

# Sending data without GPS fix

## Introduction

### Sending data without GPS fix

Device cold-start often causes problems because the device is not sending data, therefore the user is unable to see parameter values until GPS fix is obtained. This can happen when devices are used in areas where there is no GPS coverage (under the roof, etc.), when devices are being disconnected from the power supply or when devices are being shut-down in order to avoid battery depletion. Frequent cold-starts also result in loss of CANbus data, drivers registration data and other peripherals at the beginning of the trip. In order to solve these problems a functionality, which enables sending data without GPS fix, was implemented.

### GSM tracking

When the device loses GPS fix, there is no way to determine its location. The GSM tracking feature can now be used to obtain an approximate location in densely urbanized areas, where the GNSS signal is not available.

Sending data without GPS fix is available for the following FM devices with the latest firmware version:

- FM-Tco4 HCV
- FM-Tco4 LCV
- FM-Pro4
- FM-Eco4
- FM-Eco4 S
- FM-Plug4

You can get the latest firmware and configurator from our documentation web site: [doc.ruptela.it](http://doc.ruptela.it)

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## Document change log

Date	Version	Change details
2016-01-07	1.0	Initial draft.
2016-09-07	1.1	Changes in the introduction, new link to the documentation web site.
2016-09-19	1.2	Added short description how to activate the "Send data without GPS fix" feature.
2017-04-18	1.3	Added a description for the "GSM tracking" feature.
2017-05-10	1.4	"GSM tracking" feature for Eco family devices.
2017-05-22	1.5	"GSM tracking" feature for FM-Plug4.
2018-10-04	1.6	Supported device list updated.
2018-10-22	1.7	Configuration examples updated.
2019-02-22	1.8	Descriptions and configuration steps of different "Sending data without GPS fix" methods contracted into "Sending data without GPS fix configuration" paragraph.

## Sending data without GPS fix

### Feature description

By default, FM devices do not collect records, if they fail to acquire a GPS fix. The main reason for this is that devices require an exact time from GPS. When it is not available, data is not being collected and sent, this in turn causes data loss.

FM devices keep track of the exact time in several ways:

- By counting a timestamp, starting from 946684800 in Unix timestamp. Unix timestamp – time variable, calculated from 2000.01.01 00:00:00 (starts from 946684800).
- By adding time from GPS, as soon as it is obtained. GPS time – when the global positioning system time is being used for timestamp records, before GPS fix is acquired.
- By synchronizing time with a Network Time protocol (NTP) server. NTP time – time acquired from the NTP server.
- By synchronizing time with an operator. GSM operator time – time acquired from a local GSM operator.

The sending data without GPS fix functionality is governed by these rules:

- You can turn this feature on/off.
- The same event triggers are used for collecting data without GPS fix.
- Data collected without GPS fix can be recognized on the server side by having <0xFF> values in the following fields: *Longitude, Latitude, Altitude, Angle, Satellites* and *Speed*.

### Notes

- To prevent data confusion and other problems with report mechanisms, this feature must be supported in the server software!
- This feature will not work in FM Tco4/Pro4 devices with an SD card logging mechanism.
- The "Send data without GPS fix" feature becomes active only after restarting the GSM modem. Prepare the configuration and upload it to the device. Reboot the FM device. This will restart the GSM modem and activate the "Send data without GPS fix" feature.

### Sending data without GPS fix configuration

Follow these steps provided below to enable sending data without GPS fix:

- Launch the FM device configurator and select your device.
- Under **Global** settings, locate the **Send data without GPS fix** section and press the **Options** button.
- Tick the **Send data without GPS fix** checkbox to enable this feature. The time is synchronized again after acquiring GPS fix. If there is no GPS fix, but GPS time is available, then the device will use the GPS time as a record timestamp. After GPS fix is acquired, the time will be synchronized once again. Follow the further steps for other possible synchronization methods.
- Ticking the **Collect data without time** checkbox will use a Unix timestamp for records, but only until a timestamp is acquired from GPS or other methods listed in *Step 5*.
- The **Use time synchronization** drop-down list allows selecting the time synchronization method.

