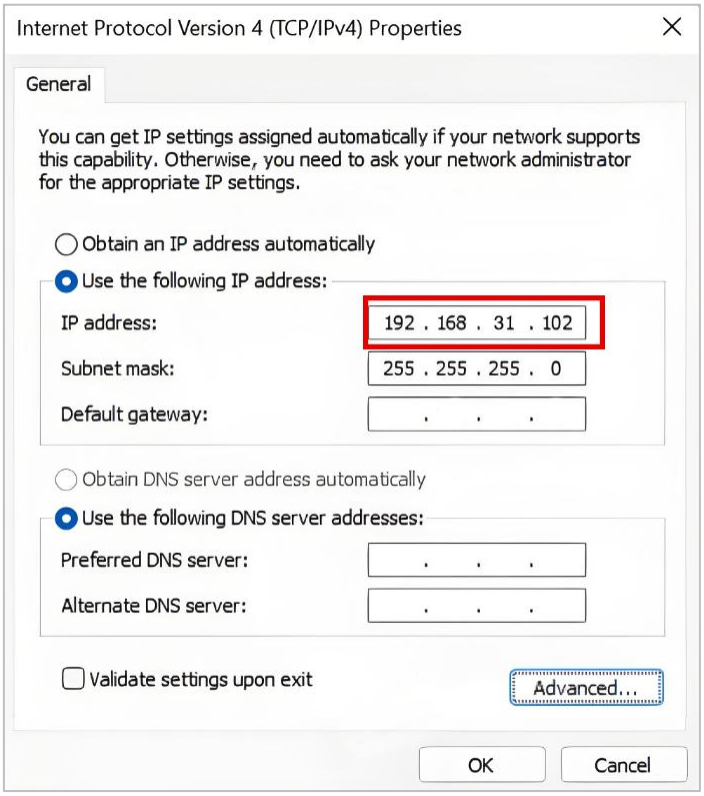


5.3 Device Connection

After the device is powered on, connect the device and the debugging computer to the same network, and manually set the computer IP address segment to the same segment as the device IP: **192.168.31.XX.**

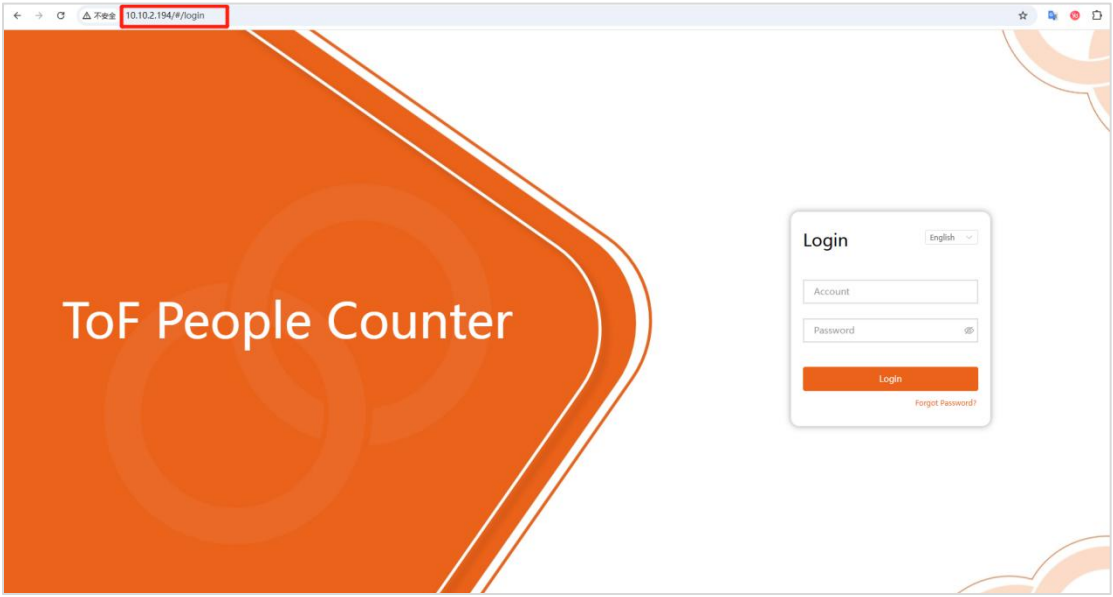
⚠ **Device static IP address: 192.168.31.100**

⚠ **XX is a number between 0 and 255, and XX cannot be 100**

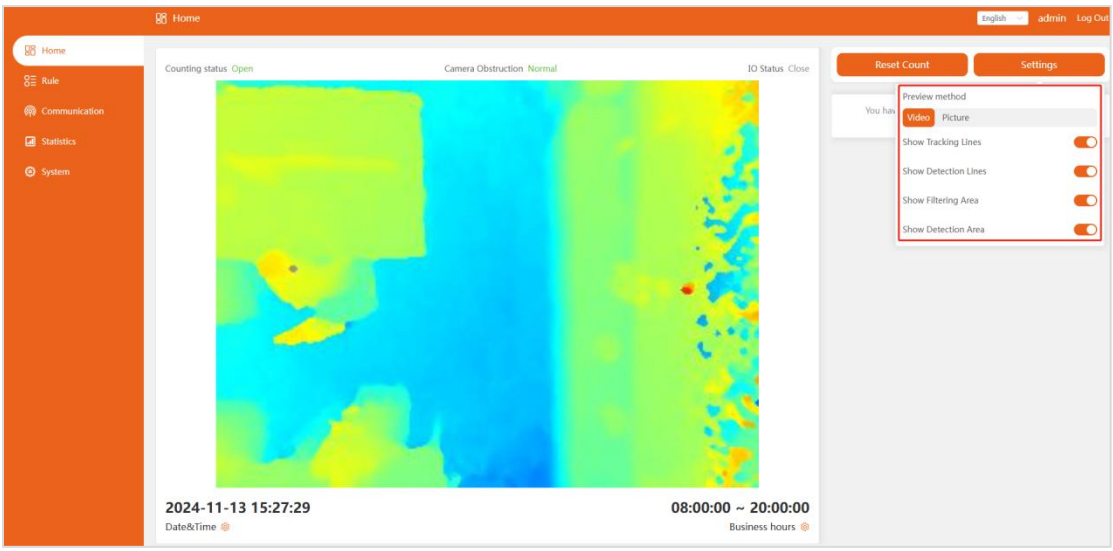


5.4 Login Configuration Page

Open the computer browser, enter the device IP: 192.168.31.100 in the address bar , and log in to the ToF passenger **flow** counter configuration page . Enter **the account : admin, password : 123456** .

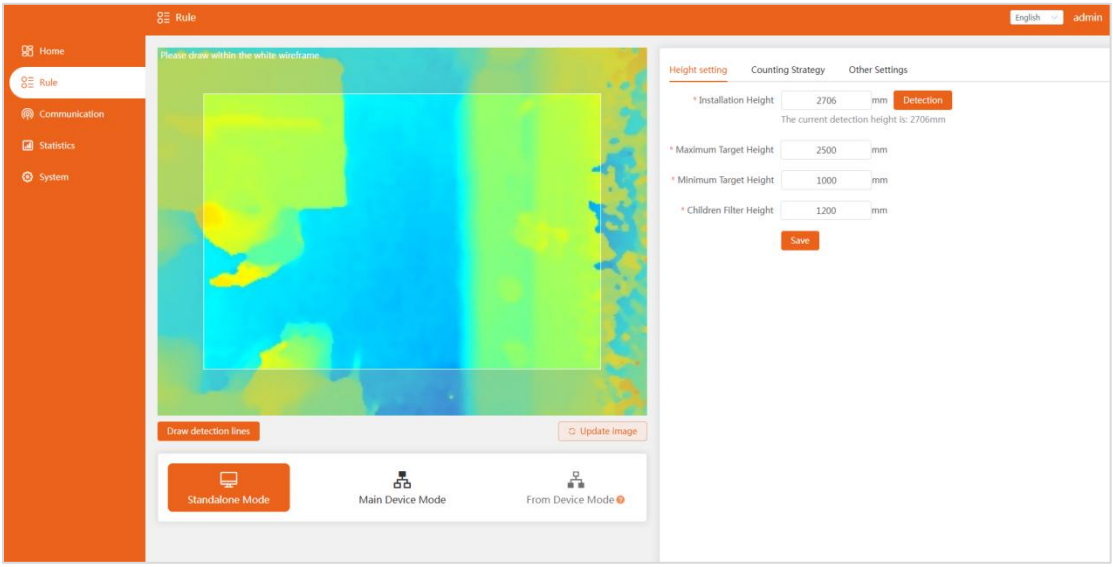


After logging in successfully, you will be redirected to the homepage. Click " Settings " on the right to turn on the functions of displaying tracking lines, displaying detection lines, and displaying detection areas. After the subsequent rules are set, you can view them on the homepage.



