Ruptela

# ECO4\4+

# USER MANUAL

2014/06

VILNIUS

# TABLE OF CONTENTS

# 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 |

# 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



## 2.4 SAFETY


All the associated (additional) equipment as PC, batteries, sensors and others, 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 power supply source.


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


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


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


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

Be sure that the terminal is installed in a place where it will not be affected by harsh environment conditions for extended 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.

Use cables for configuration purchased from Ruptela. Ruptela is not responsible for any harm caused by using wrong cables for PC ↔ FM Terminal connection.

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

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

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 $mm^2$.

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:

- ECO 4/4+ Datasheet – Technical data of ECO 4/4+ 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 ECO 4/4+ 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: ftp://dev.ruptela.lt | Login: ftp<br>Password: ftp |

# 3 DEVICE DESCRIPTION

## 3.1 ABOUT

Ruptela's 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. ECO4/4+ new features compared to ECO3:

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

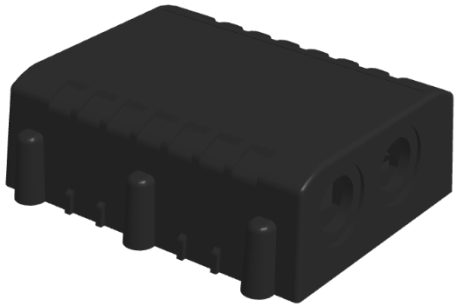


*Figure 1. ECO 4/4+ device*

## 3.2 PACKAGE CONTENTS

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:

- ECO4/4+ device
- 12 PINs cable (preinstalled)
- GPS/GLONASS all-in-one antenna (preinstalled)
- USB cable (as optional accessory)

*Figure 2. Box contents: 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 CONSUMPTION | ECO4 | ECO4+ |
|---|---|---|
| Deep sleep mode | 6 mA @ 12 V | 7 mA @ 12 V |
| Normal mode | Max. 100 mA @ 12 V | Max. 100 mA @ 12 V |
| Battery charging | × | Max. 200 mA @ 12 V |
| **Ambient temperature ratings, °C:** | | |
| Storage temperature | -40 - +65 | -40 - +65 |
| Operating temperature | -35 - +60 | -35 - +60 |
| Battery charging | × | 0 - +45 |
| Battery discharging | × | -20 - +60 |

### COMMON SPECIFICATIONS

| | |
|---|---|
| Power supply | 10-32 V DC |
| Absolute maximum ratings (on ECO4+) | 50 V @ 60 s |
| | 72 V @ 0.1 s |
| Internal power supply (ECO 4+ only) | 3.7 V, 190 mA |
| Digital input threshold | 4 V |
| Analogue input resolution | 12 bit |
| GPS/GLONASS module | 56 channel |
| Sensitivity | -161 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

## 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 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 (login: ftp; Password: ftp).

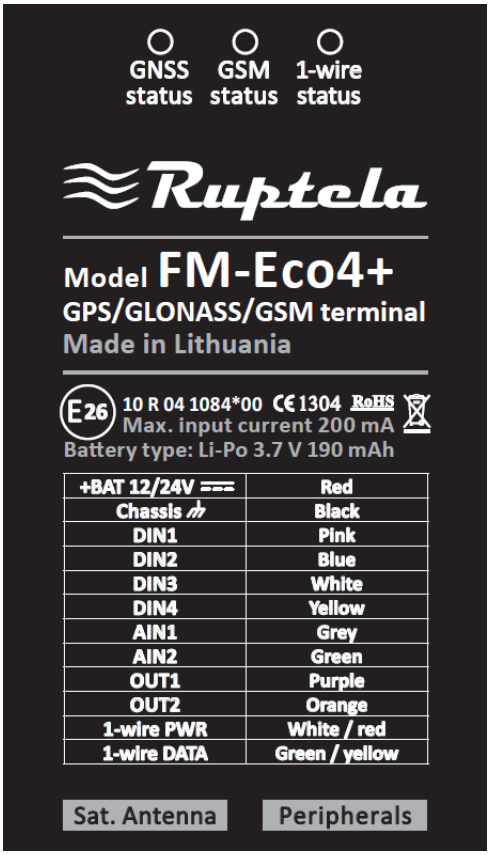



*Figure 3. ECO 4+ label*

## 3.7 CERTIFICATION

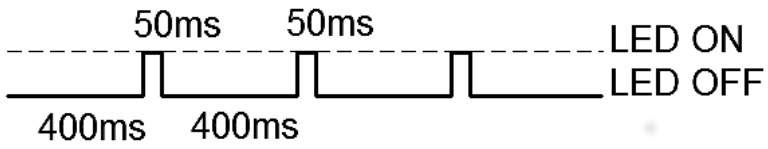
ECO4/4+ devices have passed quality tests and comply with following certifications:

- E-Mark
- CE ready
- RoHS

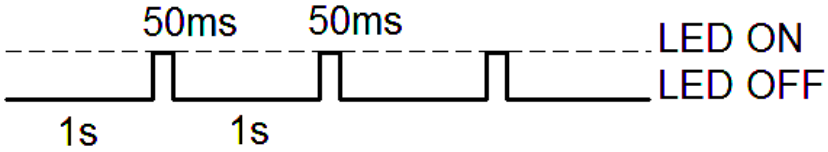
## 3.8 LED STATUS

### 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:

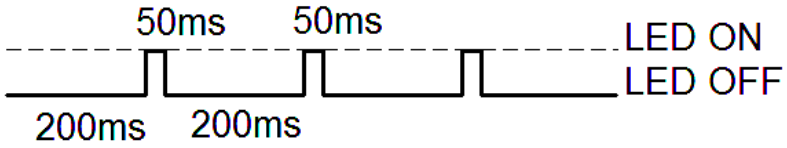



When accurate GPS/GLONASS signal is received, the GPS LED is blinking as follows:

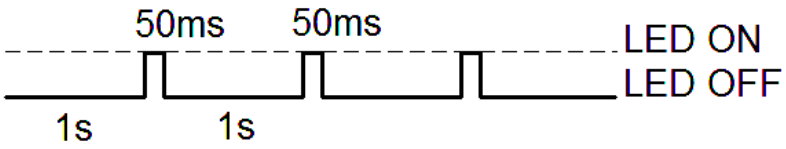



### 3.8.2 GSM LED

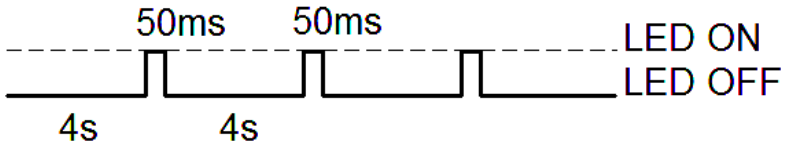
When GSM signal is not received, GSM LED is blinking as follows:



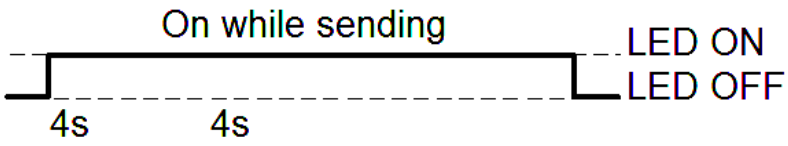

When device has a good GSM signal, but no GPRS, LED is blinking as follows:




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

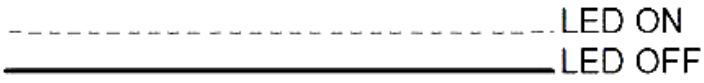



When the ECO4/4+ terminal has GSM signal and it is sending data via GPRS, LED is blinking:

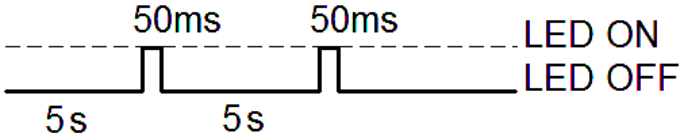



### 3.8.3 1-WIRE LED

To the 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.

