Ruptela
Transport Telematics

FM-Eco4/4+
User Manual

2018/05

Table of contents

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1 Preface

1.1 Use of this document

This document provides required information for proper device handling, preparation, configuration and installation to a vehicle. This document has a linear structure – from the device package box reception to the recommendations on how to install the device to the vehicle. However it is not overfilled with unnecessary information. You will find only basic descriptions about various functions and actions needed to start using the device with the reference to extensive descriptions of the contents.

The following markings are used to highlight important information:
● Notes contain important information that you need to pay attention to.

> **Note**
> Notes like this contain important information!

● Actions and various elements of the software required for configuration of the device are marked in **bold**.
● All actions are described in sequence in the following five sections: Introduction, Device description, Device preparation, Device configuration and Installation recommendations.

1.2 Document change log

Date	Version	Change details
2014-06-06	1.0	Initial draft.
2014-06-10	1.1	Minor update.
2014-06-17	1.2	Structural update.
2014-08-06	1.3	Charging temperature fixed.
2014-09-01	1.4	Advanced configuration added.
2015-02-04	1.5	Branding changes.
2015-09-21	1.6	Waste equipment disposal rules; driver installation section updated.
2015-10-28	1.7	GPS/GLONASS module.
2016-01-22	1.8	SIM lock, SIM card status, Towing detection, Send data without GPS fix, Custom ignition.
2016-04-08	1.9	2nd level temporary black list.
2017-02-06	1.10	"Constant TCP link" functionality description in "Profile settings" chapter.
2017-03-09	1.11	Changed DIFF file description in "Advanced Configuration" chapter.
2017-04-12	1.12	1-Wire interface added.
2017-05-10	1.13	"GSM tracking" feature description and option to enable/disable SIM status feature in "Global settings" chapter. Configurable sleep mode description in "Profile settings" chapter.
2017-06-08	1.14	Automatic IO enable function in IO setting chapter.
2017-08-30	1.15	Debounce description added in "IO settings" section.
2017-10-18	1.16	Added "Configuration information" description in the "Sample configuration section.
2017-12-22	1.17	Added description of "Link settings – Heartbeat" in the "Profile settings" section. Added note regarding greyed out fields in "Global settings".
2017-05-11	1.18	Added description of automatic firmware update from configurator.

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2 Introduction

2.1 Purpose

The purpose of this document is to provide physical and technical data of the device, to explain device's behavior and how various conditions are indicated. Also, device preparation for operation and its configuration instructions are included.

2.2 Acronyms

AC / DC – Alternating Current/Direct Current;
ACK - A signal to acknowledge the receipt of data;
GLONASS – Global Navigation Satellite System;
GNSS – Global Navigation Satellite System;
GPRS – General Packet Radio Service;
GPS – Global Positioning System;
GSM – Global System for Mobile Communications;
I / O – Inputs / Outputs;
LED – Light Emitting Diode;
PC – Personal Computer;
PCB – Printed Circuit Board;
SMS – Short Message Service;
UMTS – Universal Mobile Telecommunications System;

2.3 Legal Information

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2.4 Safety

All the associated (additional) equipment such as PC's, batteries, sensors etc., shall meet the requirements of standard EN60950-1.

Do not disassemble the terminal. If the enclosure of the terminal is damaged, or the insulation of wires is damaged, first of all disconnect power supply cables from the power supply source.

All of the wireless data transferring equipment produces interference that may affect other devices, which are placed nearby.

The terminal can be installed or dismounted only by qualified personnel!

The terminal must be firmly fastened in the predefined location. Predefined location is described in the mounting instructions.

The programming must be performed using a 2nd safety class PCs (with an autonomic power supply).

Make sure that the terminal is installed in a place, where it will not be subjected to harsh environmental conditions for extended time periods.

Any installation and/or handling during a lightning storm is prohibited.

For configuration use cables that were purchased from Ruptela. Ruptela is not responsible for any harm caused, while using wrong cables for the PC ↔ Terminal connection.

⚠ Attention! Do not connect the wires marked red (power supply) and black (chassis) to the wrong battery poles. Device has a reverse polarity protection, however if connected incorrectly, the device will not work.

⚠ To disconnect the device from the power supply, you need to disconnect 12 PIN plug from the device or disconnect the wires from the vehicle's power supply.

🗑 This crossed-out wheelie bin symbol means that waste equipment should not be disposed of with your other household waste. The product must be taken to separate collection points at the product`s end-of life.

This chapter contains procedures to help you safely operate the FM terminal. By following these requirements and recommendations, you will avoid dangerous situations. You must read these instructions carefully and follow them strictly before operating the device! The terminal is supplied from a car battery with these ratings: 12/24 V DC. The allowed voltage range from the battery is from 10 volts to 32 volts DC. Max. current 150 mA @ 12 V DC.

To avoid mechanical damage, it is advised to transport the FM terminal in an impact-proof package.

Before connecting wires of the 12 PIN cable to the vehicle, it is recommended to ensure that the cross-sectional area of wires mounting is at least 0.75 mm^2. To correctly dismount the terminal from the vehicle, first of all disconnect power supply wires. Only then other plugs or interfaces can be disconnected.

The terminal is intended to be installed in a restricted access location, which is not accessible for the operator.

2.5 References

This document is designed to work in a conjunction with other documents. Documentation is kept light, unnecessary information is omitted. Additional and extensive explanations can be found in the documentation referenced below:

- FM-Eco4 /4+ Datasheet – Contains technical data of the FM-Eco4/4+ devices. Can be acquired from support@ruptela.com
- Quick start guide – A quick guide that will help to understand device's configuration process and its functions.
- Peripheral accessories – Instructions on how to use peripheral accessories together with the FM-Eco4/4+ device.
- Website – Our documentation website that contains the latest firmware, configurator and sample configuration files.
- Microsoft Framework – This additional software is required in order to run our configurator.
- VCOM drivers – Drivers are required in order to connect the device to a PC.

All links are also provided in corresponding sections, where additional information might be needed.

Note
Ruptela documentation website address: doc.ruptela.lt

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3   Device description

3.1   About

Ruptela`s FM-Eco4 / 4+ is a 4th generation low cost, low power consumption basic tracking device. It acquires its position by a GPS/GLONASS signal and transfers data to a server via cellular GPRS network. FM-Eco4/4+ new features compared to FM-Eco3:

- Lower power consumption
- 1-Wire interface
- Internal power supply available (FM-Eco 4+ only)
- Waterproof housing
- Power supply from USB for configuration purpose

FM-Eco4 / 4+

3.2   Package contents

FM-Eco4/4+ device is supplied in a cardboard box. GPS/GLONASS antenna and IO cable are already installed to the device and you do not need to plug them in. Package contents:

- FM-Eco4/4+ device
- 12 PINs cable (preinstalled)
- GPS/GLONASS all-in-one antenna (preinstalled)
- USB cable (as an optional accessory)

Note

Providing a SIM card is optional, according to your payment plan. The SIM card is necessary for connection to the GSM network. The SIM card can be obtained from your local GSM service provider. The SIM card can work with the terminal only when all SIM card security codes are disabled.

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3.3 Physical characteristics

Properties	
Enclosure dimensions	82L x 63W x 28H mm
Indication	3 LEDs: GNSS status, GSM status, 1-Wire status
Housing	Plastic with cable glands, waterproof
Configuration interface	USB
Connectors	12 PINs insulated

3.4 Technical characteristics

[1]Power consumption @ 12V	FM-Eco4	FM-Eco4 +
Idle mode, mA	40	45
Sending records, mA	240	250
Deep sleep mode, mA	12	15
Internal power supply	-	LiPo 3,7 V 190 mAh

[1] Firmware dependent; given values are valid when there are no peripheral devices attached. If battery is in charging mode, then power consumption in each mode will be higher within 100 mA.

Ambient temperature ratings, °C:	
Temperature range for device (without battery)	
Storage temperature, °C	-40 ~ +65
Operating temperature, °C	-35 ~ +60
[2]Temperature range for battery	
Battery charging	0 ~ +45
Battery discharging	- 20 ~ +60

Common specifications	
Power supply	12/24 V DC (range: 10 – 32 V DC)
Absolute maximum ratings	50 V @ 60 s 72 V @ 0,1 s
Digital input threshold	4 V
Analogue input resolution	12 bit (Analogue input range: 0-30 V)
GPS/GLONASS module	Ublox EVA-M8M
Channels	72
Sensitivity	-163 dBm
GPS antenna	External
Frequency	1575.42 ± 3 MHz
FM-Eco4 / 4+ GSM modem	Quectel M95
Bands	GSM850/GSM900/DCS1800/PCS1900
GSM antenna	Internal
Bands	GSM850/GSM900/DCS1800/PCS1900
Accelerometer	3-axis; 2g/4g/8g/16g

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3.6 Peripheral accessories

There are several peripheral accessories that can be mounted with the FM-Eco4 / 4+ device. With these peripherals you can get even more features and extended functionality. All available peripherals can be purchased from Ruptela. Please contact your manager for details.

Available on 1-Wire:
- 4 × Temperature sensors DS18B20/DS18S20 (10 mA @ 5 V)
- 1 × iButton DS1990 (20 mA @ 5 V)

Available on DOUTs:
- 1 × Buzzer/LED
- 1 × ECO Driving panel (Power supply from 1-Wire. 40 mA @ 5 V)
- 1 × Ignition lock

Available on AINs:
- 2 × Analogue fuel sensors

You can find peripheral accessories installation instructions and documentation on our website.

