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Product Construction Instruction Manual (Passenger Flow Solution)

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DH Network Camera Product Construction Manual (Passenger Flow Solution) V3.1

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Revision History

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I. Introduction

Passenger flow products primarily comprise monocular and stereo vision cameras mostly top mounted and angle mounted. Shape-wise, these cameras include F-type bullet cameras, E-type bullet camera, E-type dome camera, and stereo vision eyeball cameras. Passenger flow products are ideal for use in multiple indoor and outdoor scenarios, and provide people counting, region people counting, linkage alarm, and statement generation functions. Passenger flow products are widely used in banks, prisons, stores, tourist sites, and satisfy different business demands. This document focuses on stereo vision passenger flow products.

Stereo Vision Passenger Flow Camera

Stereo vision passenger flow products can be top mounted or ceilings mounted, and are mainly used for indoor passenger flow surveillance. The easy installation makes them the preferred products in passenger flow count.

Model	Picture	Features
DH-IPC-HDW8341X-3D series		IP67 rating 2.8 mm, 3.6 mm
DH-IPC-HD4140X-3D series		IP54 rating 2.1 mm, 2.8 mm

II. Site Survey and Type Selection

Overall Standard

1. The installation site must be bright enough, at least to ensure the head and shoulder contour of people in the detection area is clear.

2. Avoid a complex scenario with frequently changing light, backlight, and direct light exposure;

3. People count is more accurate where people largely flow in one direction and the camera is installed to directly face against the mainstream flow.
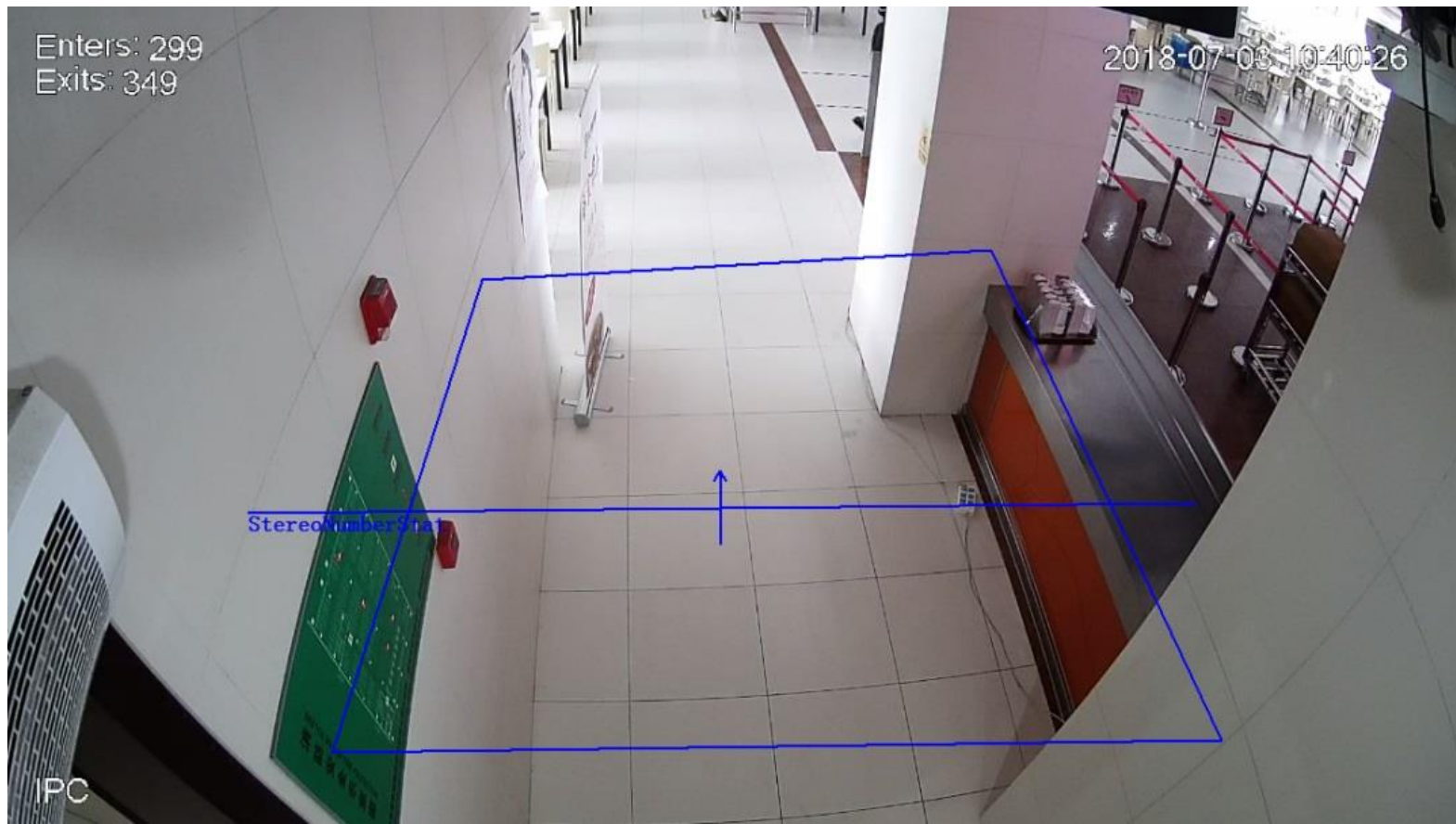
Top Mounting:

Install the product in such a way that the lens looks vertically down on the head and shoulders, and the pedestrian direction is vertical to the rule lines. The head and shoulders of a person standing in the center block the sight of his/her feet. A typical arming scenario is as follows:

Angle Mounting:

The camera directly faces the pedestrian direction that is vertical to the trigger lines. The horizontal included angle is 30°. The following figure shows a typical arming scenario:

Camera image of angle mounting

8341 Stereo Vision Camera

Type selection principles: Select a proper focal length of lens according to the installation height.

3 MP HDW8341X-3D stereo vision dome camera

⬚**NOTE**

Detection thickness: regional people counting.

Top-mounted 8341 stereo vision camera

| Product P/N Material Number	Focal length (mm)	Height range (m)	Installation height (m)	Arming width for passenger flow (m)	Detection thickness (m)
DH-IPC-HDW8341X-3D-0280B	2.8	2.2＜H＜3.0	2.2	1.35	1
			2.5	2.2	1.6
			2.8	3.0	2.2
DH-IPC-HDW8341X-3D-0360B	3.6	3.0≤H＜5.0	3.0	2.4	1.1
			3.5	3.4	1.5
			4.0	4.3	1.9
			4.5	5.2	2.4
			5.0	6.2	2.8

Passenger flow products are mostly installed at entrance and exit ceiling to monitor entrances and exits. Here comes an issue: Some scenarios feature a high top door edge, blocking the line of sight and affecting the detection rate. With this factor and the field of view (FOV) of the camera in mind, an arming specification list is given as follows for reference:

An arming list of top-mounted 8341 stereo vision cameras factoring in top door edge blocking

Segment (mm)	FOV (°)	Height range (m)	The horizontal distance between the camera and the top door edge (m) when the top door edge is h (m) high
2.8	79.82*106.31	2.2＜H＜3.0	≧0.84h

3.6	58*78.5	3.0≤H＜5.0	≧0.55h

Installation requirements
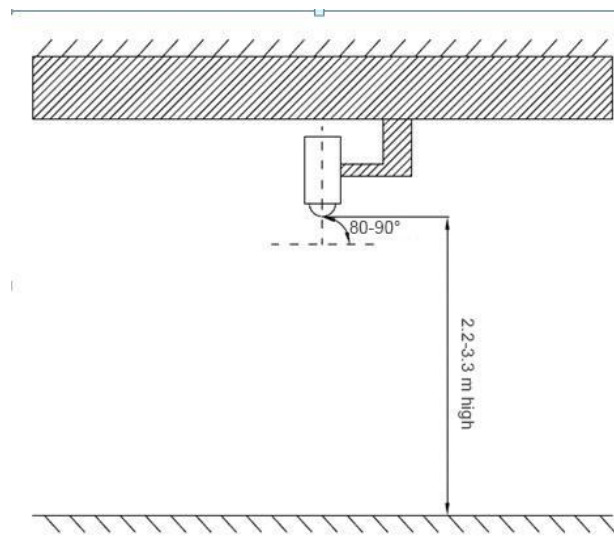
Installation diagram of stereo vision dome camera

Arming requirements:

- Top mounted, with the lens forming a 90° angle with the horizontal plane.

- Sufficient lighting in the region covered by the detection image.

- No blocking of sight in the region covered by the detection image (along the passenger flow direction).

