MicRadar

24G Millimeter Wave Radar

R24DVD1 Human Presence Radar

User Manual V1.6

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1. Product Overview

Description:

Click on the link or scan the QR code to ensure you are using the latest version of the document at

http://www.micradar.cn/go_file.php?id=113

This document mainly describes the use of the radar, the various stages of the problem points need to pay attention to, as far as possible to reduce design costs and increase the stability of the product, to improve the efficiency of the completion of the project.

From hardware circuit reference design, radar antenna and housing layout requirements, how to differentiate between interference and multi-functional standard UART protocol outputs.

This radar is a self-contained system of space sensing sensor, which is a module combined by RF antenna, radar chip and high speed main frequency MCU together, relying on stable and flexible superior algorithm architecture core to solve users' various scene detection needs, which can be equipped with upper computer or host computer to flexibly output detection status and data, and meet several groups of GPIO for users' custom development.

The radar antenna transmits electromagnetic wave signal and receives the echo signal after the target reflection simultaneously, and the radar processor feeds back the distance, direction, speed and other information of the target by analyzing the waveform parameters of the echo signal. It can detect the state and trajectory of moving objects

2. Working Principle

The radar transmits 24G band millimeter wave signals, the measured target reflects the electromagnetic wave signals, and demodulates the transmitted signals, which are then processed by amplification, filtering, ADC, etc. to obtain the echo demodulated signal data. The amplitude, frequency, and phase of the echo signal are decoded in the MCU unit, and the target parameters (breathing, movement, micro-motion, etc.) are measured and evaluated in the end.

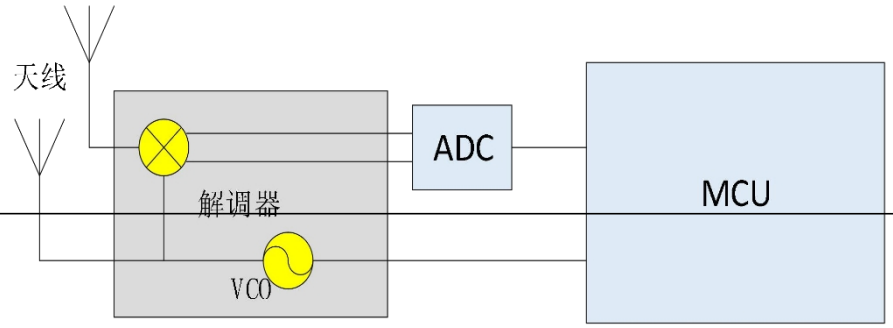

Figure 1:
Working
principle
diagram

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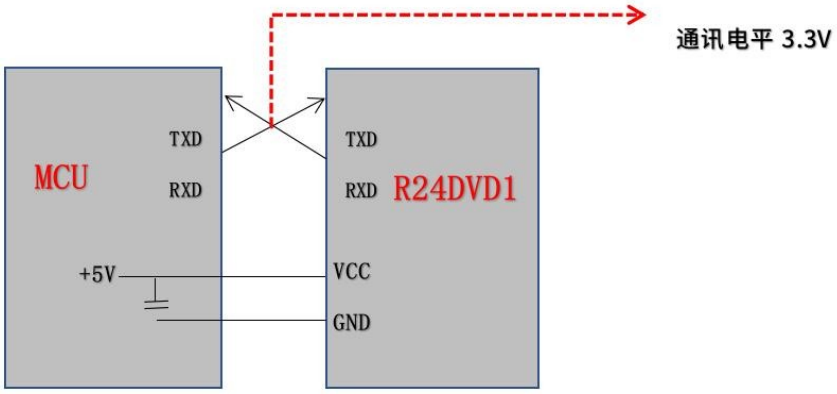
Catalog

3. Communication wiring instructions

The radar's rated supply voltage needs to meet 4.9 - 6V (default 5V), and the rated current requires 200mA or more input under normal operation. The power supply is designed with a power supply ripple of ≤



100mv.

