



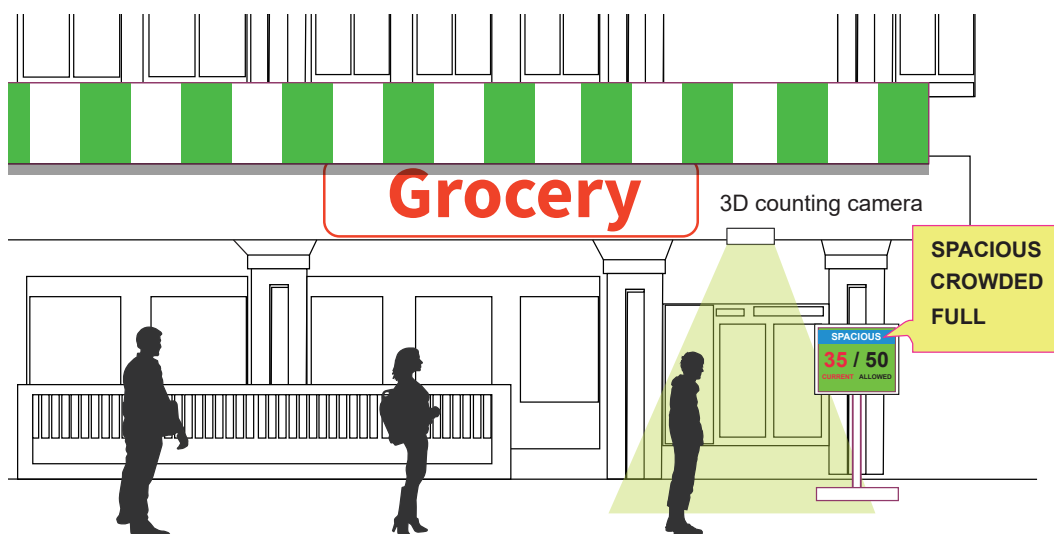
Crowd Control Solution

SC8131

User Guide

Rev.: 1.0

SW rev.: 2.7.0.5a



Facing the pandemic outbreak of coronavirus, many governments imposed social distancing methods to reduce the risk of contraction. One method is to control the number of visitors inside a building while allowing people to work or purchase the necessities. Using the 3D people counting cameras at the entrance and exit of a facility, the current occupancy number can be displayed at the store front.

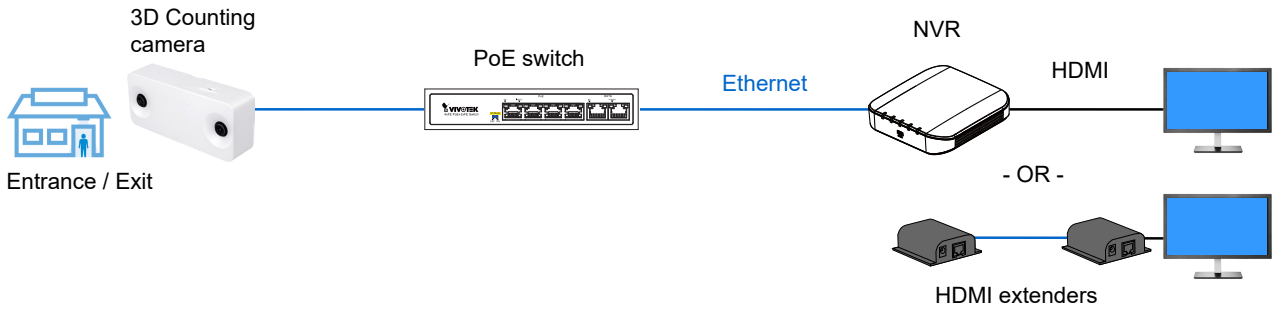
You can configure an occupancy limit and display the message when the limit is reached. Instead of having a security personnel to count the number, the solution can help control the customer traffic.

The solution enables the following:

- Accurate counting of people entering or leaving a facility.
- Displays the occupancy number on an HDMI monitor.
- Business owners can transfer the solution into VIVOCLOUD Retail solution when social distancing becomes unnecessary.

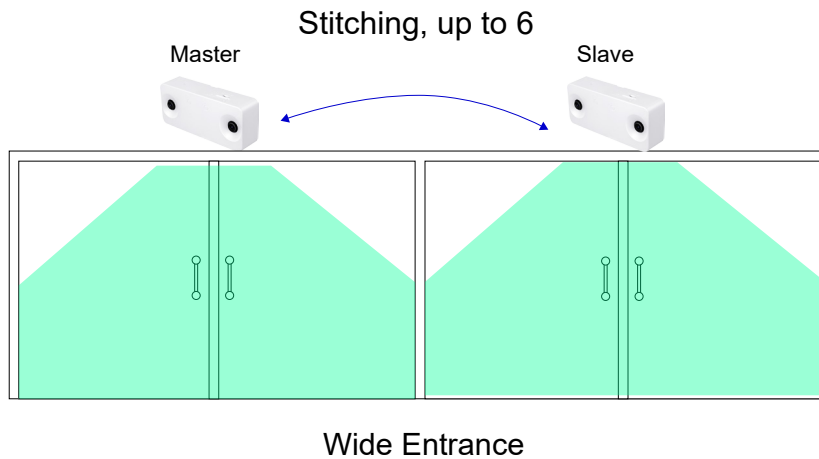
The Social Distancing package comes with the following components:

1. 1 or multiple SC8131 3D counting cameras.
 2. 1 PoE switch
 3. 1 NVR
- * The Ethernet, HDMI cables, and HDMI extenders are user-supplied.

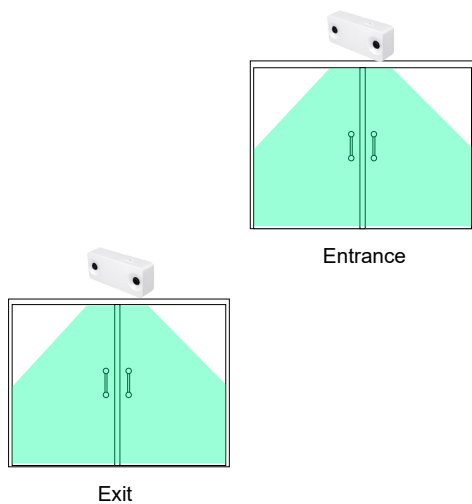


Deployment:

If the need should arise, multiple counting cameras can be stitched together to cover a wide entrance. The calculated data is polled from the Master camera.

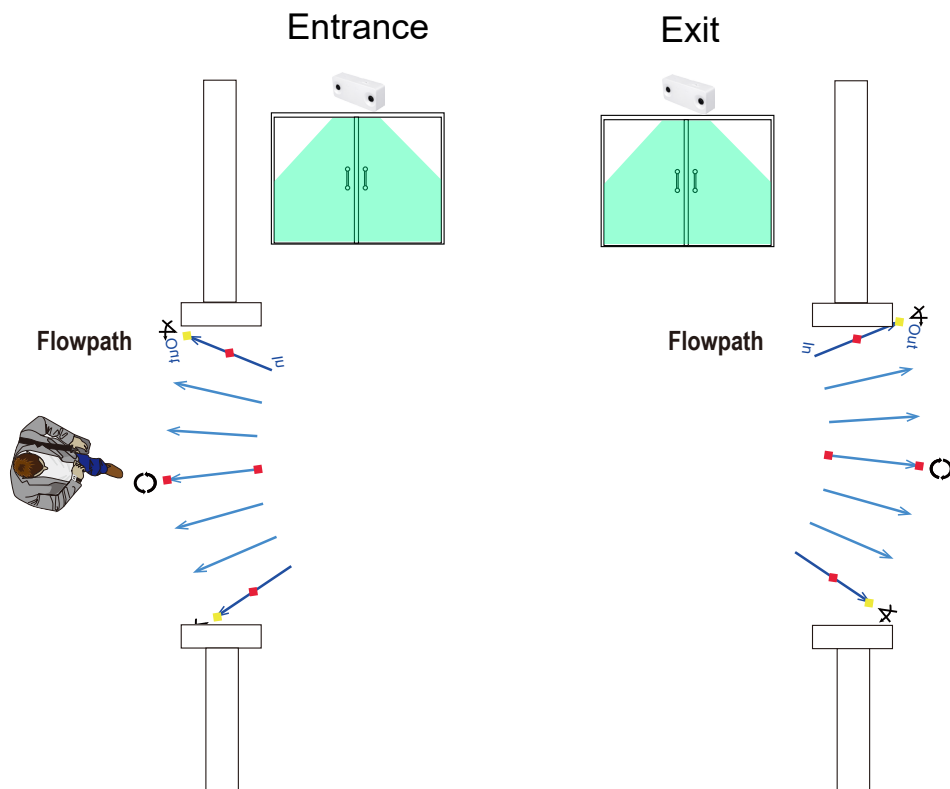


A facility may have separate entrance and exit.



A sample configuration of 2 cameras mounted on an entrance and an exit is shown below. Each camera covers a flowpath indicating the IN and OUT directions.

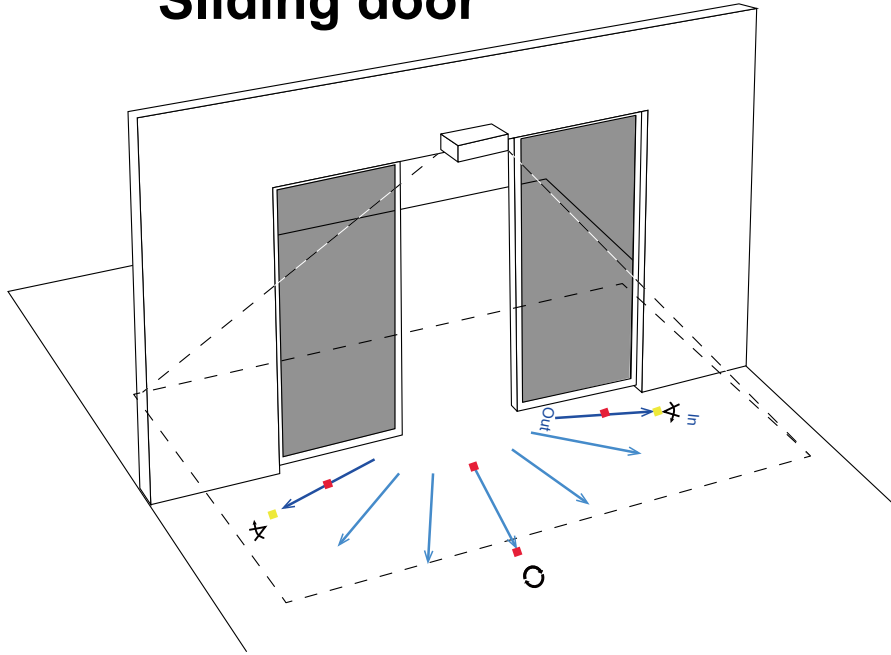
When any person passes the flowpath, an IN or OUT count occurs. When both cameras are added to the NVR configuration, their IN/OUT counts will be combined, and the final result displays on the screen via the HDMI connection.



In addition to this document, for more information for the installation and configuration of the SC8131 camera, you can refer to its Quick Installation Guide and User Manual.