- The detected person must be fully exposed (such as the shoulder width).
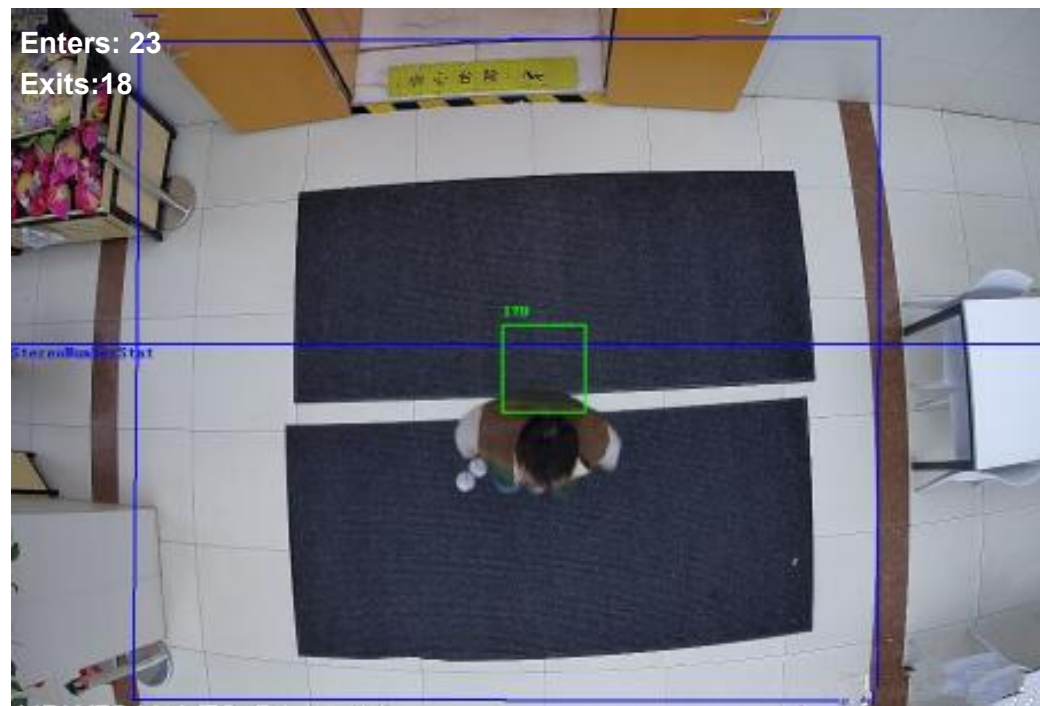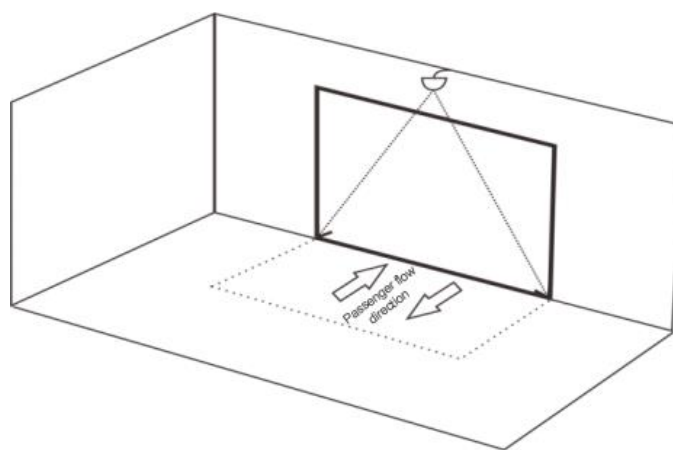
- See Figure 3.

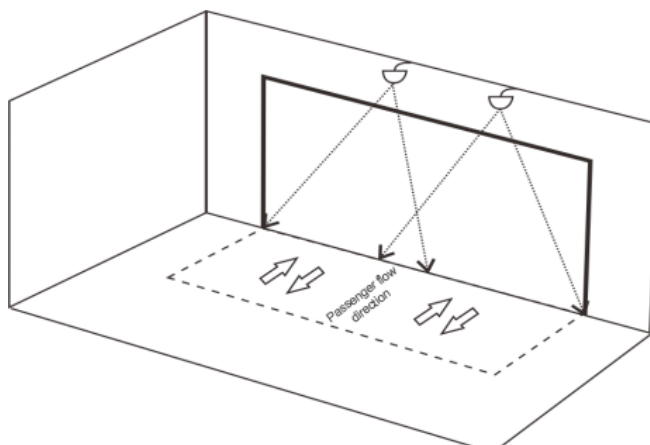Illustration of arming

Arming quantity:

- Installation of a single device

Figure 4   Installation of a single device

- Installation of multiple coordinated devices

Figure 5   Installation of multiple devices

4140 Stereo Vision Camera

Type selection principles: Select a proper focal length of lens according to the installation height.

DH-IPC-HD4140X-3D series high definition (1.3 MP) stereo vision top-mounted dome network cameras

Figure 6   DH-IPC-HD4140X-3D series cameras

☐**NOTE**

1. The detection width is calculated on the basis of a 1.8 m tall person; persons falling within this width can be effectively detected;

2. W is the effective detection width corresponding to the central axle of the camera. Do not mistake it for the detection width of the farthest end or nearest end of the camera;

3. Advised installation heights corresponding to different focal lengths;

Top-mounting manner:

Focal length	Installation Height	Recommended height	Maximum detection width
2.1 mm	2.2-3.3 m	2.75 m	4.7 m
2.8 mm	2.5-3.8 m	3.2 m	4.1 m

Top-mounting--he pairing of parameters is given as follows:

Focal length	Installation height(m)	Surveillance width W(m)	Surveillance length L(m)
2.1 mm	2.2	1.2	0.8
	2.75	3	1.865
	3.3	4.7	3
2.8 mm	2.5	1.4	0.9
	3.2	2.9	1.82
	3.8	4.1	2.6

Angle-mounting manner:

Focal length	Installation Height	Maximum detection width	Installation angle
2.1 mm	2.2-3.3 m	Maximum detection width 5 m	30-70°
2.8 mm	2.5-3.8 m	Maximum detection width 4 m	30-70°

Angle-mounting-the pairing of parameters is given as follows:

Focal length(m)	Installation height(m)	Installation angle/°	Surveillance width W(m)	Surveillance length L(m)
2.1	2.2	30	2.4	3.1
		45	1.7	3.3
		70	1.3	1.2
	2.75	30	6	2.9
		45	4.25	3.2
		70	3.2	2.4
	3.3	30	9.4	2.5
		45	6.65	2.9
		70	5	3.8
2.8	2.5	30	2.8	3.4
		45	2	3.2
		70	1.5	1.1
	3.2	30	5.8	2.8
		45	4.1	3.2
		70	3.1	2.2
	3.8	30	8.2	2.2
		45	5.8	2.8
		70	4.4	3.1

Passenger flow products are mostly installed at entrance and exit ceiling to monitor entrances and exits. Here comes an issue: Some scenarios feature a high top door edge, blocking the line of sight and affecting the detection rate. With this factor and the field of view (FOV) of the camera in

mind, an arming specification list is given as follows for reference:

An arming list of top-mounted 4140 stereo vision cameras factoring in top door edge blocking

Segment (mm)	FOV (°)	Height range (m)	The horizontal distance between the camera and the top door edge (m) when the latter is h(m)
2.1	84.3 *109.5	2.2＜H＜3.3	≧0.91h
2.8	64 *89	2.5≤H＜3.8	≧0.62h

Installation requirements

Top-mounting instructions:

Figure 9 Top mounting of (DH) IPC-HD4140X-3D-0210B
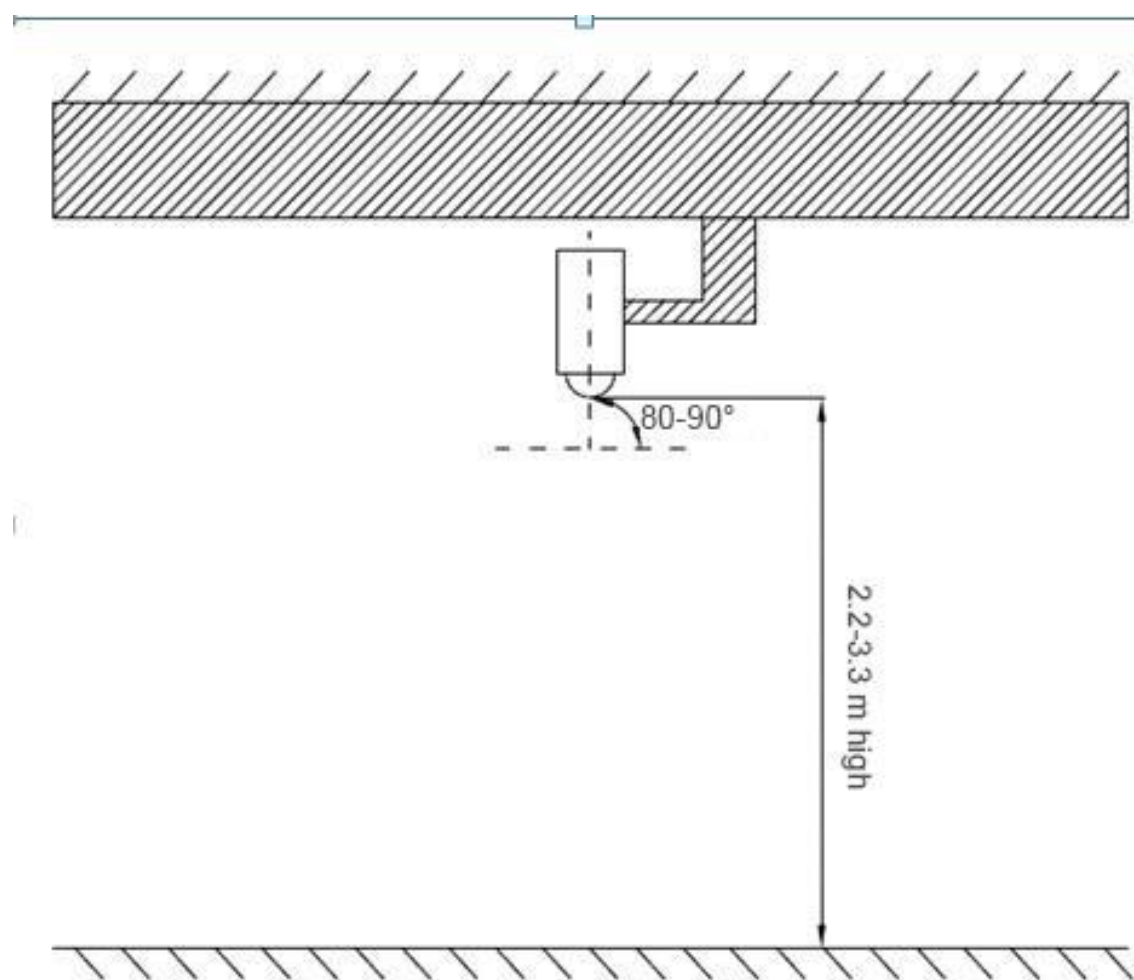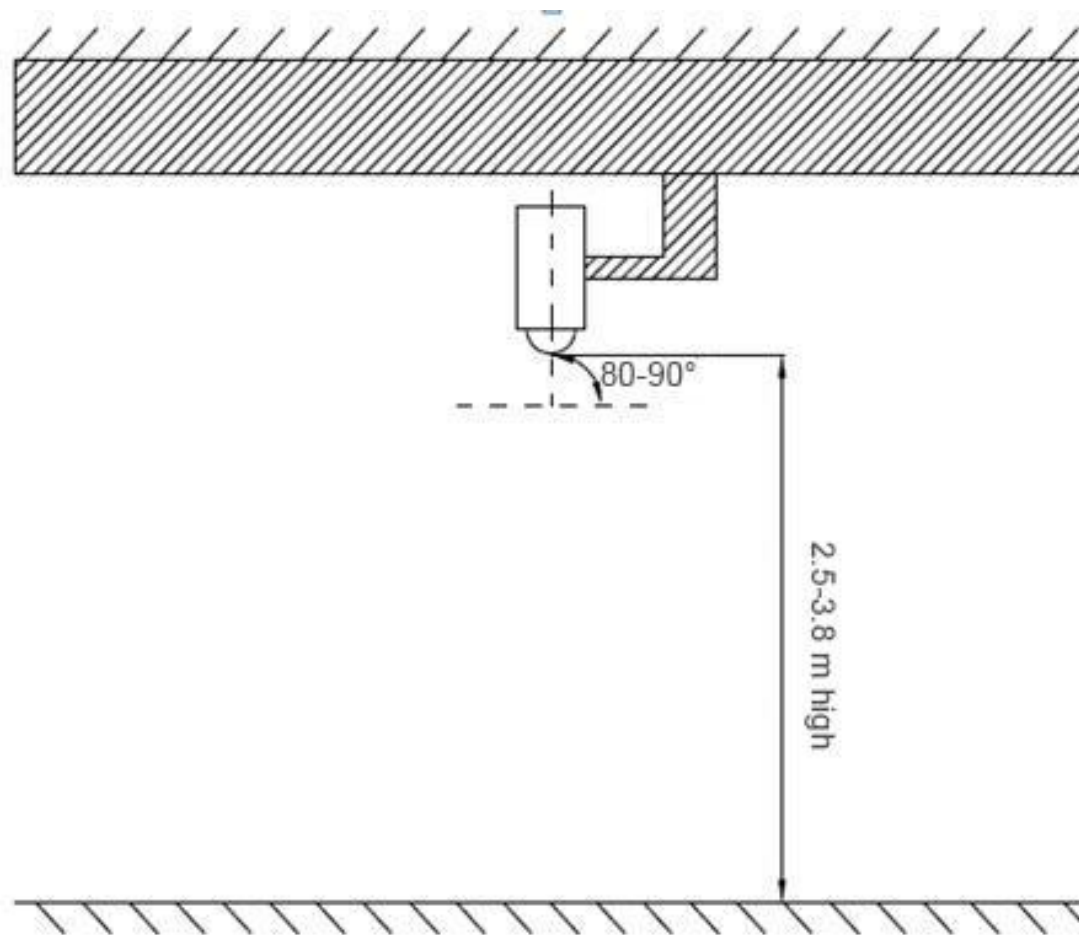

80-90°

2.2-3.3 m high

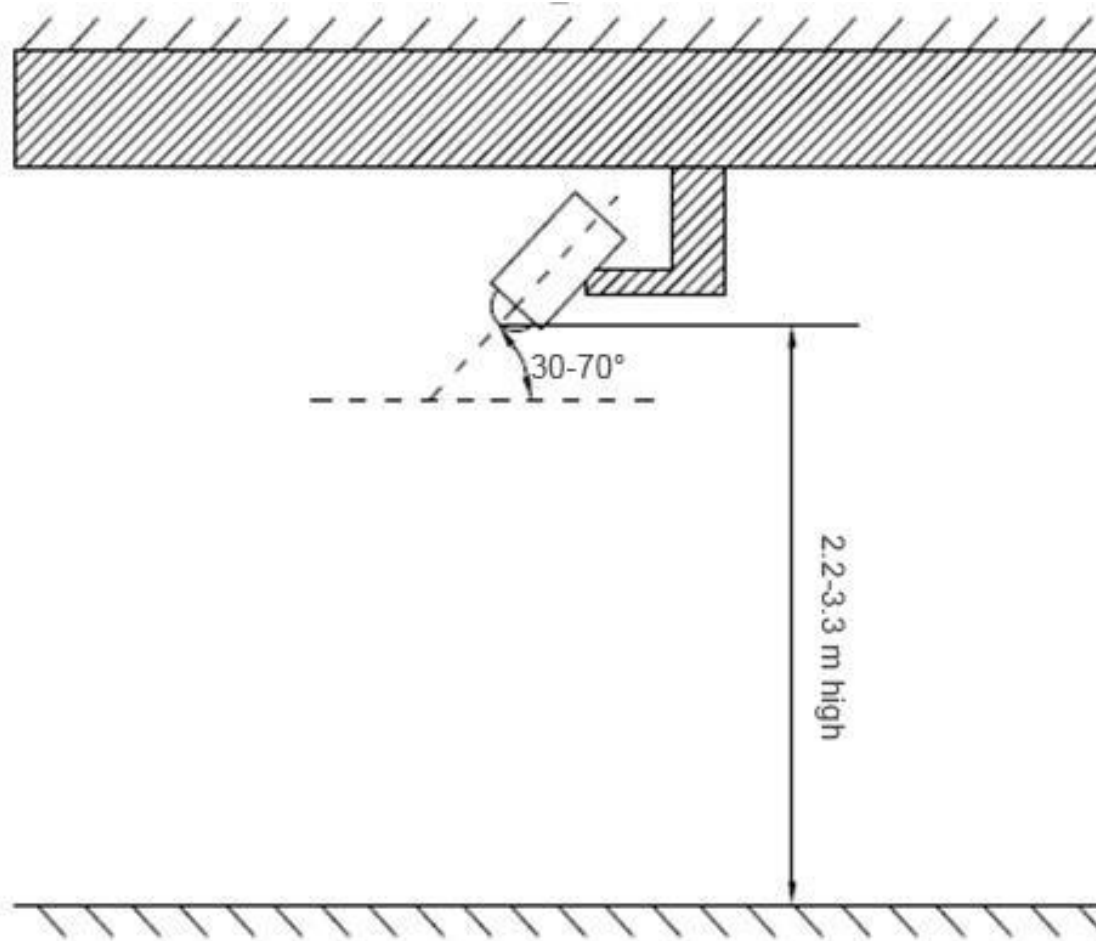Figure 10 Top mounting of (DH) IPC-HD4140X-3D-0280B

The optical axle of the camera lens form an 80-90° angle with the ground, and 2.5-3.8 m above the ground.

Keep the underneath of the lens horizontal as much as possible for easy calibration and counting.

Angle-mounting instructions:

Figure 11 Angle mounting of (DH) IPC-HD4140X-3D-0210B

When angle-mounting the camera, make sure the optical axle of the camera lens forms an angle with the horizontal plane from 30° to 70°, the larger the better in this range. Install the camera at 2.2-3.3 m; the higher the camera is installed, the bigger the angle with the horizontal plane, facilitating passenger flow count. For more accurate device detection, see "Recommended Installation Height".

