



FM-Eco4 S Series User Manual

2019/05

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1 Preface

1.1 Use of this document

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

The following markings are used to highlight important information:

- Notes that contain important information which 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
2018-10-01	1.0	Initial draft.
2018-05-11	1.1	Added description of automatic firmware update from configurator.
2018-05-14	1.2	Added environmental and electrical specifications in the "Safety" section.
2018-08-24	1.3	Added description of "Periodical redirect" in "Global settings".
2018-10-12	1.4	Added new devices: FM-Eco4+ S and FM-Eco4+ E S.
2018-10-23	1.5	Added description of sending only header information in records in "Profile settings". Updated description of "Send identification string" in "Global settings".
2018-11-16	1.6	Updated operating system requirements in "Sample configuration". Added description of DOUT inversion in "IO settings".
2018-12-06	1.7	Updated list of the peripheral devices in "Peripheral accessories".
2019-01-02	1.8	Added description of antenna reconnection for FM-Eco4+ E S.
2019-03-08	1.9	LED status diagrams replaced by a table in "LED status". Added description of profile switching notification in "Profile settings". Updated description of "Operator list". Updated description of "Configurable navigation filtering" in "Profile settings".
2019-05-10	1.10	Added description of "Use ID in SMS commands" in "Global settings". Added description of automatic APN selection settings in "Global settings". Added ANATEL certification info in "Certification".
2019-05-28	1.11	Updated wiring diagram for the FM-Eco4 S light.

2 Introduction

2.1 Purpose

The purpose of this document is to provide physical and technical data of the device, to explain how the device works and how various states are indicated. It also includes instructions on how to prepare the device for operation and configure it.

2.2 Acronyms

AC/DC – Alternating Current/Direct Current;

ACK – Acknowledged, 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;

IO – Input/Output;

LED – Light Emitting Diode;

PCB – Printed Circuit Board;

SELV – 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;

2.3 Legal Information

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2.4 Document application

Given parameter values and various characteristics within this document apply only to the most recent device hardware version.

2.5 Safety

This chapter contains procedures to help you safely use the FM device. 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!



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



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



All wireless data transferring equipment produces interference that may affect other devices placed nearby.



The device can be installed or dismantled only by qualified personnel!












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-  The device must be firmly fastened in a predefined location. The predefined location is described in the mounting instructions.
-  The configuration must be performed using a 2nd safety class computer (with an autonomic power supply).
-  Make sure that the device is installed in a location 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.
-  Caution! If an incorrect type of battery is used for replacement, there is a high explosion risk. Dispose of used batteries according to the environmental requirements.
-  For configuration use cables that were purchased from Ruptela. Ruptela is not responsible for any harm or damage caused, while using wrong cables for the computer ↔ device connection.
-  Attention! Do not connect the wires marked red (power supply) and black (chassis) to the wrong battery poles. The device has reverse polarity protection, however if connected incorrectly, the device will not work.
-  To disconnect the device from the power supply, you need to disconnect the 12 Pin connector 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.

Please follow these ratings to avoid environmental or electrical damage:

	FM-Eco4 light S	FM-Eco4 light+ S	FM-Eco4+ S	FM-Eco4+ E S
Environmental specifications				
Temperature	Operating: -30 to +60 °C Storage: -40 to +65 °C	Operating: Battery charging: Battery discharging: Storage:	-20 to +60 °C 0 to +45 °C -20 to +60 °C -20 to +60 °C	
Electrical specifications				
Power supply range	6 ÷ 31.5 V DC			
Power supply voltage	6/12/24 V DC			
Maximum current rating	400 mA @ 6 V DC	500 mA @ 6 V DC		
Internal battery	–	LiPo 3.7 V 190 mAh		
Internal fuse rating	3 A			
External fuse rating	2 A			

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

Before connecting the wires of the 12 Pin cable to the vehicle, it is recommended to ensure that the cross-sectional area of the wire mounting is at least 0.75 mm². To correctly dismount the device from the vehicle, first of all disconnect the power supply wires. Only then other plugs or wires can be disconnected.

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

2.6 References

This document is designed to work in 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 S Series datasheets](#) – contain technical data of FM-Eco4 S devices.
- [Quick start guide](#) – a quick guide that will help understand the device configuration process and its functionalities.
- [Peripheral accessories](#) – instructions on how to use peripheral accessories together with the FM-Eco4 S devices.
- [Firmwares and configurators](#) – the latest firmware, configurator and sample configuration files.
- [Microsoft Framework](#) – this additional software is required in order to run our configurator.
- [VCOM drivers](#) – the drivers are required in order to connect the device to a computer.

All links are also provided in the 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 S device is a 4th generation low cost, low power consumption basic tracking device. It acquires its position with a GNSS signal and transfers data to a server via cellular GSM/GPRS networks. The FM-Eco4 S Series devices come in the following variations:

- FM-Eco4 light S (the most basic version, no internal battery)
- FM-Eco4 light+ S (includes an internal battery)
- FM-Eco4+ S (includes an internal battery and IP67 certified housing)
- FM-Eco4+ E S (includes an internal battery, IP67 certified housing and an external GNSS antenna)



FM-Eco4 light S



FM-Eco4+ E S

3.2 Package contents

The FM-Eco4 device is supplied in a cardboard box. The package contains:

- The FM-Eco4 device;
- A 12 Pin cable;
- A USB cable (as an optional accessory);



Note

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

3.3 Physical characteristics

Properties	
Housing dimensions (L x W x H)	64.5 x 61 x 22 mm (regular) 95 x 76.4 x 28.8 mm (IP67)
Indication	3 LEDs: GNSS status, GSM status, 1-Wire status
Housing material	Plastic
Configuration interface	USB
Connector	12 Pin, insulated

3.4 Technical characteristics

Technical characteristics can be found in the FM-Eco4 S Series datasheet.

3.5 Device pinout

Pin	Wire color	Description
+BAT 6/12/24V	Red	Power supply
GND	Black	Ground connection
DIN1	Pink	Digital input 1
DIN2	Blue	Digital input 2
DIN3	White	Digital input 3 (invertible)
DIN4	Yellow	Digital input 4 (invertible)
AIN1	Grey	Analog input 1
AIN2	Green	Analog input 2
DOUT1	Purple	Digital output 1
DOUT2	Orange	Digital output 2
1-Wire POWER	White with red stripe	1-Wire power output
1-Wire DATA	Green with yellow stripe	1-Wire data transfer

3.6 Peripheral accessories

There are several peripheral accessories that can be connected to FM-Eco4 devices. With these peripherals you can get even more features and extended functionalities. All available peripherals can be purchased from Ruptela. Please contact your sales manager for more details.

Note

1-Wire power maximum power output is 80 mA @ 4.1 V

Available on 1-Wire:

- 4 × Temperature sensors DS18B20/DS18S20
- 1 × iButton DS1990/DS1971
- 1 × 1-Wire RFID

Available on DOUTs:

- 1 × Buzzer/LED
- 1 × ECO Driving panel (power supply from 1-Wire)
- 1 × Ignition lock

Available on DINs:

- 1 × Panic button
- 1 × Door sensor

Available on AINs:

- 2 × Analog fuel sensors

You can find installation instructions and documentation of peripheral accessories on our [website](#).

3.7 Certification

FM-Eco4 devices have passed quality tests and comply with the following certifications:

- E-Mark
- CE ready
- RoHS
- ANATEL: 02411-19-10736



3.8 LED Status

The device has three LEDs with different blinking patterns that show the state of the device's communication.

LED	Pattern	Description
GNSS	Once every second	Accurate signal
	Once every 0.4 seconds	No signal
GSM	Once every 4 seconds	Accurate signal
	Once every 0.2 seconds	No signal
	Always on	Link with the server is open
1-Wire	Always off	No devices connected
	Once every 5 seconds	One device connected
	Twice every 5 seconds	Two devices connected
	Three times every 5 seconds	Three devices connected
All	Once every 5 seconds	Sleep/deep sleep mode

4 Device preparation (regular housing)

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 the 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 the picture on the right*). Inappropriate tools might cause permanent damage to the device.

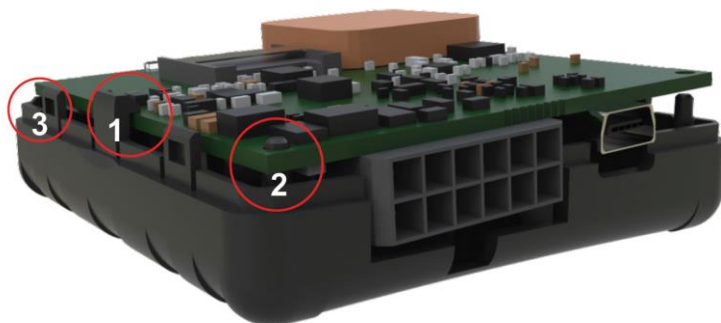
To correctly assemble the device, you must know the exact positions of all the plastic pins used to hold the PCB in place (*see the picture on the right*). These positions are listed in the table below:

Proper assembly sequence:

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

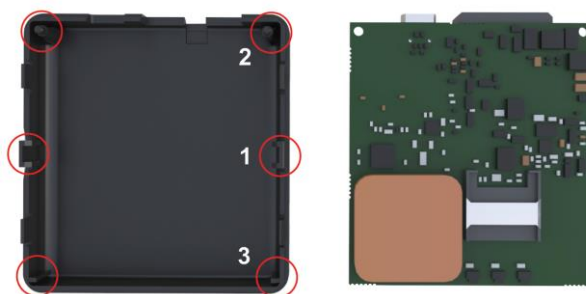
1. Make sure that the PCB is facing upwards. Only then it can be mounted in its plastic housing.
2. The PCB goes under the intermediary plastic pin (1).
3. It is then mounted on the stabilizer (2).
4. The PCB must be correctly placed on the PCB support pin (3).

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 the above picture*).

To correctly seal the plastic housing of the device, start by placing the plastic lid at either side of the device (*see the picture 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

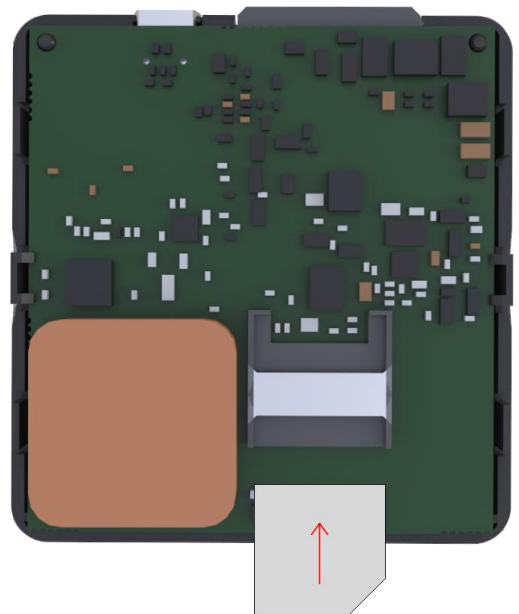
Connect the USB cable to the device (*see the picture on the right*). The cable can be connected in only one way, be careful not to damage the plug. Connect the other end to your computer.