5.5 Rule Settings

5.5.1 Height setting



Parameter	Explain
Installation Height	The actual installation height of the equipment, in millimeters (mm); The detection button is the installation height of the equipment detection (auxiliary function)
Maximum Target Height	The highest height of the detection target. The device will not count if the height exceeds this value. Unit: millimeter (mm)
Minimum Target Height	The minimum height of the detected target. The device will not count below this height. Unit: millimeter (mm)
Children Filter Height	Classify targets by height. Set the maximum height for children. Devices below this height and above the

	minimum target height will be considered children. Unit: millimeters (mm) ⚠ **You need to turn on "Children's Separation" in "Rules-Other Settings"**

5.5.2 Counting Strategy

(1) Draw the detection line (in and out detection):

The direction of the detection line in/out depends on the drawing direction. The direction of the △ vertex in the middle of the detection line is " in", and the opposite direction is "out". Detection targets are counted after crossing the line; support drawing up to 4 independent detection lines (detection line names can be modified).

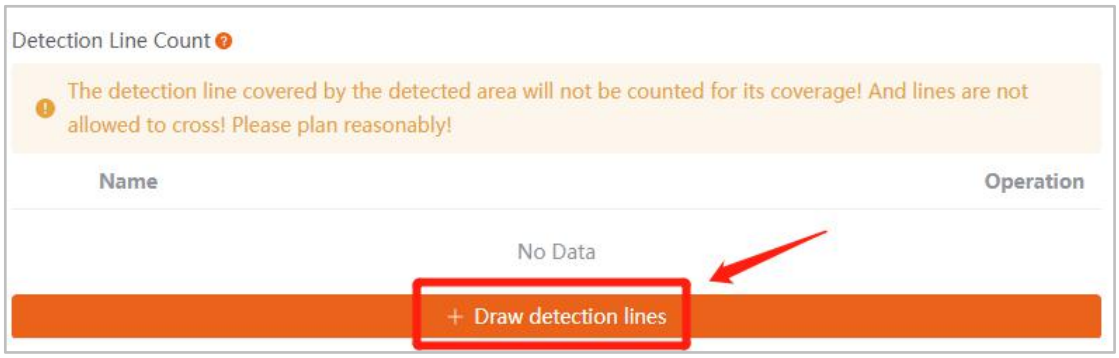
⚠ **Intersection between detection lines is not allowed.**

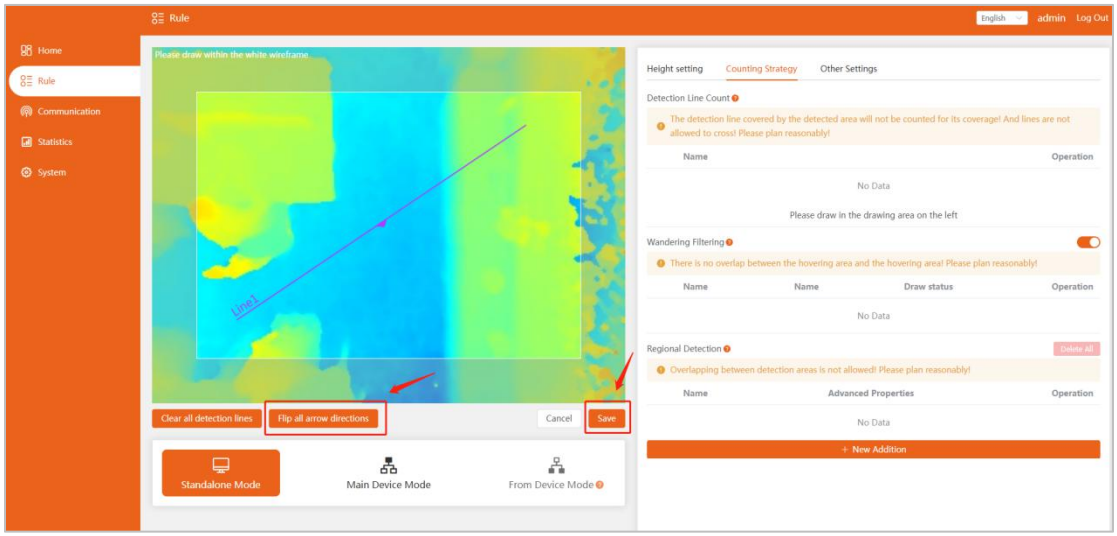
Step 1 : Click the "Draw Detection Lines" button, move the mouse to the depth map on the left, and start drawing in the white box.

Step 2 : Click the left mouse button to start drawing the starting point, drag the mouse to draw the line, and click the left mouse button again to end drawing.

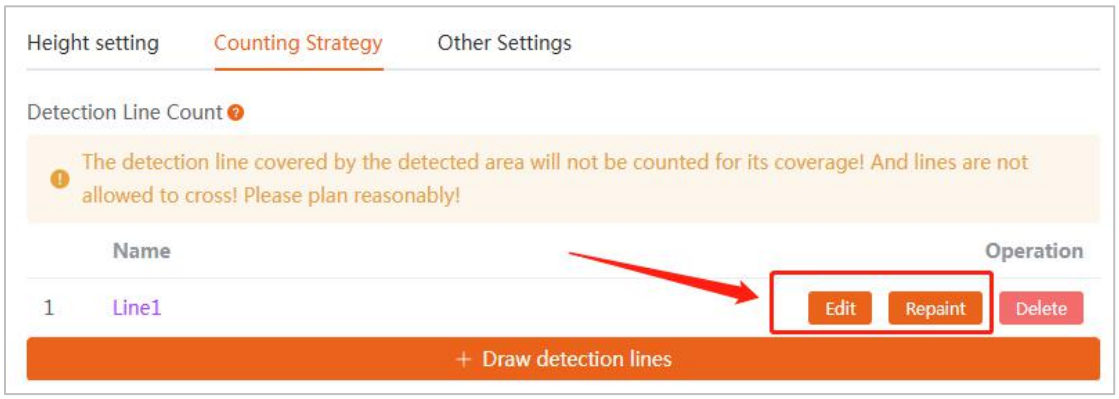
Step 3: Click the left mouse button to select the detection line, and confirm the in and out direction by clicking "Flip Arrow Direction".

Step 4: Click "Save" in the lower right corner to complete the drawing.





After drawing, you can click "Edit" to modify the name of the detection line; click "Repaint" to re-enter the editing state, move the mouse to the detection line, it will turn into a four-cornered arrow, hold down the left mouse button and drag the detection line to a new position, you can readjust the entry and exit direction, and click "Save" when finished.



(2) Draw the wandering filter region:

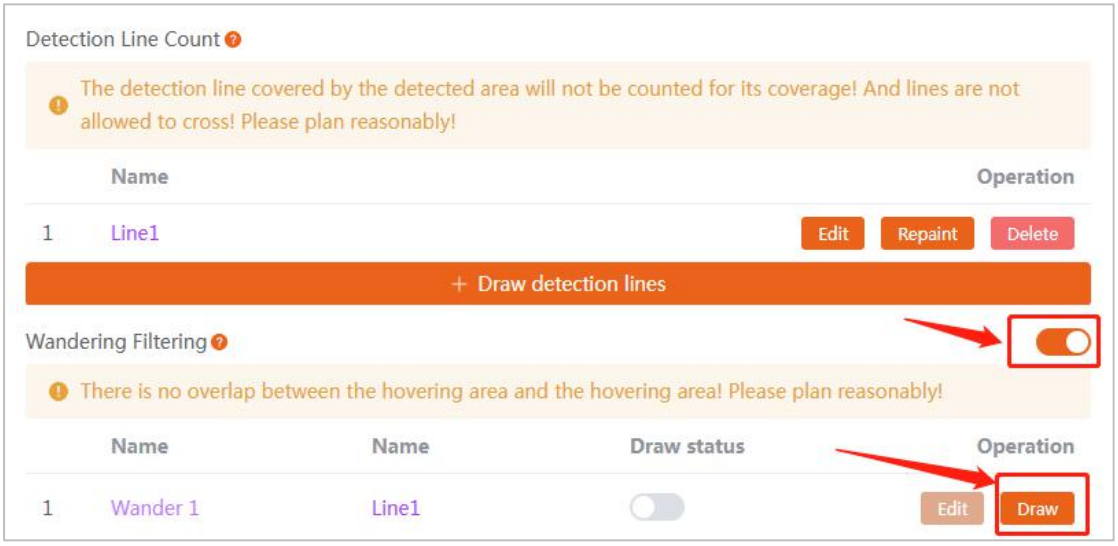
The device has a wandering filtering function, which can eliminate people who wander around the passage but do not actually enter or leave, thereby preventing duplicate counting. If a person passes through the detection line multiple times without leaving the wandering area, the data will be recorded as one data.

