# FMB630 User Manual
# V1.2

# Table of contents

# 1   INTRODUCTION

## 1.1   Attention

Do not disassemble the device. If the device is damaged, the power supply cables are not isolated or the isolation is damaged, before unplugging the power supply, do not touch the device.

All wireless data transferring devices produce interference that may affect other devices which are placed nearby.

The device must be connected only by qualified personnel.

The device must be firmly fastened in the predefined location.

The programming must be performed using a second class PC (with autonomic power supply).

The device is susceptible to water and humidity.

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

FMB630 has USB interface;
Please use cables provided with FMB630 device.
Teltonika is not responsible for any harm caused by using wrong cables for PC <-> FMB630 connection.

This sign on the packaging means that the electric and electronic equipment to be utilized must be stored separately.

## 1.2 Instructions of safety

This chapter contains information on how to operate FMB630 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!

To avoid mechanical damage, it is advised to transport the FMB630 device in an impact-proof package. Before usage, the device should be placed so that its LED indicators are visible, which show the status of operation the device is in.

The device uses SELV limited power source. The allowed range of voltage is 10V...30V DC.

When connecting the connection (2x10) cables to the vehicle, the appropriate jumpers of the power supply of the vehicle should be disconnected.

Before dismounting the device from the vehicle, the 2x10 connection must be disconnected.

The device is designed to be mounted in a zone of limited access, which is inaccessible for the operator. All related devices must meet the requirements of standard EN 60950-1.

The device FMB630 is not designed as a navigational device for boats.

## 1.3 Legal Notice

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## 1.4 About document

This document contains information about the architecture, possibilities, mechanical characteristics, and configuration of the FMB630 device.

Acronyms and terms used in document:

PC – Personal Computer

GPRS – General Packet Radio Service

GPS – Global Positioning System

GSM – Global System for Mobile Communications

SMS – Short Message Service

AC/DC – Alternating Current/Direct Current

I/O – Input/Output.

Record – AVL data stored in FMB630 memory. AVL data contains GPS and I/O information

AVL packet - Data packet that is being sent to server during data transmission. AVL packet contains from 1 to 50 records.

Geofence – a virtual geographic area of interest that can be defined by a radius or polygon for the location. In this document term "Geofence" is often used as functionality, which generates an event when crossing a defined area.

## 2   BASIC DESCRIPTION

FMB630 is a terminal with GPS and GSMconnectivity, which is able to determine the object's coordinates and transfer them via the GSM network. This device is perfectly suitable for applications, which need location acquirement of remote objects. It is important to mention that FMB630 has additional inputs and outputs, which let you control and monitor other devices on remote objects. FMB630 also has a USB port for device status log output and entering configurations.

### 2.1   Package contents[1]

Usually the FMB630 device sample is supplied to the customer in a cardboard box containing all the equipment that is necessary for operation. The package contains:

FMB630 device
Input and output power supply cable with 2x10 connection pins
4 screws for assembling device
GPS/GLONASS antenna
GSM antenna
USB cable
Port 1/2 cable
Port 3 cable

### 2.2   Basic characteristics

GSM / GPRS / GNSS features:
- Teltonika TM2500 quad band module (GSM 850 / 900 / 1800 / 1900 MHz);
- GPRS class 12;
- SMS (text, data);
- Integrated GNSS receiver;
- Up to -162 dBm GNSS receiver sensitivity;

GNSS TG3300 Module features:
- Navigation Systems; GPS/GLONASS;
- Protocol NMEA-0183: GGA, GGL, GSA, GSV, RMC, VTG;
- Up to -162 dBm sensitivity;

Hardware features:
- STM32 processor;
- 1 MB internal Flash memory;
- External memory card slot;
- Built-in accelerometer;
- Built-in Bluetooth 3.0;
- Internal backup battery included;

Interface features:
- Power supply: 10 ÷ 30V;
- USB port;
- 4 digital inputs;

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[1] Package content depends on Order Code, and can be customized by customer needs.

- 3 analog inputs;
- 4 open collector digital outputs;
- 4 1Wire® temperature sensor;
- 1Wire® iButton;
- LEDs indicating device status;
- K-Line interface for online Tachograph Vehicle Data transfer;
- 2xRS232 port;
- RS485 port;
- J1708 interface;
- LVCAN interface;
- CAN messages 2.0 A, B Active support. Speed up to 1 Mbit/s;
- Roaming enabling/disabling;
- Offline working mode;
- Records importing using USB/microSD card;
- Remote logs reading via SMS/GPRS;

Overvoltage protection:

**Table 1 Overvoltage Protecton:**

| Description | Voltage | Duration |
|---|---|---|
| Normal operation | 10-30V | Unlimited |
| Protection turns on, device turns off. | 34V | Unlimited |
| Maximum voltage | <70V | Unlimited |
| Maximum voltage impulse | 90V | 5 miliseconds |

## 2.3 Mechanical features

**Table 2 FMB630 physical interfaces and operation environment**

| Part name | Physical specification | Operation environment |
|---|---|---|
| Navigation LED | LED | Power supply 10...30 V DC |
| Modem LED | LED | 2 W Max |
| GPS | GPS antenna connector SMA | Operation temperature: -25°C … +55°C |
| GSM | GSM antenna connector SMA female outer shell, female inner pin | Storage temperature: -40°C … +70°C  Energy consumption[1]: GPRS: — 120 mA r.m.s Max., |
| Socket 2x10 | Tyco Micro MATE-N-LOK™ or similar | Nominal: — average 65 mA r.m.s, GPS Sleep: — average 28 mA, Deep Sleep: — average less than 7 mA[2] |
| USB | Mini USB socket | Storage relative humidity 5 … 95 % (non |

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[1] Energy consumption has been tested at 12V voltage with no battery charging.
[2] When in Deep Sleep mode no data storing and sending is activated.

| Part name | Physical specification | Operation environment |
|---|---|---|
| Port1 | RS232 or RS485 port channel 1 (RJ45 socket) | condensating) Battery charge current: ▭ average 100 mA, Rated current: ▭ 250 mA, Internal fuse: 3A, 125V |
| Port2 | RS232 port channel 1 (RJ45 socket) | |
| J1708 | J1708 port channel | |
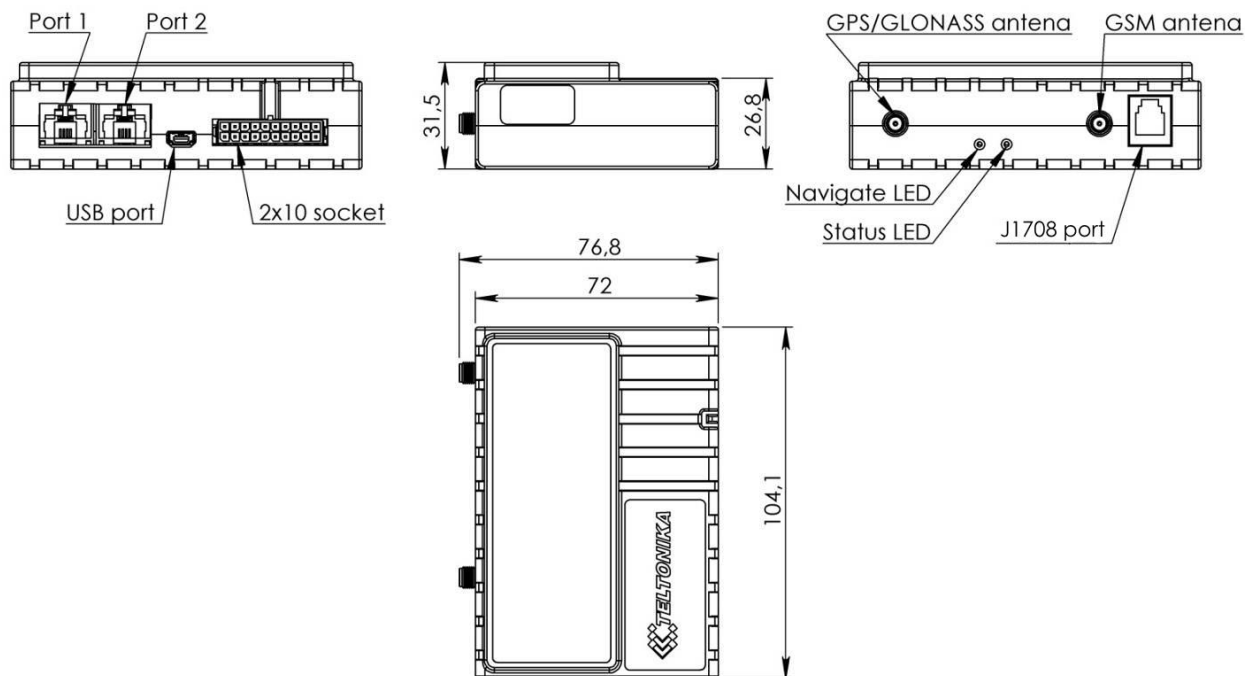


**Figure 1 FMB630 view & dimensions in mm (tolerance ±2mm)**

## 2.4 Technical Information about internal battery!

Ni-MH Rechargeable battery, 8.4V, 550 mA.

FMB630 operating time with internal backup battery depends on temperature, data sending frequency (SMS and GPRS), and accumulator age, number of charge/discharge cycles.
For example:

- In sleep mode a new FMB630 device, operating time approximately 5 hours
- In deep sleep mode – 35 hours
- Operating time for a new FMB630 device, working in normal mode (records are being acquired every 10 sec. and sent in packets of 4 records every 60 sec.), is approximately 2 h 10 min.
- Charging temperature: 0 – 40 °C



CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

### 2.4.1 Battery Disposal instructions:

Battery should not be disposed of with general household waste.
Bring damaged or worn-out batteries to your local recycling center or dispose
them to battery recycle bin found in stores.

## 2.5 Electrical characteristics

Table 3 Electrical characteristics

| CHARACTERISTIC DESCRIPTION / VALUE | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|
| **SUPPLY VOLTAGE** | | | | |
| Supply Voltage (Recommended Operating Conditions) | 10 | - | 30 | V |
| Supply Voltage (for internal rechargeable battery charging proper functioning) | 10 | - | 30 | V |
| **POWER SUPPLY CURRENT (HARDWARE VERSION WITH INTERNAL BATTERY)** | | | | |
| Deep Sleep, average, Icc.ds | - | 2.5 | 4 | mA |
| Sleep, average, Icc.ds, Vcc=10V | - | 45 | - | mA |
| Sleep, average, Icc.ds, Vcc=30V | - | 25 | - | mA |
| Ucc=12.6V, all modules fully working, internal battery is charging, Icc1 | - | - | 350 | mA |
| Ucc=12.6V, all modules fully working, internal battery is charged, Icc2 | - | - | 300 | mA |
| Ucc=25.2V, all modules fully working, internal battery is charging, Icc3 | - | - | 195 | mA |
| Ucc=25.2V, all modules fully working, internal battery is charged, Icc4 | - | - | 140 | mA |
| **DIGITAL OUTPUT (OPEN DRAIN GRADE)** | | | | |
| Drain current (Digital Output OFF) | - | - | 120 | uA |
| Drain current (Digital Output ON, Recommended Operating Conditions) | - | - | 300 | mA |
| Static Drain-Source resistance (Digital Output ON) | - | - | 300 | mOhm |
| **DIGITAL INPUTS** | | | | |
| Input resistance (DIN1, DIN2, DIN3) | 15 | - | - | kOhm |
| Input Voltage (Recommended Operating Conditions) | 0 | - | Supply voltage | V |
| Input Voltage threshold (DIN1) | - | 7,5 | - | V |
| Input Voltage threshold (DIN2, DIN3, DIN4) | - | 2,5 | - | V |

| CHARACTERISTIC DESCRIPTION | VALUE Min. | Typ. | Max. | Unit |
|---|---|---|---|---|
| **ANALOG INPUTS** | | | | |
| Input Voltage (Recommended Operating Conditions), Range1 | 0 | - | 10 | V |
| Input resistance, Range1 | - | 120 | - | kOhm |
| Input Voltage (Recommended Operating Conditions) Range2 | 0 | - | 30 | V |
| Input resistance, Range2 | - | 147 | - | kOhm |
| **OUTPUT SUPPLY VOLTAGE 1-WIRE[3]** | | | | |
| Supply Voltage | 3,3 | - | 3,9 | V |
| Output inner resistance | - | 7 | - | Ohm |
| Output current ($U_{out}$ > 3.0V) | - | 30 | - | mA |
| Short circuit current ($U_{out}$ = 0) | - | 130 | - | mA |
| **CAN INTERFACE** | | | | |
| Internal terminal resistors CAN bus | - | 120 | - | Ohm |
| Differential input resistance | 19 | 30 | 52 | kOhm |
| Recessive output voltage | 2 | 2.5 | 3 | V |
| Differential receiver threshold Voltage | 0.5 | 0.7 | 0.9 | V |
| Common mode input voltage | -30 | - | 30 | V |

When connecting a COM port to an active external device keep in mind that the first power supply must be connected to FMB630, and then the external device should be powered. Connecting external devices when FMB630 is powered off is not recommended.

## 2.6 Absolute Maximum Ratings

Table 4 Absolute maximum ratings

| CHARACTERISTIC DESCRIPTION | VALUE Min. | Typ. | Max. | Unit |
|---|---|---|---|---|
| Supply Voltage (Absolute Maximum Ratings) | -32 | | 32 | V |
| Digital output clamp threshold voltage (Absolute Maximum Ratings), ($I_{drain}$ = 2mA) | 36 | | | V |
| Digital Input Voltage (Absolute Maximum Ratings) | -32 | | 32 | V |
| Analog Input Voltage (Absolute Maximum Ratings) | -32 | | 32 | V |
| Voltage on Supply Voltage 1-Wire (Absolute Maximum Ratings) | 0 | | 10 | V |

[3-] 1-wire Supply voltage PIN is dedicated for 1-wire devices ONLY, do not use it for any other purpose.

| | | | | |
|---|---|---|---|---|
| Voltage on Data Input/Output 1-Wire (Absolute Maximum Ratings) | 0 | | 10 | V |
| Voltage on CANH, CANL (Absolute Maximum Ratings) | -58 | | 58 | V |

## 3 CONNECTION AND PINOUT

### 3.1 SIM card insert scheme
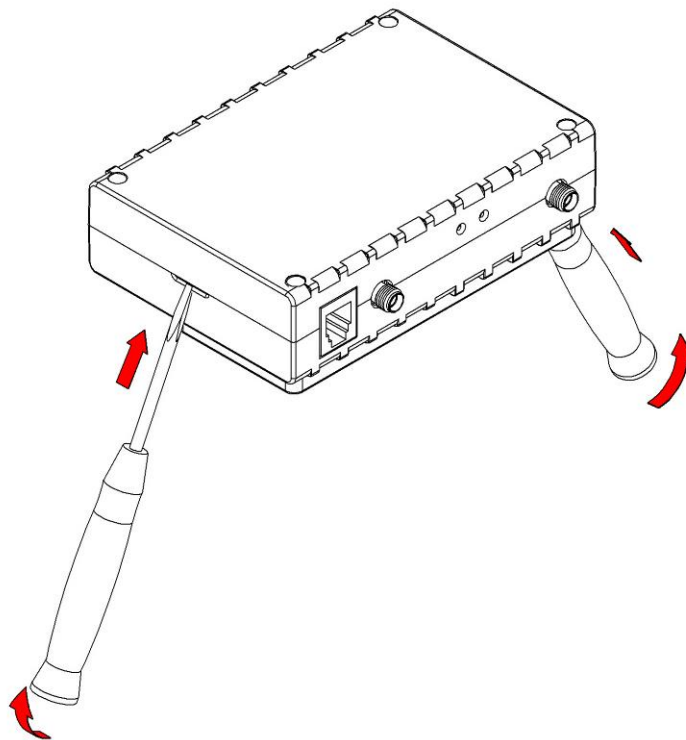
①

Gently open FMB630 case using screwdrivers
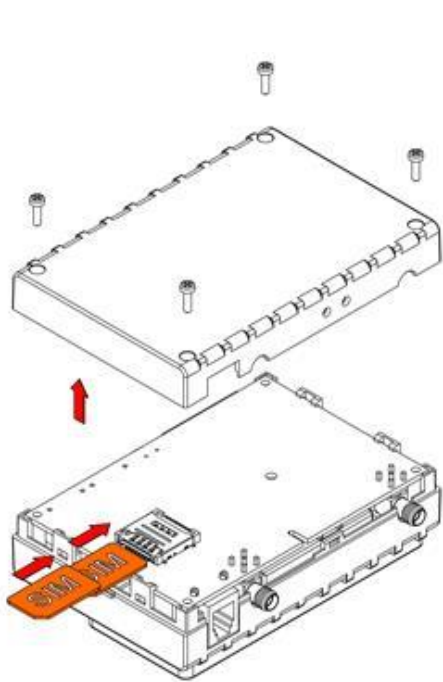
②

Take off FMB630 case and insert SIM cards as shown. SIM SLOT 1 (default, recommended for 1 SIM mode) is closer to PCB, SIM SLOT 2 is the upper one
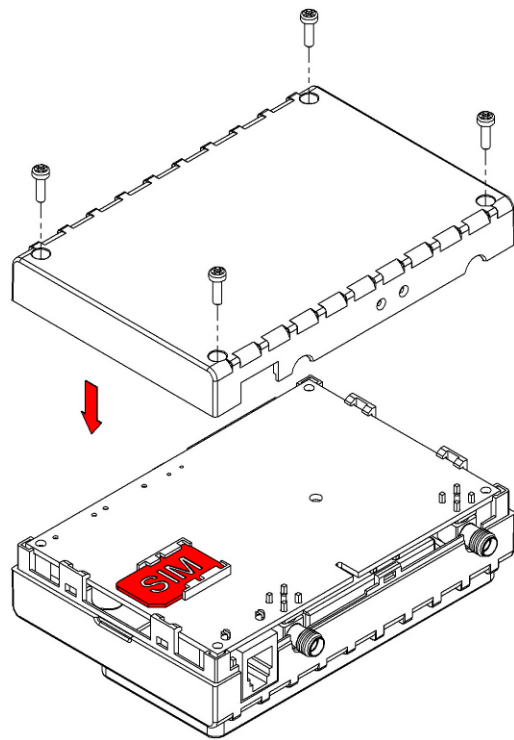
③

Assemble device as shown and put screws into the holes
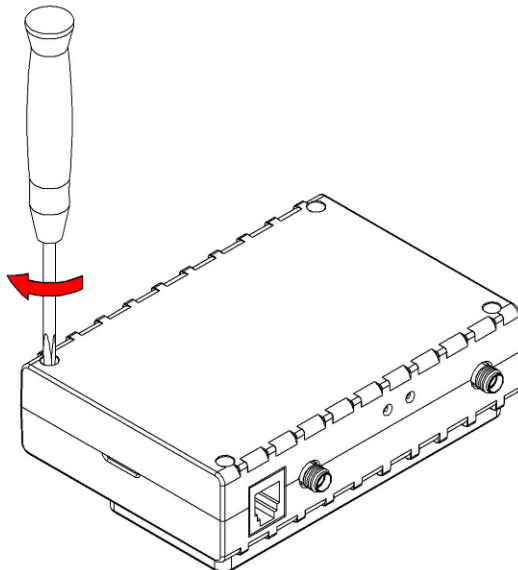


④

Screw all 4 screws
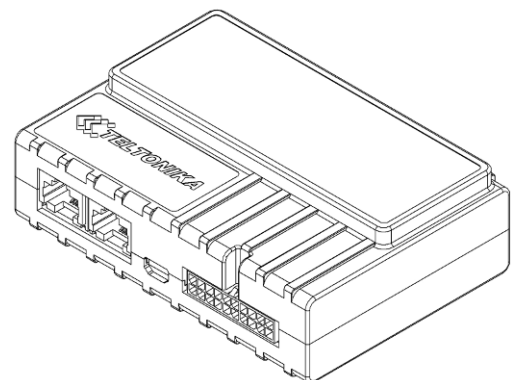
⑤

Device is ready

## 3.2 Installing FMB630 drivers

**Software requirements**

• Operating system 32-bit and 64-bit: XP with SP3 or later, Windows Vista, Windows 7, 8 and 10.

• MS .NET Framework V3.5 or later (Microsoft)

**Drivers**

Please download Virtual COM Port drivers from Teltonika website: FMB630 VCP Driver

**Installing drivers**

Extract and run VCPDriver_V1.3.1_Setup.exe. This driver is used to detect FMB630 device connected to the computer. Click 'Next' in driver installation window (figures below):
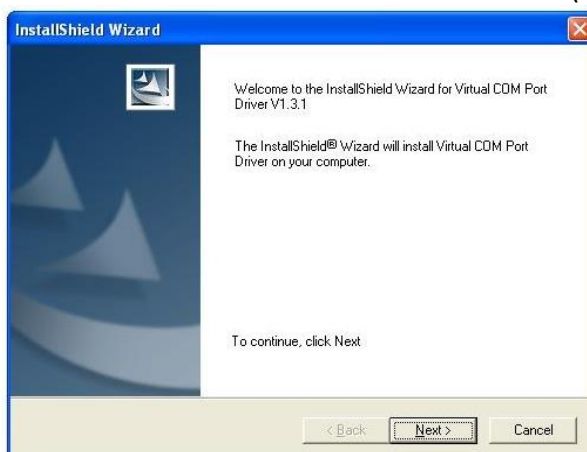


**Figure 2 Driver installation window**

This will launch the device driver installation wizard. In the following window click 'Next' button again:



**Figure 3 Driver installation window**

Setup will continue installing drivers and will display a window about successful process in the end. Click 'Finish' to complete setup:

**Figure 4 Driver installation window**

You have now installed drivers for FMB630 device successfully.

## 3.3 Navigate LED

**Table 5 Navigate LED operation**

| Behaviour | Meaning |
|---|---|
| Permanently switched on | GPS signal is not received |
| Blinking every second | Normal mode, GPS is working |
| Off | GPS is turned off because:<br>• Deep sleep mode<br>Or<br>• GPS antenna short circuited |

## 3.4 Status LED

**Table 6 Status LED Operation**

| Behaviour | Meaning |
|---|---|
| Blinking every second | Normal mode |
| Blinking every 2 seconds | Deep sleep mode |
| Blinking fast for a short time | Modem activity |
| Blinking fast constantly | Boot mode |
| Off | • Device is not working<br>Or<br>• Device firmware being flashed |

## 3.5 Socket 2×10 pinout

```
   AIN 3     10  □  □   20   K-Line
   OUT 2      9  □  □   19   OUT 1
   OUT 3      8  □  □   18   OUT 4
   AIN 2      7  □  □   17   AIN 1
  CAN2 L      6  □  □   16   CAN2_H
   DIN 2      5  □  □   15   IGN (DIN1)
   DIN 4      4  □  □   14   DIN 3
  1W. PWR     3  □  □   13   1W. data
  CAN1 L      2  □  □   12   CAN1 H
 (–)GND       1  □  □   11   (+)VCC (10÷30)V DC
```
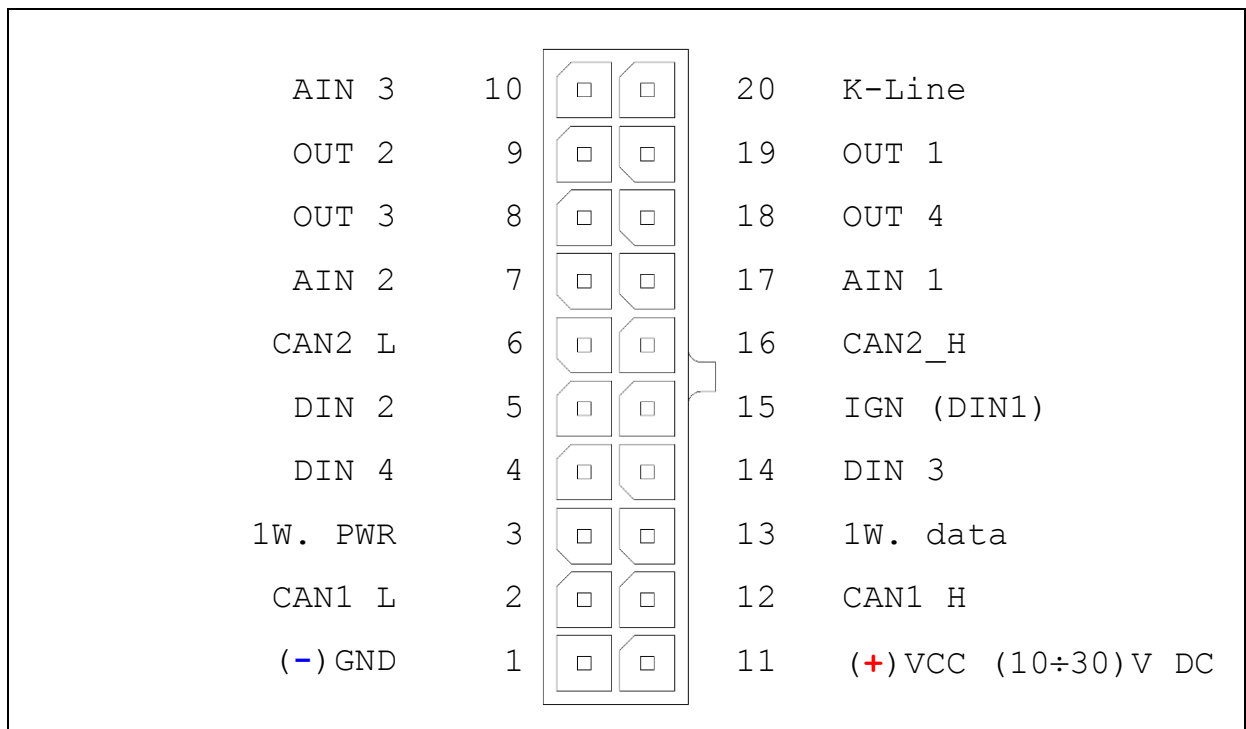
**Figure 5 2x10 socket pinout**

**Table 7 2x10 SOCKET PINOUT DESCRIPTION**

| Pin Nr. | Pin Name | Description |
|---|---|---|
| 1 | (-)GND | ( - ) Ground pin. (10…30) V DC* |
| 2 | CAN1 L | SAE J1939 CAN interface Low channel 1 |
| 3 | 1W. PWR | Power supply pin for Dallas 1-Wire® devices |
| 4 | DIN 4 | Digital input. Channel 4 |
| 5 | DIN 2 | Digital input. Channel 2 |
| 6 | CAN2 L | SAE J1939 CAN interface Low channel 2 |
| 7 | AIN 2 | Analog input, channel 2. Input range: 0 - 30V/ 0 - 10V  DC |
| 8 | OUT 3 | Digital output. Channel 3. Open collector output |
| 9 | OUT 2 | Digital output. Channel 2. Open collector output |
| 10 | AIN 3 | Analog input, channel 3. Input range: 0 - 30V/ 0 - 10V  DC |
| 11 | (+)VCC (10…30) V DC | Power supply pin |
| 12 | CAN1 H | SAE J1939 CAN interface High channel 1 |
| 13 | 1W. data | Data channel for Dallas 1-Wire® devices |
| 14 | DIN 3 | Digital input, channel 3 |
| 15 | DIN 1 | Digital input, channel 1 (RESERVED FOR IGNITION LINE) |
| 16 | CAN2 H | SAE J1939 CAN interface High channel 2 |
| 17 | AIN 1 | Analog input, channel 1. Input range: 0 - 30V/ 0 - 10V  DC |
| 18 | OUT 4 | Digital output. Channel 4. Open collector output |
| 19 | OUT 1 | Digital output. Channel 1. Open collector output |
| 20 | K-LINE | K-LINE interface for online Tachograph Vehicle Data transfer |

## 3.6 USB

When FMB630 is connected to a PC it creates a STM Virtual COM Port, which can be used as a system port (to flash firmware and configure the device).
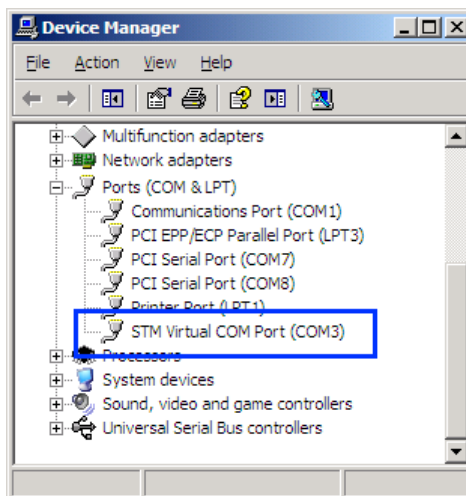

**Figure 6 COM-Ports**

## 3.7 Accessories

Note: Teltonika does not provide any additional equipment like panic buttons, door sensors etc, except 1 – wire devices: TTJ-101 thermo sensor, I-Button, 1-wire RFID. These devices are not included in FMB630 package and can be offered by special order only.

### 1 – Wire devices

One of the FMB630 features is realized 1-Wire data protocol, which enables connection of up to three different type thermometers (DS1820, DS18S20 and DS18B20) and I-Button DS1990A. Figure 7 and Figure 9 shows FMB630 and 1-wire devices connection schemes.
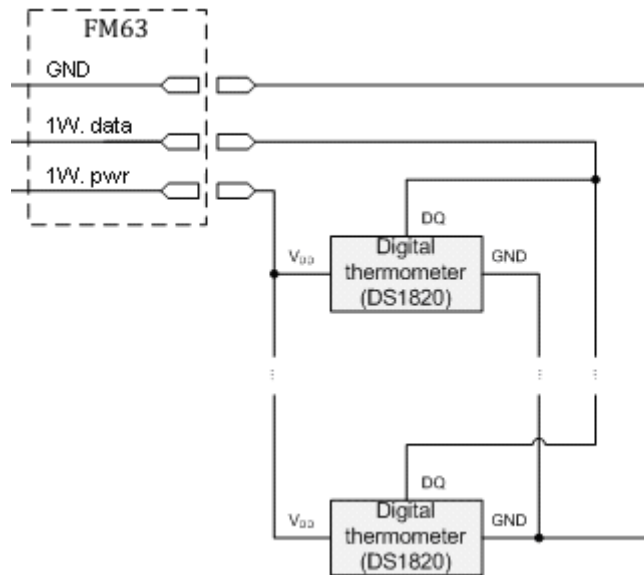
**Figure 7 Temperature sensors connection scheme**

Left row of pins

Right row of pins



| 1W. PWR (FMB630 – pin3) | 1 |
|---|---|
| 1W. Data (FMB630 – pin13) | 2 |
| GND (FMB630 – pin1) | 3 |
| Digital Input | 4 |

| 1 | Vpp(+5 Volts DC) – power source for external digital sensor |
|---|---|
| 2 | Output from external digital sensor |
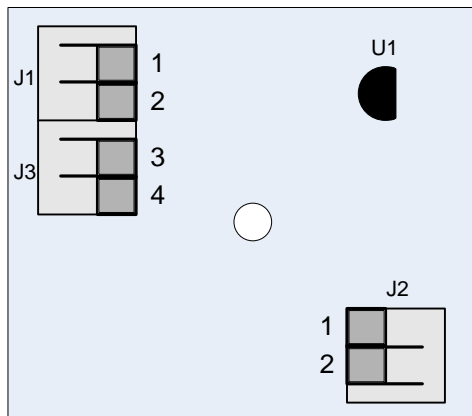
**Figure 8 Digital thermometer DS1820 and TTJ 100 connection scheme**
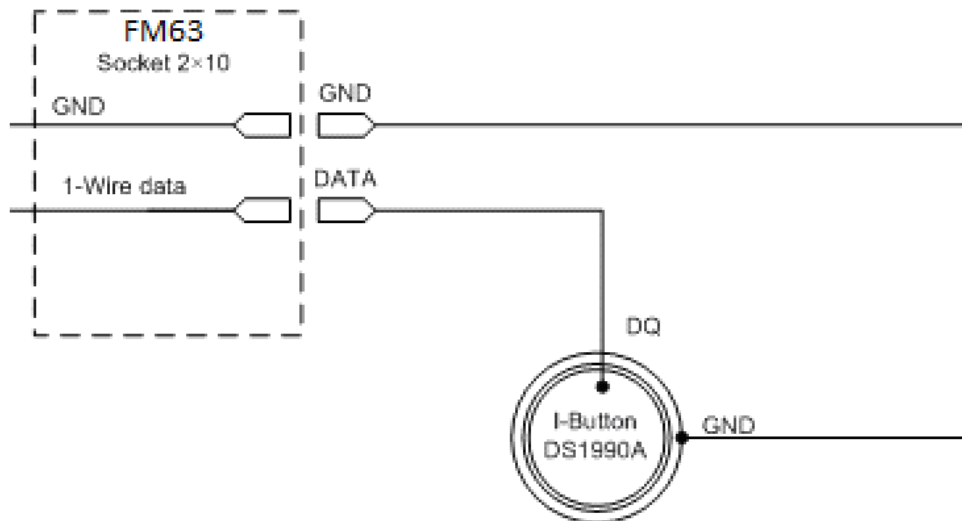
**Figure 9 Digital key "I-Button" DS1990A connection scheme**

**Fuel tank sensors**

A fuel tank level sensor exists in most of the cars, which shows the approximate fuel level in the driver's indicator panel. It is possible to connect FMB630 Analog input (if sensor returns analogue signal proportional to fuel level). Figure 10 describes the connection scheme to the FMB630 and fuel tank sensor. After the connection to the tank fuel level sensor, calibration is needed. Calibrations needed due of the fact that most fuel tank sensors are not linear. Calibration is being performing by measuring voltage dependence on volume of fuel in tank.
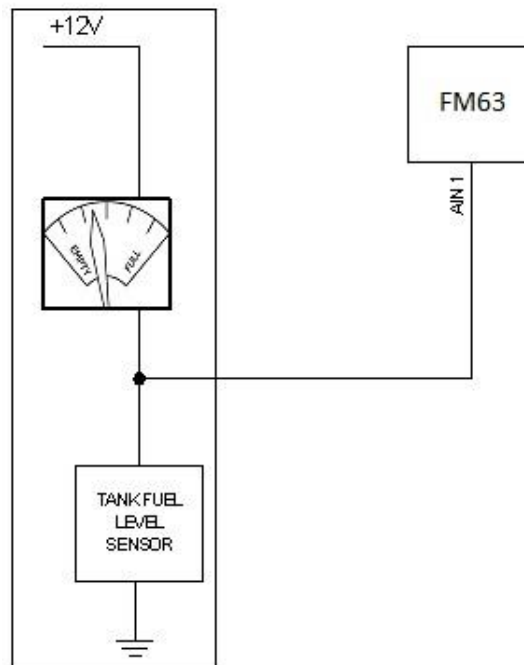


**Figure 10 Fuel tank sensor**

### Impulse counters

Figure 11 describes the connection scheme to the FMB630. Here two pulse meters are used, where one is mounted on the direct flow valve and the other on the return flow valve. Data from both meters is sent to the FMB630. Then FMB630 calculates DIN3-DIN4. Resulting difference equals to fuel consumption. Filter should be used on the direct flow pipe to prevent any damage caused by impurities in the liquid. The filter mounted in the meter inlet is only a safety filter and it is too small to act as a strainer.
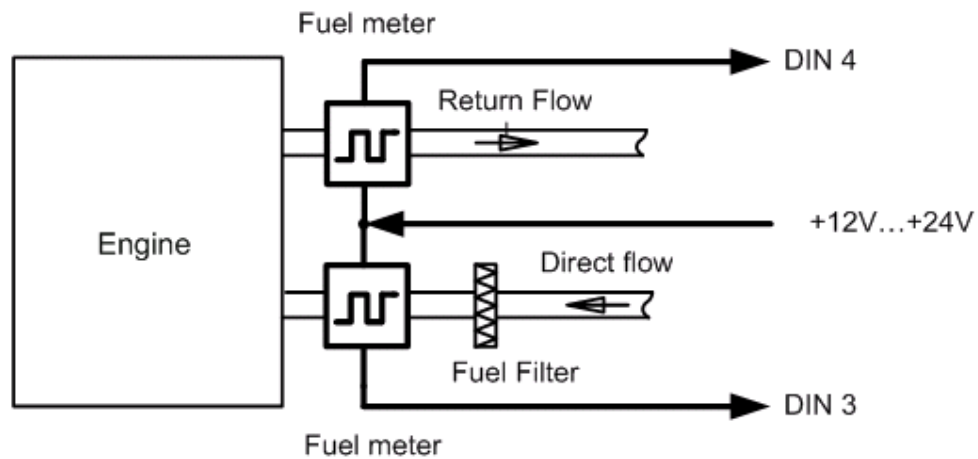


**Figure 11 Pulse fuel meters connection scheme**

### Alarm buttons, door sensors, etc

Alarm buttons, door sensors, ignition, etc return two states: high or low voltage. Digital inputs should be used to read this information. Figure 12 below shows how to connect alarm button, door sensor, etc.
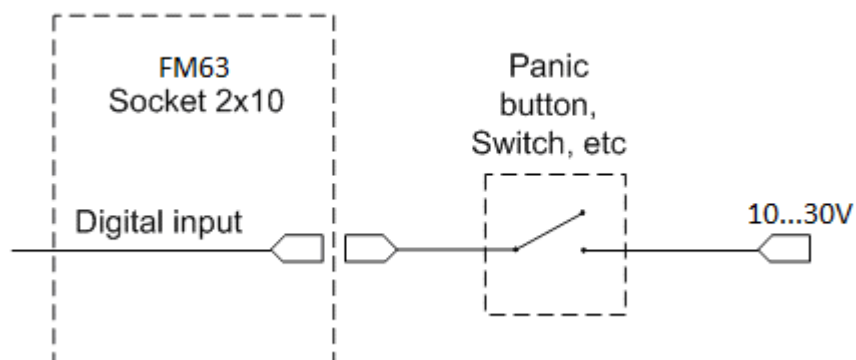


**Figure 12 Panic button connection**

In cases when sensor output signal is negative an additional relay has to be installed to convert negative signal to positive.
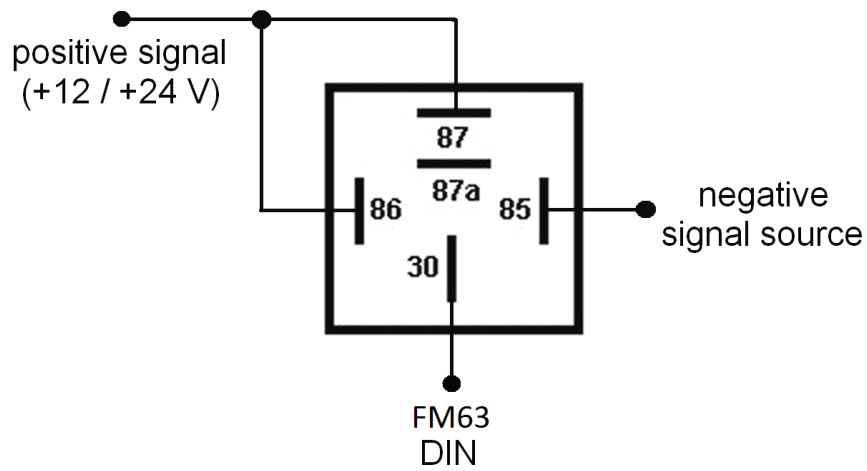
**Figure 13 Inverting relay connection**

### Immobilizer relay

When connected a shown below, FMB630 disables engine starter when output is ON. More details about relays can be found below.
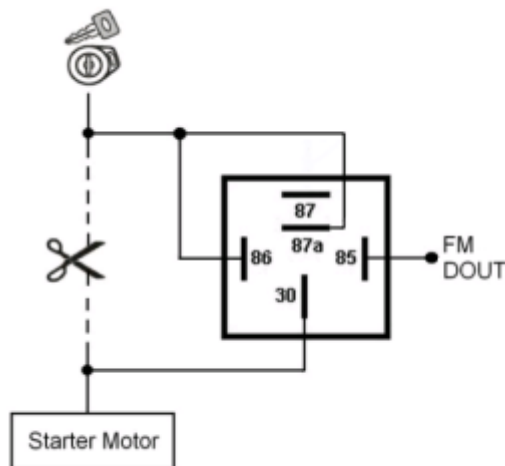
**Figure 14 Immobilizer relay connection**

### Relays

A simple automotive relays is used to invert input signal or to immobilize engine starter. Note, that they are available as 12 or 24 Volt.
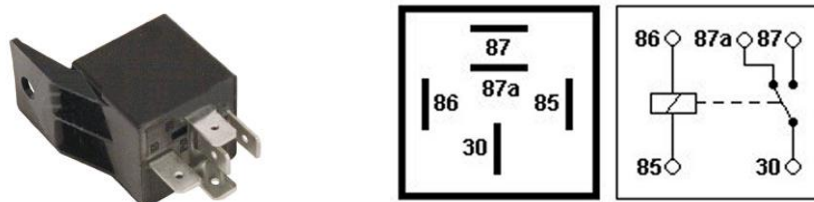
**Figure 15 Relay pinout**

**LV-CAN200**

Light vehicle CAN adapter, which allows to read CAN data from light vehicles. LV-CAN200 supports more than 1200 models of vehicles.

Readable data:

- Vehicle Driven Distance
- Total fuel consumption
- Fuel level (Dashboard)
- Engine speed (RPM)
- Vehicle speed (wheel)
- Acceleration position



**Figure 16 LV-CAN200 adapter**

Technical details:
- Power supply (+9… +50)V DC
- Power supply current:
    - o   Active mode max 50mA
    - o   Standby mode max 2mA
- Working temperature -40..85 ºC
- Max working humidity 85 % (non condensate)

Information about LV-CAN200 installation schemes will be provided individualy by sales representative.

**ALL-CAN300**

ALL-CAN300 is designed to acquire CAN data from any kind of transport (light vehicles, trucks, buses, agriculture transport, special transport). ALL-CAN300 supports more than 1800 models of vehicles.



**Figure 17 ALL-CAN300 adapter**

Supported OnBoard computer data:
- Ignition indication
- Vehicle mileage
- Vehicle speed
- Total fuel consumption
- Fuel level (Dashboard)
- Acceleration position
- Engine temperature
- Engine working
- Engine lifetime
- Alarm
- Driver's seat belt
- Passenger's seat belt

Technical data:
- Power supply (+9… +50)V DC
- Power supply current:
  o Active mode max 50mA
  o Standby mode max 2mA
- Working temperature -40..85 ºC
- Max working humidity 85 % (non condensate)

# 4 FIRMWARE

## 4.1 Updating firmware using USB cable

FMB630 functionality is always improving, new firmware versions are developed. Current module firmware version can be retrieved from configurator. See configuration description for details.

**Contact sales manager to get the latest firmware.**

Connect FMB630 to PC with USB cable. Launch "Firmware Updater", select COM port, click connect and update. Update process may take up to several minutes.
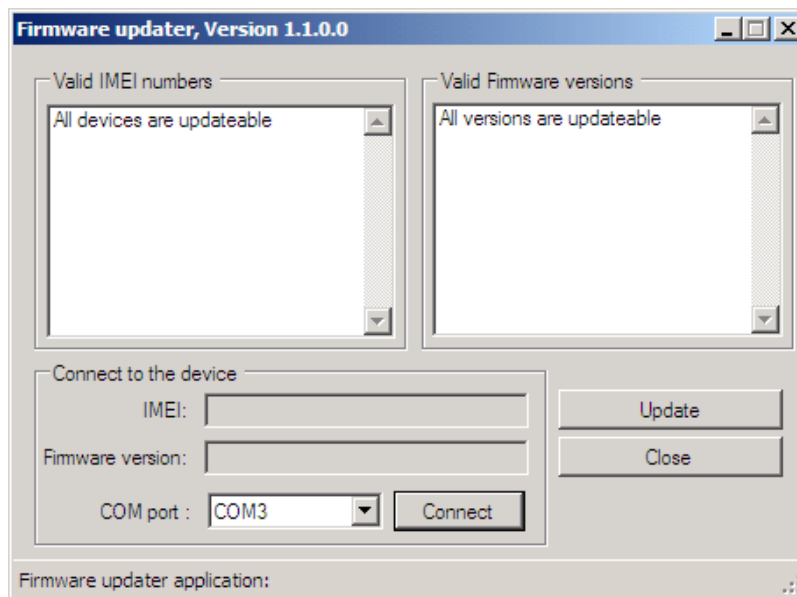


**Figure 18 FM updater screen**
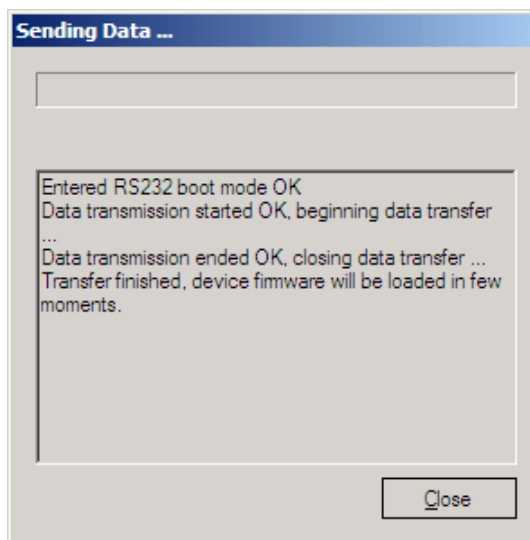


**Figure 19 FM firmware updating finished**

## 5   OPERATIONAL BASICS

### 5.1   Operational principles

FMB630 module is designed to acquire records and send them to server. Records contain GPS and I/O information. Module uses GPS receiver to acquire GPS data and is powered with 3 data acquire methods: time-based, distance-based and angle-based. Method's details are described in Data Acquisition chapter 9. All data is stored in flash memory and later can be sent via GPRS or SMS channels. GPRS mode is the most preferred data sending mode. SMS mode is mostly used in areas without GPRS coverage or when GPRS usage is too expensive.