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



4.3 Inserting a SIM card

If you received the 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.



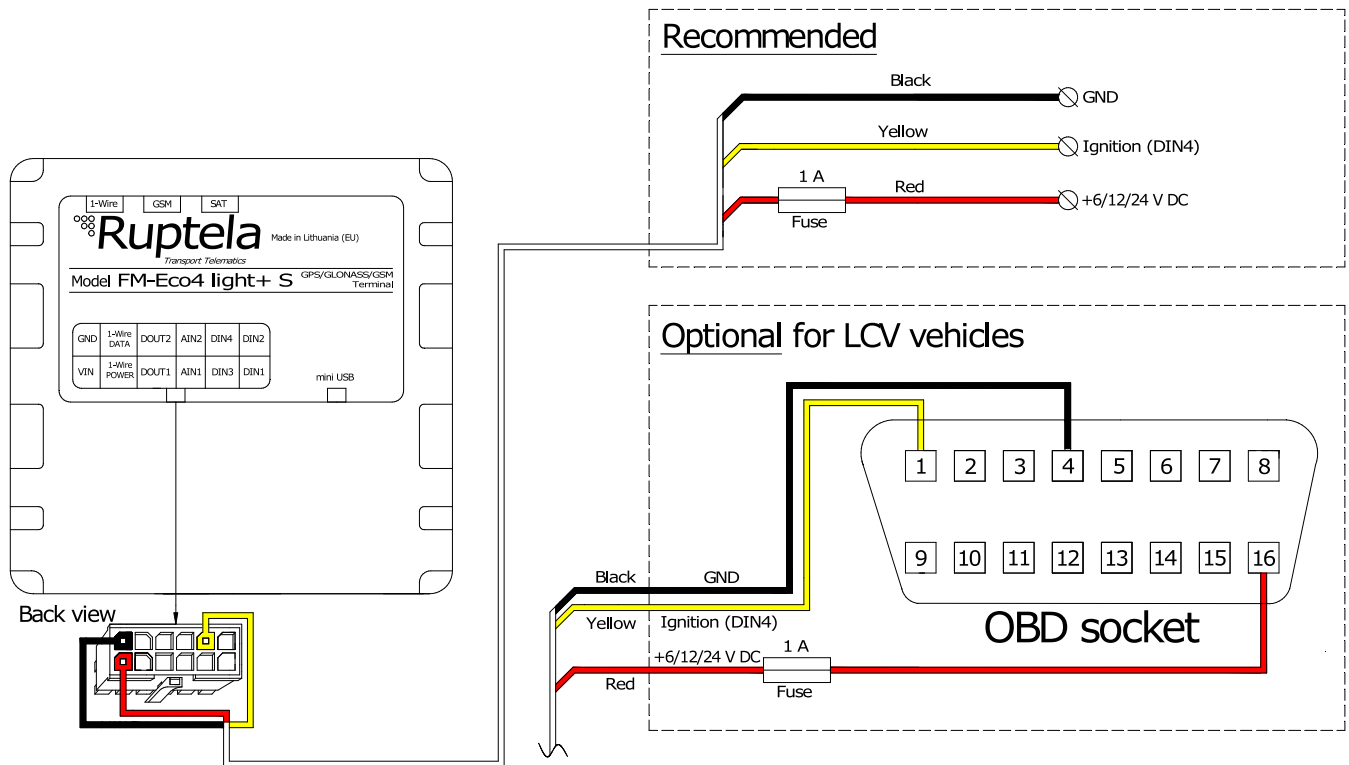
4.4 12 Pin cable

Connect the 12 Pin cable plug to the Micro-Fit slot on the device (*see the picture on the right*). The cable can be connected only in one way.



4.5 Wiring diagram

Power input: 6-31.5 V DC. We recommend an external 1 A fuse.



5 Device preparation (IP67 housing)

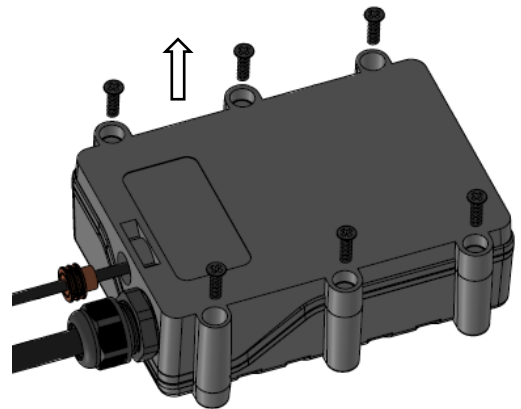
In order for the device to work you have to configure it and insert a SIM card. To do so, you have to open the device housing and perform certain actions described below.

5.1 Opening the device

First of all, you have to unscrew six "+" shaped screws on the bottom of device to access the internal components.

Note

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

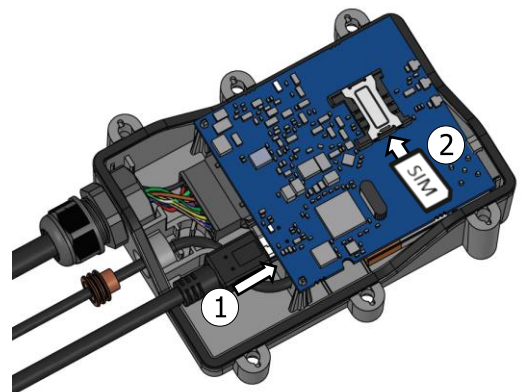


5.2 Connecting the USB cable

Connect the USB cable to the device (1). The cable will plug in only in one way, be careful not to damage the plug. Connect the other end to your PC or laptop.

5.3 Inserting a SIM card

If you received a device without a SIM card, place your own SIM card into the device using the SIM card slot (2). Make sure the microchip is facing down.



5.4 Cables

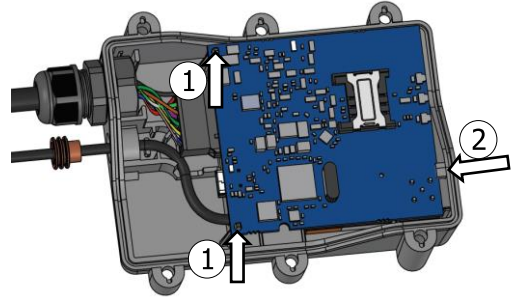
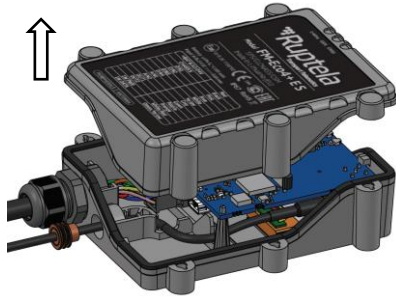
GNSS antenna (FM-Eco4+ E S only) and 12 Pin cables are connected already, and you do not need to reconnect them. The configuration can be done without an external power supply – the device can be powered for configuration via USB.

5.5 Antenna reconnection (FM-Eco4+ E S only)

In some cases you may need to disconnect the antenna from the device during installation. It is important to disconnect and reconnect the antenna properly to maintain the integrity of the housing.

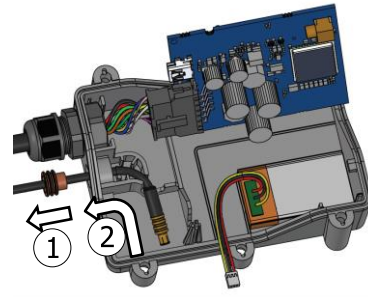
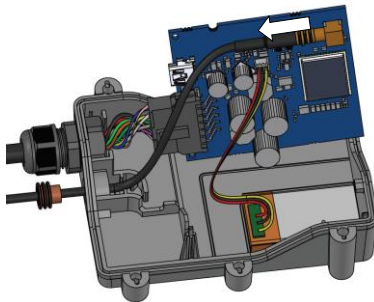
Follow these steps to disconnect the antenna:

1. Unscrew the housing screws and remove the top (see the picture in section 5.1).
2. Carefully remove the PCB from the holding points.



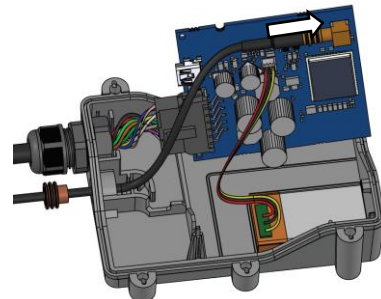
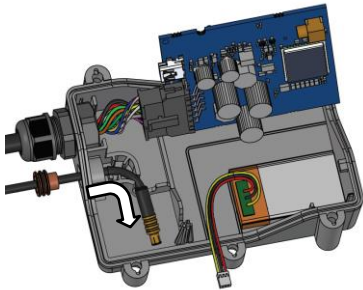
3. Disconnect the antenna cable from the PCB.

4. Move the antenna gasket (1) out of the housing and remove the antenna cable (2) from the housing.



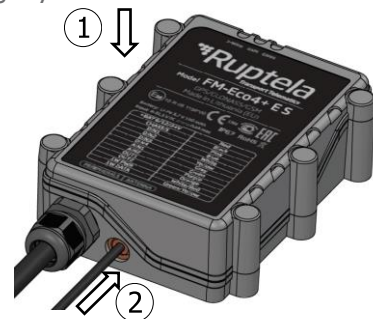
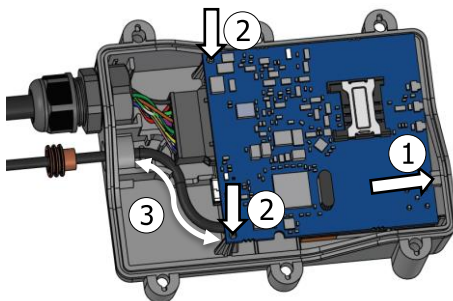
Afterwards, follow these steps to reconnect the antenna:

1. Insert the antenna cable into the housing.
2. Reconnect the antenna cable to the PCB.



3. Mount the PCB onto the holding points (1) (2), while placing the cable into its designated location (3).

4. Put the top on and screw in the screws (1). Carefully insert the gasket (2) into its place, make sure it is inserted tightly.

