

# Sentinel Automatic Antenna Tracker

## LITE

USER GUIDE – CONFIGURING TO USE MAVLINK

**VirtualPilot**

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This device must only be used in compliance with applicable legislation.

This use of device can be impacted by ferromagnetic / electromagnetic and GPS interference.

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Patents pending

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## Introduction

The Sentinel AAT supports tracking utilising MAVLINK protocol over Wi-Fi in addition to its default intend use of video telemetry. This enables the use of the tracker for systems using digital video or FC's that do not support video telemetry – such as Pixel OSD based Flight Controllers.

This guide shows the steps required to use the Sentinel AAT in MAVLINK tracking mode.

**RECOMMENDATION:** Choose video telemetry over CRSF / MAVLINK unless there is a good reason not to do so.

## Should I use MAVLINK or video telemetry to drive AAT?

Most UAV using antenna trackers are used with a FC that has RTH capabilities and in those situations the failure of the tracker is not usually a concern for the loss of signal and aircraft, however impact in video quality from reliability and loss of flight time is one of the most frustrating elements.

The following table highlights some of the considerations to aid your decision.

### **Special note: Consideration in the use of Wi-Fi / Bluetooth for driving an AAT.**

If you are in the proximity of either 2.4G video or 2.4G RC transmitters, these have a detrimental impact causing the Wi-Fi connections to become unreliable. Similar may occur with 900Mhz / UHF RC TX. A working setup that works fine for a solo flier may be unusable when flying with others.

	Sentinel Video telemetry	Wi-Fi CRSF telemetry	Wi-Fi MAVLINK telemetry
2.4G interference	No issue	Consider carefully for anyone using 2.4G video or flying with others using video or RC TX on 2.4	Consider carefully for anyone using 2.4G video or flying with others using video or RC TX on 2.4
Performance at distance	Typically works up to point of non-flyable video	Typically works up to loss of telemetry.	Typically works up to loss of telemetry.
Refresh rate	Up to 30hz	1-2hz	1-5hz
UAV / AAT Complexity	Firmware update only for supported systems	Typically requires Bluetooth / Wi-Fi adapter converter	Typically requires Bluetooth / Wi-Fi adapter converter
RC TX support	Independent of RC TX - supports all TX	TBS or others with MAVLINK data modem	TBS or others with MAVLINK data modem
Reliability*	Simple and least problematic	More complex with higher probability of connectivity issues	Most complex with higher probability of connectivity issues
Pixel OSD support	No	Yes	Yes
Can support iNav safe zone	Not currently	Yes	Yes
Supports launching away from AAT	*Yes – note requires arming in proximity of the AAT first	Yes	Yes
Support for HD video	No	Yes	Yes
Support for iNav SAFEHOME	No	Yes	Yes
Tracking for long periods without video	Will track once video is detected. If aircraft strays outside of antenna beam, it may not track until closer	Will track whilst RC is connected	Will track whilst RC is connected
Tracking for long periods without RC	Will track whilst video signal is present	Will track once RC has reconnected	Will track once RC has reconnected

\*Reliability is subjective. YMMV

**RECOMMENDATION: Use video telemetry unless there is a good reason not to.**

## User guide – visual indicator

*Initial power up state:* the AAT will center pan and point at an angle slightly above the horizon. The unit can be manually aimed for manual tracking if required. This state will remain until a valid telemetry signal is received.

*AAT receiving telemetry – waiting satellites / home:* when the AAT receives telemetry but satellite fix is low or not fully established, it will point horizontally and due North to indicate to the user that the AAT is waiting. 15 seconds of minimum of 6 satellites is required to set home position.

*AAT receiving telemetry – home set:* the AAT will point vertically and due North to indicate to the user that the AAT is ready. This state will remain until the FC enters FC armed state.

*AAT armed state > 10m:* when the aircraft is armed, once the aircraft has moved outside its activation perimeter (10 meters), it will engage and point at the aircraft.

