

MF18

Auto Antenna Tracking System

Introduction / Instruction / Installation

Disclaimer

- Please read the user's manual carefully before use. Be sure to pay attention to the warnings and understand all points completely.
- This product is a sophisticated mechanical device. Please use it in strict accordance with the user manual. Our company and agent will not take legal responsibility for the damage of equipment or personnel caused by the installation and modification of users.
- This product is only suitable for flight model or civilian drone. Due to strong electrical interference or GPS signal is too weak, the accuracy of the tracking will be affected. Users need to bear the risk themselves when using this product.
- This copyright of this manual belongs to Shenzhen Mainlink Aero Communication Technology Co., LTD. No one may make copies without written consent.

Caution

Attention to installation

1. Make sure that the voltage is within the range of use. Otherwise, it may cause irreversible damage to the device.
2. Pay attention to the line sequence of the power supply

Before use

1. Make sure that all cables are connected correctly and firmly.
2. No foreign objects (e.g. liquids, sand, etc.) can be entered inside the device.
3. It takes 20 seconds for the device to start. Video and data cannot be transferred until the device has finished booting.

Get instructional video

In order to use the system correctly, you can get the instructional Video at the following address:

<https://mainlinkaero.com/cn/video/video-main.html>



Content

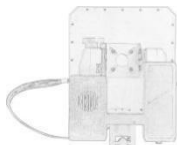
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Packing list

Device X 1



Front view



Backward view

Accessories

XT60 cable X 1

antenna X 1



For power supply

WIFI antenna

SBUS convert cable X 1



- 1: black , GND
- 2: red, Vcc
- 3: white, Sbus signal

For remote controller Sbus to wireless transmission system Sbus

Overview

In the long range drone application scenario, high gain directional antenna has better performance in receiving wireless signal. While the higher the gain of the directional antenna, the narrower the beam width. So we design this auto antenna tracking system MF18. It includes a number of functional components: High gain directional antenna, auto tracking motor, WIFI module and Sbus signal retransmission unit. MF18 has high integration level. It is very suitable for long-distance drone.

MF18 is compatible with Mavlink protocol. So it can get the latitude, longitude and altitude data from the drone, which can be used to calculate the real-time position of the drone. By controlling the movement of the motor, MF18 can ensure the directional antenna is aimed at the drone. If the flight control data is not Mavlink protocol, we can also provide customized solution. In this way, there is no need to add extra equipment to the drone.

MF18 can be used with M51、M52 and 4G transmission system M61. We have designed rich interface to meet the diverse needs of wireless transmission. Please refer to the relevant section below.

In a typical application, we use MF18 to work with M52, the drone flight controller is Pixhawk. When the ground unit of M52 receives the drone data, it transmits the data to MF18 through UART1 and transmits the video stream through ethernet. MF18 transmits the data and video to upper computer through WIFI. User can use Mission Planner or QGC on the computer to control the drone and watch real-time video.

Features

Tracking capability

Maximum horizontal rotation speed	300°/S
Maximum pitch rotation speed	60°/S
Maximum horizontal rotation angle	unlimited
Maximum pitch rotation angle	-15~+135°
Horizontal tracking error	< 0.5°
Pitch tracking error	< 0.1°

