

24G Radar Altimeter (SR-PA24R) User Manual

Version: V1.0



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Version History

Date	Version	Description
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1 SR-PA24R Introduction

SR-PA24R is a professional 24G millimeter-wave radar altimeter for industrial drones. It uses 24GHz-ISM frequency band, with 2cm measurement accuracy, compact size, high sensitivity, light weight, easy integration and stable performance. The radar can output the distance from the drone to the ground in real time with strong anti-interference ability. It can work in the all-weather environment. The product can be directly adapted to DJI A3/N3 FCU, DJI M600 Pro, Pixhawk and other flight platforms.

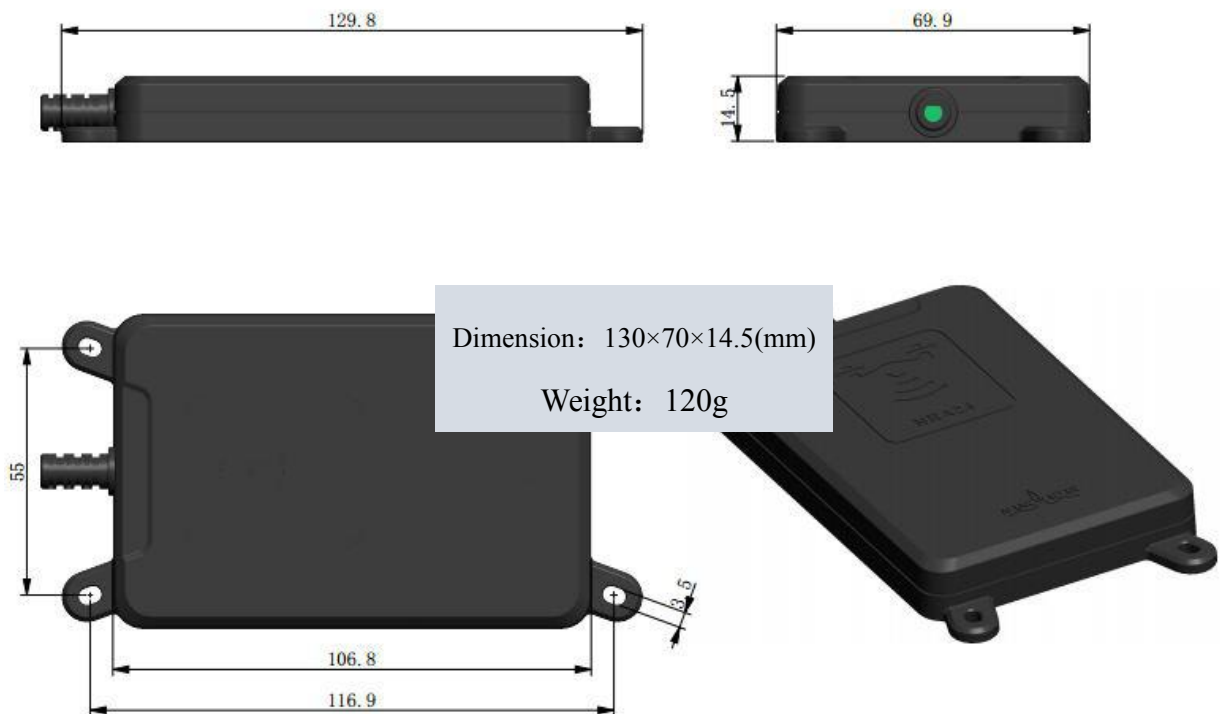


Figure 1 SR-PA24R outline

2 Precautions

- (1) The power supply pin needs to be externally connected to a 5~12V DC regulated power supply;
- (2) Fix the radar SR-PA24R with 4 M3 screws.

3 Radar Parameter

Table 1 Parameter

Parameter	Specification
Transmitting frequency	24.00-24.20GHZ
Detection range	≥100m
Measurement accuracy	± 0.02m
Beam wave width	Azimuth28°, Elevation 18°
Interface	UART
Working voltage	5~12VDC
Consumption	1.5W(typical value)
Working Temperature	-40~80°C
Weight	120g
Dimension	130x70x14.5mm(LxWxH)

4 Quick use steps

4.1 Pin Definition

SR-PA24R Interface pin definitions, as shown in Table 2:

Table 2 SR-PA24R pin definition

Pin	Definition	Range
1	VCC(red)	5~20V DC
2	GND(black)	-
3	UART_RX (white)	TTL 3.3V DC
4	UART_TX (yellow)	TTL 3.3VDC

4.2 Test

Use USB to serial device to connect the output serial port, connect the USB port to the PC serial port debugging assistant software, the radar output data will be displayed.