GPRS and SMS settings are described in chapters 6.3.5.1 and 6.3.5.3. FMB630 communicates with server using special data protocol. Data protocol is described in device protocols documentation. Please contact Teltonika sale manager to find out more about protocols documentation purchase.

FMB630 can be managed by SMS commands (SMS Command list is described in SMS Command List section) and GPRS commands (GPRS Command list is described in GPRS Command List section). Module configuration can be performed over TCP or via SMS. Configuration parameters and modes are described in device protocols documentation.

### 5.2   Operational Modes

FMB630 is designed to operate in two different modes: Normal Mode and Deep Sleep Mode (Standby mode). Normal Mode means that FMB630 is fully functional and performs all the functionality mentioned above in Operational principals section.

Deep Sleep Mode is designed to dramatically reduce power consumption. It is a separate mode and certain conditions must be fulfilled to switch from Normal operation and enter this mode. Detailed information about how FMB630 enters/exits Deep Sleep Mode and what functions does FMB630 perform while in this mode can be found in chapter 11.

### 5.3   Accelerometer

FMB630 has a built in 3 axis accelerometer which allows the device to indicate if vehicle is moving or not, as well as measure acceleration. Accelerometer sensitivity can be configured – it has 2 configurable global parameters: start and stop timeouts that define time intervals in seconds. To indicate that a vehicle is moving, FMB630 constantly (in frequency of 50 Hz) checks for g force change on X, Y and Z axes. If measured g force keeps exceeding the set limit (it is not configurable) for defined time interval in "Movement Filter Start" field (Figure 20), then the vehicle is considered as moving. Same settings for idle indication apply – if g force change is less than the set limit for time interval defined in "Movement Filter Stop" field then the vehicle is considered as idle (not moving).

Example for default parameters: Movement Filter Start = 1 and Movement Filter Stop = 30 means that movement will be detected after 1 second and stop will be detected after 30 seconds of inactivity.

**Figure 20 Accelerometer settings**

## 5.4 Virtual Odometer

Virtual odometer is used to calculate travelled distance in FMB630 as a separate I/O element. When FMB630 detects movement, it starts counting distance using GPS signal: every second it checks current location and calculates distance between current and previous point. It keeps adding these intervals until it is time to make a record, then FMB630 records its location and adds odometer value, which is equal to the sum of all distances, measured every second. When record is made, odometer resets to zero and distance calculation starts all over again.

Virtual odometer as an I/O element can be also used with Trip feature, read chapter 6.3.6.3.

## 5.5 Profiles

FMB630 has 4 profiles saved in Flash memory of the module. Every profile has a list of parameters, which enables FMB630 to operate in different modes while using different profiles. The easiest way to understand what is a profile is to compare it to a list of instructions that are written for different cases. You are allowed to setup up to 4 different module behaviours. Global parameters contain settings that are common for all 4 profiles. This means that if FMB630 is set to call to predefined number, you will be able to call it while using any profile.

Profile 3 is default profile for FMB630. It is always loaded on the very first start-up and further profile switching is proceeded after operator scan or I/O element changes.

Switching between profiles (changing behaviour) can be performed by GSM Operator (mostly used for roaming applications), or by Profile switching depending on I/O Event (on I/O value changing). More information about Profile switching functionalities can be found in chapters 7.1 (Switching by GSM Operator) and 7.2 (Switching by I/O Element).

## 5.6 Features

Using available features can greatly increase FMB630 usability options.

### 5.6.1 Scenarios

Six scenarios are available on FMB630 device:
- Any Digital Output can be used by scenarios: Authorized Driving/Immobilizer, iButton notification, ECO driving/Green driving, Overspeeding and Jamming detection.
- Excessive idling don't use Digital Output

#### 5.6.1.1 ECO driving/Green driving Scenario.
Gives the ability to periodically monitor driving characteristics and warn the driver against over accelerating, braking or cornering. More about ECO driving/Green driving read in chapter 12.1

### 5.6.1.2  Over Speeding Scenario.

Helps to prevent from exceeding fixed speed and inspects driver if needed. Any DOUT (which is configured) is controlled by scenario for user needs, to manage buzzer, LED etc.

### 5.6.1.3  Authorized Driving and Immobilizer Scenario.

Gives ability to use vehicle for 500 specific iButton owners (specified in iButton list). Any DOUT (which is configured) is controlled by scenario for user needs, to manage buzzer, LED etc.

Vehicle can be used only if iButton is connected. In this scenario iButton list is not used - connect any iButton to pass Immobilizer security. Any DOUT (which is configured) is controlled by scenario for user needs. DOUTX is continuously OFF. DOUTX turns ON if Ignition turns ON (Din1=1). After iButton ID is read (any iButton is attached), DOUTX turns OFF. After iButton identification DIN1 (ignition) can be turned OFF (Din1=0) for no longer than 30 seconds, otherwise immobilizer must be repeated.

### 5.6.1.4  iButton notification.

scenario is introduced. If scenario is enabled, when iButton is attached and is successfully read, configured DOUT goes ON for configurable amount of time (min: 0.1 s; max: 10.00 s; default: 0.5 s). If Immobilizer scenario is enabled and iButton's indication scenario is enabled and the same DOUT controls are chosen then in case iButton is attached DOUT is not affected.

iButton's event generation works as a standard IO event generation

### 5.6.1.5  Excessive idling.

If ignition (DIN1 or Power Voltage) is on and vehicle is not moving, FMB630 after configured time period generate event. When vehicle starts moving FMB630 after configured time period generate event that vehicle idle time ends.

### 5.6.1.6  Jamming detection.

Radio jamming is the (usually deliberate) transmission of radio signals that disrupt communications by decreasing the signal to noise ratio. When jamming detection is enabled, FMB630 informs (with buzzer or LED, connected to any DOUT) driver about jamming event.



Note: Authorized Driving and Immobilizer Scenarios are combined into a single scenario.



Note: All scenarios can be activated at the same time and one DOUT can control all scenarios.

### *5.6.2   Trip*

Trip customizable feature enables user extended monitoring of performed trips (from engine start at present location to engine stop at arrived location), log their start and stop points, view driven total distance. Event will be **generated (included into send records) only** when trip starts and finishes.

### *5.6.3   Geofencing*

Geofencing is another feature which is highly customizable and can detect wherever a car enters or leaves customized areas. More about Geofencing can be read in chapter 6.3.6.4.

### 5.6.4 Auto Geofencing

Auto Geofencing feature, if enabled, is activated automatically by turning off car ignition. Next time before driving user has to disable Auto Geofencing with iButton or by turning on car ignition. In case of theft, the car leaves Auto Geofencing zone without authorization and FMB630 device automatically sends high priority record to AVL application.

### 5.6.5 iButton list

IButton list is used to enter authorized iButton ID codes, which are used to authenticate driver in Authorized driving and Auto Geofencing options.

# 6 CONFIGURATOR

## 6.1 STARTUP

FMB630 configuration is performed via FMB630 Configurator program. FMB630 Configurator can be downloaded from <u>FMB630 Downloads</u>. Contact sales manager to get the latest FMB630 Configurator version. FMB630 configurator operates on Microsoft Windows OS and uses MS .Net Framework 3.5 or higher. Please ensure that MS .Net Framework 3.5 or later is installed on your PC before starting configurator. Latest MS .Net Framework version can be downloaded from official Microsoft web page.

Module configuration is performed over USB cable or COM connection. Configuration process starts from starting FMB630 Configurator program and then connecting to FMB630 device via "Connect" button located on the top left corner of configurator. If one of the communication sources (USB cable or COM2) is connected to the device, the configurator will detect it automatically and if connected successfully IMEI, version fields, which were empty, now are filled with certain numbers depending on Modem IMEI and firmware version of your device (Figure 21).
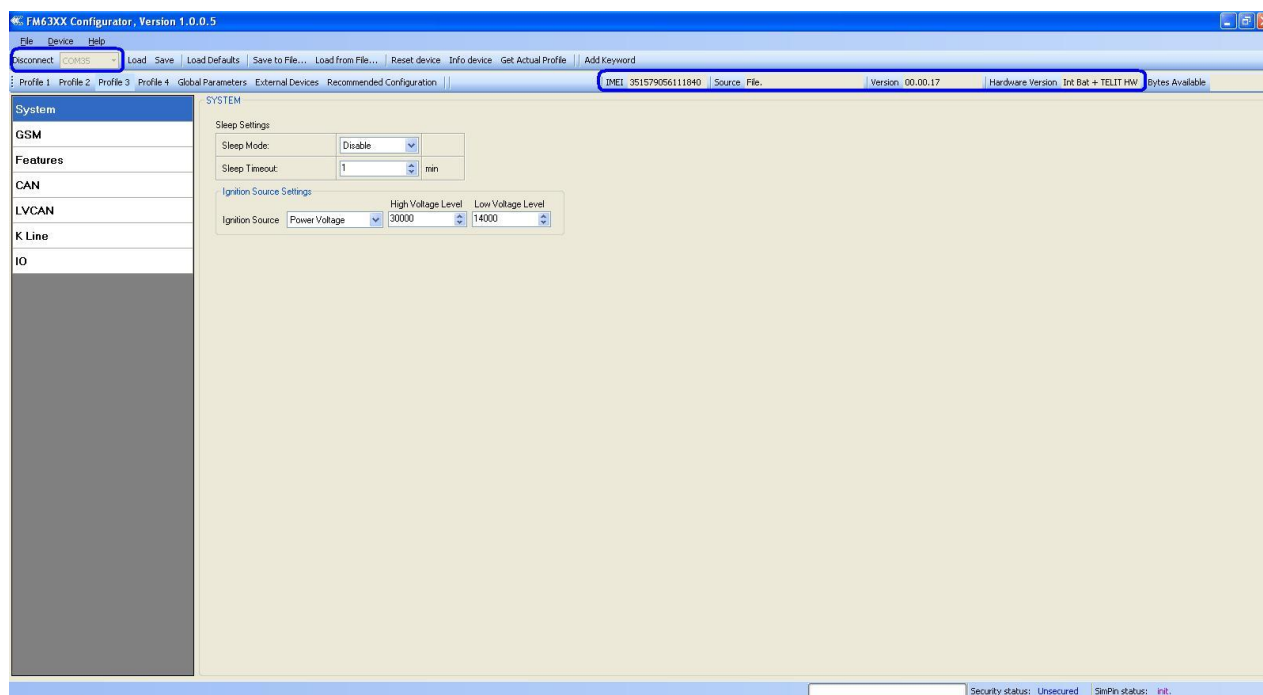


**Figure 21 FMB630 Configurator window**

## 6.2 Configurator structure

FMB630 has four user editable profiles, which can be both loaded and saved to the device. User can also revert to default settings, by pressing Load Defaults button. Any modification of configuration settings has to be saved to FMB630 device, otherwise it will not be written to device flash memory.

FMB630 Configurator is divided into 5 main areas (Figure 22):
1. Buttons area;
2. Information area;
3. Profiles or global parameters selection area;
4. Settings menu;
5. Configurable parameters and values menu.
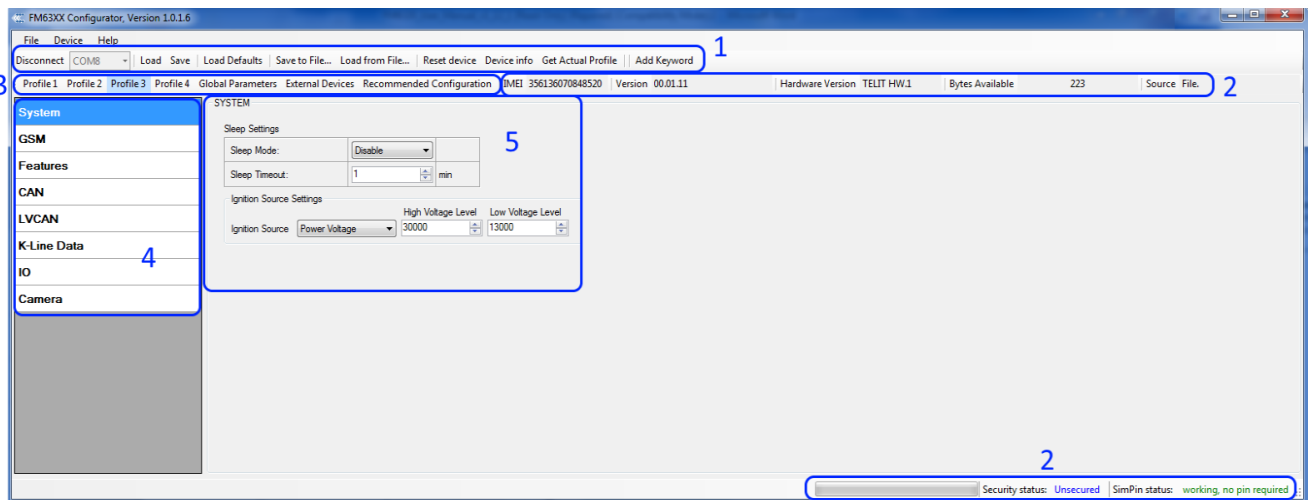


**Figure 22 FMB630 Configurator window structure**

### 6.2.1 Buttons area

**Table 8 Configurator buttons area description**

| Main Buttons | |
|---|---|
| **Button** | **Description** |
| Connect | connects the device |
| Load | reads configuration parameters from FMB630 Flash memory |
| Save | saves configuration parameters to FMB630 Flash memory |
| Load Defaults | loads default FMB630 settings that later can be modified |
| Save to File… | allows user to save currently entered settings to .XML or .Bin file for later usage or update over FOTA. |
| Load from File… | allows user to load configuration saved in .XML or .Bin extension file |
| Reset device | reboots FMB630 and displays processor firmware version |
| Info device | allows user to see actual device I/O's information |
| Get Actual Profile | Informs user about active profile |
| **Additional Buttons** | |
| **Button** | **Description** |
| SIM PIN | allows to enter PIN code if inserted SIM card has activated PIN code security |

| | |
|---|---|
| *Add Keyword[4] /* *Change Keyword /* *Switch Security Off* | buttons are used to protect configurator from unauthorized access to configuration |

### 6.2.2 Information area

FMB630 information area is divided into 2 parts located on the top right and bottom of the configurator. When configurator is connected to the device via USB or COM2 port all necessary information about the device is shown here:

- IMEI – unique number for every FMB630 and usually servers recognize different devices by this number;
- Version – firmware version of the device;
- Hardware version – hardware version of the device;
- Bytes available – shows how much bytes remains in configugration.
- SOURCE – configuration source (device or file);
- STATUS – status bar;
- SECURITY STATUS – status of the configurator security;
- SIM PIN STATUS – status of SIM card in the device;

### 6.2.3 Profiles/global parameters selection area

FMB630 has 4 user editable profiles stored in Flash no. 1-4 memories and one extra profile stored in Flash no. 0 which cannot be edited by user. Profile from Flash no. 0 is used by system and cannot be selected as active, while profiles from Flash no. 1-4 are fully editable and can be selected as active.

Reading profiles, Global parameters and External Devices from Flash memory is a very simple procedure. By pressing "Load" button all 4 profiles, Global parameters and External Devices are loaded to the configurator (Figure 23). To configure 3$^{rd}$ profile choose the TAB named "Profile 3" and all configurable parameters of this profile will be available to change.
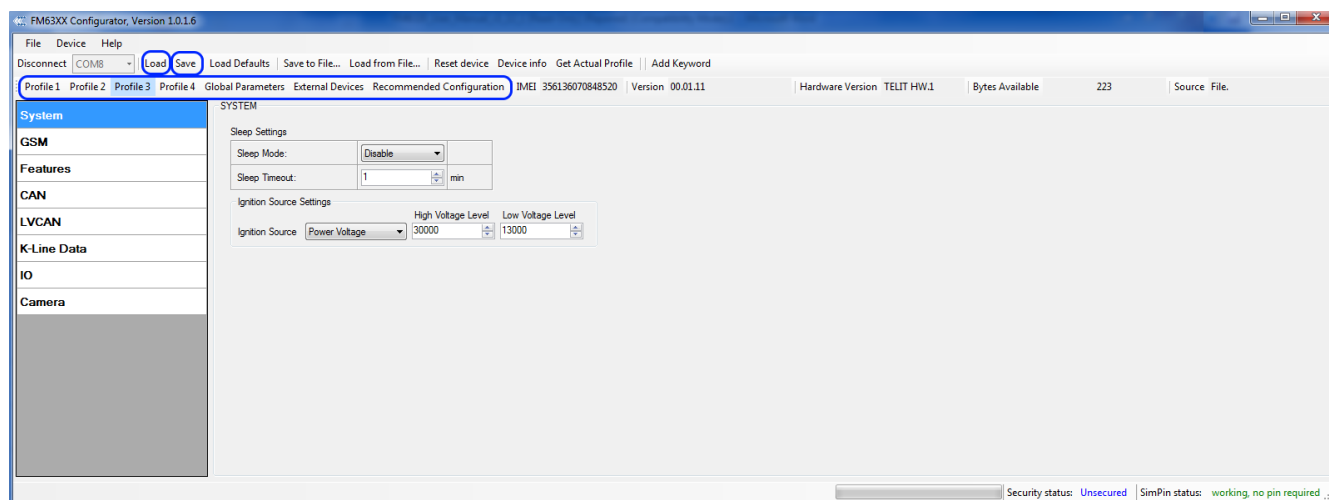


**Figure 23 FMB630 Configurator profiles loading window**

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[4] Keyword is of 4 - 10 symbol length (Latin text and/or numbers). If a keyword is set, every time user reconnects FMB630 to USB or COM ports he will be asked to enter a valid keyword when connecting FMB630 to configurator. User is given 5 attempts to enter a valid keyword before blocking the configurator.

After changing profile, Global parameters and External Devices, changes can be saved to FMB630 Flash. By pressing "Save" button all 4 profiles, Global parameters and External Devices are saved to the Flash (Figure 24).



**Figure 24 FMB630 Configurator profiles saving information**

## 6.3 Parameters Configuration

### 6.3.1 Global parameters Settings

Global parameters do not depend on selected profile; they are common for all profiles. To configure these parameters choose the TAB named "Global Parameters" and make all necessary changes (Figure 25)
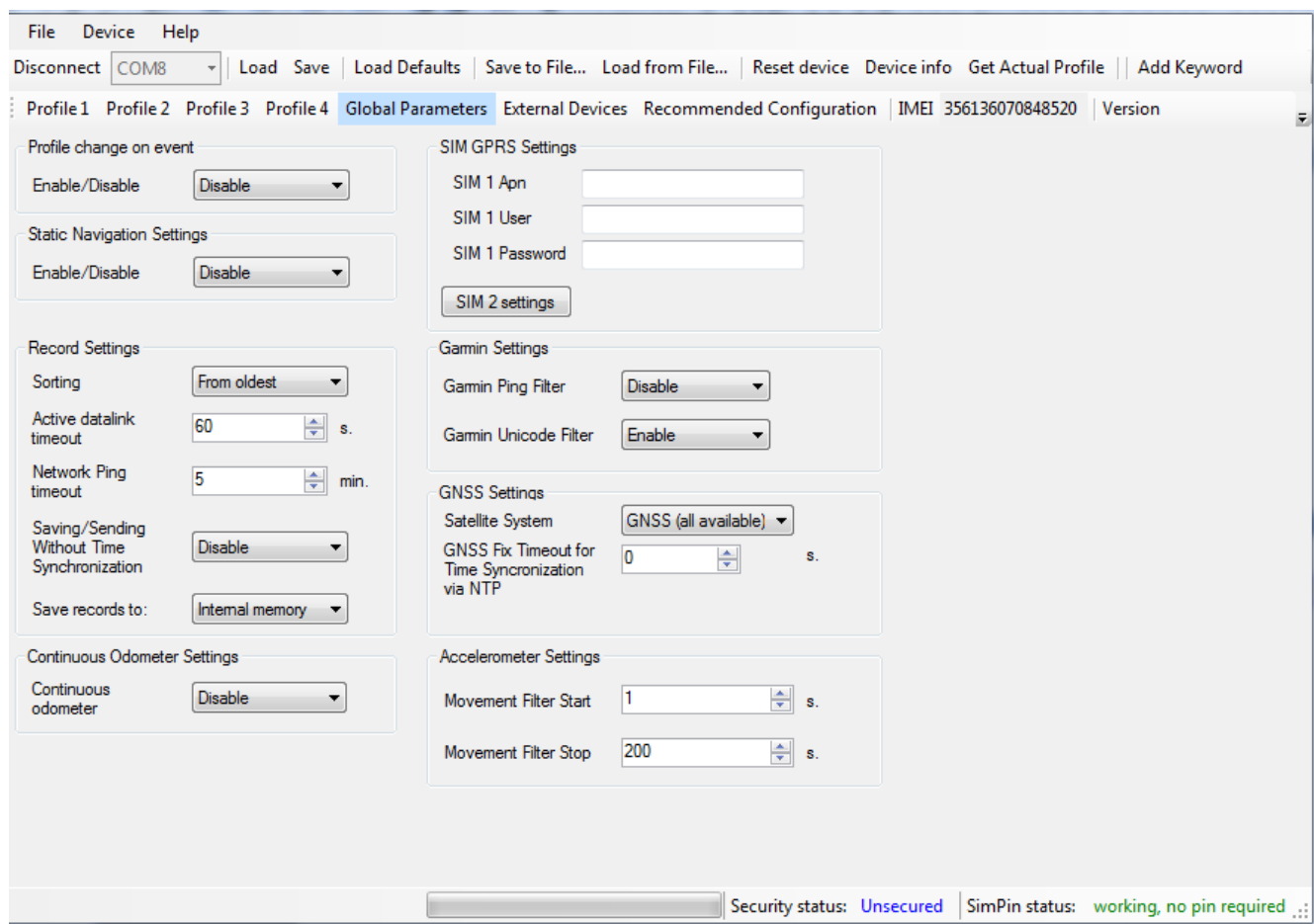


**Figure 25 FMB630 Global parameters**

**Table 9 Global parameters description**

| Parameter Name | Parameter description |
|---|---|
| Profile change on event | Allows selecting profile switching method. When 'Profile change on event' is disabled – FMB630 switches profiles depending on GSM operator code method. Otherwise it switches profiles depending on I/O events. |
| Record Settings | Are used to switch between two data sending modes: starting from |

| Parameter Name | Parameter description |
|---|---|
|  | newest records or starting from oldest record. Active data link timeout defines how many seconds should FMB630 keep connection to the server before disconnecting after successful data transfer. Note that even if it disconnects from server, it always keep active GPRS session. |
| Accelerometer settings | Defines accelerometer how many seconds should movement be detected by accelerometer in order to set movement for FMB630 application and how many seconds after movement is not detected by accelerometer FMB630 application should treat like movement is still there. |
| Static Navigation settings | Functionlity filters GNSS data and filters GNSS jums till movement or ignition detected. Parameter can be enabled or disabled. |
| GNSS Settings | Allows choosing satellite systems – GNSS(all available), GPS, GLONASS, GNSS+SBAS, GPS+SBAS |
| Continuous Odometer settings | Allows enabling or disabling functionality and start value setting. |
| Garmin settings | Allows enabling or disabling functionality and Unicode. |
| DualSim GPRS Settings | Allows to enter Sim Apn, user name and password. |
| Tachograph settings | Allows to choose ignition source for tachograph. |

### 6.3.2 External Devices Settings

External Devices do not depend on selected profile; they are common for all profiles. To configure these parameters choose the TAB named "External Devices" and make all necessary changes (Figure 26)



**Figure 26 FMB630 External Devices**

**Table 10 Global parameters description**

| Parameter Name | Parameter description |
|---|---|
| FMS/Tachograph Settings | Are used to configure CAN line and Tachograph setting such as Enable/Disable, baudrate, operation mode, tachograph ignition source, tachograph type. |
| Web DDD | User can enable Web DDD synchronization functionality, enter WebDDD server domain and port. |
| Analog Input Settings | User can change the range of analog inputs. There are two possible changes: 10 V (0-10 V) and 30 V (0-30 V). |
| COM1 and COM2 Settings | Configures COM1 and COM2 ports. User can configure baudrate, working mode, enable/disable timestamp and change CMD ID(used to identify from which COM port data came). |
| RS485 Settings(COM1) | Configures RS485 settings such as activation of RS485 protocol, baudrate and working mode. |
| LLS Sensor Settings | Allows user to set LLS sensors addresses in preffered order |
| Network Time Protocol | GNSS Settings, where you Enables/Disables time synchronization from NTP server when there is no valid GPS signal from satellites |

### 6.3.3 Settings and configurable parameters menu

Every FMB630 profile has seven main groups of parameters:
1. System – main parameters for all device;
2. GSM has 7 subgroups:
   a. GPRS
   b. GPRS Limits
   c. SMS Security
   d. SMS Data
   e. SMS Events Numbers
   f. SMS Events
   g. Operator list
3. Features has 6 subgroups:
   a. sMode
   b. Scenarios
   c. Trip
   d. Geofencing
   e. Auto Geofencing
   f. IButton List
4. CAN
5. LVCAN
6. I/O
7. Camera

### 6.3.4 System Settings

System settings have 2 configurable parameters (Figure 27):
- Sleep settings, where user can disable sleep, turn on or deep sleep.

- Ignition source settings, for choosing which ignition source prefer to use DIN1, DIN2, DIN3, DIN4, Movement or External Voltage. While using External Voltage levels must be set.



**Figure 27 System Settings Configuration**

When Vehicle Alternator is working supply voltage is usually 2-4 Volts higher than nominal battery voltage. By such difference FMB630 can identify when engine is on.

**Example:**

High Level: 15000
Low Level: 13000

If External Voltage 14V, then ignition is ON.
If External Voltage 12V, then ignition is OFF.
If External Voltage 16V, then ignition is OFF.

### 6.3.5   GSM Settings

### 6.3.5.1   GPRS

'GPRS' defines main parameters for FMB630: destination server Domain (can be entered either IP or domain name) and port. Also both TCP and UDP protocols are supported. Server Response Time defines the time how long device will wait for response from server before device denies the connection between FMB630 and server.
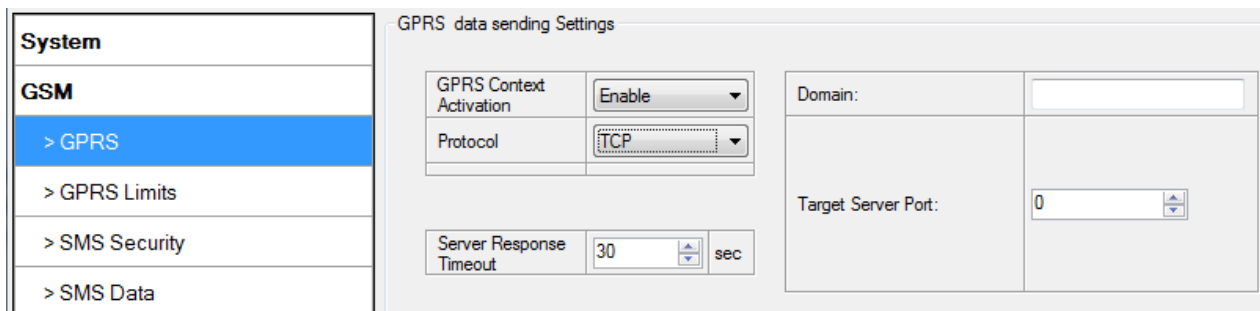
**Figure 28 GSM->GPRS Settings Configuration**

### 6.3.5.2  Data limits functionality

Data limit can be configured for Home and Roaming Separately. Currently Min Settings for Home and Roaming are 1MB. User can choose to get SMS notification (in SMS Events section) if Data limit has been reached. SMS is send only one time.
User can get current status of datalimits using SMS: **'getlimits'**.
User can reset data limits using SMS: **'resetlimits'**.
These SMS can be GPRS commands too. When data limit will be hit following scenario will be executed:

*In TCP mode:*

Open GPRS only if there is high or panic Priority. Send only high or panic priority. Low priority records sending will recover on month 1 day.

*In UDP mode:*

Open GPRS only if there is high or panic Priority. Send only high or panic priority. Low priority records sending will recover on month 1 day.

### 6.3.5.3  SMS Security

Essential fields in 'SMS Security' part is 'SMS Login' and 'SMS Password' (Figure 29). This login and password is used with every SMS sent to FMB630. If login and password are not set, every SMS sent to FMB630 device has to include two spaces before command (<space><space><command>).
Command structure: *<login><space><password><space><command>.*
Examples:
1. SMS login and password are set - "asd 123 getgps"
2. SMS login and password are not set - " getgps"

Phone numbers have to be written in international standard, without using "+" or "00" signs in prefix. **If no numbers are entered in configuration then commands SMS are allowed to be sent from all GSM numbers.**

**Figure 29 GSM->SMS Settings Configuration (1)**

### 6.3.5.4 SMS Data

SMS data sending Settings enables or disables **periodic** data and event SMS sending to server (Figure 30). Configuration is divided into 4 main parts:

1.  SMS data sending settings;
2.  SMS Week Time button;
3.  Server Phone Number (has to be written in first position of Authorized phone numbers);
4.  SMS Events PreDefined Numbers (phone numbers, to which SMS [has to be written in SMS Event Numbers section] events will be sent);
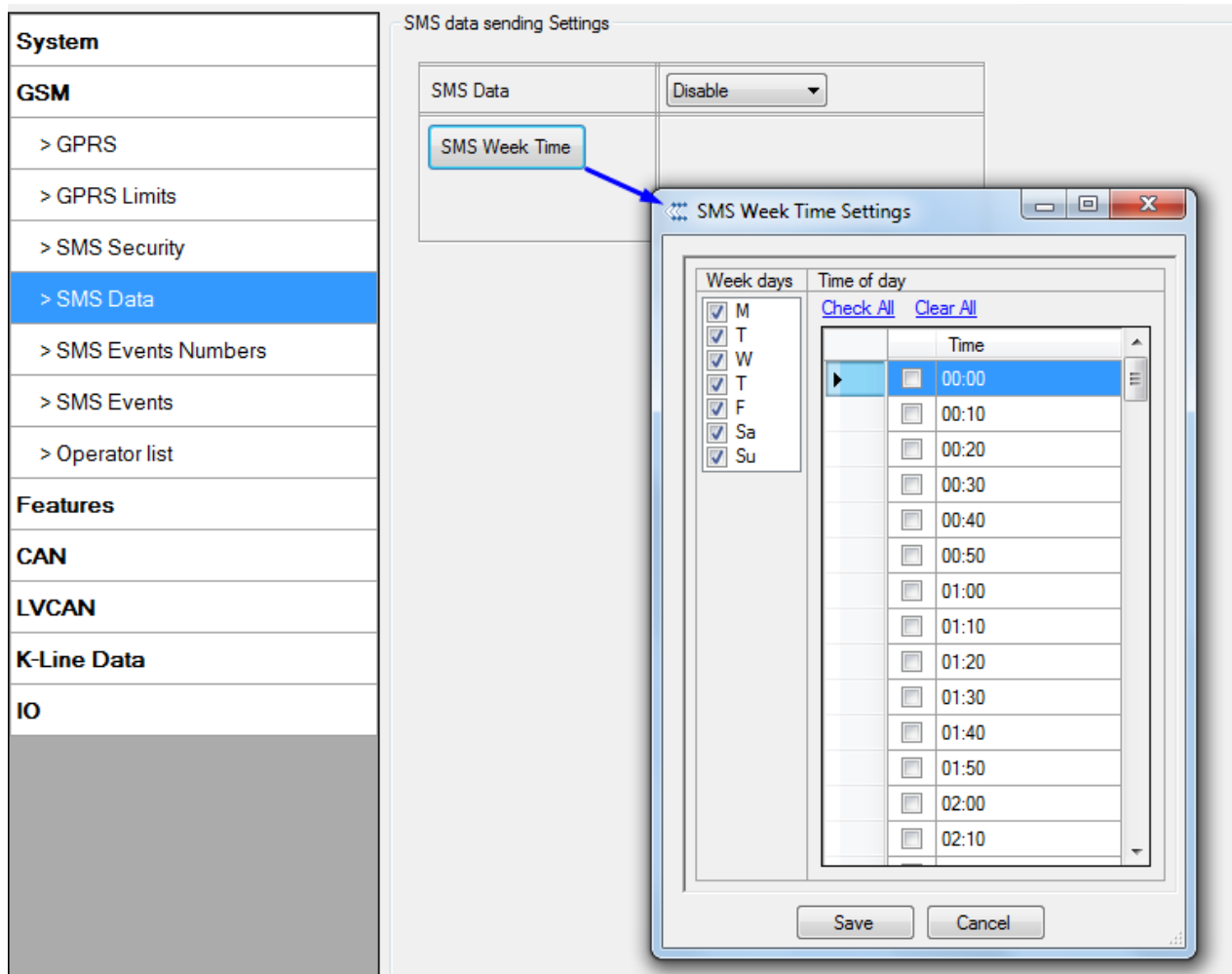
**Figure 30 GSM->SMS Settings Configuration (2)**

Using these settings FMB630 can send SMS with 24-coordinates in one SMS; it is used in areas where no GPRS coverage is available. Module collects data and sends to server binary SMS containing information about last 24 collected points. SMS sending schedule is set in SMS Week Time tab. 24-Coordinates SMS decoding is described in device documentation document. Please contact Teltonika sale manager to find out more about protocols documentation purchase.

**6.3.5.5  SMS Events**

FMB630 is able to send SMS messages to PreDefined phone numbers (recipients) if any of selected events are triggered. User can send SMS alert message of selected event to maximum 10 preDefined phone numbers. AVL ID of parameter has to be entered in configuraton to receive its SMS event (Figure 31). PreDfined phone numbers must be entered in SMS Events Numbers list. Maximum 10 recipients are allowed in SMS Events Numbers list (Figure 32).

**Figure 31 FM63 SMS events List Configuration**



**Figure 32 SMS Events Numbers list**

### 6.3.5.6 Operator List

FMB630 is able to use GPRS with all operators but if any operator is entered in the preferred operator list, FMB630 is allowed to connect to GPRS only when operating in listed operator's network. Also operator list has influence on profile switching (see details in chapter 7.1) if Global parameter "Profile switching on event" is disabled.

FMB630 will not connect to GPRS using network of operator which is listed in black list.
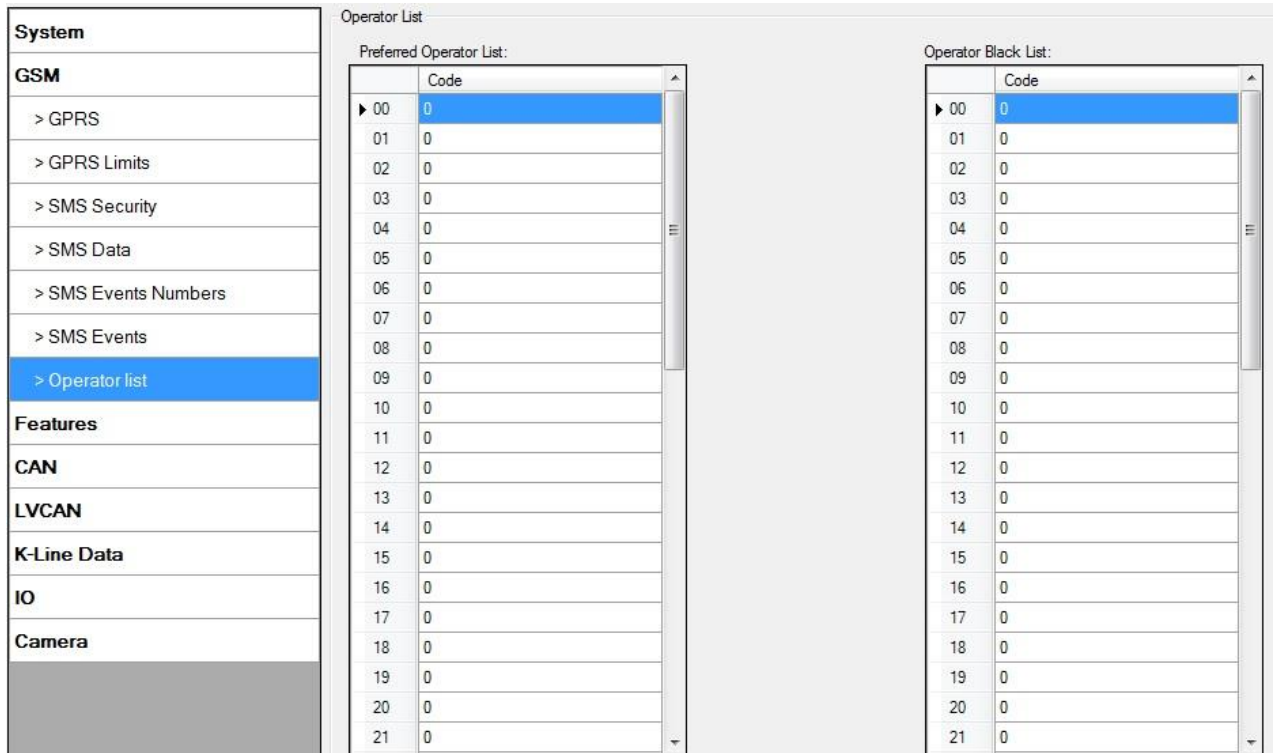


**Figure 33 FMB630 Operator List Configuration**

### 6.3.5.7 Connecting to device via Bluetooth

FMB630 supports Bluetooth. We are in a transaction mode at the moment and releasing FMB630 with integrated Bluetooth. Functionalities supportd by Bluetooth will be announced soon.

### *6.3.6 Features*

### 6.3.6.1 sMode

FMB630 is able to collect records using four methods at the same time: time, distance, speed and angle based data acquisition (Chapter 9) Send and Save Parameters configuration is available in Features->sMode category (6.3.6.1):

- Min Period – time period change that initializes record save.
- Min Angle – angle change that initializes record save (only if vehicle is moving).
- Min Distance – distance change that initializes record save (only if vehicle is moving).
- Send period – GPRS data sending to server period. Module makes attempts to send collected data to server every defined period. If it does not have enough records (depends on parameter Min. Saved Records described above), it tries again after defined time interval.
- Min speed – minimal speed the vehicle has to move in order to save record (only if neither Min Angle nor Min Distance was triggered).
- GPRS Context Week Time tab – most GSM billing systems charge number of bytes (kilobytes) transmitted per session. During the session FMB630 makes connection

and transmits data to a server. FMB630 tries to control the session as much as possible. Session can last hours, days, weeks or session can be closed after every connection in certain GSM networks – this depends on GSM network provider. GPRS Context Week Time defines session re-establishing schedule if session was closed by network. New GPRS context is opened if 10 minutes are left till time checked in table. Therefore if all boxes are checked, FMB630 is able to open new connection anytime. At scheduled time match FMB630 checks for GPRS session activity. If GPRS session is alive, FMB630 sends data to server according to Send period parameter. If it is not, FMB630 checks if it is able to re-establish the session.
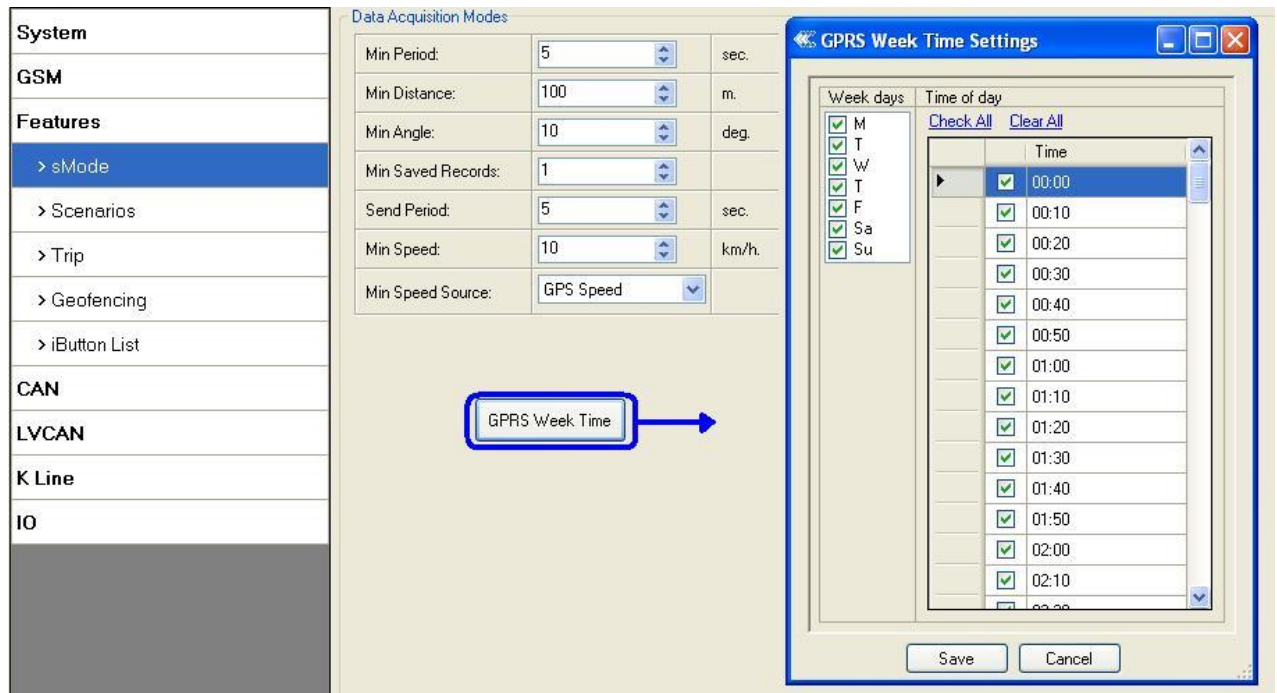


**Figure 34 FMB630 Operator List Configuration**

### 6.3.6.2 Scenarios

In scenarios window six different scenarios are available (Eco/Green Driving, Immobilizer/ Authorizing driving, iButton notification, Excessive Idling, Jamming detection and Over speeding). They have six possible states: disabled, no DOUT control, DOUT1 control, DOUT2 control, DOUT3 control, DOUT4 control (expect excessive idling). Excessive idling scenario has two states: Disable and Enable. All scenarios can be activated at the same time and all scenarios that use DOUT can control the same DOUT. Scenarios configurable parameters are shown in Figure 35. All values of these parameters are described in Chapter 12.
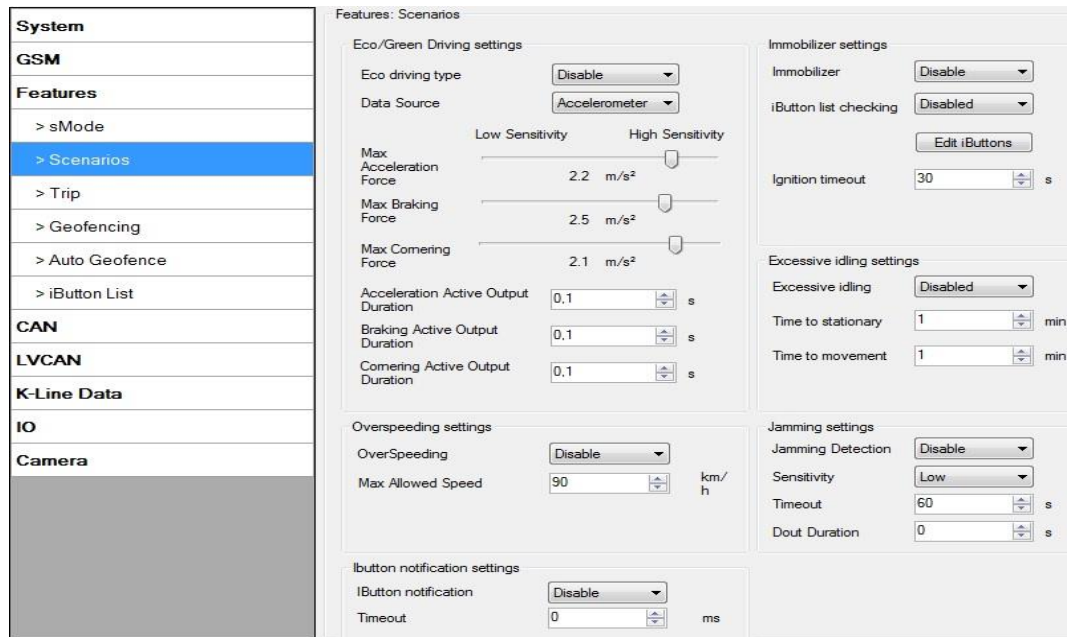
**Figure 35 FMB630 Scenarios configuration**

### 6.3.6.3  Trip

Trip window offers user to configure Trip feature. If Trip is enabled configuration of parameters is available:

- Start Speed – speed, which is detected as minimum speed to indicate Trip start.
- Ignition Off Timeout – timeout to wait if ignition was off, to detect Trip stop.
- Continuous distance counting – Not or Continuous can be chosen in Global parameters (see paragraph"**Global parameters Settings 6.3"**). For this feature I/O Odometer must be enabled.
- Remember iButton ID- Send ibutton value to server while trip is detected
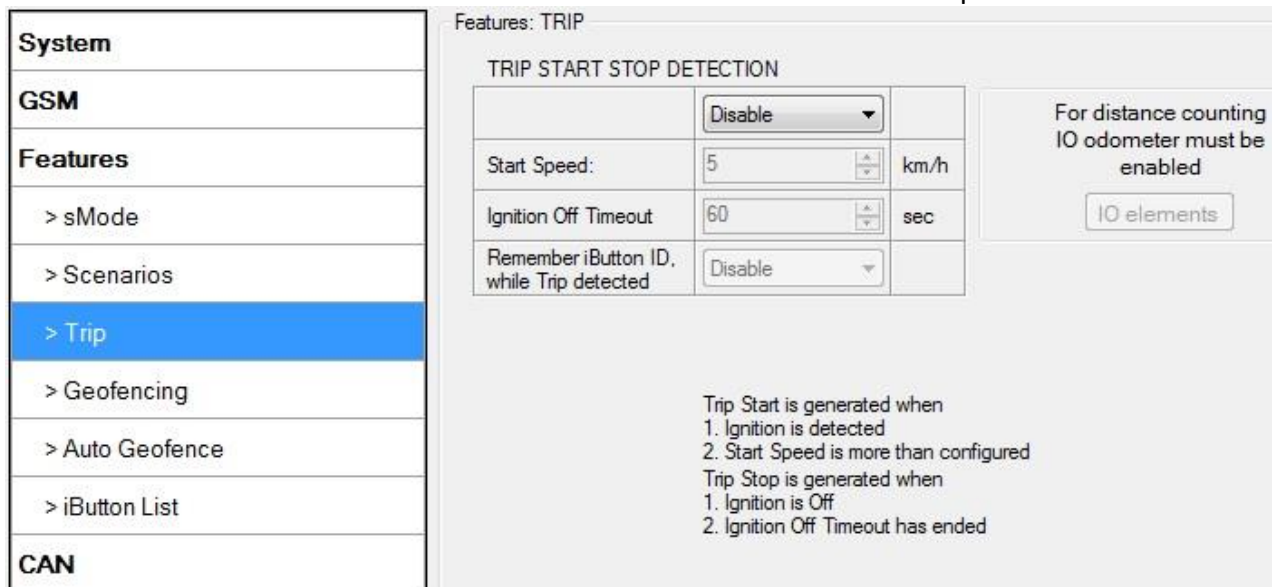


**Figure 36 FMB630 Features->Trip Configuration**

If I/O Odometer is enabled and Continuous distance counting variable is set to Continuous, Trip distance is going to be counted continuously (from Trip start to Trip stop). This value is written to I/O Odometer value field. When Trip is over and next Trip begins, Odometer value is not reset to zero, it is counted continuously again.