⚠ **When the wandering filter function is enabled, a wandering filter area needs to be set for each detection line.**

⚠ **The wandering filter area needs to wrap around the corresponding detection line.**

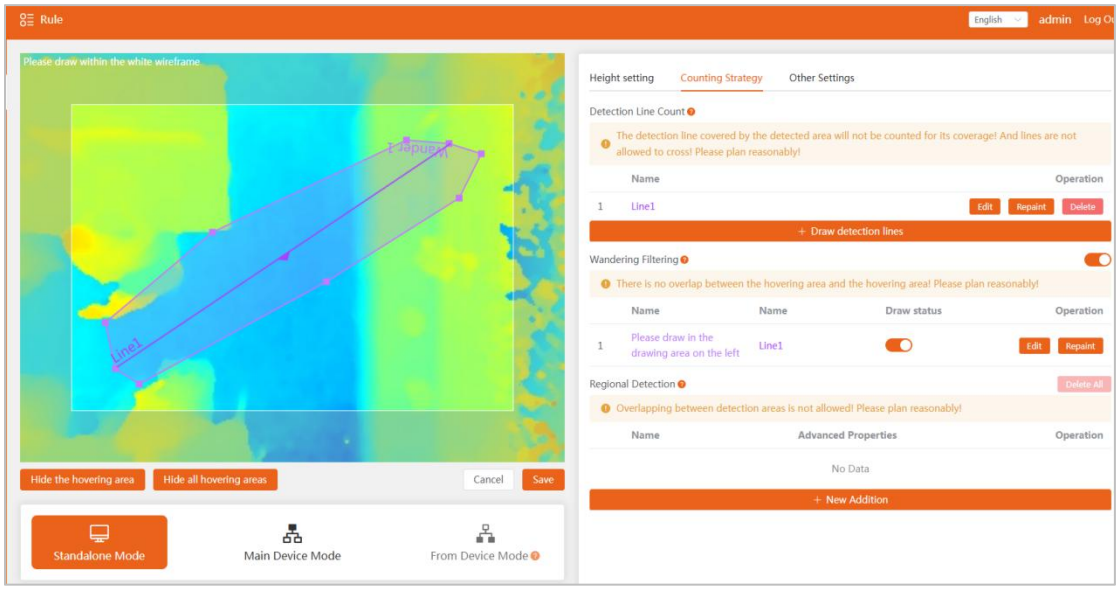
⚠ **Wandering areas are not allowed to overlap, and line segments within a single wandering area are not allowed to intersect.**

Step 1 : Enable the button corresponding to the wandering filter, then click the "Draw" button, move the mouse to the white box on the left side of the depth map screen and start drawing. A maximum of 10 edges can be drawn in the wandering filter area.



Step 2 : Click the left mouse button to draw the starting point, drag the mouse to draw the line, click the left mouse button again to draw the second vertex, and so on, until the box formed by all the points wraps the detection line. **Click the right mouse button to end the drawing.**

Step 3: Click "Save" in the lower right corner to complete the drawing.



(3) Draw the detection area:

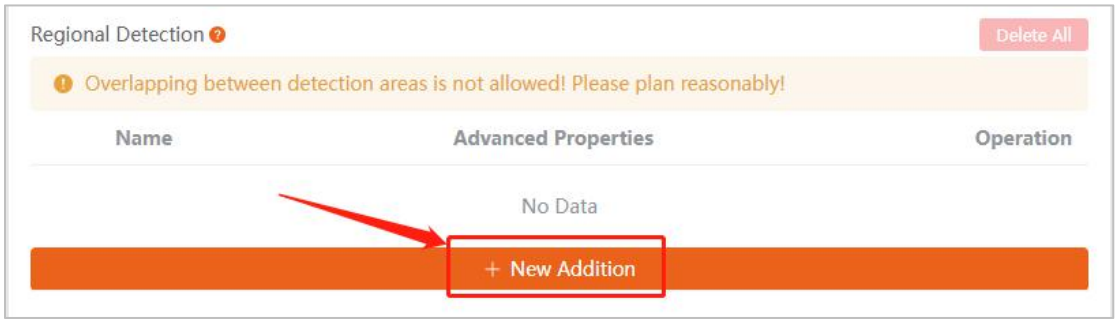
The device supports counting the number of people in a specified area and the length of time they stay in the area.

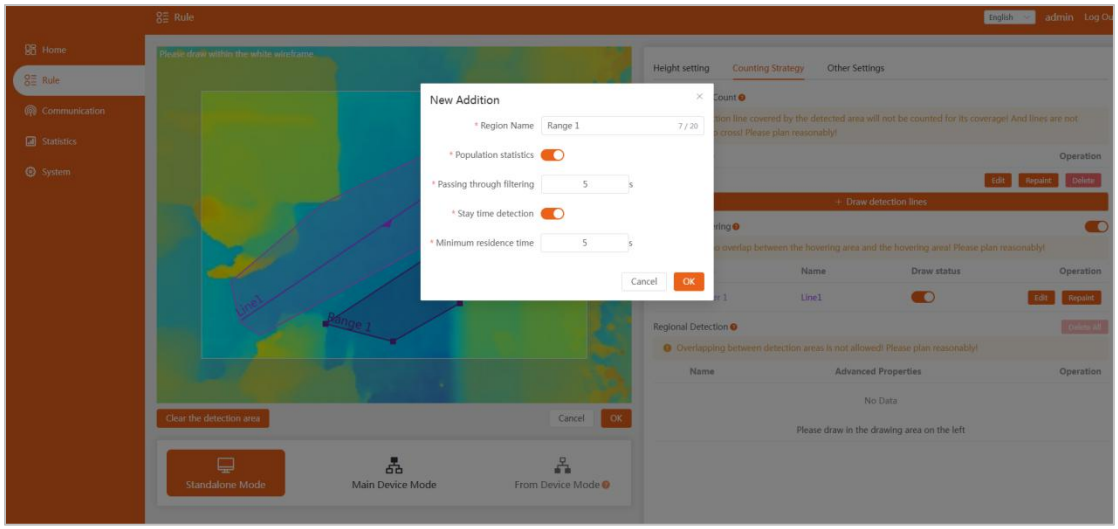
⚠ **The device supports drawing up to 4 independent detection areas, and each detection area can have up to 10 edges .**
⚠ **Detection areas are not allowed to overlap, and line segments within a single detection area are not allowed to intersect .**
⚠ **The detection area and the wandering area are not allowed to overlap.**
⚠ **When the detection area and the detection line overlap, the overlapping part is not counted.**

Step 1 : Under Area Detection, click the "Add" button, then move the mouse to the white box on the left side of the depth map screen and start drawing.

Step 2 : Click the left mouse button to draw the starting point, drag the mouse to draw the line, click the left button again to draw the second vertex, and so on, until the box formed by all the points covers the range to be detected. **Click the right mouse button to end the drawing.**

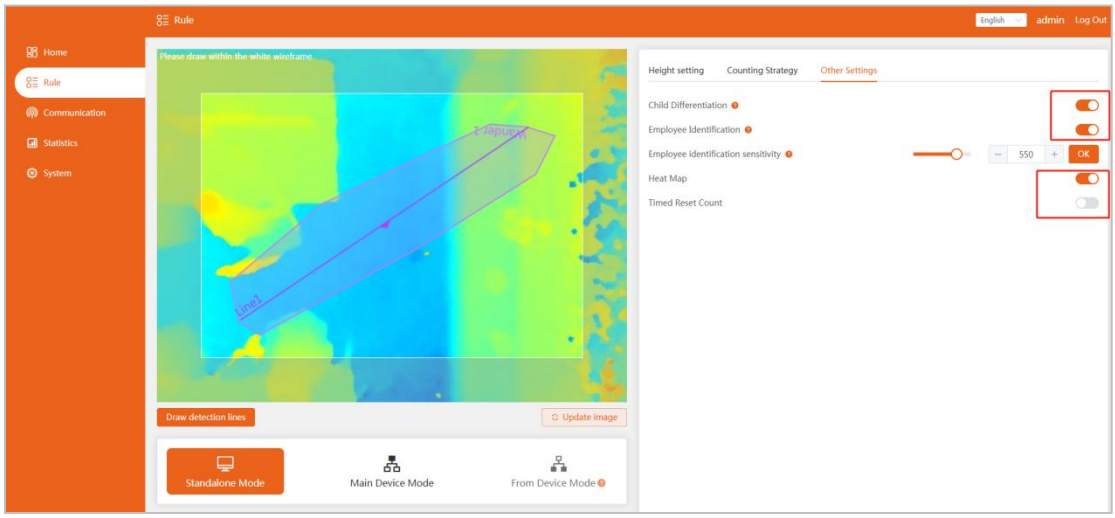
Step 3 : After the area is drawn, click "OK" in the lower right corner of the depth map to pop up the parameter setting page.





