GPS F3X Tracker for Ethos Version 1.1

Installation guide and user manual

Content

1. General Description

GPS F3X Tracker for Ethos is the LUA application for FrSky transmitters with Ethos operating system. It supports training of slope racing events (F3F). Whole competition event is supported, starting with initial 30 sec countdown sequence, crossing base A line for the first time and counting and time measuring of 10 legs. Via a GPS sensor the turn lines are identified and an acoustic signal is given while crossing them. A supported GPS sensor must be placed in the model and connected and configured to telemetry subsystem.

There are also two modes for F3B available, where in case of speed task the time for 4 legs is measured, in case of distance task number of legs done in allocated time is counted.

The application is based on ideas of Frank Schreiber's F3F Tool for Jeti and on code of Alex Barnitzke's gpsF3XTracker for OpenTx. Its code is published under the MIT License.

This manual describes how to install, configure and use the GPS F3X Tracker.

2. Requirements

a) GPS sensor: SM-Modelbau GPS-Logger 3, FrSky GPS ADV and generally any other GPS with 3-axes gyro and with data rate 10Hz are supported. The Logger 3 is strongly recommended as FrSky GPS ADV lacks gyro
b) Ethos: versions 1.5.x and newer are supported
c) Transmitter: The application supports units with touchscreen resolution 800*480

3. Known limitations

a) Due to accuracy of GPS sensors (e.g. FrSky GPS ADV has accuracy approx 2.5m CEP) and telemetry latency the turn signals are not 100% precise, but still give a good F3F-experience. Issue can be worse for F3B speed tasks

b) Sometimes there is a GPS-drift of given start point. In this case the whole course might drift to left or right some meters, because the turn positions are calculated in relation to the start point

c) File with list of event sites (locations.lua) can be edited only via an external editor

d) Max 14 fully defined and one "live" event sites are supported

e) Application texts and menus are only in English. Speech announcements are given in language configured in the transmitter

f) Application is resource demanding. There should not be many widgets/system tools/tasks/sources running otherwise accuracy of application can be compromised. It is valid also vice versa, so other applications can be affected by the GPS F3X Tracker

4. Installation

Unzip the installation package and place all files into directory /SCRIPTS on your transmitter. Folders gpstraca (keeping setup part) and gpstrack (keeping operation part) should not be changed. Please note all modules, excluding locations.lua, are in the compiled form (*.luac).

Start the transmitter and configure two widgets – "GPS F3X Tracker Setup" and "GPS F3X Tracker" when a target model is selected. The application is capable to partly modify size of text to size of widget windows, however, for accommodation of all information properly it is recommended to use half wide screen for the setup widget and whole screen for main widget, or to use two half height / full wide layout for both setup and main widget (in such case widget titles should be switched off):
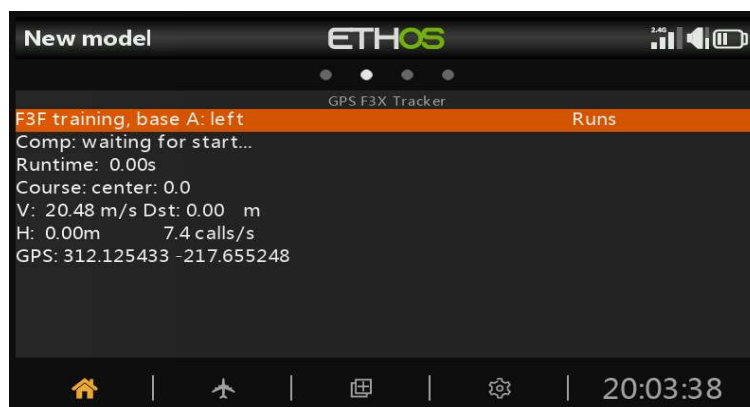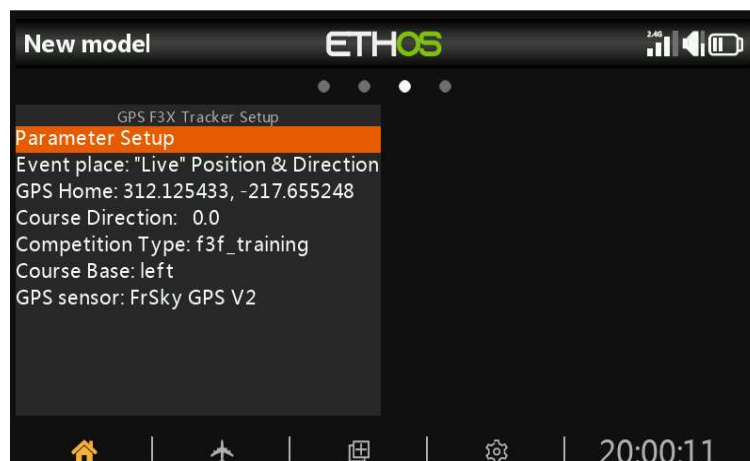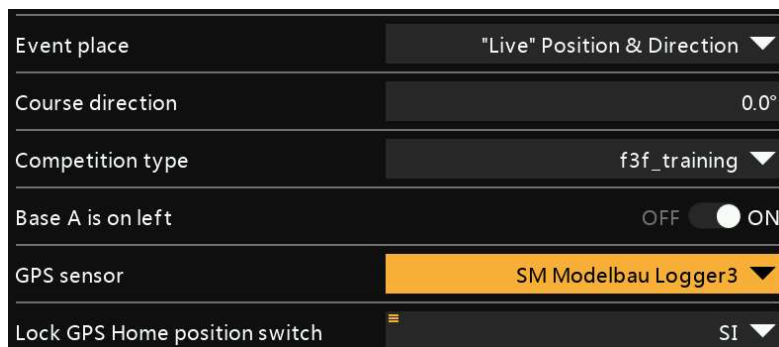
5. Configuration

