

Operating Instructions



Intelligent Thermal Imaging Dual Spectrum Detection Camera

Please read this manual thoroughly before operating the device,
and keep it for future reference.

V1.0

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1. Precautions

1.1 Storage and Keeping

- 1) Storage temperature: $-30\sim+80^{\circ}\text{C}$, operating temperature: $-20\sim+70^{\circ}\text{C}$.
- 2) Avoid dropping or striking this device.
- 3) Do not damage the shell with sharp objects.
- 4) Do not place cables where they may be pinched or stepped on.

1.2 Operating Precautions

- 1) Working voltage: 10-32V. It stops working when below 9V and power supply of improper voltage may cause damage permanently to the device.
- 2) Make sure all cables are connected properly before power up.
- 3) This product is a safe driving auxiliary equipment, not a substitution for driver's any operating actions in the process of vehicle driving. Also, it cannot guarantee a 100% recognition rate.
- 4) No obstacles are allowed within the end of lens.
- 5) If the installed device is manually adjusted again, it needs to be re-calibrated to show the normal detection effect.



Warning!

1. Excessive working voltage will damage the equipment.
2. When the device is connected to a monitor, drivers should not rely too much on this device while driving.
3. It is prohibited to disassemble the equipment without the assistance of professionals.



Special Notice

Never try to repair this device by yourself. In case of any problems, please turn off the device at once and notify our company or authorized dealer. The device is a complex device. Any disassembly or modification may lead to damage and void the warranty.

1.3 Maintenance

- 1) Remove all the cable connections from the device before cleaning the device.
- 2) Use a mild household detergent and clean the unit with a slightly damp, soft cloth.
- 3) Never use strong solvents such as diluent or benzyl, as they might damage the surface of the device.

	Caution	
	Risk of electric shock Do not open	
Caution: to reduce the risk of electric shock, Do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel.		



This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute risk of electric shock to persons.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.



This symbol is intended to alert the user not to dispose of electrical and electronic equipment.

CAUTION

You are cautioned that any changes or modifications not expressly approved in this manual could void the warranty and necessitate expensive repairs.

2. Product Features

2.1 Pedestrians and Vehicles Detection Features

- 1) Pedestrians and vehicles can be detected in the set Detection Zone, with "ding" sound alarming issued.

- 2) The closer pedestrians (or vehicles) are to the camera-equipped vehicle, the more rapid the alarm sounds.
- 3) The device can detect the distance between pedestrians and vehicles as shown in the table below:

Type	Infrared lens detection distance	Infrared lens recognition distance	Infrared lens confirm distance	Algorithm detection distance
	Pedestrian: 130m Vehicle: 310m	Pedestrian: 30m Vehicle: 80m	Pedestrian: 20m Vehicle: 40m	Visible light: 30m Infrared thermal imaging: 15m
	Pedestrian: 360m Vehicle: 880m	Pedestrian: 90m Vehicle: 220m	Pedestrian: 50m Vehicle: 110m	Visible light: 50m Infrared thermal imaging: 50m

- Infrared lens detection distance: You can see the infrared spot image of an object, but you cannot distinguish the type of object.
- Infrared lens recognition distance: The type of object can be identified through the blurred infrared imaging of the object.
- Infrared lens confirm distance: The type of object can be clearly confirmed through the infrared imaging of the object.
- Algorithm detection distance: When the AI algorithm can stably detect and identify people, the farthest distance between the person and the camera.

Note: During the actual test process, affected by parameters such as the test environment, there will be a certain error between the actual measured data and the reference data.

2.2 Added Artificial Intelligence Algorithm

- 1) Intelligent thermal imaging dual spectrum detection camera adopts deep learning technology, contributing to the realization of intelligent and accurate pedestrian detection.
- 2) The embedded platform integrates Deep learning (DL) + Artificial intelligence (AI).

2.3 External Wi-Fi Communication and LAN Communication

- 1) Users can connect mobile phone with the device through an external Wi-Fi module to calibrate and set the device.
- 2) Users can also connect the device with an external USB-LAN cable to check RTSP.

3. Technical Specifications

Items	Parameters		
Camera with built-in visible light	Resolution / Frame	FHD 1920x1080/25fps or 1920x1080/30fps	
	Focal Distance& Horizontal viewing Angle	6mm&52°	8mm&40°
Camera with built-in infrared light	Resolution / Frame	256x192/25fps	384x288/25fps
	Horizontal viewing Angle	51°	28°
Video	Video Output	AHD(1.0Vp-p,75Ohm)	
	Resolution / Frame	1920x1080/25fps or 1920x1080/30fps	
Audio	Audio Output	Sound Alarming Output	
Interface Module	Communication Interface	USB 2.0(For Software upgrading)	
Power Input	Input Voltage	DC:10~32V	
	Power Dissipation (12V IN)	380±20mA	335±20mA
Wire Parameter	Wire Length	0.5m	
Temperature Parameter	Operation Temperature	-20~+70°C	
	Storage Temperature	-30~+80°C	
Protection Parameter	Waterproof Rating	IP69K	
Appearance Parameter	Dimension	98x73x74 mm	
	Weight	534g	576g
	Housing Colour	Black	

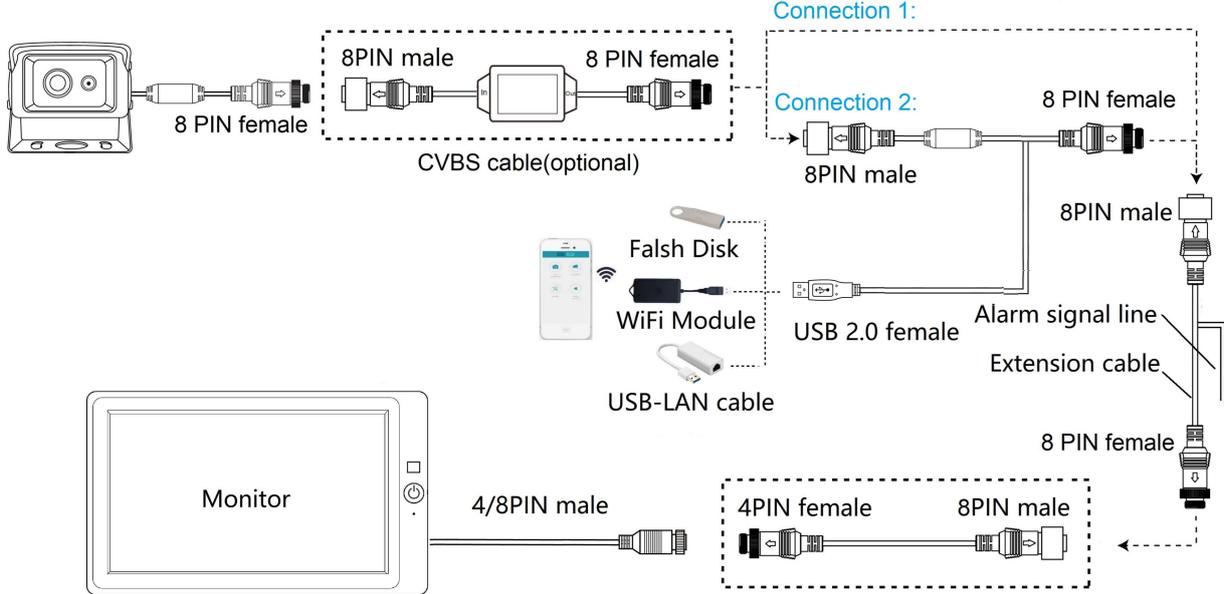
4. Components and Accessories

Components or accessories	Quantity (pcs)	Description
	1	Intelligent thermal imaging dual spectrum detection camera
	1	Hexagon wrench (for camera Angle adjustment)
	1(optional)	External Communication Cable (8Pin to 8Pin&USB2.0)
	1(optional)	External Wi-Fi module
	1(optional)	Extension Cable(8Pin to 8Pin extension cable, Alarm signal cable available)
	1(optional)	Dedicated Monitor
	1(optional)	Video input cable (8Pin to 4Pin, With a common Monitor)
	1(optional)	CVBS Cable (8Pin to 8Pin, output CVBS signal)

Note: Accessories supply may be different for different application. Multiple devices can share an external Wi-Fi module and external communication cable.