Parameter	Explain
Region Name	Custom region name.
Regional Population Statistics	Area people counting can be enabled or disabled.
Passing Filter	The detected target will be counted in the area only if it stays in the corresponding area for more than the specified time.
Dwell Time Detection	Dwell time detection can be enabled or disabled .
Minimum Stay Time	The detection target will be counted in the residence time only when it stays in the corresponding area for more than the specified time, which is used to calculate the average residence time.

5.5.2 Other Settings



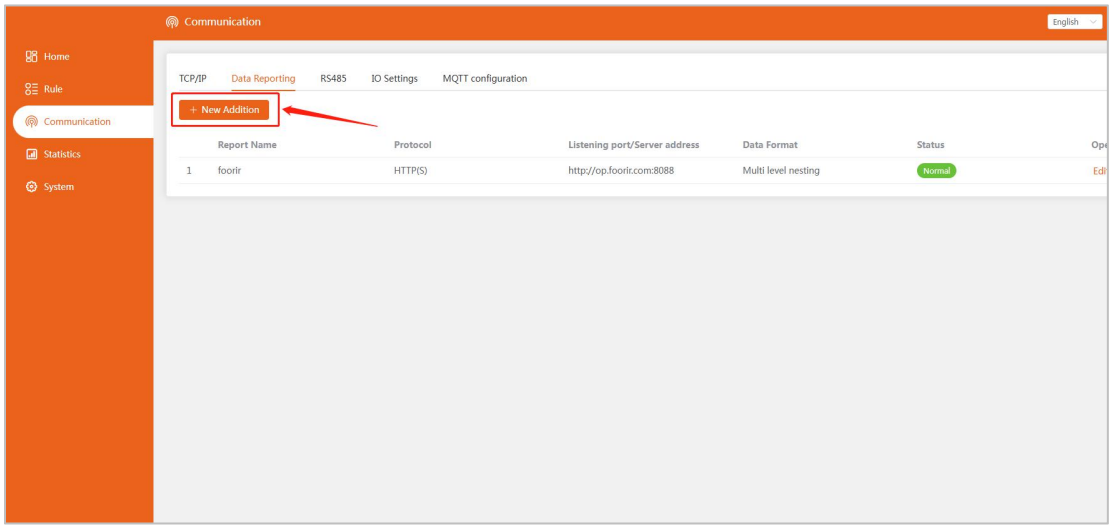
Parameter	Explain
Children's Classification	After it is turned on, the device will collect statistical data of children through the "Child Filter Height" in the "Height Settings";
Employee Recognition	Categorize targets by employee identification tags;
Employee Identification Sensitivity	The sensitivity of employee identification tag recognition, **the smaller the value, the more sensitive it is** ;
Heatmap	Used for statistical query; when turned on, it will be displayed on the statistics page, and you can query the movement heat map and stay heat map.
Timed Reset Count	Only the data count of the home page is reset to zero, which is the same as "Reset count" on the home page;

5.6 Data Push

The device supports data push via HTTP or HTTPS .

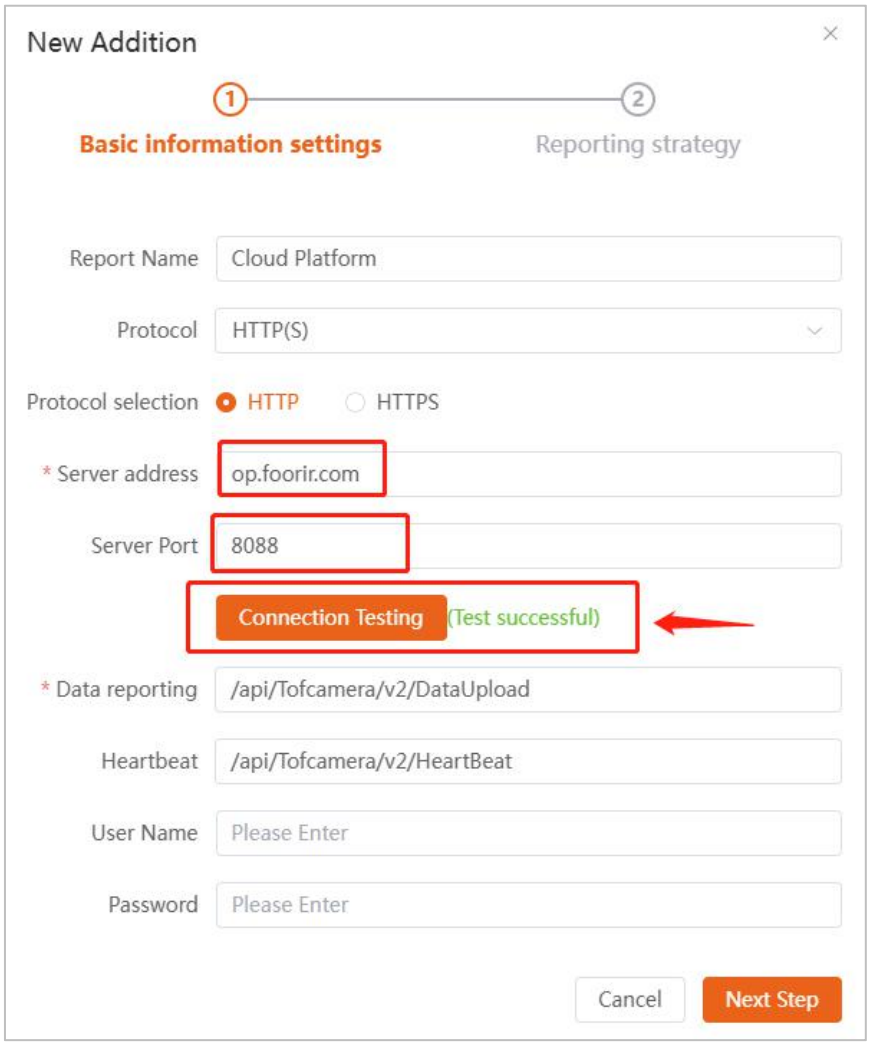
⚠ **In this way, data can be pushed to the smart retail cloud management platform, and users can log in to vf.foorir.com to operate and use it.**
For detailed operations, see < Cloud Platform Binding Operation >

Step 1 : Select "Communication- > Data Reporting" on the page and click "Add".

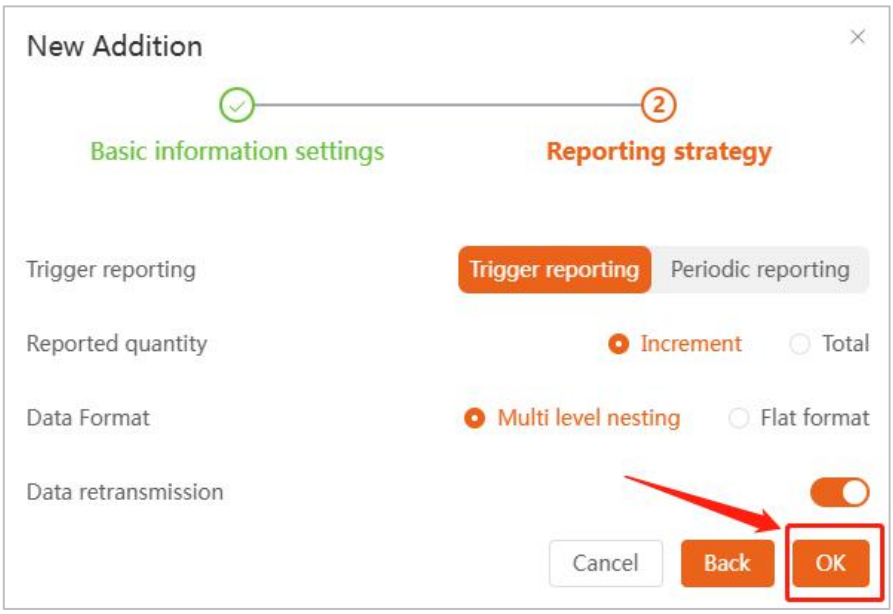


Step 2 : Fill in the report name, server address and server port in turn . Click the "Connection Test" button, and click Next after the test is successful. **If there is no special requirement, fill in the other options by default.**

Note: If the test fails, it means that the communication between the device and the target server is abnormal. You need to check the network.



Step 3 : If there is no special requirement, keep the default settings on this page . Click "OK".