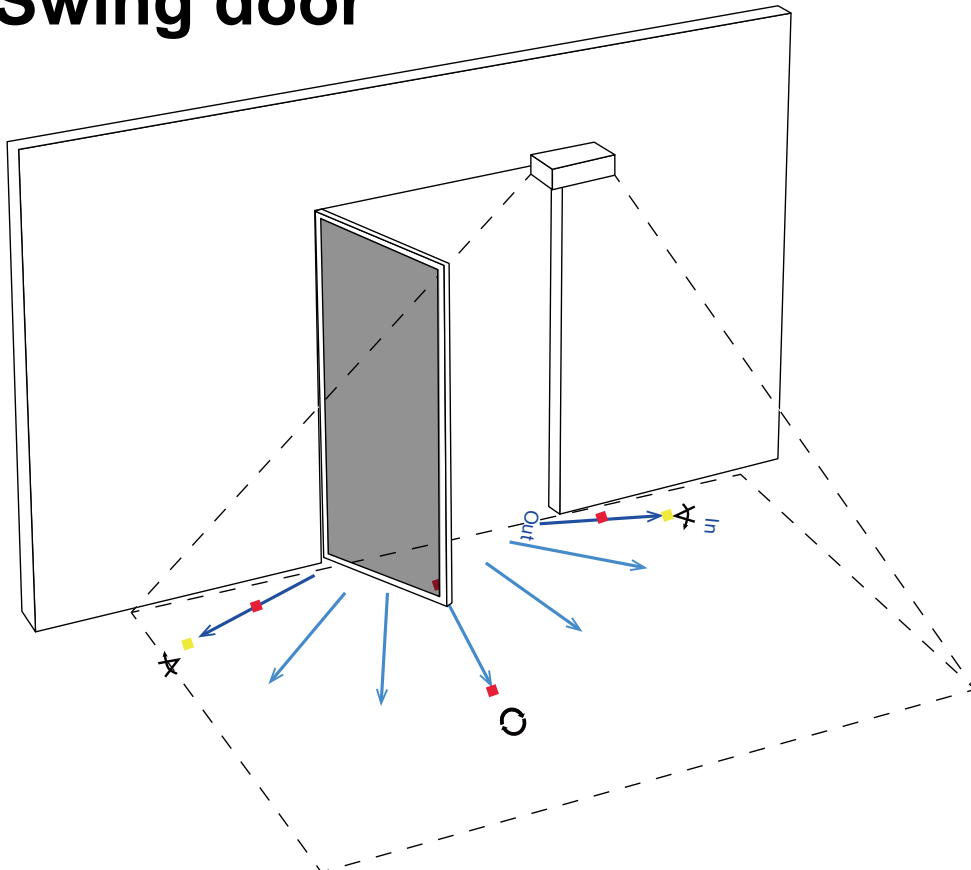
If installed on top of a sliding door, the camera can be mounted directly above the door frame.

Sliding door

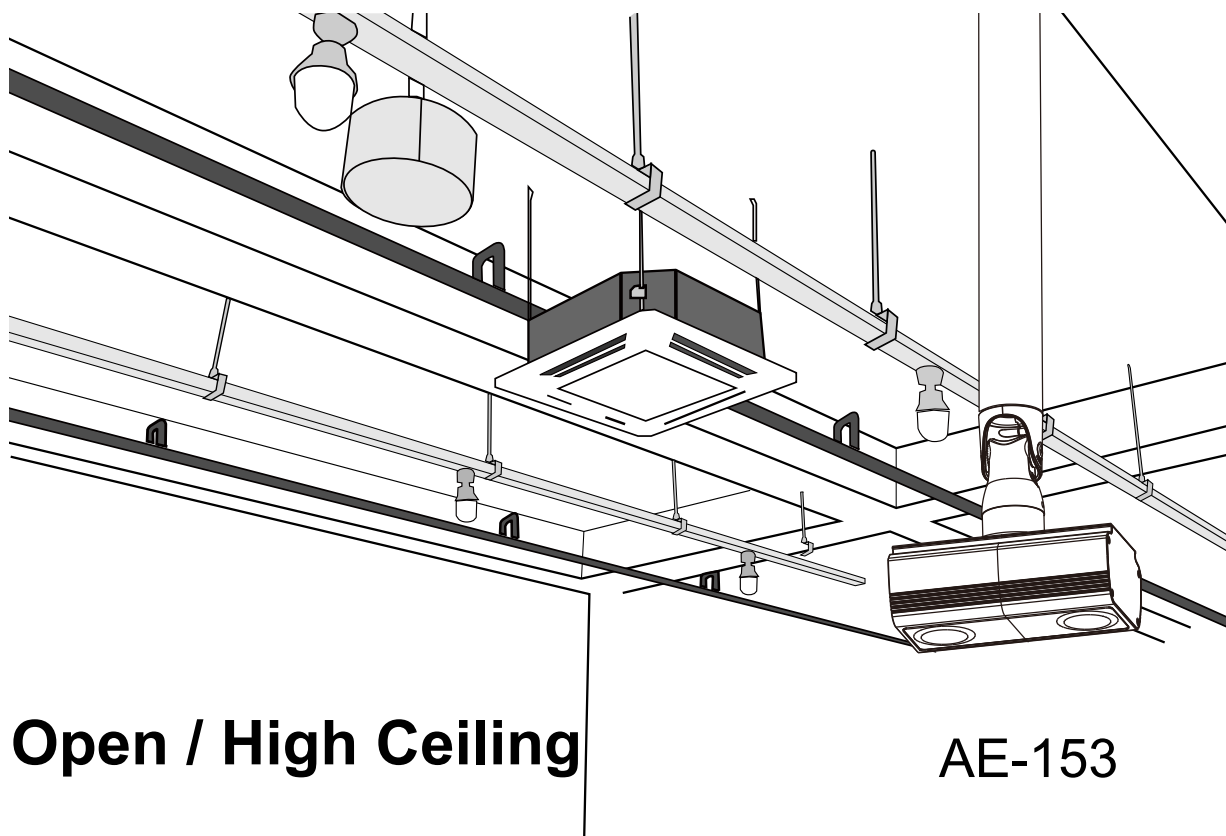


If installed on top of a swing door, the camera should be mounted on the ceiling inside the door, and with a distance to the door. Its detection coverage should cover the area inside the door.

Swing door



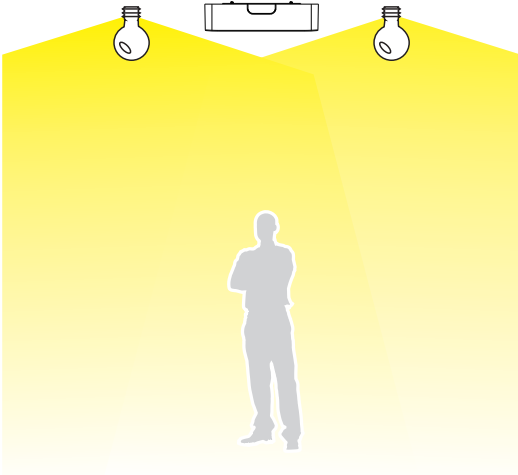
If necessary, you can purchase the AE-153 ceiling mount accessory with a high ceiling installation.



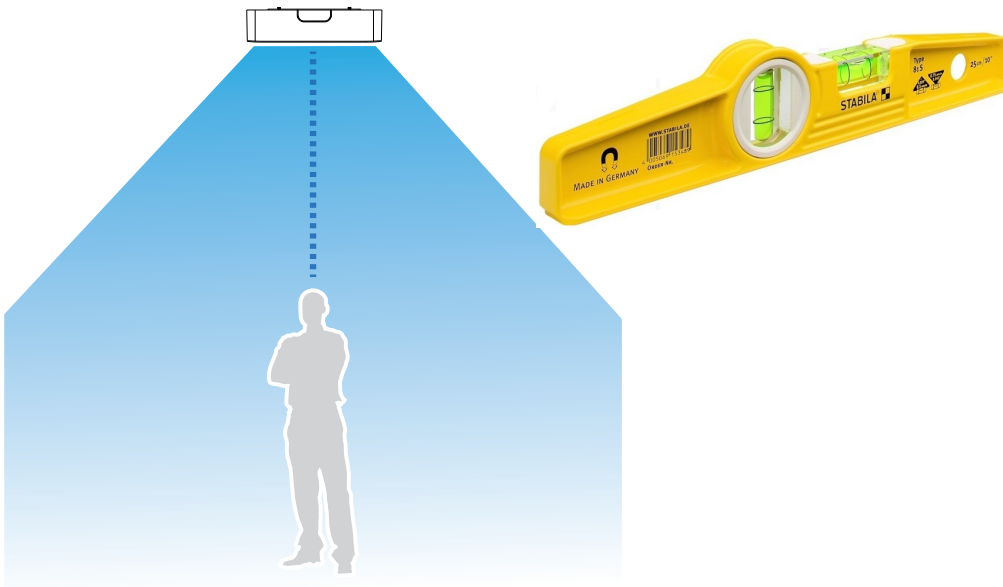
Considerations

Note the following when planning the camera installation:

1. The installation site must be adequately lighted for optimal accuracy with video analysis.



2. It is preferred that the camera is mounted directly above the objects to be counted. Use tools such as a spirit level to ensure the camera is installed level.



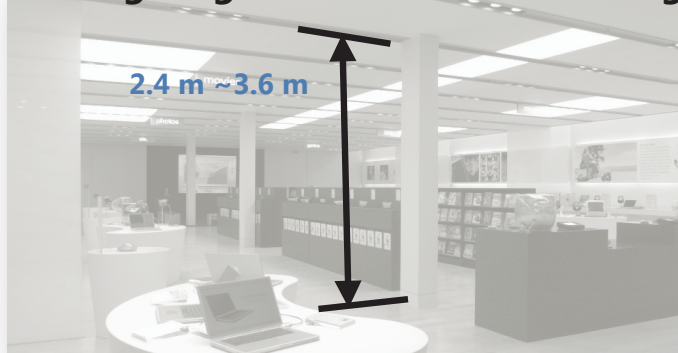
3. The recommended installation position is **2.4m ~ 3.6m**. Higher position is also allowed. For positions higher than **3.6m**, you can also use the Zoom-in mode operation.

3-1. Use a spirit level to ensure the camera is installed level.

3-2. Use a laser distance meter to measure the installation height. The height information **MUST BE** correctly measured and entered in the camera's configuration page.

3-3. Please **delete** the height of the camera canister, e.g., 250cm (ceiling height) -4cm (the height of camera canister) = 246cm. The reason for doing so is because the lenses are at the lower edge of the canister.

Ceiling height - camera canister height (4cm)



+



Software config. page

Camera Installation

1. Installation height: cm

2.

3. Check detection height to fine tuning installation height

Installation Heights

Below are the reference charts of the installation height and the coverage areas.

Note that zooming the view is not necessary unless the camera is installed at a position higher than 3.6m.

SC8131

Zoom ratio		1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
FOV (Horizontal)		HFOV	HFOV	HFOV	HFOV	HFOV	HFOV	HFOV	HFOV	HFOV
Distance with next camera (H)*	Height									
140.1	240	254.8	242.1	229.4	216.6	203.9	191.1	178.4	165.6	152.9
191.1	260	305.8	290.5	275.2	259.9	244.6	229.4	214.1	198.8	183.5
242.0	280	356.8	338.9	321.1	303.3	285.4	267.6	249.7	231.9	214.1
293.0	300	407.7	387.4	367.0	346.6	326.2	305.8	285.4	265.0	244.6
344.0	320	458.7	435.8	412.8	389.9	367.0	344.0	321.1	298.2	275.2
395.0	340	509.7	484.2	458.7	433.2	407.7	382.3	356.8	331.3	305.8
445.9	360	560.6	532.6	504.6	476.6	448.5	420.5	392.5	364.4	336.4
	380		581.0	550.5	519.9	489.3	458.7	428.1	397.6	367.0
	400				563.2	530.1	496.9	463.8	430.7	397.6
	420					570.8	535.2	499.5	463.8	428.1
	440						573.4	535.2	496.9	458.7
	460							570.8	530.1	489.3
	480								563.2	519.9
	500									550.5

* Distance between cameras when configured in a stitching configuration.

