



FM-EC04/4+ USER MANUAL

2015/02

VILNIUS

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1 PREFACE

1.1 USE OF THIS DOCUMENT

This document provide required information for proper device handling, preparation, configuration and installation to vehicle. This document has linear structure – from opening box to recommendations how to install device to vehicle. However it is not overfilled with unnecessary information. You will find basic description of functions and actions to start using device with reference to extensive content descriptions.

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 software required for configuration of device are marked in **bold**.
- All actions are described in sequence in five sections: Introduction, Device description, Device preparation, Device configuration and Installation recommendations.

1.2 DOCUMENT CHANGE LOG

DATE	VERSION	CHANGE DETAILS
2014-06-06	v1.0	Initial draft
2014-06-10	v1.1	Minor update
2014-06-17	v1.2	Structural update
2014-08-06	v1.3	Charging temperature fixed
2014-09-01	v1.4	Advanced configuration added
2015-02-04	v1.5	Branding changes
2015-09-21	v1.6	Waste equipment disposal rules; driver installation section updated
2015-10-28	v1.7	GPS/GLONASS module
2016-01-22	v1.8	SIM lock, SIM card status, Towing detection, Send data without GPS fix, Custom ignition
2016-04-08	v1.9	2 nd level temporary black list

2 INTRODUCTION

2.1 PURPOSE

Purpose of this document is to provide physical and technical data of the device, explain device behavior and indication of various conditions. Also device preparation for operation and configuration instructions are included.

2.2 ACRONYMS

PC – Personal Computer;
 GPRS – General Packet Radio Service;
 GPS – Global Positioning System;
 GSM – Global System for Mobile Communications;
 GLONASS – Global Navigation Satellite System;
 SMS – Short Message Service;
 AC / DC – Alternating Current/Direct Current;
 PCB – Printed Circuit Board;
 LED – Light Emitting Diode;
 I / O – Inputs / Outputs;

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 dismantled 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.



Caution! There is a risk of explosion if the battery is replaced by an incorrect type. Dispose used batteries according to the environmental requirements.



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



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



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



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



This crossed-out wheeled 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 information on how to operate with the FM terminal safely. 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 @ 200/100 mA. The allowed voltage range for the battery is: 10 – 32 V DC.

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

Before connecting the wires of 12 PINs cable to the vehicle, ensure that cross-sectional area of wires mounting is at least 0.75 mm².

To dismount terminal correctly from the vehicle, first of all disconnect power supply wires and 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 conjunction with other documents. This way documentation is kept light, not overfilled with unnecessary information. All additional and extensive explanation can be found in referenced documentation:

- FM-Eco4/4+ Datasheet – Technical data of FM-Eco4/4+ device. Can be acquired from support@ruptela.com
- [Quick start guide](#) – A quick guide for better configuration process and functions understanding.
- [Peripheral accessories](#) – Instructions how to use peripheral accessories with FM-Eco4/4+ device.
- [FTP link](#) – Our FTP containing newest firmware, newest configurator and sample configuration files.
- [Microsoft Framework](#) – This additional software is required in order to run our configurator.
- [VCOM drivers](#) – Drivers required for device connection to PC.

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

NOTE

Ruptela FTP address: doc.ruptela.it

3 DEVICE DESCRIPTION

3.1 ABOUT

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

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



Figure 1. FM-Eco4/4+ device

3.2 PACKAGE CONTENTS

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

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



Figure 2. Box contents: FM-Eco4/4+ device, GPS/GLONASS antenna, IO cable, USB cable (optional accessory)

NOTE

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

3.3 PHYSICAL CHARACTERISTICS

PROPERTIES

Enclosure dimensions	82 x 63 x 28 mm
Indication	3 LEDs: GNSS status, GSM status, 1-Wire status
Housing	Plastic with cable glands, waterproof
External elements	GPS/GLONASS all-in-one antenna
Configuration interface	USB
Cables	12 PINs insulated

3.4 TECHNICAL CHARACTERISTICS

POWER CONSUMPTION¹ @ 12V

	FM-EC04	FM-EC04+
Idle mode, mA	40	45
Sending records, mA	240	250
Deep sleep, mA	12	15
Ambient temperature ratings, °C:		
Storage temperature	-40 - +65	-40 - +65
Operating temperature	-35 - +60	-35 - +60
Battery charging	x	0 - +45
Battery discharging	x	-20 - +60

¹Firmware 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.

COMMON SPECIFICATIONS

Power supply	10-32 V DC
Absolute maximum ratings (on FM-Eco4+)	50 V @ 60 s
	72 V @ 0.1 s
Internal power supply (FM-Eco4+ only)	3.7 V, 190 mA
Digital input threshold	4 V
Analogue input resolution	12 bit
GPS/GLONASS module	72 channel
Sensitivity	-163 dBm
GPS/GLONASS antenna frequency	1575.42 ± 3 MHz
GSM modem	Quad band
GSM antenna	Internal, Quad band

PROTECTIONS

Short circuit protection
Reverse polarity protection
Electrostatic discharge protection on USB
Electrostatic discharge protection on 1-wire
Overcurrent protection on 1-wire power
Electrostatic discharge protection on sim card slot
Charging protection ² (on FM-Eco4+)

²If temp is >45C, charging is disabled, if >60C battery is disconnected from the system at all.

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/red	1-wire power supply, 5 V
1-wire DATA	Green/yellow	1-wire data transfer

3.6 PERIPHERAL ACCESSORIES

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

NOTE

1-Wire power maximum power consumption is 80 mA @ 5 V

Available on 1-Wire:

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

Available on DOUTs:

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

Available on AINs:

- 2 × Analogue fuel sensors

You can find peripheral accessories installation instructions and documentation at our [FTP server](#).

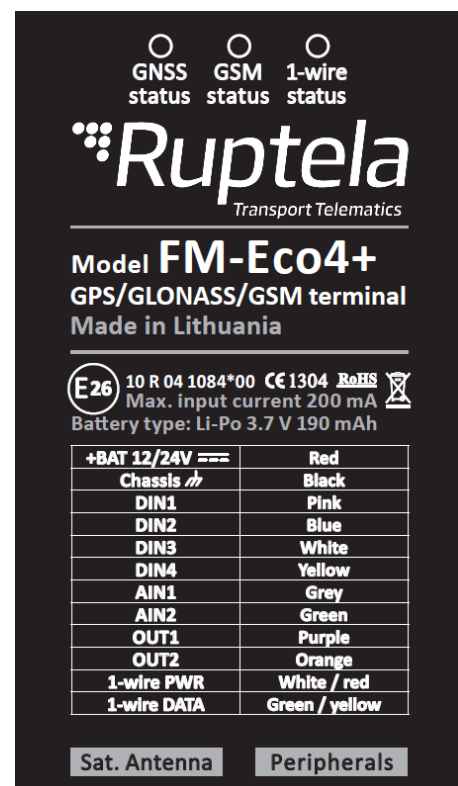


Figure 3. FM-Eco4/4+ label

3.7 CERTIFICATION

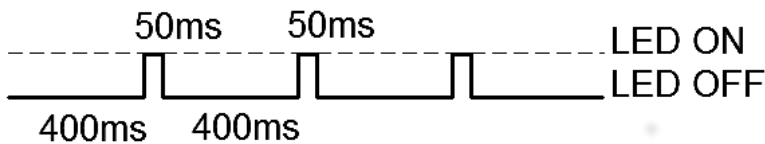
FM-Eco4/4+ devices have passed quality tests and comply with following certifications:

- E-Mark
- CE ready
- RoHS

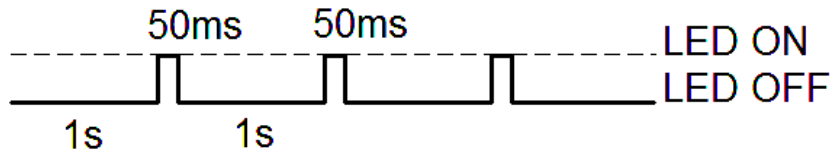
3.8 LED STATUS

3.8.1 GNSS LED

When GPS/GLONASS signal is not received or GPS/GLONASS signal is not accurate, the GPS LED is blinking as follows:

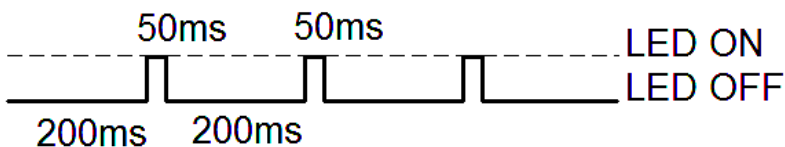


When accurate GPS/GLONASS signal is received, the GPS LED is blinking as follows:

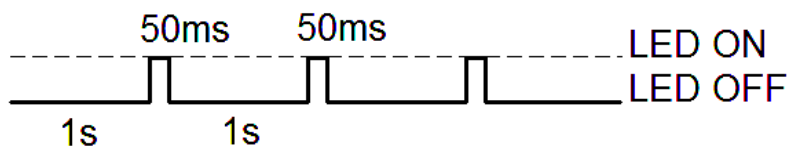


3.8.2 GSM LED

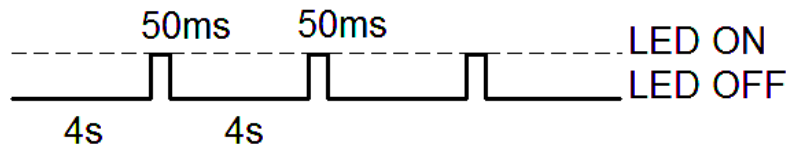
When GSM signal is not received, GSM LED is blinking as follows:



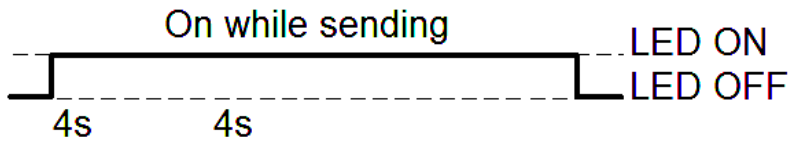
When device has a good GSM signal, but no GPRS, LED is blinking as follows:



When device has good GSM signal and it is connected to GPRS, then LED is blinking as follows:



When the FM-Eco4/4+ terminal has GSM signal and it is sending data via GPRS, LED is blinking:

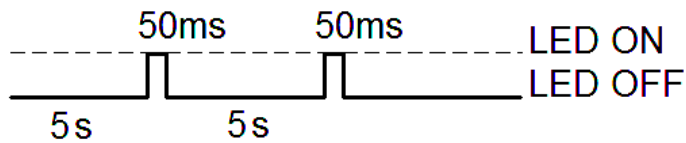


3.8.3 1-WIRE LED

To the FM-Eco4/4+ terminal can have 1-Wire peripheral devices attached. So there are 2 different types LED states when peripheral device is connected. When there is no peripheral attached, LED will not blink at all:



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



4 DEVICE PREPARATION

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

4.1 OPENING DEVICE

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

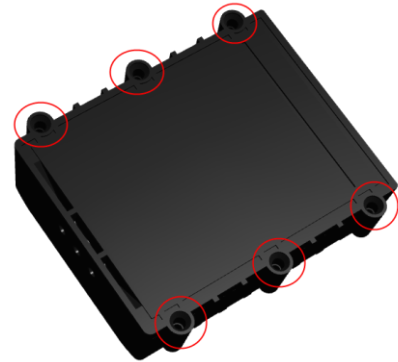


Figure 4. Unscrew bolts marked with red circles

4.2 CONNECTING USB CABLE

Connect USB cable to device. USB cable used is specific nonstandard connector. Please plug cable to device as shown in picture below. Cable will plug in only in one way, be careful not to damage the plug. Connect other end to your PC or laptop.



Figure 5. USB cable connection location on PCB

4.3 INSERTING SIM CARD

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



Figure 6. Insert SIM card into holder chip facing down

4.1 IO CABLE

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

However if you accidentally disconnected IO cable from device:

1. Make sure cable is in gland.
2. Take PCB out of housing.
3. Turn PCB over.
4. On IO cable find small **triangle** (see figure 7)
5. Plug cable again **triangle** facing up.
6. Turn PCB over again and put into housing.

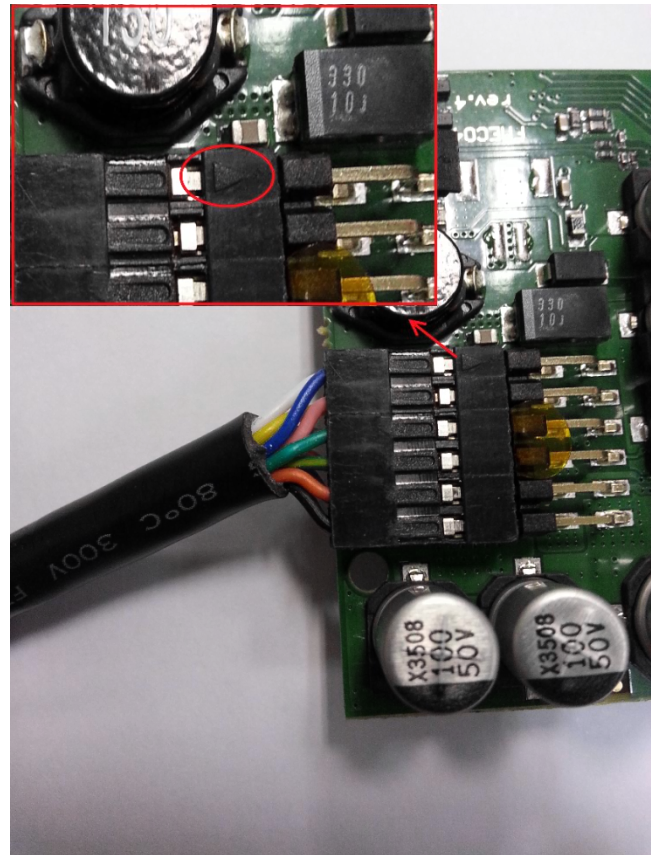


Figure 7. IO cable correct connection

5 DEVICE CONFIGURATION

5.1 DRIVER INSTALLATION

Virtual COM port driver installation is mandatory, only then your PC will recognize your device that was connected to the USB port. You can download newest drivers from our FTP server ([VCOM drivers](http://ftp://ftp.dev.ruptela.lt/Temp/FM4 drivers/)).

