Follow-Me User Manual V1.0

Firmware Version：Anchor：V1.5.9，Tag：V1.1.11

FM Tool Version：V1.0.7

Product Series：Follow-Me

Contents

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1 Introduction

The Follow-Me product series includes an Anchor and a Tag. The Anchor is installed on a carrier such as an agent, and when paired with the Tag, it enables 360° ranging and angle measurement, which can be applied in scenarios such as high-precision, high-experience following and short-range positioning. Among them, the FM-RC1 model Tag can be used with a supporting 2.4G receiver to remotely control the movement of the agent at the same time;

- For more information, please refer to Reference.

2 Interface Definition

This chapter describes the hardware interface. For the protocol interface, please refer to Follow-Me Protocol.

The FM-A1 (Anchor) main unit uses an M8 aviation plug (male), which includes VCC and GND power supply interfaces and a UART interface. The interface definition of the M8 aviation plug and the interface definition of the accompanying adapter cable are shown in Figure 1 and Figure 2. For pin functions, please refer to Table 1; The accessories include an M8 8P female to GH1.25 4P male terminal adapter shielded cable for quickly using the module to view data.

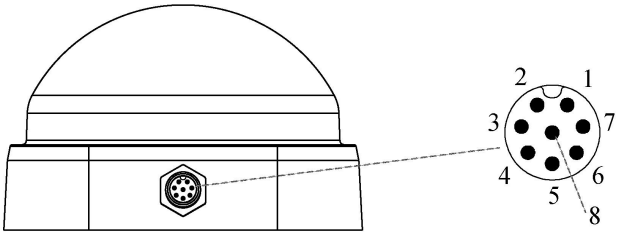

Figure 1: FM-A1 Aviation Connector Assignment Diagram

Table 1: FM-A1 Aviation Connector Pin Function Table

M8 Aviation Plug Pin	Signal	Function	Color	Description
8	VCC	Power Supply	Red	Refer to the Datasheet for the supply voltage range.
2	GND	Ground	Black	
3	UART_TX	UART Data Output	Yellow	TTL level, 3.3V voltage threshold.
4	UART_RX	UART Data Input	Blue	
1、5、6、7	NC	Reserved	—	Unused interfaces should be left floating.

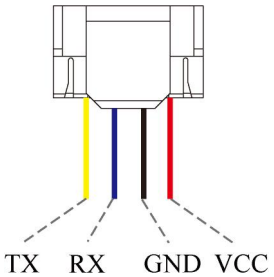

Figure 2: GH1.25 Terminal Pin Sequence of the Adapter Cable

Connect the included adapter shielded cable to the Anchor main unit via the aviation plug, tighten the flange nut of the aviation plug, connect the GH1.25 terminal at the other end of the cable to the

NUTT (TTL to USB level conversion) module in the accessories, and connect the NUTT module to the computer to view data.

3 Anchor Positioning Coordinate System and Angle Definition

The Anchor positioning coordinate system and angle definition are shown in the following figure:

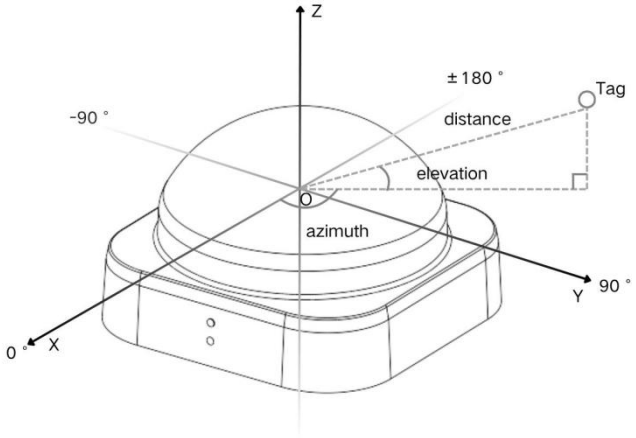

Figure3: Positioning Coordinate System and Angle Definition

The center of the Anchor is the coordinate origin O. The direction of the indicator light and button corresponds to the positive direction of the X-axis, with an azimuth angle of 0°. The direction of the aviation plug corresponds to the negative direction of the X-axis, with an azimuth angle of ±180°. The Z-axis is vertically upward, and the XYZ axes form a right-hand coordinate system. The angle between the line connecting the Tag and the Anchor and the XOY plane is the elevation angle, and the angle between the projection of the line connecting the Tag and the Anchor on the XOY plane and the positive direction of the X-axis is the azimuth angle. It is generally recommended to install the Anchor with the positive direction of the X-axis facing the front of the carrier.

4 Installation Method and Precautions

The Follow-Me series utilizes UWB (Ultra-Wideband) wireless electromagnetic waves for ranging and angle measurement. However, if there is an obstruction between the Anchor and the Tag, or if the devices are installed too close to large-area reflective surfaces (such as glass, metal, etc.), multipath effects may occur, which can degrade ranging and angle measurement accuracy.

In general, the closer an obstructing object is to the Anchor or Tag, the greater its negative impact. Obstruents such as metal and the human body exert a much stronger blocking effect than non-metallic materials like plastic. Furthermore, the further the Anchor and Tag installation positions are from large-area reflective surfaces, the lower the probability of generating multipath effects.

Adjusting certain Anchor parameters (such as maximum acceleration) can help identify and filter out some abnormal data caused by multipath effects. However, employing a proper and reasonable installation method is the most effective way to fundamentally maximize ranging and angle measurement precision.

The recommended installation methods and precautions are as follows:

- If the operational space height of the Tag is higher than the carrier (e.g., robotic dogs, small wheeled robots, etc.): It is recommended to install the Anchor on the highest plane or position of the carrier. To minimize the probability of multipath effects, keep it as far away from large glass or metallic objects as allowed by your configuration. Additionally, ensure the installation position is free from obstruction by other structural parts.
- If the operational space height of the Tag is lower than the carrier (e.g., UAVs/drones, tall humanoid robots, etc.): The installation position can be selected based on actual conditions. For UAVs, it is recommended to mount the Anchor underneath the drone fuselage. For humanoid robots, consider using 3 to 4 non-metallic brackets to elevate the Anchor at the head position, or mount it inverted with the Z-axis pointing downward.

5 Pairing Process

5.1 UWB Pairing

The Anchor and Tag only support one-to-one pairing. Pairing is completed by default in the factory state, and no secondary operation is required; for other requirements, please follow the steps below.

Note: The indicator light and button of the FM-A1 (Anchor) are located at the front of the device, and the indicator light and button of the FM-RC1 (Remote Control Tag) are located at the tail of the remote control.

5.1.1 New Pairing

1. After the device is powered on, refer to the UWB Pairing, and confirm through the indicator light that the pair of Anchor and Tag that need to be paired are in the unpaired state. If they are in the paired state, both need to be unpaired first.
2. Pairing via buttons: The spatial distance between the Anchor and the Tag is less than 1m. Press and hold the buttons on both sides to keep them in the pairing state (blue light is on). When the green light flashes quickly, it indicates that the pairing is successful.
3. Pairing via upper computer: Connect the device to the upper computer via a wired connection, click the start pairing button, and the device enters the pairing state (blue light is on). Then immediately put the other device into the pairing state via the button or upper computer. The distance between the two devices is within 1m. When the green light flashes quickly, it indicates that the pairing is successful. If pairing is not successful within 10s, it will automatically return to the unpaired state.

5.1.2 Cancel Pairing

1. Judge whether the device is in the paired state through the indicator light.
2. Press and hold the button to cancel pairing or click the cancel pairing button corresponding to the Anchor or Tag area on the upper computer, and judge through the indicator light that it returns to the unpaired state.

5.1.3 Restore Pairing

Prerequisite: The Anchor/Tag hardware has been paired, and one party has returned to the unpaired state by pressing and holding the button/upper computer.

