

FM4

User Manual v2.2

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1. INTRODUCTION

1.1. Attention



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



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



The device may be connected only by qualified individuals.



The device must be firmly fastened in the predefined location.



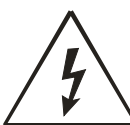
The programming must be performed using a second class PC (with autonomic power supply).



The device is susceptible to water and humidity.



Warning!! May explode, if a wrong accumulator is used.



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

1.2. Instructions of safety

This chapter contains information on how to operate FM4 safely. By following these requirements and recommendations you will avoid dangerous situations. You must read these instructions carefully and follow them strictly before operating the device! The device uses a 10V...30V DC power supply. The nominal voltage is 24V DC. The allowed range of voltage is 10V...30V DC, power – not more than 12 W.

To avoid mechanical damage, it is advised to transport the FM4 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.

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

Before dismantling the device from the vehicle, the (2x10) connection must be disconnected.

The device is designed to mount 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 FM4 is not designed as a navigational device for boats.

1.3. Legal Notice

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1-Wire is a registered trademark of Dallas Semiconductor.

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1.4. About document

This document contains information about the architecture, possibilities, mechanical characteristics, and configuration of the FM4100 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.
- Record – AVL data stored in FM4100 memory. AVL data contains GPS and I/O information
- AVL packet - Data packet which is being sent to server during data transmission. AVL packet contains from 1 to 25 records.

2. BASIC DESCRIPTION

FM4100 is a terminal with GPS and GSM connectivity, which is able to determine the object's coordinates and transfer them via the GSM network. This device is perfectly suitable for applications where location acquirement of remote objects is needed. It is important to mention that FM4100 has additional inputs and outputs, which let you control and monitor other devices on remote objects. 1-Wire® interface (for Dallas digital thermometer or I-Button reader) and CAN interface integrated (for trucks FMS interface data acquisition). It also has a RS232 port for NMEA output and configuration (also it could be used for peripheral devices communication with special firmware).

2.1. Package contents

The FM4100 device is supplied to the customer in a cardboard box containing all the equipment that is necessary for operation. The package contains:

1. The FM4100 device.
2. Input and output power supply cable with a 2x10 connection.
3. GPS and GSM antennas.
4. Port 1/2 and Port 3 cables
- 5.

2.2. Additional accessories

There are two accessories available for FM4 that are not included in the package:

1. Temperature sensor TTJ-101
2. iButton

Note: the manufacturer does not supply a SIM card in the package, which is necessary for connection to the GSM network! SIM card can be obtained from your local GSM service provider!

If any of the components are not in the package, please contact the manufacturer's representative or the vendor. (www.teltonika.eu)

2.3. Basic characteristics

GSM / GPRS features:

- Teltonika TM2 quad band module (850, 900, 1800, 1900 MHz)
- GPRS class 10
- SMS (text, data)
- Voice calling

GPS features:

- SirfStarIII 20 channel receiver
- NMEA, GGA, GGL, GSA, GSV, RMC, WGS-84 protocol compatible
- -159 dBm sensitivity

Hardware features:

- ARM7 TDMI processor

- 1 MB internal Flash memory (upgradeable up to 4 MB)
- Built-in CAN-BUS support (J1939 / FMS protocol)
- Built-in 3 axis accelerometer
- Internal backup battery included

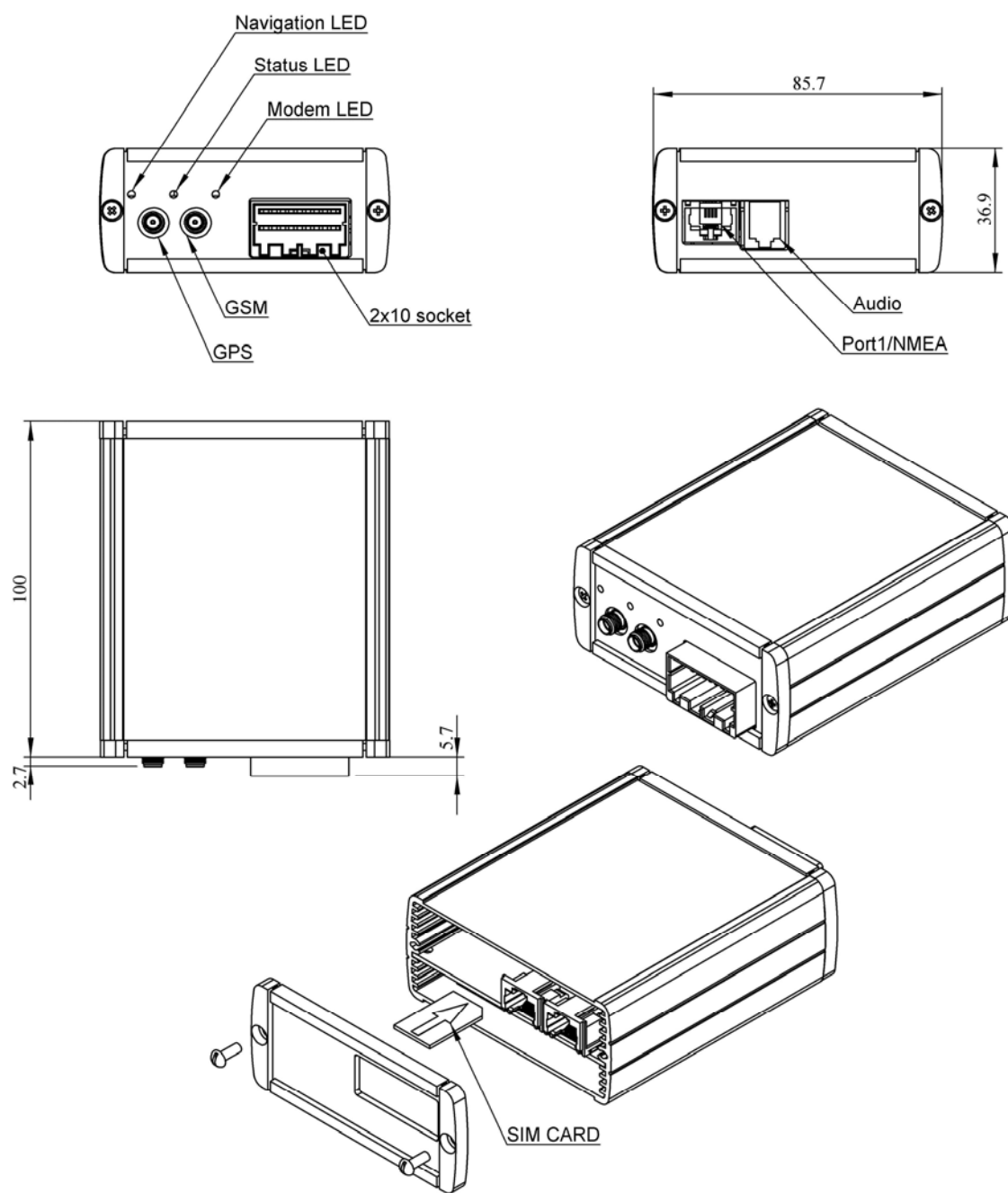
Interface features:

- Power supply: 10 – 30V
- RS232 port
- Audio port
- 4 digital inputs
- 4 analog inputs
- 4 open collector outputs
- Fuel counter inputs
- 1Wire® temperature sensor
- 1Wire® iButton
- External battery input
- 3 status LEDs

Special features:

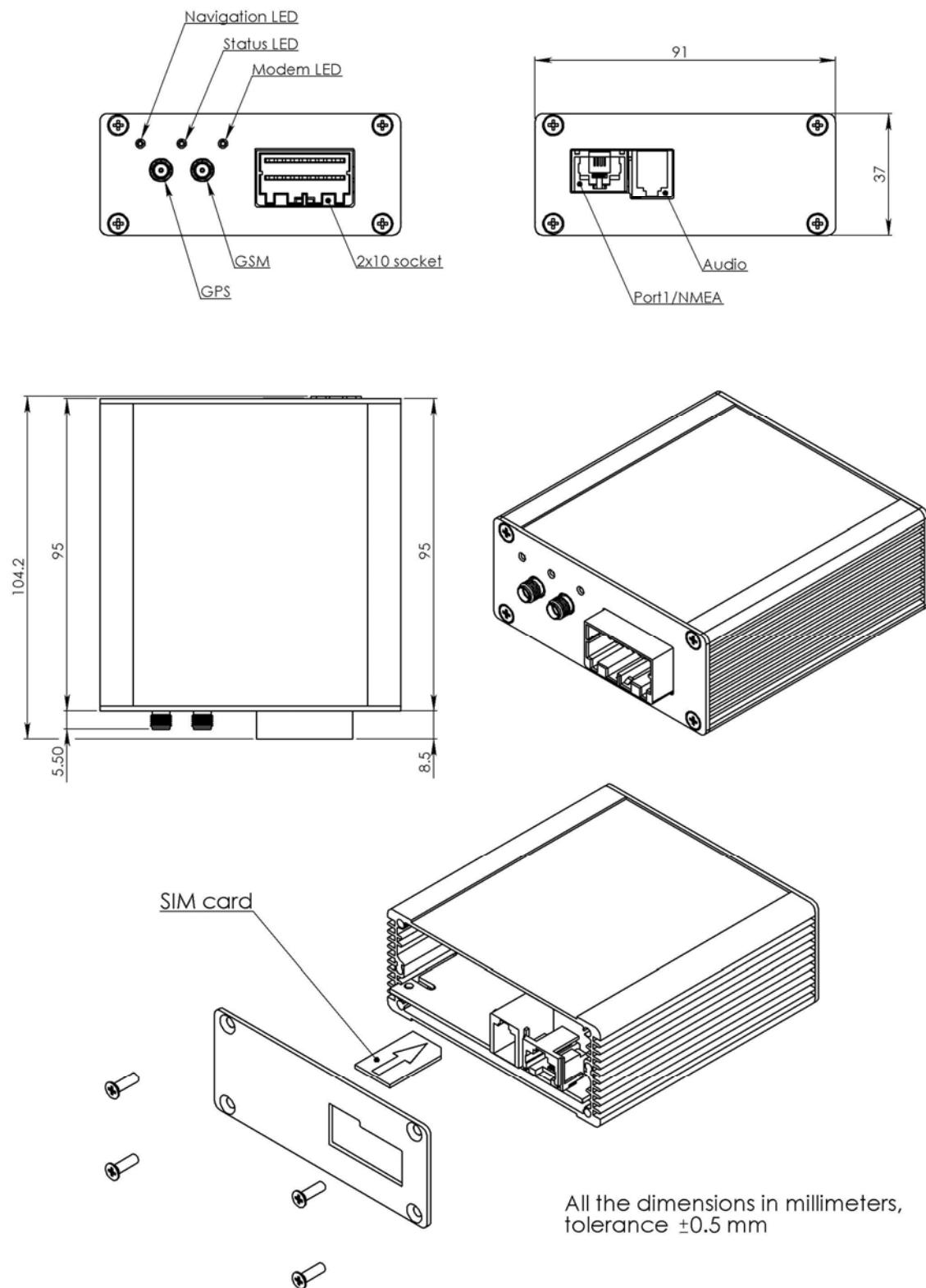
- Any element event triggers (external sensor, input, speed, temperature, etc.)
- Smart profile switching (GSM operator or any element dependant)
- Highly configurable data acquisition and sending
- Multiple geofence areas
- Sleep mode
- Real-time process monitoring
- Authorized number list for remote access
- Firmware update via GPRS or RS232 port
- Configuration update via GPRS, SMS or RS232 port
- TCP/IP or UDP/IP protocol support
- 7500 record storing (upgradeable up to 30000)
- Robust aluminum case (100 x 85.7 x 36.9)
- CE and e-mark certified

2.4. Mechanical features



All the dimensions in millimeters, tolerance ± 0.5 mm

OR



1 Figure FM4100 drawing & spec, two enclosures

Part name	Physical specification
Navigation LED	LED
STATUS LED	LED
MODEM LED	LED
GSM	GSM antenna connector SMA
GPS	GPS antenna connector SMA
Socket 2×10	Tyco Multi-Lock I/O MK-II C-175975
SIM	GSM SIM card socket
PORT 1/NMEA	RJ45 8 pin socket
AUDIO	RJ11 4 pin socket

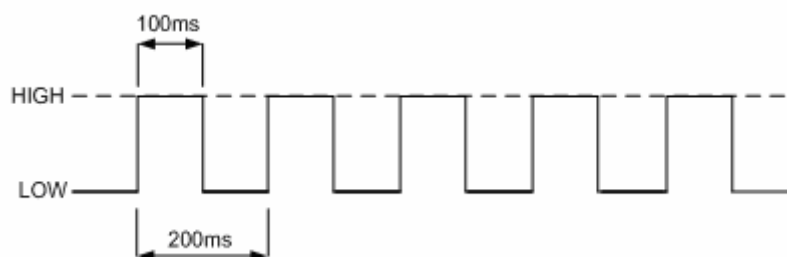
Technical details
Power supply 12..30 V DC 12W Max
Energy consumption:
GPRS: --- 250 mA r.m.s Max.,
Nominal: --- 110 mA r.m.s..
Sleep: --- 45 mA r.m.s..
Operation temperature:
-25°C ... +55°C
Storage temperature:
-40°C ... +70°C
Relative humidity 5 ... 95%

3. CONNECTION, PINOUT, ACCESSORIES

3.1. LED status

Navigation LED

When GPS signal is not received or GPS signal is not accurate, the **Navigation LED** is blinking as follows:



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



When Navigation LED is off, that means that a short circuit occurred in GPS antenna or connector.

Modem LED

When device is connected to the GPRS – Modem LED is blinking every second:



When device is not connected to GPRS – Modem LED is blinking every 5 seconds.