*AAT armed state < 10m:* if the aircraft moves back within the activation perimeter, the antenna tracking will stop until outside the activation perimeter.

*AAT disarmed state:* the AAT will point vertically and due North to indicate to the user that the AAT is ready. (Full MAVLINK mode only)

## User guide – OLED indicator

*No HB:* No heartbeat being received.

*Wait:* Waiting for good sat fix.

*Set H:* Setting home.

*Low S:* Low sats – tracking suspended.

*Ready:* ready to fly / tracking.

*X / Y:* Packet count per 5 secs: Heartbeat / GPS.

*External:* Tracking using Mavlink or other external telemetry.

## Setting up - Requirements

- AAT tracker with release 4.0.0 minimum.
- FC (Flight Controller) that can output telemetry to RC TX
- TBS Crossfire / Tracer or similar Wi-Fi enabled device with MAVLINK over IP

## Setting up - Quick Start overview

This is intended for users who think they know what they are doing:

1. RC TX must be receiving telemetry (CRSF or MAVLINK via data)
2. TBS Crossfire configured to connect to AAT with matching protocol /port
3. AAT telemetry enabled and MAC of TBS Wi-Fi module selected

# Setting up - step guide – TBS Crossfire / Tracer setup

This is intended for users who want a step by step guide:

## CRSF telemetry. This is simplest setup.

1. TBS: Ensure Wi-Fi Module minimum of 2.04 firmware
2. TBS: Ensure TX firmware minimum of 4.11 beta
3. TBS: Load agent Agent-X
4. TBS: AgentX - Wi-Fi – select “Scan for networks”
5. TBS: AgentX - Wi-Fi – Select SSID = SSID AP name of Sentinel AAT from scan
6. TBS: AgentX - Wi-Fi – Password = password of Sentinel AAT (if set)
7. TBS: AgentX - Wi-Fi – select “Connect”
8. TBS: AgentX - Wi-Fi – set protocol = UDP, port = 8888
9. TBS: AgentX - TX – set OP Mode = normal, MAVLINK = On
10. AAT: connect PC to Wi-Fi hotspot of AAT (Leave TBS TX powered on)
11. AAT: browse to 192.168.4.1 and select external telemetry from menu
12. AAT: set external telemetry = enabled
13. AAT: set protocol = MAVLINK
14. AAT: set type = UDP, port = 8888
15. AAT: select refresh until PC and TBS MAC / IP are listed
16. AAT: select “use “for address with MAC same as TBS Wi-Fi (Not the PC MAC !)
17. AAT: Save settings



**MAVLINK telemetry. This is more complex setup and for users who wish to use full MAVLINK data link.**

1. FC: Connect serial TX of FC to MAVLINK RX pin of TBS RX
2. FC: Enable MAVLINK telemetry on FC serial port
3. FC: Set correct serial speed (115k for TBS 6.09+)
4. FC: Ensure MAVLINK stream contains Heartbeat and GPS RAW packets (see notes)
5. TBS: Ensure Wi-Fi Module minimum of 2.04 firmware
6. TBS: Ensure TX firmware minimum of 4.11 beta
7. TBS: Load agent Agent-X
8. TBS: AgentX - Wi-Fi – select “Scan for networks”
9. TBS: AgentX - Wi-Fi – Select SSID = SSID AP name of Sentinel AAT from scan
10. TBS: AgentX - Wi-Fi – Password = password of Sentinel AAT (if set)
11. TBS: AgentX - Wi-Fi – select “Connect”
12. TBS: AgentX - Wi-Fi – set protocol = UDP, port = 8888
13. TBS: AgentX - TX – set OP Mode = normal, MAVLINK = On
14. TBS: AgentX - RX – set Output MAP (typical Output 4 = MAVL TX)
15. TBS: AgentX - RX – set RF Profile = dynamic
16. TBS: AgentX - RX – set Output MAP (typical Output 4 = MAVL TX)
17. AAT: connect PC to Wi-Fi hotspot of AAT (Leave TBS TX powered on)
18. AAT: browse to 192.168.4.1 and select external telemetry from menu
19. AAT: set external telemetry = enabled
20. AAT: set protocol = MAVLINK
21. AAT: set type = UDP, port = 8888
22. AAT: select refresh until PC and TBS MAC / IP are listed
23. AAT: select “use “for address with MAC same as TBS Wi-Fi (Not the PC MAC !)
24. AAT: Save settings