Power consumption and weight

Average power consumption	<15W
weight	4kg

Transport protocol

Flight controller	Mavlink/Customized
WIFI	2.4G/5.8G
Remote control	Sbus

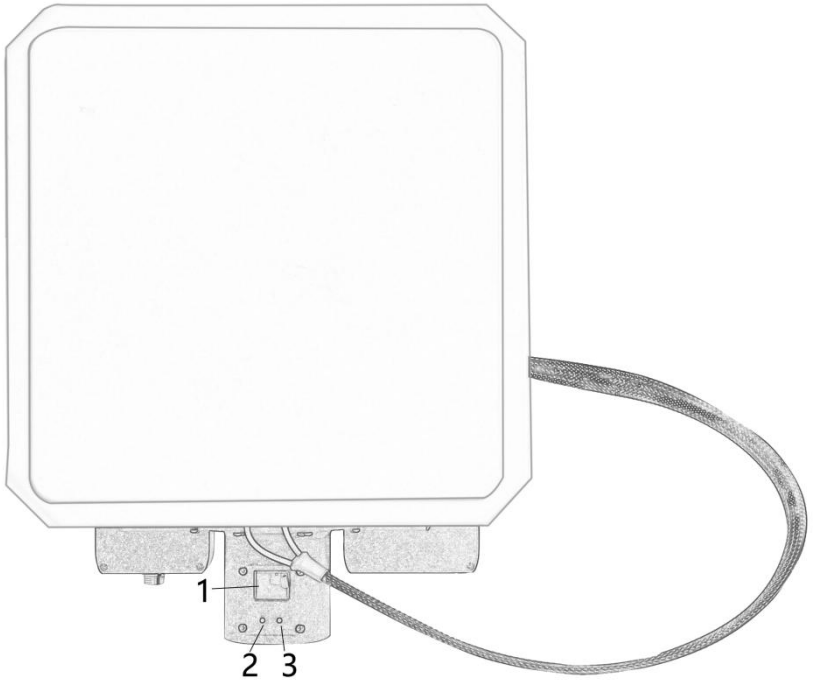
Power range

DC 11V~16V	Battery 3S~4S
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Work temperature

-20°C ~ +60°C

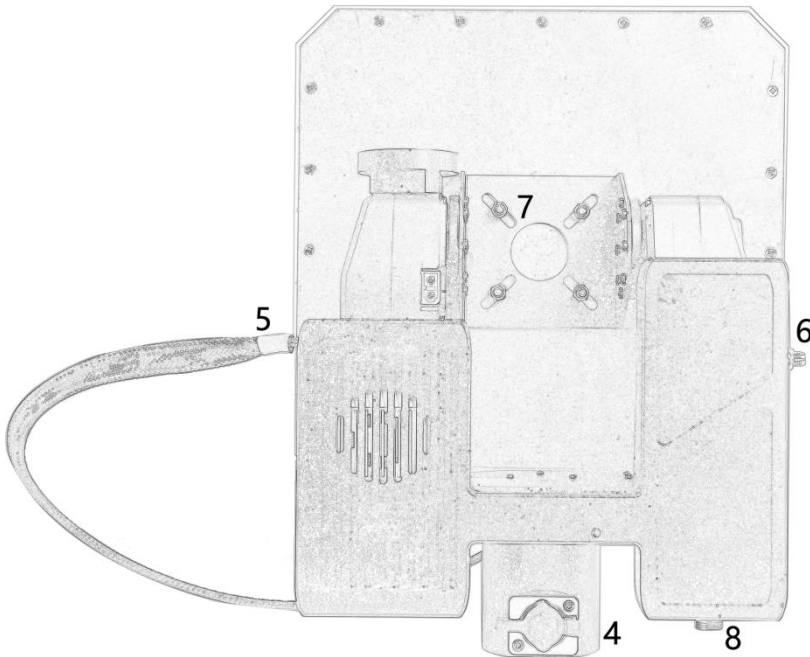
MF18 Interface Description



Front view

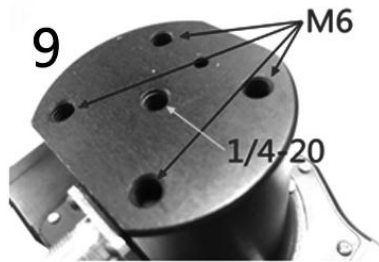
- 1、LCD display: Used to display the status and menus of MF18.
- 2、Button L: left button, short press*1 to switch working mode (Online/Offline) , long press*1to enter/exit setting menu.
- 3、Button R: right button, short press to set “Home” position. After entering the setting menu, short press to select the current setting.

**1: A short press requires less than one second of keystroke time. A long press requires more than 1.5S keystroke time. All button operations in the text are in accordance with this provision.*



Backward view

- 4、RJ45 network interface: this port has been connected to the network port of video transmission system. When connecting to the computer through a network cable, user can get video and data from this port directly.
- 5、RF cable of directional antenna: When working with M51 or M52, connect the antenna connector to this connector.
- 6、WIFI antenna connector: SMA connector, this is the WIFI antenna connector.
- 7、Mounting bracket for antenna: Attach the antenna to this bracket, please keep the RF cable downward. When installing the antenna, tighten the screws. Factory matched antennas are recommended.
- 8、SBUS transfer: When MF18 works with M51 and M52, connect this interface to remote controller Sbus port using the cable in the accessory box. The system will transmit Sbus signal to flight controller transparently.