5. Wiring diagram

The peripheral wiring of the intelligent thermal imaging dual spectrum detection camera is shown in the figure below:



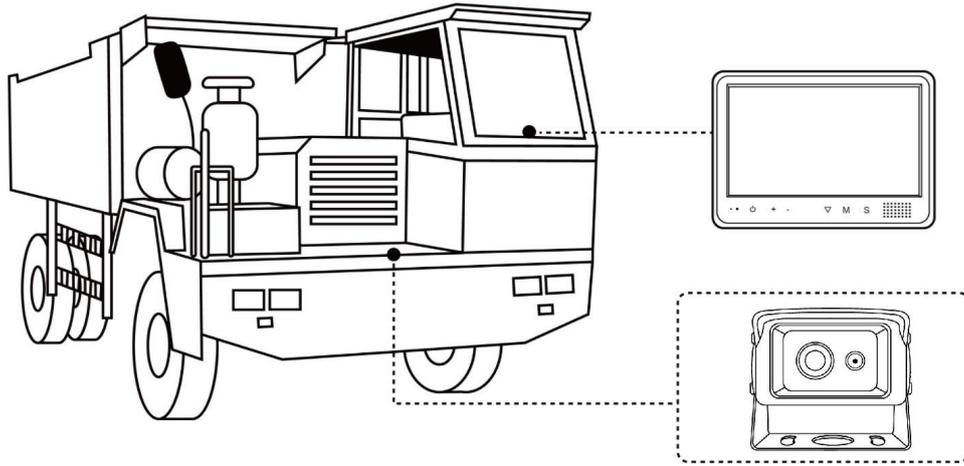
In the figure, the connection mode of the equipment under normal working conditions is shown as connection 1 or connection 2, connection 2 can be used for calibration and device parameter setting through the external Wi-Fi module. In addition, you can connect the network cable, log in to the web page of the device, connect to the RTSP, and upgrade the device by using a USB flash drive. The camera can be powered directly by the monitor and show the video in real time.

6. Installation

The intelligent thermal imaging dual spectrum detection camera can be divided into horizontal version and vertical version according to the direction, which can be installed in the front, rear and side of the vehicle.

The camera is mainly composed of a visible light camera and an infrared thermal imaging camera. The installation height is recommended to be within 1.0-1.6m. While installing, we suggests having an assistant in the back of the car to adjust the device, the driver sitting in the driver's seat to check the image of the monitor, and calibrating the device after it is installed.

The following illustration takes the intelligent thermal imaging dual spectrum detection camera installed in front of the vehicle as an example.

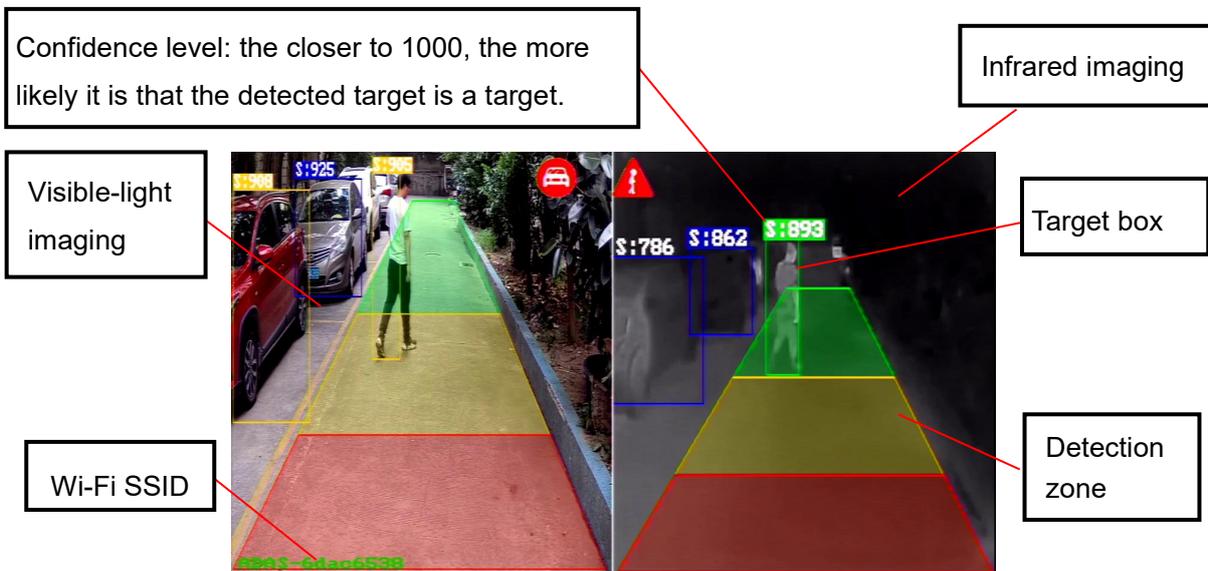


7. Camera Installation

7.1 Startup Screen

7.1.1 Boot Screen Description

Connect the power supply, turn on the device display screen as shown below, is the left and right double segmentation structure. The color picture is the image picture of the visible light camera, and the black and white picture is pictured by the infrared thermal imaging camera. The red, yellow, and green areas make up the "Detection Zone". Only this area detects the target (pedestrian and vehicle) and emits the alarm sound.



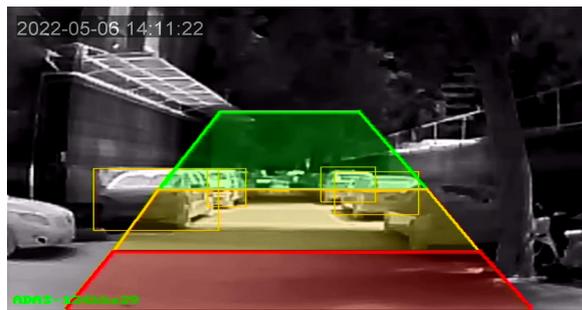
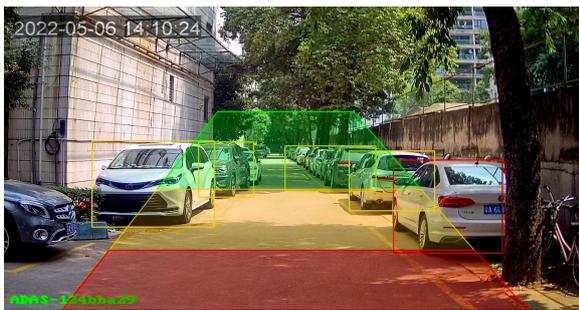
Notes:

- 1) Wi-Fi name and version number in blue font are displayed in the lower left area of the screen after booting. After about 10 seconds, the version number in blue font will disappear, and the Wi-Fi name in blue font will turn green and keep displaying. If the Wi-Fi module is not connected, the green Wi-Fi SSID will also disappear.
- 2) Whether to display such parameters as detection zone, target box and confidence can be set on the web page. Please refer to 9.2 for more details.

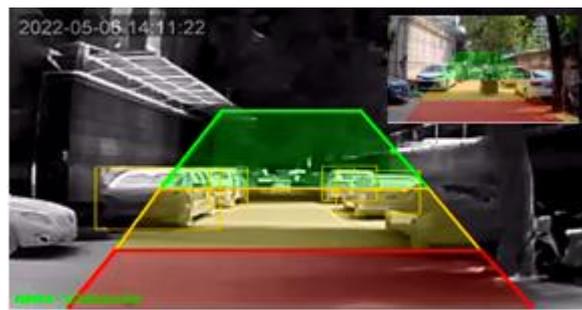
7.1.2 Imaging display mode

Go to web page->parameter configure->media configure->display format->display mode. A total of 7 imaging modes can be selected. When different imaging modes are selected, the monitor will display the corresponding view.

- Visible light single view & Infrared single view.



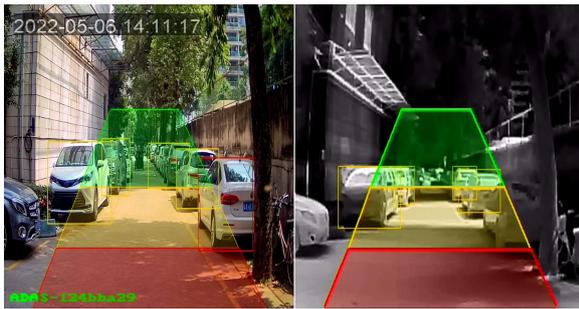
- Picture-in-picture double split & Picture-in-picture double split 2.



