Ruptela
Transport Telematics

FM-Tco4 LCV
User Manual

2015/09
VILNIUS

Table of contents

1 Preface....2
1.1 Use of this document....2
1.2 Document change log....2
2 Introduction....3
2.1 Purpose....3
2.2 Acronyms....3
2.3 Legal Information....3
2.4 Safety....4
2.5 References....5
3 Device description....6
3.1 About....6
3.2 Package contents....6
3.3 Physical characteristics....7
3.4 Technical characteristics....7
3.5 IO pin out....8
3.6 Interfaces and peripheral accessories....9
3.7 Certification....10
3.8 LED status....10
3.8.1 GNSS LED....10
3.8.2 GSM LED....11
3.8.3 Peripheral LED....11
4 Device configuration....13
4.1 Driver installation....13
4.2 Sample configuration....15
4.3 Advanced configuration....17
4.3.1 Global settings....18
4.3.2 Profile settings....23
4.3.3 IO settings....28
4.4 Integration protocol....34
5 Installation recommendations....35
5.1 Device installation....35
5.2 Antenna installation....35

1 Preface

1.1 Use of this document

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

The following markings are used to highlight important information:

- Notes contain important information that you need to pay attention to.

  Note

  Notes like this contain important information!
- Actions and various elements of the software required for configuration of the device are marked in **bold**.
- All actions are described in sequence in the following five sections: Introduction, Device description, Device preparation, Device configuration and Installation recommendations.

1.2 Document change log

Date	Version	Change details
2015-09-03	v1.0	Initial draft
2015-10-28	v1.1	GPS/GLONASS module
2016-01-20	v1.2	SIM lock, SIM card status, Towing detection, Send data without GPS fix, Custom ignition, Dual LCV CAN
2016-02-18	v1.3	2G, 3G support
2016-04-08	v1.4	2nd level temporary black list, Smart LCV Selection changes

2 Introduction

2.1 Purpose

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

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;
GNSS – 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;
2G – second generation of mobile telecommunications technology;
3G – third generation of mobile telecommunications technology;
UMTS – Universal Mobile Telecommunications System;

2.3 Legal Information

Copyright © 2015 Ruptela. All rights reserved. Reproduction, transfer, distribution or storage of parts or all of the contents in this document in any form without the prior written permission of Ruptela is prohibited. Other products and company names mentioned in this document are trademarks or trade names of their respective owners.

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 power supply source.


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


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


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


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


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


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


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 PINs plug from the device or disconnect the wires from the vehicle's power supply.


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

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

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

Before connecting wires of the 12 PIN cable to the vehicle, it is recommended to ensure that the cross-sectional area of wires mounting is at least 0.75 mm^2.

To correctly dismount the terminal from the vehicle, first of all disconnect power supply wires (12 PIN connector). Only then other plugs or interfaces can be disconnected.

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

2.5 References

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

- FM-Tco4 LCV Datasheet – Contains technical data of the FM-Tco4 LCV device. Can be acquired from support@ruptela.com
- Quick start guide – A quick guide for a better understanding of the device configuration process and functions.
- Peripheral accessories – Instructions on how to use peripheral accessories together with the FM-Tco4 LCV light 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.lt

3 Device description

3.1 About



Ruptela's FM-Tco4 LCV is 4th generation, low power consumption tracking device. It acquires it's position by a GPS/GLONASS signal and transfers data to a server via a GPRS cellular network. FM-Tco4 LCV support basic functionalities together with full LCV support. Main features:

- LCV support
- OBD K-line, L-line
- Eco-Dive (from ACC, CAN, OBD, GPS)
- USB power supply for configuration
- 2 x RS232 and 1 x RS485 ports work at the same time
- Dual CAN support

3.2 Package contents

FM-Tco4 LCV device is supplied in cardboard package. GPS/GLONASS antenna and IO cables are disconnected from device. Package contents:

- FM-Tco4 LCV device
- 12 PINs and 14 PINs cables
- GPS/GLONASS all-in-one antenna



Note

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

3.3 Physical characteristics

Properties

Enclosure dimensions	111 x 75 x 25 mm
Indication	3 LEDs: Sat. status, GSM status, Periph. status
Housing	Plastic
External elements	GPS/GLONASS all-in-one antenna
Configuration interface	USB
Connectors	12 & 14 PINs

3.4 Technical characteristics

Power consumption

Deep sleep mode	16 mA* @ 12 V
Normal mode	Max. 100 mA @ 12 V
Battery charging	Max. 250 mA @ 12 V
Ambient temperature ratings, °C:	
Storage temperature	-40 - +65
Operating temperature	-35 - +55
Battery charging	-20 - +45
Battery discharging	-20 - +60

**Firmware dependent; does not apply when Eco-Drive panel is connected.*

Electrical and internal elements

Power supply	10-32 V DC
Absolute maximum ratings	50 V @ 60 s 72 V @ 0.1 s
Internal power supply	Li-Po 3.7 V, 1050 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

3.5 IO pin out

12 PIN connector

Pin nr	Pin	Wire color	Description
1	10-32 V	Red	Power supply 12/24 V (range: 10-32 V)
2	Chassis	Black	Ground connection
3	DIN1	Pink	Digital input, threshold 4 V
4	AIN1	Gray	Analogue input (range: 0-30 V)
5	DIN2	Blue	Digital input, threshold 4 V
6	AIN2	Green	Analogue input (range: 0-30 V)
7	DIN3	White	Digital input, threshold 4 V
8	DOUT1	Purple	Digital output open collector up to 32 V, 1 A
9	DIN4	Yellow	Digital input, threshold 4 V
10	DOUT2	Orange	Digital output open collector up to 32 V, 1 A
11	CAN2 L	Blue/red	J1939 CAN interface low connection
12	CAN2 H	White/red	J1939 CAN interface high connection

14 PIN connector

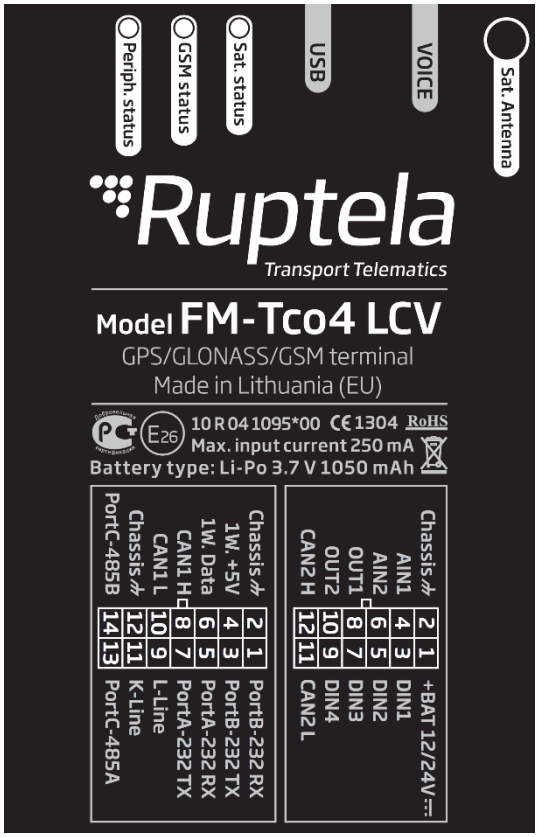
Pin nr	Pin	Wire color	Description
1	PortB-232 RX	Yellow	RS 232 port B receive signal
2	Chassis	Black	Ground connection
3	PortB-232 TX	Orange	RS 232 port B transit signal
4	1W. +5V	Red	1-wire power supply +5 V, 200 mA
5	PortA-232 RX	Purple	RS 232 port A receive signal
6	1W. Data	Green/yellow	1-wire data channel
7	PortA-232 TX	Pink	RS 232 port A transit signal
8	CAN1 H	White	J1939 CAN interface high connection
9	L-Line	Green	J1939 CAN interface L line channel, diagnostics
10	CAN1 L	Blue	J1939 CAN interface low connection
11	K-Line	Brown	J1939 CAN interface K line channel, diagnostics
12	Chassis	Black	Ground connection
13	PortC-485 A -	White/red	RS 485 differential signaling line A (-)
14	PortC-485 B +	Yellow/brown	RS 485 differential signaling line B (+)

Note

Both CAN lines work at the same time. CAN1 is in 14 pin connector and CAN2 is in 12 pin connector. Connect your hardware to one of the interfaces and configure it accordingly.

3.6 Interfaces and peripheral accessories

There are several peripheral accessories that can be connected to the FM-Tco4 LCV device. With peripherals you can get even more features and extended functionality. All available peripherals can be purchased from Ruptela. Please contact your manager for more details.



Note

Maximum 1-Wire interface power output is 200 mA @ 5 V.

FM-Tco4 LCV device support RS232, RS485, 1-wire and CAN interfaces. List of available peripherals devices that can be used with FM-Tco4 LCV:

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 (including ignition block upon GSM jamming detection)

Available on AINs:

- 2 × Analogue fuel sensors

Available on RS232 ports A and/or B:

- 2 x LLS digital fuel sensors
- 1 x Garmin (Send and receive SMS, routes to/from navigation system. Only on port B)
- 2 x RFID readers
- 1 x TCO driver card reader
- Alcohol sensor
- Transparent channel

Available on RS485 port C:

- Up to 10 LLS fuel sensors
- Transparent channel

Available on CAN interface:

- LCV CAN (light & commercial vehicles)
- OBD parameters and diagnostic trouble codes (DTC) reading (depends on vehicle)
- MobilEye

K-line interface:

- OBD parameters and diagnostic trouble codes (DTC) and reading (depends on vehicle)

You can find peripheral accessories installation instructions and documentation at our FTP server .