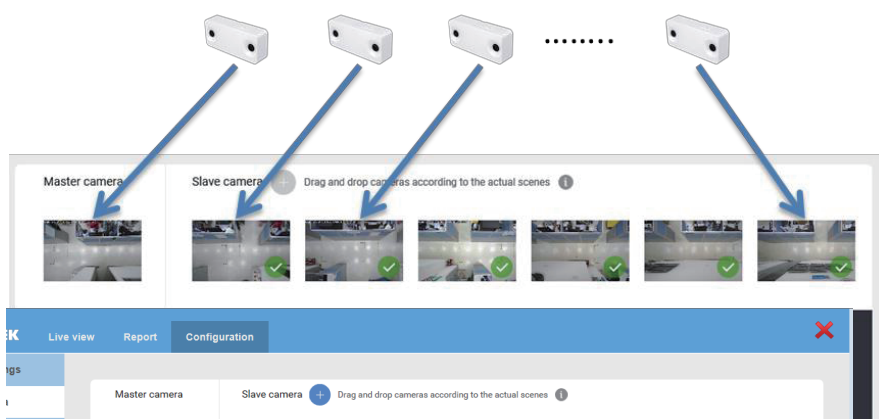
* Unit in centimeter.

** The number in front of HFOV (Horizontal FOV) stands for zoom ratio, if applied.

Stitching Considerations

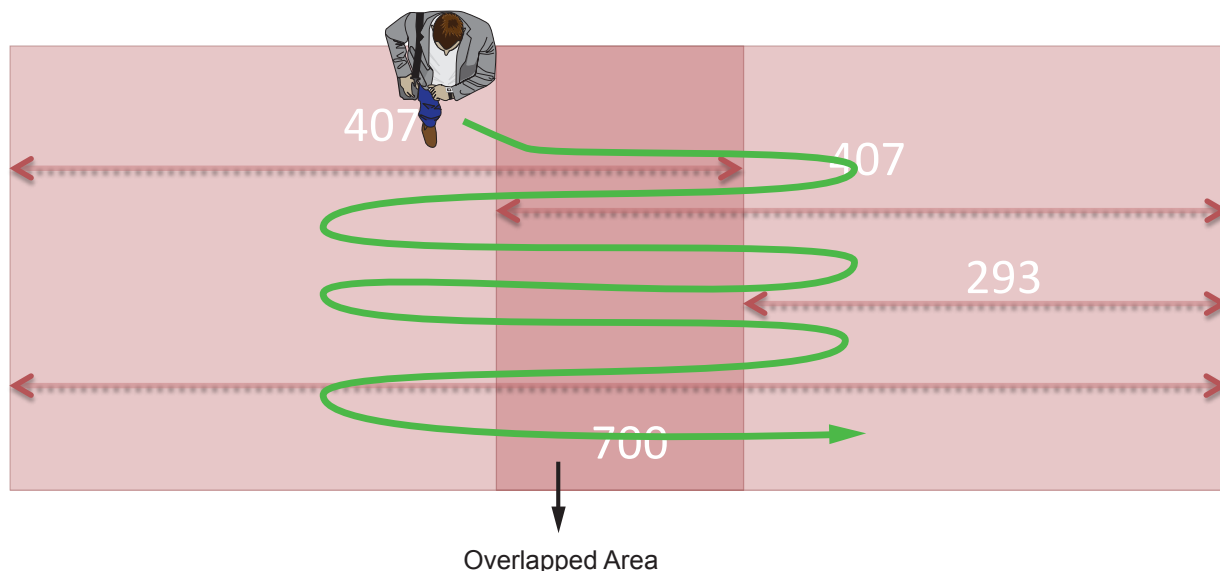
The following applies when stitching multiple SC8131 cameras:

1. The **Stitching** configuration takes place on the **Master** camera. 1 Master camera with up to 6 Slave cameras can form a stitching configuration.
2. All Master and Slave cameras in a Stitching configuration should be running the same firmware.
3. The physical positions of cameras should be consistent with the stitching order. It is recommended you keep a note of all cameras' positions and IP addresses. Static IP addresses are preferred.



4. Select a camera on the edge of the line as the Master camera.
5. Recruit the Slave cameras via a web console to the Master camera.
6. When software configuration is done, it is best to have human traffic in and through the coverage areas of these cameras. If there are no traffic when you configure the Stitching configuration, you should have someone walking in the overlapped areas.

The peer cameras then automatically calculate the coordinations of the same moving objects that appear in the overlapped FOVs between them. The walking should persist for at least 2 minutes.



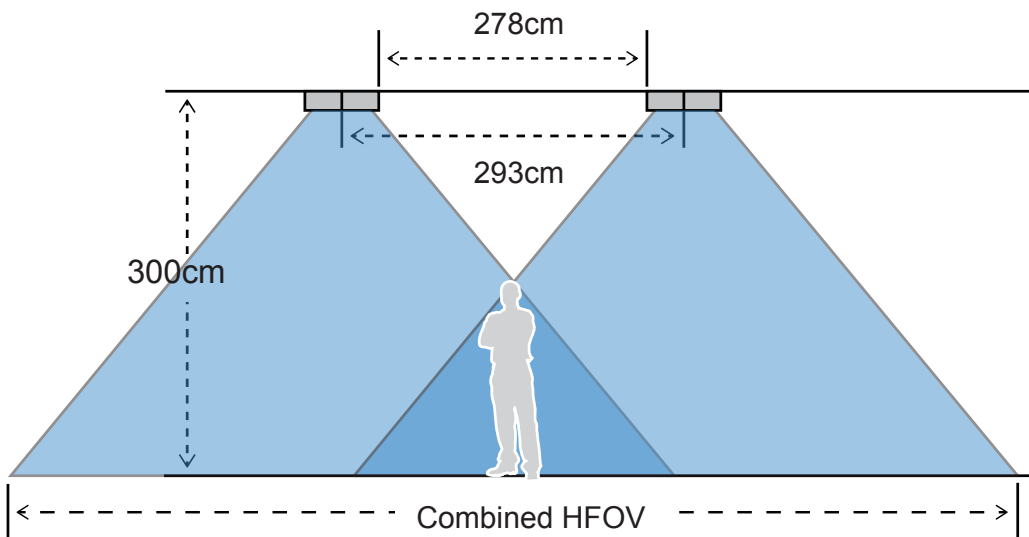
7. Once the Stitching configuration is done, the positioning order of peer cameras will be fixed, and you cannot change their Stitching order unless you unstash them.

Consider the following when stitching multiple cameras to form a large virtual floor plan:

Height (cm)*	Dist. to the next camera	Combined HFOV
240	140.2	395.0
260	191.1	522.4
280	242.1	598.9
300	293.1	700.8
320	344.0	802.7
340	395.0	904.7
360	446.0	1006.6

* Unit in centimeter.

8. The maximum distance between cameras, when mounted at a height of 300cm, is 278cm (from edge to edge). The FOVs of two cameras must overlap to a certain amount in order to cover people walking between them. An estimation of a man of 185cm tall is applied here.



NOTE:

- The cameras here are shown on their long side.
- The FOV is the camera's "detecting area."

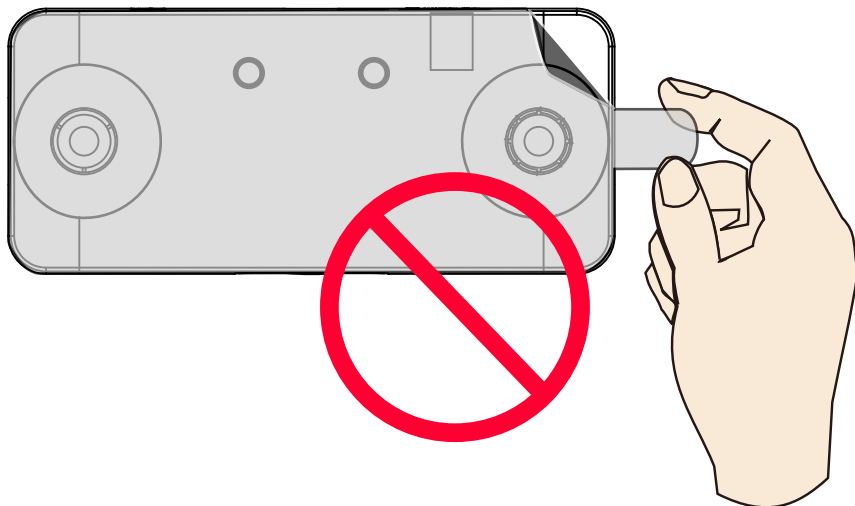
9. The tracked objects will appear on the live view of a stitched configuration after a 3-seconds delay, due to the network transfer and processing time.

10. It is best that all cameras in a Stitching configuration are installed at the same height and with the same tilt angle (if applied).

Hardware Installation

WARNING:

Please do not remove the protective sheet before the installation is done. Dirty lens can seriously affect the accuracy of video analysis.



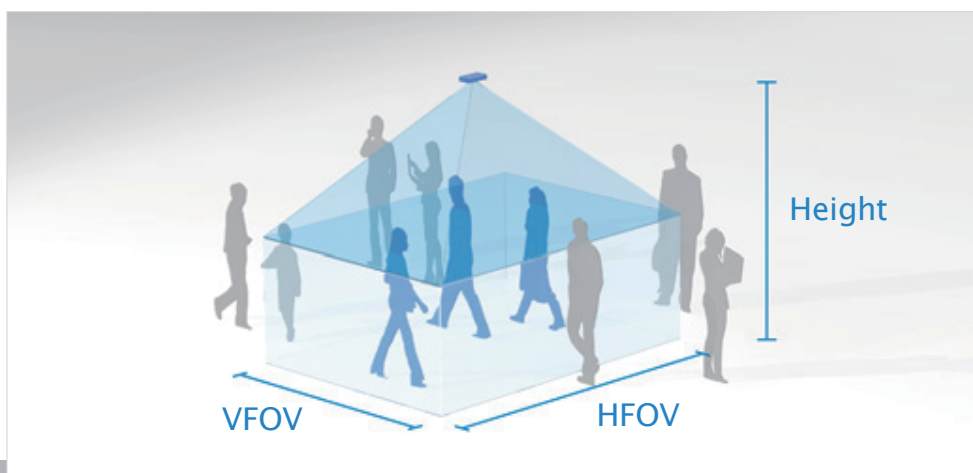
1. Jot down the camera's MAC address for later reference.



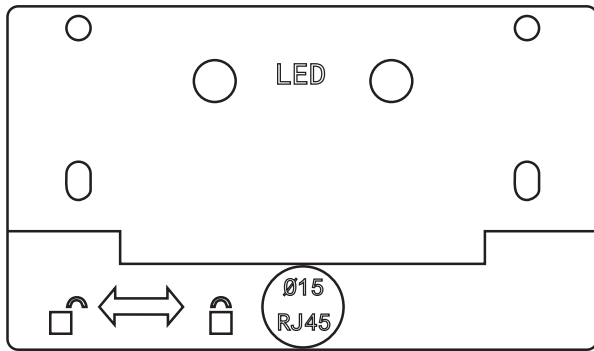
2. Plan the installation features, e.g., position and installation height.