If I/O Odometer is enabled and Continuous Distance Counting variable is set to "Not", then distance is going to be counted only between every record made. This value is written to I/O Odometer value field and reset to zero every new record until Trip stops. If later all Odometer values are summed up manually user gets distance driven over the whole Trip period.

When trip is enabled and Remember iButton ID in trip settings is also enabled, device will remember iButton (during trip) when it is attached. Ibutton value will lose after reset. When iButton value is saved, it will be stored in iButton IO and will be added with every record. When new iButton is attached, its ID will be added to iButton IO and old iButton value will be forgotten. When iButton is attached and ignition is not ON, then iButton is saved but value will not be added to IO. If ignition is not attached in Ignition OFF timeout, then iButton value is removed. It is added only when ignition is set on and trip event occurred. The iButton is removed from iButton IO (set to 0) when trip end event occurs.

### 6.3.6.4 Geofencing

**Geofencing settings:**

FMB630 has 20 configurable Geofence zones and it can generate event when defined Geofence zone border has been crossed.
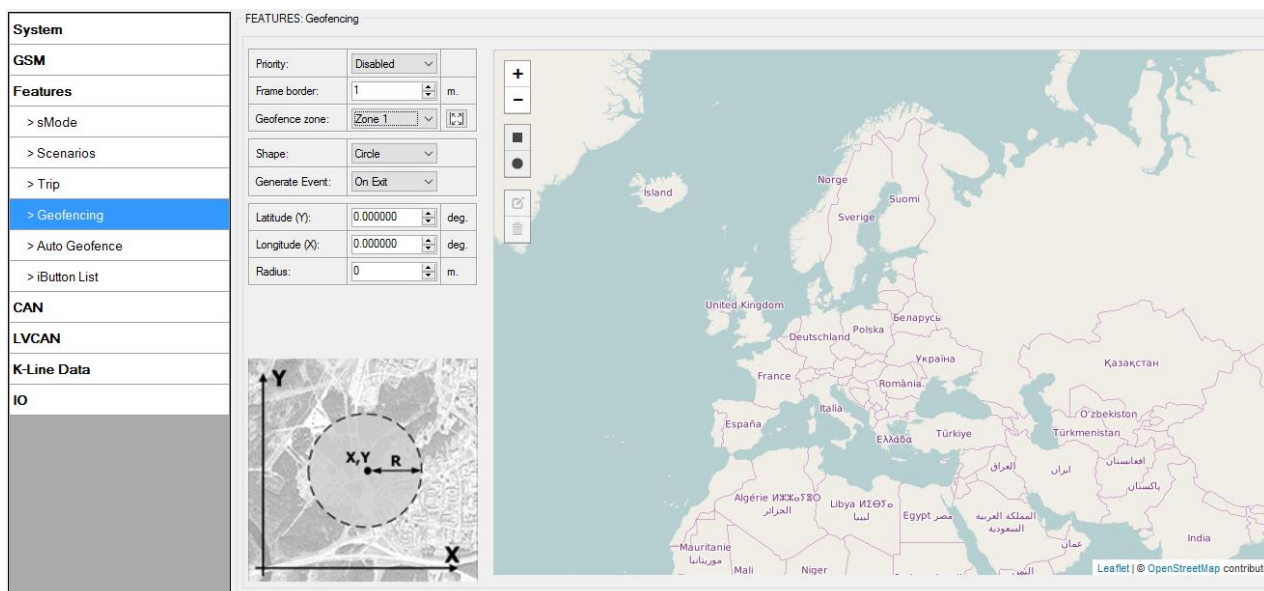


**Figure 37 FMB630 Features->Geofencing Configuration (1)**

Configuration of the parameters is available in Features->Geofencing (Figure 37)

- Frame border – frame border is an additional border around Geofence zone. It is additional area around defined zone used to prevent false event recording when object stops on the border of the area and because of GPS errors some records are made inside area and some – outside. Event is generated only when both borders are crossed. See Figure 38 for details: track 1 is considered to enter the area while track 2 does not.
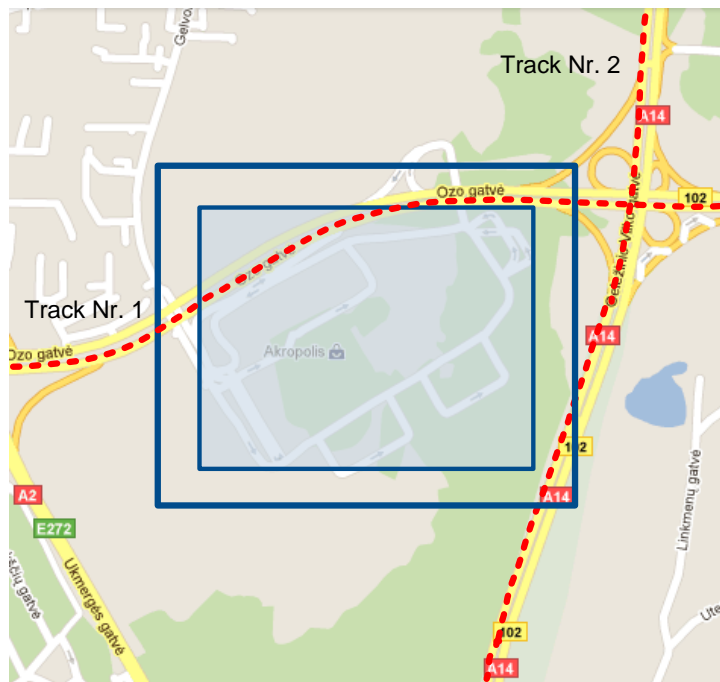
**Figure 38 Geofence border**

- Shape – can be rectangular or circle
- Priority – priority of Geofence event: low, high or panic, SW21, SW22, SW23, SW24. These levels define priority of event information sending to server. See I/O element description for more details about priorities.
- Generate event (On entrance, On exit, On both) – choose when record will be generated (or no event);
- X1 – geofence zone left bottom corner X coordinate;
- Y1 – geofence zone left bottom corner Y coordinate;
- X2 or R – geofence zone upper right corner X coordinate (radius of circle when Circular zone used);
- Y2 – geofence zone upper right corner Y coordinate;

### 6.3.6.5 AutoGeofencing

AutoGeofence – the last known position after movement = off. If your car is being taken away – you can be notified. The shape and size of the geofence zones are configurable. There is a possibility to state whether entering in or out of the geofence triggers an asynchronous message.
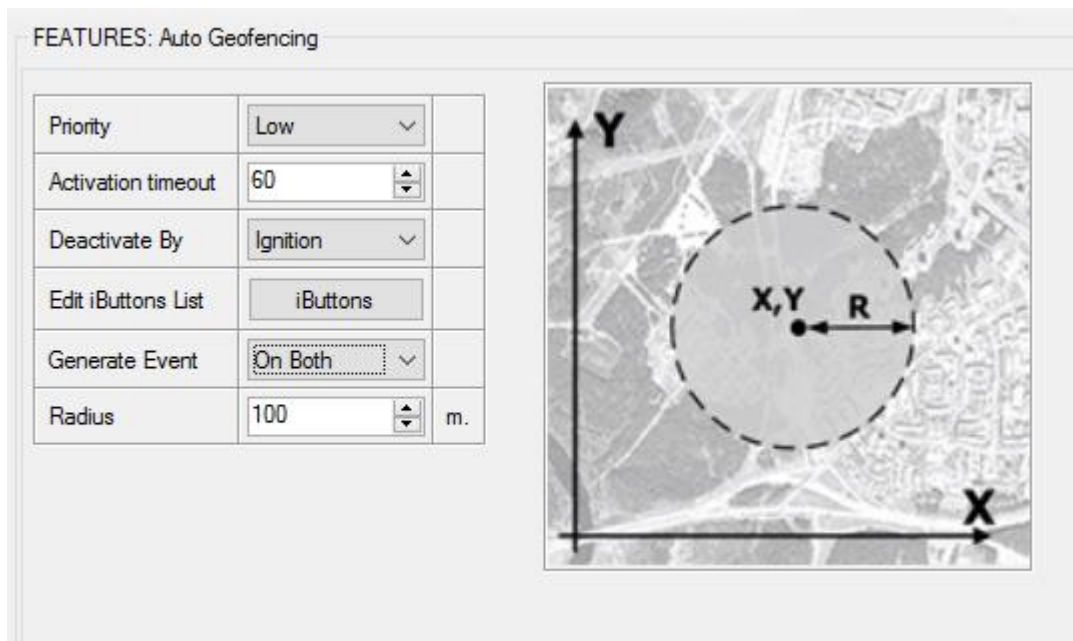
**Figure 39 FMB630 Features->Geofencing Configuration (2)**

Auto Geofencing option can be configured by following parameters (Figure 39):
- Activation TMO – Time period before Geofence is activated after vehicle stops.
- Deactivate By:
    - Ignition – if ignition becomes high it will drop AutoGeofenze Zone
    - iButton – if iButton is attached it will drop AutoGeofence Zone
- Edit iButton List – if list is not empty, attached iButton is tested against iButton list, if match is found AutoGeofence zone is dropped.
- Priority – Priority of generated event, which will be applied to saved record.
- Generate Event:
    - Enter Event – Event generation on Geofence entrance.
    - Exit Event – Event generation on Geofence exit.
    - On Both - Event generation on Geofence entrance or exit.
    - No Event

Auto Geofencing does not require entering coordinates, instead it requires GPS visibility. If vehicle stopped and activation timeout is reached, Auto Geofence will be created around the vehicles last position by set Radius value. Auto Geofence event generation works the same as Geofencing mentioned above.

#### 6.3.6.6 iButton List

iButton list is used to enter authorized iButton ID codes, which are used to authenticate driver in Authorized driving and Auto Geofencing options.
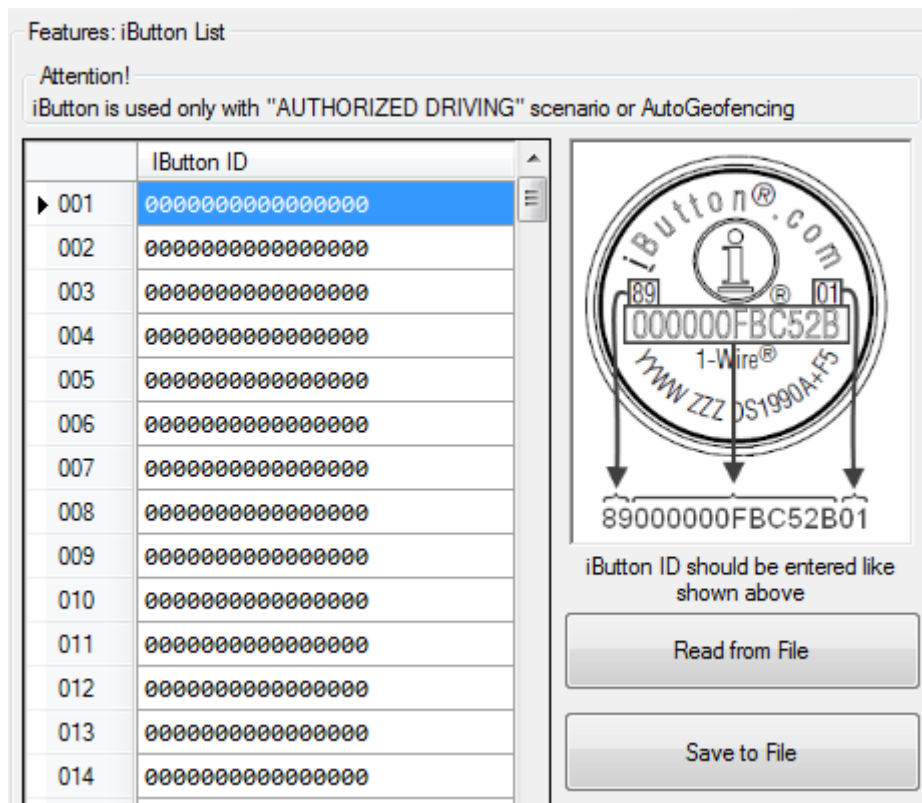
**Figure 40 Features->iButton Configuration**

iButton value must be entered as it is written on it. User can save 500 iButtons to .csv file and read them from same file using *Read from File* and *Save to File* buttons.

### 6.3.7 CAN

CAN - Controller Area Network (CAN or CAN-bus) is a computer network protocol and bus standard designed to allow microcontrollers and devices to communicate with each other and without a host computer.

#### 6.3.7.1 CAN interface parameters

CAN 1 Enable parameter (ID=146)

Parameter enables or disables CAN 1 interface. Possible values: 0 – disable, 1 – enable.

**Table 11 CAN 1 Enable parameter**

| Minimum value | Maximum value | Recommended value | Value type |
|---|---|---|---|
| 0 | 1 | 1 | U8 |

CAN 1 Baud Rate (ID=147)

Parameter defines CAN 1 bus baud rate. For Auto Baud rate ID=760 value is 0. Available baud rates are 50, 100, 125, 250, 500 and 1000 kbps.

**Table 12 CAN 1 Baud Rate**

| Minimum value | Maximum value | Recommended value | Value type |
|---|---|---|---|
| 0 | 1000 | 250 | U32 |

CAN 1 operational mode (ID=148)

Parameter defines if CAN 1 line working at silent mode or normal mode. 0 – Silent, 1 – Normal.

**Table 13 CAN Baud Rate**

| Minimum value | Maximum value | Recommended value | Value type |
|---|---|---|---|
| 0 | 1 | 1 | U8 |

CAN 2 Enable parameter (Used for tachograph) (ID=149)

Parameter enables or disables CAN 2 interface. Possible values: 0 – disable, 1 – enable.

**Table 14 CAN 2 Enable parameter**

| Minimum value | Maximum value | Recommended value | Value type |
|---|---|---|---|
| 0 | 1 | 1 | U8 |

CAN 2 Baud Rate (ID=150)

Parameter defines CAN 2 bus baud rate. Available baud rates are 250, 500.

**Table 15 CAN Baud Rate**

| Minimum value | Maximum value | Recommended value | Value type |
|---|---|---|---|
| 250 | 500 | 250 | U32 |

CAN#0 I/O (ID=x406)

CAN#0 I/O parameter priority

Parameter defines CAN I/O element priority level. There are three possible priorities: 0 – Low, 1 – High, 2 – Panic.

**Table 16 CAN#0 I/O priority**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 2 | 0 | CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | U8 |

CAN#0 I/O HighLevel

Parameter defines high value of triggered I/O property. This parameter is used to set thresholds for CAN I/O properties to generate events.

**Table 17 CAN#0 I/O HighLevel**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 9999999 | 1 | CAN#0 I/O Priority<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | S32 |

CAN#0 I/O LowLevel

Parameter defines low value of triggered I/O property. This parameter is used to set thresholds for CAN I/O properties to generate events.

**Table 18 CAN#0 I/O LowLevel**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 9999999 | 0 | CAN#0 I/O Priority<br>CAN#0 I/O HighLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | S32 |

CAN#0 I/O Logic Operand

Parameter defines when event is sent: 0 is event on exit, 1 – on entrance, 2 – on both, 3 – monitoring, 4 – hysteresis, 5 – on change.

**Table 19 CAN#0 I/O Logic Operand**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 5 | 0 | CAN#0 I/O Priority<br>CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | U8 |

CAN#0 I/O Averaging Constant

Parameter defines I/O property sample length to average. If no averaging needed default value is 1.

**Table 20 CAN#0 I/O Averaging Constant**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 1 | 99999999 | 1 | CAN#0 I/O Priority | S32 |

| | | | CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | |

CAN#0 I/O CAN Type ID

Parameter defines CAN element ID length. CAN element ID could be 11 or 29 bits length. For 11 bits ID parameter value is 0, for 29 bits ID – 1.

<div align="center">Table 21 CAN#0 CAN Type ID</div>

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 1 | 1 | CAN#0 I/O Priority<br>CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O OutputDataMask<br>CAN#0 I/O CAN ID | U8 |

CAN#0 Output data mask

Parameter defines CAN data mask. This parameter is 8 bit length and indicates which data bytes of CAN message are sent for calculation and which are ignored. Bit value 1 means that CAN data byte will be preceded and sent to server.

Example: 00110011 is 51 integer.

<div align="center">Table 22 CAN#0 Output data mask</div>

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 255 | - | CAN#0 I/O Priority<br>CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O CAN ID | U8 |

CAN#0 CAN ID

Parameter defines CAN identifier. ID can be 11 or 29 bits length.

Example: 18FEE925 (total fuel used)

<div align="center">Table 23 CAN#0 CAN ID</div>

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | FFFFFFFF | - | CAN#0 I/O Priority | U32 |

| | | | CAN#0 I/O HighLevel<br>CAN#0 I/O LowLevel<br>CAN#0 I/O Logic Operand<br>CAN#0 I/O Averaging Constant<br>CAN#0 I/O CAN Type ID<br>CAN#0 I/O OutputDataMask | |
|---|---|---|---|---|

**To configure CAN#0 I/O element every value above should be separated with comma. For example, SMS should look like:**

**" setparam 1406 0,1,0,0,1,1,00110011,18FEE925" (" setparam 1406 <priority>,<HighLevel>,<LowLevel>,<LogicOperand>,<AveragingConstant>,<CANTypeID>,<outputDataMask>,<CANID>)**

*51 is output data mask converted in binary **00110011**

**\***Above SMS example will configure first profile CAN#0 I/O element with low priority,high level 1,low level 0,logic operand is event on exit,averaging constant is 1,CAN type ID is for 29 bits,output data mask is 51 but must be written after converting in binary,CAN ID is for total fuel used.

The rest CAN elements are configured in the same sequence. CAN elements and parameters ID's are listed below.

**Table 24 CAN elements and parameters**

| CAN Element Number | CAN Element parameters |
|---|---|
| CAN#0 | x406 |
| CAN#1 | x407 |
| CAN#2 | x408 |
| CAN#3 | x409 |
| CAN#4 | x410 |
| CAN#5 | x411 |
| CAN#6 | x412 |
| CAN#7 | x413 |
| CAN#8 | x414 |
| CAN#9 | x415 |

There are only 14 I/O parameters that could use Averaging Constant: Digital Inputs (1-4); Analog Inputs (1-4); Battery Voltage; Battery Current; External Voltage; PDOP; HDOP; Speedometer.

I/O parameters: "Current Profile", "Fuel level meter" (1-2), "Fuel temperature" (1-2), "GNSS Status", "Movement", "Active GSM Operator", "iButton ID", "Odometer", "GSM Signal", "Deep Sleep", "Cell ID", "Area Code", "PCB Temperature", "Dallas temperature Sensor 0..2", "Fuel Counter" and "RFID ID" cannot use Averaging constant functionality.

### 6.3.8   I/O

If all I/O elements are disabled AVL packet comes with GPS information only. After enabling I/O element(s) AVL packet in couple with GPS information contains current value(s) of enabled I/O element.

### 6.3.8.1 FMB630 available I/O list

| Nr. | Property Name | Bytes | Description |
|---|---|---|---|
| | Permanent I/O elements (are always sent (with every record) to server if enabled) | | |
| 1 | Digital Input Status 1 | 1 | Logic: 0 / 1 |
| 2 | Digital Input Status 2 | 1 | Logic: 0 / 1 |
| 3 | Digital Input Status 3 | 1 | Logic: 0 / 1 |
| 4 | Digital Input Status 4 | 1 | Logic: 0 / 1 |
| 5 | Digital Output Status 1 | 1 | Logic: 0 / 1 |
| 6 | Digital Output Status 2 | 1 | Logic: 0 / 1 |
| 7 | Digital Output Status 3 | 1 | Logic: 0 / 1 |
| 8 | Digital Output Status 4 | 1 | Logic: 0 / 1 |
| 9 | Analog Input 1 | 3 | Voltage: mV, 0 – 30 V |
| 10 | Analog Input 2 | 3 | Voltage: mV, 0 – 30 V |
| 11 | Profile | 1 | Value in scale 1 – 4 |
| 12 | Battery Voltage | 2 | Voltage: mV |
| 13 | Battery Current | 2 | Voltage: mA |
| 14 | GNSS PDOP | 2 | Probability * 10; 0-500 |
| 15 | GNSS HDOP | 2 | Probability * 10; 0-500 |
| 16 | External Voltage | 2 | Voltage: mV, 0 – 30 V |
| 17 | GNSS status | 2 | 0-off/ 1-no antenna / 2- no fix/ 3-got fix/ 4-sleep/ 5-over current |
| 18 | Movement sensor | 1 | 0 – not moving, 1 – moving. |
| 19 | Odometer value | 4 | Distance between two records: m |
| 20 | GSM Operator | 4 | Currently used GSM Operator code |
| 21 | Speed | 2 | Value in km/h, 0 – xxx km/h |
| 22 | iButton ID | 8 | iButton ID number |
| 23 | GSM signal level | 2 | Value in scale 1 – 5 |
| 24 | Deep Sleep | 1 | 0 – not deep sleep mode, 1 – deep sleep mode |
| 25 | PCB Temperature | 2 | 10 * Degrees ( °C ) |
| 26 | Dallas ID 1 | 9 | Shows ID of first Dallas sensor |
| 27 | Dallas Temperature 1 | 8 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 28 | Dallas ID 2 | 9 | Shows ID of second Dallas sensor |
| 29 | Dallas Temperature 2 | 8 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 30 | Dallas ID 3 | 9 | Shows ID of third Dallas sensor |
| 31 | Dallas Temperature 3 | 8 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 32 | Dallas ID 3 | 9 | Shows ID of fourth Dallas sensor |
| 33 | Dallas Temperature 4 | 8 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 34 | Fuel Counter | 4 | Difference of generated impulses on two signal lines |
| 35 | Ignition | 1 | 0 – ignition is off, 1 – ignition is on |
| 36 | RFID | 9 | Displays activated RFID card ID |
| 37 | LLS #1Fuel | 3 | Fuel level, measured by LLS sensor on COM2, in kvants or liters. |
| 38 | LLS #1 temperature | 2 | Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius. |
| 39 | LLS #2 Fuel | 3 | Fuel level, measured by LLS sensor on COM2, in kvants or liters. |
| 40 | LLS #2 temperature | 2 | Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius. |

| Permanent I/O elements (are always sent (with every record) to server if enabled) | | | |
|---|---|---|---|
| Nr. | Property Name | Bytes | Description |
| 41 | LLS #3 Fuel | 3 | Fuel level, measured by LLS sensor on COM2, in kvants or liters. |
| 42 | LLS #3 temperature | 2 | Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius. |
| 43 | LLS #4 Fuel | 3 | Fuel level, measured by LLS sensor on COM2, in kvants or liters. |
| 44 | LLS #4 temperature | 2 | Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius. |
| 45 | LLS #5 Fuel | 3 | Fuel level, measured by LLS sensor on COM2, in kvants or liters. |
| 46 | LLS #5 temperature | 2 | Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius. |

**Table 26 EVENTUAL I/O elements list description**

| Eventual IO elements (generated and sent record to server only if appropriate conditions are met) | | | |
|---|---|---|---|
| Nr. | Property Name | Bytes | Description |
| 43 | CAN 0 | Varying[5] | ID Specific data |
| 44 | CAN 1 | Varying | ID Specific data |
| 45 | CAN 2 | Varying | ID Specific data |
| 46 | CAN 3 | Varying | ID Specific data |
| 47 | CAN 4 | Varying | ID Specific data |
| 48 | CAN 5 | Varying | ID Specific data |
| 49 | CAN 6 | Varying | ID Specific data |
| 50 | CAN 7 | Varying | ID Specific data |
| 51 | CAN 8 | Varying | ID Specific data |
| 52 | CAN 9 | Varying | ID Specific data |
| 53 | Geofence zone 01 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 54 | Geofence zone 02 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 55 | Geofence zone 03 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 56 | Geofence zone 04 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 57 | Geofence zone 05 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 58 | Geofence zone 06 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 59 | Geofence zone 07 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 60 | Geofence zone 08 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 61 | Geofence zone 09 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 62 | Geofence zone 10 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 63 | Geofence zone 11 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 64 | Geofence zone 12 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 65 | Geofence zone 13 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 66 | Geofence zone 14 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 67 | Geofence zone 15 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 68 | Geofence zone 16 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 69 | Geofence zone 17 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 70 | Geofence zone 18 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 71 | Geofence zone 19 | 1 | Event: 0 – target left zone, 1 – target entered zone |

[5] CAN property length can vary depending on filter settings. Data can be sent as 1, 2, 4 or 8 byte property.

| Eventual IO elements (generated and sent record to server only if appropriate conditions are met) | | | |
|---|---|---|---|
| Nr. | Property Name | Bytes | Description |
| 72 | Geofence zone 20 | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 73 | Auto Geofence | 1 | Event: 0 – target left zone, 1 – target entered zone |
| 74 | Trip | 1 | 1 – trip start, 0 – trip stop |
| 75 | Immobilizer | 1 | 1 – iButton connected |
| 76 | Authorized driving | 1 | 1 – authorized iButton connected |
| 77 | ECO driving/Green driving type | 1 | 1 – harsh acceleration, 2 – harsh braking, 3 - harsh cornering |
| 78 | ECO driving/Green driving value | 1 | Depending on ECO driving/Green driving type: if harsh acceleration, braking and cornering – $g*10$ m/s$^2$ |
| 79 | Over Speeding | 1 | At over speeding start km/h, at over speeding end km/h |
| 80 | Excessive idling | 1 | 1- idling detected, 0- idling ended |

⚠️ There are two types of operations with Permanent I/O elements: simple monitoring and event generating. Monitoring method is used when current I/O information needed with regular GPS coordinates. Event generating method is used when additional AVL packet is needed when current value of I/O exceeds predefined High and Low levels. I/O settings allow defining I/O event criteria.

### 6.3.8.2  I/O configuring

I/O configuration has 7 main parts (Figure 41)



**Figure 41 FMB630 I/O Configuration (1)**

**Table 27 I/O Configuration window description**

| Pos. Nr. | DESCRIPTION |
|---|---|
| 1. | Property inputs list |
| 2. | Enable/Disable chosen property input - allows enabling I/O element so it is added to the data packet and is sent to the server. By default, all I/O elements are disabled and FMB630 records only GPS information. |
| 3. | Priority - AVL packet priority. There are Low, High, Panic, SW21, SW22, SW23 and SW24 priorities. Regular packets are sent as Low priority records. When low priority event is triggered, FMB630 makes additional record with indication that the reason for that was I/O element change. When High priority is selected, module makes additional record with high priority flag and sends event packet immediately to the server. First it tries to send it using GPRS. If GPRS fails, it doesn't send AVL packet using SMS mode, if SMS is enabled in SMS settings. Panic priority event forces module to send AVL packet to server via GPRS and if GPRS fails, it sends AVL packet using SMS mode, if SMS is enabled in SMS settings. Then it switches its operating profile to Profile 4 (for details see chapter 7.2). SW2X priorities switch profiles on event (SW21 – Profile 1, SW22 – Profile 2 and so on). |
| 4. | High Level - define I/O value range. If I/O value enters or exits this range, FMB630 generates event. |
| 5. | Low Level – define I/O value range. If I/O value enters or exits this range, FMB630 generates event. |
| 6. | Generate event – defines when to generate event. When value enters defined range, exits it or both enters and exits. |
| 7. | Averaging Constant – it is an I/O event delay parameter. In some applications there is no need to generate events on every I/O range enter/exit immediately. Sometimes it is necessary to wait some time interval before event generating to be ensuring that current event is not a short time event. Averaging constant allows setting I/O event delay (averaging). If I/O value is entering or leaving predefined range, it must have same value for Averaging constant time. One unit of averaging constant value equals 20 milliseconds.<br><br>Selected data source value input averaging constant are calculated by following formula:<br><br>$$VAL^{Mean} = \frac{VAL^{Mean-1} \times (CONST - 1) + REALVAL}{CONST}$$<br><br>Where:<br>$VAL^{Mean}$ – Value calculated during actual cycle[6];<br>$VAL^{Mean-1}$ – Value calculated during previous cycle;<br>CONST – Averaging constant;<br>REALVAL – Real value detected on digital input. |

### 6.3.8.3   I/O properties

I/O properties are additional data sources, which are recorded along with usual GPS data.
IO#0 (ID=x300)
I/O#0 priority

---

[6] One cycle equal to 20 ms.

Parameter defines I/O property type of priority: 0 is disabled, 1 is low, 2 – high, 3 – panic, 4 – SW21, 5 – SW22, 6 – SW23, 7 –SW24.

**Table 28 I/O Type of Priority**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 7 (ex. 3) | 0 | I/O#0 property parameter<br>I/O#0 High level<br>I/O#0 Low level<br>I/O#0 logic operand<br>I/O#0 averaging constant | S8 |

I/O#0 High level

Parameter defines high value of triggered I/O property. This parameter is used to set thresholds for I/O properties to generate events.

**Table 29 I/O High Value**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 9999999 | 1 | I/O#0 property parameter<br>priority<br>I/O#0 Low level<br>I/O#0 logic operand<br>I/O#0 averaging constant | S32 |

I/O#0 Low level

Parameter defines low value of triggered I/O property. This parameter is used to set thresholds for I/O properties to generate events.

**Table 30 I/O Low Value**

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 9999999 | 0 | I/O#0 property parameter<br>priority<br>I/O#0 High level<br>I/O#0 logic operand<br>I/O#0 averaging constant | S32 |

I/O#0 logic operand

Parameter defines when event is sent: 0 is event on exit, 1 – on entrance, 2 – on both, 3 – monitoring, 4 – hysteresis, 5 – on change.

**Table 31 I/O Logic Operand**

| Minimal value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 0 | 5 | 2 | I/O#0 priority<br>I/O#0 High level | S8 |

| | | | I/O#0 Low level I/O#0 averaging constant IO#0 (ID=x300) | |
|---|---|---|---|---|
| | | | | |

I/O#0 averaging constant

Parameter defines I/O property sample length to average. If no averaging needed default value is 1.

<p align="center">Table 32 I/O Averaging constant</p>

| Minimum value | Maximum value | Recommended value | Goes with (depends on) parameters | Value type |
|---|---|---|---|---|
| 1 | 99999999 | 1 | IO#0 (ID=x300) I/O#0 priority I/O#0 High level I/O#0 Low level I/O#0 logic operand | S32 |

**To configure I/O#0 element every value above should be separated with comma. For example, configuring first profile I/O#0 element by SMS, SMS should look like: " setparam 1300 1,0,0,1,1" (" setparam 1300 <priority>,<HighLevel>,<LowLevel>,<Operand>,<Avg Constant>")**

Other I/O property elements can be configured in the same logic. All I/O element parameters are listed below.

<p align="center">Table 33 I/O Elements</p>

| I/O Element Number | I/O element parameters | I/O Element Number | I/O element parameters |
|---|---|---|---|
| I/O#0 – Digital input 1 | x300 | I/O#23 – Deep Sleep | x323 |
| I/O#1 – Digital input 2 | x301 | I/O#24 – PCB Temp. | x324 |
| I/O#2 – Digital input 3 | x302 | I/O#25 – Dallas ID 1 | x325 |
| I/O#3 – Digital input 4 | x303 | I/O#26 – Dallas Temp. 1 | x326 |
| I/O#4 – Digital output 1 | x304 | I/O#27 – Dallas ID 2 | x327 |
| I/O#5 – Digital output 2 | x305 | I/O#28 – Dallas Temp. 2 | x328 |
| I/O#6 – Digital output 3 | x306 | I/O#29 – Dallas ID 3 | x329 |
| I/O#7 – Digital output 4 | x307 | I/O#30 – Dallas Temp. 3 | x330 |
| I/O#8 – Analog input 1 | x308 | I/O#31 – Dallas ID 4 | x331 |
| I/O#9 – Analog input 2 | x309 | I/O#32 – Dallas Temp. 4 | x332 |
| I/O#10 – Profile | x310 | I/O#33 – Fuel Counter | x333 |
| I/O#11 – Battery voltage | x311 | I/O#34 – Ignition | x334 |
| I/O#12 – Battery Current | x312 | I/O#35 – RFID ID | x335 |
| I/O#13 – GPS PDOP | x313 | I/O#36 – LLS #1 temp. | x336 |
| I/O#14 – GPS HDOP | x314 | I/O#37 – LLS #1 meter | x337 |
| I/O#15 – Ext. Voltage | x315 | I/O#38 – LLS #2 temp. | x338 |
| I/O#16 – GNSS Status | x316 | I/O#39 – LLS #2 meter | x339 |
| I/O#17 – Movement sensor | x317 | I/O#40 – LLS #3 temp. | x340 |
| I/O#18 – Odometer | x318 | I/O#41 – LLS #3 meter | x341 |

| I/O#19 – GSM Operator | x319 | I/O#42 – LLS #4 temp. | x342 |
| I/O#20 – Speed | x320 | I/O#43 – LLS #4 meter | x343 |
| I/O#21 – iButton ID | x321 | I/O#44 – LLS #5 temp. | x344 |
| I/O#22 – GSM Signal | x322 | I/O#45 – LLS #5 meter | x345 |

### 6.3.8.4  K Line parameters

**Table 34 K line elements and parameters**

| Name | Parameter Name | Configuration ID | Available Values |
|---|---|---|---|
| KLINE Driver Recognize | Priority | X050 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 1 working state | Priority | X051 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 2 working state | Priority | X052 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Overspeed | Priority | X053 | 0 – disable<br>1 - low<br>1 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 1 card | Priority | X054 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 2 card | Priority | X055 | 0 – disable<br>1 – low<br>2 – high |

| Name | Parameter Name | Configuration ID | Available Values |
|---|---|---|---|
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 1 rel time states | Priority | X056 | 0 - disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 2 rel time states | Priority | X057 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Vehicle speed | Priority | X058 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | 0 – 255 km/h |
| | Low level | | 0 – 255 km/h |
| | Generate event | | 0 – On range exit<br>1 – On range entrance<br>2 – On both<br>3 – Monitoring<br>4 – Hysteresis<br>5 – On change |
| KLINE Odometer | Priority | X059 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Distance | Priority | X060 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 1 ID | Priority | X061 | 0 – disable<br>1 – low |

| Name | Parameter Name | Configuration ID | Available Values |
|---|---|---|---|
| | | | 2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 – Monitoring<br>5 – On change |
| KLINE Driver 2 ID | Priority | X062 | 0 – disable<br>1 – low<br>2 – high |
| | High level | | N/A |
| | Low level | | N/A |
| | Generate event | | 3 –Monitoring<br>5 – On change |

To configure any K Line parameter, every parameter should be separated with comma. For example, configuring first profile Kline Driver 2 ID by SMS, SMS should look like: " setparam 1062 1,,,3" (" setparam 1062 <Priority>,<HighLevel>,<LowLevel>,<generateEvent>")

Driver 2 ID do not have High/Low level so they are skipped by using comma ",,"

Other Kline properties can be configured in the same logic.

### 6.3.8.5 Configurable parameter values and Global parameter values

**Configurable parameters:**

Table 35 Configurable parameter values

| Parameter | | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | Default | Recommended | |
| System settings (6.3.4) | | | | | | | |
| **Sleep Mode** | | **x000** | 0 | 2 | 0 | - | U8 |
| 0 | Disable | | | | | | |
| 1 | Enable | | | | | | |
| 2 | Deep sleep | | | | | | |
| Sleep Timeout | | **x001** | 0 | 9000 | 1 | - | U16 |
| **Ignition source** | | **x900** | 0 | 5 | 0 | - | U8 |
| 0 | Power voltage | | | | | | |
| 1 | Din 1 | | | | | | |
| 2 | Din 2 | | | | | | |
| 3 | Din 3 | | | | | | |
| 4 | Din 4 | | | | | | |
| 5 | Movement | | | | | | |
| High Voltage Level (for Ignition) | | **x901** | 0 | 30000 | 0 | - | U16 |
| Low Voltage Level (for Ignition) | | **x902** | 0 | 30000 | 0 | - | U16 |
| GPRS data sending settings (6.3.5.1) | | | | | | | |
| GPRS Context Activation | | **x240** | 0 (Disable) | 1 (Enable) | 0 | - | S8 |
| Protocol | | | 0 (TCP) | 1 (UDP) | 0 | - | U8 |

| Parameter | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|
| | | MIN | MAX | Default | Recommended | |
| Server Response Timeout | | 5 | 300 | 5 | - | U16 |
| Domain | | Empty | 56 char | Empty | - | - |
| Target Server Port | | 0 | 65535 | 0 | - | U16 |
| **Configuring format:** | | <Enable>,<IP>,<port>,<protocol>,<Server Reponse Tmo> | | | | |
| **GPRS data limit settings (6.3.5.2)** | | | | | | |
| Enable GPRS limits | | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| Data limit Home | **x241** | 1 | 10000 | 100 | - | U16 |
| Data limit Roaming | | 1 | 10000 | 10 | - | U16 |
| **Configuring format:** | | <Enable>,<Data Limit Home>,<Data Limit Roaming> | | | | |
| **SMS security settings (6.3.5.3)** | | | | | | |
| SMS Login | **x252** | Empty | 5 char | Empty | - | S8[5] |
| SMS Password | **x253** | Empty | 5 char | Empty | - | S8[5] |
| Authorized phone numbers | **x260-x269** | Empty | 16 char | Empty | - | S8[17] |
| **SMS data sending settings (6.3.5.4)** | | | | | | |
| SMS Data | **x250** | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| SMS Data send week time schedule | **x273** | Binary decoding | Binary decoding | - | - | 20 byte array |
| **Configuring format:** | | <x1>,<x2>,<x3>,<x4>......<x19> | | | | |
| **Operator list settings (6.3.5.3)** | | | | | | |
| Operator Code | **x271** | 0 | 99999999 | 0 | - | U32 |
| **Configuring format:** | | <op1>,<op2>,<op3>,....<op50> | | | | |
| **Data Acquisition settings (Chapter 9)** | | | | | | |
| **Data acquisition modes** | | | | | | |
| Min Period (in seconds) | | 0 | 9999999 | 600 | - | U32 |
| Min Distance (in meters) | | 0 | 65535 | 0 | - | U32 |
| Min Angle (in degrees) | **x010** | 0 | 180 | 0 | - | U16 |
| Min Speed (in km/h) | | 0 | 400 | 0 | - | U16 |
| Min Speed Source | | 0 (from GPS) | 1 (from LVCAN) | 0 | - | U8 |
| Min Saved Records | | 1 | 25 | 10 | 1 | U8 |
| Min Send Period (in seconds) | | 0 | 9999999 | 600 | - | U32 |
| **Configuring format:** | | <minperiod>,<mindistance>,<minangle>,<minspeed>,<minspeedsource>,<minsavedrec>, <sendperiod> | | | | |
| GPRS Week Time | **x016** | - | - | - | - | - |
| **Configuring format:** | | <x1>,<x2>,<x3>,<x4>......<x19> | | | | |
| **Geofencing settings (6.3.6.4)** | | | | | | |
| Frame Border (in meters) | **x020** | 0 | 9999999 | 1 | 1000 | U32 |
| Geofence Zone #1 | **x030** | | | | | |
| Zone #1 Shape | | 0 (Circle) | 1 (Rectangle) | 0 | - | U32 |

| Parameter | | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | Default | Recommended | |
| **Zone #1 priority** | | | 0 | 7 (exl. 3) | 0 | - | U8 |
| 0 | Low | | | | | | |
| 1 | High | | | | | | |
| 2 | Panic | | | | | | |
| 4 | SW21 | | | | | | |
| 5 | SW22 | | | | | | |
| 6 | SW23 | | | | | | |
| 7 | SW24 | | | | | | |
| **Zone #1 Generate Event** | | | 0 | 3 | 0 | - | U8 |
| 0 | No Event | | | | | | |
| 1 | On enter | | | | | | |
| 2 | On exit | | | | | | |
| 3 | On both | | | | | | |
| Min Angle (in degrees) | | | 0 | 180 | 0 | - | U16 |
| Zone #1 Longitude X1 (Rectangle) / X (Circle) | | | -180 | 180 | 0 | - | Float |
| | | | -180 | 180 | 0 | - | Float |
| Zone #1 Latitude Y1 (Rectangle) / Y (Circle) | | | -90 | 90 | 0 | - | Float |
| | | | -90 | 90 | 0 | - | Float |
| Zone #1 Longitude X2 (Rectangle) / R (Circle) | | | -180 | 180 | 0 | - | Float |
| | | | 0 | 180 / 9999999.99 | 0 | 0 | Float |
| Zone #1 Latitude Y2 (Rectangle) / None (Circle) | | | -90 | 90 | 0 | - | Float |
| | | | - | - | - | - | - |
| **Configuring format:** | | | <shape>,<priority>,<generateEvent>,<fx1>,<fy1>,<fx2>,<fy2> | | | | |
| Geofence Zone #2 | | **x031** | | | | | |
| Geofence Zone #3 | | **x032** | | | | | |
| Geofence Zone #4 | | **x033** | | | | | |
| Geofence Zone #5 | | **x034** | | | | | |
| Geofence Zone #6 | | **x035** | | | | | |
| Geofence Zone #7 | | **x036** | | | | | |
| Geofence Zone #8 | | **x037** | | | | | |
| Geofence Zone #9 | | **x038** | | | | | |
| Geofence Zone #10 | | **x039** | | | | | |
| Geofence Zone #11 | | **x040** | Same configuration as Geofence Zone #1 | | | | |
| Geofence Zone #12 | | **x041** | | | | | |
| Geofence Zone #13 | | **x042** | | | | | |
| Geofence Zone #14 | | **x043** | | | | | |
| Geofence Zone #15 | | **x044** | | | | | |
| Geofence Zone #16 | | **x045** | | | | | |
| Geofence Zone #17 | | **x046** | | | | | |
| Geofence Zone #18 | | **x047** | | | | | |
| Geofence Zone #19 | | **x048** | | | | | |
| Geofence Zone #20 | | **x049** | | | | | |
| **Auto Geofencing settings (6.3.6.5)** | | | | | | | |
| Autogeofence | | **x290** | | | | | |

| Parameter | | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | Default | Recommended | |
| Deactivate By | | | 0 (Ignition) | 1 (iButton) | 0 | - | U8 |
| Activation Timeout (in seconds) | | | 0 | 65535 | 60 | 60 | U16 |
| Min Angle (in degrees) | | | 0 | 180 | 0 | - | U16 |
| **Zone #1 priority** | | | 0 | 7 | 1 | 1 | U8 |
| 0 | Low | | | | | | |
| 1 | High | | | | | | |
| 2 | Panic | | | | | | |
| 4 | SW21 | | | | | | |
| 5 | SW22 | | | | | | |
| 6 | SW23 | | | | | | |
| 7 | SW24 | | | | | | |
| **Zone #1 Generate Event** | | | 0 | 3 | 0 | 2 | U8 |
| 0 | No Event | | | | | | |
| 1 | On enter | | | | | | |
| 2 | On exit | | | | | | |
| 3 | On both | | | | | | |
| Radius (in meters) | | | 0 | 9999999 | 100 | 100 | U32 |
| **Configuring format:** | | | <deactivateBy>,<tmo>,<priority>,<eventGenerating>,<radius> | | | | |
| **iButton List (6.3.6.6)** | | | | | | | |
| Authorized iButtons | | **x500-999** | 0 | FFFFFFFF | | - | U64 |
| | | | | FFFFFFFF | | | |
| **Eco/Green driving settings (Chapter 12.1)** | | | | | | | |
| **Eco driving type** | | | 0 | 5 | 0 | - | U8 |
| 0 | Disable | | | | | | |
| 1 | No DOUT control | | | | | | |
| 2 | DOUT1 control | | | | | | |
| 3 | DOUT2 control | | | | | | |
| 4 | DOUT3 control | | | | | | |
| 5 | DOUT4 control | **x910** | | | | | |
| **Eco source** | | | 0 (accelerometer) | 1 (GPS) | 0 | - | U8 |
| Max Acceleration Force | | | 5 | 100 | 22 | 25 | Float |
| Max Braking Force | | | 5 | 100 | 25 | 35 | Float |
| Max Cornering Force | | | 5 | 100 | 21 | - | Float |
| Acceleration Active Output Duration | | | 0 | 100 | 1 | - | Float |
| Breaking Active Output Duration | | | 0 | 100 | 1 | - | Float |
| Cornering Active Output Duration | | | 0 | 100 | 1 | - | Float |
| **Configuring format:** | | | <Eco driving type>,<Ecosource><MaxAcceleration>,<MaxBraking>,<MaxCornering>,<AccOutputDurati | | | | |

| Parameter | | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | Default | Recommended | |
| | | | on>,<BrakingOutputDuration>,<CorneringOutputDuration> | | | | |
| **Overspeeding settings (Chapter 12.2)** | | | | | | | |
| **Overspeeding mode** | | **x911** | 0 | 5 | 0 | - | U8 |
| 0 | Disable | | | | | | |
| 1 | No DOUT control | | | | | | |
| 2 | DOUT 1 control | | | | | | |
| 3 | DOUT 2 control | | | | | | |
| 4 | DOUT 3 control | | | | | | |
| 5 | DOUT 4 control | | | | | | |
| Max Allowed Speed | | | 0 | 300 | 90 | - | U16 |
| **Configuring format:** | | | <Overspeeding mode>,<MaxSpeed> | | | | |
| **Immobilizer settings (Chapter 12.3)** | | | | | | | |
| **Immobilizer mode** | | **x912** | 0 | 5 | 0 | - | U8 |
| 0 | Disable | | | | | | |
| 1 | No DOUT | | | | | | |
| 2 | DOUT1 control | | | | | | |
| 3 | DOUT2 control | | | | | | |
| 4 | DOUT3 control | | | | | | |
| 5 | DOUT4 control | | | | | | |
| iButton List checking | | | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| Ignition Timeout | | | 1 | 255 | 30 | - | U16 |
| **Configuring format:** | | | <ImmobMode>,<button_enable>,<TMO> | | | | |
| **Excessive Idling settings (Chapter 12.4)** | | | | | | | |
| Excessive Idling | | **x913** | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| Time to stationary | | | 0 | 255 | 1 | - | U16 |
| Time to movement | | | 0 | 255 | 1 | - | U16 |
| **Configuring format:** | | | <Enable>,<Time to stationary>,<Time to movement> | | | | |
| **Jamming settings (Chapter 12.5)** | | | | | | | |
| **Jamming Detection** | | **x914** | 0 | 5 | 0 | - | U8 |
| 0 | Disable | | | | | | |
| 1 | No DOUT | | | | | | |
| 2 | DOUT1 control | | | | | | |
| 3 | DOUT2 control | | | | | | |
| 4 | DOUT3 control | | | | | | |

| Parameter | | ID | Parameter value | | | | Value type |
|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | Default | Recommended | |
| 5 | DOUT4 control | | | | | | |
| Sensitivity | | | 1 (low) | 3 (High) | 0 | - | U8 |
| Timeout | | | 1 | 255 | 60 | | |
| Dout duration | | | 1 | 255 | 0 | - | U16 |
| **Configuring format:** | | | <Enable>,<Sensitivity>,<Start_TMO>,<DOUT_duration_TMO> | | | | |
| **iButton Notification settings (Chapter 12.6)** | | | | | | | |
| **iButton notification** | | | | | | | |
| 0 | Disable | | | | | | |
| 1 | No DOUT control | | | | | | |
| 2 | DOUT1 control | | | | | | |
| 3 | DOUT2 control | **x915** | 0 | 5 | 0 | - | U8 |
| 4 | DOUT3 control | | | | | | |
| 5 | DOUT4 control | | | | | | |
| iButton Notification | | | 0 (Disable) | 1 (No dout control) | 0 | - | U8 |
| Timeout | | | 1 | 65530 | 0 | - | U16 |
| **Configuring format:** | | | <Enable/Dout control>,<DOUT TMO> | | | | |
| **Trip settings (6.3.6.3)** | | | | | | | |
| Trip | | | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| Start Speed | | | 0 | 255 | 5 | - | U8 |
| Ignition Off Timeout | **x280** | | 0 | 65536 | 60 | - | U16 |
| Remember iButton ID, while Trip detected | | | 0 (Disable) | 1 (Enable) | 0 | - | U8 |
| **Configuring format:** | | | <Enable>,<StartStopSpeed>,<IgnitionOffTimeout>,<remember iButton> | | | | |

This parameter manages when it is allowed to open GPRS context. When module starts it is prohibited to open the context. When modem's GPRS context is closing (for example changing network) it is allowed to open it only at a defined time. It is possible to allow connections every 10 minutes up to once per day.