3.7 Certification

FM-Eco4 / 4+ devices have passed quality tests and comply with the following certifications:
- E-Mark
- CE ready
- RoHS

3.8 LED Status

3.8.1 GNSS LED

When a GPS/GLONASS signal is not received or it is not accurate, the GPS LED is blinking as follows:
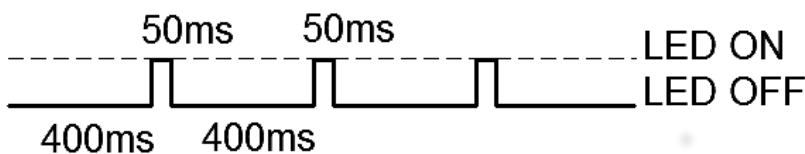
When an accurate GPS/GLONASS signal is received, the GPS LED is blinking as follows:
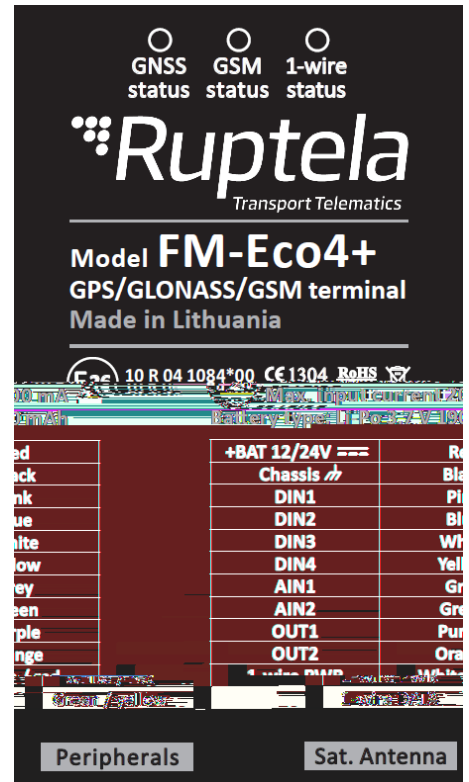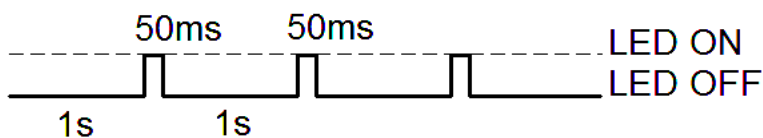
3.8.2 GSM LED

When a GSM signal is not received, the GSM LED is blinking as follows:
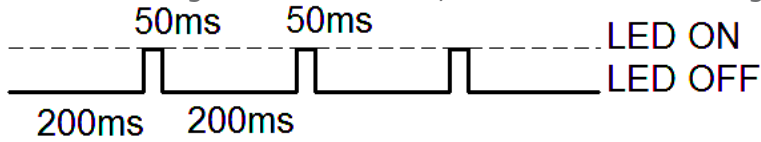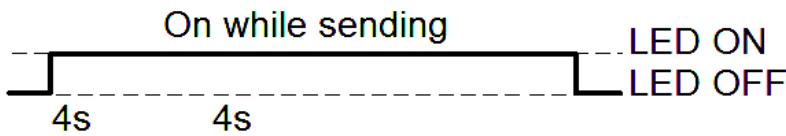

When the device has a good GSM signal, but no GPRS, the LED is blinking as follows:
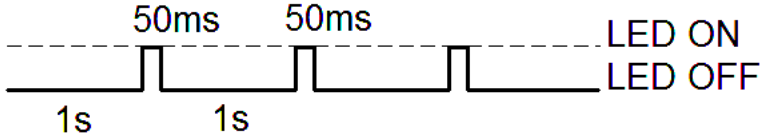
When the device acquires a good GSM signal and it is connected to GPRS, the LED is blinking as follows:
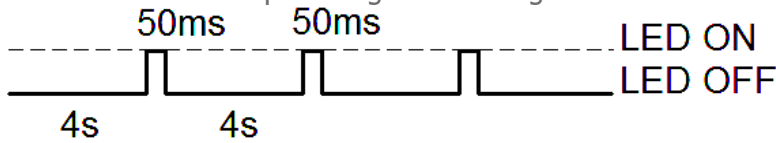
When the device acquires a GSM signal and is sending data via GPRS, the LED is blinking:
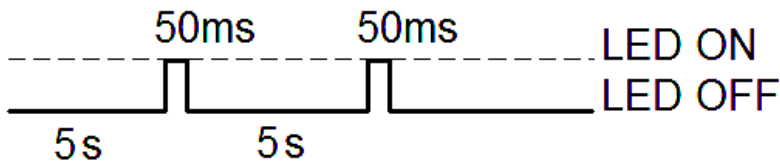

3.8.3 1-Wire LED

The FM device can have 1-Wire peripheral devices attached to it. 2 different LED states can be seen. When there is no peripheral attached, the LED will not blink at all:

When there is a 1-Wire peripheral interface device connected, the 1-Wire LED is blinking:


3.8.4 LED status in sleep and deep sleep modes

When the device is in sleep / deep sleep mode all three LEDs blink at the same time in the following pattern:

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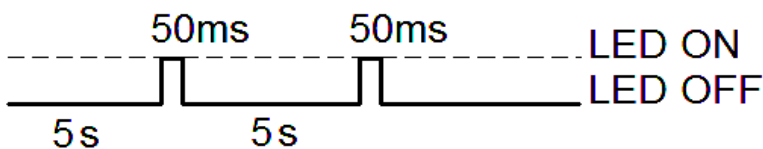
4 Device preparation

In order for the device to work you have to configure it and insert a SIM card. To do so, you have to open the device enclosure and perform certain actions described below.
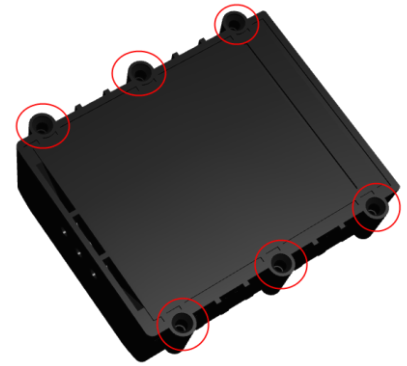

4.1 Opening the device

First of all you have to unscrew six "+" shaped bolts on bottom of device to access internal elements. Bolts are marked in picture with red circles.

Note

It is recommended to keep the number of opening procedures to the minimum.

4.2 Connecting the USB cable

Connect the USB cable to device. The used USB cable has a specific nonstandard connector. Please plug the cable into device as shown in picture below. The cable will plug in only in one way, be careful not to damage the plug. Connect other end to your PC or laptop.
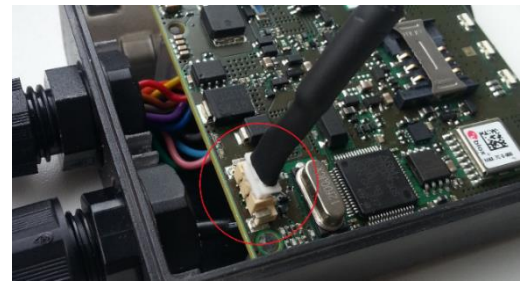
4.3 Inserting a SIM card

If you received the device without SIM card, place SIM card of your own into device as shown in picture below. The microchip must face down.


4.4 IO cable

GPS antenna and IO cables are connected already and you do not need to reinstall them. Configuration can be done without external power supply – the device can be powered for configuration from USB.

However if you accidently disconnected IO cable from device:

1. Make sure cable is in gland.
2. Take PCB out of housing.
3. Turn PCB over.
4. On IO cable find small **triangle**
5. Plug cable again **triangle** facing up.
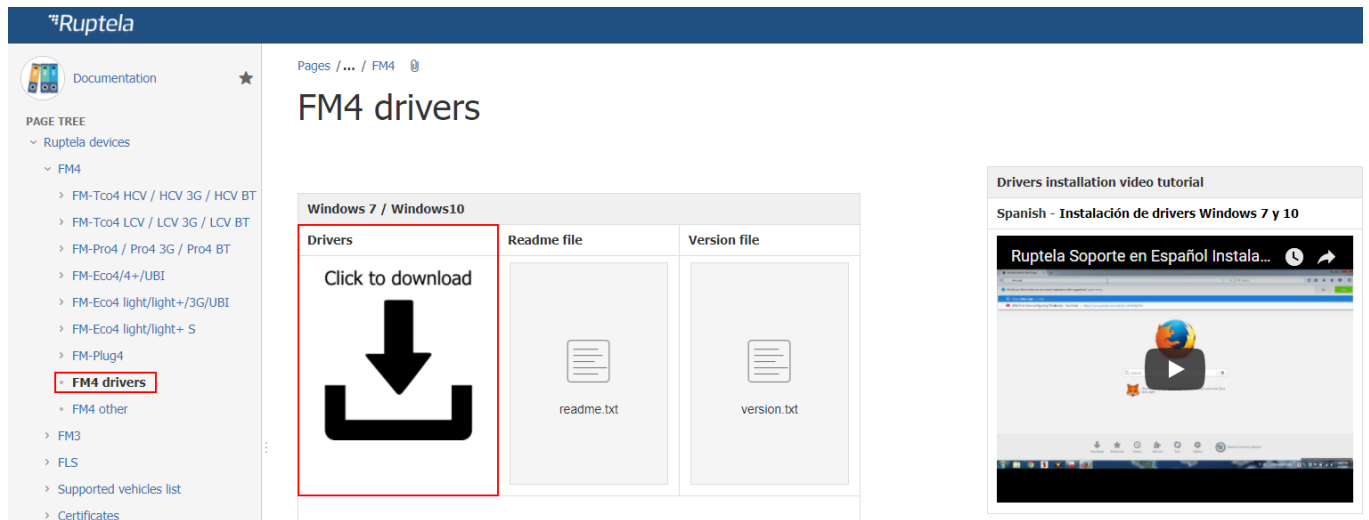6. Turn PCB over again and put into housing.
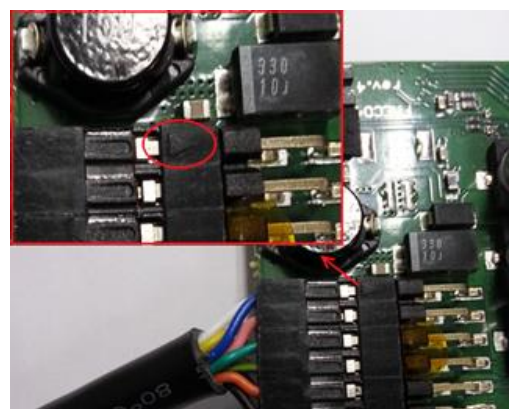
5 Device configuration

5.1 Driver installation

Virtual COM port driver installation is mandatory, only then your PC will recognize the FM-Eco4 / 4+ device that was connected to the USB port. You can download the latest driver from our documentation website server (VCOM drivers).

