

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 the 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.

This feature description applies to FM devices with the latest firmware version in them. Compatible devices:

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

You can get the latest firmware and configurator from our documentation web site: 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. |

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1 Sending data without GPS fix

1.1 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 the GPS. When it is not available, data is not being collected and sent, this in turn causes data loss.

The implementation of this new feature enables FM devices to keep track of the exact time in several different 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 the GPS, as soon as we obtain it. GPS time – when the global positioning system time is being used for timestamp records, before the GPS fix is acquired.
- By synchronizing time with NTP server. NTP time – time acquired from the network time protocol server.
- By synchronizing time with a operator. GSM operator time – time, which you receive from your local GSM operator.

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

- You can turn this feature on/off.
- Same event triggers are used for collecting data without GPS fix.
- Data collected without GPS fix can be recognized in server side by having no coordinates (0xFF).

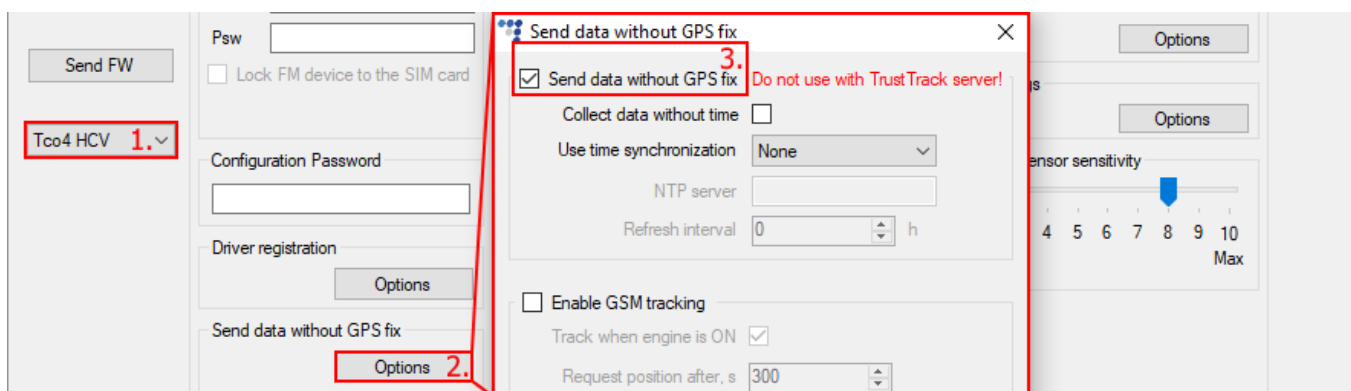
Notes

- To prevent data confusion and other problems with report mechanisms, feature must be supported in the server software!
- This feature will not work in FM Tco/Pro devices with a 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.

1.2 "Sending data without GPS fix" configuration

Follow these steps to enable sending data without GPS fix:

- Launch the FM device configurator and choose your device.
- Under **Global** settings locate **Send data without GPS fix** section and press the "Options" button.
- Tick the **Send data without GPS fix** checkbox to enable this feature.

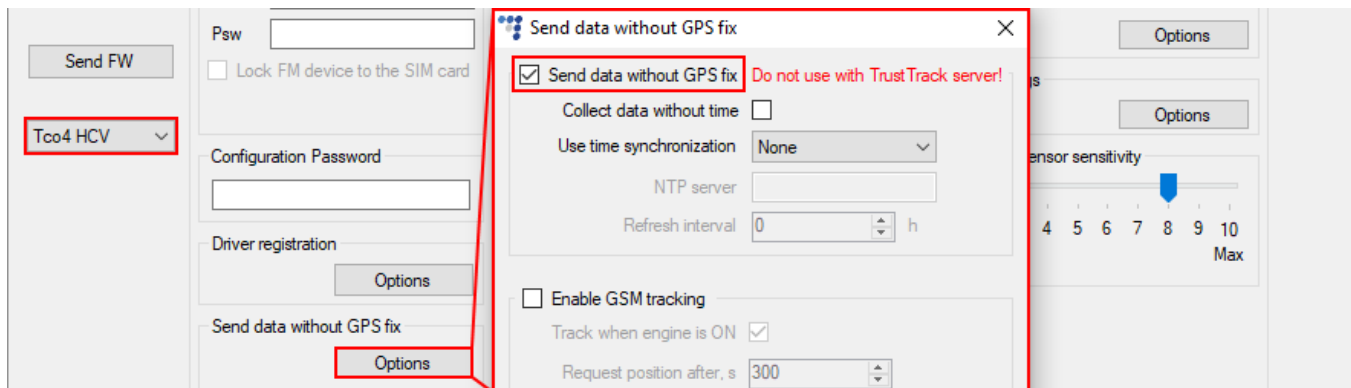


There can be several scenarios how data can be sent without having GPS fix, depending on the source from which we receive the timestamp. Possible configuration options are described below.