Figure 12 Angle mounting of (DH) IPC-HD4140X-3D-0280B
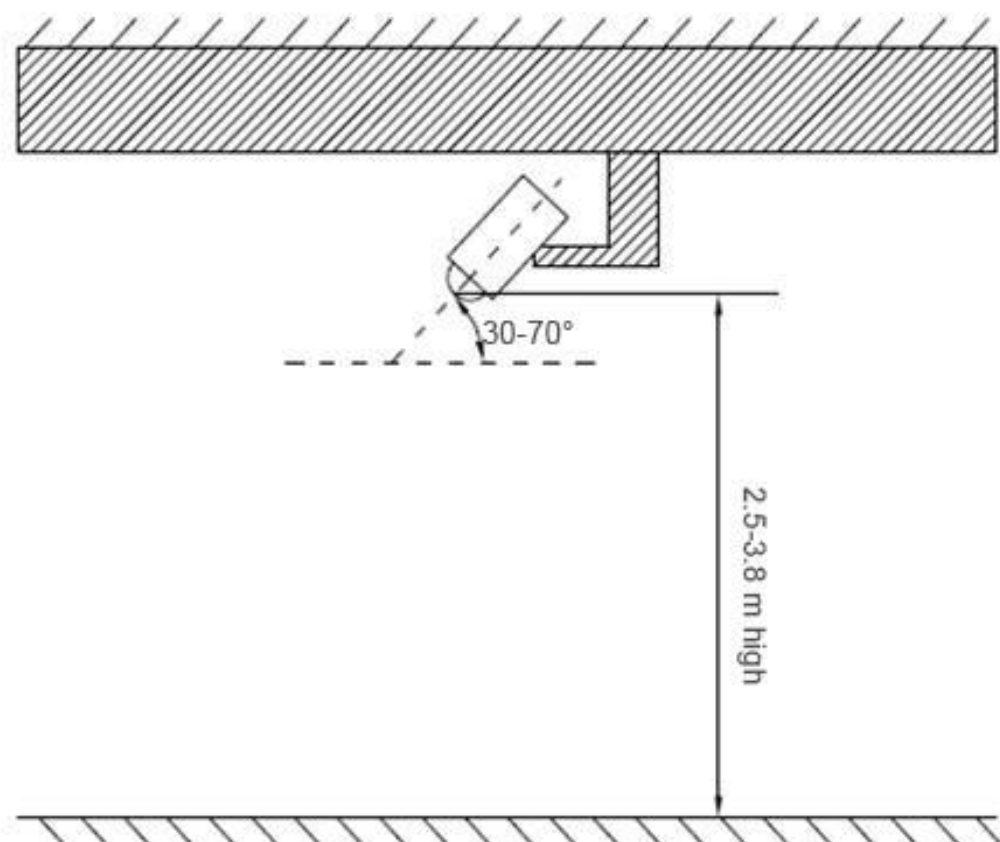
Precautions:

1. A camera with a 2.1 mm lens must not be installed less than 2.2 m above the ground; a camera with a 2.8 mm focal length not less than 2.5 m; install an angle-mounted camera with a 30~70° angle with the horizontal plane. See the specific installation illustration;

2. In a top-mounted camera, make sure the passenger flow direction is vertical to the line connecting the two lenses of the camera (see the calibration illustration for details);

3. The ANPR (trigger lines) of the top-mounted camera shall be right under the camera; regarding angle-mounting, adapt to the specific installation site in deciding where to place the ANPR;

4. The calibrated height or angle can differ from the actual height or angle; do several rounds of calibration in this case to rule out occasional disturbance from the ground or lights. In calibration, draw a large frame if possible to frame the ground inside. If abnormal data keeps coming up, contact Dahua's after-sales service;

5. Use this device where there is sufficient lighting;

6. Use this device indoor;

7. When using this device in a slightly dark environment, choose manual exposure and set the exposure time to 0-10 ms;

III. Configuring Images

The monocular passenger flow system comprises traditional bullet cameras and can also be used as a traditional camera system for surveillance. In outdoor and angle-mounting applications where the monocular passenger flow system is installed, you likely have to handle backlight and low luminance scenarios, so an additional section is dedicated to image adjustment in this situation. Stereo vision passenger flow devices typically need not adjust the image effect.

1. Upgrade to the latest general program before configuration. On GDP (gdp.dahuatech.com), choose the correct **Program Type** according to model numbers: Baseline, general patches, and then download the latest programs.

2. Set up different parameters for different scenarios in configuration. Some scenarios need two configuration plans to show the effect. In this case, switch between the configurations by time. See the following figure:
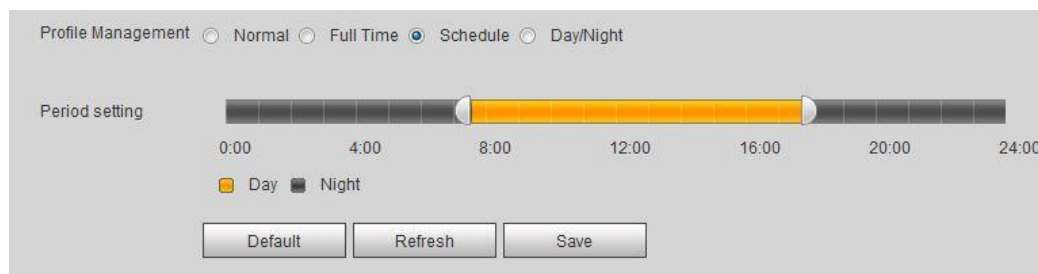
3. Like traditional cameras, angle-mounting passenger flow cameras can be used for surveillance. To this end, adjust the image quality. The default settings are enough to handle common scenarios; Adjust the **Exposure** first. See the following figure:
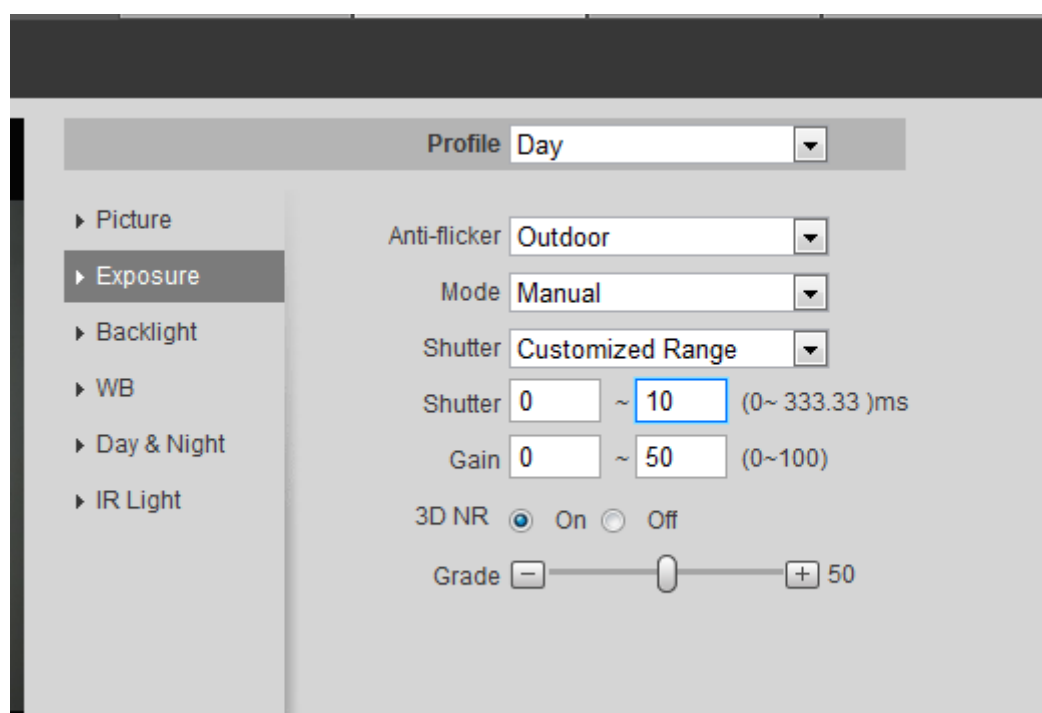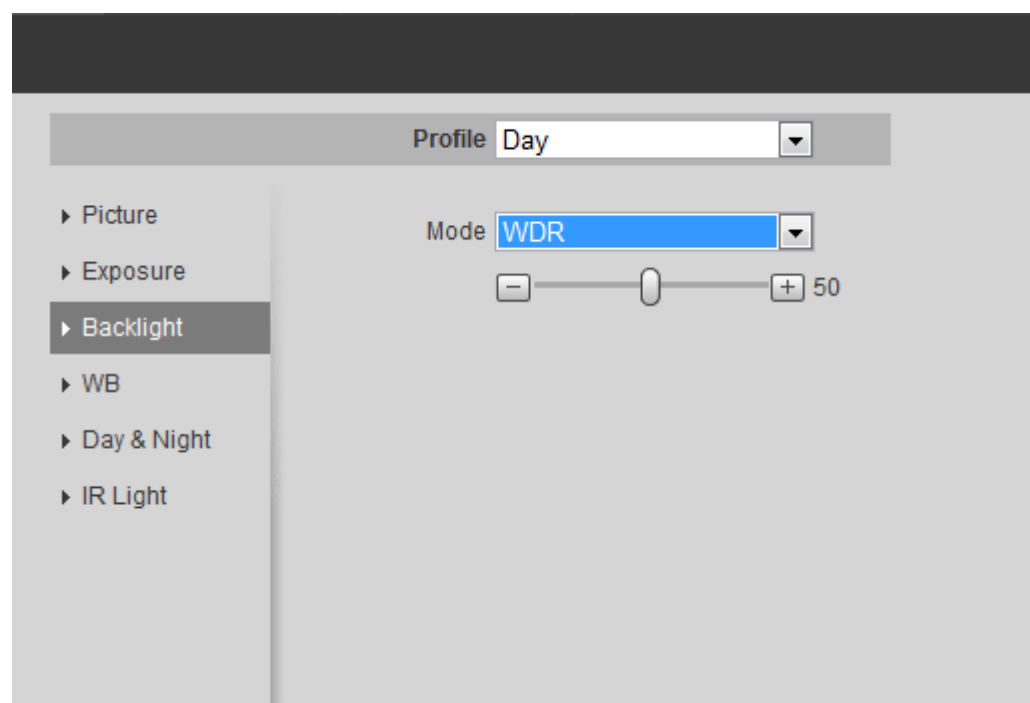