Example value: 7F,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF

*Schedule parameter format:*

Time is defined as 19 byte array ('getparam' 1545 returns 20 bytes). First byte of array defines week days; the rest 18 bytes define timestamps with 10 minute interval. In first byte, first bit (LSB) defines if module should connect to GPRS (send SMS) on Monday, second bit – on Tuesday and so on up to seventh bit – which means Sunday. Eighth bit (MSB) is not used. If bits value is 0 then device is not allowed to open GPRS context, but if it is already open – does not close it. If value is 1 it will work as day minutes are defined in rest of the bytes. Day's minutes are defined by 18 bytes (144 bits). Every $n^{th}$ bit (beginning from the first bit (LSB) and ending 18 bytes $8^{th}$ bit (MSB)) indicates every $10^{th}$ minute of the day (day has 1440 minutes).

Sample: GPRS will be allowed on Monday to Friday at 8:00 and 16:00 GMT. The following value should be configured:

00011111 00000000 00000000 00000000 000000000 00000000 00000000 00000001 00000000 00000000 00000000 00000000 00000000 000000001 00000000 00000000 00000000 00000000 00000000

Red bits indicate that GPRS will be allowed every day except Saturdays and Sundays. Blue bits indicate 480 and 720 minutes (480min = 8h and 720min = 16h). So the parameter value should be: 1F,00,00,00,00,00,00,01,00,00,00,00,00,01,00,00,00,00,00

It should be sent as UTF8 encoded string.

**Global and External devices parameters:**

Table 36 Global parameters values

| Parameter | ID | Possible Parameter Value | Default Value |
|---|---|---|---|
| Profile Change On Event | 100 | 0/1 (0 – disable, 1 – enable) | 0 |
| Prefered records saving destination | 101 | 0/1 (0 – internal memory, 1 – SDcard) | 10 |
| Analog Input 1-2 Type | 105 | 0/1 ( 0 – 10 V, 1 – 30 V) | 0 |
| Static Navigation On/Off | 107 | 0/1 (0 – disable, 1 – enable) | 1 |
| Records Sorting | 108 | 0/1 ( 0 – from newest, 1 – from oldest) | 0 |
| Active Data Link Timeout | 109 | 0 – 259200 (time in seconds) | 5 |
| Accelerometer Filter Start Value | 112 | 1 – 10 (time in seconds) | 1 |
| Accelerometer Filter Stop Value | 113 | 1 – 255 (time in seconds) | 30 |
| Continious Odometer | 114 | 0/1 (0 – disable, 1 – enable) | 0 |
| J1708 Enable parameter | 115 | 0/1 (0 – disable, 1 – enable) | 0 |
| GNSS Satellite System | 116 | 0/1/2/3/4 (0 – all available, 1 – GPS, 2 – GLONASS, 3 – GNSS (all available) + SBAS, 4 – GPS + SBAS) | 0 |
| Garmin Ping | 117 | 0/1 (0 – disable, 1 – enable) | 0 |
| Garmin Unicode | 118 | 0/1 (0 – disable, 1 – enable) | 1 |
| Com1 baudrate | 119 | 0 – 115200 | |
| COM1 Mode | 120 | 0-255 (5 - Silent,97 – LLS Mode,98 – LCD Mode, 99 – RFID Mode, 100 – RFID MF7 Mode, 101 – Garmin Mode, 161 – COM TCP Link Mode, 177 – COM TCP Link Mode Binary, 203 – DTO 1731, 204 –SE500, 10-11 – reserved) | 0 |
| GNSS TMO For NTP | 121 | 0-300 | 0 |
| COM2 Baudrate | 122 | 0 – 115200 | 5 |
| COM2 Mode | 124 | 0 – 255 (5 - Silent, 13 - FM Log, 15 – NMEA, 97 - LLS, 98 - LCD, 99 - RFID, 100 - RFID M7, 101 - Garmin, 161 - COM TCP Link, 177 - COM TCP Link binary) | 115200 |
| COM1 Timestamp | 151 | 0/1 (0 – disable, 1 – enable) | 0 |
| COM1 CMD ID | 152 | 0 – 255 | 0 |
| COM2 Timestamp | 151 | 0/1 (0 – disable, 1 – enable) | 10 |
| COM2 CMD ID | 152 | 0 – 255 | 3 |
| Network Ping Timeout | 155 | 0 – 30 (time in minutes) | 0 |
| Data saving without time synchronization | 157 | 0/1 (0 – disable, 1 – enable) | 0 |
| Tachograph ignition source | 158 | 1/2/3/4 | 3 |

| Parameter | ID | Possible Parameter Value | Default Value |
|---|---|---|---|
| SMS Event number | 222-231 | string | „" |
| RS485 Activate | 232 | 0/1 | 0 |
| RS485 Baudrate | 233 | 0 – 115200 | 115200 |
| RS485 Mode | 234 | 0 – 255 (5 – Silent, 13 – Log mode, 15 – NMEA, 97 – LLS Mode, 161 – TCP link mode, 171 – Binary mode) | 5 |
| SIM1 GPRS APN | 240 | All character range | |
| SIM1 GPRS USER | 241 | All character range | |
| SIM1 GPRS PASS | 242 | All character range | |
| SIM2 GPRS APN | 243 | All character range | |
| SIM2 GPRS USER | 244 | All character range | |
| SIM2 GPRS PASS | 245 | All character range | |
| LLS 1-5 | 256-260 | 0,255 | 0 |
| SMS event data min-max | 300-499 | SMS Events | |
| Tachograph device | 159 | 0 - DTC0 1381, 1 - SE5000 | 0 |
| webDDD | 160 | 0/1 (0 – disable, 1 – enable) | 0 |
| webDDD domain | 161 | Maximum 56 Char | Empty |
| webDDD port | 162 | 0 - 65535 | 0 |

Configuring SMS event by SMS there is special SMS format:

SMS Format: setparam X Y,W,Z
X – ID
Y – Enable/Disable (1/0)
W – Telephone number INDEX (0 – 9)
Z – SMS Text

**Example: " setparam 300 1,5,Digital Input 1 Event!"**

## 7 PROFILE SWITCHING

FMB630 has 4 profiles saved in Flash memory of the module. Every profile has a list of parameters, which enables FMB630 to operate in different modes while using different profiles. The easiest way to understand what is a profile is to compare it to a list of instructions that are written for different cases. You are allowed to setup up to 4 different module behaviours. Global parameters and external devices contain settings that are common for all 4 profiles. This means that if you set FMB630 to call to a predefined number, you will be able to call it while using any profile. Basic scheme of Global parameters, external devices and profiles is shown below. According to the scheme, every profile has a list of parameters. Global parameters and external devices are common for all profiles. (Figure 42)
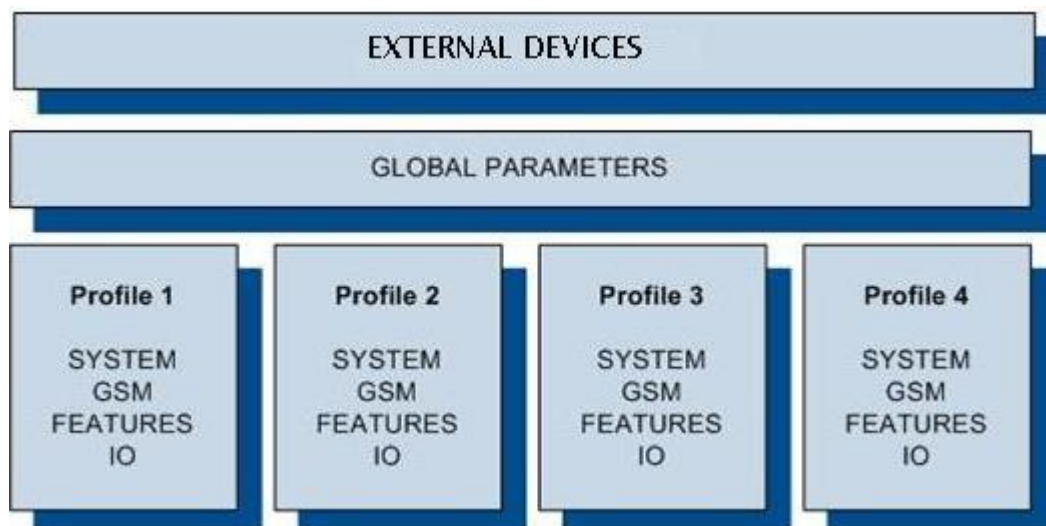
**Figure 42 FMB630 profile structure**

Switching between profiles (changing behaviour) can be performed by Profile switch depending on GSM operator code (mostly used for roaming applications), or by Profile switch depending on I/O event (on I/O value changing).

Profile 3 is default profile for FMB630. It is always loaded on the very first start-up and further profile switching is proceeded after operator scan or I/O element changes (although device remembers which profile it used after that).

## 7.1 Profile Switching dependence on GSM Operator

GSM Operator code profile switching is mostly used in roaming applications, when the purpose is to have information from module both from Home and Roaming operator network for a reasonable price. This method allows you to define different module behaviour in Home network, Roaming network and unknown operator areas. See Figure 43 below for details.

Profile 1 is configured for home network. Data acquisition and send intervals are quite frequent here. To make profile use effective, it is wise to set more optimized parameters in roaming profile (Profile 2) – this usually includes larger coordinate recording intervals, packets with greater number of coordinates sending, and in some cases GPRS context available only for a certain time interval. Profile 3 can either contain operator codes (rarely used) or have an empty list. Profile 4 is not used (profile 4 can only be used when FMB630 encounters a 'panic' priority event (see Chapter 7)).

In the example (Figure 43) FMB630 connects to operator with code 24702. It checks profile 1 operator list, but there is only one operator code entered which does not mach. Then it checks profile 2 operators list. This code is entered there, so FMB630 switches to profile 2.

If there are no operator codes entered in all profiles after operator search task FMB630 will check all 3 profiles and won't find any operators in any list. In such a case, FMB630 will switch to profile 3. Note that before switching to profile 3, the device closes the GPRS session.

Operator search is performed every 15 minutes. If no operators are entered in any profile it can have influence on GPRS sessions. IF GPRS sessions are attaching/detaching every 15 minutes it means configuration of FMB630 is performed incorrectly.
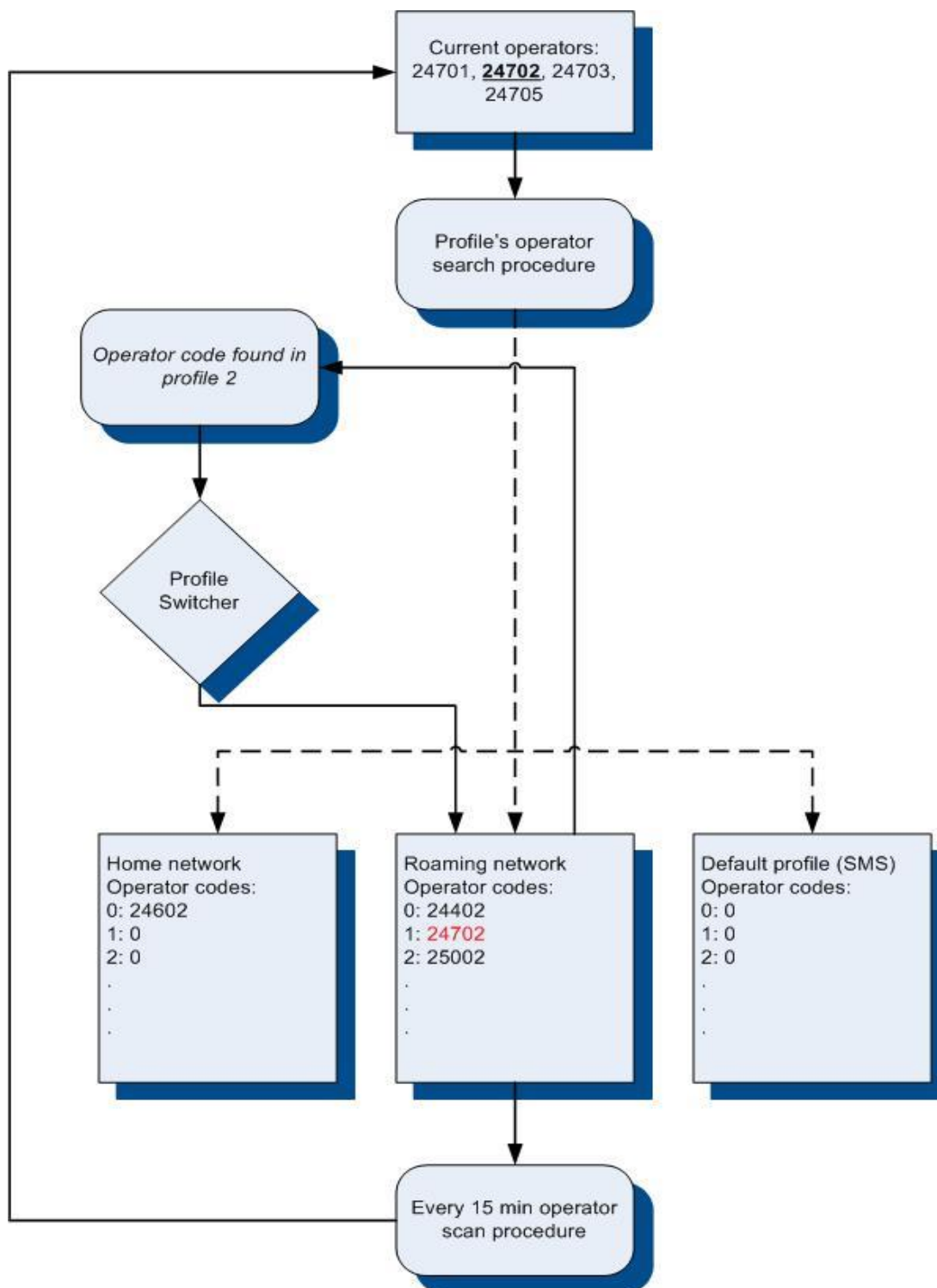


**Figure 43 GSM Operator code profile switching (…)**

## 7.2 Profile switching dependence on I/O event

Another profile switch method is based on I/O event. Events happen when the value of enabled I/O intersects thresholds (enter, exit, on both, hysteresis) predefined by High and Low level thresholds. SW21, SW22, SW23, SW24 stands for "Switch to profile No. X". After an event happens, FMB630 switches to a defined profile. Using profile switching you can create smart applications. SW2X actions can be performed only if "Profile change on event" is enabled in Global parameters. Pictures below illustrate profile switching depending on digital events:
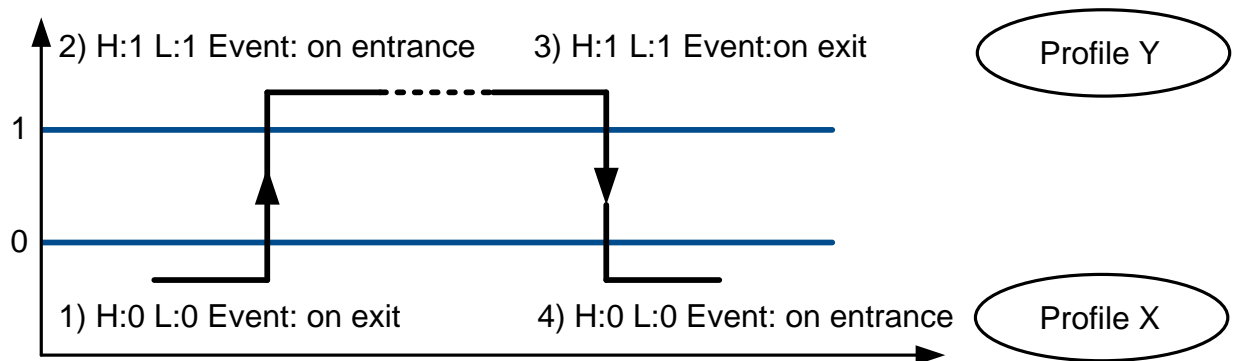


**Figure 44 Digital input event criteria**

### 7.2.1 Example #1

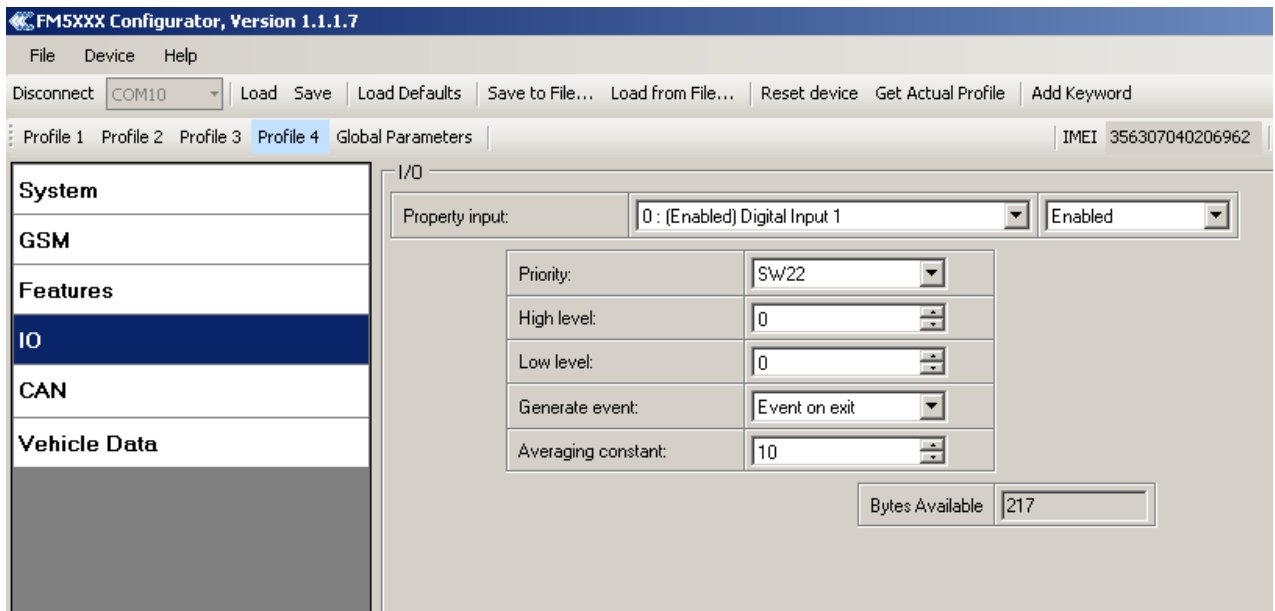Configuration of Profile1 to switch to Profile2 on DIN1 value change from 0 to 1:



**Figure 45 Switch to profile on event (1)**

### 7.2.2 Example #2

Configuration of Profile2 to switch to Profile1 on DIN1 value change from 1 to 0:
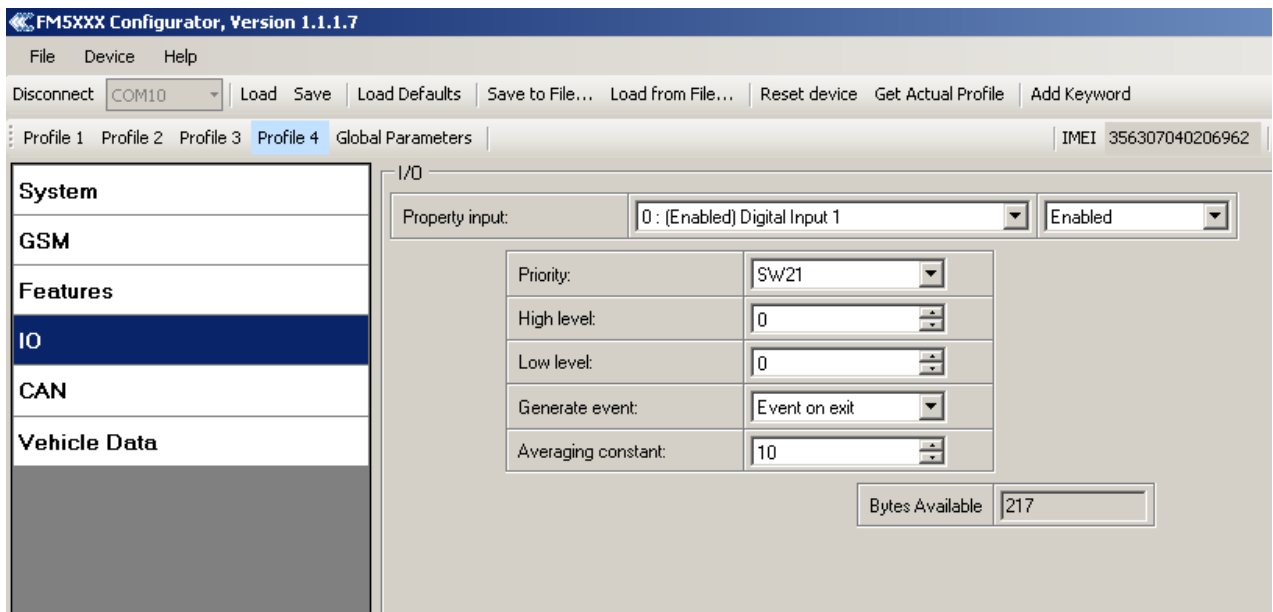
**Figure 46 Switch to profile on event (2)**

# 8 DUAL SIM FUNCTIONALITY

FMB630 is able to operate in DUAL SIM switching mode to minimize the bill accounts for GSM/GPRS services. To use this mode, 2 SIM Operator list enumerated value must be chosen for Profile Change On setting in Global parameters tab after FMB630 is connected to configurator (shown in Figure 47).

When DUAL SIM operating mode is set: profile 1 becomes Home, profile 2 becomes SIM 1 Roaming, profile 3 becomes SIM 2 Roaming and profile 4 becomes Unknown Operator. In this chapter the operation and configuration of DUAL SIM mode is presented.

FMB630 can be used with one SIM. SIM1 card has higher priority than SIM2. For one SIM card using it must be placed in SIM1 slot for FMB630 to switch minimum times.

If SIM card is inserted into SIM 2 slot and 1 SIM operator list mode is used, FMB630 will work normally, but there will be more switching activities. In addition, APN settings in Global parameters should be entered for SIM 1 and SIM 2 to avoid not sending records over GPRS.

When FMB630 connected to configurator choose Global Parameter section as shown on Figure 47, then in Profile Change ON select 2 SIM Operator List.
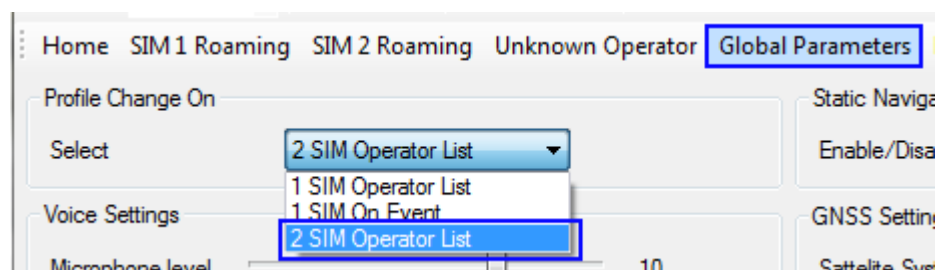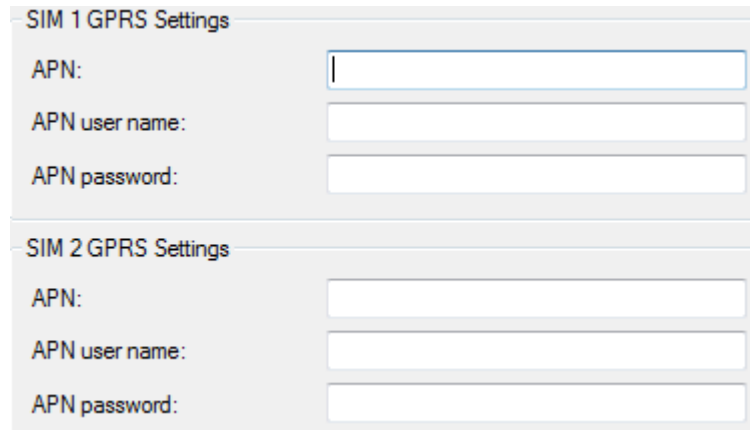


**Figure 47 FMB630 Configurator window 2SIM mode setup**

You can see four new profiles buttons after changing to 2 SIM Operators list: Home, SIM 1 Roaming, SIM 2 Roaming and Unknown Operator.

SIM 1 and SIM 2 APN settings are set in the Global parameters tab (Figure 48). Some operators use specific authentication for GPRS session – CHAP or PAP. If any of these is used, APN should be entered as 'chap:<APN>' or 'pap:<APN>'. I.e. if operator is using APN 'internet' with CHAP authentication, it should be entered as 'chap:internet'. Information about APN and authentication type should be provided by your GSM operator.
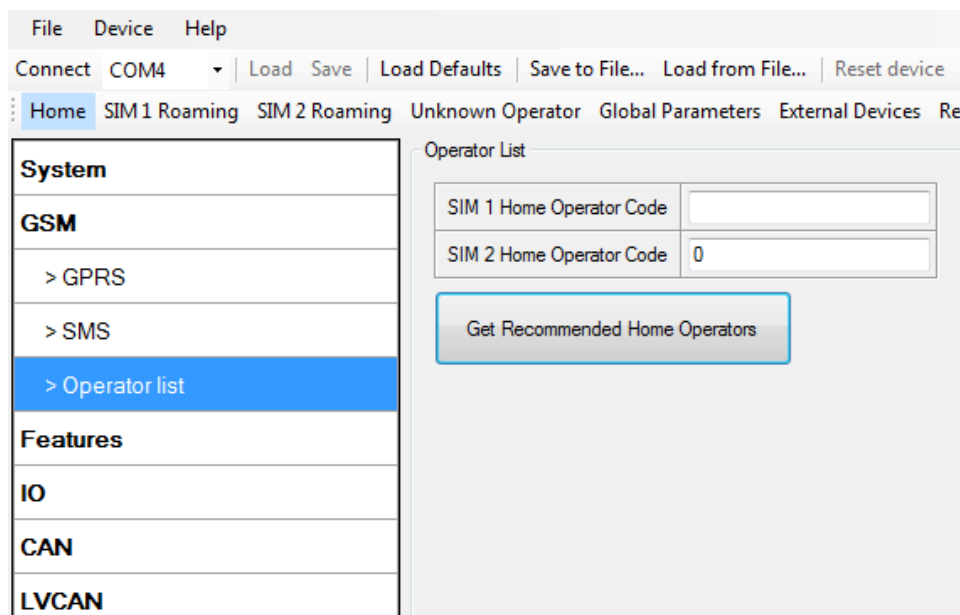


**Figure 48 APN settings for SIM 1 and SIM 2**

### 8.1.1 Home Network

Selecting Home profile gives Home Operator Code settings possibility for SIM 1 and for SIM 2 (Figure 49). These Home Operators have the highest priority and must be inserted. FMB630 gets possible operator codes list from the network and compares them with the operator codes inserted in Home profile's list. At first, it tries to connect to SIM 1 Home Operator, if operator is unreachable; the device switches to SIM 2 slot and tries to connect to SIM 2 Home Operator.



**Figure 49 Home network setting**

When the connection procedure is successful, FMB630 stays connected to the available Home operator using the SIM card, which was inserted for and works according to the Home profile parameter settings.

If none of the Home operators could be connected with, FMB630 switches to the SIM 1 card tries to connected to its roaming operators from SIM 1 Roaming profile.

### 8.1.2 SIM 1 Roaming

In this window you can fill the Preferred Operators List for SIM 1, up to 50 operators (Figure 50). SIM 1 Roaming operator list has the second priority after the Home operators. If there are no available home operators, FMB630 checks if there are available SIM 1 Roaming operators from the list. If there are several available Roaming operators from the list, FMB630 connect to the higher priority operator from the SIM 1 Roaming operator list.

If there are no available operators from SIM 1 Operator list or the list is empty, FMB630 scans the SIM 2 Roaming operator list for available operators.

If the connection is lost, FMB630 will return to Home profile and try to connect to Home operators as it has higher priority. FMB630 checks a possibility to connect to Home network every 10 min. and goes further by priority.
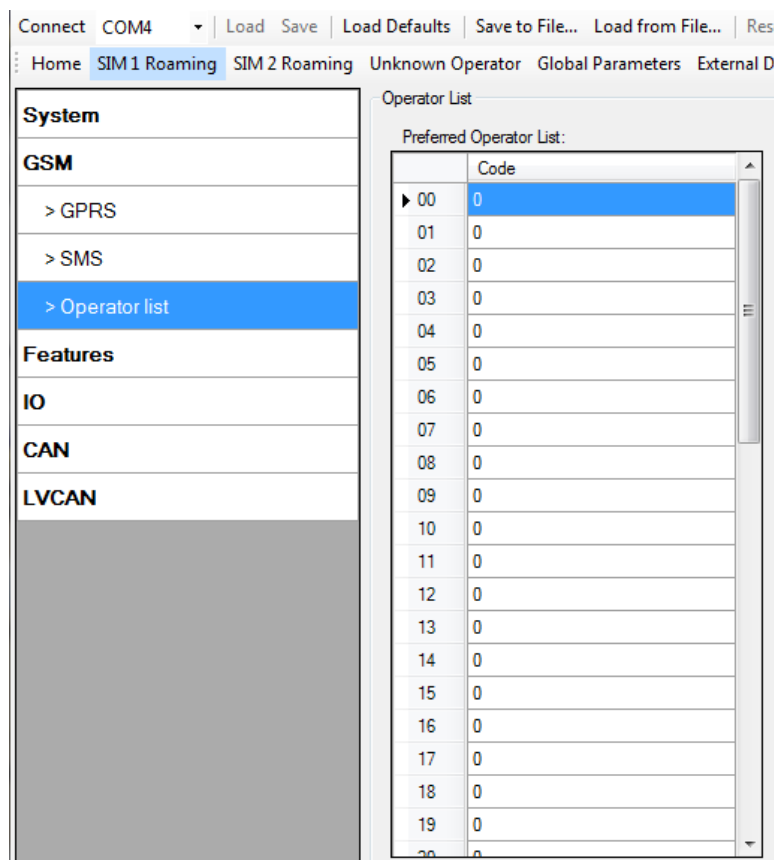


**Figure 50 SIM 1 Roaming Operator list**

### 8.1.3 SIM 2 Roaming

In this window you can fill the Preferred Operators List for SIM 2 up to 50 operators (Figure 51). SIM 2 Roaming operators list has the third priority after the Home network and after SIM 1 Roaming operators list. If there are no available operators from Home operator list and SIM 1 Roaming operators list, FMB630 scans for available operator in the SIM 2 Roaming operator list. If there is an available SIM 2 Roaming operator in the list, FMB630 switches the profile to SIM 2 Roaming, switches the SIM card to Slot 2 and connects to available operator from the SIM 2 Roaming operator list.

If the connection is lost, FMB630 will return to scan Home network as it has higher priority, after it goes to scan SIM 1 Roaming operators list as it has the second priority, only will be not

connections in higher priorities lists it goes to scan SIM 2 Roaming operators list again. FMB630 every 10 min. checks a possibility to Home network connection and further, if it is necessary, operates by the priority.
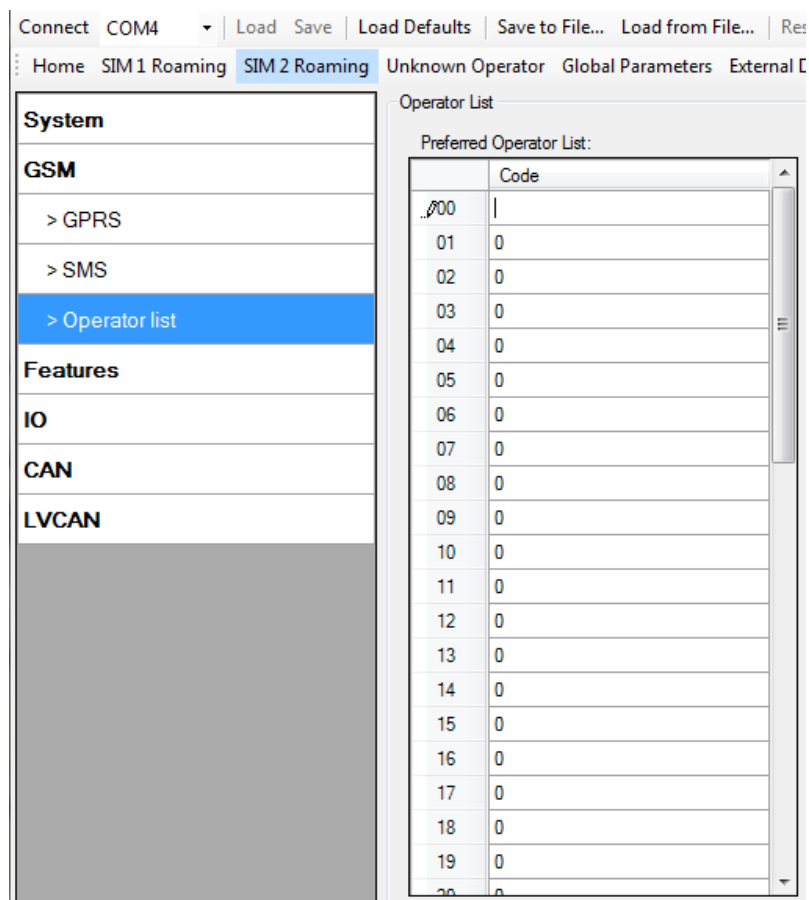


**Figure 51 SIM 1 Roaming Operator list**

### *8.1.4 Unknown Operator*

Unknown Operator profile (Figure 52) has the fourth priority after the Home network, after SIM 1 Roaming operators list and after SIM 2 Roaming operators list. The user cannot insert operators in Unknown operator list, it is not usable.

The FMB630 switches to Unknown operator profile using the SIM card it has used before (FMB630 doesn't switch the SIM cards) when SIM 1 and SIM 2 operator lists are empty and there is no possibility to connect to SIM 1 and SIM 2 Home operators. In this profile FMB630 connects to an operator from the list, received from the network, with the best signal quality.

FMB630 every 10 min. checks a possibility to Home network connection and further, if it is necessary, operates by the priority.

**Figure 52 Unknown Operator List**

### 8.1.5  Dual SIM algorithm

Two SIM cards use algorithm is shown in the diagram (Figure 53).
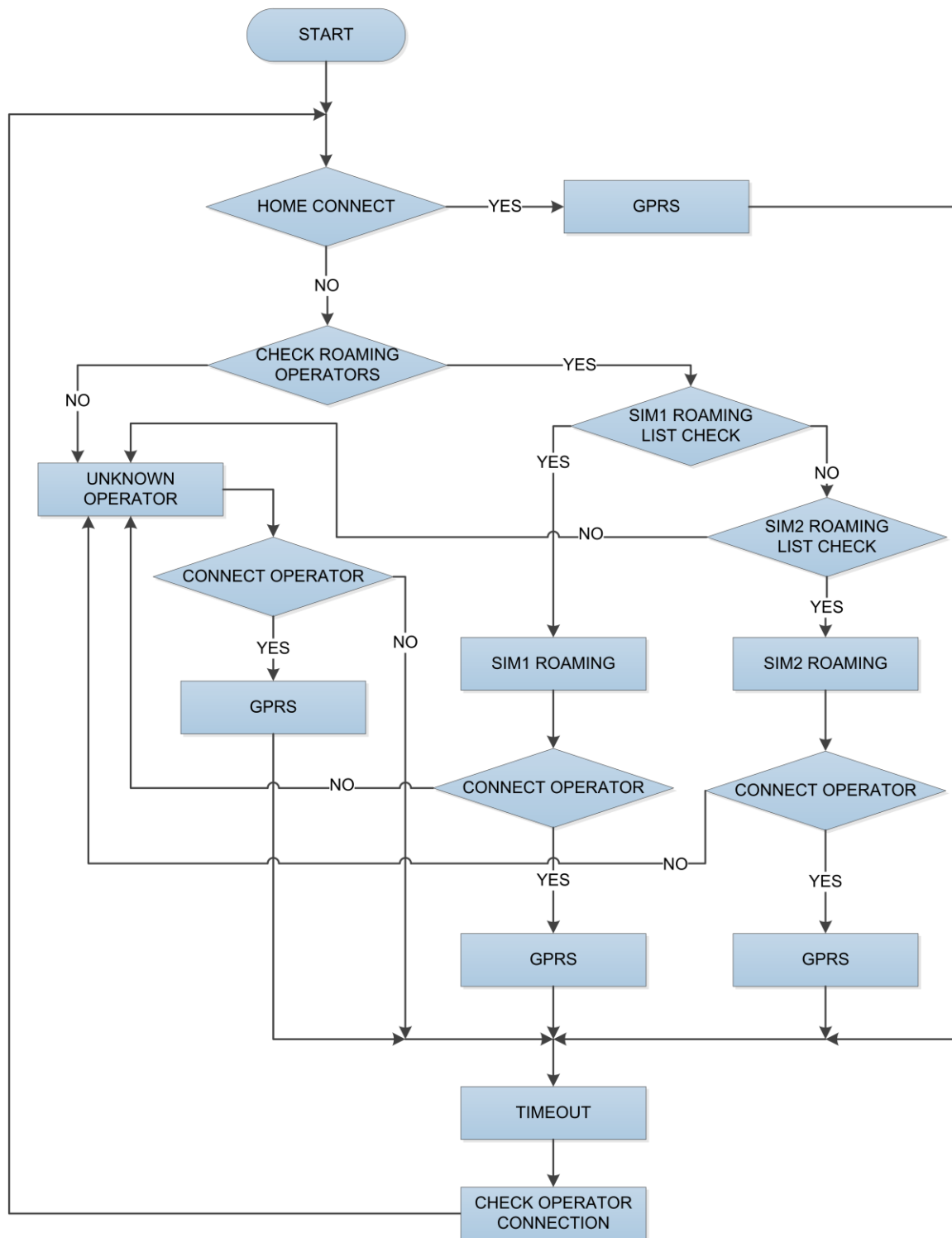


**Figure 53 Dual SIM connection algorithm**

The FMB630 is always trying to connect to Home operator. If it cannot connect, then it goes to Roaming Operator. The Roaming Operator is chosen by priority. Higher placed operator in the operators list has higher priority. If impossible to connect to Roaming Operator from operator's list or the operators list is empty, then the FMB630 connects to Unknown operator.

In all cases when a timeout has appeared the operator search procedure is done. If better home operator is found or the higher priority operator from the roaming operator list is found, the device connects to it. For example: Home is better than Roaming Operator, Roaming operator is better than Unknown operator. In other cases the primary operator's connection is continued.

# 9    DATA ACQUISITION

Data can be acquired using GPS or I/O elements. GPS data is for basic vehicle tracking, data acquisition by I/O elements gives more specific information.

## 9.1    GPS data acquisition

There are four ways of GPS data acquisition which are configured in *Features > sMode* menu (Figure 54).

Device checks angle, distance, time and speed differences with last saved record. If differences are greater than configured a record is generated. Checking sequence: first angle is checked then distance then time differences and last – speed differences.
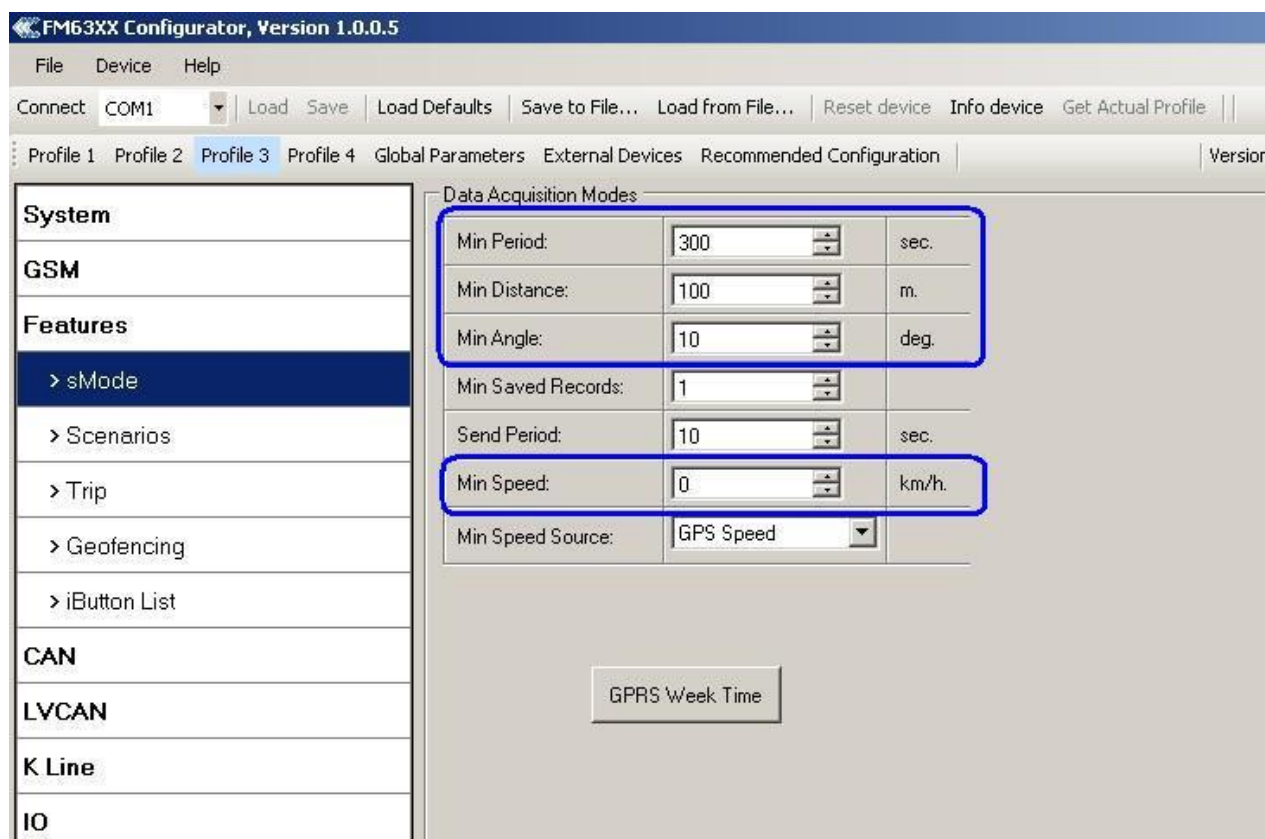


**Figure 54 GPS acquisition configuration window**

Actual configuration parameters are marked in blue.

