Ruptela
Transport Telematics

FM-Eco4 light 3G/light+ 3G
FM-Eco4 light/light+
User Manual

2018/05

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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
2016-07-21	1.0	Initial draft
2017-02-06	1.1	"Constant TCP link" functionality description in "Profile settings" chapter.
2017-03-09	1.2	Changed DIFF file description in "Advanced Configuration" chapter.
2017-03-13	1.3	Added temperature range for battery.
2017-04-12	1.4	1-Wire interface added.
2017-05-08	1.5	"GSM tracking" feature description and option to enable/disable SIM status feature in "Global settings" chapter. Configurable sleep mode description in "Profile settings" chapter.
2017-05-24	1.6	Removed "Absolute maximum ratings" in common specifications.
2017-06-08	1.7	Automatic IO enable function in IO setting chapter.
2017-08-30	1.8	Debounce description added in "IO settings" section.
2017-10-18	1.9	Added "Configuration information" description in the "Sample configuration section.
2017-12-22	1.10	Added description of "Link settings – Heartbeat" in the "Profile settings" section. Added note regarding greyed out fields in "Global settings".
2018-05-11	1.11	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;
SELV – stands for Safety Extra Low Voltage. A SELV circuit is a secondary circuit which is so designed and protected that under normal and single fault conditions, its voltages do not exceed a safe value.
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.

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⚠️ Caution! If an incorrect type of battery is used for replacement, there is a high explosion risk. Dispose used batteries according to the environmental requirements.

⚠️ 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 (*Supplied from SELV power supply source*).

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 light /light 3G Datasheet – Contains technical data of the FM-Eco4 light/light+ and FM-Eco4 light 3G/light+ 3G 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 light /light 3G 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

3 Device description

3.1 About

Ruptela's FM-Eco4 light / FM-Eco4 light 3G device is a 4th generation low cost, low power consumption basic tracking device. It acquires it's position by a GPS/GLONASS signal and transfers data to a server via cellular GSM/GPRS / 3G network. 3G network support was not previously available for FM4 devices. This new feature in FM-Eco4 light 3G is the main advantage over the FM-Eco4 light devices.

Both device versions FM-Eco4 light and FM-Eco4 light 3G have various improvements over the older 3rd generation FM-Eco3 devices:
- Lower power consumption
- 1-Wire interface
- Internal GPS/GLONASS antenna

FM-Eco4 light   FM-Eco4 light 3G

Both devices can have an internal power supply source. Device versions with batteries are labeled FM-Eco4 light+ and FM-Eco4 light+ 3G.

3.2 Package contents

FM-Eco4 light / FM-Eco4 light 3G device is supplied in a cardboard. Package contents:
- FM-Eco4 light / FM-Eco4 light 3G device or its variant with battery
- 12 PINs cable
- USB 2.0 cable: USB A - male to mini USB B (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.

3.3 Physical characteristics

Properties	
Enclosure dimensions	64,5L x 61W x 22H mm
Indication	3 LEDs: GNSS status, GSM status, 1-Wire status
Housing	Plastic
Configuration interface	USB
Connectors	12 PINs insulated

3.4 Technical characteristics

[1]Power consumption @ 12V	FM-Eco4 light	FM-Eco4 light 3G	FM-Eco4 light+	FM-Eco4 light+ 3G
Idle mode, mA	33	32	36	35
Sending records, mA	300	90	310	100
Deep sleep mode, mA	11	14	12	14
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	
Storage temperature, °C	-40 ~ +65
Operating temperature, °C	-30 ~ +60
Temperature range for battery	
Charge, ºC	0 ~ +45
Discharge (operating), ºC	-20 ~ +60
Storage, ºC	-20 ~ +60

Common specifications	
Power supply	10/24 V DC (range: 10 - 32 DC)
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/GLONASS antenna	Internal
Frequency	1575.0 ± 3 MHz
FM-Eco4 light / light+ GSM modem	Quectel M95
Bands	850/900/1800/1900 MHz @ GSM
GSM antenna	Internal, Quad band
FM-Eco4 light 3G / light+ 3G GSM modem	Quectel UG96
Bands	800/850/900/1900/2100 MHz @ UMTS 850/900/1800/1900 MHz @ GSM
GSM antenna	Internal, Quad band

Protections
Short circuit protection
Reverse polarity protection
Unit provides internal protection F2 (1 A slow-blow 63 V fuse)

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3.5 IO pin out

Pin	Wire color	Description
10-32 V	Red	Power supply 12/24 V (range: 10-32 V)
Chassis	Black	Ground connection
DIN1	Pink	Digital input, threshold 4 V
DIN2	Blue	Digital input, threshold 4 V
DIN3	White	Digital input, threshold 4 V
DIN4	Yellow	Digital input, threshold 4 V
AIN1	Grey	Analogue input (range: 0-30 V)
AIN2	Green	Analogue input (range: 0-30 V)
DOUT1	Purple	Digital output open collector up to 32 V, 1 A
DOUT2	Orange	Digital output open collector up to 32 V, 1 A
1-Wire POWER	White with red stripe	1-wire power output: 80 mA @ 4,1 V
1-wire DATA	Green with yellow stripe	1-wire data transfer

3.6 Peripheral accessories

There are several peripheral accessories that can be mounted with the FM-Eco4 light/ FM-Eco4 light 3G 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.

Note
1-Wire power maximum power consumption is 80 mA @ 4,1 V

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

Available on DOUTs:
- 1 × Buzzer/LED
- 1 × ECO Driving panel (Power supply from 1-Wire. 40 mA @ 4,1 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 light and FM-Eco4 light 3G devices have passed quality tests and comply with the following certifications:
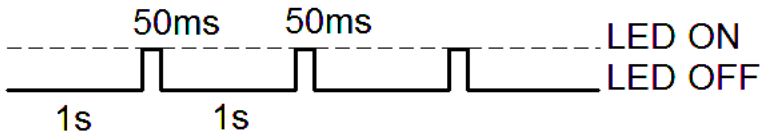- E-Mark
- CE ready

