

AI ToF People Counting Sensor Featuring LoRaWAN®

VS133

User Guide



Safety Precautions

lilesight

Milesight will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

- Though the device is compliant with Class 1 (IEC/EN 60825-1:2014), please DO NOT look at the ToF sensor too close and directly.
- The device must not be disassembled or remodeled in any way.
- To avoid risk of fire and electric shock, do keep the product away from rain and moisture before installation.
- Do not place the device where the temperature is below/above the operating range.
- ***** Do not touch the device directly to avoid the scalds when the device is running.
- The device must never be subjected to shocks or impacts.
- Make sure the device is firmly fixed when installing.
- Do not expose the device to where laser beam equipment is used.
- Use a soft, dry cloth to clean the lens of the device.

Declaration of Conformity

VS133 is in conformity with the essential requirements and other relevant provisions of the CE,

FCC, and RoHS.



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Revision History

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Date	Doc Version	Description
May 24, 2023	V1.0	Initial version
		1. Add staff lanyard accessory;
A 10, 0000	V11 1	2. Add installation height detection feature;
Aug. 10, 2023	VI.I	3. Add DST time feature;
		4. Add ToF frequency setting.
		1. Add Region Monitoring function;
Con 28 2022	V1 0	2. Add Feet Tracking tracking mode of counting;
Sep. 28, 2023	V1.Z	3. Add preview layout edition feature;
		4. Add cumulative count reset schedule feature.
		1. Add Group Counting function;
Nov. 30, 2023	V1.3	2. Add video validation function;
		3. Add other functions.
		1. Support to configure WLAN IP address;
Mar. 31, 2024	V1.4	2. Add ToF lighting mode and noise filtering;
		3. Add validation record task list.
May 20, 2024	V1 E	1. Add Enhanced Detection Mode.
Way 20, 2024	V1.5	2. Update installation distance.
Jun. 19, 2024	V1.6	Add People Counting Trigger Report.
		1. Add configuration passwords at login, user
Feb. 11, 2025	V1.7	passwords are required to contain 4 styles.
		2. Support for downloading logs and Ping detection.

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1. Product Introduction

1.1 Overview

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VS133 is a sensor that uses second-generation ToF technology to accurately count people. This technology provides more precise depth maps and longer detection distances while maintaining an excellent privacy protection rate. The advanced ToF technology combined with an AI algorithm enables the sensor to handle complex scenes and distinguish non-human objects with up to 99.8% accuracy. VS133 sensor can be used in conjunction with the Milesight LoRaWAN[®] gateways and the Milesight IoT Cloud. With easy installation, VS133 sensors are ideal for entrances or corridors in retail stores, malls, offices, subways, and other locations.

1.2 Key Features

- Up to 99.8% accuracy combining the 2nd generation ToF technology and AI algorithm
- Working well even in low-light or completely dark environments with great lighting adaptability
- Free from privacy concerns without image capturing
- Allow to collect people counting data by differentiating between children and adults and detecting staffs via identification features for clearer people analysis
- Smart U-turn detection to filter redundant counting of people wandering in the area
- Support queuing management via dwell time detection and regional people counting
- Wider field angle to obtain longer-distance depth maps and cover a larger area
- Store a million counting data locally and securely
- Support video validation function to help customers verify statistical accuracy
- Easy configuration via Wi-Fi for web GUI configuration
- Function well with standard LoRaWAN® gateways and network servers
- Quick and easy management with Milesight IoT Cloud

2. Hardware Introduction

2.1 Packing List



=0	
50	
=0	
=0	-

		_



1 × VS133 Device

4 × Ceiling Mounting Kits 8 × Staff Tags





If any of the above items is missing or damaged, please contact your sales representative.

2.2 Hardware Overview



2.3 Button and LED Indicators

Function	Action	LED Indication
		Blue blinks 3s
Turn On/Off Wi-Fi	Press and hold the button for more than 3 seconds.	Wi-Fi on: Blue on
		Wi-Fi off: Green on
Reset to Factory	Press and hold the reset button for more than 10	Croon Plinko
Default	seconds.	Green billiks.

2.4 Dimensions (mm)



3. Power Supply

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VS133 can be powered by power adapter (12VDC, 2A).



4. Access the Sensor

VS133 provides user-friendly web GUI for configuration and users can access it via Wi-Fi connection. The recommended browsers are Chrome and Microsoft Edge. The default IP of Wi-Fi is **192.168.1.1**, and default SSID is **People Counter_XXXXXX** (can be found on the label). **Step 1:** Power on the device.

Step 2: Enable the Wireless Network Connection on your computer and search for corresponding access point, then connect computer to this access point.