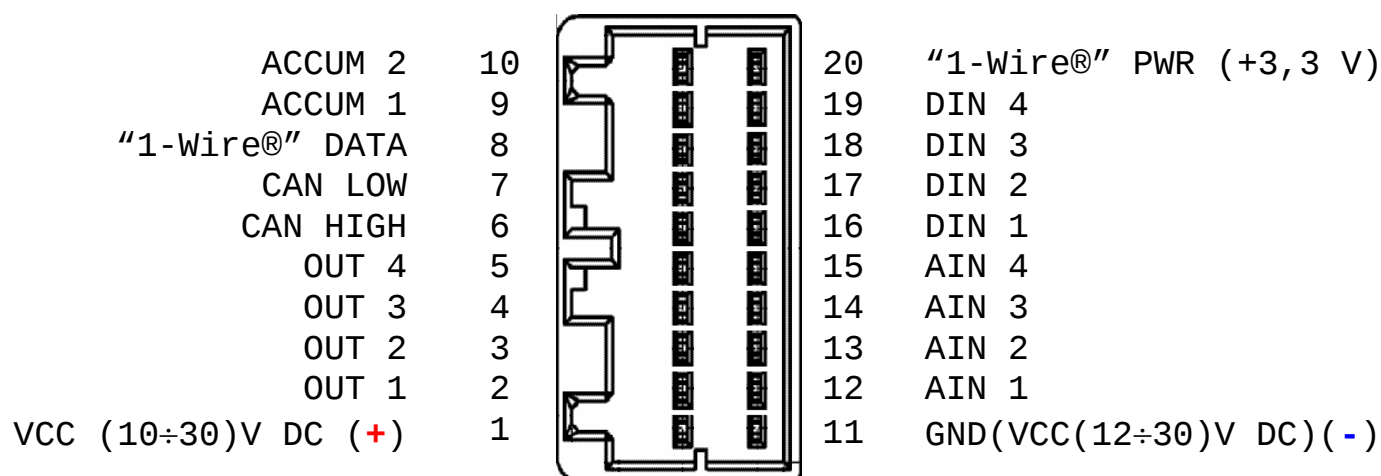


Status LED

When device has uploaded firmware – Status LED should blink. If LED does not blink – it means that device does not function.

3.2. Socket 2x10

Standard FM4100 2x10 socket pinout shown on 2 Figure Standard FM4100 2x10 socket pinout



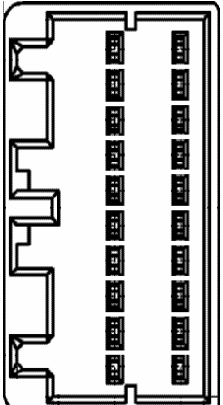
2 Figure Standard FM4100 2x10 socket pinout

Standard FM4100 2x10 socket pinout description:

Pin Nr.	Pin Name	Description
1	2	3
1	VCC (10÷30)V DC (+)	Power supply for module. Power supply range (12...30) V DC Energy consumption: GPRS: 400 mA r.m.s Max., Nominal: 150 mA r.m.s..
2	OUT 1	Digital output. Channel 1. Open collector output. Max. 500mA.
3	OUT 2	Digital output. Channel 2. Open collector output. Max. 500mA.
4	OUT 3	Digital output. Channel 3. Open collector output. Max. 500mA.
5	OUT 4	Digital output. Channel 4. Open collector output. Max. 500mA.
6	CAN HIGH	SAE J1939 CAN interface High channel
7	CAN LOW	SAE J1939 CAN interface Low channel
8	"1-Wire®" DATA	Data channel for Dallas 1-Wire® devices
9	Ext accumulator "-"	This pin is used connected with pin ACUM 2. Function of those pins is to disconnect the internal accumulator during shipment or storage. When ACUM 1 and ACUM 2 are connected, the internal accumulator is on, while disconnected - the internal accumulator is off.
10	Ext accumulator "+"	This pin is used connected with pin ACUM 1. Function of those pins is to disconnect the internal accumulator during shipment or storage. When ACUM 1 and ACUM 2 are connected, the internal accumulator is on, while disconnected - the internal accumulator is off.
11	GND(VCC(10÷30)V DC)(-)	Ground pin. (10÷30)V DC (-)
12	AIN 1	Analog input, channel 1. Input range: 0-30V DC
13	AIN 2	Analog input, channel 2. Input range: 0-30V DC
14	AIN 3	Analog input, channel 3. Input range: 0-30V DC.
15	AIN 4	Analog input, channel 4. Input range: 0-30V DC
16	DIN 1	Digital input, channel 1
17	DIN 2	Digital input, channel 2
18	DIN 3	Digital input, channel 3
19	DIN 4	Digital input, channel 4
20	"1-Wire®" PWR (+3,3 V)	+ 3,3 V output for Dallas 1-Wire® devices. (max 20mA)

There is special version of FM4100 which allow to connect additional external backup battery. This device version should be purchased by special order. Contact sales manager for details.

Special FM4100 version 2x10 socket pinout shown on 3 Figure Special FM4100 version pinout.

Ext accumulator "-"	10		20	"1-Wire®" PWR (+3,3 V)
Ext accumulator "+"	9		19	DIN 4
"1-Wire®" DATA	8		18	DIN 3
CAN LOW	7		17	DIN 2
CAN HIGH	6		16	DIN 1
OUT 4	5		15	AIN 4
OUT 3	4		14	AIN 3
OUT 2	3		13	AIN 2
OUT 1	2		12	AIN 1
VCC (10÷30)V DC (+)	1		11	GND(VCC(12÷30)V DC)(-)

3 Figure Special FM4100 version pinout

Special FM4100 2x10 socket pinout description:

Pin Nr.	Pin Name	Description
1	VCC (10÷30)V DC (+)	Power supply for module. Power supply range (12...30) V DC Energy consumption: GPRS: --- 400 mA r.m.s Max., Nominal: --- 150 mA r.m.s..
2	OUT 1	Digital output. Channel 1. Open collector output. Max. --- 500mA.
3	OUT 2	Digital output. Channel 2. Open collector output. Max. --- 500mA.
4	OUT 3	Digital output. Channel 3. Open collector output. Max. --- 500mA.
5	OUT 4	Digital output. Channel 4. Open collector output. Max. --- 500mA.
6	CAN HIGH	SAE J1939 CAN interface High channel
7	CAN LOW	SAE J1939 CAN interface Low channel
8	"1-Wire®" DATA	Data channel for Dallas 1-Wire® devices
9	Ext accumulator "-"	This pin is used for connecting external accumulator (Seal lead rechargeable 6V only). Should be connected to negative pole (-)
10	Ext accumulator "+"	This pin is used for connecting external accumulator (Seal lead rechargeable only). Should be connected to positive pole (+)
11	GND(VCC(10÷30)V DC)(-)	Ground pin. (10÷30)V DC (-)
12	AIN 1	Analog input, channel 1. Input range: 0-30V DC
13	AIN 2	Analog input, channel 2. Input range: 0-30V DC
14	AIN 3	Analog input, channel 3. Input range: 0-30V DC.
15	AIN 4	Analog input, channel 4. Input range: 0-30V DC
16	DIN 1	Digital input, channel 1
17	DIN 2	Digital input, channel 2
18	DIN 3	Digital input, channel 3
19	DIN 4	Digital input, channel 4
20	"1-Wire®" PWR (+3,3 V)	+ 3,3 V output for Dallas 1-Wire® devices. (max 20mA)

TECHNICAL INFORMATION:

Maximum charge current 300 mA @ 6V. Operating from backup accumulator turns on if external power supply is less than 6.5 V

Accumulator is operating up to 5.2 V. If accumulator's voltage decreases to 5.1, turns FM4 off.



Attention – it is possible to start FM4100 device only from external power supply. Only after external supply is off – FM4100 is operating from backup accumulator.

CHARGE TIMINGS

1.4 Ah accumulator (model - FM4100 ~6 hours operating from backup battery (24° C temperature, normal work mode (without sleep), sending data via GPRS every minute, any peripheral devices connected).

Operating time depends on temperature, data sending frequency (SMS and GPRS), and accumulator age, number of charge/discharge cycles.

Approximate time of charging fully discharged 1.4 Ah accumulator (24° C temperature, external power 12 V) 10 hours.



Attention! FM4100 should be connected only with 6 V Sealed lead rechargeable batteries (accumulators). Teltonika is not responsible for any harm caused by using wrong accumulator type.

Power sonic Sealed lead Acid batteries 6V

PS – 605 (0.5 Ah)

PS – 612 (1.4 Ah)

PS – 628 (2.9 Ah)

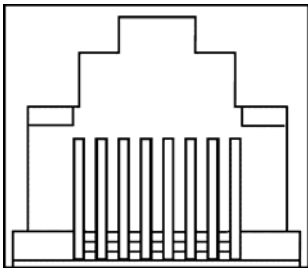
EXTERNAL LEAD SEAL ACCUMULATOR BENEFITS

Operation (discharge) temperature -40° C ...+60° C (check with accumulator datasheet)

Operation (charge) temperature -20° C ...+50° C (check with accumulator datasheet)

Connecting any capacity 6V accumulator due to customer's needs of backup operation time. Time of charging the accumulator increases while using the accumulator with higher capacity. It is recommended to use accumulators less than 11 Ah capacity.

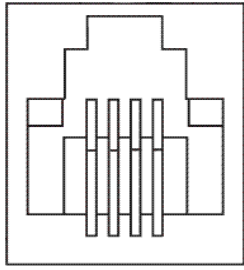
3.3. PORT1/NMEA

RJ-45 socket	PORT 1	
	Pin Nr.	Description
	1	GPS_IN (Sirf In)
	2	TX_GPS (NMEA)
	3	-
	4	GND
	5	RX
	6	TX
	7	CTS
	8	RTS

4 Figure RJ-45 Socket pinout

This port can be used as system port (for firmware flashing, device configuration, viewing log) with cable labeled “Port1/2” and as GPS NMEA 0183 output with cable labeled “Port 3” at 4800 baud rate.

3.4. Audio

RJ-11 socket	AUDIO PORT	
	Pin Nr.	Description
	1	Mic_Signal
	2	Speaker_Out_2
	3	Speaker_Out_1
	4	Mic_GND

5 Figure RJ-11 socket pinout

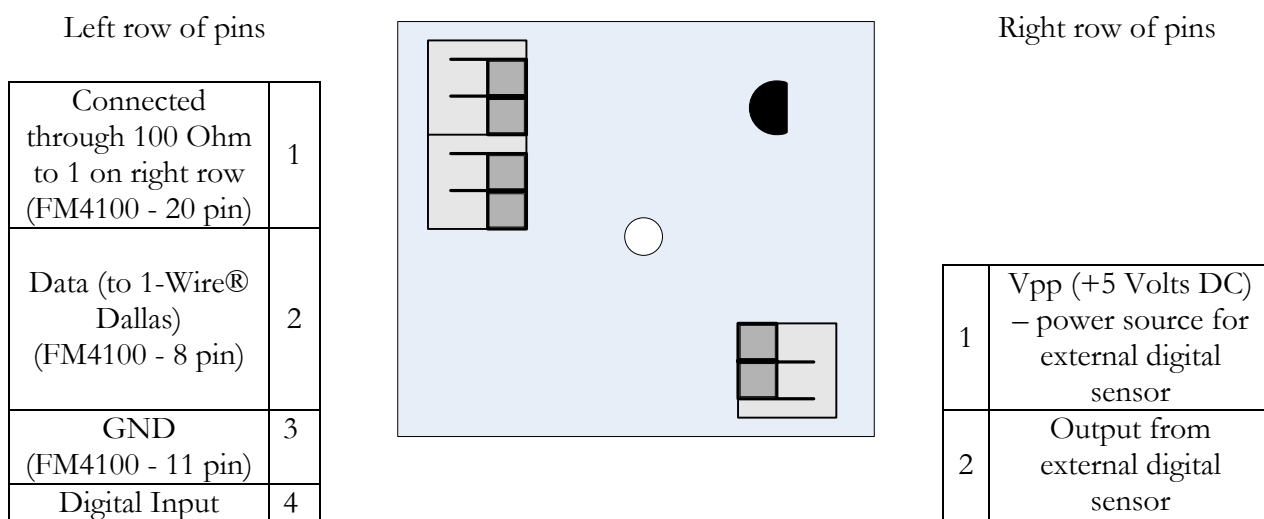
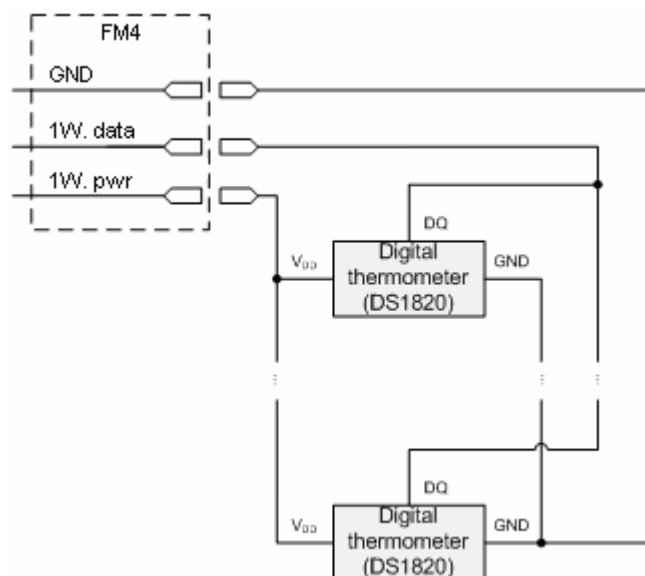
3.5. Accessories



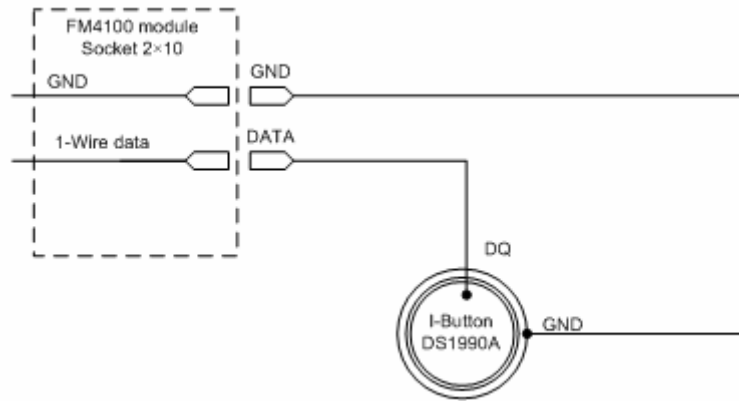
Note: Teltonika doesn't provide any additional equipment like panic buttons, door sensors or other, except of 1 – wire devices: TTJ-101 thermo sensor and I-Button. These devices aren't included in FM4100 package and can be offered by special order only.