Base for install

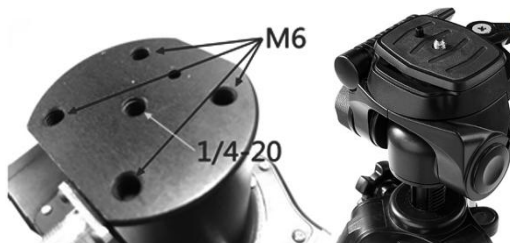
9、Mounting holes: There are standard 1/4-20 mounting holes at the bottom of the tracker. Please mount the tracker on a sturdy tripod.

MF18 Instruction

Quick start

1、 Fixed the tracker

Mount the tracker on a sturdy tripod. Attention, when the device automatically tracks, it will turn at a large angle. Make sure the tripod is securely mounted. Our company will not be responsible for the damage of the equipment caused by human factors.



2、 The directional antenna

Generally ,please purchase directional antenna from our company. If you purchase

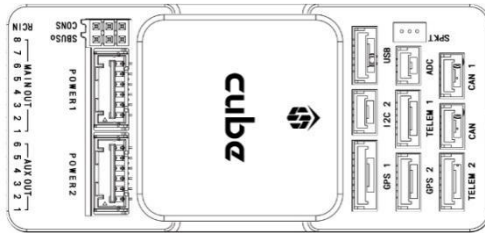
MF18 and M51/M52 at the same time, we will install all the equipment and connect the cables. The user can use the device after powering up.

3. We use MF18 working with M52 as an example.



3.1 Set up all the equipment.

We used a quadrotor drone. The flight controller is Pixhawk-Cube. Connect UART1 of M52 to TELEM1 of Cube. Connect Sbus.out of M52 to RCIN of Cube.



MF18, which integrated M52 before leaving factory, will work after supplying power. The power range is 11V~16V. User can also use 3S/4S battery.

Lithium polymer battery is recommended. Please fix the battery in the groove in the middle of MF18 with 3M glue.

3.2 Initialization of MF18

When MF18 is powered on, the pitch angle will return to horizontal zero, and then

rotate horizontally several times. The LCD display will show the following information:

- Line 1 shows Batt and GPS alternately
Batt is the supply voltage of MF18, GPS the number of satellites received .
Note: If the external GPS module is enable, The GPS of line 1 will show the the number of satellites of external GPS and drone GPS alternately. If the external GPS module is disable, the data is only the number of satellites of drone GPS.



- Line 2 shows Dist, the distance between the drone and MF18. If the home point is not set, the distance will be N/A.
- Line 3 shows Alt, indicates the altitude of drone.
- Line 4 shows Azim, indicates the azimuth of drone, which is the angle of the drone relative to MF18. North is 0 degree. East is 90 degree. South is 180 degree. West is 270 degree.
- Line 5 shows Vlink/Dlink, indicates the received Mavlink data. Maximum is 100%. The large the value , the better the signal quality.
- Line 6 shows Dir/ExDir, the current pointing angle detected by the compass.

3.3 Compass calibration

Long press button "L" to enter the setting menu.

Then short press "L" to select "CalCompass" .

Short press button " R" .

MF18 begins to rotate and calibrate the compass. After successful calibration, the LCD displays "OK" .

Then long press button "L" to exit the setting menu.

3.4 Set home position

After receiving the flight control Mavlink data, the LCD display of MF18 will show the signal strength. When the value of Vlink/Dlink reaches 100%, short press the button "L"

to set home position.

After setting the home point, the value of Dist will become 0, which means the distance between MF18 and drone is 0 meter.

If the external GPS module is enabled, the user doesn't need to set the home position.

3.5 Connect computer to MF18 via WIFI

The network hotspot name of MF18 is MF20_XXX_YY. Code is 87654321. User can connect to this WIFI network through a computer. After connection, open Mission Planner, user can get video and flight controller data. Please refer to the user's manual of M52 or watch the instructional video.

After setting up, the drone can be controlled to fly for a long distance through the ground station.