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

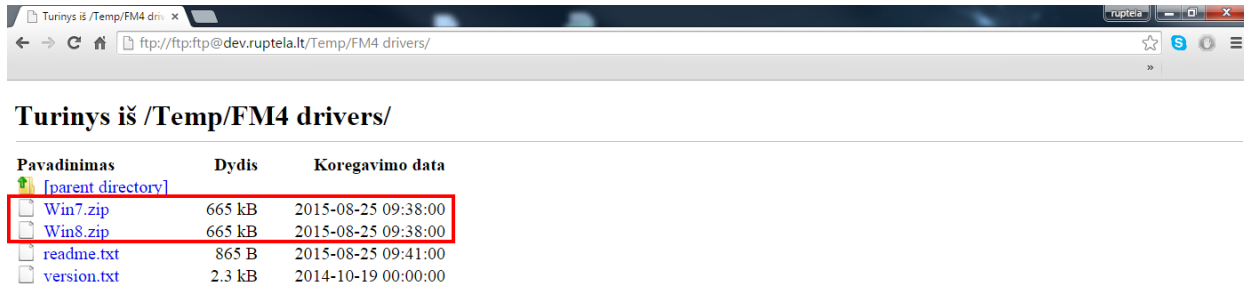


Figure 8. Virtual COM port driver IO

Installation procedure:

- ❖ Uninstall previous Virtual COM port driver versions (Start-> Settings-> Control Panel-> Add or remove programs).
- ❖ 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 (see figure 9). Click “Yes” [3.].



Figure 9. Virtual COM port drivers for 32-bit and 64-bit systems

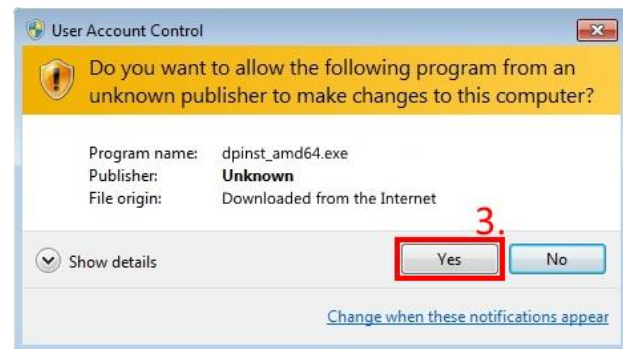


Figure 10. User Account Control

In the next window (see figure 11) select “Next” [4.].

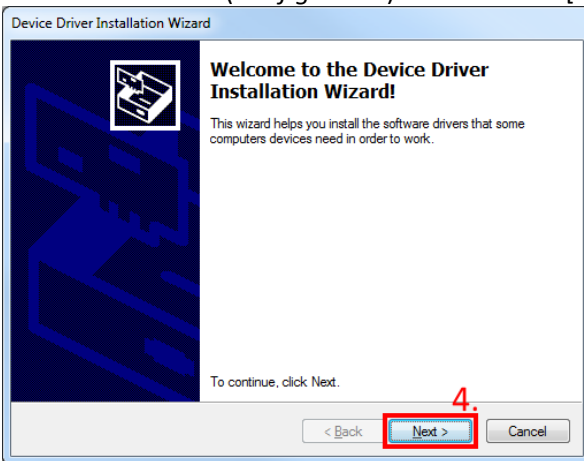


Figure 11. Device Driver Installation Wizard

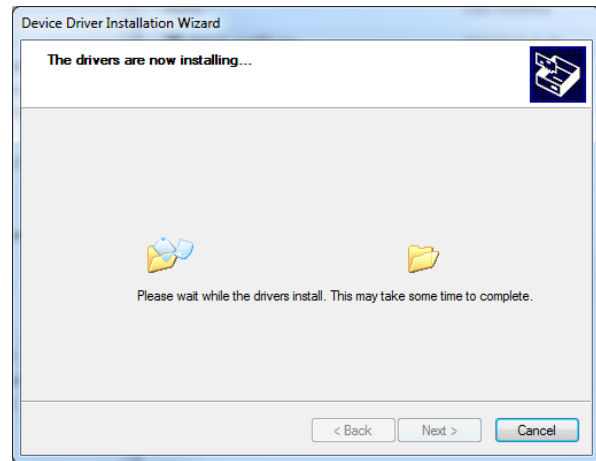


Figure 12. Device Driver Installation Wizard - installing driver

Wait for the setup to complete the installation and click “Finish” [5.].

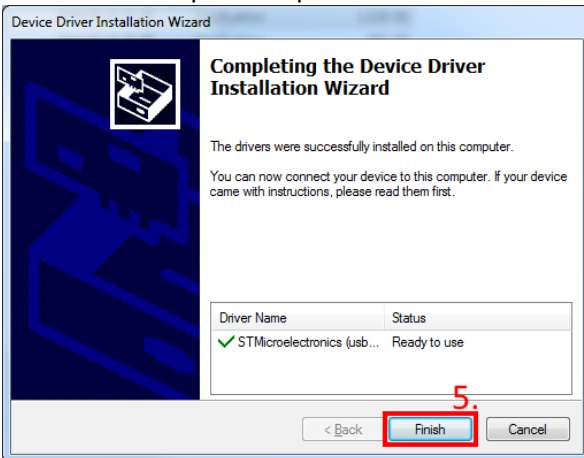


Figure 13. Device Driver Installation Wizard - driver installation complete

Driver is now installed and ready to use.

5.2 SAMPLE CONFIGURATION

Please log in to our FTP server and download [sample configuration](#) and newest [configurator](#) . Also you need newest [Microsoft Framework](#).

Operating system requirements:

- MS Windows XP/Vista/7/8

Start VCP.exe from configurator folder.