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:
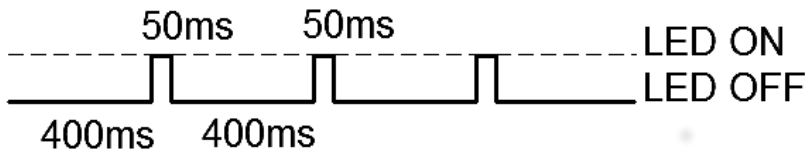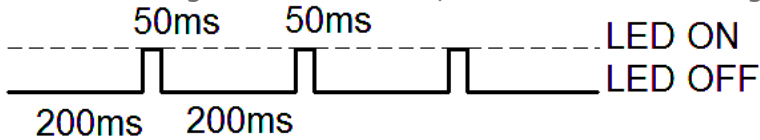

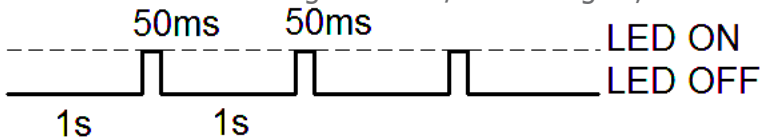When an accurate GPS/GLONASS signal is received, the GPS LED is blinking as follows:
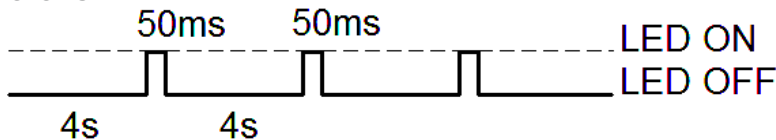

3.8.2 GSM LED

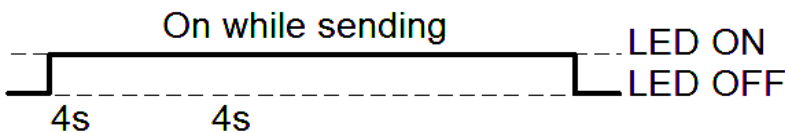When a GSM signal is not received, the GSM LED is blinking as follows:

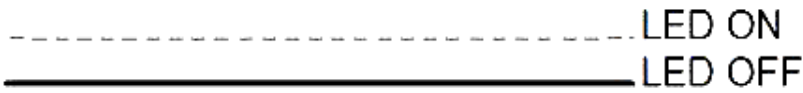When the device has a good GSM / [2]UMTS signal, but no GPRS, the LED is blinking as follows:

When the device acquires a good GSM / [2]UMTS signal and is connected to GPRS, the LED is blinking as follows:

When the device acquires a GSM / [2]UMTS signal and is sending data via GPRS, the LED is blinking:

[2] FM-Eco4 light 3G and FM-Eco4 light+ 3G devices only.

3.8.3 1-Wire LED

FM device terminal 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:
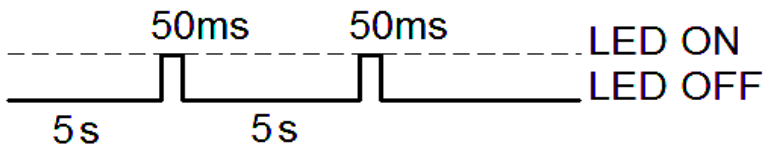
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```
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ .LED ON
_____.LED OFF
```

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

```
        50ms        50ms
_ _ _ _ _┌┐_ _ _ _ _┌┐_ _ _ _ _ .LED ON
_____┘└_____┘└_____.LED OFF
   5s         5s
```
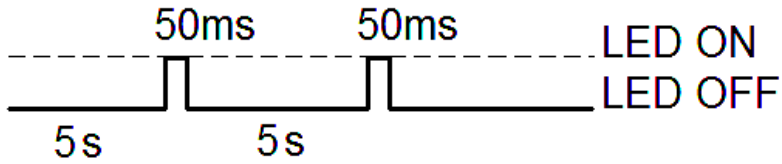
3.8.4 LED status in sleep and deep sleep modes

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