1 – Wire devices

One of the FM4100 features is realized 1-Wire data protocol, which enables connection of up to three thermometers (DS1820, DS18S20 and DS18B20) and I-Button DS1990A. Figures 6 and 7 show FM4100 and 1-wire devices connection schemes.



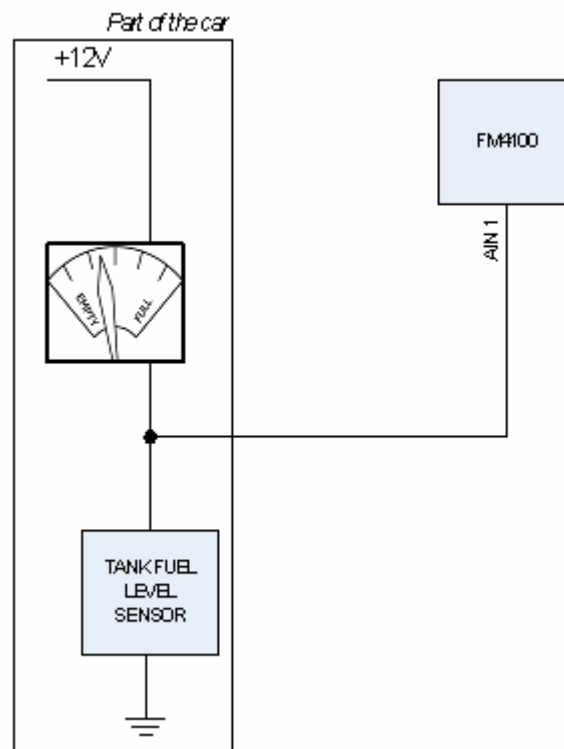
6 Figure Digital thermometer DS1820 and TTI 100 connection scheme



7 Figure Digital key “I-Button” DS1990A connection scheme

Fuel Tank sensors

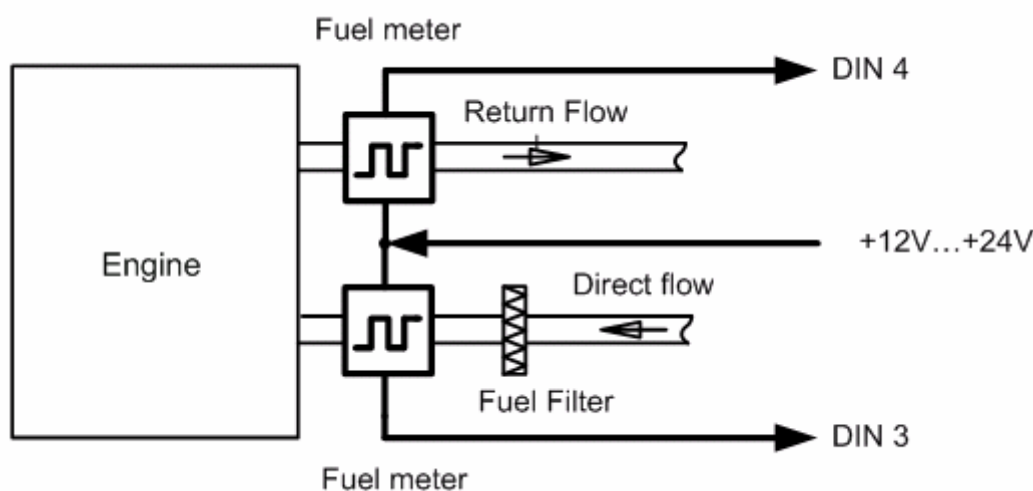
A fuel tank level sensor exists in most of the cars, which shows the approximate fuel level in the driver's indicator panel. It is possible to connect FM4100 Analog input (if sensor returns analogue signal proportional to fuel level). Figure describes the connection scheme to the FM4100 and fuel tank 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.



Note: Teltonika does not provide any fuel sensors. Factory installed or other third party sensors may be used instead.

Impulse counters

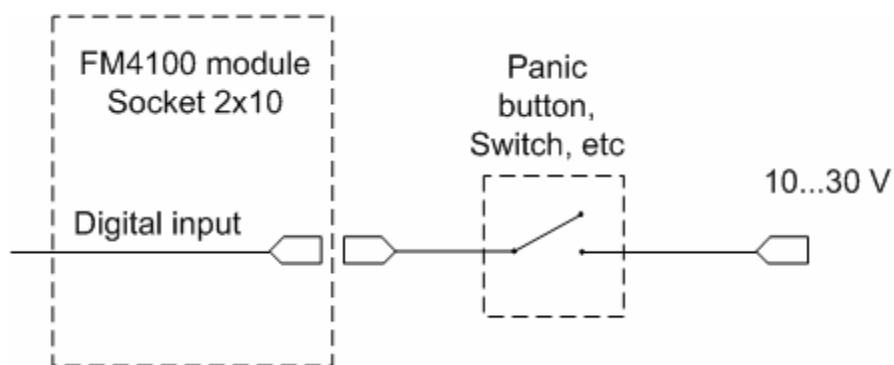
Figure describes the connection scheme to the FM4100. Here two pulse meters are used, where one is mounted on the direct flow pipe and the other on the return flow pipe. Data from both meters is sent to the FM4100. Then FM4100 calculates DIN3-DIN4. Resulting difference equals to fuel consumption. Filter 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.



8 Figure 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 below shows how to connect alarm button, door sensor, etc.



9 Figure Panic button connection

4. FIRMWARE

FM4 is powered with smart firmware. FM4 functionality is always improving, new firmware versions appear. Current module firmware version can be retrieved from configurator. See configuration description for details.

Find major firmware change log below.

Firmware series	Release date	Configurator version	Details
0.47.XX	2007-10-25	1.0.0.37	iButton, Accelerometer functionalities added; High, Panic event priorities added, I/O event based profile switching algorithm added
0.48.XX	2008-01-04	1.0.0.37	Voice call functionality added, User SMS Commands added; NMEA filters added; Fuel counter I/Os added
0.49.XX	2008-02-27	1.0.49.XX	Movement I/O added, CAN bug fixed, Link closing 5 seconds delay added, SMS Commands added
0.50.XX	2008-04-11	1.0.50.XX	Angle based data acquire algorithm added; 1-Wire bus for 3 Thermo sensor support; CAN bug fixed

Firmware can be updated by RILS system over GPRS.

RILS stands for Remote Imlet Loading System which is also used for updating FM4100 ARM processor firmware. To update firmware, server has to send a SMS to the FM4100 and should force it to connect to the server and download new firmware. This can be done by connecting to one of Teltonika servers and using special web interface. Two public servers are available with different GSM operator SIM cards to ensure that procedure will proceed without any problem.

- Server1: <http://81.7.64.110:7022/RILS-web/>
- Server2: <http://212.47.99.62:5002/RILS-web/>
- Login and password for both servers are 'demo' / 'demo'.

Remote Imlet Loading

[Upload N12](#) [Upload Fm4](#) [Monitor](#) [User](#) User: demo [Logout](#)

Step 2: Configure modules.

Upload modules from file: [Browse...](#) [Upload](#)

Please configure module (s)

IMEI:		Server IP address:	
Server port:		Module number:	
APN:		chap login:	
chap password:		Add module	

[Back](#)

After entering them click on 'Upload FM4' and select latest firmware version available. Enter necessary parameters in the fields. Server port and Server IP are different for both servers:

- Server1 IP: 81.7.64.110 Server1 port: 7009
- Server2 IP: 212.47.99.62 Server2 port: 5009

Module number is GSM number of FM SIM in world wide standart: *like* +37069912345.

Enter your APN, APN login and password. After entering all parameters click 'Add Module'. To operate multiple devices, enter new IMEI and GSM number and click 'Add Module' again. Otherwise click 'Next' and if all data is correct, in next window click 'Upload'.

5. OPERATIONAL BASICS

5.1. Operational principals

FM4100 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 methods. Method's details are described in **GPS** section. All data is stored in flash memory and later can be sent via GPRS or SMS channels. GPRS mode is most preferred data sending mode. SMS mode is mostly used in areas without GPRS coverage or GPRS usage is too expensive.

GPRS and SMS settings are described in **GPRS** section. FM4100 communicates with server using special data protocol. Data protocol is described in "FM Protocols" document.

FM4100 can be managed by SMS commands. SMS Command list is described in **SMS COMMAND LIST** section. Module configuration can be performed over TCP or via SMS. Configuration parameters and modes are described in "FM Protocols" document.

5.2. Sleep mode

FM4 can enter sleep mode (standby mode) under two conditions:

- FM4 does not detect movement. Accelerometer has to be configured properly, so it provides correct indication about movement. Usually most sensitive settings are used. See accelerometer settings in chapter 6 for more details.
- FM4 does not send or receive any data for 5 minutes. This means that if coordinate recording interval is more frequent than 5 minutes, FM4 will never go to sleep mode.

FM4 can exit sleep mode under three conditions:

- FM4 detects movement. Again – accelerometer has to be configured properly.
- FM4 receives any SMS
- FM4 detects status change on any digital input.

While in sleep mode, FM4 sets GPS receiver to sleep mode, therefore it does not record or send any data. The power usage also decreases allowing to save vehicle battery.

5.3. Accelerometer

FM4 has a built in 3 axis accelerometer which allows FM4 to indicate if vehicle is moving or not as well as measure acceleration. Accelerometer sensitivity can be configured – it has 5 ongoing parameters: Delta X, Y and Z define angles in 3D space and start/stop timeouts define time intervals in milliseconds. To indicate that vehicle is moving, FM4 constantly checks for angle change greater than the one defined in Delta X, Y or Z fields. If angle keeps changing for defined time interval in 'Start Move Timeout' field, then vehicle is considered as moving. Same settings for idle indication apply – if angle change is less than the one defined in appropriate field for time interval defined in 'Stop Move Timeout' field, then vehicle is considered as idle (not moving). For best effect it is recommended to set accelerometer to highest sensitivity – see picture below for sample values.

Accelerometer		
Delta X:	1	°, degrees
Delta Y:	1	°, degrees
Delta Z:	1	°, degrees
Start Move timeout:	1	* 100 mS
Stop Move timeout:	600	* 100 mS

10 Figure Accelerometer settings

5.4. Virtual odometer

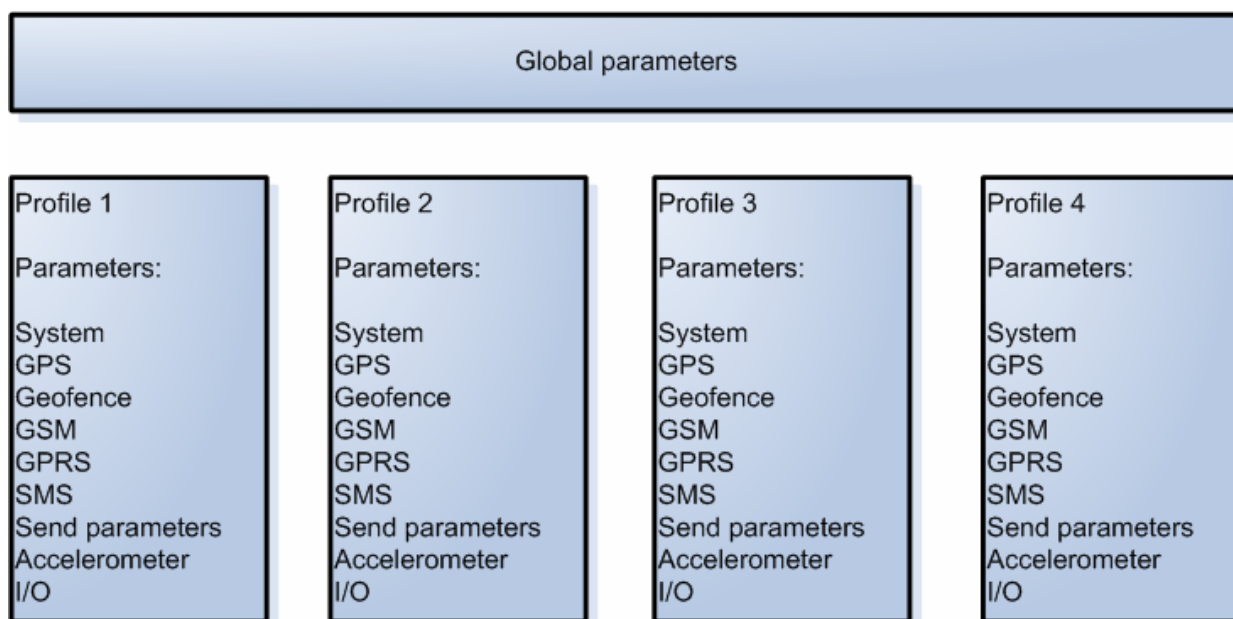
Virtual odometer is used to calculate traveled distance in FM4 as a separate I/O element. When FM4 detects movement, it starts counting distance using GPS signal: every second it checks current location and calculates distance between current and previous point. It keeps adding these intervals until it is time to make a record, then FM4 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. Note, that FM4 does not measure distance between coordinates, that it records using time, distance or angle change intervals. Instead it uses virtual points which are established every second, and calculates distance between them.