**Unable to scan and find AAT?**

If TBS AgentX fails to find AAT in scan, try using AGENT-M web based or access the Wi-Fi module directly:

1. TBS: AgentX - Wi-Fi – enable AP
2. TBS: Wi-Fi – connect PC to Wi-Fi hotspot of TBS Crossfire
3. TBS: Wi-Fi – browse to 192.168.4.1 and select Wi-Fi from menu
4. TBS: Wi-Fi – with AAT turned on, select Scan
5. TBS: Wi-Fi – once found, select AAT and select connect

## NOTES: MAVLINK stream optimal settings (optional config)

The AAT uses MAVLINK HEARTBEAT and GPS\_RAW packets. It is better to only send the data required to minimise load and maximise the number of packets sent.

### iNAV – set the following in the CLI:

```
set MAVLINK_rc_chan_rate = 0
set MAVLINK_pos_rate = 5
set MAVLINK_extra1_rate = 0
set MAVLINK_extra2_rate = 2
set MAVLINK_extra3_rate = 0
set MAVLINK_version = 2
```

### Ardupilot – set the following:

```
SERIALX_BAUD, 115 (telemetry output at 115200)
SRX_EXT_STAT, 3 (3hz GPS raw)
SRX_EXTRA1, 0
SRX_EXTRA2, 0
SRX_EXTRA3, 0
SRX_POSITION, 0
SRX_RAW_SENS, 0
SRX_RC_CHAN, 0
```

## NOTES: Set home position when armed - operation

When using CRSF, arm/disarm is not available from the MAVLINK data sent by the TX. To improve accuracy of the home position, the GPS co-ordinates are saved every 7.5 seconds until distance > 10m in a 7.5-15 second period. Once launch detected it uses an earlier GPS position saved before launch is detected. This should give a much more accurate home position and altitude however requires care by multirotor users to launch and exit the 10m guard zone quickly.

With “arm at home” = disabled: home is set once only. It is not so accurate but is useful for iNAV “SAFEHOME” or if plane is launched away from tracker. Arming is as above.

## AAT – Telemetry settings

*Telemetry:* when **enabled**, the AAT will use Wi-Fi telemetry input

*Protocol:* must match RC TX Wi-Fi module settings (UDP)

*Port:* must match RC TX Wi-Fi module settings. Typically, 8888 or 5970

*MAC:* must match RC TX Wi-Fi module MAC address

*Reset home at arm:* when **enabled**, the AAT will set its home location when it is armed. It is typically more accurate than when disabled as the GPS will usually achieve a more accurate location than when first powered up.

For CRSF telemetry (MAVLINK EMU), this will only set it once.

For MAVLINK TELEMETRY it will set the home position each time it is armed.

Consider using this mode if you launch close to your AAT

*Reset home at arm:* when **disabled**, the AAT will set its home location as being the GPS coordinates of the aircraft when the tracker is powered up and receiving GPS telemetry coordinates. You should power up the aircraft next to the AAT and wait until home set is indicated by the tracker positioning.

Consider using this mode if you launch away from the AAT – e.g. From a runway 50m from AAT or hover / move slowly from launch point with a multi-rotor.

Home set is less accurate and accuracy at distances less than 100m might be noticeable. Power cycling AAT after aircraft has a good long-established fix provides best accuracy for proximity tracking.