- One party is in the paired state, and the other party is in the unpaired state. Within the communication range of the paired node, for the unpaired party, press and hold the button/click start pairing on the upper computer to automatically restore pairing (green light blink).

5.2 Remote Control and Receiver Pairing

The remote control and receiver are paired successfully before leaving the factory. If users need to replace with another receiver, please follow the steps below for pairing:

1. Press and hold the power buttons on both sides of the remote control to turn it on. Press and hold the icon to unlock it, then click the icon to enter 【SYSTEM】, then select 【RX Bind】.
2. Connect the pairing cable to the BIND/VCC interface on the receiver.
3. Connect the power cable to any other interface on the receiver. The indicator light on the receiver starts flashing quickly, indicating that the receiver has entered the pairing state.
4. After successful pairing, the transmitter automatically exits the pairing interface. At this time, the indicator light on the receiver stops flashing quickly and stays on.
5. Disconnect the pairing and power cables from the receiver. Then reconnect the power cable to the BIND/VCC interface.
6. Check whether the transmitter, receiver, and model are working normally. If there is an abnormality, repeat the above steps to pair again.

6 FM Tool

6.1 Software Installation

Download FM Tool to an independent path, and double-click to open the software to complete the installation.

If using the NUTT (TTL to USB level conversion) module included with the product to connect to the computer, it is recommended to install CH343 Serial Driver.

6.2 Usage Method

This section briefly describes the usage method using the FM-A1 (Following Anchor) and FM-RC1 (Following Remote Control) as examples.

First, ensure that the Anchor and Tag have been paired. For pairing operations, refer to the UWB Pairing.

After connecting the Anchor to the computer (refer to the Interface Definition), place the Anchor in a relatively open area (for precautions during actual installation, refer to the Installation Method and Precautions). Open the FM Tool software, select the serial port number corresponding to the Anchor in the upper left menu bar, the default baud rate is 921600, then click the connect button on the right to connect the Anchor. If the connection is successful, the Anchor hardware status area at the bottom of the main page displays information about the Anchor, indicating successful identification.

Then press and hold the power buttons on both sides of the FM-RC1 panel to turn it on and power the Tag. Observe the minimum working distance parameter (unit:meter) displayed in the Anchor positioning parameter area on the main page of the upper computer. Move the Tag away from the Anchor beyond this minimum working distance. The Tag information can be obtained in the Tag hardware status area on the main page, and the variable curves can be seen refreshing in the one-dimensional window that is opened by default, indicating that the Anchor and Tag have successfully established a connection and communication (if there is no one-dimensional window, users can adjust the number of one-dimensional windows to 1 in the menu bar).