5.5. Profiles

FM4 has 4 profiles saved in Flash memory of the module. Every profile has a list of parameters, which enables FM4 to operate in different modes while using different profiles. The easiest way to understand what is 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 behaviors. Global parameters contain settings that are common for all 4 profiles. This means that if you set FM4 to call to predefined number, you will be able to call it while using any profile. Basic scheme of Global parameters and profiles is shown below.

According to the scheme every profile has a list of parameters. Global parameters are common for all profiles.

Switching between profiles (changing behavior) 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).



11 Figure FM4100 profile structure



Profile 3 is default profile for FM4. It is always loaded on first startup and further profile switching is proceeded after operator scan or I/O element change.



Profile 4 is 'panic' profile for FM4. FM4 can only switch to this profile if 'panic' priority event is detected (see event configuration). There is only one way to exit profile 4 – send a special SMS command (see SMS Command List). All records sent while using profile 4 are marked as high priority records.

5.6. Profile switch depending on GSM operator code

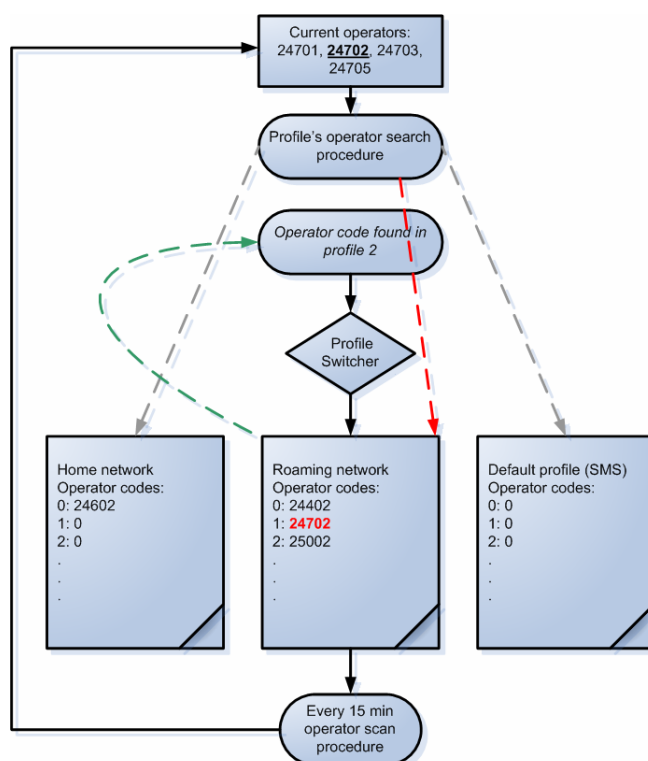
GSM Operator code profile switching is mostly used in roaming applications, when the purpose is to have information from module both from Home and Roaming operator network for reasonable price. This method allows you to define different module behavior in Home network, Roaming network and unknown operator areas. See figure 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 certain time interval. Profile 3 should not allow GPRS transfer at all and should only send few position SMS with coordinates just to have basic idea where vehicle is located. Profile 4 is not used.



12 Figure Roaming application profile configuration example

Find profile switching diagram below: In the example FM4 connects to operator with code 24702. It checks profile 1 operator list, but there is only one operator code entered which does not match. Then it checks profile 2 list. This code is entered there, so FM4 switches to profile 2. If profile 2 would not contain this operator code, then FM4 would switch to profile 3, which is default profile for FM4. Note, that FM4 does not read operator codes entered in profile 3, instead it uses this profile if currently used operator code is not listed in profile 1 or 2. Profile 4 is not used in this scenario and can only be used when FM4 encounters a 'panic' priority event (see event configuration for more details).



13 Figure GSM operator code based profile switching algorithm

5.7. Profile switch depending on I/O event

Another profile switch method is based on I/O event. See I/O settings for information how to configure FM4 to switch profiles depending on I/O elements.

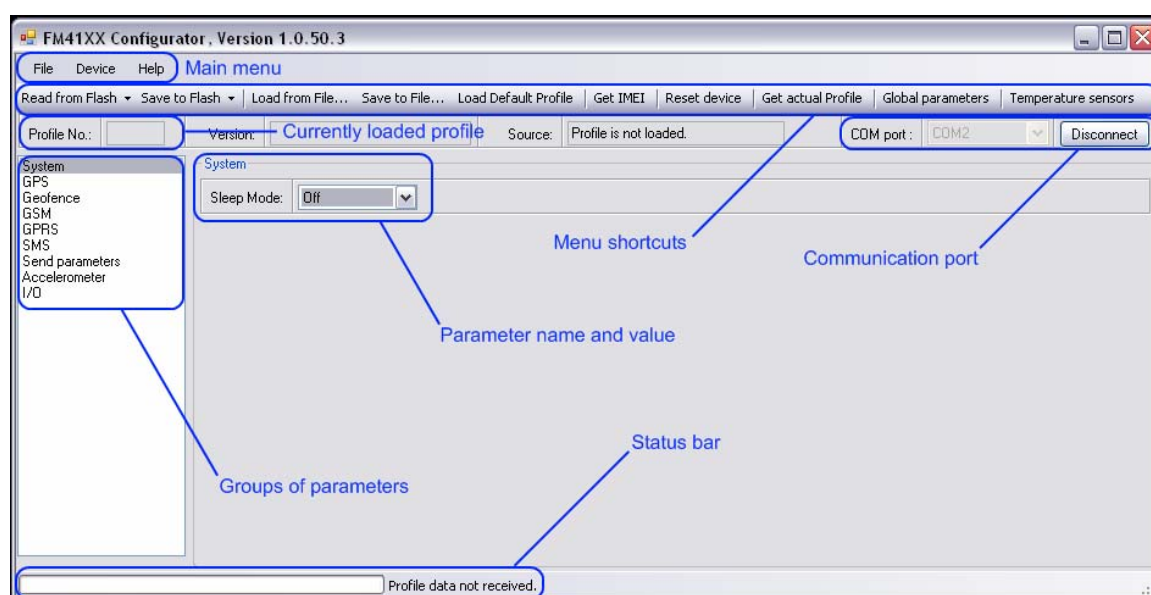
6. CONFIGURATION

6.1. Configurator

New FM4100 module has default factory settings. Settings should be changed according to your application and your GSM operator information.

FM4100 Configuration is performed via FM4100 Configurator program. Latest FM4100 Configurator versions can be downloaded from <http://av11.teltonika.lt/downloads/FM4>. FM4100 configurator operates on Microsoft Windows OS and uses MS .Net Framework 2.0 or higher. Please ensure that MS .Net Framework 2.0 or higher is installed on your PC before starting configurator. Latest MS .Net Framework version can be downloaded from official Microsoft web page.

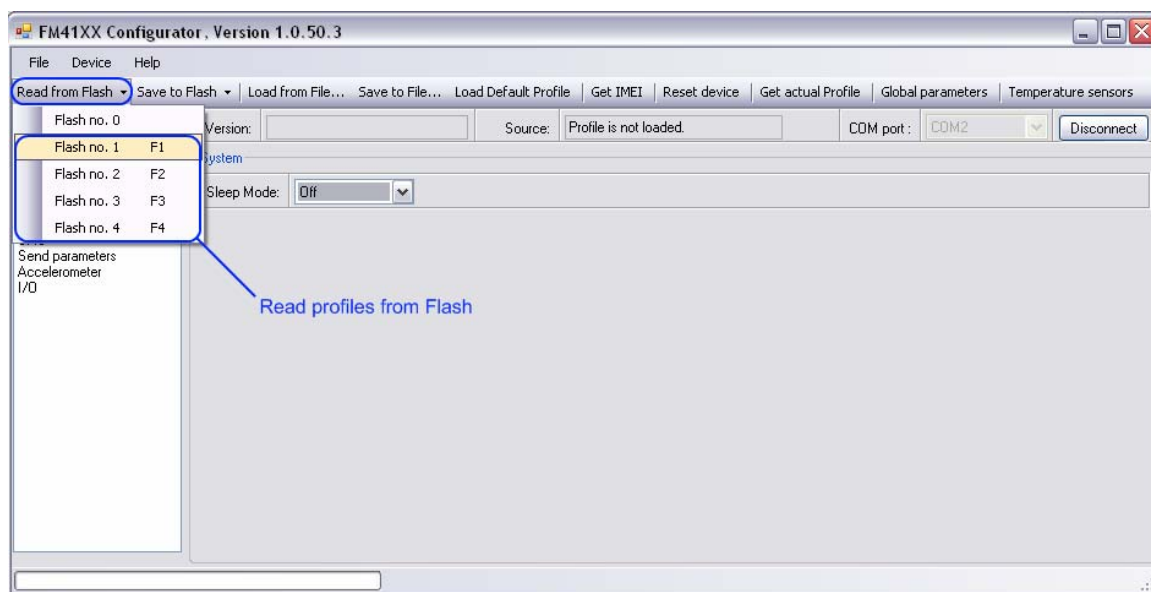
Module configuration is performed over cable labeled PORT1/2. Configuration process starts from loading FM4100 Configurator program and selecting COM port. Select COM port and click 'Connect' button.



14 Figure Configurator window

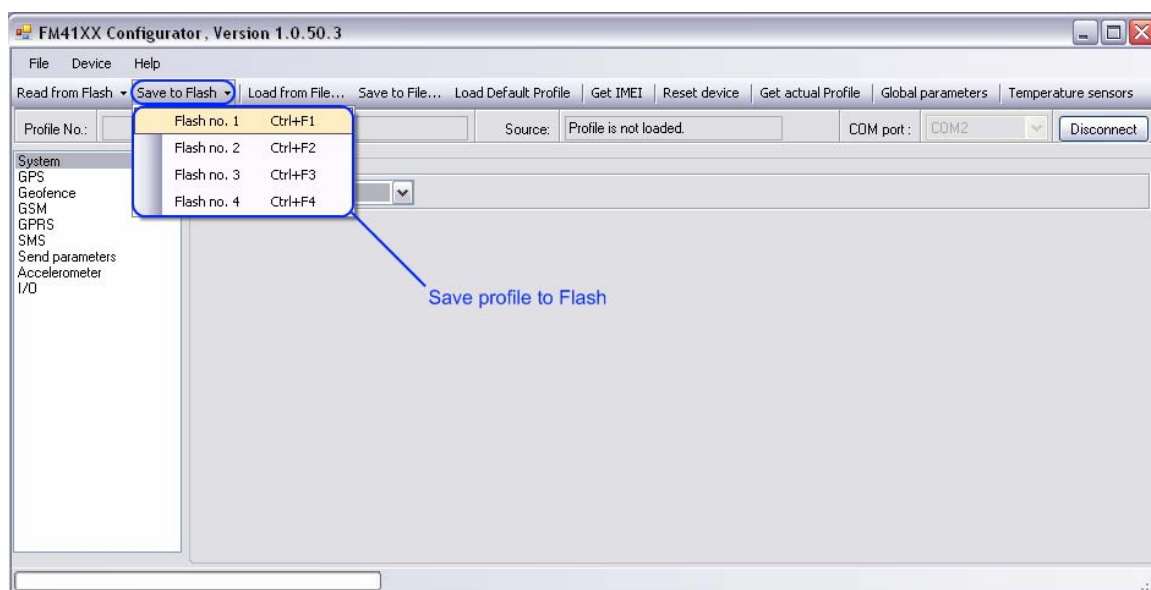
FM4100 has 4 user editable profiles stored in Flash no. 1-4 memories and one extra profile stored in Flash no. 0 which can not be edited by user. Profile from Flash no. 0 is used by system and can not be selected as active, while profiles from Flash no. 1-4 are fully editable and can be selected as active.

Figure below shows reading profiles from Flash memory procedure.



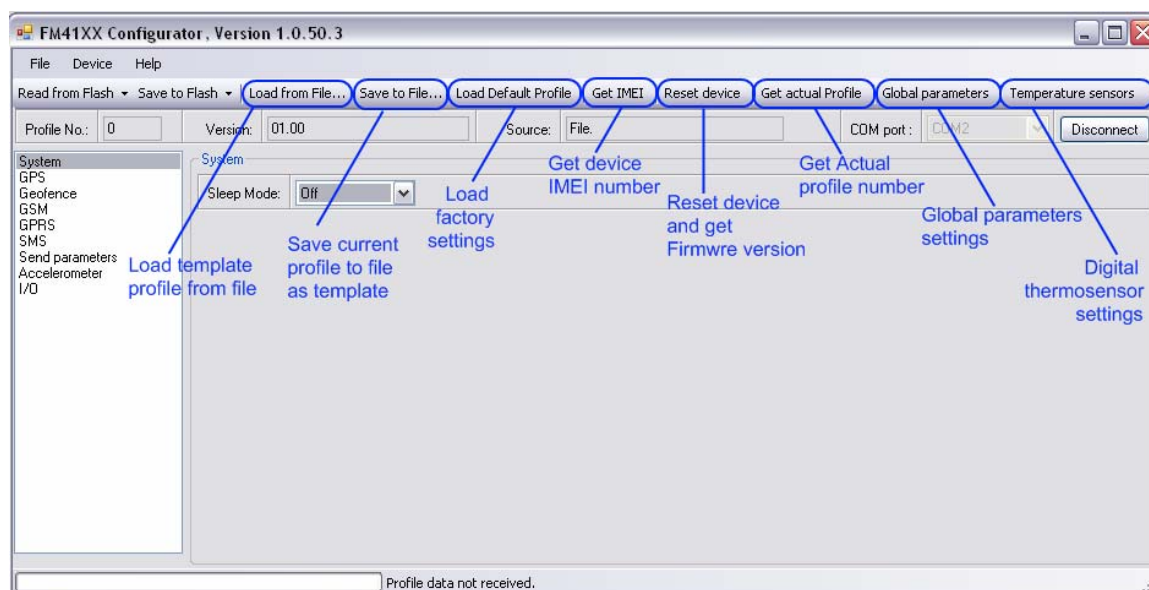
15 Figure Reading profiles from flash

After changing profile parameters, changes can be saved to FM4100 Flash. Figure below shows saving to flash memory procedure.