1.3 GPS time as a record timestamp

If there is no GPS fix, but GPS time is available, then the device will use the GPS time as a timestamp record. After the GPS fix is acquired the time will be synchronized once again.

This time the synchronization method becomes active once you put a tick in the **Send data without GPS fix** checkbox. After GPS fix acquisition, the time is once again synchronized.



Note
If GPS time is available, it will be used in all cases. It has higher priority than other time synchronization methods. Even if the configuration specifies to use different methods (Unix, NTP server, GSM etc.), when GPS time is available, it is used instead for timestamp records.

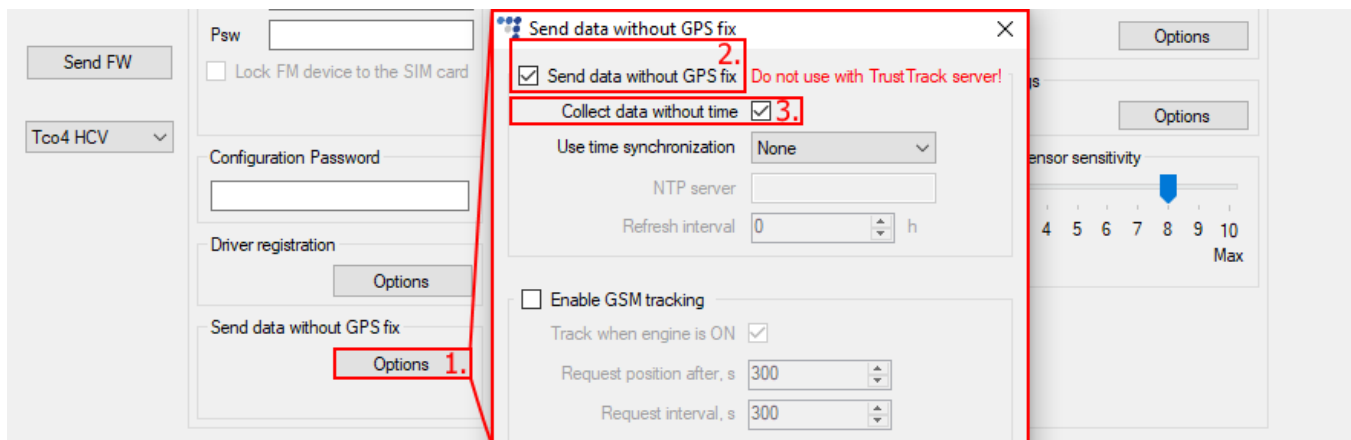
1.4 Unix timestamp

On a coldstart, the timestamp starts calculating from Unix timestamp date (starting from 946684800), with each record increasing the timestamp according to the internal clock. The last timestamp used for a record is saved in the internal memory. This is done in order to avoid having two records with the same timestamp after device reset. After reset time the calculation continues from the last saved timestamp value.

By default, if at any time the device acquires the GPS time, it will be used for timestamp records. After GPS fix, the time is once again synchronized.

To activate this time synchronization method:

1. Under **Global** settings locate **Send data without GPS fix** section and press the "Options" button.
2. Tick the **Send data without GPS fix** checkbox.
3. Tick the **Collect data without time** checkbox.



1.5 Time from NTP server

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. There is also an option to set a time refresh interval for the NTP server.

By default, if the device acquires the GPS time before acquiring the NTP time, GPS time is used over NTP time. After GPS fix, the time is once again synchronized.

To activate this time synchronization method:

1. Under **Global** settings locate **Send data without GPS fix** section and press the “Options” button.
2. Tick the **Send data without GPS fix** checkbox.
3. Locate the **Use time synchronization** dropdown list and choose *NTP*.
4. Enter an appropriate NTP server address in the **NTP server** section. An IP address or domain name can be used (max length 40 symbols).
5. The refresh interval value in hours for the NTP server is entered in the **Refresh interval** section. The time interval range is from 0 h to 255 h. If is is set to 0 h, the refresh is not performed until the next device start-up.

The screenshot displays the Ruptela configurator interface. A dialog box titled "Send data without GPS fix" is open, showing the following configuration options:

- Send data without GPS fix (2). Do not use with TrustTrack server!
- Collect data without time
- Use time synchronization: NTP (3)
- NTP server: (4)
- Refresh interval: 0 h (5)
- Enable GSM tracking
- Track when engine is ON:
- Request position after, s: 300
- Request interval, s: 300

The background interface shows the "Global" settings section. The "Options" button for "Send data without GPS fix" is highlighted with a red box (1).

1.6 Time from GSM operator*

*Depends on operator. The time will be acquired, if GSM operator provides it.