Step 3: Open the Browser and type 192.168.1.1 to access the web GUI.

Step 4: Users need to set the password and three security questions when using the sensor for the first time.

		🖬 English 🛩
Activation	☑ English ∨ admin	Ale
Password Confirm Password		
At least: • 8 characters • Must contain upp special character	ercase letters, lowercase letters, numbers, and s	
By continuing, you a	agree to the <u>Privacy Policy</u> .	

			A.	🖾 English 🗸
	Set Security Ques	tions	🖾 English 🗸	
	Security Question1	What is your lucky number	· 0	
A	Answer1			
	Security Question2	What is your favorite sport?	• ¢	
	Answer2			
	Security Question3	What is your favorite color?	\$	
	Answer3			
	By continuing, you agree t	to the <u>Privacy Policy</u> .		

Step 5: After configuration, log in with username (admin) and custom password.

Step 6: Set the Wi-Fi password.

				🖾 English 🛩
	WLAN Settings		🖾 English 🗸	
	Wi-Fi SSID	People Counter_FA790	06	
	WLAN IP Address	192.168.1.1		
	Protocol	802.11n (2.4G)	\$	
	Bandwidth	20MHZ	\$	
	Channel	Auto	\$	
	Security Mode	WPA2-PSK	0	
	Cipher	AES	0	
North States	Wi-Fi Password			
in the second second				

Note:

1) Password and Wi-Fi password must be 8 to 63 characters long and contain numbers, lowercase letters, uppercase letters and special characters. If the password is entered incorrectly five times, the account will be locked for 10 minutes.

2) It is recommended that users regularly update their passwords to enhance device security and prevent unauthorized access.

3) You can click the "forgot password" in login page to reset the password by answering three security questions when you forget the password if you set the security questions in advance.

5. Operation Guide

5.1 Dashboard

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After logging on to the device web GUI successfully, user is allowed to view live video as follows.



5.2 Rule

Milesight		Master Settings	
ali Dashboard		Working Mode	
E Rule		Working Mode	Standalone Master Node
🖨 Report		Deployment Parameters	
Validation		Installation Height mm(2000-3500)	3197 Detect
System		Max. Target Height mm(500-3000)	2000
		Min. Target Height	1000
		Child Filter Height imm(500-3000)	1500
		Fully Loaded Cart Height mm(500-1500)	700
		Empty Cart Height	450
	Refresh Image		×
	Multi-Device List	Counting Strategy	
	Device IP Address SN Device Name Operation	Tracking Mode ①	Heads Tracking Feet Tracking
🖾 English >	Master 192.168.46.79 6757D326752100 People Counter 🖸	Enhanced Detection Mode ()	
	Node1 192.168.46.83 6757D168669700 People Counter 🖸 🖉		
🚨 admin >	Node2 @ Bind Node2	Children Distinction	

Draw Detection Lines

Users can draw detection lines to record the people count values which indicate the number of people enter or exit.

Step 1: Click Draw Detection Lines.

Step 2: Left-click to start drawing and drag the mouse to draw a line, left-click again to continue drawing a different direction edge and right-click the mouse to complete the drawing. The line can be dragged to adjust the location and length. One device supports at most 4 broken lines with maximum 4 segments each.

Step 3: If users need to delete the line, click **Draw Detection Lines** and select the line which need to be deleted, then click **Clear This Line** or click **Clear All**.



Note:

1) The arrow direction of the detection line depends on your drawing direction. If users need to flip the line, select the line which need to be flipped and click Flip Arrow Direction. And users can click Flip All to flip all detection lines.



2) Ensure that the detected target can pass through the detection line completely. It's recommended that the detection line is perpendicular to the In/Out direction and on the center of the detection area without other objects around.

3) A redundant identification area needed to be left on both sides of the detection line for the target. This is to ensure that the sensor has stable recognition and tracking of this target before it passes the detection line, which will make the detection and count more accurate.

Rule Configuration

Users can set the rules to ensure accurate counting.