```
        50ms        50ms
_ _ _ _ _┌┐_ _ _ _ _┌┐_ _ _ _ _ .LED ON
_____┘└_____┘└_____.LED OFF
   5s         5s
```

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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/Closing the device

Use a screwdriver or a similar tool to open up the plastic housing of the device. It is recommended to use a flat-head type screwdriver (*see figure on the right*). Inappropriate tools might cause permanent damage to the device.

To correctly assemble the device you have to know the exact positions of all the plastic pins used to hold the PCB in place (*see figure on the right*). These positions are listed in the table below:

Proper assembly sequence:

No	Name
1	The intermediary PCB pin
2	The PCB stabilizer pin
3	The PCB support pin

1. Make sure that the PCB is facing up. Only then it can be mounted in its plastic housing.
2. The PCB goes under the intermediary plastic pin - 1.
3. Then it is mounted on the stabilizer – 2.
4. The PCB must be correctly placed on the PCB support pin - 3.

When the assembly sequence described above is completed, push the other side of the PCB down into a stable position.
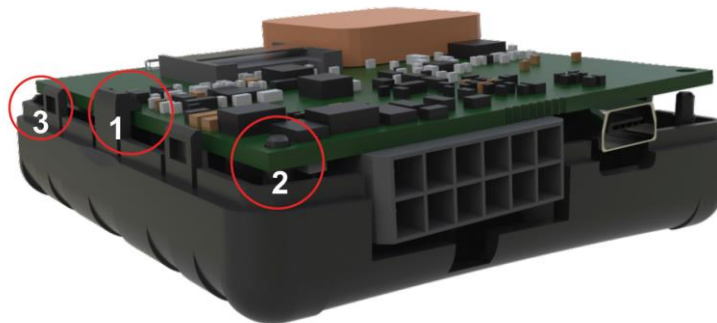
The plastic lid of the device can be mounted only when all of the PCB pins are holding the PCB in a stable position (*see figure above*).
To correctly seal the plastic housing of the device, start by placing the plastic lid at either side of the device (*see figure on the right*). Then push the remaining side down until the housing is fully closed.
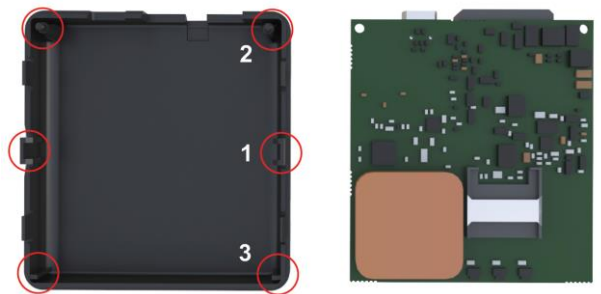
Note
It is recommended to keep the number of opening procedures to the minimum.

4.2 Connecting the USB cable

Connect a mini USB cable to the device (*see figure on the right*). The cable can be connected only in one way, be careful not to damage the plug. Connect the other end to your PC or a laptop.