Figure 2: Schematic diagram of radar module and peripheral connection

4. Requirements for the layout of the antenna and housing

PCBA: Need to keep the radar patch height ≥ 1mm compared to other devices

Housing construction: 2 - 5mm distance between the radar antenna face and the housing face needs to be maintained

Shell detection surface: non-metallic shell, need to be straight to avoid bending surface, affecting the performance of the entire swept surface area

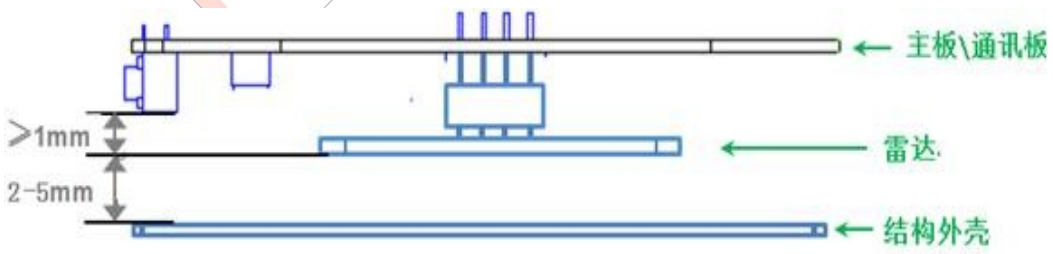


Figure 3: Layout of the antenna and housing

5. Static Protection

Radar products have electrostatic sensitive circuitry inside and are susceptible to electrostatic hazards, so you need to do a good job of electrostatic protection during transportation, storage, work and pick-up. Do

not touch the surface of the radar module antenna and connector pins with your hands and only touch the corners. When operating the radar sensor, please try to wear anti-static gloves.

6. Functional Interference Items

6.1 No one state, abnormal output someone

In the normal state, the radar will accurately determine the presence of the human body in a sedentary state and sleep, and output the corresponding vital signs and other information.

A. **Radar scanning area is large, the doorway, the next door movement of the wood panel wall is detected.** Adjustment method: reduce radar sensitivity, radar provides scene settings.

B. **The lower part of the radar is facing the running air conditioner, fan.**
Adjustment method: adjust the radar position, do not directly face the air conditioner, fan.

C. **Shaking of objects caused by air conditioning wind.**
Adjustment method: cotton, non-metallic items will not cause false alarms, metal items need to be fixed.

D. **The radar is not fixed and vibration causes false alarms.** Avoid support shaking, vibration.

E. **Pets, flying birds and other occasional moving objects.**
Due to the radar measurement micro-motion, the sensitivity is very high and this interference cannot be excluded.

F. **Power interference, resulting in occasional misjudgments.**
Try to keep the supply current stable and reduce ripple.

6.2 Manned state, abnormal output no one

Radar determines the presence of a human body by sending and receiving electromagnetic waves. The closer the distance to the radar, the higher the accuracy.

A. **Human body out of radar range**

Radar scan range, adjust the installation angle.

Radar measurement range, in different environments, the electromagnetic wave reflection area is different, the scanning area will have a small difference.

B. **Metal masking causes incorrect output**

Excessively thick desks and chairs with metal seats. It will block electromagnetic wave penetration and cause misjudgment.

C. **Scanning angle difference**

The radar did not scan the torso position，resulting in a misjudgment.

D. **Radar sensitivity is too low**

The radar provides parameter adjustment to increase sensitivity improvement.

7. Function Details

7.1 Standard Function Point Description

Radar setup function point	Status change time/function explanation
DP1: Manned/unmanned	No one to someone, report within 0.5s Manned to unmanned, about 30s output unmanned state
DP2: Active/Static/No	Report active to active within 0.5s Report active to active within 2s Report when no one is present Report when no one is present
DP3: scene mode (living room mode, bedroom mode, area detection mode, bathroom mode)	According to the size of the dynamic detection area, adapted to different scene modes, the default setting [living room mode
DP4: Sensitivity (1-3 steps)	According to the size of the static detection area, adapted to different sensitivity, the default setting [sensitivity 3]