### 9.1.1    Min. Period

**Time based data acquiring** (Figure 55) – records are being acquired every time when defined interval of time passes. Entering zero means that data will not be recorded according to time. This method is suitable best for basic position update.
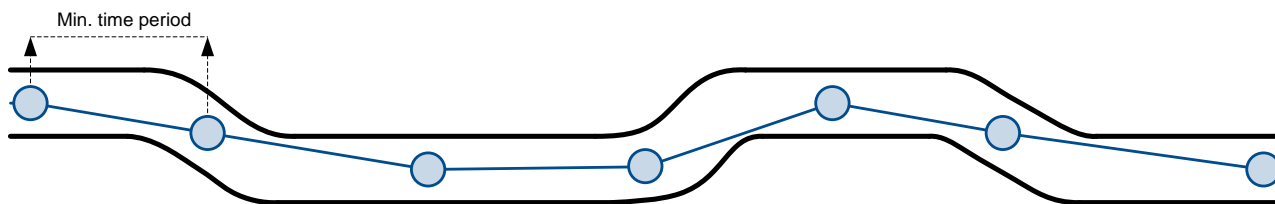
**Figure 55 Time based tracking**

### 9.1.2 Min. Distance

**Distance based data acquiring** (Figure 56) – records are being acquired when the distance between previous coordinate and current position is greater than defined parameter value. Entering zero means that data won't be recorded. This method is suitable for non-urban territories where moving trajectory is straight.
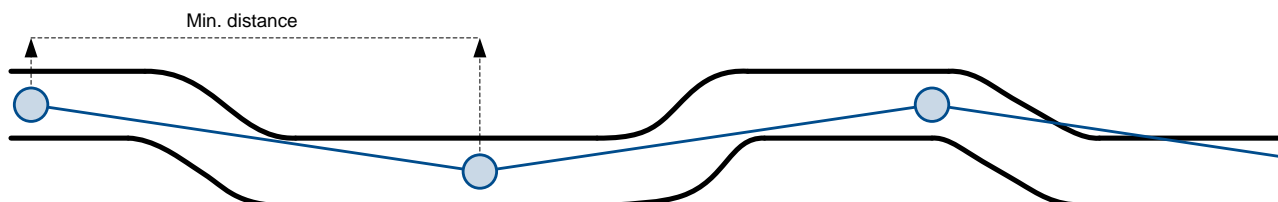


**Figure 56 Distance based tracking**

### 9.1.3 Min. Angle

**Angle based data acquiring** (Figure 57) – records are being acquired when angle difference between last recorded coordinate and current position is greater than the defined value. Entering zero disables data acquisition depending on angle. This method is suitable for urban territories. Note that record generation by angle is performed if vehicle is moving at least 6 km/h.
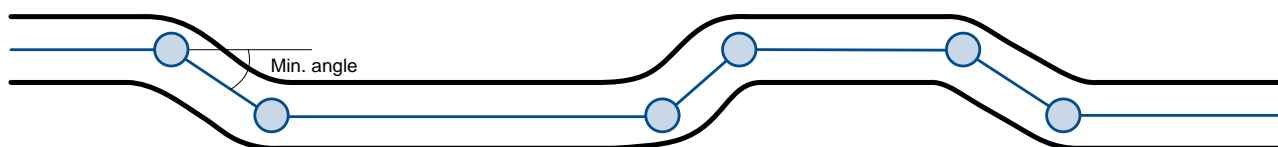


**Figure 57 Angle based tracking**

### 9.1.4 Min. Speed

**Speed based data acquiring** (Figure 58) – records are being acquired when speed difference between last recorded coordinate and current position is greater than the defined value. Entering zero disables data acquisition depending on speed. This method is suitable for urban territories.
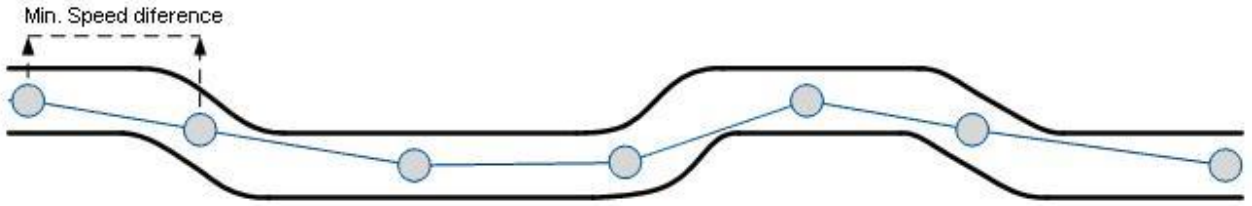
**Figure 58 Speed based tracking**

## 9.2 I/O data acquisition

Data also can be acquired using input output elements (it's change). All base elements are declared in sMode and in I/O

### 9.2.1 Configuration

Data acquisition by I/O elements can be configured selecting I/O menu in configurator (refer to Chapter 6.3.8.2).

*Priority:* Low – as a regular data; High – generated record are sent immediately to server; Panic - generated record are sent immediately to server and simultaneously the same record as SMS message;

*High Level*: High range of value input;

*Low Level*: Low Range of value input;

*Averaging constant*: (see detailed description in Chapter 6.3.8.2)

### 9.2.2 Event generation

There are five record event generation type examples (I/O speed is taken as I/O value example), please refer to Figures below.
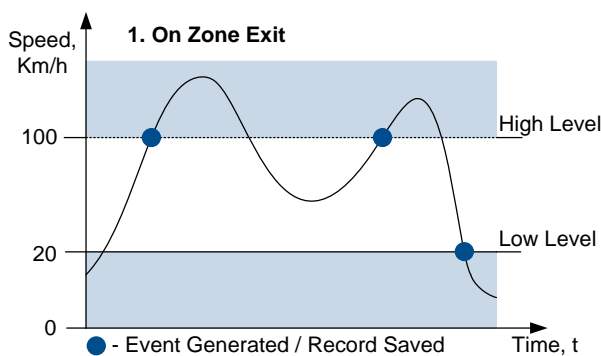


**Figure 59 Event On Zone exit**
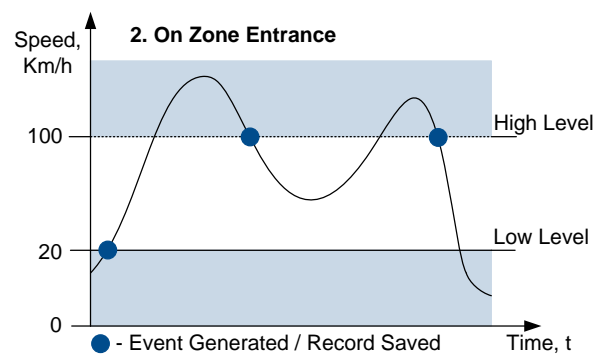


**Figure 60 Event On Zone entrance**
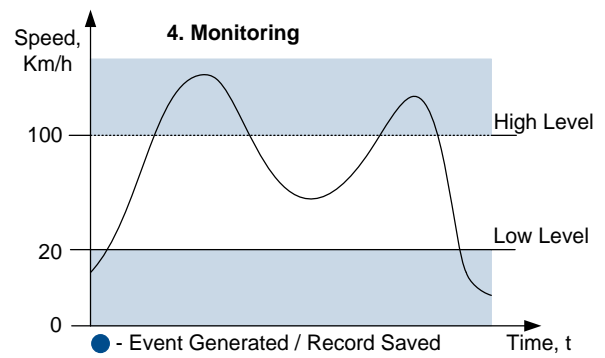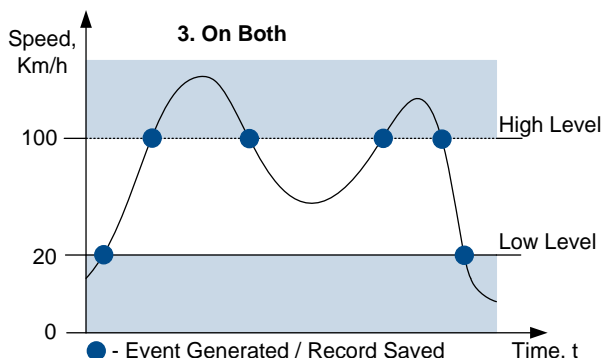
**Figure 61 Event On both**                    **Figure 62 Monitoring**
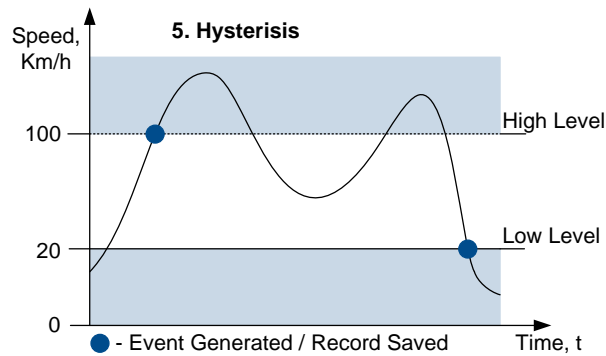


**Figure 63 Event on Hysteresis**

*Event on Zone Entrance:* record is generated when actual source value input is between High and Low level ranges which are set in configuration;

*Event on Zone Exit:* record is generated when actual source value input increases and becomes higher than High level and Low level values;

*Event on Both*: record is generated when actual source value input increases/decreases and becomes higher/lower than high and low level declared values;

*Monitoring*: no event at all; I/O values are recorded only when other trigger have worked (GPS acquisition or other I/O trigger)

*Hysteresis*: record is generated when actual source value input becomes higher than High level value, and decreasing becomes less than Low level value

*Event on Change*: record is generated on every source value change.

## 10 SLEEP MODE

While in sleep mode, FMB630 sets GPS receiver to sleep mode but GSM/GPRS module stays active, in Sleep mode power usage can be decreased to save vehicle's battery, because GPS module is turned off.

FMB630 can enter sleep mode if **ALL** of these conditions are met:
- FMB630 has to be configured to work in Sleep mode;
- Start-up timeout has elapsed (5 minutes after every restart of the device);
- No movement by accelerometer is detected;
- Ignition is off;
- USB cable is not connected.

FMB630 exits sleep mode if **ONE** of the following conditions are true:
- Movement by accelerometer is detected (depends on accelerometer start settings);
- Ignition (DIN1) is turned on (driven logic high);
- USB cable is connected;
- HIGH or PANIC priority eventual record is detected;

While being in sleep mode FMB630:
- cannot save periodical or eventual records;
- send data to server;

## 11 DEEP SLEEP MODE

While in deep sleep mode, FMB630 sets GPS receiver to sleep mode and turns off GSM/GPRS module (it is not possible to wake up device via SMS), therefore records with last good coordinates are being saved and sent to AVL server if configured (GSM/GPRS module is turned on to send data and after turned off). Depending on two configurable parameters, send period and min period, in Deep Sleep mode power usage can be decreased to save vehicle's battery.

FMB630 can enter deep sleep mode (standby mode) if **ALL** of these conditions are met:
- FMB630 has to be configured to work in Deep Sleep mode;
- Start-up timeout has elapsed (5 minutes after every restart of the device);
- No movement by accelerometer is detected;
- Ignition is off;
- Send period is more than 60 seconds (Data Acquisition Mode settings);
- USB cable is not connected.

FMB630 exits deep sleep mode if **ONE** of the following conditions are true:
- Movement by accelerometer is detected (depends on accelerometer start settings);
- Ignition is turned on (driven logic high);
- USB cable is connected;
- HIGH or PANIC priority eventual record is detected;

While being in deep sleep mode FMB630:
- can save periodical or eventual records;
- send data to server;

Note: If there is no need to save or send periodical data FMB630 has to be configured to switch to another profile on Deep Sleep Event where Min Period and Send Period parameters are 0 or big enough.

Note: In order to save GPRS traffic records saved in deep sleep mode contain below listed I/O elements information:
Digital Inputs (1-4), Analog Inputs (1-4), Battery Voltage, Battery Current, Digital Outputs (1-4), External Voltage, Movement Sensor, Deep Sleep.
Also, Deep Sleep I/O is always LOW PRIORITY!

## 12 FEATURES AND SCENARIOS

### 12.1 ECO driving/Green driving Scenarios

Six scenarios are available on FMB630 device. All scenarios can be activated at the same time and all activated scenarios can be configured to control the same DOUT (expect excessive idling).



**ECO driving/Green driving Scenarios.** Helps to prevent and inspect driver about harsh driving. Eco driving scenario continuously monitors: accelerating, braking and cornering forces depending on build in accelerometer or Green driving depending on GPS. The device inspects driver if needed. Monitoring sensitivity is configurable.

Any of the four DOUT can be configured and then controlled by scenario for user needs, buzzer or LED for example. Output activation time after harsh event is also configurable.

To save GPRS traffic ECO driving/Green driving event will be **generated (included into records) only** when FMB630 measured values are higher than those set in configuration, without additional I/O settings.

To prevent generating false events, harsh acceleration and harsh braking is monitored only when following conditions are fulfilled:
- Ignition is ON
- Vehicle speed is equal or higher than 10km/h

Harsh cornering is monitored only when following conditions are fulfilled:
- Ignition is ON
- Vehicle speed is equal or higher than 30km/h

**ECO driving or Green driving Scenario:** Eco driving is based on accelerometer value and Green driving based on GPS position.



PLEASE NOTE that Eco Driving functionality generally is dependent on accelerometer. Device must be on plain/horizontal surface to calibrate itself correctly. It calibrates once it is powered up.

#### 12.1.1 Mounting Requirements



PLEASE PAY ATTENTION, that ECO driving functionality will operate correctly only if device is mounted into the vehicle in a proper position.

ECO driving functionality operation is based on accelerometer. It is important to mount FMB630 device correctly to avoid functionality malfunctions (first condition). In the picture below (Figure 64) mounting recommendations are displayed. Please **note** that beside those recommendations

1. You can choose how FMB630 is deployed. It means that that there is no effect to measurements if FMB630 top/bottom side points up or down.
2. Device can be deployed at any place in the car.
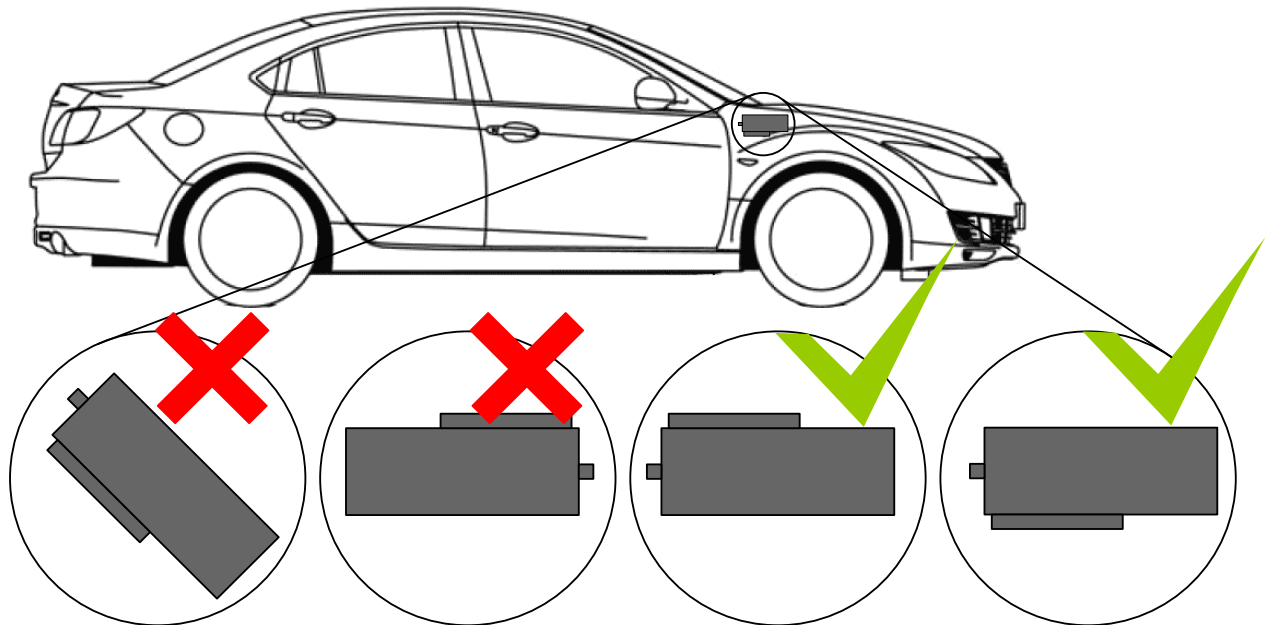


**Figure 64 Correct mounting position of the FMB630 in the vehicle**

For ECO driving to work properly, device connection pins socket must point towards the vehicles front side. Deviations of +/- 2$^o$ are allowed. But it should be as straight as possible. Deviations of maximum +/- 15$^o$ are allowed (Figure 65).
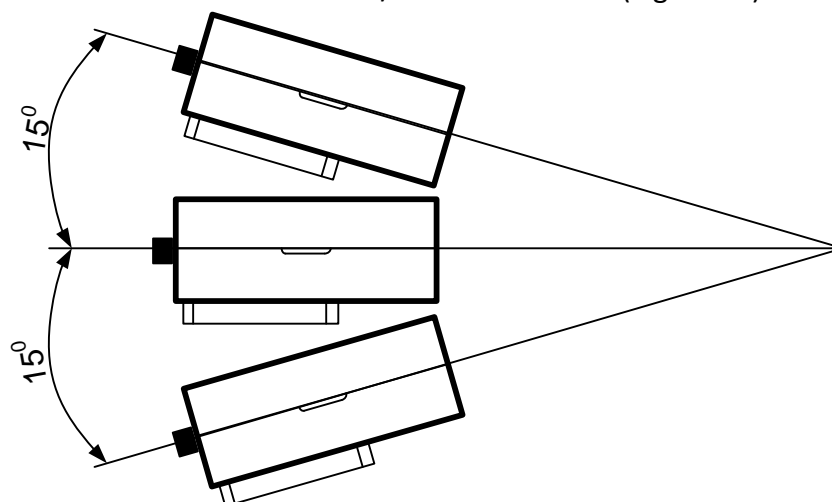


**Figure 65 MAX deviation from horizontal plane of FMB630 mounting**
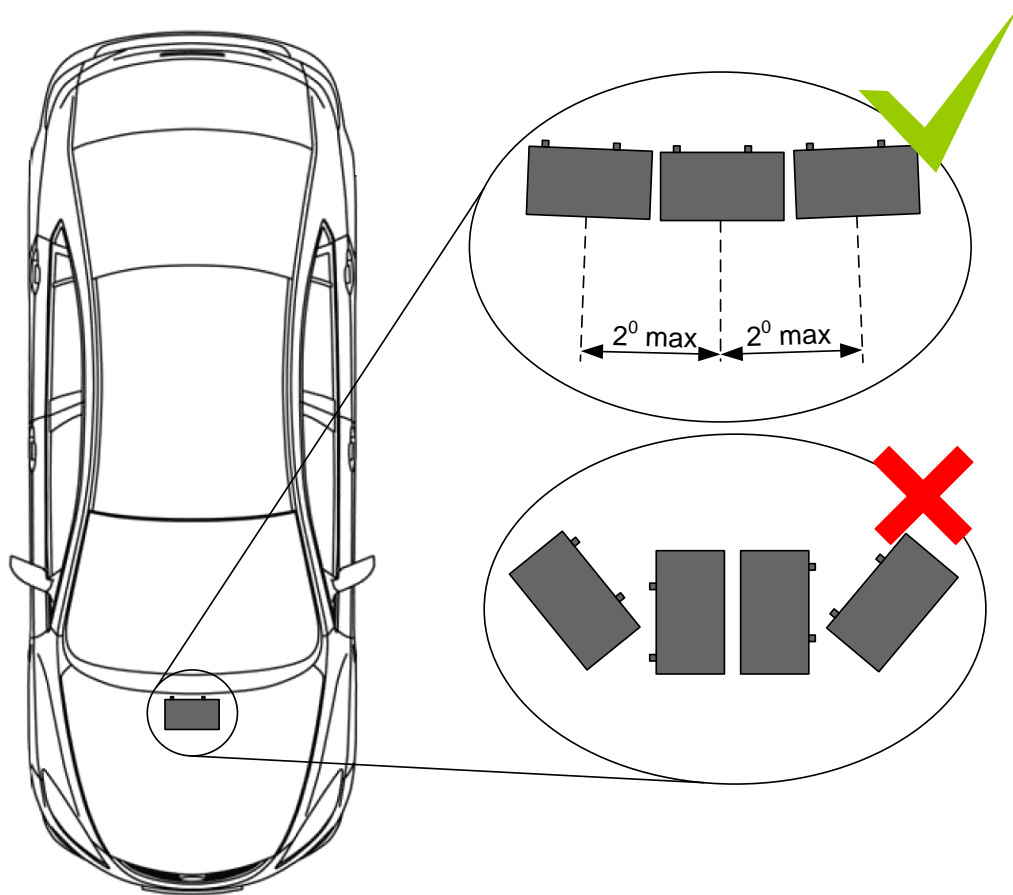
**Figure 66 Horizontal position MAX deviation of FMB630 mounting**

Horizontal position must be as flat as possible – parallel with vehicle plain.

### 12.1.2 Configuration

Parameters used with ECO driving/Green driving functionality.

**Figure 67 ECO driving/Green driving configuration parameters**

**Table 37 ECO driving/Green driving parameters description**

| ECO driving/Green driving configuration parameter name | Description |
|---|---|
| ECO driving type | Selects which DOUT will control scenario |
| Data source | Selects from where data will be taken |
| Max Acceleration Force | Value which can be reached while accelerating without triggering harsh acceleration event. |
| Max Braking Force | Value which can be reached while braking without triggering harsh braking event. |
| Max Cornering Force | Value which can be reached while cornering without triggering harsh cornering event. |
| Acceleration Active Output Duration | Set active output duration after harsh acceleration event detected |
| Braking Active Output Duration | Set active output duration after harsh braking event detected |
| Cornering Active Output Duration | Set active output duration after harsh cornering event detected |

### 12.1.3 Data output

ECO driving/Green driving functionality generates events on three cases. If vehicles:
- Acceleration exceeds defined parameter value
- Deceleration (braking) exceeds defined value
- Cornering force exceeds defined value

Program continously monitors and process data from accelerometer than decides whether harsh event is detected or not. If any of three cases are satisfied event is generated. Record is saved and sent to server (FMB630 must be configured properly). Event value is multiplied by 10 before sending/saving record to get more precision when displaying **data***.

Digital output No.1 is activated for a period of time to warn driver. Output on-time should/can be configured separately for each case.

> **\*Example.** If acceleration harsh event of 3.55 m/s2 detected. Record with value 3.55\*10 = 35.5 ≈ 36 will be saved ant sent to server.

## 12.2 Overspeeding Scenario

**Overspeeding.** Helps to prevent from exceeding fixed speed and inspects driver if needed. Any DOUT (which is configured) is controlled by scenario for user needs, to manage buzzer, LED etc.

### 12.2.1 Mounting Requirements and Working Conditions

1. All scenarios on corresponding Digital Output can be enabled at once.
2. Ignition must be on.
3. Device module mounting position doesn't have any influence for correct scenario operation.

### 12.2.2 Configuration



**Figure 68 Overspeeding configuration parameters**

**Overspeeding.** Selects which DOUT will control Overspeeding scenario.
**Max Allowed Speed.** Set speed limit to reach without triggering Overspeeding event.

## 12.3 Immobilizer/ Authorized Driving Scenario

**Immobilizer (iButton list checking disabled).** Vehicle can be used only if iButton is connected. In this scenario iButton list is not used; connect any iButton to pass Immobilizer security.  Selected DOUT is controlled by scenario for user needs.

### 12.3.1 Configuration
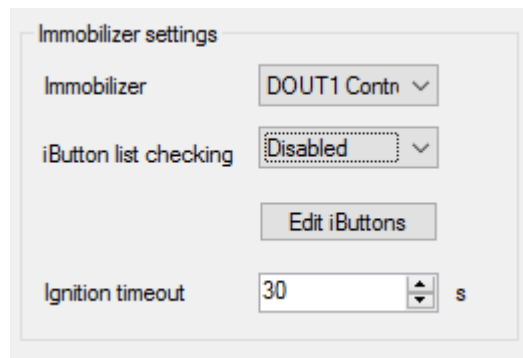
**Figure 69 Immobilizer configuration parameters**

**Immobilizer.** Selects which DOUT will control Immobilizer Scenario.

**iButton list checking**. When Disabled turn on Immobilizer Scenario.

**Ignition timeout.** Time that need to be passed when ignition (DIN1) turns off to reactivate scenario.

**Authorized Driving (iButton list checking enabled).** Gives ability to use vehicle for 500 specific iButton owners (specified in iButton list). Selected DOUT is controlled by scenario for user needs, to manage buzzer, LED etc.

### 12.3.2  Configuration
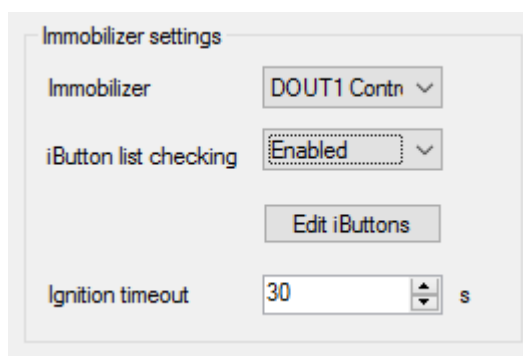


**Figure 70 Authorized driving configuration parameters**

**Immobilizer.** Selects which DOUT will control Immobilizer Scenario.

**iButton list checking.** When Enabled turn on authorized driving Scenario.

**Ignition timeout.** Time that need to be passed when ignition (DIN1) turns off to reactivate scenario.

## 12.4  Excessive Idling Scenario

Scenario is activated when vehicle stops for specific amount of time. You can configure time it takes to turn on this scenario (Time to Stationary). Scenario is activated until vehicle starts moving and keeps moving for amount of time that is configured (time to movement).
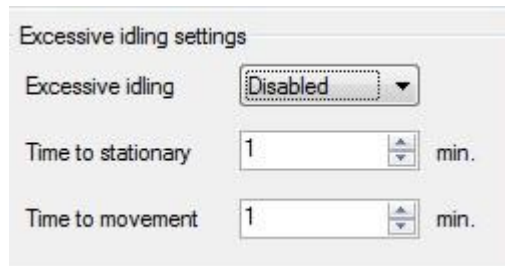
**Figure 71 Excessive Idling Configuration**

## 12.5 Jamming Detection Scenario

Scenario is activated and DOUT can be control when jamming is detected

### 12.5.1 Configuration
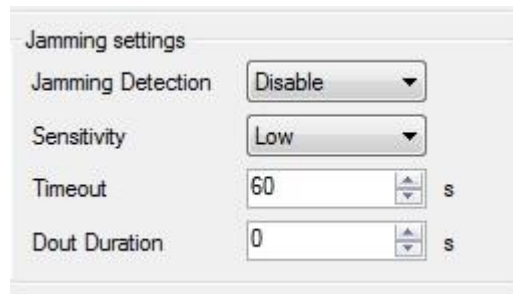


**Figure 72 Jamming Detection Configuration**

**Jamming Detection:** Scenario Enable, Disable and DOUT selection
**Sesitivity:** Sensitivity to control false jamming detection
**Timeout:** Jamming timeout is the duration after how much time device should initiate jamming event after detecting jamming.
**Dout Duration:** Time, how long DOUT should stay active after jamming detection event is generated.

## 12.6 iButton Notification Scenario

Gives ability to use ibutton to control DOUT for configurable amount of time. When iButton is attached and is successfully read, configured DOUT goes ON

### 12.6.1 Configuraton
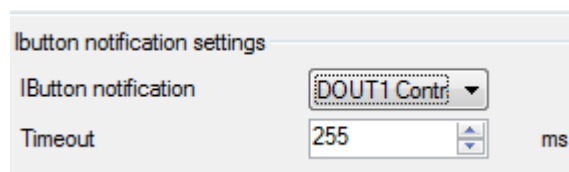


**Figure 73 iButton notification configuration parameters**

**iButton notification:** Selects which DOUT will control this scenario

**Timeout:** Configurable amount of time for which DOUT will be ON

### 12.7 COM1 and COM2 Working Modes

COM1 is dedicated only for connecting tachograph. Protocols DTCO 1381 and SE 5000 are available.

**COM2 Working Modes:**

#### 12.7.1 Silent Mode

FMB630 doesn't do any activity in silent mode. Logs aren't saved and any data isn't sent.

#### 12.7.2 FM Log Mode

This is default mode of the FMB630. It is suitable for debugging.

#### 12.7.3 LLS Mode

#### 12.7.3.1 LLS Mode Configuration

1. Globals->COM2 Settings->Baudrate = 19200
2. Globals->COM2 Settings->Mode = LLS

Note
    COM2: Level will be with ID:203 Temperature will be with ID:204.
    On Valid data Receive Status LED will blink.

#### 12.7.4 LCD Mode Configuration

1. External Devices->COM2 Settings->Baudrate = 57600
2. External Devices ->COM2 Settings->Mode = LCD

How to use:

* From Terminal need send command "WT^W your text here"
* From Hercules (server) Send "#DO DAT=you text here" (in special packet)

Notes:
#DO DAT= command prints only to COM2
Link between FM and server has to be established for this functionality to work
On Valid data Receive Status LED will blink.

#### 12.7.5 RFID HID Mode Configuration

1. External Devices ->COM2 Settings->Baudrate = 57600
2. External Devices ->COM2 Settings->Mode = RFID
3. External Devices ->COM2 Settings->Parity = Even

### 12.7.6  RFID MF7 Mode Configuration

1. External Devices ->COM2 Settings->Baudrate = 9600
2. External Devices ->COM2 Settings->Mode = RFID MF7
3. External Devices ->COM2 Settings->Parity = None

### 12.7.7  Garmin Mode Configuration

#### 12.7.7.1 Settings

1. External Devices ->COM2 Settings->Baudrate = 9600
2. External Devices ->COM2 Settings->Mode = Garmin
3. External Devices ->COM2 Settings->Parity = None

Ping Filter Enable Parameter:

0 - [DISABLED] = Ping packet will not blocked.
1 - [ENABLED] = Ping packet will be blocked.

Unicode Support Packet Enable Parameter:

0 - [DISABLED] = Unicode Packet will be send to server.
1 - [ENABLED] = Unicode Support Packet will not be send to server.

#### 12.7.7.2 Firmware Configuration

Supported Garmin protocols: A***

(http://developer.garmin.com/lbs/fleet-management/fmi-protocol-support-matrix/)

Blocked Garmin ID's:

- Command 0A
- Date/Time Data 0E
- Unit ID/ESN 26
- Pvt Data 33
- Legacy Stop Message 87
- Legacy Text Message 88
- Ping 0260
- Ping response 0261
- Product ID Request 0001
- Product ID Data 0002

FM send ACK the these packets, ant these packets are not sent to server to reduce traffic.

Allowed Garmin ID's:

- ACK 06
- NAK 15
- Fleet Management Packet A1

Note:If packet are not listed here packet ID will be ignored.

### 12.7.8 TCP Link Mode

In this mode link with external device using text messages can be established.

Any string of data coming to COM will be routed to server. (if link is currently active) First message will be packet to special packet[7]. Packet will be sent as Codec12.

If you want to send message to COM, you need to pack in special packet.

1. External Devices ->COMx Settings->Baudrate = any of available baudrates
2. External Devices ->COMx Settings->Mode = TCP Link Mode
3. External Devices ->COMx Settings->Parity = any setting
4. When sending a packet through COMx don't forget to enter a new line otherwise the packet will not be recognized. Packet format: <enter your message> <enter new line> - send. For example: *message/n* or in HEX it should look like: *6D 65 73 73 61 67 65 0D 0A*

These parameters are automaticaly configured when TCP Link mode is selected:

* Record refresh timeout 9999999 sec.
* ignores weektime, timesync, and records

### 12.7.9 TCP Link Mode (Binary)

This mode is the same as above but binary message doesn't need new line. Packet will be sent as Codec12. Packet format: <enter your message> - send. For example: *message* or in HEX it should look like: *6D 65 73 73 61 67 65*

1. External Devices ->COMx Settings->Baudrate = any of the available baudrates
2. External Devices ->COMx Settings->Mode = TCP Link Mode(Binary)

FMB630 supports buffering messages when there is no data link, messages will be saved to flash with a timestamp. Space reserved for buffering is 64 kB. By default buffering is disabled. To enable set "TimeStamp" property. Buffered messages will be sent using Codec13 protocol.
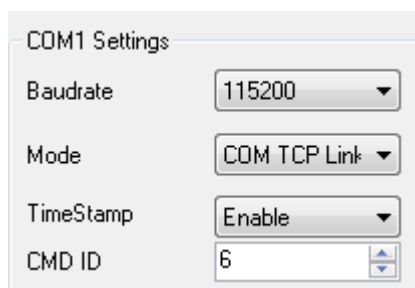


**Figure 74**

*Note. There is a default timeout which is 30ms. When no packets are received for more than 30ms, its seen as the end of the packet.*

---

[7] For additional information of special packet, please contact to your local sales representative

### 12.7.10    NMEA Log Mode

In this mode NMEA logs are sent via COM2 ports.

## 13  SMS COMMAND LIST

SMS commands are used to identify FMB630 current state, possible configuration errors, perform reset, set parameters, switch on/off outputs, etc.

SMS commands should be sent along with module login and password and sender number must be entered in the authorized number list (if at least one other number is entered). Please see SMS settings in Chapter 6.3.5.3 for more details.

SMS structure is as follows:
<login><space><password><space><command>
*Example:*
*opa opa getgps*

**Table 38 SMS command list and description**

| Command | Description | Response |
|---|---|---|
| getstatus | Modem Status information | Yes |
| getweektime | Current device time, Day of Week and amount of minutes passed since start of week | Yes |
| getops | List of currently used and available GSM operators | Yes |
| readops# | Emergency gsm operator readout from active profile<br># - 1,2,3<br>1 – operators [1-20]<br>2 – operators [21-40]<br>3 – operators [41-50] | Yes |
| getnmeainfo | Nmea error debug sms | Yes |
| getcfgtime | Date and Time of last successful configuration | Yes |
| getgps | Current GPS data and time | Yes |
| loadprofile# | Load specified profile into RAM Engine Profile. # - number of profile to load | Yes |
| cpureset | Reset CPU | No |
| resetallprof | Reset all FLASH profiles to default profile | Yes |
| getver | Device / Modem / Code version information | Yes |
| getinfo | Device runtime system information | Yes |
| deleterecords | Delete all records saved on FLASH | No |
| getio | Readout digital inputs and outputs, analog inputs | Yes |
| readio # | Readout input value according entered ID, # - ID value | Yes |
| setdigout XXXX Y1 Y2 Y3 Y4 | Set digital outputs<br>0 – OFF, 1 – ON<br>Y1 – timeout for DO1<br>Y2 – timeout for DO2<br>Y3 – timeout for DO3<br>Y4 – timeout for DO4 | Yes |

| Command | Description | Response |
|---|---|---|
| getparam # | Readout parameter value according entered ID.<br>\# - ID value. | Yes |
| setparam # # | Set parameter value according entered ID and Value.<br>1.# - ID value.<br>2.# - New Parameter Value | Yes |
| flush<br>#,#,#,#,#,#,# | Initiates all data sending to specified target server<br>1.# - IMEI<br>2.# - APN<br>3.# - LOGIN<br>4.# - PASS<br>5.# - IP<br>6.# - PORT<br>7.# - MODE (0-TCP/1-UDP) | Yes |
| sn x [x=0;1] | Enable/disable static navigation | Yes |
| banlist | Banlist information | Yes |
| crashlog | Crash log information | Yes |
| delete_all_sms | Delete all read SMS | No |
| getgnss | Current GNSS information | Yes |
| odinfo | Current odometer information | Yes |
| prof2backup | Saves configuration to backup | Yes |
| backup2prof | Recovers saved profile | Yes |
| backupinfo | Backup information | Yes |

## 13.1 getstatus

**Table 39 getstaus command response**

| Response details | Description |
|---|---|
| Data Link | Indicate module connection to server at the moment: 0 – Not connected, 1 – connected |
| GPRS | Indicate if GPRS is available at the moment |
| Phone | Voice Call status: 0 – ready, 1 – unavailable, 2 – unknown, 3 – ringing, 4 – call in progress, 5 – asleep |
| SIM | SIM Status: 0-ready, 1-pin, 2-puk, 3-pin2, 4-puk2 |
| OP | Connected to GSM Operator: Numerical id of operator |
| Signal | GSM Signal Quality [0-5] |
| NewSMS | Indicate if new message received |
| Roaming | 0 – Home Network, 1 – roaming |
| SMSFull | SMS storage is full? 0 – ok, 1 – SMS storage full |
| LAC | Location Area Code |
| Celll ID | Cell ID |

*Answer Example: Data Link: 0 GPRS: 1 Phone: 0 SIM: 0 OP: 24602 Signal: 5 NewSMS: 0 Roaming: 0 SMSFull: 0 LAC: 0 Cell ID: 0*

## 13.2 getweektime

| Response details | Description |
|---|---|
| Clock Sync | Indicates system clock synchronization status. 0 – System is not synchronized, 1 – System synchronized |
| DOW | Day Of Week – indicates current day of week starting from 1 – Monday, 2 – Tuesday, etc. |
| Time | Indicates current GMT time |
| WeekTime | Indicates time in minutes starting from Monday 00:00 GMT |

*Answer Example:  Clock Sync: 1 DOW: 4 Time 12:58 Weektime: 6538*

## 13.3 getops

**Table 41 getops command response**

| Response details | Description |
|---|---|
| LIST | Returns list of current available allowed operators. |

*Answer Example: GSM OP LIST: 0. 24602*

## 13.4 readops

**Table 42 readops command response**

| Response details | Description |
|---|---|
| LIST | Returns acknowledgment of operators in active profile configuration. |

## 13.5 getnmeainfo

**Table 43 getnmeainfo command response**

| Response details | Description |
|---|---|
| BChSum | Nmea packets with bad checksum counter. |
| HAct | Actual HDOP |
| BT | Nmea packets with bad timestamp counter |
| BLat | Nmea packets with bad latitude counter |
| BLon | Nmea packets with bad longitude counter |
| BSpd | Nmea packets with bad speed counter |
| BAng | Nmea packets with bad angle counter |
| GJC | Nmea packets with GPS jumps counter |
| Rjc | Rejected Nmea packets counter |

## 13.6 getcfgtime

**Table 44 getcfgtime command response**

| Response details | Description |
|---|---|
| Date/Time | Returns last performed configuration date and time. |

*Answer Example: Last Configuration was performed on: 2010.4.15 5:45:19*

### 13.7 getgps

**Table 45 getgps command response**

| Response details | Description |
| --- | --- |
| GPS | Indicates valid (1) or invalid (0) GPS data |
| Sat | Count of currently available satellites |
| Lat | Latitude (Last good Latitude) |
| Long | Longitude (Last good Longitude) |
| Alt | Altitude, m |
| Speed | Ground speed, km/h |
| Dir | Ground direction, degrees |
| Date | Current date |
| Time | Current GMT time |

*Answer Example: GPS:1 Sat:7 Lat:54.71473 Long:25.30304 Alt:147 Speed:0 Dir:77 Date: 2007/8/24 Time: 13:4:36*

### 13.8 loadprofile#

Returns acknowledgment of successful profile changing from currently used to preferred.
*Example: Profile Nr.1 successfully changed to Profile Nr.3*

### 13.9 cpureset

Resets cpu – does not send a response back to the sender.

### 13.10 resetallprof

Resets all FLASH profiles to default profile.
*Answer Example: All Profiles Reseted.*

### 13.11 getver

**Table 46 getver command response**

| Response details | Description |
| --- | --- |
| Code Ver | Firmware version |
| Device IMEI | IMEI |
| Device ID | Device ID is used to detect which type of configuration to load |
| BL Ver | Bootloader Version |
| Modem App Ver | Version of modem application |
| Hw | Hardware type |

*Answer Example: Code Ver:01.02.12 Rev:1 Device IMEI:353976010139156 Device ID:000007 BL Ver:05.16 Modem Ver:TM11Q_R_01.03.04.00_004 Hw:Int Bat + GGG + LIS3DH*

## 13.12　　　getio

**Table 47 getio command response**

| Response details | Description |
|---|---|
| DI# | Digital Input state |
| DO# | Digital Output state |
| AI# | Analog Input state |

*Answer Example: DI1:0 DI2:0 DI3:0 DI4:0 AI1:0 AI2:0 DO1:0 DO2:0 DO3:0 DO4:0*

## 13.13　　　getinfo

**Table 48 getinfo command response**

| Response details | Description |
|---|---|
| INI | Device Initialization Time |
| RTC | RTC Time |
| RST | Restart Counter |
| ERR | Error Counter |
| SR | Number of Sent Records |
| BR | Number of broken records |
| CF | Profile CRC Fail counter |
| FG | Failed GPRS counter |
| FL | Failed link counter |
| UT | UPD Timeout counter |
| P# | Current profile |
| #;#;#;#;# | # - how many times appropriate profile ( Profile0;  Profile1; Profile2; Profile3; Profile4 ) was loaded |
| SMS | Sent SMS Counter |
| NOGPS | No GPS Timer |
| GPS | GPS receiver state. 0 – OFF, 1 – restarting, 2 – ON but no fix, 3 – ON and operational, 4 – sleep mode |
| SAT | Average satellites |
| RS | Reset Source Identification |
| RF | Number of records found on FLASH |

*Answer Example: INI:2007/8/24 10:15 RTC:2007/8/24 12:43 RST:2 ERR:11 SR:182 BR:0 CF:0 FG:0 FL:0 UT: P:1;0;1;0;0;0 SMS:2 NOGPS:0:0 GPS:3 SAT:7 RS:7 RF:11*

## 13.14　　　deleterecords

Deletes all saved records from device memory. Device does not send a response back to the sender.

## 13.15　　　readio #

**Table 49 readio command response**

| Response details | Description |
|---|---|
| ID | IO element ID |
| Value | IO Element value |

*Answer Example: IO ID:3 Value:0*

### 13.16        setdigout #### X Y Z W

Sets digital outputs to ON or OFF state (for some time if needed). Value is written as a row for OUT1, OUT2, OUT3, OUT4 values.

*Example: 'setdigout 0010 0 0 5 0' will set OUT3 to high level for 5 seconds, while OUT1, OUT3 and OUT4 to low level.*
*Ans. example:  "DOUTS are set to:0010 TMOs are: 0 0 5 0. Out1 Scenario: Enabled Out2 Scenario: Disabled"*

### 13.17        getparam ####

Read parameter value. ID consists of 4 digits – first digit identifies profile, second, third and fourth identifies parameter ID as described in Parameters Configuration chapter 6.3.

Table 50 getparam####

| Response details | Description |
|---|---|
| ID | Profile number and parameter ID |
| Value | Parameter value |

*Example: 'getparam 1245' command will request server IP address in profile1.*

### 13.18        setparam #### #

Sets new value for parameter. ID consists of 4 digits – first digit identifies profile, second, third and fourth identifies parameter ID as described in Parameters Configuration chapter 6.3. In value field a new parameter value is entered.
*Example: 'setparam 1245 127.0.0.1' will change configured IP address in profile1 with new value*

### 13.19        flush #,#,#,#,#,#,#

Initiates all data sending by GPRS to specified target server. Comma separated parameters go as numbered:
1.# - IMEI
2.# - APN
3.# - GPRS LOGIN
4.# - GPRS PASSWORD
5.# - IP
6.# - PORT
7.# - MODE (0-TCP/1-UDP)
Parameters are separated by comma (no spaces needed). In case you do not need to enter parameter (Login/Pass) – do not put space, simply put comma and write next parameter.
Example: opa opa flush 353976012555151,banga,,,212.47.99.62,12050,0

**Table 51 flush**

| Response details | Description |
|---|---|
| FLUSH SMS Accepted | FLUSH SMS Accepted |
| # records found on FLASH | Number of records found on FLASH |
| Minimum Records to Send: # | Number of minimum saved records to send |
| GPRS Enabled: # | State of the GPRS connection, 0 – disabled; 1 – enabled |
| Time Sync: # | Indicates time synchronization on the device, 0 – not synchronized; 1 – synchronized |

Answer Example: FLUSH SMS Accepted. 11 records found on FLASH. Minimum Records to Send: 1. GPRS Enabled: 1. Time Sync: 1.