Adjust the **Picture** parameters for more refined details.
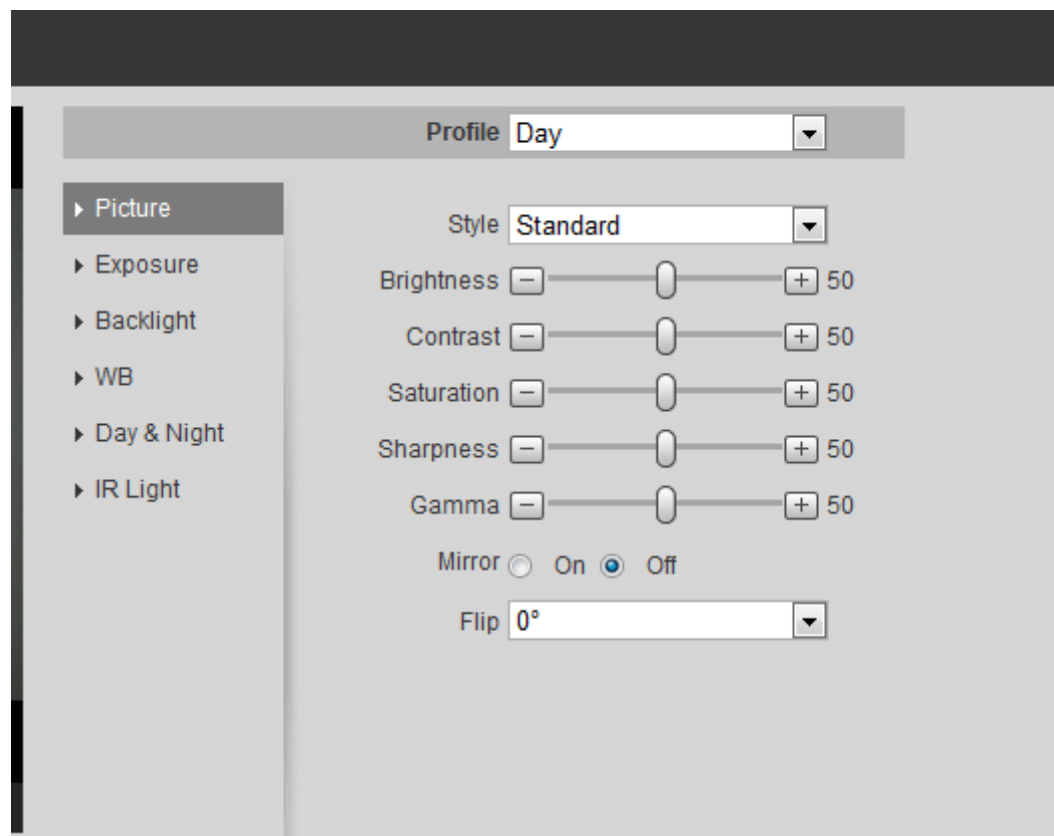
4. Adjusting the overall color: The overall cast can switch to the white balance mode, which can be done with the **Outdoor** or **Road Lamp** settings.

5. In a backlight scenario, enable **Backlight WDR** to adjust the picture quality.

IV. Function Config

8341 Stereo Vision Camera

The system counts the passenger flow into and out of the detected region. When the counted passenger flow exceeds the preset alarm-triggered quantity, an alarm is triggered, followed by linked settings.
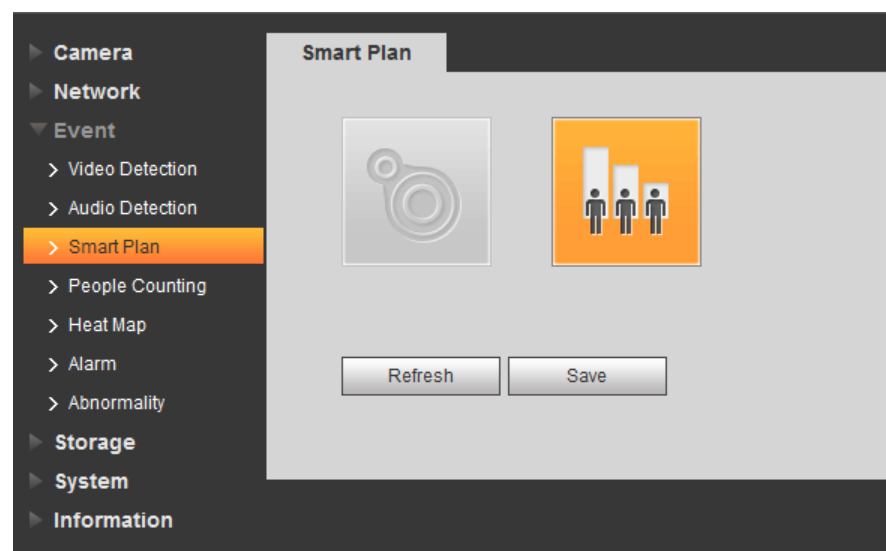
1. Enable Smart Plan

The passenger flow function of the device becomes effective only after the smart plan is enabled.

Step 1 Select **Setup > Event > Smart Plan**.

The **Smart Plan** interface is displayed. See Figure 3-1.

Figure 3-1   Smart plan

Step 2   Click the selected smart plan.

Click **Save** to complete the configurations.

2. People Counting

The system provides two counting methods: Region people counting, people counting.
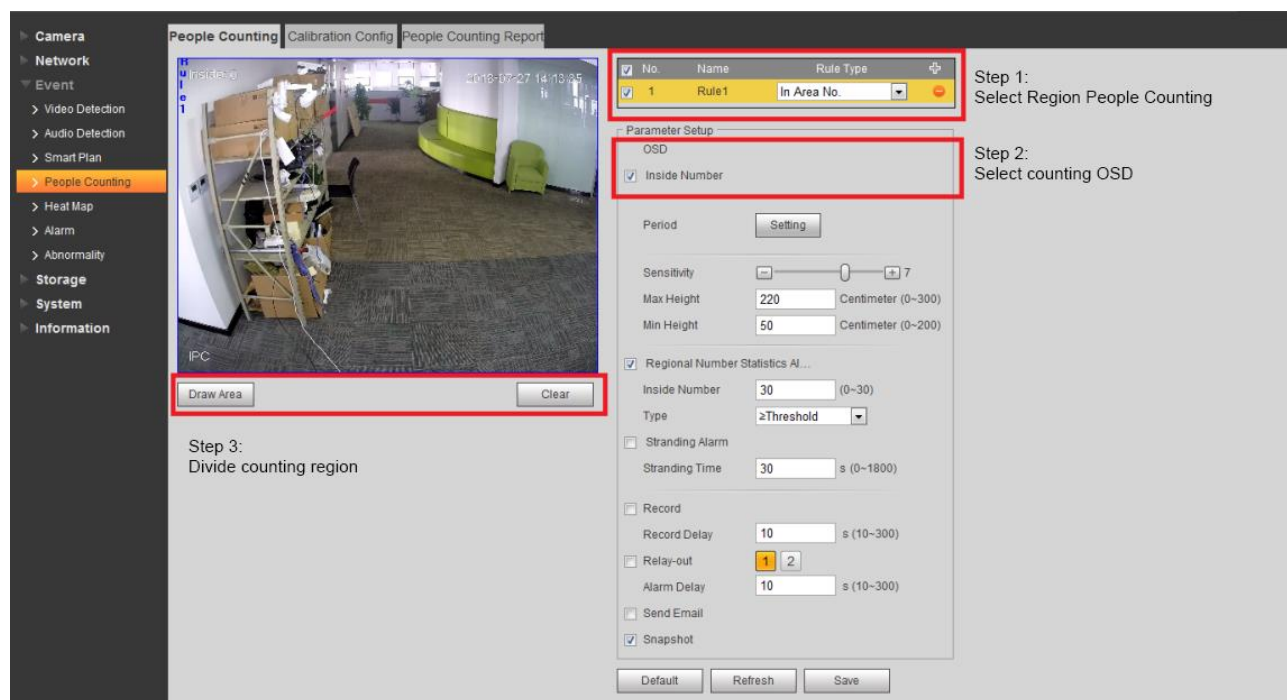
Region People Counting

Use **Region People Counting** to set up a closed region. The system counts the passenger flow into and out of the region. When the counted passenger flow exceeds the preset alarm-triggered quantity, an alarm is triggered.

Step 1   Select **Setup > Event > People Counting**.

The **People Counting** interface is displayed. See Figure 3-2.

Figure 3-2   People counting (1)

Step 2 Set the **Rule** to **Region People Counting**.

Step 3 Select **Enable** to turn on region people counting.

Step 4 Click **Draw Area** to draw the detected area in the surveillance image.

- For passenger flow and region people counting, drawing one closed area is enough. The difference is that an additional direction shall be drawn when counting passenger flow to differentiate the entry and exit directions.

- When drawing the rule direction for passenger flow counting, draft the trigger line from left to right, with the direction pointing downward.

- When drawing the rule direction for passenger flow counting, draft the trigger line from right to left, with the direction pointing upward.

- Draw the trigger line in the image center.

- Where only one device is mounted: The length of the drawn trigger line must exceed the width of the passage.

- Where multiple devices are mounted: The drawing of trigger lines cannot circumvent the coinciding areas of different cameras. Based on actual count data, draft the length of trigger lines of adjacent cameras to circumvent these coinciding areas as much as possible.

Step 5 Set up the **people counting parameter**. See 图 1-1Table 3-1

Table 3-1 Description of region people counting

Parameters	Description
Threshold	The number of persons exceeding the preset threshold value triggers an alarm.
Types	You can select "equal to or greater than the threshold" or "equal to or less than the threshold" based on the threshold you set.