16 Figure Saving profiles to flash

Shortcuts help access menu functions more quickly.



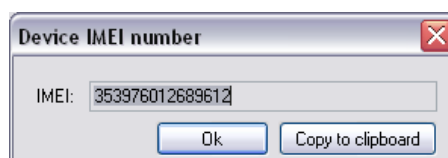
17 Figure Configurator shortcuts

'Load from file' – allows user to load configuration saved in .XML extension file.

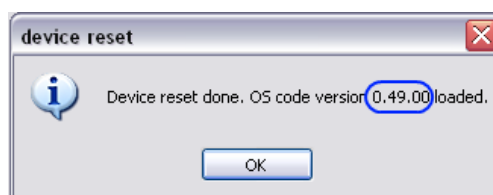
'Save to file' – allows user to save currently entered settings to a file.

'Load default profile' – loads default FM4 settings that later can be modified. This procedure must be performed before entering new parameters.

'Get IMEI' – reads FM4 IMEI number. This number is unique for every FM4 and usually servers recognize different devices by this number.



'Reset device' – reboots FM4 and displays processor firmware version.

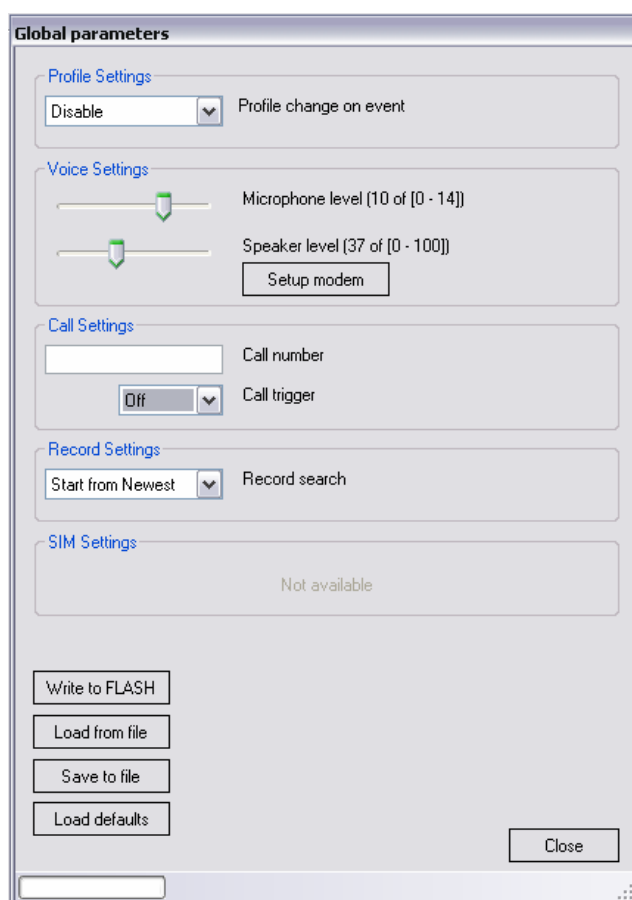


'Get actual profile' – allows to read currently used profile number.



6.2. Global parameter settings

Global parameters are parameters of the module that do not depend on selected profile. They are common for all profiles.



18 Figure Global parameters window

'Profile settings' – allow you to select profile switching method. When 'Profile change on event' is disabled – FM4100 switches profiles depending on GSM operator code method. Otherwise it switches profiles depending on I/O events (see chapter 5 for more details about profile switching).

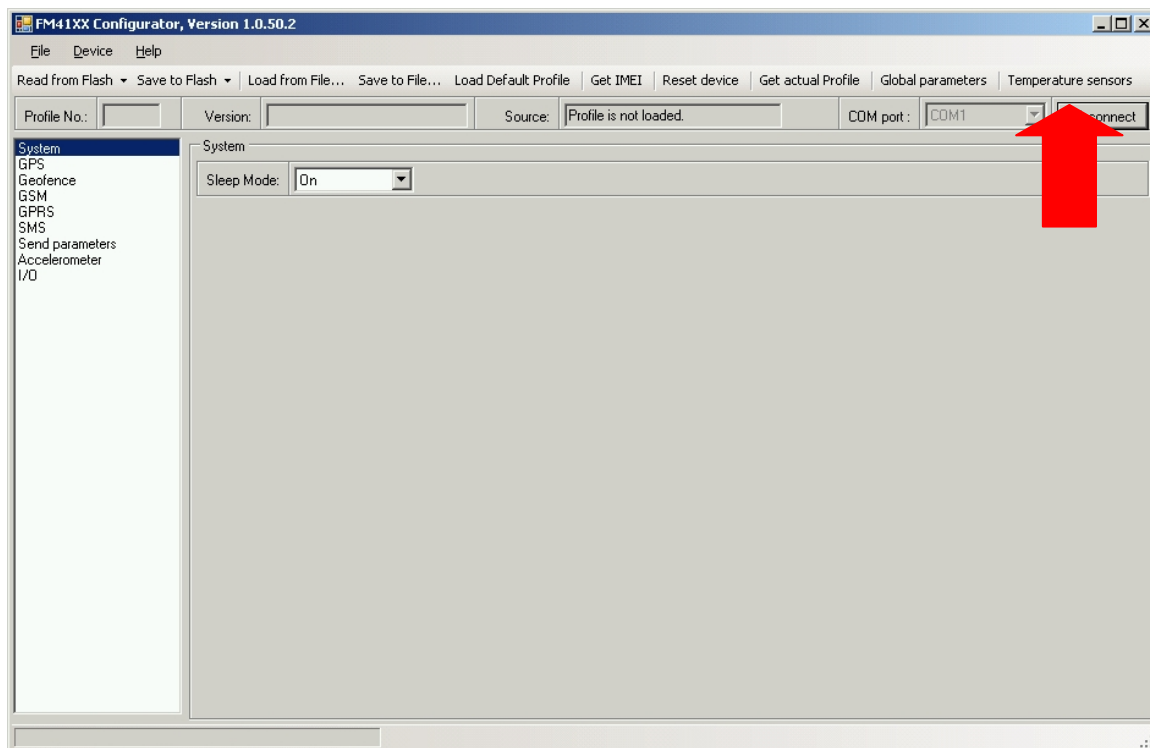
'Voice settings' – allow to setup microphone sensitivity level and speaker loudness level.

'Call Settings' – allow to enter one number to which FM4 will be able to call to. Call trigger defines input, which will be used to receive or make a call. Usually to that input a button is connected.

'Record Settings' – are used to switch between two data sending modes: starting from newest records or starting from oldest record.

6.3. Temperature sensors

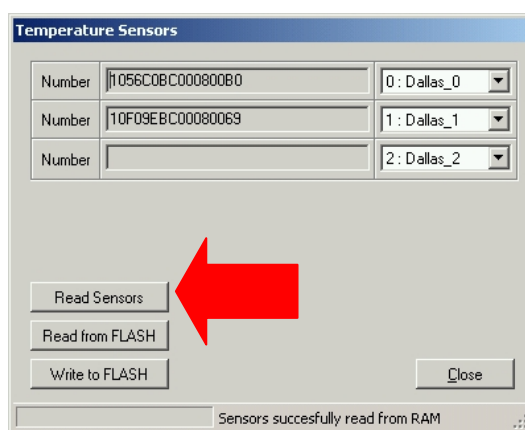
When two or three temperature sensors are connected to FM4 it is necessary to define sensor ID to certain property separately. This way FM4 will know which temperature sensor is which property. Definition is preceded with configurator: choose 'Temperature Sensors'.



Make sure, that sensors are connected to FM4 and click 'Read Sensors' in the new window. In the fields Dallas0, Dallas1 and/or Dallas2 sensor unique identifiers appear. Click 'Write to Flash' – now FM4 memorized sensor IDs and attached them to defined properties. If different sensors will be used, FM4 will not recognize them.

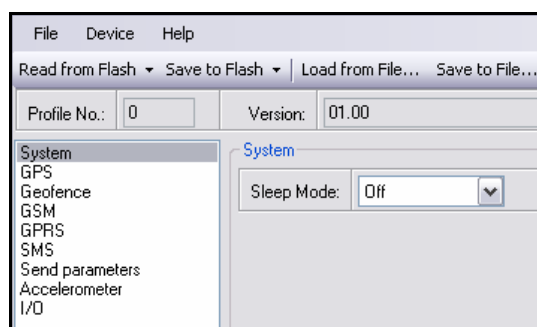
When FM4 is installed with two or more temperature sensors, it should always be preconfigured and same temperature sensor used as the ones that configuration was made with.

If only one temperature sensor is connected, no definition is necessary, FM4 automatically reads sensor as Dallas0 property.



6.4. System settings

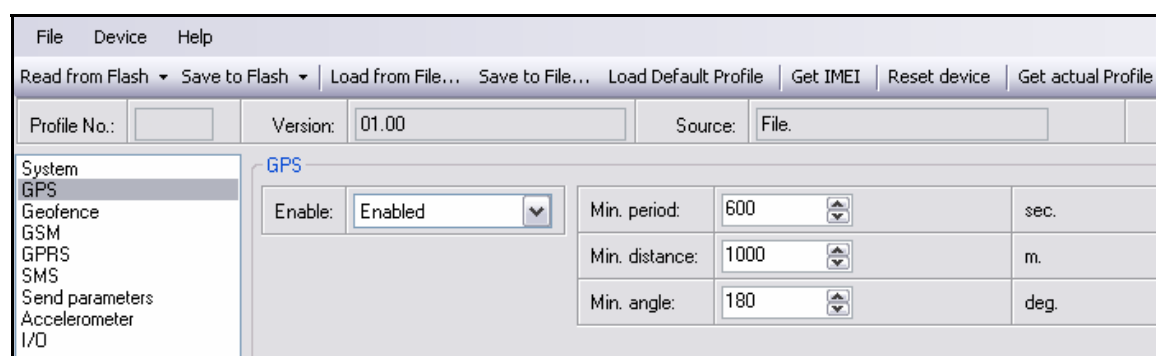
System settings menu has only one parameter – Sleep mode. It can be enabled or disabled by turning it on or off. See sleep mode description on chapter 5.2 for more details.



19 Figure System settings

6.5. GPS settings

GPS settings define GPS data acquiring methods and frequencies.

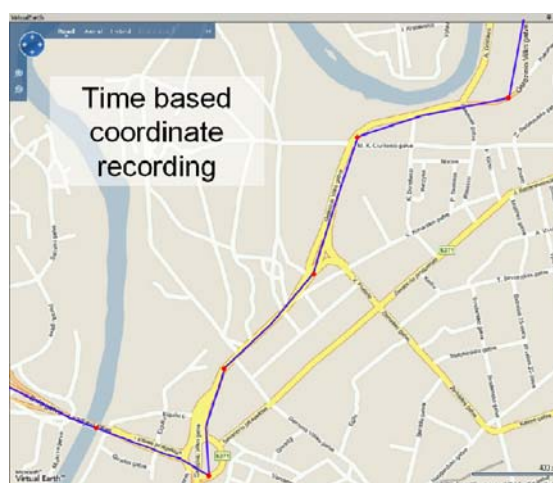


20 Figure GPS Settings

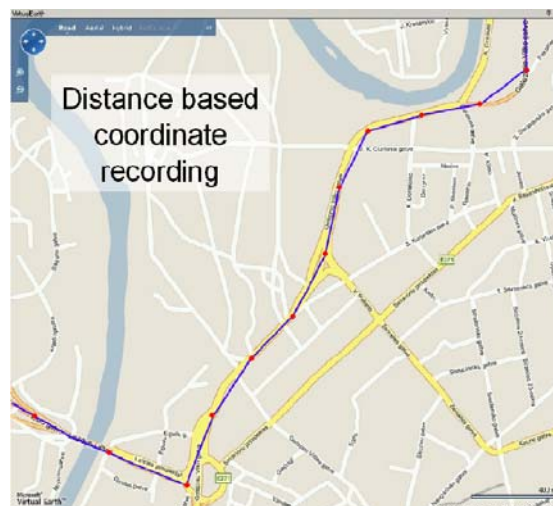
Device is checking if the time between last saved record and current time is equal or higher than Time based acquire interval. If so, FM saves record to memory. If not, FM checks if the distance from last record to current record is equal or higher than Distance based acquire interval. If so, saves the record to memory. If not and speed is higher than 10km/h, then FM is checking if angle difference between last record and current record is equal or higher than Angle based acquire value. If so, saves the record to memory. This check is being performed every second.

FM4100 is able to collect records using three methods at the same time: time, distance and angle based data acquisition:

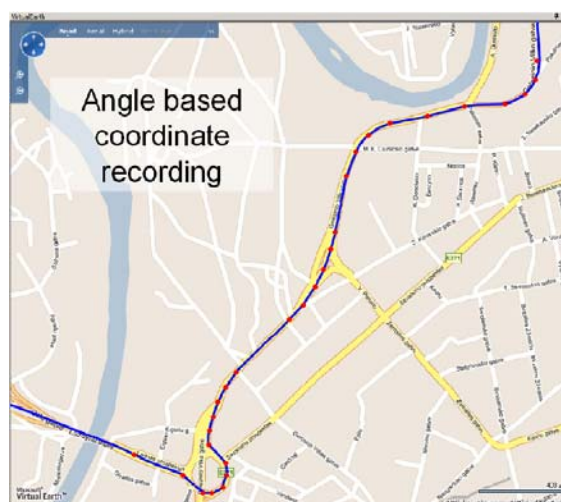
- Time based data acquiring (Min. period) – records are being acquired every time when defined interval of time passes. Entering zero means that data will be recorded as fast as possible (every second).