Recommended Installation Height

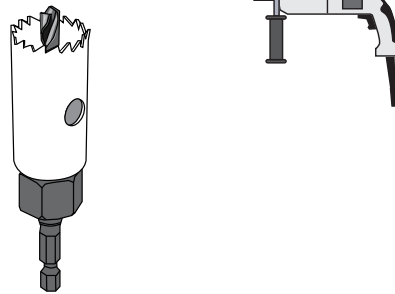
- Installation Height: 2.4M ~ 3.6M
- Coverage area: 1.7M² ~ 5.1M²



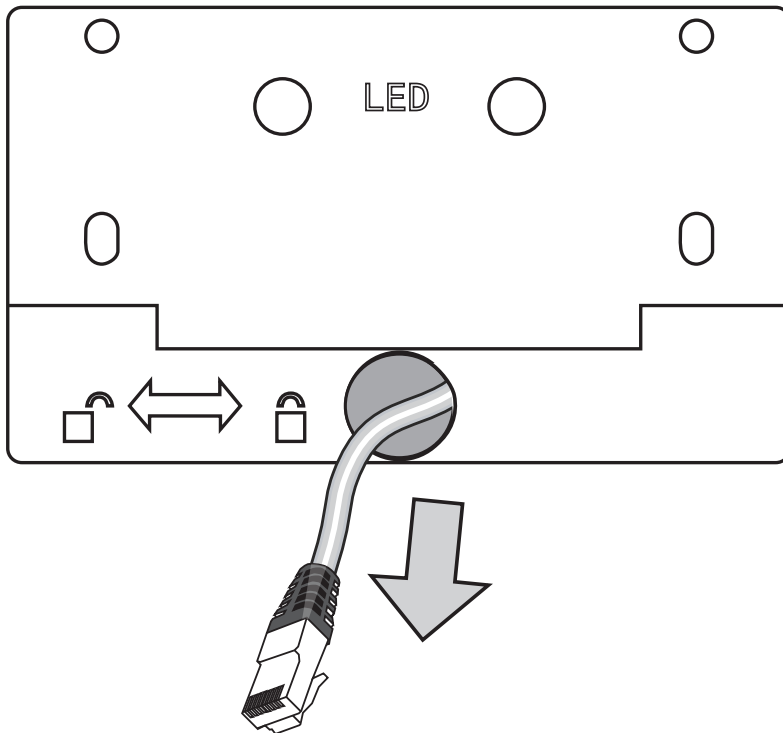
3. Attach the alignment sticker to a preferred position. If preferred, drill a cabling hole. See below for the diameters of it.



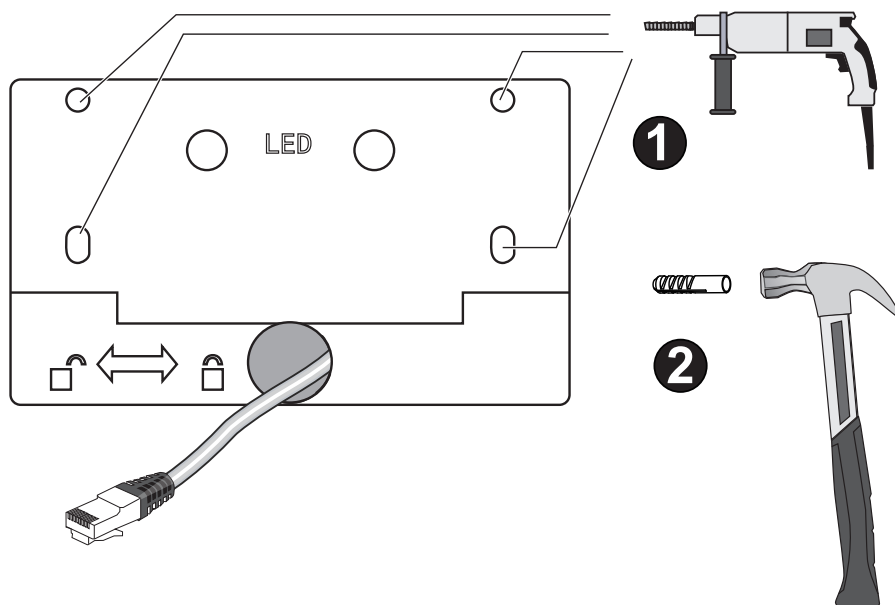
Ø15mm



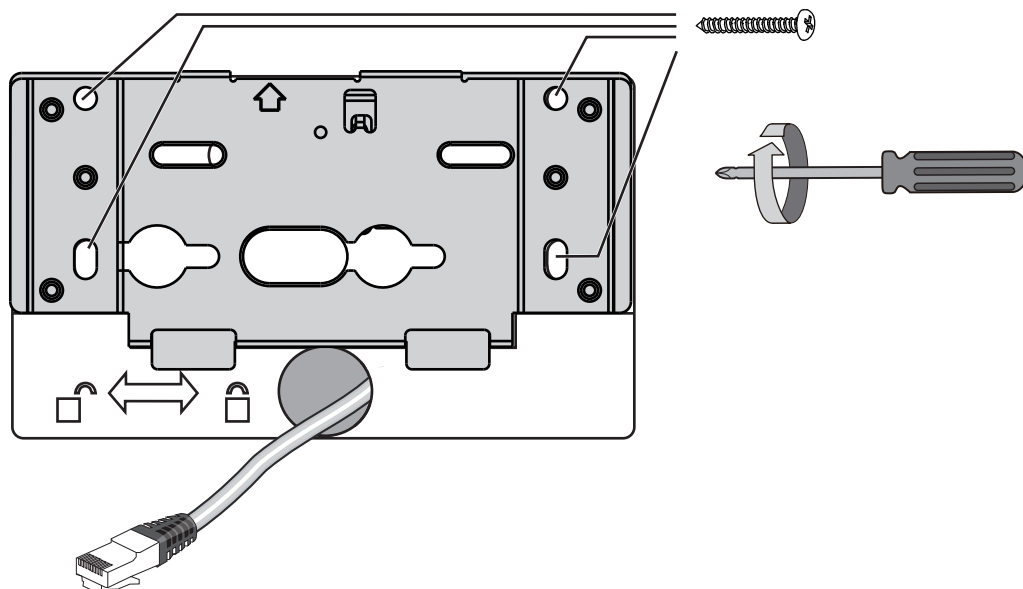
4. Route an Ethernet cable through the cabling hole.



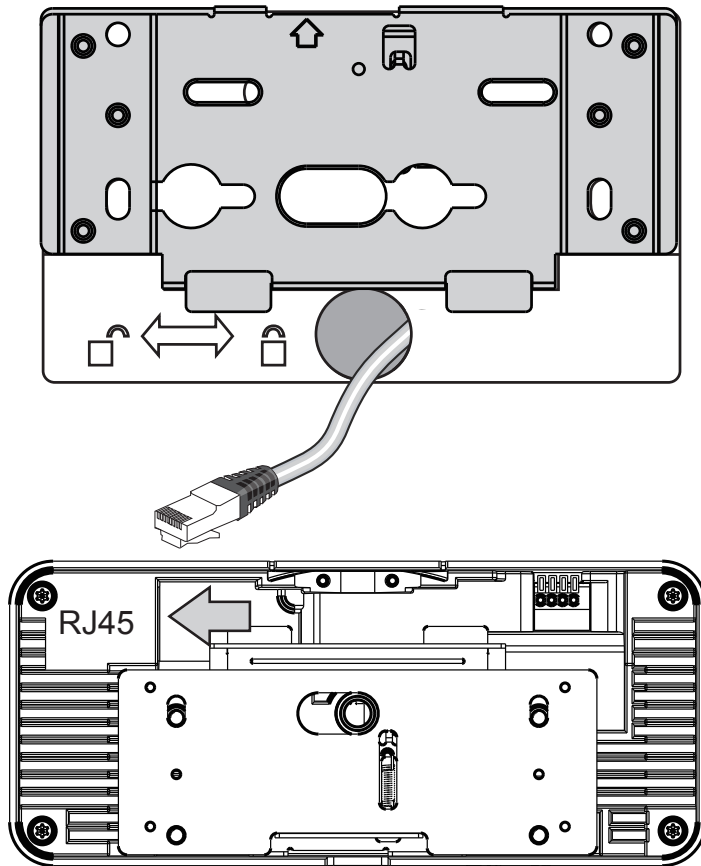
5. Drill mounting holes and hammer the included anchors into the mounting holes.



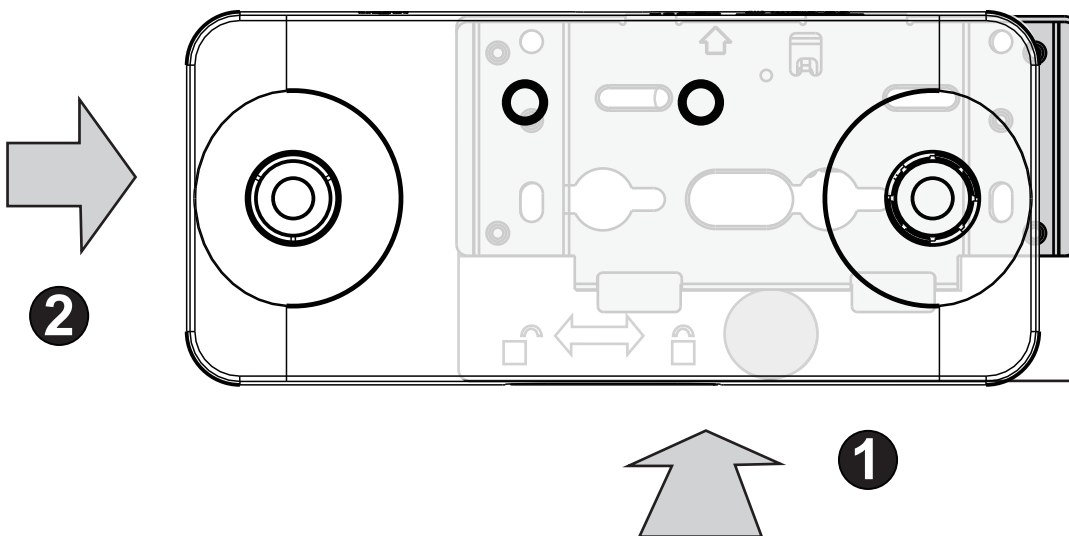
6. Secure the mounting plate to ceiling using the included screws.



7. Connect the Ethernet cable to the camera.

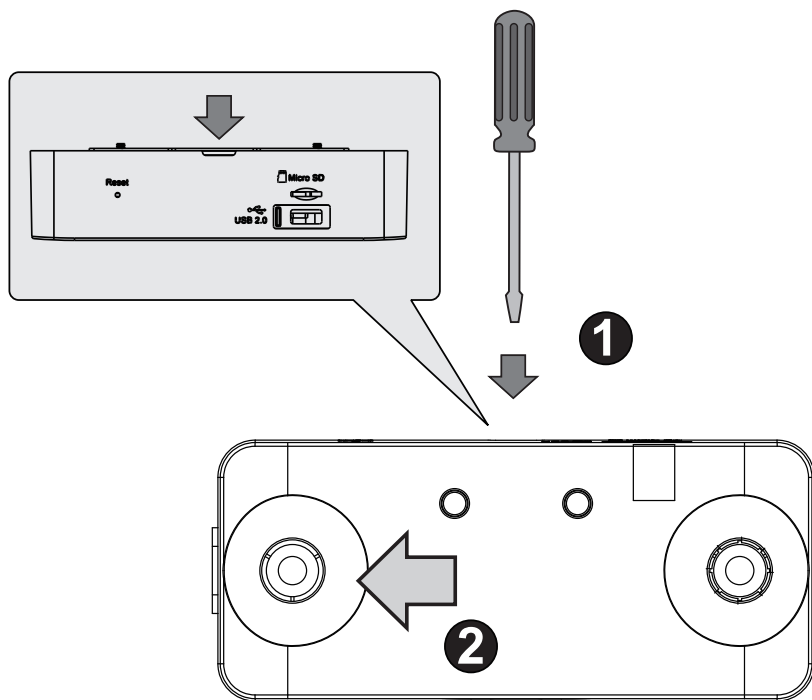


8. Align the camera with the bracket, and slide the camera to the right. The camera will then be securely mounted to the bracket. Note that the side with two LEDs is the top side, and should be aligned with the arrow mark on the mounting plate.