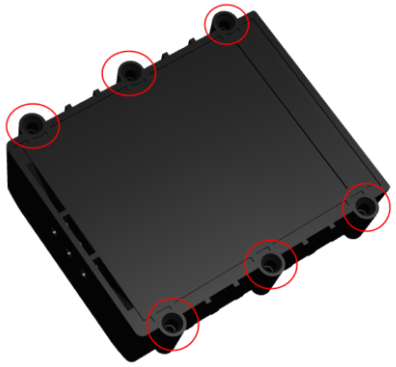


*Figure 4. Unscrew bolts marked with red circles*

## 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.

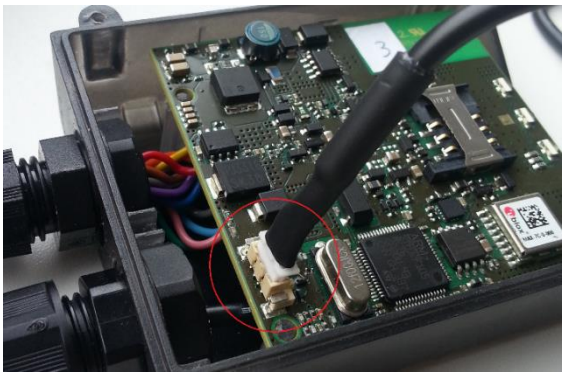


*Figure 5. USB cable connection location on PCB*

## 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*

## 4.4 IO CABLE

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

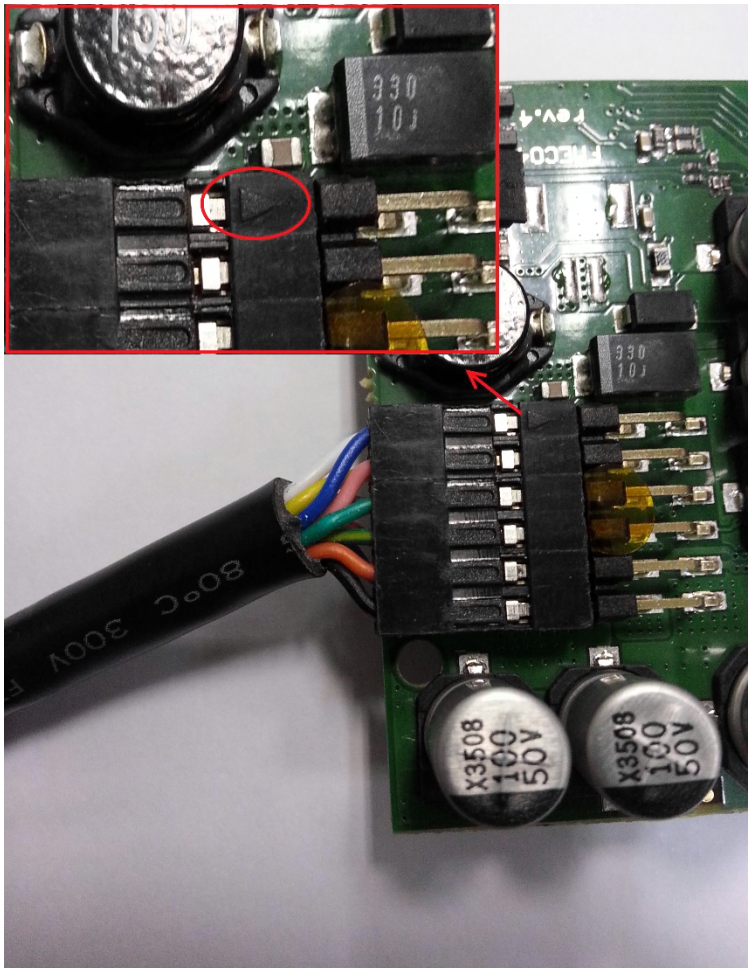



*Figure 7. IO cable correct connection*

# 5 DEVICE CONFIGURATION

## 5.1 DRIVER INSTALLATION

In order PC can recognize device, drivers must be installed first. You can download newest drivers from ST web page (VCOM drivers).

Please note that drivers must be installed on Windows XP/vista/7/8 system.

1. Run Driver installation file according to your system - x86 (32 bit) or x64 (64 bit)
2. When installation wizard loads up click **Next**
3. When next window pops up, click **Next** again
4. After installation you will see confirmation that everything is OK, click **Finnish**