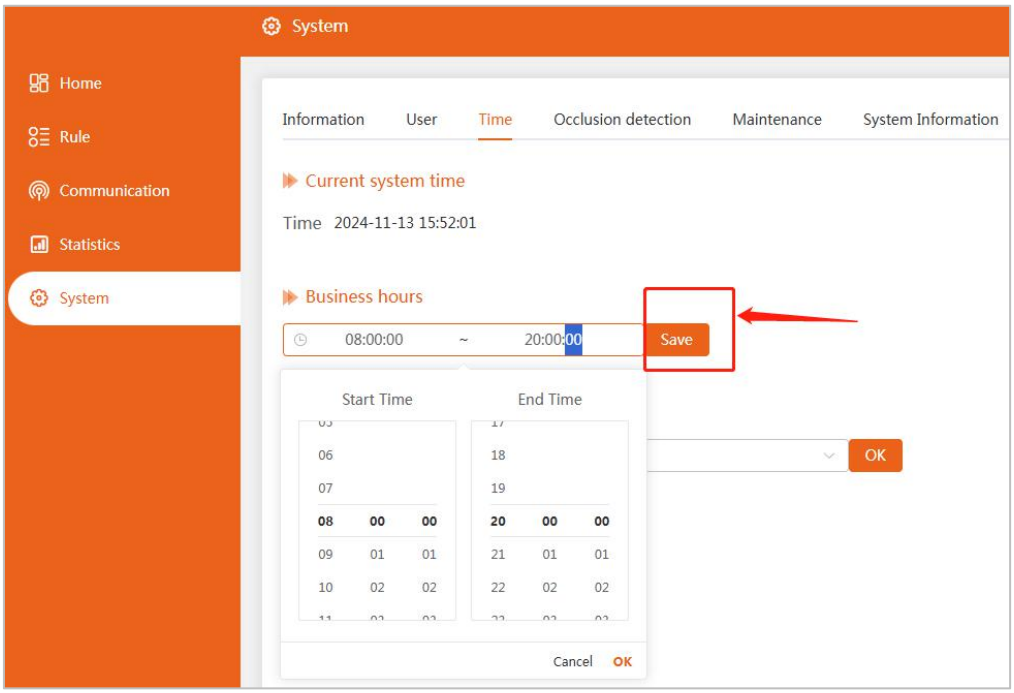
5.7 Time Settings

This function is used to set the device time and business hours. Select "System- > Time Configuration" on the page.

5.7.1 Business Hours

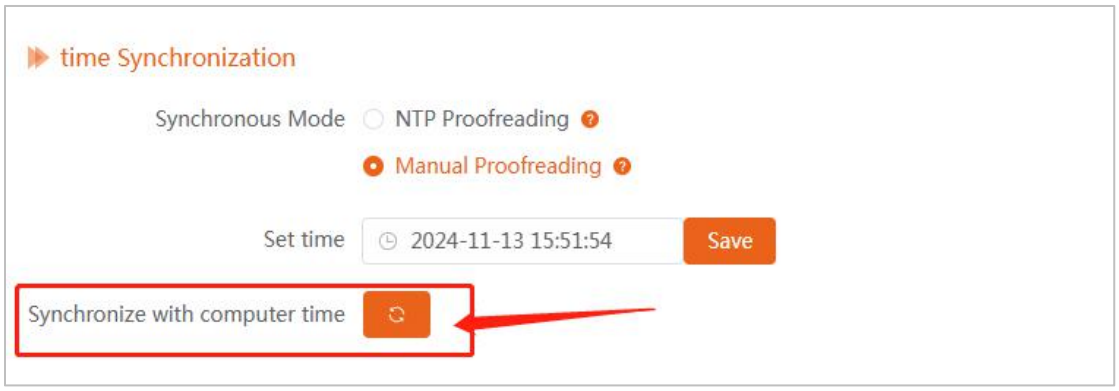
Set the business hours of the device (device working hours). Click the drop-down box to select the time, and click "Save" when finished.

⚠ **Equipment is counted normally during business hours, and is not counted outside business hours.**



5.7.2 Time Synchronization

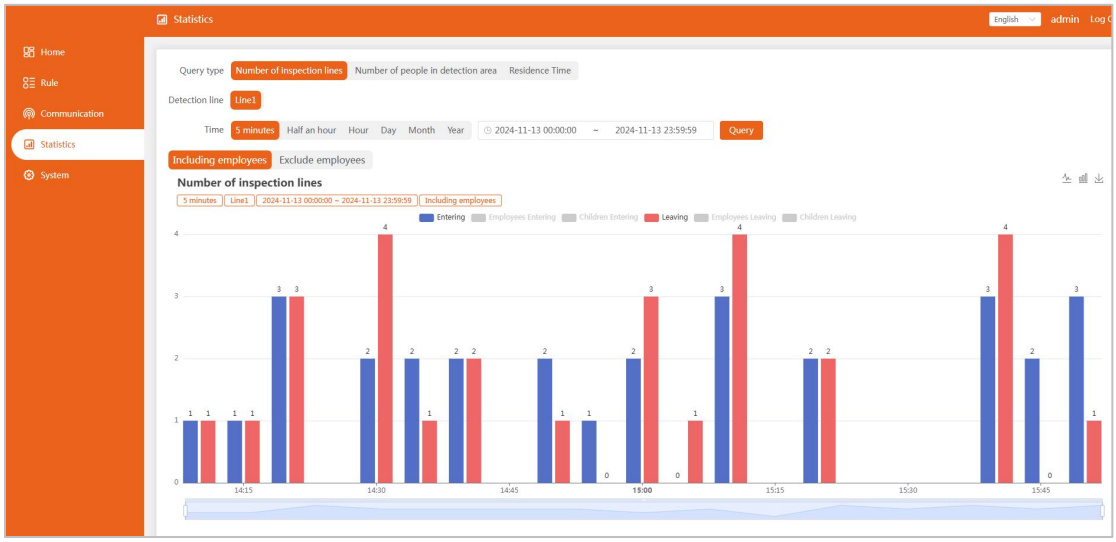
Select Manual Proofreading, click the Set Time drop-down box to select the time, and click "Save" when finished. Or use shortcuts to synchronize with the computer time.

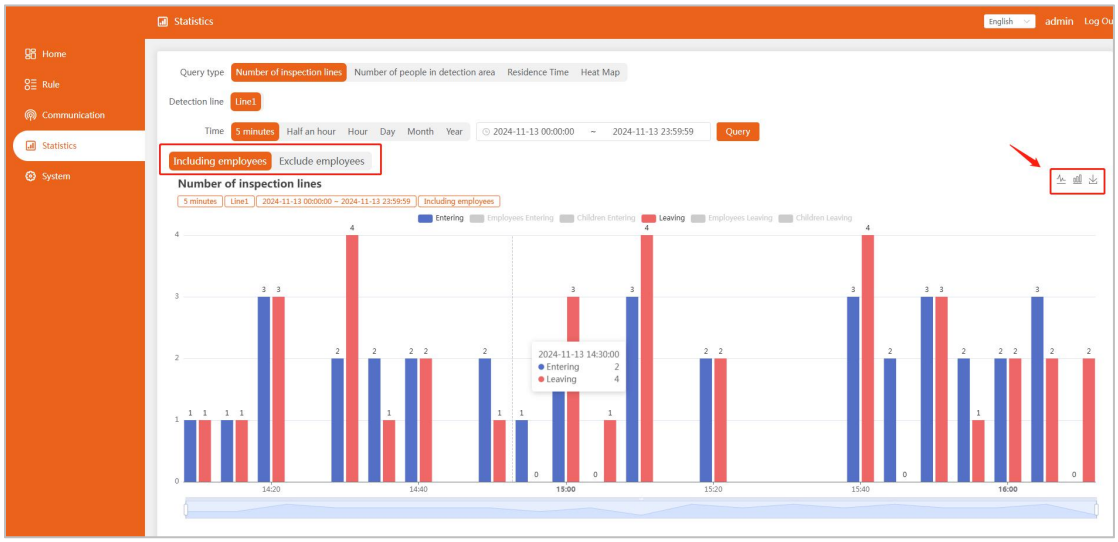


5.8 Statistics Query

The configuration page also supports data statistics functions, provides a variety of charts and data reports, and supports displaying data according to the time dimensions of 5 minutes/half hour/hour/day/month/year, and can also export data.

⚠ **This statistical query function can only be used within the local area network**





Parameter	Explain
Query Type	The options include: detection line population statistics, detection area population statistics, dwell time statistics and heat map. ⚠ **The heat map will only be displayed after it is enabled in "Rule-Other Settings".**
Time	Select the time range to generate the graph. The number of people counting on the detection line supports the time dimension of 5 minutes/half hour/hour/day/month/year. The time range can be selected through the dimension. Directly select the time range for detection area population statistics, residence time statistics, and heat map.
Including employees Exclude employees	data on the chart . ⚠ **This feature will only be displayed after it is enabled in "Rule-Other Settings".**
	Select the chart display type as Line Chart or Bar Chart.
	Export the icon as a PNG image based on the selected time unit. Export the data table to an Excel file based on the selected time unit.
Heatmap Type	Optional items: Movement heat map, Stay heat map, select and click "Query".