Choose the correct archive file with drivers for your OS version and download it to your PC.


Installation procedure:

- Uninstall any previous Virtual COM port driver versions:
    - Start -> Settings -> Control Panel -> Add or remove programs (Windows 7);
    - Start -> Settings -> Apps -> Apps & features (Windows 10);
- Extract archive file "Win7.zip" or "Win8.zip" to a desired location on your PC.
    - If you are running a 32-bits OS version, launch the "dpinst_x86.exe" [1.]
    - If you are running a 64-bits OS version, launch the "dpinst_amd64.exe" [2.]
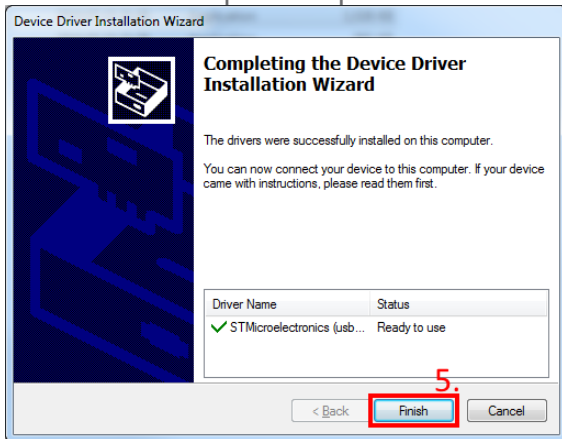
Windows 7 Users might get a Security Warning message. Click "Yes" [3.].
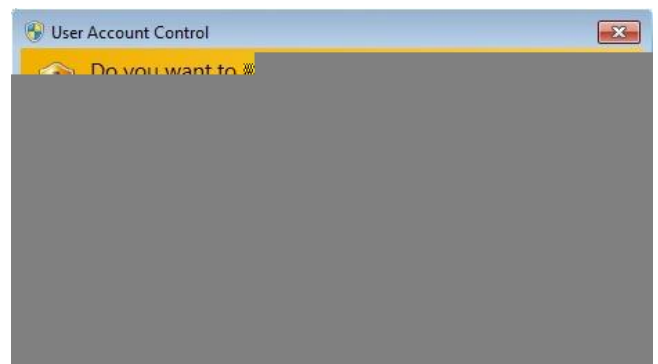
In the next window select "Next" [4.].
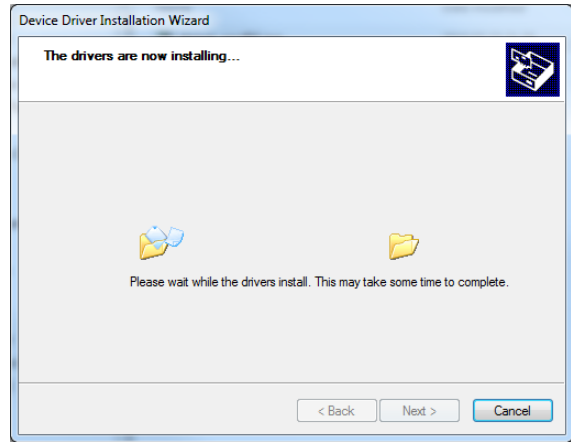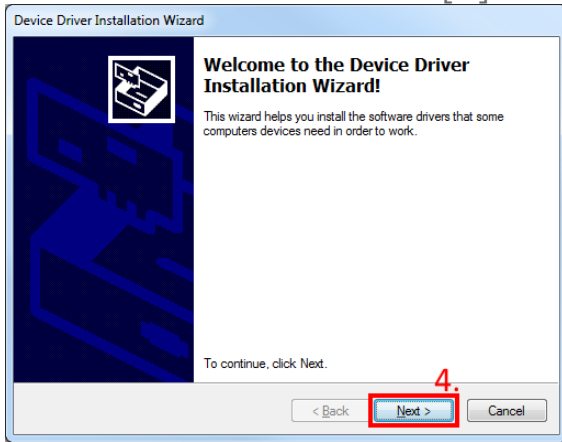
Wait for the setup to complete the installation and click "Finish" [5.].

The driver is now installed and ready to use.

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5.2 Sample configuration
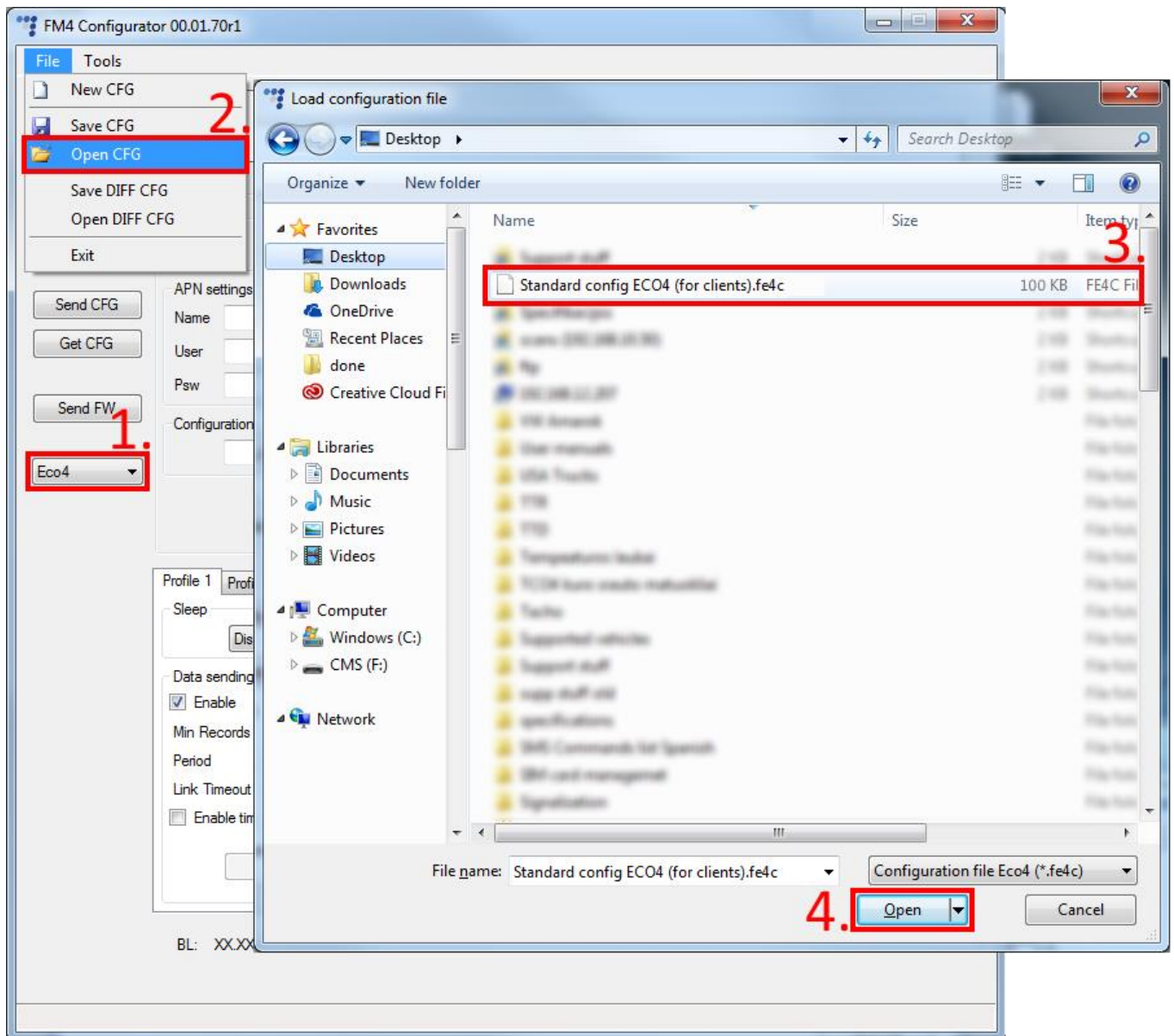
Go to our documentation website server and download sample configuration and the latest configurator. Also you will need the latest version of Microsoft Framework.

Operating system requirements:
- MS Windows XP/Vista/7/8/10

Start VCP.exe from configurator folder.