7.2 Open Function Point Description

Radar setup function point	Status change time/function explanation

DP1: Presence of energy values reported	Stationary information contains: presence energy value/ stationary distance Presence energy value: for real-time environmental micro-motion bottom noise, real-time reporting, [range 0~250] resting distance: the straight-line distance from the module detection to human breathing; [0~10m
DP2: Movement energy value reporting	Movement information includes: movement energy value / movement distance / movement speed Motion energy value: for real-time environmental motion bottom noise, real-time reporting, [range 0~250] motion distance: the straight-line distance of the module detecting human motion; [range 0~10m], motion speed: the real-time speed of the module detecting human motion [range ±5m/s];
DP3: Presence judgment threshold setting	The electromagnetic wave value threshold setting for unoccupied people in the environment, please refer to the default value, such as moving interference objects are collected after the presence of energy values set. 【Range 0~250】

DP4: Motion trigger amplitude threshold setting	Radar trigger setting: the magnitude of the movement of personnel into the environment is set for limiting outside false alarms. Please give priority to the default value [range 0~250
DP5: Presence judgment boundary setting	Radar breath detection distance setting for reducing radar false alarm rate Reduce the interference outside the detection range [range 0.5~10m
DP6: Motion trigger boundary setting	Human activity detection distance setting, used to reduce the rate of false radar alarms. Reduce the detection range outside the door, the interference of walking outside the glass door. 【Range 0.5~10m】
DP7: Motion trigger time setting	Time accumulation for motion triggering, multiple judgment triggering to reduce false alarms. Can be used with the motion amplitude trigger threshold and motion trigger boundary to do performance limits [range 0~1000ms, default value is 150ms]
DP8: Motion to rest time setting	This parameter setting is used to report the duration of the curren human motion state adjustment. Cooperate with the stationary motion trigger threshold setting conditions to complete th approximate state of human motion amplitude within the environmen [range 1~60s, default value is 3s]
DP9: Enter unmanned state time setting	The radar continues for a period of time without detecting respiratory micro-motion, it will automatically enter the unmanned state. This parameter is used to manually set the time setting to quickly enter unoccupied. 【Range≥30s】

8. Agreement Description

This protocol is applied to the communication between the 24G millimeter wave human presence detection radar and the host computer.

This protocol outlines the radar workflow, gives a brief introduction to the interface protocol composition architecture, and gives the relevant radar work required control commands and data, serial communication is defined as follows:

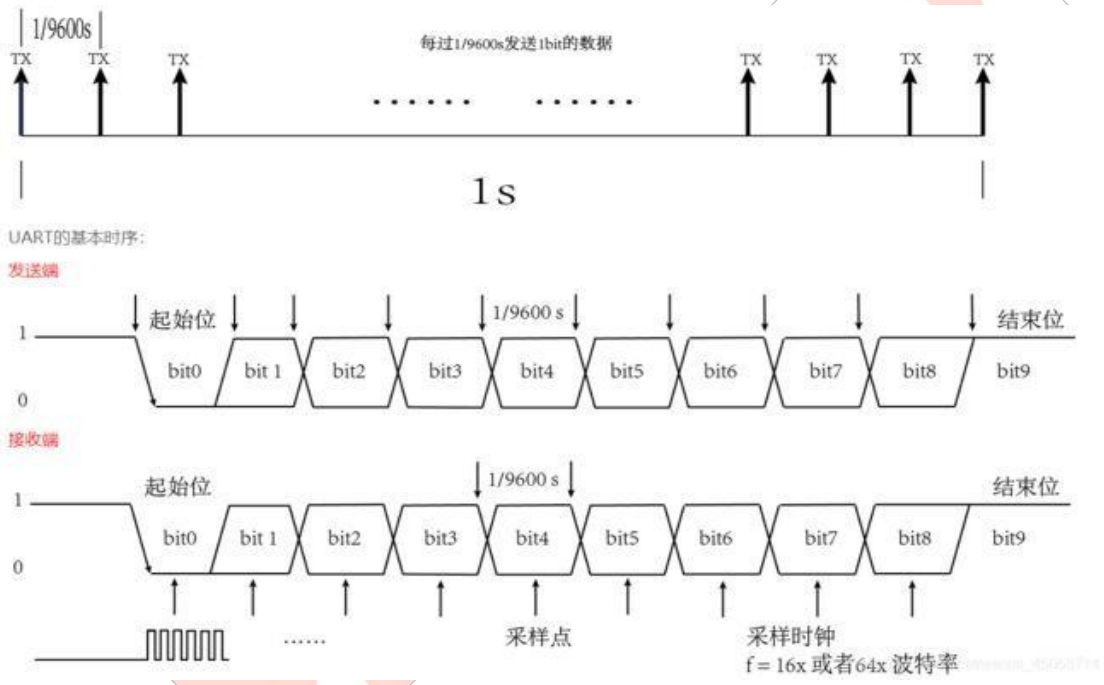
- Interface level: TTL
- Baud rate: 115200bps
- Stop bit: 1
- Data bits: 8
- Parity check: None