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

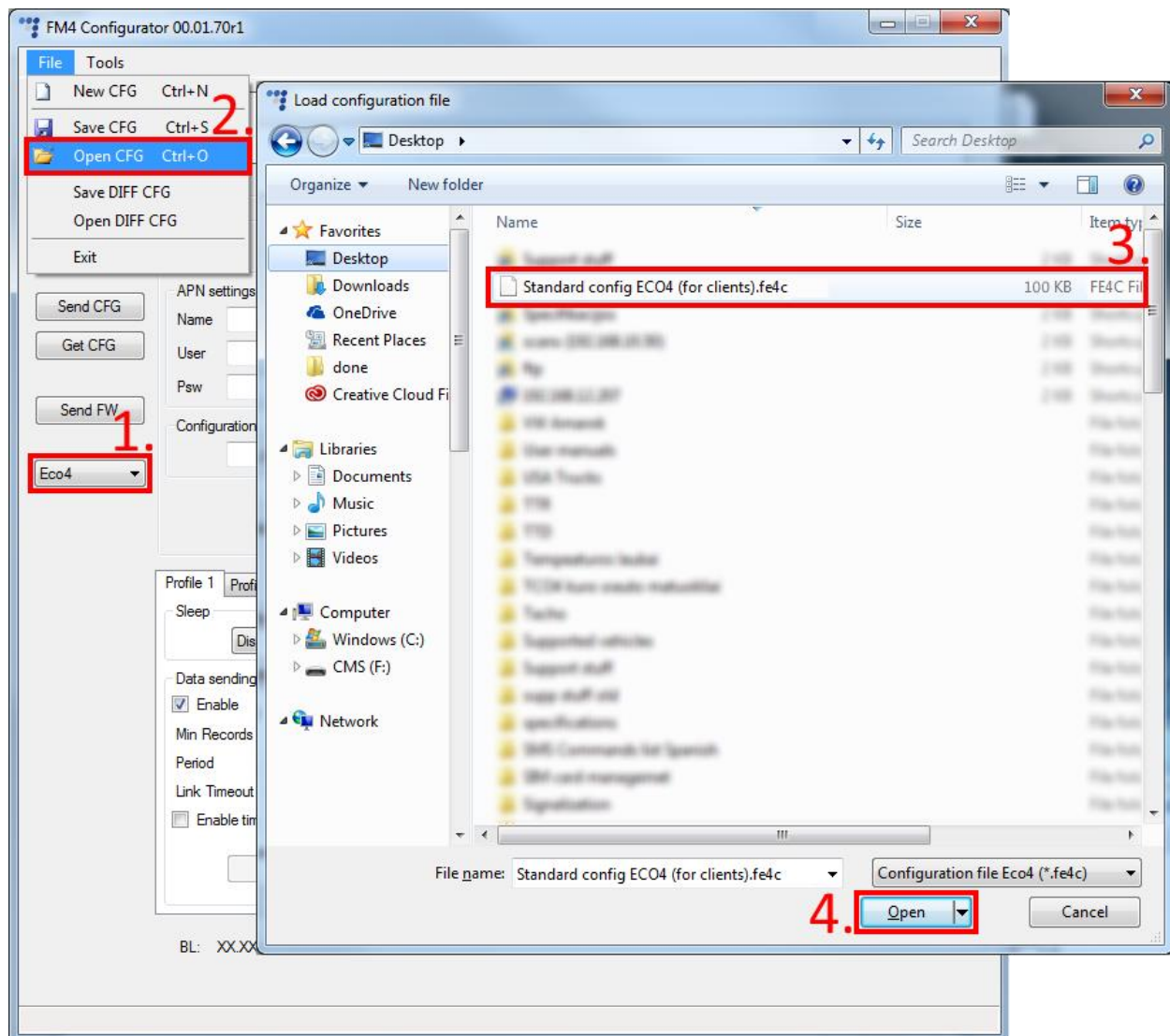


Figure 14. Sample configuration

Sample parameters will be loaded. However you need to enter some parameters by 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 COM port you connected device to and click **Connect**. At this point configuration is ready to send to device so device must be connected to computer.
4. Click **Send CFG** button. Configuration will be uploaded to device.

NOTE

APN name, login and password should be provided by your mobile network operator

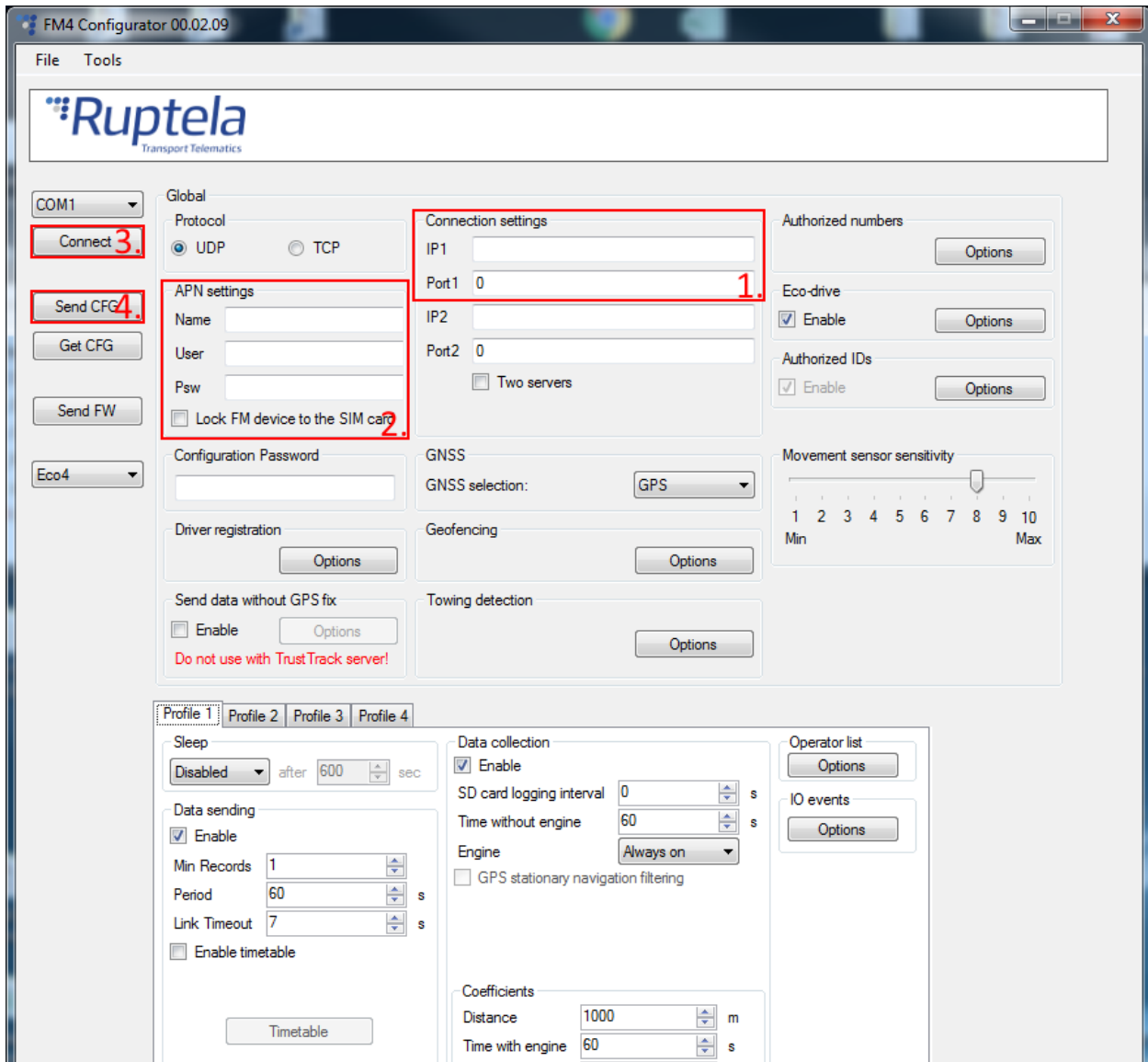


Figure 15. Required connection settings

Now device is configured to send data to specific server. Sample IO parameters are enabled (loaded with configuration file). You can log in to your tracking platform to see if device is sending data.