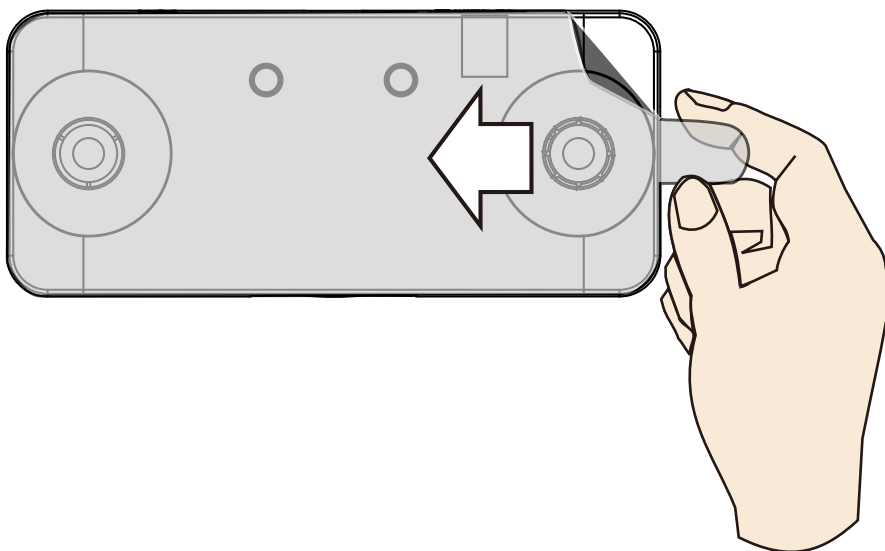




To remove a camera, use a flat blade screwdriver. Press it down against the release tab from the top side and slide the camera to the left.



9. When the installation is done, remove the protective sheet.

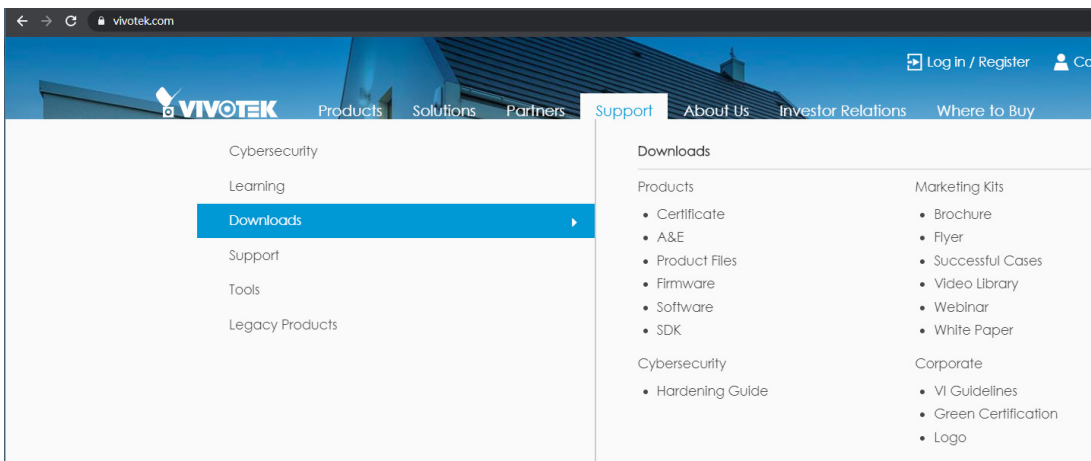


10. On a laptop computer, use the Shepherd utility to find and access the camera. Open a web console to the camera.



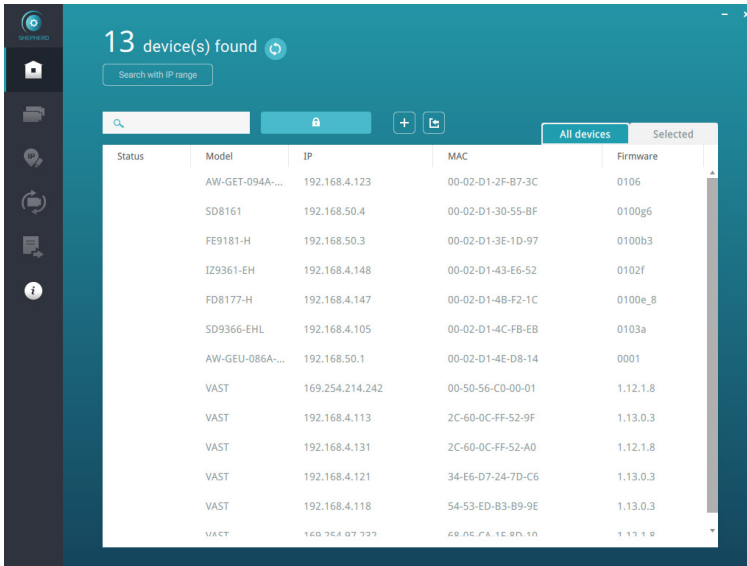
The default user name and password is **root / root**.

10-1. Install the **Shepherd** utility, which helps you locate and configure your Network Camera in the local network. If your camera comes without the CD, go to VIVOTEK's website, and locate the utility in the Downloads > Software page.



10-2. Run the Shepherd utility.

10-3. The program will conduct an analysis of your network environment.



13 device(s) found

Search with IP range

Status	Model	IP	MAC	Firmware
	AW-GET-094A-...	192.168.4.123	00-02-D1-2F-B7-3C	0106
	SD8161	192.168.50.4	00-02-D1-30-55-BF	0100g6
	FE9181-H	192.168.50.3	00-02-D1-3E-1D-97	0100b3
	IZ9361-EH	192.168.4.148	00-02-D1-43-E6-52	0102f
	FD8177-H	192.168.4.147	00-02-D1-48-F2-1C	0100e_8
	SD9366-EHL	192.168.4.105	00-02-D1-4C-FB-EB	0103a
	AW-GEU-086A-...	192.168.50.1	00-02-D1-4E-D8-14	0001
	VAST	169.254.214.242	00-50-56-C0-00-01	1.12.1.8
	VAST	192.168.4.113	2C-60-0C-FF-52-9F	1.13.0.3
	VAST	192.168.4.131	2C-60-0C-FF-52-A0	1.12.1.8
	VAST	192.168.4.121	34-E6-D7-24-7D-C6	1.13.0.3
	VAST	192.168.4.118	54-53-ED-B3-B9-9E	1.13.0.3
	VAST	169.254.07.222	69.0C.FA.1E.8D.1D	1.13.1.9

If access across networks is necessary, open the following ports.

- HTTP port: default is **80**
- RTSP port: default is **554**
- RTP port for video: default is **5556**
- RTCP port for video: default is **5557**
- Websocket port: default is **888** (metadata)
- Secured Websocket port: default is **889** (metadata)

- You can use the shortcut on the home page or open the **Configuration > Application > Package** management page to access the tracking and counting configuration utility.

Home Client settings **Configuration** Language

Applications > Package management

Status License

Upload package

Select file Browse... Upload

Resource status

- CPU Status:
- Storage status:
- Memory status:

Package list

Module name	Vendor	Version	Status	License		
<input type="radio"/> Stereo Tracker	VIVOTEK	1.0	ON	N/A		

Start Stop

Basic Settings:

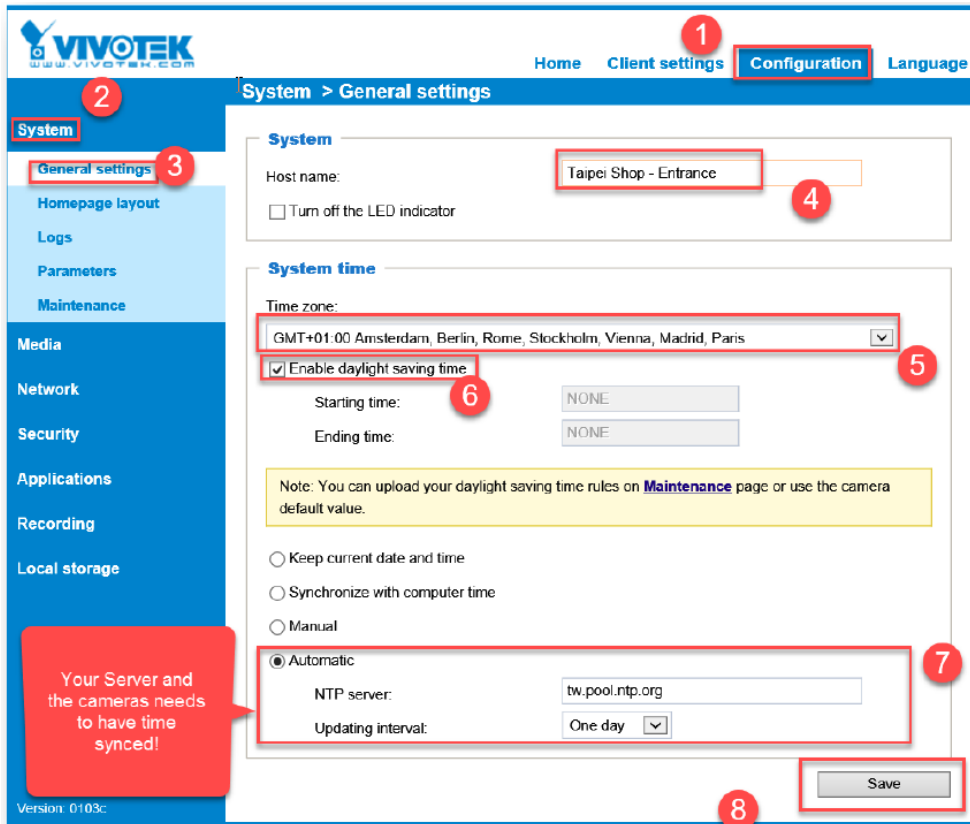
1. It is recommended to configure a **fixed IP** for the camera. Enter **Configuration > Network > General Settings** to configure the camera IP.

The screenshot shows the VIVOTEK web interface for configuring network settings. The left sidebar contains a menu with categories: System, Media, Network, Streaming protocols, DDNS, QoS, SNMP, FTP, Security, Applications, Recording, and Local storage. The 'Network' category is selected, and 'General settings' is highlighted. The main content area is titled 'Network > General settings' and features a 'Configuration' tab. Under 'Network type', the 'LAN' option is selected, and 'Use fixed IP address' is chosen. The IP address is set to 192.168.42.99, the subnet mask to 255.255.255.0, the default router to 192.168.42.1, and the primary DNS to 8.8.8.8. A 'Save' button is located at the bottom right. A red callout bubble points to the DNS field with the text 'DNS is important!'.

