PPK Kit Mavic3 v1.0

Turn your DJI Mavic 3 into a PPK system.
Easy integration without the need to open or modify the drone.

Description:

The PPK-Kit-Mavic3 is a non-intrusive adapter system to connect an Emlid Reach M2 GNSS receiver (not included) to a DJI Mavic 3 drone.

Main Advantages:

- Works with Reach M2 module (not included)
- No need to open or modify the drone
- Kit attaches and detaches in seconds
- No batteries required
- Ultra-fast image trigger detector sensor
- Lightweight microelectronics: 80 grams.

An externally installed sensor on the drone detects the trigger for each photograph and records a timestamp in the Reach M module's log file. Timestamps are extracted from the module post-flight and added to images taken in flight as centimeter precision geotags (geotags) type metadata using various specialized software options available on the market.

The Emlid Reach M2 module (**not included in the Kit**) is a centimeter precision multiband GNSS system for UAV mapping up to 100km respectively.

Image: Emlid Reach M2 Module and Antenna. Not included in the kit.

Operation requirements

For integration requires:

1. A PPK Kit Mavic3
2. A DJI Mavic 3 Drone (Not included)
3. An Emlid Reach M2 with GNSS Antenna (Not included)
4. A RINEX compatible GPS Base Receiver (Not included)

Kit Components

1. **Antenna and M2 Module holder** with internal electronic PCB trigger system, internal battery and power regulator system.
2. **Photo Trigger Sensor**, attached to the module.
3. **Cable connector for antenna**.

Installation

1. Attach the two pieces of the main plastic bracket.
2. Install the GNSS antenna on the antenna bracket using the short cable connector provided.
3. Insert the M2 module into the plastic bracket in the space below the antenna.
4. Connect the 5-pin connector to the C1 connector of the M2 module.
5. Connect the antenna cable to the M2.
6. Insert the battery over the M2 module and connect the 5-pin power cable connector to the C2 connector of the M2 module.
7. At this time the PPK Kit Mavic3 is ready to be placed on the drone.
8. Place the already attached plastic bracket on the front of the drone.
9. Once placed, check that the propellers of the drone when turning do not touch the support: it is enough to have a safety margin of five millimeters.
10. Carefully insert the Trigger Sensor under the motor of the left front arm of the drone.
11. Firmly place the plastic clip on the left arm of the drone.
12. Finally, make sure that none of the system cables are within the turning radius of the drone's propellers. It is sufficient to have a safety distance of five millimeters.

Drone configuration

1. Turn on the Mavic 3 drone and the remote control.
2. Enter the DJI GO4 App and activate the front lights of the drone arms:
Settings / MC Settings / Advanced Settings / Turn on Aircraft Arm LEDs.

M2 module configuration
Reachview 3 App and Firmware Update

1. Download and Install the ReachView 3 application on your Android or iPhone cell phone or tablet.
2. When starting the application for the first time you need to update to the latest Firmware. To do this: Disable mobile data on Android phones while using ReachView 3.
3. Power on your Reach M2 module.
4. In the Wi-Fi settings of your mobile device: connect to the access point of the M2 ("reach: XX: XX"). The initial password is: emlidreach
5. Launch the ReachView 3 application and select your M2 module.
6. Select the "+" symbol to add your Wi-Fi network to the list of available networks.
7. Enter your Wi-Fi network information.
8. Restart the M2 module.
9. Reconnect your mobile device to your Wi-Fi network.
10. Refresh the ReachView application 3. The M2 module will now have a local IP address (192.168.1.XXX)
11. Update ReachView 3 (M2 firmware will be updated). Restart the M2 when done.
12. Restart the ReachView 3 application and connect to the M2 module. You can now view the status of the satellite connection, download logs, and make changes to the M2 configuration.

Settings on the M2

1. Go to **REACHVIEW 3> RTK SETTINGS** and in the **GNSS SELECT** section select GPS, GLONASS and other GNSS systems that, according to the geographic location of your project, suit you. The M2 version tracks GPS, GLONASS, GALILEO, QZSS and BEIDOU satellite systems. Data can be recorded with a refresh rate of 1 Hz, 5 Hz, or 10 Hz.

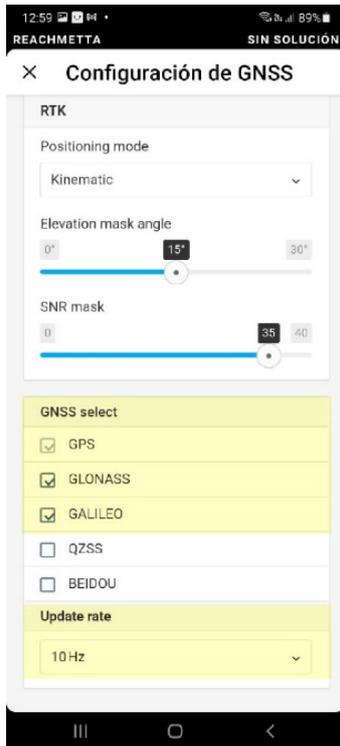For a drone flight, set the refresh rate to 10 Hz.

Image: GNSS Configuration screen with selected satellites and 10Hz frequency.