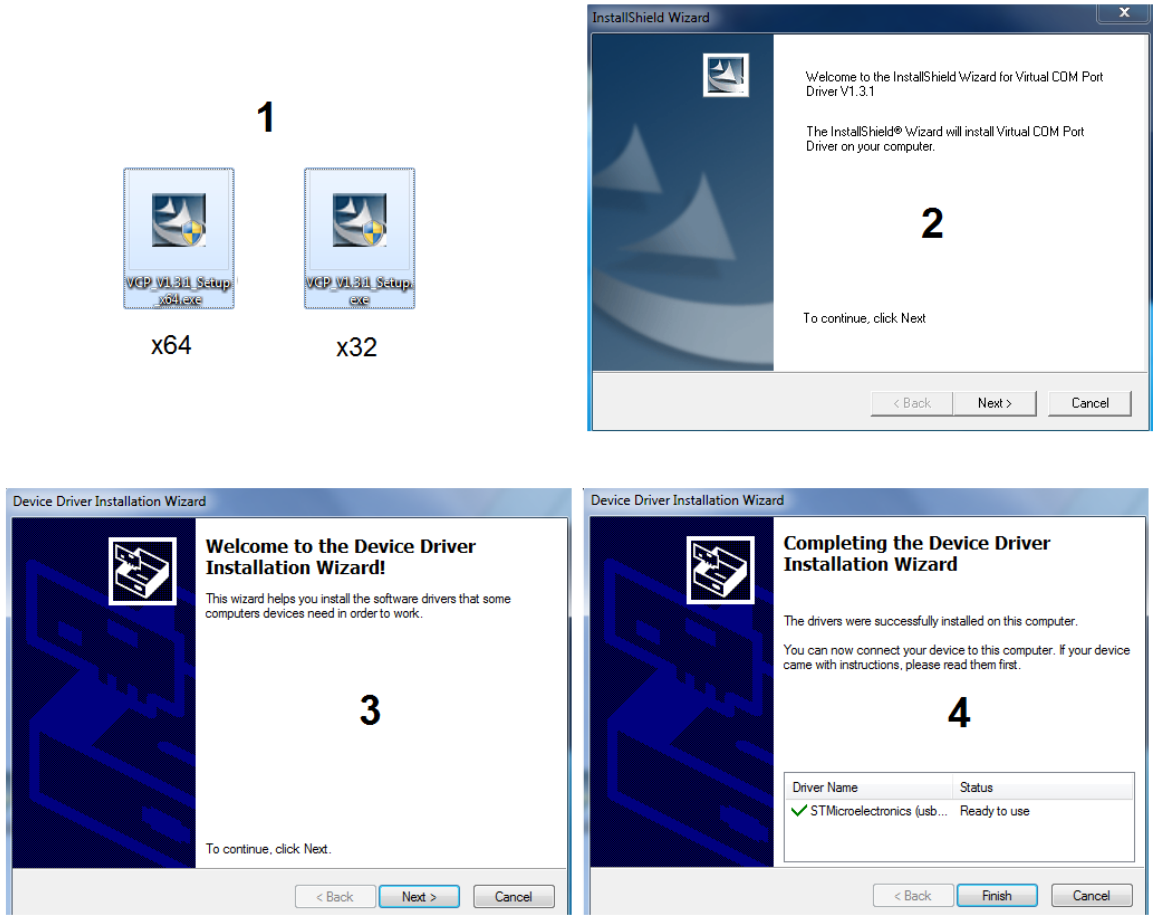



*Figure 8. USB driver installation steps*

## 5.2 SAMPLE CONFIGURATION

Please log in to our FTP server and download sample configuration and newest configurator (Login: ftp; Password: ftp). 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. Click **Open**

