FM6300 User Manual
V1.3

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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.

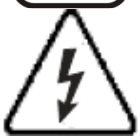
All wireless data transferring devices produce interference that may affect other devices which are placed nearby.

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.

FM6300 has USB interface;
Please use cables provided with FM6300 device.
Teltonika is not responsible for any harm caused by using wrong cables for PC <-> FM6300 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 FM6300 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 FM6300 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 FM6300 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 FM6300 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 FM6300 memory. AVL data contains GPS and I/O information

AVL packet - Data packet which is sent to server during data transmission.AVL packet can contain 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

FM6300 is a professional tracker 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 FM6300 has additional inputs and outputs, which let you control and monitor other devices on remote objects. FM6300 also has a USB port for device status log output and for saving configurations.

2.1 Package contents[1]

Usually the FM6300 device sample is supplied to the customer in a cardboard box containing all the equipment that is necessary for operation. The package contains:

FM6300 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/3G features:

- Quectel UC20-G 5-band module (GSM 800 / 850 / 900 / 1900 / 2100 MHz);
- EGPRS class 12;
- SMS (text, data).

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;
- Internal backup battery included;

Interface features:

- Power supply: 10 ÷ 30V;
- USB port;
- 4 digital inputs;
- 3 analog inputs;
- 4 open collector digital outputs;

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

- 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 FM6300 physical interfaces and operation environment

Part name	Physical specification	Operation environment
Navigation LED	LED	Power supply 10...30 V DC 2 W Max Operation temperature: -25°C … +55°C Storage temperature: -40°C … +70°C Energy consumption[1]: GPRS: ⎓ 120 mA r.m.s Max., Nominal: ⎓ average 65 mA r.m.s, GPS Sleep: ⎓ average 28 mA, Deep Sleep: ⎓ average less than 7 mA[2] Storage relative humidity 5 … 95 % (non condensating) Battery charge current: ⎓ average 100 mA,
Modem LED	LED	
GPS	GPS antenna connector SMA jack(female outer shell, female inner pin)	
GSM	GSM antenna connector RP-SMA jack(female outer shell, male inner pin)	
Socket 2x10	Tyco Micro MATE-N-LOK™ or similar	
USB	Mini USB socket	

[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)	
Port2	RS232 port channel 1 (RJ45 socket)	
J1708	J1708 port channel	

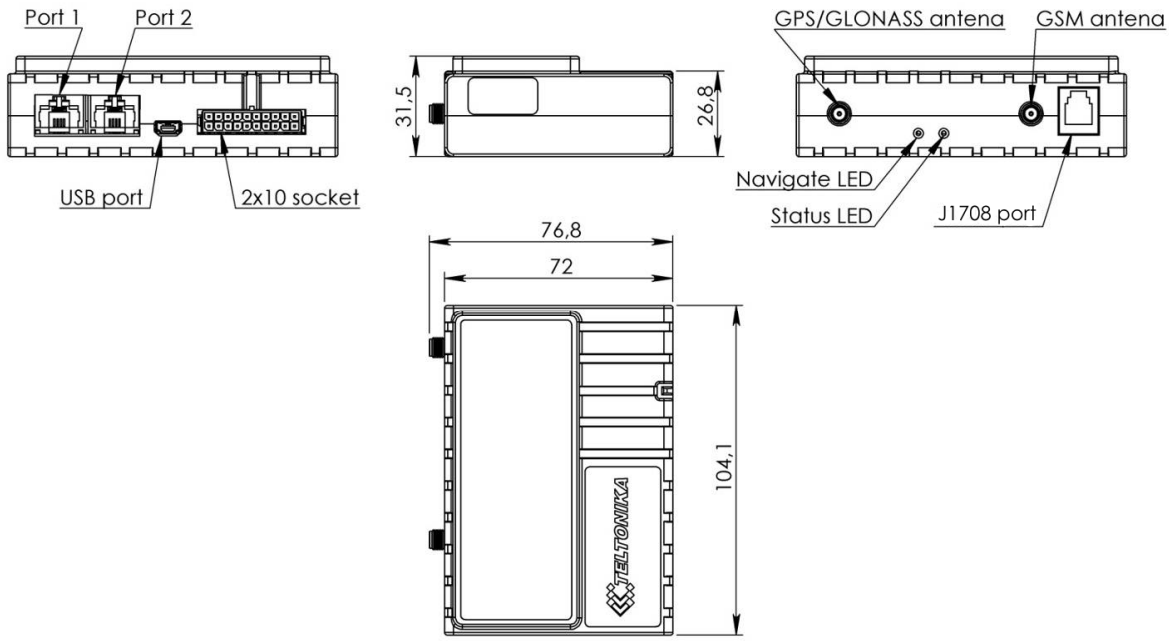


Figure 1 FM6300 view & dimensions in mm (tolerance ±2mm)

2.4 Technical Information about internal battery!

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

FM6300 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 FM6300 device, operating time approximately 5 hours
- In deep sleep mode – 35 hours
- Operating time for a new FM6300 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

VALUE / CHARACTERISTIC DESCRIPTION	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 FM6300, and then the external device should be powered. Connecting external devices when FM6300 is powered off is not recommended.

2.6 Absolute Maximum Ratings

Table 4 Absolute maximum ratings

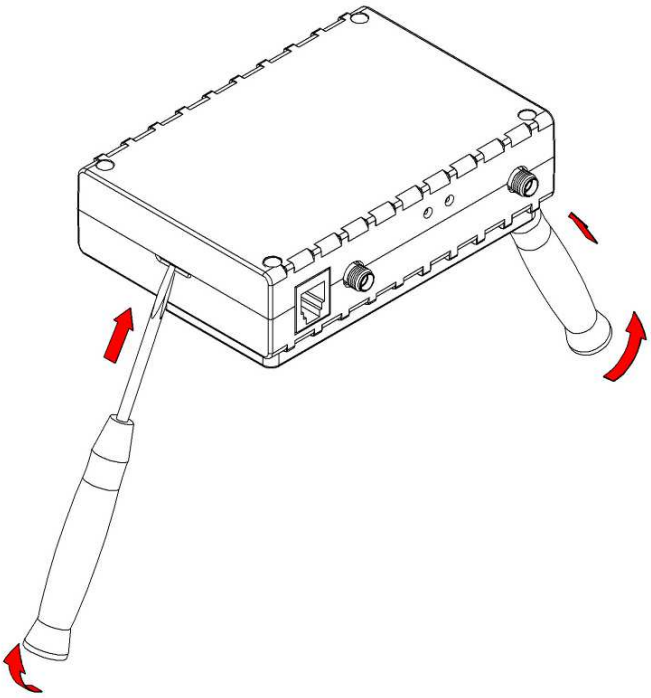
CHARACTERISTIC DESCRIPTION / VALUE	Min.	Typ.	Max.	Unit
Supply Voltage (Absolute Maximum Ratings)	-32		32	V
Digital output clamp threshold voltage (Absolute Maximum Ratings), (I_{drain} = 2mA)	36			V
Digital Input Voltage (Absolute Maximum Ratings)	-32		32	V
Analog Input Voltage (Absolute Maximum Ratings)	-32		32	V
Voltage on Supply Voltage 1-Wire (Absolute Maximum Ratings)	0		10	V
Voltage on Data Input/Output 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 CANH, CANL (Absolute Maximum Ratings)	-58		58	V

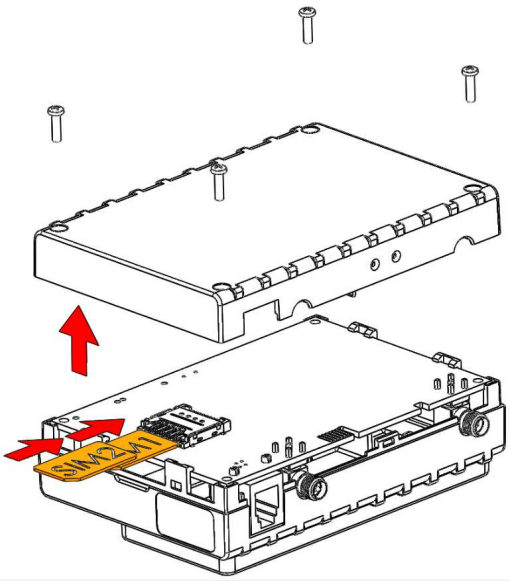
3 CONNECTION AND PINOUT

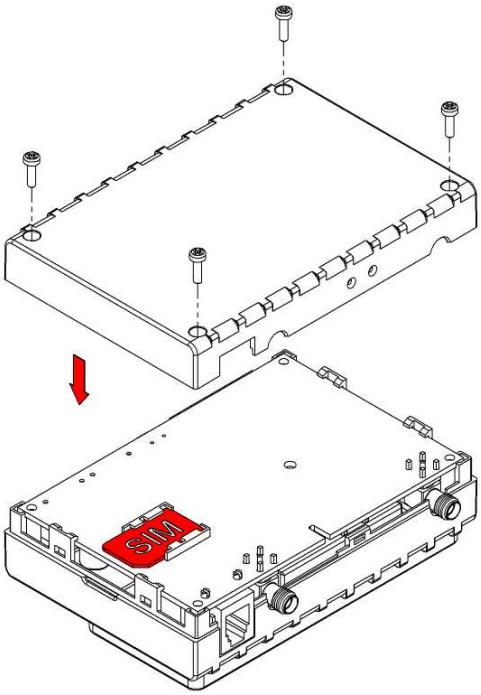
3.1 SIM card insert scheme



①

Gently open FM6300 case using screwdrivers



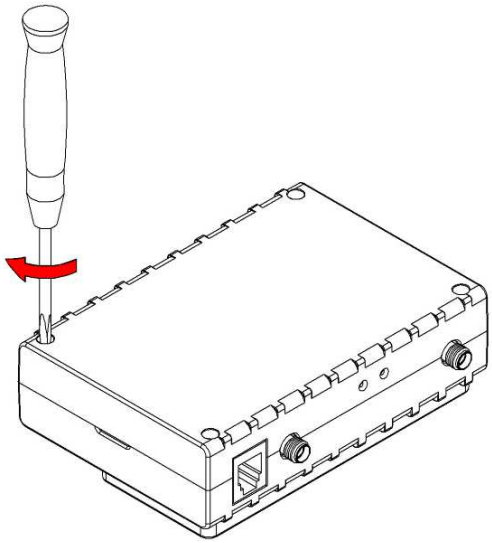


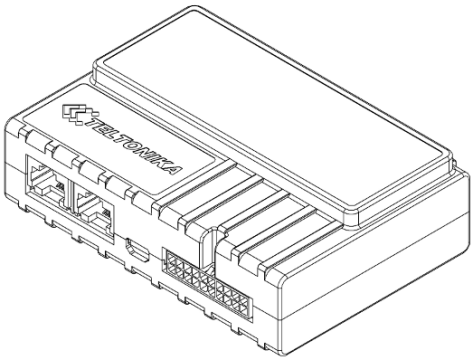
②

Take off FM6300 case and insert SIM cards as shown. SIM1 SLOT (default, recommended for 1 SIM mode) is closer to PCB, SIM2 SLOT 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 FM6300 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: FM6300 VCP Driver

Installing drivers

Extract and run VCPDriver_V1.3.1_Setup.exe. This driver is used to detect FM6300 device connected to the computer. Click 'Next' in driver installation window (figures below):

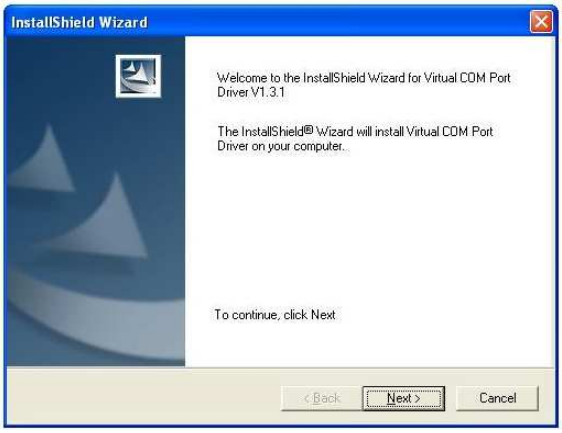


Figure 2 Driver installation window

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 FM6300 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: • Deep sleep mode Or • 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 Or • Device firmware being flashed

3.5 Socket 2×10 pinout

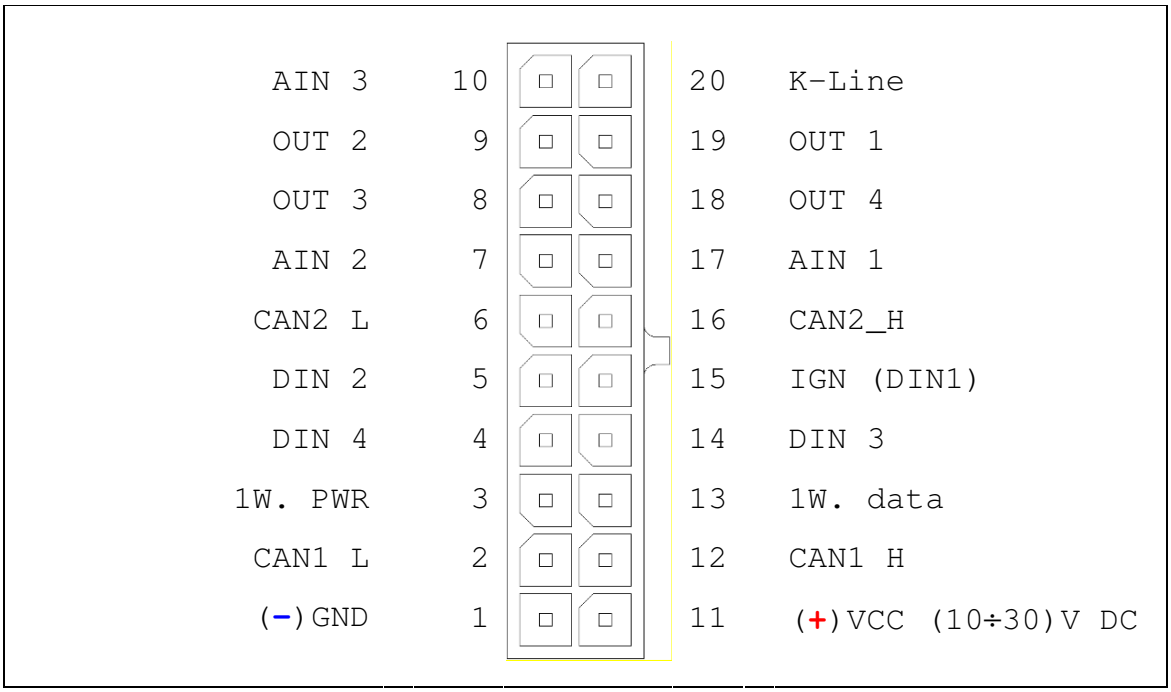


Figure 5 2x10 socket pinout

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 FM6300 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).

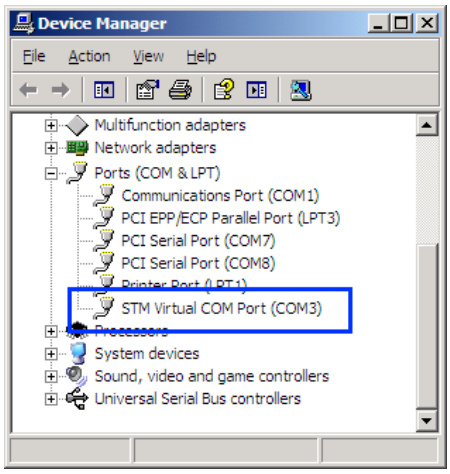


Figure 6 COM-Ports

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 FM6300 package and can be offered by special order only.

1 – Wire devices

One of the FM6300 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 FM6300 and 1-wire devices connection schemes.

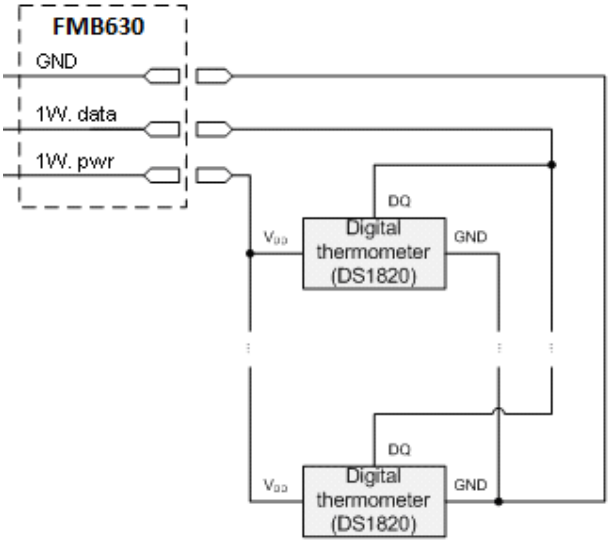


Figure 7 Temperature sensors connection scheme

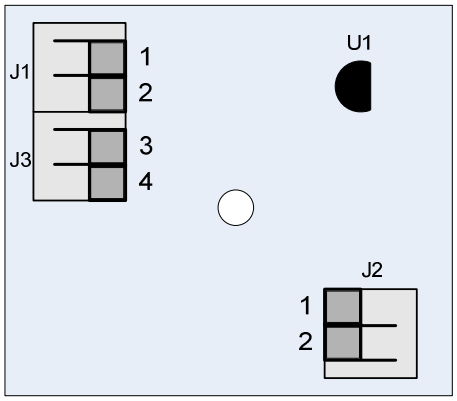
Left row of pins			Right row of pins	
1W. PWR (FM6300 – pin3)	1			
1W. Data (FM6300 – pin13)	2		1	Vpp(+5 Volts DC) – power source for external digital sensor
GND (FM6300 – pin1)	3		2	Output from external digital sensor
Digital Input	4			

Figure 8 Digital thermometer DS1820 and TTJ 100 connection scheme

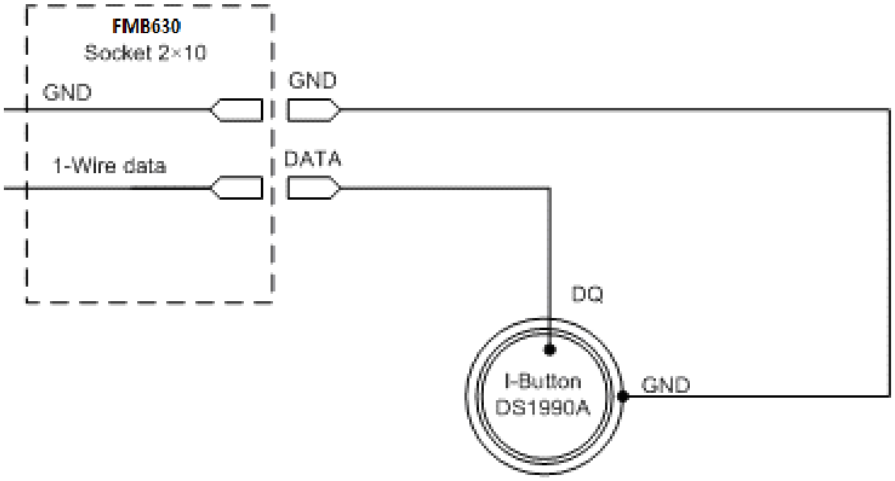


Figure 9 Digital key "I-Button" DS1990A connection scheme

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 FM6300 Analog input (if sensor returns analogue signal proportional to fuel level). Figure 10 describes the connection scheme to the FM6300 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.

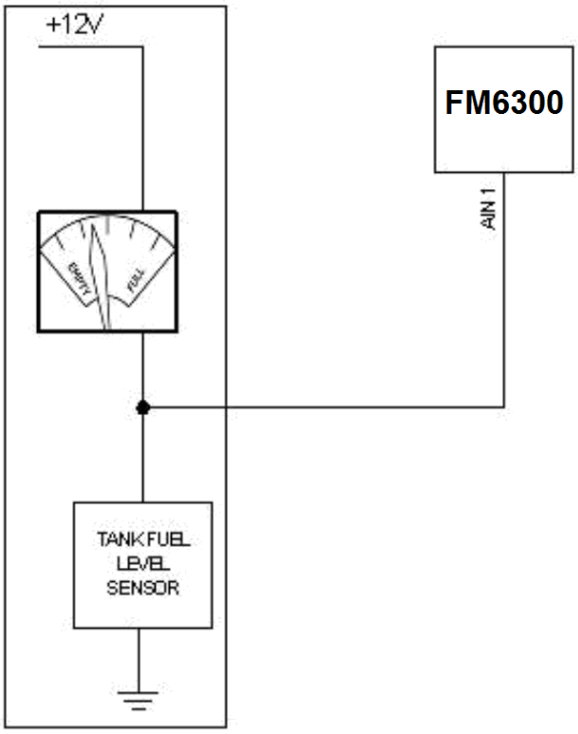


Figure 10 Fuel tank sensor

Impulse counters

Figure 11 describes the connection scheme to the FM6300. 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 FM6300. Then FM6300 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.

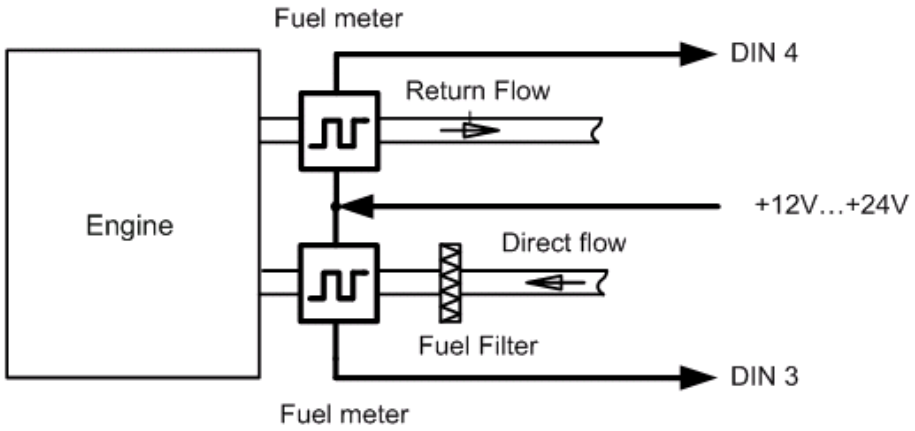


Figure 11 Pulse fuel meters connection scheme

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.

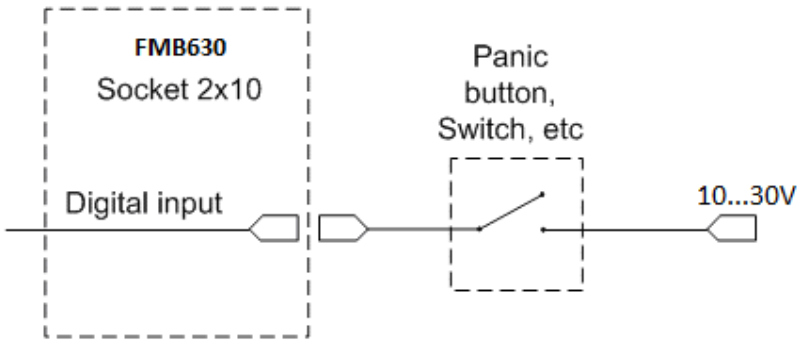


Figure 12 Panic button connection

In cases when sensor output signal is negative an additional relay has to be installed to convert negative signal to positive.

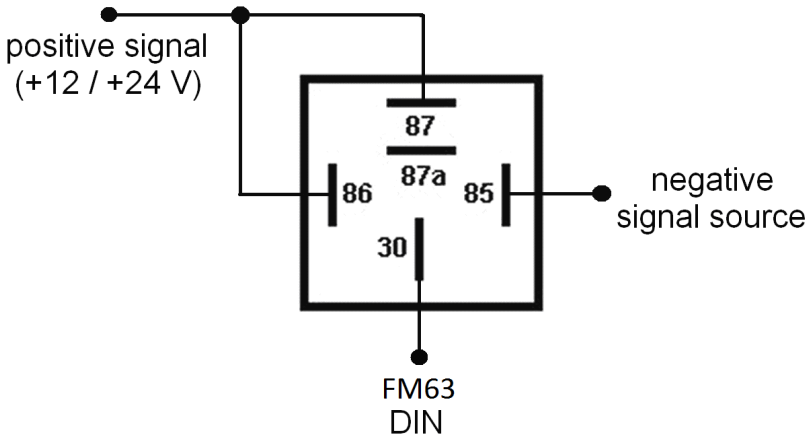


Figure 13 Inverting relay connection

Immobilizer relay

When connected a shown below, FM6300 disables engine starter when output is ON. More details about relays can be found below.

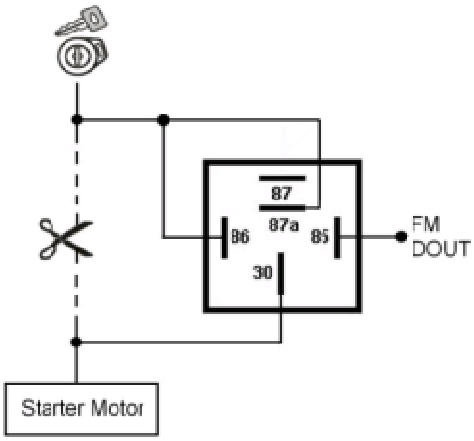


Figure 14 Immobilizer relay connection

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.

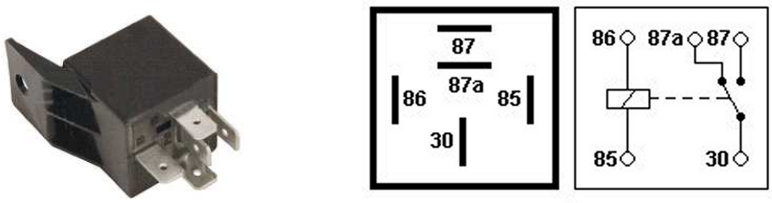


Figure 15 Relay pinout

LV-CAN200

Light vehicle CAN adapter, which allows reading CAN data from light vehicles. LV-CAN200 supports more than 2000 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:
  - Active mode max 50mA
  - 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:
  - Active mode max 50mA
  - Standby mode max 2mA
- Working temperature -40..85 ºC
- Max working humidity 85 % (non condensate)

4 FIRMWARE

4.1 Updating firmware using USB cable

FM6300 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 FM6300 to PC with the USB cable. Launch “Firmware Updater”, select COM port to which device is connected, click connect, and when IMEI and Firmware version fields are filled, start the update. Device needs some time to send IMEI and Firmware version, so do not be afraid if IMEI will not show up immediately, disconnect and after 1-2 minutes try to connect again. When starting update device will open link with updater. With link open device downloads firmware and starts installing. Wait until updater becomes green and it gives message that firmware is done. Update process may take up to several minutes.

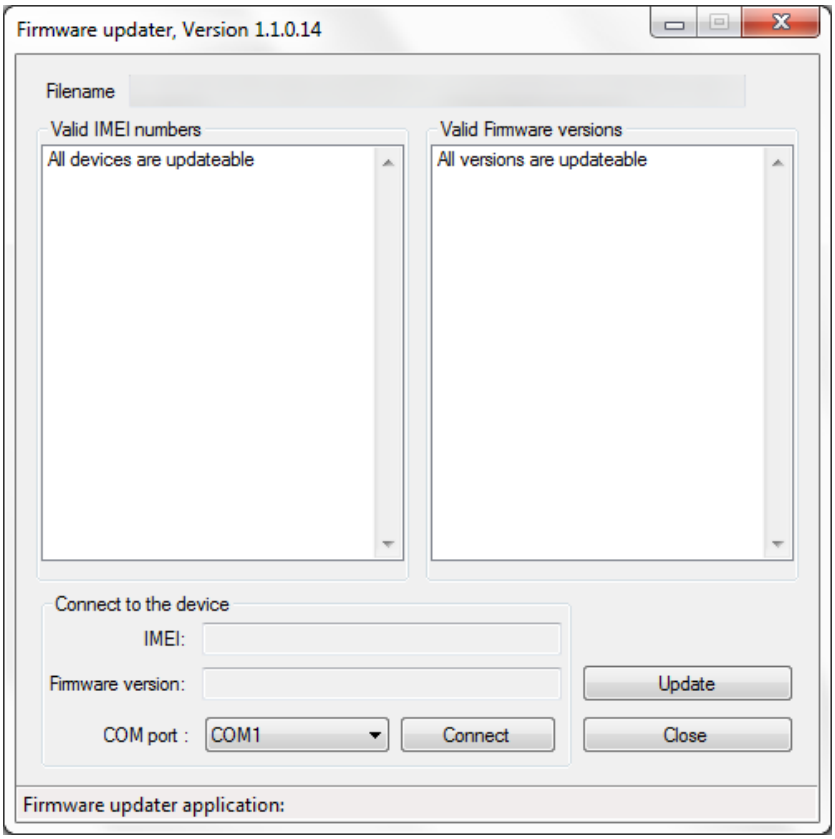


Figure 18 FM updater screen

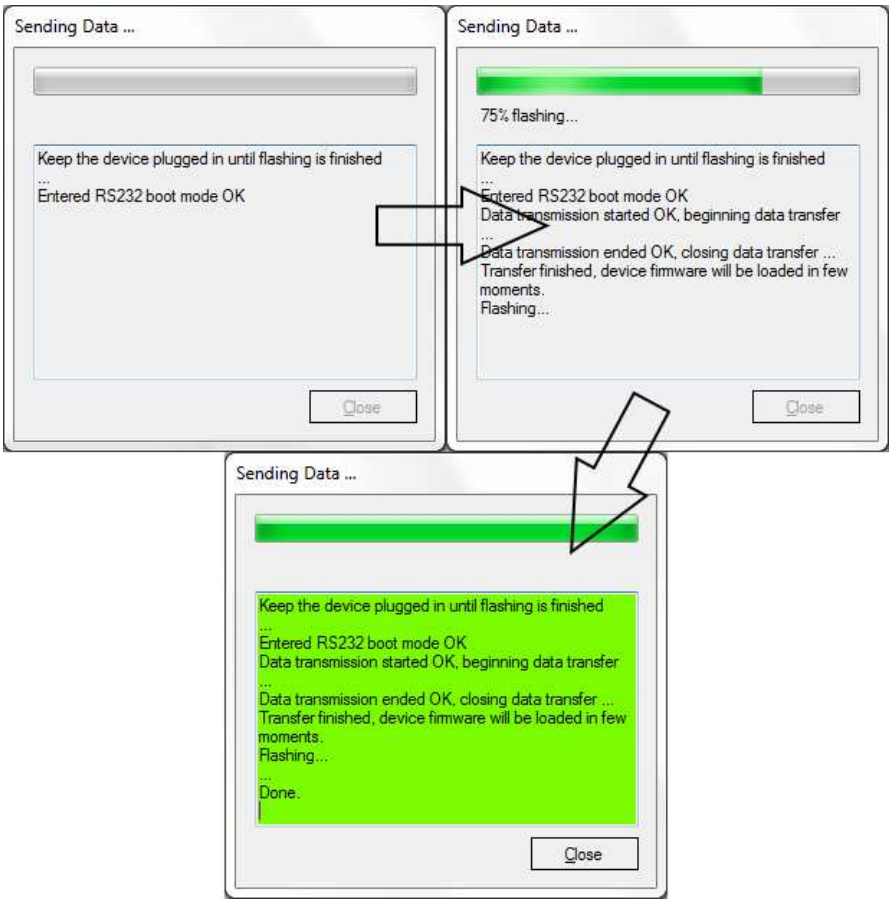


Figure 19 FM firmware updating finished

You may now close the update window and start using your FM6300 device.

5 OPERATIONAL BASICS

5.1 Operational principles

FM6300 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, angle-based and speed-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. FM6300 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.

FM6300 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

FM6300 is designed to operate in two different modes: Normal Mode and Sleep Modes (Standby mode). Normal Mode means that FM6300 is fully functional and performs all the functionality mentioned above in Operational principals section.

Sleep Modes are 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 FM6300 enters/exits Sleep Modes and what functions does FM6300 perform while in this mode can be found in chapter 11.

5.3 Accelerometer

FM6300 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, FM6300 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 = 200 means that movement will be detected after 1 second and stop will be detected after 200 seconds of inactivity.

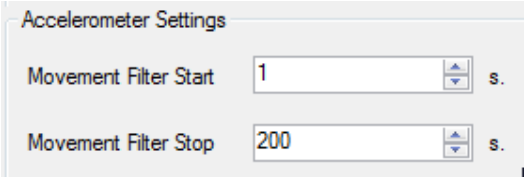


Figure 20 Accelerometer settings

5.4 Virtual Odometer

Virtual odometer is used to calculate travelled distance in FM6300 as a separate I/O element. When FM6300 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 FM6300 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

FM6300 has 4 profiles saved in Flash memory of the module. Every profile has a list of parameters, which enables FM6300 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 FM6300 is set to call to predefined number, you will be able to call it while using any profile.

Profile 3 is default profile for FM6300. 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 FM6300 usability options.

5.6.1 Scenarios

Seven scenarios are available on FM6300 device:

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

5.6.1.1 ECO driving or Green driving Scenario.

Gives the ability to periodically monitor drivings characteristics and warn the driver against over accelerating, braking or cornering. More about ECO driving/Green driving read in chapter 13.1

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, FM6300 after configured time period generate event. When vehicle starts moving FM6300 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, FM6300 informs (with buzzer or LED, connected to any DOUT) driver about jamming event.

5.6.1.7 Crash detection.

If Crash detection is enabled, it monitors acceleration on each axis, if acceleration exceeds configured value; event with value “1” is generated.