Before starting the configuration procedure of the device, make sure that it is connected to the external power supply.

4.3 Inserting a SIM card

If you received a device without a SIM card, place your own SIM card into the device as shown in the picture below. The microchip must be facing down.
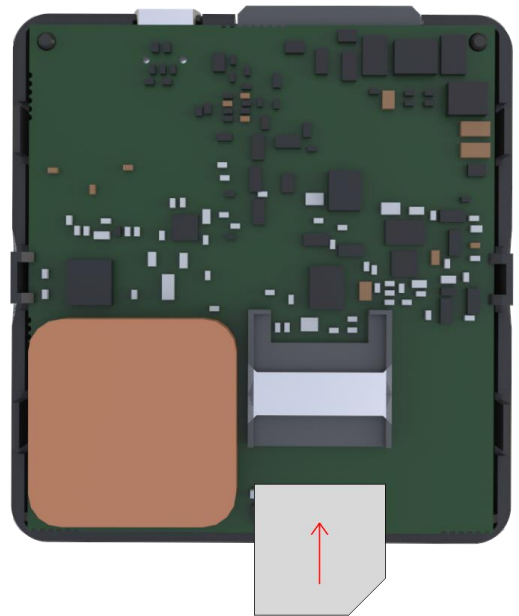
4.4 IO cable

Connect the IO cables plug to the Micro - Fit slot on the device (*see figure on the right*). The cable can be connected only in one way.

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5 Device configuration

5.1 Driver installation

Virtual COM port driver installation is mandatory, only then your PC will recognize the FM-Eco4 light 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.
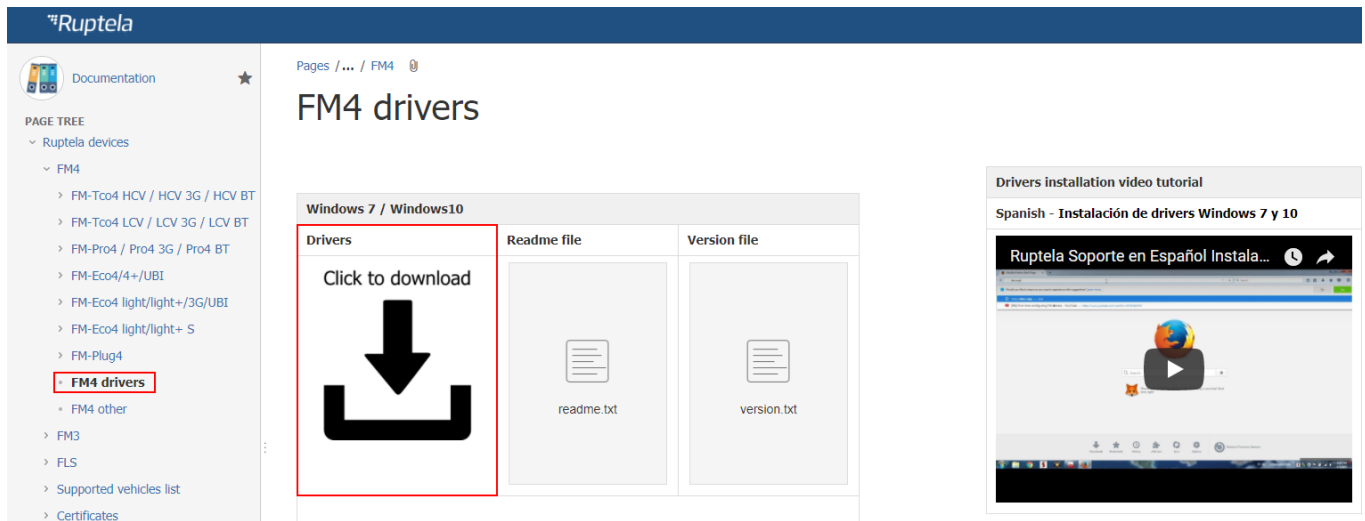
Installation procedure:

- 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.]
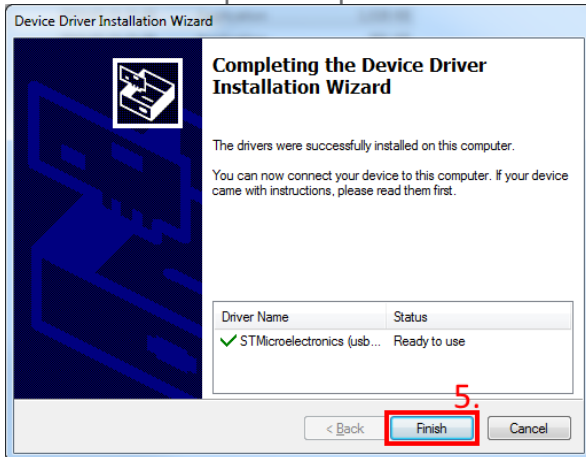
Windows 7 Users might get a Security Warning message. Click "Yes" [3.].
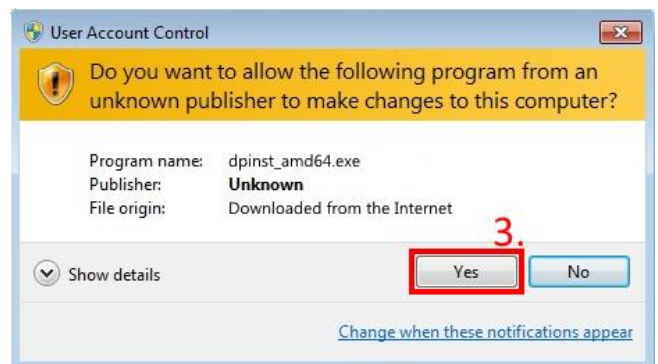
In the next window select "Next" [4.].
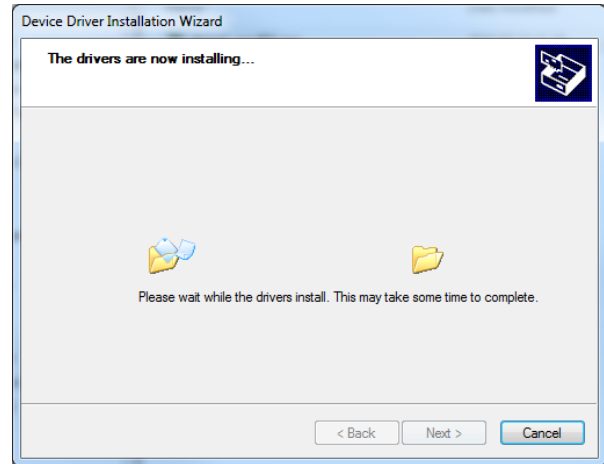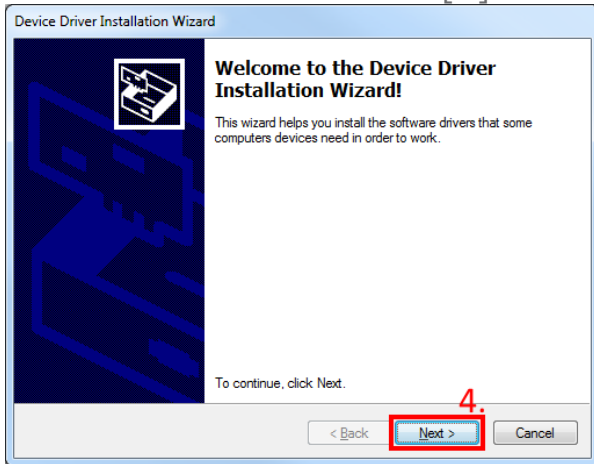
Wait for the setup to complete the installation and click "Finish" [5.].


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**.
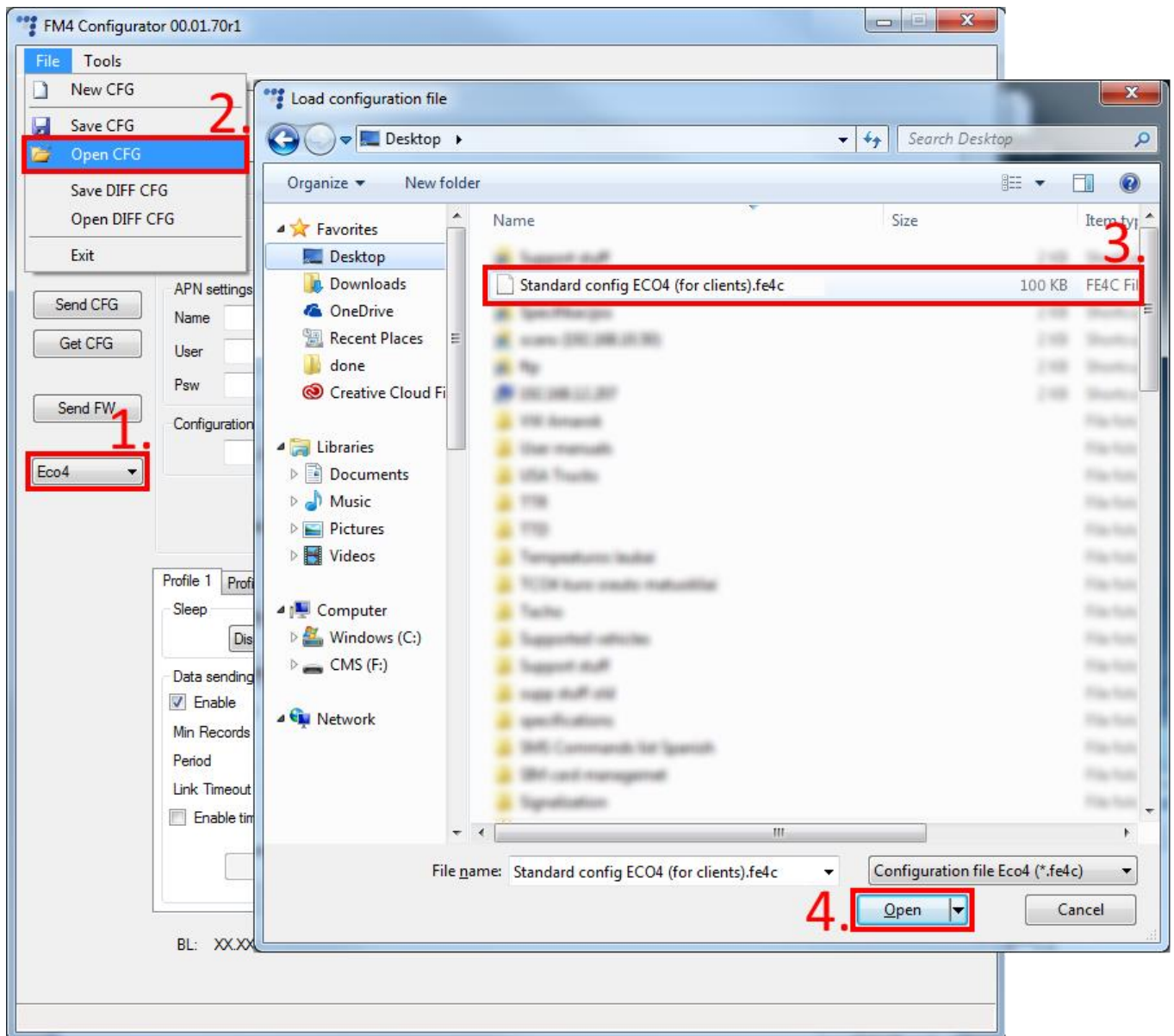
Configuration information

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.
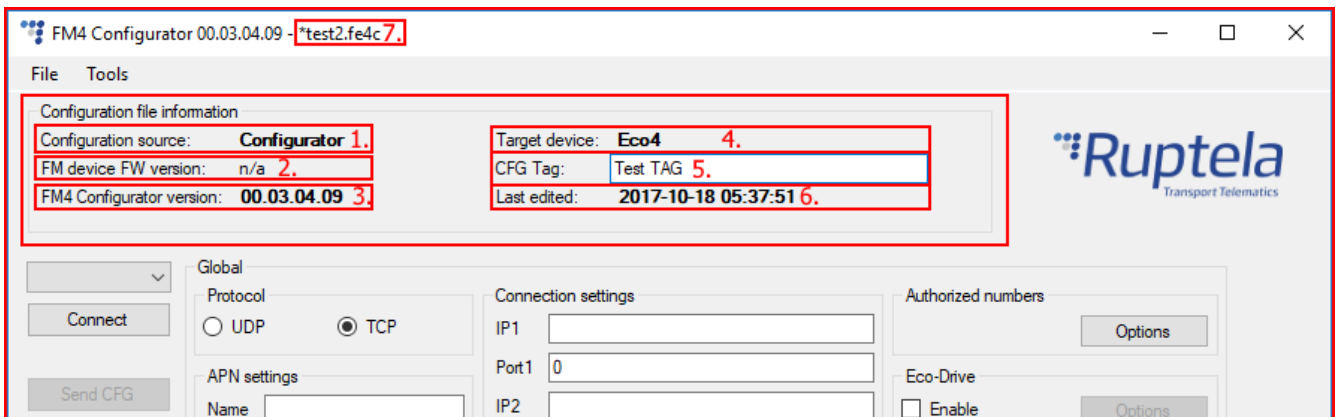

Configuration additional steps

Sample parameters will be loaded. However you will need to enter other parameters on your own.

1. 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.
2. 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.
3. 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.
4. Click **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.
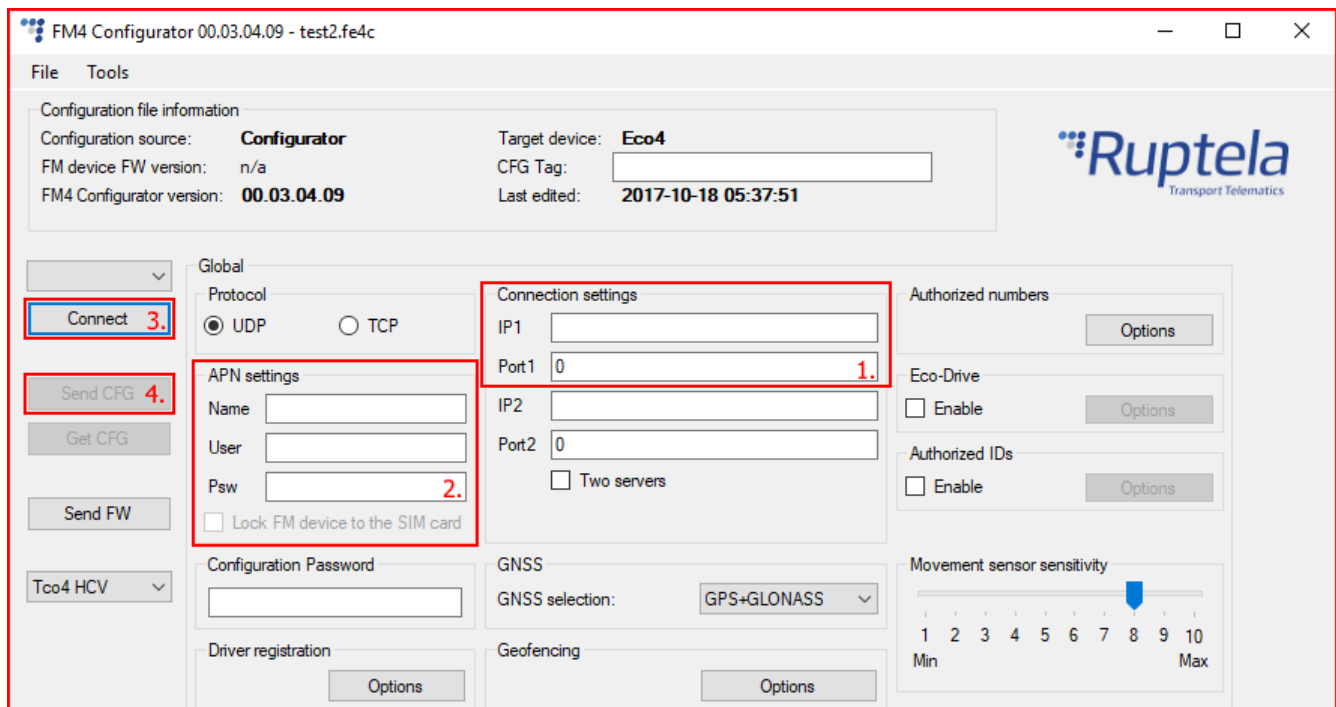