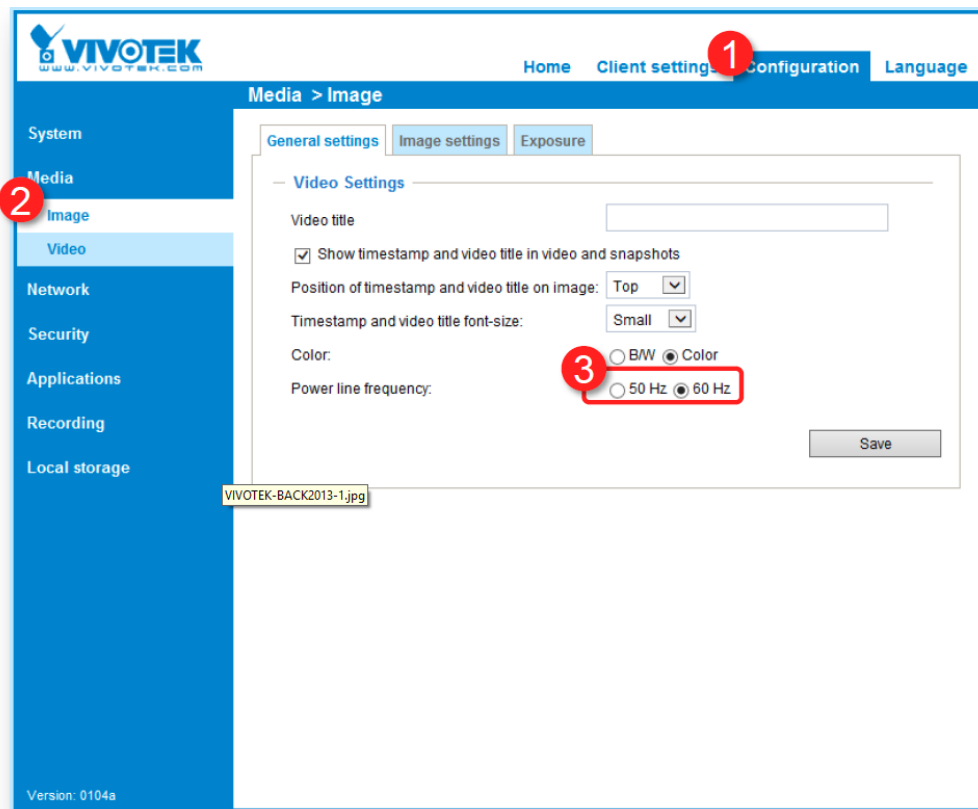
2. It is recommended to configure a complex root password for better protection especially when your camera has access to the Internet.

The screenshot shows the VIVOTEK web interface for configuring user accounts. The left sidebar contains a menu with categories: System, Media, Network, and Security. The 'Security' category is selected, and 'User accounts' is highlighted. The main content area is titled 'Security > User accounts' and features a 'Root password' tab. The page shows fields for 'Root password' and 'Confirm root password', both masked with dots. A 'Save' button is located at the bottom right.

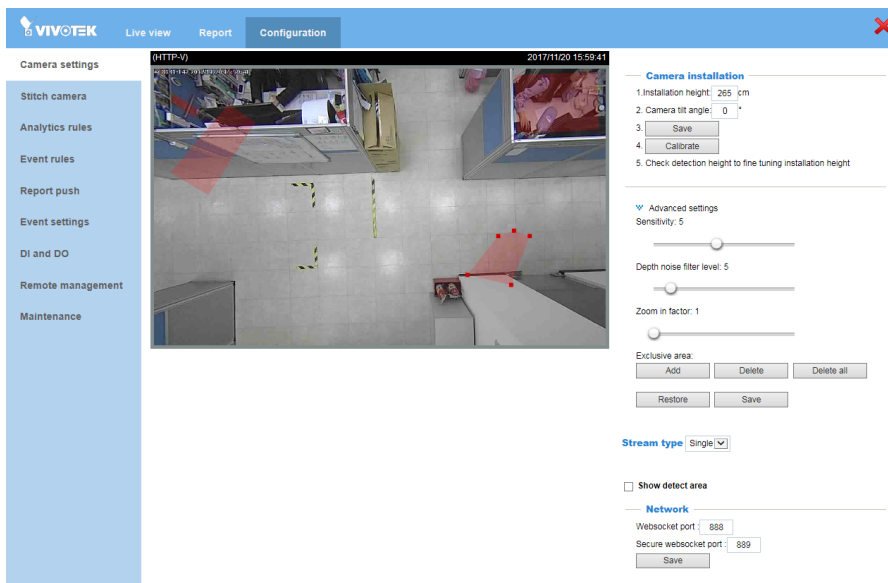
3. Enter a meaningful name for the camera. If Internet connection is available, you can configure the camera and the NVR to listen to the same NTP server for a synchronous time setting.



4. Depending on your location, configure 60Hz for countries using American National Television Systems Committee (NTSC), or 50Hz for countries using European Phase Alternation Line Rate (PAL) system

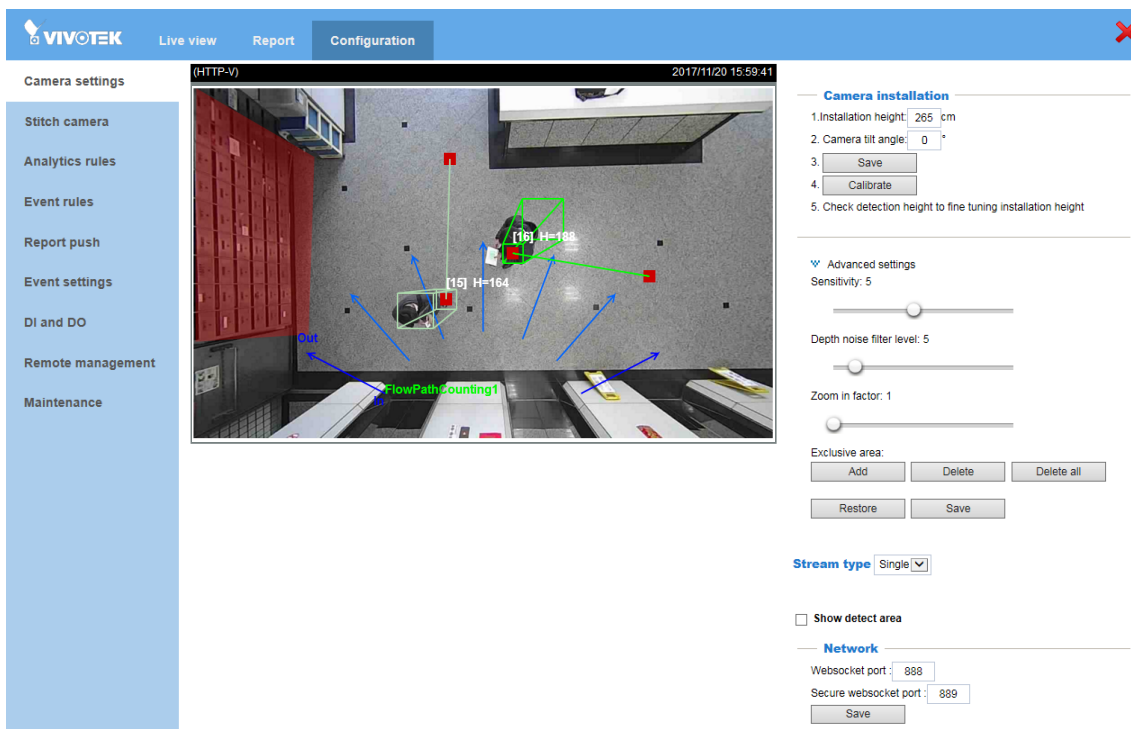


12. To start configuring the tracking and counting rules, click on **Configurations**. The **Camera settings** window will appear.



Configuration - Camera settings

The Camera settings page contains key parameters related to the physical characteristics at your installation site. You need to carefully tune the parameters to acquire the best detection results.



- **Installation height:** It is recommended you measure the installation height of the stereo camera and enter the number. Use a laser distance meter for an accurate number.

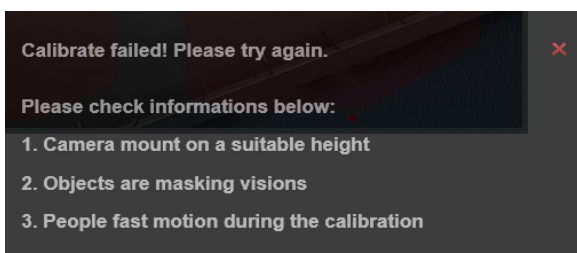
If you were measuring the ceiling height (from floor to ceiling), please delete the height of the camera canister (4cm). You may also measure the height from floor to camera canister.

- **Calibrate:** Users can calibrate the installation height especially when installing the camera for the first time. The calibration function helps verify the correctness of the dual-lens depth map in the stereo vision. The correctness of such vision can be affected by incorrect installation. Please note that errors can occur if you install the camera in a faulty condition, e.g., at a place that is too low.

Also note that you should avoid using the function with heavy traffic in the scene while the calibration is taking place. When calibration is done, the management screen will be refreshed.



The following message will prompt if errors occur during the calibration.



Check detection height: Check the height number detected by camera and compare with the the actual height you measured. Adjust the installation if necessary.

Advanced settings (click to expand the configuration menu)

- **Sensitivity:** This refers to the effectiveness level of human head shape and depth differential algorithms for human activity detection. You may try to tune up or tune down the sensitivity level and observe the result in the Liveview window. However, if your installation site contains a lot of misleading objects, e.g., complex scenes with numerous non-target moving objects, setting the sensitivity level too high may result in false inputs.

- **Depth noise filter level:** An analytics mechanism filters out unreliable depth correlation data in cases where homogeneous surface or periodic pattern scene exist. Chances are it may be impossible to ignore these regions because objects may still pass through these regions.

- **When to consider increasing the Depth noise filter level?**

Sometimes, the floor itself may consist of homogeneous surface or patterned materials. In such cases, it is not possible to draw exclusive regions to get rid of these regions because the moving object will inevitably pass these regions.

The Depth noise filter level is useful when you need to suppress the interference from homogeneous or patterned surfaces on the floor. Increase the level to suppress possible interference. However, if the level is too high, the depth information of moving objects may also be suppressed, resulting in the chance of losing objects' movement tracks.

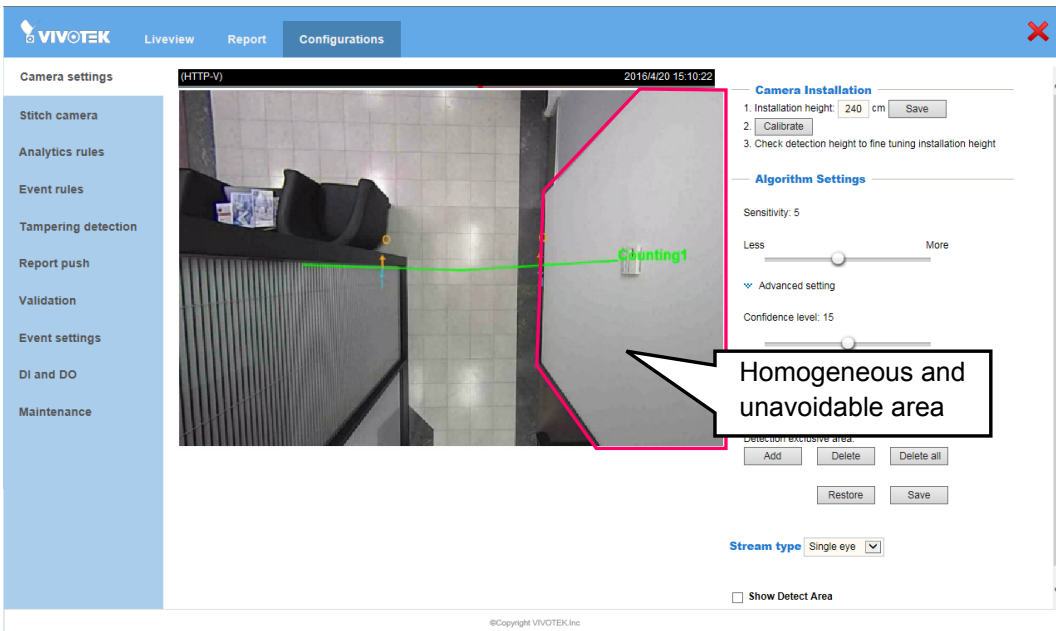
If the interference is very significant and the Depth noise filter level must be set to a higher value, try increase the Sensitivity level to reduce the possibility of losing object tracks. You can check if the Depth noise filter level should be increased. For example, the Depth view video shows significant flickering white noises in the floor area.