* Crash detection scenario available from firmware Ver.00.02.34

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 FM6300 device automatically sends high priority record to AVL application.

5.6.5 Towing Detection

Towing detection feature helps to inform user about car deporting. FM6300 generates event when car is being towed or lifted, for example in case of vehicle evacuation.

5.6.6 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.

6 CONFIGURATOR

6.1 STARTUP

FM6300 configuration is performed via FM6300 Configurator program. FM6300 Configurator can be downloaded from FM6300 Downloads. Contact sales manager to get the latest FM6300 Configurator version. FM6300 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 FM6300 Configurator program and then connecting to FM6300 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).

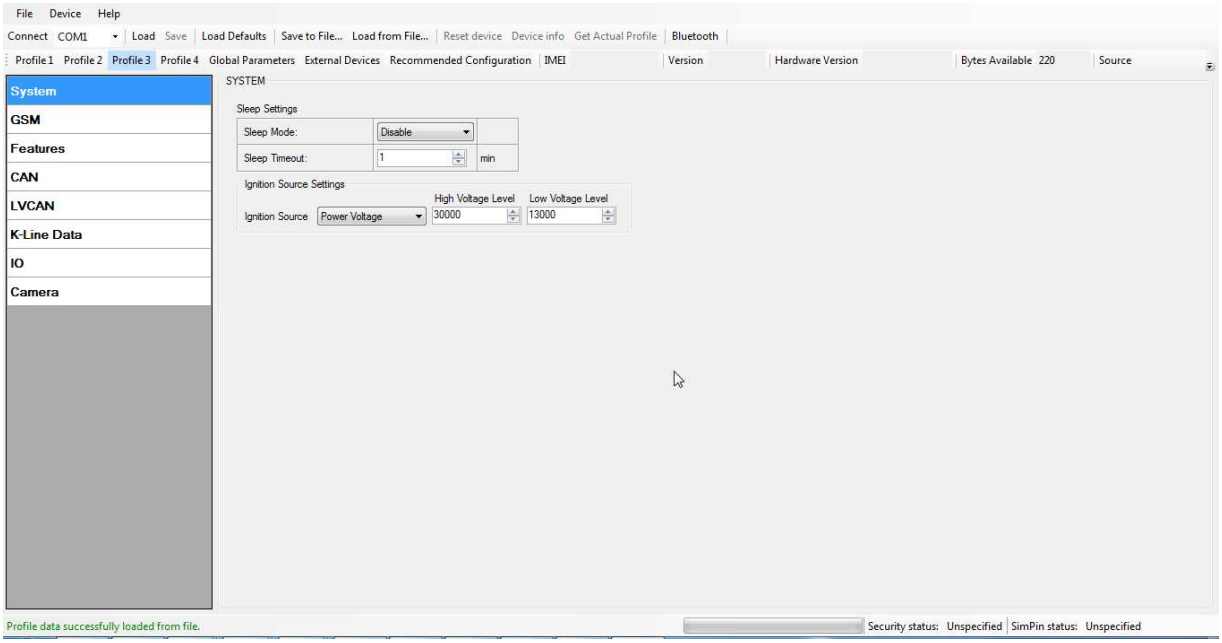


Figure 21 FM6300 Configurator window

6.2 Configurator structure

FM6300 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 FM6300 device; otherwise it will not be written to device flash memory.

FM6300 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.

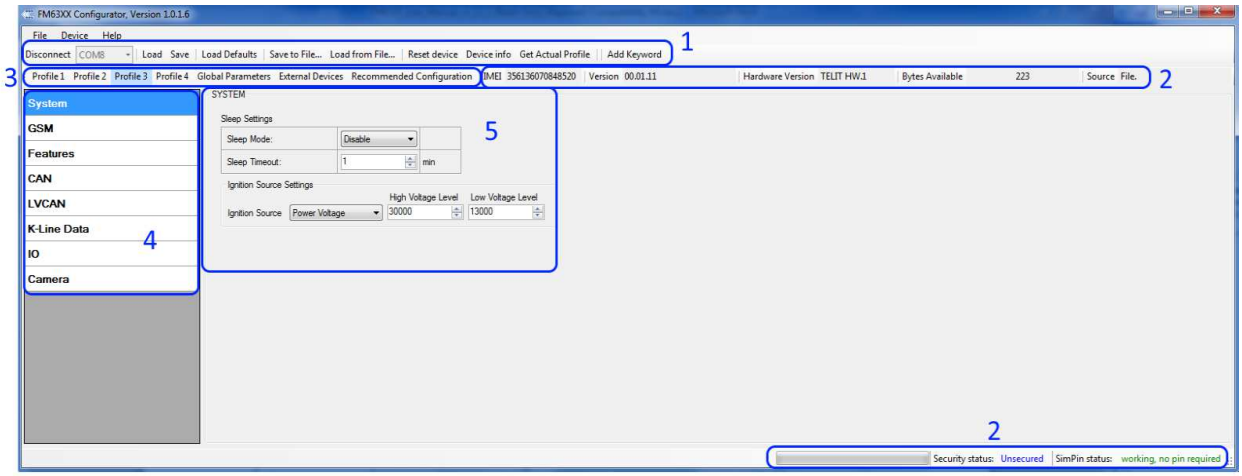


Figure 22 FM6300 Configurator window structure

6.2.1 Buttons area

Table 8 Configurator buttons area description

Main Buttons	
Button	**Description**
Connect	connects the device
Load	reads configuration parameters from FM6300 Flash memory
Save	saves configuration parameters to FM6300 Flash memory
Load Defaults	loads default FM6300 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 FM6300 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

[4] Keyword is of 4 - 10 symbol length (Latin text and/or numbers). If a keyword is set, every time user reconnects FM6300 to USB or COM ports he will be asked to enter a valid keyword when connecting FM6300 to configurator. User is given 5 attempts to enter a valid keyword before blocking the configurator.

6.2.2 Information area

FM6300 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 FM6300 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

FM6300 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 3rd profile choose the TAB named "Profile 3" and all configurable parameters of this profile will be available to change.

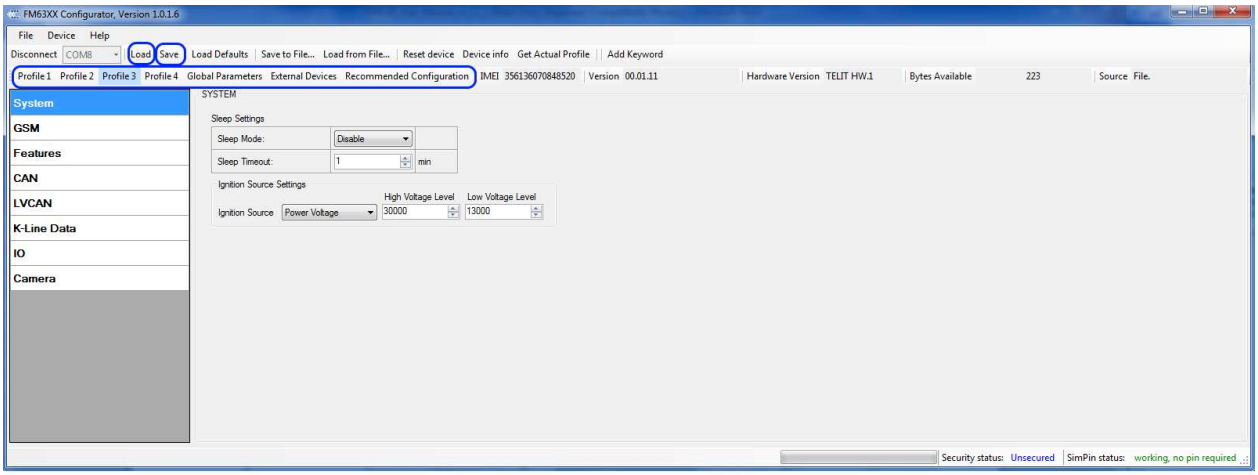


Figure 23 FM6300 Configurator profiles loading window

After changing profile, Global parameters and External Devices, changes can be saved to FM6300 Flash. By pressing "Save" button all 4 profiles, Global parameters and External Devices are saved to the Flash (Figure 24).

Figure 24 FM6300 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)

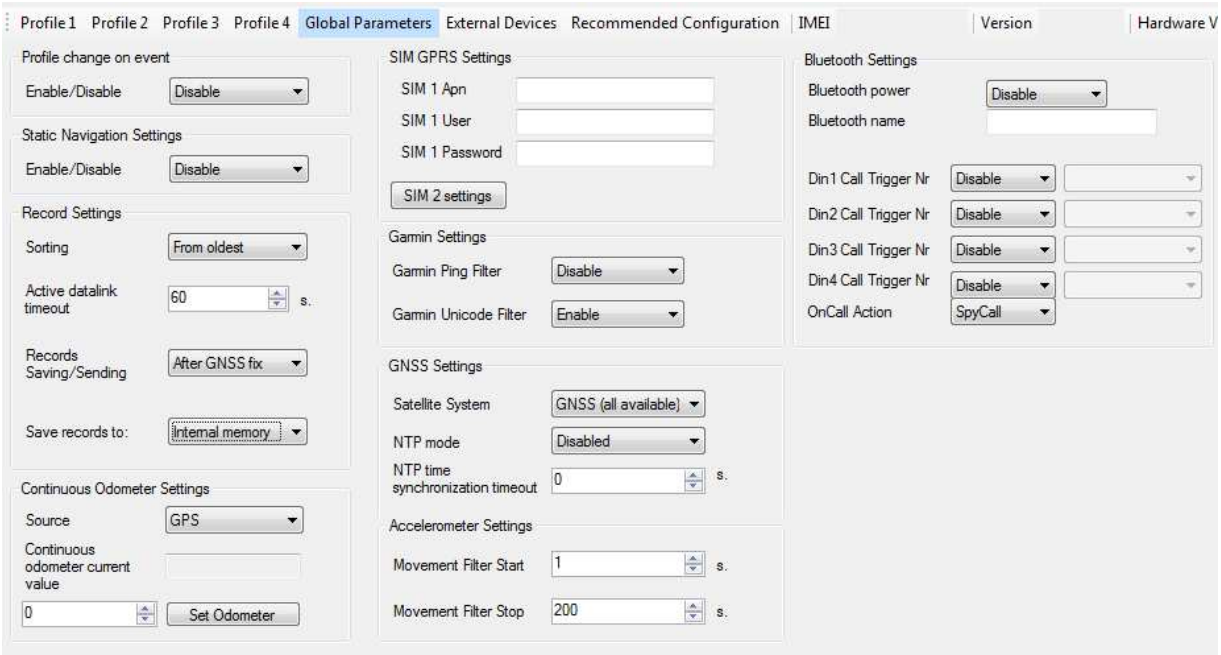


Figure 25 FM6300 Global parameters

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 – FM6300 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 newest records or starting from oldest record. Active data link timeout defines how many seconds should FM6300 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 FM6300 application and how many seconds after movement is not detected by accelerometer FM6300 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.
Network Time	GNSS Settings, where you Enables/Disables time synchronization from

Parameter Name	Parameter description
Protocol	NTP server when there is no valid GPS signal from satellites
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.

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)

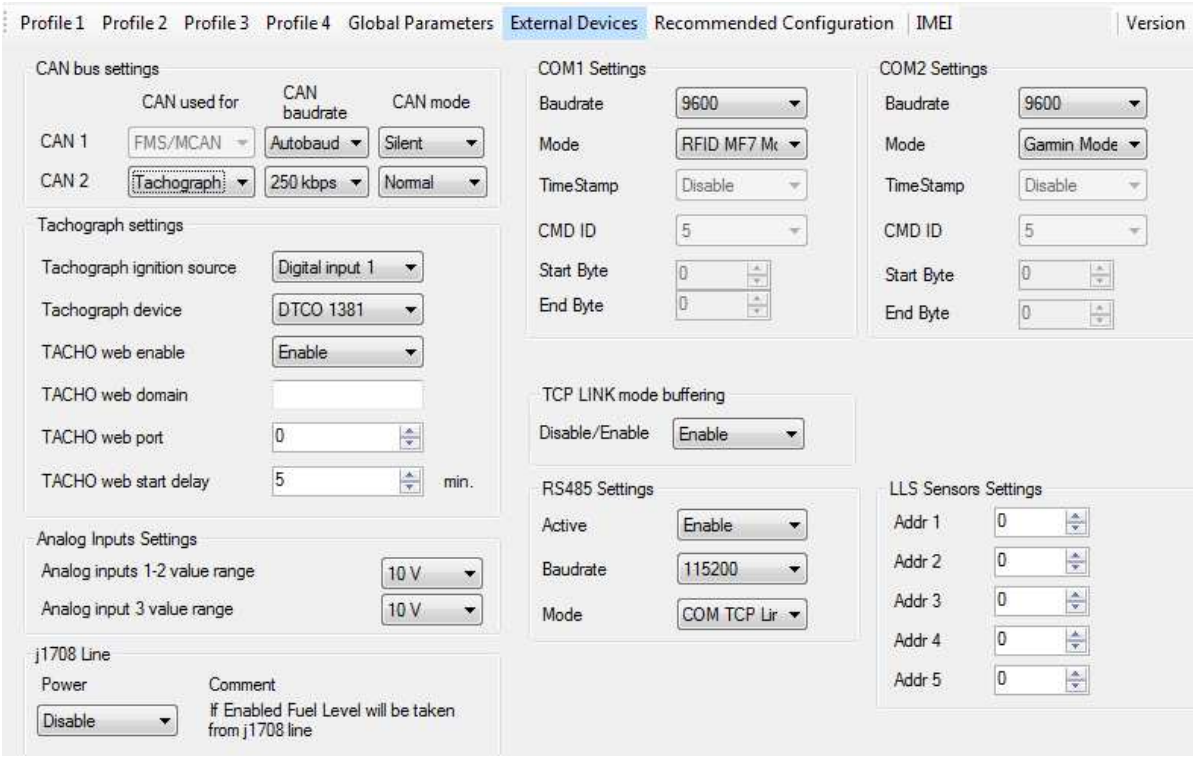


Figure 26 FM6300 External Devices

Table 10 External Devices 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.
Tacho Web	User can enable Web DDD synchronization functionality; enter tacho web server domain and port.
Tacho Web start delay	When ignition is on Tacho web starts after this delay.
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	Configures COM1 and COM2 ports. User can configure baudrate,

Parameter Name	Parameter description
Settings	working mode, enable/disable timestamp and change CMD ID(used to identify from which COM port data came)
COM start/end byte	COM1 and COM2 start and end byte are filter for TCP Binary link mode.
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

6.3.3 Settings and configurable parameters menu

Every FM6300 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 7 subgroups:
    a. sMode
    b. Scenarios
    c. Trip
    d. Geofencing
    e. Auto Geofencing
    f. Towing Detection
    g. IButton List
4. CAN
5. LVCAN
6. K-Line Data
7. I/O
8. Camera

6.3.4 System Settings

System settings have 2 configurable parameters (Figure 27):

- Sleep settings, where user can disable sleep, turn on or choose deep sleep/online 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.

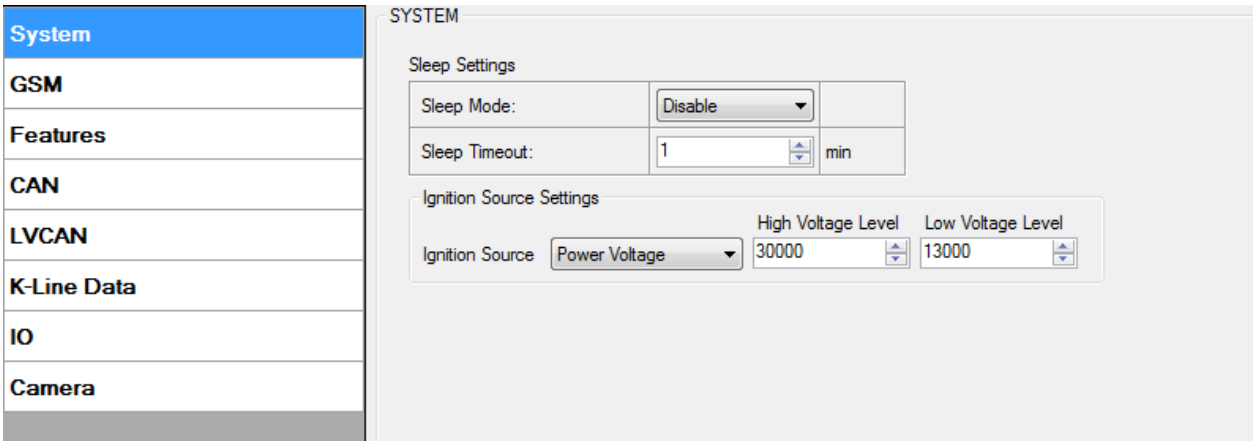


Figure 27 System Settings Configuration

When Vehicle Alternator is working supply voltage is usually 2-4 Volts higher than nominal battery voltage. By such difference FM6300 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 FM6300: destination servers 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 FM6300 and server. Server 2 is used as dublicated server (not back up server).

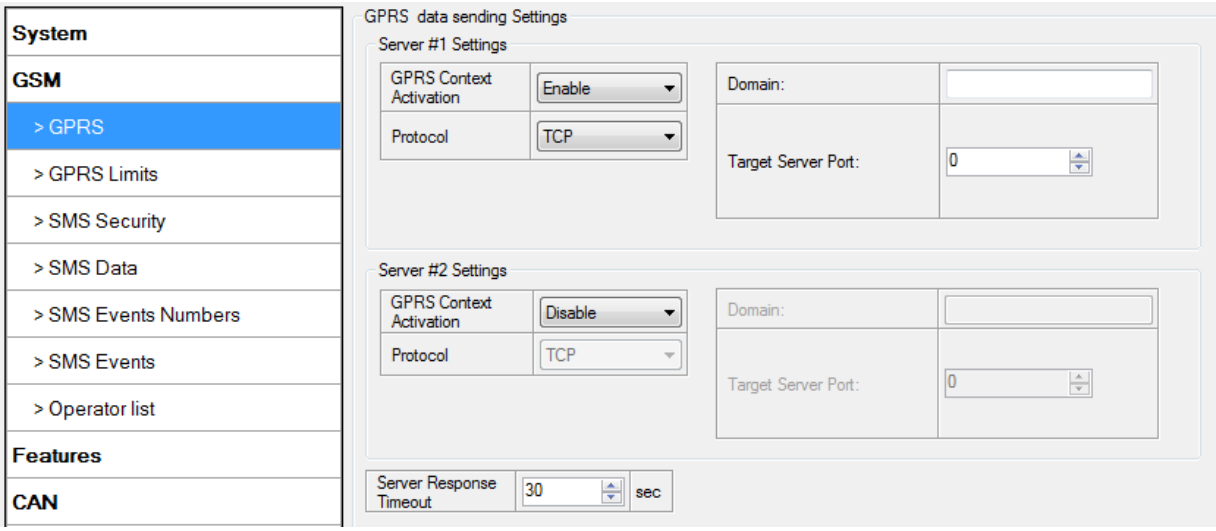


Figure 28 GSM->GPRS Settings Configuration

6.3.5.2 Data limits functionality

Data limit can be configured for Home and Roaming Separately. Currently Min Settings for Home are 100MB and Roaming are 10MB. 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 and UDP modes:

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 are 'SMS Login' and 'SMS Password' (Figure 29). This login and password is used with every SMS sent to FM6300. If login and password are not set, every SMS sent to FM6300 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.**

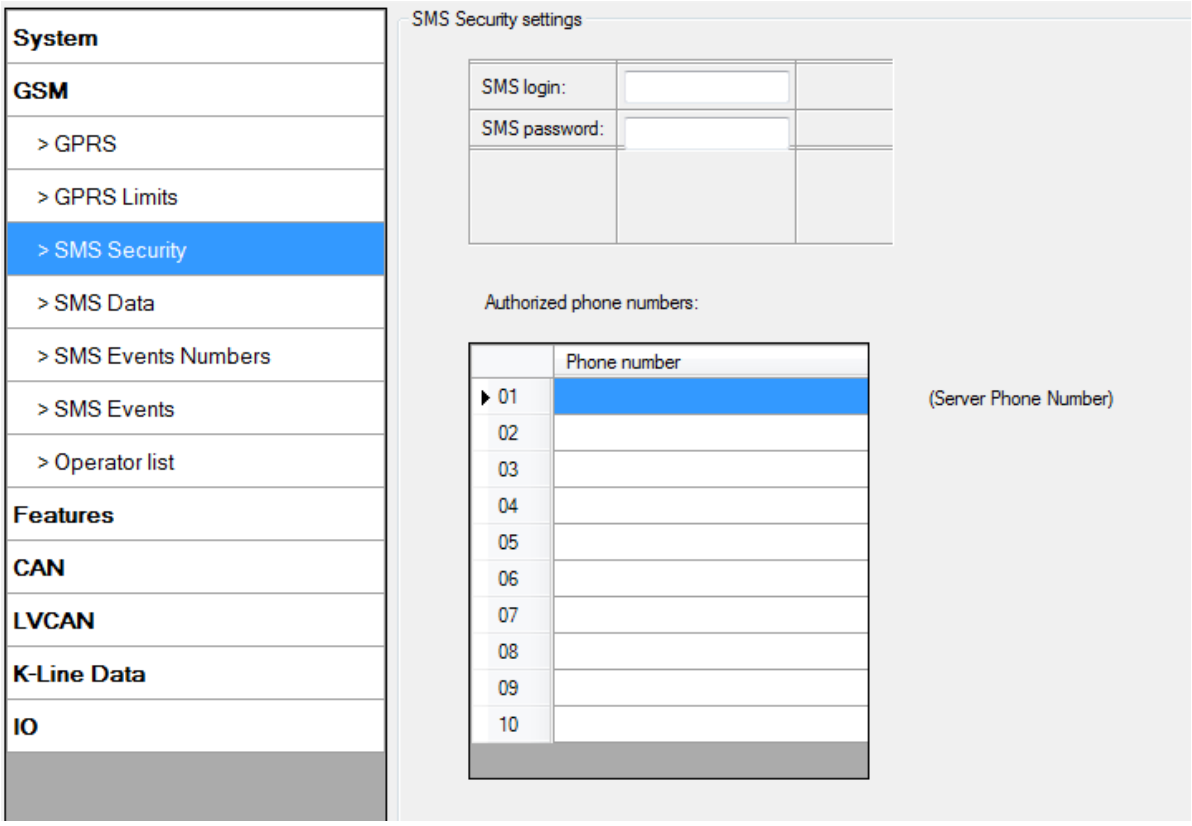


Figure 29 GSM->SMS Security Settings

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);

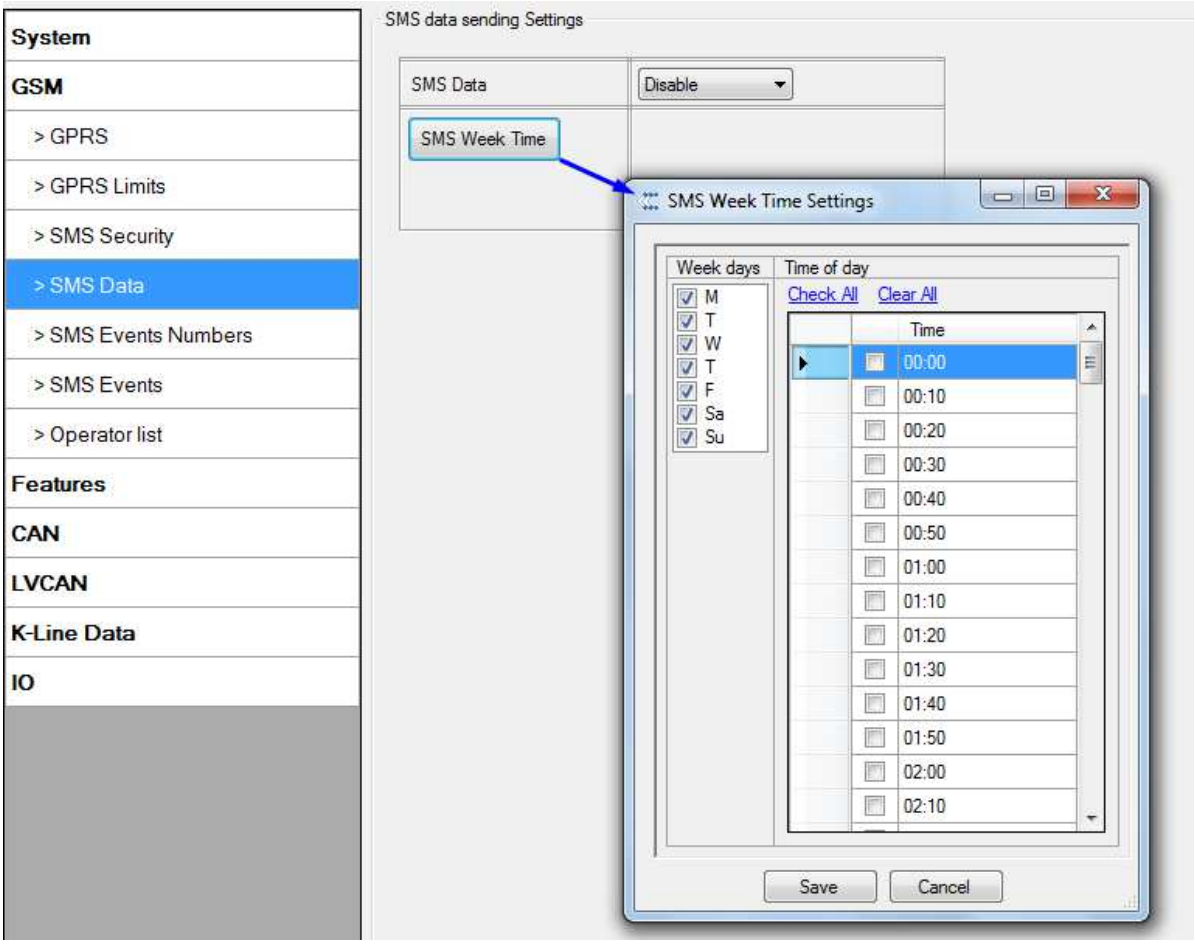


Figure 30 GSM->SMS Settings Configuration (2)

Using these settings FM6300 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

FM6300 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).

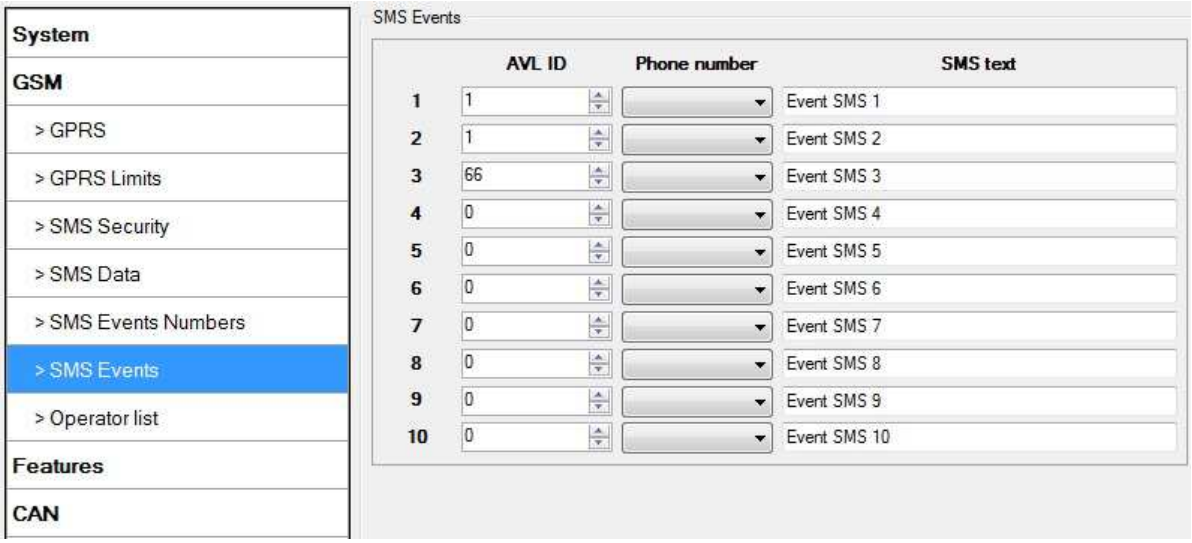


Figure 31 FM63 SMS events List Configuration

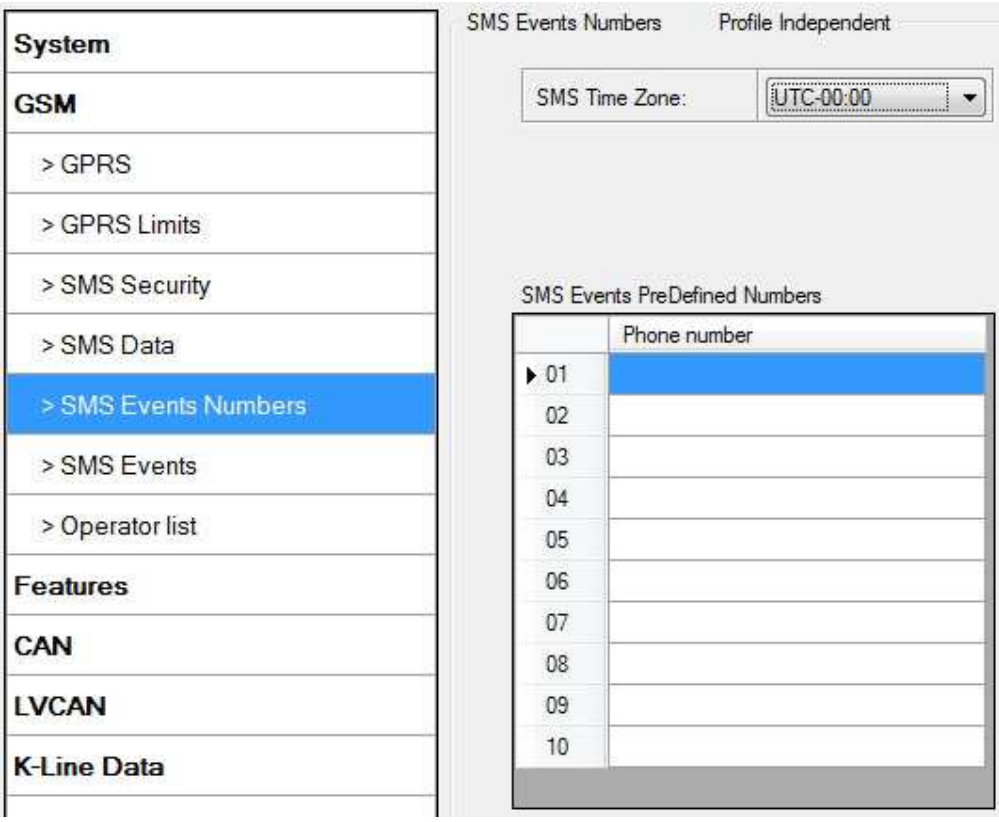


Figure 32 SMS Events Numbers list

6.3.5.6 Operator List

FM6300 is able to use GPRS with all operators but if any operator is entered in the preferred operator list, FM6300 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.

FM6300 will not connect to GPRS using network of operator which is listed in black list.

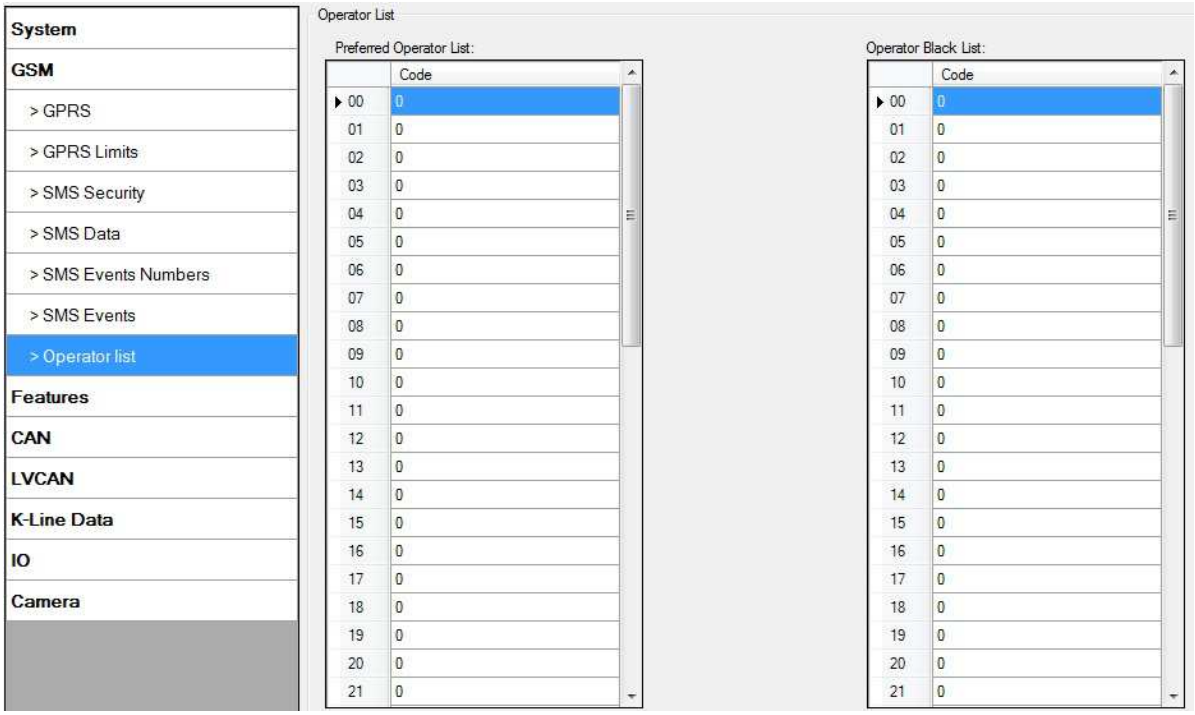


Figure 33 FM6300 Operator List Configuration

6.3.6 Features

6.3.6.1 sMode

FM6300 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). Min speed source can be selected by GPS speed, LVCAN speed, ALLCAN speed, FMS Speed or KLINE speed.