a) GPS sensor: set data rate to 10Hz = 0.1s (or higher if possible). Crosscheck names of available GPS sensors and rename, if needed. The application generally expects sensors altitude, coordinates, speed, date, satellites, accelerations:
1. SM-Modelbau GPS-Logger 3: "GAlt", "GPS", "GSpd", "Date", "GSats", "AccX", "AccY", "AccZ"
2. FrSky GPS ADV: "GPS Alt", "GPS", "GPS Speed", "GPS Clock"
3. Other GPS: "GAlt", "GPS", "GSpd", "Date", "AccX", "AccY", "AccZ"

b) "GPS F3X Tracker Setup" widget configuration:
1. Event place: any item from list of places in locations.lua file
2. Course direction: course bearing from the left base to the right base in degrees*
3. Competition type: any type from supported types (f3f_training, f3f_competition, f3b_distance, f3b_speed, f3f_debug)*
4. Base A is on left: set "true" if it is so (default status)**
5. Lock GPS Home position switch: any 2-position switch or functional switch, mandatory
* These items are available only for "Live Position & Direction event", otherwise are locked as they are determined by event information from locations.lua file
** This item is available only for F3F event types, for F3B event types is Base A always on left

c) "GPS F3X Tracker" widget configuration:
1. Start race switch: any 2-position switch or functional switch, mandatory
2. Elevator output channel: mandatory only for FrSky GPS, used for simulation of accelerometer

3. Input debug GPS latitude and longitude: used for emulation of GPS input in debug mode (suggested analog sources elevator and rudder), not mandatory

6. Locations.lua

File Locations.lua, located in "/scripts/gpstrack/gpstrack" folder, keeps event location items in the format "Name of event site, home latitude, home longitude, course ldirection, course length difference, event type". Event types are:
-- type 1: f3f training
-- type 2: f3f competition
-- type 3: f3b distance
-- type 4: f3b speed
-- type 5: f3f debug

Default Location.lua looks like below. You can edit it as per your needs, but please do not delete the first row, which defines "live" event location not defined exactly in the Location.lua. Default event type in such case is f3f training (type 1), however you can change it during configuration. Home position is defined from current GPS information:

```
{name = '"Live" Position & Direction', lat = 0.0, lon = 0.0, dir = 0.0, dif = 0, comp = 1},
{name = "Parkplatz", lat=53.550707, lon=9.923472,dir = 9.0, dif = 0, comp = 5},
{name = "Loechle", lat = 47.701974, lon = 8.3558498, dir = 152.0, dif = 0, comp = 2},
{name = "Soenderborg", lat = 53.333333, lon = 51.987654, dir = 19.9, dif = 0, comp = 3},
{name = "Toftum Bjerge", lat = 56.5422283333, lon = 8.52163166667, dir = 244.0, dif = 0, comp = 1},
{name = "Last Entry", lat = 53.555555, lon = 51.987654, dir = 10.9, dif = 0, comp = 4}
```

At this moment you need to edit the file on a PC. Max 15 event sites are supported.

Notes:
- home latitude and longitude is for F3F events position of a center of the course
- home latitude and longitude is for F3B events position of a baseline A of the course
- course length of competition event types is defined as per F3X rules – F3F 100m and F3B 150m. F3F debug has its course length set to 30m. You can change this default course length for a particular event site via item "dif" if needed - course is longer when value is positive and course is shorter when value is negative