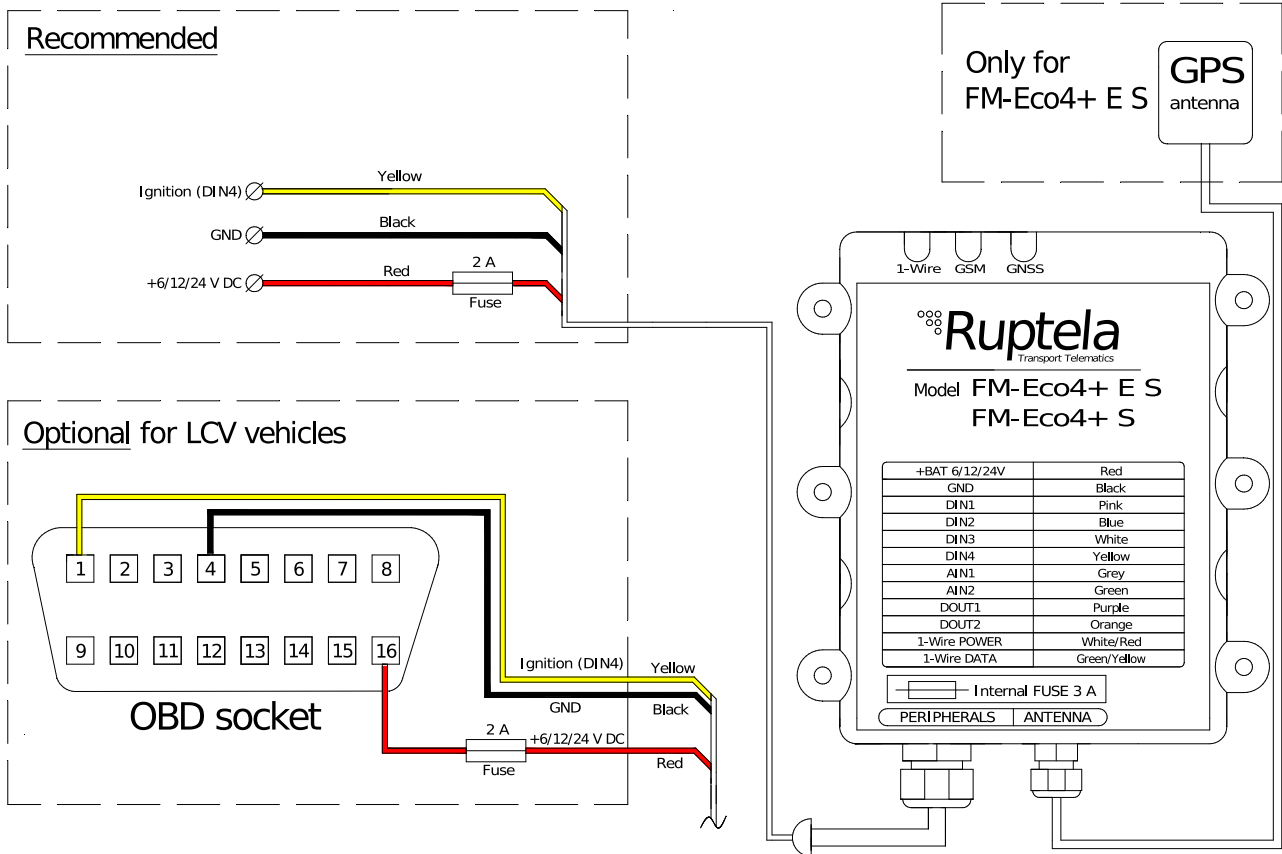


Important!

If step 4 is not completed, the housing will not be waterproof!

5.6 Wiring diagram

Power input: 6-31.5 V DC. We recommend an external 2A fuse.



6 Device configuration

6.1 Driver installation

Installing the Virtual COM port driver is mandatory, only then your computer will recognize the FM device that was connected to the USB port. You can download the latest drivers from our documentation website ([VCOM drivers](#)).

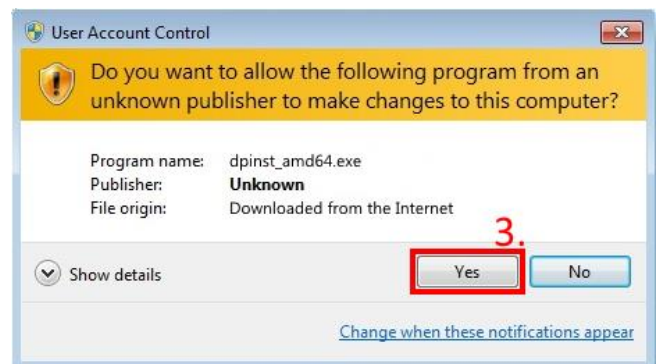
Choose the correct file with drivers for your operating system and download it to your computer.



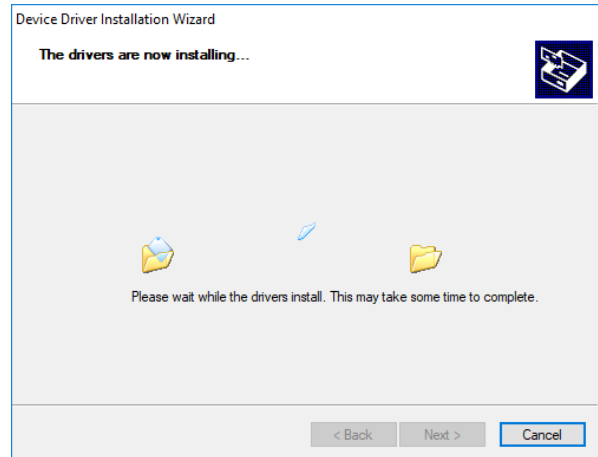
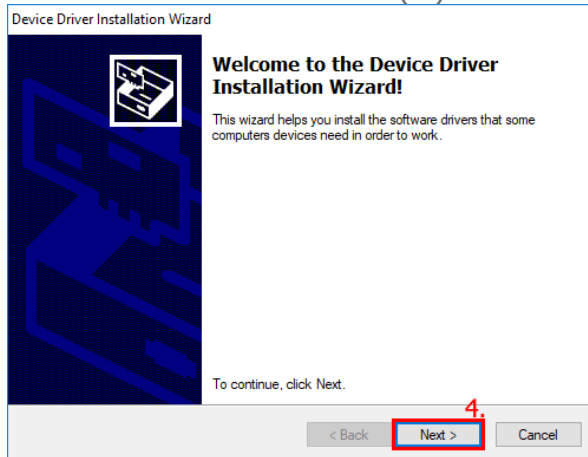
Installation procedure:

- 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 the file **Win7.zip** or **Win8.zip** to a desired location on your computer:
 - If you are running a 32-bit OS, launch **dpinst_x86.exe** (1.)
 - If you are running a 64-bit OS, launch **dpinst_amd64.exe** (2.)

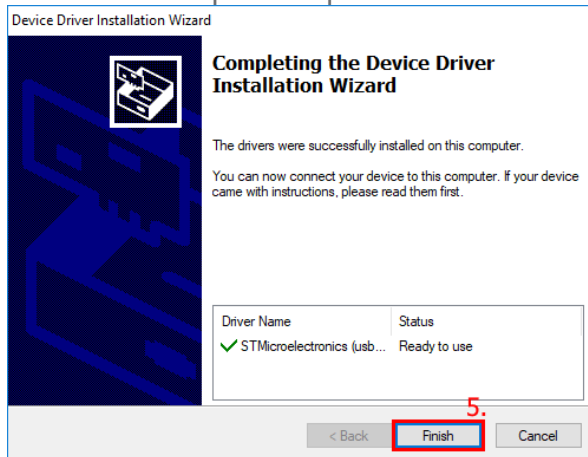
Windows 7 Users might get a Security Warning message. Click **Yes** (3.).



In the next window click **Next** (4.).



Wait for the setup to complete the installation and click **Finish** (5.).



The driver is now installed and ready to use.

6.2 Sample configuration

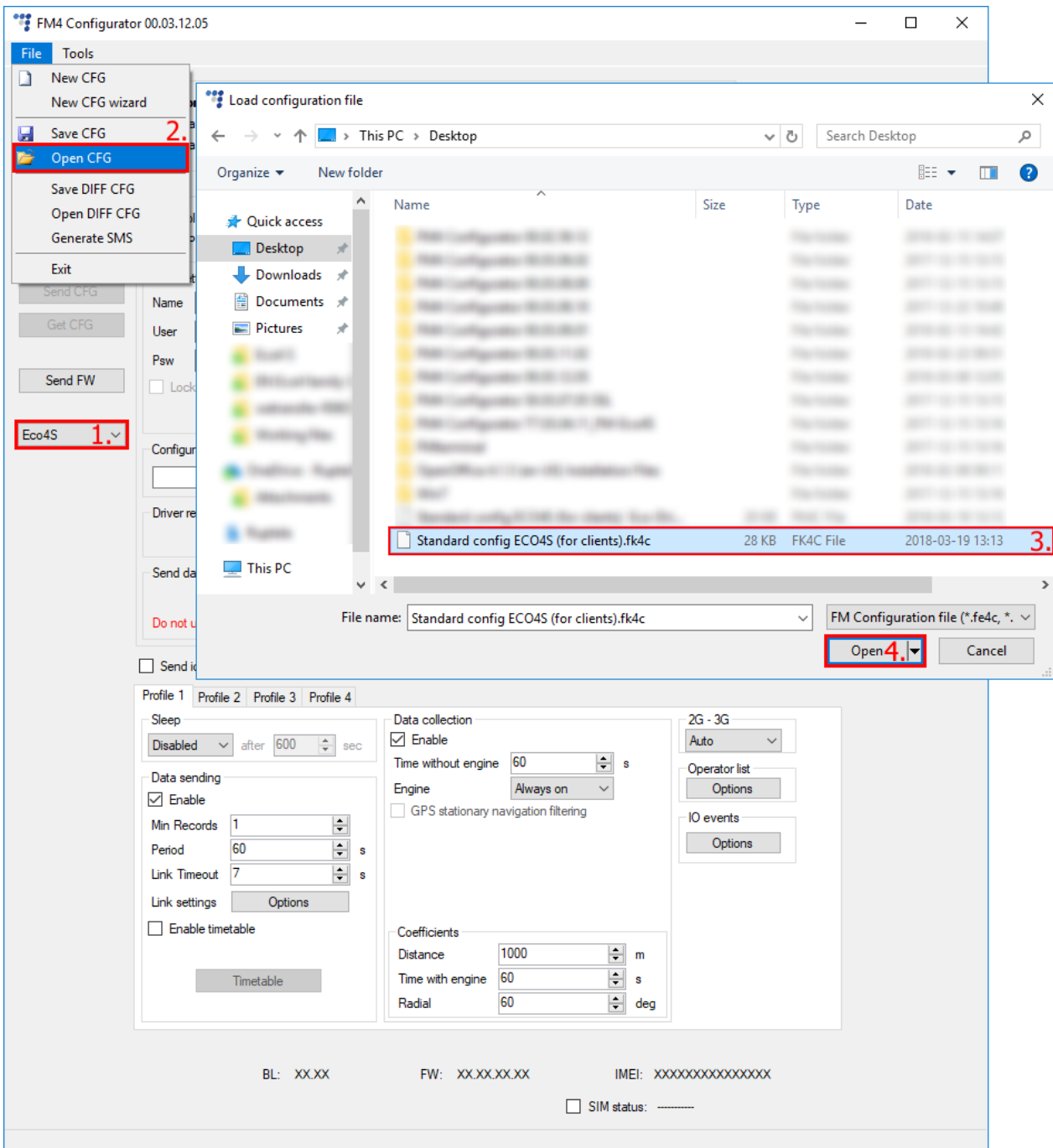
Go to our documentation website and download the [sample configuration](#) and the latest [configurator](#). You will also need the latest version of [Microsoft Framework](#).