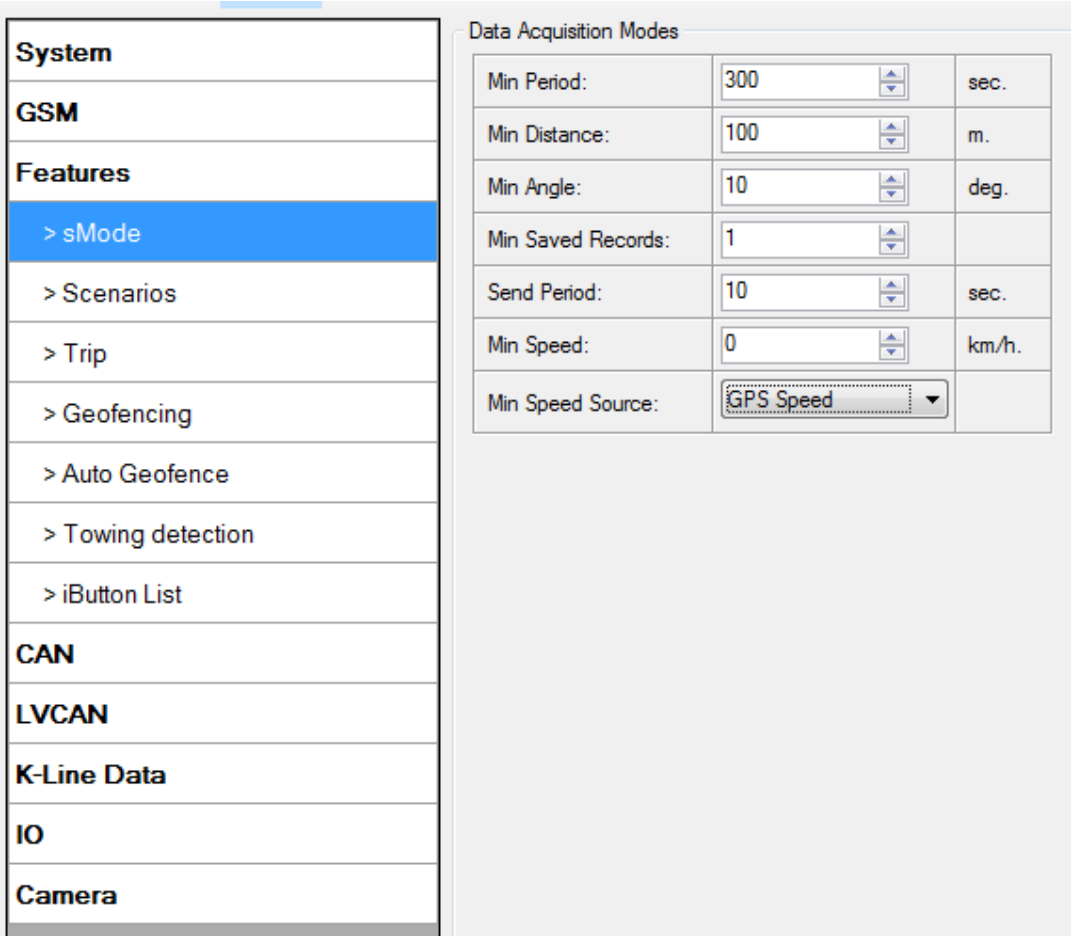


Figure 34 FM6300 sMode>Data Acquisition

6.3.6.2 Scenarios

In scenarios window seven different scenarios are available (Eco/Green Driving, Immobilizer/ Authorizing driving, iButton notification, Excessive Idling, Jamming detection, over speeding and Crash detection). They have six possible states: disabled, no DOUT control, DOUT1 control, DOUT2 control, DOUT3 control, DOUT4 control (expect excessive idling and Crash detection). Excessive idling and Crash detection 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.

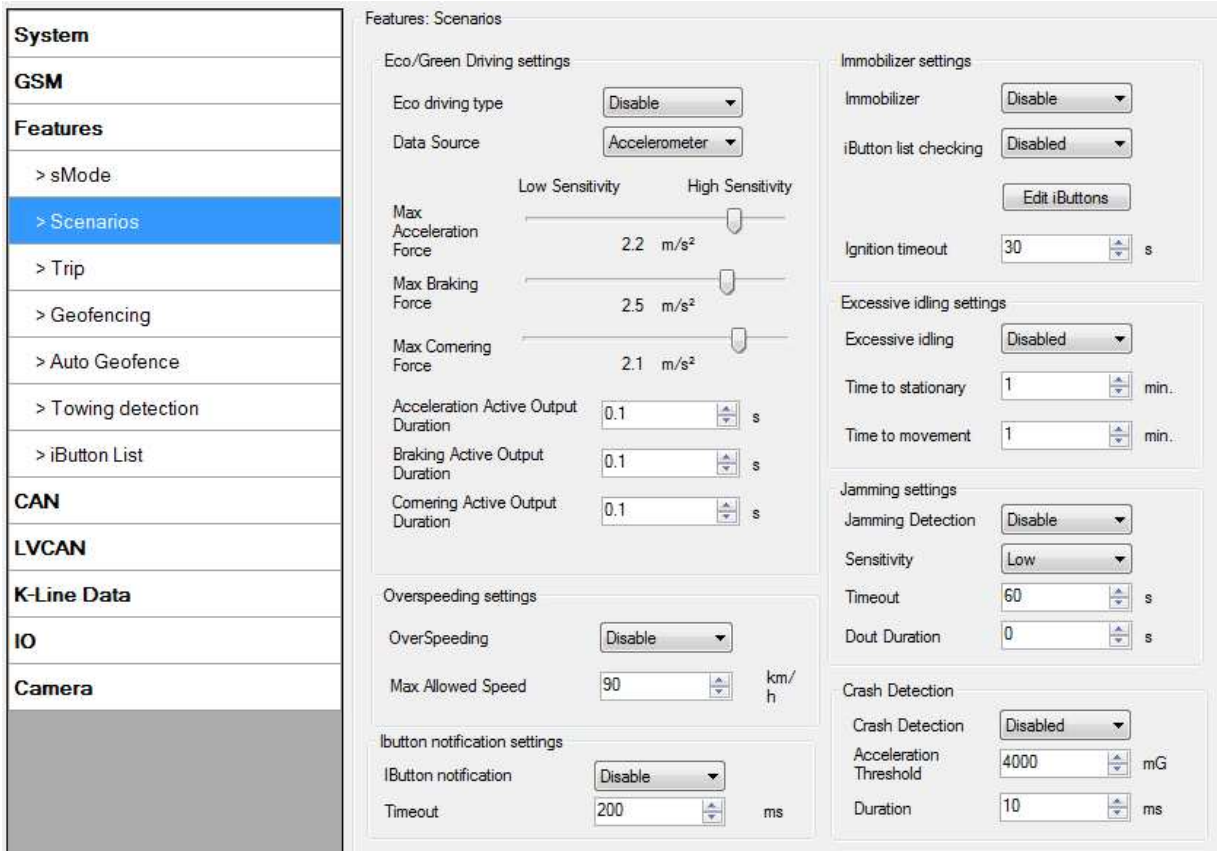


Figure 35 FM6300 Scenarios configuration

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.
- Remember iButton ID- Send ibutton value to server while trip is detected
- Odometer Trip Mode – Between records or Continuous can be chosen. For this feature I/O Trip Odometer value feature must be enabled.

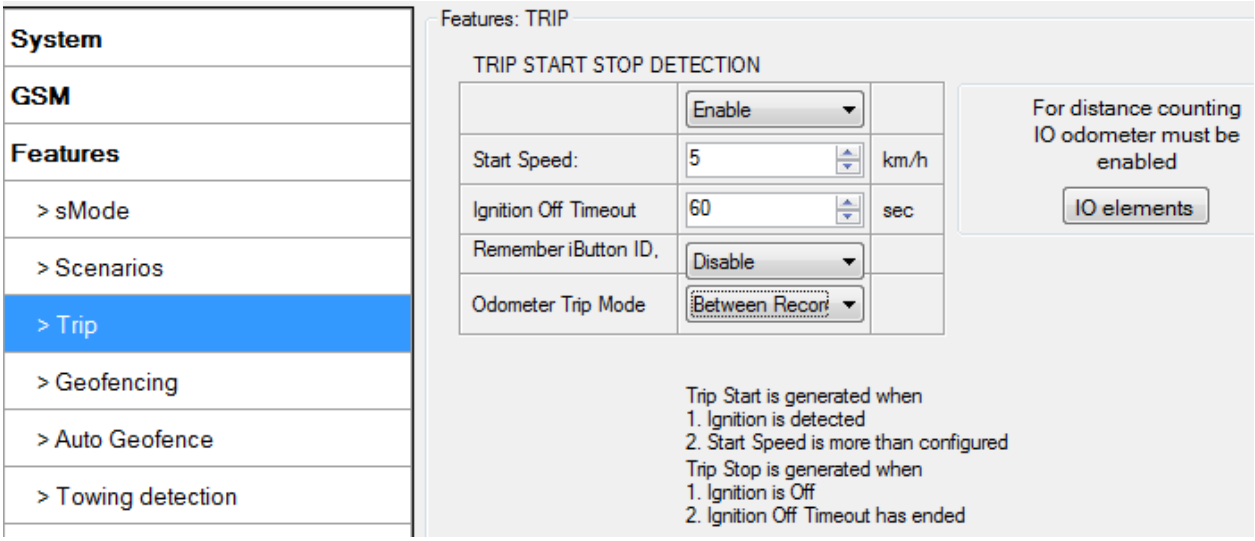


Figure 36 FM6300 Features->Trip Configuration

If I/O Trip Odometer is enabled and Odometer Trip Mode 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 Trip value is reset to zero, and it is counted continuously again.

If I/O Trip Odometer is enabled and Continuous Distance Counting variable is set to "Between Records", then distance is going to be counted only between every record made. This value is written to I/O Trip 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 I/O and will be added with every record. When new iButton is attached, its ID will be added to iButton I/O 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 I/O. If iButton 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:

FM6300 has 20 configurable Geofence zones and it can generate event when defined Geofence zone border has been crossed. Or overspeeding is occured in a configured geofence zone.

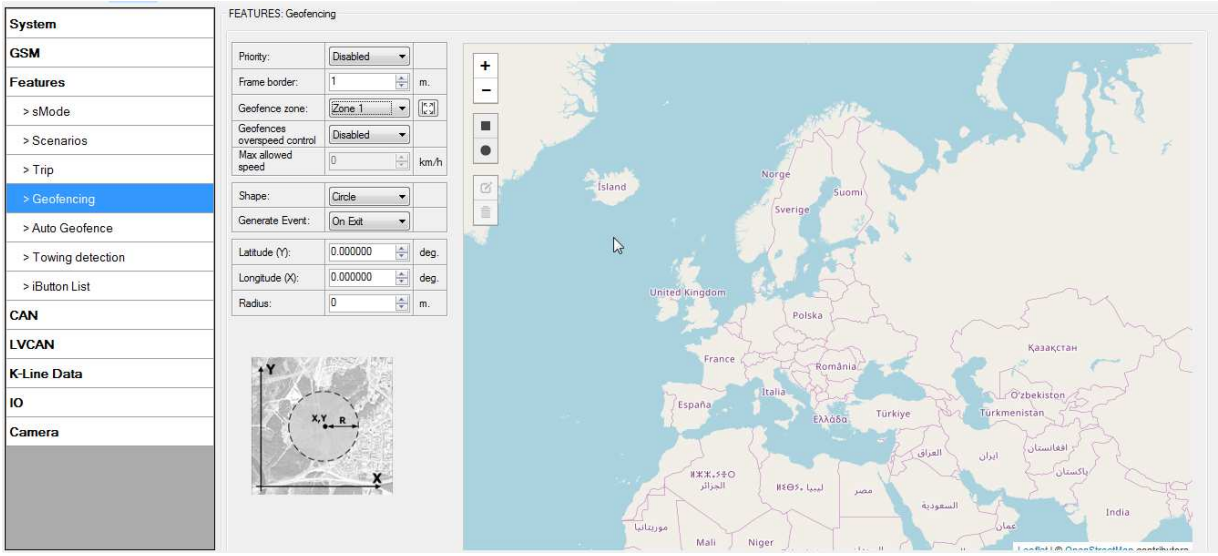


Figure 37 FM6300 Features->Geofencing Configuration (1)

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.
- Geofence zone - User can configure upto 50 geofence zones without interfering DOUT control or allowed speed limit of other zones.
- Geofence overspeed control – Option to use any DOUT if overspeed event happens in a configured geozone.
- Max allowed speed – Max allowed speed in a configured geozone

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.

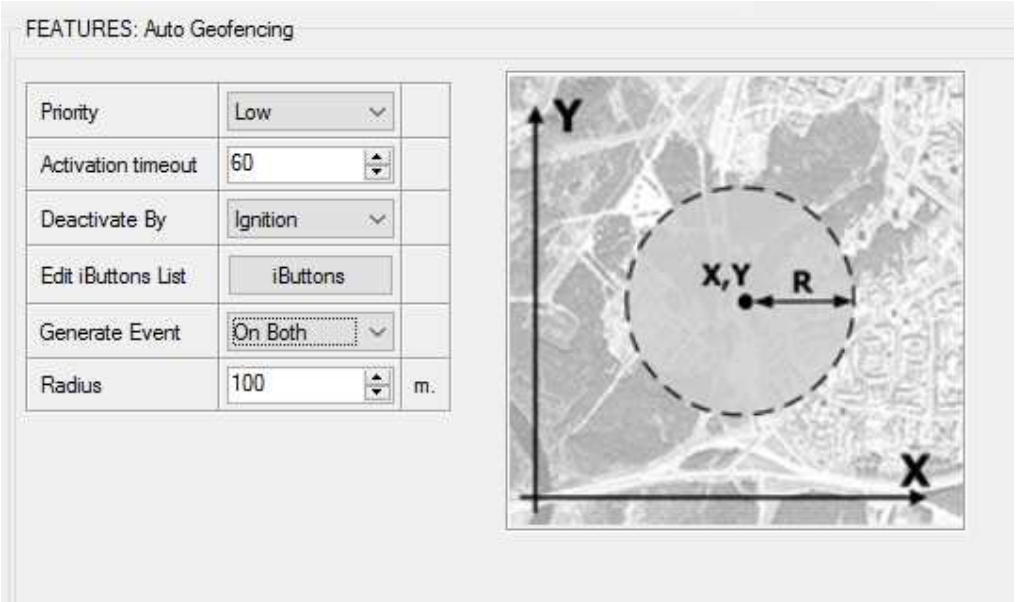


Figure 39 FM6300 Features->Geofencing Configuration (2)

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 Towing Detection

FM6300 activates towing function when below conditions are met:

- Ignition (configured Ignition Source) is OFF.
- Activation Timeout (set in Towing detection features) is reached.

When Activation Timeout is reached and Ignition is OFF, FM6300 monitors accelerometer data. If Acceleration or Angle value reaches configured threshold for configured time (in ms), device again checks Ignition state. If Ignition is still OFF according to configured "Ignition check after Event" time, then event is generated and can send sms or make call if configured. Function will be reactivated after FM6300 again detects change of Ignition state from ON to OFF.

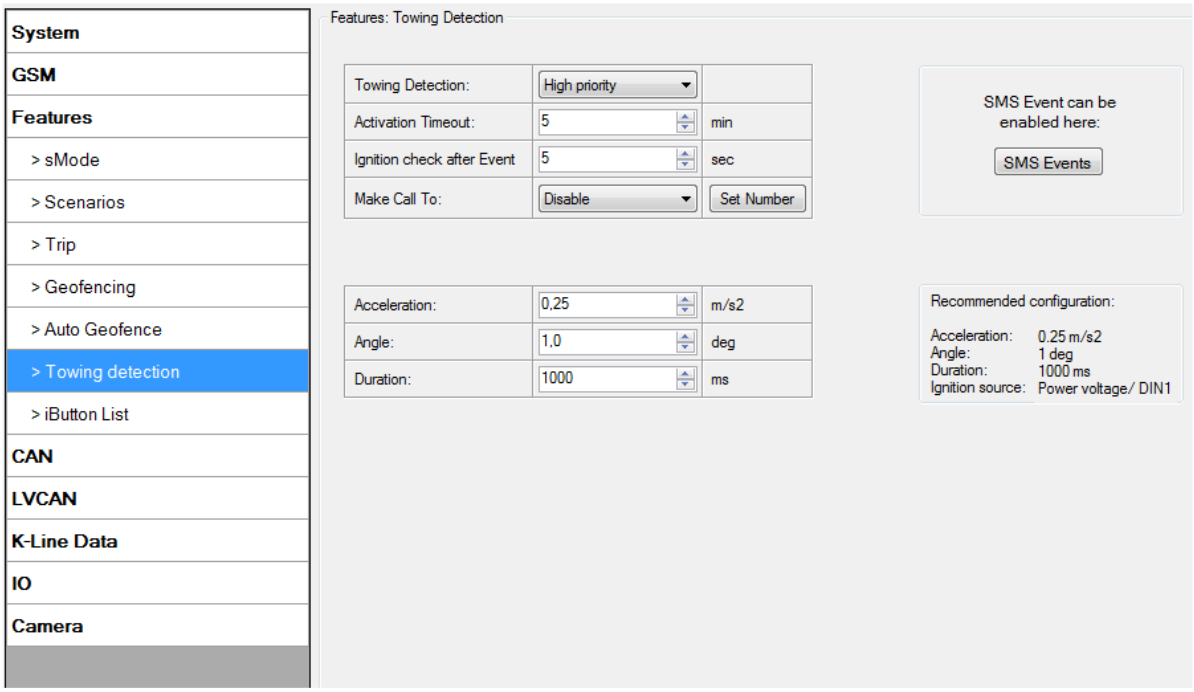


Figure 40 Towing Detection Configuraton

- Activation timeout – Activation timeout is time after which FM6300 turns ON towing detection function if other condition mets (Ignition OFF state detected). It is measured in minutes.
- Make Call to – if function enabled makes call to specified phone number (configured in predefined numbers)
- Acceleration and Angle – values used to detect towing when ignition is OFF.
- Duration – defines time period to check Acceleration and Angle values.

6.3.6.7 IButton List

IButton list is used to enter authorized iButton ID codes, which are used to authenticate driver in Immobilizer scenario or Auto Geofencing options.

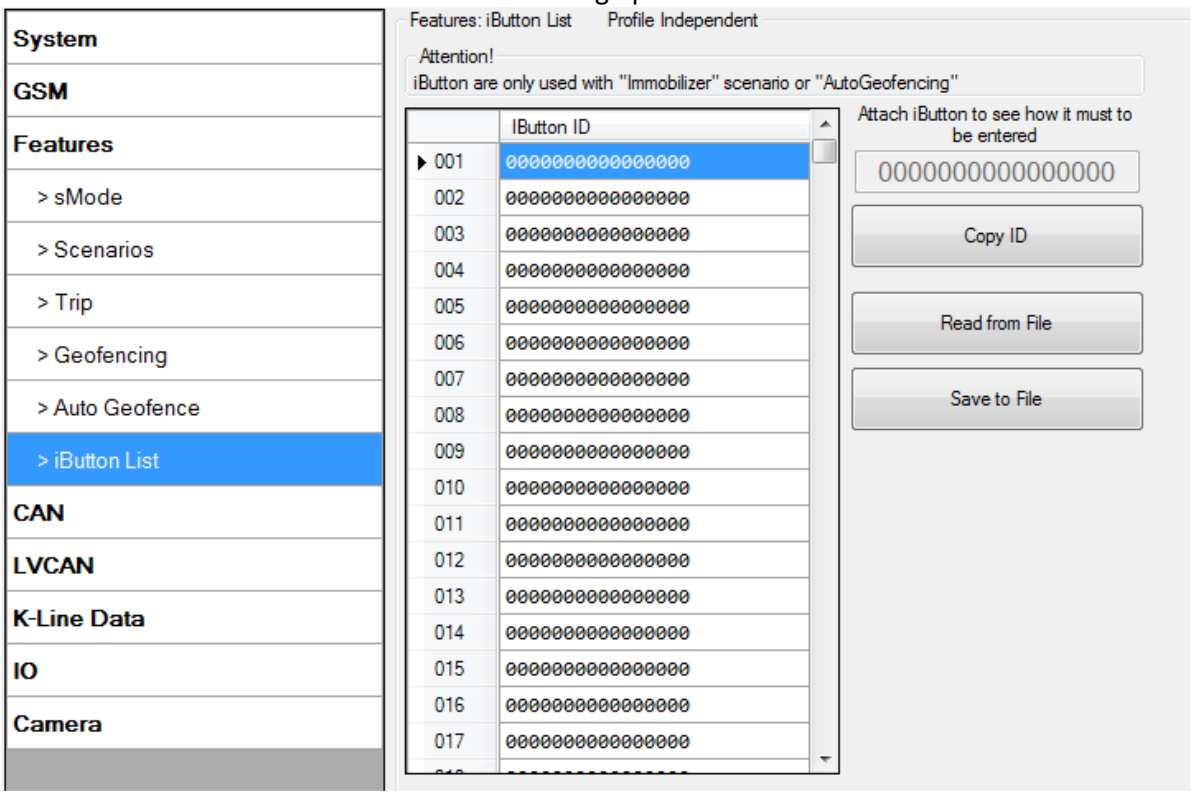


Figure 41 Features->iButton Configuration

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. User can also enter ibutton key ID in Ibutton ID list by attaching ibutton key to reader then connecting reader to device after that click 'copy ID' and paste ibutton key in ibutton ID list.

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 Bus settings

CAN 1 Enable parameter (ID=146)

Parameter enables or disables CAN 1 interface. Possible values: 0 – disable, 1 – enabled as FMS line, 2 – enabled as FMS line and Tacho line.

Table 11 CAN 1 Enable parameter

Minimum value	Maximum value	Recommended value	Value type
0	2	1	U8

CAN 1 Baud Rate (ID=147)

Parameter defines CAN 1 bus baud rate. For Auto Baud rate 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	0	U8

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

Parameter enables or disables CAN 2 interface. Possible values: 0 – disable, 1 – enable as Tacho line, 2 – enable as FMS line (MCAN2), 3 – enabled as FMS line (MCAN2) and Tacho line

Table 14 CAN 2 Enable parameter

Minimum value	Maximum value	Recommended value	Value type
0	2	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 2 operational mode (ID=163)

Parameter defines if CAN 2 line working at silent mode or normal mode. 0 – Silent, 1 – Normal

Table 16 CAN Baud Rate

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

ManualCAN CAN#0 I/O properties **(ID=x406):**
CAN#0 I/O parameter priority
Parameter defines CAN I/O element priority. Enable or Disable.

Table 17 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 CAN Type ID CAN#0 I/O OutputDataMask CAN#0 I/O CAN ID	U8

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.

Table 18 CAN#0 CAN Type ID

Minimum value	Maximum value	Recommended value	Goes with (depends on) parameters	Value type
0	1	1	CAN#0 I/O Priority CAN#0 I/O OutputDataMask 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 integers.

Table 19 CAN#0 Output data mask

Minimum value	Maximum value	Recommended value	Goes with (depends on) parameters	Value type
0	255	-	CAN#0 I/O Priority CAN#0 I/O CAN Type ID 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)

Table 20 CAN#0 CAN ID

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

To configure CAN#0 I/O element every value above should be separated with comma. For example, SMS should look like:
“ setparam 1406 1,0,51,18FEE925” (“ setparam 1406 <priority>,<CANTypeID>,<outputDataMask>, <CANID>)

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

***Above SMS example will configure first profile CAN#0 I/O element with CAN type ID 29 bits, output data mask 51 (must be written after converting in decimal from binary),CAN ID FEE9 - **total fuel used**.

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

Table 21 CAN elements and parameters

Manual CAN1 Element Number	CAN1 Element parameters	Manual CAN 2 Element Number	CAN2 Element parameters
CAN#0	x406	CAN#0	x504
CAN#1	x407	CAN#1	x505
CAN#2	x408	CAN#2	x506
CAN#3	x409	CAN#3	x507
CAN#4	x410	CAN#4	x508
CAN#5	x411	CAN#5	x509
CAN#6	x412	CAN#6	x510
CAN#7	x413	CAN#7	x511
CAN#8	x414	CAN#8	x512
CAN#9	x415	CAN#9	x513

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”, “Network Type”, “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 FM6300 available I/O list

Table 22 PERMANENT I/O elements list description

Permanent I/O elements (are always sent (with every record) to server if enabled)			
Nr.	Property Name	Bytes	Description
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	2	Voltage: mV, 0 – 30 V
10	Analog Input 2	2	Voltage: mV, 0 – 30 V
11	Analog Input 3	2	Voltage: mV, 0 – 30 V
12	Profile	1	Value in scale 1 – 4
13	Battery Voltage	2	Voltage: mV
14	Battery Current	2	Voltage: mA
15	GNSS PDOP	2	Probability * 10; 0-500
16	GNSS HDOP	2	Probability * 10; 0-500
17	External Voltage	2	Voltage: mV, 0 – 30 V
18	GNSS status	2	0-off/ 1-no antenna / 2- no fix/ 3-got fix/ 4-sleep/ 5-over current
19	Movement sensor	1	0 – not moving, 1 – moving.
20	Trip Odometer value	4	Distance between two records: m
21	GSM Operator	4	Currently used GSM Operator code
22	Speed	2	Value in km/h, 0 – xxx km/h
23	iButton ID	8	iButton ID number
24	GSM signal level	2	Value in scale 1 – 5
25	Network Type	1	Logic: 0 / 1
26	Acceleration	1	In mG /10. Acceleration change on X axis * Available since 00.00.54
27	Deceleration	1	In mG /10. Acceleration change on X axis * Available since 00.00.54
28	Cell ID	4	Base station ID.Vvalid CID ranges are from 0 to 65535 on GSM and CDMA networks and from 0 to 268435455 on UMTS and LTE networks.
29	Area Code	2	Location Area code (LAC), it depends on GSM operator. It provides unique number which assigned to a set of base GSM stations. Max value: 65536
30	Deep Sleep	1	0 – not deep sleep mode, 1 – deep sleep mode
31	PCB Temperature	2	10 * Degrees (°C)
32	Dallas ID 1	2	Shows ID of first Dallas sensor
33	Dallas Temperature 1	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
34	Dallas ID 2	2	Shows ID of second Dallas sensor
35	Dallas Temperature 2	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
36	Dallas ID 3	2	Shows ID of third Dallas sensor
37	Dallas Temperature 3	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
38	Dallas ID 4	2	Shows ID of fourth Dallas sensor

Permanent I/O elements (are always sent (with every record) to server if enabled)			
Nr.	Property Name	Bytes	Description
39	Dallas Temperature 4	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
40	Dallas ID 5	2	Shows ID of fifth Dallas sensor
41	Dallas Temperature5	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
42	Dallas ID 6	2	Shows ID of sixth Dallas sensor
43	Dallas Temperature 6	8	10 * Degrees (°C), -55 - +115, if 3000 – Dallas error
44	Fuel Counter	4	Difference of generated impulses on two signal lines
45	Ignition	1	0 – ignition is off, 1 – ignition is on
46	RFID COM1	8	Displays activated RFID card ID from COM1
47	Total Odometer	4	Total odometer value km
48	RFID COM2	8	Displays activated RFID card ID from COM2
49	IMSI	8	IMSI code
50	CCID	24	CCID Code
51	LLS #1Fuel	2	Fuel level, measured by LLS sensor on COM2, in kvants or liters.
52	LLS #1 temperature	1	Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius.
53	LLS #2 Fuel	2	Fuel level, measured by LLS sensor on COM2, in kvants or liters.
54	LLS #2 temperature	1	Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius.
55	LLS #3 Fuel	2	Fuel level, measured by LLS sensor on COM2, in kvants or liters.
56	LLS #3 temperature	1	Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius.
57	LLS #4 Fuel	2	Fuel level, measured by LLS sensor on COM2, in kvants or liters.
58	LLS #4 temperature	1	Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius.
59	LLS #5 Fuel	2	Fuel level, measured by LLS sensor on COM2, in kvants or liters.
60	LLS #5 temperature	1	Fuel temperature, measured by LLS sensor on COM2, in degrees Celsius.

Table 23 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
55	CAN1 0	Varying[5]	ID Specific data
56	CAN1 1	Varying	ID Specific data
57	CAN1 2	Varying	ID Specific data
58	CAN1 3	Varying	ID Specific data
59	CAN1 4	Varying	ID Specific data
60	CAN1 5	Varying	ID Specific data
61	CAN1 6	Varying	ID Specific data
62	CAN1 7	Varying	ID Specific data

[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
63	CAN1 8	Varying	ID Specific data
64	CAN1 9	Varying	ID Specific data
65	CAN2 0	Varying[6]	ID Specific data
66	CAN2 1	Varying	ID Specific data
67	CAN2 2	Varying	ID Specific data
68	CAN2 3	Varying	ID Specific data
69	CAN2 4	Varying	ID Specific data
70	CAN2 5	Varying	ID Specific data
71	CAN2 6	Varying	ID Specific data
72	CAN2 7	Varying	ID Specific data
73	CAN2 8	Varying	ID Specific data
74	CAN2 9	Varying	ID Specific data
75	Geofence zone 01	1	Event: 0 – target left zone, 1 – target entered zone
76	Geofence zone 02	1	Event: 0 – target left zone, 1 – target entered zone
77	Geofence zone 03	1	Event: 0 – target left zone, 1 – target entered zone
78	Geofence zone 04	1	Event: 0 – target left zone, 1 – target entered zone
79	Geofence zone 05	1	Event: 0 – target left zone, 1 – target entered zone
80	Geofence zone 06	1	Event: 0 – target left zone, 1 – target entered zone
81	Geofence zone 07	1	Event: 0 – target left zone, 1 – target entered zone
82	Geofence zone 08	1	Event: 0 – target left zone, 1 – target entered zone
83	Geofence zone 09	1	Event: 0 – target left zone, 1 – target entered zone
84	Geofence zone 10	1	Event: 0 – target left zone, 1 – target entered zone
85	Geofence zone 11	1	Event: 0 – target left zone, 1 – target entered zone
86	Geofence zone 12	1	Event: 0 – target left zone, 1 – target entered zone
87	Geofence zone 13	1	Event: 0 – target left zone, 1 – target entered zone
88	Geofence zone 14	1	Event: 0 – target left zone, 1 – target entered zone
89	Geofence zone 15	1	Event: 0 – target left zone, 1 – target entered zone
90	Geofence zone 16	1	Event: 0 – target left zone, 1 – target entered zone
91	Geofence zone 17	1	Event: 0 – target left zone, 1 – target entered zone
92	Geofence zone 18	1	Event: 0 – target left zone, 1 – target entered zone
93	Geofence zone 19	1	Event: 0 – target left zone, 1 – target entered zone
94	Geofence zone 20	1	Event: 0 – target left zone, 1 – target entered zone
95	Auto Geofence	1	Event: 0 – target left zone, 1 – target entered zone
96	Trip	1	1 – trip start, 0 – trip stop
97	Immobilizer	1	1 – iButton connected
98	Authorized driving	1	1 – authorized iButton connected
99	ECO driving/Green driving type	1	1 – harsh acceleration, 2 – harsh braking, 3 - harsh cornering
100	ECO driving/Green driving value	1	Depending on ECO driving/Green driving type: if harsh acceleration, braking and cornering – g*10 m/s^2
101	Over Speeding	1	At over speeding start km/h, at over speeding end km/h
102	Excessive idling	1	1- idling detected, 0- idling ended
103	Jamming detection	1	1 – jamming start, 0 – jamming stop
104	Crash detection	1	1 – crash event occured

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

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 42)

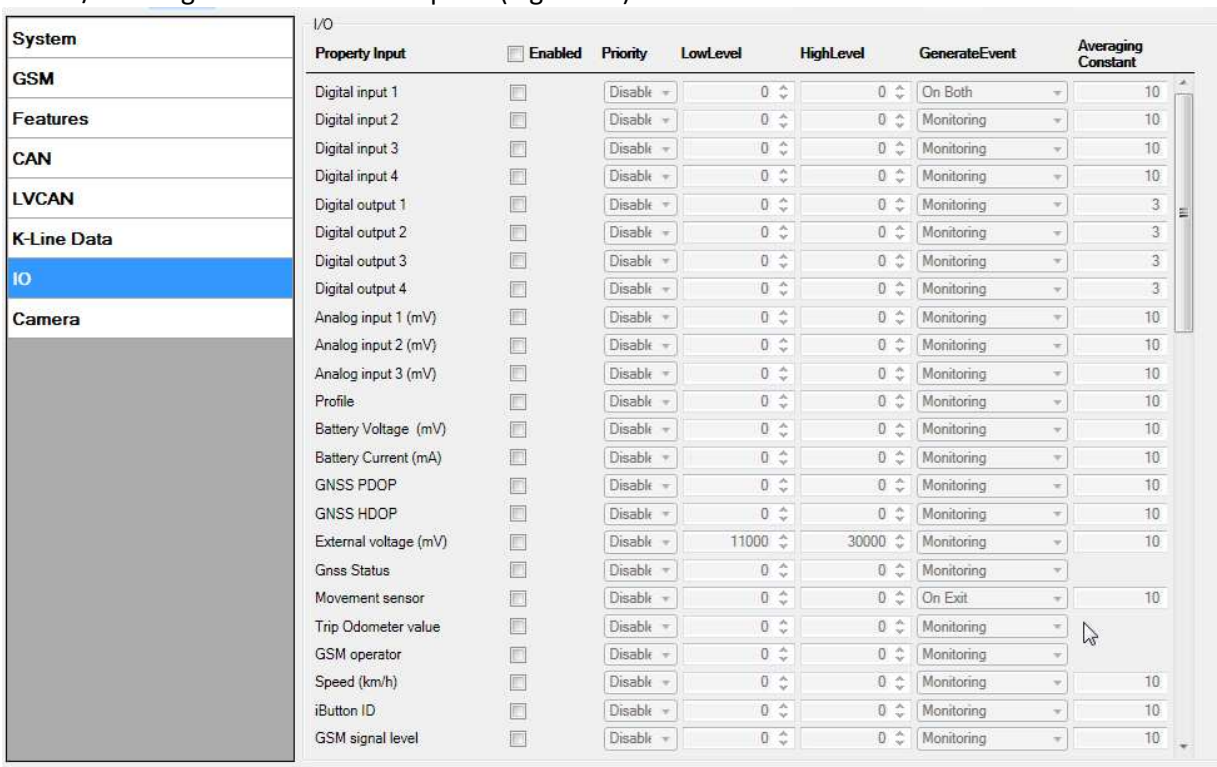


Figure 42 FM6300 I/O Configuration (1)

Table 24 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 FM6300 records only GPS information.
3.	Priority - AVL packet priority. There are Low, High, and Panic, SW21, SW22, SW23 and SW24 priorities. Regular packets are sent as Low priority records. When low priority event is triggered, FM6300 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

Pos. Nr.	DESCRIPTION
	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, FM6300 generates event.
5.	Low Level – define I/O value range. If I/O value enters or exits this range, FM6300 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 100 milliseconds. Selected data source value input averaging constant are calculated by following formula: $$VAL^{Mean} = \frac{VAL^{Mean-1} \times (CONST - 1) + REALVAL}{CONST}$$ Where: VAL^{Mean} – Value calculated during actual cycle[7]; VAL^{Mean-1} – Value calculated during previous cycle; CONST – Averaging constant; 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

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 25 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 I/O#0 High level I/O#0 Low level I/O#0 logic operand I/O#0 averaging constant	S8

[7] One cycle equal to 100 ms.