- Distance based data acquiring (Min. distance) - records are being acquired when the distance between previous coordinate and current position is greater than defined parameter value. Entering zero means that data will be recorded every 0 meters (as fast as possible – every 1 second).



- Angle based data acquiring (Min. angle) - records are being acquired when angle difference between last recorded coordinate and current position is greater than defined value. Entering zero disables data acquisition depending on angle.



6.6. Geofence settings

FM4100 has 20 configurable Geofence zones and it can generate event when defined Geofence zone border is crossed.

- 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 for details: track 1 is considered to enter the area while track 2 does not.



21 Figure Geofence border

- Shape – can be rectangular or circle
- Priority – priority of Geofence event – low, high or panic. These levels define priority of event information sending to server. See I/O element description for more details about priorities.
- Enter event – enable or disable zone entering event
- Exit event – enable or disable zone leaving 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

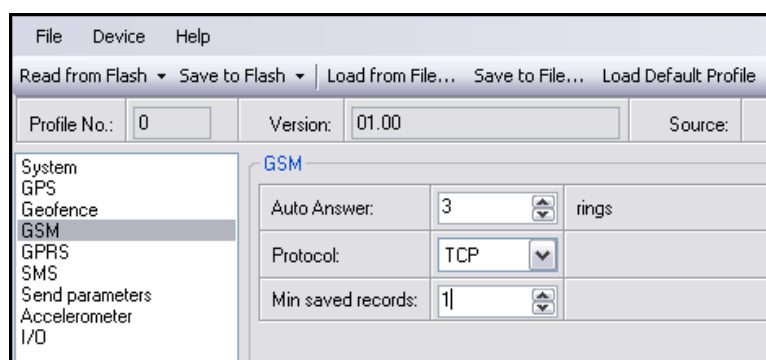
File Device Help	
Read from Flash ▾ Save to Flash ▾ Load from File... Save to File... Load Default Profile Get IMEI Reset device Get actual Profile	
Profile No.: 0	Version: 01.00 Source: File.
System GPS Geofence GSM GPRS SMS Send parameters Accelerometer I/O	Geofence Frame border: 100 m. Geofence zone: 1 Shape: Rectangular Priority: Low Enter event: Enable Exit event: Enable X1: 25.000000 Y1: 46.000000 X2: 26.000000 Y2: 47.000000

22 Figure Geofence settings

6.7. GSM settings

GSM settings allows to set up basic GSM parameters:

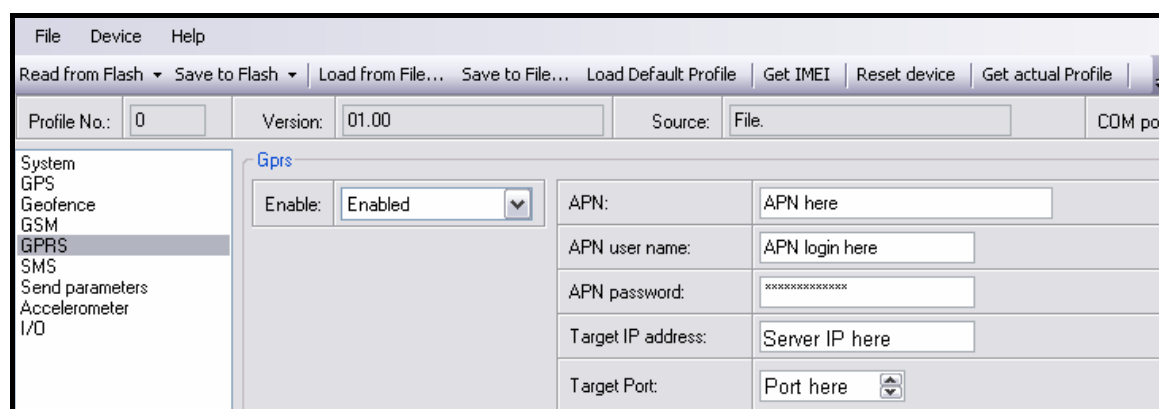
- Auto answer – number of rings after which module automatically answers incoming voice call
- Protocol – data transport protocol: TCP or UDP
- Min. saved records – minimum records (positions) to send in AVL data packet. If FM4 does not have enough records (positions) to send to server, it will check again after time interval defined in 'Sending Period' (see below).



23 Figure GSM settings

6.8. GPRS settings

- Enable – enables or disables GPRS usage in current profile.
- APN – GPRS Access Point Name (provided by your GSM operator)
- APN username – GPRS user name (provided by your GSM operator – optional parameter)
- APN Password – GPRS user password (provided by your GSM operator – optional parameter)
- IP address - AVL Server IP Address
- Port – AVL Server port number



24 Figure GPRS Settings

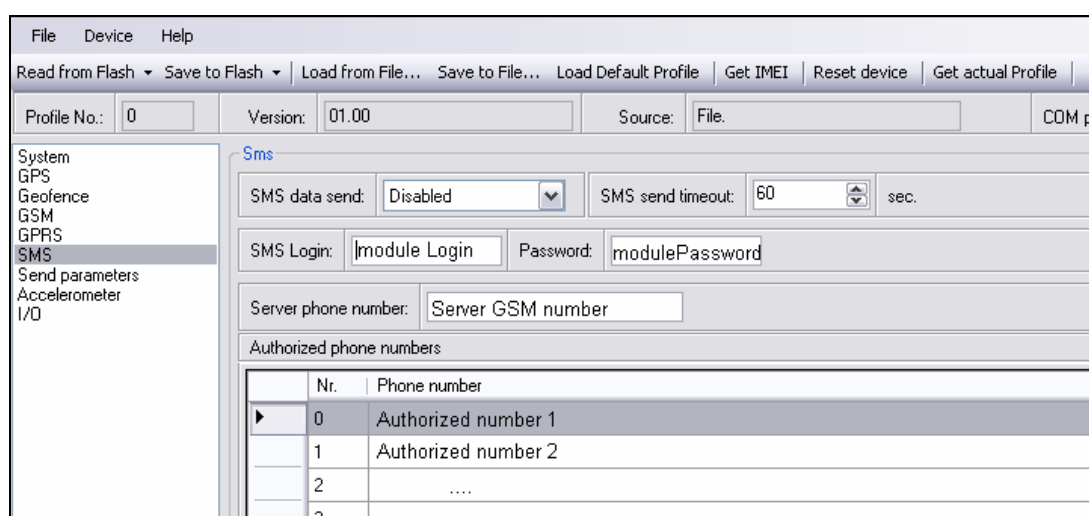
6.9. SMS settings

- SMS data send – enable or disable periodic data and event SMS use. Note, that this does not affect replies to messages – they are always sent to sender number.
- SMS send timeout – SMS send timeout (recommended 60 sec.)

- SMS Login – module login for SMS
- SMS Password – module password for SMS
- Server phone number – authorized server phone number for SMS requests, configuration, 24-coordinates and event binary SMS
- Authorized phone numbers – other authorized numbers that are allowed to control FM4 remotely



Module login and password, server and authorised number list is used to protect FM4 module from unauthorised access. Module accepts messages only from a list of authorised numbers and with proper module login and password. Numbers must be without “+” or “00” prefix. If no authorised numbers are entered, module accepts messages from all numbers. Server phone number automatically counts as authorised number.



Nr.	Phone number
0	Authorized number 1
1	Authorized number 2
2	
3	

25 Figure SMS Settings

6.10. Send Parameter settings

Send parameters window allow to set GPRS and SMS data send periods, sending schedules, set allowed operator list.

- 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 (depend on parameter Min. Saved Records described above), it tries again after defined time interval
- Time step - FM4 is improved with 24-coordinates-in-one-SMS sending mechanism. 24-coordinates-in-one-SMS mechanism 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 with interval between them defined in time step field. SMS sending schedule is set in SMS Week Time tab. 24-Coordinates SMS decoding is described in “FM Protocols” document.
- GPRS Context Week Time tab – most GSM billing systems charge number of bytes (kilobytes) transmitted per session. During the session FM4 makes connection and transmits data to a server. FM4 tries to handle session as much as possible. Session can last hours, days, weeks or session can be closed after every connection in certain GSM networks – this depends on GSM network provider. GPRS Context Week Time defines session re-establish schedule if session was closed by network. New

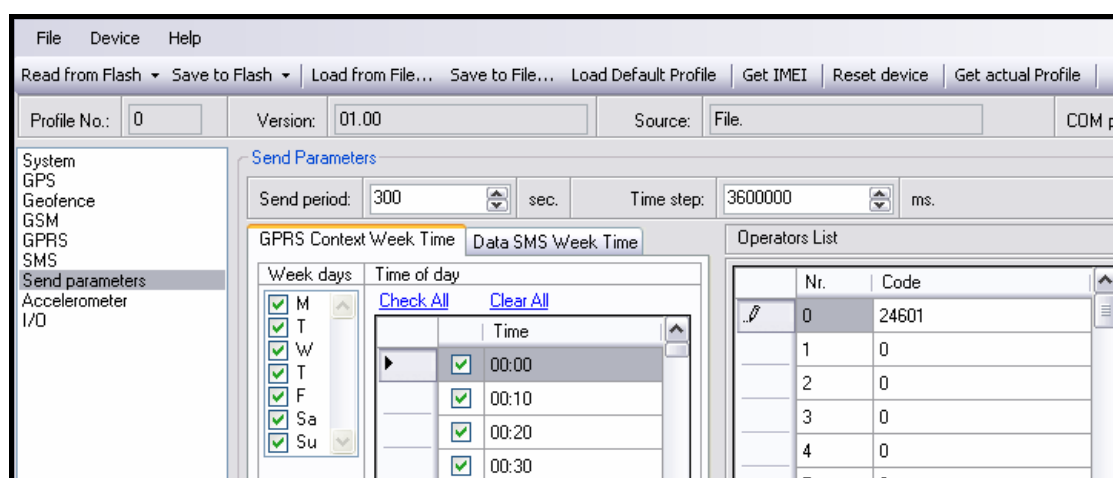
GPRS context is opened if time is 10 minutes till time checked in table. Therefore if all boxes are checked, FM4 is able to open new connection anytime. At scheduled time match FM4 checks for GPRS session activity. If GPRS session is alive, FM4 sends data to server according to Send period parameter. If it is not, FM4 checks if it is able to re-establish the session.

- SMS Week Time tab – week time allows to set SMS data sending schedule. SMS mode mostly used in areas where GPRS is not available.



Note FM4100 operates GMT time without daylight saving.

- Operators list - FM4 one of profile switching methods is GSM operator code profile switching according to currently selected operator. If currently selected GSM operator code is in profile list, FM4 will load the profile containing this GSM operator code. See profile description for more details. If no operator codes are entered in any profile, FM4 will operate in Profile Nr3. Operator codes are usually 5 digit numbers that should be entered without no additional symbols, such as "-" or other – first three numbers define country code, last two numbers – operator number. It is possible for one operator to have more than one operator code. In the picture below displayed is only a sample operator code.



26 Figure data send parameters settings

6.11. Accelerometer

Detailed accelerometer functionality along with setting fields is described in Operational Basics, Accelerometer chapter.

6.12. I/O settings

When no I/O element is enabled, 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.

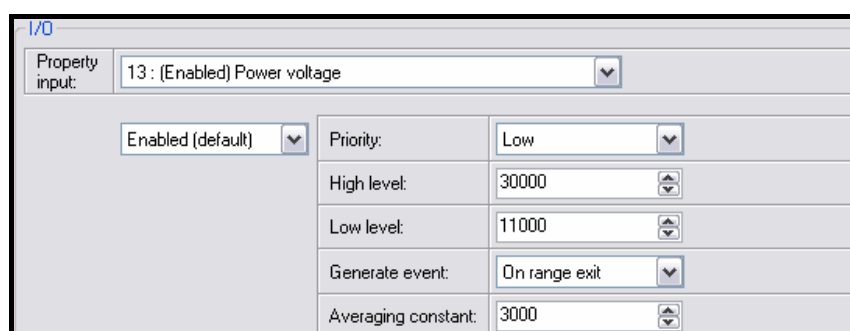
List of available I/O elements includes I/O id, names, units, minimum and maximum values. This list should be used during module configuration.

Id	Name	Units	Minimum value	Maximum value	Other
0	Analog – Input1	mV	0	30000	
1	Analog – Input2	mV	0	30000	
2	Analog – Input3	mV	0	30000	
3	Analog – Input4	mV	0	30000	
4	Digital – DI1	Boolean	0	1	0 – no high voltage on DIN, 1 – high voltage on DIN detected
5	Digital – DI2	Boolean	0	1	See DI1
6	Digital – DI3	Boolean	0	1	See DI1
7	Digital – DI4	Boolean	0	1	See DI1
8	Acceleration event	g x 100	0	400	4g max
9	Dallas – Dallas_0	10 * degrees °C	-550	1250 (3000)	3000 Value returned when no Thermo sensor connected to FM4100
10	Dallas - iButton	Unique id	0	$2^{64}-1$	8 Byte Value
11	Battery voltage	mV	0	30000	
12	Battery level	mA	0	330	Battery Charging Current
13	Power Voltage	mV	0	30000	
14	PCB temperature	10 * degrees °C	-550	1250	
15	GPS Power	States	0	1	0 – GPS Protection Mode Active; 1 – Normal GPS Operation.
16	Fuel counter	Number of pulses counted from last acquired point	0	$2^{64}-1$	8 Byte Value
17	GSM signal strength	Percentage	0	5	0 – 0% 1 – 20% 2 – 40% 3 – 60% 4 – 80% 5 – 100%
18	Current profile	Profile number	1	4	

19	Speed	km/h	0	$2^{16}-1$	2 Byte Value
20	Odometer	m	0	$2^{32}-1$	4 Byte Value
21	Movement	Boolean	0	1	0 – no movement detected, 1 – movement
22	Dallas – Dallas_1	10 * degrees °C	-550	1250 (3000)	See Dallas – Dallas_0
23	Dallas – Dallas_2	10 * degrees °C	-550	1250 (3000)	See Dallas – Dallas_0



There are two types of operations with 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 to define I/O event criteria.