Operating system requirements:

- MS Windows 7/8/10

Start **FM4 Configurator.exe** from the configurator folder and follow these steps:

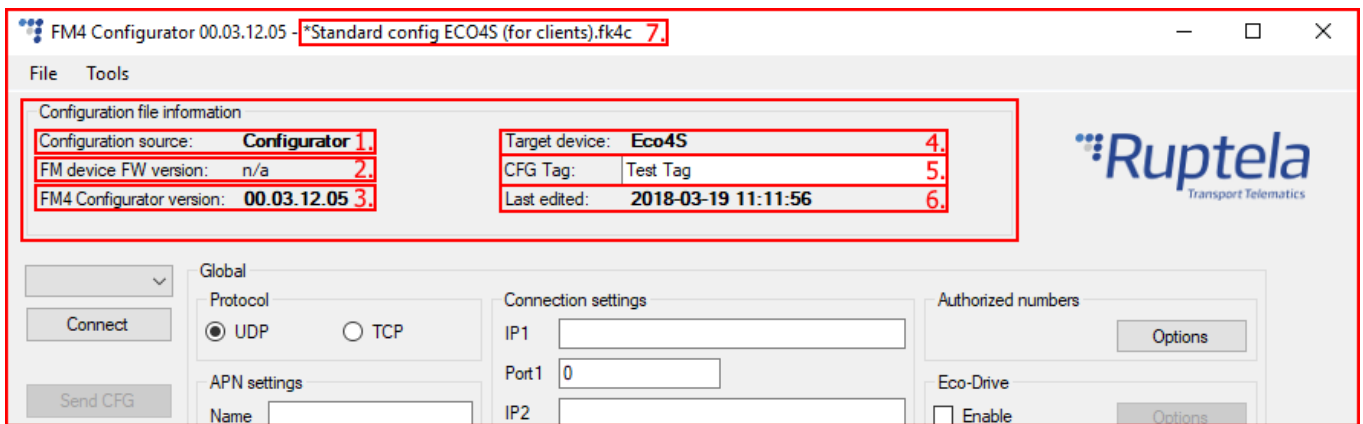
1. Select your device from the dropdown list.
2. Click **File** → **Open CFG** (CFG – full configuration file).
3. In the dialog window, select the sample configuration file that you have downloaded from the documentation website.
4. Click **Open**.



Configuration information

The following information regarding the loaded configuration is 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 *Configurator* or *Device*.
 - *Configurator* – the configuration is loaded from a computer;
 - *Device* [Device_IMEI] – 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 – displays the configurator version on which the currently loaded configuration was made.
4. Target device – displays the FM device model for which this configuration was created or from which device it was downloaded.
5. CFG Tag – a field for additional information that the user can save with the configuration file. The maximum length is 32 symbols, only ASCII characters are allowed.
6. Last edited – displays the date and time when the configuration was last edited. If the edit was made from a computer, the time will be the same as the computer's 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.



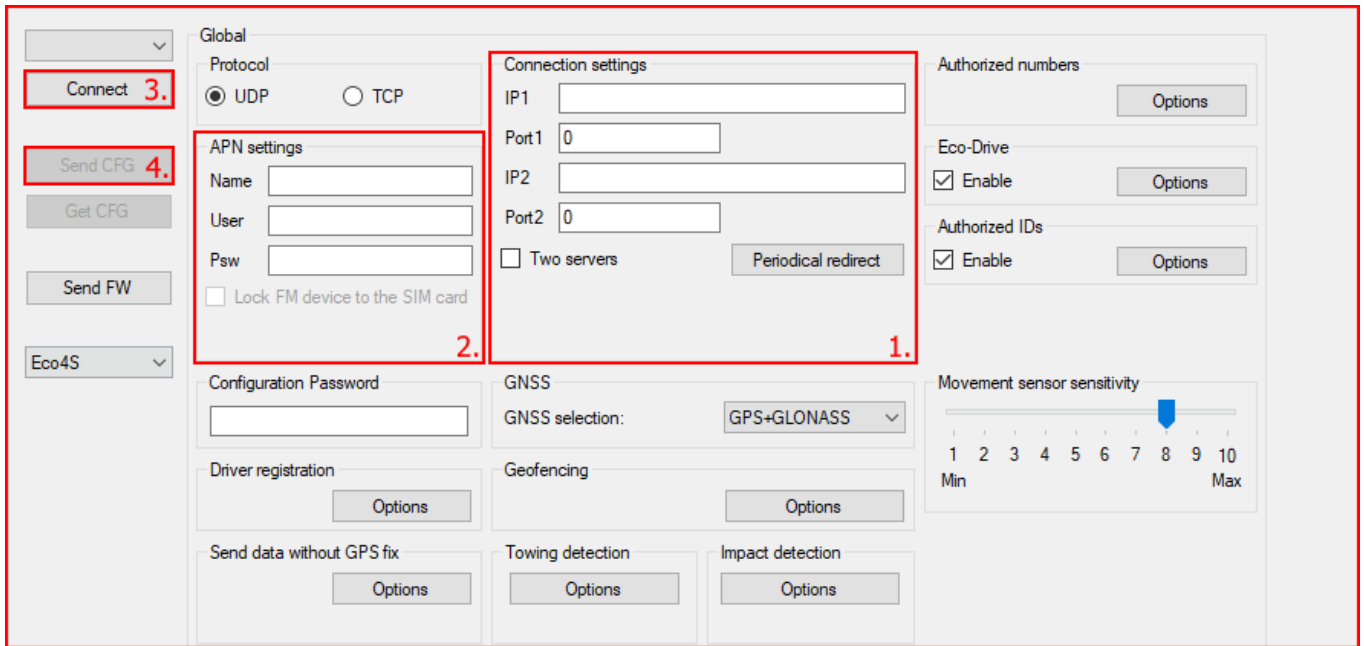
Additional configuration steps

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

1. Enter the IP address (in a 255.255.255.255 format) or the domain name (not exceeding 40 characters) and the port to which the device should send data.
2. Enter the APN settings: *APN name*, *User* and *Psw* (password) (if login and password are required). If you choose to enable the **Lock FM device to the SIM card** checkbox you will be required to enter the 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 the COM port you connected the device to and click **Connect**. At this point the configuration is ready to be sent to the device, so the device must be connected to a computer.
4. Click the **Send CFG** button. The configuration will be sent to the device.

Note

The 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 from the configuration file). You can log in to your tracking platform to see whether the device is sending data.

6.3 Advanced configuration

The configurator can be used to configure advanced functionalities. An overview of the configuration is described in sections.

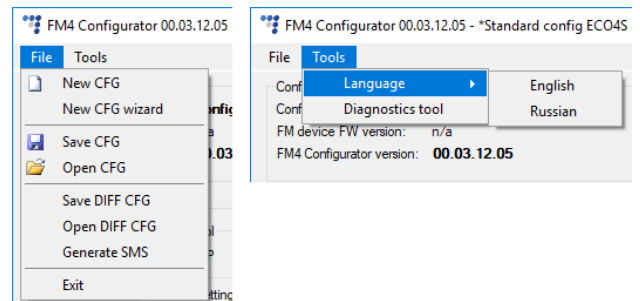
The **File** menu allows you to control configuration files. Choose *New/Save/Open CFG* to perform the corresponding action.

New CFG wizard – helps the user to go through all basic configuration steps.

The **Tools** menu contains:

- A language selector. English or Russian are available;
- A diagnostic tool.

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



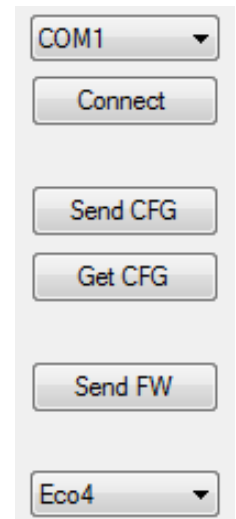
Attention

The DIFF file will save all changes made to the configuration. For example, changing a number in the IP field or marking a checkbox is considered a change. However, if a change was made and afterwards reverted to a previous state (checkbox checked and unchecked afterwards), it will not be considered as a change. The DIFF file will only record changes made to the initial configuration (a loaded preset configuration is considered an initial configuration). Particular attention must be paid when creating a DIFF file to avoid accidental changes to the configuration.

Generate SMS – used to generate SMS messages for device configuration via SMS. This functionality is described in detail in the following document: [Device configuration via SMS](#).

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. The buttons become active once the device is connected.

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

In the dropdown list below the **Send FW** button you can select the model of the device. If you connected the device to your computer, the device name should be displayed automatically.

6.3.1 Global settings

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

The screenshot shows the 'Global' settings configuration page. It includes sections for Protocol (UDP selected), APN settings (Name, User, Psw, Lock FM device), Connection settings (IP1, Port1, IP2, Port2, Two servers, Periodical redirect), Authorized numbers, Eco-Drive (checked), Authorized IDs (checked), Configuration Password, GNSS (GPS+GLONASS selected), Movement sensor sensitivity (slider at 8), Driver registration, Geofencing, Send data without GPS fix, Towing detection, and Impact detection. Each section has an 'Options' button.

Connection settings – here you should enter the server IP address and port that the device should connect to. The IP address can be entered in the following format: 255.255.255.255. You can also use the domain name (not exceeding 40 characters). IP2 is a backup IP address, used when the device is unable to connect to the first server.

Note

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

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

In this mode the data is sent to IP2 only when connection to IP1 is established. The packets sent to the IP1 server are also sent to the IP2 server.