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 26 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 priority I/O#0 Low level I/O#0 logic operand 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 27 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 priority I/O#0 High level I/O#0 logic operand 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 28 I/O Logic Operand

Minimal value	Maximum value	Recommended value	Goes with (depends on) parameters	Value type
0	5	2	I/O#0 priority I/O#0 High level I/O#0 Low level I/O#0 averaging constant IO#0 (ID=x300)	S8

I/O#0 averaging constant

Parameter defines I/O property sample length to average. If no averaging needed default value is 10.

Table 29 I/O Averaging constant

Minimum value	Maximum value	Recommended value	Goes with (depends on) parameters	Value type
1	99999999	1	IO#0 (ID=x300)	S32

			I/O#0 priority I/O#0 High level I/O#0 Low level I/O#0 logic operand	

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>,<AvgConstant>”)

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

Table 30 I/O Elements

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#29 – PCB Temp.	x324
I/O#1 – Digital input 2	x301	I/O#30 – Dallas ID 1	x325
I/O#2 – Digital input 3	x302	I/O#31 – Dallas Temp. 1	x326
I/O#3 – Digital input 4	x303	I/O#32 – Dallas ID 2	x327
I/O#4 – Digital output 1	x304	I/O#33 – Dallas Temp. 2	x328
I/O#5 – Digital output 2	x305	I/O#34 – Dallas ID 3	x329
I/O#6 – Digital output 3	x306	I/O#35 – Dallas Temp. 3	x330
I/O#7 – Digital output 4	x307	I/O#36 – Dallas ID 4	x331
I/O#8 – Analog input 1	x308	I/O#37 – Dallas Temp. 4	x332
I/O#9 – Analog input 2	x309	I/O#38 – Dallas ID 5	x499
I/O#10 – Analog input 3	X445	I/O#39 – Dallas Temp. 5	x500
I/O#10 – Profile	x310	I/O#40 – Dallas ID 6	x501
I/O#11 – Battery voltage	x311	I/O#41 – Dallas Temp. 6	x502
I/O#12 – Battery Current	x312	I/O#42 – Fuel Counter	x333
I/O#13 – GPS PDOP	x313	I/O#43 – Ignition	x334
I/O#14 – GPS HDOP	x314	I/O#44 – RFID ID	x335
I/O#15 – Ext. Voltage	x315	I/O#45 – Total Odometer	x519
I/O#16 – GNSS Status	x316	I/O#46 – RFID COM2	x520
I/O#17 – Movement sensor	x317	I/O#47 – IMSI code	x524
I/O#18 – Trip Odometer	x318	I/O#48 – CCID code	x525
I/O#19 – GSM Operator	x319	I/O#49 – LLS #1 temp.	x336
I/O#20 – Speed	x320	I/O#50 – LLS #1 meter	x337
I/O#21 – iButton ID	x321	I/O#51 – LLS #2 temp.	x338
I/O#22 – GSM Signal level	x322	I/O#52 – LLS #2 meter	x339
I/O#23 – Network Type	x447	I/O#53 – LLS #3 temp.	x340
I/O#24 – Acceleration	x448	I/O#54 – LLS #3 meter	x341
I/O#25 – Deceleration	x449	I/O#55 – LLS #4 temp.	x342
I/O#26 – Cell ID	x450	I/O#56 – LLS #4 meter	x343
I/O#27 – Area Code	x451	I/O#57 – LLS #5 temp.	x344
I/O#28 – Deep Sleep	x323	I/O#58 – LLS #5 meter	x345

6.3.8.4 SMS event configuration

To configure SMS event every value above should be separated with comma. For example, configuring first SMS event from DIN1(AVLID 1) to send to first number in list, SMS should look like: **“ setparam 300 1,1,text”** (“ setparam 300 <avl id>, <number index>, <text>”)

Sms events are configurable for all profiles at ones.

6.3.8.5 LVCAN/ALL-CAN300 I/O elements

LVCAN IO elements can be configured remotely via SMS command.

Table 31 LVCAN elements and parameters

Element name (default SMS Event Text)	ID
[LVC Vehicle Speed]	x399
[LVC Acce Pedal Position]	x400
[LVC Fuel Consumed]	x401
[LVC Fuel Level Liters]	x402
[LVC Engine RPM]	x403
[LVC Total Mileage]	x404
[LVC Fuel Level Percent]	x405
[LVC Program Number]	x452
[LVC ModuleID]	x453
[LVC Engine Work Time]	x454
[LVC Engine Work Time (counted)]	x455
[LVC Total Mileage (counted)]	x456
[LVC Fuel Consumed (counted)]	x457
[LVC Fuel Rate]	x458
[LVC AdBlue Level (percent)]	x459
[LVC AdBlue Level (liters)]	x460
[LVC Engine Load]	x461
[LVC Engine Temperature]	x462
[LVC Axle 1 Load]	x463
[LVC Axle 2 Load]	x464
[LVC Axle 3 Load]	x465
[LVC Axle 4 Load]	x466
[LVC Axle 5 Load]	x467
[LVC Control State Flags]	x468
[LVC Agricultural Machinery Flags]	x469
[LVC Harvesting Time]	x470
[LVC Area of Harvest]	x471
[LVC Mowing Efficiency]	x472
[LVC Grain Mown Volume]	x473
[LVC Grain Moisture]	x474
[LVC Harvesting Drum RPM]	x475
[LVC Gap Under Harvesting Drum]	x476
[LVC Security State Flags]	x477
[LVC Tacho Total Vehicle Distance]	x478
[LVC Trip Distance]	x479
[LVC Tacho Vehicle Speed]	x480
[LVC Tacho Driver Card Presence]	x481
[LVC Driver1 States]	x482

[LVC Driver2 States]	x483
[LVC Driver1 Continuous Driving Time]	x484
[LVC Driver2 Continuous Driving Time]	x485
[LVC Driver1 Cumulative Break Time]	x486
[LVC Driver2 Cumulative Break Time]	x487
[LVC Driver1 Duration Of Selected Activity]	x488
[LVC Driver2 Duration Of Selected Activity]	x489
[LVC Driver1 Cumulative Driving Time]	x490
[LVC Driver2 Cumulative Driving Time]	x491
[LVC Driver1 ID High]	x492
[LVC Driver1 ID Low]	x493
[LVC Driver2 ID High]	x494
[LVC Driver2 ID Low]	x495
[LVC Battery Temperature]	x496
[LVC Battery Level (percent)]	x497
[LVC Door Status]	x498
[DTC Errors]	x514
[CNG Status]	x515
[CNG Used]	x516
[CNG Level]	x517
[DTC Codes]	X518
Configuration Format	<priority>,<HighLevel>,<LowLevel>, <Operand>,<AvgConstant>
Example:	'setparam 3400 1,0,0,3,10' Acce Pedal Position is set on low priority in profile 3

6.3.8.6 K-Line parameters

Table 32 K-line elements and parameters

Name	Parameter Name	Configuration ID	Available Values
KLINE Driver Recognize	Priority	X050	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 1 working state	Priority	X051	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 2 working state	Priority	X052	0 – disable 1 – low 2 – high
	High level		N/A

Name	Parameter Name	Configuration ID	Available Values
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Overspeed	Priority	X053	0 – disable 1 - low 1 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 1 card	Priority	X054	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 2 card	Priority	X055	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 1 rel time states	Priority	X056	0 - disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 2 rel time states	Priority	X057	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Vehicle speed	Priority	X058	0 – disable 1 – low 2 – high
	High level		0 – 255 km/h
	Low level		0 – 255 km/h
	Generate event		0 – On range exit 1 – On range

Name	Parameter Name	Configuration ID	Available Values
			entrance 2 – On both 3 – Monitoring 4 – Hysteresis 5 – On change
KLINE Odometer	Priority	X059	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Distance	Priority	X060	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Tacho Timestamp	-	X061	-
KLINE Driver 1 ID	Priority	X062	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 – Monitoring 5 – On change
KLINE Driver 2 ID	Priority	X063	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 –Monitoring 5 – On change
KLINE Vehicle Identification Number	Priority	X065	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 –Monitoring 5 – On change
KLINE Vehicle Registration Number	Priority	X066	0 – disable 1 – low 2 – high
	High level		N/A

Name	Parameter Name	Configuration ID	Available Values
	Low level		N/A
	Generate event		3 –Monitoring 5 – On change
KLINE Card 1 issuing number state	Priority	X067	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 –Monitoring 5 – On change
KLINE Card 2 issuing number state	Priority	X068	0 – disable 1 – low 2 – high
	High level		N/A
	Low level		N/A
	Generate event		3 –Monitoring 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.

6.3.8.7 Configurable parameter values and Global parameter values

Configurable parameters:

Table 33 Configurable parameter values

Parameter		ID	Parameter value				Value type
			MIN	MAX	Default	Recommended	
System settings (6.3.4)							
Sleep Mode		**x000**	0	3	0	-	U8
0	Disable						
1	Enable						
2	Deep sleep						
3	Online 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						

Parameter	ID	Parameter value				Value type
		MIN	MAX	Default	Recommended	
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)						
Server 1						
GPRS Context Activation	**x240**	0 (Disable)	1 (Enable)	0	-	S8
Protocol		0 (TCP)	1 (UDP)	0	-	U8
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>					
Server 2						
GPRS Context Activation	**x242**	0 (Disable)	1 (Enable)	0	-	S8
Protocol		0 (TCP)	1 (UDP)	0	-	U8
Domain		Empty	56 char	Empty	-	-
Target Server Port		0	65535	0	-	U16
Configuring format:	<Enable>,<IP>,<port>,<protocol>					
GPRS data limit settings (6.3.5.2)						
Enable GPRS limits	**x241**	0 (Disable)	1 (Enable)	0	-	U8
Data limit Home		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 (6.3.5.6)						
Preferred Operator	**x271**	0	99999999	0	-	U32
Black List Operator	**x272**	0	99999999	0	-	U32
Configuring format: (setparam Y271 X)	X is start position. If no X is set starts from 0 Max 19 operator codes can be set (separated by comma) in one SMS command.					
Reading format: (getparam Y271 X)	X values can be 1,2,3. If X = 1, Operator codes from 0-19 are read from configuration and sent via SMS. If X = 2, Operator codes from 20-39 are read from configuration and sent via SMS. If X = 3, Operator codes from 40-49 are read from configuration and sent via SMS. If X = any other, Operator codes from 0-19 are read from configuration and sent via SMS *User must use X, without X value device responds that parameter is wrong or it can respond with wrong operator codes.					
Data Acquisition settings (Chapter 9)						
Data acquisition modes	**x010**					

Parameter	ID	Parameter value				Value type
		MIN	MAX	Default	Recommended	
Min Period (in seconds)		0	9999999	600	-	U32
Min Distance (in meters)		0	65535	0	-	U32
Min Angle (in degrees)		0	180	0	-	U16
Min Speed (in km/h)		0	400	0	-	U16
Min Speed Source		0/1/2/3/4 (0-GPS, 1-LVCAN, 2-ALLCAN, 3-FMS, 4-KLINE)		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>					
Geofencing settings (6.3.6.4)						
Frame Border (in meters)	**x020**	0	9999999	1	1000	U32
Geofence Overspeed control	**x021**	0	5	0	-	U8
Geofence Zone #1	**x030**					
Zone #1 Shape		0 (Circle)	1 (Rectangle)	0	-	U32
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**	Same configuration as Geofence Zone #1				
Geofence Zone #3	**x032**					
Geofence Zone #4	**x033**					

Parameter	ID	Parameter value				Value type
		MIN	MAX	Default	Recommended	
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**					
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**					
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>				
Towing Detection settings (6.3.6.6)						
Towing Detection	**X917**	0 (Disable)	2 (High priority)	0	-	U8
Activation Tmo (min)		0	1440	5		
Ignition Check (sec)		0	60	5		
Duraton (ms)		100	5000	1000	1000	
Acceleration		0.15	5	0.25	0.25 m/s^2	
Angle (deg.)		0.5	5	1.0	1.0	U8
Make Call Number		0	9	-	-	
Configuring Format		<priority>,<activationTmo>,<TowingEvtTmo>,<Duration>,<Acceleration>,<Towing				

Parameter		ID	Parameter value				Value type
			MIN	MAX	Default	Recommended	
			Angle>,<TowingCallNr>				
iButton List (6.3.6.7)							
Authorized iButtons		**500-999**	0	FFFFFFFF FFFFFFFF		-	U64
Eco/Green driving settings (Chapter 13.1)							
Eco driving type		**x910**	0	5	0	-	U8
0	Disable						
1	No DOUT control						
2	DOUT1 control						
3	DOUT2 control						
4	DOUT3 control						
5	DOUT4 control						
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>,<AccOutputDuration>,<BrakingOutputDuration>,<CorneringOutputDuration>					
Overspeeding settings (Chapter 13.2)							
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 13.3)							
Immobilizer mode		**x912**	0	5	0	-	U8
0	Disable						

Parameter		ID	Parameter value				Value type
			MIN	MAX	Default	Recommended	
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 13.4)							
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 13.5)							
Jamming Detection		**x914**	0	5	0	-	U8
0	Disable						
1	No DOUT						
2	DOUT1 control						
3	DOUT2 control						
4	DOUT3 control						
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 13.6)							
iButton notification		**x915**	0	5	0	-	U8
0	Disable						
1	No DOUT control						
2	DOUT1 control						
3	DOUT2 control						
4	DOUT3 control						
5	DOUT4						

Parameter	ID	Parameter value				Value type
		MIN	MAX	Default	Recommended	
control						
Timeout		1	65530	0	-	U16
Configuring format:	<Enable/Dout control>,<DOUT TMO>					
Crash Detection settings (Chapter 13.7)						
Scenario	**X918**	0 (Disable)	1 (Enable)	0	-	U8
Acceleration Threshold		16	8000	4000	-	U8
Duration		0	600	10	-	U8
Configuring format:	<Scenario>,<Threshold>,< Duration>					
Trip settings (6.3.6.3)						
Trip	**x280**	0 (Disable)	1 (Enable)	0	-	U8
Start Speed		0	255	5	-	U8
Ignition Off Timeout		0	65536	60	-	U16
Remember iButton ID, while Trip detected		0 (Disable)	1 (Enable)	0	-	U8
Trip Mode		0 (Between)	1 (Continous)	0	-	U8
Configuring format:	<Enable>,<StartStopSpeed>,<IgnitionOffTimeout>,<RememberiButton>,<Mode>					

Global and External devices parameters:

Table 34 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
Analog Input 3 Type	106	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
Total Odometer source	114	0/1/2/3/4 (0 – GPS, 1 – LVCAN, 2-ALLCAN, 3-FMS, 4-KLINE)	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
NTP mode	129	0/1/2/3 (0 – disable, 1 – NTP + NITZ2, 2 – NTP Only, 3 – NITZ Only)	0
GNSS TMO For NTP	121	0-300	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	

Parameter	ID	Possible Parameter Value	Default Value
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
COM2 Baudrate	122	0 – 115200	5
COM1 start byte	123	0 - 255	0
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
TCP Link mode buffering	125	0/1 (0 – disable, 1 – enable)	0
COM1 end byte	126	0 - 255	0
COM2 start byte	127	0 - 255	0
COM2 end byte	128	0 - 255	0
COM1 Timestamp	151	0/1 (0 – disable, 1 – enable)	0
COM1 CMD ID	152	0 – 255	0
COM2 Timestamp	153	0/1 (0 – disable, 1 – enable)	10
COM2 CMD ID	154	0 – 255	3
Records saving/Sending	157	0/1/2 (0 – After GNSS fix,1 – Always, 2 – After time synchronization)	0
SMS Event number	222-231	SMS Event number	„“
SMS Event ID	300-499	SMS Events	
Authorized iButtons	500-999	Authorized iButtons FFFFFFFF	-
RS485 Activate	232	0/1 (0 – disable, 1 – enable)	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
LLS 1-5 adress	256-260	0,255	0
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	
Tachograph ignition source	158	1/2/3/4	3
Tachograph device	159	0 - DTC0 1381, 1 - SE5000	0
Tacho web	160	0/1 (0 – disable, 1 – enable)	0

Parameter	ID	Possible Parameter Value	Default Value
Tacho web domain	161	Maximum 56 Char	Empty
Tacho web port	162	0 - 65535	0
Tacho web start delay	174	0 – 255 (Min)	5

7 PROFILE SWITCHING

FM6300 has 4 profiles saved in Flash memory of the module. Every profile has a list of parameters, which enables FM6300 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 FM6300 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 43)

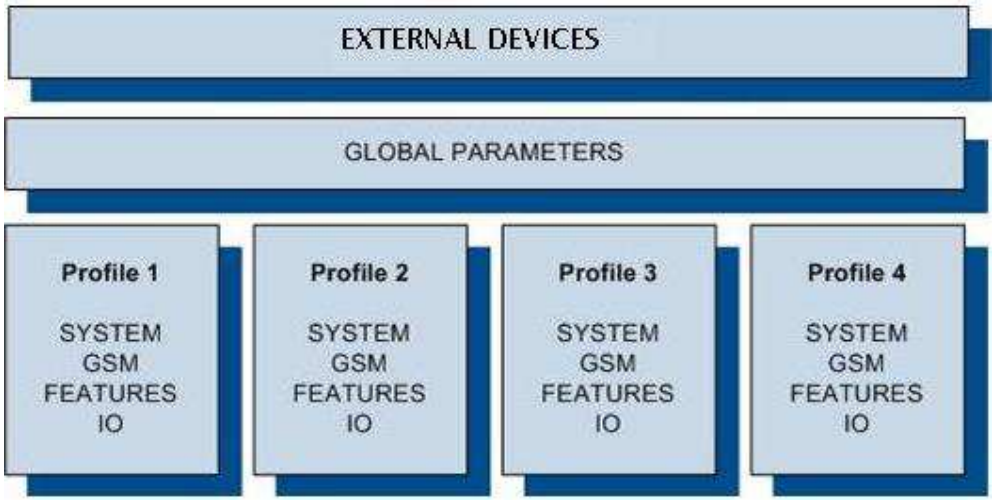


Figure 43 FM6300 profile structure

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 FM6300. 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 44 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 FM6300 encounters a 'panic' priority event (see Chapter 7)

In the example (Figure 44) FM6300 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 FM6300 switches to profile 2.

If there are no operator codes entered in all profiles after operator search task FM6300 will check all 3 profiles and won't find any operators in any list. In such a case, FM6300 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 FM6300 is performed incorrectly.

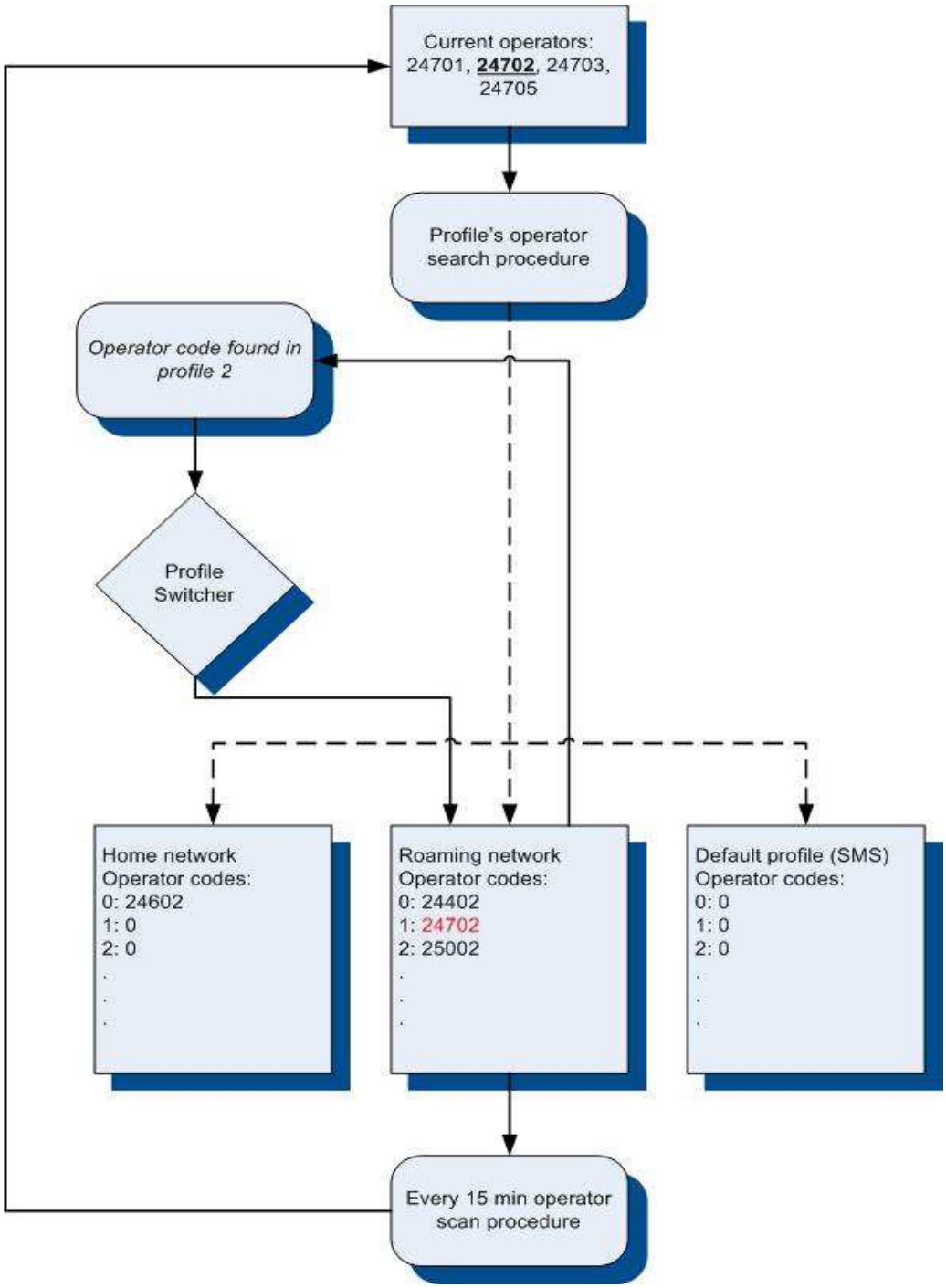


Figure 44 GSM Operator code profile switching (…)

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, FM6300 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:

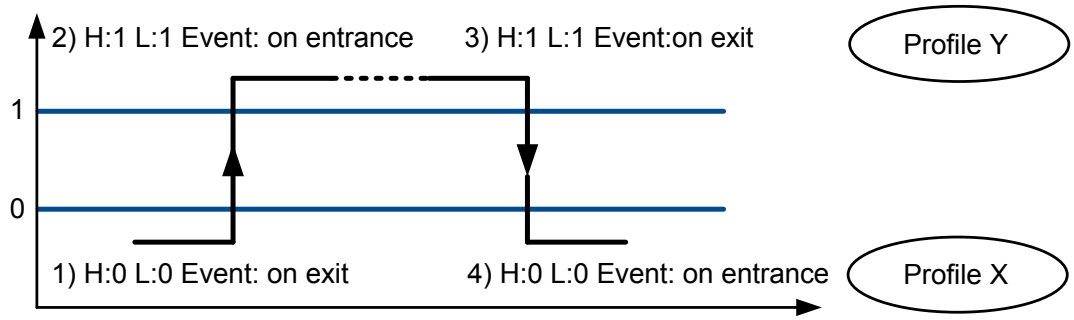


Figure 45 Digital input event criteria

7.2.1 Example #1

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

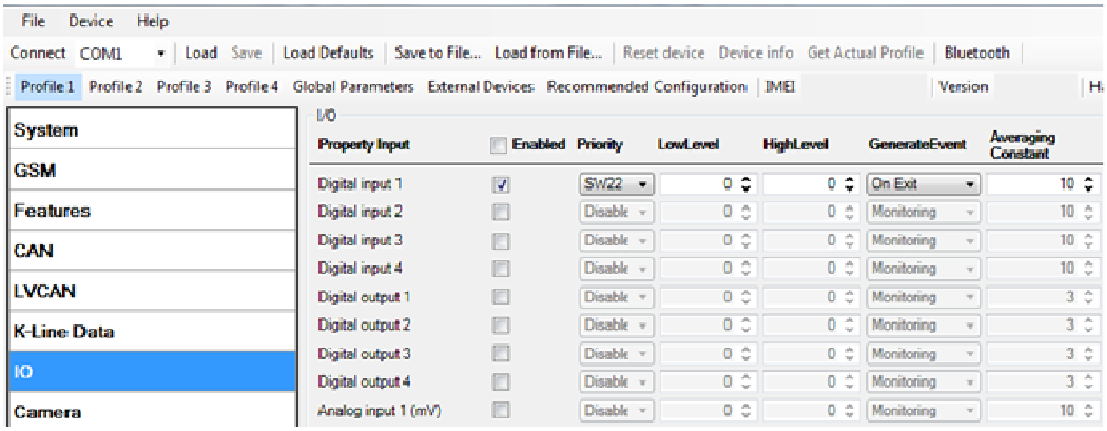


Figure 46 Switch to profile on event (1)

7.2.2 Example #2

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

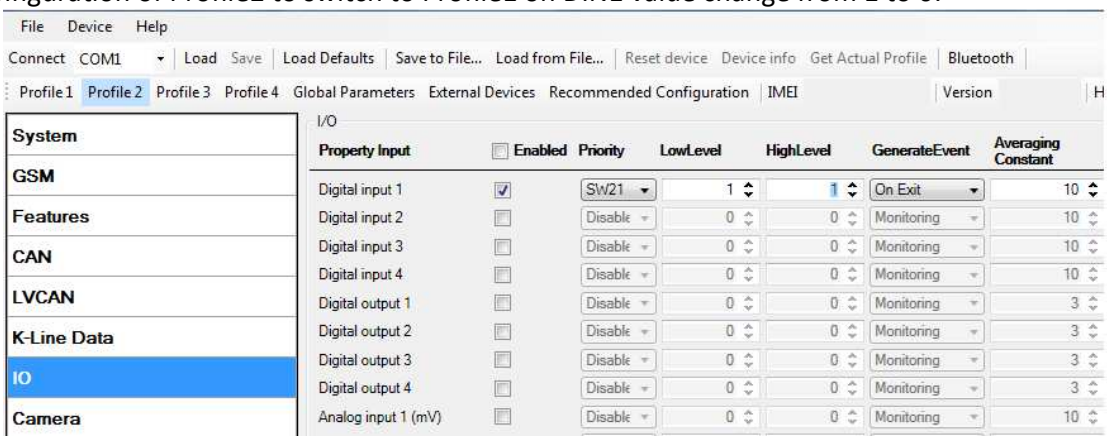


Figure 47 Switch to profile on event (2)

8 DUAL SIM FUNCTIONALITY

FM6300 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 FM6300 is connected to configurator (shown in Figure 48).

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.

FM6300 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 FM6300 to switch minimum times.

If SIM card is inserted into SIM 2 slot and 1 SIM operator list mode is used, FM6300 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 FM6300 connected to configurator choose Global Parameter section as shown on Figure 48, then in Profile Change ON select 2 SIM Operator List.

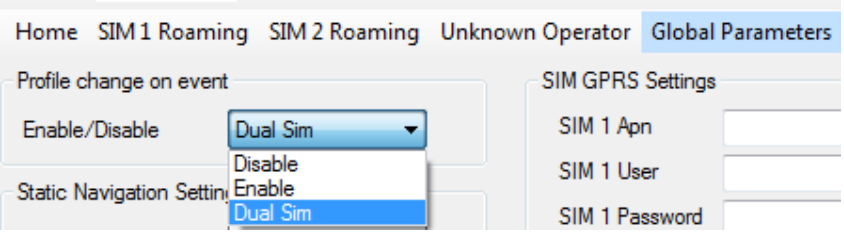


Figure 48 FM6300 Configurator window 2SIM mode setup

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 49). 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.

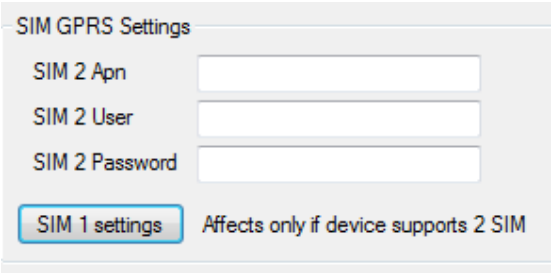


Figure 49 APN settings for SIM 1 and SIM 2

8.1.1 Home Network

Selecting Home profile gives Home Operator Code settings possibility for SIM 1 and for SIM 2 (Figure 50). These Home Operators have the highest priority and must be inserted. FM6300 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.

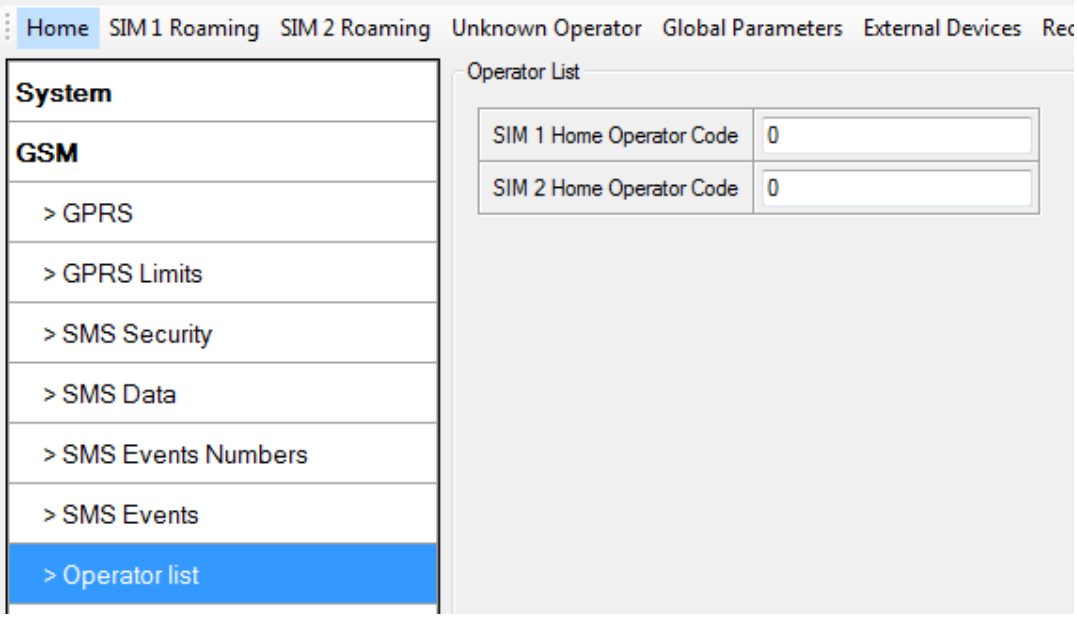


Figure 50 Home network setting

When the connection procedure is successful, FM6300 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, FM6300 switches to the SIM 1 card tries to connect 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 51). SIM 1 Roaming operator list has the second priority after the Home operators. If there are no available home operators, FM6300 checks if there are available SIM 1 Roaming operators from the list. If there are several available Roaming operators from the list, FM6300 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, FM6300 scans the SIM 2 Roaming operator list for available operators.