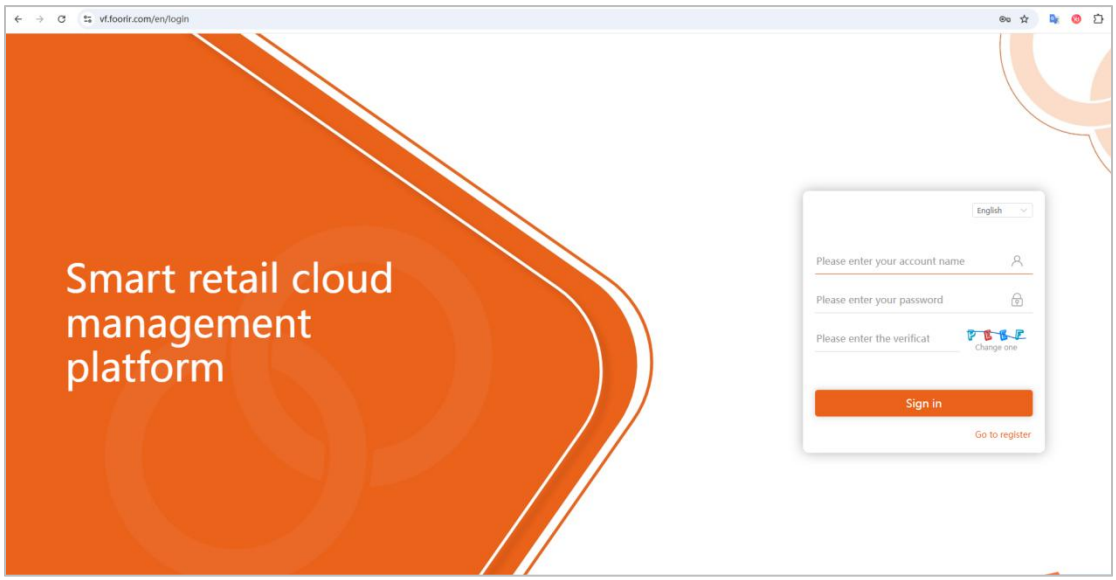
*** For more extended functions, please refer to the configuration page user manual**

6. Cloud platform binding operation

The smart retail cloud management platform relies on the online uploading of passenger flow data to realize data query and data analysis in parks, companies, stores, shopping malls, stations, hotels and other areas, and obtain visual curves and charts of intuitive passenger flow data. From data analysis, passenger flow KPI, holiday passenger flow, to trend analysis, users can customize the viewing on the cloud platform according to their actual needs.

6.1 Device Binding Operation

Step 1: Visit the Smart Retail Cloud Management Platform **vf.foorir.cn** to register an account.

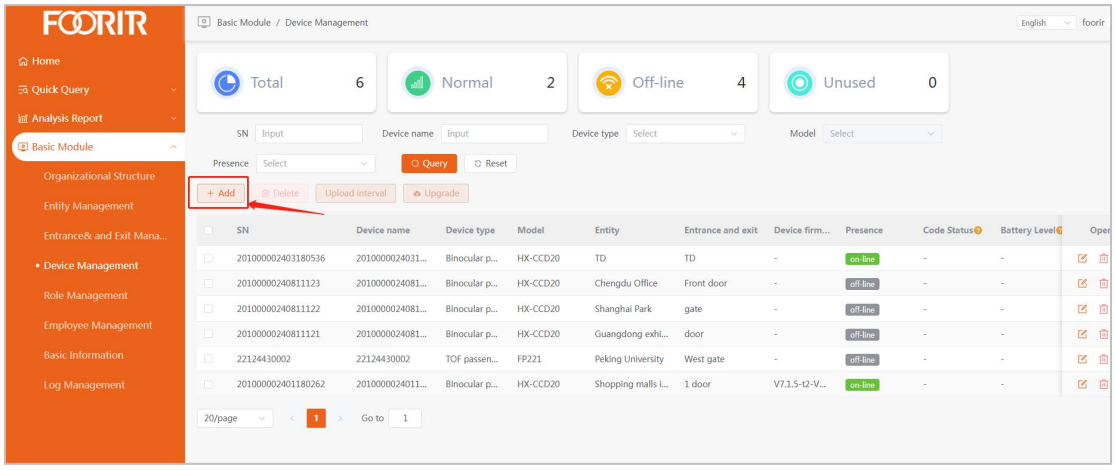


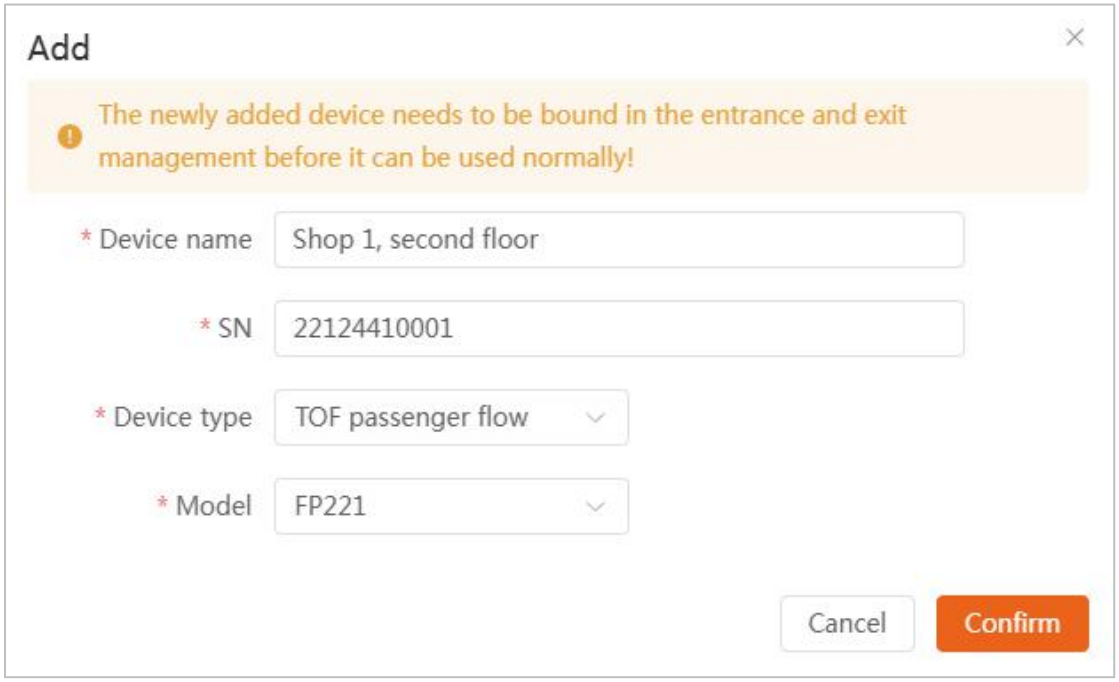
Step 2: Add a device, select "Basic Module->Device Management->Add Device"

⚠ **It is recommended to fill in the device installation location of the device name**

⚠ **The serial number (SN) is the unique identification code of the device and must be filled in strictly according to the serial number displayed on the device**

⚠ **The serial number (SN) is printed on the back label of the device and the packaging label**





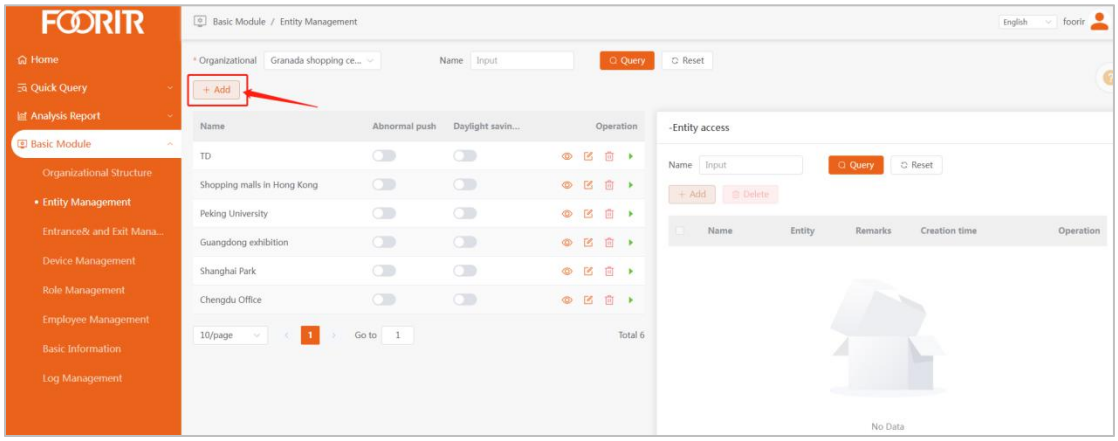
Step 3: Create an entity , select "Basic Module- > Entity Management- > Add Entity"