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

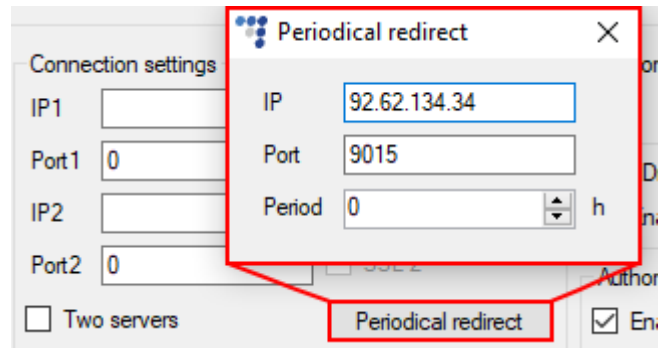
When unable to establish connection to the IP1 server, the device does not connect to the IP2 server as well. If the device is connected to the IP1 server and transmitting data, but the IP2 server is unreachable, the data is removed from the memory after receiving ACK from the IP1 server. This can cause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

Note

The two server's mode doubles the amount of data that is being sent. Before using this functionality, consider the extra costs that would arise from higher data traffic.

- **Periodical redirect** – clicking on this button will open the “Periodical redirect” window. This functionality is used to periodically redirect the FM device to a specified server to initiate automatic configuration or firmware updates when using 3rd party tracking software. The following settings can be changed:

- **IP** – the IP address of the server. The default value is 92.62.134.34;
- **Port** – the port of the server. **Note:** the redirection is done using the TCP protocol. The default value is 9015.
- **Period** – how often the device should connect to the server. The period is measured in hours. The default value is 0 hours. The maximum value is 168 hours (1 week). If it is set to 0 hours, the functionality is disabled.



Once the period timer passes, the device checks the following conditions:

- If there are unsent records in device memory;
- If the GSM level is lower than 9;
- If the power supply voltage status is 0 (refer to the *version* SMS command);
- If the device is in a critical process.

If at least one condition is true, the device waits until no conditions are true. If none of the conditions are true, the device connects to the previously configured server. The device then initiates updates and closes the connection. After the connection to the server is closed, the period timer is reset to zero.

The **Protocol** section allows you to choose from two protocols. The **UDP** protocol is less reliable than **TCP**, but also uses less traffic. **TCP** uses more internet traffic, but it is more reliable. Choose one according to your needs.

Note

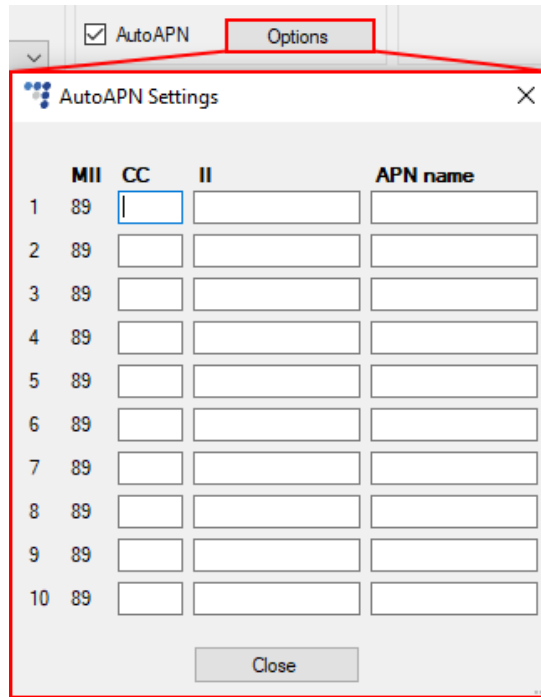
If the IP, port or APN fields are greyed out when the device is connected to the configurator, their values cannot be changed.

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.

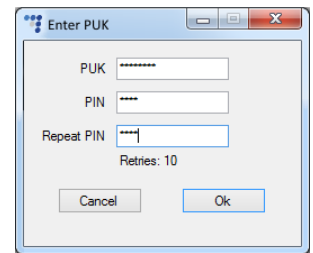
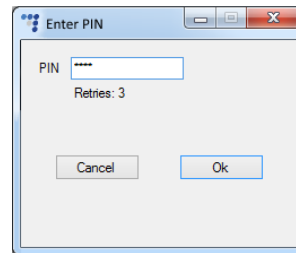
If you tick the **AutoAPN** checkbox, the APN settings will automatically be selected from a list of predefined APNs and the settings fields will be greyed out. The selection is made according to the SIM card ICCID. If no suitable APN is detected, the first APN in the list will be used. If there is no GPRS connectivity, the device will attempt to connect to the next APN in the list.

The list of predefined APNs can be edited by clicking the **Options** button. The list can contain up to 10 entries. Each entry contains the following settings:

- MII – major industry identifier, the value is always 89
- CC – country code (e.g. 370)
- II – issuer identifier
- APN name – the name of the APN



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

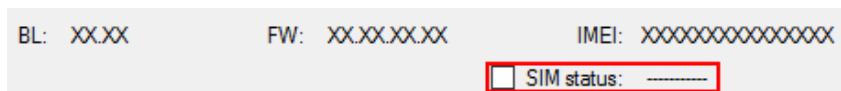


Note

If the **SIM status** checkbox at the bottom of the configurator window is not enabled, the **Enter PIN** window will not appear when connecting to the FM device. This means you will not be able to access your 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 the 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.

The **SIM status** section at the bottom of the configuration window displays SIM card related information. This feature is disabled by default. Tick the checkbox to enable it.



Seven different statuses are available:

1. Ready – the PIN code is accepted, or PIN code check is disabled. The GSM/GPRS modem can operate normally.
2. Error – represents a wide range of possible problems. A common reason would be an old FW version that does not support SIM commands.
3. Unknown – the communication between the device and the GSM/GPRS modem failed, the SIM status is unknown.

4. PIN Request – the SIM card requests a PIN code; the FM device cannot provide it (the code provided by the device is incorrect).
5. PUK Request – the SIM card requests a PUK code.
6. Locked – a different SIM card is inserted to the FM device.
7. Not inserted – no SIM card is inserted.

The screenshot shows a 'Global' configuration screen. It is divided into several sections:

- Protocol:** UDP (selected), TCP.
- APN settings:** Name, User, Psw, Lock FM device to the SIM card (checkbox).
- Connection settings:** IP1, Port1 (0), IP2, Port2 (0), Two servers (checkbox), Periodical redirect (button).
- Authorized numbers:** Options (button).
- Eco-Drive:** Enable (checked), Options (button).
- Authorized IDs:** Enable (checked), Options (button).
- Bottom row:** Configuration Password, GNSS, Movement sensor sensitivity.

Configuration password allows locking the configuration – without the password no one can change the device configuration via USB. However, over-the-air updates ignore the configuration password.

Driver registration is used to authorize the ignition of the vehicle, identify the driver and account working hours. A 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. A full functionality description can be found in "Send data without GPS fix" document on our documentation [website](#).

When the device loses GPS fix, there is no way to determine its location. The GSM tracking feature can be used to obtain an approximate location in densely urbanized areas, where the GNSS signal is not available. A full functionality description can be found in the "Send data without GPS fix" document on our documentation [website](#).

GNSS allows selecting the positioning network – GPS, GLONASS or GPS+GLONASS. GPS+GLONASS is selected by default (*it is recommended not to change this*).

Geofencing allows using internal geozones, configured directly into the device. The full functionality description can be found on our documentation website: [Internal geozones](#).

Towing detection – with towing detection the driver can be informed in case his vehicle is being towed. Information about towing events is sent to the server, therefore the driver might still have time to come back to the vehicle before it is towed away. A full functionality description can be found on our documentation [website](#).

Impact detection – when this feature is active, the FM device monitors its acceleration in all directions and generates records when its acceleration exceeds configured limits. Clients can use this feature to get notifications from the server about irresponsible drivers, who hit sidewalks or other obstacles. A 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 a specific IO 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 SMS commands to the device.
- The **Enable configuration over SMS** checkbox controls configuration over the SMS feature. The full functionality description can be found on our documentation [website](#).
- If **Use ID in SMS commands** is enabled, an ID tag must be added to each SMS command. The same ID will be returned in SMS responses, showing to which command the device replied. More information is available in the [SMS commands list](#).

Note

If **Use ID in SMS commands** is enabled, SMS commands sent without an ID will not be processed.

Eco-Drive options are used to configure the Eco-Drive functionality. It rates drivers according to how safe they drive or their behavior. The full functionality description can be found on our documentation website: [Eco-Drive](#).

Authorized IDs allows you to fill in a list of authorized IDs which can start the 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 the sensitivity of the movement sensor according to your needs. If you slide the bar towards *Max*, the sensor will detect even the slightest movements. If you slide it to *Min*, only strong movements will be detected.

Global

Protocol
 UDP TCP

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

Connection settings
 IP1
 Port1
 IP2
 Port2
 Two servers

Authorized numbers

Eco-Drive
 Enable

Authorized IDs
 Enable

Configuration Password

GNSS
 GNSS selection:

Movement sensor sensitivity

 1 2 3 4 5 6 7 8 9 10
 Min Max

Driver registration

Geofencing

Send data without GPS fix

Towing detection

Impact detection

Send identification string forces the FM device to send an identification packet to the server. After that, the device waits for the ACK packet from the server. Once the device receives this packet, it begins data transfer. For more information about this functionality, go to our documentation website and look for the "[Transparent channel and Identification string](#)" document.

Identification string

Profile 1 Profile 2 Profile 3 Profile 4

6.3.2 Profile settings

The second part of the configuration tool is **Profile** settings. This section also contains explanations for other features that need extensive configuration.

Each profile is a set of settings for specific circumstances (e.g. one profile can be used when the vehicle is operated in the native country and a different one can be used when it is abroad).

The FM device will switch to a different profile if one of the following conditions is met:

- An IO parameter with an active **Switch to** setting is triggered (see [IO settings](#));
- No suitable operators are found in the operator list in the current profile (see [Operator list](#)).

A red notification message will be displayed if:

- Any IO parameter has an active **Switch to** setting;
- Any operator is entered in the operator list;
- Any operator is entered in the blacklist.

For IO parameters and the operator list, the message will also display which profile(s) contain the switching conditions.

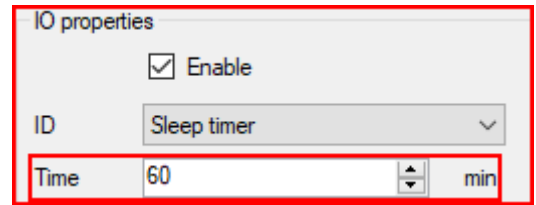
Sleep can be *Disabled*, set to *Sleep*, *Deep sleep* or *Custom*. *Sleep* extends internal battery life by turning off the GNSS/GSM modems. *Deep sleep* disables everything except DINs, AINs and DOUTs. When *Sleep* or *Deep sleep* is selected, it is possible to set a timeout. Once this timeout is reached, 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, disregarding the records in the buffer. By default, the timeout is set to 600 seconds.