1. Select Eco4.
2. Click **File → Open CFG**.
3. In the dialog window, browse the sample configuration file that you have downloaded from the documentation website.
4. Click **Open**.

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Configuration information

Starting from configurator version 00.03.04.XX, the configurator will display additional information regarding the loaded configuration. The following information will be displayed at the top of the configurator once a configuration is loaded (if no configuration is loaded, the fields will be empty):

1. Configuration source – can be from "Configurator" or from "Device".
   - •• Configurator – means that the configuration is loaded from the PC;
   - •• Device [Device_IMEI] – means that the configuration was received from the FM device;
2. FM device FW version – this will be displayed only if the configuration was received from the device;
3. FM4 configurator version – show the configurator version on which the currently loaded configuration was made;
4. Target device – display the FM device model for which this configuration was created or from which device it was downloaded;
5. CFG Tag – is simply additional information that the user can save with the configuration file. Maximum length is 32 symbols, only printable ASCII characters are allowed;
6. Last edited – display the date and time when the configuration was last edited. If the edit was from a PC, the time will be the same as the PCs local time. If the configuration was received from the device, and the device currently has no time from any source, the date and time will be shown as the beginning of this century (2000/01/01 00:00:00);
7. If any changes were made to the currently loaded configuration, a small "*" symbol will appear next to the name of the configuration.
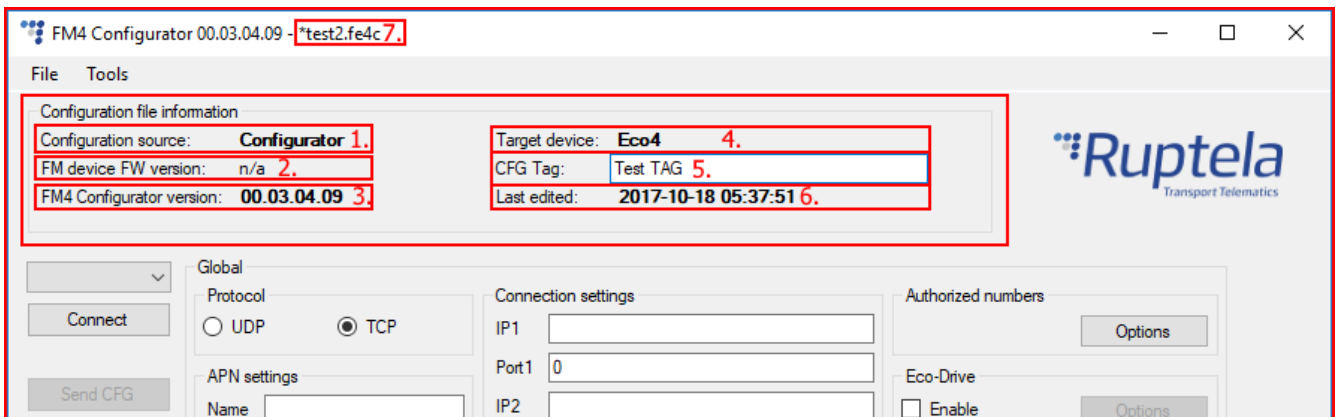

Configuration additional steps

Sample parameters will be loaded. However you will need to enter other parameters on your own. Enter IP (in the 255.255.255.255 format) or a Domain Name (not exceeding 40 characters) and PORT to which the device should send data.

1. Enter APN settings: APN name, User login and Password (if login and password needed). If you choose to enable **Lock FM device to the SIM card** check-box you will be required to enter SIM card's PIN code every time you try to connect to the device via USB cable. As long as it is checked you will not be able to use different SIM cards with this device.
2. Select a COM port you connected the device to and click **Connect**. At this point the configuration is ready to be send to the device, so the device must be connected to the computer.
3. Click the **Send CFG** button. The configuration will be uploaded to the device.

Note
APN name, login and password should be provided by your mobile network operator
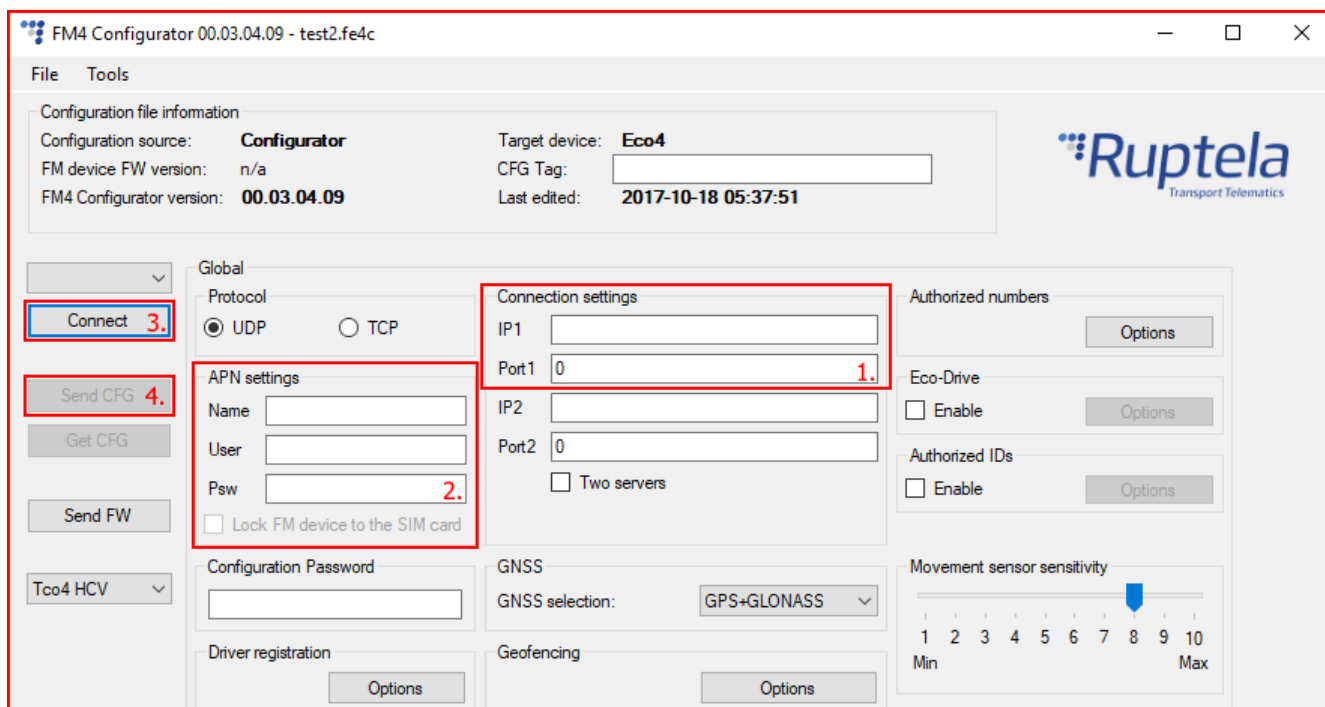
Now the device is configured to send data to the specific server. Sample IO parameters are enabled (loaded with configuration file). You can log in to your tracking platform to see whether the device is sending data.

5.3   Advanced configuration

The configuration tool is quite similar to the one used for 3rd generation devices. Overview of the configuration is described in sections.

The **File** menu gives you access to control configuration files. Choose *New/Save/Open CFG* to perform the corresponding action. CFG means full configuration file.
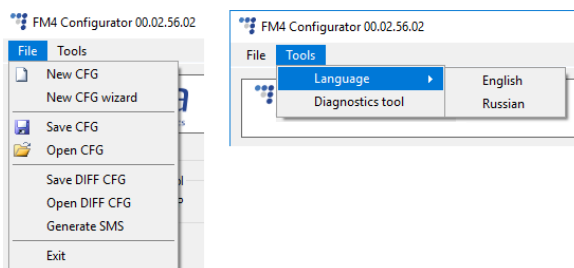
New CFG wizard – It helps users to go through all basic configuration steps.

Generate SMS – This tool allows the user to generate a SMS command to configure the FM device remotely. Working principle and general SMS command functionality is described in the "Device configuration via SMS" document at doc.ruptela.lt

The **Tools** menu contains:
- Language selection options: English or Russian are available.
- Diagnostics tool.

Save/Open DIFF allows you to create a DIFF file. DIFF files are used to change only one or few certain parameters without a need to upload the full configuration to the device. It is useful, when updating over-the-air.
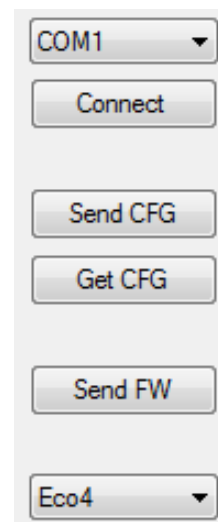
Attention

A DIFF file will save all made changes to a configuration. For example changing a number in the IP filed, or marking a checkbox, but, if a change was made, and afterwards reverted to the previous state (checkbox checked, and unchecked afterwards), this will not be marked as a "change made". DIFF will only record changes made to the initial configuration (a loaded pre-set configuration is considered an initial configuration). Particular attention must be taken, when creating a DIFF file, to avoid accidental changes to the configuration.

The control panel on the left hand side allows you to select and control the device.