Parameters	Description
Installation	Set the device installation height. Click Detect to detect the current installation height automatically.
Height	 Ensure that there are no objects directly below the device avoiding interfering the height detection. The automatic detection of the installation height is not supported with

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	dark floor/carpet	(black, grey, etc.)		
Max. Target Height	Set the maximum higher than this set	n target height, then the d etting value.	evice will ignore	e the objects
Min. Target Height	Set the minimum shorter than this s	n target height, then the c setting value.	levice will ignor	re the object
Tracking Mode	Select the trackin Tracking. Note: It is recomm height is low in sta	g mode of counting, includ nended to use heads trackir andalone working mode.	ing Heads Track 1g mode when th	king and Feet ne installation
Enhanced Detection Mode	Turn on when ar normal counting a • The depth imag • There is obstac • Installation cor	ny one of the following situ and detecting: ge is abnormal; cle in the live view; nditions are not met.	lations occurs,	it will ensure
Children Distinction	The device will de	tect the people shorter than	child filter heigh	t as children.
Staff Detection	The device will de on the visible part Reflective stripe re	etect the people who wear r s (neck, shoulders, etc.) as s equirements: width > 2cm, 5	eflective stripes staffs. 00 cd/lux.m ²	as staff tags
U-turn Filtering	When enabled, it count the In and left-click to start to stop drawing. Master Click "+Add" to ad maximum 4 segments	allows to draw an area for Out values only when peop he drawing and add edges f In the U-turn filtering. Up to 4 hents each.	every line and th de pass this are or this area, then this area, then a regions are sup	ne device will ea. Users can n right-click to ported with
	Line No.	Line Name	Operation	
	No.1	L		
	No.2	123456		
	No.3	中文		
	You can edit the click the buttons.	+add detection line, U-turn area,	line name and o	delete line by
Group Counting	Click to enable the moving direction customer' behavion Note:	he group counting function and speed difference to ors.	that based on gain deeper	the distance, insights into

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1) This function is only applicable for line cross people counting.

2) Only report group counting data when group counting function is enabled.

Click "+Add" to add the region monitoring. Up to 4 regions are supported with maximum 10 segments each.

Step 1: Draw the region monitoring areas on the screen.



Step 2: You can customize the zone name. And click to enable Region People Counting and Dwell Time Detection as needed. Pass-by Filtering can be set to improve statistical accuracy and Min.Dwell Time can be set to improve statistical validity.

Zone Name	Region1
Region People Counting	
Pass-by Filtering s(0~3600)	5
Dwell Time Detection	
Min. Dwell Time s(0~3600)	5

Step 3: The configuration is displayed in the list after the configuration is complete. You can redraw the areas by clicking the redraw button in the list. And click the edit button to modify the advanced settings of the areas or click delete button to delete the areas separately.

gion M	onitoring		
No.	Region Name	Advanced Properties	Operation
No.1	Region1	Region People Counting(5s)	F C 8
		+ Add	

Region Monitoring



Reset	Enable to periodically reset cumulative count on schedule.	
Cumulative	Cumulative Count includes:	
Count on	Total In/Out counting of each detection line.	
Schedule	Max./Avg. Dwell Time of each detection region.	
Periodic Report	Report the people counting data periodically.	
Dariad	Set the period of reporting periodic report.	
Penou	Range: 1-1080 mins, default: 10 mins	
Trigger Deport	Report immediately when there is a change of the line cross people	
ngger kepon	counting number or region people counting number.	

Note:

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Due to the error in ToF distance measurement (0.035 m), the Max. Target Height should be set as maximum pedestrian height plus 0.035 m and the Min. Target Height as minimal pedestrian height minus 0.035 m in the actual applications. For example, if the pedestrian height is 1.6 m to 1.8 m, the Max. and Min. Target Height should be configured as 1.835 m and 1.565 m respectively.

5.3 Communication

5.3.1 WLAN

VS133 supports wlan feature to work as AP mode to configure device and it can not connect to other access point.

Milesight	WLAN			Device LoRa Info.			
di Dashboard	Enable WLAN			LoRa Status	Activated 0		
E Rule	WLAN Settings			Device EUI	24E124757D321812 🗗		
Communication	Wi-Fi SSID	People Counter_F8D343		LoRaWAN* Settings			
Validation	WLAN IP Address	192.168.1.1		APP EUI	24E124C0002A0001		
System	Protocol	802.11n (2.4G)	0	Application Port (1–223)	85		
	Bandwidth	20MHz	0	Join Type	OTAA \$		
	Channel	Auto	0	Application Key	•••••••		
	Security Mode	WPA2-PSK	0	Rejoin Mode			
	Cipher	AES	\$	Number of Detection (4–32)	5		
	Wi-Fi Password	••••••		LoRaWAN [®] Version	V1.0.3		
🛤 English 🔉			×	Region	US915 \$		
≜ admin >				RX2 Data Rate	DR8 (SF12, 500k)		
Parameters			Des	scription			
	Enable o	r disable Wi-F	i feature.	If disabled, use	ers can use button or		
	LoRaWA	LoRaWAN [®] downlink command to enable it.					
Wi-Fi SSID	The uniqu	ue name for this	s device W	i-Fi access point			
WLAN IP	Configure	e WLAN IP add	dress for	web access, the	e default IP address is		
Address	192.168.	1.1.					