- If engine detection is set to *Always on*, the device will not go to sleep;
- If DIN state is High (value = 1), the device will not go to sleep or deep sleep mode;
- If the device is plugged in via USB, the device will not go to sleep;
- Any IO events (except those related to disabled 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;
- The configured engine state changes to "ON";
- The 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 is possible to set a timeout. Once the set timeout passes, the device will switch to *Custom* sleep mode. The full functionality description can be found on our documentation [website](#).

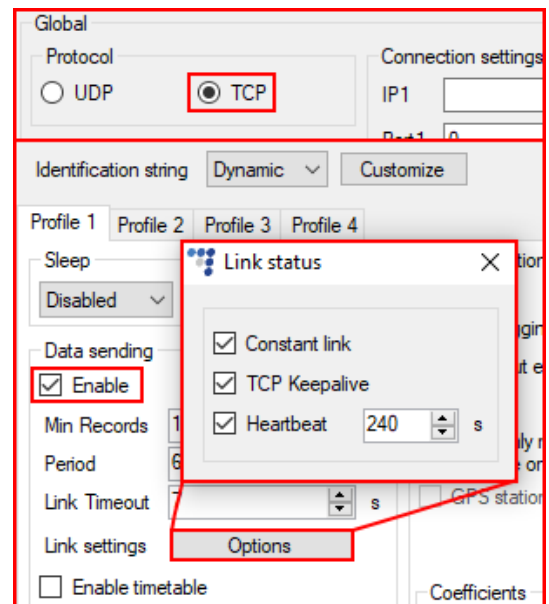


With **Data sending** settings you can configure the data sending frequency and conditions.

- The **Enable** checkbox must be enabled.
 - **Min. records** – the minimum number of records required to establish a connection to the server. If the device detects less records than the entered value, the link to the server will not be opened.
 - **Period** – sets how often the device will check for the required number of records.
 - **Link timeout** – this value indicates how long the device should wait before closing the link, after the 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:

- The **Constant link** checkbox forces the FM device to check the server link state and keep it "alive" all the time. If the server or network closes the link, the device automatically reopens it but does not send any packets.
- The **TCP Keep alive** checkbox 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 the 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 that 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 the constant TCP link functionality is enabled, the device ignores the link timeout parameter for the main connection and uses it only for emergency connections. The 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 at.

The screenshot shows the configuration interface for Profile 1. The 'Data collection' section is highlighted with a red box. It includes the following settings:

- Data collection:**
 - Enable
 - SD card logging interval: 0 s
 - Time without engine: 60 s
 - Engine: Always on
 - Send only record header if triggered by time, distance or course
 - GPS navigation filtering: Customize
 - Coefficients:**
 - Distance: 1000 m
 - Time with engine: 60 s
 - Radial: 60 deg
- Sleep:** Disabled after 600 sec
- Data sending:**
 - Enable
 - Min Records: 1
 - Period: 60 s
 - Link Timeout: 7 s
 - Link settings: Options
 - Enable timetable
 - Timetable
- 2G - 3G:** Auto
- Operator list:** Options
- IO events:** Options

Data collection must be enabled to collect the data.

- **Time without engine** – how often records should be made, when the engine is off;
- **Engine** – allows you to choose how the device will detect the ignition (consider that the engine is on):
 - *Always on* – no ignition detection, the engine is considered to be always on;
 - *Ignition (DIN4)* – digital input 4 is the default DIN used for ignition detection;
 - *MovSensor* – detects vehicle movement and considers the engine to be on;
 - *Custom* – the custom ignition functionality allows user to select more than one condition to detect engine ignition. The full functionality description can be found on our documentation [website](#).
- **Send only record header if triggered by time, distance or course** allows sending only record headers if the records are triggered by time, distance or course (angle change), in order to reduce data consumption. Record headers contain only basic time, position and speed data.
- **GPS stationary navigation filtering** is used to eliminate inaccurate GPS coordinates. The functionality can be modified by clicking the **Customize** button. A full functionality description can be found on our documentation [website](#).
- **Coefficients** are used to collect records in addition to the engine on/off status parameters. A record will be made when:
 - The **Distance** that was set has been travelled;
 - The **Time with engine** has passed;
 - The **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. Some examples:

- The device is configured to track one event for 1 hour. However, the actual event tracking might last for 1h ± deviation (i.e. 5 seconds);
- The 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).

6.3.2.1 Operator list

Clicking the **Options** button in the **Operator list** section will open the **Operator list** settings. Here you can configure operator acquisition settings.

GPRS Attempt – how many times the device will try to connect to the operator’s GPRS before trying a different operator.

GPRS data counter – how many bytes of data the device should send before performing another operator search.

Temporary blacklist – temporal ban period in seconds. Sometimes, when the FM device connects to an operator with unavailable GPRS, the device is connected, but cannot transmit any data to the server. In such cases the temporary blacklist is used. The operator with unavailable GPRS is put into the temporary blacklist, which prevents the FM device from connecting to this operator during the next operator search.

In some cases, the device connects to the operator and successfully obtains GSM and GPRS signals but records still do not reach the server. The device may work around the faulty network (i.e. when network connection is lost) by putting this operator into the temporary blacklist. 2nd level temporary blacklist logic is used in this case. Network verification is done as follows:

1. The device performs server pinging if there is no response (no ACK) from the server and if the connection to server is not available.
2. It will make up to 3 separate pinging attempts. If any of these attempts are successful, the network will be verified. In an ideal case, the server responds after the first attempt, the network is verified, and no more pinging operations are needed.
3. If the server fails to respond to all 3 attempts, the device will switch to another list operator and put the current operator into the temporary blacklist.

Key points about the temporary blacklist:

- The ban period is configurable. When all operators get into the blacklist, the blacklist is cleared.
- Banned means that the device was unable to connect to the operator or the server failed to respond to 3 consecutive ping requests.
- The blacklist is cleared after device reset or power off.

Enable priority in list – search for operators according to their number in list. If it is not selected, the device will search for a random operator.

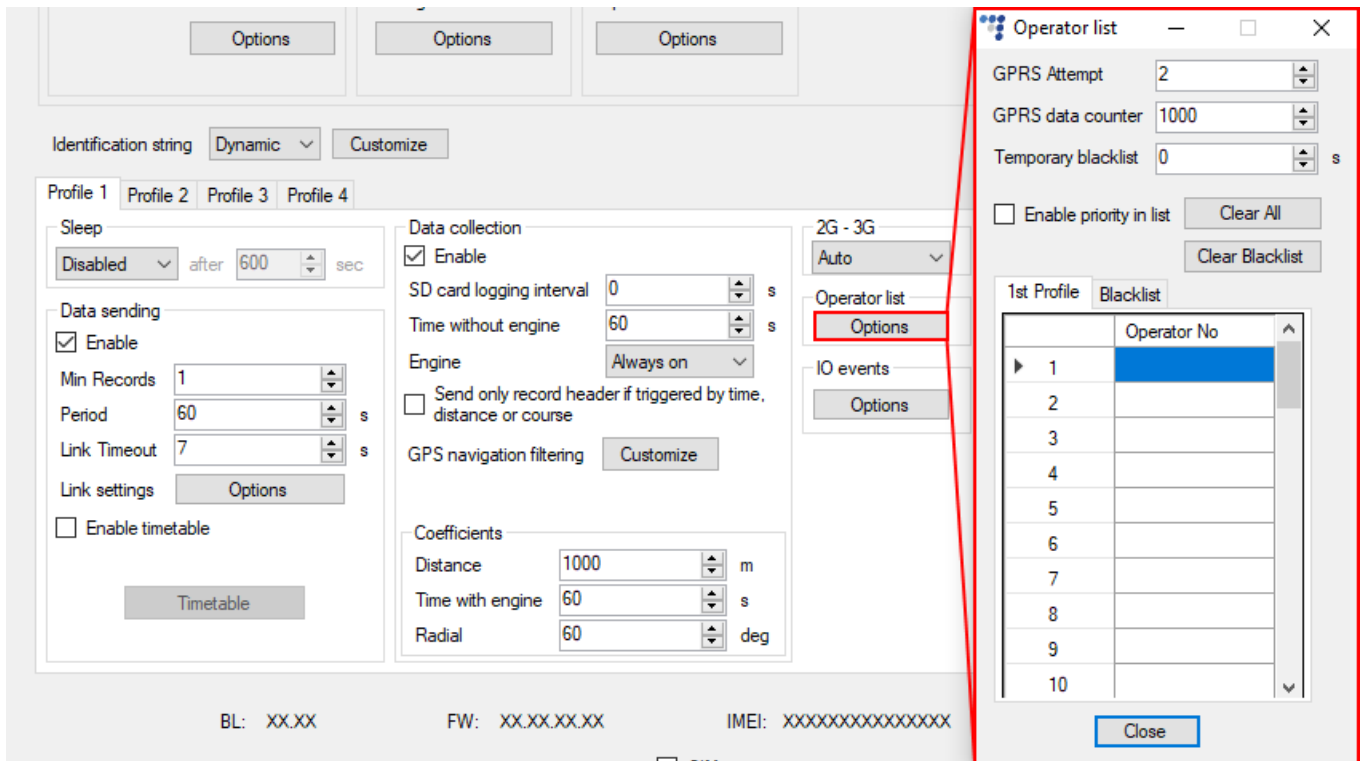
Profile tab – the operators used in the current profile are entered here. If an operator that is in the list was not found, the device will search for another operator in the list. If no operators were found, the device will switch to the next available profile.

Blacklist – the operators entered in the blacklist will be ignored during operator search.

Note

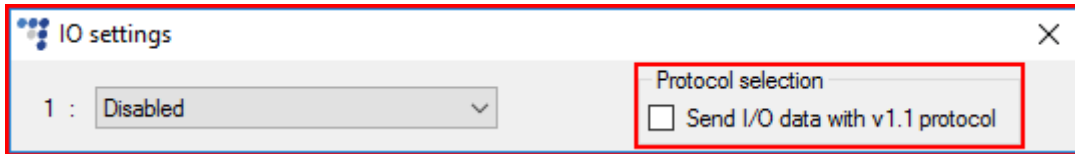
A single blacklist is used for all profiles, but each profile has a different operator list.

Clicking the **Clear All** button will clear all operators from the current profile operator list. Clicking the **Clear Blacklist** button will clear all operators from the blacklist.