Select the COM port that the device is connected to and click "Connect". At this point the FM4 configurator checks the compatibility between itself and firmware in the device. Every firmware version is released together with a recommended FM4 configurator. More information about different firmwares and recommended configurators for them can be found in firmware changelogs. After the compatibility check, three outcomes are possible:

1. The firmware and configurator versions are compatible. Go ahead and continue configuring the FM device.
2. The configurator is too old for the current firmware version. An error message will appear. The "Send CFG" and "Get CFG" buttons will be disabled. You will need to download a new version of the configurator, recommended for the firmware version.
3. The firmware is too old for the current configurator version. An error message will appear. The configurator will suggest to update the firmware automatically. To update the firmware, click "Yes". The firmware will be updated to the version supported by the configurator. This can be done without an internet connection. Click "No" to close the message without updating the firmware. If the firmware is not updated, the "Send CFG" and "Get CFG" buttons will be disabled. We highly recommend using the latest firmware and configurator.

The "Send CFG" and "Get CFG" buttons are used to send and receive the configuration file to/from the device.

"Send FW" is used to send new firmware to your device manually.

In the drop-down list below you can select the model of the device. If you connected one to your PC, it will be displayed. Now Eco4 should be displayed.

5.3.1 Global settings

The first part of the configuration tool is "Global" settings. Global includes connection settings and other settings independent from the profile settings – global settings are the same for all profiles.

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Connection settings here you should enter server IP and port that the device should connect to. The IP can be entered in the numeric format: 255.255.255.255. You can also use a Domain name (not exceeding 40 characters). IP 2 is a backup IP address, which is used when the device is unable to connect to the first server.

Note
Please have in mind that ports for TCP and UDP transfer protocols usually are different – please select the correct transfer protocol and enter the correct port.

- **Two servers** – checkbox changes the logic described above. It enables a two servers mode – the same data is repeatedly transmitted to another server with IP2, unless we get a timeout. IP1 is dedicated IP for server, from which we get the ACK's for our record packets sent. After we get the ACK from this IP, record data is considered as successfully transmitted to the server and it is removed from the memory.

    In this mode data is sent to IP2 only when connection to the IP1 is established. Packet, which is sent to the IP1 server is also sent to the IP2 server.

    Only records are going to be send to the IP2. Data packets such as Transparent Channel, Tachograph, SD card, Garmin will not be send to the IP2.

    Unable to send data:

    When unable to establish connection to IP1, device does not connect to the IP2 as well. When connected to IP1 and doing data transmission, but IP2 is unreachable – after receiving ACK from IP1 server, data is removed from memory, which can cause information loss in IP2 server.

Note
Two server mode doubles the amount of data that is being sent. Before using this functionality consider the cost which arises from the higher data traffic.
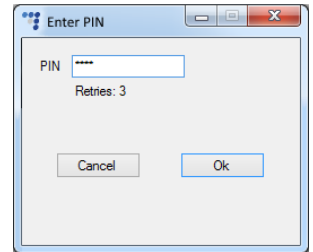
Protocol sections allows you to choose from two protocols. **UDP** protocol is less reliable than the **TCP,** but also uses less traffic. TCP uses more internet traffic, but it is more reliable. Choose one according to your needs.

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APN settings are needed for internet connection. These settings must be provided by your mobile network provider. Without APN settings the device will not send any data.

- If you choose to enable the **Lock FM device to the SIM card** check-box you will be required to the enter SIM card's PIN code every time you try to connect to the device via USB cable. As long as it is checked you will not be able to use a different SIM card with this device.

If the wrong PIN is typed in more than three times, the SIM card will be locked.

It can be returned to its original unlocked state by entering a PUK, provided by the service operator after verification. If the wrong PUK is entered ten times in a row, the device will become permanently blocked and unrecoverable, requiring a new SIM card. Once you enter the PUK code, you must set a new PIN.
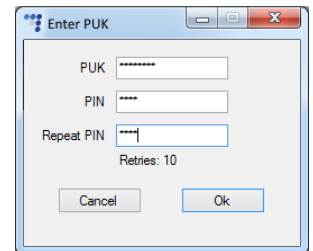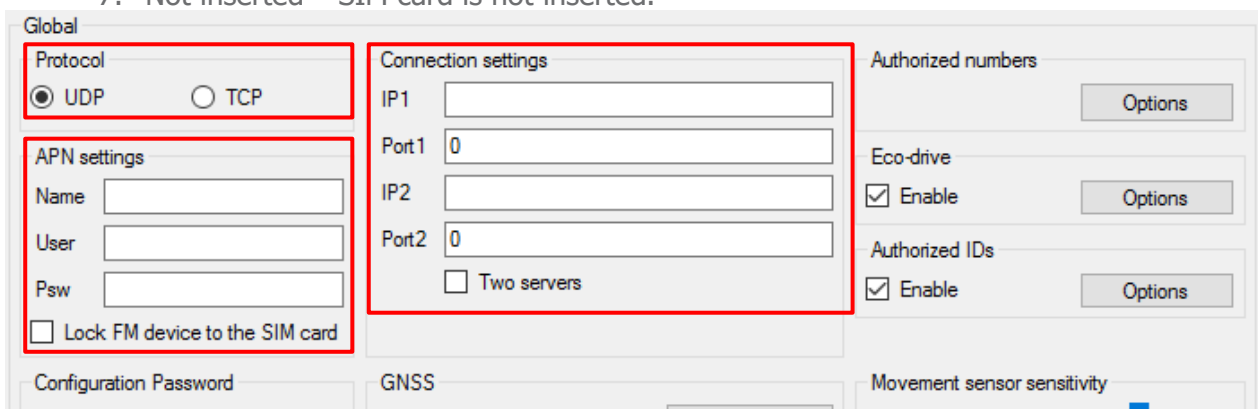
SIM status section at the bottom of the configuration tool displays SIM card related information. By default, feature is disabled. Tick the checkbox to enable it.

Total of seven different statuses are available:
1. Ready – PIN code is known or PIN code check is disabled. GSM/GPRS modem can operate normally.
2. Error – Represents a wide range of possible problems. Common reason would be old FW version, which does not support SIM commands.
3. Unknown – Communication between device and GSM/GPRS modem failed, SIM status is unknown.
4. PIN Request – SIM card requests a PIN code, FM device cannot provide it (code provided by the device is incorrect).
5. PUK Request - SIM card requests a PUK code.
6. Locked – This FM device is attached to a different SIM card.
7. Not inserted – SIM card is not inserted.

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Configuration password allows to lock the configuration – without the password no one can change the device configuration via cable. However, over-the-air update ignores the configuration password.

Driver registration is used to authorize the start of the vehicle, identify a driver and account working hours. The full functionality description can be found on our documentation website, Driver registration.

Send data without GPS fix – device cold-start often causes issues, because it is not sending data, therefore the user is unable to see parameter values until GPS fix is obtained. This functionality allows data sending even when there is no GPS fix. This feature cannot be used with TrustTrack server! Full functionality description can be found in "Send data without GPS fix" document on our documentation website.

Also, when the device loses GPS fix, there is no way to determine its location. GSM tracking feature can now be used to obtain an approximate location in the densely urbanized areas, where GNSS signal is not available. This feature cannot be used with TrustTrack server! Full functionality description can be found in "Send data without GPS fix" document on our documentation website.

GNSS allows to select positioning network – GPS, GLONASS or GPS+GLONASS. GPS+GLONASS by default (*recommended not to change this*).

Geofencing allow to use internal geozones, configured directly into device. Full description can be found on our documentation website, Internal geozones.

Towing detection – with Towing detection driver can be informed, that his car is being towed. Information about such event is sent to the server, therefore driver might still have time to come back to his vehicle before it is taken away. Full functionality description can be found on our documentation website.

Impact detection – when this feature is active, FM device monitors its acceleration in all directions and generates records, when acceleration exceeds configured limits. Clients can use this feature to get notifications to the server about irresponsible drivers, who hit sidewalks or other obstacles. Full functionality description can be found on our documentation website.

Authorized numbers

- Set a **Password** to restrict access to the SMS commands feature.
- **SMS Alert Number**. When specific I/O parameter is triggered, the FM device will send an alert message to this number.
- In the **Valid Numbers** table enter specific numbers that will be able to send commands to the device.
- **Enable configuration over SMS** checkbox controls configuration over the SMS feature. Full functionality description can be found on our documentation website.
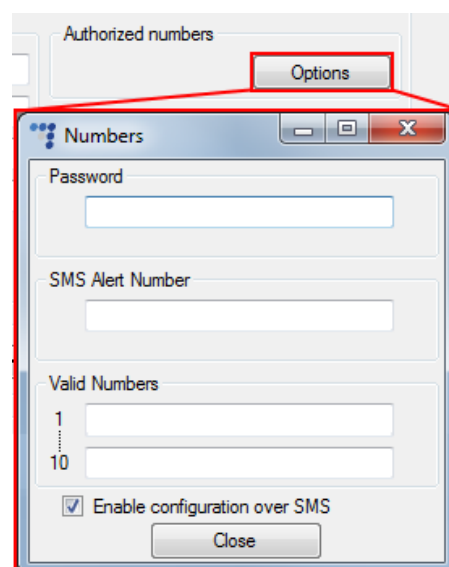

ECO Driving options are used to choose sensitivity for the ECO Drive functionality. It helps to rate drivers according to their safety or according to driver's behavior. Full functionality description can be found on our documentation website, ECO Drive.

Authorized ID's allows you to fill in a list of authorized IDs who can start engine when ignition blocking is used. More information about this functionality is available on our documentation website, FM-Eco4, Pro4, Tco4 + Driver registration.