3.7 Certification

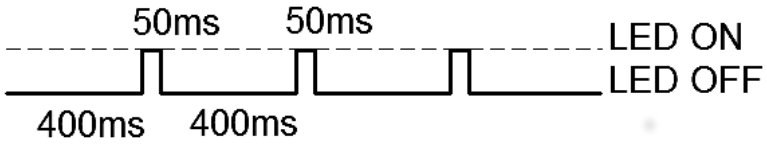
FM-Tco4 LCV devices have passed quality tests and comply with following certifications:

- E-Mark (E26 10 R 04 1095*00)
- CE (CE 1304)
- RoHS

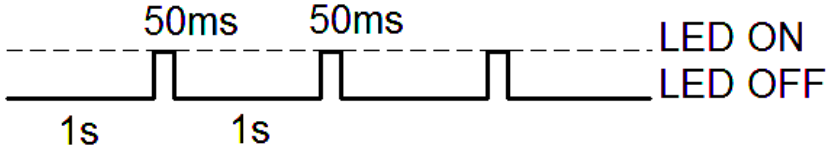
3.8 LED status

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:

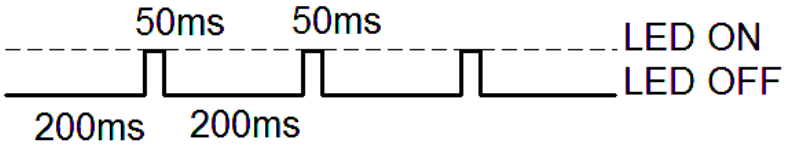


When accurate GPS/GLONASS signal is received, the GPS LED is blinking as follows:

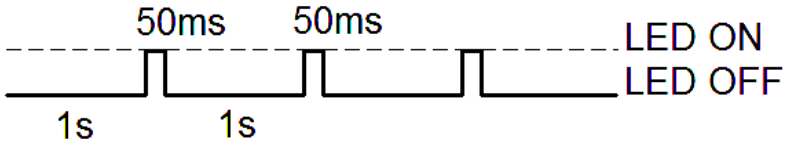


3.8.2 GSM LED

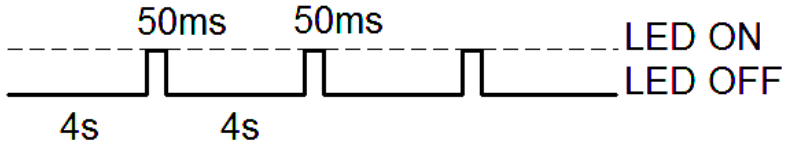
When GSM signal is not received, GSM LED is blinking as follows:



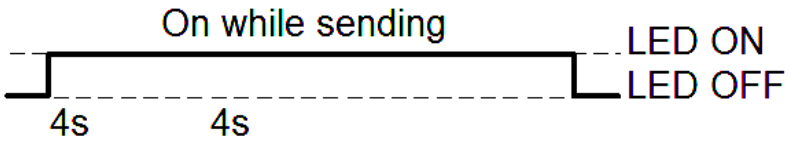
When device has a good GSM signal, but no GPRS, LED is blinking as follows:



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

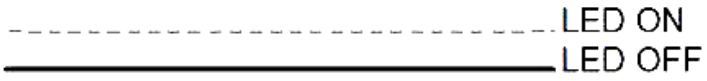


When the FM-Tco4 LCV terminal has GSM signal and it is sending data via GPRS, LED is blinking:

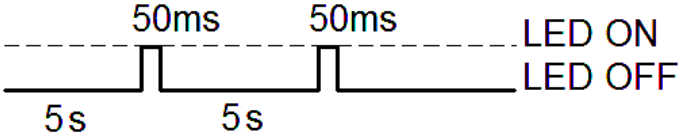


3.8.3 Peripheral LED

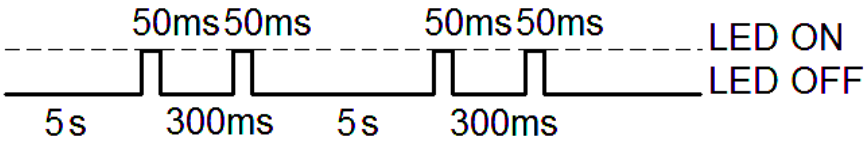
The FM-Tco4 LCV terminal can have up to 3 peripheral devices attached to it (e.g. CAN, LLS, 1-wire). So there are 4 different types of LED states possible. When there is no peripheral attached, LED will not blink at all:



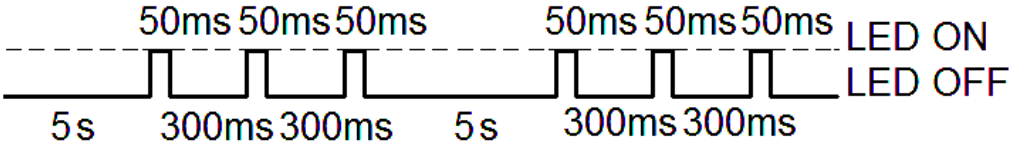
When there is 1 peripheral interface connected, the peripheral LED is blinking:



When there are 2 peripheral interfaces connected, the peripheral LED is blinking:



When there are 3 peripheral interfaces connected, the peripheral LED is blinking:

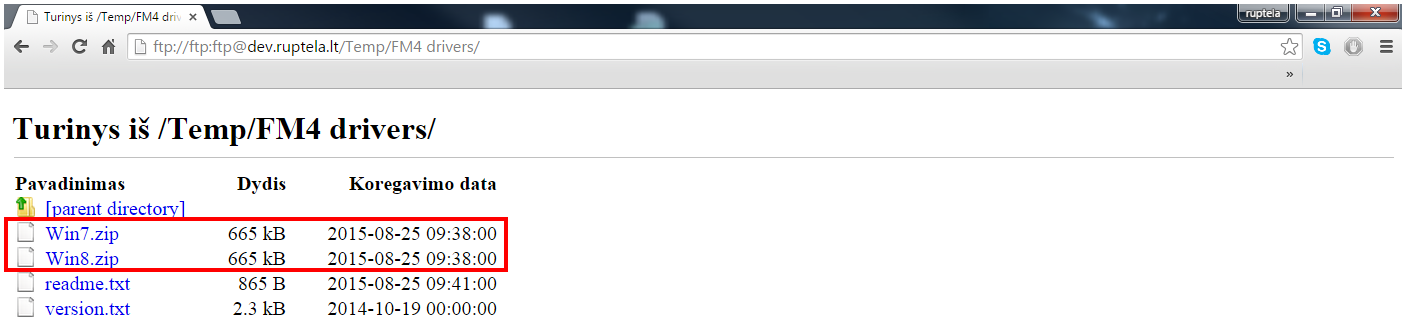


4 Device configuration

4.1 Driver installation

Virtual COM port driver installation is mandatory, only then your PC will recognize the FM-Tco4 LCV device that was connected to the USB port. You can download newest drivers from our FTP server (VCOM drivers).

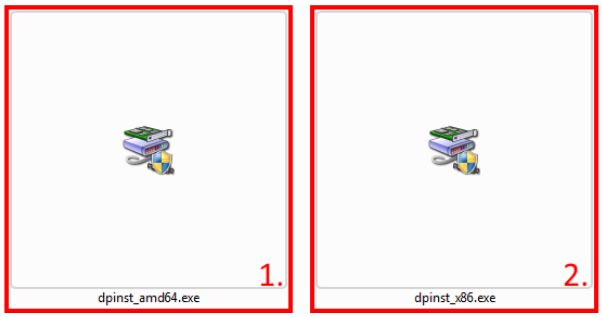
Choose correct archive file with drivers for your OS version and download it to your PC.

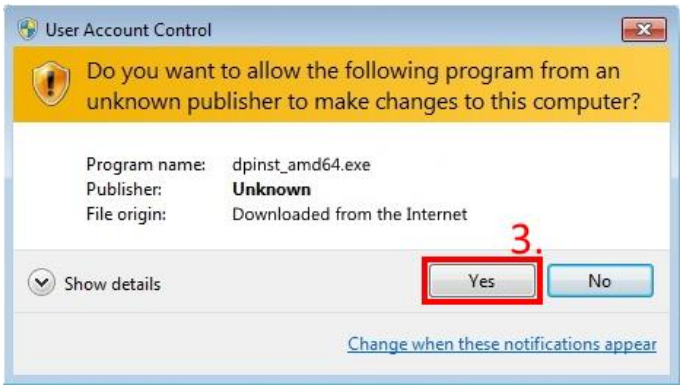


Installation procedure:

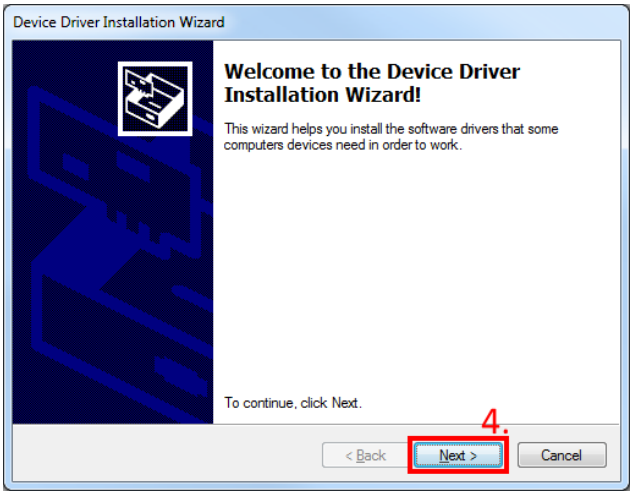
- Uninstall previous Virtual COM port driver versions (Start-> Settings-> Control Panel-> Add or remove programs).
- Extract archive file "Win7.zip" or "Win8.zip" to a desired location on your PC.
  - If you are running a 32-bits OS version, launch the "dpinst_x86.exe" [1.]
  - If you are running a 64-bits OS version, launch the "dpinst_amd64.exe" [2.]

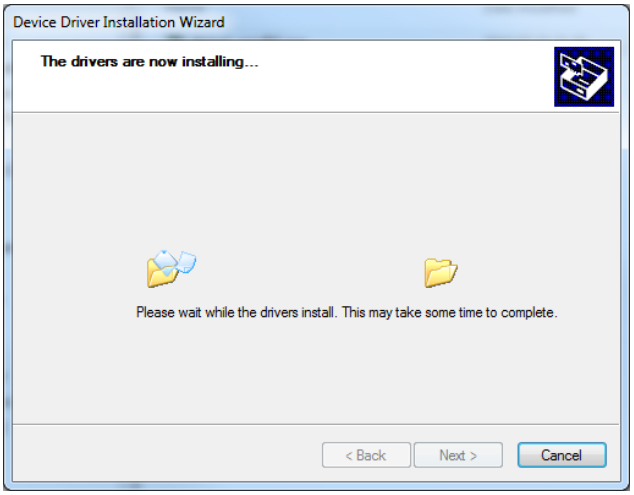
Windows 7 Users might get a Security Warning message. Click "Yes" [3.].