The screenshot displays the VIVOTEK configuration interface. On the left, a sidebar lists various settings categories: Camera settings, Stitch camera, Analytics rules, Event rules, Tampering detection, Report push, Validation, Event settings, DI and DO, and Maintenance. The main area is divided into two sections: 'Camera Installation' and 'Algorithm Settings'. The 'Camera Installation' section includes fields for 'Installation height' (240 cm) and a 'Calibrate' button. The 'Algorithm Settings' section features sliders for 'Sensitivity' (set to 5), 'Confidence level' (set to 15), and 'Zoomin factor' (set to 1). Below these are buttons for 'Add', 'Delete', 'Delete all', 'Restore', and 'Save' under the 'Detection exclusive area' section. A 'Stream type' dropdown is set to 'Single eye', and a 'Show Detect Area' checkbox is present at the bottom. The central video feed shows a grayscale image of a floor with a red circle highlighting a noisy, flickering area.

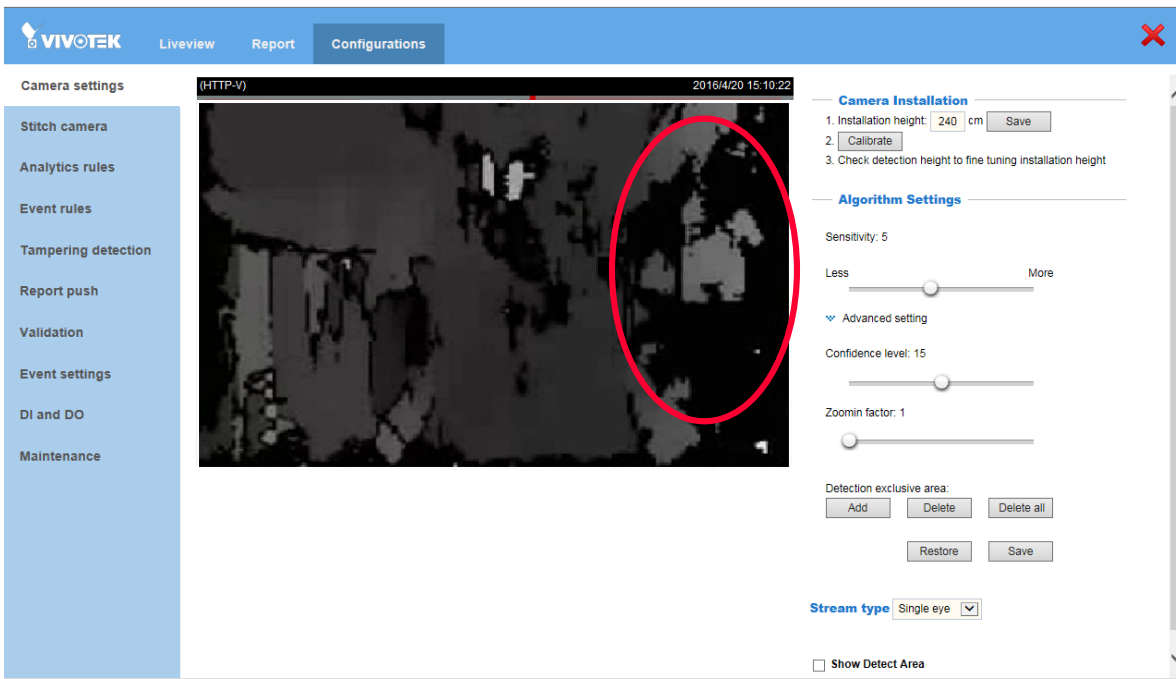
Object trajectories are likely to be trapped in these regions

For other advanced configuration settings, such as stitching, please refer to SC8131's User Manual.

This is the view of the installation site. The white wall is unavoidable.



Shown below is the result when the Depth noise filter level is tuned up. White noises have disappeared.



- **When to consider decreasing Depth noise filter level?**

If camera installation height is higher, the effective area of a person moving in the depth map will be smaller.

If camera installation is higher than 3.3 meters, it is recommended to revise the following settings to minimize the possibility of losing objects' tracks.

In this case, you can decrease the Depth noise filter level in order to preserve more depth information.

You can increase the sensitivity level to keep good track of objects with their depth information.

- **Zoom-in factor:** The digital zoom-in applies when the camera installation height is higher than 3.6 meters. The tradeoff is that you may lose some of the field of view.
- **Exclusive area settings:** This allows you to exclude certain areas in your field of view from tracking detection: such as a table, a mono-color wall, a surface of a different height, mirror, objects that are reflective, glass door, and shadows. The Exclusive area should not cover the floor.

Up to 8 polygon "exclusive" windows can be created using multiple mouse clicks on the screen (create peripheral points). Click on the peripherals of the target area (polygon). At least 3 clicks are required, and up to 20 clicks can be applied to define an exclusive area. Conclude the exclusive area by clicking on the initial point the second time. You can create multiple exclusive areas. Double-click on the last corner point to complete an exclusive window.

Click **Add** if you need more exclusive windows. Click **Save** to preserve your configuration every time you created an exclusive window.

If necessary, repeat the process to create more exclusive windows.

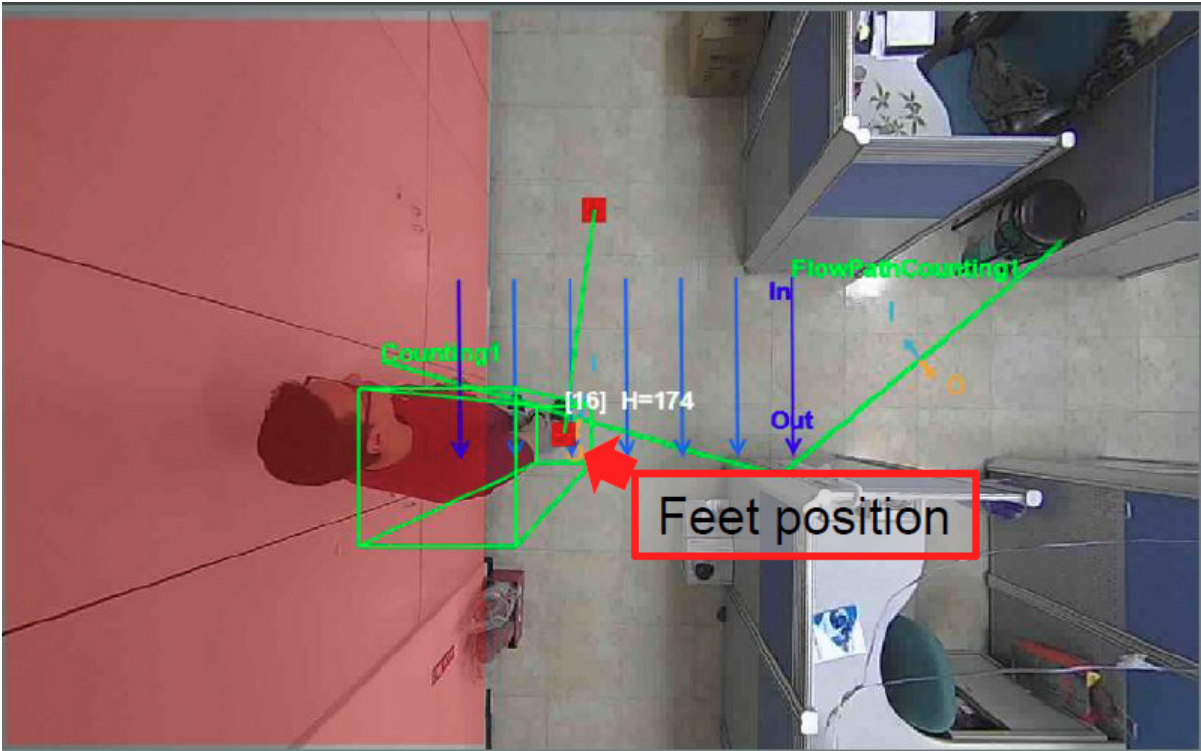
The screenshot displays the VIVOTEK Configuration interface. On the left is a navigation menu with options: Camera settings, Stitch camera, Analytics rules, Event rules, Tampering detection, Report push, Validation, Event settings, DI and DO, and Maintenance. The main area is split into a live view and a configuration panel.

Live View: Shows a top-down camera view of a shopping cart in a store. Several red bounding boxes track the cart's position, with labels like [90] H=1538, [87] H=1577, [86] H=1533, [77] H=1670, [84] H=1758, [89] H=1564, and [88] H=1341. A status box in the top left of the live view shows: (HTTP-V) 2017/11/16 17:30:13, 2015/11/15 10:40:03, In: 0, Total In: 58, Out: 0, Total Out: 0.

Configuration Panel:

- Camera installation:**
 1. Installation height: 265 cm
 2. Camera tilt angle: 0°
 3. Save
 4. Calibrate
 5. Check detection height to fine tuning installation height
- Advanced settings:**
 - Sensitivity: 5
 - Depth noise filter level: 5
 - Zoom in factor: 1
- Exclusive area:**
 - Add
 - Delete
 - Delete all
 - Restore
 - Save
- Stream type:** Single
- Show detect area
- Network:**
 - Websocket port: 888
 - Secure websocket port: 889
 - Save

- An exclusive area should not be drawn on the area where people might walk through. If the body or the head of the person is shown inside the excluded area, the person can still be detected, since his feet still fall within the detection zone.



- **Stream type:**

The following display options are available:

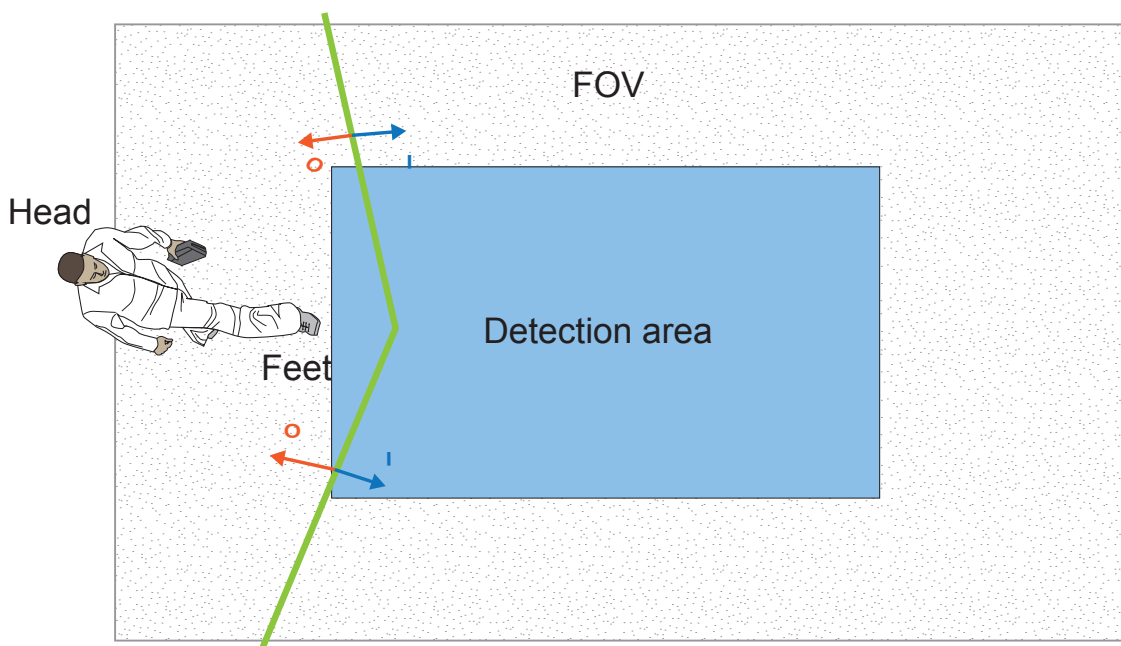
- * Single Eye Rectified HD video (up to 1280x960)
- * Depth view video (320x208)

See the [Configuration > Camera Settings](#) page.