If the connection is lost, FM6300 will return to Home profile and try to connect to Home operators as it has higher priority. FM6300 checks a possibility to connect to Home network every 10 min. and goes further by priority.

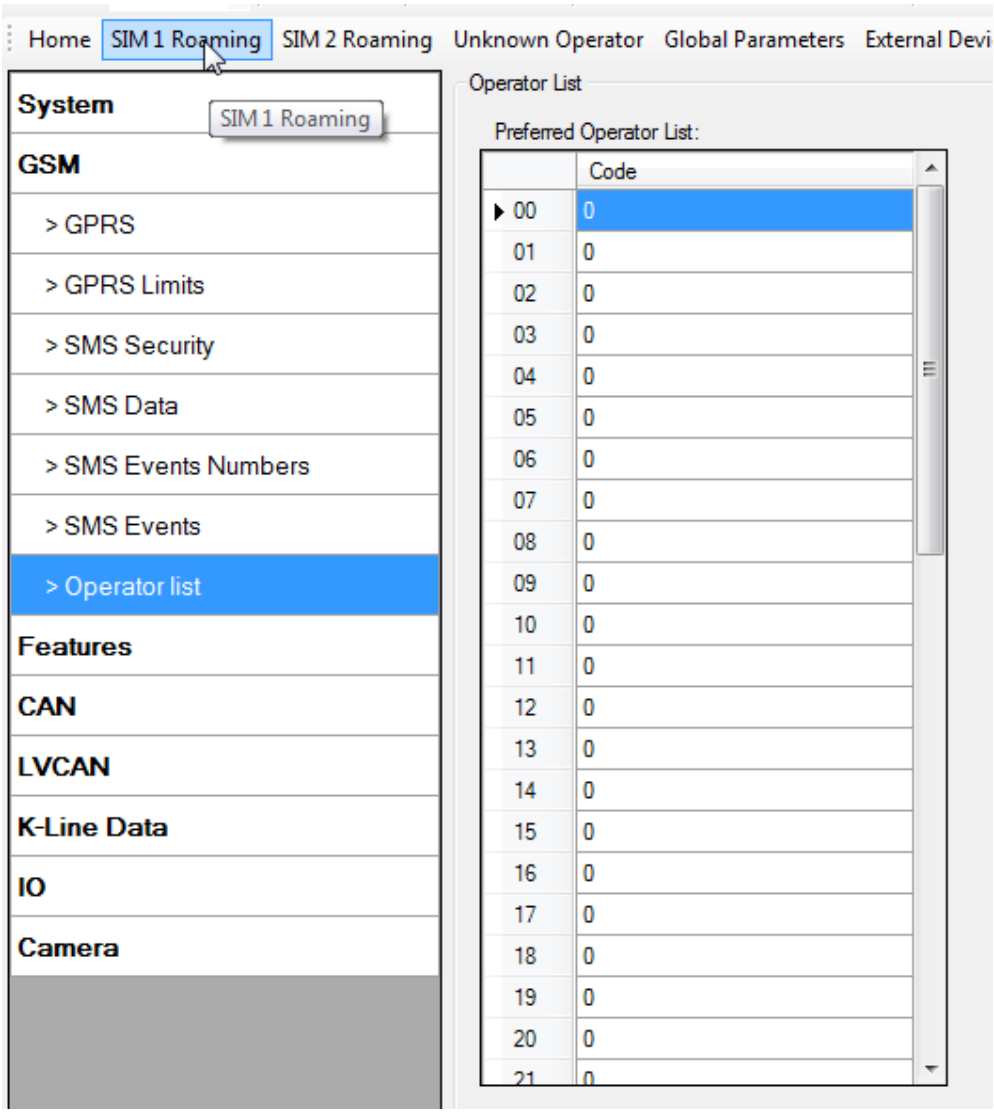


Figure 51 SIM 1 Roaming Operator list

8.1.3 SIM 2 Roaming

In this window you can fill the Preferred Operators List for SIM 2 up to 50 operators (Figure 52). 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, FM6300 scans for available operator in the SIM 2 Roaming operator list. If there is an available SIM 2 Roaming operator in the list, FM6300 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, FM6300 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. FM6300 every 10 min. checks a possibility to Home network connection and further, if it is necessary, operates by the priority.

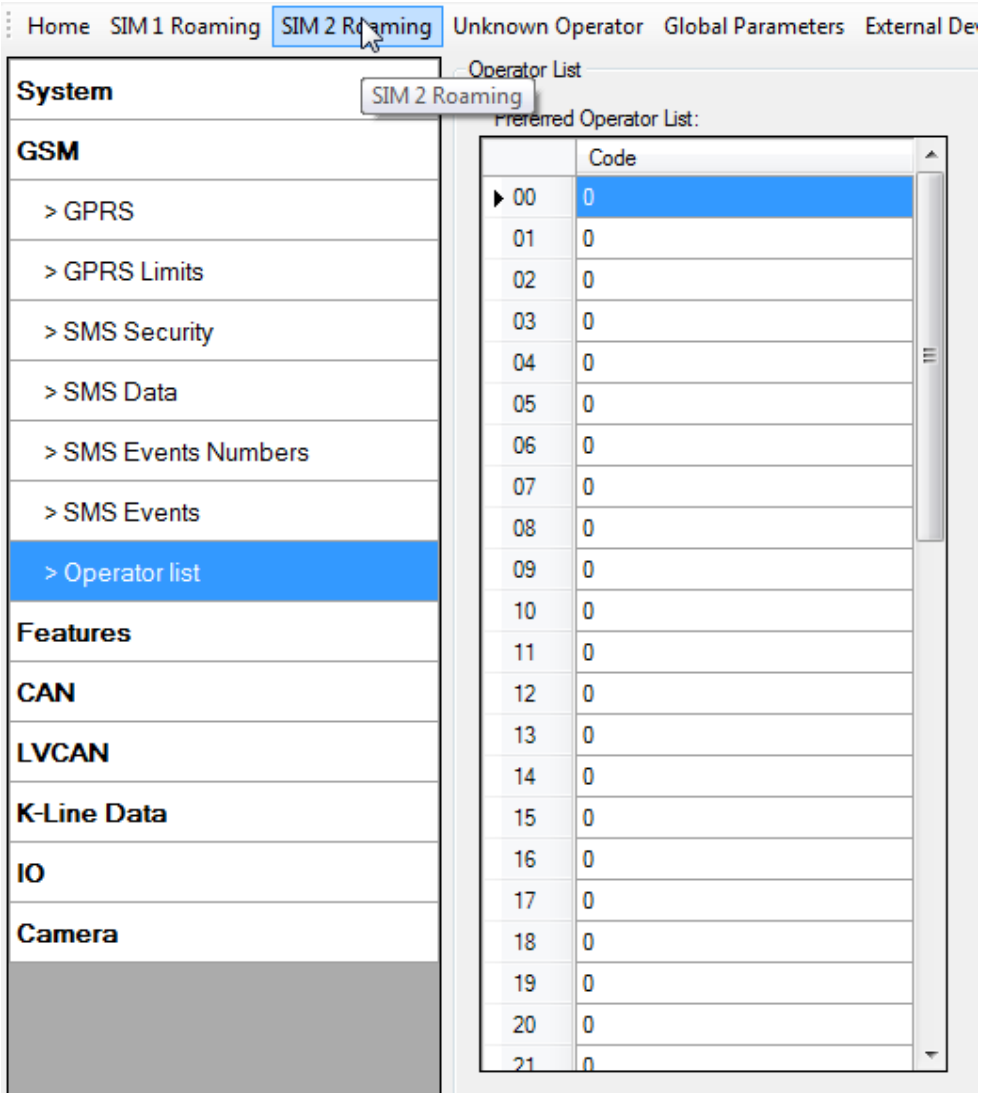


Figure 52 SIM 2 Roaming Operator list

8.1.4 Unknown Operator

Unknown Operator profile (Figure 53) has the fourth priority after the Home network, 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 FM6300 switches to Unknown operator profile using the SIM card it has used before (FM6300 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 FM6300 connects to an operator from the list, received from the network, with the best signal quality.

FM6300 every 10 min. checks a possibility to Home network connection and further, if it is necessary, operates by the priority.

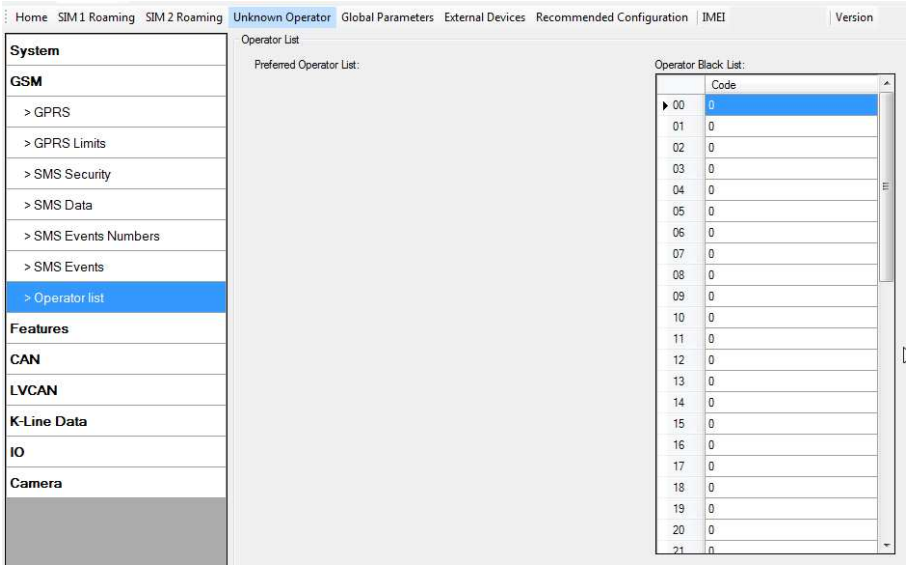


Figure 53 Unknown Operator List

8.1.5 Dual SIM algorithm

Two SIM cards use algorithm is shown in the diagram (Figure 54).

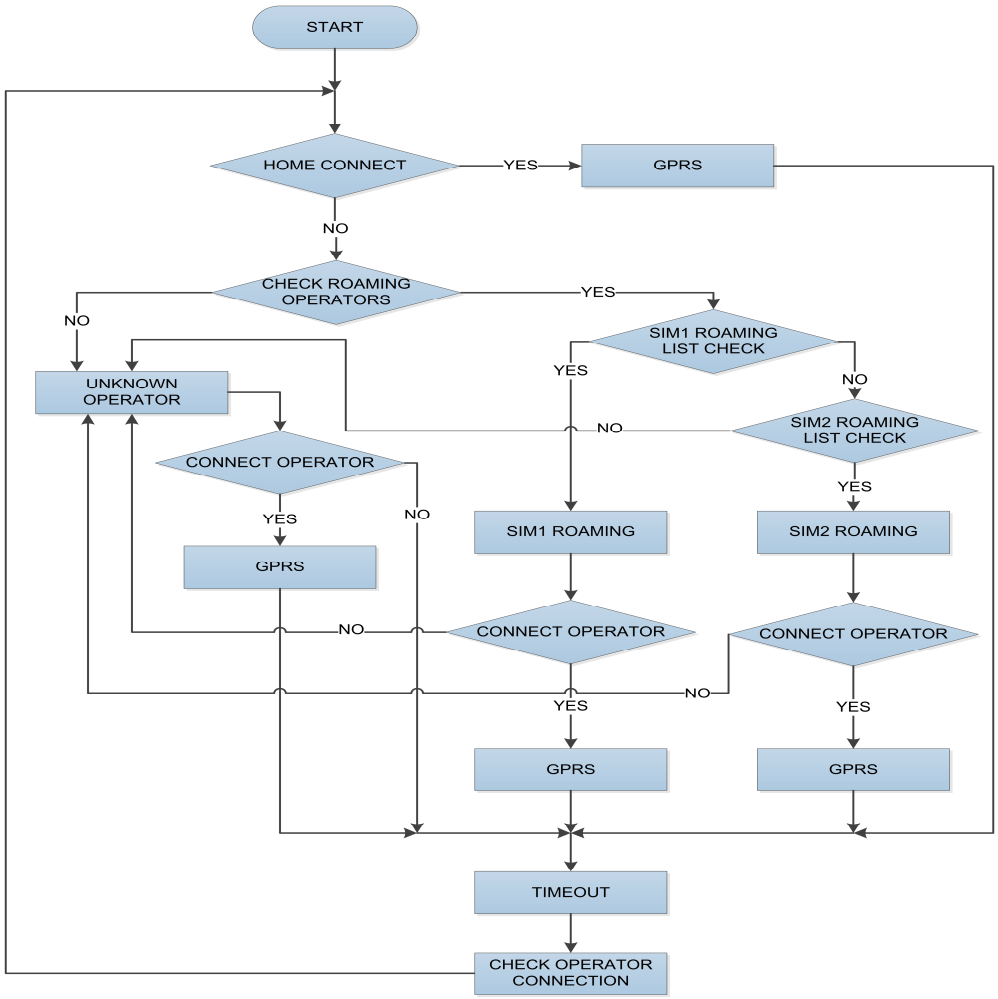


Figure 54 Dual SIM connection algorithm

The FM6300 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 FM6300 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 55).

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.

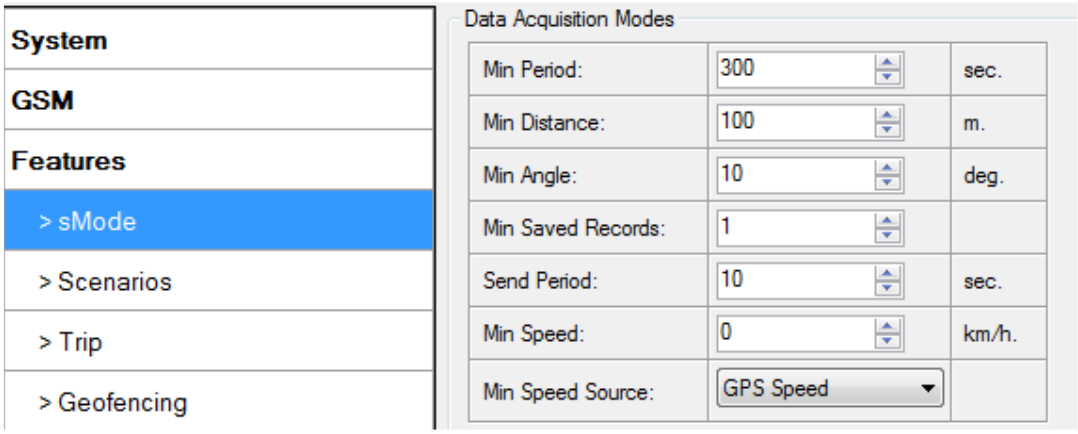


Figure 55 GPS acquisition configuration window

9.1.1 Min. Period

Time based data acquiring (Figure 56) – 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.

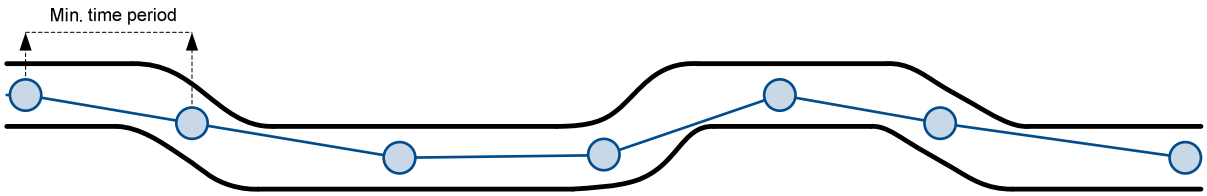


Figure 56 Time based tracking

9.1.2 Min. Distance

Distance based data acquiring (Figure 57) – 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.

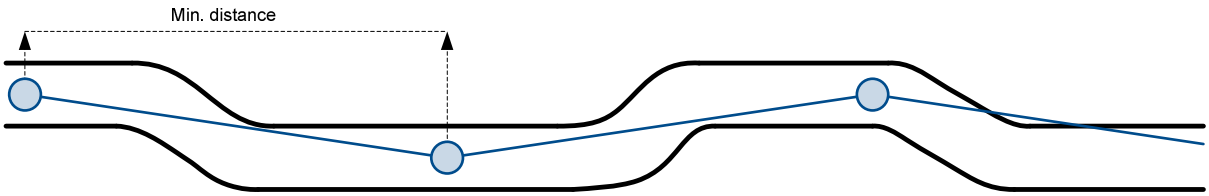


Figure 57 Distance based tracking

9.1.3 Min. Angle

Angle based data acquiring (Figure 58) – 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.

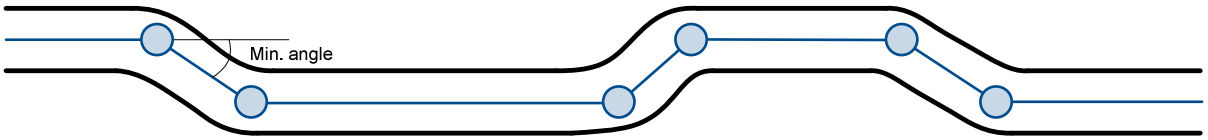


Figure 58 Angle based tracking

9.1.4 Min. Speed

Speed based data acquiring (Figure 59) – 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. Min speed source can be selected by GPS speed, LVCAN speed, ALLCAN speed, FMS Speed or KLINE speed

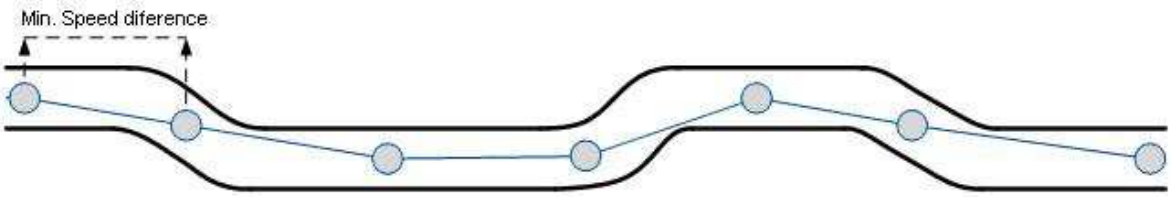


Figure 59 Speed based tracking

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 is sent immediately to server; Panic - generated record is 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.

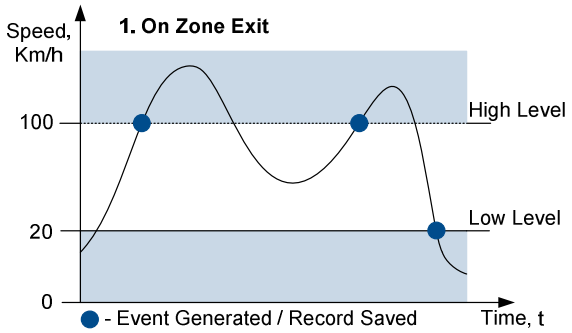


Figure 60 Event On Zone exit

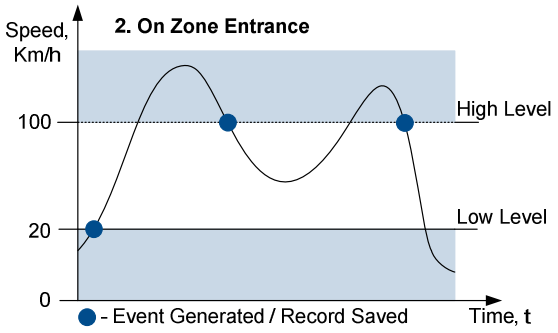


Figure 61 Event On Zone entrance

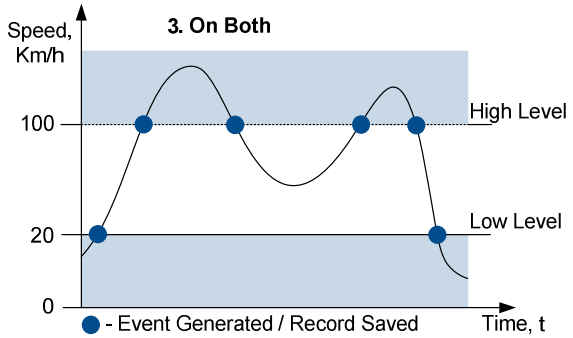


Figure 62 Event On both

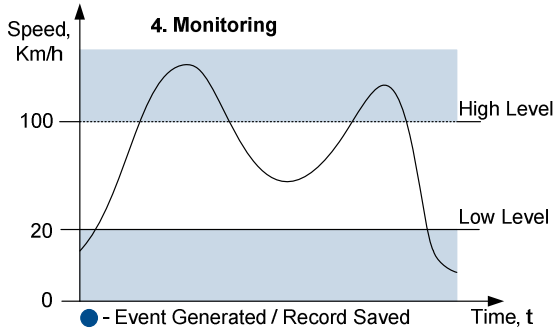


Figure 63 Monitoring

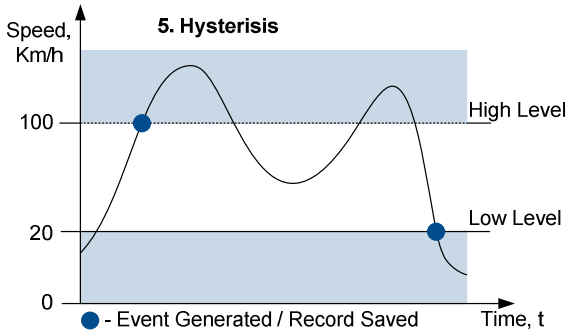


Figure 64 Event on Hysteresis

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, FM6300 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.

FM6300 can enter sleep mode if **ALL** of these conditions are met:

- FM6300 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.

FM6300 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 FM6300:

- cannot save periodical or eventual records;
- send data to server;

11 DEEP SLEEP MODE

While in deep sleep mode, FM6300 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.

FM6300 can enter deep sleep mode (standby mode) if **ALL** of these conditions are met:

- FM6300 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.

FM6300 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 FM6300:

- can save periodical or eventual records;
- send data to server;

Note: If there is no need to save or send periodical data FM6300 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 ONLINE DEEP SLEEP MODE

In this mode device works as in Deep Sleep mode, but without deregistering from GSM network. GSM part stays powered, so this increases power consumption. In this mode, device should receive/send SMS and make/receive calls. Also not closes GPRS context, if previously opened.

Conditions to enter Online Sleep mode is the same as entering Deep Sleep mode.

FM6300 exits Online Sleep mode when if **ONE** of following conditions are true:

- Movement by accelerometer or configured movement source is detected;
- Ignition (configured Ignition Source) is turned on.

13 FEATURES AND SCENARIOS

13.1 ECO driving or Green driving Scenarios

Six scenarios are available on FM6300 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 or 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 FM6300 measured values are higher than those set in configuration, without additional I/O settings.

To prevent generating false events for Green driving, 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

To prevent generating false events for ECO driving, harsh acceleration and harsh braking is monitored only when following conditions are fulfilled:

- Ignition is ON

Harsh cornering is monitored only when following conditions are fulfilled:

- Ignition is ON

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 is dependent on accelerometer. Device must be mounted correctly on plain/horizontal surface. FM6300 measures relative acceleration every second.

13.1.1 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 FM6300 device correctly to avoid functionality malfunctions (first condition). In the picture below (Figure 65) mounting recommendations are displayed. Please **note** that beside those recommendations

1. You can choose how FM6300 is deployed. It means that that there is no effect to measurements if FM6300 top/bottom side points up or down.
2. Device can be deployed at any place in the car.

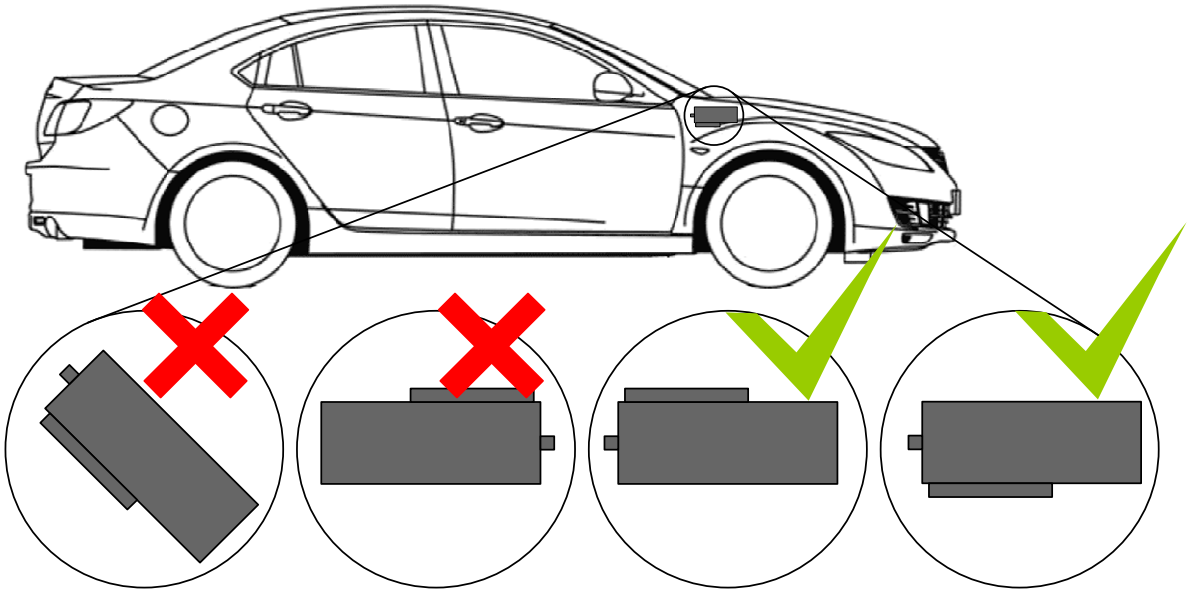


Figure 65 Correct mounting position of the FM6300 in the vehicle

For ECO driving to work properly, device connection pins socket must point towards the vehicles front side. Deviations of +/- 2° are allowed. But it should be as straight as possible. Deviations of maximum +/- 15° are allowed (Figure 66)

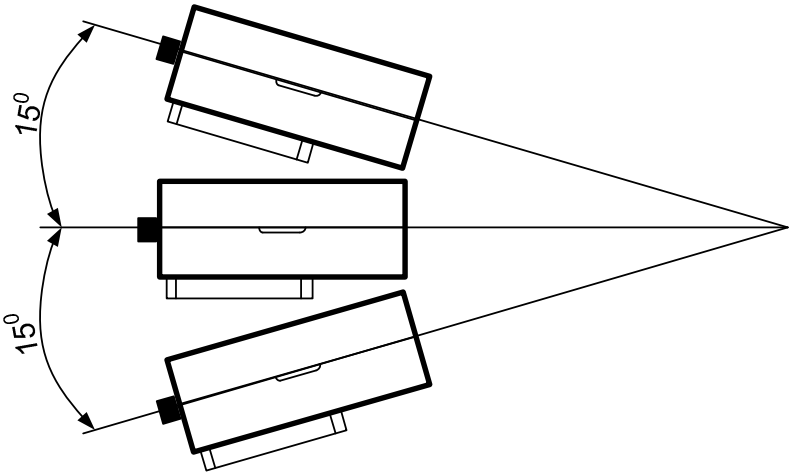


Figure 66 MAX deviation from horizontal plane of FM6300 mounting

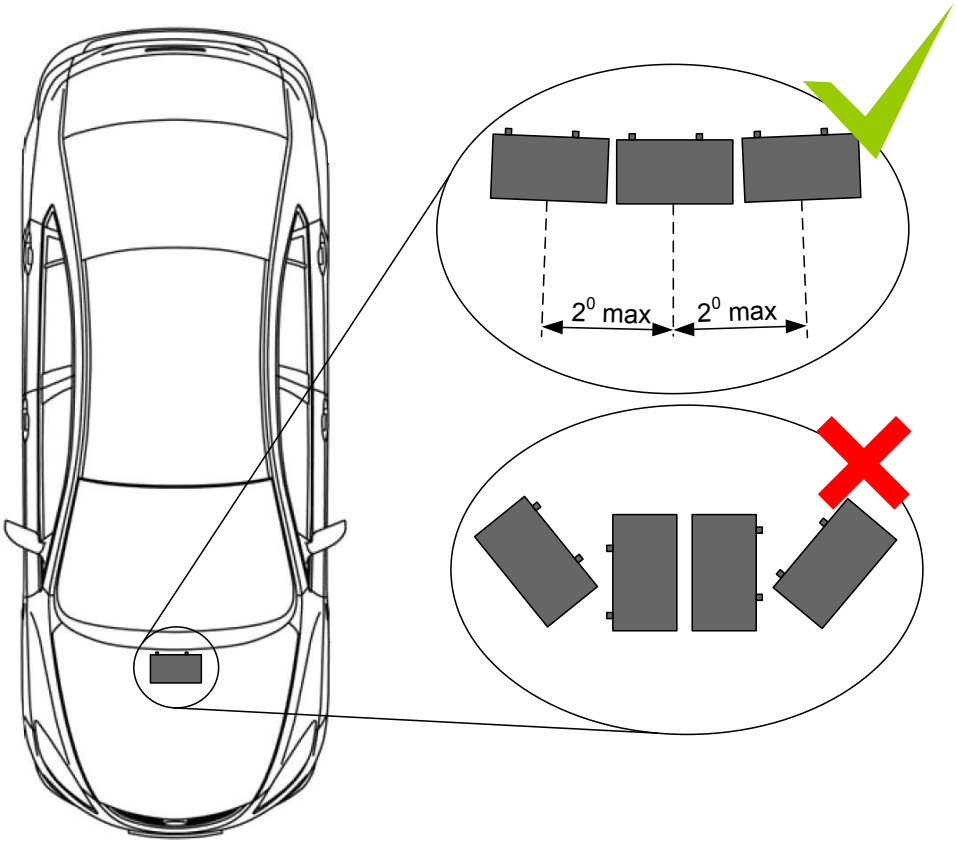


Figure 67 Horizontal position MAX deviation of FM6300 mounting

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

13.1.2 Configuration

Parameters used with ECO driving or Green driving functionality.

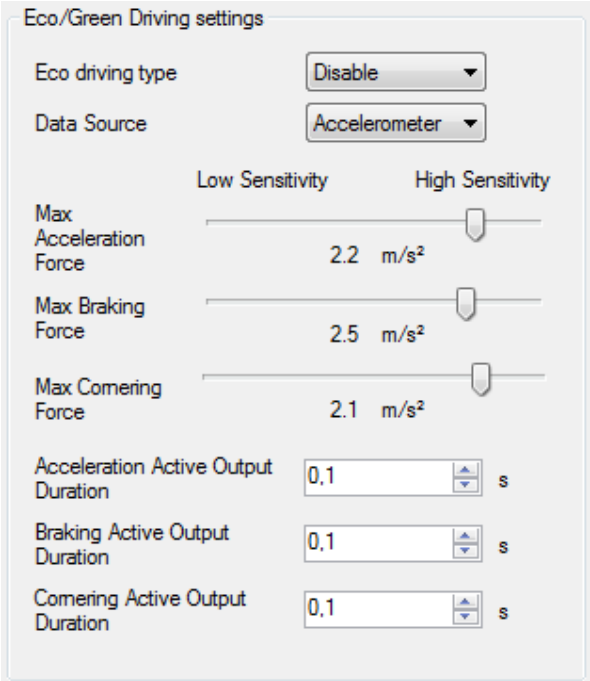


Figure 68 ECO driving or Green driving configuration parameters

Table 35 ECO driving or 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

13.1.3 Data output

ECO driving or 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 (FM6300 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.

13.2 Overspeeding Scenario

Overspeeding 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. Then DOUT control is enebled and Overspeeding is detected, DOUT becomes active for 0,3 second every 1 second.

13.2.1 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.

13.2.2 Configuration

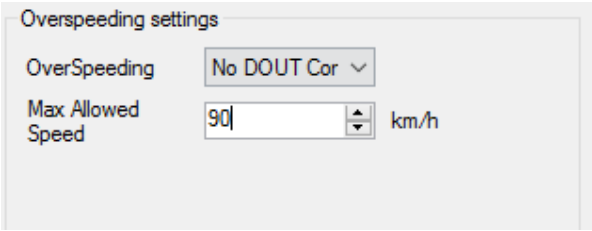


Figure 69 Overspeeding configuration parameters

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

13.3 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.

13.3.1 Configuration

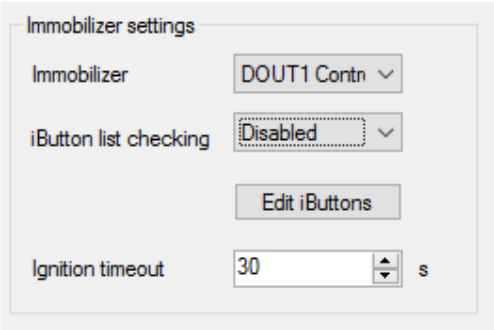


Figure 70 Immobilizer configuration parameters

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.

13.3.2 Configuration

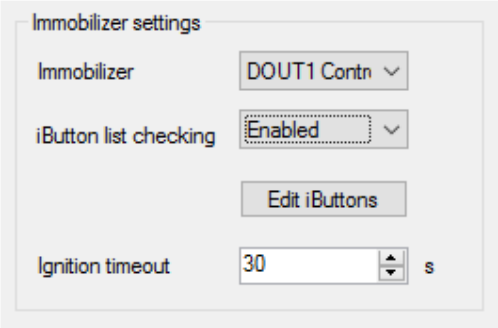


Figure 71 Authorized driving configuration parameters

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.