5.3 ADVANCED CONFIGURATION

Configuration tool is quite similar to 3rd generation devices. Overview of configuration is described in sections.

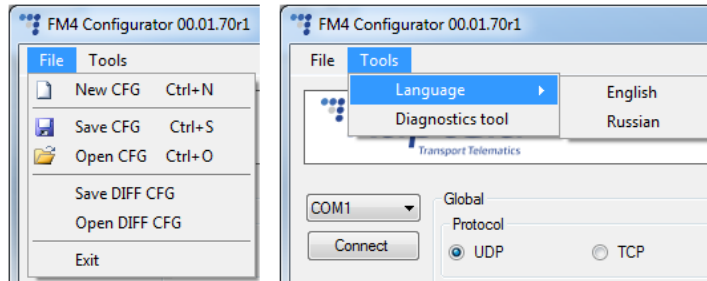


Figure 16. Menu bar

File menu gives you access to control configuration files. Choose *New/Save/Open CFG* to perform corresponding action. CFG means full configuration file.

Tools menu contain language selection: English or Russian.

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

ATTENTION

DIFF file will save EVERY field in configuration that you touch with mouse. For example, you only click on IP field but do not change anything – when you save DIFF file, IP will be included in DIFF even if it was not changed. That is why particular attention must be taken when using DIFF files. It is very easy to change/remove parameters that you do not want to change.

Control panel on left side allow you to choose and control device.

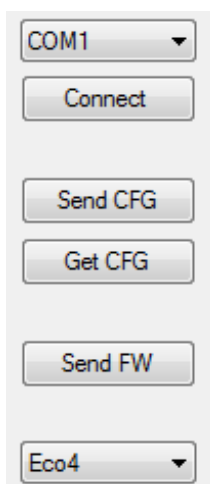


Figure 8. Global section

Select COM port that device is connected and hit **Connect**.

Send CFG and **Get CFG** buttons are used to send and receive configuration file to hardware.

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

In **drop box** you can select device type. If you connected one to your PC, it will be displayed.

5.3.1 GLOBAL SETTINGS

First part of configuration tool is global settings.

Figure 18. Protocol, APN settings, Connection settings, GNSS

Global section contain connection settings and other settings independent from profile settings. Global settings are the same for all profiles.

UDP protocol is less reliable than **TCP** but also uses less traffic. TCP however use more internet traffic but 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 device will not send any data.

- 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 a different SIM cards with this device.

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

It can be returned to its original unlocked state by entering a PUK, provided by the service operator after verification. If the wrong PUK is entered ten times in a row, the device will become permanently blocked and unrecoverable, requiring a new SIM card. Once you enter the PUK code, you must set a new PIN.

Figure 9. PIN, PUK codes

SIM status section at the bottom of the configuration tool displays SIM card related information.

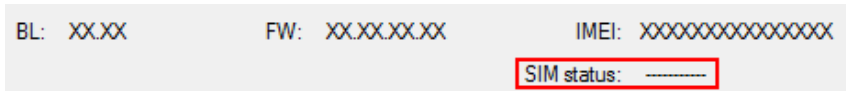


Figure 20. SIM status

Total of seven different statuses are available:

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

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

GNSS allow to select positioning network – GPS or GLONASS. GPS by default (*suggestion not to change this*).

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

NOTE

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

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

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

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

Unable to send data:

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

NOTE

Two server mode doubles the amount of data that is being sent. Before using this functionality consider the cost which arises from the higher data traffic.

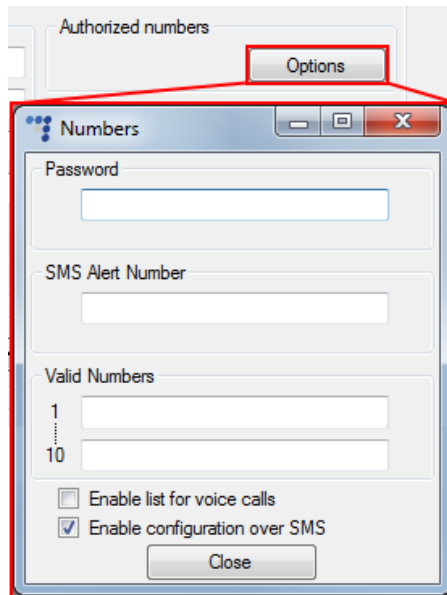


Figure 10. Authorized numbers list

With **Authorized numbers** you can apply password for SMS commands. Also you can enter specific numbers who can send commands to the device.

If you check **Enable list for voice calls** entered numbers will be able to call to device for conversation or for listen-in purposes.

Enable configuration over this checkbox controls configuration over the SMS feature. Full functionality description can be found at our [FTP server](#).

Following features need extensive configuration and functionalities descriptions are available.