9. Communication command and parameter definition - standard function point / open bottom function point

9.1. Frame structure definition and description

A. Frame Structure Definition

Frame header	Control word	Command word	Length Identification		Data	Check sum	End of frame
0X53 0X59	Control	Command	Lenth_H	Lenth_H	Data	Sum	0X54 0X43
2 Byte	1 Byte	1 Byte	1 Byte	1 Byte	n Byte	1 Byte	2 Byte



B. Description of the frame structure

A. Frame header: 2Byte, fixed to 0X53,0X59; B. Control word: 1 Byte

(0X01-Heartbeat Packet Identification, 0X02-Product Information, 0X03-OTA Upgrade, 0X05-Working Status, 0X80-Human Presence)

C. Command word: 1Byte (to identify the current data content) D. Length identification: 2Byte, equal to the specific byte length of the data E. Data: nByte, defined according to the

actual function

F. Checksum: 1Byte.

(Check digit calculation: frame header + control word + command word + length identification + data) after summing, take the lower eight bits)

G. End of frame: 2Byte, fixed to 0X54,0X43;

9.2 Description of address assignment and data information

9.2.1. Standard Function Point Information Description

System Functions	Heartbeat Package Inquiry	Issued	5359	01	01	0001	0F	sum	5443	
		Reply	5359	01	01	0001	0F	sum	5443	
	Module Reset	Issued	5359	01	02	0001	0F	sum	5443	
		Report	5359	01	02	0001	0F	sum	5443	
Product Information	Information Search									
	Product Model Search	Issued	5359	02	A1	0001	0F	sum	5443	
		Reply	5359	02	A1	len	len B Product Information	sum	5443	
	Product id lookup	Issued	5359	02	A2	0001	0F	sum	5443	
		Reply	5359	02	A2	len	len B product id	sum	5443	
	Hardware Model Search	Issued	5359	02	A3	0001	0F	sum	5443	
		Reply	5359	02	A3	len	len B Hardware Model	sum	5443	
	Firmware Version Search	Issued	5359	02	A4	0001	0F	sum	5443	
		Reply	5359	02	A4	len	len B firmware version	sum	5443	
	Protocol Type Search	Issued	5359	02	A5	0001	0F	sum	5443	
		Reply	5359	02	A5	0001	01: Common Protocol 03: Doodle WIFI Protocol	sum	5443	

Working Status	Initialization completion message	Report	5359	05	01	0001	0f	sum	5443	
	Scene setting	Issued	5359	05	07	0001	01-04	sum	5443	1: Living room; 2: Bedroom; 3: Restrooms; 4: Area detection

		Reply	5359	05	07	0001	01-04	sum	5443	Detection range of each scene mode: living room: 4m Bedroom: 3.5m Washroom: 2.5m Area testing: 3m
	Sensitivity Settings	Issued	5359	05	08	0001	01-03	sum	5443	1: Sensitivity 1 2: Sensitivity 2 3: Sensitivity 3
		Reply	5359	05	08	0001	01-03	sum	5443	Each sensitivity detection range: sensitivity 1:2m Sensitivity 2: 3m Sensitivity 3: 4m
	Information Search									
	Initialize whether the query is completed	Issued	5359	05	81	0001	0F	sum	5443	
		Reply	5359	05	81	0001	01: Completed 02: Unfinished	sum	5443	
	Scene setting query	Issued	5359	05	87	0001	0F	sum	5443	
		Reply	5359	05	87	0001	0X00-0X04	sum	5443	0: Scene mode not set 1: Living room 2: Bedroom 3: Bathroom 4: Area detection
		Issued	5359	05	88	0001	0F	sum	5443	

