u360gts: Position Data Frequency 10Hz

This document contains information about the configuration of the different elements involved to achieve a frequency of up to 10 Hz for GPS position messages feeding the **u360gts** antenna tracker.

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1. Introduction

The **u360gts** is compatible, among others, with telemetry based on MAVLink v2 and can receive position messages from different sources, including Ardupilot-based flight controllers or similar systems.

The MAVLink messages processed by u360gts for tracking the aircraft are:

- **MAVLINK_MSG_ID_GPS_RAW_INT**: Contains 3D position data and the number of satellites. This is sufficient for tracking.
- **MAVLINK_MSG_ID_GLOBAL_POSITION_INT**: Contains only 3D position data.
- **MAVLINK_MSG_ID_ATTITUDE**: Optional message used for other purposes.

Depending on the configuration, these messages can be sent through different interfaces (UART, Wi-Fi, RF). The following sections detail various tests conducted to reach frequencies of up to 10 Hz.

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2. Configuration

2.1 Radio Frequency System

- **Handset Radiomaster TX16S**
  - Firmware Version: **EdgeTX 2.10.5** (Centurion).
  - External RF Baud Rate: **1.87 M**.
- **TX Radiomaster Nomad**
  - Firmware Version: **ExpressLRS 3.5.3**.
  - Mode: **K1000** Full Low Band.
  - Packet Rate **1:2**.
  - Link Type: **Mavlink**.
- **Radiomaster Nomad Backpack**
  - Firmware Version **1.5.1**.
  - Configured as **Wi-Fi**.
  - Operating as an Access Point (**AP**).

2.2 u360gts Antenna Tracker

The u360gts antenna tracker is built using the official case and recommended components. Below is the most relevant information for the purpose of these tests:

- Board: **Flip32**.
- Target: **NAZE**.
- Firmware Version: **11.4.0**-RC1.
- Telemetry Protocol: **Mavlink**.
- Baud Rate: **115200**.

2.3 u360gts Backpack

A Wi-Fi device connected to the UART0 of the antenna tracker controller, delivering telemetry messages from the aircraft via the RF system. This Wi-Fi module, referred to as the **u360gts backpack**, is flashed with custom firmware to filter the received telemetry messages and send only the necessary ones to the antenna tracker for proper operation.

- Wi-Fi Module **ESP32/ESP8266**.
- Configured as a client (STA) connected to the network SSID "ExpressLRS TX Backpack XXXXXX".
- u360gts backpack firmware v1.0: filters messages, delivering only those required by the tracker:
  - `MAVLINK_MSG_ID_GPS_RAW_INT`.
  - `MAVLINK_MSG_ID_GLOBAL_POSITION_INT`.
  - `MAVLINK_MSG_ID_ATTITUDE`.

2.4 Aircraft

- **Flight Controller**
  - Board: **Speedybee F405 Wing**.
  - Firmware Version: **Arduplane 4.4.4**.
- **RX Radiomaster XR4**
  - Firmware Version: **ExpressLRS Pre-3.5.2**.
  - Link Mode: **Mavlink**.
- **Arduplane Parameters**
  - **SERIAL1_PROTOCOL**: 2 (Mavlink v2).
  - **SERIAL1_BAUD**: 460 (460800).
  - **SERIAL1_OPTIONS**: 4096 (Ignore Stream Rates from GCS).
  - RSSY_TYPE: 5
  - SR1_ADSB: 0

- **SR1_EXT_STAT: 1** (GPS_RAW_INT for satellites and 3D position)
- SR1_EXTA1: 2 (ATTITUDE for course)
- SR1_EXTRA2: 2
- SR1_EXTRA3: 1
- SR1_PARAMS: 10
- **SR1_POSITION: 10** (GLOBAL_POSITION_INT for 3D position)
- SR1_RAW_CTRL: 0
- SR1_RAW_SENS: 0
- SR1_RC_CHAN: 1

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3. Results

As shown in the video, a 10 Hz reception rate of position messages has been achieved by transmitting only the three message types required for the antenna tracker to function properly. This configuration is ideal for real-time tracking.

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4. General Recommendations

1. **Configuring SRx_ Parameters:**

- Adjust the rates for each message group (e.g., `SRx_POSITION`, `SRx_EXT_STAT`) according to the desired frequency.
- A 10 Hz frequency can be achieved by reducing the number of non-essential messages sent.

2. **Filtering MAVLink Messages:**

- Implement firmware that filters and transmits only the necessary messages to the tracker, as done with the ESP32/ESP8266.

3. **Interconnection:**

- Choose the appropriate interface (UART, RF, Wi-Fi) depending on the available devices and environmental conditions.

4. **Testing and Adjustments:**

- Conduct tests under real conditions to validate the configuration and optimize parameters.

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5. Reference Images

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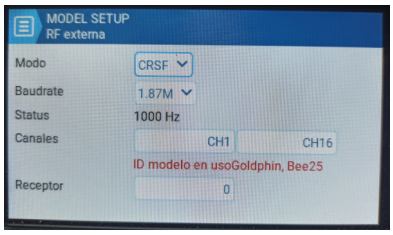

Figure 1: External RF Bauds

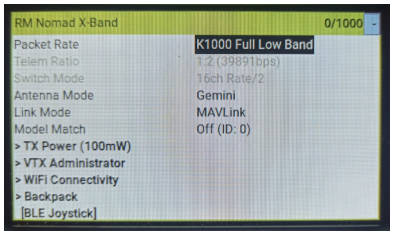

Figure 2: TX Nomad

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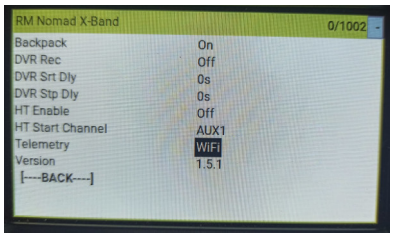

Figure 3: TX Backpack

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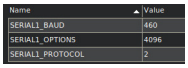
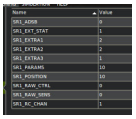


Name	Value
SERIAL1_BAUD	460
SERIAL1_OPTIONS	4096
SERIAL1_PROTOCOL	2

Figure 4: Serial 1



Name	Value
SR1_ADSB	0
SR1_EXT_STAT	1
SR1_EXTRA1	2
SR1_EXTRA2	2
SR1_EXTRA3	1
SR1_PARAMS	10
SR1_POSITION	10
SR1_RAW_CTRL	9
SR1_RAW_SENS	0
SR1_RC_CHAN	1

Figure 5: SRx Params