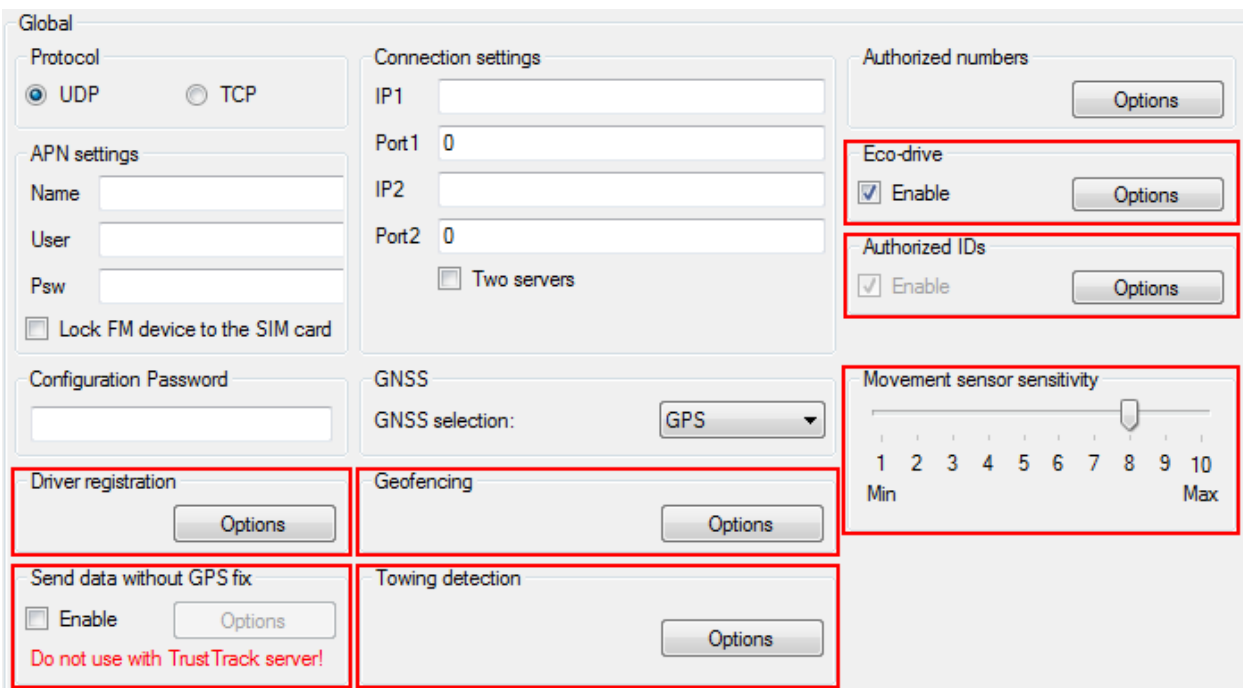


Figure 22. Driver registration, Geofencing, Towing, Send data without GPS fix, ECO driving, Mov. sensor

ECO Driving options are used to choose sensitivity for ECO Drive functionality. It help rate drivers by safety or by fuel economy. Full functionality description can be found at our FTP server, [ECO Drive from Accelerometer/from GPS](#).

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 FTP server, [FM-Eco4, FM-Pro4, FM-Tco4 + Driver registration](#).

Driver registration is used to authorize vehicle start, identify driver and account working hours. Full functionality description can be found at our FTP, [Driver registration](#).

Geofencing allow to use internal geozones, configured directly into device. Full description can be found at our FTP, [Internal geozones](#).

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 data without GPS fix - device cold-start often causes problems, because it is not not sending data, therefore user is unable to see parameter values until the GPS fix is obtained. In order to face these problems new functionality, which enables sending data without GPS fix was implemented. This feature cannot be used with TrustTrack server! Full functionality description can be found at our [FTP server](#).

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 at our [FTP server](#).

5.3.2 PROFILE SETTINGS

Second part of configuration tool is settings for each profile. Profile is a set of settings for specific circumstances (e.g. when vehicle is operated in native country or abroad).

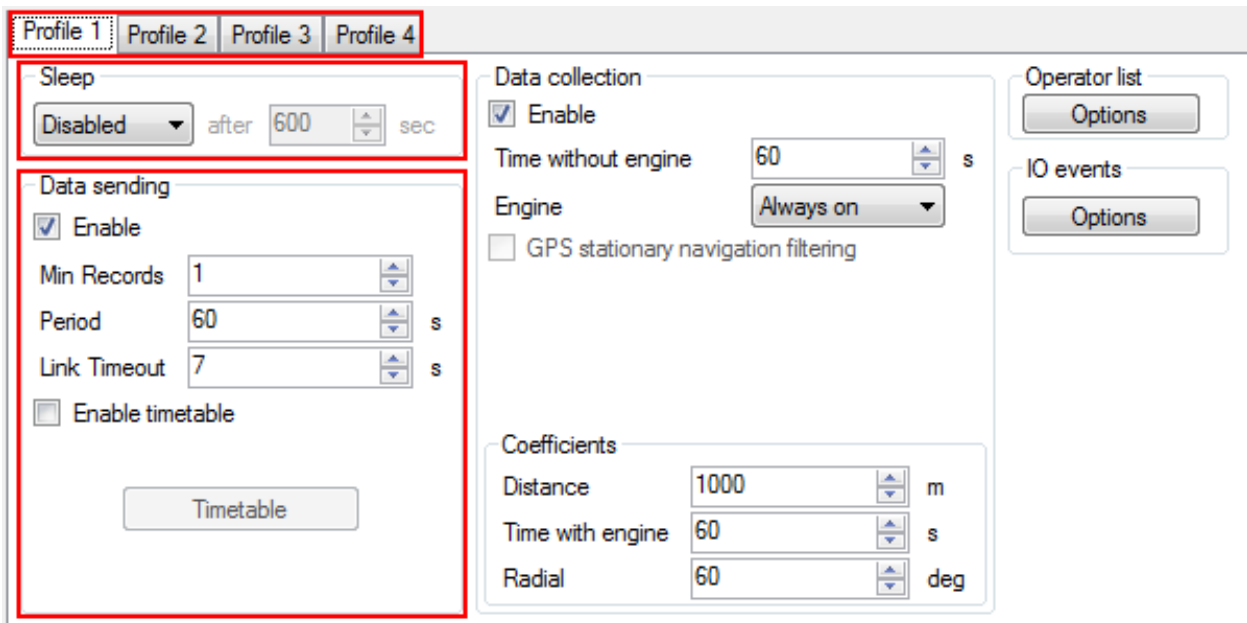


Figure 23. Profile settings: Sleep, Data sending

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 everything except DINs. When *Sleep* or *Deep sleep* is selected, it is possible to set a time limit. Once this time limit is reached, the device will switch to Sleep/Deep sleep mode.

With **Data sending** settings you can configure data sending frequency and conditions. **Enable** check box must be enabled.

- Min. records – Minimum number of records required to establish connection to server. If device detects less records than entered, link will not be opened to server.
- Period – sets how often device will check for required number of records.
- Link timeout – when device opens link to server and send all records, this value indicate how long device should wait before closing it. Default is 7 seconds, suggested not to change.

Timetable allow you to select particular days and hours data should be sent.