Movement sensor sensitivity allows you to configure movement sensor according to your needs. If you slide the bar towards the Max, the sensor will detect even very slight movements. If you slide it to the Min, than only stronger movements will be detected.
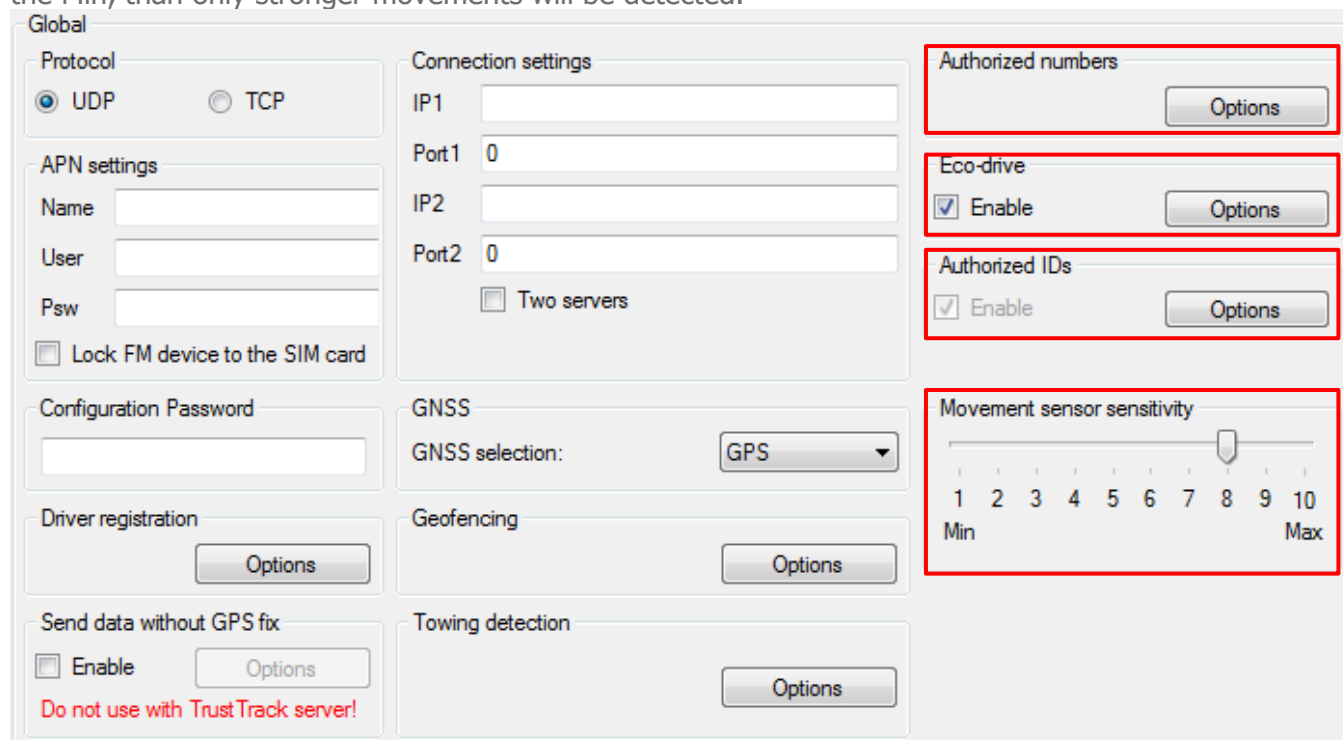
Send identification string feature forces FM device to send an identification packet to the server. After that the device waits for the ACK packet from the server. Once device receives this packet, it begins data transfer.
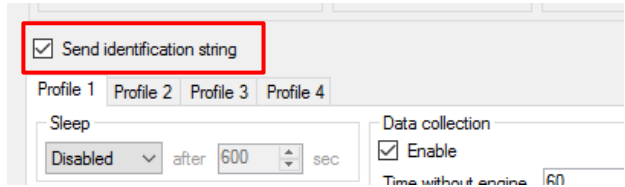

5.3.2 Profile settings

The second part of the configuration tool is for profile settings. This section also contain explanations for other features that needs extensive configuration. Functionalities descriptions are available.

Each "Profile" is a settings set for specific circumstances (e.g. One profile for the vehicle, when it is operated in the native country and another profile, when it is abroad).

Sleep can be *Disabled* or set to *Sleep* or *Deep sleep*. Sleep extends internal battery life by turning off GPS/GSM modems. Deep sleep disables advanced peripherals (1-Wire, CAN1, CAN2, Serial Ports, K-Line). When *Sleep*, *Deep sleep* or *Custom* is selected, it is possible to modify the sleep timeout. Once this time limit is reached, the device will first check if there are any unsent records, if there are no records pending, the device will switch to the configured sleep mode. If there are records pending, the timeout will be twice as long, but it will activate the selected sleep mode non regarding the records in the buffer. By default, timeout is set to 600 seconds.
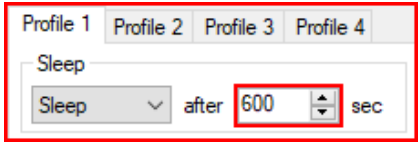
- If engine detection is set to *Always on* – device will not go to sleep;
- If DIN state is High (Value = 1) - device will not go to sleep or deep sleep mode;
- Device cannot go to sleep, if Garmin is connected to it and switched on;
- Any IO events (except those related to switched off peripherals, according to sleep configuration) that are set to generate records on *High* priority will wake up the device.

Conditions for device wake up from sleep mode:
- A High priority event is triggered;
- Configured engine state changes to "ON";
- Sleep timer IO configured time is reached.
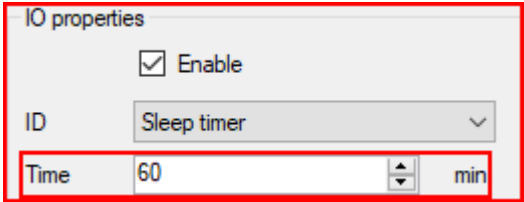
When *Custom* is selected, you can choose, which functionalities should work during device sleep and which functionalities should be disabled. Like previously, it possible to set a time limit. Once this time limit is reached, the device will switch to Custom sleep mode. Full functionality description can be found on our documentation website.

With **Data sending** settings you can configure the data sending frequency and conditions.

- The **Enable** check box must be enabled.

  - **Min. records** – Minimum number of records required to establish a connection to the server. If the device detects less records than entered value, link to the server will not be opened.
  - **Period** – sets how often the device will check for required number of records.
  - **Link timeout** – this value indicates how long the device should wait before closing the link, after this link was successfully established with the server and all the records had been sent. The default value is 7 seconds, it is recommended not to change it.

- **Link settings** contain the following settings:

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- **Constant link** check box forces the FM device to check server link state and keep it "alive" all the time. If server or network closes the link, the device automatically reopens it but does not send any packets.
- **TCP Keep alive** check box if enabled will send "keep alive packets" every minute if there is no data being sent. Therefore, the device is always accessible via GPRS. **(requires the use of TCP protocol)**
- **Heartbeat** – is a special function that sends a heartbeat packet – GPRS command 16/116 after the set time period has passed **since the last packet sent.** Which means if the device is constantly sending packets, the heartbeat packet will not be sent. As the name explains, this function is used to keep an open socket on the server side if no other packets are sent.
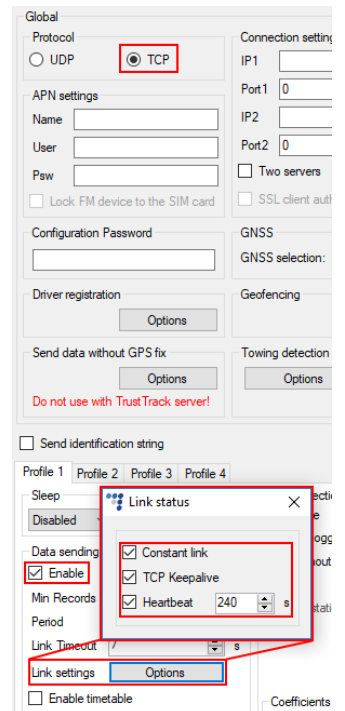
Notes
- If constant TCP link functionality is enabled, the device ignores link timeout parameter for the main connection and uses it only for the emergency connections.
- Constant TCP link and Heartbeat functionalities do not work with the second server if "**Two Servers**" mode is used.