Protocol	802.11b (2.4 GHz), 802.11g (2.4 GHz), 802.11n (2.4 GHz) are optional.
Bandwidth	20 MHz or 40 MHz are optional.
Channel	Select the wireless channel. Auto, 1,11 are optional.
Security Mode	It's fixed as WPA2-PSK.
Cipher	It's fixed as AES.
	Customize the password, 8-63 characters, including numbers, lowercase
Wi-Fi Password	letters, uppercase letters and special characters.

5.3.2 LoRa

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LoRa settings are used for configuring the transmission parameters in LoRaWAN® network.

Device LoRa Info.			
LoRa Status		De-activated	0
Device EUI		24E1246936202833	Ģ
LoRaWAN [®] Settings			
APP EUI	24E124C0002A0001		
Application Port (1~223)	85		
Join Type	ОТАА		$\hat{\mathbf{v}}$
Application Key	•••••		~
Rejoin Mode			0
Number of Detection	8		
LoRaWAN [®] Version	V1.0.3		\$
Region	US915		÷
RX2 Data Rate	DR0 (SF12, 125k)		\$
RX2 Frequency MHz(923.3~927.5)	923.3		
Spreading Factor	SF10-DR0		\$
Enabled Channel Index	0-71		

Index	Frequency	
	MHz	
0-15	902.3-905.3	
16-31	905.5-908.5	
32-47	908.7-911.7	
48-63	911.9-914.9	
54-71	903-914.2	
		×
a Working Mode		IV
irm Mode		C

Parameters	Description		
LoRa Status	LoRaWAN [®] network joining status of this device.		
Device EUI	Unique ID of the device, which can also be found on the label.		
App EUI	The Default App EUI is 24E124C0002A0001.		
Application Port	The port used for sending and receiving data, default port is 85.		
Join Type	OTAA and ABP mode are available.		
Application Kay	Appkey for OTAA mode, the default key is		
Аррисацоп кеу	5572404C696E6B4C6F52613230313823.		
Device Address	DevAddr for ABP mode, the default address is the 5 th to 12 th digits of SN.		
Network Session	Nwkskey for ABP mode, the default key is		
Key	5572404C696E6B4C6F52613230313823.		
Application	Appskey for ABP mode, the default key is		
Session Key	5572404C696E6B4C6F52613230313823.		
	Reporting interval ≤ 35 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval		
	or every double reporting interval to validate connectivity; If there is no		
D · · · M · ·	response, the device will re-join the network.		
Rejoin Mode	Reporting interval > 35 mins: the device will send a specific number of		
	LinkCheckReq MAC packets to the network server every reporting interval		
	to validate connectivity; If there is no response, the device will re-join the		
	network.		

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Number of	When rejoin mode is enabled, set the number of detection.		
Detection	Note: the actual sending number is Number of Detection + 1.		
LoRaWAN [®] Version	V1.0.2, V1.0.3 are available.		
Region	Frequency plan of this device.		
RX2 Data Rate	RX2 data rate to receive downlinks.		
RX2 Frequency	RX2 frequency to receive downlinks.		
Spreading Factor	If ADR is disabled, the device will send data via this spreading factor.		
Channel	Select the channel from channel list or enter the index to select the frequency channel. Index examples: 1, 40: Enabling Channel 1 and Channel 40 1-40: Enabling Channel 1 to Channel 40 1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60 All: Enabling all channels Null: Indicates that all channels are disabled		
Confirm Mode	If the device does not receive ACK packet from network server, it will resend data once.		
ADR	Allow network server to adjust data rate of the device.		

Note:

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- 1) Please contact sales for device EUI list if there are many units.
- 2) Please contact sales if you need random App keys before purchase.
- 3) Only OTAA mode supports rejoin mode.
- 4) Select OTAA mode when you connect device to Milesight IoT Cloud.

5.4 Report

VS133 supports to visual line chart or bar chart generation to display people traffic and supports report exporting. Before using this feature, ensure that the device time is correct on **System** page.