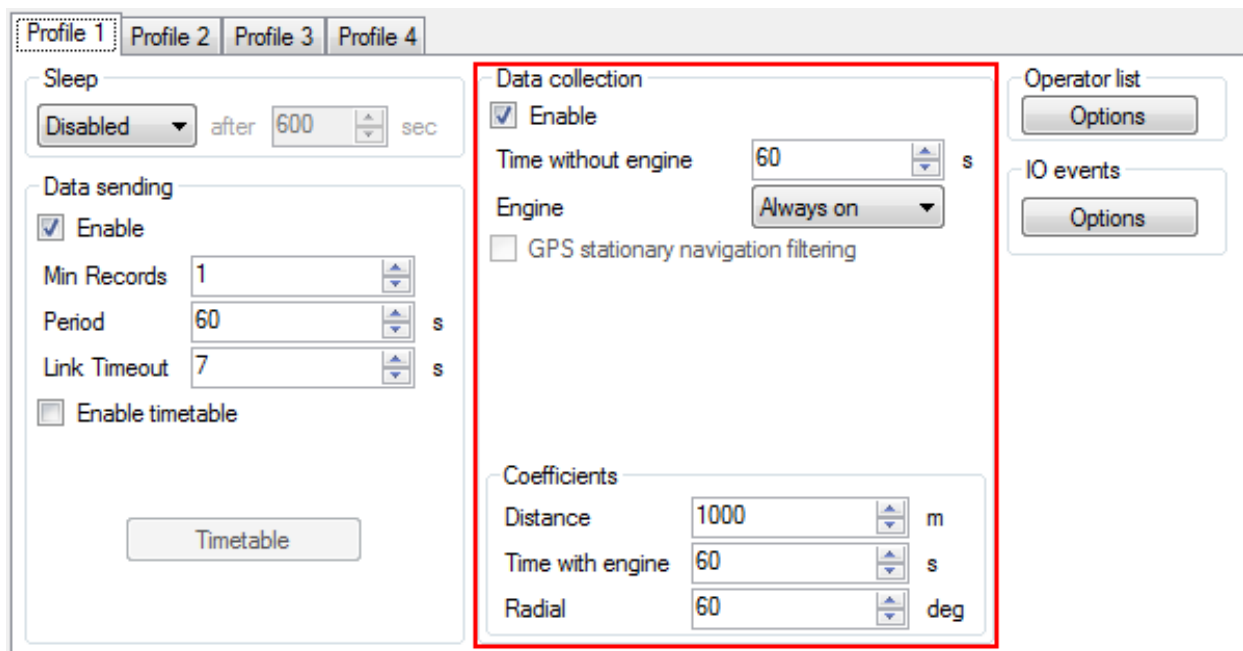


Figure 24. Profile settings: Data collection

Data collection must be enabled to collect information. **Time without engine** means how often records should be made when engine is off. **Engine** drop box allow you to choose how device will pick up ignition (consider that 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 at our [FTP server](#).

GPS stationary navigation filtering eliminates GPS jumps when vehicle is not moving.

Coefficients are used to collect records in addition to engine on/off parameters. Record will be made when:

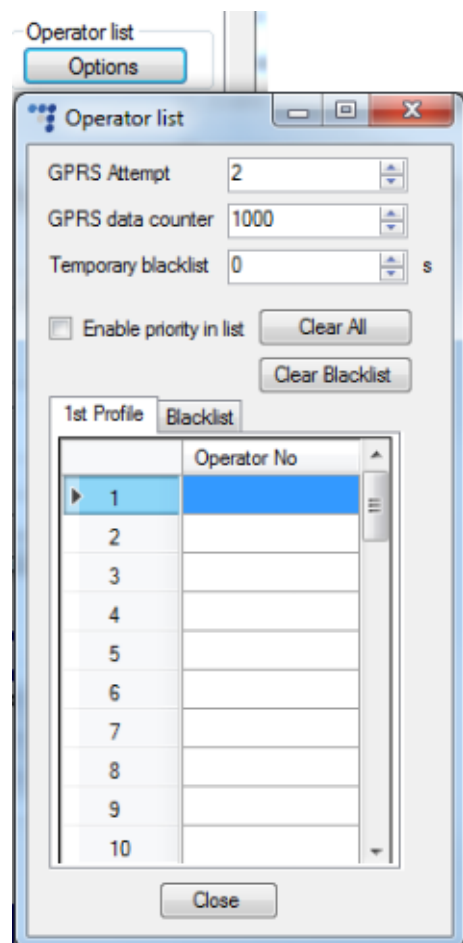
- **Distance** that is set is achieved
- **Time with engine** have passed
- **Radial** turn of degrees entered is detected.

These coefficients help to get route of vehicle more accurate.

NOTE

Keep in mind that FM Device is not designed to have a perfectly accurate time tracking function. Due to various reasons minimal deviations are possible. Over prolonged time periods these small deviations might add up and produce time tracking inaccuracies. Few examples:

- ❖ Device is configured to track one event for 1h. However actual event tracking might last for $1h \pm \text{Error}$ (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).



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 be 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 blacklist. 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.

5.3.3 IO SETTINGS

Next important section is IO events. Here you can enable or disable IO parameters that will be sent to server.