6.3.3 IO settings

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

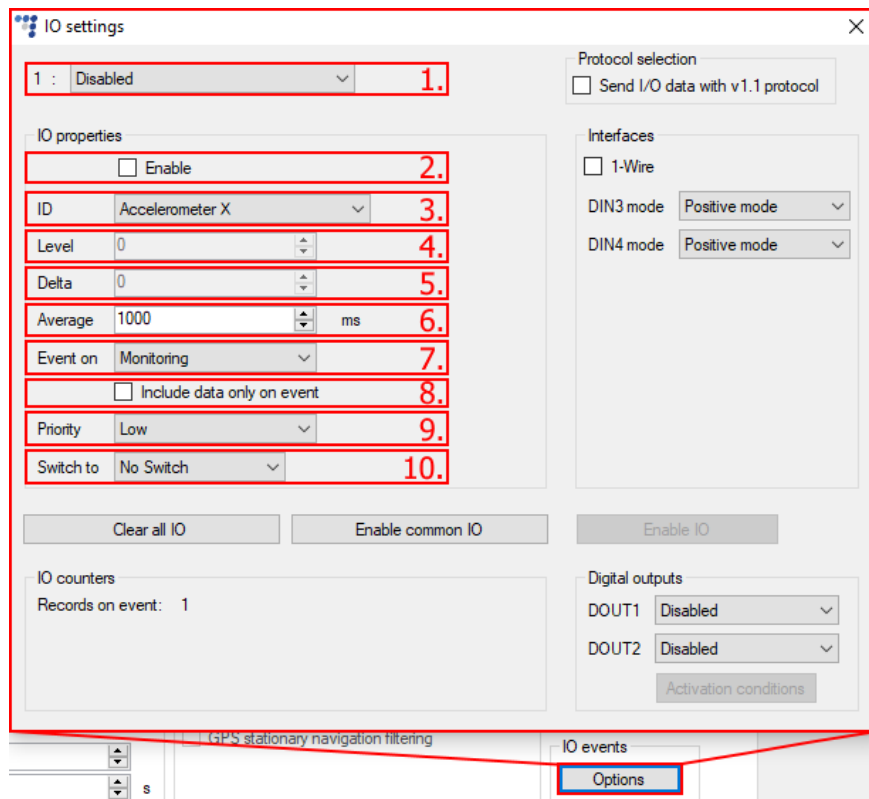


Note

A significant part of the IO parameters requires protocol v1.1 to be 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!

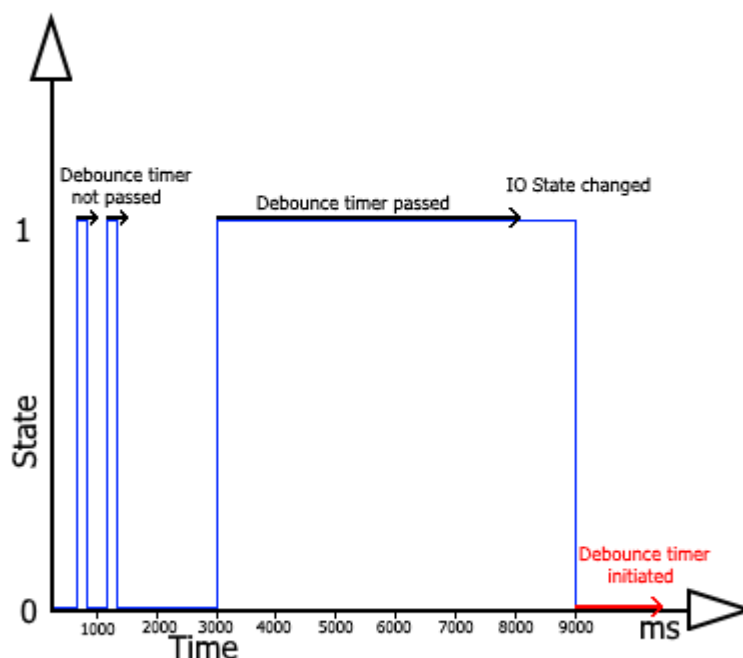
After deciding which protocol suits your needs, you can move on to the IO parameters. There are several ways to enable IO parameters. The first way described below is the fully manual way, where you have to enable and configure each IO by hand:

1. You have 40 slots for parameters. Select the slot that 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 the parameter you want to enable for the selected slot. Each parameter can be enabled only once.
4. **Level** is used with hysteresis mode, see step 7.c below for more details.
5. **Delta** is used with hysteresis mode, see step 7.c below for more details.
6. **Average** – the values of some parameters change rapidly and do not provide any valuable information. Averaging values for some period of time gives a more informative parameter value (e.g. fuel level often oscillates, averaging gives you an approximate value that corresponds to the real fuel level in the tank).
7. **Event on** – describes how the parameter will be measured and sent:
 - a. *Monitoring* – the parameter value is always monitored and sent with every record;
 - b. *Change* – when the parameter value changes, a record will be made regarding this change. However, the parameter value is also monitored and sent to the server with every record;
 - c. *Hysteresis* – records are made after specified changes in the parameter value. For example, *Power supply voltage* is being configured. **Level** sets the reference point, e.g. 12700 mV. **Delta** is the deviation of the value, e.g. 1000 mV. Records will be made (because of changes in the parameter value) when *Power supply voltage* drops below 11700 mV and/or rises above 13700 mV. The condition is specified by selecting either *On Rising*, *On Falling* or *On Both*.
8. Select **Include data only on event** to include parameter values only when the condition (set in step 7) is met. In other cases, parameter values 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 the link to server and send the record.
10. You can configure the device to **Switch to** another profile after a change in parameter values.

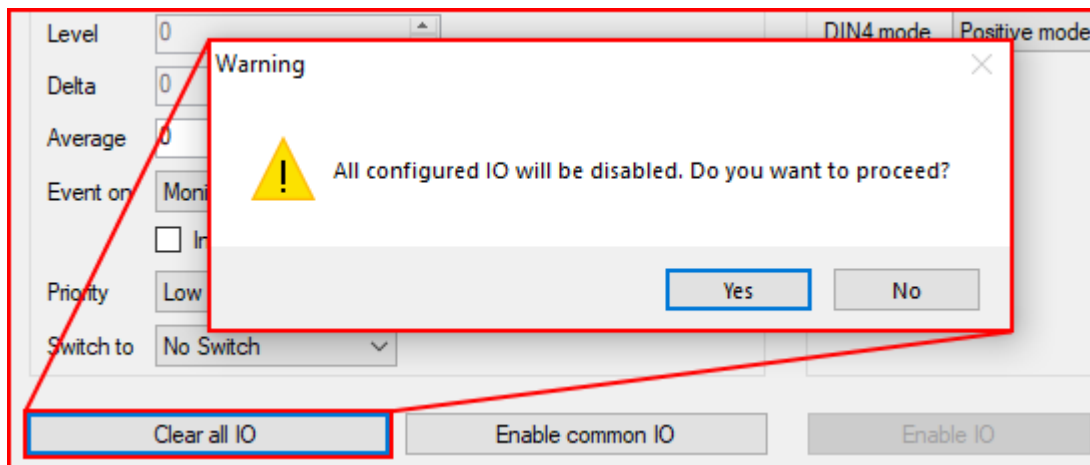


Note

Some IO parameters will have a "Debounce" setting instead of the "Average" setting. Debounce defines for how long the device must receive a changed IO state before it registers the changed state. For example, the DIN state changed from 0 to 1 and "Debounce" is set to 5000 ms, so the signal from the DIN must remain constant for the period of 5000 ms to actually change the state of the IO from 0 to 1.



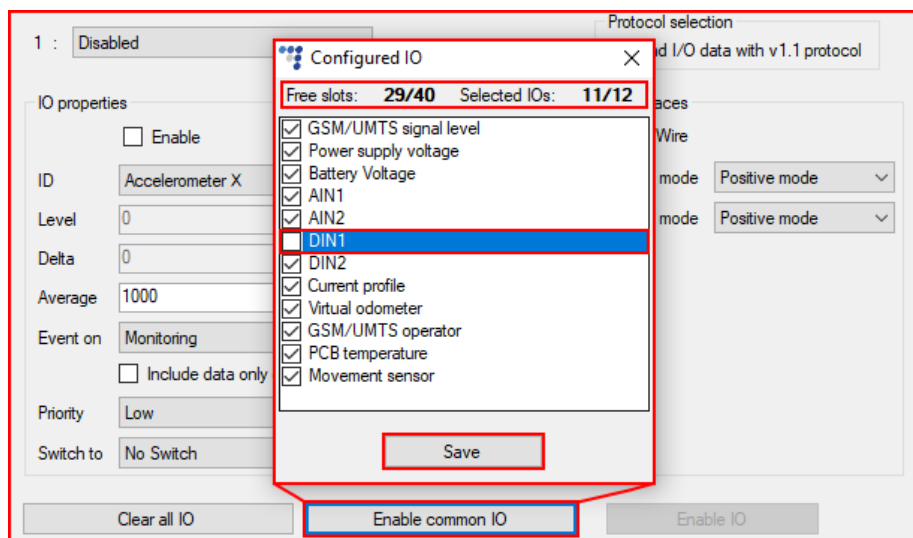
If the IO parameters were configured incorrectly, or the user simply decides to redo the configuration, he can use the **Clear all IO** button, which disables all the enabled IOs along with their configuration in the selected profile.



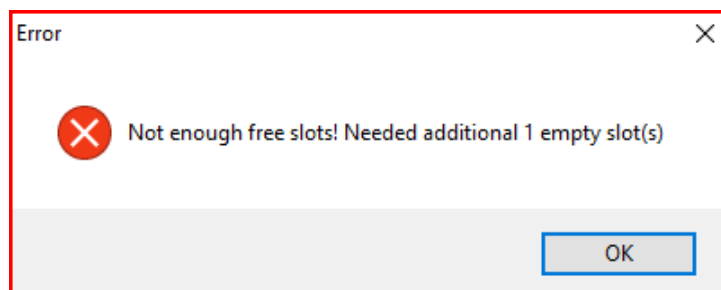
The next method describes how to automatically enable and configure commonly used IOs. To do this, the user must simply click the **Enable common IO** button. This will open a window with a list of common IO parameters that will be enabled along with additional information, such as:

- The amount of free IO slots remaining after the selected IO parameters are enabled;
- The amount of selected IO parameters.