For details, please refer to the serial data protocol description. The test tools or software is shown in the following table:

Table 3 Product test tool

No	Device	Qty
1	SR-PA24R	1
2	PC	1
3	USB to TTL adapter	1
4	5V or 12V power adapter	1
5	Serial port debugging assistant software	1

Note: The TX and RX pins of the USB to TTL adapter and the TX and RX pins of the SR-PA24R Radar need to be cross-connected.

5 Data Parsing

The 24G radar altimeter outputs data through the serial port, 115200bps, 8N1, no data no output, the specific protocol format is as follows:

Table 4 Data parsing

Data type	Number of bytes	Description
Header byte	1Byte	static, 0x48
Height data	2Bytes	The lower 8 bits are in the front, the higher 8 bits are in the back; the unit is cm; the signed integer is used, and the highest bit of each byte should be discarded when acquiring data;

Radar altimeter 3-byte protocol: 0x48, DataL, DataH; In order to adapt to open source flight control, the actual distance is calculated in the following formula:

$$\text{actual distance (cm)} = [(DataH \& 0x7F) * 128 + (DataL \& 0x7F)] * 2.5。$$

6 Open source platform

The SR-PA24R is compatible with the open source flight control altimeter protocol

and can be directly connected to the general open source flight control platform. The following is a brief description of the integrated application settings of the SR-PA24R on the APM flight control platform.

Flight Control Hardware: PixhawkV3

Flight Control Software: ArduPilot Copter 3.5.5

Ground station software: MissionPlanner 1.3.62

6.1 Radar installation and wiring

The radar serial port is connected to the pixhawk TELEM2 interface. The radar power supply needs to be powered separately. The interface definition is as follows:



TELEM 1 & 2

Pin #	Name	Dir	Wire Color	Description
1	VCC_5V	out	red / gray	Supply to GPS from AP
2	MCU_TX	out	yellow / black	3.3V-5.0V TTL level, TX of AP
3	MCU_RX	in	green / black	3.3V-5.0V TTL level, RX of AP
4	MCU_CTS (TX)	out	gray / black	3.3V-5.0V TTL level or TX of AP
5	MCU_RTS (RX)	in	gray / black	3.3V-5.0V TTL level or RX of AP
6	GND	-	black	GND connection

Pic 2 pixhawk TELEM2 interface definition

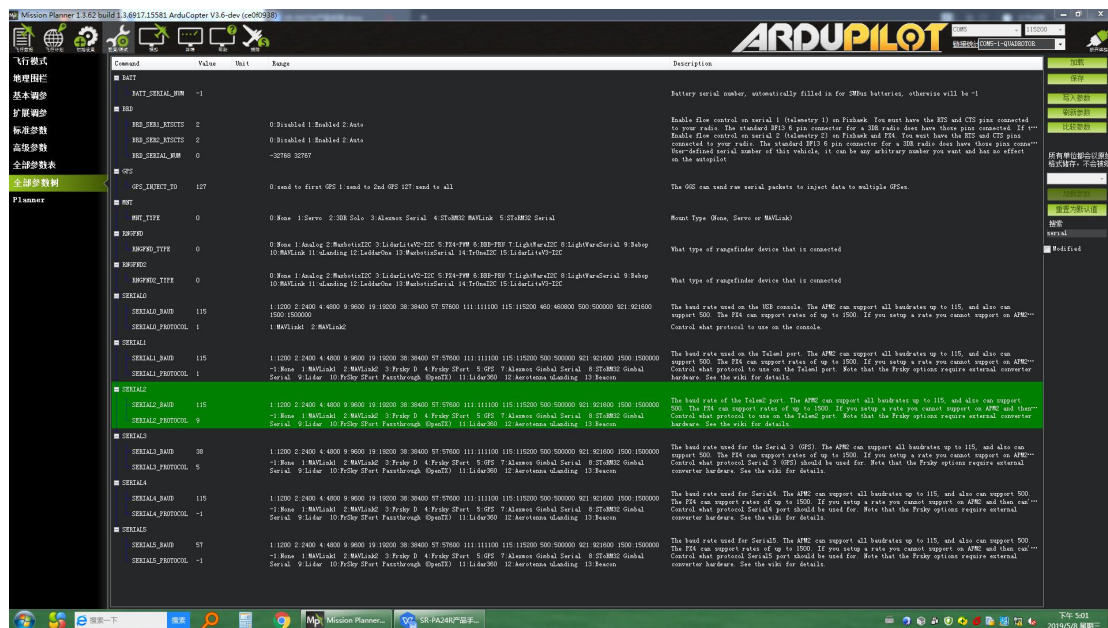
For the installation method, please refer to the following figure (taking the D600 M600 Pro flight control platform as an example):