## 13.20    getgnss

**Table 52 getgnss**

| Response details | Description |
|---|---|
| FIX | GPS fix |
| SAT GL | Total glonass sattelites |
| GP | Total gps sattelites |

Answer Example: FIX:1 SAT GL:5 GP:10

## 13.21    sn x

Returns state of static navigation and previous state: Static Nav is Disabled. Was:X or Static Nav is Enabled. Was:X ( 1 – enabled, 0 – disabled). If sent X is not 0 or 1, then response is: WARNING: Undefined SN parameter: X.

## 13.22    banlist

Returns a list of possible banned operators. If device returns zeroes, there are no banned operators saved. Format: A.Bs.C.D

**Table 53 banlist**

| Response details | Description |
|---|---|
| A | Banned operator code |
| Bs | Time left |
| C | Reason (GSM or GPRS |
| D | Counter (how many times this operator code was already banned) |

## 13.23 crashlog

Returns list of possible device crashes.

## 13.24 braminfo

**Table 54 braminfo**

| Response details | Description |
|---|---|
| Boot | Bootloader parameter |
| Uptime | Device uptime |
| RST | Device reset counter |
| IWDF_RST | Independent watchdog reset counter |
| BadRec | Bad record counter |
| AD | Authorized driving state |
| GD | ECO driving/Green driving state |
| IM | Immobilizer state |

## 13.25 odinfo

Odometer Debug

**Table 55 odinfo**

| Field Name | Full Name | Posible values |
|---|---|---|
| E | Odoemter Enable | 0-Disable<br>1-Enabled |
| V | Odometer Value | 0-UINT32_MAX |
| M: | Mode | 0-  Differential 1-  Continuous |
| Mv: | Movement | 0-  Not moving 1-  moving |
| GPS: | GPS Module Status | 0-OFF<br>1-Restarting<br>2-Ready no FIX<br>3-Working FIX<br>4-Sleep |
| FIX: | GPS FIX | 0-  No FIX<br>1-  FIX |
| Valid: | Valid Nmea data | 0-  Not Valid 1-  Valid |
| Sp: | GPS Speed | [0-350] |
| Ns: | Nmea Stable Flag | 0 – Not Stable 1 –Stable |
| Jl: | Jump Lock | 0-  Lock ON<br>2-  Lock OFF |
| ALong: | Current Longitude | |
| ALat: | Current Latitude | |
| OLong: | Odometer Longitude | |
| OLat: | Odometer Latitude | |

Answer Example: E:1 V:300 M:1 Mv:1, GPS:2 FIX:0 Valid:1 Sp:0 Ns:0 Jl:1 ALong:0.000000 ALat:0.000000 OLong:0.000000 OLat: 0.000000

# 14  FMB630 WITH LV-CAN 200 AND ALL-CAN 300 CAN ADAPTER

## 14.1  Purpose of Can Adapters LV-CAN200 and ALL-CAN300

LV-CAN200 is used to listening data from light vehicles, while ALL-CAN300 is used to listening data from any type of transport:  light vehicles, Trucks, busses, agriculture and other special transport. With those adapters FMB630 device is able to collect and send vehicle data.
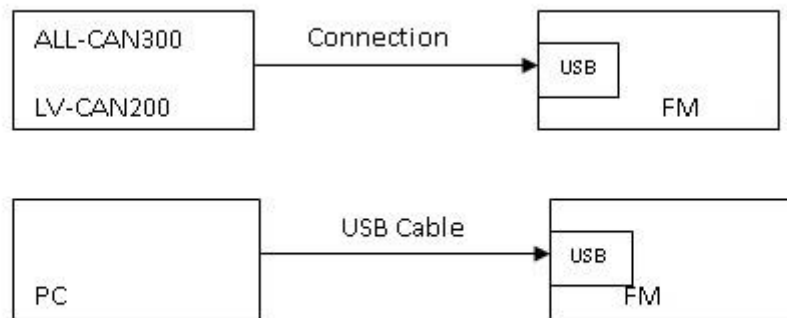


**Figure 75 connection block diagram**

FMB630 shares the same USB port for connecting adapter and configuring device with PC. LV-CAN200 and ALL-CAN300 Technical characteristics:

| PARAMETER | VALUE |
|---|---|
| Supply voltage | 9 to 50V |
| Power supply current | Average 10mA Max (peak) 100mA |
| Working temperature | -40..85 ºC |
| Max working humidity | 60 % (non condensate) |

## 14.2  LV-CAN200 and ALL-CAN300 program number selection

LV-CAN200 or ALL-CAN300 must be set to program number which depends on vehicle model. **Needed program number is always written on LV-CAN200 or ALL-CAN300 mounting scheme.** Please contact Your Teltonika sales manager to get latest supported vehicle list and mounting scheme for your vehicle, please provide CAR manufacturer, model and year information.

### 14.2.1  LV-CAN200 and ALL-CAN300 program number configuration via SMS command

LV-CAN200 and ALL-CAN300 program number can be set remotely, using SMS command:

**lvcansetprog X**

X is new program number value.

### 14.2.2 Selecting LV-CAN200 and ALL-CAN300 program number manually

Steps to set program number:

- Hold SWITCH down till LED stars blinking
- Release the SWITCH
- Then LED starts blinking and counting first digit of program number, (one blink means digit 1, two blink digit 2 etc.)
- To stop counter push SWITCH
- Release the SWITCH, then LED starts blinking and counting second digit of program number
- To stop counter push SWITCH
- Release the SWITCH, then LED starts blinking and counting third digit on program number
- To stop counter push SWITCH
- Release SWITCH, if programming is succeded LED will blink 10 times



**Figure 76 Adapter signaling led**

## 14.3 SIMPLE-CAN - contactless CAN-BUS reader

SIMPLE-CAN is contactless adapter used to read vehicle CAN data with LV-CAN200, ALL-CAN300. If LV-CAN200 or ALL-CAN300 connection requires two CAN lines to get all data, then you need two SIMPLE-CAN readers

**TECHNICAL DETAILS**

- Power supply voltage 9-63 V
- Power supply current:

| Mode | 12V | 24V |
|---|---|---|
| Active | 8.3 mA | 4.3 mA |
| Standby | 1.6 mA | 0.91 mA |

- CAN-BUS speeds from 33,33 to 500 kb/s
- Automatically sets CAN Low, CAN High polarity
- Automatically adjusts signal level and speed
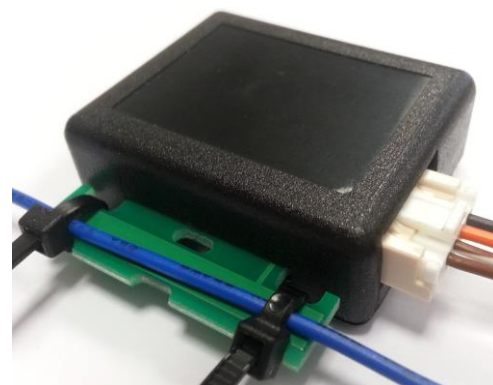
SIMPLE-CAN works in the **listening mode only**, so not all the data available on the CAN-BUS may be received using this solution. **The device automatically sets CAN L/H polarity**, but the calibration has to be always executed during installation process. Connection of previously calibrated unit to another car needs new calibration because the reader **automatically adjusts signal level and speed** to different CAN-BUSes. The device also **automatically adapts to** the found **noise level.**
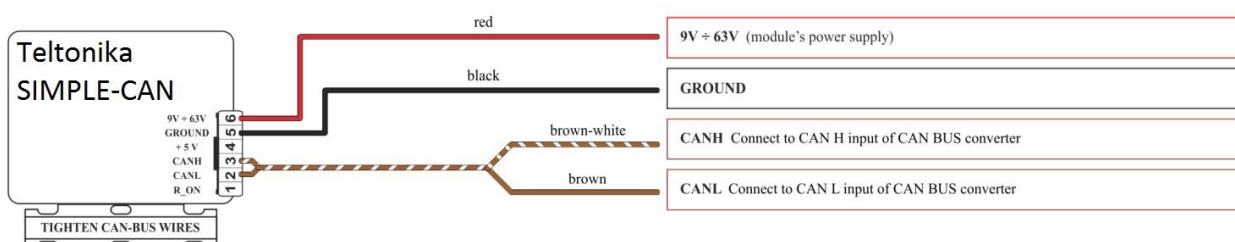


**Figure 77 Simple can connection**

After power supply connecting, LED shines continuously. It means that device waits for calibration. **Calibration process** has to be carried out when CAN-BUS twisted pair is tightened on SIMPLE-CAN and when the ignition is ON. Please press the switch shortly and wait for the LED to start blinking every 1 second. Automatic calibration process takes up to 10 seconds depending on the vehicle's model. Correct calibration process is confirmed by LED's every 2 seconds blink (when the CAN-BUS is active). When the CAN-BUS enters sleep mode, SIMPLE-CAN device does it also and takes 1,6mA/12V. In the sleep mode LED does not shine. If after calibration process LED shines continuously, it means that device is not calibrated yet, CAN-BUS transmission has failed or ignition during calibration was not ON.

## 14.4 Connecting FMB630 Can adapters ALL-CAN300 and LV-CAN200

Connect USB Plug to FMB630 device, connect Light Vehicles Can adapter to other end of the cable.

Connect Light Vehicles Can adapter Pin 1 and Pin 2 to cars CAN bus. CAN interface location of the supported light vehicle is described on mounting scheme.

Connect car power supply lines to Pin 3 positive, Pin 4 Negative.

Pins 9,10 connection is optional it depends on exact car model.

For exact pinout see sticker on Light Vehicles Can adapter.
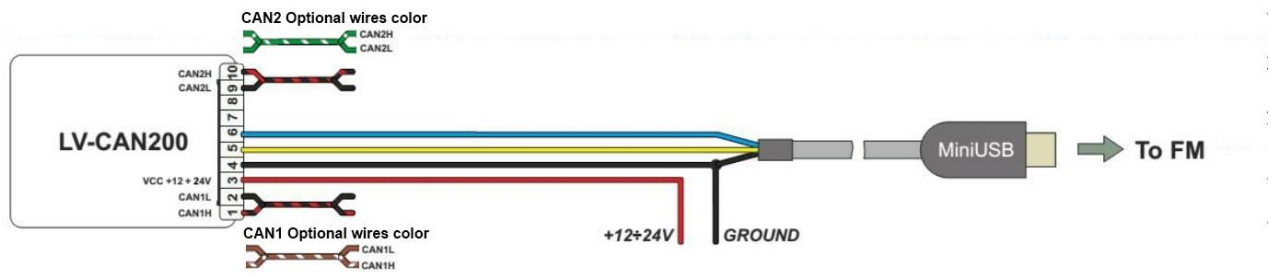


**Figure 78 LV-CAN200 Adapter connection cable pinout**
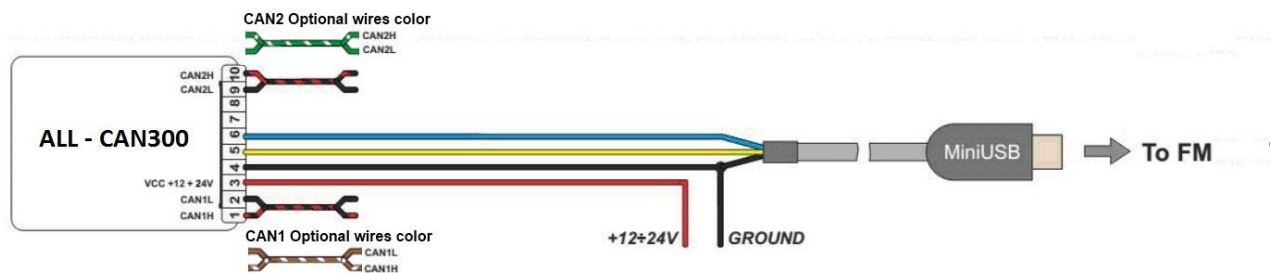


**Figure 79 ALL-CAN300 Adapter connection cable pinout**

**Attention! Ordered LV-CAN200 and ALL-CAN300 packaging may vary:**
1. **Standard with mini-USB cable.**
2. **USB PCB (female) + mini-USB cable.**

**Attention! For detailed connection diagram of adapter to light vehicle please contact Teltonika, LTD sales representative and provide CAR manufacturer, model and year information.**

**Attention! Do not swap CAN L and CAN H lines.**

**Do not swap power supply lines. Make sure that voltage do not exceeds 30V. Power supply lines should be connected at the end of installation work.**

## 14.5 FMB630 Configuraton

FMB630 shares the same USB port for connecting LV-CAN200 or ALL-CAN300 adapter and configuring device with PC.

FMB630 can be configured using "SCAN" function or "Offline Configuration"

**SCAN function** – is in use when FMB630 is connected to CAN adapter (Figure 79), then wait 10s (Note, that car engine must be started), disconnect adapter from FMB630, and connect PC USB cable to FMB630 Device (Figure79) It is very important not to disconnect FMB630 from power source during this operation, because if FMB630 is reconnected all received CAN bus data will be lost. FMB630 remembers received data from LV-CAN200 or ALL-CAN300 and at the end of the procedure when "SCAN" button is pressed, user will see all CAN data which is sent by adapter. Enable CAN data which needs send to server and save configuration pressing "Save" button.

To configure CAN data:

1. In car, connect LV-CAN200 or ALL-CAN300 to CAN bus and to the FMB630 device (Figure 80) wait 10 seconds. Note, that car engine must be started.
2. Disconnect LV-CAN200 or ALL-CAN300 from FMB630 and connect PC USB cable to FMB630 Device (Figure 81). It is very important not to disconnect FMB630 from power source, because then all CAN data will be lost.

**Figure 80 Connect adapter LV-CAN200 to FMB630**
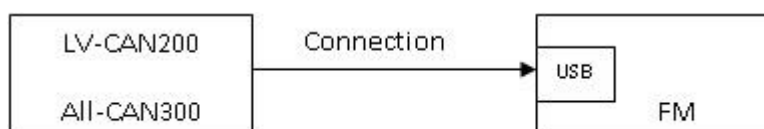


**Figure 81 Connect FMB630 to PC and configure**
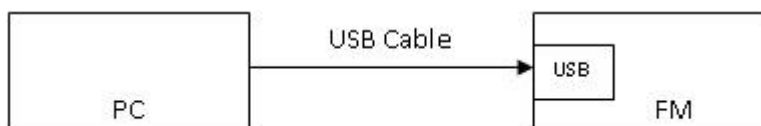


CAN bus data which can be read from your car is shown in "Light or ALL Vehicles Can adapter supported cars" document.

**Offline configuration** – user can select which CAN data will be red from LV-CAN200 or ALL-CAN300 and directly sent to server without connection to adapter. Please note that parameters depend on vehicle manufacturer and vehicle model. Please for further information check "Light and All Vehicles Can adapter supported cars" document.

There are two types of operations with CAN data elements:

- Monitoring of CAN bus data

- CAN bus data event capturing

Monitoring method is used when user wants to receive CAN data on regular basis, for example every 20 seconds.

Event functionality is used to store additional AVL packet when state of CAN element is changing. For example Speed changes, low fuel level, engine temperate, etc.

Send data to server field – allows enabling CAN element so it is added to the AVL data packet and sent to the server. By default, all CAN elements are disabled and FMB630 records only GPS data.

It is possible to set CAN message priority: On Low Priority, On High Priority, and On Panic. Regular packets are sent as Low priority records. When low priority event is triggered, FMB630 makes additional record with indication what was the reason for that was CAN element change. When High priority is selected, module makes additional record with high priority flag and sends event packet immediately to the server by GPRS. Panic priority triggers same actions as high priority, but if GPRS fails, it sends AVL packet to server using SMS mode if SMS is enabled in SMS settings.

Data Acquisition Type – defines when to generate event – when value enters defined range, exits it or both, also is possible to select event which you want to generate then you change values, like crossing both values in high and low levels (Hysteresis).

High and Low levels – defines CAN value range. If CAN value enter or exits this range, FMB630 generates event by "Data Acquisition Type" settings. Figure 82 show example of FMB630 CAN configuration.
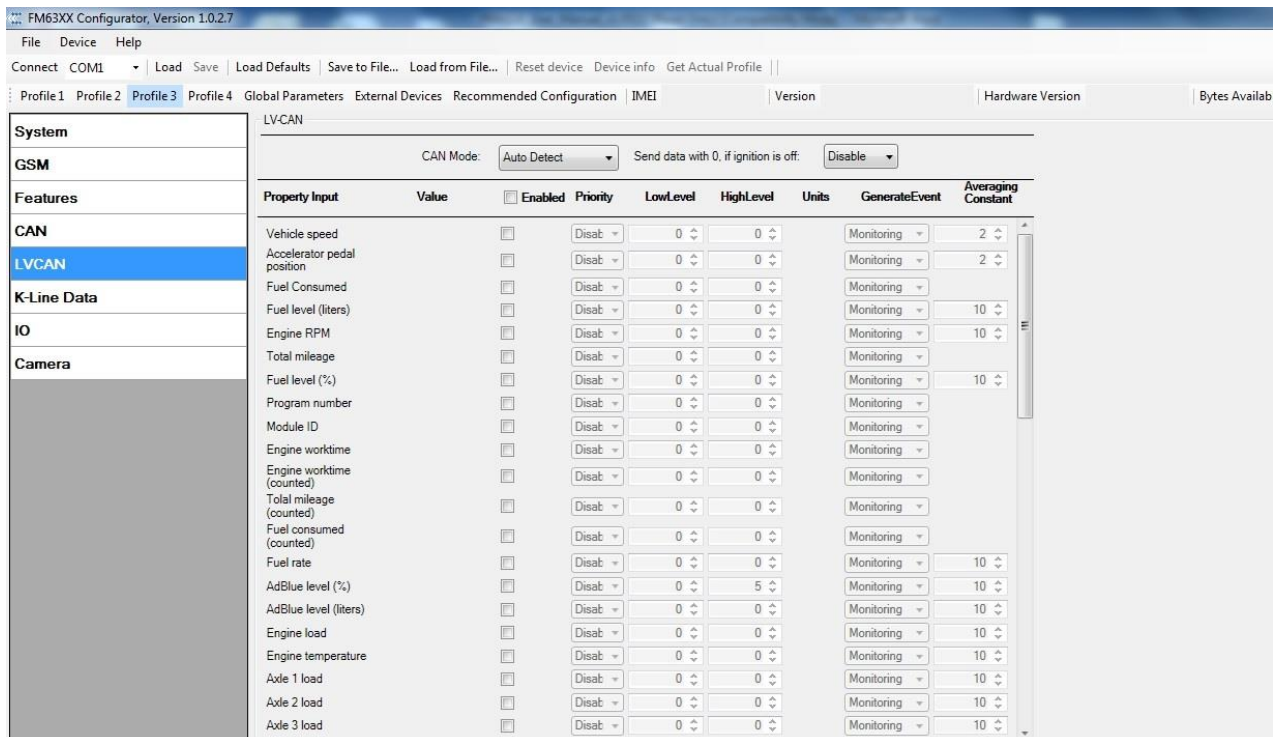


**Figure 82 Configurator example**

## 15  CAN

Controller Area Network (CAN or CAN-bus) is a computer network protocol and bus standard designed to allow microcontrollers and devices to communicate with each other and without a host computer. It was designed specifically for automotive applications but is now also used in other areas.

SAE J1939 and J1708* is the vehicle bus standard used for communication and diagnostics among vehicle components. Based on the same architecture FMS protocol dedicated to telematics systems is available. It has certain standardized parameters available, such as fuel

consumption, engine work-hours, etc. Please visit http://www.fms-standard.com/ for more information and message structure.

The FMS-interface is an optional interface of different truck manufacturers. Supported information is dependent upon vehicle equipment. For the full information set, additional Electronic Control Units (ECU) may be required. Please contact the manufacturer or your dealer for more details.

Vehicle brands supported:
- Mercedes Benz
- Volvo
- MAN
- DAF
- Iveco
- Scania
- Renault

Available parameters:
- Total Fuel
- Total Distance
- Status of brake pedal *
- Engine Torque *
- Actual fuel
- Accelerator pedal position *
- Status engine brake
- Speed *
- RPM
- Engine hours
- Vehicle Weight *
- Fuel level
- Tachograph data *

\* Availability of parameter depends on vehicle's model and configuration of FMS interface of the truck.
*J1708 is additional FMS protocol used by some vehicle manufacturers. If your vehicle supports J1939 and J1708 both protocols then you must disable J1708 in configuration to receive fuel data.*

## 15.1 General description
- CAN works if no USB cable is inserted and isn't in deep sleep mode;
- Uses six different speeds: 50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 1000kbps;
- Auto Baud rate detection;
- Filtering messages (StId, ExtId) according to configuration;
- Using mask, filters required bytes;
- Different CAN configurations.

## 15.2 Configuration

Manual CAN data can be configured using "Manual CAN" in CAN tab, Figure 83 below ( CAN configuration window).



**Figure 83 CAN configuration window**

*CAN message ID type*: Message ID type (Figure 84) two types according to SAEJ1939 standard: Standard ID (value: 0 to 0x7FFh) and Extended ID (value: 0 to 0x1FFFFFFFh).



**Figure 84 CAN message ID types**

Message ID value is entered in hex format. This parameter is used to configure hardware message filter (Figure 85). All messages contain 8 bytes of data, to select particular data/bytes "Output Data Mask" is used, it's done by ticking required bytes, only selected bytes are sent to server.



**Figure 85 CAN message filter configuration**

### 15.3 Example

A sample CAN message has the following structure: X18FEE9018FFFFFFFF23840300, where essential parts are 'FEE9' – identifier and 'FFFFFFFF23840300' – data bytes.

CAN messages are configured like any other I/O parameters. They consist of 4 identifier bytes and 8 data bytes. Below you will find a sample configuration for fuel consumption parameter:

ID type – is always 29 bits.

Output data mask – defines which data bytes are sent to the server (sometimes not all data bytes are necessary).

CAN ID – this is 4 byte identifier. Messages use 4 bytes, but the first and last bytes may differ in different vehicle models while the middle four bytes are the same for all vehicles. The first and last bytes may have any value. Because of this reason it is recommended to write FF in the first byte and the same in the last byte.

This information is provided only as an example and Teltonika
takes no responsibility for information accuracy or damage that may be done
to the vehicle or FMB630 module while integrating it.

Example:

All Mercedes Benz Actros 2 models with Vehicle Identification Number (VIN) starting with WDB93 have a possibility to connect FMB630 module to CAN bus. This can be done by connecting to special PSM module (which may or may not be included in the truck) or ground module of the vehicle. For CAN signal to be available, parameter 520 must be enabled in "kommunikationsschnittstelle" in the vehicle with Mercedes Stardiagnose.

CAN wires can be found on X5 connector located in the fuse box (Figure 86):

Pin 5: CAN Low signal (yellow wire)
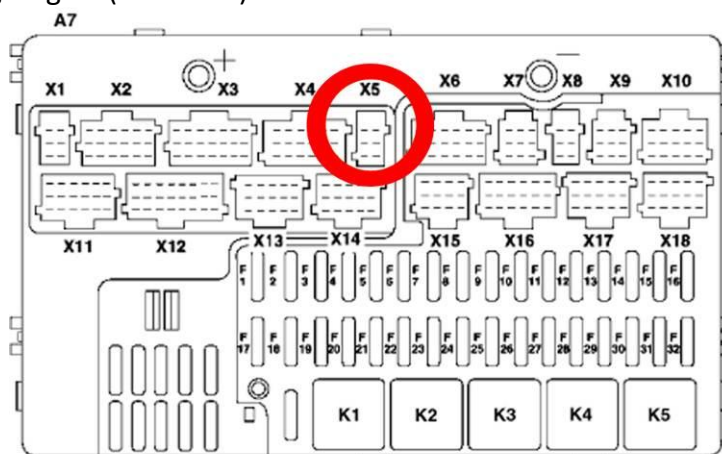
Pin 2: CAN High signal (blue wire)

**Figure 86 X5 plug on Mercedes Benz**

In the example FMB630 will filter all CAN messages with identifier FFFEE9FF (fuel consumption) (Figure 87).

**Figure 87 CAN parameter configuration example**

Note: Averaging constant cannot be used with CAN data, because this information comes in digital format. So in order to prevent data loss, set Averaging constant parameter to 1.

Most parameters have certain resolution. FEE9 parameter has 0.5L/bit gain, so value that is sent to server has to be multiplied by 0.5.

Data parsing is preceded by selecting correct message from all available on CAN bus. FMS standard interface description indicates that fuel consumption is parameter with ID FEE9:

**Table 56 FMS standard – fuel consumption**

| 00FEE9 | | | | | | | | PGN Hex |
|---|---|---|---|---|---|---|---|---|
| 65,257 | | | | | | | | PGN |
| 1000 ms | | | | | | | | Rep. Rate |
| Data Byte 1 | Data Byte 2 | Data Byte 3 | Data Byte 4 | Data Byte 5 | Data Byte 6 | Data Byte 7 | Data Byte 8 | Byte No. |
| Not used for FMS-Standard | Not used for FMS-Standard | Not used for FMS-Standard | Not used for FMS-Standard | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | Name Values Values Values SAE ref SPN |

The example indicates how fuel consumption message is selected and how configuration impacts this selection (Figure 88).
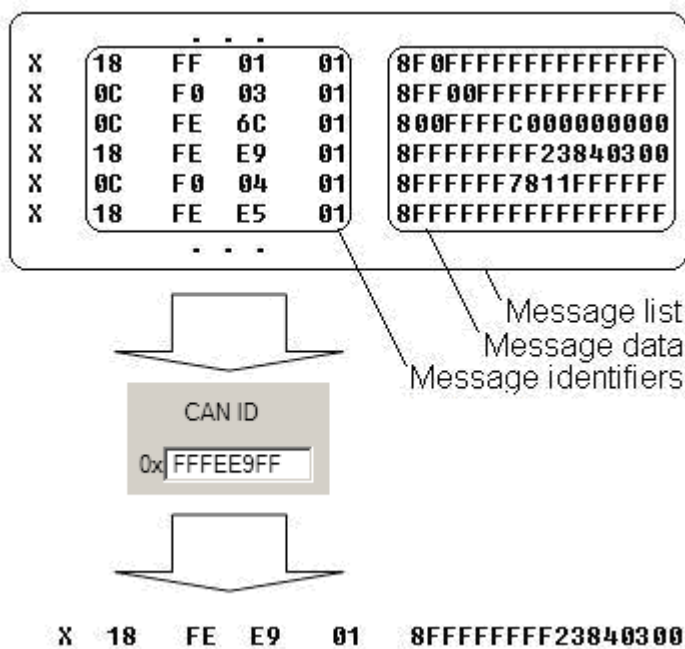


**Figure 88 Example**

When certain message is filtered, FMB630 checks which data bytes should be sent to server. Document indicates that 5-8 bytes are used in FMS standard.

**Table 57 FMS standard – fuel consumption (5-8 bytes)**

| Data Byte 5 | | | | | | | | Data Byte 6 | | | | | | | | Data Byte 7 | | | | | | | | Data Byte 8 | | | | | | | | Byte No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Bit no |
| Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | | | | | | | | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | | | | | | | | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | | | | | | | | Total fuel used 0,5 L/Bit gain 0 L offset 5.2.5.66 SPN 250 | | | | | | | | Name Values Values Values SAE ref SPN |



**Figure 89 Example**

Data bytes are filtered by selecting the checkboxes in Output data mask. Note, that configurator has them listed starting with MSB.

After message is filtered it is attached to the data packet and sent to the server. Values are returned in HEX. 00 03 84 23(HEX) = 230435(DEC). Notice, that data resolution is 0.5L/bit gain – value has to be multiplied by 0.5, therefore vehicle used a total 115217,5 liters of fuel.

### 15.4 FMB630 J1708 Connection
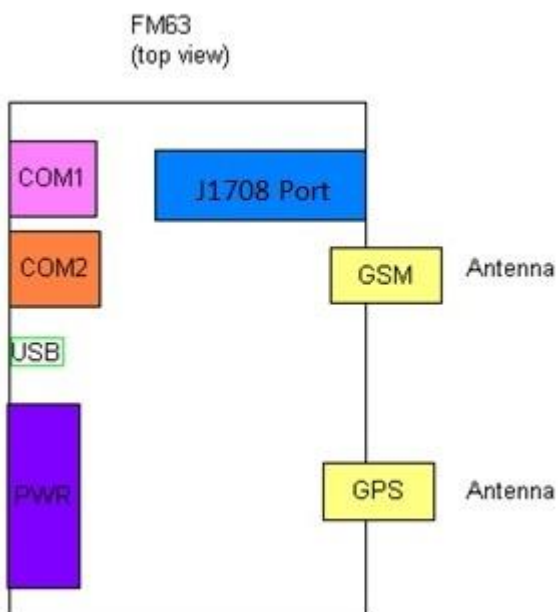


**Figure 90 FMB630 diagram**

J1708 Connector
(top view)

| | |
|---|---|
| | 1- J1708 - A |
| | 2 - GND |
| | 2 - GND |
| | 4- J1708 - B |

**Figure 91 J1708 Connector diagram**

**Connection with Vehicle port**

Check Vehicle diagsnostic port pinout diagram and connect like is shown below.

| FM63 | Vehicle |
|---|---|
| J1708-A | J1708A  J1708+ |
| J1708-B | J1708B and  J1708- |



Vehicle
Diagnostic
Port

HD10-9-1939P
\* Minimum 18 AWG wire recommended

A KL31 (batt-)
B KL15 (ignition) with 10 A fuse
C CAN-H
D CAN-L
E J1939 GND
F J1708+
G J1708-
H Not Connected
J Not Connected

From
Vehicle

**Figure 92 Example of Diagnostic port**

## 15.5  Software Configuration of FMB630 with J1708

Firmware version: 00.00.24 or above
Configurator version: 1.0.0.12
**Step 1**
Enable J1708 Line in External Devces Tab



**Figure 93**

**Option 1**
Enable Fuel Level in AutoCAN

**Figure 94**

For AVL ID please consult FMS document.

**Option 2**

Enable PGN in manual CAN



**Figure 95**

## 15.6  AutoCAN description

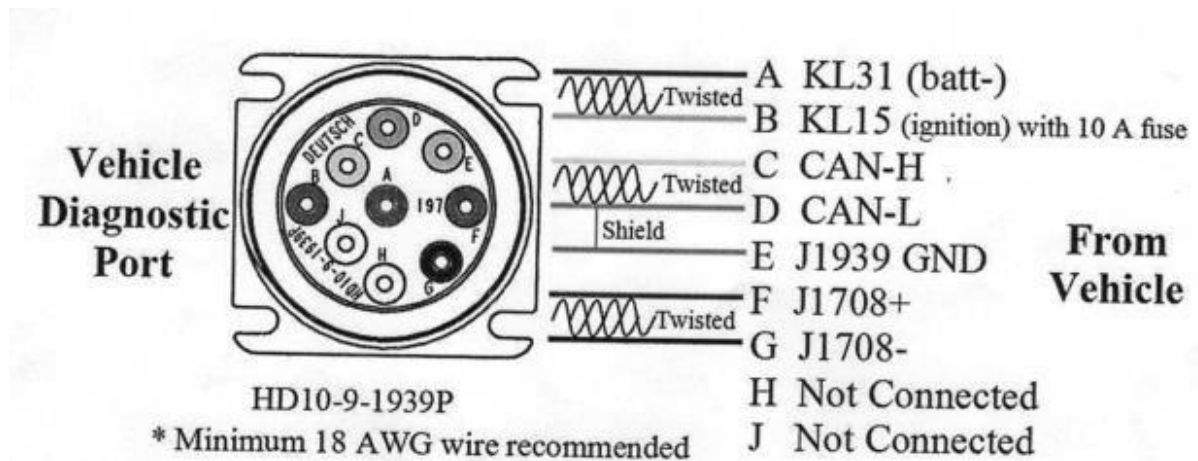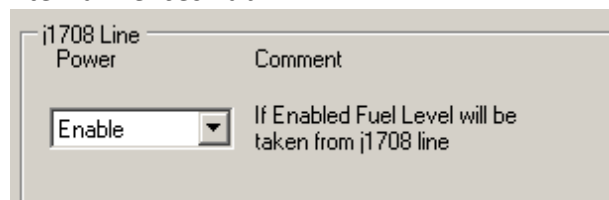AutoCAN function allows user to automatically scan for available messages on CAN bus and configure CAN data sending to server. In order to configure AutoCAN connect FMB630 to computer with Port ½ cable. Launch FMB630xx configurator version 1.1.1.7 or higher. Push "Connect" button, then „CAN" button (Figure 96). CAN configuration menu will be opened.
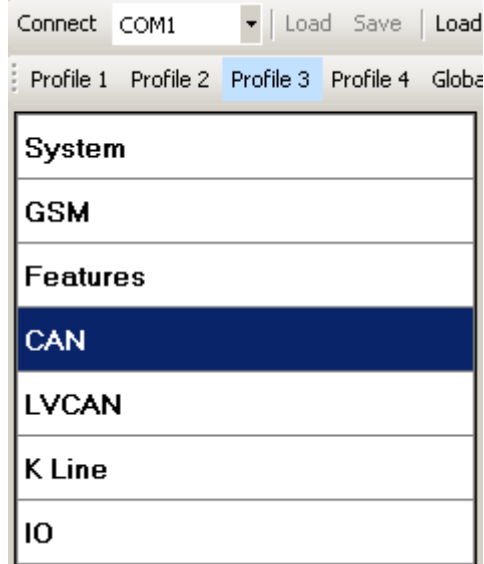


**Figure 96 Entering CAN configuration**

- SCAN scans once for available messages on CAN bus;
- Monitoring – toggles scanning of messages on CAN bus every 3 seconds;
- Offline Configuration – enables CAN configuration when FMB630 xx is not connected to CAN bus;
- Auto CAN tab – configure CAN by selecting available messages from CAN bus;
- Manual CAN tab – Configure CAN by manually entering CAN message ID and data mask;
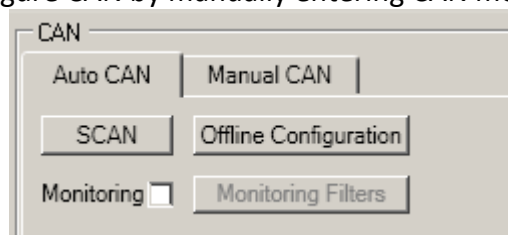


**Figure 97 CAN configuration menu**

### 15.6.1  Configuration

To start CAN configuration push "SCAN" button. A table of all available CAN messages will appear (Figure 98). Description of columns:

- Category – shows CAN message;
- Parameter – shows configurable parameter name;
- Value – shows scanned value of parameter;
- Send data to server – allows to choose the type of data when it's generated:
  - o Disabled – Data will not be collected
  - o On low priority – records will be generated as low priority events;

- o On high priority – records will be generated as high priority events and immediately sent to server via GPRS (if GPRS is available);
  - o On panic - records will be generated as panic priority events and immediately sent to server via GPRS, if GPRS is not available records will be sent via SMS messages;
- Data acquisition type – allows to choose when records are generated:
  - o Monitoring – monitors data;
  - o On change – record is generated when parameter value is changed;
  - o Hysteresis – record is generated when increasing parameter value becomes higher than High value, and decreasing becomes less than Low value
  - o Event on exit – record is generated when parameter value becomes higher than High value or lower than Low value;
  - o Event on entrance – record is generated when parameter value becomes between High and Low values;
  - o Event on both – record is generated when parameter value crosses High or Low values;
- Low – allows to choose low value for Data acquisition;
- High – allows to choose High level for Data acquisition;



**Figure 98 CAN data table**

### 15.6.2  CAN monitoring

To start CAN bus monitoring mark *Monitoring* check box. Table of available CAN messages will appear (Figure 98). Data from CAN bus will be updated every 3 seconds. In order to see only desired data open "Monitoring filters" menu (Figure 99).
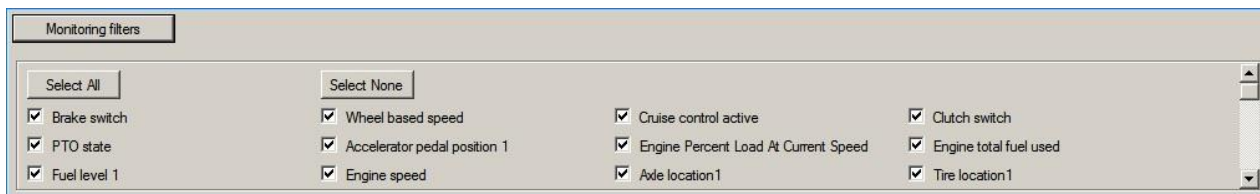
**Figure 99 Monitoring filters**

Monitoring filters menu allows choosing which data will be shown in configuration menu. To enable/disable particular data monitoring use checkbox next to data name. To enable all data monitoring click *Select all* , to disable all data monitoring click *Select none*.

Note: CAN monitoring is FMB630 configurator function; it does not enable data sending to server. In order to configure data sending to server refer to Configuration section.

### 15.6.3  Offline configuration

When FMB630 device is not connected to CAN bus you can configure CAN data sending by pushing "Offline configuration" button. When offline configuration is enabled a configuration table of all FMS standard CAN data is shown.

### 15.6.4  AutoCAN ID list

**Table 58 AutoCAN ID list**

| Category name | Par Nr in P:FMS: | Par Nr. In P:FMSDAT: | (signal) name | Size (Bytes) | Param IO ID | Value range |
|---|---|---|---|---|---|---|
| 65265 – Cruise Control/Vehicle Speed | 1 | 1 | Brake switch | 1 | 79 | 0-1<br>0 = pedal released<br>1 = pedal depressed |
| | 2 | 2 | wheel based speed | 4 | 80 | 0-65536 (km/h)* |
| | 3 | 3 | cruise control active | 1 | 81 | 0-1<br>0 = switched off<br>1 = switched on |
| | 4 | 4 | clutch switch | 1 | 82 | 0-1<br>0 = pedal released<br>1 = pedal depressed |
| | 5 | 5 | PTO state | 1 | 83 | 0-3<br>0 = off/disabled<br>1 = Set<br>2 = not available |
| 61443 – Electronic Engine Controller #2 | 6 | 6 | accelerator pedal position 1 X | 4 | 84 | 0-102 (%)* |
| | 7 | 7 | Engine Percent Load At Current Speed X | 1 | 85 | 0-125 (%)* |
| 65257 – Fuel Consumption | 8 | 8 | Engine total fuel used | 4 | 86 | 0 – 2105540607,5 (Liters)* |
| 65276 – Dash Display | 9 | 9 | fuel level 1 X | 4 | 87 | 1-100 (%)* |
| 61444 – Electronic Engine Controller #1 | 10 | 10 | engine speed X | 4 | 88 | 0 – 8031,875 (rpm)* |
| 65258 – Vehicle | [11-25] | 11 | Axle location | 1 | | 1-15 |

| Category name | Par Nr in P:FMS: | Par Nr. In P:FMSDAT: | (signal) name | Size (Bytes) | Param IO ID | Value range |
|---|---|---|---|---|---|---|
| Weight ** | (Tire No 1 - 15) | | Tire location | 1 | | 1-15 |
| | | | Axle weight | 4 | [89 – 103] | 32766 (kg)* |
| 65253 – Engine Hours, Revolutions: HOURS | 26 | 12 | Engine total hours of Operation X | 4 | 104 | 0 – 214748364 (Hours)* |
| 65260 – Vehicle Identification | 27 | 13 | vehicle identification number X | Max 24 | [105 - 108] | Max 24 ASCII bytes |
| 64977 – FMS Standard interface | 28 | 14 | SW-version supported X | 4 | 109 | 4 ASCII bytes (Version format – ab.cd) |
| | 29 | 15 | Diagnostics supported X | 1 | 110 | 0-3<br><br>0 = diagnostics is not supported<br>1 = diagnostics is supported<br>2 = reserved<br>3 = don´t care |
| | 30 | 16 | Requests supported X | 1 | 111 | 0-3<br><br>0 = request is not supported<br>1= request is supported<br>2 = reserved<br>3 = don´t care |
| 65217 - High Resolution Vehicle Distance | 31 | 17 | High resolution total vehicle distance X | 4 | 112 | 0 - 21055406 km* |
| 65216 - Service Information | 32 | 18 | Service distance | 4 | 113 | -160 635 – 167040 km* |
| 65132 - Tachograph | 33 | 19 | Vehicle motion X | 1 | 114 | 0 – Motion Not Detected<br>1 – Motion Detected |
| | 34 | 20 | driver 2 working state X | 1 | 115 | 0 – Rest<br>1 – Driver Available<br>2 – Work<br>3 - Drive<br>4 – Error<br>5 – not available |
| | 35 | 21 | driver 1 working state X | 1 | 116 | 0 – Rest<br>1 – Driver Available<br>2 – Work<br>3 - Drive<br>4 – Error<br>5 – not available |
| | 36 | 22 | Vehicle overspeed | 1 | 117 | 0 – No Overspeed<br>1 – Overspeed |
| | 37 | 23 | Driver 1 time rel. states | 1 | 118 | 0 – Normal<br>1 – 15min bef. 4,5h<br>2 – 4,5h reached<br>3 – 15min bef. 9h<br>4 – 9h reached<br>5 – 15min bef. 16h<br>6 – 16h reached<br>7 – Error<br>8 – not available |
| | 38 | 24 | Driver 2 time rel. states | 1 | 119 | 0 – Normal<br>1 – 15min bef. 4,5h<br>2 – 4,5h reached |

| Category name | Par Nr in P:FMS: | Par Nr. In P:FMSDAT: | (signal) name | Size (Bytes) | Param IO ID | Value range |
|---|---|---|---|---|---|---|
| | | | | | | 3 – 15min bef. 9h<br>4 – 9h reached<br>5 – 15min bef. 16h<br>6 – 16h reached<br>7 – Error<br>8 – not available |
| 65132 - Tachograph | 39 | 25 | Driver 1 card X | 1 | 120 | 0 – Card Not Present<br>1 – Card Present |
| | 40 | 26 | Driver 2 card X | 1 | 121 | 0 – Card Not Present<br>1 – Card Present |
| | 41 | 27 | Direction indicator | 1 | 122 | 0 – Forward<br>1 – Reverse |
| | 42 | 28 | Tachograph performance X | 1 | 123 | 0 – Normal Performance<br>1 – Performance Analysis |
| | 43 | 29 | Handling information X | 1 | 124 | 0 – No Handling Information<br>1 – Handling Information |
| | 44 | 30 | System event X | 1 | 125 | 0 – No Tacho Event<br>1 – Tacho Event |
| | 45 | 31 | Tachograph vehicle speed X | 2 | 126 | [0 – 65000] – Tacho Vehicle Speed km/h* |
| 65262 - Engine Temperature 1 | 46 | 32 | engine coolant temperature X | 1 | 127 | [-40 – 210] oC– Engine Cooilant Temperature* |
| 65269 - Ambient Conditions | 47 | 33 | Ambient Air Temperature X | 2 | 128 | [-273 – 1770]oC – Ambient Air Temperature* |
| 65131 - Driver's Identification | 48 | 34 | Driver 1 Identification | 32 | 129,130,131 | 24 ASCII Bytes per Driver ID |
| 65131 - Driver's Identification | 49 | | Driver 2 Identification X | 32 | 132,133,134 | 24 ASCII Bytes per Driver ID |
| 65266 – Fuel Economy | 50 | 35 | Fuel rate X | 4 | 135 | [0 – 3212,75] litres/h* |
| | 51 | 36 | Instantaneous Fuel Economy X | 4 | 136 | [0 – 125.5 km/litre ]* |
| 64932 - PTO Drive Engagement | 52 | 37 | At least one PTO engaged | 1 | 137 | 0 – No PTO Drive is Engaged<br>1 – At least one PTO drive is engaged<br>2 – Error<br>3 – not available |
| 64777 - High Resolution Fuel Consumption (Liquid) | 53 | 38 | High resolution engine total fuel used | 4 | 138 | [0 - 4211081,215] litres* |

Brake switch:

Switch signal which indicates that the driver operated brake foot pedal is being pressed. This brake foot pedal is controlling the vehicles' service brake (total vehicle braking application, not park brakes). It is necessary for safe drivetrain behavior that the switch activates before the physical braking components are activated (i.e. Disengage the cruise control function prior to the activation of friction brakes).

00 – Brake pedal released

01 – Brake pedal pressed

10 – Error

11 – Not Available

Data Length:  2 bits

Resolution:  4 states/2 bit, 0 offset

Data Range:  0 to 3 Operational Range:  same as data range

Type: Measured
Supporting information:
PGN   65265
Note: Firmware captures only [0,1] values. [2,3] – are ignored.


<u>Wheel based speed:</u>
Speed of the vehicle as calculated from wheel or tailshaft speed.
Data Length: 2 bytes
Resolution: 1/256 km/h per bit, 0 offset
Data Range: 0 to 250.996 km/h Operational Range: same as data range
Type: Measured
Supporting information:
PGN   65265
Note: Firmware sends data as U32, so value after floating point is ignored. Also value sent to server is already adjusted with bitgain.