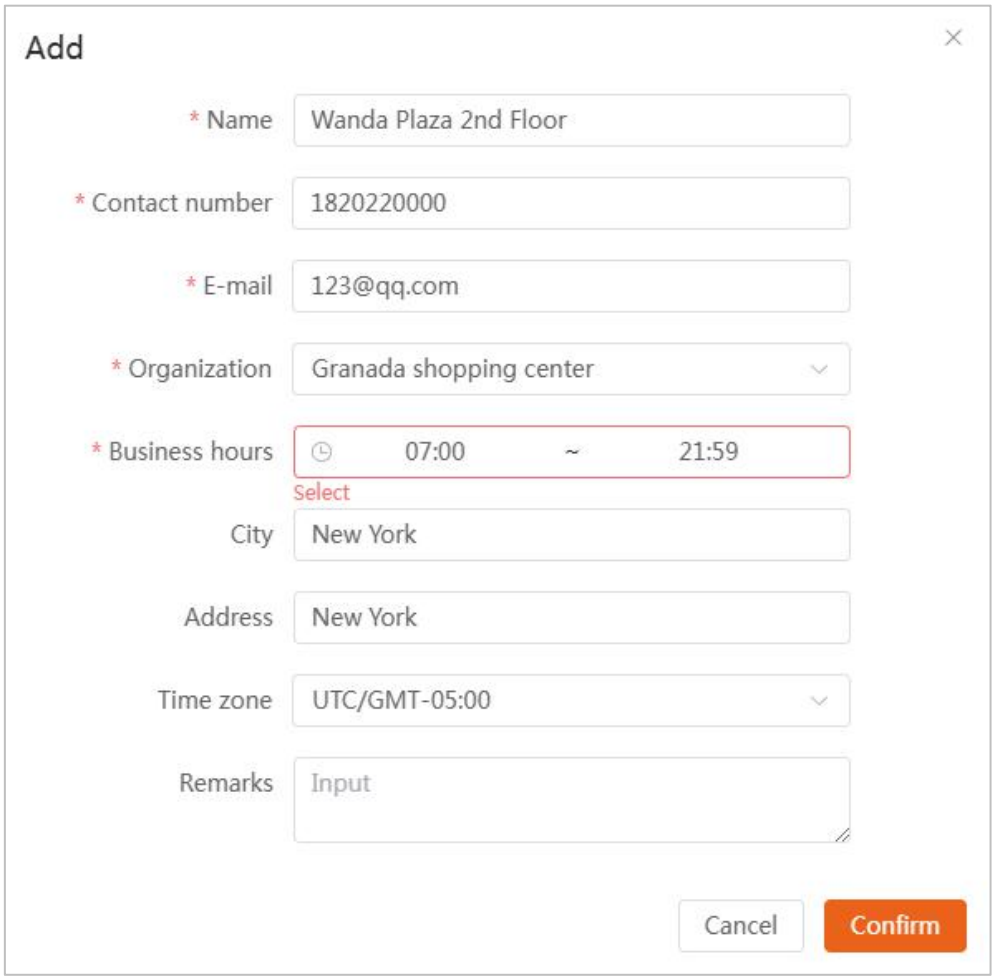
⚠ **Email: used to push abnormal status of the device**

⚠ **Organizational structure: Select the default structure**

⚠ **Business hours: Business hours are based on the settings on the device configuration page and are not processed by the platform.**

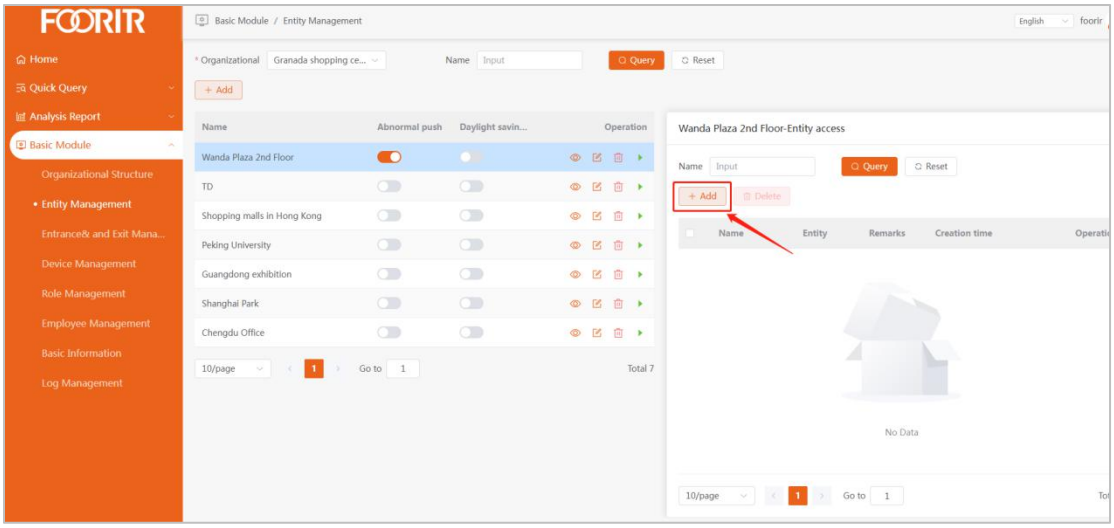
⚠ **Time zone: used to convert the time when the device uploads data. The default domestic time zone is UTC/GMT+08:00, and the default overseas time zone is selected according to the local time zone.**

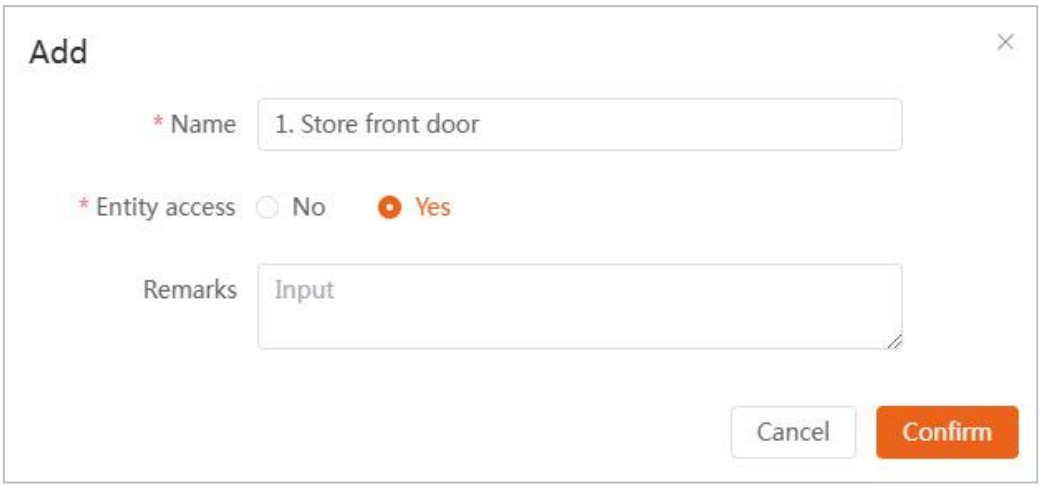




Step 4.1: Create an entity entrance and exit. On the entity management page, select the entity and create a new entrance and exit directly on the right.