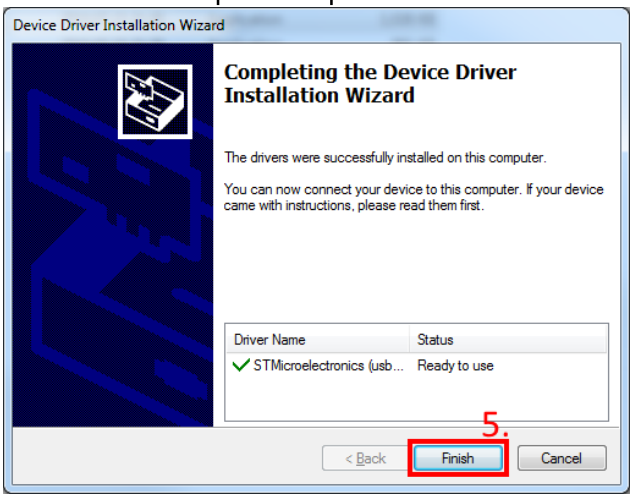


In the next window select "Next" [4.].





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



Driver is now installed and ready to use.

4.2 Sample configuration

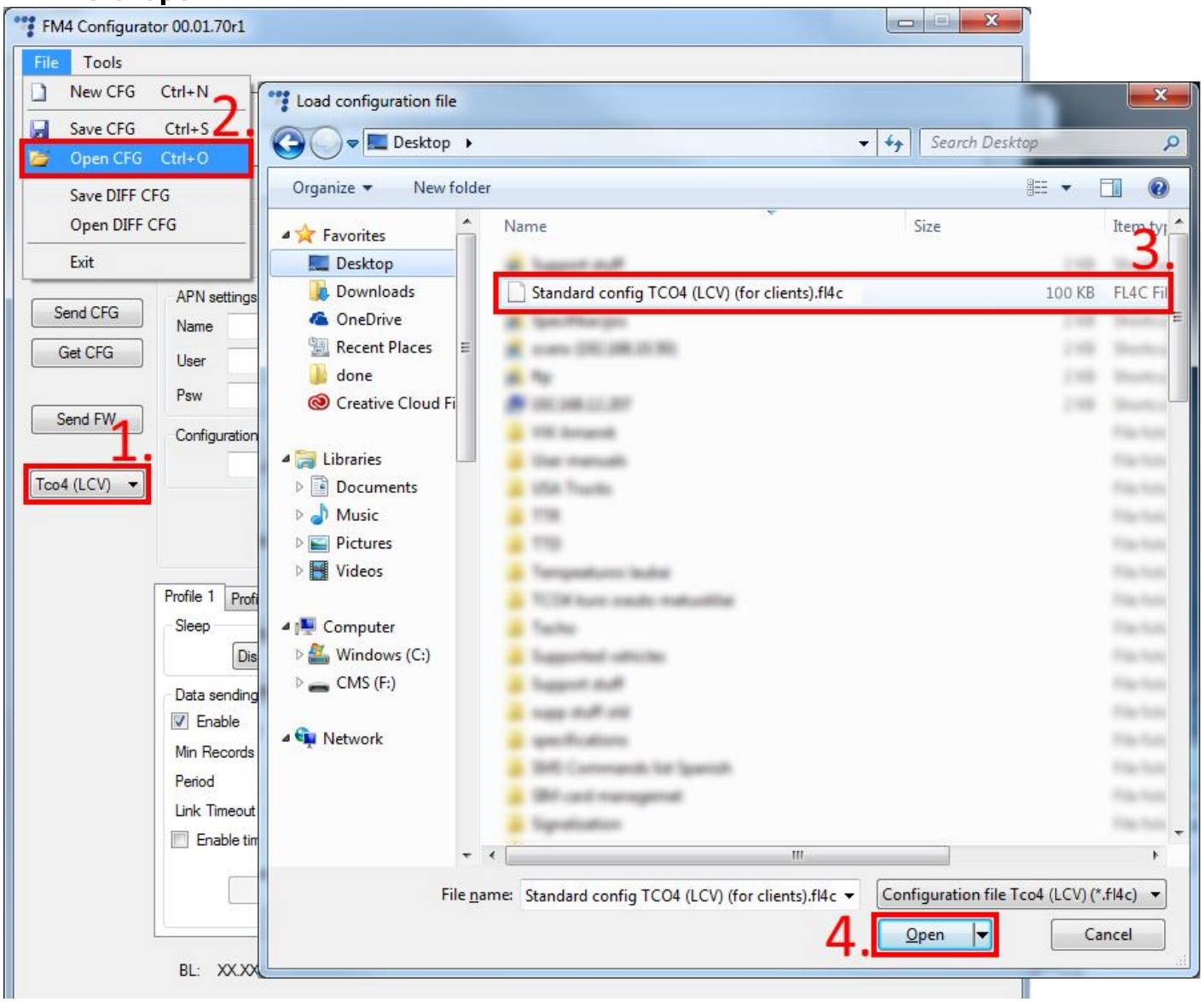
Please log in to our FTP server and download sample configuration and the latest configurator. Also you will need the latest version of Microsoft Framework.

Operating system requirements:

- MS Windows XP/Vista/7/8

Start the VCP.exe from configurator folder.

1. Select Tco4 LCV.
2. Click **File → Open CFG.**
3. In dialog window, browse the sample configuration file you downloaded from the FTP.
4. Click **Open.**

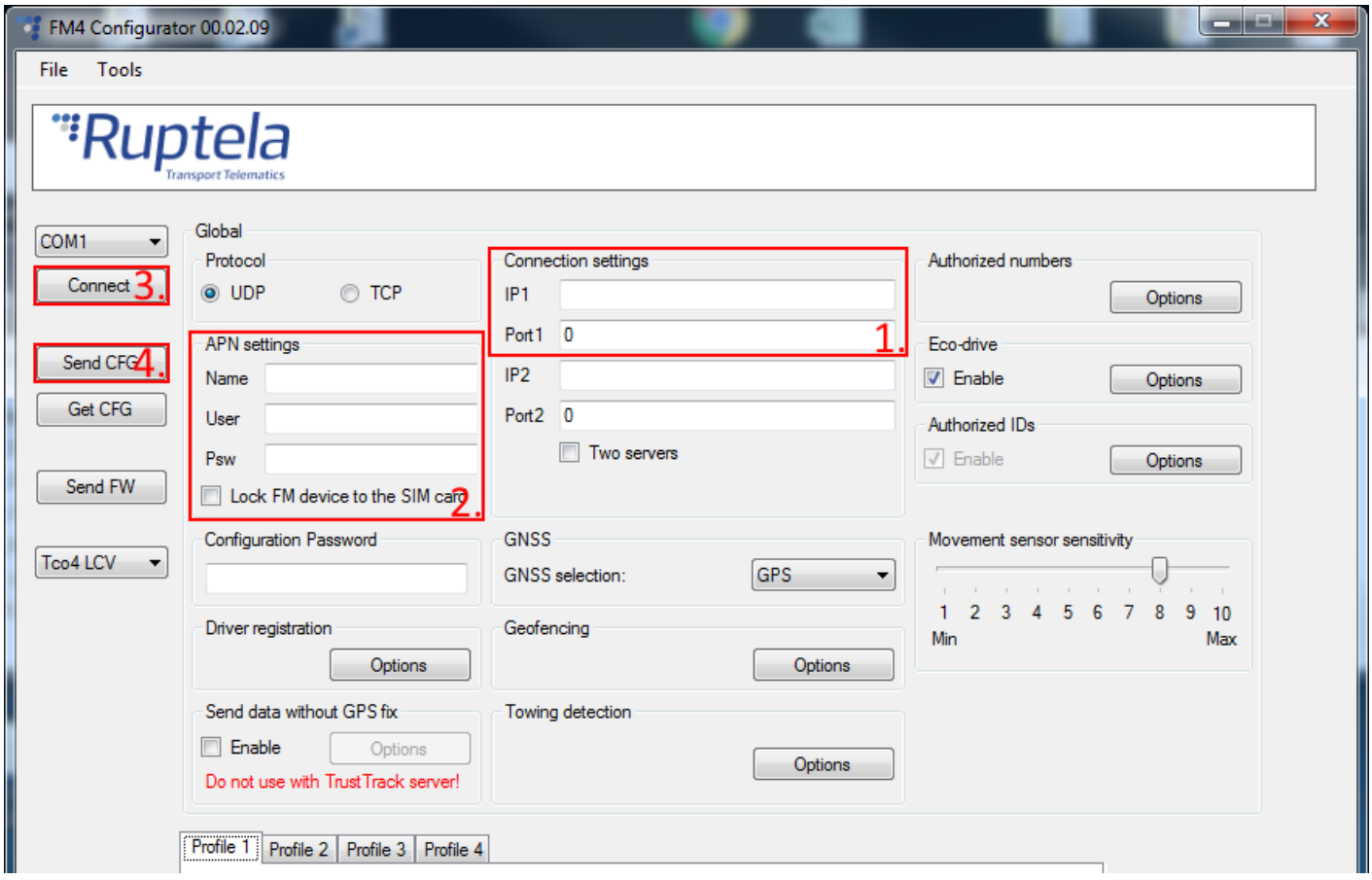


Sample parameters will be loaded. However you will need to enter other parameters on your own.

1. Enter IP (in the 255.255.255.255 format) or a Domain Name (not exceeding 40 characters) and PORT to which the device should send data.
2. Enter APN settings: APN name, User login and Password (if login and password is needed). If you choose to enable **Lock FM device to the SIM card** check-box you will be required to enter SIM card's PIN code every time you try to connect to the device via USB cable. As long as it is checked you will not be able to use different SIM cards with this device.
3. Select a COM port you connected the device to and click "Connect". At this point the configuration is ready to be send to the device, so the device must be connected to the computer.
4. Click "Send CFG" button. The configuration will be uploaded to the device.

Note

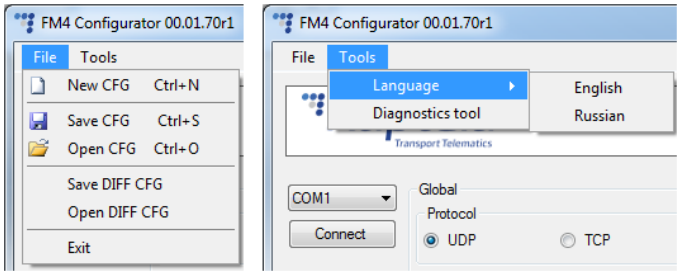
APN name, login and password should be provided by your mobile network operator



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

4.3 Advanced configuration

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



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

The "Tools" menu contains language selection options: English or Russian are available.

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

Attention

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



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

Select the "COM" port that the device is connected to and hit "Connect".

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

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

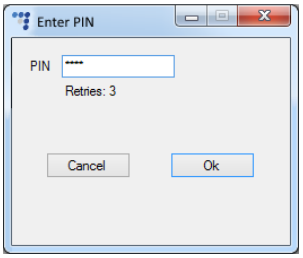
In the drop box below you can select a type of the device. If you connected one to your PC, it will be displayed. Now Tco4 LCV name should be displayed.