Ev	Line Crossing Counting Region	People Counting Dwell Time Detection				
Tir	me Unit Hour Day Month T	ime Range ③ 31/12/1969 18:00:00 - 01/01/1970	18:00:00 Line1 0	Individuals	Stroup Counting	Search
mmunication port	People Traffic Report Hour	Line1			* • •	平
stem	50					
	40					
	20	_				in 🗾 Out
	10	ul I				
	0					

Parameters	Description
Event	Select the event which you want to query the report. Line crossing
Lvent	counting, region people counting and dwell time detection are optional.
Time Unit	Select the unit to generate the graph or export the data.
Time Range	Select the time range to generate the graph.
Line1 🗘	Select the line to display the graph.
Individuals Groups	Select the individuals counting reports or groups counting reports.
Region1 🗘	Select the region to display the graph.
Q Search	Click to generate the graph according to the time range and line option.
Export	Export the historical traffic data as CSV file according to the selected time unit. The device can store up to one million data records to CSV file.
Staff Included/Excluded	Select whether to contain staff counting values on the graph.
<u>~</u> dı	Select the display type as line or bar.
下	Download the graph screenshot.



5.5 Validation

Video validation function can assist users in verifying the accuracy of people counting by setting up a video recording task.

M ilesight	Recording Task						
ali Dashboard	Task Name	Start Time	End Time	Duration min	Task Status	Operation	
🚦 Rule	Task 1	2024-03-13 08:30:00.000	2024-03-13 09:00:00.000	30	Finished		
Communication			+Add				
C Report							
Validation							
System							
🛤 English 🔸							
🛓 admin 🔸							
Parameters			Descrij	ption			
Task Name	Show the	task name.					
Start/End Time	Show the start time and end time of this video.						
Duration	Show the	Show the length of the video.					
-	Show the	video task sta	tus.				
Task Status		nace tack of					
Task Status Operation	Click to c	heck the video	details, stop re	ecording	or delete the t	ask.	

Task Name	Taskname
Recording Mode	Record Now Setting Time
Start Time	© 25/03/2024 20:33:45.000
Duration min(1~60)	30
Video Quality	Standard Low Quality

Parameters	Description
Task Name	Customize a name for this task.
Recording Mode	Record Now or Setting Time is optional.
Start Time	Set the start recording time.
Duration	Set the duration of the recording, the duration of all tasks should not be more than 60 minutes.
Video Quality	When video quality is low, the video size will be smaller and quicker to download.

Note:

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- The setting time range of different tasks can not be overlap.
- Detection rules and ToF frequency parameters cannot be modified during the recording process.
- If the validation videos need to be played locally, please contact Milesight IoT support for a specialized player.



Note: The playback progress bar of video stream footage highlights the video frame where the data changes.

5.6 System

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5.6.1 Device Info

All information about the hardware and software can be checked on this page.

Device Info.	
Device Name	People Counter × ✓
Product Model	VS133-915M
SN	6757D13928710005
Hardware Version	V1.0
Software Version	V_133.1.0.1-b-t14
MAC Address	24:E1:24:FF:00:04

5.6.2 User

Users		
User	name User Level	Operation
ad	min Administrator	6 0
	+ Add User	
Parameters	Description	
ß	You can change the login password of this device.	

0

lsername	admin	
User Level	Administrator	¢
Administrator Password		
New Password		
Confirm		
At least: • 8 characters • 2 types of characters: N	umber, letter and symbol	

Click to set three security questions for your device. In case that you forget the password, you can click **Forget Password** button on login page to reset the password by answering three security questions correctly.

Password	
Security Question1	What is your lucky number?
Answer1	
Security Question2	What is your favorite sport?
Answer2	
Security Question3	What is your favorite game?
Answer3	

Click to add a viewer, who will only have access to the "Dashboard" and "Report" interfaces.

	l Add User		
	Username	viewer	
	User Level	Viewer	\$
+ Add User	Password		
	Confirm		
	At least: • 8 characters • 2 types of character:	:: Number, letter and syr	mbol

5.6.3 Time Configuration

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01/08/2023					
05:36:15					
UTC-0:00 We	stern Europear	n Time (WE	T), Gre	enwich M	€ \$
					D
	lact ^	Sun	^	02:00	0
May. 🗸	Last	Sun.	×		×
Oct.	Last 🗘	Sun.	Ŷ	03:00	\$
May. 💝 Oct. 🗘	Last 🗘	Sun.	~	03:00	<>
May. 💝 Oct. 🗘	Last 🗘	Sun.	\$	03:00 ×	
May. 🞺 Oct. 🗘 60	Last 🗘	Sun.	\$	03:00 ×	
	01/08/2023 05:36:15 UTC-0:00 We	01/08/2023 05:36:15 UTC-0:00 Western Europear	01/08/2023 05:36:15 UTC-0:00 Western European Time (WE	01/08/2023 05:36:15 UTC-0:00 Western European Time (WET), Gre	01/08/2023 05:36:15 UTC-0:00 Western European Time (WET), Greenwich M

Parameters	Description			
Time Zone	Choose the time zone for your location.			
	Enable or disable Daylight Saving Time (DST).			
Daylight Saving	Start Time: the start time of DST time range.			
Time	End Time: the end time of DST time range.			
	DST Bias: the DST time will be faster according to this bias setting.			
Setting Time	Set the device time manually.			
Synchronize with				
computer time	Synchronize the time with your computer.			