Now the device is configured to send data to the specific server. Sample IO parameters are enabled (loaded with configuration file). You can log in to your tracking platform to see whether the device is sending data.

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.
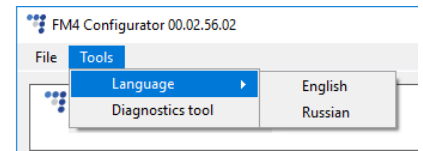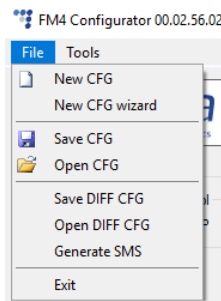
New CFG wizard – It helps users to go through all basic configuration steps.

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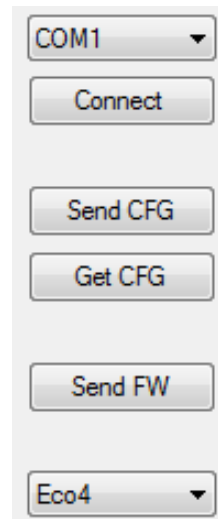
The "Send CFG" and "Get CFG" buttons are used to send and receive the configuration file to/from the device.

"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 include connection settings and other settings independent from the profile settings – global settings are the same for all profiles.
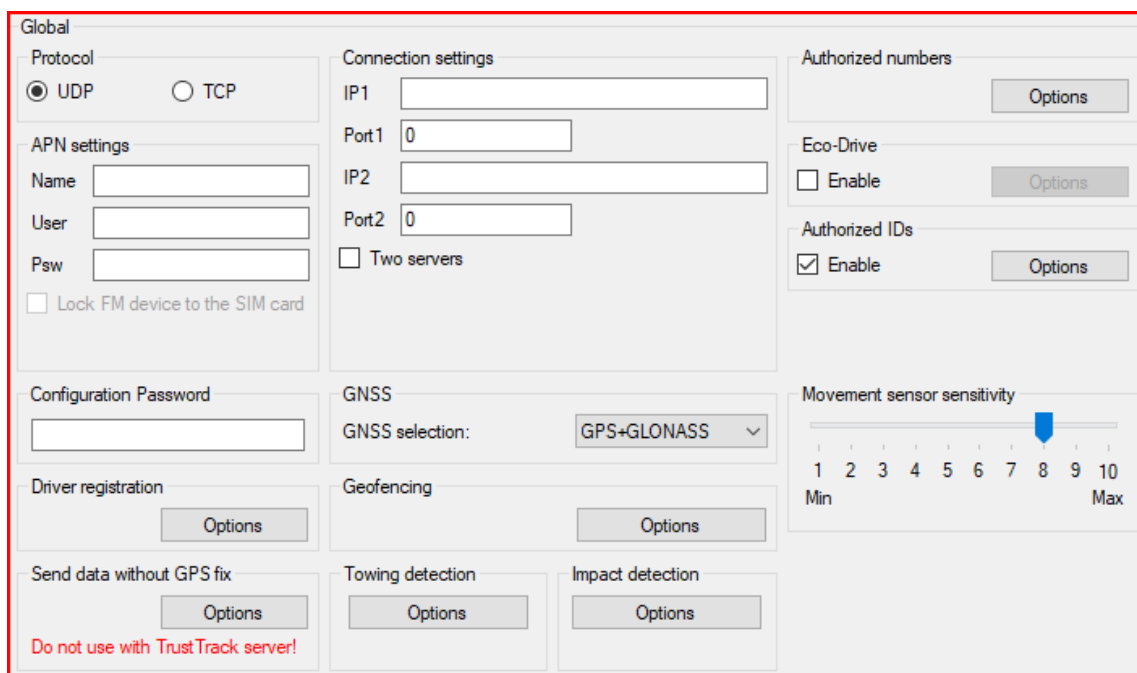
Connection settings here you should enter server IP and port that the device should connect to. The IP can be entered in the numeric format: 255.255.255.255. You can also use a Domain name (not exceeding 40 characters). IP2 is a backup IP address, which is used when the device is unable to connect to the first server.

- **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.

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.

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.
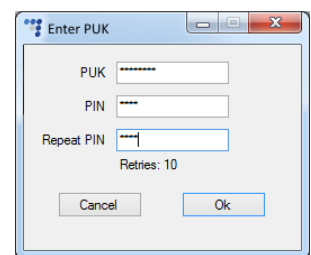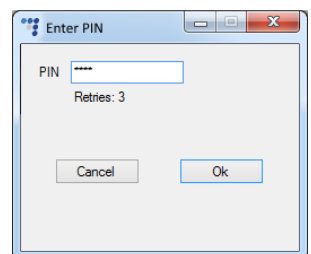
If the wrong PIN is typed in more than three times, the SIM card will be locked.
It can be returned to its original unlocked state by entering a PUK, provided by the service operator after verification. If the wrong PUK is entered ten times in a row, the device will become permanently

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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 (/UMTS) 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 (/UMTS) 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.