In this mode, the home is always set once only.

# **AAT MAVLINK – Troubleshooting**

First, please read the Quick Start configuration guide steps to make sure no steps have been missed.

## **AAT – Troubleshooting #0 – Not connecting**

1. If tracker is configured and previously worked, restart TX / tracker. Connection should be made within 60 seconds.

## **AAT – Troubleshooting #1 – No tracking Telemetry**

2. Ensure the OLED / GUI shows telemetry data – must be higher than 0/0.
3. Ensure the MAC address of TBS module has been selected – not the device running the GUI.
4. Ensure same port, protocol and type settings match TBS settings.
5. Ensure telemetry is enabled.

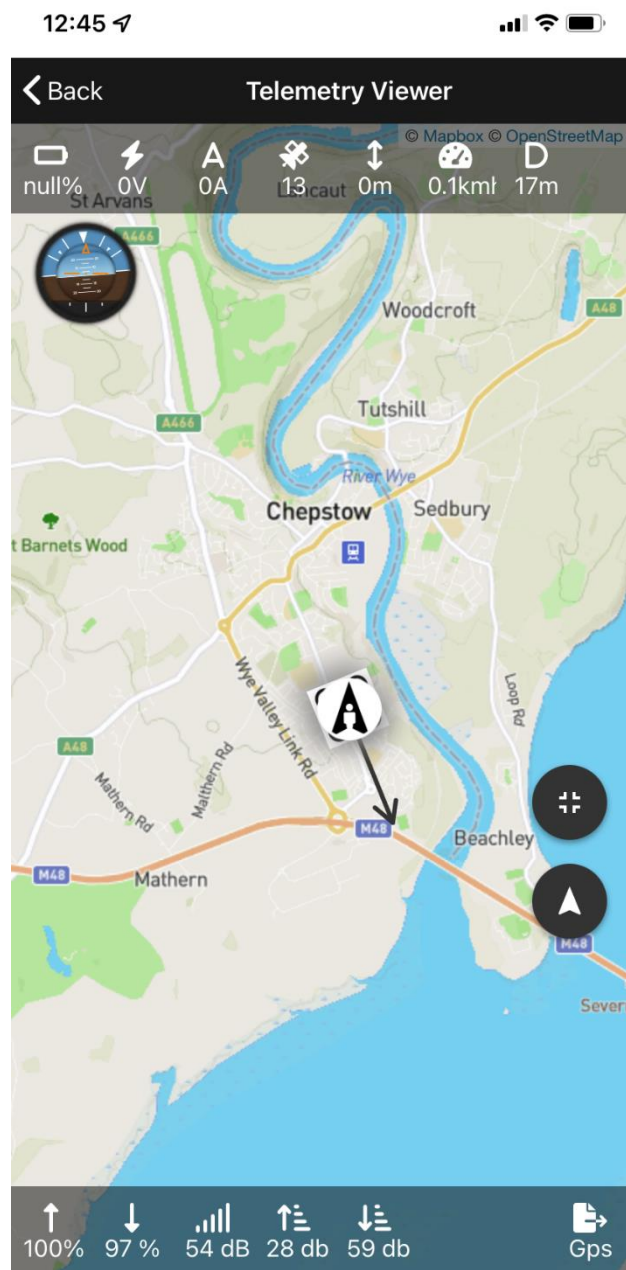
## **AAT – Troubleshooting #2 – Telemetry on works when mobile device connected**

1. Select TBS MAC address instead of mobile device MAC.

## AAT – MAP location view

*TBS Crossfire MAP view:* This can also be used with video telemetry. MAVLINK not required!

Note: if using mobile device, it is recommended to set tracker IP in WiFi settings to the secondary IP to avoid conflict with TBS module. i.e set tracker IP to 192.168.5.1 (note you will have to use this in browser access in future)



# Document revisions

1.0	Initial release
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