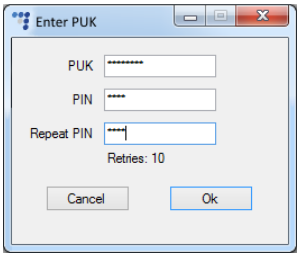
4.3.1 Global settings

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

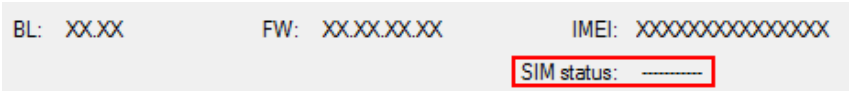
1. **Protocol** sections allows you to choose from two protocols. **UDP** protocol is less reliable than the **TCP,** but also uses less traffic. TCP uses more internet traffic, but it is more reliable. Choose one according to your needs.
2. **APN settings** are needed for internet connection. These settings must be provided by your mobile network provider. Without APN settings the device will not send any data.
   - If you choose to enable **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.





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

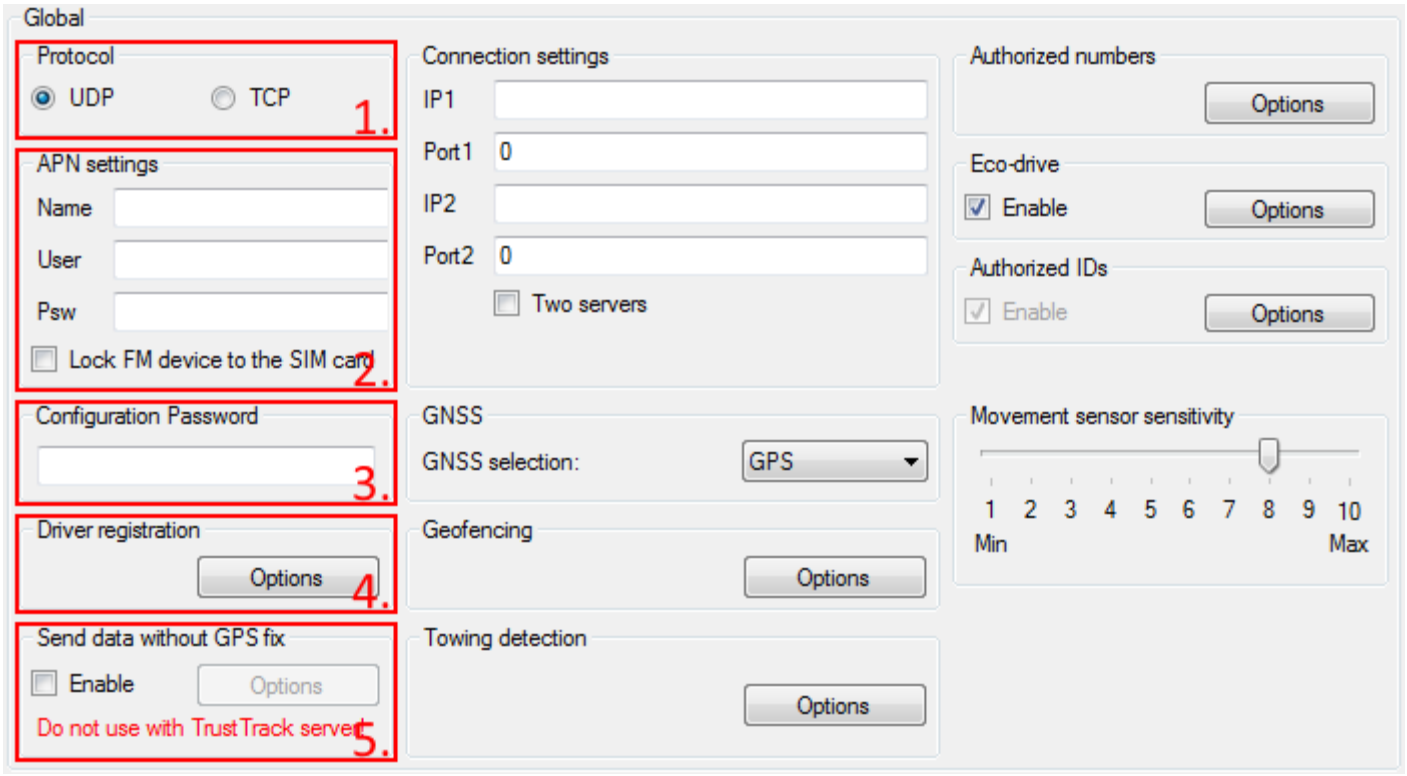


Total of seven different statuses are available:

I. Ready – PIN code is known or PIN code check is disabled. GSM/GPRS modem can operate normally.
II. Error – Represents a wide range of possible problems. Common reason would be old FW version, which does not support SIM commands.
III. Unknown – Communication between device and GSM/GPRS modem failed, SIM status is unknown.
IV. PIN Request – SIM card requests a PIN code, FM device cannot provide it (code provided by the device is incorrect).
V. PUK Request - SIM card requests a PUK code.

VI. Locked – This FM device is attached to a different SIM card.
VII. Not inserted – SIM card is not inserted.

3. **Configuration password** allows to lock the configuration – without the password no one can change the device configuration via cable. However, over-the-air update ignores the configuration password.
4. **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.
5. **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.



6. 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 the correct transfer protocol and enter the correct port.

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

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

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

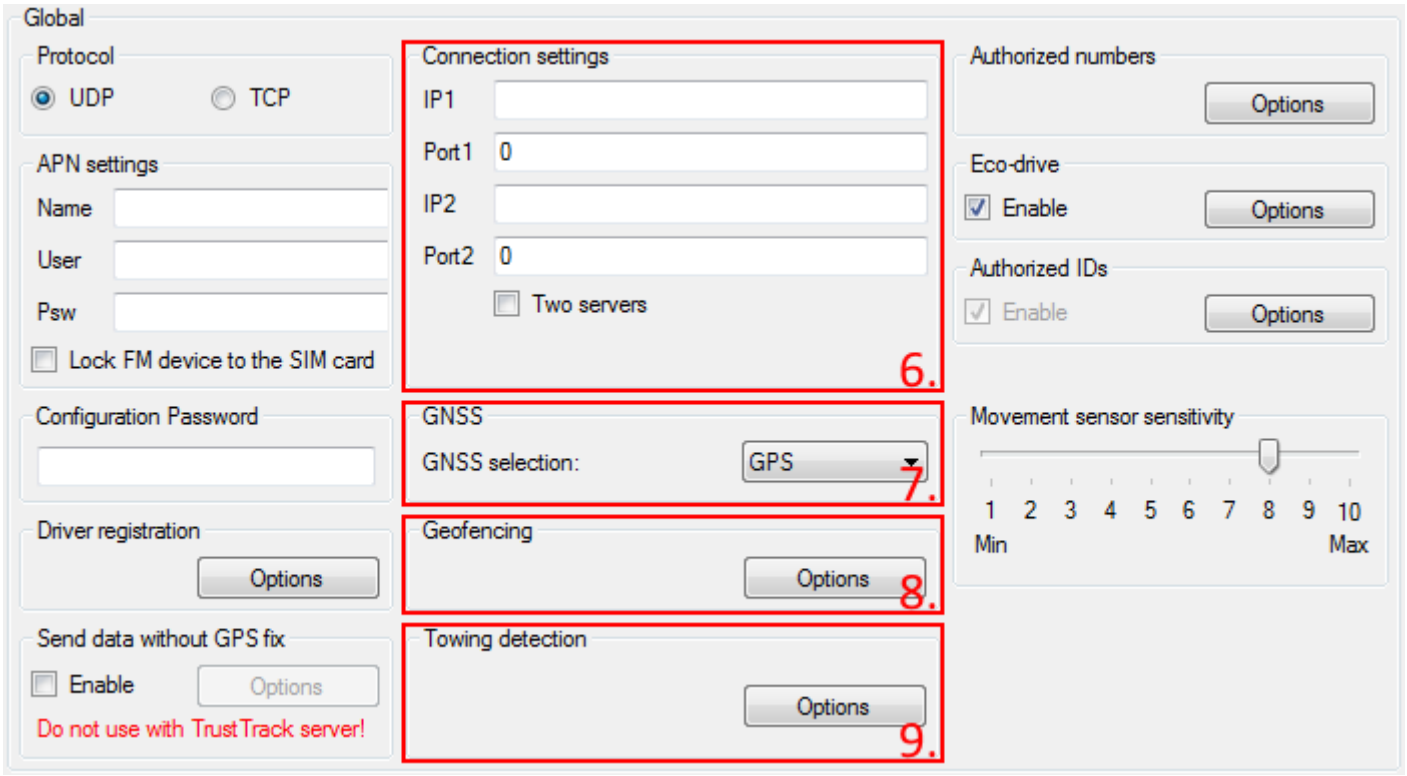
  Unable to send data:

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

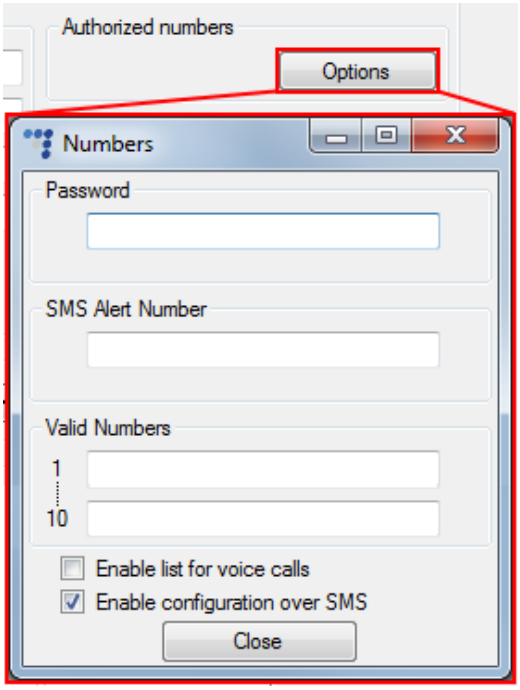
Note

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

7. **GNSS** allows to select positioning network – GPS or GLONASS. GPS by default (*recommended not to change this*).
8. **Geofencing** allow to use internal geozones, configured directly into device. Full description can be found at our FTP, Internal geozones.
9. **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.