- **Timetable** allows you to select particular days and hours for the data to be sent.
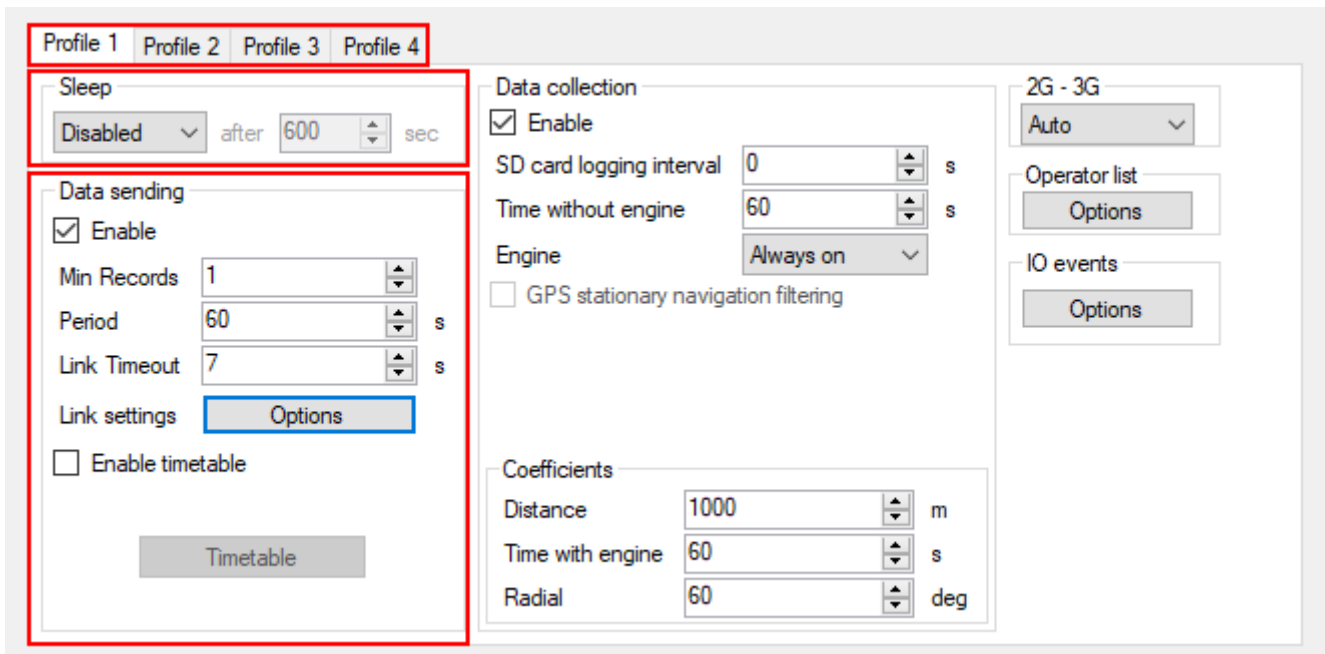
Data collection must be enabled to collect the information.
- **Time without engine** means how often records should be made, when the engine is off.
- **Engine** drop box allows you to choose how the device will pick up the ignition (consider that the engine is on).
  - *Always on* – No ignition pick up, engine considered always to be on
  - *Ignition(DIN4)* – Digital input 4 is default DIN used for ignition pick up.
  - *MovSensor* – Detect moving of vehicle and consider engine to be on.
  - *Custom* – Custom Ignition functionality enables user to select more than one condition to detect engine ignition. Full functionality description can be found on our documentation website.

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- **GPS stationary navigation filtering** eliminates GPS jumps, when the vehicle is not moving.
- **Coefficients** are used to collect records in addition to the engine on/off parameters. A record will be made when:
  - **Distance** that was set - has been achieved
  - **Time with engine** has passed
  - **Radial** turn of degrees that was entered - has been detected.

Note

Keep in mind that FM Device is not designed to have a perfectly accurate time tracking function. Due to various reasons minimal deviations are possible. Over prolonged time periods these small deviations might add up and produce time tracking inaccuracies. Few examples:
- Device is configured to track one event for 1h. However actual event tracking might last for 1h ± Error (i.e. 5 seconds).
- Device is configured to gather records every second. Depending on the device's state, record gathering time might deviate and last longer (i.e. 2, 3 or even 5 seconds).

2G – 3G section allows to set device operation mode either to 2G or to 3G. This feature is supported in FM4 devices that have UG96 GSM modem.

Note
- FM-Eco4/4+ devices with hardware versions that do not have UG96 modem operate only in 2G mode. For these devices *"Auto", "GSM only"* and *"UMTS only"* options have no effect.

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Operator list

- **1st... 3rd Profile** tab – operators list in this tab allows selection of operators used in current profile. If operator that is in the list was not found, then device will search for other operator in the list. If no operators were found, device will switch to the next profile.
- **Blacklist** has opposite meaning for operator list. Operators that are in blacklist will not joined.
- **Enable priority in list -** search for operators according to number in list. If it is not selected, device will search for operator randomly.

Note

Black list is one for all profiles, but operator lists are different for each profile.

- **GPRS Attempt** – how many times device will try to attach to operator`s GPRS before trying another operator.
- **GPRS data counter** – how many kilobytes of data device should send before performing next operator search.
- **Temporary blacklist** – temporal ban period in seconds. Sometimes when the FM device connects to the operator with unavailable GPRS, the device is connected, but cannot transmit any data to the server. In such case temporary blacklist is used. Operator with unavailable GPRS gets into the temporary blacklist, which prevents the FM device's connection to this operator on the next operator search.

  In other case, device connects to mobile operator and successfully obtains GSM and GPRS signal. However, records still do not reach the server. Device has an ability to work around the faulty network (i.e. when network connection is lost) by putting this operator into the temporary backlist. Ban in this case is implemented via 2nd level temporary black list logic. Network verification is done as follows:

  - •• Server pinging – device performs server pinging only when there is no response (no ACK) from the server and if the connection to server is not available.

    It will make up to 3 separate pinging attempts. If any of these attempts are successful, network will be verified. In an ideal case, server responds after the first attempt, network is verified and no more pinging operations are needed.

    If the server fails to respond to all of them, the device will switch to another operator, after putting current operator into the temporary black list.

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During a single pinging operation device transmits approximately 256 bytes of data. If device needs to make all three attempts, it will send approximately 768 bytes.

- Operator is also added to the temporary black list, when the device receives "13110" error code from the operator. According to Quectel M95 AT command manual the first number in error code "1" stands for "Cause for protocol stack (PS) layer" and the rest "3110" stands for "Network fail".

Received trouble codes can be monitored with the help of "GSM trouble codes" IO parameter.

Note
This functionality might be compatible and might be supported with 3G modems used in Ruptela's FM devices.

Key point about the temporary black list:

- Ban period is configurable. When all operators get into the ban list, ban list is cleared.
- Banned means that the terminal was not able to get the GPRS context, it was unable to connect to the operator, server failed to respond to 3 consecutive ping requests or that the terminal received "3110" error code from the mobile operator.
- Ban list is in the RAM the memory, it is cleared after reset or power off.

5.3.3 IO settings

IO events "Options" buttons opens up a new "IO settings" window, here you can enable or disable IO parameters that will be sent to a server. The setting the user should configure, is the protocol selection. **Protocol selection** section has a checkbox, where you can choose to "Send I/O data with v1.1 protocol".
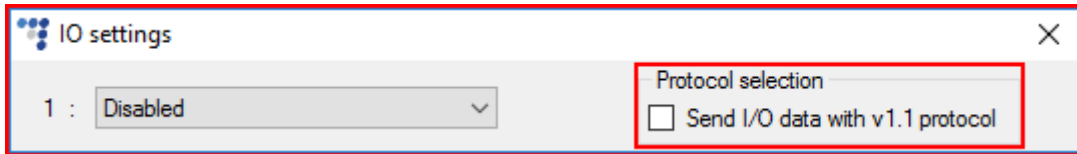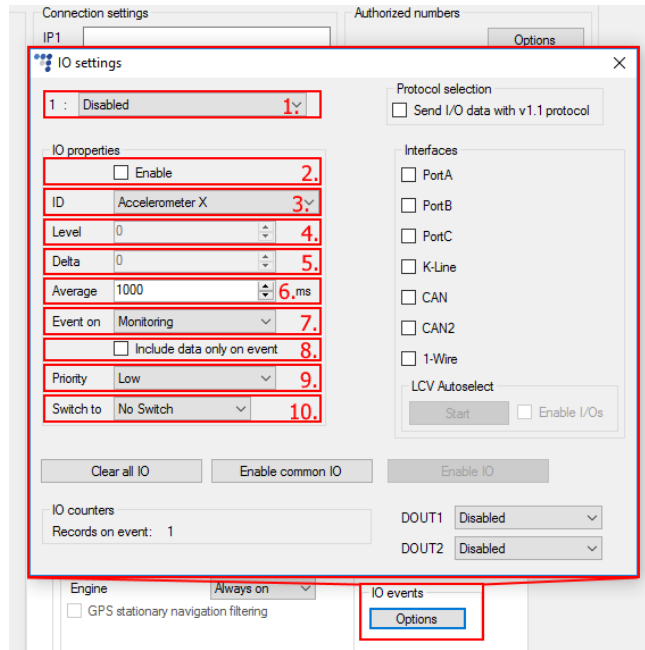

Note
A significant part of the IO parameters require that the protocol v1.1 is enabled! Without it enabled, these parameters will not be displayed in the ID list. Enabling the protocol will delete all unsent records from the device.