<u>Cruise control active:</u>
Cruise control is switched on. It is not ensured that the engine is controlled by cruise control, as in the case of a large driver's demand the engine is controlled by the driver while cruise control is active(maximum selection of cruise control and driver's demand). The cruise control is set to 0 if a switch off condition occurs.
00 – Cruise control switched off
01 – Cruise control switched on
10 – Error
11 – Not available
Data Length: 2 bits
Resolution: 4 states/2 bit, 0 offset
Data Range: 0 to 3 Operational Range: same as data range
Type: Measured
Supporting information:
PGN   65265
Note: Firmware captures only [0,1] values. [2,3] – are ignored.


<u>Clutch switch:</u>
Switch signal which indicates that the clutch pedal is being pressed. It is necessary for a safe drivetrain behavior that the clutch switch is set before the clutch is opened (cruise control function).
00 – Clutch pedal released
01 – Clutch pedal pressed
10 – Error
11 – Not available
Data Length: 2 bits
Resolution: 4 states/2 bit, 0 offset
Data Range: 0 to 3 Operational Range: same as data range
Type: Measured
Supporting information:
PGN   65265
Note: Firmware captures only [0,1] values. [2,3] – are ignored.

PTO state information:

This parameter is used to indicate the current state or mode of operation by the power takeoff (PTO) governor. In lieu of support for PTO Drive Engagement parameters, this parameter may represent the status of a PTO drive. The broadcasting device must ensure that each achieved state is conveyed in at least one message broadcast before a transition to another state is allowed.

00000 Off/Disabled
00001 Hold
00010 Remote Hold
00011 Standby
00100 Remote Standby
00101 Set
00110 Decelerate/Coast
00111 Resume
01000 Accelerate
01001 Accelerator Override
01010 Preprogrammed set speed 1
01011 Preprogrammed set speed 2
01100 Preprogrammed set speed 3
01101 Preprogrammed set speed 4
01110 Preprogrammed set speed 5
01111 Preprogrammed set speed 6
10000 Preprogrammed set speed 7
10001 Preprogrammed set speed 8
10010 PTO set speed memory 1
10011 PTO set speed memory 2
10100-11110 not defined
11111 Not available

Off/Disabled 00000b — Used to indicate that the PTO governor enable switch is in the off position.

Hold 00001b — used to indicate that the PTO governor is active and currently maintaining a captured operating speed.

Remote Hold 00010b — used to indicate that the remote PTO governor is active and the PTO governor is currently maintaining a captured operating speed.

Standby 00011b — used to indicate that the PTO governor device enable switch is in the ON position and it is possible to manage the PTO governor.

Remote Standby 00100b — used to indicate that the remote PTO governor device enable switch is in the ON position and it is possible to manage the PTO governor.

Set 00101b — Used to indicate that the PTO governor is establishing current speed as the operating speed (captured value).

Decelerate/Coast 00110b — Used to indicate that the PTO governor is in the process of ramping down, or coasting, from the current operating speed.

Resume 00111b — Used to indicate that the PTO governor is in the process of resuming the operating speed to a previously captured value.

Accelerate 01000b — Used to indicate that the PTO governor is in the process of ramping up the operating speed.

Accelerator Override 01001b—used to indicate that the PTO governor is active but for the present time the engine is controlled by a large driver's demand.

Preprogrammed PTO Governor Set Speed 1 01010b—used to indicate that the PTO device is establishing a first preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 2 01011b—used to indicate that the PTO device is establishing a second preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 3 01100b —used to indicate that the remote PTO device is establishing a third preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 4 01101b —used to indicate that the remote PTO device is establishing a fourth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 5 01110b —used to indicate that the remote PTO device is establishing a fifth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 6 01111b—used to indicate that the remote PTO device is establishing a sixth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 7 10000b —used to indicate that the remote PTO device is establishing a seventh preprogrammed PTO governor set speed (user programmable) as the current operating speed.

Preprogrammed PTO Governor Set Speed 8 10001b —used to indicate that the remote PTO device is establishing a eighth preprogrammed PTO governor set speed (user programmable) as the current operating speed.

PTO set speed memory 1 10010b —Used to indicate that PTO set speed memory one set state is active.

PTO set speed memory 2 10011b — Used to indicate that PTO set speed memory two set state is active.

Data Length:  5 bits
Resolution:  32 states/5 bit, 0 offset
Data Range:  0 to 31 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   65265
Note: Firmware captures full data range [0x00..0x1F]. All states.


Accelerator pedal position 1:
The ratio of actual position of the analog engine speed/torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device. This parameter is intended for the primary accelerator control in an application. If an application has only one accelerator control, use SPN 91.

For on-highway vehicles, this will typically be the operator's accelerator pedal. Although it is used as an input to determine powertrain demand, it also provides anticipatory information to transmission and ASR algorithms about driver actions.

In marine applications, this will typically be the operator's throttle lever.

If a low idle validation switch is used in conjunction with accelerator pedal position 1, use Accelerator Pedal Low Idle Switch 1, SPN 558.

Data Length: 1 byte

Resolution: 0.4 %/bit, 0 offset

Data Range: 0 to 100 % Operational Range: same as data range

Type: Measured

Supporting information:

PGN 61443

Note: Firmware sends data as U32 (although it would be enough to send as 1B), so value after floating point is ignored. Also value sent to server is already adjusted with bitgain.

Engine percent load at current speed:

The ratio of actual engine percent torque (indicated) to maximum indicated torque available at the current engine speed, clipped to zero torque during engine braking.

Data Length: 1 byte

Resolution: 1 %/bit, 0 offset

Data Range: 0 to 250 % Operational Range: 0 to 125%

Type: Status

Supporting information:

PGN 61443

Note: Since bitgain is 1%/bit – raw data is sent to server. But, data is limited to max 125 (0x7D). If captured data is higher than 125 (decimal) – data is truncated to 125.

Engine total fuel used:

Accumulated amount of fuel used during vehicle operation.

Data Length: 4 bytes

Resolution: 0.5 L/bit, 0 offset

Data Range: 0 to 2,105,540,607.5 L Operational Range: same as data range

Type: Measured

Supporting information:

PGN 65257

Note: Value sent to server is already adjusted with bitgain. Since data is sent as U32, value after floating point is ignored.

Fuel level 1:

Ratio of volume of fuel to the total volume of fuel storage container.

When Fuel Level 2 (SPN 38) is not used, Fuel Level 1 represents the total fuel in all fuel storage containers. When Fuel

Level 2 is used; Fuel Level 1 represents the fuel level in the primary or left-side fuel storage container.

Data Length: 1 byte

Resolution: 0.4 %/bit, 0 offset

Data Range: 0 to 100 % Operational Range: same as data range

Type: Measured

Supporting information:

PGN 65276

Note: Value sent to server is already adjusted with bitgain. Since data is sent as U32, value after floating point is ignored.

Engine speed:

Actual engine speed which is calculated over a minimum crankshaft angle of 720 degrees divided by the number of cylinders.

Data Length:  2 bytes

Resolution:  0.125 rpm/bit, 0 offset

Data Range:  0 to 8,031.875 rpm Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   61444

Note: Value sent to server is already adjusted with bitgain. Since data as sent as U32, value after floating point is ignored.

Axle weight:

Total mass imposed by the tires on the road surface at the specified axle.

Data Length:  2 bytes

Resolution:  0.5 kg/bit, 0 offset

Data Range:  0 to 32,127.5 kg Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   65258

Note: Value sent to server is already adjusted with bitgain. Data sent to server is a sum of all weights per tire per specific axle [1-15]. I.e. axle[1].total_weight, axle[2].total_weight etc. Since data is sent as U32, value after floating point is ignored.

Engine total hours of operation:

Accumulated time of operation of engine.

Data Length:  4 bytes

Resolution:  0.05 hour/bit, 0 offset

Data Range:  0 to 210,554,060.75 hour. Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   65253

Note: Value sent to server is already adjusted with bitgain. Since data as sent as U32, value after floating point is ignored.

Vehicle identification number:

Vehicle Identification Number (VIN) as assigned by the vehicle manufacturer.

NOTE The ASCII character "*" is reserved as a delimiter.

Data Length:  Variable – up to 200 characters ("*" delimited)

Resolution:  ASCII, 0 offset

Data Range:  0 to 255 per byte Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   65260

Note: Firmware expects VIN to fit into 24 bytes. According to captured VIN length either 1/2/3 IO ID's will be sent to server (8 Bytes each). I.e. if VIN length <= 8, only one IO ID (105) will be sent

to server, if VIN length >9 and <= 16, then two IO ID's will be sent to server (105,106), and if VIN length > 16 and <= 24 then three IO ID's will be sent to server (105,106,107).

FMS-standard SW version supported:

Information that identifies which issue level of the FMS-standard document the software included in the FMS gateway

supports. Four bytes, representing xx.yy type revision level identification.

Information to be ASCII equivalent of the numeric revision level of the FMS document, 00.01 to 99.99. The first released version will be 01.00.

Note:

Byte 2 and byte 3 represents the SW version supported for trucks. Version number in the format ab.cd where Byte 2 represents "a" ASCII and Byte 3 represents "b" ASCII.

Byte 4 and byte 5 represents the SW version supported for bus and coaches; version number in the format ab.cd where

Byte 4 represents "c" ASCII and Byte 5 represents "d" ASCII.

Data Length:  4 bytes

Resolution:  ASCII, 0 offset

Data Range:  0 to 255 per byte Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   64977

Note: Firmware sends 4 bytes, which should be interpreted as xx.yy.

FMS-standard diagnostics supported:

Status signal which indicates if the FMS Vehicle Interface (FMS Gateway) supports the handling of diagnostic messages from the vehicle network onto the FMS network.

The FMS gateway does NOT support the re-broadcast of diagnostics messages present on the vehicle network.

If this 'FMS-standard Diagnostics Supported' feature is supported by the FMS Gateway, the FMS Gateway will support the requests for diagnostics information (from the FMS device) onto the vehicle network and pass the responses onto the FMS network.

Note: This feature of the FMS Gateway is independent of the 'FMS-standard Requests Supported'. The FMS Gateway may support diagnostics without supporting the 'FMS-standard Requests Supported' function, or visa-versa.

>       00 Diagnostics Is Not Supported
>       01 Diagnostics Is Supported
>       10 Reserved
>       11 Don't care
>       Data Length:  2 bits
>       Resolution:  4 states/2 bit, 0 offset
>       Data Range:  0 to 3 Operational Range:  same as data range
>       Type:  Status
>       Supporting information:
>       PGN   64977

Note: Firmware captures all values [0x00-0x03].

FMS-standard requests supported:

Status signal which indicates if the FMS Vehicle Interface (FMS Gateway) will respond to requests from the FMS device for the PGNs listed in the FMS Interface Specification.

This mode is to support FMS gateway devices that only operate in a 'Request' mode.

The FMS PGNs may also be broadcast periodically in this mode.

The FMS Gateway will NOT support the requests for information not included in the FMS Interface Specification onto the vehicle network."

00 On request mode is not supported

01 On request mode is supported

10 Reserved

11 Don't care

Data Length:  2 bits

Resolution:  4 states/2 bit, 0 offset

Data Range:  0 to 3 Operational Range:  same as data range

Type:  Status

Supporting information:

PGN   64977

Note: Firmware captures all values [0x00-0x03].


High resolution total vehicle distance:

Accumulated distance traveled by the vehicle during its operation.

NOTE – See SPN 245 for alternate resolution.

Data Length:  4 bytes

Resolution:  5 m/bit, 0 offset

Data Range:  0 to 21,055,406 km Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   65217

Note: Value sent to server is already adjusted with bitgain.


Service distance:

The distance which can be traveled by the vehicle before the next service inspection is required. A negative distance is transmitted if the service inspection has been passed. The component that requires service is identified by the service component identification (see SPN 911-913, 1379, and 1584).

Data Length:  2 bytes

Resolution:  5 km/bit, -160,635 km offset

Data Range:  -160,635 to 160,640 km Operational Range:  same as data range

Type:  Measured

Supporting information:

PGN   65216

Note: Value sent to server is already adjusted with bitgain.


Vehicle motion:

Indicates whether motion of the vehicle is detected or not.

00 Vehicle motion not detected

01 Vehicle motion detected

10 – Error

11 – Not available
Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x03].

Driver 1/2 working state:
State of work of the driver.
000 Rest – sleeping
001 Driver available – short break
010 Work – loading, unloading, working in an office
011 Drive – behind wheel
100-101 Reserved
110 Error
111 Not available
Data Length:  3 bits
Resolution:  8 states/3 bit, 0 offset
Data Range:  0 to 7 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x07].

Vehicle overspeed:
Indicates whether the vehicle is exceeding the legal speed limit set in the tachograph.
00 No overspeed
01 Overspeed
10 Error
11 Not available
Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x03].

Driver 1/2 time related states:
Indicates if the driver approaches or exceeds working time limits (or other limits).
0000 Normal/No limits reached
0001 Limit #1 – 15 min before 4 ½ h
0010 Limit #2 – 4 ½ h reached
0011 Limit #3 – 15 min before 9 h
0100 Limit #4 – 9 h reached
0101 Limit #5 – 15 min before 16 h (not having 8h rest during the last 24h)

0110 Limit #6 – 16 h reached

0111-1100 Reserved

1101 Other

1110 Error

1111 Not available

Data Length: 4 bits

Resolution: 16 states/4 bit, 0 offset

Data Range: 0 to 15 Operational Range: same as data range

Type: Measured

Supporting information:

PGN 65132

Note: Firmware captures all values [0x00-0x0F].


Driver card, driver 1/2:

Indicates the presence of a driver card

00 – Driver card not present

01 – Driver card present

10 – Error

11 – Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3 Operational Range: same as data range

Type: Measured

Supporting information:

PGN 65132

Note: Firmware captures all values [0x00-0x03].


Direction indicator:

Indicates the direction of the vehicle.

00 – Forward

01 – Reverse

10 – Error

11 – Not available

Data Length: 2 bits

Resolution: 4 states/2 bit, 0 offset

Data Range: 0 to 3 Operational Range: same as data range

Type: Measured

Supporting information:

PGN 65132

Note: Firmware captures all values [0x00-0x03].


Tachograph performance:

Indicates the tachograph performance; including electronic or mechanical analysis, instrument analysis, speed sensor analysis, mass storage analysis, and printer analysis.

00 – Normal performance

01 – Performance analysis

10 – Error

11 – Not available

Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x03].

Handling information:
Indicates that handling information is present. Information could include "no printer paper", "no driver card", etc.
00 – No handling information
01 – Handling information
10 – Error
11 – Not available
Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x03].

System event:
Indicates that a tachograph event has occurred. This may include power supply interruption, interruption of the speed sensor, incorrect data on the driver card, driving without a driver card, illegal removal of a driver card, insertion of a driver card during driving, and time adjustment.
00 – No tachograph event
01 – Tachograph event
10 – Error
11 – Not available
Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   65132
Note: Firmware captures all values [0x00-0x03].

Tachograph vehicle speed:
Speed of the vehicle registered by the tachograph.
Data Length:  2 bytes
Resolution:  1/256 km/h per bit, 0 offset
Data Range:  0 to 250.996 km/h Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65132

Note: Since FM FW sends this parameter as U16 (2 Bytes), value after floating point is discarded. So data limit becomes [0-250]. This parameter could be send as 1Byte IO (as [0-250] fits into 1B, but it is sent as 2B).
<u>Firmware sends value which is already adjusted with bitgain.</u>

Engine coolant temperature:
Temperature of liquid found in engine cooling system.
Data Length:  1 byte
Resolution:  1 deg C/bit, -40 deg C offset
Data Range:  -40 to 210 deg C Operational Range:  same as data range
Note: This parameter is to be interpreted as either a uint8_t or a int8_t, depending on the binary value. Values from 0x00 up to and including 0xD2 are of the type uint8_t (unsigned integer). Values from 0xD3 up to and including 0xFF are of the type int8_t (signed integer, two's complement). <u>The value sent to the server has already been adjusted for the bitgain and offset.</u>

Ambient air temperature:
Temperature of air surrounding vehicle.
Data Length:  2 bytes
Resolution:  0.03125 deg C/bit, -273 deg C offset
Data Range:  -273 to 1735 deg C Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65269
<u>Note: Firmware sends value which is already adjusted with bitgain.</u>

Driver 1/2 identification:
Used to obtain the driver identity.
Data Length:  Variable ("*" delimited)
Resolution:  ASCII, 0 offset
Data Range:  0 to 255 per byte Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65131
Note: Firmware expects driver identification to fit into 24 bytes. According to captured driver ID length either 1/2/3 IO ID's will be sent to server (8 Bytes each). I.e. if driver ID length <= 8, only one IO ID (129) will be sent to server, if VIN length >9 and <= 16, then two IO ID's will be sent to server (129,130), and if driver ID length > 16 and <= 24 then three IO ID's will be sent to server (129,130,131).

Engine fuel rate:
Amount of fuel consumed by engine per unit of time.
Data Length:  2 bytes
Resolution:  0.05 L/h per bit, 0 offset
Data Range:  0 to 3,212.75 L/h Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65266

Note: Since FW sends this parameter as U32, value after floating point is discarded. Data limit becomes [0-3,212]. <u>Firmware sends value which is already adjusted with bitgain.</u>

<u>Engine instantaneous fuel economy:</u>
Current fuel economy at current vehicle velocity.
Data Length:  2 bytes
Resolution:  1/512 km/L per bit, 0 offset
Data Range:  0 to 125.5 km/L Operational Range:  same as data range
Type:  Measured
Supporting information:
PGN   65266
Note: FW sends this parameter as U32, value after floating point is discarded. Data limit becomes [0-125]. This could have been 1 B IO element, but it is 4 B. <u>Firmware sends value which is already adjusted with bitgain.</u>

<u>At least one PTO engaged:</u>
Indicates that at least one PTO is engaged
00 No PTO drive is engaged
01 At least one PTO drive is engaged
10 Error
11 Not available
Note: This parameter should only be sent by the controller that has knowledge of all PTO drives on the vehicle (e.g, the FMS gateway). Individual PTO drive controllers should broadcast this parameter as "not available".
Data Length:  2 bits
Resolution:  4 states/2 bit, 0 offset
Data Range:  0 to 3 Operational Range:  same as data range
Type:  Status
Supporting information:
PGN   64932
Note: Firmware captures all values [0x00-0x03].

<u>High resolution engine total fuel used:</u>
Note: <u>Firmware sends value which is already adjusted with bitgain.</u>

## 15.7  AutoCAN Configuration over SMS

### 15.7.1  SMS command format:

"<login><space><password><space>setparam<space><profile number><Element ID><space><Element format>"


if there is no login and password configured in FM configuration, 2 spaces must be used before command :
<space><space><command>.

Element format:
<SendDataToServer>,<HighLevel>,<LowLevel>,<DataAcquisitionType><averaging constant>

Element format values: <[0-7]>,<int32>,<int32>,<[0-5]>,<int32>

*For example: <space><space>setparam 3347 2,70,50,3,10*
*Here we set* FMB630 *to make a high priority event once the* FMB630 *either reaches higher than 70km/h speed or starts going lower than 50km/h.*

\*\*If we wanted to configure FMB630 to make a panic event everytime brake pedal is either pushed or released, the SMS we would have to send is:
*<space><space>setparam 3346 3,0,0,1,10 (here we skip HighLevel and LowLevel so we write 0)*

### 15.7.2  AutoCAN element Id's

**Table 59 AutoCAN element Id's**

| Category name | Element ID | Element name |
|---|---|---|
| Cruise Control/Vehicle Speed | 346 | Brake switch |
| | 347 | wheel based speed |
| | 348 | cruise control active |
| | 349 | clutch switch |
| | 350 | PTO state |
| Electronic Engine Controller #2 | 351 | Accelerator pedal position 1 X |
| | 352 | Engine Percent Load At Current Speed X |
| Fuel Consumption | 353 | Engine total fuel used |
| Dash Display | 354 | fuel level 1 X |
| Electronic Engine Controller #1 | 355 | Engine speed X |
| Vehicle Weight \*\* | 356-370 | Axle location |
| | | Tire location |
| | | Axle weight |
| Engine Hours, Revolutions: HOURS | 371 | Engine total hours of Operation X |
| Vehicle Identification | 372 | vehicle identification number X |
| FMS Standard interface | 373 | SW-version supported X |
| | 374 | Diagnostics supported X |
| | 375 | Requests supported X |
| High Resolution Vehicle Distance | 376 | High resolution total vehicle distance X |
| Service Information | 377 | Service distance |
| Tachograph | 378 | Vehicle motion X |
| | 379 | driver 2 working state X |
| | 380 | driver 1 working state X |
| | 381 | Vehicle overspeed |
| | 382 | Driver 1 time rel. states |
| | 383 | Driver 2 time rel. states |
| | 384 | Driver 1 card X |
| | 385 | Driver 2 card X |
| | 386 | Direction indicator |
| | 387 | Tachograph performance X |
| | 388 | Handling information X |
| | 389 | System event X |

| Category name | Element ID | Element name |
|---|---|---|
| | 390 | Tachograph vehicle speed X |
| Engine Temperature 1 | 391 | engine coolant temperature X |
| Ambient Conditions | 392 | Ambient Air Temperature X |
| Driver's Identification | 393 | Driver 1 ID |
| Driver's Identification | 394 | Driver 2 ID |
| Fuel Economy | 395 | Fuel rate |
| | 396 | Instantaneous Fuel Economy |
| PTO Drive Engagement | 397 | At least one PTO engaged |
| High Resolution Fuel Consumption (Liquid) | 398 | High resolution engine total fuel used |

## 16  USING TACHOGRAPH

FMB630 device can read tachograph data. User can connect FM to vehicle unit tachograph device. Supported devices are: Siemens VDO Digital Tachograph – DTCO 1381 (release 1.3a, 1.4 or later) and Stoneridge Tachograph – SE5000 (release 7.1 or later)

### 16.1  Connecting to tachograph
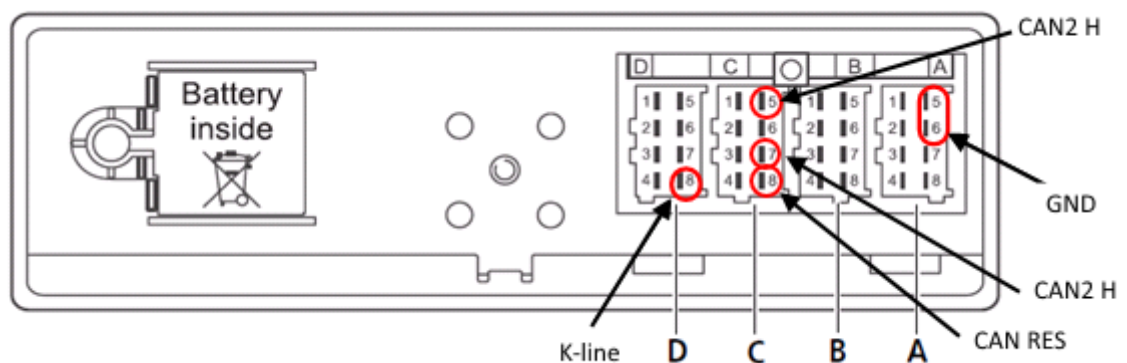


**Figure 100 Tachograph connection**

Connection to tachograph (Figure 100):

- Before connecting tachograph wires, it is required to measure CAN line resistance while tachograph is switched off:
  - Turn off the vehicle ignition;
  - Measure resistance between the C5 (CAN2 H) and C7 (CAN2 L) contacts;
  - If the multimeter shows ~120 Ohms, skip the next step;
  - If the multimeter shows kiloOhms resistance then it is needed to connect tachograph C8 (CAN-RES) and C7 (CAN2 L) contacts with wire and then perform further actions;
  - Re-measure the resistance of the line – it has to be ~120 Ohms.

- Connect CAN2 L and CAN2 H wires to tachograph (C5 (CAN2 H) and C7 (CAN2 L))
- All of the same level CAN-L and CAN-H wires must be interlaced with each other.

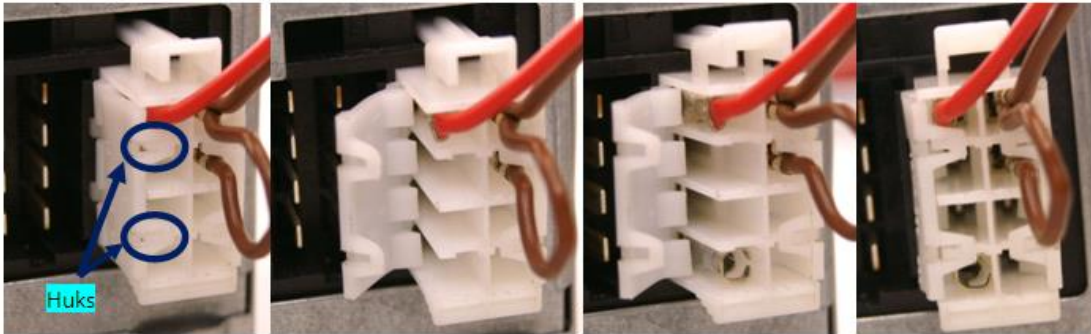- CAN wires need to be installed as far as possible from GSM antenna.

**Figure 101 Adding contact on tachograph connector**

- Tachograph D8 and adapter K-Line connectors connected directly.
- Tachograph mounted on vehicles does not have D8 contact. In order to add it, you have to undo the hooks and add the contacts (Figure 101). Contact code in Farnell system: 925596-1.
- Direct GND connection is required only if vehicle and tachograph grounds are not merged. (It can be checked using multimeter. Connection between different grounds should be 0 volts)

NOTE! Connecting to Stoneridge tachograph, for K-Line data, this configuration must take place:
1. Insert Company card in tachograph.
2. Configure tachograph in this way:
   **Menu->Settings->Parameters->D8 data format->SRE**

Each described Vehicle Data element is packed to standard AVL packet and sent to server. Parameter values are sent depending on configuration element ID that are described in „K LINE ID" column (IO parameter ID).

Vehicle data configuration window (Figure 102) can be opened by selecting "K Line" in the Configurator. There is the list which holds all elements, each one can be selected by ticking to its name.
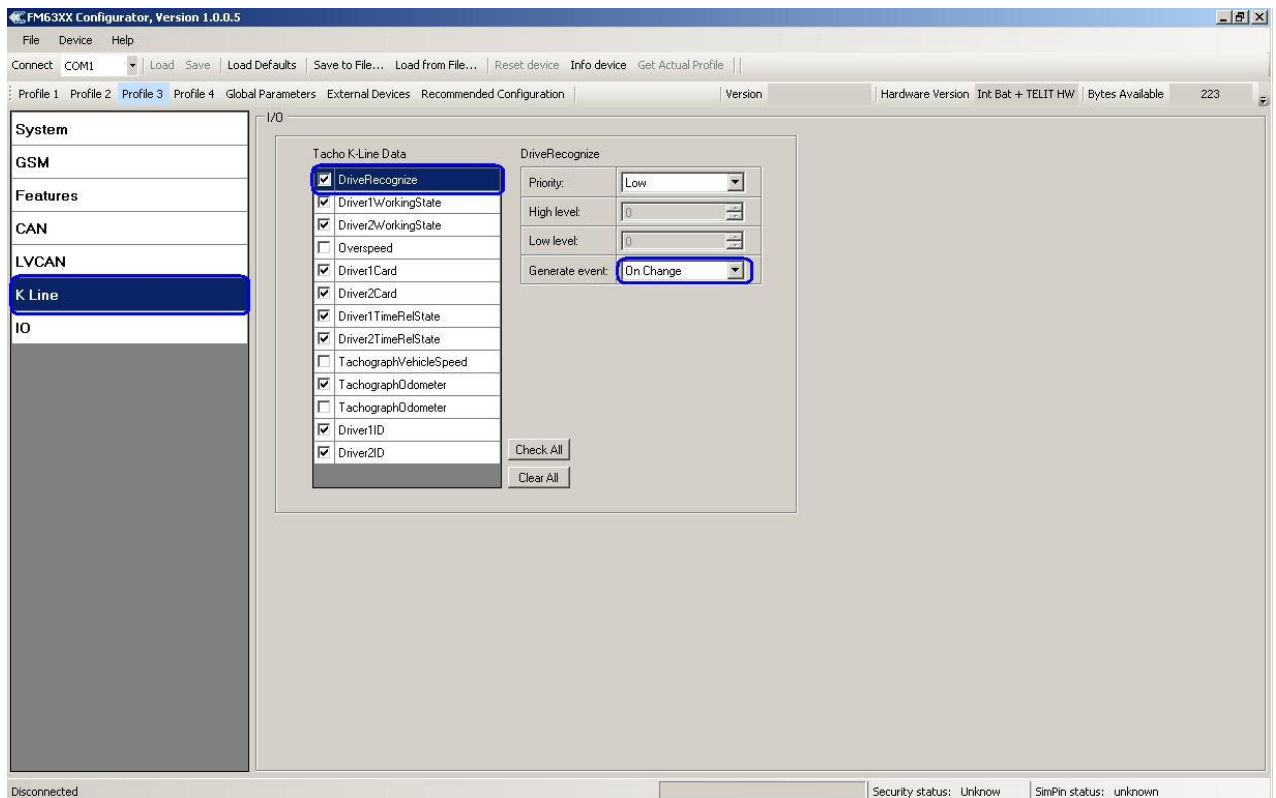
**Figure 102 Vehicle data configuration window**

Element configuration (Figure 103) shows selected element name (marked blue). By selecting other element name will change that way indicating which element is configurating. Priority: low and high. High, low level can be selected only by "Tachograph vehicle speed", it depends on generate event selection which have "On change" and "Monitoring" modes, "Tachograph vehicle speed" has all (on exit, on enter, on both, hysteresis, monitoring, on change) modes.

To reduce GPRS traffic we recommend using default settings (most I/O elements should be generated "on change")
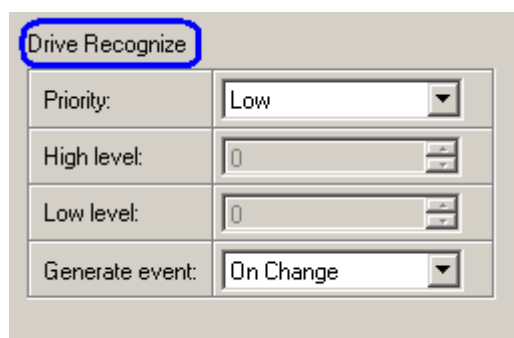


**Figure 103 Vehicle data configuration window**

Below configuration available byte size in record is shown, by selecting elements its decreasing and when reaches zero no more elements could not be selected.

Driver 1 ID and Driver 2 ID Tachograph data elements are packed to standard AVL packet and send to server dependent on configuration with element ID described in „K LINE ID" column. Note that driver ID is 16 bytes long. For this reason it is split to 2 IO elements. On the server side it is required to merge those two IO elements to have full driver ID for whole 16 bytes.

It is also possible to configure Vehicle Data element using SMS or GPRS according to basic FM functionality, parameters described in table 32

## 16.2 Tacho WEB

WEB Solution for Tachograph files download. Teltonika Tacho WEB Solution is a big forward leap in remote tachograph data files download. Solution is easily manageable and does not require any complex software* installation. Everything is accessible via web page. Now you can download tachograph files from any place and from any PC with internet access.

**\*- requires company card reader software installation on a single company PC**

Access and download tachograph files of your whole fleet from within a single, web browser-based interface. Compatible with browsers across all platforms, requires no installation or additional plug-ins

Once you create a schedule, selected tachograph files will be downloaded automatically. Data will be downloaded every defined period, for example once a week, once a month etc.

FMB630 device has a possibility to connect to WebDDD IP every 1 hour and check if there are any schedules for downloading DDD files. If FMB630 connects to WebDDD server, and there is a planned schedule but other device is already downloading and company card is in use, device keeps link with WebDDD server but still sends data to main server with AVL data. After successful download, device closes link with WebDDD and reconnects after 1 hour. Data is stored on secured server and can be accessed only by your authorized users. You don't need to worry that any file is lost and you have to download it from tachograph once again.

We support not only the standard DDD file extension, but also Spanish TGD and French V1B, C1B file formats. You simply set required one in Tacho Web user settings
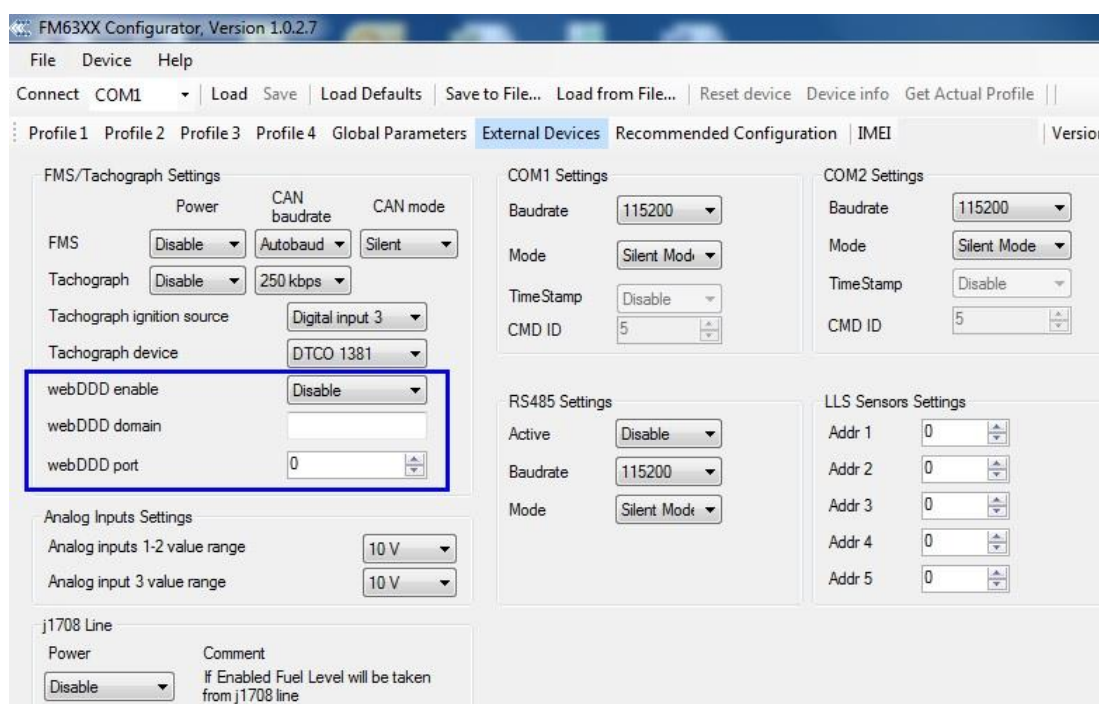


**Figure 104 Connection to Web DDD**

## 16.3  TACHOCHECK SMS

"tachocheck" sms message can be sent to device. It is used for getting status information. SMS response is of such structure:

CAN_2:[TRC],[ABCD], K-Line:[K]

[T] – Tachograph presence on bus:
- 0 – Tachograph doesn't respond on bus;
- 1 – Tachograph responds on bus.

[R] – Response to OpenRemoteSession validity check:
- 0 – Wrong or unknown response (failed to open RemoteSession);
- 1 – Tachograph responds positively (RemoteSession opened successfully).

[C] – Response to CloseLastAuthenticationSession validity check:
- 0 – Wrong or unknown response (failed to close last authentication session);
- 1 – Last authentication session closed successfully, device is ready to open new authentication session.

[K] – K-Line data presence on bus:
- 0 – K-Line data not present on bus;
- 1 – K-Line data present on bus.

[ABCD] – FMS data presence on bus:
- 0000 – FMS data not present on bus
- Non-zero – FMS data detected on bus.

FMS data value is shown in hexadecimal system and it is not important for the client.


## 17  RS485 INTERFACE

RS485 supports only Half Duplex communication.  It means that at the same time you can't send/receive Data.

When activated RS485 driver chip draws constant 30mA current.

When Entering Sleep or Deep sleep Chip will be powered off too.


## 17.1  RS485 modes

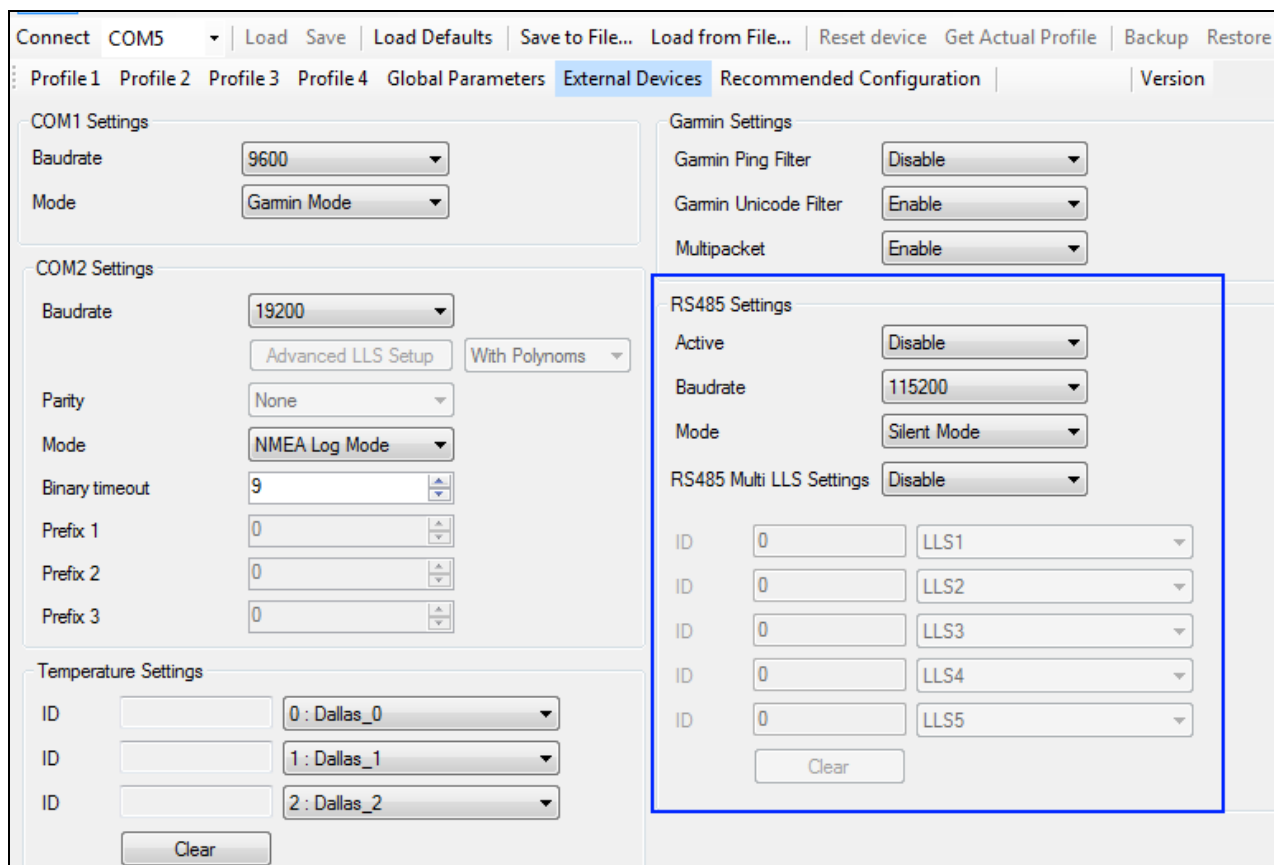In Configurator's windows select External devices window where is RS485 Settings as shown in Figure 105.

**Figure 105 External Devices**

The modes are described below are setting in the configuration window.

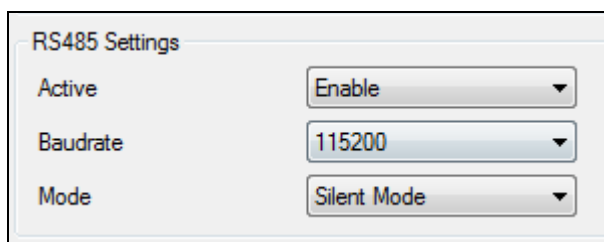### 17.1.1 RS485 Receive (Silent) Mode



**Figure 106 Silent Mode**

RS485 Works in receive mode. Support debug and testing commands. When command is received answer is sent after that it back up to Receive mode.

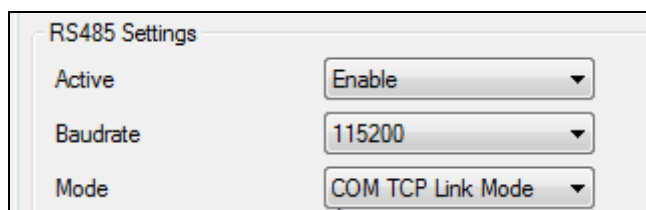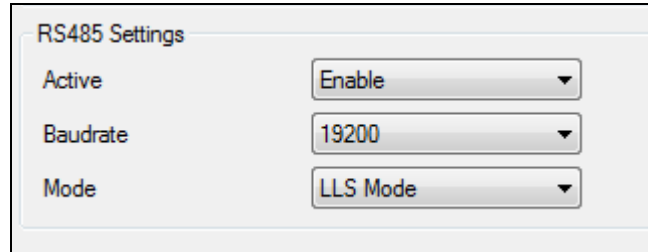### 17.1.2 RS485 Receive (TCP Link) Mode



**Figure 107 COM TCP Link Mode**

RS485 works in receive mode. When data received from server RS485 is switched to transmit mode for 2 seconds.
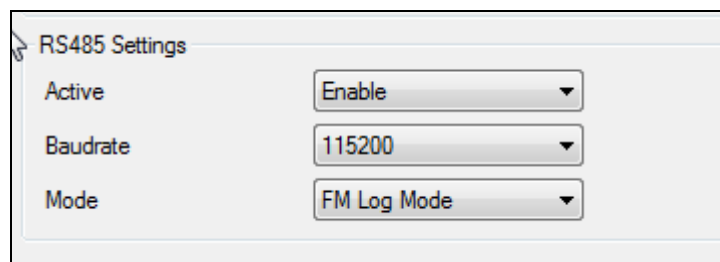
### 17.1.3 RS485 Receive (LLS) Mode



**Figure 108 LLS Mode**

The mode supports up to two LLS. Baud rate must be 19200. LLS have receiver id. Smaller ID will get ID: 201 and ID: 202. Bigger ID will get ID: 203 and ID: 204
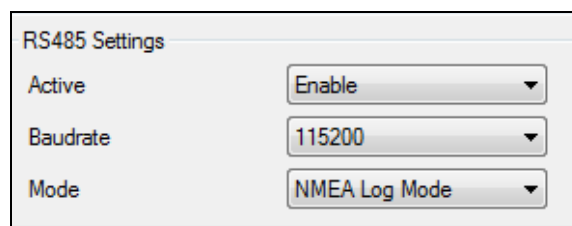
### 17.1.4 RS485 Transmit (FM Log) Mode



**Figure 109 FM Log Mode**

RS485 works in transmit mode, it prints FM log. It won't respond to commands

### 17.1.5 RS485 Transmit (GPS Nmea) Mode



**Figure 110 NMEA Log Mode**

RS485 works in transmit mode, it prints NEMA. It won't respond to commands
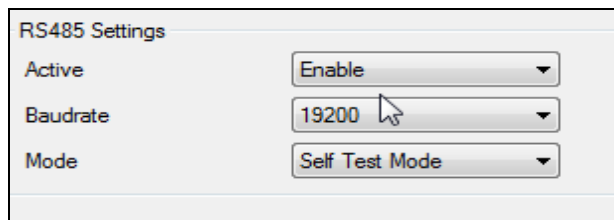
### 17.1.6 RS485 Self-Test Mode

**Figure 111 Self Test Mode**

Both transmitter and receiver are active. Transmitted info will be echoed back.