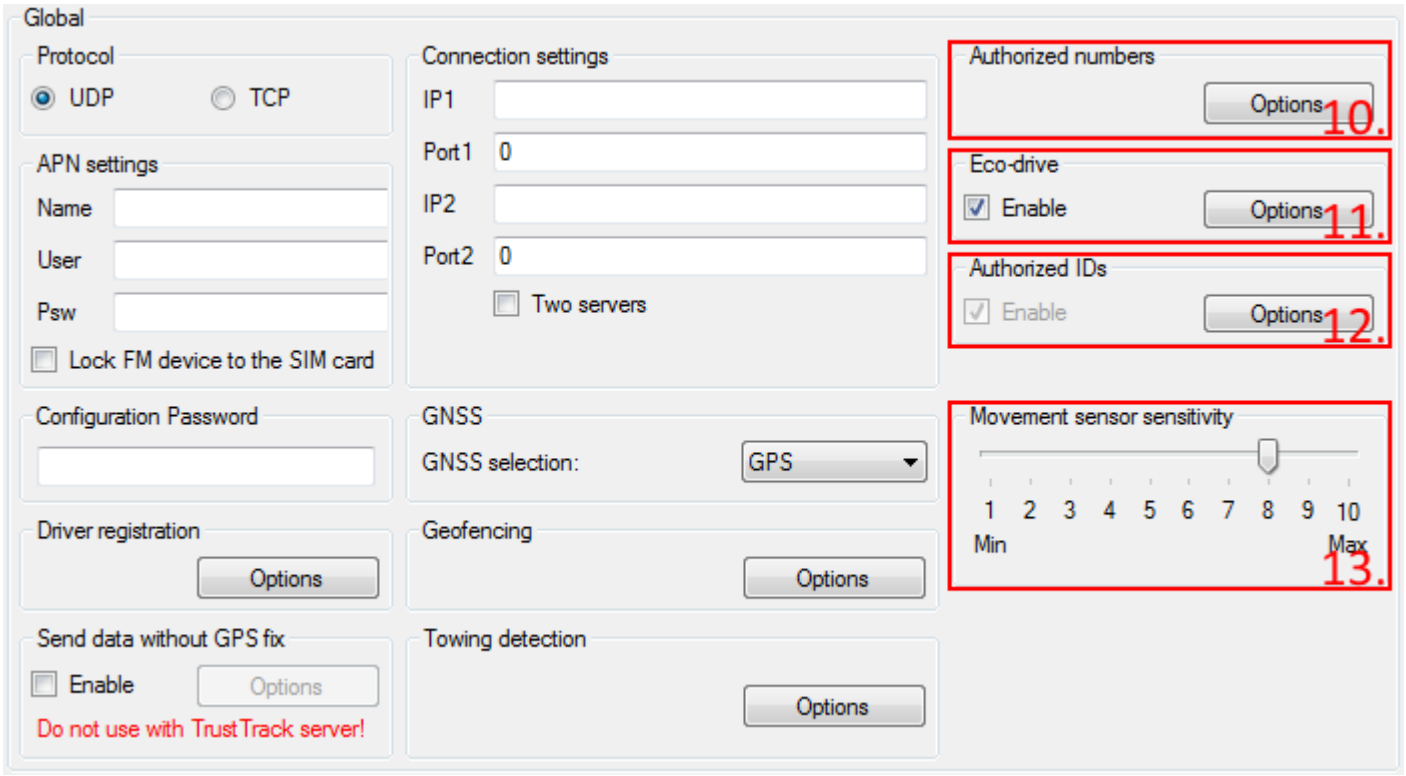


10. With **Authorized numbers** you can apply a password for SMS commands. Also you can enter specific numbers that will be able to send commands to the device.



- If you check **Enable list for voice calls** entered numbers will be able to make a call through the device for a conversation or for listen-in purposes.
- **Enable configuration over SMS** checkbox controls configuration over the SMS feature. Full functionality description can be found at our FTP server.

11. **ECO Driving** options are used to choose sensitivity for the ECO Drive functionality. It helps to rate drivers according to their safety or according to driver's behavior. Full functionality description can be found on our FTP server, ECO Drive.
12. **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, Pro4, Tco4 + Driver registration.
13. **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.

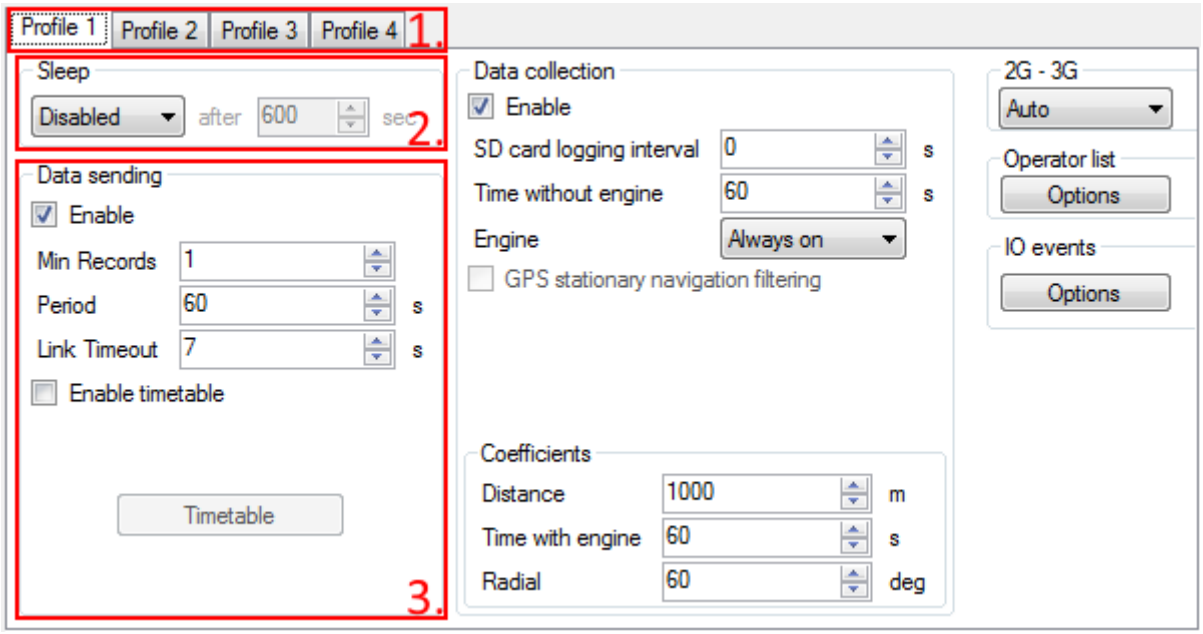


4.3.2 Profile settings

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

1. Each "Profile" is a settings set for specific circumstances (e.g. One profile for the vehicle, when it is operated in the native country and another profile, when it is abroad).
2. **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.
3. **Data sending** settings you can configure the data sending frequency and conditions.

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



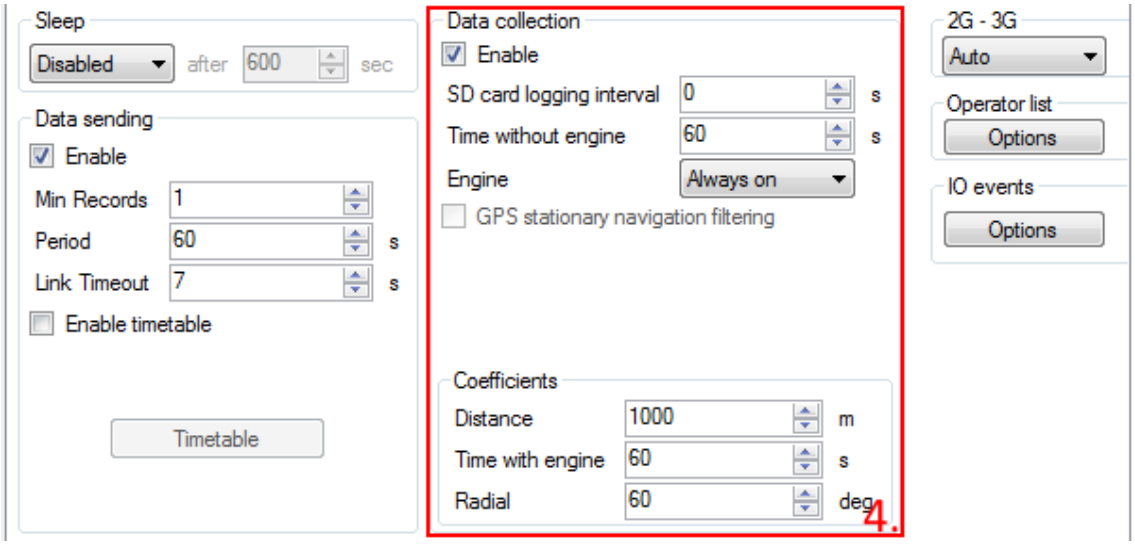
4. **Data collection** must be enabled to collect the information.
   - **Time without engine** means how often records should be made, when the engine is off.
   - The **Engine** drop box allows you to choose how the device will pick up the ignition (consider that the engine is on).
     - *Always on* – No ignition pick up, engine considered always to be on.
     - *Ignition (DIN4)* – Digital input 4 is default DIN used for ignition pick up.
     - *MovSensor* – Detect movement of the 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 the vehicle is not moving.
   - **Coefficients** are used to collect records in addition to the engine on/off parameters. They help to get a more accurate route of the vehicle. A record will be made when:
     - **Distance** that was set - has been achieved
     - **Time with engine** has passed
     - **Radial** turn of degrees that was entered - has been detected.

Note

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

- Device is configured to track one event for 1h. However actual event tracking might last for 1h ± Error (i.e. 5 seconds).
- Device is configured to gather records every second. Depending on the device's state, record gathering time might deviate and last longer (i.e. 2, 3 or even 5 seconds).



5. **2G - 3G** section allows to set device operation mode either to 2G or to 3G
   This feature is supported only with the most recent FM-Tco4 LCV device hardware versions that have UG96 GSM modem. These devices have (3G) added in their label.