- Enabled or disabled field – allows to enable I/O element so it is added to the data packet and is sent to the server. By default all I/O element are disabled and FM4 records only coordinates. It is also possible to set CAN message instead of any I/O element – this way CAN element will be sent to the server instead of chosen element. See CAN description below for more details.
- Priority – AVL packet priority. There are Low, High, Panic, SW21, SW22, SW23, and SW24. Regular packets are sent as Low priority records. When low priority event is triggered, FM4 makes additional record with indication that the reason for that was IO 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 it send using GPRS, if GPRS fails, it sends AVL packet using SMS mode if SMS is enabled in **SMS** settings. Panic priority event forces module to send AVL packet to server and switch operating profile to Profile 4. (see profiles description for more details). SW2X priorities switch profiles on event.
- High and Low levels – define I/O value range. If I/O value enters or exits this range, FM4 generates event. “Generate event” parameter defines when to generate event – when value enters defined range, exits it or both.
- 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. Averaging constant allows to set I/O event delay (averaging). If I/O value is entering or leaving predefined range, it must have same value for Averaging constant time. 1 Averaging constant value equals 20 milliseconds.

6.12.1 Monitoring

I/O monitoring starts after enabling I/O element and setting up I/O parameters in the following order:

Priority	always low
High level	-1000
Low level	-1000
Generate event	on range enter
Average constant	1

High and Low level's values are always -1000 because these thresholds will never be reached by any of I/O and never generate any additional AVL packet.

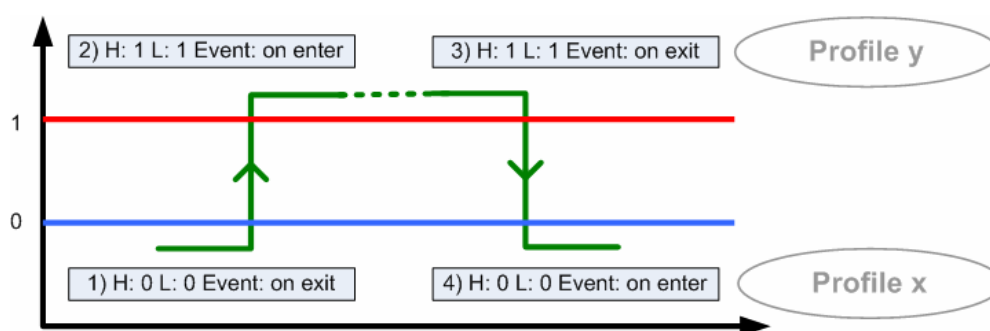
6.12.2 Event Generating

Events happen when the value of enabled I/O intersects thresholds (enter, exit or on both) predefined by High and Low level thresholds. Table below defines all available values of I/O settings.

Priority	low, high, panic, SW21, SW22, SW23, SW24
High level	maximum threshold
Low level	minimum threshold
Generate event	on interval enter, on interval exit, on both enter and exit
Average constant	$1 - 2^{32}$ (4 Bytes)

SW21, SW22, SW23, SW24 stand for "SWitch to profile No. X" – after event happens, FM4 switches to 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.

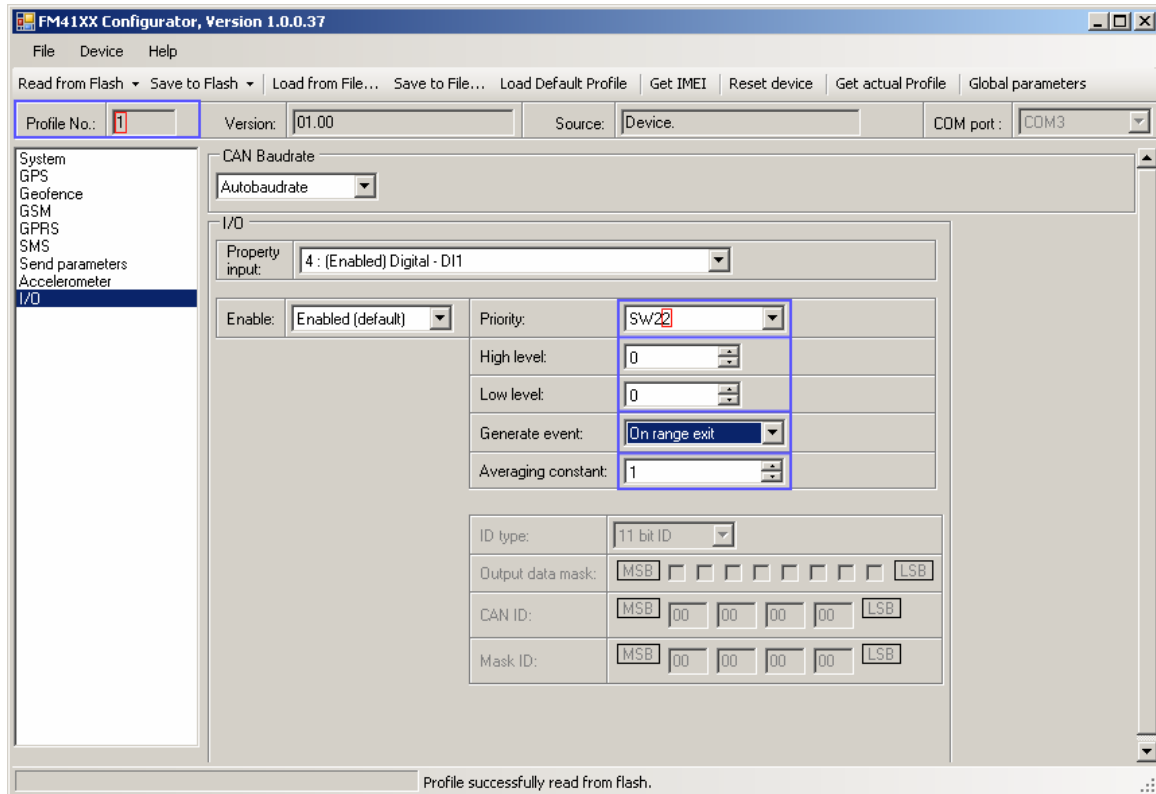
Pictures below illustrate profile switching depending on digital events:



27 Figure Digital input event criteria

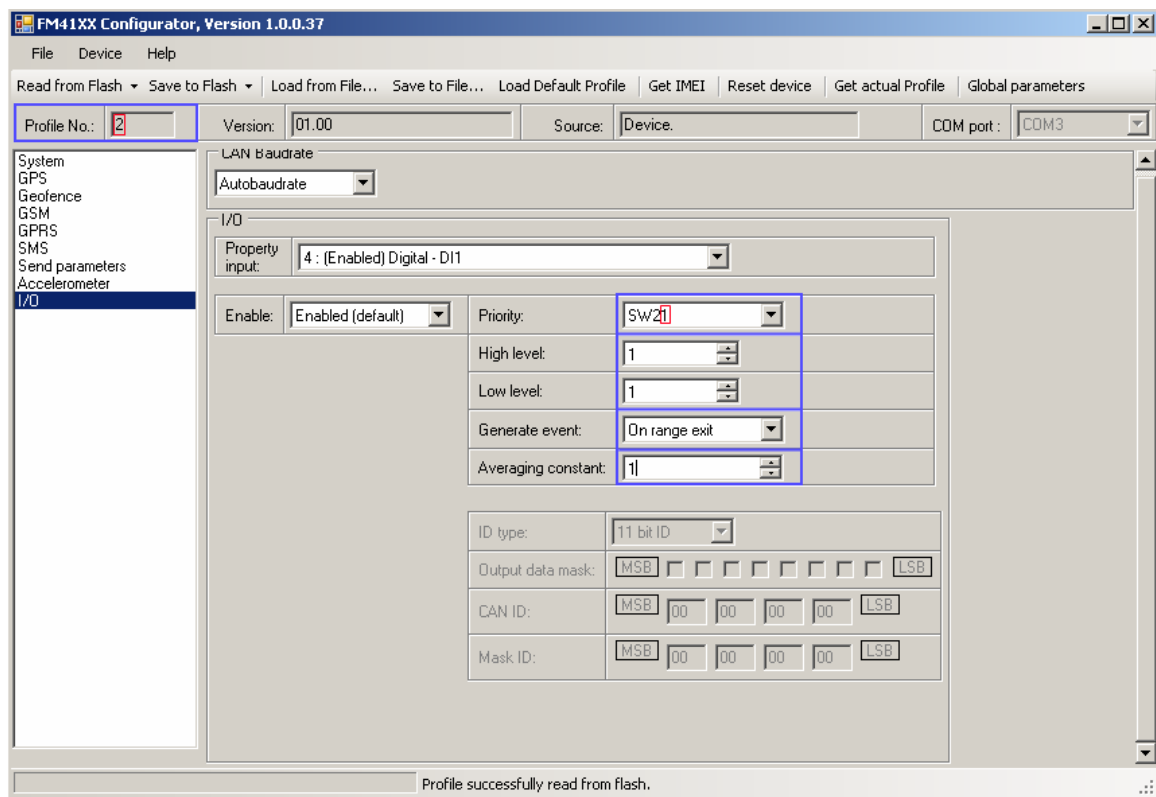
According to Figure, event on digital inputs could be described in different ways by using 1 and 3, 1 and 4, 2 and 3, 2 and 4 settings.

Profile1 switches to Profile2 when DIN1 value changes from 0 to 1.



28 Figure Switch to profile on event

Profile2 changes to Profile1 when DIN1 state changes from 1 to 0.



29 Figure Switch to profile on event

In same way you can configure profile switching depending on any I/O event.

6.13. CAN settings

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 is the vehicle bus standard used for communication and diagnostics among vehicle components. Based on same architecture FMS protocol dedicated to telematic 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.

A sample CAN message has the following structure: X18FEE9018FFFFFFFF23840300, where essential parts are 'FEE9' – identifier and 'FFFFFFFF23840300' – data bytes. According to FMS standard description, only four bytes are used as can be seen in data field.

CAN messages are configured like any other I/O parameters. They consist of 8 identifier bytes and 8 data bytes. In the screenshot 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 8 byte identifier. Messages use only four bytes - first two and last two bytes may differ in different vehicle models. Those unused bytes can have any values.

Mask ID - parameter defines which part of CAN ID field should be considered for filtering. To identify message only 3rd, 4th, 5th and 6th bytes are used, that's why Mask ID is always 00 00 FF FF 00 00.

As an example full solution how to setup Mercedes Benz Actros truck is provided.



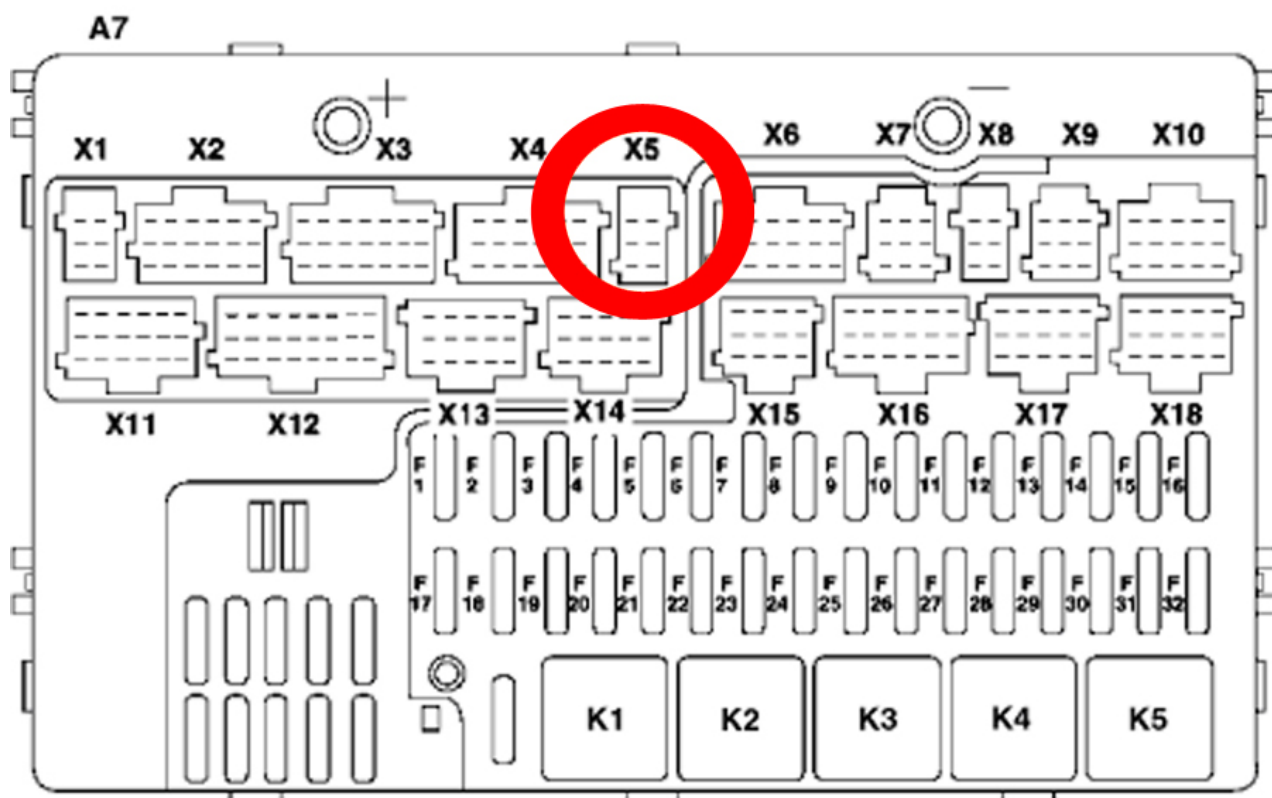
This information is provided only as an example and Teltonika takes no responsibility for information accuracy or damage that may be done to the vehicle or FM4100 module while integrating it.