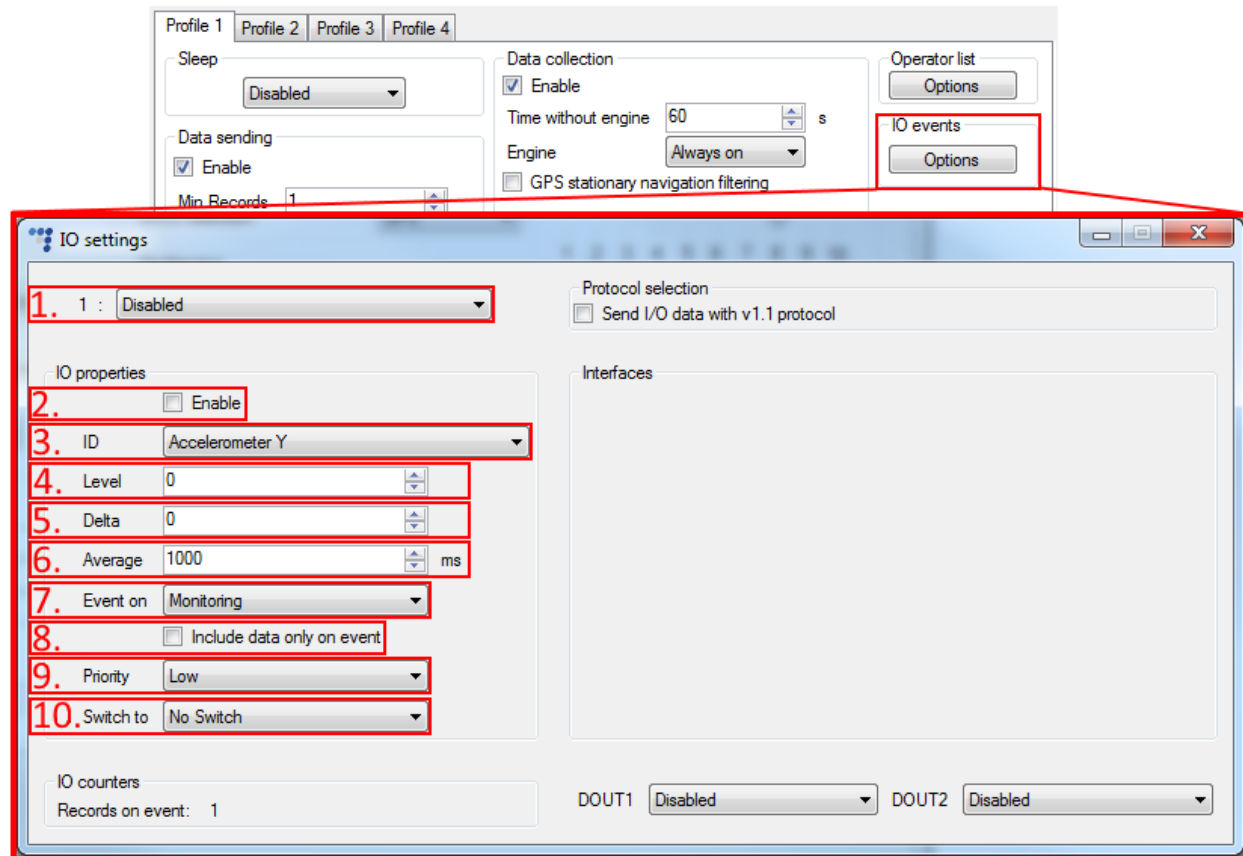


Figure 26. IO settings

1. You have 40 slots for parameters. Select slot you want to enable.
2. Enable this check box otherwise slot will remain empty
3. Parameter list. Choose parameter you want to enable for selected slot. One parameter can be enabled only one time.
4. Used with hysteresis mode, *see 7.c*
5. Used with hysteresis mode, *see 7.c*
6. Value averaging time. Some parameter's values change rapidly and do not correspond any valuable information. Averaging values for some period of time gives usable value of parameter (e.g. fuel level often oscillates. Averaging gives you value approximated value that correspond real fuel level in tank)
7. Event on describes how 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 parameter value only when condition (set in step 7) is met. In other cases parameter value will not be included in records
9. If priority is set to high, record will be sent immediately, disregarding data sending settings. If it is low, device will wait for suitable conditions to open link to server
10. Upon event of value change in some parameter you can configure device to **switch to** another profile

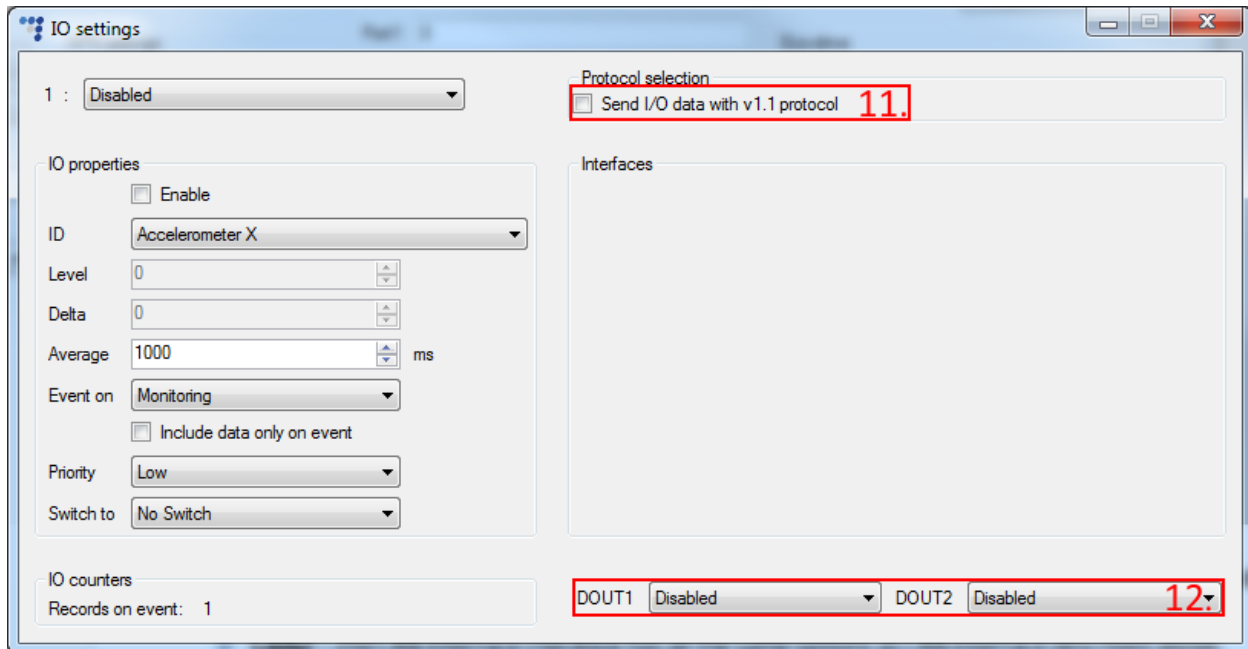


Figure 27. Protocol, DOUT1, DOUT2

11. **Protocol selection** section has a checkbox, where you can choose to “Send I/O data with v1.1 protocol”.

NOTE

Enabling this checkbox will result in the loss of all unsent records.

12. **DOUT1** and **DOUT2** – dropdown lists let you choose one of the following: “Disabled”, “LED”, “Buzzer”, “Blocking”, “GSM jamming block”.

More information available at our FTP server: [FTP link](#)

5.4 INTEGRATION PROTOCOL

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

6 INSTALLATION RECOMMENDATIONS

6.1 DEVICE INSTALLATION

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

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

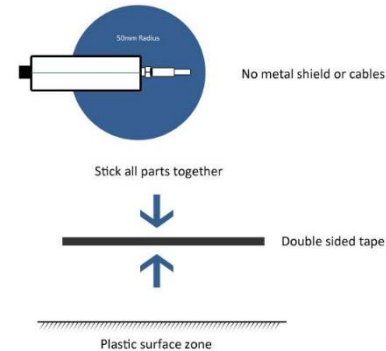


Figure 28. General requirements for device installation

6.2 ANTENNA INSTALLATION

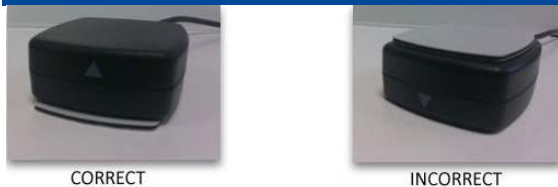


Figure 29. Correct antenna positioning

It is recommended to place GPS/GLONASS antenna behind the dashboard as close to the window as possible.

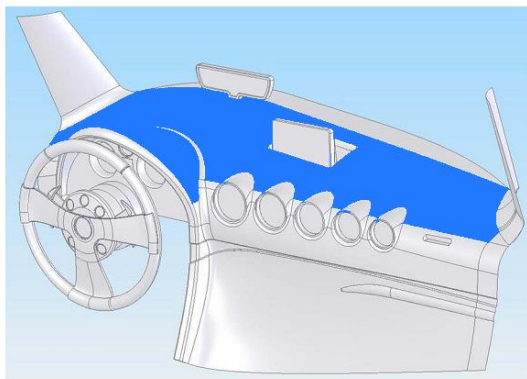


Figure 30. Recommended antenna location marked in blue

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