When the distance between the drone and MF18 is more than 30 meters, the tracker will automatically track the drone.



Attention: If the antenna is found to have a significant deviation from the drone, please calibrate manually. Please refer to the relevant section.

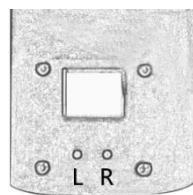
Menu operation guide of MF18

MF18 has an LCD screen to display the current information. It has two buttons: L and R. User can change the working mode or parameter settings through these buttons.

Main page and button operation

After the device is initialized, the main page information is displayed on the LCD screen.

On the main page, the functions of the buttons are as follows:



Button operation		Function
L	short press	Online/Offline working mode switching
	long press	Enter/Exit setting menu
R	short press	Set home position
	long press	None

Attention: A short press requires less than one second of keystroke time. A long press requires more than 1.5S keystroke time. All button operations in the text are in accordance with this provision.

Working mode:

Online: In this mode, the tracker gets Mavlink data from drone, and tracks the drone automatically.

Offline: In this mode, the tracker will remain in its last direction and will not update.

Setting menu and button operation

Long press “L” button in main page to enter setting menu. In the setting menu interface, the functions of the buttons are as follow:

Button operation		function
L	short press	Cycle from top to bottom to switch setting item
	long press	Back to main page
R	short press	Select or identify the current parameter
	long press	None

Details abouts setting parameter:

- **MAIN MENU** title
- **YawTrim** Fine-tune the horizontal and pitch angle

Yaw: Fine-tune the horizontal angle. Change this parameter to compensate if the directional antenna is closer or farther from the drone. The maximum value of this adjustment is ± 20 degree.

Pitch: Fine-tune the pitch angle. Change this parameter to compensate if the directional antenna is below or beyond the drone. The maximum value of this

adjustment is ± 20 degree.

- **HomePos** Record of the home positions that have been used previously.
 - UsePreHome** title
 - H1:D:800** The most recently used parameter of home position. 800 means now the distance between H1 and drone is 800 meters.
 - H2:D:XXX** The home position before H1.
 - H3:D:XXX** The home position before H2.
 - H4:D:XXX** The home position before H3.
 - H5:D:XXX** The home position before H4.
 - AutoLoad=N** Automatic loading H1 or not. Value Y stands yes while N stands no.
 - Exit** exit
- **CalCompass** Calibrate the compass.
 - Exit** exit
 - The calibration operation takes 20 seconds. Then the LCD will display "OK" .
- **MotorCurr** set the drive current for the motor
 - MotorCurr** title
 - Pitch: XXXX(ma)** 2000ma is recommend
 - Yaw: XXXX(ma)** 2000ma is recommend
 - AutoDetect:** Automatically adjusts the motor current according to the load.
- **CaliPitch** calibrate the pitch bearing
 - CaliPitch** title
 - PitchUp** Increase the pitch angle
 - PitchDown** Decrease the pitch angle
 - Save L-Pos** Save the lowest position
 - Safe H-Pos** Save the highest position
 - Safe&Exit** save and exit.
 - Exit** Exit without saving
- **CompassMod** Magnetic compass setting
 - InitOnly** Only use magnetic compass during startup. After powering up t

the device, the buzzer will beep three times. Then the tracker rotates horizontally and the pitch angle become zero.

Always Always use magnetic compass.

Never Never use magnetic compass.

ExtGPS=Y Enable/Disable the External GPS. The value Y stands for yes and N stands for no. When using external GPS, the home position of MF18 does not need to be set. When using the drone' s GPS signal, the home position need to be set after initialization.

Exit Exit

- **BaudRate** Set the uart baud rate of Mavlink flight control data.