Parameters	Description
Sensitivity	Set up the sensitivity of triggered alarm. The higher the sensitivity, the easier the alarm is triggered.
Maximum detection height	Set up the maximum detection height that triggers alarm when an object or person stands up.
Minimum detection height	Set up the minimum detection height that triggers alarm when an object or person stands up.
OSD	Select **OSD** to display the internal people count in the surveillance image.
Inside Number	Select Inside number and this data is counted and displayed.
Arming and disarming period	Set the alarm time period to enable the alarm event in the time range set.
Record	Select **Record** and when an alarm occurs, the system will automatically record the alarm.
Record Delay	When the alarm is over, the alarm recording will stop for an extended period of time.
Alarm Output	Select **Relay-out** to start the alarm linkage output port. In case of an alarm, the system links the corresponding relay-out device.
Alarm Delay	After an alarm finishes, the alarm is extended for a period of time and stops.
Send Email	Select **Send Email** and the system emails you when an alarm is triggered.
Snapshot	Select **Snapshot** and the system auto takes snapshot when an alarm is triggered.

Step 6 Click **Save** to complete the configurations.

People Counting

The system uses **People Counting** to count the passenger flow into and out of the region. When the counted passenger flow exceeds the preset alarm-triggered quantity, an alarm is triggered.

Step 1 Select **Setup > Event > People Counting**.

The **People Counting** interface is displayed. See Figure 5 .

Figure 3-3   People counting (2)
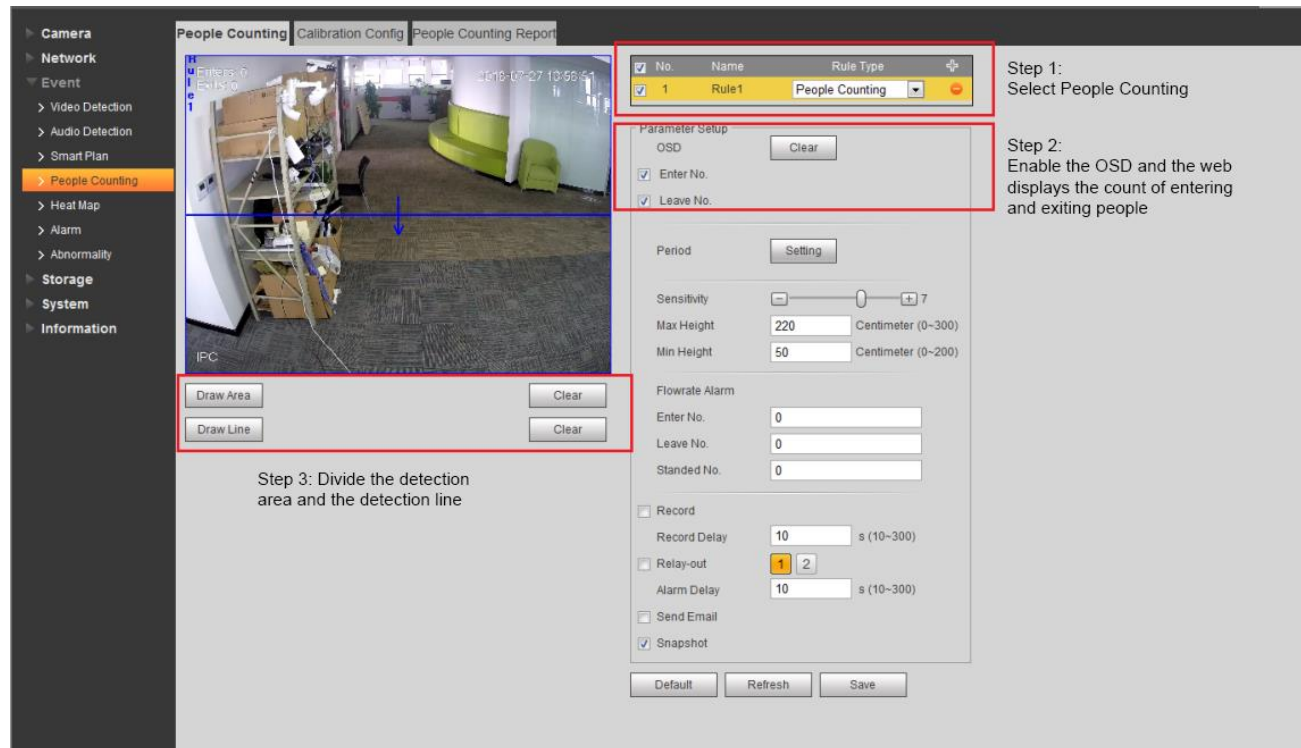
Step 2 Set the **Rule** to **People Counting**

Step 3 Select **Enable** to turn on region people counting.

Step 4 Click **Draw Area** to draw the detected are in the surveillance image.

Step 5 Click **Draw Rule** to set up the counting rule for entering and exiting the detection area.

Step 6 Set up the **people counting parameter**. See Table 3-2.

Table 3-2 Description of people counting

Parameters	Description
Sensitivity	Set up the sensitivity of triggered alarm. The higher the sensitivity, the easier the alarm is triggered.
Maximum detection height	Set up the maximum detection height that triggers alarm when an object or person stands up.
Minimum detection height	Set up the minimum detection height that triggers alarm when an object or person stands up.
OSD	Select **OSD** to display the count of people entering and exiting in the surveillance image. Click **Clear** to clear the count.
People counting alarm	Allows for setting up the number of people entering, exiting, and lingering. Hitting the set limit triggers alarm.

| Parameters	Description
Record	Select **Record** and when an alarm occurs, the system will automatically record the alarm. ◻**NOTE**
Record Delay	When the alarm is over, the alarm recording will stop for an extended period of time.
Alarm Output	Select **Relay-out** to start the alarm linkage output port. In case of an alarm, the system links the corresponding relay-out device.
Alarm Delay	After an alarm finishes, the alarm is extended for a period of time and stops.
Send Email	Select **Send Email** and the system emails you when an alarm is triggered.
Snapshot	Select **Snapshot** and the system auto takes snapshot when an alarm is triggered.

3. Calibration Config

Configure the installation height and angle of the device.

Step 1 Select **Setup > Event > People Counting > Calibration Config.**

The **Calibration Config** interface is displayed. See Figure 6 .

Figure 3-4   Calibration Config
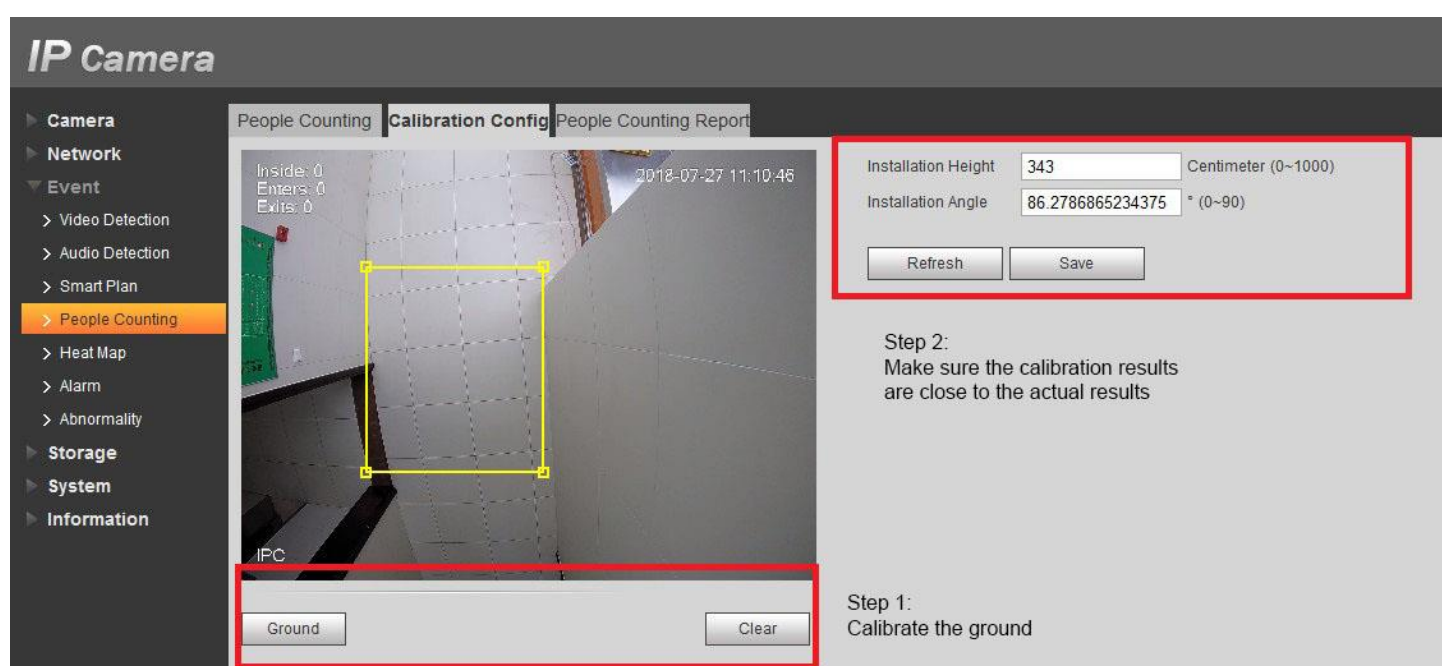
Step 2 Click **Clear** to remove the calibration frame.

Step 3 Click **Ground** to draw a rectangle to frame the ground.

The device then calculates its height above the ground and the angle it forms with the ground.

Review **Height** and **Angle.**

Step 4 Click **Save** to complete the configurations.

4. People Counting Report

Exports people counting data in a report.

<u>Step 1</u> Select **Setup > Event > People Counting > People Counting Report.**

The **People Counting Report** interface is displayed. See 0.