	Sensitivity query	Reply	5359	05	88	0001	0X00-0X03	sum	5443	0: Sensitivity not set 1: Sensitivity 1 2: Sensitivity 2 3: Sensitivity 3
Human Presence Function	Human body proactive reporting									
	Presence information proactive reporting	Report	5359	80	01	0001	00: No one 01: Someone	sum	5443	Reporting method: Reported when the status changes

	Campaign information proactive reporting	Report	5359	80	02	0001	00: None 01: Stillness 02: Active	sum	5443	Reporting method: Reported when the status changes
	Active reporting of body movement parameters	Report	5359	80	03	0001	1B Body motion parameters	sum	5443	Reporting method: 1s reporting once Body motion parameter: the value of human motion amplitude. The body motion parameter is 0 when the space is unoccupied; 1 for body motion in the presence of a person and at rest; The body motion parameter is 2~100 when the human body is in motion (the greater the motion range, the closer the body motion) (target parameter) value range: 0-100
	Unmanned time	Issued	5359	80	0a	0001	none: 0X00 10s: 0X01 30s: 0X02 1min： 0X03 2min： 0X04 5min： 0X05 10min：0X06 30min：0X07 1hour：0X08	sum	5443	Default setting is 30s

	setting	Repl y	5359	80	0a	0001	none: 0X00 10s: 0X01 30s: 0X02 1min： 0X03 2min： 0X04 5min： 0X05 10min：0X06 30min：0X07 1hour：0X08			

	Human movement reporting	Report	5359	80	0b	0001	none:0X00 close_to:0X01 far_away:0X02	sum	5443	00: unoccupied/occupied stationary/disorderly movement 01: Continuous 3s near radar 02: Continuous 3s Away from Radar
	Information Search									
	Presence Information Search	Issued	5359	80	81	0001	0F	sum	5443	
		Reply	5359	80	81	0001	00: No one 01: Someone	sum	5443	
	Campaign Information Search	Issued	5359	80	82	0001	0F	sum	5443	
		Reply	5359	80	82	0001	00: None 01: Stillness 02: Active	sum	5443	
	Body movement parameter query	Issued	5359	80	83	0001	0F	sum	5443	
		Reply	5359	80	83	0001	1B Body motion parameters	sum	5443	Numerical range: 0-100
		Issued	5359	80	8a	0001	0F	sum	5443	

	No one time query	Reply	5359	80	8a	0001	none: 0X00 10s: 0X01 30s: 0X02 1min： 0X03 2min： 0X04 5min： 0X05 10min：0X06 30min：0X07 1hour：0X08	sum	5443	Default setting is 30s
	Human movement up to check	Issued	5359	80	8b	0001	0F	sum	5443	

	Inquiries	Repl y	5359	80	8b	0001	none:0X00 close_to:0X01 far_away:0X02	sum	5443	00: unoccupied/occupied stationary/disorderly movement 01: Continuous 3s near radar 02: Continuous 3s Away from Radar
OTA	Start OTA Upgrade	Issu ed	5359	03	01	0004	4B Upgrade package size	sum	5443	
		Repl y	5359	03	01	0004	4B Firmware size per frame	sum	5443	
	Upgrade Package Transfer	Issu ed	5359	03	02	0404	4Byte Packet Offset Address + 1024Byte upgrade package	sum	5443	
		Repl y	5359	03	02	0001	01: Received successfully 02: Receiving failure	sum	5443	
	End OTA Upgrade	Issu ed	5359	03	03	0X000 1	0X01: Upgrade package delivery completed 0X02: Upgrade package delivery not completed	sum	5443	
		Repl y	5359	03	03	0X000 1	0X01: Received successfully 0X02: Receiving failure	sum	5443	