All MB Actros 2 models with Vehicle Identification Number (VIN) starting with WDB93 have a possibility to connect FM4100 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:

Pin 5: CAN Low signal (yellow wire)

Pin 2: CAN High signal (blue wire)

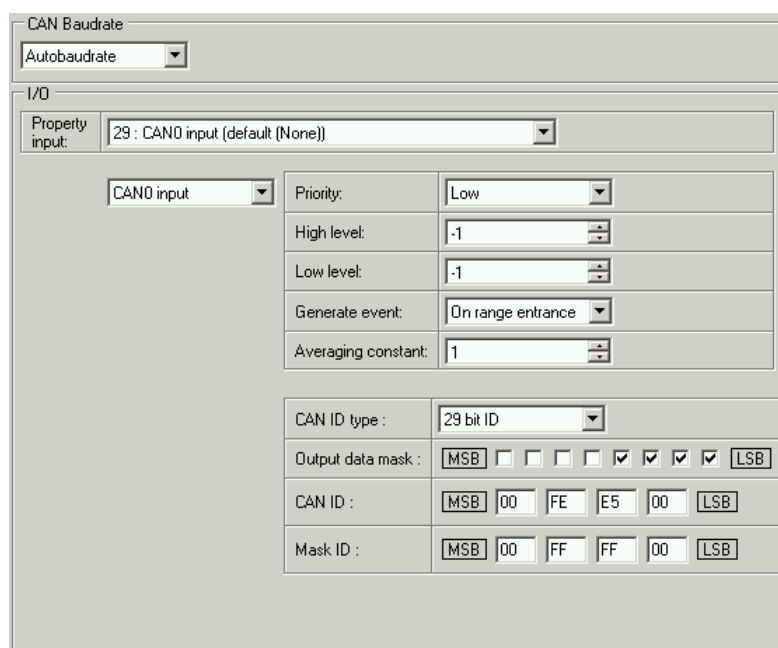


30 Figure X5 plug on MB

In the example FM4100 will filter all CAN messages with identifier XXFEE9XX (fuel consumption), XXFEFCXX (fuel level) and XXFEE5XX (total engine hours). In this case X is any symbol.

CAN Baudrate																															
Autobaudrate																															
I/O																															
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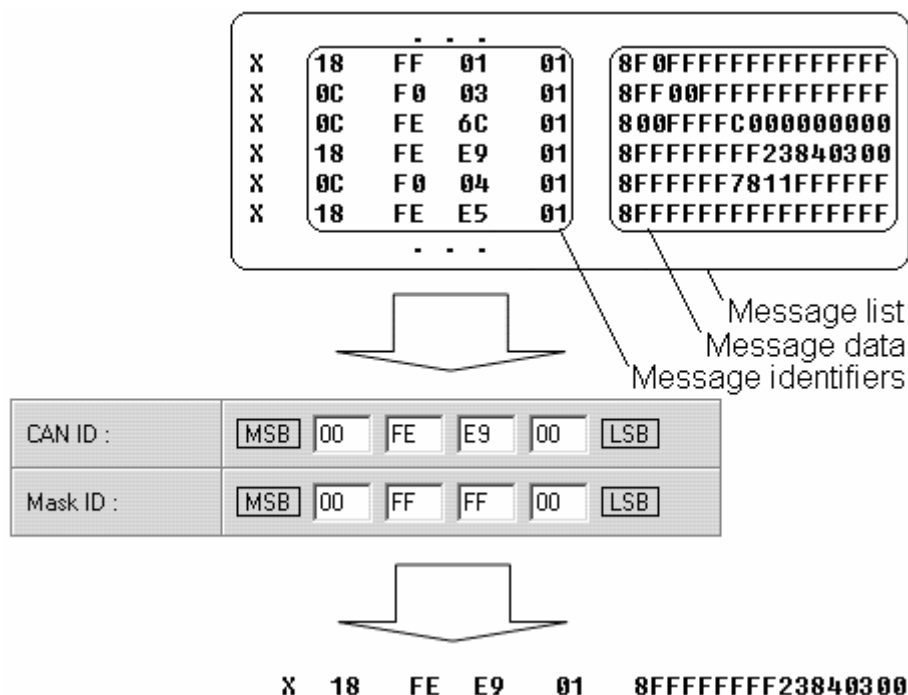
31 Figure CAN parameters configuration examples

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. FEFC has resolution of 0.4%/bit gain, so it has to be multiplied by 0.4. FEE5 has 0.05 h/bit gain – multiplier is 0.05.

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:

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
				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
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 SAE ref SPN

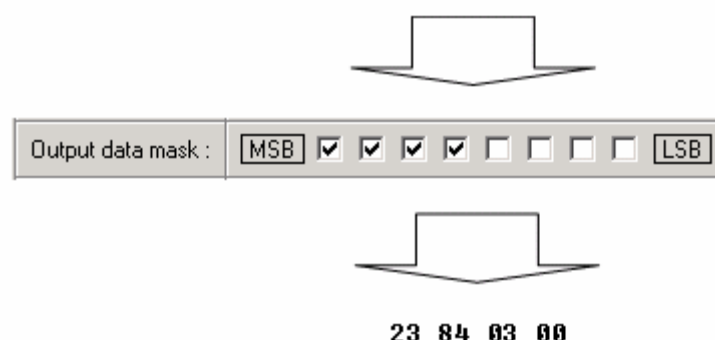
The example indicates how fuel consumption message is selected and how configuration impacts this selection. CAN ID is message identifier and Mask ID selects which identifier bytes should be used to filter messages:



When certain message is filtered, FM4100 checks which data bytes should be sent to server. Document indicates that 5-8 bytes are used in FMS standard:

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								Total fuel used 0,5 L / Bit gain 0 L offset								Total fuel used 0,5 L / Bit gain 0 L offset								Total fuel used 0,5 L / Bit gain 0 L offset								Name values values values SAE ref SPN
5.2.5.66 SPN 250								5.2.5.66 SPN 250								5.2.5.66 SPN 250								5.2.5.66 SPN 250								

X18FEE9018 FF FF FF FF 23 84 03 00



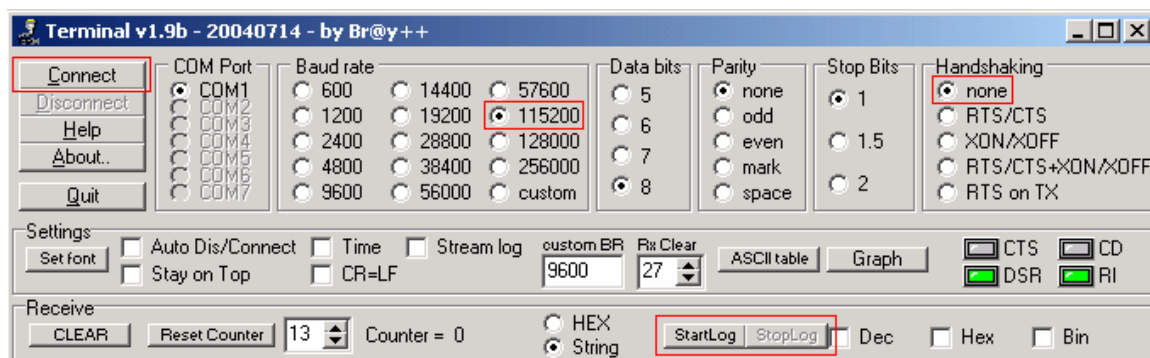
Data bytes are filtered by selecting the checkboxes in Output data mask. Note, that configurator has them listed starting with MSB.

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 total of 115217,5 liters of fuel since it was manufactured.

7. DEBUG MODE

FM4 is able to transmit its current state when connected to PC using PORT1/2 cable. It is used to detect errors and provide information to possible solutions when operating as unexpected.

Download Terminal from: <http://213.226.139.30/Downloads/Software/Terminal.rar>. 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 FM4.



8. SMS COMMAND LIST

SMS commands are used to identify FM4 current state, possible configuration errors, perform reset, set parameters, switch on/off outputs, etc.

SMS command 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 6.9 for more details.



32 Figure Module login, password and authorized numbers settings

SMS structure is as follows:

<login> <password> <command>

Example:

opa opa getgps

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 available GSM operator	Yes
getcfgtime	Date and Time of last successful configuration	Yes
getgps	Current GPS data and time	Yes
loadprofile#	Load specified profile into	Yes

	RAM Engine Profile. # - number of profile to load	
cpureset	Reset CPU	No
rstallprof	Reset all FLASH profiles to default profile	No
getver	Device / Modem / Code version information	Yes
getstack	Device maximum task stack load 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 #####	set digital outputs 0 - OFF, 1 – ON DO1 DO2 DO3 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)	No

SMS command response description

8.1. getstatus

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
Bat	Battery charge level [0-5]
Signal	GSM Signal Quality [0-5]
Service	GSM service availability (0 – unavailable, 1 – available)
NewSMS	Indicate if new message received
Roaming	0 – Home Network, 1 - roaming
SMSFull	SMS storage is full? 0 – ok, 1 – SMS storage full

Example: Data Link: 0 GPRS: 1 Phone: 0 SIM: 0 OP: 24602 Bat: 4 Signal: 5 Service: 1 NewSMS: 0 Roaming: 0 SMSFull: 0

8.2. getweektime

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

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

8.3. getops

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

Example: GSM OP LIST: 0. 24602

8.4. getcfgtime

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

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

8.5. getgps

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

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

8.6. loadprofile#

DESCRIPTION: Returns acknowledgment of successful profile changing from currently used to preferred.

Example: Profile Nr.1 successfully changed to Profile Nr.3

8.7. getver

Response details	Description
Code Ver	Firmware version
Device IMEI	IMEI
Device ID	Device ID is used to detect by server which type of configuration to load
Modem App Ver	Version of modem application
Modem REV Ver	Modem Firmware version

Example: Code Ver:0.48.17 Device IMEI:353976010139156 Device ID:000001 Modem APP Ver:2007.11.07 Modem REV Ver:04.13.00

8.8. getstack

Response details	Description
Maximum stack load	Indicates maximum stack load from last start
At Address	Process address which caused maximum stack load

Example: Maximum Stack Load:53% At Address:000155DB

8.9. getinfo

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, P#: 0 – inactive profile, 1 – active profile
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

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:0 P:1 P0:0 P1:1 P2:0 P3:0 P4:0 SMS:2 NOGPS:0:0 GPS:3 SAT:7 RS:7

8.10. getio

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

Example: DI1:0 DI2:0 DI3:0 DI4:0 DO1:0 DO2:0 DO3:0 DO4:0 AI1:0mV AI2:0mV AI3:0mV AI4:0mV

8.11. readio

Response details	Description
ID	IO element ID
Value	IO Element value

Example: IO ID:3 Value:0

8.12. setdigout

Sets digital outputs to ON or OFF state. Value is written as a row for OUT1, OUT2, OUT3, OUT4 values.

Example: 'setdigout 0100' will set OUT2 to high level, while OUT1, OUT3 and OUT4 to low level.

8.13. **getparam #####**

Read parameter value. ID consists of 4 digits – first digit identifies profile, second, third and fourth identifies parameter ID as described in FM4XX Parameter and Functionality document.

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

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

8.14. **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 FMXXX Parameter and Functionality document. In value field a new parameter value is entered.

Example: 'setparam 1245 127.0.0.1' will change configured IP address in profile1 with new value

8.15. **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 don't 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

9. MOUNTING RECOMMENDATIONS

Modules installation on the object consists of four main steps:

- Connecting wires.
- Fitting GPS/GSM antenna.
- Fitting module.
- Check-up.

Each of them must be carried out with safety precautions.

If you have trouble finding correct wires or you are not sure about their purpose, please check the vehicles wiring diagram.

9.1. 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 heating and moving objects near the wires.

To connect wires the special connectors are used depending on the width of the wire or they are soldered together. For +12 V and ground wires special loops are recommended. In any case a contact should be firm and isolated.

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 and etc., additional isolation should be applied.

Wires cannot be connected to the board computers or control units, because warranty is not applied after that.

9.2. Connecting Power Source

Be sure that after the car computer falls asleep, power is still available on chosen wire. Depending on a car, this may happen in 5 to 20 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.

9.3. 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).

Be sure to 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.

Connection to the ABS relay is prohibited.

9.4. 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 is connected to the end of the wire.

For better contact scrub paint from the place where loop is connected.

9.5. Connecting Antennas

Antennas should not be seen and easily reached.

Antennas cannot be placed under metal surfaces. GSM antenna should be placed with as little metal obstacles around it as possible.

GPS antenna is placed under panel, behind dashboard or under vent cover and as close to the front glass as possible.

GPS antenna is placed so its state is as horizontal as possible (if antenna is leant more than 30 degrees, it is considered incorrect mounting).

When antenna is stucked or glued the surface must be wiped and cleaned with fat removing liquid.

Antennas cable cannot be bent more than 80 degrees.

9.6. 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).

9.7. Check-Up

- After mounting and connecting the module, its check-up should be carried out. During check-up as little obstacles as possible should occur for GPS signal (metal and concrete doesn't allow GPS signals to pass through it).
- Check if vehicle's computer doesn't generate any errors.
- Check if vehicle's electrical instruments are working properly (lights, electric windows, etc.).
- Check if the ignition relay is still working after connecting ignition wire to it.
- After power is connected to the module three light diodes should light up and "Navigation" diode should start blinking at fast rate. If module can receive GPS signal in 15 minutes, "Navigation" diode should begin blinking at 1Hz rate (one blink per second).
- Further check-up is carried out with the help of the TAVL application. The operator is contacted and it is checked if the module is sending data to the server.

10. CHANGE LOG

Nr.	Date	New version number	Comments
1	086025	2.1	6.2.9 chapter revised
2	080819	2.2	Major revision.