After the user decided on the protocol settings in accordance with his needs, he can move on to the IO parameters. There are several ways to enable IO parameters, the first way described is the fully manual way, where the user enables and configures each IO by hand:

1. You have 40 slots for parameters. Select slot you want to enable.
2. In the **IO properties** section tick the **Enable** check box, otherwise the slot will remain empty.
3. **ID** contains the parameter list. Choose a parameter you want to enable for the selected slot. One parameter can be enabled only one time.
4. **Level** is used with hysteresis mode, *see 7.c below for more details.*
5. **Delta** is used with hysteresis mode, *see 7.c below for more details.*
6. **Average**. Some parameter`s values change rapidly and do not correspond any valuable information. Averaging values for some period of time gives a more usable value of the parameter (e.g. fuel level often oscillates. Averaging gives you an approximated value that correspond to the real fuel level in the tank).
7. **Event on** – describes how the parameter will be measured and sent:
   a. *Monitoring* – Parameter value is always monitored and sent with every record
   b. *Change* – when value is changed record will be made regarding this change. However parameter is monitored and sent to server with every record
   c. *Hysteresis* – Record is generated because of specified change in parameter value. E.g. parameter is Power Supply voltage. Level sets point of reference, in this case 12700 mV. Delta is variation in value, e.g. 1000 mV. Record will be generated (because of parameter value change) when Power supply voltage drops to < 11700 mV and/or > 13700 mV. You can select condition "on rising" or "on falling"
8. Select **Include data only on event** to get a parameter value only when the condition (set in step 7) is met. In other cases the parameter value will not be included in the records.
9. If **Priority** is set to "High", the record will be sent immediately, disregarding data sending settings. If it is "Low", the device will wait for suitable conditions to open a link to server.
10. Upon an event of a value change in some parameter you can configure the device to **Switch to** the other profile.
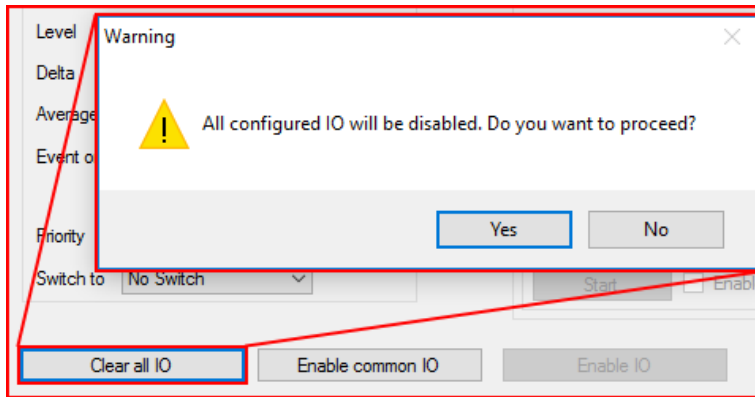
Note

Some IOs will have a "Debounce" setting instead of the "Average" setting. Debounce defines for how long the device must receive a changed state of an IO, before it registers the changed state. For example, the DIN state changed from 0 to 1 and Debounce is set to 5000ms, so the signal from the DIN must remain constant for the period of 5000ms to actually change the state of the IO from 0 to 1.
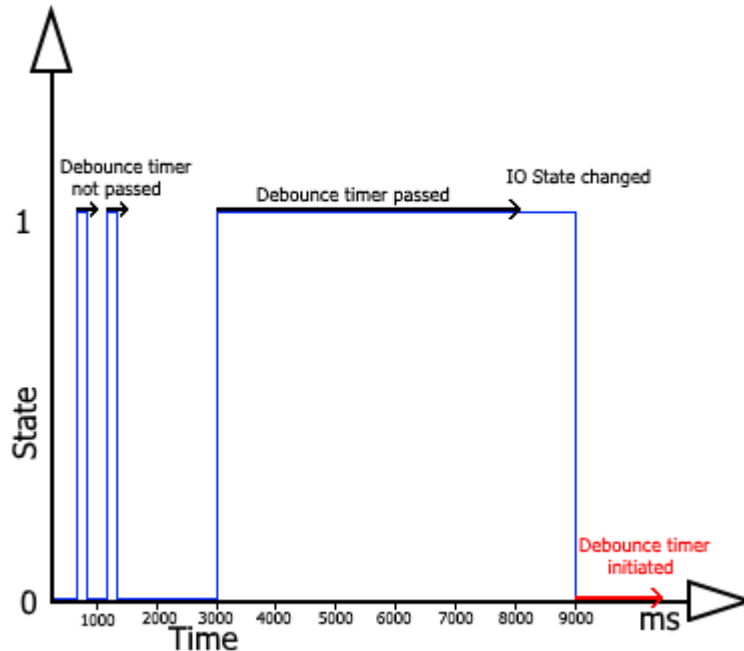
If IOs were configured incorrectly, or the user simply decides to re-do the configuration, he can use the "Clear all IO" button, which disables all the enabled IOs along with their configuration in the selected profile.

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The next method describes how to automatically enable and configure commonly used IOs. To do this, the user must simply click the "Enable common IO" button. This will open a window with a list of IO parameters that will be enabled along with additional information, such as:

- Free IO slots remaining after the selected IOs are enabled;
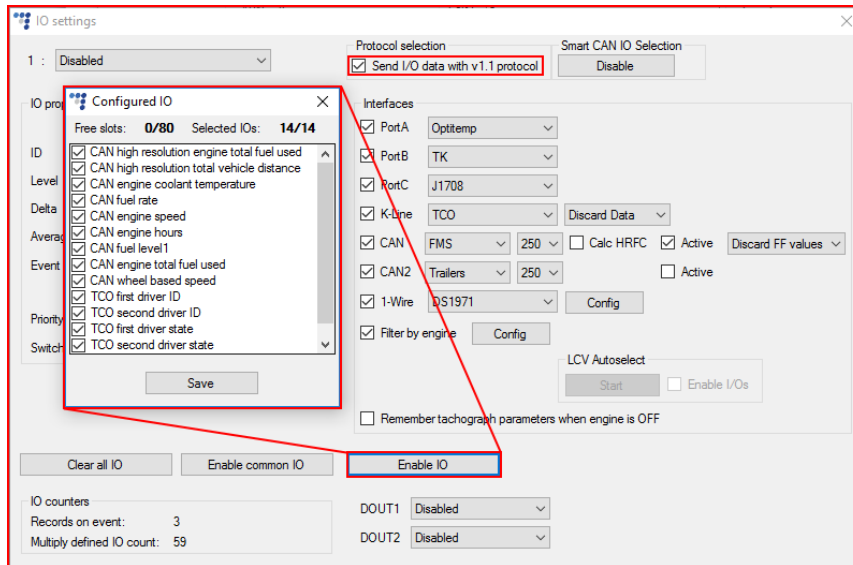- Amount of IO parameters selected.

The user can also choose, which of the IO parameters to enable, this can be done by unchecking the checkbox before the IO parameter name. To enable the selected parameters, the user must click "Save".
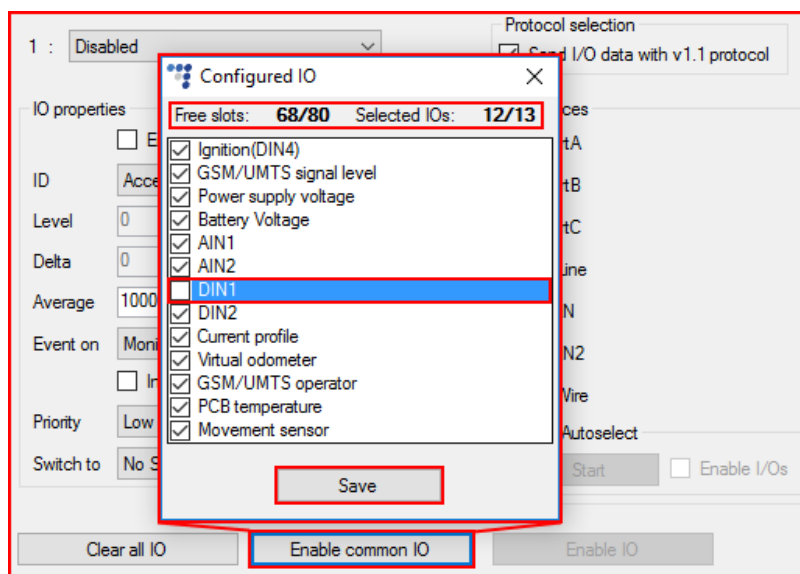
If there are not enough slots to enable the selected IO parameters, an error window will appear.
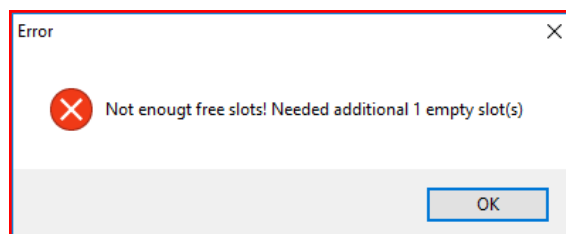
Lastly, the "Enable IO" button enables IOs for the selected interfaces. **This button is available only if the "Protocol v1.1" is enabled!**

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Interfaces are described further down in this document.

1-Wire DS1971:
Use the 1-Wire interface to enable and configure DS1971 iButton EEPROM memory reading. This process is described in the "Drivers registration" document located [here](#).

Digital outputs section

DOUT1 and **DOUT2** – dropdown lists let you choose one of the following: *"Disabled"*, *"LED"*, *"Buzzer"*, *"Blocking"*, *"GSM jamming block"*, *"Custom"*.
More information available at our on our documentation [website](#)

5.4 Integration protocol
All integration related questions and documentation can be acquired from Ruptela technical support: support@ruptela.com

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6   Installation recommendations

6.1   Device installation

When installing device into vehicle please obey these instructions otherwise you device may not work properly.

- Module should not be seen or easily reached.
- Module should be firmly fixed to the surface. Please avoid mounting module near the metal surface or cables (see the picture below).
- Wrong module mounting may be the cause of module malfunction.
- Module cannot be fixed to heat emitting or moving parts.
- SIM card should be inserted in the module while the connector is plugged off (while module has no power).
- Module could be fitted with double sided stick tape!
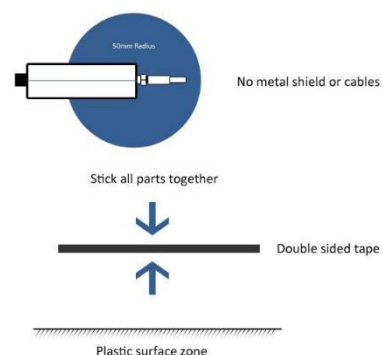
6.2   Antenna installation

It is recommended to place GPS/GLONASS antenna behind the dashboard as close to the window as possible. It must be uncovered, installed heads up (*see the picture*).

The best place for the GPS/GLONASS antenna is marked in blue (*see the picture*).

Correct   Incorrect

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