9.2.2 Open underlying function point information description

A. Open parameter output switch

Function Description	Transmission direction	Frame header	Control words	Command word	Length Identification	Data	Checksum field	End of frame	Remarks
Open bottom information output switch									
Radar output information switch setting	Issued	5359	08	00	0001	0X00: Off 0X01: Open	sum	5443	Switch to control the open parameter output, on to report, off to not report
	Reply	5359	08	00	0001	0X00: Off 0X01: Open	sum	5443	Default is off

Open bottom information output switch query									
Radar output information switch query (default off)	Issued	5359	08	80	0001	0f	sum	5443	
	Reply	5359	08	80	0001	0X00: Off 0X01: Open	sum	5443	Default is off

B.Customized mode

Custom Mode Settings									
Custom Mode Settings	Issued	5359	05	09	0X0001	0X01-0X04	sum	5443	0X01: Custom mode 1 0X02: Custom mode 2 0X03: Custom mode 3 0X04: Custom mode 4
	Reply	5359	05	09	0X0001	0X01-0X04	sum	5443	
End of custom mode settings	Issued	5359	05	0a	0X0001	0X0f	sum	5443	For saving custom parameters
	Reply	5359	05	0a	0X0001	0X0f	sum	5443	
Custom Pattern Query									
Custom Pattern Query	Issued	5359	05	89	0X0001	0F	sum	5443	
	Reply	5359	05	89	0X0001	0X00-0X04	Sum	5443	0X00: Customization is not turned on 0X01: Custom mode 1 0X02: Custom mode 2 0X03: Custom mode 3 0X04: Custom mode 4

C. Real-time radar bottom parameters reporting/querying

Radar open bottom function information proactive reporting									
Radar information reporting	Report	5359	08	01	0005	byte1: Presence energy value range: 0-250	sum	5443	**Presence of energy values: the** presence of electromagnetic waves in the environment and the low frequency variation of electromagnetic waves when no one is present. Space

						byte2：Static distance range: 0X00-0X14 byte3: Range of motion energy values: 0-250 byte4: Movement distance range: 0X00-0X14 byte5: speed information range: 0X01-0X14			The overall spatial electromagnetic wave reflection fluctuates slightly when there is someone breathing in the room (thoracic respiratory micro-motion). **Resting distance:** the straight line distance from the module detection to human breathing; usually not more than 3 meters **Motion energy value:** motion amplitude value, different motion amplitude causes different electromagnetic wave frequency change, the **Movement distance:** movement target distance detection **Movement speed:** real-time judgment of the speed of the target movement degree size; near the radar speed is positive (0X01-0X09), away from the negative (0X0b-0X14). When there is no motion speed, the value is 0a (0m/s), and the speed step is in 0.5m/s progression, such as 0X0b is +0.5m/s; 0X09 is -0.5m/s.
Radar open bottom function information query									
Presence energy value query	Issued	5359	08	81	0001	0f	sum	5443	
	Reply	5359	08	81	0001	Range: 0-250	sum	5443	
Exercise Energy Value Search	Issued	5359	08	82	0001	0f	sum	5443	
	Reply	5359	08	82	0001	Range: 0-250	sum	5443	
	Issued	5359	08	83	0001	0f	sum	5443	

Stationary Distance Search	Reply	5359	08	83	0001	0X00: No one 0X01: 0.5m 0X02: 1m 0X03: 1.5m 0X04: 2.0m 0X05: 2.5m 0X06: 3m 0X07: 3.5m 0X08: 4m 0X09: 4.5m 0X0a: 5m	sum	5443	

						0X0b: 5.5m 0X0c: 6m 0X0d: 6.5m 0X0e:7m 0X0f: 7.5m 0X10: 8m 0X11: 8.5m 0X12: 9m 0X13: 9.5m 0X14: 10m			
Movement Distance Search	Issued	5359	08	84	0001	0f	sum	5443	
	Reply	5359	08	84	0001	0X00: No motion target 0X01: 0.5m 0X02: 1m 0X03: 1.5m 0X04: 2.0m 0X05: 2.5m 0X06: 3m 0X07: 3.5m 0X08: 4m 0X09: 4.5m 0X0a: 5m 0X0b: 5.5m 0X0c: 6m 0X0d: 6.5m 0X0e:7m 0X0f: 7.5m 0X10: 8m 0X11: 8.5m 0X12: 9m 0X13: 9.5m	sum	5443	