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.

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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.

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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.
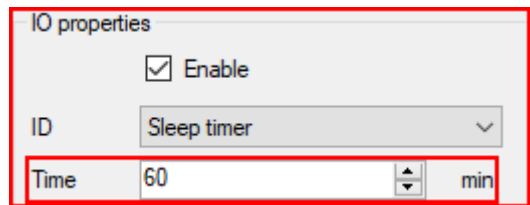
When *Custom* is selected, you can choose, which functionalities should work during device sleep and which functionalities should be disabled. Like previously, it possible to set a time limit. Once this time limit is reached, the device will switch to Custom sleep mode. Full functionality description 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:
  - **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.
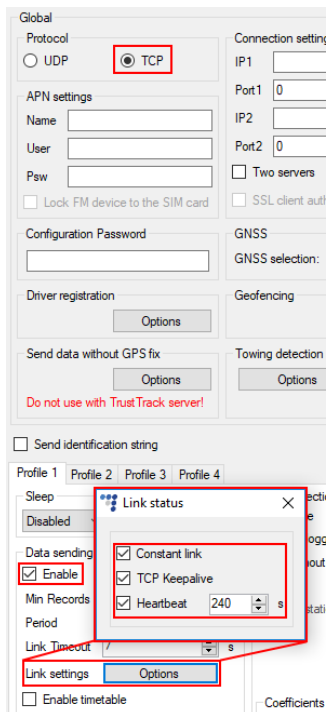
Notes
- If constant TCP link functionality is enabled, the device ignores link timeout parameter for the main connection and uses it only for the emergency connections.
- Constant TCP link and Heartbeat functionalities do not work with the second server if "**Two Servers**" mode is used.

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- **Timetable** allows you to select particular days and hours for the data to be sent.
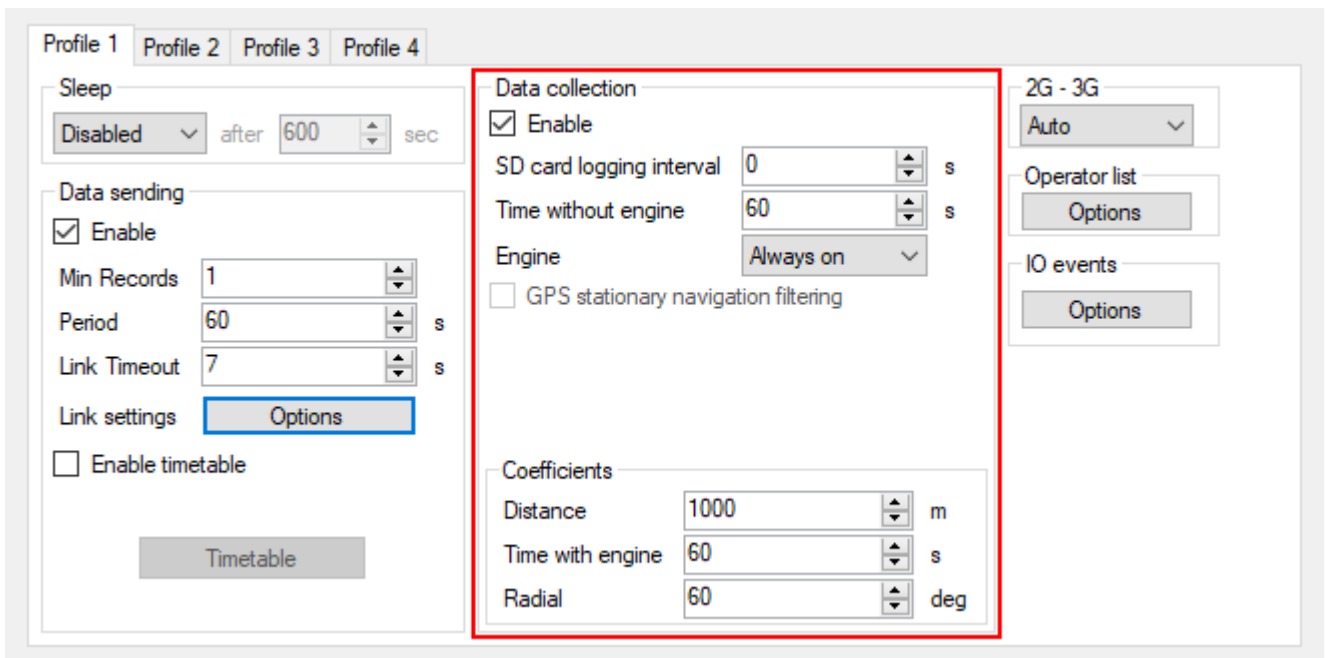

Data collection must be enabled to collect the information.
- **Time without engine** means how often records should be made, when the engine is off.
- **Engine** drop box allows you to choose how the device will pick up the ignition (consider that the engine is on).
  - *Always on* – No ignition pick 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.

- **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 the 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).

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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. Three different operation modes can be set:

- *Auto* – Default option. FM device uses 3G when it is available. If for some reason 3G is unavailable or it becomes unavailable during operation, device makes 3 attempts to connect to the UMTS network. In case this is not possible, it will automatically switch to GSM/GPRSS (2G mode) and stay in this mode.

  Device can be forced to switch back to UMTS network with SMS command. Command structure would be:

  password set3g 1/0 – where value: '1' means enabled and '0' means disabled.

  Example: password set3g 1 – In this example, 3G would be enabled.

  More information about SMS commands available in "SMS Commands List" which can be found on our documentation website.

- *GSM only* – Device operates only in 2G mode.
- *UMTS only* – Device operates only in 3G mode.

> **Note**
> - FM-Eco4 light 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.
> - Almost all functionalities that are available in FM-Eco4 light devices are also available in FM-Eco4 light 3G. Among previously mentioned exceptions, GSM/UMTS modem in this device does not support modem firmware update over the air.

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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.

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.

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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".
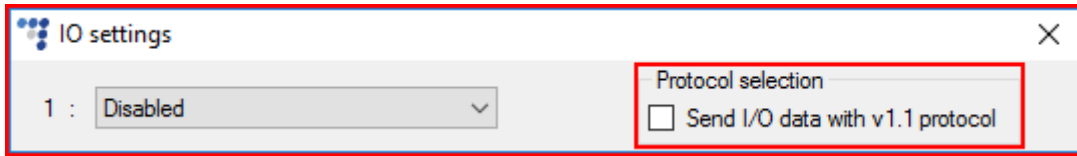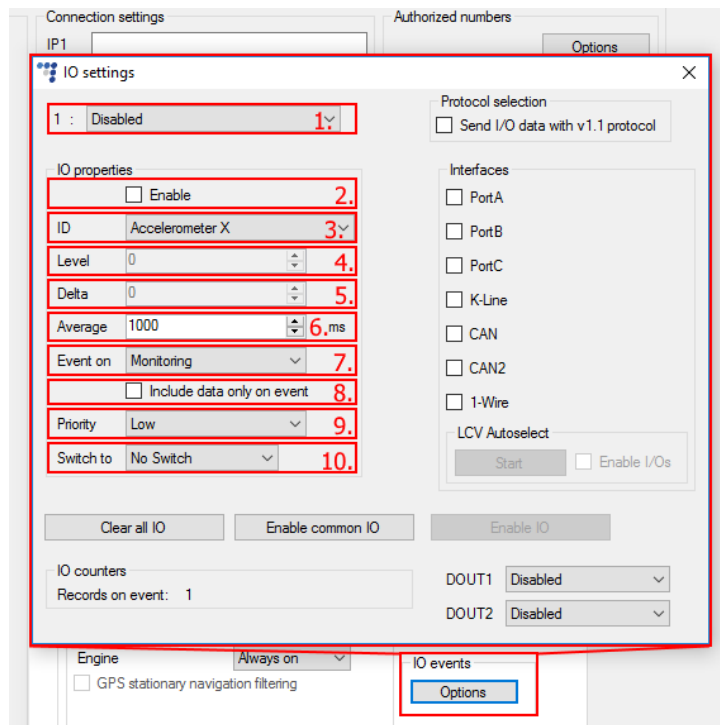

> **Note**
> A significant part of the IO parameters require that the protocol v1.1 is enabled! Without it enabled, these parameters will not be displayed in the ID list. Enabling the protocol will delete all unsent records from the device.

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.
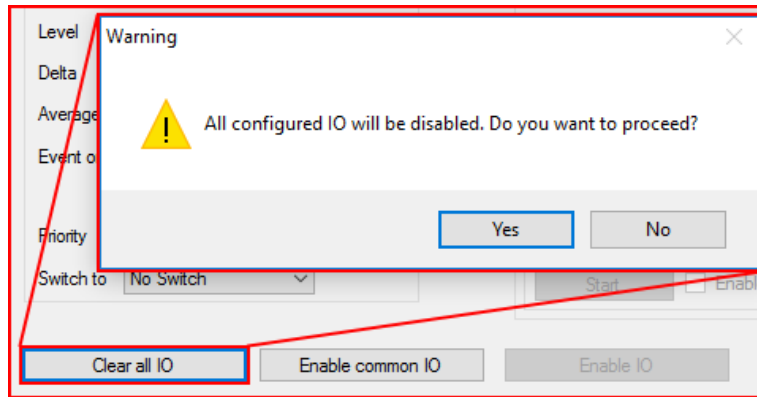
Note

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.