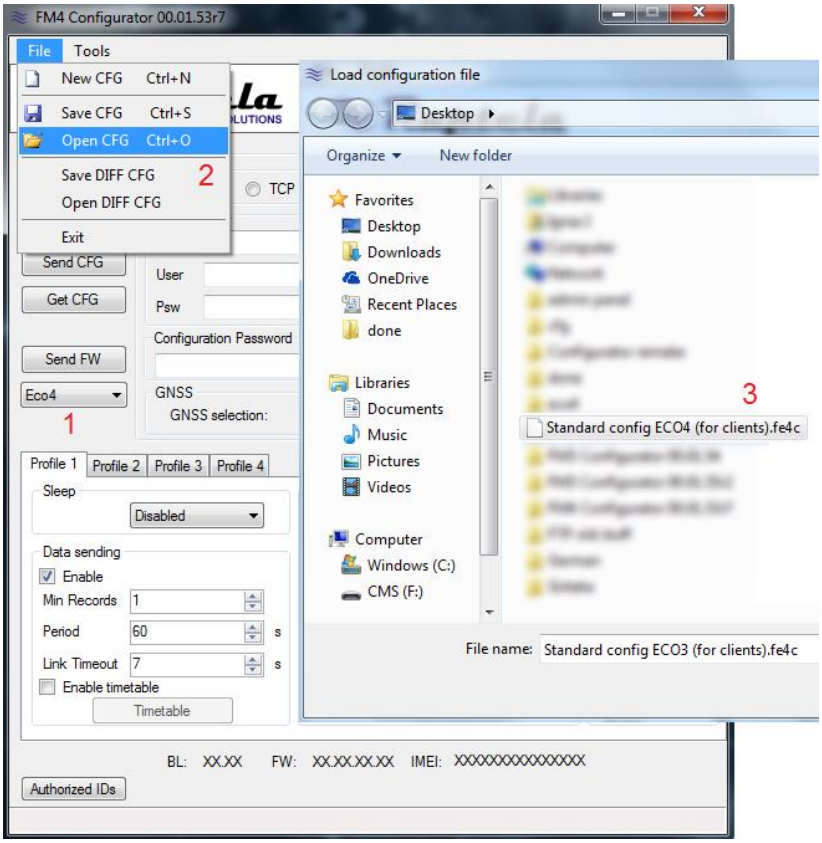



*Figure 9. Configuration steps*

Sample parameters will be loaded. However you need to enter some parameters by your own.

1. Enter IP (in 256.256.256.256 format) and PORT to which device should send data.
2. Enter APN settings: APN name, User login and Password (if login and password needed)
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

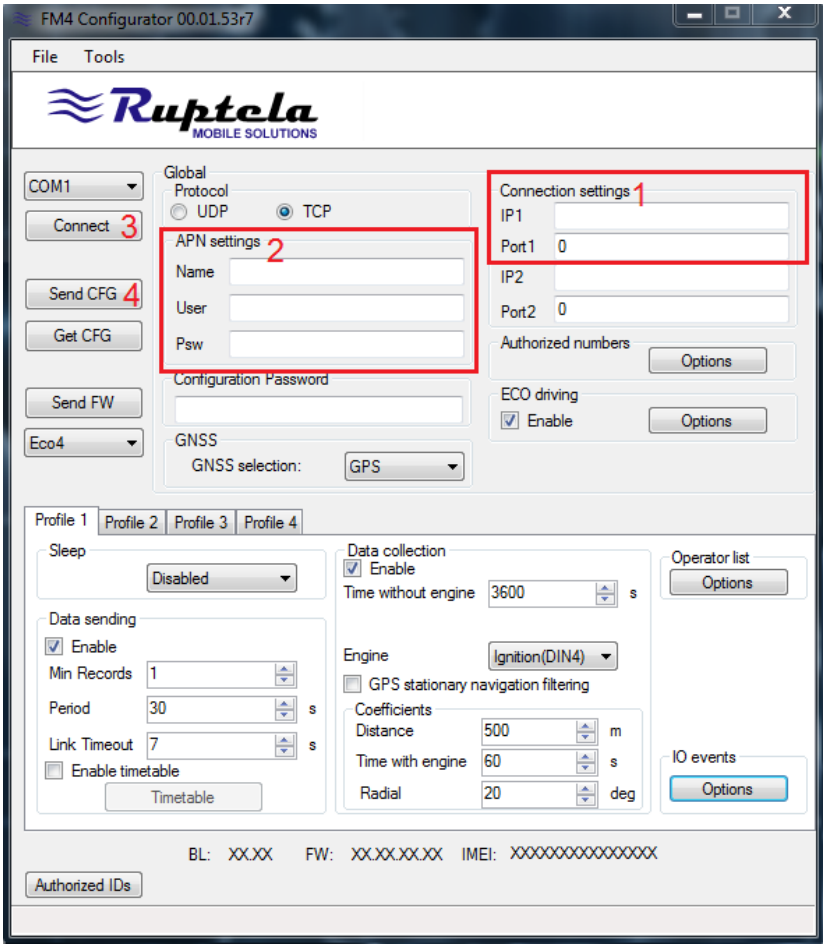



*Figure 10. Required connection settings*

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.