Baud Rate title

115200

57600

38400

19200

9600

1200

Exit

- **FlightInfo** Drone information

FlightInfo title

Lon: EAST/WEST Longitude of drone

DD.DDDDDD value of longitude

Lat: SOUTH/NORTH Latitude of drone

DD.DDDDDD value of latitude

ASL: XXXm Altitude of drone

BARO: XXXm The height of drone' s barometer

HOME Lon:E/W Longitude of home position

DD.DDDDDD value of the longitude

HOME lat:N/S Latitude of home position

DD.DDDDDD value of the latitude

- H_ASL: Altitude of home position
- EXIT Exit
- **PayloadSel** Payload selection. The payload is the directional antenna. If you don't change the antenna, it doesn't need to set .
 - Light Light payload
 - Medium Medium payload
 - Heavy Heavy payload
 - UltraHeavy Ultraheavy payload
 - Exit Exit
- **OSDLevel** Not used
 - Brightness
 - Level: 0~100
 - Exit
- **VBISetting** Only for customization.
- **Protocol** Protocol for tracking.The user does not need to change.
 - Protocol** title
 - ALT=BARO/GPS** To choose which one for the altitude of drone, barometer or GPS?
 - LNK=DIGIT/ANALOG** To choose which one for tracking source.
- **TrackerID** ID of tracker. Not in use.
 - Tracker ID title
 - TrackerNo. value of tracker ID
 - Exit
- **SysInfo** System information
 - SysInfo title
 - Ver.: X.XXX Fireware version number
 - Exit Exit
- **Factory:** Factory mode, not used for user
 - Test

YawTest:

PitchTest:

AllTest:

CoreData:

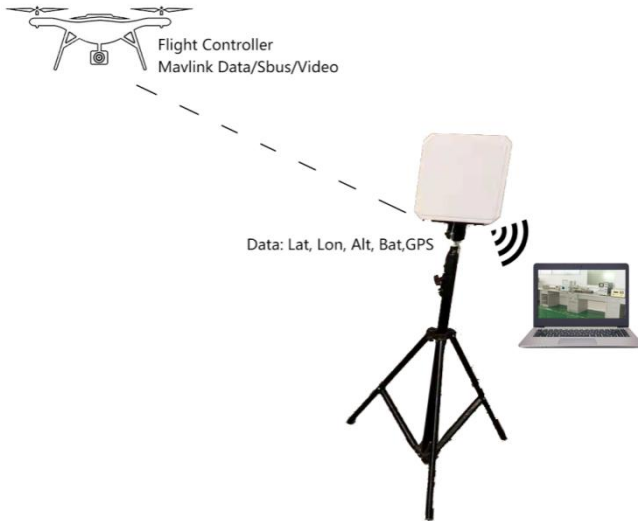
RX:

POS/OTH/ORE

EXIT

- EXIT Exit the setup menu.

Calibration of MF18



This is an introduction to you how MF18 works:

- The flight controller is connected to a wireless transmission system. Then the Mavlink flight data can be transmitted to the automatic tracking system MF18. Due to the high gain of the directional antenna, the transmission distance and the stability of the wireless link can be improved.
- The ground unit of the wireless transmission system can be integrated into MF18. The automatic tracking unit of MF18 receives real-time position information of the drone. Then the angle of the directional antenna is controlled by motors. Video and flight controller data can also be transmitted to a computer through a low-latency WiFi unit.
- MF18 also has an Sbus port. A user can add a remote receiver to this port. If the ground unit of M51/M52 is integrated into MF18, the remote signal can be transmitted transparently to the drone.

- MF18 has a magnetic compass and a GPS sensor. Because the magnetic field varies from place to place on the earth, calibrate the magnetic compass is needed before in use. When the number of received GPS stars is more than 10, the tracking accuracy is better.

Calibration of compass

As can be seen from the above, the magnetic compass needs to be calibrated before use. The method is as follow:

1. Long press “L” button in main page to enter MAIN MENU;
2. Short press “L” button to select CalCompass, then short press “R” button.

The device will automatically rotate and calibrate.

3. When the calibration is complete, the LCD will displayed “OK” . Long press “L” button to exit setting menu.



Note: Move the tripod or change the location of use, it is recommended to do a calibration again.