						0X14: 10m			
Target movement speed query	Issued	5359	08	85	0001	0f	sum	5443	
	Reply	5359	08	85	0001	0X00: No motion target 0X01-0X14	sum	5443	
Proximity away from the query	Issued	5359	08	86	0001	0f	sum	5443	
	Reply	5359	08	86	0001	0X00: None 0X01: Proximity 0X02: Stay away	sum	5443	00: unoccupied/occupied stationary/disorderly movement 01: Continuous 3s near radar 02: Continuous 3s Away from Radar
Body movement parameter query	Issued	5359	08	87	0001	0f	sum	5443	
	Reply	5359	08	87	0001	Range: 0-100	sum	5443	

D. Threshold parameter setting/query

Status judgment threshold setting									
Presence judgment threshold setting	Issued	5359	08	08	0001	Range:0-250	sum	5443	Please refer to the default value for setting the threshold of electromagnetic wave value in the environment with people and no one, and set the static value of space after collecting if there are moving disturbing objects
	Reply	5359	08	08	0001	Range:0-250	sum	5443	Default value is 5
Motion amplitude trigger threshold	Issued	5359	08	09	0001	Range:0-250	sum	5443	Radar trigger setting: the magnitude of the movement of the person into the environment is set to limit outside false alarms. Please use the default value in preference

setting	Reply	5359	08	09	0001	Range:0-250	sum	5443	Default value is 3
Presence-aware boundary setting	Issued	5359	08	0a	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m	sum	5443	Radar breath detection distance setting for reducing radar false alarm rate Reduces interference outside the detection range

						0x08:4m 0x09:4.5m 0x0a:5m 0x0b: 5.5m 0x0c: 6m 0x0d: 6.5m 0x0e: 7m 0x0f: 7.5m 0x10: 8m 0x11: 8.5m 0x12: 9m 0x13: 9.5m 0x14: 10m			
	Reply	5359	08	0a	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m 0x08:4m 0x09:4.5m 0x0a:5m 0x0b:5.5m 0x0c:6m 0x0d:6.5m 0x0e:7m 0x0f:7.5m 0x10:8m 0x11: 8.5m 0x12: 9m	sum	5443	Default value is 5m

						0x13: 9.5m 0x14: 10m			
Motion trigger boundary setting	Issued	5359	08	0b	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m 0x08:4m 0x09:4.5m 0x0a:5m 0x0b:5.5m 0x0c:6m 0x0d:6.5m 0x0e:7m 0x0f:7.5m 0x10:8m 0x11: 8.5m 0x12: 9m 0x13: 9.5m 0x14: 10m	sum	5443	Human activity detection distance setting, used to reduce the rate of false radar alarms. Reduce the detection range outside the door, the interference of walking outside the glass door
	Reply	5359	08	0b	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m 0x08:4m 0x09:4.5m	sum	5443	Default value is 5m

						0x0a:5m 0x0b: 5.5m 0x0c: 6m 0x0d: 6.5m 0x0e: 7m 0x0f: 7.5m 0x10: 8m 0x11: 8.5m 0x12: 9m 0x13: 9.5m 0x14: 10m			
Status judgment threshold query									
Presence judgment threshold setting query	Issued	5359	08	88	0001	0f	sum	5443	
	Reply	5359	08	88	0001	Range:0-250	sum	5443	
Motion range trigger threshold setting query	Issued	5359	08	89	0001	0f	sum	5443	
	Reply	5359	08	89	0001	Range:0-250	sum	5443	
	Issued	5359	08	8a	0001	0f	sum	5443	

Presence-aware boundary setting queries	Reply	5359	08	8a	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m 0x08:4m 0x09:4.5m 0x0a:5m 0x0b:5.5m 0x0c:6m	sum	5443	