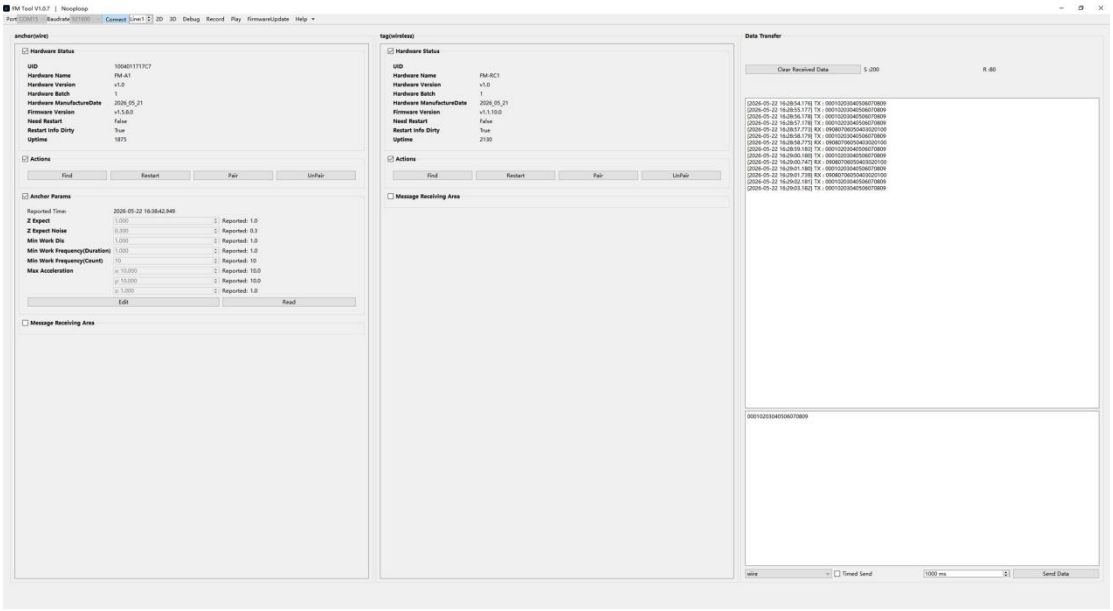

Figure 4: FM Tool Main Interface

Observe Data: In the one-dimensional page, users can check and view the change curves of each variable output by the Anchor. Click to open the two-dimensional or three-dimensional page in the main page menu bar to view the two-dimensional and three-dimensional trajectories of the Tag under the coordinate system and angle definition defined by the Anchor. For the meaning of variables, please refer to the Anchor Positioning Coordinate System and Follow-Me Protocol related content.

The ranging information is output at a fixed frequency of 25Hz by default. Due to the abnormal value processing mechanism, the output frequency of positioning information and angle information may be lower than 25Hz in case of occlusion or severe multipath effects.

Data Transmission Function: Users can connect the paired Anchor and Tag (only for models with an open UART interface) to two upper computer software respectively, and refer to the prompts on the main page to transmit a small amount of data bidirectionally in the data transmission window on the right.

Obtain Data: The default UART interface configuration of the device is 921600 bps, 8 data bits, 1 stop bit, no parity, and no flow control (TTL 3.3V active high). Users can connect the device to controllers such as PC, flight controller, single-chip microcomputer, Raspberry Pi, Arduino, etc. (after level conversion and physical interface conversion), program to receive data through the serial port, and then refer to the Follow-Me Protocol to obtain real-time data (Note: The the output protocols of the Anchor and Tag are different). Or refer to the released driver packages for application.