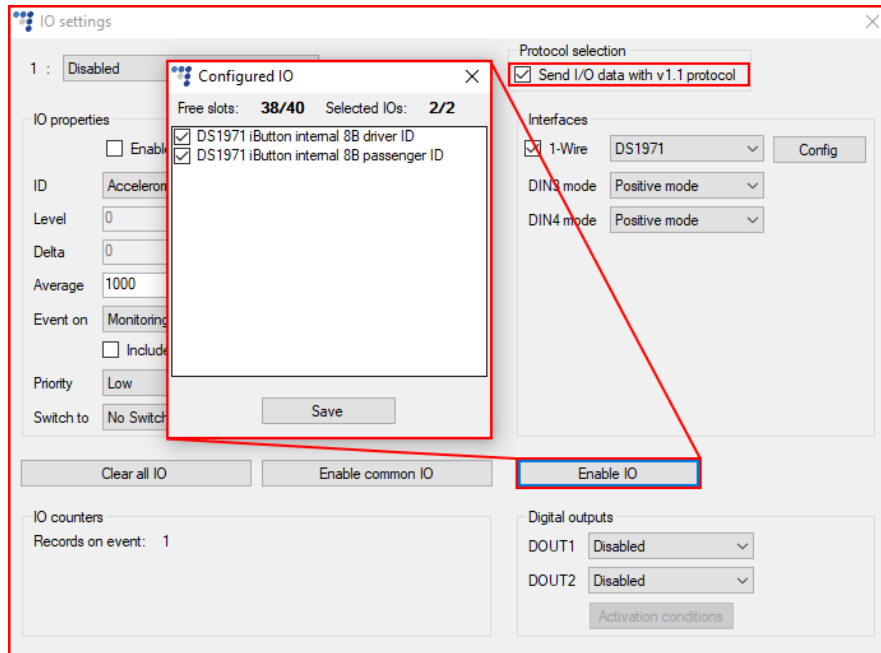
You can also choose which IO parameters you want to enable, this can be done by unticking the checkbox next to the name of the IO parameter. To enable the selected parameters, the user must click **Save**.



An error window will appear if there are not enough slots to enable the selected IO parameters.



Lastly, the **Enable IO** button enables IOs for the selected interface. **This button is available only if Protocol v1.1 is enabled!**

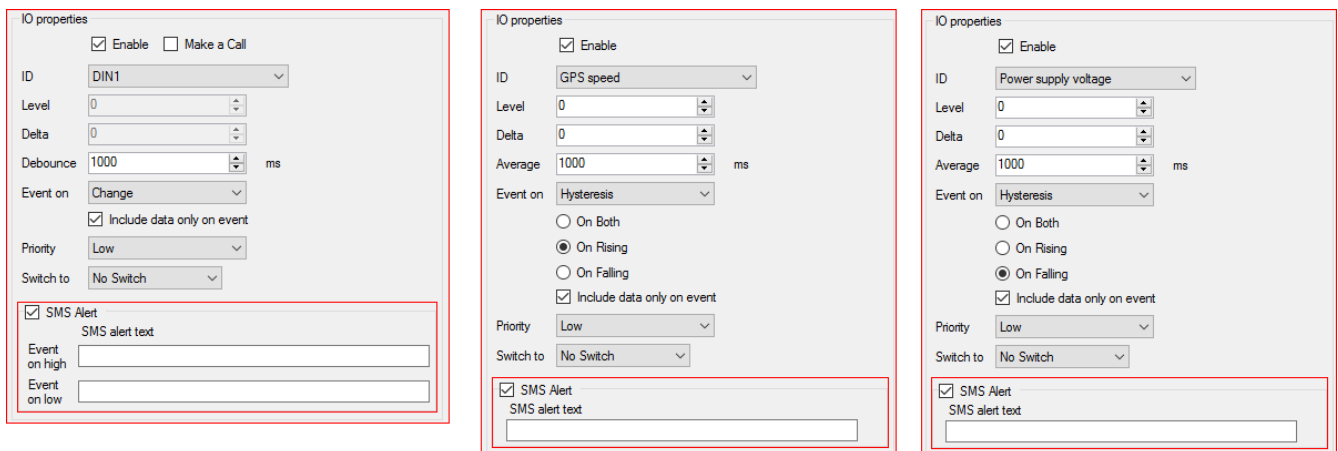


6.3.3.1 SMS Alerts and Custom SMS Alerts

Some of the enabled IO parameters have the option to enable SMS alerts. SMS alerts will be sent to the number previously configured in section 5.3.1 "Global settings". This functionality is available only for the IO parameters described below. In addition to sending a SMS alert, the user can customize the SMS message. The list of IO parameters that can have SMS alerts and their mandatory configuration is provided further on:

- DIN1 – Event on *Change*, custom SMS alert available on DIN status *High & Low*;
- DIN2 – Event on *Change*, custom SMS alert available on DIN status *High & Low*;
- DIN3 – Event on *Change*, custom SMS alert available on DIN status *High & Low*;
- Ignition (DIN4) – Event on *Change*, custom SMS alert available on DIN status *High & Low*;
- Power supply voltage – Event on *Hysteresis*, custom SMS alert available on *Falling or Both*;
- GPS speed – Event on *Hysteresis*, custom SMS alert available on *Rising or Both*.

Examples of the custom SMS fields are shown below:



Standard rules for SMS alerts apply, described in the "SMS Command list", available at doc.ruptela.it, section 1.2.2 "SMS alerts with date & time". The maximum length of a custom SMS is 50 symbols.

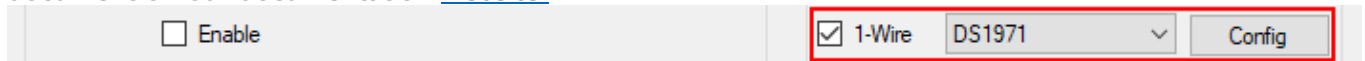
Note

Only GSM 03.38 symbols can be used in the custom SMS text.

6.3.3.2 Interfaces

1-Wire

Use the 1-Wire interface to enable and configure peripheral devices and their functionalities, for instance DS1971 iButton EEPROM memory reading. This process is described in the “Drivers registration” document on our documentation [website](#).



Digital outputs section

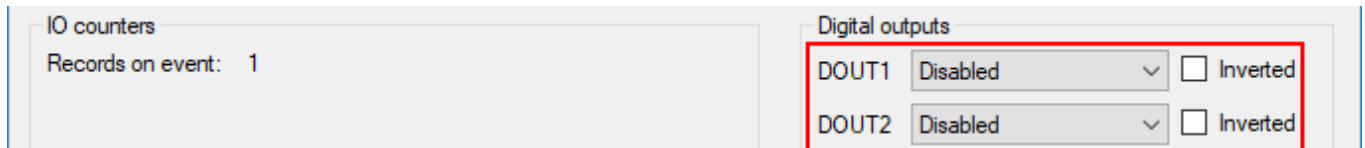
Digital outputs (DOUTs) can have two states – active or inactive. These states can change once a condition is met or they can be changed by using SMS commands. Depending on the state and pattern, a control signal is outputted. This signal can activate various indication peripherals or control the vehicle by blocking the engine or limiting its speed.

DOUT1 and **DOUT2** – drop-down lists let you select one of the following: *Disabled, LED, Buzzer, Blocking, GSM jamming block, Custom, Immobilizer*.

The **Inverted** checkbox inverts the logic of the selected DOUT.

For example, if *LED* is selected and the **Inverted** checkbox is not ticked, LED status will turn ON when the DOUT state is active. Otherwise, if the **Inverted** checkbox is ticked, LED status will turn ON when the DOUT state is inactive.

More information available on our documentation [website](#).

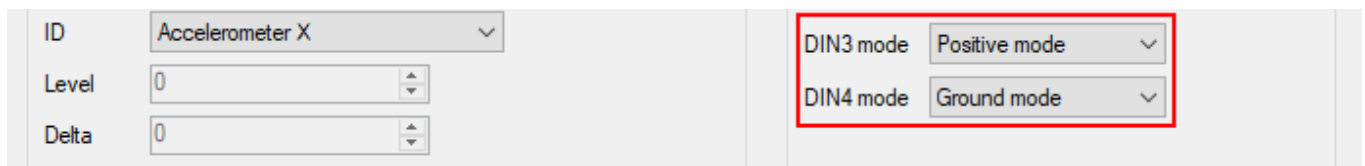


Digital input mode configuration

In Eco4 S devices DIN3 and DIN4 digital inputs are invertible and can be configured to work either in **Positive mode** or **Ground mode**.

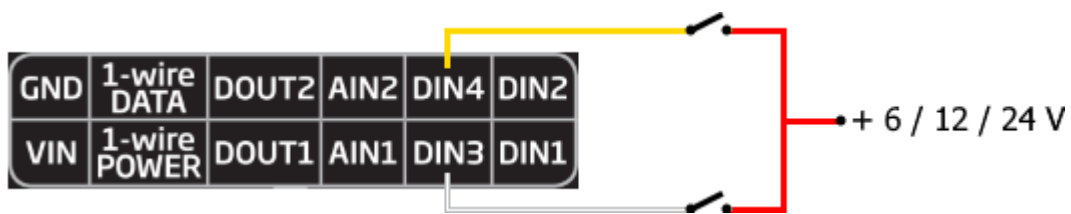
Positive mode – this is the default mode for DIN3/DIN4. The state of the digital input is changed by a rising signal edge.

Ground mode – the state of the digital input is changed by a falling signal edge.

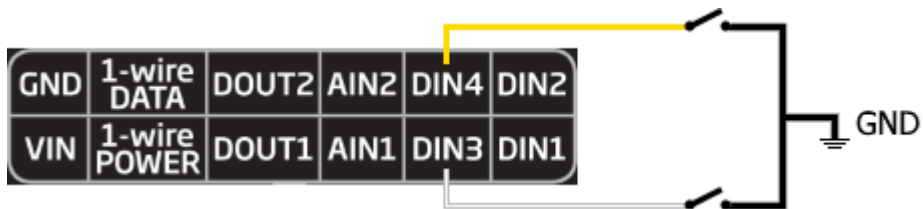


The selection of the digital input mode depends solely on the peripheral devices connected to the digital inputs. A connection example for both connection modes is shown below.

Positive mode:



Ground mode:



6.4 Integration protocol

All integration and documentation related questions can be answered by Ruptela technical support: support@ruptela.com

7 Installation recommendations

7.1 Device installation

When installing the device into a vehicle please obey these instructions, otherwise your device may not function properly.

- The device should not be seen or easily reached;
- The device should be firmly fixed to the surface. Please avoid installing the device near a metal surface or cables;
- The device must be facing up, so that the internal GNSS antenna is facing up as well (*see the pictures below*);
- Incorrect device installation may result in a malfunction;
- The device cannot be fixed to heat emitting or moving parts;
- The SIM card should be inserted in the device, while the connector is unplugged (while the device has no power);
- The device must be fixed with double sided stick tape!



GNSS antenna position

7.2 Device installation position

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



CORRECT



INCORRECT



CORRECT



INCORRECT

The device can be installed with an angle of up to 45° in any axis, but the top surface must be facing up in any case.

7.3 External antenna installation (FM-Eco4+ E S only)

It is recommended to place the GNSS antenna behind the dashboard as close to the window as possible. It must be uncovered and facing up (see the picture).

The best location for the GNSS antenna is marked in blue (see the picture).