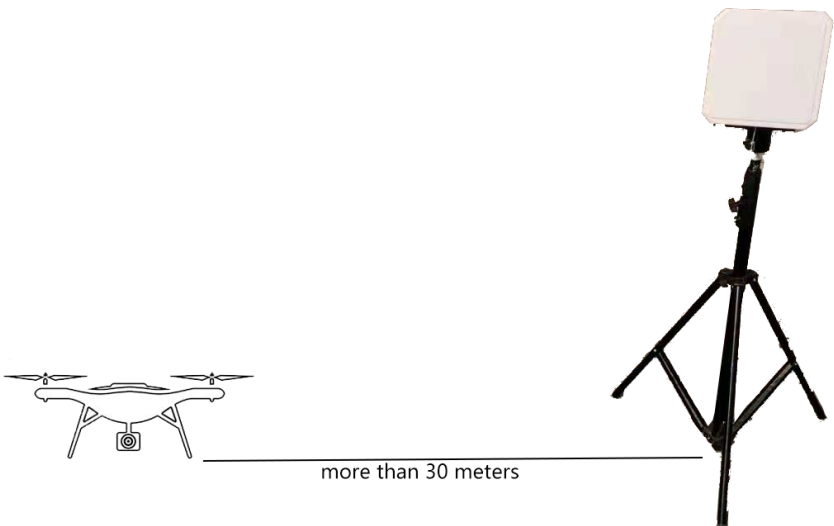
The horizontal and pitch angle calibration

Step motors are used for drive MF18 to rotate in horizontal or vertical direction. There may be some errors between the compass and GPS. The step motors may also have errors. The item **YawTrim** can be used for calibration. The method is as follow:

1. If the ExtGPS is disable, please place the drone one meter away from MF18. Power on the drone and MF18. When the value of Vlink/Dlink reaches 100%, short press button “R” to set home position. If the ExtGPS is enable, ignore this step.



2. Keep the tripod and MF18 still. Move the drone to a distance of more than 30 meters. The tracker will automatically point at the drone.



At this time, user can look at the orientation of the drone right behind the

directional antenna. If the drone is in the center of the antenna, the tracking is accurate. If you find an off-center position, follow these steps to fine tune the azimuth of the tracker.

3. Long press button "L" to enter the MAIN MENU.

4. Select "YawTrim" to fine tune the horizontal and pitch angle.

Yaw: Fine tune the horizontal angle. A positive number turns the antenna to the right. A negative number turns the antenna to the left. The maximum number is ± 20 degree.

Pitch: Fine tune the pitch angle. A positive number is to let the antenna rise while a negative number is to let the antenna be lower.

Button "L" is to change the item and Button "R" is to change the value.

After fine-tuning, the drone is located in the center of the antenna.

5. Long press button "L" to exit setting menu.



Note: Move the tripod or change the location of use, it is recommended to do a calibration again.

Internal or external GPS module



The tracker has an external GPS module and an internal GPS module. In the case of good satellites effect, the external GPS and magnetic compass can provide good tracking accuracy. At this time , user do not need to set home position.

When the external GPS signal of the tracker is weak, please use the initial position of the drone as home position. At this time , user need to turn off the external GPS module.The operation steps are as follow:

1. Long press button "L" to enter the MAIN MENU.
2. Short press button "L" to select "CompassMod" , short press button "R" to enter "CompassUse" .
3. Select ExtGPS item, change the value to Y/N to enable/disable the external GPS module.
4. After changing the status of "ExtGPS" , please recalibrate the tracker.
5. Restarting the device takes effect.

Specifications

Category	Item	Detail
Tracking performance	Maximum horizontal rotation speed	300 degree per second
	Maximum pitch rotation speed	60 degreee per second
	Maximum horizontal rotation angle	unlimited
	Maximum pitch rotation angle	-15 ~ + 135 degree
	Horizontal tracking error	< 0.5°
	Pitch tracking error	< 0.1°
	Maximum pitch torque	300N.m
	Power range	11~16V DC
	Average power consumption	<20W
Antenna specifications	Frequency	1425MHz ~ 1450MHz (800M/2.4G customizable)
	Gain	9.0±1 (800MHz and 2.4GHz will be different)
	SWR	≤1.8
	Polarization mode	Vertical
	Half lobe width	65°±5°
	Size	260*260*40mm
	Operating humidity	10% ~ 95%
	Color	White
	Material	ABS

Interface	Power	X 1 , XT60,
	Antenna interface	X 1, SMA , WIFI antenna X 2, SMA, video transmission antenna
	LCD	X 1,
	Ethernet	X 1 , RJ45
	Button	X 2

Note: The explanation right of the above product specification belongs to Shenzhen Mainlink Aero communication Technology Co., LTD.