

Sentinel Automatic Antenna Tracker

LITE

USER GUIDE – CONFIGURING TO USE TBS CROSSFIRE MAVLINK

VirtualPilot

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

Patents

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.

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 - TBS Crossfire / Tracer step guide

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

AAT 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.

Should I use TBS WiFi 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.

If you are in the proximity of either 2.4G video or other 2.4G RC transmitters, these *may* have a detrimental impact causing the WiFi connections to become unreliable. A working setup that works fine for a solo flier may be impacted when flying in proximity with others.

Another consideration is telemetry range vs video range. Whichever is greater will give better range performance.

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)

MAVLINK full telemetry - advanced

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

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 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.

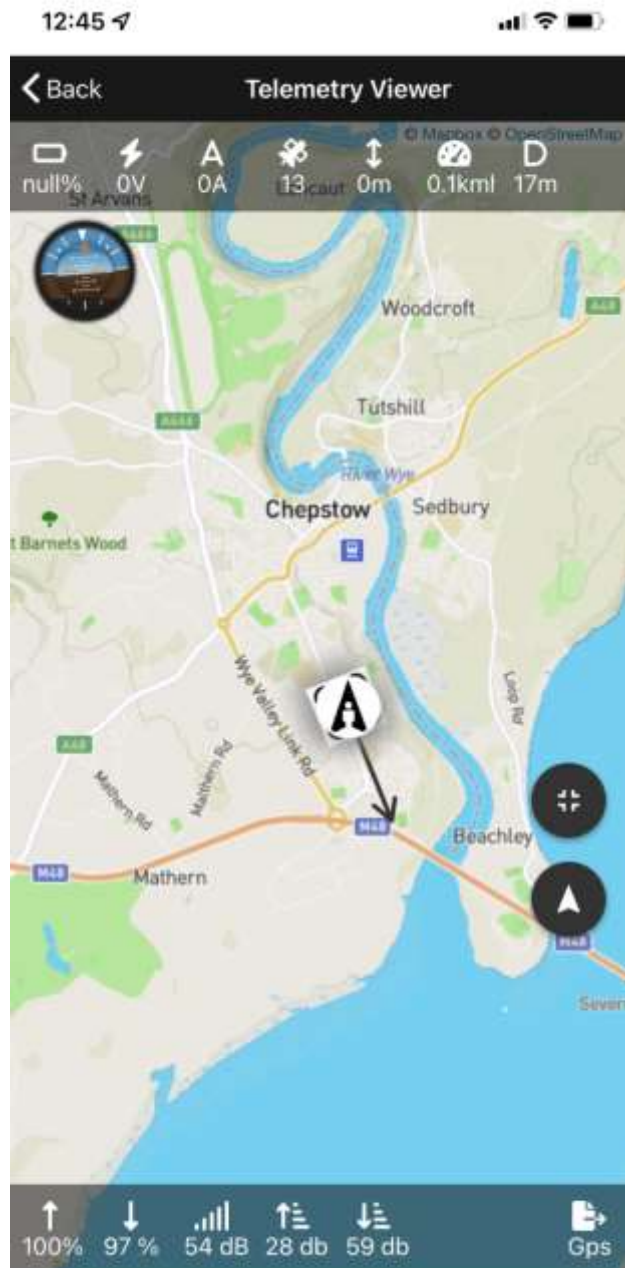
AAT – Troubleshooting #2 – Telemetry on works when mobile device connected

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
1.1	Restructured to match ELRS