5.6.4 System Maintenance

I Time of Flight Advanced Settings

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Frequency Adjustment	Modulation Mode A		\$
ToF Lighting Mode		Always On	Schedule
Schedule Settings	© 09:0	0 - 22:00	× ✓
ToF Noise Filtering			
Noise Filtering Level 🕦 🤇			
Reset			
Recovery device basic configuration	on	Basic	Recovery
Recovery device to factory setting	s	All	Recovery
l Reboot			
Reboot the Device		R	eboot

Parameters	Description
Frequency Adjustment	Adjust the ToF frequency modulation mode to avoid the interference of surrounding IR devices. Please avoid using the same mode if there are multiple VS133 devices around. Note: if there is only one option, please contact Milesight IoT support: iot.support@milesight.com
ToF Lighting Mode	 Adjust the ToF light mode as Always On or Schedule. When using Schedule mode, the device will only turn on the ToF light during scheduled time range to save power. Note: ToF light off will not affect the periodic report. During validation, the ToF lighting will be fixed as On irregardless of its lighting mode configuration. When using ToF Lighting Mode, the Dashboard will display relevant information.

	<complex-block> Image: Constraint of the constraint</complex-block>			
ToF Noise Filtering	Filter the noisy point on the screen when working with dark floor or carpet.			
Noise Filtering Level	When installing in a spacious environment with black carpet, it is recommended to set the strength to 2; when installing in a narrow environment with black carpet, it is recommended to set the strength to 10.			
Deest	Recovery device basic configuration: keep the IP settings and user information when resetting.			
Reset	Recovery device to factory settings: reset device to factory default, which needs to verify admin password.			
Reboot	Restart the device immediately.			
Upgrade	Click the folder icon and select the upgrading file, then click the Upgrade button to upgrade. The update is done when the system reboots successfully. Note: The upgrade process takes about 1-10 minutes. Do not turn off the power and complete automatic restart after the upgrade.			
Backup and	Export Config File: Export configuration file.			
Restore	Import Config File: Click the file icon and select the configuration file, click Import button to import configuration file.			
D : .:	System Log: Download log files that can be used for troubleshooting.			
Diagnostics	IP Ping: Type the IP address or URL to test network connection.			

6. Installation Instruction

Parameter definition:

Parameters	Explanation	Value
Н	Installation height	≤3.5 m
d	Minimum detection distance of VS133	0.5 m
Δd	Distance measurement error of VS133	0.035 m
h _{max}	Maximum pedestrian height	Example 1.8 m
h _{min}	Minimum pedestrian height	Example 1.7 m
α	ToF horizontal field of view angle	98°
β	ToF vertical field of view angle	80°

х	Length of detection range	
у	Width of detection range	

6.1 Installation Height

The maximum installation height is 3.5 m and the minimum installation height is $h_{max}+d+\Delta d$. For example, when the maximum pedestrian height is 1.8 m, then the minimum installation height is 1.8+0.5+0.035=2.335 m.

6.2 Covered Detection Area

The monitored area refers to the range visible to the device (FOV), which is displayed on the dashboard. The detection area, which is smaller, refers to the range within the monitored area where the device can detect changes in the number of people.

The detection area covered by the device is related to the field of view angle of the device, the installation height and the target height. The length of the detection area is approximately $x=2.300\times(H-h_{min})$ and the width of the detection area is approximately $y=1.678 \times (H-h_{min})$.



For example, if the Minimum height of pedestrians is 1.7 m, the detection area corresponding to each installation height is as follows:

Installation Height	FoV Monitored Area (m)	Detection Area (m)
2.5	5.75 × 4.20	1.84 × 1.34
2.6	5.98 × 4.36	2.07 × 1.51
2.7	6.21 × 4.53	2.30 × 1.68
2.8	6.44 × 4.70	2.53 × 1.85
2.9	6.67 × 4.87	2.76 × 2.01
3.0	6.90 × 5.03	2.99 × 2.18
3.1	7.13 × 5.20	3.22 × 2.35
3.2	7.36 × 5.37	3.45 × 2.52
3.3	7.59 × 5.54	3.68 × 2.69

3.4	7.82 × 5.71	3.91 × 2.85
3.5	8.05 × 5.87	4.14 × 3.02

6.3 Environment Requirements

 Dark floor/carpet (black, grey, etc.) will affect the device to count staffs when Staff Detection is enabled.