2. Go to **REACHVIEW 3> LOGGING** and enable **RAW DATA** with **UBX**. **It is recommended to activate the option to start automatic registration (Autostart)**: the UBX registration will start each time the module is successfully powered up.
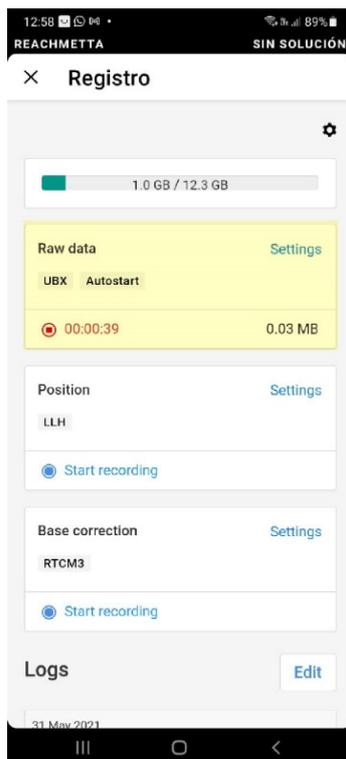

Image: Registration screen with the Autostart function activated and recording in UBX format.

3. Go to **REACHVIEW 3> CAMERA CONTROL** and manually take a photo with the Photo Shoot button located on the Mavic 2 drone remote control. The value in the **CAMERA EVENTS: LAST TIME MARK** field should update at this time. You can take several photos to verify the correct operation of the Time Stamp capture and registration system.
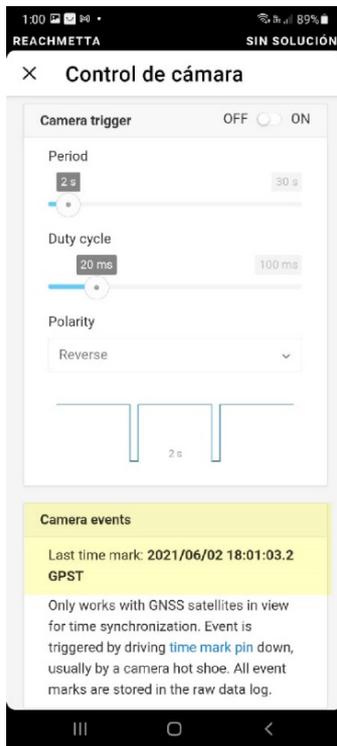

Image: Camera Control screen with trigger event time detected by the sensor.

4. Now the M2 module is ready to operate.

Topographic Survey Flights

Before the flight:

1. Program your flight plan following the instructions of the flight control application you use: DJI GS Pro, Pix4D, DroneDeploy, MapsMadeEasy or others.
2. Connect the previously installed PPK KIT by connecting the Micro-USB type C connector to the drone.
3. Turn on the drone.
4. Wait for all three lights on the M2 to come on: Orange, Blue, and Green. It takes about 30 seconds to wait for the Blue (Wifi) and Green (Satellite) lights.
5. In the event that the M2 module does not turn on completely when the drone is first turned on (only orange light on), do the following: disconnect and reconnect the Micro-USB type C connector.
6. Connect to the M2 via Wi-Fi (See point 6 of the section: M2 module configuration: Reachview 3 App and Firmware update).
7. If necessary, take a manual photograph to verify the correct registration of the Time Stamp (CAMERA EVENTS: LAST TIME MARK).

8. If the M2 is not yet in Autostart start mode, start or verify the start of GNSS data logging (RAW DATA / UBX) on the M2.
9. Once these verifications and recommendations have been made, you can proceed to fly the drone and take photos.

IMPORTANT RECOMMENDATION: It is recommended, at the end of each flight plan, to take a photograph with the drone camera placed on a Ground Control Point (with the camera located over the central point of the same) using the Trigger button on the drone remote control.

After the trip:

1. At the end of each flight, disable the UBX log recording using the Reachview 3 App. Before turning off the M2, wait for the log processing to finish.
   Note: Make sure the GNSS data (.UBX file) has been saved correctly.
2. Download the data logs (RAW DATA LOGS - UBX) from the M2. To do this, in the Reachview 3 App, press the download buttons for each log in the **REACHVIEW> LOGGING** section.
   Find the UBX file in your mobile device's file system and email it. Then retrieve it on your PC for further processing. The UBX file will be inside a .ZIP folder. Save it and unzip it for use.

As a result of the flight session and in order to perform a correct processing in PPK, you must obtain the following data set:

1. Photographs captured by the drone
2. RAW LOGS UBX of the M2 module of each flight performed
3. RAW LOGS (UBX or RINEX) from a ground-based GNSS receiver
4. List of Control Point coordinates

With this information, you will be ready to process the data through different photogrammetric software options.

Post Process - PPK

The final PPK (Post Processed Kinematic) mapping workflow can be performed using the following software options. Each of them has its own steps to follow at the user's choice. This is a list of post-process programs according to their degree of difficulty and knowledge requirement in topography:

1. Toposetter 2.0 Pro (Trial Version / Buy)
2. REDtoolbox (Trial Version / Buy)
3. RTKLIB (Free program)

Once the information is processed, you can import the image set into any mapping software, such as Agisoft Metashape, DroneDeploy, Pix4D and others of your choice.