13.4 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).

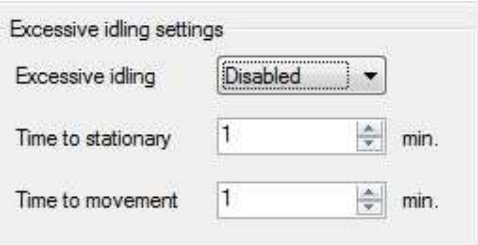


Figure 72 Excessive Idling Configuration

13.5 Jamming Detection Scenario

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

13.5.1 Configuration

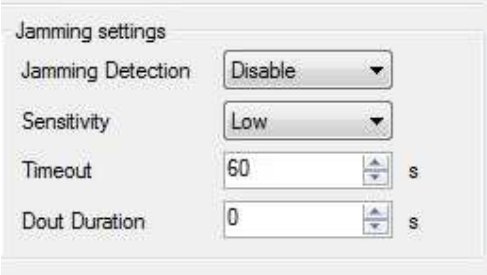


Figure 73 Jamming Detection Configuration

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.

13.6 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

13.6.1 Configuraton

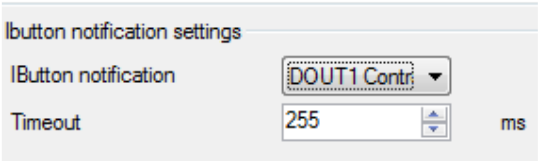


Figure 74 iButton notification configuration parameters

IButton notification: Selects which DOUT will control this scenario
Timeout: Configurable amount of time for which DOUT will be ON

13.7 Crash Detection Scenario

Scenario is activated when Crash is detected by device using accelartaion values

13.7.1 Configuration

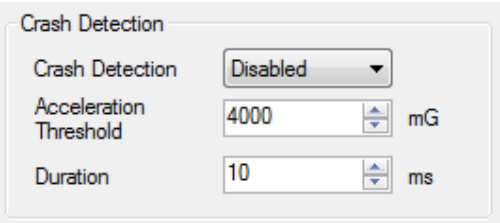


Figure 75 Crash detection configuration parameters

Crash detecion: Scenario Enable or Disable

Acceleration threshold: Acceleration values, Scenario is activated if configured value exceeds

Acceleration duration: Duration of acceleration for scenario activation

13.8 COM1 and COM2 Working Modes

COM1 and Com2 are used to connect external devices.

13.8.1 Silent Mode

FM6300 doesn't do any activity in silent mode. Logs aren't saved and any data isn't sent.

13.8.2 FM Log Mode

This is default mode of the FM6300. It is suitable for debugging.

13.8.3 LLS Mode

This mode is suitable for LLS sensors.

13.8.3.1 LLS Mode Configuration

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

Note
On Valid data Receive Status LED will blink.

13.8.4 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.

13.8.5 RFID HID Mode Configuration

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

13.8.6 RFID MF7 Mode Configuration

1. External Devices ->COM2 Settings->Baudrate = 9600
2. External Devices ->COM2 Settings->Mode = RFID MF7

13.8.7 Garmin Mode Configuration

13.8.7.1 Settings

1. External Devices ->COM2 Settings->Baudrate = 9600
2. External Devices ->COM2 Settings->Mode = Garmin

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.

13.8.7.2 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 to 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.

13.8.8 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[8]. 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. When sending a packet through COMx doesn'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*

When you send command to port X you assign Port A or port B as a recipient in your message unique ID.
Message comes to device with port number added by +1 for example if message is for port 9 device will understand as 10.

Ignores timesync, and records because these parameters are automaticaly configured when TCP Link mode is selected.

13.8.9 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)

FM6300 supports buffering messages when there is no data link, by default buffering is enabled, so messages will be saved to flash with/without a timestamp, depends on enabled/disabled timestamp parameter. Space reserved for buffering is 64 kB. Buffered messages will be sent using Codec13 protocol.

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

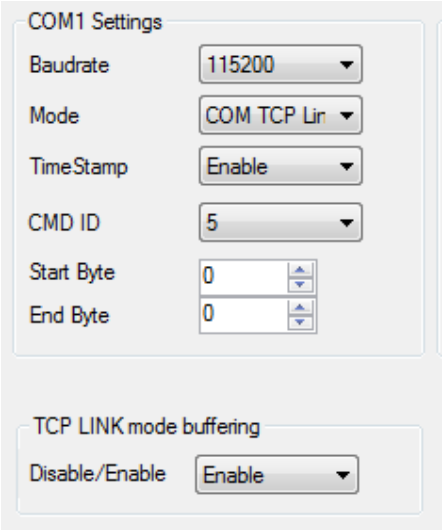


Figure 76 TCP link mode binary parameters

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

13.8.10 NMEA Log Mode

In this mode NMEA logs are sent via COM2 ports.

13.8.11 Records to LCD mode

In this mode records are sent via ports.

14 SMS COMMAND LIST

SMS commands are used to identify FM6300 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 36 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	Yes

Command	Description	Response
	# - 1,2,3 1 – operators [1-20] 2 – operators [21-40] 3 – operators [41-50]	
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 0 – OFF, 1 – ON Y1 – timeout for DO1 Y2 – timeout for DO2 Y3 – timeout for DO3 Y4 – timeout for DO4	Yes
getparam #	Readout parameter value according entered ID. # - ID value.	Yes
setparam # #	Set parameter value according entered ID and Value. 1.# - ID value. 2.# - New Parameter Value	Yes
flush #,#,#,#,#,#,#	Initiates all data sending to specified target server 1.# - IMEI 2.# - APN 3.# - LOGIN 4.# - PASS 5.# - IP 6.# - PORT 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

14.1 getstatus

Table 37 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
Network Type	Information about connected network: 0 – 3G, 1- 2G
Active SIM	Active SIM

Answer Example: Data Link: 1 GPRS: 1(1) Phone: 0 SIM: 0 OP: 22288 Signal: 5 NewSMS: 0 Roaming: 0 SMSFull: 0 LAC: 26050 Cell ID: 34371 Network Type: 1 SIM1

14.2 getweektime

Table 38 getweektime command response

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

14.3 getops

Table 39 getops command response

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

Answer Example: GSM OP LIST: 0. 24602

14.4 readops

Table 40 readops command response

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

14.5 getnmeainfo

Table 41 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

14.6 getcfgtime

Table 42 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

14.7 getgps

Table 43 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

14.8 loadprofile#

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

14.9 cpureset

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

14.10 resetallprof

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

14.11 getver

Table 44 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:00.02.77 Device IMEI:861075029463221 Device ID:000014 BL Ver:06.46 Modem Ver:Quectel UC20 UC20GQBR03A14E1G Hw:K-Line QUECTEL HW.5 DSIM

14.12 getio

Table 45 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

14.13 getinfo

Table 46 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

14.14 deleterecords

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

14.15 readio

Table 47 readio command response

Response details	Description
ID	IO element ID
Value	IO Element value

Answer Example: IO ID:3 Value:0

14.16 setdigout #### X Y Z W

Sets digital outputs to ON or OFF state.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.

Device Ans example: "DOUTS are set to:0010 TMOs are: 0 0 5 0. Out1 Scenario: Enabled Out2 Scenario: Disabled"

14.17 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 48 getparam####

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

Example: 'getparam 240' command will request SIM1 APN.

14.18 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 240 internet' will change SIM1 APN with new value"internet"

For ignoring value and leave it as it was before "?" should be used.

14.19 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 49 flush SMS

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.

14.20 getgnss

Table 50 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

14.21 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.

14.22 banlist

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

Table 51 banlist

Response details	Description
A	Banned operator code
Bs	Time left
C	Reason (1 – can't connect to operator; 2 – can't open GPRS connection; 3 – operator closed connection itself; 4 – connection to operator was successful, but after that device was disconnected from GSM network)
D	Counter (how many times this operator code was already banned)

14.23 crashlog

Returns list of possible device crashes.

14.24 braminfo

Table 52 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

14.25 odinfo

Odometer Debug info.

Table 53 odinfo

Field Name	Full Name	Posible values
E	Odoemter Enable	0-Disable 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 1-Restarting 2-Ready no FIX 3-Working FIX 4-Sleep
FIX:	GPS FIX	0- No FIX 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 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

15 FM6300 WITH LV-CAN 200 AND ALL-CAN 300 CAN ADAPTER

15.1 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 FM6300 device is able to collect and send vehicle data.

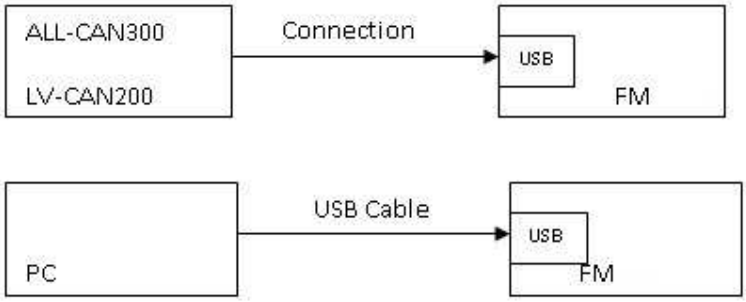


Figure 77 connection block diagram

FM6300 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)

15.2 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.

15.2.1 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.

CAN program number can be obtained via SMS: **lvcangetprog**
Response: "CAN Program Nr: XXX"

Get CAN info by SMS: **lvcangetinfo**
Response: "Prog: 139SWRevison: 6KernVer: 10KernVar: 49MdlID: 8884443332221110"

15.2.2 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 78 Adapter signaling led

15.2.3 Program number logic change

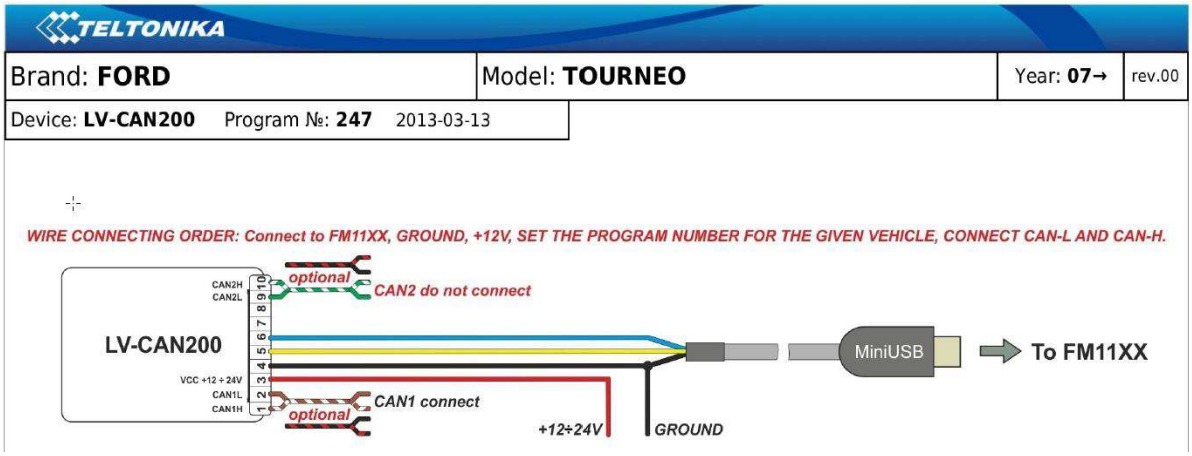
Due to the growing number of supported cars, program numbers have exceeded 999. In order to maintain one number format, we are moving from 3 digits, to 4 digits program numbers.

In new LV-CAN200/ALL-CAN300 firmware (from 2017-09-01) all program numbers that were up to 999 are changed to start from 1000. So that further program numbers would continue the counting with 4 digit numbers.

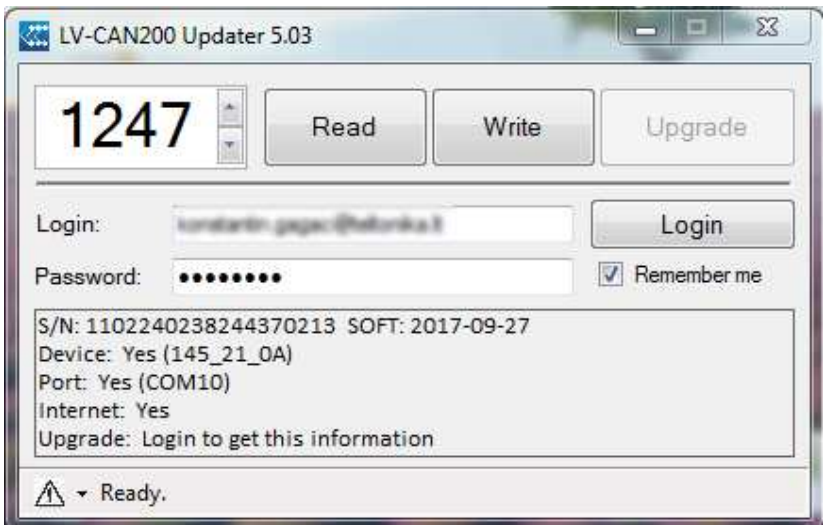
However, all existing program numbers stays the same, it is just "1" appeared in front of them. Device still understands entered 3 digit program number (via SMS/GPRS), it will automatically add "1" before it. If you enter "247" - device will turn it into the "1247". In Bootloader it is only 4 digit format available, just add "1" in from of the needed program number.

Example:

If use oldest connection schemes where program number displayed as 3 digit program number:



Using LV-CAN200/ALL-CAN300 Bootloader from soft version 2017-09-27 need add "1" before it:



15.3 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**.**

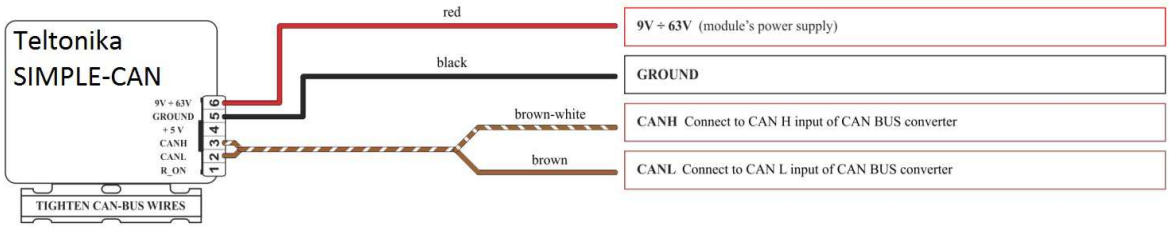


Figure 79 Simple can connection

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.

15.4 Connecting FM6300 Can adapters ALL-CAN300 and LV-CAN200

Connect USB Plug to FM6300 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 connections are optional it depends on exact car model.

For exact pinout see sticker on Light Vehicles Can adapter.

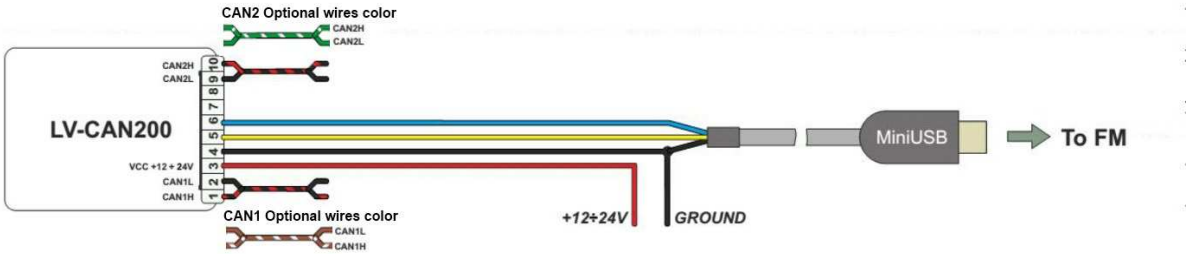


Figure 80 LV-CAN200 Adapter connection cable pinout

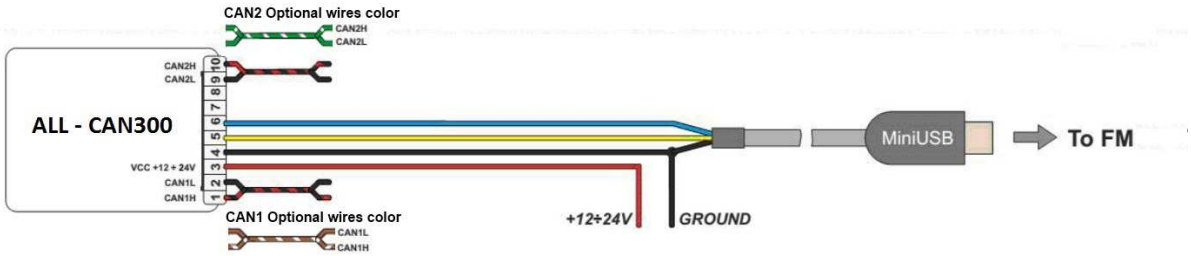


Figure 81 ALL-CAN300 Adapter connection cable pinout

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.

15.5 FM6300 Configuraton

FM6300 shares the same USB port for connecting LV-CAN200 or ALL-CAN300 adapter and configuring device with PC.

FM6300 can be configured using “SCAN” function or “Offline Configuration”

SCAN function – is in use when FM6300 is connected to CAN adapter (Figure 79), then wait 10s (Note, that car engine must be started), disconnect adapter from FM6300, and connect PC USB cable to FM6300 Device, It is very important not to disconnect FM6300 from power source during this operation, because if FM6300 is reconnected all received CAN bus data will be lost. FM6300 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 FM6300 device (Figure 80) wait 10 seconds. Note, that car engine must be started.
2. Disconnect LV-CAN200 or ALL-CAN300 from FM6300 and connect PC USB cable to FM6300 Device, It is very important not to disconnect FM6300 from power source, because then all CAN data will be lost.

Figure 82 Connect adapter LV-CAN200 to FM6300

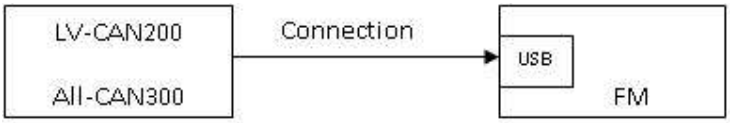
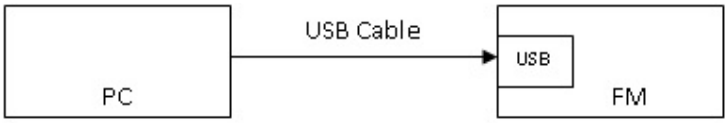


Figure 83 Connect FM6300 to PC and configure



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 FM6300 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, FM6300 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, FM6300 generates event by "Data Acquisition Type" settings. Figure 84 show example of FM6300 CAN configuration.

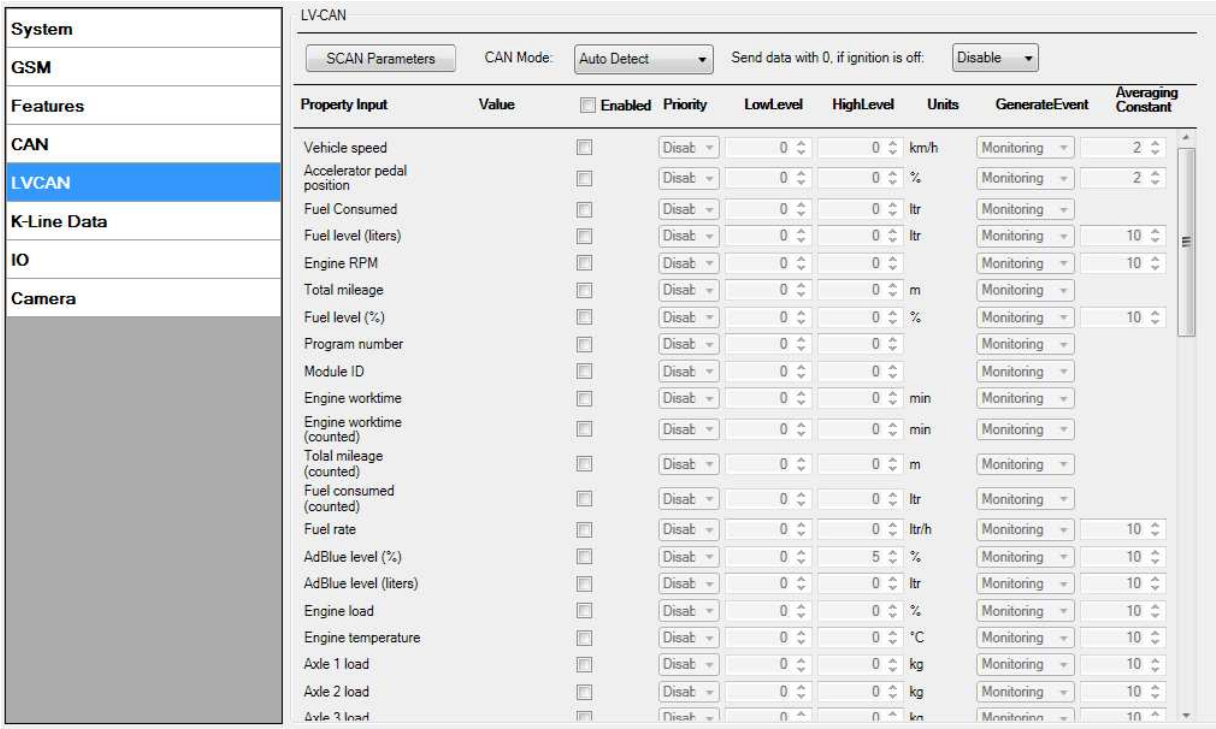


Figure 84 Configurator example

LVCAN mode (ID=903)

This parameter sets LVCAN/ALLCAN detection, available values: 0 – Auto Detect, 1 – LVCAN200, 2 – ALLCAN300.

Minimum	Maximum	Recommended	Goes with (depends on)	Value

value	value	value	parameters	type
0	2	0		U8

Send data with 0, if ignition is off. Depending on LVCAN/ALLCAN I/O parameters and ignition status, FM6300 can send *locked* (last known) LVCAN/ALLCAN I/O parameters values, *reset* values (set to 0) and *active* (real time) parameters values.

When ignition is off, LVCAN/ALLCAN I/O parameters values sent to server are:

Speed	reset
Accelerator pedal position	reset
Total fuel used	lock
Fuel level (liters)	lock
Engine RPM	reset
Total mileage	lock
Fuel level (proc.)	lock
Program number	lock
Module ID	lock
Engine Work Time	lock
Engine Work Time (counted)	lock
Total Mileage (counted)	lock
Fuel Consumed (counted)	lock
Fuel Rate	reset
AdBlue Level (percent)	lock
AdBlue Level (liters)	lock
Engine Load	reset
Engine Temperature	active
Axle 1 Load	lock
Axle 2 Load	lock
Axle 3 Load	lock
Axle 4 Load	lock
Axle 5 Load	lock
Control State Flags	active
Agricultural Machinery Flags	active
Harvesting Time	lock
Area of Harvest	reset
Mowing Efficiency	active
Grain Mown Volume	active
Grain Moisture	active
Harvesting Drum RPM	reset
Gap Under Harvesting Drum	active
Security State Flags	active
Tachograph Total Vehicle Distance	lock
Trip Distance	reset
Tachograph Vehicle Speed	reset
Tachograph Driver Card Presence	active
Driver1 States	active
Driver2 States	active
Driver1 Continuous Driving Time	active

Driver2 Continuous Driving Time	active
Driver1 Cumulative Break Time	active
Driver2 Cumulative Break Time	active
Driver1 Selected Activity Duration	active
Driver2 Selected Activity Duration	active
Driver1 Cumulative Driving Time	active
Driver2 Cumulative Driving Time	active

Send data with 0, if ignition is off (ID=904)

This parameter enables/disables data sending with 0 value, if ignition is off. 0 – disable, 1- enable.

Minimum value	Maximum value	Recommended value	Goes with (depends on) parameters	Value type
0	1	1		U8

15.6 Parameters ID

When no I/O element is enabled, AVL packet comes with GPS information only. After enabling I/O element(s) AVL packet comes with GPS information and also contains current value(s) of enabled I/O element. AVL packet decoding is described in "FMXXXX Protocols" document. List of available CAN bus data, parameter size, ID and value range you can find in Table 31

Table 54 ACQUIRED LV- CAN200 PARAMETRS IO ID

Property ID in AVL packet	Property Name	Bytes	Description
30	LVCAN Speed	1	Value in km/h
31	LVCAN Acc Pedal	1	Value in persentages, %
33	LVCAN Fuel Consumed	4	Value in liters, L
34	LVCAN Fuel Level (liters)	2	Value in liters, L
35	LVCAN Engine RPM	2	Value in rounds per minute, rpm
36	LVCAN Total Mileage	4	Value in meters, m
37	LVCAN Fule Level (percent)	1	Value in percentages, %
12	LVCAN Program Number	4	LVCAN Program Number

NOTE: "Total Fuel Used" is sent to server multiplied by 10.
Example: if value was 150.5 liters, „1505" will be sent to server.

Table 55 ACQUIRED ALL-CAN300 PARAMETRS IO ID

Property ID in AVL packet	Property Name	Bytes	Description
14	LVCAN Engine Work Time	4	Engine work time in minutes

Property ID in AVL packet	Property Name	Bytes	Description
15	LVCAN Engine Work Time (counted)	4	Total Engine work time in minutes
16	LVCAN Total Mileage (counted)	4	Total Vehicle Mileage, m
17	LVCAN Fuel Consumed (counted)	4	Total Fuel Consumed,liters * 10
18	LVCAN Fuel Rate	2	Fuel Rate, liters *10
19	LVCAN AdBlue Level (percent)	1	AdBlue, %
20	LVCAN AdBlue Level (liters)	2	AdBlue level, L
23	LVCAN Engine Load	1	Engine load, %
25	LVCAN Engine Temperature	2	Engine Temperature, 10 * Degrees (°C),
26	LVCAN Axle 1 Load	2	Axle 1 load, kg
27	LVCAN Axle 2 Load	2	Axle 2 load, kg
28	LVCAN Axle 3 Load	2	Axle 3 load, kg
29	LVCAN Axle 4 Load	2	Axle 4 load, kg
32	LVCAN Axle 5 Load	2	Axle 5 load, kg
38	LVCAN Control State Flags	4	Control state flags
39	LVCAN Agricultural Machinery Flags	8	Agricultural machinery flags
40	LVCAN Harvesting Time	4	Harvesting Time, minutes
41	LVCAN Area of Harvest	4	Area of Harvest, m^2
42	LVCAN Mowing Efficiency	4	Mowing efficiency, (m^2)/h
43	LVCAN Grain Mown Volume	4	Mown Volume, kg
44	LVCAN Grain Moisture	2	Grain Moisture in proc, %
45	LVCAN Harvesting Drum RPM	2	Harvesting Drum RPM, RPM
46	LVCAN Gap Under Harvesting Drum	1	Gap Under Harvesting Drum, mm
47	LVCAN Security State Flags	8	Security State Flag
48	LVCAN Tacho Total Vehicle Distance	4	Tacho Total Vehicle Distance, m
49	LVCAN Trip Distance	4	Trip Distance, m
52	LVCAN Tacho Vehicle Speed	2	Tacho Vehicle Speed, km/h
53	LVCAN Tacho Driver Card Presence	1	Tacho Driver Card Presence
54	LVCAN Driver1 States	1	Driver1 States
55	LVCAN Driver2 States	1	Driver2 States
56	LVCAN Driver1 Continuous Driving Time	2	Driver1 Continuous Driving Time, minutes

Property ID in AVL packet	Property Name	Bytes	Description
57	LVCAN Driver2 Continuous Driving Time	2	Driver2 Continuous Driving Time, minutes
58	LVCAN Driver1 Cumulative Break Time	2	Driver1 Cumulative Break Time, minutes
59	LVCAN Driver2 Cumulative Break Time	2	Driver2 Cumulative Break Time, minutes
60	LVCAN Driver1 Duration Of Selected Activity	2	Driver1 Duration Of Selected Activity, minutes
61	LVCAN Driver2 Duration Of Selected Activity	2	Driver2 Duration Of Selected Activity, minutes
69	LVCAN Driver1 Cumulative Driving Time	2	Driver1 Cumulative Driving Time, minutes
77	LVCAN Driver2 Cumulative Driving Time	2	Driver2 Cumulative Driving Time, minutes
106	LVCAN Driver1 ID High	8	Driver1 ID High
107	LVCAN Driver1 ID Low	8	Driver1 ID Low
108	LVCAN Driver2 ID High	8	Driver2 ID High
140	LVCAN Driver2 ID Low	8	Driver2 ID Low
141	LVCAN Battery Temperature	2	10* Degrees, (°C)
142	LVCAN Battery Level (percent)	1	Value in percentages, %
143	LVCAN Door Status	2	Door status value: Min – 0, Max – 16128 Door status is represented as bitmask converted to decimal value. Possible values: 0 – all doors closed, 0x100 (256) – front left door is opened, 0x200 (512) – front right door is opened, 0x400 (1024) – rear left door is opened, 0x800 (2048) – rear right door is opened, 0x1000 (4096) – hood is opened, 0x2000 (8192) – trunk is opened, 0x3F00 (16128) – all doors are opened, or combinations of values
176	LVCAN DTC Errors	1	DTC errors count
226	LVCAN CNG Status	1	0 – engine not on CNG 1 – engine not on CNG
227	LVCAN CNG Used	4	CNG used Value in kg * 10
228	LVCAN CNG Level	2	CNG level in percentages, % * 10
177	LVCAN DTC Codes		DTC codes

NOTE:

„Total Fuel Used“ is sent to server multiplied by 10.
Example: if value was 150.5 liters, „1505“ will be sent to server.

Table 56 ALLCAN300 IO element values

Idx	Description	Size,	AVL	Value bitmasks

		Bytes	ID	
1	Control state flags	4	38	**Byte0 (LSB):** **0x01** – STOP **0x02** – Oil pressure / level **0x04** – Coolant liquid temperature / level **0x08** – Handbrake system **0x10** – Battery charging **0x20** – AIRBAG **Byte1:** **0x01** – CHECK ENGINE **0x02** – Lights failure **0x04** – Low tire pressure **0x08** – Wear of brake pads **0x10** – Warning **0x20** – ABS **0x40** – Low Fuel **Byte2:** **0x01** – ESP **0x02** – Glow plug indicator **0x04** – FAP **0x08** – Electronics pressure control **0x10** – Parking lights **0x20** – Dipped headlights **0x40** – Full beam headlights **Byte3:** **0x40** – Passenger's seat belt **0x80** – Driver's seat belt
2	Agricultural machinery flags	8	39	**Byte0 (LSB):** **0x01** – Mowing **0x02** – Grain release from hopper **0x04** – First front hydraulic turned on **0x08** – Rear Power Take-Off turned on **Byte1:** **0x01** – Excessive play under the threshing drum **0x02** – Grain tank is open **0x04** – 100% of Grain tank **0x08** – 70% of Grain tank **0x10** – Drain filter in hydraulic system of drive cylinders is plugged **0x20** – Pressure filter of drive cylinders hydraulic system is plugged **0x40** – Alarm oil level in oil tank **0x80** – Pressure filter of brakes hydraulic system is plugged **Byte2:** **0x01** – Oil filter of engine is plugged **0x02** – Fuel filter is plugged **0x04** – Air filter is plugged **0x08** – Alarm oil temperature in hydraulic system of chasis

				0x10 – Alarm oil temperature in hydraulic system of drive cylinders 0x20 – Alarm oil pressure in engine 0x40 – Alarm coolant level 0x80 – Overflow chamber of hydraulic unit **Byte3:** 0x01 – Unloader drive is ON. Unloading tube pivot is in idle position 0x02 – No operator! 0x04 – Straw walker is plugged 0x08 – Water in fuel 0x10 – Cleaning fan RPM 0x20 – Trashing drum RPM **Byte4:** 0x02 – Low water level in the tank 0x04 – First rear hydraulic turned on 0x08 – Standalone engine working 0x10 – Right joystick moved right 0x20 – Right joystick moved left 0x40 – Right joystick moved front 0x80 – Right joystick moved back **Byte5:** 0x01 – Brushes turned on 0x02 – Water supply turned on 0x04 – Vacuum cleaner 0x08 – Unloading from the hopper 0x10 – High Pressure washer (Karcher) 0x20 – Salt (sand) disperser ON 0x40 – Low salt (sand) level **Byte6:** 0x01 – Second front hydraulic turned on 0x02 – Third front hydraulic turned on 0x04 – Fourth front hydraulic turned on 0x08 – Second rear hydraulic turned on 0x10 – Third rear hydraulic turned on 0x20 – Fourth rear hydraulic turned on 0x40 – Front three-point Hitch turned on 0x80 – Rear three-point Hitch turned on **Byte7:** **0x01** – Left joystick moved right **0x02** – Left joystick moved left **0x04** – Left joystick moved front **0x08** – Left joystick moved back **0x10** – Front Power Take-Off turned on
3	Security state flags	8	47	**Byte0 (LSB):** 0x20 – bit appears when any operate button in car was put 0x40 – bit appears when immobilizer is in service mode 0x80 – immobiliser, bit appears during introduction of a programmed sequence of keys in the car.