- Main and subsidiary quintuple split 1 & Main and subsidiary quintuple split 2.

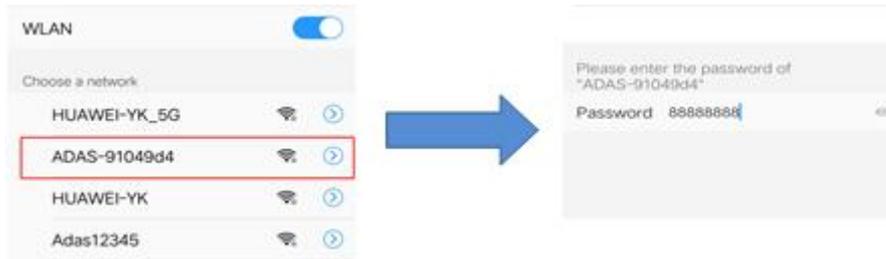


- Left and right double split

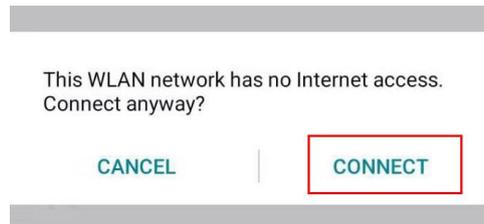


7.2 Building the Wi-Fi Connection

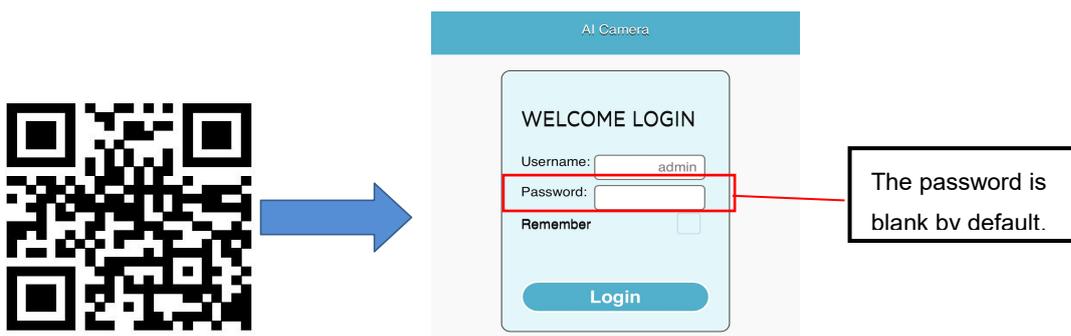
- 1) Find the Wi-Fi SSID corresponding to the device through the mobile phone (confirm that the Wi-Fi module has been connected, and see the green Wi-Fi SSID in the lower left corner of the monitor), then connect, and the initial password of Wi-Fi is "88888888".



- 2) If it is the first time to connect with the Wi-Fi hot spot, it may prompt the message as followings. If so, choose the “connect” button to remain the valid connection.



- 3) Enter the URL “http://192.168.60.1” in the web browser of the mobile phone, (or scan the QR code below).The browser will enter the main menu as follows. And the effective communication distance of Wi-Fi is about 7m, please keep in this range.



After finishing Wi-Fi connection, we can calibrate the pedestrian detection alarm system or operate some other settings about the device according to web page.

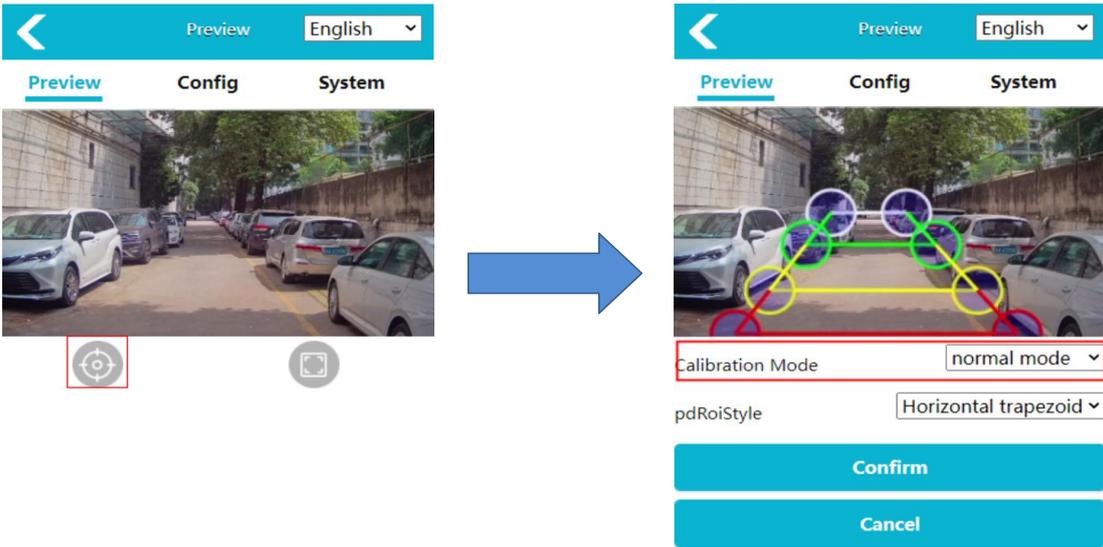
7.3 Detection Zone Calibration Operation

The detection areas of visible light camera and infrared camera are independent and can be calibrated separately. The calibration methods of the two are the same, and the visible light camera has ranging mode calibration and infrared camera not. Click the corresponding screen to enter the calibration mode. The following takes the calibration of visible light camera as an example.



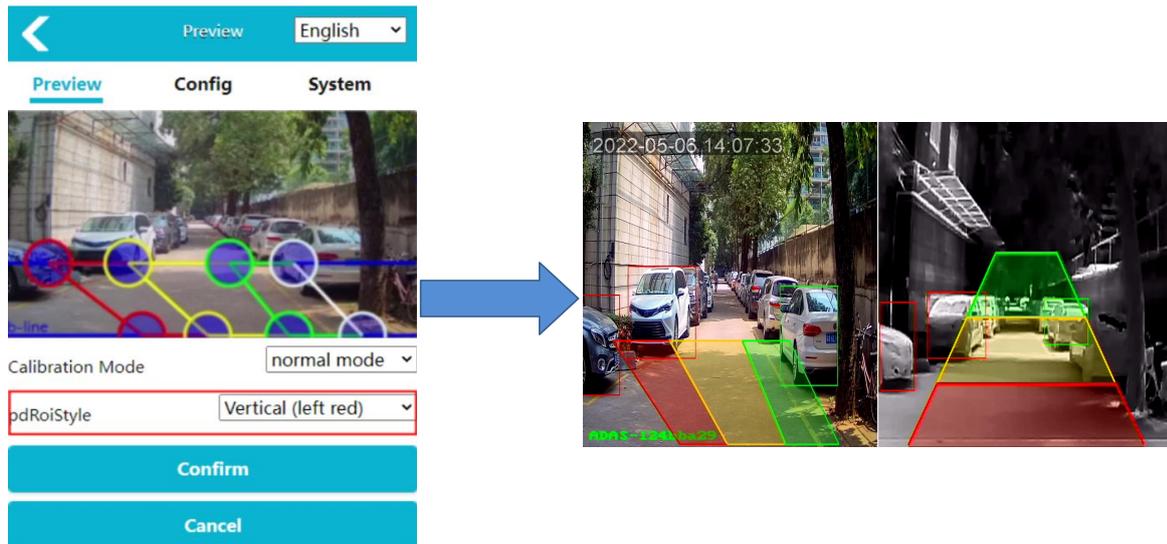
7.3.1 Calibration of normal mode

Click the calibration button on the web page and select “Normal Mode”. The divided area on the mobile phone screen corresponds to the detection area of the display. There are three ROI types to choose: horizontal trapezoid, vertical (left red), and vertical (right red).