- **Show Detect Area:** Select to display the effective detection area currently enabled by your analytics rules. Note that this area may not display if you have no effective rules.

Due to the visual perspective of the camera mounted on top, a person enters the scene from the edge of the FOV with his feet appearing first, and then his/her head. Only until he/she comes to a place directly underneath the camera, the head and feet positions can be aligned. A person's feet are detected first, and if a detection line is configured too close to the border, a person may not be appropriately recognized when his/her head has not entered the FOV.

The conceptual drawing below shows a camera view at a low installation height.



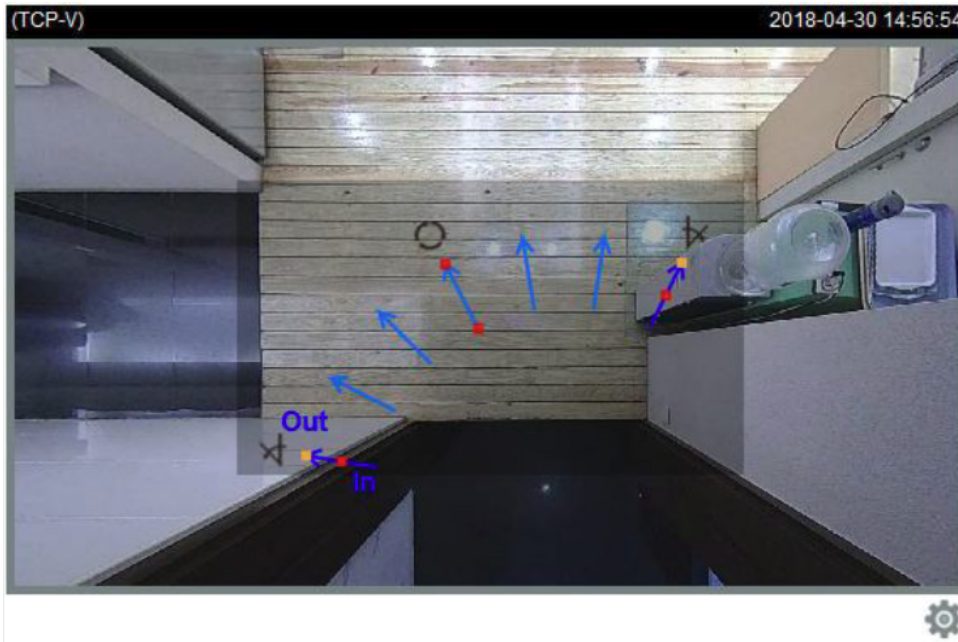
- **Network:**

Websocket port: The Websocket enables two-way communications between browser-based applications with servers that does not rely on opening multiple HTTP connections, in order to avoid long polling. The protocol consists of an opening handshake followed by basic message framing, layered over TCP. The protocol provides an alternative to HTTP polling from a web page to a remote server.

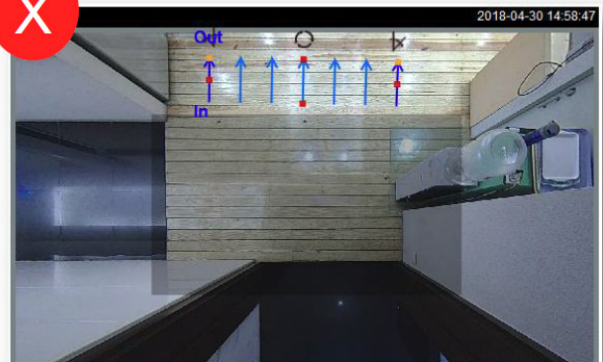
For a management session across a firewall or router (over the Internet), it is necessary to open a **Websocket port 888** or a secure port **889** on your router using the NAT traversal method for transferring metadata for counting. The default Websocket port is also user configurable.

Analytics: Drawing Flow Paths for Counting

Draw flow path within the detection zone instead of a counting line for better accuracy.



If counting takes place on a passage, the flow path should extend and be able to cover the complete passage. Tests should be conducted on site to ensure the accuracy of counting results.



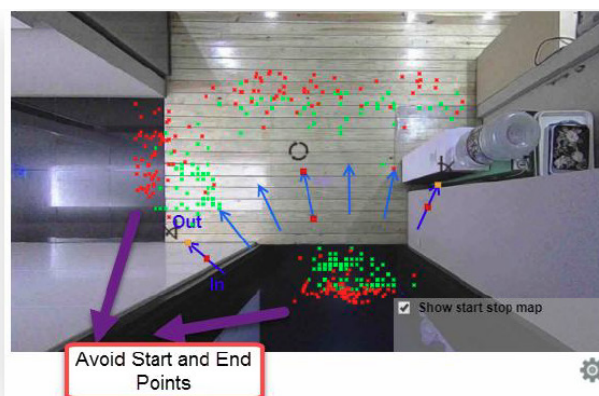
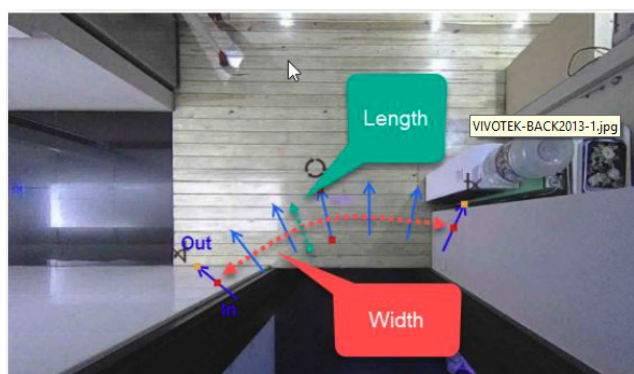
Another method to ensure objects have been properly tracked is the use of Start-Stop map. Enable the map in the display option. Always draw a flow path between the start and stop points.

Flow path is placed between the start and stop points.

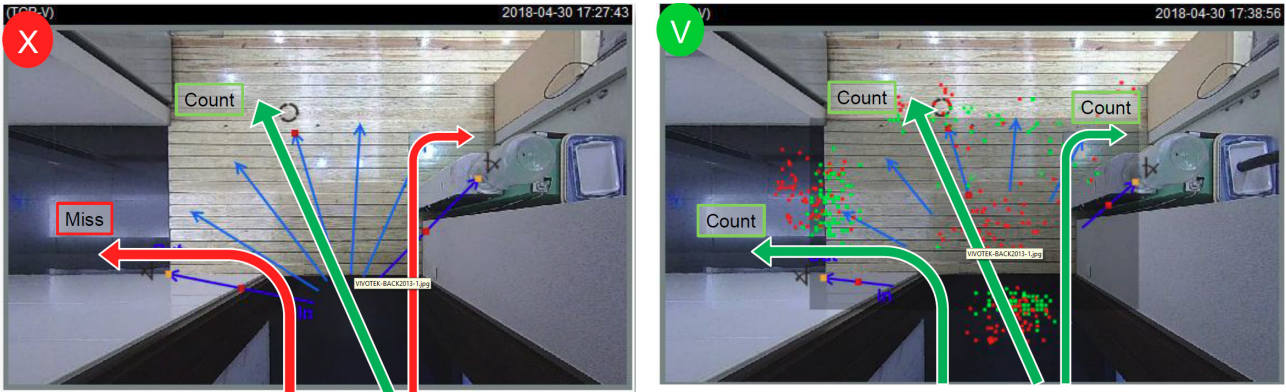
Flow path is placed across the start and stop points. Mis-calculation can occur.



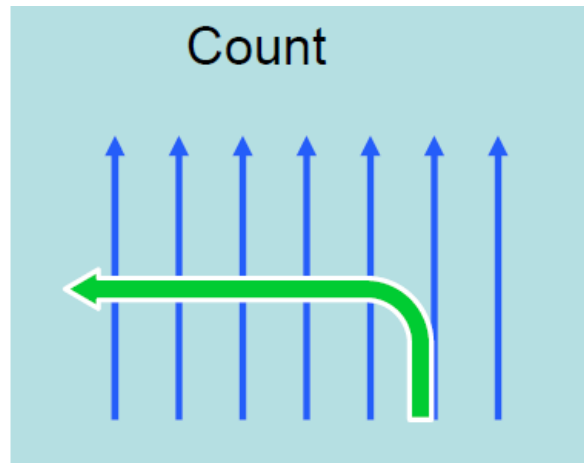
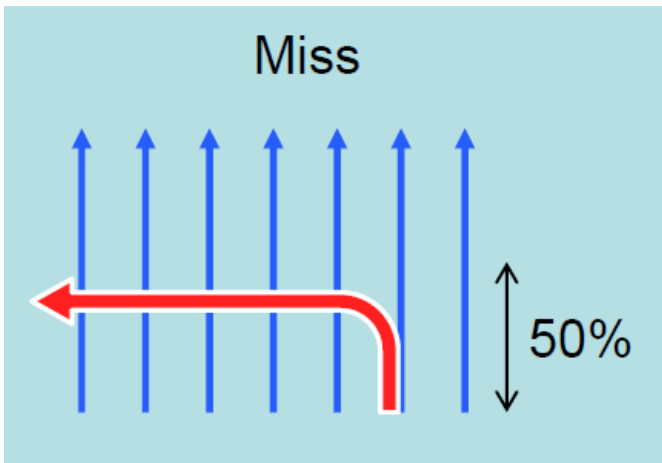
The length of flow path should cover the entire passage width. The length of arrows should be set to be between the start and stop points.



Counting misses will occur if the arrows do not cover the whole passage. Shorter and more extended flow paths can help cover unexpected sharp turns.



If the default sensitivity is 5, people need to travel at least 50% of the flow path length to trigger an effective count. If sensitivity is increased, movements of a shorter travel length will be counted.



Revision History

- Rev. 1.0: Initial release



IMPORTANT:

1. Lens cleanliness is also required because dust spots or smears on dirty lens can produce miscalculation of pixels, correlation, and movements.
2. Avoid glass and reflective materials, such as aluminum foils, in the field of view. If unavoidable, you can use the Exclusive area settings to get rid of the side effects.
3. Due to the system load, do not open two configuration web consoles at the same time.



NOTE:

1. The effectiveness of the detection slightly diminishes for objects lower than 130cm, such as children.
 2. When using an HTTPS connection, you should stop and re-start the VCA after you upload a license.
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