Fig 3 Radar Installation reference

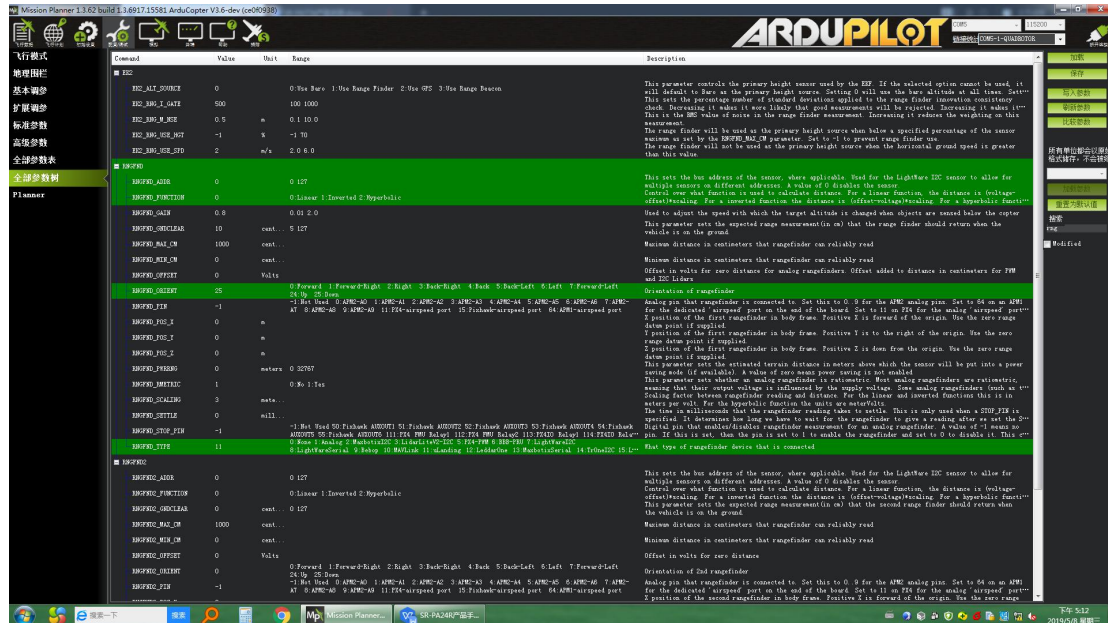
6.2 MissionPlanner Ground station for flight control parameter setting

(1) Set the TELEM2 serial port parameters, the SERIAL2 baud rate is set to 115200bit/s (SERIAL2_BAUD is set to 115), and the communication protocol is set to Lidar (SERIAL2_PROTOCOL is set to 9), as shown in the following figure:



Pic 4set TELEM2 serial port parameter

(2) Set the radar library parameters, set the radar type to ulanding (RNGFND_TYPE is set to 11), and set the radar installation direction to vertical downward (RNGFND_ORIENT is set to 25), as shown in the following figure:



Pic 5 Set radar library parameter

Finish set above parameters and save the setting, then restart the flight control to test the radar outdoors.

7 FAQ

(1) What is the angular accuracy of the SR-PA24R?

The SR-PA24R is a 24GHz radar sensor is with one transmitter one receiver antenna, which can not be used to measure the angle of the target.

(2) When SR-PA24R facing vegetation and ground/water surface when measuring height, which target will be subject to it?

The SR-PA24R is a millimeter-wave radar with high range accuracy developed by our company. In practice, the height should be divided. If the height is less than 3m, the airflow under the aircraft is large and the vegetation is likely to be blown away. The

reference point is the ground or the water surface. If the aircraft fly above 5m, the airflow will not affect the vegetation below. If the vegetation density is high, then the detected height will be the distance from vegetation to the aircraft.