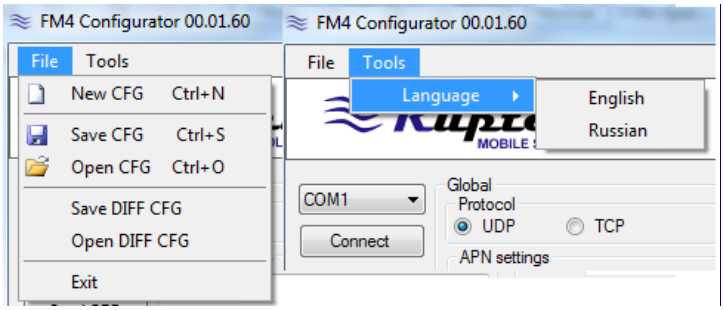



*Figure 11. Menu bar*

**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.

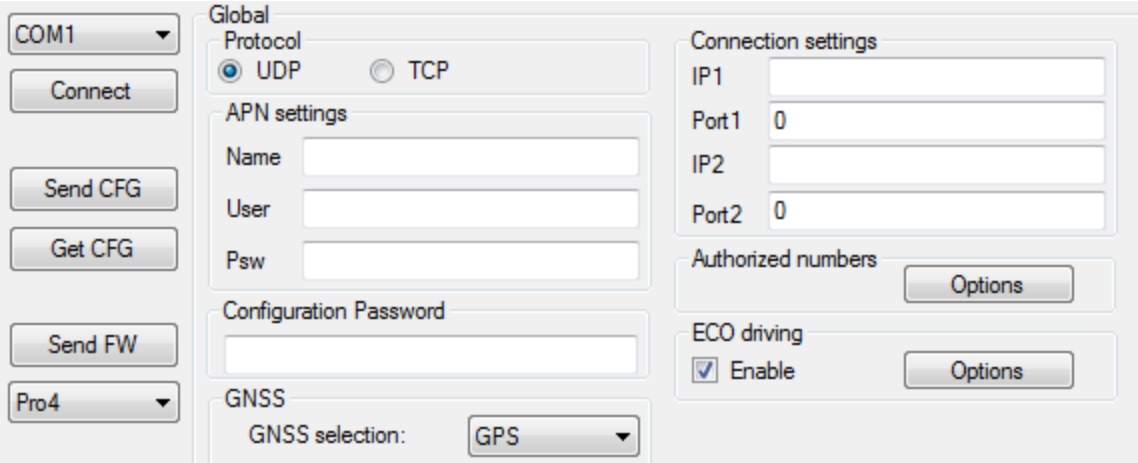



*Figure 12. Global section*

First part of configuration tool is global settings. Global include connection settings and other settings independent from profile settings – global settings are same for all profiles.
Control panel on left side allow you to choose and control device.
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.

Global settings contain connection information.

**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.

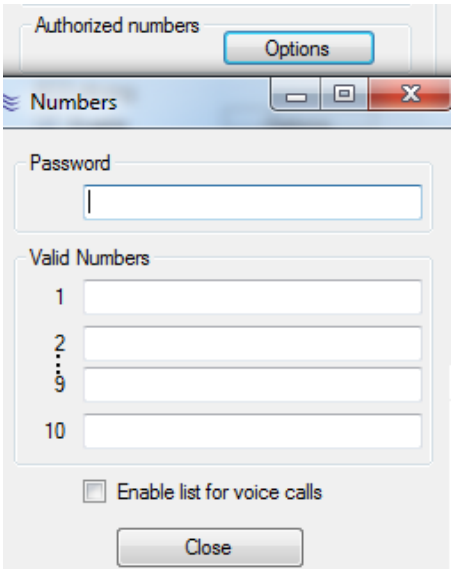
**Configuration password** allow to lock configuration – without password no one can change device configuration via cable. However, over-the-air update ignores configuration password.

**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 device should connect to. IP must be entered in format 255.255.255.255, domain names are not supported.

## 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.




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

*Figure 13. Authorized number list*

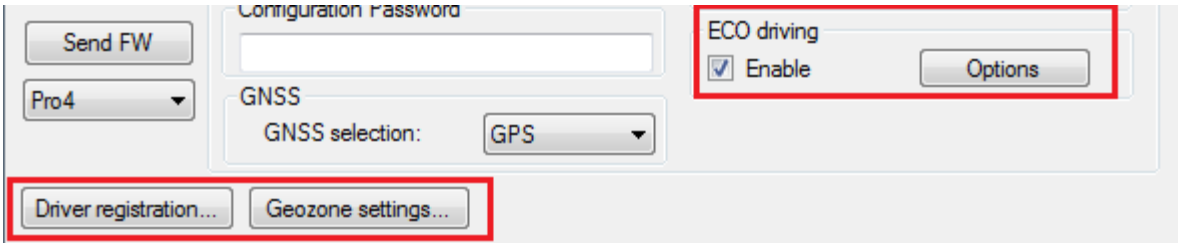



*Figure 14. Driver registration, Geozone settings and ECO driving*

Following features need extensive configuration and functionalities descriptions are available.