The device checks for GSM operator time, when this time is acquired, the RTC (real time clock) uses it to count further timestamps.

By default, if the device acquires the GPS time before acquiring the GSM operator time, GPS time is used over GSM time. After GPS fix, the time is once again synchronized.

To activate this time synchronization method:

1. Under **Global** settings locate **Send data without GPS fix** section and press the "Options" button.
2. Tick the **Send data without GPS fix** checkbox.
3. Locate the **Use time synchronization** dropdown list and choose *GSM*.

The screenshot displays the Ruptela configuration software interface. A dialog box titled "Send data without GPS fix" is open, with three red boxes and numbers highlighting key settings: 1. The "Options" button in the "Send data without GPS fix" section of the main interface. 2. The checked checkbox for "Send data without GPS fix" in the dialog box. 3. The "Use time synchronization" dropdown menu set to "GSM" in the dialog box. The main interface shows various configuration sections like "Global", "Connection settings", and "Data collection". The Ruptela logo is visible in the top right corner.

1.7 Start from Unix timestamp, but include NTP time as soon as it is received

Initially, after device start-up, it uses a Unix timestamp, as described in the "Unix timestamp" chapter. However, as soon as it receives the NTP time, it switches to a NTP timestamp.

As with all the previous cases, if the GPS time is acquired before acquiring the NTP time, GPS time is used for the timestamp. After GPS fix, the time is once again synchronized.

To activate this time synchronization method:

1. Under **Global** settings locate **Send data without GPS fix** section and press the "Options" button.
2. Tick the **Send data without GPS fix** checkbox.
3. Tick the **Collect data without time** checkbox.
4. Then, locate the **Use time synchronization** dropdown list and choose *NTP*.
5. Enter an appropriate NTP server address in the **NTP server** section. An IP address or domain name can be used (max length 40 symbols).
6. The refresh interval value in hours for the NTP server is entered in the **Refresh interval** section. The time interval range is from 0 h to 255 h. If the time is set to 0 h, the refresh is not performed until the next device start-up.

The screenshot displays the Ruptela configurator interface. A dialog box titled "Send data without GPS fix" is open, with several settings highlighted by red boxes and numbered 1 through 6:

- 1. The "Options" button in the "Send data without GPS fix" section of the Global settings.
- 2. The "Send data without GPS fix" checkbox, which is checked.
- 3. The "Collect data without time" checkbox, which is checked.
- 4. The "Use time synchronization" dropdown menu, set to "NTP".
- 5. The "NTP server" text input field.
- 6. The "Refresh interval" spinner, set to 0 hours.

The background interface shows various configuration sections: "Configuration file information", "Global" (Protocol: UDP), "Connection settings" (IP1, Port1, IP2), "Authorized numbers", "Eco-Drive" (checked), "Sensor sensitivity" (slider), "Driver registration", "Send data without GPS fix" (with "Options" button), "Identification string" (Disabled), "Profile 1" (Sleep: Disabled, Data sending: checked), "Data collection" (checked, SD card logging interval: 0, Time without engine: 60, Engine: Always on), and "2G - 3G" (Auto).