   Three different operation modes can be set:

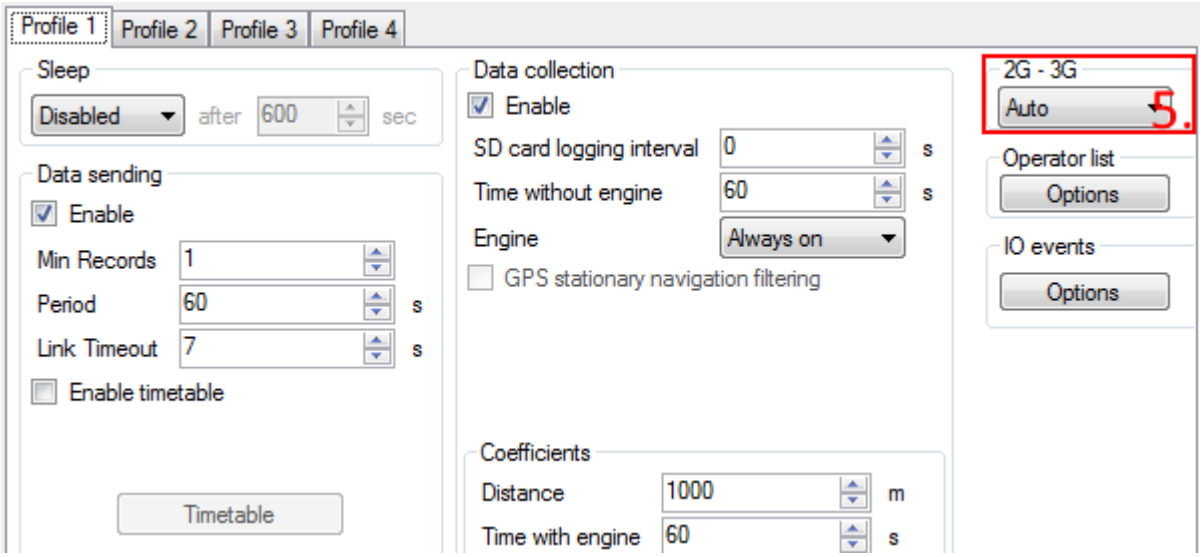
   - *Auto* – default option. FM device uses 3G when it is available. If for some reason 3G is unavailable or it becomes unavailable during operation, device makes 3 attempts to connect to the UMTS network. In case this is not possible, it will automatically switch to GSM/GPRSS (2G mode) and stay in this mode.
     Device can be forced to switch back to UMTS network with a SMS command. Command structure would be:
     password set3g 1/0 – where value: '1' means enabled and '0' means disabled.

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

     More information about SMS commands available in "SMS Commands List" which can be found in our FTP server: FTP link
   - *GSM only* – device operates only in 2G mode.
   - *UMTS only* – device operates only in 3G mode.

Note

FM-Tco4 LCV devices with hardware versions that do not have UG96 modem operate only in 2G mode. For these devices *"Auto", "GSM only"* and *"UMTS only"* options have no effect.



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

> **Note**
> Black list is one for all profiles but operator lists are different for each profile.

   - **GPRS Attempt** – how many times device will try to attach to operator`s GPRS before trying another operator.
   - **GPRS data counter** – how many kilobytes of data device should send before performing next operator search.
   - **Temporary blacklist** – temporal ban period in seconds. Sometimes when the FM device connects to the operator with unavailable GPRS, the device is connected, but cannot transmit any data to the server. In such case temporary blacklist is used. Operator with unavailable GPRS gets into the temporary blacklist, which prevents the FM device's connection to this operator on the next operator search.
     In other case, device connects to mobile operator and successfully obtains GSM and GPRS signal. However, records still do not reach the server. Device has an ability to work around the faulty network (i.e. when network connection is lost) by putting this operator into the temporary backlist. Ban in this case is implemented via 2nd level temporary black list logic. Network verification is done as follows:
     - Server pinging – device performs server pinging only when there is no response (no ACK) from the server and if the connection to server is not available.

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

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

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

     - Operator is also added to the temporary black list, when the device receives "13110" error code from the operator. According to Quectel M95 AT command manual the first number in error

code "1" stands for "Cause for protocol stack (PS) layer" and the rest "3110" stands for "Network fail".

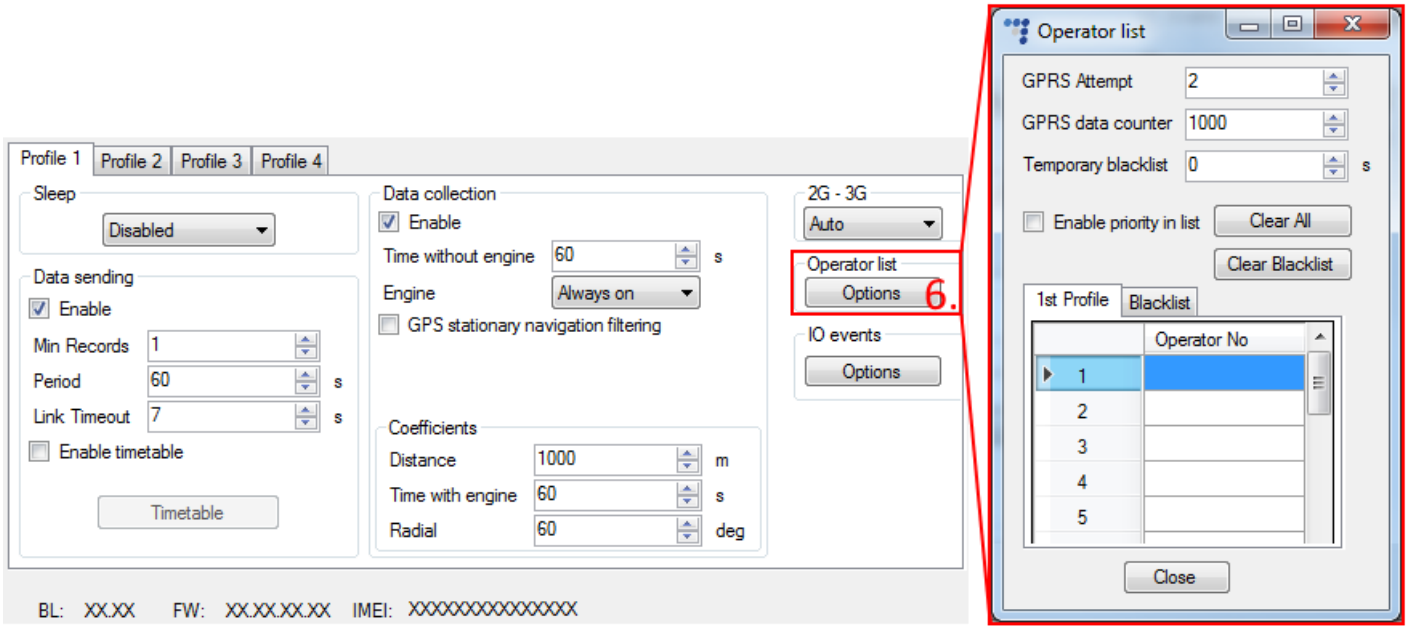
Received trouble codes can be monitored with the help of "GSM trouble codes" IO parameter.

Note

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

Key point about the temporary black list:

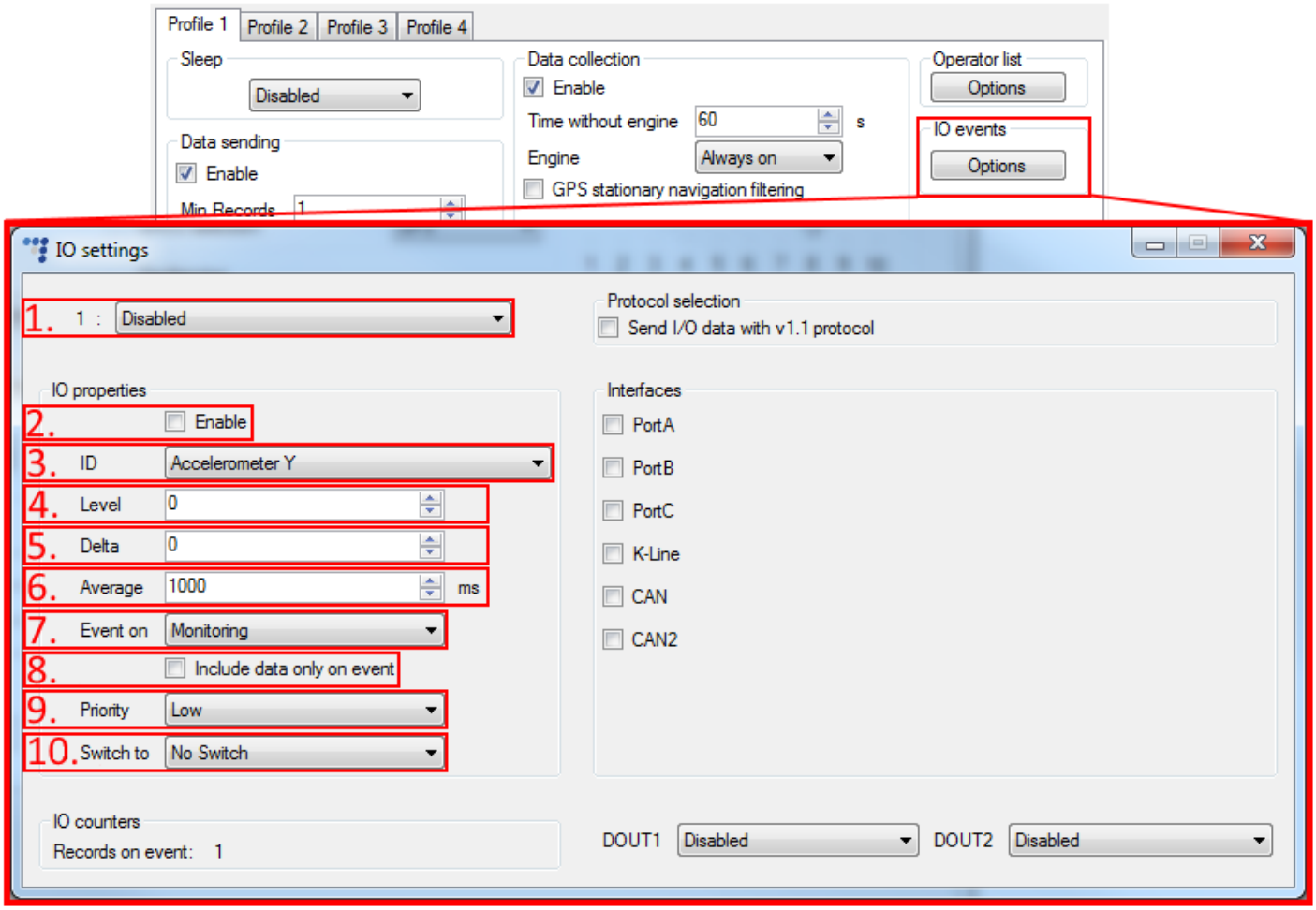
- Ban period is configurable. When all operators get into the ban list, ban list is cleared.
- Banned means that the terminal was not able to get the GPRS context, it was unable to connect to the operator, server failed to respond to 3 consecutive ping requests or that the terminal received "3110" error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



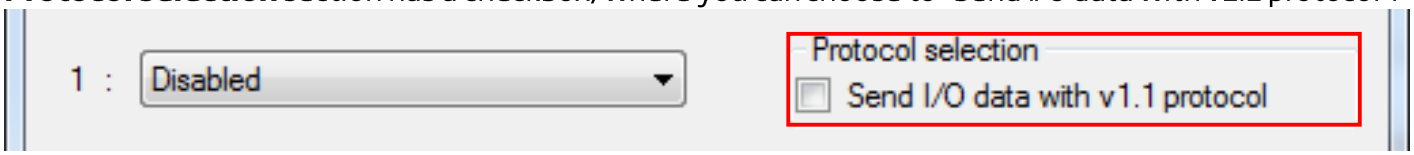
4.3.3 IO settings

IO events "Options" buttons opens up a new "IO settings" window, here you can enable or disable IO parameters that will be sent to a server.