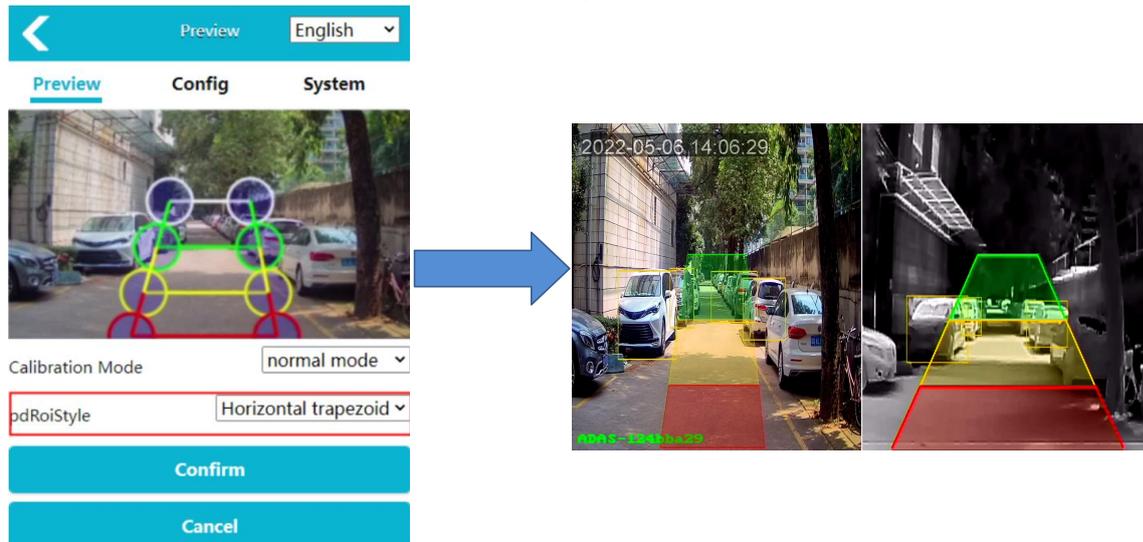


Select the corresponding ROI type, drag the corresponding line or point, and manually modify the ROI area. Click the “Confirm” button to calibrate. The calibration takes effect immediately, and the displayed detection area of the screen will update immediately.

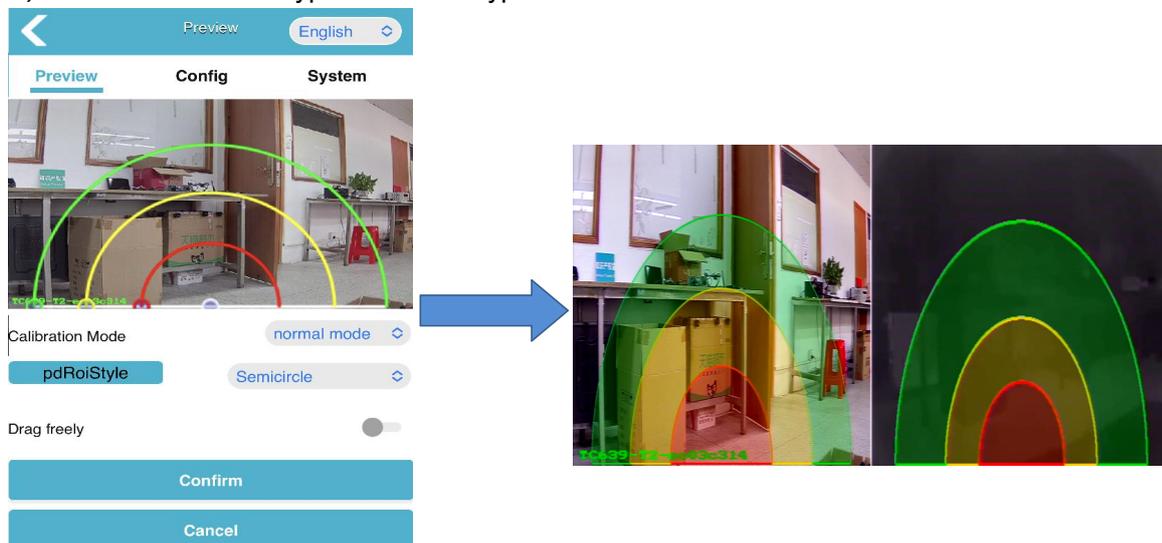
1) Vertical ROI type. "ROI Type" is "Vertical (Left Red)" or "Vertical (Right Red)".



2) Horizontal trapezoid ROI type. The "ROI type" is a horizontal trapezoid.



3) Semicircular ROI type. The "ROI type" is a "semicircle".



7.3.2 Calibration of Ranging Model

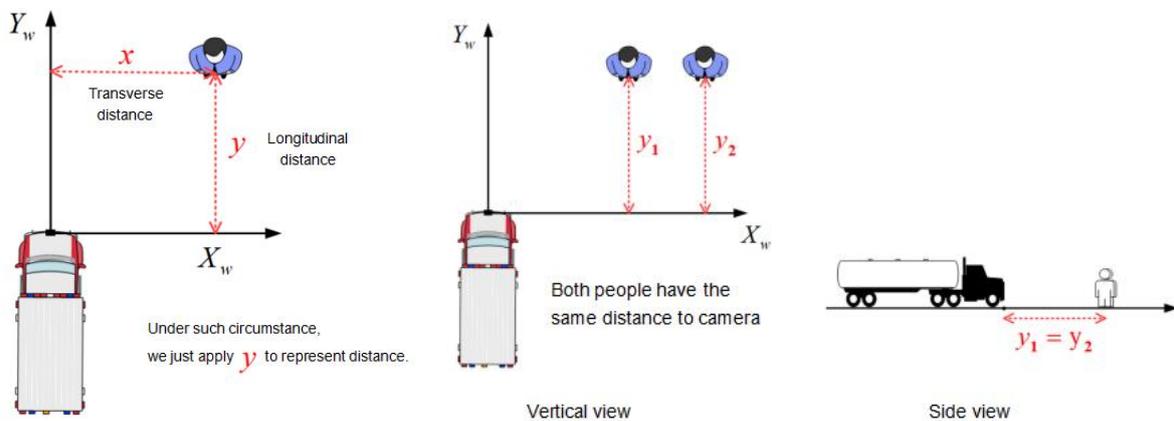
1) QR code placement

Put one in the left bottom and the other one in the right bottom. It works better as shown below.



2) Distance measurement

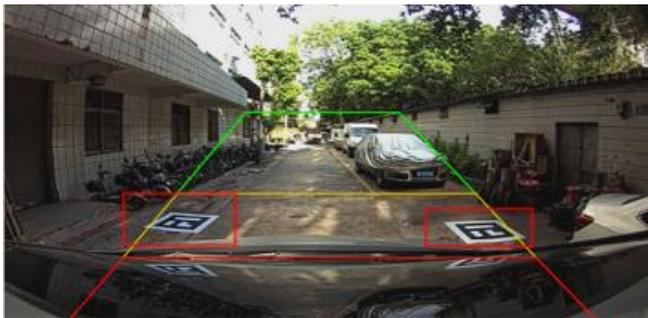
We set up a Cartesian coordinate system on the ground, which represents the position of the person, and “y” represents the ranging results.



3) Operating procedures

- Click the  Calibration button on the web page, and choose "normal mode". The ROI type only has horizontal trapezoid.
- If the camera has not calibrated the QR code before, a prompt box will pop up to remind it to calibrate the code.
- When calibrating the QR code, two calibration plates should be placed to ensure that the camera can fully see them.

- d. Drag two rectangular frames on the WEBUI with mouse manually to completely cover the two QR codes and click "Submit Calibration Board". After QR code is calibrated successfully, the ROI area will be reconfigured to the default value and the distance will be automatically filled to the red, yellow and green areas below.
- e. Modify the values of the red, yellow and green areas and press Enter/Confirm to change the corresponding ROI areas. (Red, yellow and green areas instruction: In the vertical direction, green area shows the distance between the front green edge and the camera (mm), yellow area shows the distance between the front yellow edge and the camera (mm), and red area shows the distance between the front red edge and the camera (mm).The horizontal region distance represents the distance (mm) from the left and right edges of each color ROI region to the camera.
- f. Click "Confirm" to save and exit the calibration setting.
- g. In measure mode, the pedestrian detection frame will overlay distance between camera position and X/Y wheelbase, and CAN data transmission will be converted into XY wheelbase distance (M) of the detected pedestrian.