## 17.2 RS485 interface

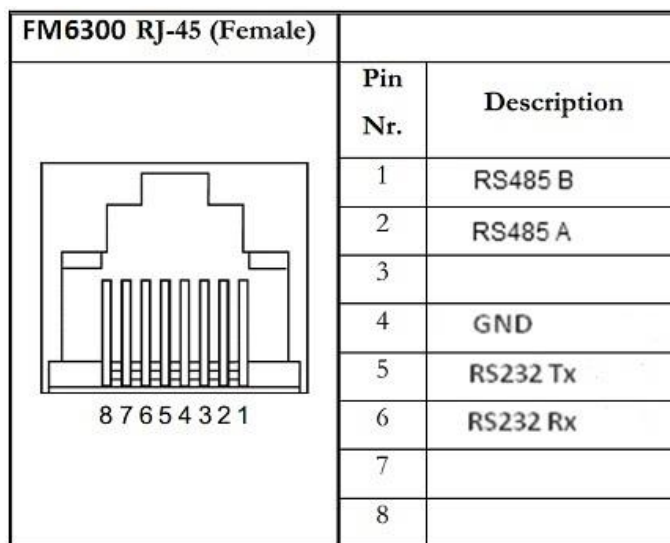Port connection diagram are shown on the Figure 112:

| FM6300 RJ-45 (Female) | Pin Nr. | Description |
|---|---|---|
| | 1 | RS485 B |
| | 2 | RS485 A |
| | 3 | |
| | 4 | GND |
| | 5 | RS232 Tx |
| | 6 | RS232 Rx |
| | 7 | |
| | 8 | |

**Figure 112 Port 1 connection diagram**

Pins numbers 1 and 2 are intended to RS485 interface connection

## 18 RFID

Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. FMB630 can be configured in a way to use with an RFID reader. When an RFID of some sorts (typically a plastic card with a magnetic line) is used with an RFID reader which is connected to FMB630, the device creates a record with the data that the RFID reader has read and can be sent to a server with all other information. RFID ID is activated like an I/O parameter (Figure 113).

| Rfid Id | ☑ | High ▾ | 0 ⇕ | 0 ⇕ | Monitoring ▾ | 10 |
|---|---|---|---|---|---|---|

**Figure 113 RFID I/O parameter**

To set up FMB630 so it can be connected to an RFID reader, Global parameters have to be set up. Go to extermal devices and set up COM2 settings to RFID Mode or RFID MF7 Mode (the

used mode depends on the mode that the RFID reader works). See Figure 114. The Baudrates for each mode are:

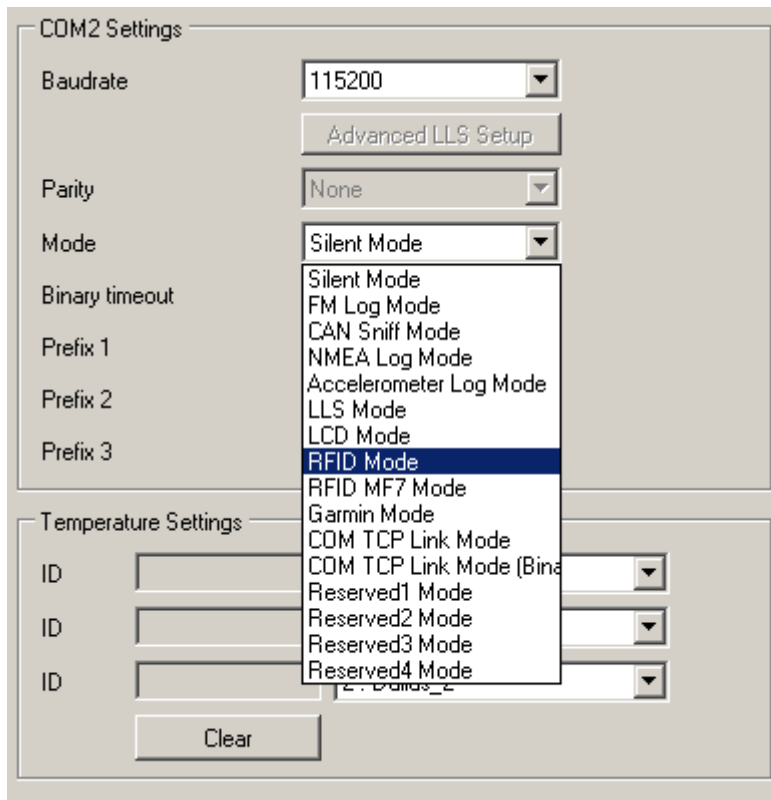RFID Mode – 57600

RFID MF7 Mode – 9600



**Figure 114 RFID Global parameter settings**

The difference between RFID Mode and RFID MF7 Mode is that in RFID Mode FMB630 understands RFID messages that are in hexadecimal format and RFID MF7 Mode understands messages that are in decimal format. For example:

RFID Mode message – *"$aa$02$03$04$17$89$00$01"*

RFID MF7 Mode message – *"1213141519"*

The chosen mode has to correspond to the RFID reader's mode. What type of RFID is sent to FMB630 depends on the reader.

For more information about RFID ID's and devices, please contact to your local sales representative.

## 19  GARMIN

Garmin provides a Fleet Management Interface Tool Kit which connected to FMB630 enables the driver to have a "screen" in their vehicle for real-time navigation, messaging, and job dispatch capabilities to help them be more efficient.

FMB630 and Garmin operational scheme is shown in Figure 115 below:

**Figure 115 FMB630 +Garmin operational scheme**

### 19.1 Supported Garmin FMI Protocols

The following is a list of protocols supported and the corresponding feature/benefit. FMB630 can fully support Fleet Management Interface (FMI) versions up to 2.1. Other or higher versions may be supported, but Teltonika is not responsible for the changes made by Garmin, which may affect the work of FMB630 and Garmin products. For more information about Garmin products and FMI versions, please go to http://www8.garmin.com/solutions/pnd/supportedproducts.jsp. Notice that some Garmin products use different connection cables than others.

#### 19.1.1 Standard protocols

Text Message Protocol:
• Allows text messages sent to device to be displayed in "inbox" on unit.
• Garmin can provide confirmation that message was read.
• Garmin can also provide a yes/no box below the text of the message to enable a simple quick response.
• Messages can be up to 199 characters in length.
• Messages can also be generated from device and sent to dispatch/office.
• Messages received will be notified to driver through a pop-up alert on Garmin screen.
• Garmin provides a "virtual keyboard" on device through a touch-screen format for all text communication.
Stop (Destination) Protocol:
• Garmin can display a list of Stops/Jobs reported to the device in a separate icon called "My Stops".
• Driver has ability to navigate directly to Stop from list.
• Garmin can provide status on current Stop in progress.
• Is driver stopped at location?
• How far has Driver progressed through the list of Stops?
• Garmin can also provide confirmation that driver has received a particular Stop, read the details, or deleted it from list.
• Can provide confirmation that a Stop has been completed.

Estimated Time of Arrival Protocol:

• Dispatcher/office can request the ETA of the current stop/job in progress.

• Garmin will notify the actual time of arrival as well as distance remaining to stop.

Auto-Arrival at Stop Protocol:

• This feature is used to tell the Garmin PND to automatically detect that it has arrived at a Stop and then to prompt the driver if they would like to mark the

Stop as done and begin navigating to next Stop on the list.

• Auto-arrival can be determined by how long the unit is stopped close to the destination (in the event driver has to park and walk) or by how close the unit needs to be to the destination before the Auto-arrival feature is activated.

Data Deletion Protocol:

• Dispatch/office has the ability to wipe clean the data on the Garmin PND.

• Clean up messages in inbox/remove stops.

### 19.1.2 Enhanced protocols

Canned Responses/Messages:

• Fleet managers can communicate by sending up to 200 "canned" responses from server to be stored directly on Garmin devices.

• Up to 50 of these canned responses can be utilized for any given scenarios.

• Drivers can store up to 120 canned messages, eliminating the need to type while driving.

Status Protocol:

• Up-to-the-minute communications that allow drivers to automatically send status updates.

• Driver's units can store up to sixteen status indicators such as start/stop shift, on/off break, etc.

## 19.2 Supported features on Tavl client application

Tavl client application lets user to use the following features of GARMIN FMI:

1. Text messaging.
2. Destination message.
3. ETA request.

## 19.3 Text messaging

Text messaging feature lets user to communicate with driver (user that uses Garmin device) by sending text messages via GPRS.

## 19.4 Destination message

Destination message is used to inform a driver of a new destination. When Garmin device receives a destination message from server it displays it as "Stop" to the driver and also gives the driver ability to start navigating to the "Stop" location. New destination in Tavl client is represented as Geozone so new Geozone (as destination) has to be created first.

### 19.5 ETA request message

ETA (Estimated Time of Arrival) request message is used when user wants to know expected arrival time to currently active destination and distance (in meters) from current object location to currently active destination.

### 19.6 Connection and pinout

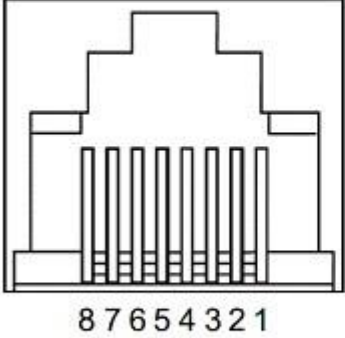| FM6300 RJ-45 (Female) | Pin Nr. | Description |
|---|---|---|
| | 1 | RS485 B |
| | 2 | RS485 A |
| | 3 | |
| | 4 | GND |
| | 5 | RS232 Tx |
| | 6 | RS232 Rx |
| | 7 | |
| | 8 | |

**Figure 116 RJ45 Pinouts**

In order to connect Garmin PND to FMB630, Garmin mode has to be set in Global parameter settings (Figure 117). Simply choose Garmin mode in COM2 settings mode, but you cannot activate Garmin mode in both ports at the same time.

FMB630 is able to filter out some of Garmin FMI packets that are not used in some applications (including Tavl system) and generates additional data transfer at the same time increasing bills of GSM services. In order to enable Garmin FMI Ping Packet Filtering set this feature from Global parameters at the bottom – enable Garmin Ping setting
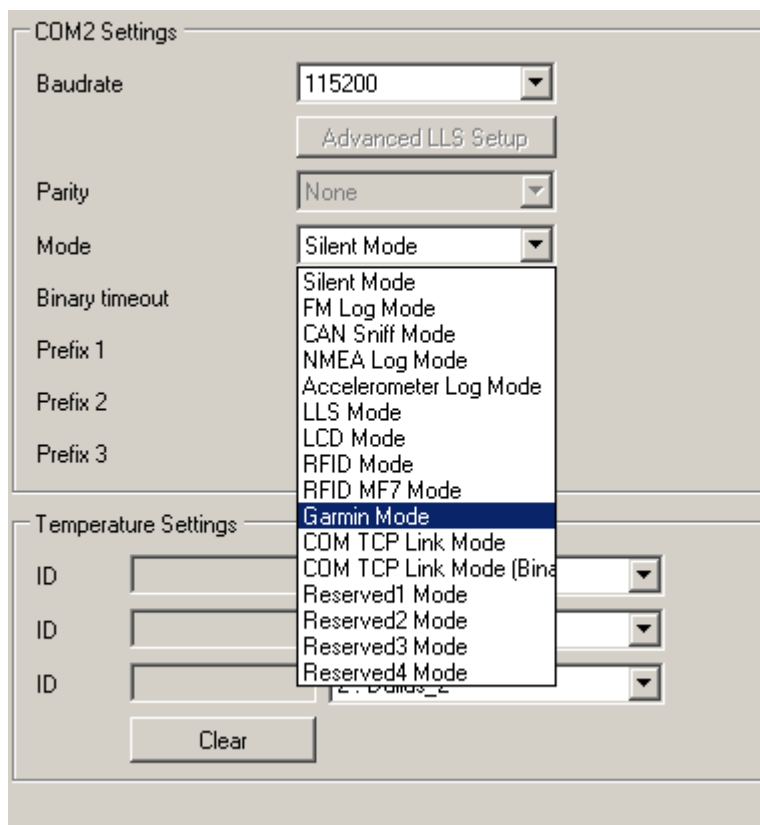
**Figure 117**
**Configuration of Garmin in Global parameter settings**

NOTE: Garmin FMI protocols are supported only in TCP data transfer mode.

Garmin Fleet management Interface documentation can be downloaded from Official Garmin web page: http://developer.garmin.com/download/FMI_v2-5.zip.
Software version updates: http://www8.garmin.com/support/download.jsp.

For more information about Garmin PND device connectivity to FMB630 and additional information, please contact to your local sales representative.

## 20  LLS SENSOR

LLS sensor series liquid level sensors are solid-state capacitive devices with no moving parts. The sensors use capacitive technology to produce accurate liquid level measurements of standard factory grade DIESEL OIL and PURE GASOLINE (BENZINE) carbon fuels.

The LLS sensor liquid level sensors are strictly prohibited to use in any liquids which are not the factory grade carbon fuels or contain: BIOFUEL, METHANOL, ETHANOL, UREA and similar aggressive components in pure form or as additives for factory grade carbon fuels for use in INTERNAL COMBUSTION ENGINES. Operating media – Diesel fuel (oil), pure gasoline (benzene).

**IMPORTANT!**
The power supply is 10-50 VDC stabilized. The wrong polarity (-) or (+) connection of power supply will damage or destroy the device. Prohibited for test or use in water and any other liquids, which are not factory grade carbon fuels. Fit the plastic insulation cap on the end of the central rod after installation accordingly to installation guide. To be installed, calibrated, tested only by qualified authorized person (installer, technician, mechatronic).

## 20.1 Specifications

| Supply voltage, DC V | 10...50* |
|---|---|
| Current consumption, mA (for 12/24 V) | 25/50 |
| Operation temperature, Celsius degrees | -40...+85 |
| Working mode | continuous |
| Weight, kg | < 2.0 |
| Working pressure | atmospheric |

## 20.2 Hardware

- Operation principle: capacitive.
- Output: RS-232.
- Standard probe lengths: 700, 1000, 1500 mm.
- Optocoupler isolation on both power and signal circuits.

## 20.3 Connecting LLS to FMB630

In order to use LLS fuel counter the newest firmware version is needed which can be obtained from Teltonika or a representative. Firmware is updated over GPRS or using cable update method (see chapter 4 for more information).

The LLS fuel sensor must be connected to the FMB630 device.  The FMB630 -LLS fuel sensor schemes are shown below Figure 118.
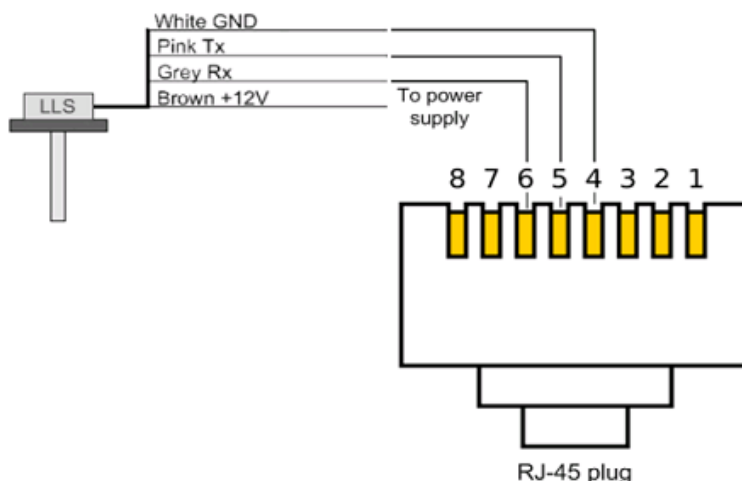


**Figure 118**
**FMB630 -LLS fuel sensor connection scheme RJ-45 male plug**

_____
*Teltonika is not responsible for any changes made by the manufacturer, which is not declared in fuel level sensor documentation.

Then FMB630 must be configured. Both fuel level and fuel temperature has to be set up by configurator's I/O menu (see Figure 119):

| | | | | | | |
|---|---|---|---|---|---|---|
| LLS #1 Fuel | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #1 Temperature | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #2 Fuel | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #2 Temperature | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #3 Fuel | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #3 Temperature | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #4 Fuel | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #4 Temperature | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #5 Fuel | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |
| LLS #5 Temperature | ☑ | Low ▼ | 0 ⬍ | 0 ⬍ | Monitoring ▼ | 10 |

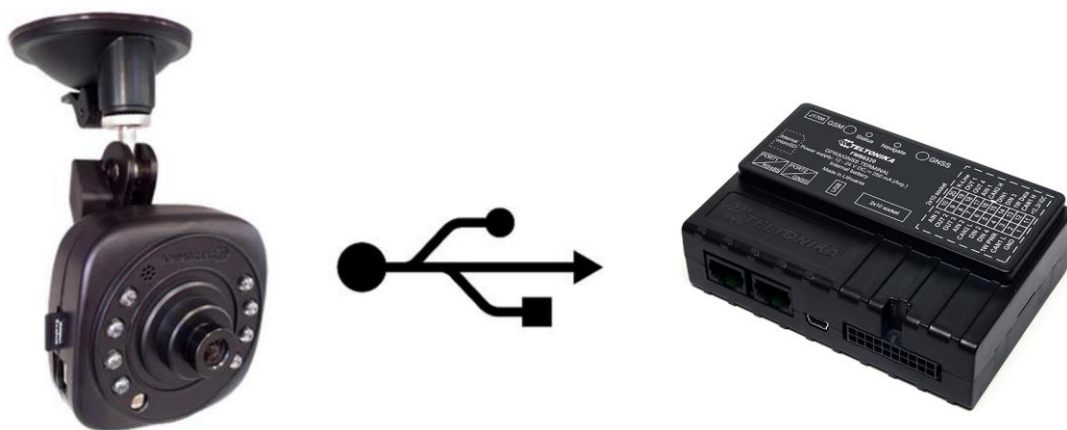**Figure 119 FMB630 I/O Configuration**

## 21 MVC300 CAMERA



**Figure 120 FMB630 and MVC300 Solution for Real time pictures**

### 21.1 Introduction

This chapter contains information about FMB630 device and MVC300 camera interconnection, integration and use. Before using this solution, you should have some basic understanding of the following:

- FMB630 operational principals;

- MVC300 operational principals;

### 21.2 Startup and Configuration

To get FMB630 ready for downloading pictures from MVC300 camera, you need to use base fw 00.01.09 or newer. In configuration, you must set server IP, port and APN of SIM card, these parameters are in first configurator page as shown in Figure 121 Simple Configuration:
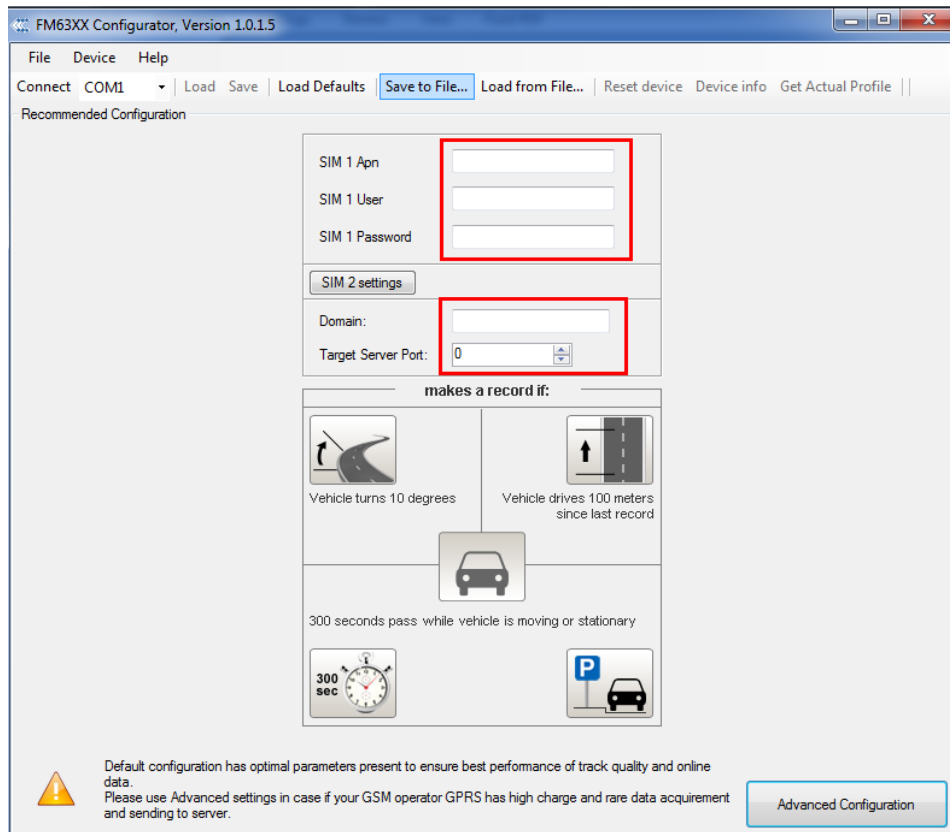
**Figure 121 Simple Configuration**

To set up picture creation configuration, select Advanced Configuration, which is in lower right corner of configuration. Select Camera page
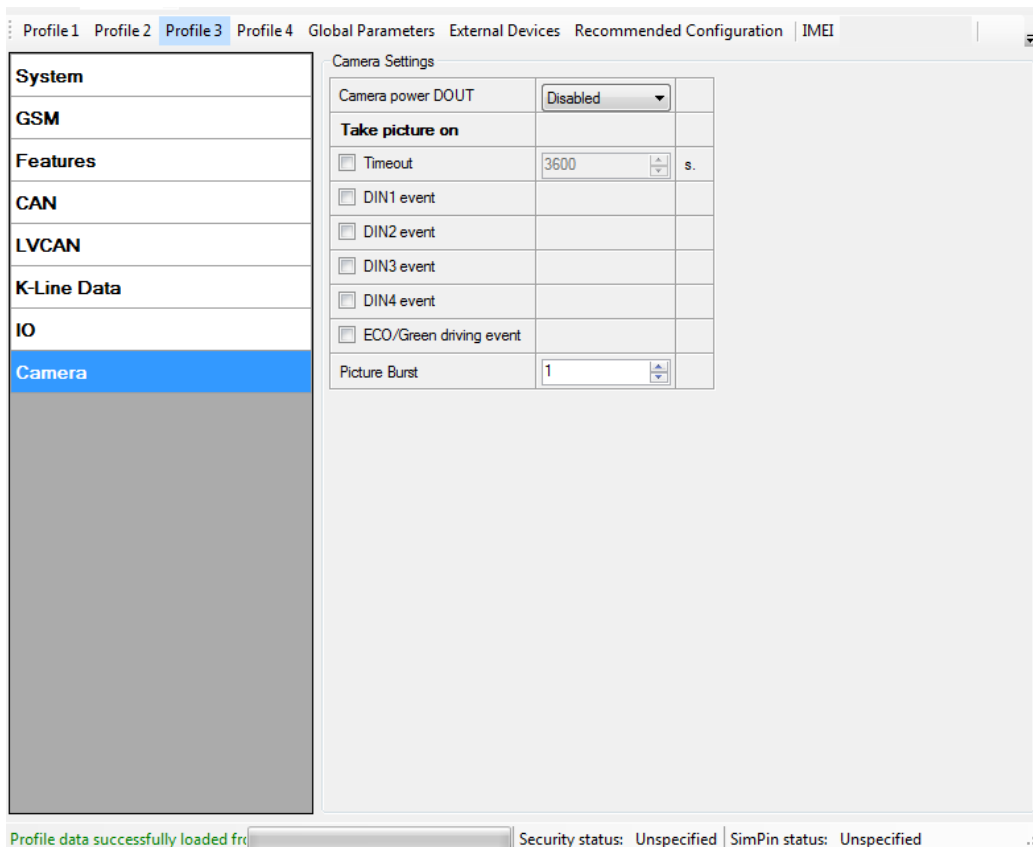


**Figure 122 Camera Configuration**

### 21.2.1 Camera parameters in FMB630:

**Camera power DOUT** – function which is used to enable Camera functionality and select defined DOUT for restarting physically MVC300 camera.

**Timeout parameter** – parameter enables periodical photo sending. Default parameter 3600 seconds.

**DIN events** – picture will be made, when selected DIN event will occur.

**Eco/Green driving events** – picture will be created, when one of eco/green driving event occured ( harsh acceleration, harsh cornering or harsh braking)

**Picture burst** – parameter defines how much pictures will be made after configured picture event occurs. Between pictures will be 3 sec time gap.

### 21.2.2 Camera parameters in MVC300:

To prepare MVC300 connection with FMB630, following steps must be done:
MVC300 must have firmware version - MVC330_WebUI_FW_MVC330_**F**_00.01.599 or newer. Main thing is, that firmware must be with F marking, which means, FM device support.  To check what firmware version your MVC300 have, you need to go - **http://192.168.1.10, it is camera's WEB UI.**

In WEB UI select – Maintenance page, there you will find box of firmware version. If your firmware is not with F marking, you must update firmware. If you don't have compatible firmware, please contact our Teltonika sales manager.
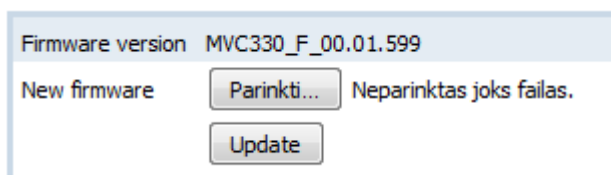


**Figure 123 Firmware Update**

After selecting firmware, press upgrade button as shown in Figure 123 Firmware Update.



**Figure 124 Firmware Upgrade**

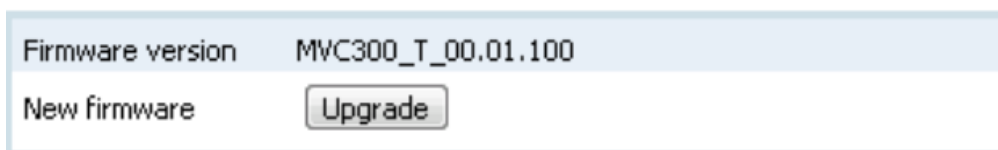After successful update, you will be redirected to main WEB UI window, if some error occurs, please clear your browser cache or open browser in new incognito window.

In WEB UI of MVC300 camera you can select resolution of picture which will be made when used in FMB630 and MVC300 solution.

In WEB UI select page – Video settings, in streams resolution, you can select between 320x190 and 720x480 resolution
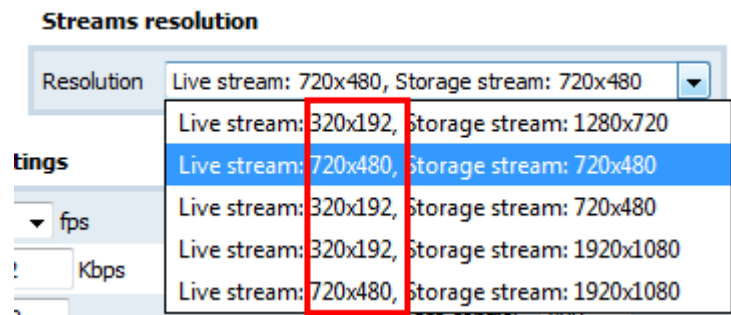
**Figure 125 Resolution Selection**

After successfully installing right firmware version and selecting resolution – MVC300 is ready to use with FMB630 device

### 21.3 FMB630 and MVC300 connection

To prepare solution you will need:

- FMB630 with 00.01.09 FW or newer version;
- MVC300 camera with original power cable or special cable which can be order severalty, for more info please contact Teltonika sales manager. Special cable have possibility to restart MVC300 camera and make solution more stable;
- Standard mini USB cable and USB plug to mini USB cable.

Connection is very simple, connect power wires of FMB630, connect MVC300 to power plug and connect camera with FMB630 over two USB cables. After connection is done, solution is ready to use.

## 22 GPRS COMMANDS

It is possible to send commands to FMB630 using GPRS. When FMB630 sends records periodically to a server, a message could be sent from the server and FMB630 will reply to it. FMB630 has to be connected to the server in order to receive commands.

**Table 60 GPRS Commands**

| Command | Description |
|---------|-------------|
| #GET DATAORDER | Get info about records sorting parameter |
| #GET RECTO | Get info about records refresh timeout parameter |
| #GET VERSION | Receive firmware version |
| #GET NETWORK | Get GSM operator to which device is connected |
| #GET IMSI | Get IMSI of the device |
| #GET OUT | Get DOUT values |
| #DO REPORT | Save a record |
| #GET ROAMINGX=Y | Get operator from the list of a certain profile, X – profile, Y – operator |

| Command | Description |
|---|---|
| | number in a list |
| #GET REMIPX | Get IP and port number from the configuration of a certain profile, X – profile |
| #GET AUPX | Get APN, user login and password from the configuration of a certain profile, X – SIMSLOT |
| #GET REPRTX | Get MinPeriod from the configuration of a certain profile, X – profile |
| #GET REPDISTX | Get MinDistance from the configuration of a certain profile, X – profile |
| #GET REPANGX | Get MinAngle from the configuration of a certain profile, X – profile |
| #GET SENDPERIODX | Get SendPeriod from the configuration of a certain profile, X – profile |
| #GET REPMRX | Get MinRecords from the configuration of a certain profile, X – profile |
| #GET IBTN=X | Get iButton value from the configuration of a certain profile, X – number on the list |
| #GET EXTERR | Get extended errors value |

There is also a possibility to send the same messages as in SMS command list (chapter 13). The device sends a response to every command received.

**Table 61 SMS Commands**

| Command | Description |
|---|---|
| getstatus | Modem Status information |
| getweektime | Current device time, Day of Week and amount of minutes passed since start of week |
| getops | List of currently used and available GSM operators |
| readops# | Emergency gsm operator readout from active profile<br># - 1,2,3<br>1 – operators [1-20]<br>2 – operators [21-40]<br>3 – operators [41-50] |
| getnmeainfo | Nmea error debug sms |
| getcfgtime | Date and Time of last successful configuration |
| getgps | Current GPS data and time |
| loadprofile# | Load specified profile into RAM Engine Profile. # - number of profile to load |
| cpureset | Reset CPU |
| resetallprof | Reset all FLASH profiles to default profile |
| getver | Device / Modem / Code version information |
| getinfo | Device runtime system information |
| deleterecords | Delete all records saved on FLASH |
| getio | Readout digital inputs and outputs, analog inputs |
| banlist | Banlist information |
| crashlog | Crash log information |
| delete_all_sms | Delete all read SMS |
| braminfo | BatRam info |

| Command | Description |
|---|---|
| | |
| getgnss | Current GNSS information |
| resetlimits | Resets data counters |
| sn x [x=0;1] | Enable/disable static navigation |
| readio # | Readout input value according entered ID, # - ID value |
| setdigout XXXX Y1 Y2 Y3 Y4 | Set digital outputs<br>0 – OFF, 1 – ON<br>Y1 – timeout for DO1<br>Y2 – timeout for DO2<br>Y3 – timeout for DO3<br>Y4 – timeout for DO4 |
| getparam # | Readout parameter value according entered ID.<br># - ID value. |
| setparam # # | Set parameter value according entered ID and Value.<br>1.# - ID value.<br>2.# - New Parameter Value |
| flush #,#,#,#,#,#,# | Initiates all data sending to specified target server<br>1.# - IMEI<br>2.# - APN<br>3.# - LOGIN<br>4.# - PASS<br>5.# - IP<br>6.# - PORT<br>7.# - MODE (0-TCP/1-UDP) |

**ATTENTION!**
In order to send these commands, they have to be converted to special format. How to convert to this format and for additional information on how to send GPRS commands, please contact to your local sales representative.

## 23 DEBUG MODE

FMB630 is able to transmit its current state when connected to PC using PORT1/2 and USB cable. To debug FMB630 with USB cable, in terminal you should set high level to DTR pin. It is used to detect errors and provide information to possible solutions when operating as unexpected. Contact our sales manager to get Terminal. After launching it choose baud rate 115200 and hardware control – none. Click on 'Start Log' button and save a new file. Then click 'Connect' to start receiving messages from FMB630 (see Figure 126)
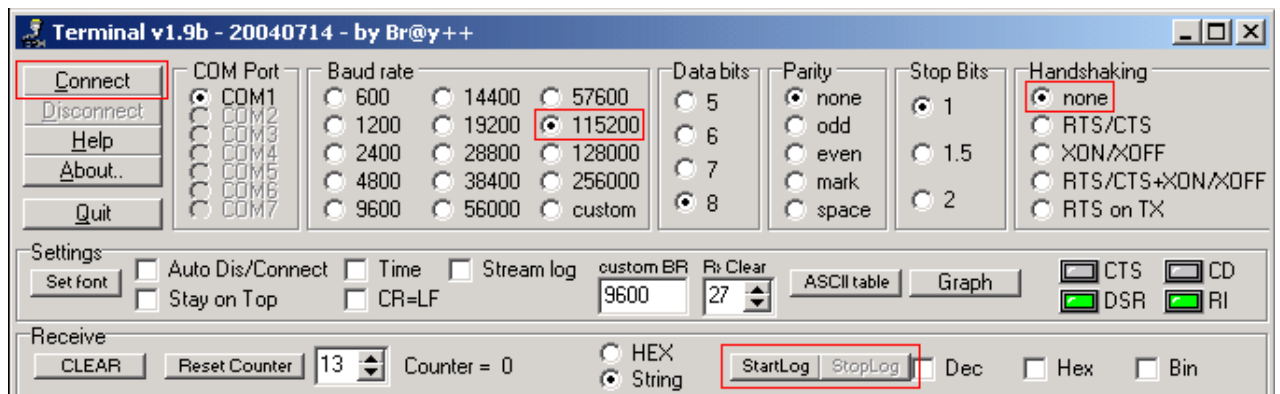
**Figure 126 Terminal Window**

To debug NMEA GPS data, connect PORT3 cable to COM2 port, or connect PORT2 cable and enable nmea log mode, or via USB cable activating nmea log mode by sending *.log_nmea:1* command in terminal.

## 24 FMB630 REMOTE LOG

*LOG BOOK*

Two types of log book: online, offline.
Online log book is initiated using command *log2srv* and set right configuration. Device establish *GPRS* connection and activates link to server, log started to stream to server until set time is elapsed. To stop streaming immediately *log2srvstop* is used.

Offline log book is initiated using command *log2srv* and set right configuration. Device start log writing to flash, this action is performed until set time is elapsed.

To read offline log *log2srvstart* command is used. It sends log to earlier preconfigured server (*log2srv*). Offline log sending also can be terminated using *log2srvstop* command.

*COMMANDS*

- *"SMSlogin<space>SMSpassword<space>**log2srv**<space><enable>,<mode>,<APN>,<userna me>,<password>,<IP>,<port>,<TMO>,<Log mode>"*
    - ○ *<enable> - enable (**1**), disable(**0**);*
    - ○ *<mode> -*
        - ▪ *silent (**0**) – connect to server and send "Hello" message (all "Terminal" commands can be used)*
        - ▪ *echo_time (**1**) – send log with lines, where is TIME "for example: -[2013.1.23 14:49:45]-[PERIODIC.BAN.LIST.INFO]:"*
        - ▪ *echo (**2**) – send log with lines where is no TIME "for example: [DIN1.FUNC]->Waiting for DIN1 to be ON"*
        - ▪ *echo/echo_time (**3**) – send full log*
        - ▪ *modem (**4**) – send just AT commands*
        - ▪ *NMEA (**5**) – send NMEA log.*
    - ○ *<APN> - operators' APN which will be used for data sending;*

o *<username> - operators' username;*
o *<password> - operators' password;*
o *<IP> - servers' IP address to which offline/online log will be send after request ("log2srvstart");*
o *<port> - servers' port;*
o *<TMO> - indicates time of offline log writing to flash or online log sending to server;*
o *<Log mode> - configuration for online mode (0), configuration for offline mode (1);*

- *"SMSlogin<space>SMSpassword<space>**log2srvstart**"*
- *"SMSlogin<space>SMSpassword<space>**log2srvstop**"*

Example: opa opa log2srv 1,3,banga,,,212.47.99.62,7092,300,0

Note: Up to 5 minutes delay could appear if wrong "*log2srv*" commands settings will be sent, during that time no SMS or GPRS command could be received. SMS will be hanging, after timeout, hanging SMS's will be proceeded.

### DOWNLOADING LOG USING "HERCULES" program

STEP 1:

- set special chars – ASCII

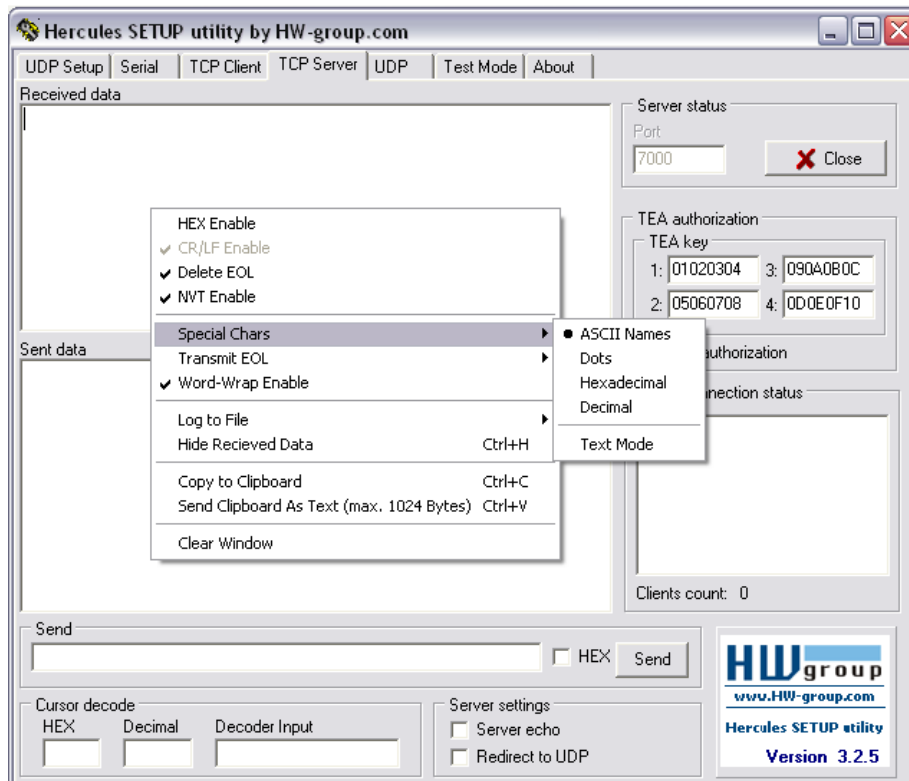- Write down your PORT in the *Port* field and click on *listen* (screen below)



**Figure 127**

STEP 2

- click *Log to File*, then choose the directory where you want to log it in, give your log a name and click *open*

- Right click again and click on *Log Enable* OR just use *Ctrl + L* combination instead.
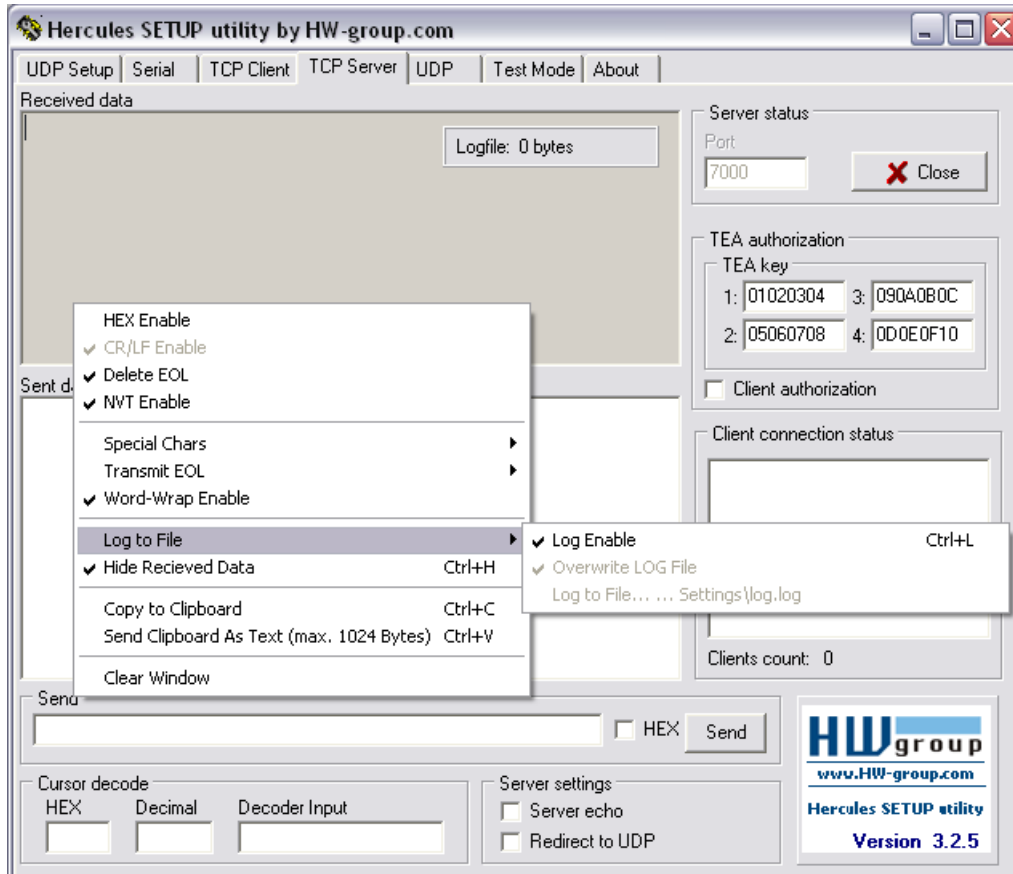


**Figure 128**

STEP 3

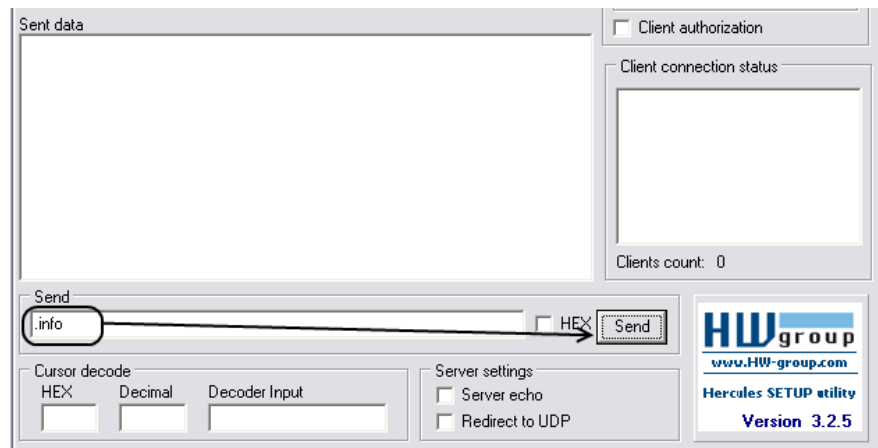- Sending "Terminal's" commands through Hercules server



**Figure 129**

## MOUNTING RECOMMENDATIONS

### 24.1 Connecting Wires

- Wires should be connected while module is not plugged in.
- Wires should be fastened to the other wires or non-moving parts. Try to avoid heat emitting and moving objects near the wires.
- The connections should not be seen very clearly. If factory isolation was removed while connecting wires, it should be applied again.
- If the wires are placed in the exterior or in places where they can be damaged or exposed to heat, humidity, dirt, etc., additional isolation should be applied.
- Wires cannot be connected to the board computers or control units.

### 24.2 Connecting Power Source

- Be sure that after the car computer falls asleep, power is still available on chosen wire. Depending on car, this may happen in 5 to 30 minutes period.
- When module is connected, be sure to measure voltage again if it did not decrease.
- It is recommended to connect to the main power cable in the fuse box.
- Use 3A, 125V external fuse.

### 24.3 Connecting Ignition Wire

- Be sure to check if it is a real ignition wire – power does not disappear while starting the engine.
- Check if this is not an ACC wire (when key is in the first position, most electronics of the vehicle are available).
- Check if power is still available when you turn off any of vehicles devices.
- Ignition is connected to the ignition relay output. As alternative, any other relay, which has power output, when ignition is on, may be chosen.

### 24.4 Connecting Ground Wire

- Ground wire is connected to the vehicle frame or metal parts that are fixed to the frame.
- If the wire is fixed with the bolt, the loop must be connected to the end of the wire.
- For better contact scrub paint from the place where loop is connected.

PAY ATTENTION! Connecting the power supply must be carried out in a very low impedance point on-board vehicle network. These points in the car are the battery terminals. Therefore, we recommend connecting the power of FMB630 (wire GND and POWER) directly to the battery terminals. Another valid option is to connect the wires to the main POWER cable inside the fuse box (if there is none, then to the power supply where the fuses of vehicle's computer are), wire GND must be connected in a special point, designed to connect GND vehicle computer. Connecting the GND at an arbitrary point to the mass of the car is unacceptable, as static and dynamic potentials on the line GND will be unpredictable, which can lead to unstable FMB630 and even its failure.

## 24.5 Connecting Antennas

- When placing antennas avoid easily reached places.
- Avoid GNSS antenna placement under metal surfaces.
- Avoid placing FMB630 device near car radio, speakers or alarm systems.
- GNSS antenna must be placed so its state is as horizontal as possible (if antenna is leant more than 30 degrees, it is considered incorrect mounting).
- GNSS antenna cable cannot be bent more than 80 degrees.
- GNSS antenna must be placed sticker facing down



**Figure 130**

It is recommended to place GNSS antenna behind dashboard as close to the window as possible. A good example of GNSS antenna placement is displayed in a picture below (area colored green).
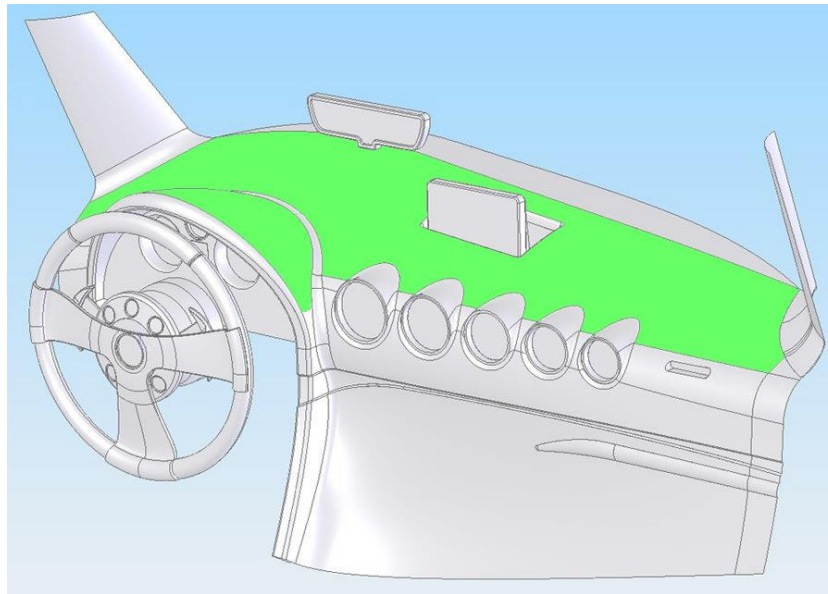


**Figure 131: Correct placement of FMB630**

## 24.6 Module Installation

- Module should not be seen or easily reached.
- Module should be firmly fixed to the surface or cables.
- 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).

## 25  CHANGE LOG

| Nr. | Date | Version | Comments | |
|-----|------|---------|----------|---|
| 1 | 2017-05-12 | v1.0 | Initial Release | 156 |
| 2 | 2017-05-25 | v1.1 | Updated LVCAN200 and ALLCAN300 description. | |
| 3 | 2017-05-31 | V1.2 | Minor changes | |