				Byte1: **0x01** – the key is in ignition lock **0x02** – ignition on **0x04** – dynamic ignition on **0x08** – webasto **0x20** – car closed by factory's remote control **0x40** – factory-installed alarm system is actuated (is in panic mode) **0x80** – factory-installed alarm system is emulated by module **Byte2:** **0x01** – parking activated (automatic gearbox) **0x10** – handbrake is actuated (information available only with ignition on) **0x20** – footbrake is actuated (information available only with ignition on) **0x40** – engine is working (information available only when the ignition on) **0x80** – revers is on **Byte3:** **0x01** – Front left door opened **0x02** – Front right door opened **0x04** – Rear left door opened **0x08** – Rear right door opened **0x10** – engine cover opened **0x20** – trunk door opened **Byte4:** **0x01** – car was closed by the factory's remote control **0x02** – car was opened by the factory's remote control **0x03** – trunk cover was opened by the factory's remote control **0x04** – module has sent a rearming signal **0x05** – car was closed three times by the factory's remote control - High nibble (mask 0xF0 bit) **0x80** – CAN module goes to sleep mode
4	Tachograph driver card presence	1	53	**0x00** – No driver card **0x01** – Driver1 card presence **0x02** – Driver2 card presence **0x03** – Driver1 and driver2 cards present
5	Driver 1 states	1	54	**0xX0** – break/rest **0xX1** – availability **0xX2** – work **0xX3** – driving **0x0X** – no time-related warning detected **0x1X** – limit #1: 15 min before 4 1/2 h **0x2X** – limit #2: 4 1/2 h reached (continuous driving time exceeded) **0x3X** – limit #3: 15 minutes before optional warning 1 **0x4X** – limit #4: optional warning 1 reached **0x5X** – limit #5: 15 min before optional warning **0x6X**
6	Driver 2 states	1	55	

				– limit #6: optional warning 2 reached
7	LVCAN Door Status	2	143	Door status value: Min – **0**, Max – **16128** Door status is represented as bitmask converted to decimal value. Possible values: 0 – all doors closed, **0x100** (256) – front left door is opened, **0x200** (512) – front right door is opened, **0x400** (1024) – rear left door is opened, **0x800** (2048) – rear right door is opened, **0x1000** (4096) – hood is opened, **0x2000** (8192) – trunk is opened, **0x3F00** (16128) – all doors are opened, or combinations of values

16 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.*

16.1 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.

16.2 Configuration

Manual CAN data can be configured using "Manual CAN" in CAN tab, Figure 85 below (CAN configuration window).

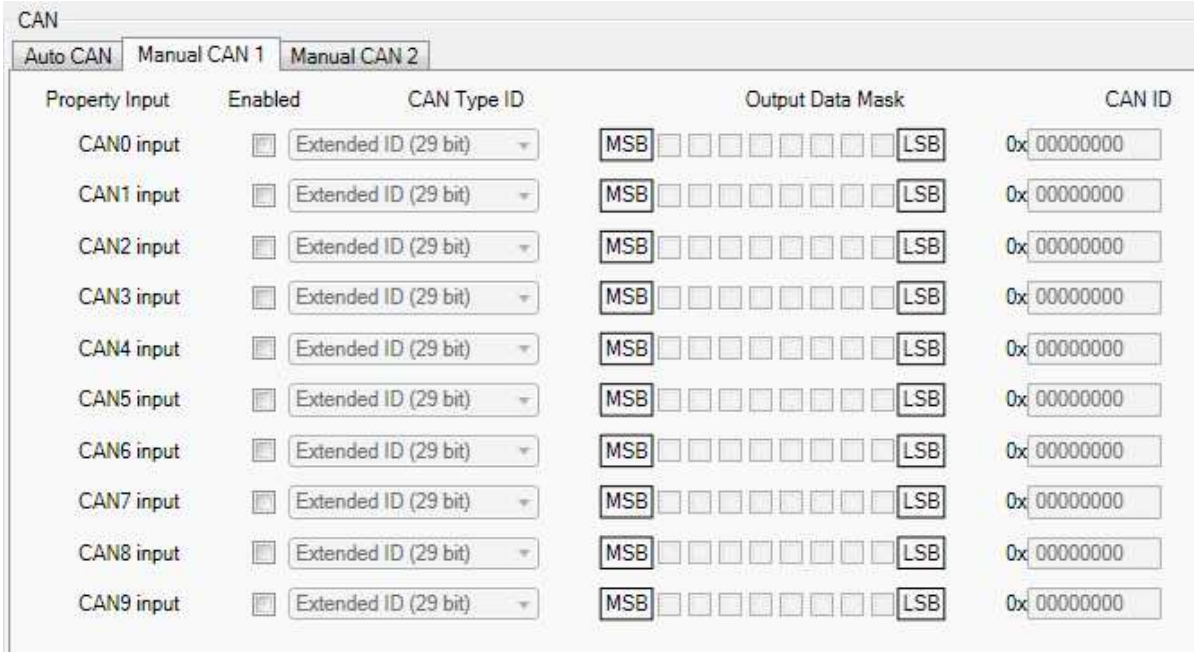


Figure 85 CAN configuration window

CAN message ID type: Message ID type (Figure 86) two types according to SAEJ1939 standard: Standard ID (value: 0 to 0x7FFh) and Extended ID (value: 0 to 0x1FFFFFFFh).

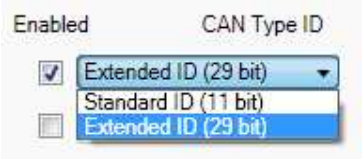


Figure 86 CAN message ID types

Message ID value is entered in hex format. This parameter is used to configure hardware message filter (Figure 87). 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 87 CAN message filter configuration

16.3 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 FM6300 module while integrating it.

Example:

All Mercedes Benz Actros 2 models with Vehicle Identification Number (VIN) starting with WDB93 have a possibility to connect FM6300 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 88):

Pin 5: CAN Low signal (yellow wire)

Pin 2: CAN High signal (blue wire)

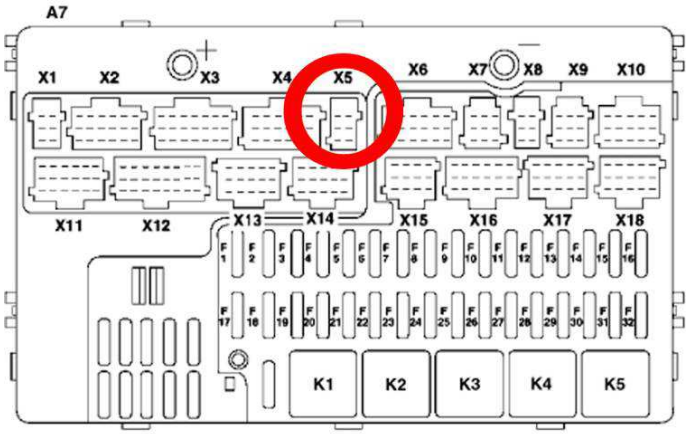


Figure 88 X5 plug on Mercedes Benz

In the example FM6300 will filter all CAN messages with identifier FFFEE9FF (fuel consumption) (Figure 89).

Figure 89 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 57 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 90).

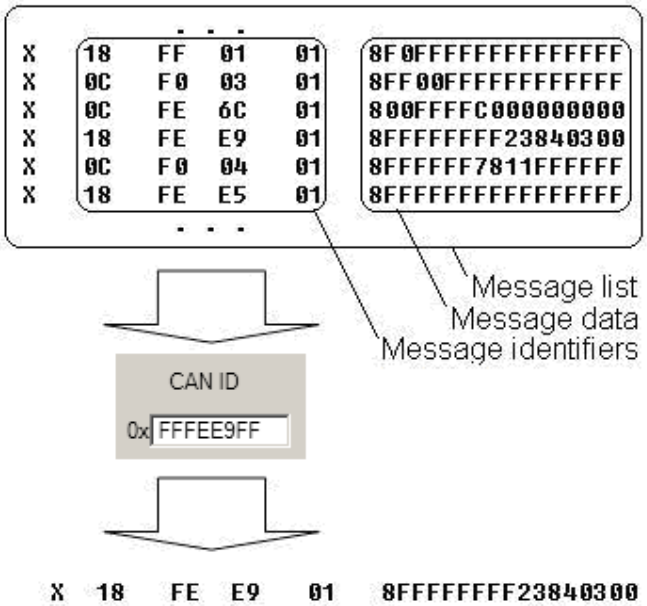


Figure 90 Example

When certain message is filtered, FM6300 checks which data bytes should be sent to server. Document indicates that 5-8 bytes are used in FMS standard.

Table 58 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

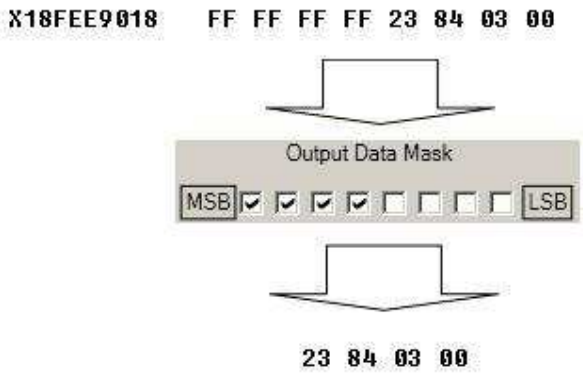


Figure 91 Example

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.

16.4 FM6300 J1708 Connection

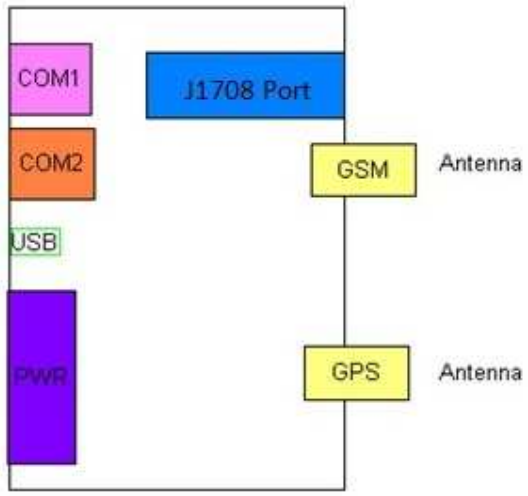


Figure 92 FM6300 diagram

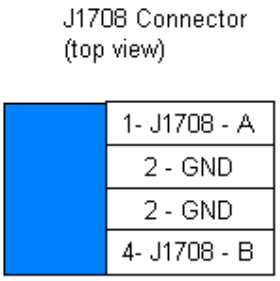


Figure 93 J1708 Connector diagram

Connection with Vehicle port

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

FM6300	Vehicle
J1708-A	J1708A J1708+
J1708-B	J1708B and J1708-

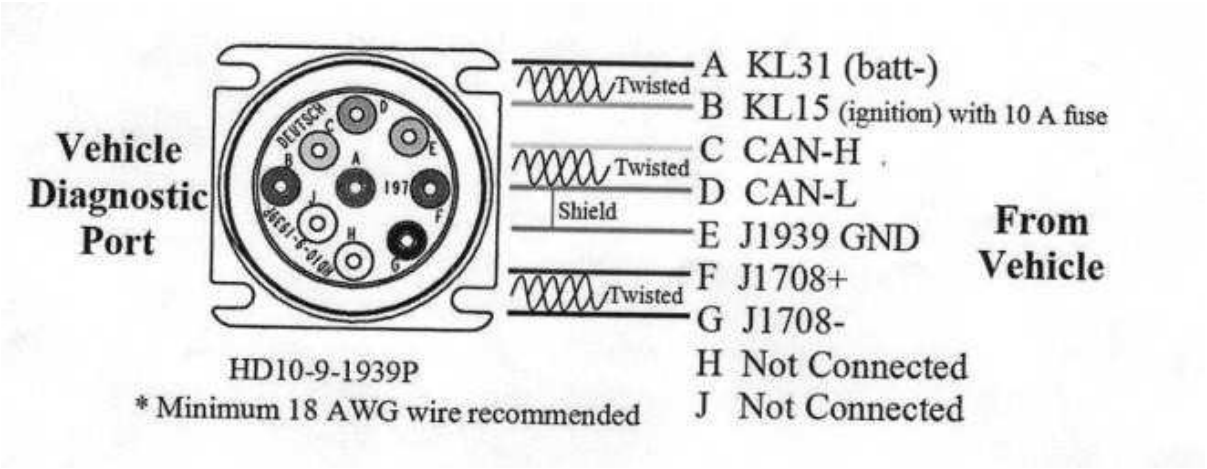


Figure 94 Example of Diagnostic port

16.5 Software Configuration of FM6300 with J1708

Firmware version: 00.00.24 or above
Configurator version: 1.0.0.12

Step 1

Enable J1708 Line in External Devces Tab

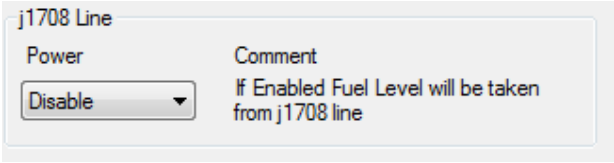


Figure 95 J1708 Line configuration

Option 1

Enable Fuel Level in AutoCAN

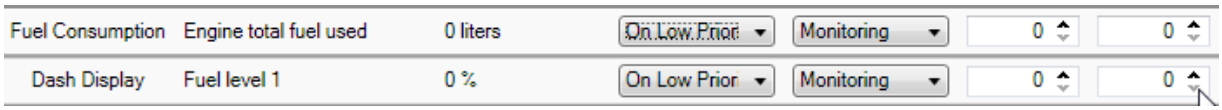


Figure 96 AutoCan fuel

For AVL ID please consult FMS document.

Option 2

Enable PGN in manual CAN

Figure 97 ManualCan fuel

16.6 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 FM6300 to computer with Port ½ cable. Launch FM6300xx configurator version 1.1.1.7 or higher. Push "Connect"button, then „CAN"button (Figure 98). CAN configuration menu will be opened.

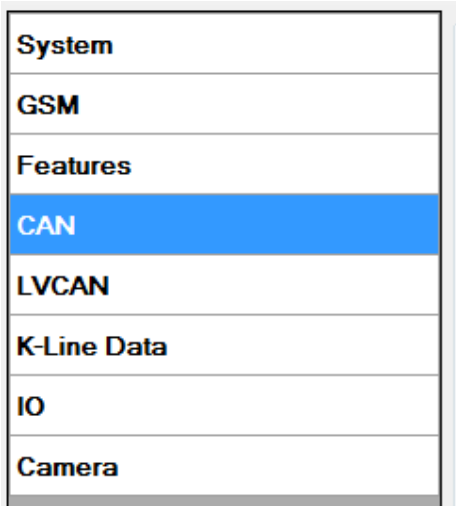


Figure 98 Entering CAN configuration

- 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 FM6300 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;

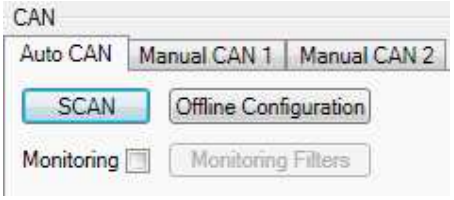


Figure 99 CAN configuration menu

16.6.1 Configuration

To start CAN configuration push "SCAN" button. A table of all available CAN messages will appear (Figure 100). 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:
  - Disabled – Data will not be collected
  - On low priority – records will be generated as low priority events;
  - On high priority – records will be generated as high priority events and immediately sent to server via GPRS (if GPRS is available);
  - 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:
  - Monitoring – monitors data;
  - On change – record is generated when parameter value is changed;
  - Hysteresis – record is generated when increasing parameter value becomes higher than High value, and decreasing becomes less than Low value
  - Event on exit – record is generated when parameter value becomes higher than High value or lower than Low value;
  - Event on entrance – record is generated when parameter value becomes between High and Low values;
  - 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;

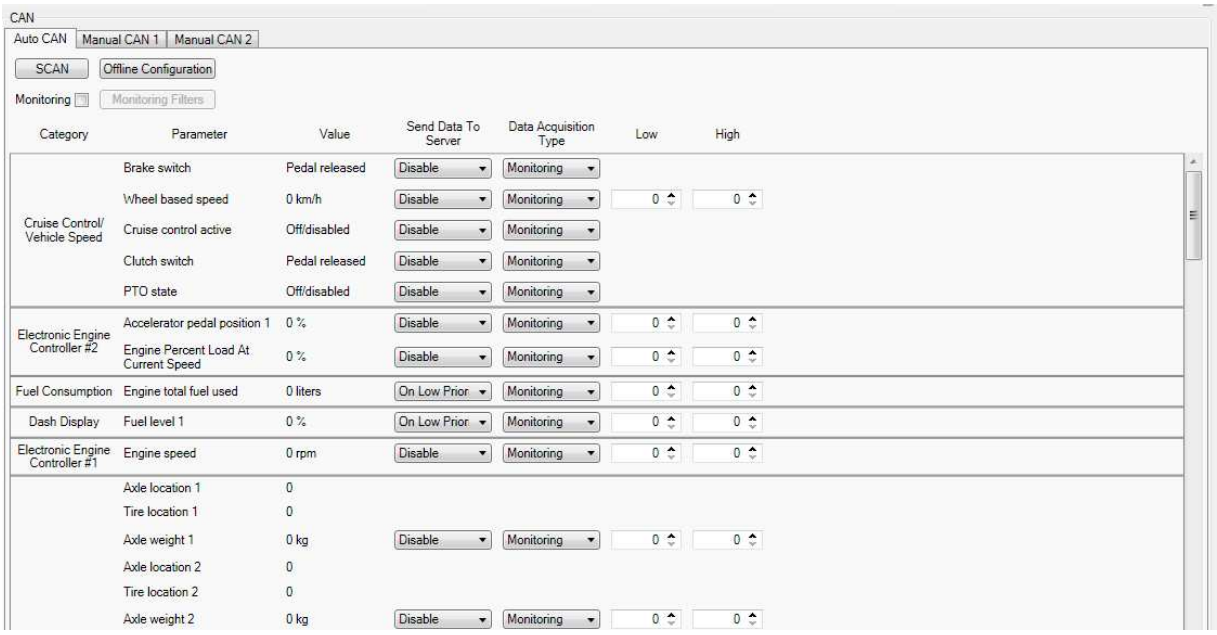


Figure 100 CAN data table

16.6.2 CAN monitoring

To start CAN bus monitoring mark *Monitoring* check box. Table of available CAN messages will appear (Figure 100). Data from CAN bus will be updated every 3 seconds. In order to see only desired data open “Monitoring filters” menu (Figure 101).

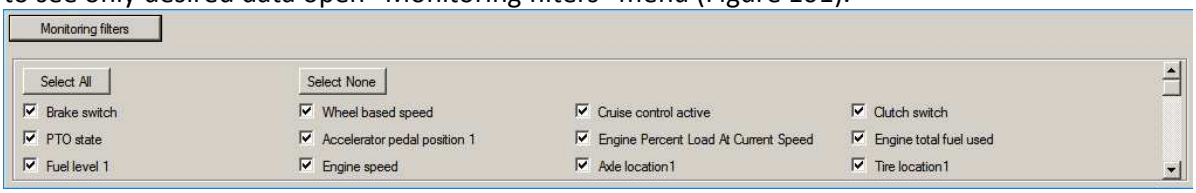


Figure 101 Monitoring filters

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 FM6300 configurator function; it does not enable data sending to server. In order to configure data sending to server refer to Configuration section.

16.6.3 Offline configuration

When FM6300 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.

16.6.4 AutoCAN ID list

Table 59 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 0 = pedal released 1 = pedal depressed
	2	2	wheel based speed	4	80	0-65536 (km/h)*
	3	3	cruise control active	1	81	0-1 0 = switched off 1 = switched on
	4	4	clutch switch	1	82	0-1 0 = pedal released 1 = pedal depressed
	5	5	PTO state	1	83	0-3 0 = off/disabled 1 = Set 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 (%)*

Category name	Par Nr in P:FMS:	Par Nr. In P:FMSDAT:	(signal) name	Size (Bytes)	Param IO ID	Value range
61444 – Electronic Engine Controller #1	10	10	engine speed X	4	88	0 – 8031,875 (rpm)*
65258 – Vehicle Weight **	[11-25] (Tire No 1 - 15)	11	Axle location	1		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 0 = diagnostics is not supported 1 = diagnostics is supported 2 = reserved 3 = don´t care
	30	16	Requests supported X	1	111	0-3 0 = request is not supported 1= request is supported 2 = reserved 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 1 – Motion Detected
	34	20	driver 2 working state X	1	115	0 – Rest 1 – Driver Available 2 – Work 3 - Drive 4 – Error 5 – not available
	35	21	driver 1 working state X	1	116	0 – Rest 1 – Driver Available 2 – Work 3 - Drive 4 – Error 5 – not available
	36	22	Vehicle overspeed	1	117	0 – No Overspeed 1 – Overspeed

Category name	Par Nr in P:FMS:	Par Nr. In P:FMSDAT:	(signal) name	Size (Bytes)	Param IO ID	Value range
	37	23	Driver 1 time rel. states	1	118	0 – Normal 1 – 15min bef. 4,5h 2 – 4,5h reached 3 – 15min bef. 9h 4 – 9h reached 5 – 15min bef. 16h 6 – 16h reached 7 – Error 8 – not available
	38	24	Driver 2 time rel. states	1	119	0 – Normal 1 – 15min bef. 4,5h 2 – 4,5h reached 3 – 15min bef. 9h 4 – 9h reached 5 – 15min bef. 16h 6 – 16h reached 7 – Error 8 – not available
65132 - Tachograph	39	25	Driver 1 card X	1	120	0 – Card Not Present 1 – Card Present
	40	26	Driver 2 card X	1	121	0 – Card Not Present 1 – Card Present
	41	27	Direction indicator	1	122	0 – Forward 1 – Reverse
	42	28	Tachograph performance X	1	123	0 – Normal Performance 1 – Performance Analysis
	43	29	Handling information X	1	124	0 – No Handling Information 1 – Handling Information
	44	30	System event X	1	125	0 – No Tacho Event 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 1 – At least one PTO drive is engaged 2 – Error 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.

Wheel based speed:
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.

Cruise control active:
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.

Clutch switch:
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.

<u>Accelerator pedal position 1:</u>

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).
Firmware sends value which is already adjusted with bitgain.

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). The value sent to the server has already been adjusted for the bitgain and offset.

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
Note: Firmware sends value which is already adjusted with bitgain.

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]. Firmware sends value which is already adjusted with bitgain.

Engine instantaneous fuel economy:
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. Firmware sends value which is already adjusted with bitgain.

At least one PTO engaged:
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].

High resolution engine total fuel used:
Note: Firmware sends value in liters without any conversion.

16.7 AutoCAN Configuration over SMS

16.7.1 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 FM6300 *to make a high priority event once the* FM6300 *either reaches higher than 70km/h speed or starts going lower than 50km/h.*

**If we want to configure FM6300 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)

16.7.2 AutoCAN element Id's

Table 60 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

Category name	Element ID	Element name
	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
	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

17 USING TACHOGRAPH

FM6300 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)

17.1 Connecting to tachograph

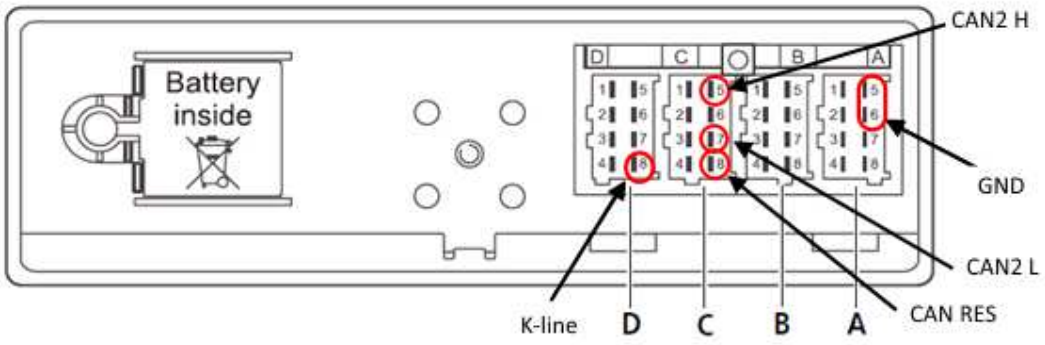


Figure 102 Tachograph connection

Connection to tachograph (Figure 102):

- 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.

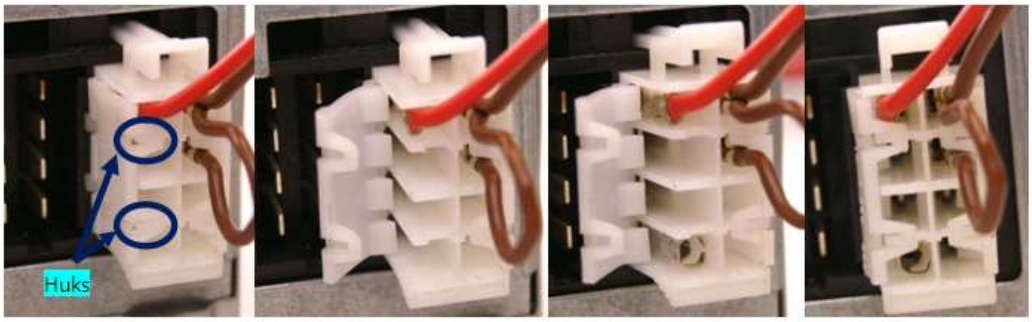


Figure 103 Adding contact on tachograph connector

- 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 103). Contact code in Farnell system: 927368-1.
- 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 is described in „K LINE ID“column (IO parameter ID).

Vehicle data configuration window (Figure 104) 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.

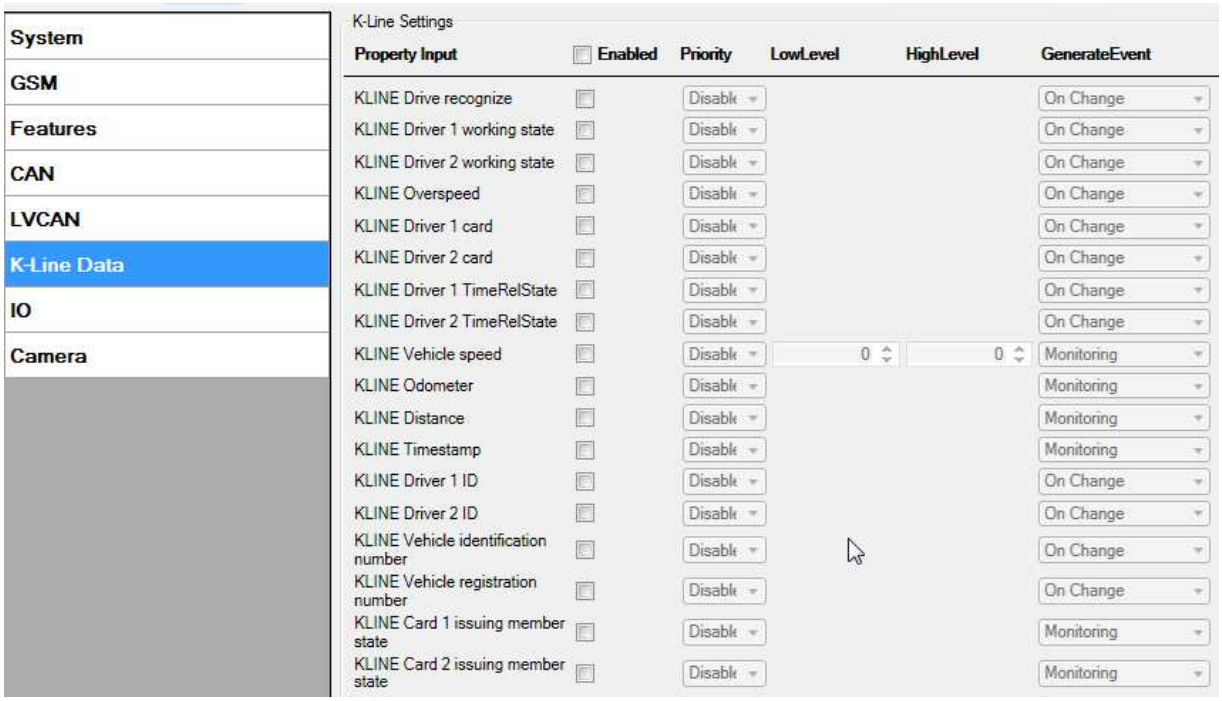


Figure 104 Vehicle data configuration window

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

17.2 WEB Tacho

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.

FM6300 device has a possibility to connect to WebDDD IP every 1 hour and check if there are any schedules for downloading DDD files. If FM6300 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

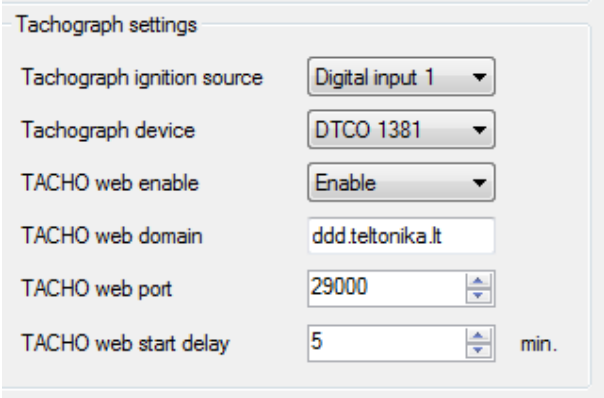


Figure 105 Connection to Web DDD

17.3 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]

<u>[T] – Tachograph presence on bus:</u>

- 0 – Tachograph doesn't respond on bus;
- 1 – Tachograph responds on bus.

<u>[R] – Response to OpenRemoteSession validity check:</u>

- 0 – Wrong or unknown response (failed to open RemoteSession);
- 1 – Tachograph responds positively (RemoteSession opened successfully).

<u>[C] – Response to CloseLastAuthenticationSession validity check:</u>

- 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.

<u>[K] – K-Line data presence on bus:</u>

- 0 – K-Line data not present on bus;
- 1 – K-Line data present on bus.

<u>[ABCD] – FMS data presence on bus:</u>

- 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.

18 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 also powered off.

18.1 RS485 modes

In Configurator's windows select External devices window where is RS485 Settings as shown in Figure 106.

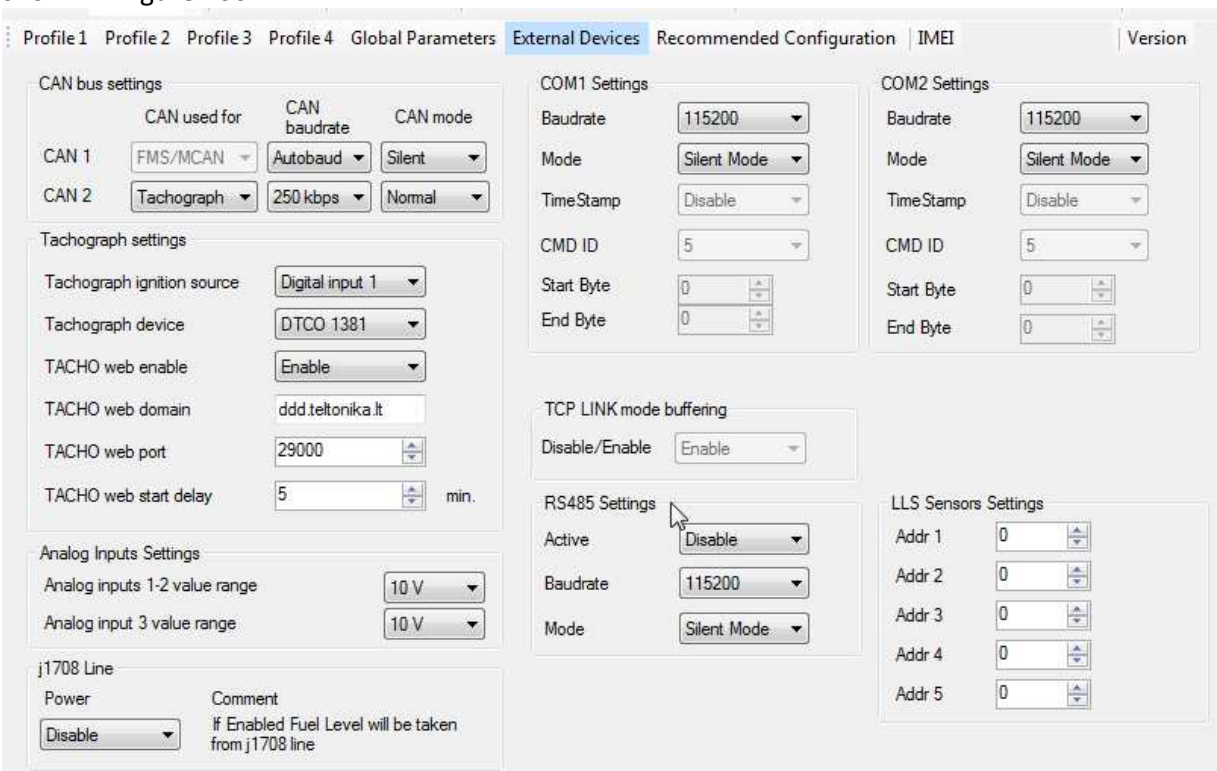


Figure 106 External Devices

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

18.1.1 RS485 Receive - Silent Mode

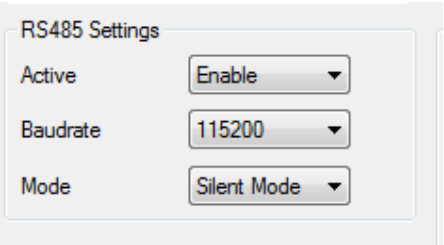


Figure 107 Silent Mode

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.