Rectangle frame dragging diagram



Red-yellow-green areas diagram

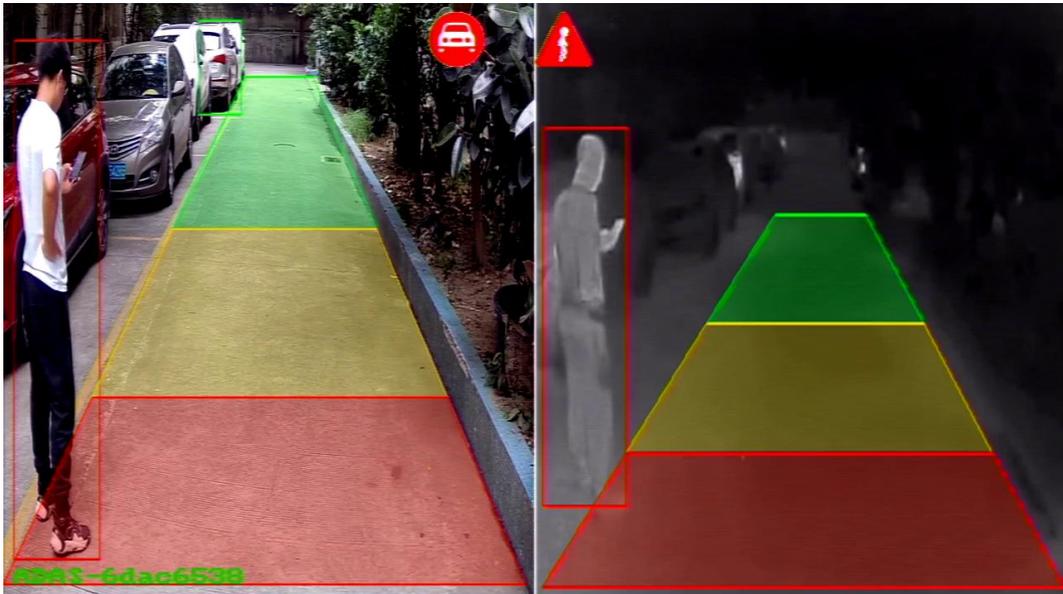
8. Intelligent Detection Function

After the device is turned on, real-time video will appear on the monitor, and the intelligent thermal imaging dual spectrum detection camera will automatically enter and maintain the target detection function. In order to ensure that the camera can operate normally, please follow the instructions in sections 6 and 7 to install and calibrate the equipment to be tested.

Function description: for visible light camera, there are pedestrian detection mode and pedestrian & vehicle detection mode; infrared camera only has pedestrian & vehicle detection mode. When the target appears in the "Detection Zone", it will be framed by corresponding color on the display, and a "ding" alarm with different degrees of urgency will be issued. The alarm continues until the target leaves the "Detection Zone".

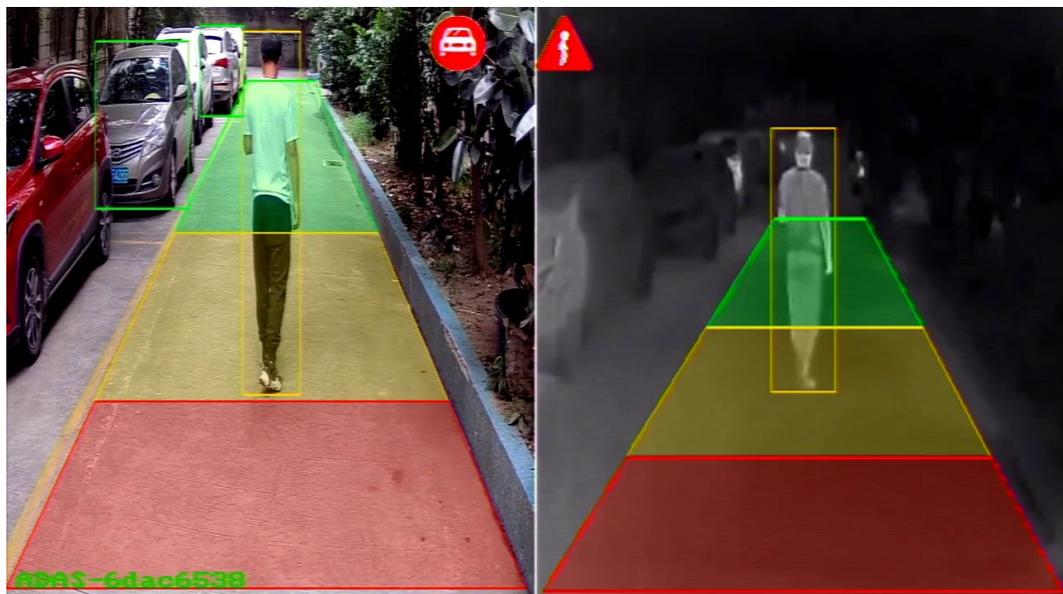
1) The red box alarm

When a target is detected and the red box is generated, it means that the target enters the red "Detection Zone". The output sound alarming will be "Ding Ding Ding" in rapid frequency.



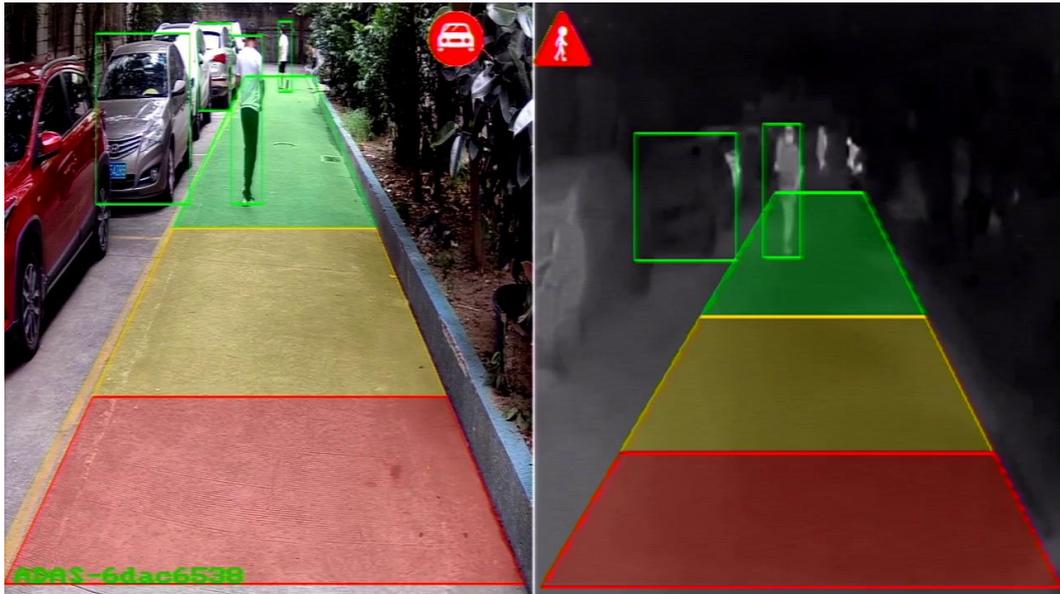
2) Yellow box alarm

When a target is detected and the yellow box is generated, the output sound alarming will be "ding-ding" in moderate frequency.



3) Green box alarm

When a target is detected and the yellow box is generated, the output sound alarming will be "ding" in slow frequency.



Note: when there are multiple boxes for detection, the priority of sound alarming is: red box (highest) yellow box (second) green box (lowest). For example, when there are three boxes at the same time, the default alarm sound is the one of red box.

9. Functions of the Web Page & System Upgrade

9.1 Calibration

For calibration, please refer to "Section 7".