Figure 3-5   Report

<u>Step 2</u> Set up the search conditions. SeeTable 3-3.

Table 3-3 Description of search conditions

Parameters	Description
Statement type	The cycle and presentation form of people counting report. You can choose to export a daily report, monthly report, or annual report, in the format of bar chart or line chart.
Begin time	The time point when the period covered by the people counting report begins.
End time	The time point when the period covered by the people counting report ends.
Flow Direction	The entering and exiting direction of the people counting report. Available options include **Enter** or **Exit.**

Parameters	Description
Display No.	Choose **Display No.** to show the number of persons entering or exiting in the people counting report.

Step 3   Click **Search** to complete the report. You can export the report by clicking **Export**.

4140 Stereo Vision Camera
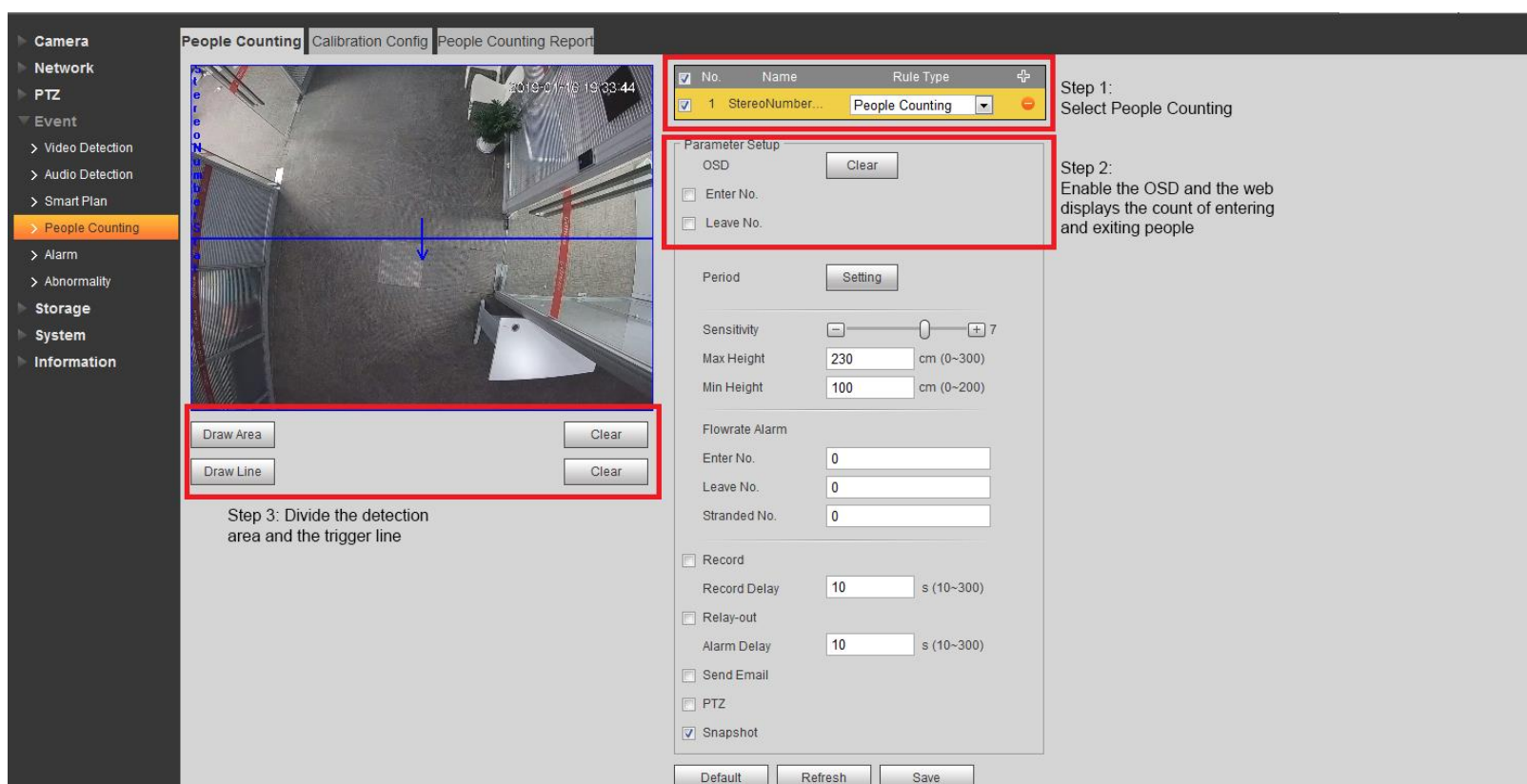
1. Selecting Smart Plan

To enable passenger flow, turn on the icon and click **Save**

Note: An icon turns yellow when enabled;

2. Enabling Rule

After smart plan selection, enable the corresponding rule by checking **StereoNumber .**

People counting


Here are critical configuration parameters:

● Sensitivity: The sensitivity in object detection. The higher the value, the more sensitive and the higher the detection rate, but at the cost of more false alarms;

- Maximum detection height: Objects above this height are not detected;

- Minimum detection height: Objects below this height are not detected;

3. Calibrating Ground

After enabling the rule, set up corresponding parameters;

Select **Calibration Config**;
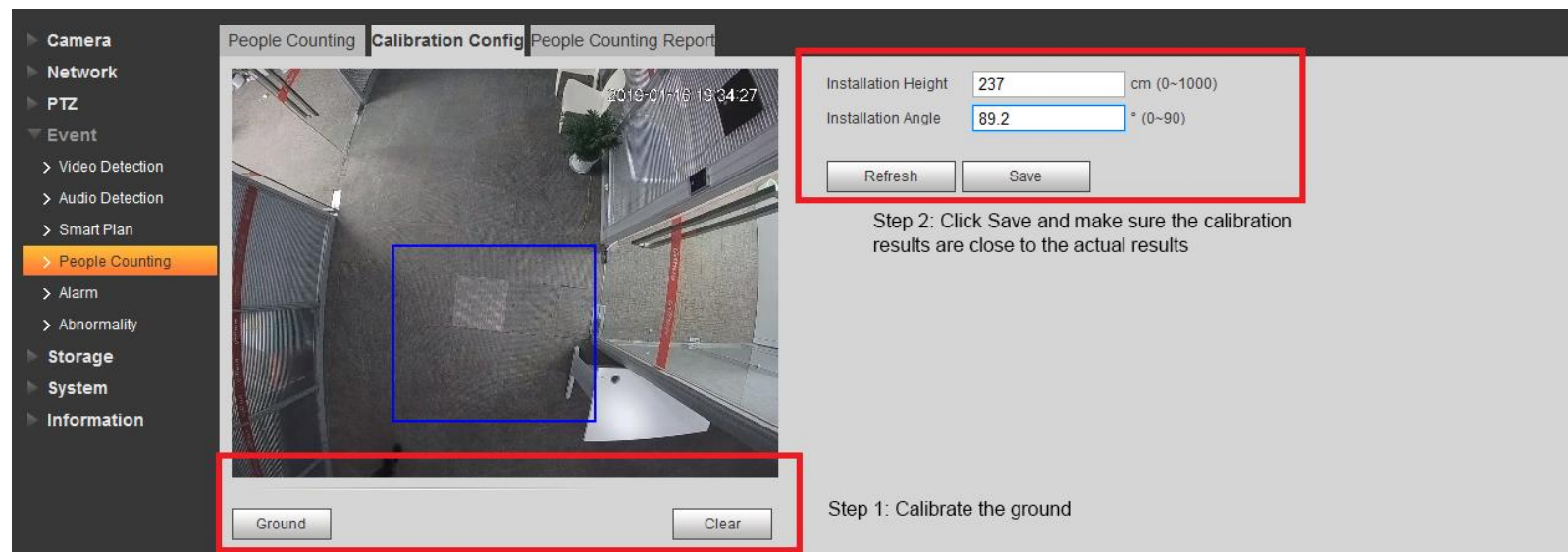
Take actions following the digital marks as above:

- Click **Clear** first

- Click **Ground.**

- As shown in the image, draw a large frame from the upper left to the lower right to cover the ground in the visual field;

- Click **Save**, and the computation for calibration takes about 10s;

- Displays the camera height and angle. Make sure the displayed values are consistent with the actual values;

Note: In ground calculation, select bare ground surface where there are textures (make sure the ground is not too bright and thus reflective).

4. Configurations of Drawing Rules

- Drawing rules for passenger flow and region people counting

For passenger flow and region people counting, drawing one closed area is enough. The difference is that an additional direction shall be drawn when counting passenger flow to differentiate the entry and exit directions.