- Avoid 940nm light which may result in incorrect counting.
- Outdoor sunlight shining on the over channel will not have any effect, but the mirrored reflections that allow sunlight to shine on the ToF Sensor should be avoided.
- Make sure there are no obstacles within the live view of device. Otherwise, the device imaging may appear abnormally red or it will affect people counting. Adjust the appropriate noise filtering level according to the actual image, the more difficult it is to see the target, the larger the filter value should be set.



6.4 Installation

Ceiling Mount

Step 1: Ensure the thickness of the ceiling is more than 30 mm, rill 4 holes with a diameter of 6mm according to the mounting holes of device. If the wire needs to be extended to the interior of the ceiling, a wire hole with a suitable size is also required to be drilled.

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Step 2: Fix the wall plugs into the ceiling holes.

Step 3: Remove the cover on the device, and then connect all required wires and pass them through the wire hole behind the device or block on the side of the device if the wires need to be protruded from the side of the device.

Step 4: Fix the device to the wall plugs via mounting screws; remember to adjust the mounting direction according to the detection area requirement.

Step 5: Fix the cover back to the device.



Ceiling/Lintel Mount (with Optional Multifunctional Bracket)

Step 1: Attach the mounting plate to the device with 4 screws.

Step 2: Fix the pole to the mounting plate with the hole on the plate.

Step 3: Adjust the length of the pole, then adjust the direction of 3-axis ball and tighten it with the handle.

Step 4: Determine the mounting location and drill 3 holes, fix the wall plugs into the mounting holes, then fix the bracket base to the wall plugs via mounting screws.

(**Note:** If the wire needs to be extended to the interior of the ceiling or wall, a wire hole with a suitable size is also required to be drilled.)



Step 5: Remove the cover on the device, and then connect all required wires and pass them through the inside of pole.

Step 6: Fix the pole to bracket base with screws and nuts.



Note:

- Tilt installation should be avoided. Ensure that the front of the device and the ground plane are paralleled.
- Avoid installing the device against the wall and ensure that the distance between the device and the wall as follows:



Condition	Standard Environment	The carpet/floor is Dark (need to set max noise filtering level)	
Condition	Standard Environment	set max noise filtering level)	
Normal imaging	x>50cm, y>60cm	x>50cm, y>75cm	

Normal counting	x>50cm, y>50cm	x>50cm, y>50cm

- Ensure that there are no other objects blocking the ToF light within a 30 cm radius of the front of the device.
- When you install devices on the top of swinging doors, it is suggested to keep the door normally open. If the door must be normally closed, please install the device on the other side of the door to keep away from the door movement. And it is suggested to keep away from the door with a distance of at least 30 cm.



6.5 Factors Affecting Accuracy

- Wearing a fisherman's hat or carrying a cardboard box on the shoulder: The target will not be recognized because it will become unlike a human in depth map.
- Handheld or cart-carrying a humanoid doll with sufficient height to pass by: The doll will be mistakenly detected as people because it is human-like in depth map.

7. Communication Protocol

7.1 Uplink Data

VS133 reports basic information of sensor whenever joining the network and the number of people periodically. For decoder examples please find files on <u>https://github.com/Milesight-IoT/SensorDecoders</u>.

Channel	Туре	Description
	01 (Protocol Version)	01=> V1
	09 (Hardware Version)	01 04 => V1.4
IT	16 (Device SN)	16 digits
	1f (Software Version)	85 01 00 05 => 133.1.0.5
03	d2 (Accumulated counter)	Line 1 accumulated in counter, 4 bytes

04	d2 (Accumulated counter)	Line 1 accumulated out counter, 4 bytes
		Line 1:
05	cc (Periodic counter)	Byte 1-2: in counter during the report interval
		Byte 3-4: out counter during the report interval
06	d2 (Accumulated counter)	Line 2 accumulated in counter, 4 bytes
07	d2 (Accumulated counter)	Line 2 accumulated out counter, 4 bytes
		Line 2:
08	cc (Periodic counter)	Byte 1-2: in counter during the report interval
		Byte 3-4: out counter during the report interval
09	d2 (Accumulated counter)	Line 3 accumulated in counter, 4 bytes
0a	d2 (Accumulated counter)	Line 3 accumulated out counter, 4 bytes
		Line 3:
0b	cc (Periodic Counter)	Byte 1-2: in counter during the report interval
		Byte 3-4: out counter during the report interval
0c	d2 (Accumulated counter)	Line 4 accumulated in counter, 4 bytes
0d	d2 (Accumulated counter)	Line 4 accumulated out counter, 4 bytes
		Line 4:
0e	cc (Periodic Counter)	Byte 1-2: in counter during the report interval
		Byte 3-4: out counter during the report interval
		Byte 1: number of people in region 1 currently
of	22 (Degion Manitaring)	Byte 2: number of people in region 2 currently
	e3 (Region Monitoring)	Byte 3: number of people in region 3 currently
		Byte 4: number of people in region 4 currently
		Byte 1: region ID
10	e4 (Region Monitoring)	Byte 2-3: avg. dwell time
		Byte 4-5: max. dwell time