9.2 System Setting

Click the "Configuration" button to enter the parameter setting interface, as shown in the figure below. Visible light and infrared light can set parameters independently, visible light corresponds to channel 1, and infrared light corresponds to channel 2:

- 1) Media Configure

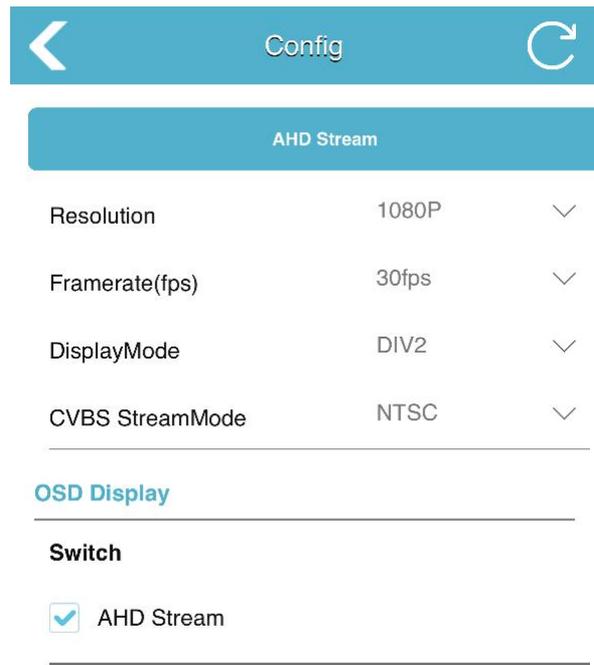
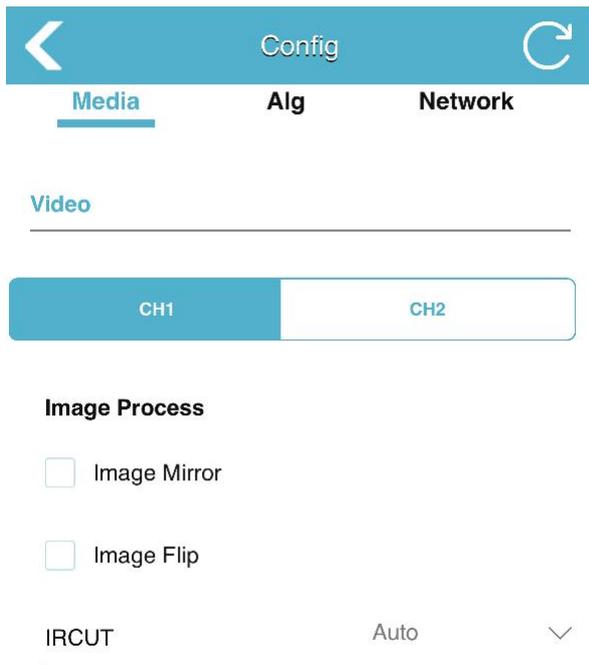
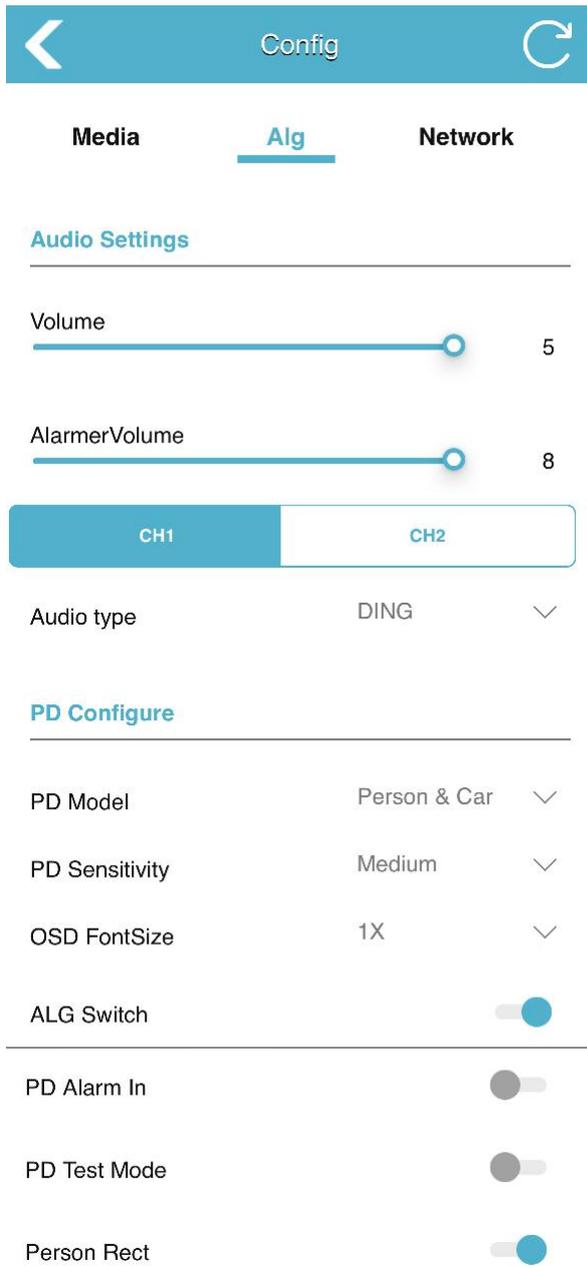


Image Mirror	Switches control whether image mirror is enabled.
Image Flip	Switches control whether image flip is enabled.
AHD	Set the resolution, output frame rate and display mode of the monitor
IRCUT	Can set Color, Black-White, Auto, adjust the picture color of visible light.
Display Mode	<p>VISCAM: Visible light single view</p> <p>IRCAM: Infrared single view</p> <p>DIV2: double segmentation</p> <p>IRCAM_OSD: Picture-in-picture double split 1</p> <p>IRCAM_OSD2: Picture-in-picture double split 2</p> <p>IRCAM_VIS: Main and subsidiary quintuple split 1</p> <p>IRCAM_IR: Main and subsidiary quintuple split 1</p>
CVBS	Set the standard definition output system (need to be used with CVBS video output cable)
OSD	Choose whether to enable AHD stream display