7. Event modes

The application supports F3F-competition, F3F-training, F3F-debug, F3B-speed and F3B-distance event types. They behave differently as below:

a) F3F-competition: it follows F3F rules, so it begins with 30 sec timer and starts the run timer when the plane enters the competition place from outside via base A toward base B for the fist time or when the initial timer expires. It then measures time for 10 laps between bases

b) F3F-training: it does not use the 30 sec and starts directly with entering the competition place from outside via base A toward base B for the fist time

c) F3F-debug: similar to F3F-training, however it uses emulation of GPS input (via configured sources "Input debug GPS latitude and longitude") for simulation of flight around the set home position

d) F3B-speed: at this moment only measures time for 4 laps since entering the competition place from outside via base A toward base B for the fist time. No check for the overall competition time is implemented

e) F3B-distance: it measures number of laps made in 4 minutes since entering the competition place from outside via base A toward base B for the fist time

The actual status is indicated by individual rows in the "GPS F3X Tracker" widget screen:

a) Comp: "waiting for start…", "started…" - just after switching the "Start race switch" on, "canceled…" - cancellation can be done by switching off/on/off of the "Start race switch", "start climbing…" - during initial event phase (so 30 sec max), "out of course" – plane between bases, "race timer started…" - initial 30 sec expired and plane between bases, "in course…" – plane outside of bases, "timer started…" - initial 30 sec expired and plane outside of bases

b) Runtime: time used for individual event

c) Course: "center", "leftOutside", "leftInside", "rightOutside", "rightInside" – distance from the center is provided

d) V, Dst, H: speed, distance from the center and height

e) GPS: actual GPS position

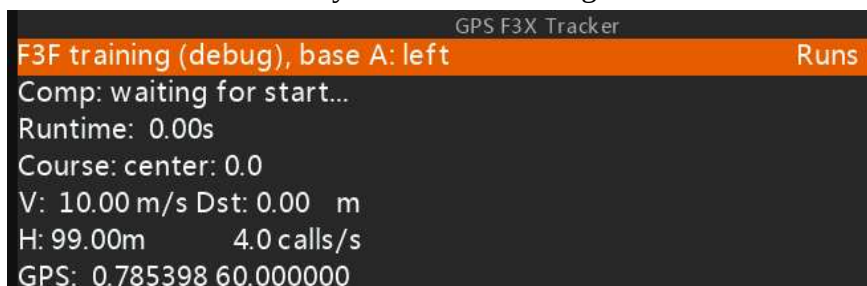f) Runs: list of last events of the same type with their runtime

Announcements and sounds:
- Beep after switching the "Start race switch" on
- Initial F3F timer countdown announcements: 30, 20, 10, 5, 4, 3, 2, 1 sec
- F3B-distance timer countdown announcements: minutes and every 10 sec for last minute
- Beeps when crossing base, tone based on condition
- Lap time announcements on even laps for F3F-traning event type
- Overall runtime at event end for F3F-x event types

8. Usage on a slope

b) Switch on RC system and give the GPS sensor enough time for initiation and satellite detection (it can take 30+ seconds)! Open "GPS F3X Tracker Setup" widget and select "Live Position & Direction event place" or any pre-configured place.

c) For F3F and "Live Position & Direction event place":
    a) Set "Competition type" and "Base A is on left" configuration items
    b) Go with your model to the center of the course
    c) Wait for stable information in the "GPS" row in the "GPS F3X Tracker Setup" widget screen
    d) Take the cardinal direction from the left base perpendicular to the right base and set it to the "Course direction" item
    e) Lock the position with the "Lock GPS Home position switch" – such status will be indicated by change of item name to "GPS Home lck"
    f) Now your flight configuration is ready, you do not start from the exact home place

d) For F3B and "Live Position & Direction event place":
    a) Set "Competition type" configuration item
    b) Go with your model to the baseline A of the course
    c) Wait for stable information in the "GPS" row in the "GPS F3X Tracker Setup" widget screen
    d) Take the cardinal direction from baseline A perpendicular to baseline B and set it to the "Course direction" item
    e) Lock the position with the "Lock GPS Home position switch" – such status will be indicated by change of item name to "GPS Home lck"
    f) Now your flight configuration is ready

e) For other F3F/F3B event places (pre-configured in the Location.lua file):
    a) Your flight configuration is ready - all parameters, excluding "Base A is on left" are set in the Location.lua file

f) Go to the "GPS F3X Tracker" widget screen
    The initial status is indicated by statement "waiting for start..."

g) Start new event with the "Start race switch"

9. Change log

V1.1:
a) List of locations in the file Locations.lua has been enhanced by item "dif", which modifies default course length (F3F 100m, F3B 150m), positive number: course is longer, negative number: course is shorter
b) Number of visible GPS satellites is available on "GPS F3X Tracker Setup" widget screen (only for SM-Modelbau GPS-Logger 3)
c) Error in timestamp function has been fixed

10. Development plan

The application hasn't been thoroughly tested and it is highly probable there will be necessary to change or enhance some parts. Do not hesitate to comment and come with ideas. At this moment we plan:

a) Enhance of application by a simple editor of locations
b) Implement position estimation function, if tests will show it is needed
c) Merge both application parts (setup and main) into one

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