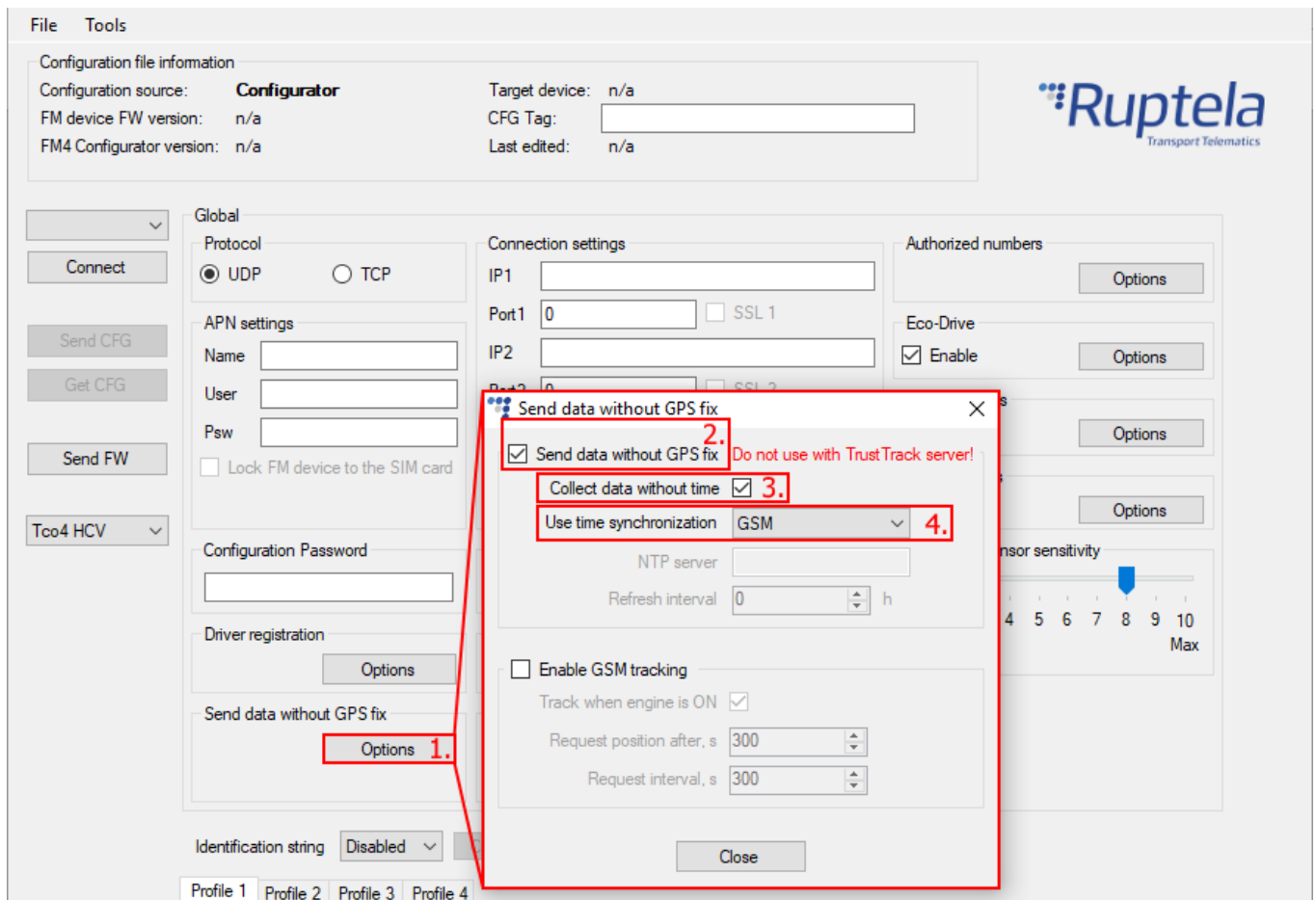
1.8 Start from Unix timestamp, but include GSM operator time as soon as it is received

Initially, after device start-up, it uses a Unix timestamp, as described in the "Unix timestamp" chapter. However, as soon as it receives the time from GSM operator, it switches to the GSM timestamp.

As with all the previous cases, if the GPS time is acquired before acquiring time from the GSM operator, GPS time is used for the timestamp. After GPS fix, the time is once again synchronized.

To activate this time synchronization method:

1. Under **Global** settings locate **Send data without GPS fix** section and press the "Options" button.
2. Tick the **Send data without GPS fix** checkbox.
3. Put a tick on **Collect data without time** checkbox.
4. Locate the **Use time synchronization** drop-down list and choose *GSM*.



2 GSM tracking

2.1 Feature description

When the device loses GPS fix, there is no way to determine an approximate location of the vehicle. As a solution, now 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 coordinates from the GNSS. The difference is that the HDOP value is always 0xFE;
- As soon as the GNSS signal becomes sufficient, 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.

2.2 “GSM tracking” configuration

Follow these steps to enable sending data without GPS fix:

1. Launch the FM device configurator and choose your device.
2. Under **Global** settings locate **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.

Configuration file information
Configuration source: **Configurator** Target device: n/a
FM device FW version: n/a CFG Tag:
FM4 Configurator version: n/a Last edited: n/a

Global

Protocol
 UDP TCP

APN settings
Name
User
Psw
 Lock FM device to the SIM card

Configuration Password

Driver registration

Send data without GPS fix
 2.

Identification string Disabled

Profile 1 Profile 2 Profile 3 Profile 4

Sleep
Disabled after 600 sec

Data sending
 Enable
Min Records 1
Period 60 s
Link Timeout 7 s

Connection settings
IP1
Port1 0 SSL 1
IP2
Port2 0 SSL 2

Authorized numbers

Eco-Drive
 Enable

Authorized IDs

Sensor sensitivity
4 5 6 7 8 9 10 Max

2G - 3G
Auto

Operator list

IO events

Data collection
 Enable
SD card logging interval 0 s
Time without engine 60 s
Engine Always on
 Send only record header if triggered by time, distance or course
 GPS stationary navigation filtering

Send data without GPS fix

Send data without GPS fix Do not use with TrustTrack server!
Collect data without time
Use time synchronization GSM
NTP server
Refresh interval 0 h

Enable GSM tracking 3.
Track when engine is ON 4.
Request position after, s 300 5.
Request interval, s 300 6.

Tco4 HCV 1.