Note: If children distinction feature or staff detection feature is enabled, the counter uplinks will minus children and staff. For example, if children distinction is enabled, the accumulated in counter=total in counter-children in, the accumulated out counter=total out counter-children out. **Example:**

1. Device information.

ff0101 ff166600b09409760000 ff090102 ff1f85010001					
Channel	Туре	Value	Channel	Туре	Value
ff	01 (Protocol Version)	01 (V1)	ff	16(Device SN)	66 00 b0 94 09 76 00 00

Channel	Туре	Value	Channel	Туре	Value
ff	09 (Hardware version)	0102 (V1.2)	ff	1f (Software version)	85 01 00 01 (V133.1.0.1)

2. People counter periodic report.

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03d2 05000000 04d2 0c000000 0fe3 0200000a 10e4 0108000b00 05cc 02000100					
Channel	Туре	Value	Channel	Туре	Value
03	d2 (accumulated in counter)	Line 1 ln: 05 00 00 00 => 00 00 00 05=5	04	d2 (accumulated out counter)	Line 1 Out: 03 00 00 00 => 00 00 00 03=3
Channel	Туре		Val	ue	
Of	e3 (Region Monitoring)	02: numbe 00: numbe 00: numbe 0a=>10: num	r of people r of people r of people ber of peop	in region 1 curre in region 2 curre in region 3 curre ble in region 4 cu	ently ently ently rrently
Channel	Туре	Value	Channel	Туре	Value
10	e4 (accumulated out counter)	01: Region 1 avg. dwell time: 08 00 => 00 08=8s max. dwell time: 0b 00 => 00 0b=11s	05	cc (Periodic Counter)	Line 1 In: 02 00 => 00 02 = 2 Line 1 Out: 01 00 => 00 01 =1

3. People counter trigger report.

04d2 11000000 0fe3 02000001			
Channel	Туре	Value	
04	d2 (Accumulated out counter)	Line1 Out: 11 00 00 00=> 00 00 00 11 = 17	
Channel	Туре	Value	
Of	e3 (Region	02: number of people in region 1 currently 00: number of people in region 2 currently	
U	0f Monitoring)	00: number of people in region 3 currently 01: number of people in region 4 currently	

7.2 Downlink Command

VS133 supports to configure the device via downlink commands. Application port is 85 by default.

Channel	Туре	Description
	10 (Reboot)	ff (Reserved)
	03 (Reporting Interval)	2 Bytes, unit: s
	04 (Confirm Mode)	00: disable, 01: enable
		Byte 1: Channel index range
		01: 0-15
		02: 16-31
		03: 32-47
	05 (LoRaWAN [®] Channel Mask)	04: 48-63
		05: 64-79
TT		06: 80-95
		Byte 2-3: indicate disable or enable via
		every bit, 0=disable, 1=enable
	40 (ADR)	00: disable, 01: enable
	41 (Application Port)	1 Byte, default is 85
	42 (Wi-Fi)	00: disable, 01: enable
	43 (People Counting Periodic Report)	00: disable, 01: enable
	44 (People Counting Trigger Report)	00: disable, 01: enable
	51 (Clear the accumulated counting)	ff (Reserved)

Note: After changing any parameter of LoRaWAN[®] settings, the device will re-join the network. **Example:**

1. Disable Wi-Fi.

ff4200				
Channel	Туре	Value		
ff	42 (Wi-Fi)	00: disable		

2. Set AU915 or US915 channel mask as 8-15.

ff0501ff00 ff05020000 ff05030000 ff05040000 ff05050000				
Channel	Туре	Value		
ff	05	01: Channel index 0-15, ff00 => 8-15 is enabled		
	(Set Channel Mask)	02-05: Channel index 16-79, 0000 => all disabled		

3. Reboot the device.

ff10ff		
Channel	Туре	Value

ff	10 (Reboot)	ff (Reserved)
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4. Set reporting interval as 20 minutes.

ff03b004				
Channel	Туре	Value		
ff	03(Set Reporting	b0 04 => 04 b0 = 1200s		
	Interval)	=20 minutes		

-END-