						0x0d: 6.5m 0x0e: 7m 0x0f: 7.5m 0x10: 8m 0x11: 8.5m 0x12: 9m 0x13: 9.5m 0x14: 10m			
Motion trigger boundary setting query	Issued	5359	08	8b	0001	0f	sum	5443	
	Reply	5359	08	8b	0001	0x01:0.5m 0x02:1m 0x03:1.5m 0x04:2.0m 0x05:2.5m 0x06:3m 0x07:3.5m 0x08:4m 0x09:4.5m 0x0a:5m 0x0b:5.5m 0x0c:6m 0x0d:6.5m 0x0e:7m 0x0f:7.5m 0x10:8m 0x11: 8.5m 0x12: 9m 0x13: 9.5m 0x14: 10m	sum	5443	

E. Time logic parameter setting/query

Time parameter setting									
Motion trigger time setting	Issued	5359	08	0c	0004	Time information (4 bytes), in ms, default 150ms	sum	5443	Time accumulation for motion triggering, multiple judgment triggering to reduce false alarms. Can be used with motion amplitude trigger threshold and motion trigger boundary for performance qualification
	Reply	5359	08	0c	0004	Time information (4 bytes)	sum	5443	Unit ms, default 150ms
Motion to rest time setting	Issued	5359	08	0d	0004	Time information (4 bytes), in ms, default 3s	sum	5443	This parameter setting is used to report the duration adjustment of the current human motion state. In conjunction with the stationary and motion trigger threshold setting conditions, the approximate state of the human motion amplitude in the environment is completed.
	Reply	5359	08	0d	0004	Time information (4 bytes)	sum	5443	Unit ms, default 3s
Enter unmanned state time setting	Issued	5359	08	0e	0004	Time information (4 bytes). Unit ms,default 30s	sum	5443	The radar continues for a period of time without detecting respiratory micro-motion, it will automatically enter the unoccupied state. This parameter is used to manually set the time setting for fast entry into unoccupied.
	Reply	5359	08	0e	0004	Time information (4 bytes)	sum	5443	Unit ms,default 30s
Time parameter query									
Campaign trigger time setting query	Issued	5359	08	8c	0001	0f	sum	5443	
	Reply	5359	08	8c	0004	Time information (4 bytes)	sum	5443	

Motion to rest time setting query	Issued	5359	08	8d	0001	0f	sum	5443	
	Reply	5359	08	8d	0004	Time information (4 bytes)	sum	5443	
Enter unoccupied time setting query	Issued	5359	08	8e	0001	0f	sum	5443	
	Reply	5359	08	8e	0004	Time information (4 bytes)	sum	5443	

Appendix 1: About data instruction generation routines

Example: Existence information query

The data construction for the presence information

query is confirmed by the protocol table above:

Frame header: 0X53 0X59

Control word:

0X80

Command

word: 0X81

Length identification: 0X00 0X01

Data: 0X0F

Checksum: 1Byte (SUM)

End of frame: 0X54

0X43

Combined into a complete command as

53 59 80 81 00 01 0F sum 54 43

Checksum sum:

(0X53+0X59+0X80+0X81+0X00+0X01+0X0F) = 0X01BD

Take the lower byte to get sum = 0XBD

So the complete existence information query command is: 53 59 80 81 00 01 0F BD 54 43

10. Contact information

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11. Revision History

Revision	Release Date	Summary	Author
V1.0	2022/8/19	First draft	Mrak, OF_Frank
V1.1	2022/9/16	Modify some protocol contents and add custom mode protocol.	Ocean
V1.2	2022/9/19	Modify some explanatory terms, such as static value → spatial static value.	Ocean

V1.3	2023/1/31	a. In radar information reporting, increase the interpretation of speed information values and modify the interpretation of standstill distance; b. Modify some parameters in the function details; c. Redefine the name of the scene mode	Ocean

V1.4	2023/2/28	Deletion of probe range limit information settings and query protocol commands	Ocean
v1.5	2023/3/3	Add some protocol explanations	Ocean
V1.6	2023/5/9	Delete the protocol instructions related to body movement and proximity away in the custom parameters; add the boundary setting parameters of dynamic and static; add the parameters of dynamic and static distance	Ocean