2) Algorithm Configure



Media **Alg** **Network**

Audio Settings

Volume 5

AlarmerVolume 8

CH1 CH2

Audio type DING ▾

PD Configure

PD Model Person & Car ▾

PD Sensitivity Medium ▾

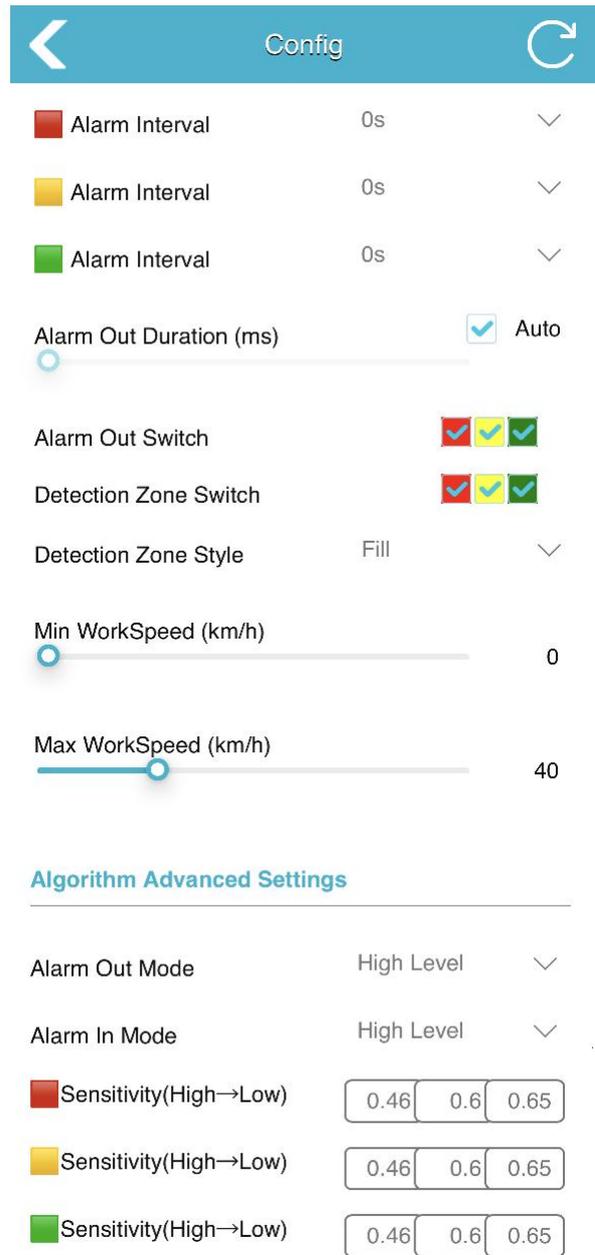
OSD FontSize 1X ▾

ALG Switch

PD Alarm In

PD Test Mode

Person Rect



Config

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Out Duration (ms) Auto

Alarm Out Switch

Detection Zone Switch

Detection Zone Style Fill ▾

Min WorkSpeed (km/h) 0

Max WorkSpeed (km/h) 40

Algorithm Advanced Settings

Alarm Out Mode High Level ▾

Alarm In Mode High Level ▾

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Out Duration (ms) Auto

Alarm Out Switch

Detection Zone Switch

Detection Zone Style Fill ▾

Min WorkSpeed (km/h) 0

Max WorkSpeed (km/h) 40

Algorithm Advanced Settings

Alarm Out Mode High Level ▾

Alarm In Mode High Level ▾

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Interval 0s ▾

Alarm Out Duration (ms) Auto

Alarm Out Switch

Detection Zone Switch

Detection Zone Style Fill ▾

Min WorkSpeed (km/h) 0

Max WorkSpeed (km/h) 40

Algorithm Advanced Settings

Alarm Out Mode High Level ▾

Alarm In Mode High Level ▾

Sensitivity(High→Low) 0.46 0.6 0.65

Sensitivity(High→Low) 0.46 0.6 0.65

Sensitivity(High→Low) 0.46 0.6 0.65

Volume	Set the alarm volume level in range 0-5. The default level is 5(max.). Level 0 means no sound.
Alarm Volume	It requires an additional RS232 cable, to set the volume of an external sound and light alarm.
Audio type	Switch alarm sound type. The default sounds 'Ding'. There are 6 different tones for option. It will restart after setting.
PD Model	Set the algorithm model. Person: only detect pedestrians; Person& Car: detect both vehicles and pedestrians. Car: only detect cars.

PD Sensitivity	The higher, the more false detection; the lower, the more missing detection.
OSD Font Size	Display OSD font size, you can turn off confidence and adjust the font size of confidence. The configuration will take effect only when the PD test mode is enabled.
PD Alarm In	Pedestrian detection trigger input. When enabled, the pedestrian detection algorithm will be enabled only when the multi-functional CAN wire or device with alarm input is connected, and the alarm in provides 12V voltage.
PD Test Mode	After turning on, when a pedestrian is detected outside a specific area, it will display within a blue box, and the 'Confidence' of the detected pedestrian will display.
Person Rectangle	Select whether to display pedestrian rectangle after detecting pedestrians.
Zone Interval	Sets the minimum interval between two alarms in the red, yellow, and green zones, during which no alarm is triggered.
Alarm Out Duration	Set the duration of trigger line output high level after pedestrian is detected in the detection area, which is 2S by default. That is, after the pedestrian is detected, the trigger line outputs a high level. When no pedestrian is detected again, the high level lasts for 2S and then drops to a low level.
Alarm Out Switch	Select whether the trigger line outputs high level after the pedestrian is detected in the red / yellow / green corresponding detection area.
Detection Zone Switch	Switches control whether the detection areas corresponding to Red/Yellow/Green are displayed. When you click to turn off, the detection area will not be displayed and pedestrian detection will not be performed. It takes effect immediately once setting.
Detection Zone Style	Set the detection area color fill display/line display/hide. It takes effect immediately once setting.
Work Speed	After the external GPS is connected, the algorithm will be activated when the driving speed is lower than the working speed.
Alarm Out Mode	The default is high level: the alarm out line outputs high level after the trigger algorithm detection.
Alarm In Mode	The default is high level: pedestrian detection trigger input, alarm in line input high level trigger.
Algorithm Advanced Settings	The detection thresholds of high, medium and low detection sensitivities are adjustable, and the smaller the set value, the higher the detection sensitivity.

3) Networking Configuration

Support to set device IP, mask, gateway and other parameters manually. When connected to the device through a network cable, you could input http://IP to access the web page. It is equivalent to section 7.2. You can also connect RTSP streams over IP.

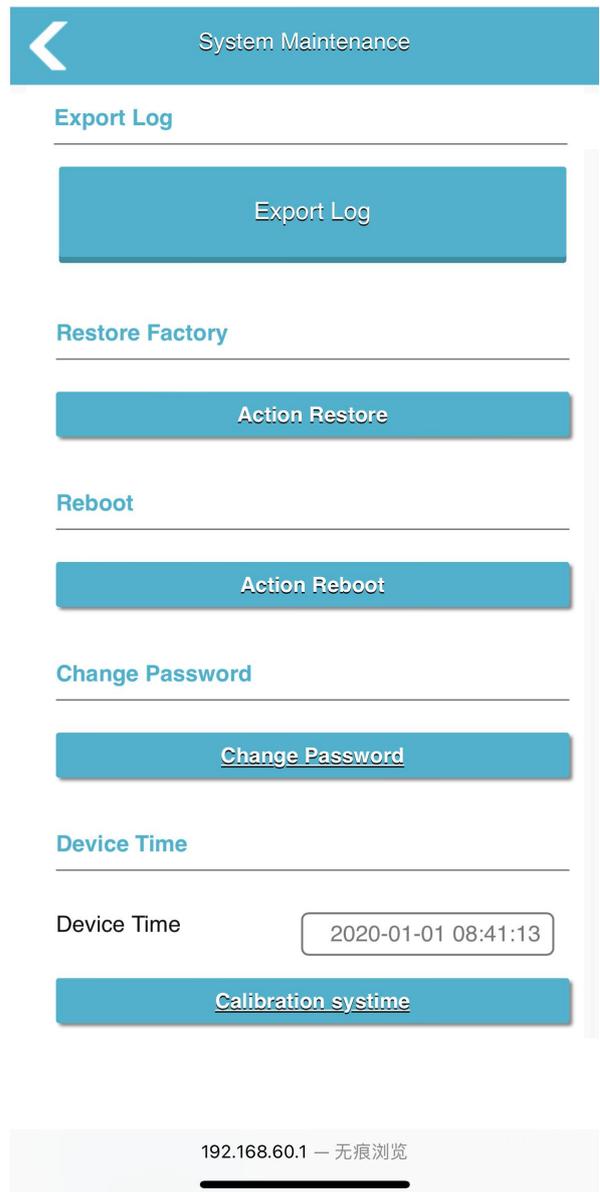
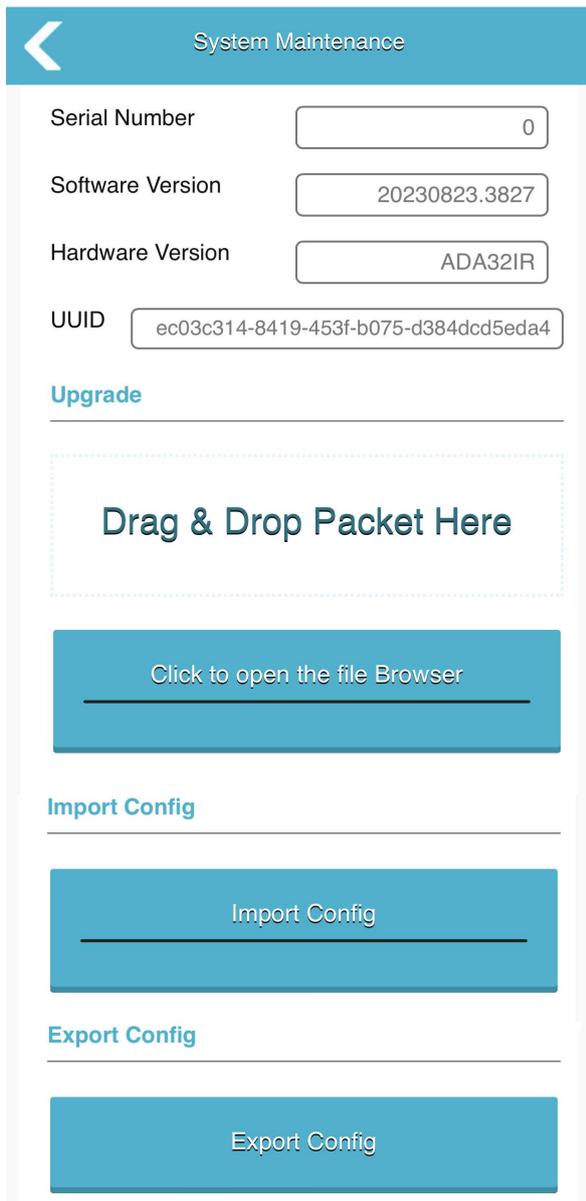


The screenshot shows a web interface for configuring a device. At the top, there is a blue header bar with a back arrow on the left, the word "Config" in the center, and a refresh icon on the right. Below the header, there are three tabs: "Media", "Alg", and "Network". The "Network" tab is selected and underlined. Under the "Network" tab, there is a section titled "Ethernet" with a horizontal line below it. Below this line, there is a checkbox labeled "DHCP" which is currently unchecked. Below the checkbox, there are four rows of configuration fields, each with a label on the left and a text input field on the right. The fields are: "DHCP Timeout (s)" with the value "16", "IP" with the value "192.168.66.95", "Subnet Mask" with the value "255.255.255.0", and "Gateway" with the value "192.168.66.1".