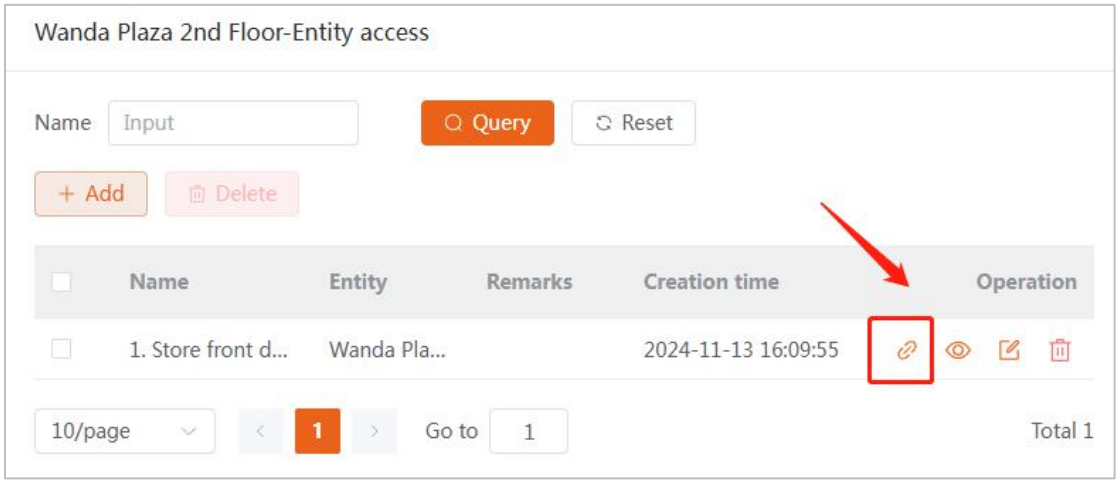
⚠ **Physical entrance and exit: Select "Yes"**

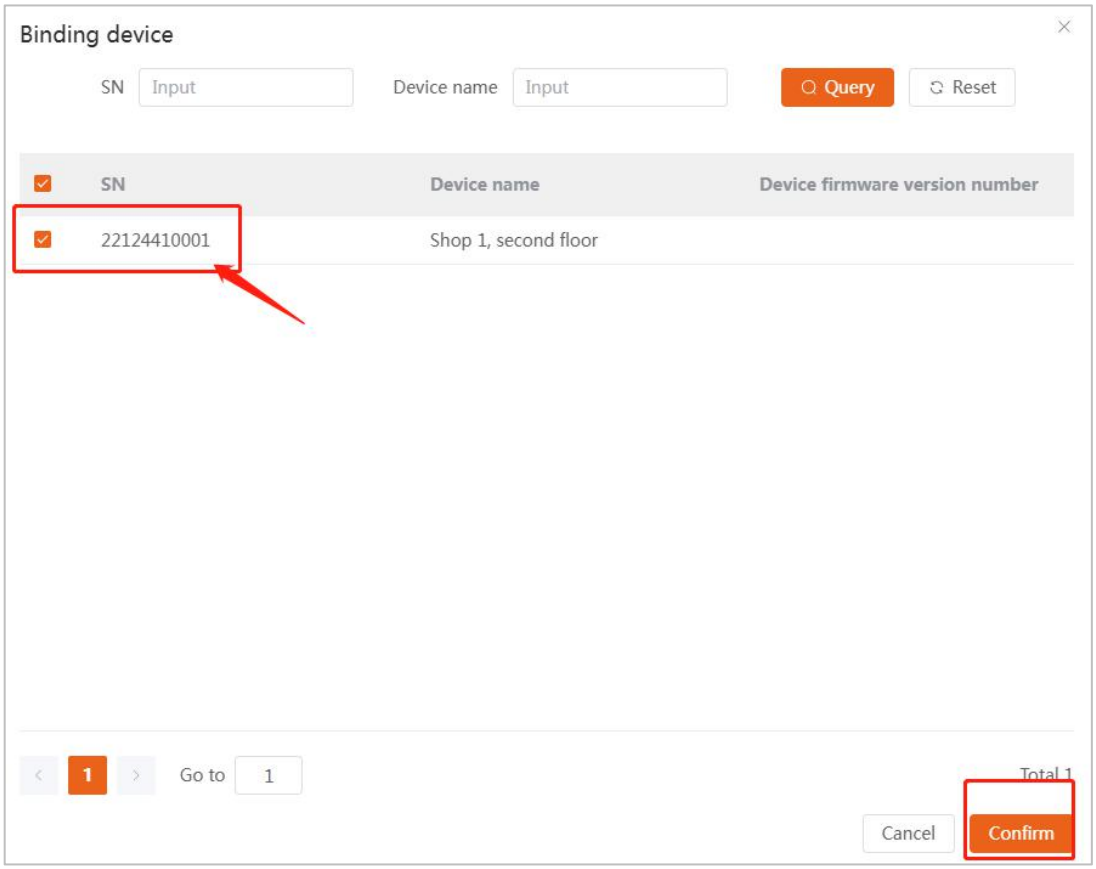




Step 4.2: Bind the device , select the entrance and exit to be bound, click the binding icon at the back, enter the binding page, check the device to be bound, and click " Confirm " ; the web networking configuration is completed.

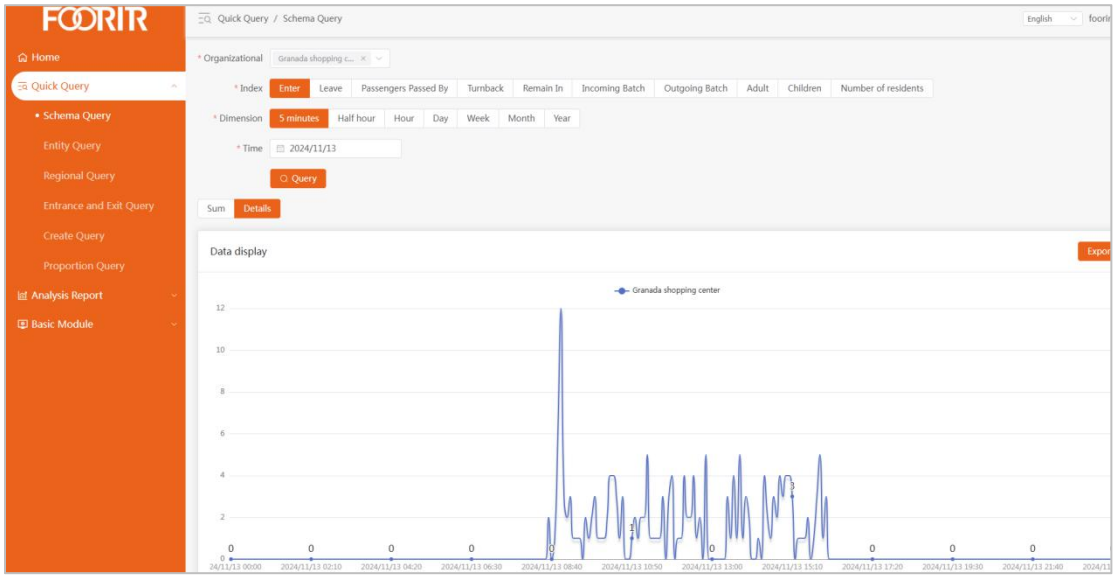
⚠ **After completing this step, the data pushed by the device can be queried from the cloud platform**





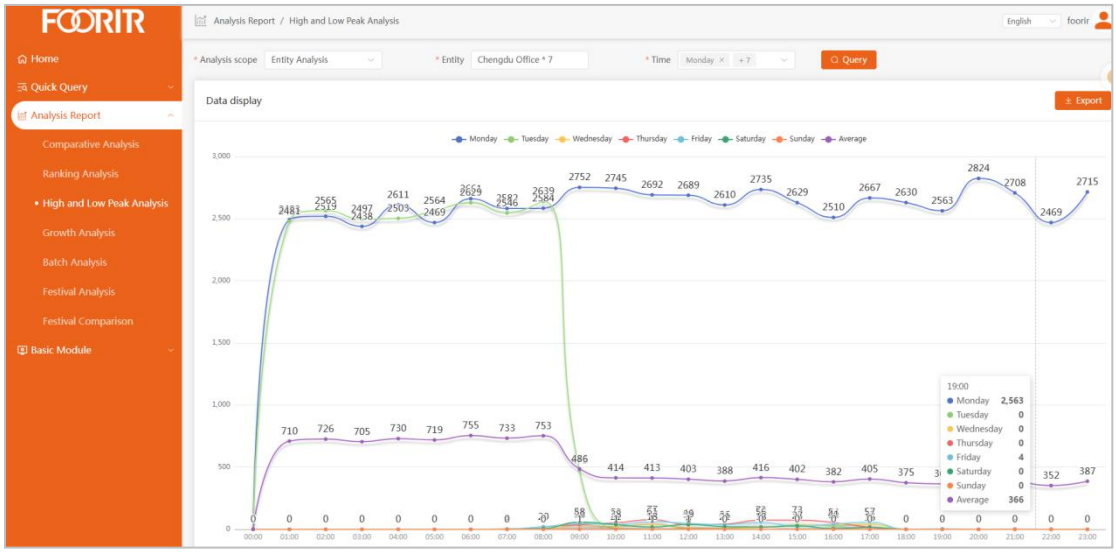
6.2 Quick Query of People Counting

The cloud platform provides a multi-dimensional passenger flow quick query function, including architecture query, entity query , area query , entrance and exit query , and can also create custom queries. Users can query data according to their needs to help you quickly obtain passenger flow information.



6.3 Analysis Report

The cloud platform provides a wealth of analysis reports, including comparative analysis, ranking analysis , peak and low peak analysis , growth analysis , batch analysis , holiday analysis , and holiday comparative analysis. Users can choose different time dimensions to customize queries.



FCC Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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