### Note

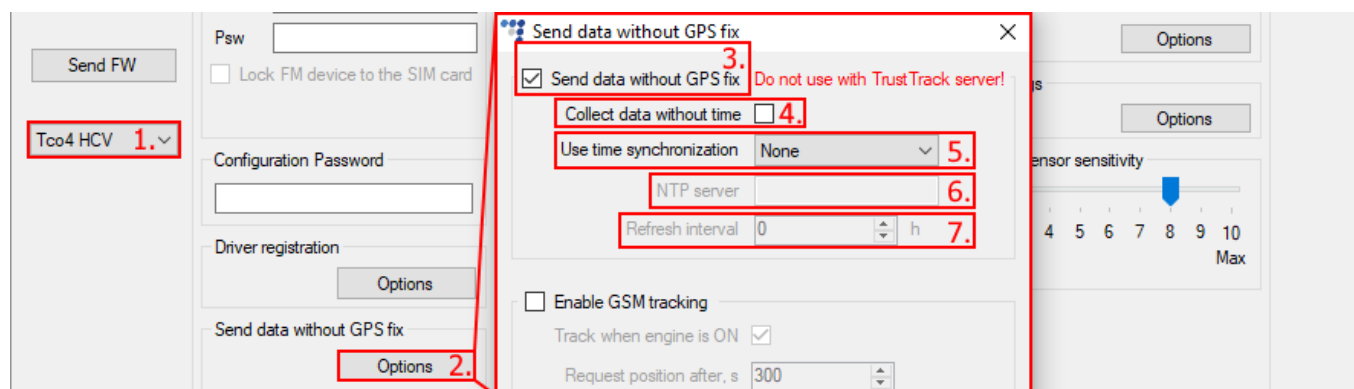
Even if different time synchronization methods are configured, GPS time will be used instead, whenever it is available.

The following methods are available:

- *None* – this is the default option; no time synchronization method is used. If the **Collect data without time** checkbox was ticked in *Step 4*, data recording is continued from the last saved timestamp value.
- *NTP* – the device checks for NTP server twice to sync the data. First – if the server is configured in the device, second – if the server is reachable. When this time is acquired, the RTC (real time clock) uses it to count further timestamps.
- *GSM* – the device checks for GSM operator time, when this time is acquired, the RTC (real time clock) uses it to count further timestamps.  
**The time will be acquired only, if the GSM operator provides it.**

The following steps apply only if *NTP* was selected in Step 5:

6. Enter an appropriate NTP server address in the **NTP server** section. An IP address or domain name can be used (max length is 40 symbols).
7. Enter a refresh interval value (in hours) for the NTP server in the **Refresh interval** section. The time interval range is from 0 to 255 hours. If it is set to 0 hours, the refresh is not performed until the next device start-up.



## GSM tracking

### Feature description

When the device loses GPS fix, there is no way to determine an approximate location of the vehicle. As a solution, it is possible to use the GSM tracking feature, which provides an approximate location in densely urbanized areas, where the GNSS signal is not available.

To do so, the FM device employs a Queclocator service provided by the Quectel modem. This service collects data from neighboring GSM stations and sends it to the Quectel server. The received response contains the approximate coordinates of the device. However, there is no way to determine position accuracy.

### Note

Each position request requires approximately 200 bytes of GPRS data. In order to prevent severe increase in data traffic the GSM tracking functionality is disabled by default.

### Main operation principles

- The device must have its internal timer running before it can start using the GSM tracking functionality:
  - GPS fix must be acquired at least once before losing fix;
  - Alternatively, NTP or GSM time synchronization should be enabled.

- The position from the Queclocator service is received only after a configurable amount of time without the GNSS fix has passed;
- The time interval between separate position requests is configurable;
- When the FM device is turned on, the timer for the GSM tracking feature starts after two minutes. During this time the GNSS module has time to acquire a first fix;
- The coordinates that were obtained from the Queclocator service are sent to the server in the record header – the same packet as GNSS coordinates. The difference is that the HDOP value is always 0xFE;
- As soon as the GNSS signal becomes strong enough, the device will switch back to GNSS tracking mode;
- It is possible to configure the GSM tracking feature to be active only when the engine is on.

## GSM tracking configuration

Follow these steps to enable GSM tracking:

1. Launch the FM device configurator and select your device.
2. Under **Global** settings locate the **Send data without GPS fix** section and press the **Options** button.
3. Tick the **Enable GSM tracking** checkbox to enable this feature.
4. Tick the **Track when engine is ON** checkbox and the tracking feature will be disabled when the engine is off.
5. The value in the **Request position after, s** field defines how long the device waits for GNSS fix before starting GSM tracking. The range is from 30 to 43200 seconds. The default value is 300 seconds.

### Note

When the FM device is turned on, the timer for the GSM tracking feature starts after 2 minutes.

6. The value in the **Request interval, s** field defines the smallest allowed time gap between separate position requests. The range is from 30 to 43200 seconds. The default value is 300 seconds.