9.3 System Function

Click "System" button and enter into system page, in which series number, software version, hardware version, and UUID are shown.

Upgrade	Add upgrade package for version upgrade.
Import Configure	Import configuration files.
Export Configure	Export the device configuration file.
Export Log	Export device log files.
Restore Factory	Restore the device to factory settings and all parameters are restored to default values.
Reboot	Restart the device.
Change Password	Modify the device login Password.
Device Time	Manually synchronize device time.



9.4 Protocol

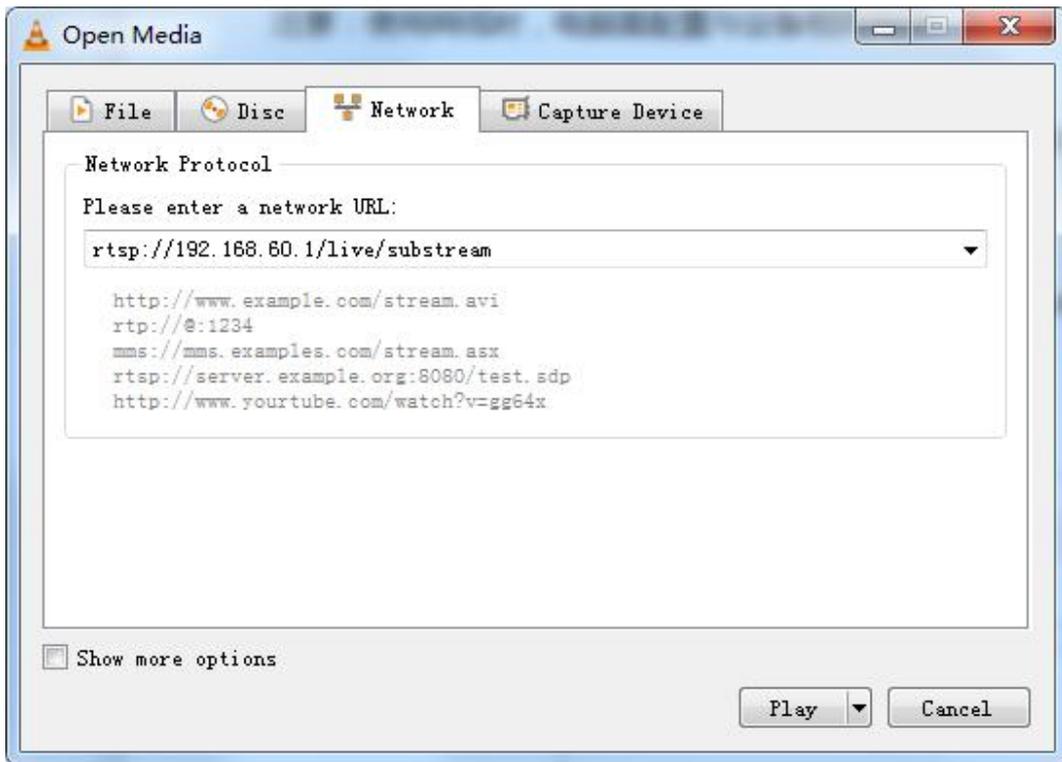
The current device supports two types of protocol, RTSP and ONVIF.

Note: When using the network cable, the computer needs to be configured with the same network segment as the device.

1) RTSP

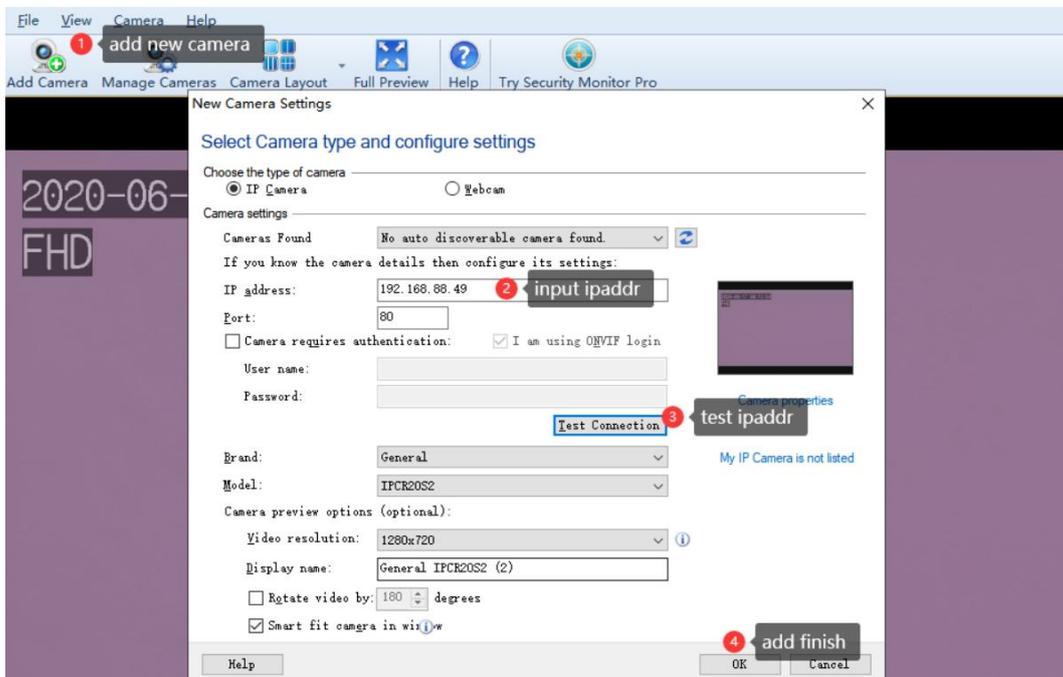
Use video software to open RTSP stream. Take VLC as an example, connect network cable, open VLC, click Media->Open Network Streaming->rtsp://IP/live/mainstream

(rtsp://192.168.60.1/live/mainstream if connect with device's Wi-Fi) ->click play.



2) ONVIF

Use IP camera Viewer or other software that supports ONVIF protocol. Followings are demonstrated by IP camera Viewer.



Make sure network is connected and then follow steps in figure 36: add new camera->input IP address ->test IP address->ok.

Note: the port number defaults to 80.

9.5 System Upgrade

The device can be upgraded with a flash disk. Specific methods:

- 1) Format the flash disk as Fat32 file system.
- 2) Place the upgrade package named "XXXXXXXX_upgrade_XXXXXXXX.XXXX.bin" on the flash disk, connect the flash disk to the device, restart the device, and wait for a few minutes to complete the upgrade. If you want to realize batch upgrade without automatically deleting the upgrade package after upgrade, you can rename the update report as "XXXXXXXX_upgrade_fixed_XXXXXXXX.XXXX.bin".
- 3) After the upgrade, the software version number of the device will also change synchronously. Check the version number in the lower left corner of the monitor when the device is turned on. Or view the version number in the "System"->"Software Version" on the web page.

10. Troubleshooting

The symptoms described below do not necessarily mean a failure within the display. Please check the following items before you initiate request for repair.

Symptoms	Possible Causes/Solutions
No picture, no sound	Improper connection of automobile adapter. The power supply of the device is wrong, check whether the power indicator is normal. The volume is set "0" by mobile phone.
Cannot login the web page	Confirm that the external Wi-Fi module is connected to the USB interface. Choose "CONNECT" when popping out dialog box of confirming the current Wi-Fi is unavailable. Confirm whether it is connected to the Wi-Fi successfully.
Fail to upgrade	Disconnect the extension cord and start the upgrade again.