**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.

**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.

**Geozone settings…** allow to use internal geozones, configured directly into device. Full description can be found at our FTP, Internal geozones.

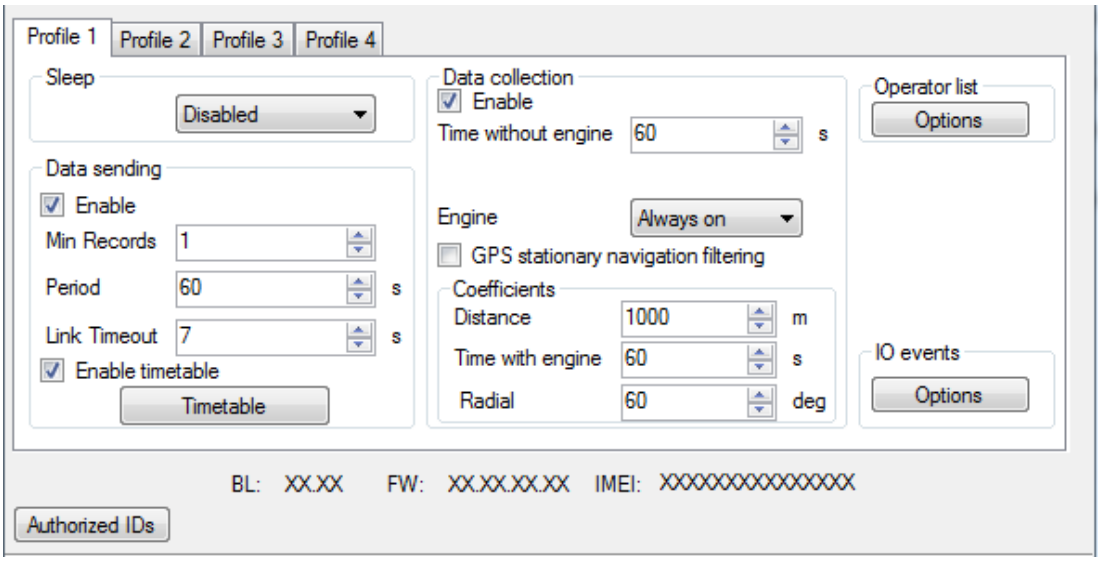



*Figure 15. Profile settings: Data collection and sending, Operator list, IO events*

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

**Sleep** can be disabled or set to sleep or deep sleep. Sleep extend internal battery life by turning off GPS/GSM modems. Deep sleep disabled everything except DINs.

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.

**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
- DIN4(ignition) – Digital input 4 is default DIN used for ignition pick up.
- MovSensor – Detect moving of vehicle and consider engine to be on.

**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.

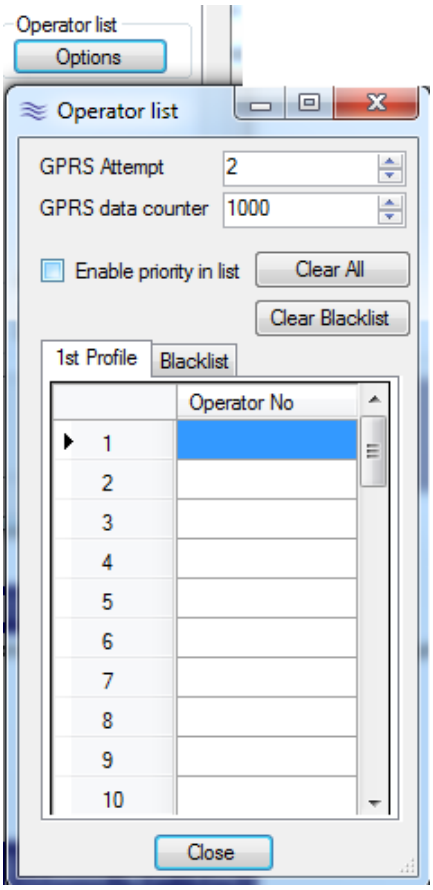



*Figure 16. Operator list*

Operator list allow selection of operators used in current profile. If operator that is in list is not found device will search for other operator in list. If no operators were found, device will switch to next profile. **Blacklist** has opposite meaning for operator list. Operators that are in blacklist will not joined.