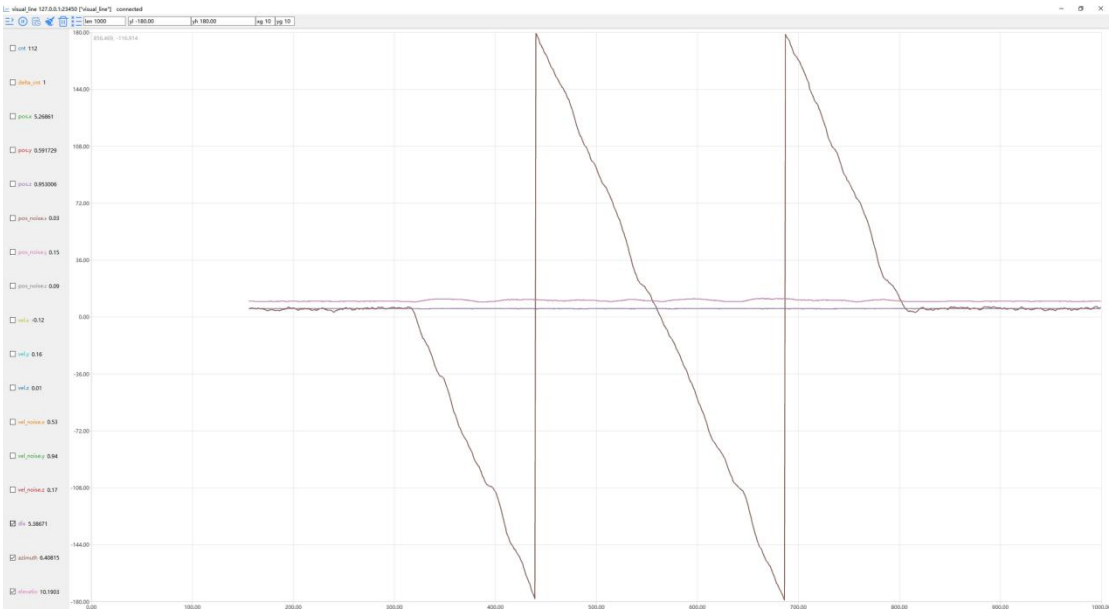

Figure 5: FM Tool One-Dimensional Interface

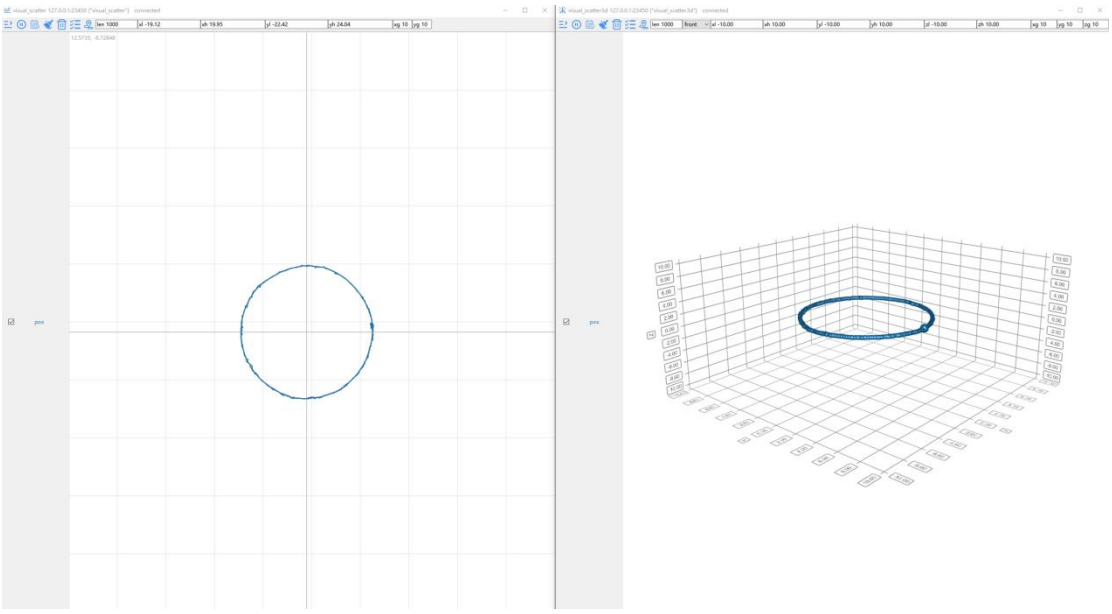

Figure 6: FM Tool Two-Dimensional and Three-Dimensional Interface

Meaning of Key Parameters:

Minimum Working Distance (m): When the spatial straight-line distance between the Anchor and the Tag is greater than this value, the angle and coordinates will be output. Setting it to an appropriate value can prevent abnormal data output that may occur when the distance is too close and exceeds the elevation angle range. If necessary, users can increase or decrease this parameter or keep it default.

Maximum Acceleration (m/s^2): The smaller the parameter value, the higher the filtering degree of the output result, and the greater the delay. When the parameter value is large, such as set to 50, no filtering is performed at all. It is recommended to set it according to the maximum 3-axis motion acceleration of the Tag. For example, if the maximum motion acceleration of the x-y-axis of the Tag is less than $3m/s^2$in most cases, set the maximum acceleration parameter of the x-y-axis to $3m/s^2$.