When drawing the rule direction for passenger flow counting, draft the trigger line from left to

right, with the direction pointing downward;

When drawing the rule direction for passenger flow counting, draft the trigger line from right to left, with the direction pointing upward;
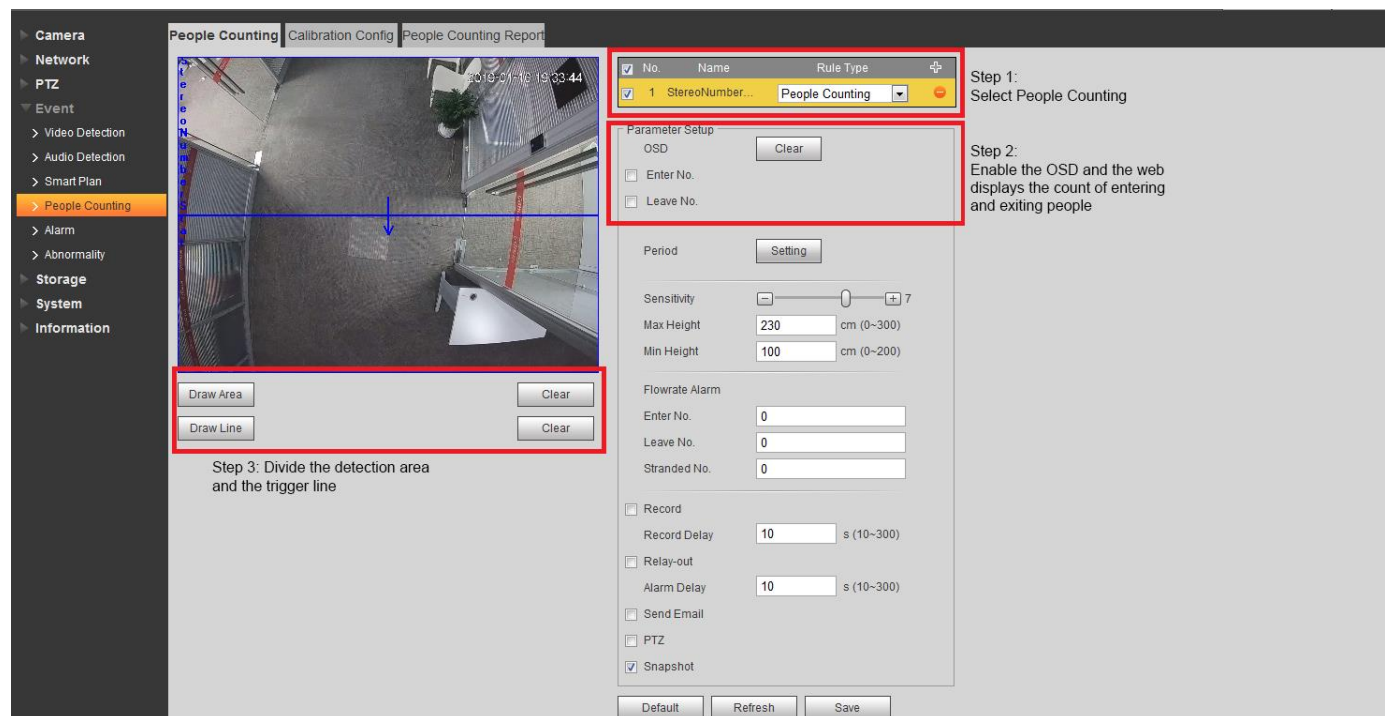
Remarks:

- In the case of **Customer Count** or **Region People Counting**, the rule frame needs to be determined based on the specific scenario, and can be of an irregular shape; otherwise, an ill-drawn rule frame can result in missed alarm and low accuracy rate of detection;

- The trigger line shall also adapt to the scenarios and not necessarily be horizontal (see the following figure). Besides, the two ends of the trigger line must both exceed the rule frame by a margin (see the following figure)
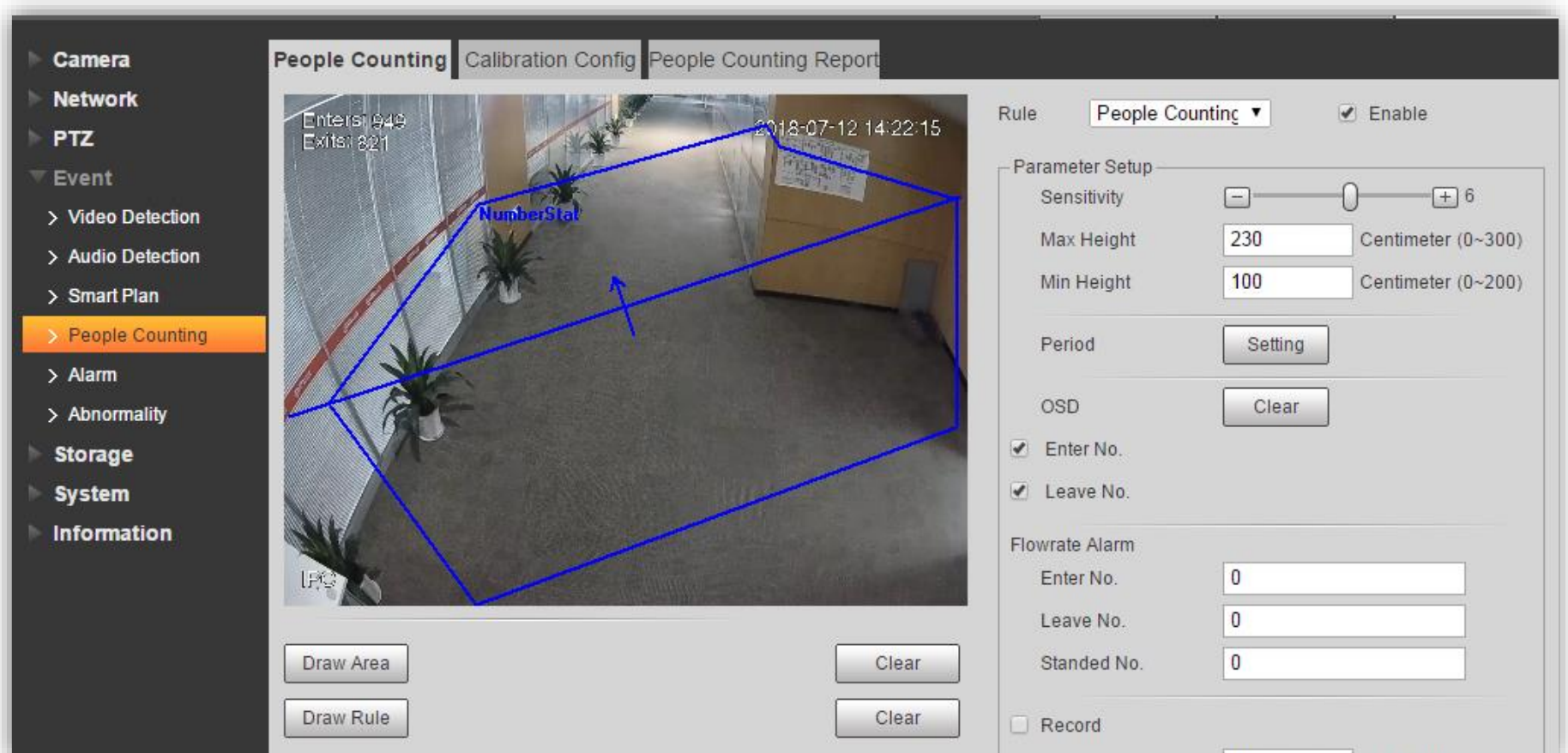
V. Notes

Stereo Vision Passenger Flow Camera

1. Factors Affecting the Count Rate

Many factors affect the count rate and the important ones are listed as follows.

- The smart algorithms occasionally give false alarm, which is proportional to the sensitivity. The more sensitive, the higher rate of false alarms.

- The calibrated height and angle differ from the actual height and angle. In this case, calibrate several times to eliminate occasional disturbance. Calibrate a large frame as much as possible to make sure the ground is framed. If abnormal data keeps coming up, contact Dahua's after-sale service.

- The tracking frame deviates from the objects.

- If water mist forms, open the small rear cover beside the camera cable. The high temperature of the camera can then remove the mist.

- The smart algorithms detect much less efficiently under the black and white mode of the camera, so avoid using the smart algorithms in this mode.

- Trolley cases and trailer trucks can be mistakenly counted to lead to count errors.

- In the entrance/exit of multiple armed devices, the overlap in the middle can result in wrong counting (related to the length of the trigger lines between adjacent devices).

- Make sure the traces of entrance/exit are complete and free of sudden appearance or disappearance.

- Drastic lighting change is also a source of wrong counting.

- Wrong counting takes place if the moving direction of passenger flow is not vertical to the trigger lines.

2. Examples of Wrong Installation Scenarios

- Random flow direction

Example of installation where people flow in various directions

- Lighting conditions vary and are uneven

Example of installation where lighting is unstable

3. Other

Passenger Flow Data Classification

Software data, hardware data.

Definitions

- Software data: The entry and exit data displayed on OSD.

- Hardware data: Data in the summary table of passenger flow count over days, usually not lost if written into the hardware FLASH.

- Clear software data (without clearing hardware data):

  None of the following actions clears the hardware data accumulated over days and included in the passenger flow report:

  The OSD display interface is cleared, meaning all OSD-overlapped entry and exit data is cleared, in a typically manmade process.

  Restores factory settings, in a typically manmade process.

  The device clears data automatically at 23:59:59, before starting count for the next day.

  If the device time is manually revised to the next day, OSD automatically clears data.

- Clear hardware data

  Be cautious because the passenger flow count data accumulated over time is cleared upon any of the following actions.

  If enabling Telnet clear settings, hardware data accumulated over days and included in the passenger flow report is cleared.

- Hardware restoration: A move completed by pressing down the RESET button on the chip of the device after opening the dome camera cover; the passenger flow report data accumulated over days is to be cleared in this move.

Others

- Data count cycle: The data count cycle in the report can be one year at longest; if this cycle is surpassed, loop overwriting ensues by hour. The data count cycle is one year at longest: Starting from the enabling date to the same date next year.

- Power-off restart: Power-off does not clear the OSD data on the very day or the hardware data.

VI. Appendix

Model

Monocular cameras:

Types	Model	Shape
Stereo vision cameras	HDW8341X-3D series	Stereo vision eyeball camera
Stereo vision cameras	HD4140X-3D series	Stereo vision dome camera