1. You have 80 slots for parameters. Select a 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 a parameter you want to enable for the selected slot. One parameter can be enabled only one time.
4. **Level** is used with hysteresis mode, *see 7.c below for more details.*
5. **Delta** is used with hysteresis mode, *see 7.c below for more details.*
6. **Average**. Some parameter`s values change rapidly and do not correspond any valuable information. Averaging values for some period of time gives a more usable value of the parameter (e.g. fuel level often oscillates. Averaging gives you an approximated value that correspond to the real fuel level in the tank).
7. **Event on** – describes how the parameter will be measured and sent:
   a. "Monitoring" – The parameter value is always monitored and sent with every record.
   b. "Change" – when the value changes, a record will be made regarding this change. However, the parameter is monitored and sent to the server with every record.
   c. "Hysteresis" – The record is generated because of the specified change in the parameter value. E.g. parameter is a "Power supply voltage". Level sets a point of reference, in this case 12700 mV. Delta is a variation in the value, e.g. 1000 mV. The record will be generated (because of the parameter value change), when a Power supply voltage drops to < 11700 mV and/or > 13700 mV. You can select the condition "on rising" or "on falling".
8. Select **Include data only on event** to get a parameter value only when the condition (set in step 7) is met. In other cases the parameter value will not be included in the records.
9. If **Priority** is set to "High", the record will be sent immediately, disregarding data sending settings. If it is "Low", the device will wait for suitable conditions to open a link to server.
10. Upon an event of a value change in some parameter you can configure the device to **Switch to** the other profile.



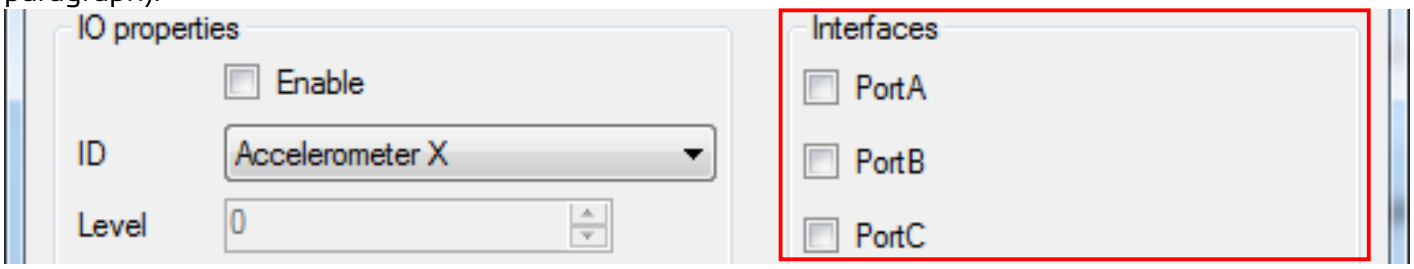
Protocol selection section has a checkbox, where you can choose to "Send I/O data with v1.1 protocol".



Note

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

Interfaces section gives ability to enable or disable all of the device's interfaces (described in 3.6 paragraph).

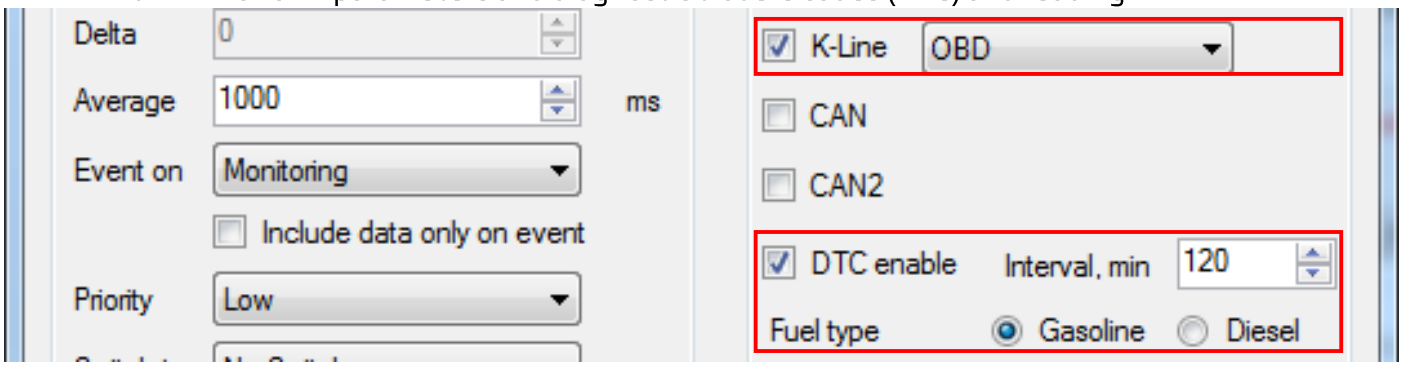


Port A – RS232 PortA.
Port B – RS232 PortB.
Port C – RS485 PortC.
More information and connection instructions available at our FTP server: FTP link

Bellow you will find checkboxes for the K-Line, CAN and CAN2 interfaces.

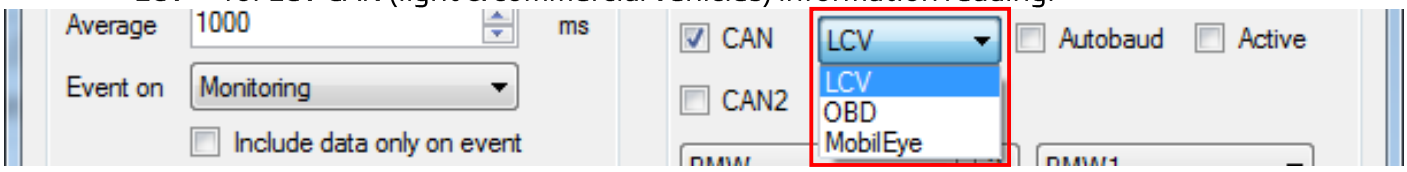
K-Line – if you put a tick in the K-Line checkbox, then a dropdown list appears, where you can choose:

- "*OBD*" – for OBD parameters and diagnostic trouble codes (DTC) and reading.



CAN – if you put a tick in the 1st CAN interface checkbox, then a dropdown list appears, where you can choose one of the following:

- *"OBD"* – for OBD parameters and diagnostic trouble codes (DTC) and reading.
- *"MobilEye"* – for communication with MobilEye device.
- *"LCV"* – for LCV CAN (light & commercial vehicles) information reading.



CAN2 – 2nd CAN interface checkbox has all the same options as CAN interface described above.

Note

Both CAN interfaces are working at the same time. If you physically connected to the 1st CAN interface, you have to configure 1st interface accordingly. Same goes for CAN2.

Additional fields can be used in conjunction with CAN interfaces. This depends on interface configuration.

Smart LCV selection

"Smart LCV Select" functionality allows to add CAN IO parameters only when *LCV* mode is enabled on the CAN interface. When other modes are set, CAN IO parameters are hidden. Smart select is mostly meant for the CAN *LCV* mode, hence the name. By default Smart LCV Selection is always on.
First we will describe CAN *LCV* mode. After that, there will be a section explaining how to turn Smart LCV Selection off and why it could be useful.

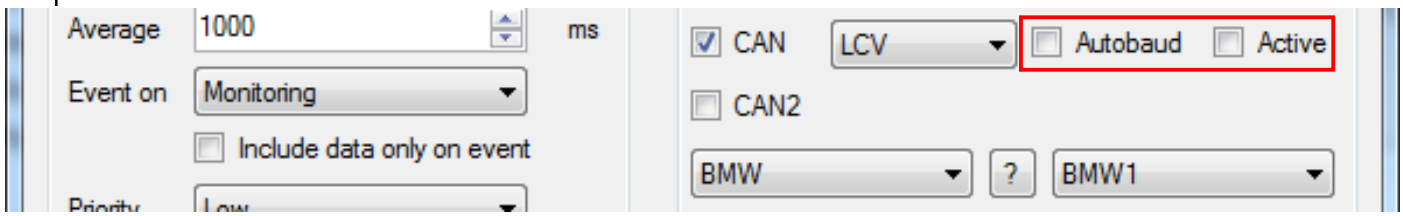
Something to consider when Smart LCV Selection turned on:

Enabling/disabling CAN interface might cause some issues. Let's say Smart LCV Selection is on. One of the CAN interfaces is enabled. *LCV* mode is selected in the drop down menu. Some CAN parameters (*CAN engine speed, CAN wheel based speed etc.*) are added to the IO list. If you decide to disable this CAN interface, some of the CAN IO parameters will be disabled as well. You will be warned about this with a new pop up window.

Similarly, if you change CAN *FMS* or CAN *LCV* mode to something else, the CAN IO parameters will be disabled.

CAN LCV:
Autobaud – If this checkbox is enabled, device will automatically determine a correct baud rate that should be used, while receiving data from vehicle's onboard computer.

Active – If this checkbox is enabled, device will do both, receive and send data to the vehicle's onboard computer.



LCV Group selection dropdown list.