18.1.2 RS485 Transmit - FM Log Mode

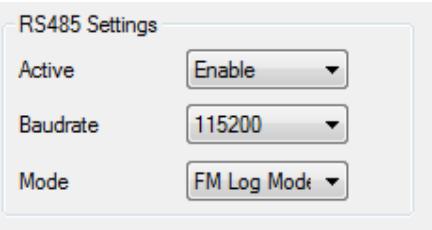


Figure 108 FM Log Mode

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

18.1.3 RS485 Transmit - GPS Nmea Mode

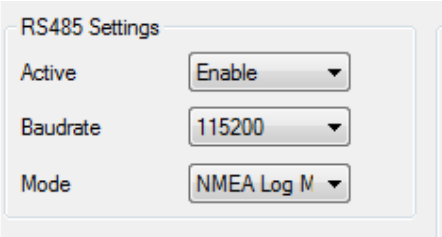


Figure 109 NMEA Log Mode

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

18.1.4 RS485 Receive - LLS Mode

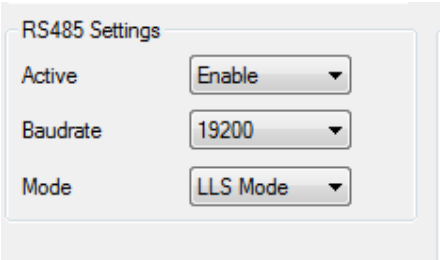


Figure 110 LLS Mode

The mode supports up to five LLS. Baud rate must be 19200. LLS have receiver id.

18.1.5 RS485 Receive -TCP Link Mode

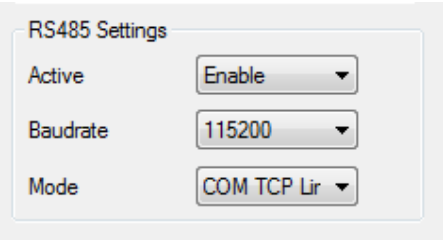


Figure 111 TCP Link Mode

RS485 works in receive mode. When data received from server RS485 is switched to transmit mode.

18.1.6 RS485 Receive - TCP Link Mode binary

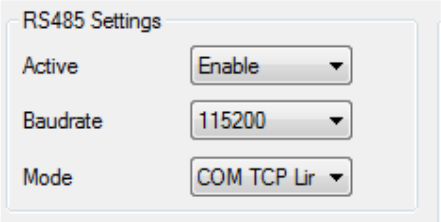
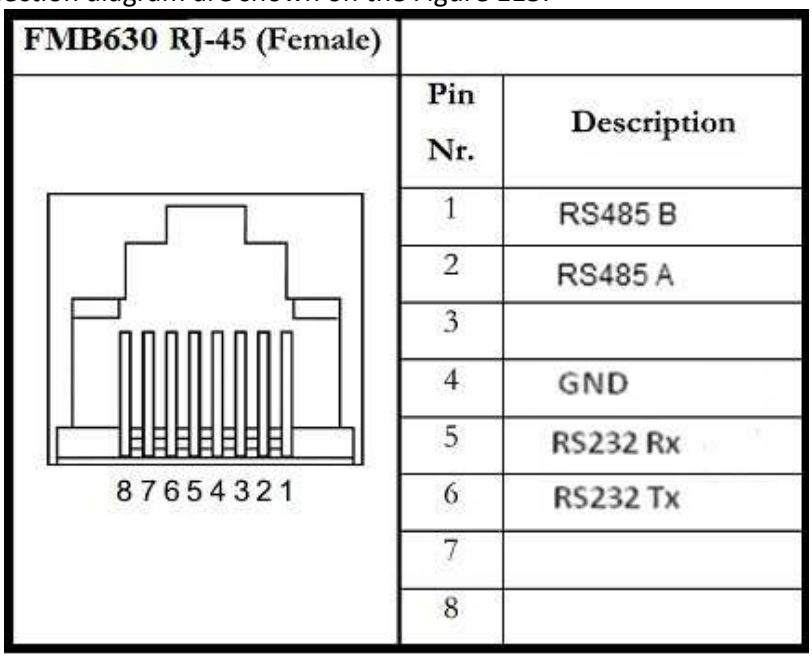


Figure 112 TCP link Mode binary

RS485 works in receive mode. When data received from server RS485 is switched to transmit mode.

18.2 RS485 interface

Port connection diagram are shown on the Figure 113:



Pin Nr.	Description
1	RS485 B
2	RS485 A
3	
4	GND
5	RS232 Rx
6	RS232 Tx
7	
8	

Figure 113 Port 1 connection diagram

Pins numbers 1 and 2 are intended to RS485 interface connection

19 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. FM6300 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 FM6300, 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 114).

Figure 114 RFID I/O parameter

To set up FM6300 so it can be connected to an RFID reader, Global parameters have to be set up. Go to extermal devices and set up COM1 or COM2 settings to RFID Mode or RFID MF7 Mode (the used mode depends on the mode that the RFID reader works). See Figure 115. The Baudrates for each mode are:

RFID Mode – 57600

RFID MF7 Mode – 9600

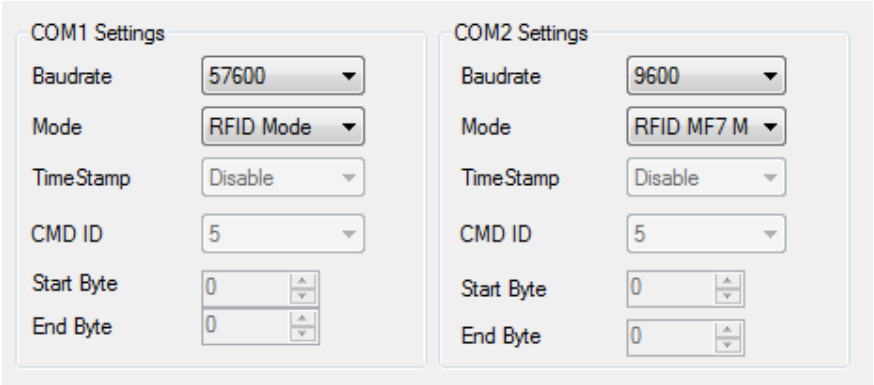


Figure 115 RFID Global parameter settings

The difference between RFID Mode and RFID MF7 Mode is that in RFID Mode FM6300 understands RFID messages that are in hexadecimal format and RFID MF7 Mode understands messages that are in decimal format. For example:

RFID Mode message – *"aa02$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 FM6300 depends on the reader.

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

20 GARMIN

Garmin provides a Fleet Management Interface Tool Kit which connected to FM6300 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.

FM6300 and Garmin operational scheme is shown in Figure 116 below:

Figure 116 FM6300 +Garmin operational scheme

20.1 Supported Garmin FMI Protocols

The following is a list of protocols supported and the corresponding feature/benefit. FM6300 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 FM6300 and Garmin products. For more information about Garmin products and FMI versions, please go to Garmin Products. Notice that some Garmin products use different connection cables than others.

20.1.1 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.

20.1.2 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.

20.2 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.

20.3 Text messaging

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

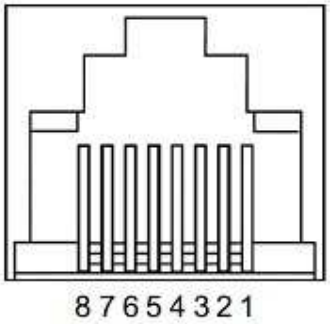
20.4 Destination message

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.

20.5 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.

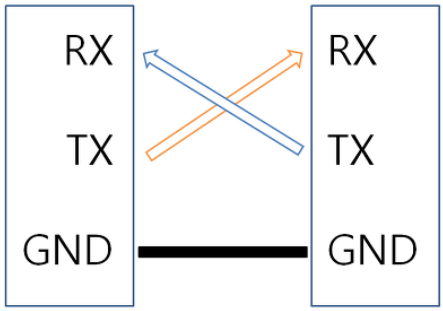
20.6 Connection and pinout



FMB630 RJ-45 (Female)	
Pin Nr.	Description
1	RS485 B
2	RS485 A
3	
4	GND
5	RS232 Rx
6	RS232 Tx
7	
8	

Figure 117 RJ45 Pinouts

FM6300 Rx (pin 5) should be connected with external device Tx likewise FM6300 Tx (pin 6) should be connected with external device Rx, also GND wires should be connected together.



FM6300 connection with external device

In order to connect Garmin PND to FM6300, Garmin mode has to be set in Global parameter settings (Figure 118). Simply choose Garmin mode in COM2 settings mode, but you cannot activate Garmin mode in both ports at the same time.

FM6300 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

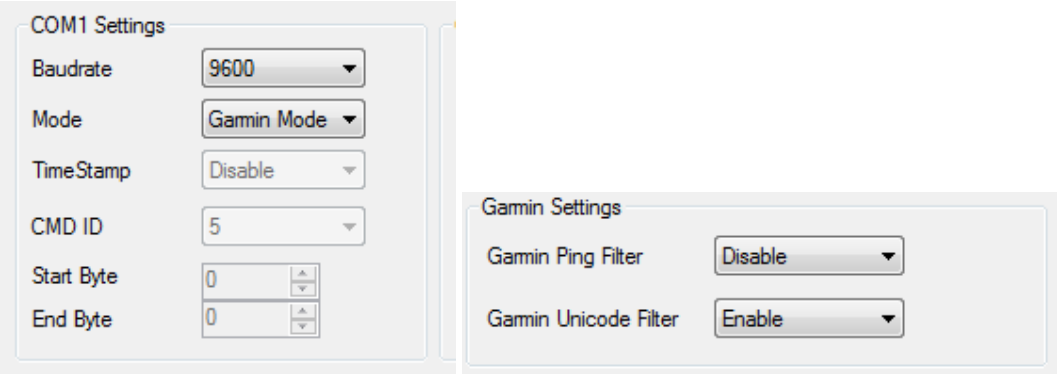


Figure 118
Configuration of Garmin in External devices and Global parameter settings

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: Garmin/Downloads.
Software version updates: Garmin/Softwares.

For more information about Garmin PND device connectivity to FM6300 and additional information, please contact to your local sales representative.

21 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).

21.1 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

21.2 Hardware

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

21.3 Connecting LLS to FM6300

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 FM6300 device. The FM6300 -LLS fuel sensor schemes are shown below Figure 119.

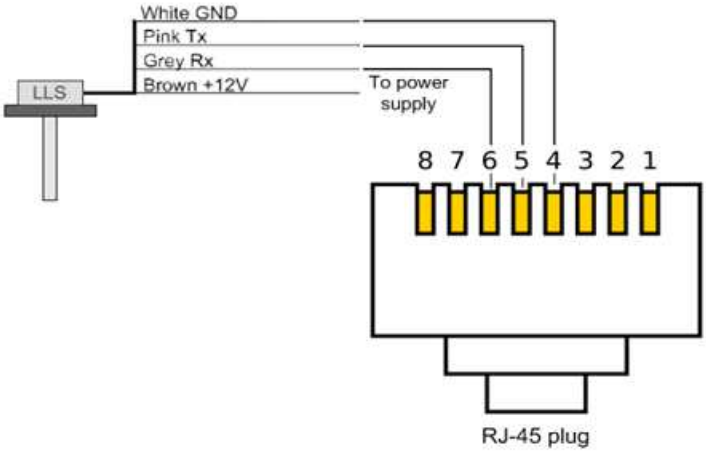


Figure 119
FM6300 -LLS fuel sensor connection scheme RJ-45 male plug

_____

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

Then FM6300 must be configured. Both fuel level and fuel temperature has to be set up by configurator's I/O menu (see Figure 120):

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 120 FM6300 I/O Configuration

22 MVC300 CAMERA

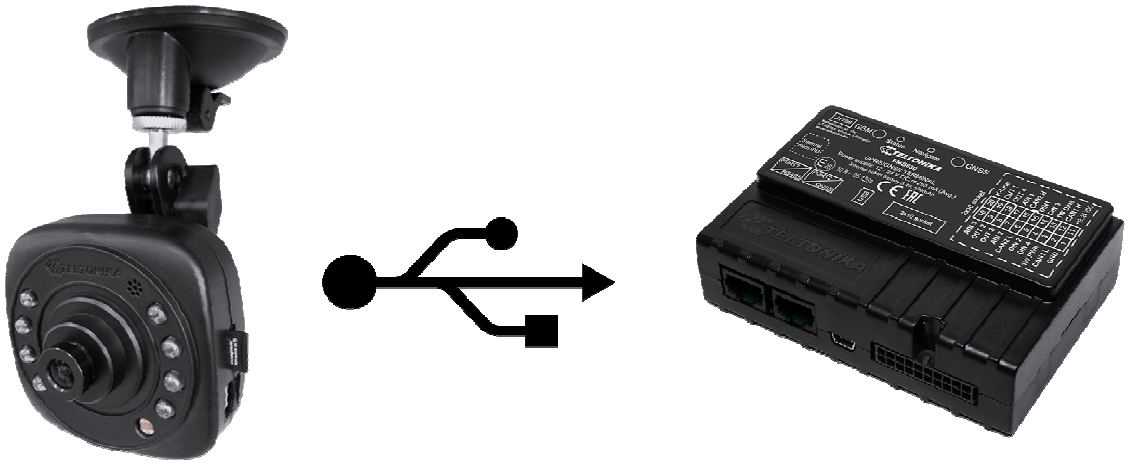


Figure 121 FM6300 and MVC300 Solution for Real time pictures

22.1 Introduction

This chapter contains information about FM6300 device and MVC300 camera interconnection, integration and use. Before using this solution, you should have some basic understanding of the following:

- FM6300 operational principals;
- MVC300 operational principals;

22.2 Startup and Configuration

To get FM6300 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 122 Simple Configuration:

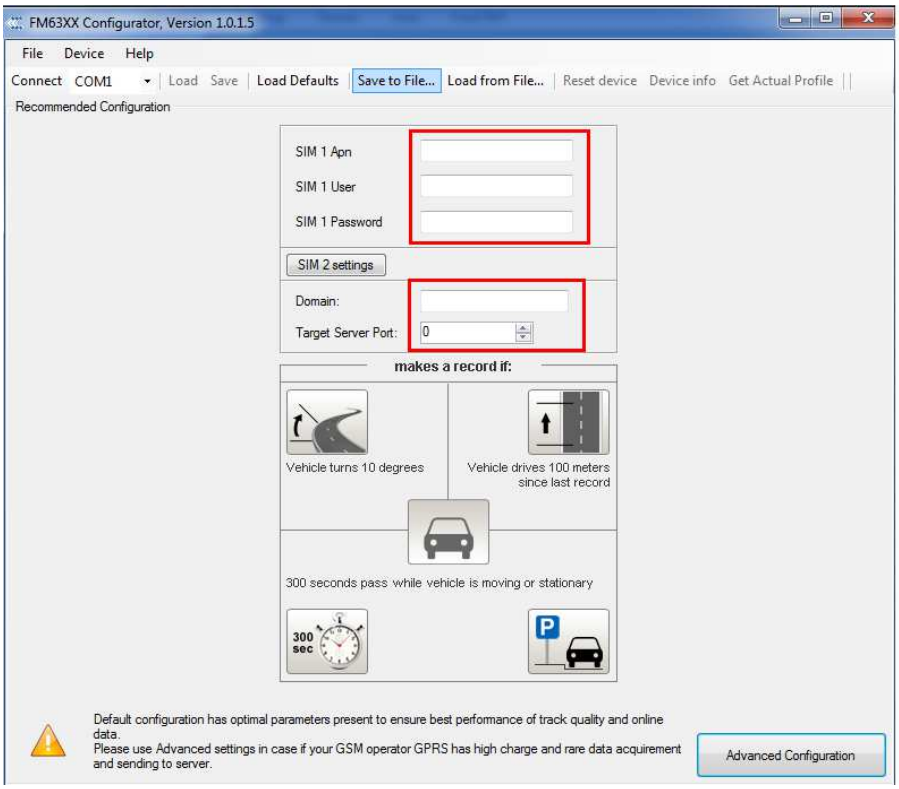


Figure 122 Simple Configuration

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

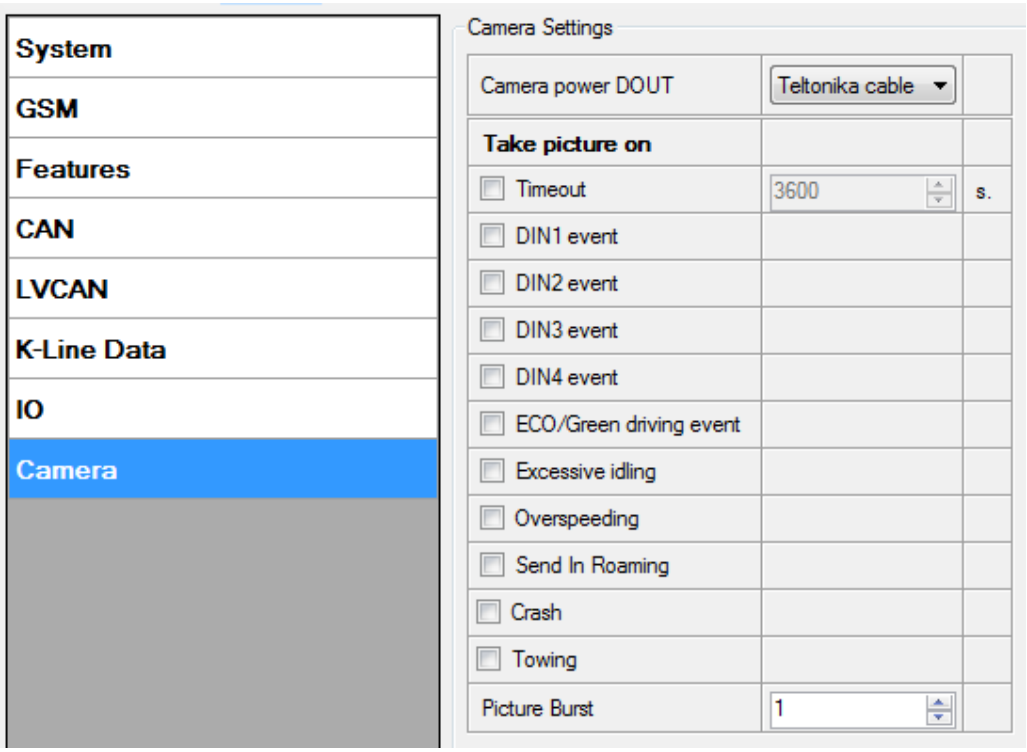


Figure 123 Camera Configuration

22.2.1 Camera parameters in FM6300:

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)

Excessive idling – picture will be made, when excessive ilding event will be occured (activated) and when event will be deactivated.

Overspeeding – picture will be made, when overspeeding event will be activated (entering) and when event will be deactivated (exiting)

Send in Roamin – When vehicle will enter in roaming or GSM operator will change to raoming picture will me made.

Crash– picture will be made, when Crash event will occur.

Towing– picture will be made, when Towing event will occur.

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

22.2.2 Camera parameters in MVC300:

To prepare MVC300 connection with FM6300, 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.

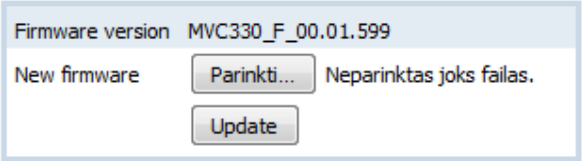


Figure 124 Firmware Update

After selecting firmware, press upgrade button as shown in Figure 124 Firmware Update.

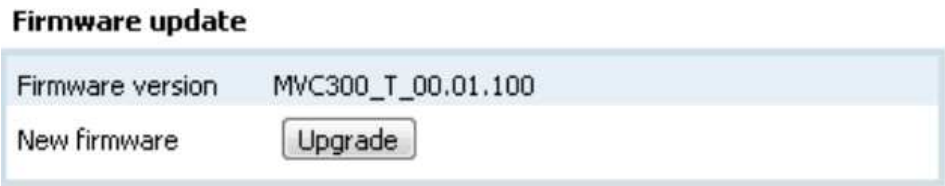


Figure 125 Firmware Upgrade

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 FM6300 and MVC300 solution.

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

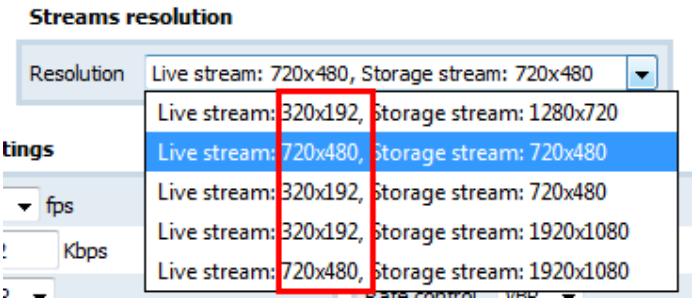


Figure 126 Resolution Selection

After successfully installing right firmware version and selecting resolution – MVC300 is ready to use with FM6300 device

22.3 FM6300 and MVC300 connection

To prepare solution you will need:

- FM6300 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 FM6300, connect MVC300 to power plug and connect camera with FM6300 over two USB cables. After connection is done, solution is ready to use.

23 GPRS COMMANDS

It is possible to send commands to FM6300 using GPRS. When FM6300 sends records periodically to a server, a message could be sent from the server and FM6300 will reply to it. FM6300 has to be connected to the server in order to receive commands.

Table 61 GPRS Commands

Command	Description
#GET DATAORDER	Get info about records sorting parameter
#GET RECTO	Get info about records refresh timeout parameter

Command	Description
#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 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 14). The device sends a response to commands received.

Table 62 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 # - 1,2,3 1 – operators [1-20] 2 – operators [21-40] 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

Command	Description
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
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 0 – OFF, 1 – ON Y1 – timeout for DO1 Y2 – timeout for DO2 Y3 – timeout for DO3 Y4 – timeout for DO4
getparam #	Readout parameter value according entered ID. # - ID value.
setparam # #	Set parameter value according entered ID and Value. 1.# - ID value. 2.# - New Parameter Value
flush #,#,#,#,#,#,#	Initiates all data sending to specified target server 1.# - IMEI 2.# - APN 3.# - LOGIN 4.# - PASS 5.# - IP 6.# - PORT 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.

24 DEBUG MODE

FM6300 is able to transmit its current state when connected to PC using PORT1/2 and USB cable. To debug FM6300 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 FM6300 (see Figure 127)

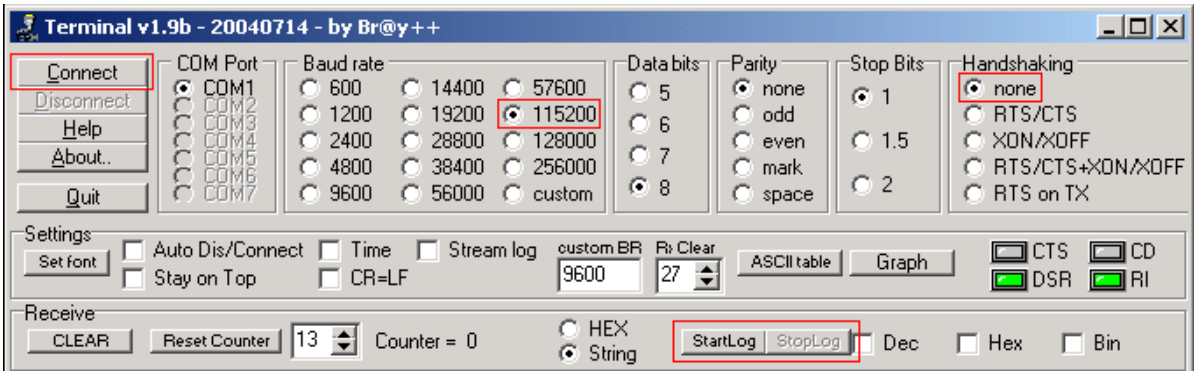


Figure 127 Terminal Window

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.

25 FM6300 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>,<username>,<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;*
- *<username> - operators' username;*
- *<password> - operators' password;*
- *<IP> - servers' IP address to which offline/online log will be send after request ("log2srvstart");*
- *<port> - servers' port;*
- *<TMO> - indicates time of offline log writing to flash or online log sending to server;*
- *<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)

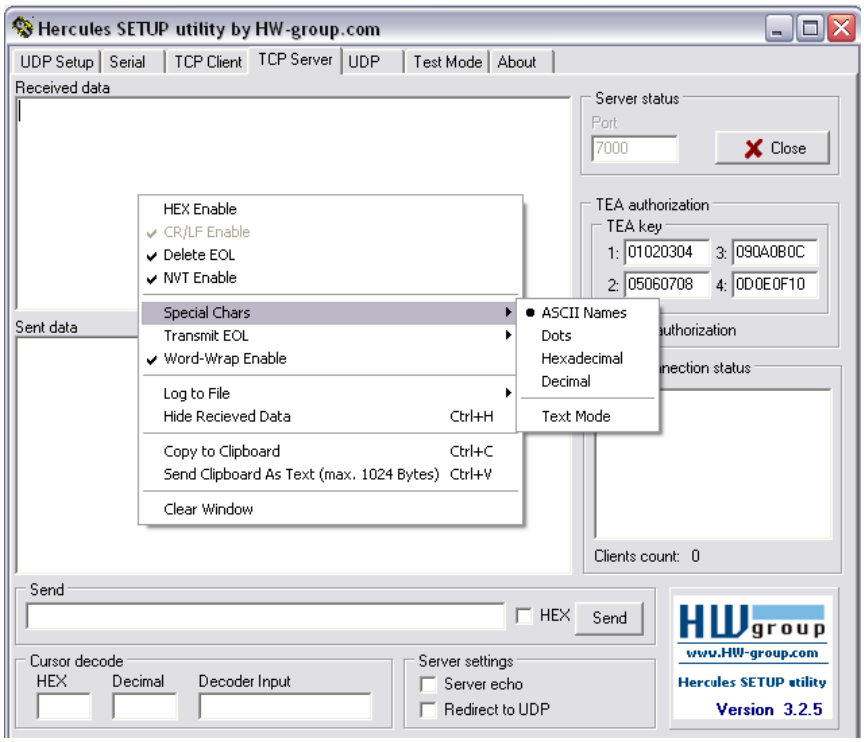


Figure 128

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.

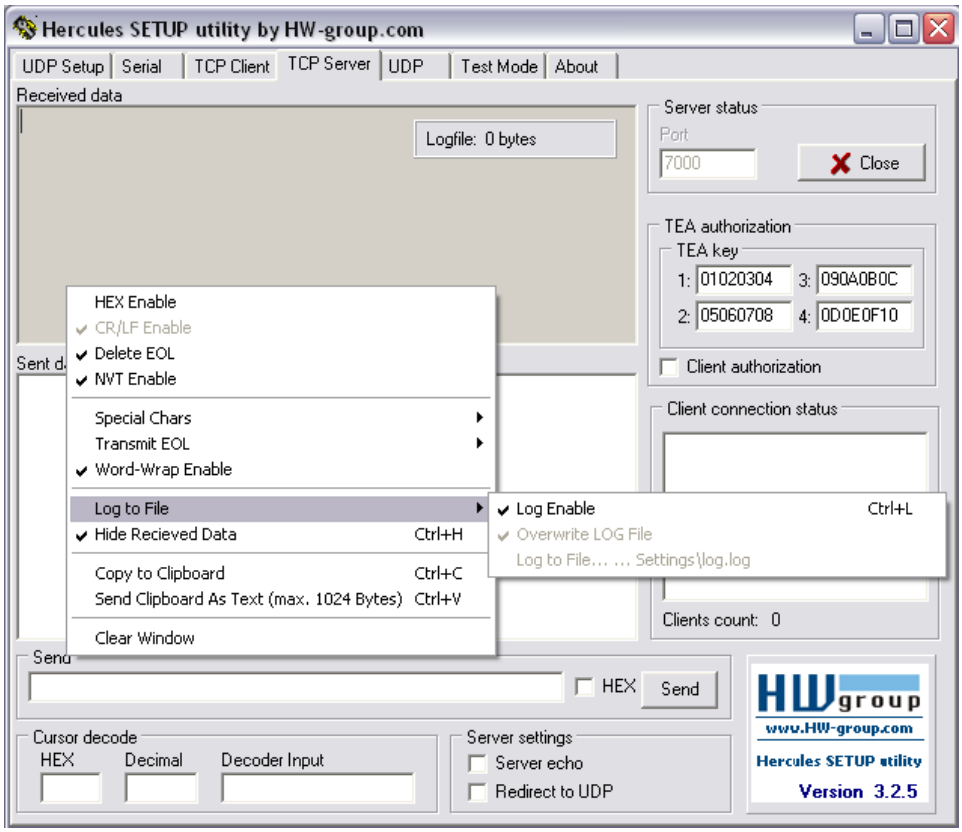


Figure 129

STEP 3

- Sending “Terminal’s” commands through Hercules server

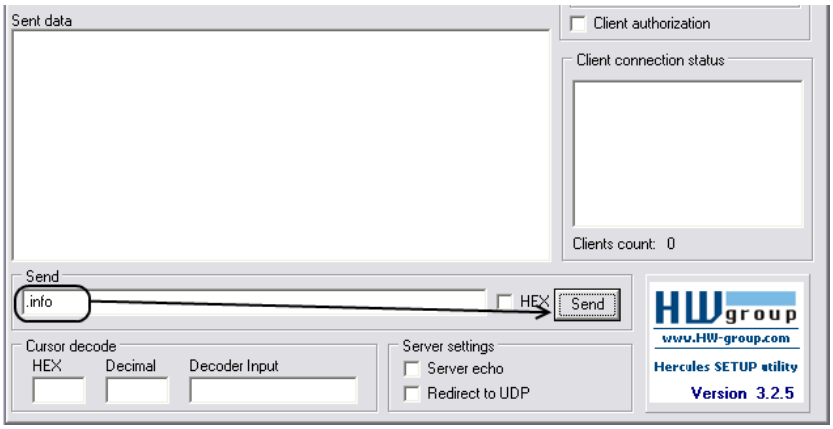


Figure 130

MOUNTING RECOMMENDATIONS

25.1 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.

25.2 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.

25.3 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.

25.4 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 FM6300 (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 FM6300 and even its failure.

25.5 Connecting Antennas

- Gently connect antennas to device by hands, without using additional equipment like pliers. The tightening torque for fixing the connector must be up to 0.5 – 0.7 Nm ('hand-tightened').
- When placing antennas avoid easily reached places.
- Avoid GNSS antenna placement under metal surfaces.
- Avoid placing FM6300 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

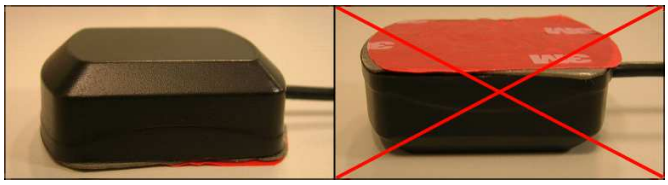


Figure 131

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).

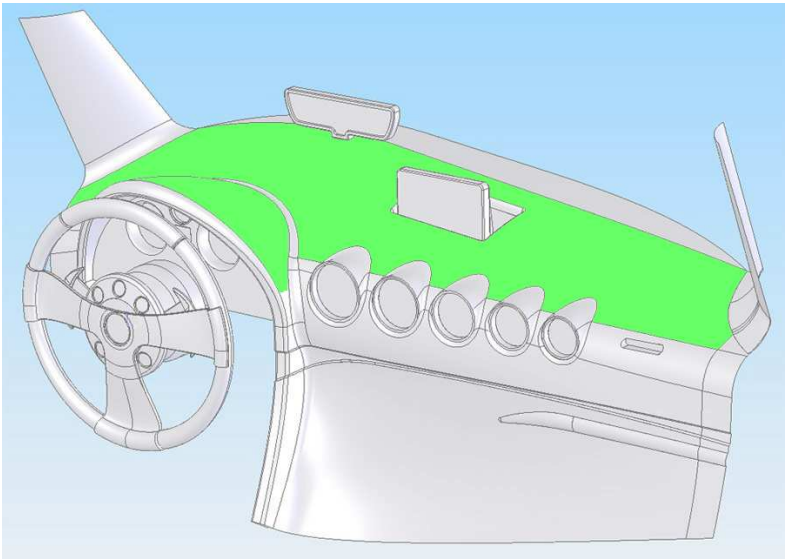


Figure 132: Correct placement of FM6300

25.6 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).

26 WARRANTY POLICY

Teltonika provides a One (1) year manufacturer's warranty, which covers all of Teltonika products.
Batteries are covered by 6 month warranty support.

27 CHANGE LOG

Nr.	Date	Version	Comments
1	2017-05-12	v1.0	Document created
2	2017-05-25	v1.1	Corrected Virtual COM Port driver download link
3	2017-05-31	V1.2	Added SELV limited power source line. Added fuse recommendation line.
4	2018-07-12	V1.3	Camera functionality updated, Firmware update instructions updated, KLINE Tacho Timestamp command added, Operator list command description updated. Manual CAN 1 and CAN2 SMS ID table are updated, Geofencing description updated, Introduced description about geozones and overspeeding, Crash detection scenario added, Towing detection feature added. GSM/GPS jack descriptions edit, MCAN# sms command format updated, TCP link mode description added. Added LV -CAN200/ALLAN300 migration to 4 digit program nr. information. Added new KLINE parameters (Vehicle Registration Number and Vehicle Identification Number, Updated Tachoweb description, COM1 and COM2 settings updated, New IO parameters added, High Resolution Fuel Consumption parameter description updated. New KLINE parameters added, All new global and external parameters added,, Connecting antennas recommendation and Waranty policy added. TCP link mode buffering, Manual CAN descriptions minor changes, Minor text changes, SMS ID updated, RJ45 pinout changes, description added for connecting RS232 external device.