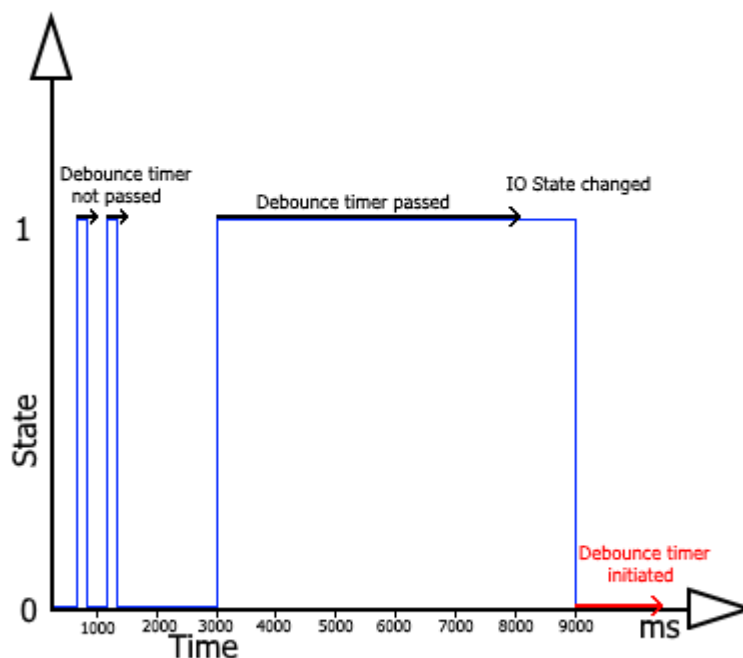
If IOs were configured incorrectly, or the user simply decides to re-do the configuration, he can use the "Clear all IO" button, which disables all the enabled IOs along with their configuration in the selected profile.

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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;
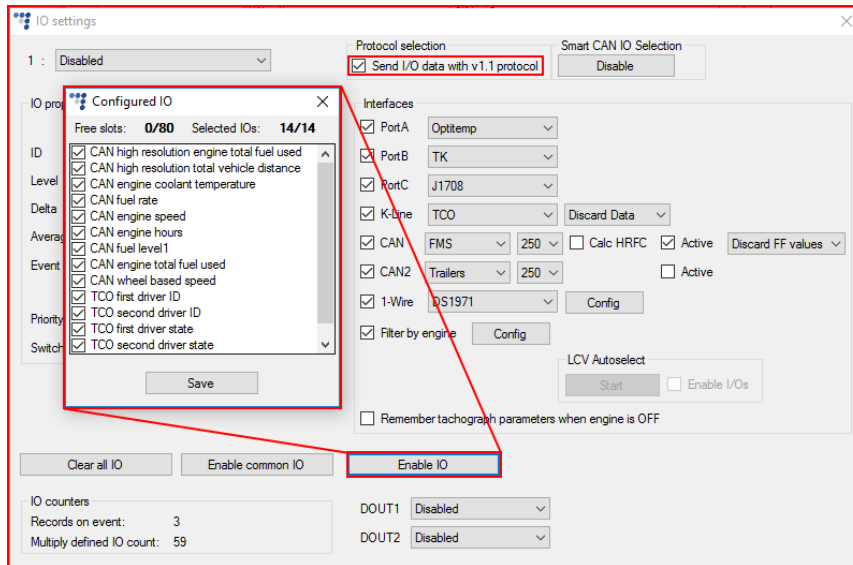- Amount of IO parameters selected.

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".
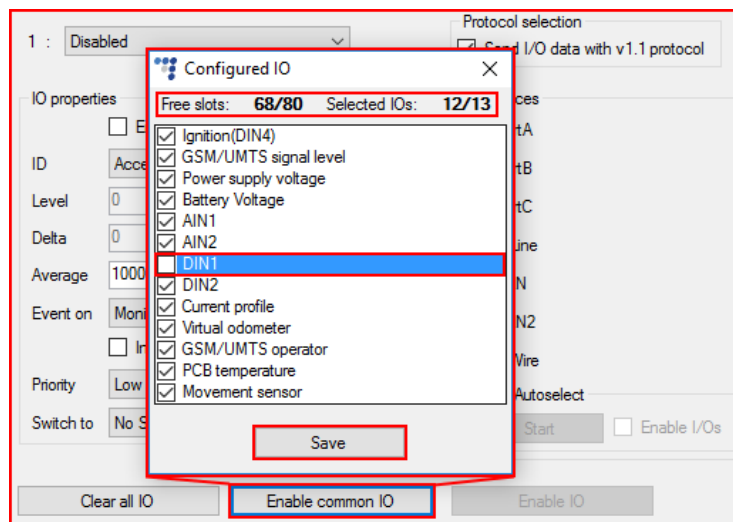
If there are not enough slots to enable the selected IO parameters, an error window will appear.
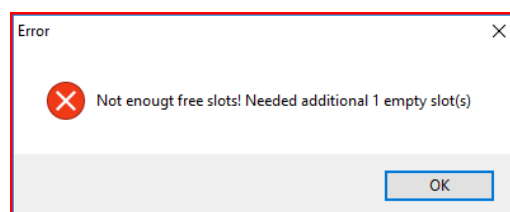
Lastly, the "Enable IO" button enables IOs for the selected interfaces. **This button is available only if the "Protocol v1.1" is enabled!**

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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 the device into a vehicle please obey these instructions otherwise your device may not work properly.

- The module should not be seen or easily reached.
- The module should be firmly fixed to the surface. Please avoid mounting module near a metal surface or cables.
- The module must be facing up, so that the internal GPS/GLONASS antenna is facing up as well (*see figure on the right*).
- A wrong module mounting may result in a malfunction.
- The module cannot be fixed to heat emitting or moving parts.
- A SIM card should be inserted in the module, while the connector is plugged off (while the module has no power).
- The module must be fitted with double sided stick tape!

6.2 Device mounting position

The device must be tightly installed in a service access area (e.g. under dashboard, behind fuse box), it cannot move or shake.

CORRECT	*INCORRECT*

The device can be installed within 45° angle in any axis, but the top surface in all cases must be facing up.