> 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.

**Enable priority in list** search for operators according to number in list. If it is not selected, device will search for operator randomly.

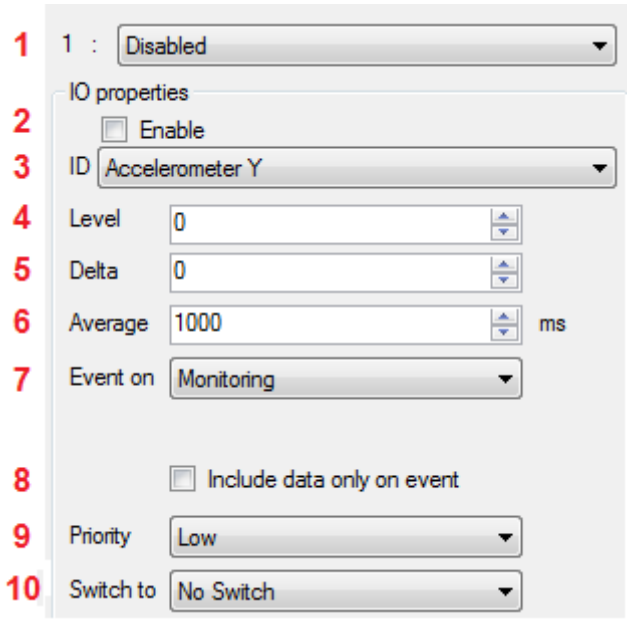



*Figure 17. IO parameter configuration*

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

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
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 Battery 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

Installation instructions for different vehicles can be acquired from Technical support team: support@ruptela.com

## 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!

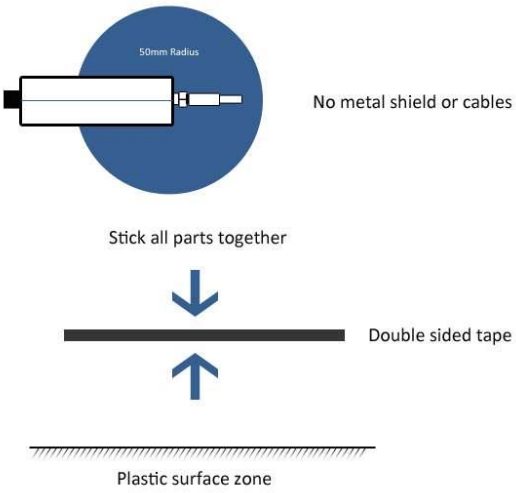



*Figure 18. General requirements for device installation*

## 6.2 ANTENNA INSTALLATION


*Figure 19. Correct antenna positioning*

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

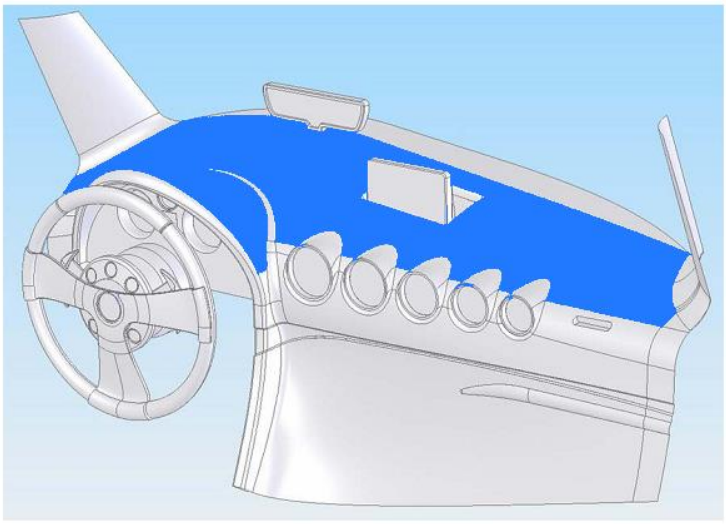


*Figure 20. Recommended antenna location marked in blue*



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