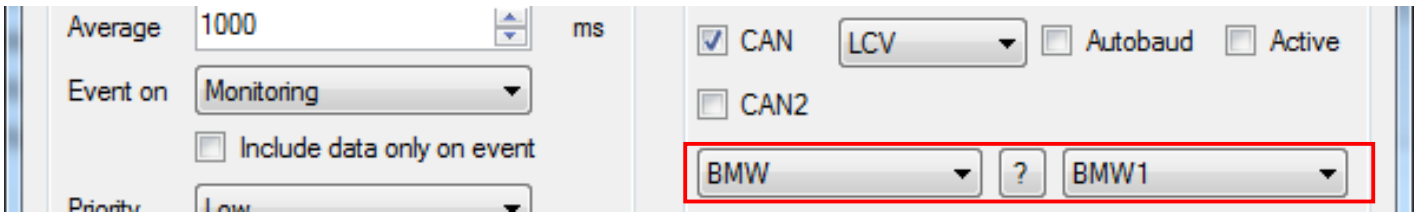
LCV Sub group selection dropdown list.

? – LCV selection by vehicle brand, model and year.

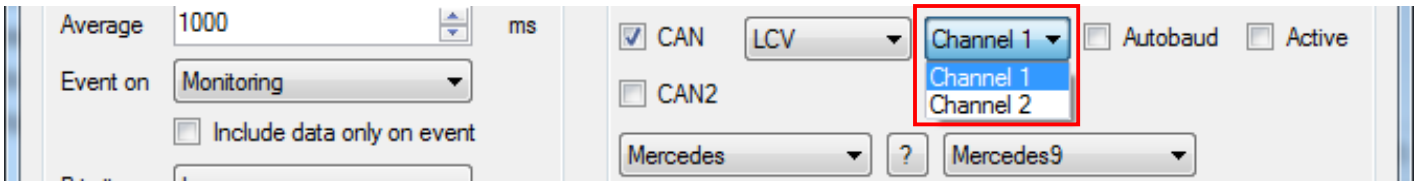
Something to consider when Smart LCV Selection turned on:

With LCV mode set on the CAN interface, only specific CAN IO parameters that are supported for currently selected LCV Group and Subgroup will be visible. Unsupported parameters will not displayed in the list. This feature helps to avoid confusion, since different LCV Groups, Subgroups support different number of CAN IO parameters.

Changing configuration from one LCV Group, Subgroup combination to another might cause some issues. Consider this case. During configuration you set some LCV Group, Subgroup. After this the IO list contains only supported CAN parameters that are available for this specific LCV Group and Subgroup combination. Let's say you enable some of these IO parameters. Now, if you decide to change current LCV Group, Subgroup combination, some of those IO parameters might be automatically disabled. It means that once again you would have to enable them one by one, which is a very time consuming task.



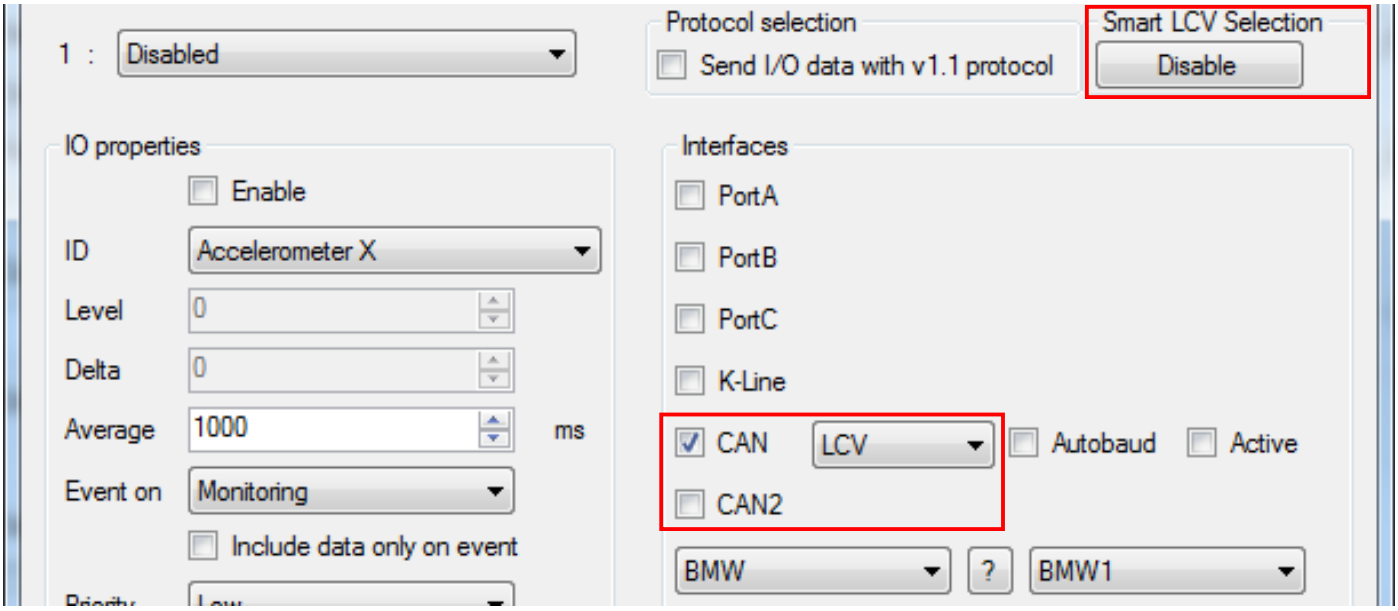
Channel – In some cases, during LCV group selection, additional "Channel" dropdown list might be displayed. This means that CANbus parameters for this particular vehicle (particular LCV group & sub group configuration) can be obtained only, when two separate physical connections are used. Dual LCV configuration is needed to get all the parameters. First set of the parameters is received through CAN interface, second set is received through CAN2 interface. Both CAN interfaces have to be set in "LCV" mode.
Choose either *"Channel 1"* or *"Channel 2"* for the first CAN interface. CAN 2 interface will be automatically set to the remaining channel.
(For example: If you set first Can interface to "Channel 2", then CAN2 interface automatically is set to "Channel 1".)
To see what vehicles can use dual CAN configuration and what parameters are available within each channel check our "CANBUS Supported vehicles" lists in out FTP server.



Disable Smart LCV Selection

The section itself and the "Disable" button will be visible only when one of the CAN interfaces is enabled and the *LCV* mode is selected. With other modes, both are hidden.

As mentioned earlier, "Smart LCV Selection" functionality allows to add CAN IO parameters only when *LCV* mode is enabled on the CAN interface. When other modes are set, CAN IO parameters are hidden.



Click the "Disable" button to turn the Smart LCV Selection off. Button will be dimmed. To turn this feature back on, close the "IO Settings" window and open it again. Smart LCV Selection functionality will go back to its default ON state.

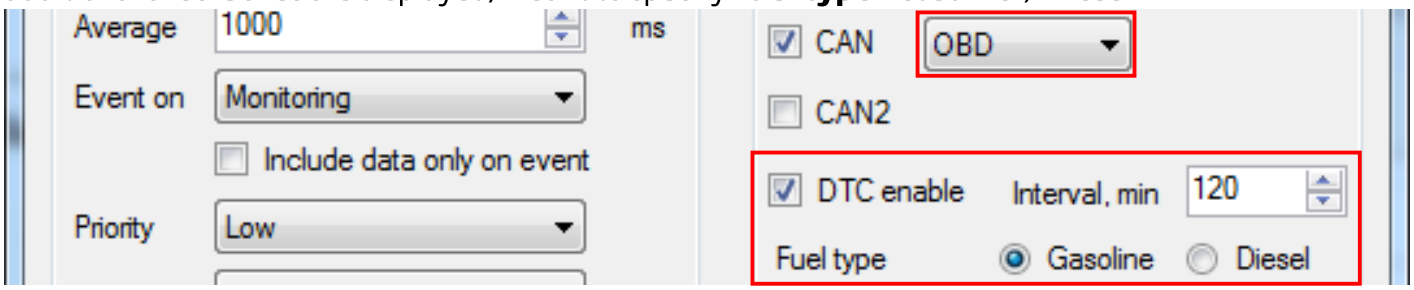
Use Smart LCV Selection "Disable" button, when you need to switch from one CAN interface to another, without losing enabled CAN IO parameters. Don't forget to set the same configuration

(Example: You have configured CAN LCV VAG-VAG1 on the 1st CAN interface. You have enabled few CAN IO parameters. Now you want to switch to the 2nd CAN interface without losing those parameters. Click "Disable" button in Smart LCV Selection section. Disable 1st CAN interface or set different mode. Enable 2nd CAN and set CAN LCV VAG-VAG1. Switch is complete.

Switching form LCV GroupX, SubgroupX to LCV GroupY, SubgroupY is not recommended. Some CAN IO parameters eventually would be lost.)

CAN OBD:

DTC enable - here you can specify Diagnostic Trouble Codes reading interval in minutes. Below two additional checkboxes are displayed, meant to specify **Fuel type**: *"Gasoline", "Diesel".*



Digital outputs section

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



4.4 Integration protocol

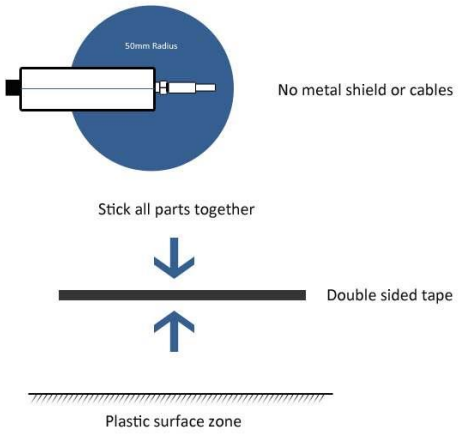
All integration related questions and documentation can be acquired from Ruptela technical support: support@ruptela.com

5 Installation recommendations

5.1 Device installation

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

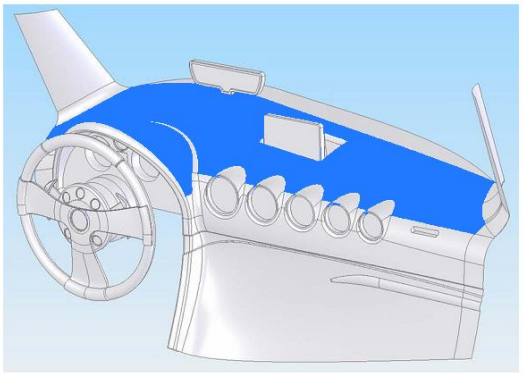
- Device should not be seen or easily reached.
- Device should be firmly fixed to the surface. Please avoid mounting it near the metal surfaces or cables.
- Wrong device mounting may result in device malfunction.
- Device cannot be fixed to heat emitting or moving parts.
- SIM card should be inserted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



5.2 Antenna installation



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



Contacts:
Main Support no.: +370 5 2045030
Polish Support no.: +48 22 2092532
Ukrainian Support no.: +380 947 107319
Web: www.ruptela.com
Email: support@ruptela.com