Minimum Working Frequency Statistics Time (s) and Minimum Working Frequency Statistics Quantity: Assume the time and quantity are set to 0.5s and 5 frames respectively. If the number of valid filtered data frames in the last 0.5s is less than 5, the current frame will not be output to prevent abnormal data when there is too little valid data. It is generally recommended to keep the default value or change it according to requirements after understanding the meaning.

6.3 Record Data and Playback

Figure 7: FM Tool Record and Playback Buttons

Click the record button in the menu bar of the upper computer software to start recording, and click the record button again to end recording. The recorded data is the data received by the upper computer software from the following device during the period from the first click of the record button to the second click of the record button. The recorded .log file is saved in the "data--record" folder in the upper computer software directory, and the file is attached with a timestamp. If users need to rename it, it is recommended to keep the timestamp and add a description after the timestamp. If users encounter problems that need to be analyzed, provide the corresponding .log file to the FAE engineer for analysis.

Click the playback button in the menu bar, select the .log file to be played back, and users can play back the previously recorded data.

6.4 Firmware Update

In some cases, the firmware of the device can be updated online through the upper computer. It is generally not recommended to update the firmware by users. If users really need to update or roll back the firmware, please contact the FAE engineer to confirm information such as firmware version compatibility before updating the firmware.

Wired Firmware Update (Recommended): Connect the device that needs firmware update to the upper computer, and after successfully obtaining the information:

1. Click the firmware update button in the secondary menu of the help menu of the upper computer software to open the firmware update page;
2. Select wired connection for the connection type;
3. Select the currently connected device (Anchor/tag, be sure to select the correct one here), select the firmware version users want to update to, and keep other parameters default;
4. Click Start Update;
5. Wait for the progress bar to reach 100% and the main page of the upper computer successfully reads the firmware version information after the update, indicating that the update is successful.

Note: Do not power off during the update process.

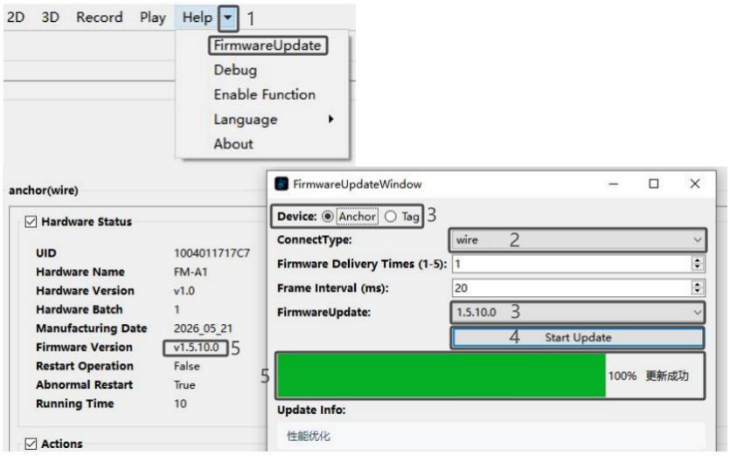

Figure 8: Firmware Update Flowchart

7 Working Status

The Follow-Me device indicates the working status through the indicator light. The corresponding relationship between the indicator light status and the UWB working status is shown in the following table:

Table 2: Corresponding Relationship Between Indicator Light Status and UWB Working Status

Indicator Light Status	Working Status
Green Light Flashes Quickly	Paired, Bidirectional Interaction in Progress
Blue Light Stays On	Pairing in Progress
Blue Light Flashes Once Every 1S	Paired, No Bidirectional Interaction in Progress
Blue Light Flashes Once Every 5S	Unpaired

8 FAQ

Q1: Must the upper computer software system run on the terminal for the system to work normally ?
No. All networking and positioning calculations are completed in the module. The upper computer software is mainly responsible for monitoring, display, and configuration functions.

9 Reference

[1] Datasheet
[2] Follow-Me Protocol
[3] FM Tool
[4] CH343 Serial Driver

10 Update Log

Table 3: Update Log

Version	Date	Description
1.0	20260530	1. Release Initial Version Manual

11 Contact Us

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