



USER GUIDE

Navigation User Terminal

iON FM





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1. Introduction

This document contains information on preparation procedures of the iON FM navigation user terminal for operation.

Version	Date	Prepared by	Revisions
1.0	14.03.2016	V. Golovin	Main document
1.0.2	07.04.2016	V. Golovin	Revisions: minor changes in sections 1.4.6, 1.4.7, 2.2, 2.3, 4.3.4, 4.4.1
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1.2.1	07.12.2016	V. Golovin	Revisions: corrections in chapter 4.4
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1.2.5	17.08.2017	V. Golovin	Revisions: parameters of frequency input (1.4.6)
1.2.6	08.11.2017	V. Golovin	Revisions: added parameters I/O (1.4.6)

1.1. Warnings and Recommendations

Before starting to use the device, please read the safety rules described in this section.

CAUTION! The device uses the cellular technology and can cause radio interference to medical and other equipment. Thus, if you are in the area where use of cellular devices is not allowed, disable the controller.

CAUTION! The controller can cause interference to cardiac pacemaker or hearing aids. Switch off the device in medical centres.

CAUTION! Switch off the device if you are in the area of blasting operations. The controller can cause interference when the operations are underway. Thus, follow the instructions and directions in such areas.



1.2. Technical Specifications*

General Features	
Navigation receiver	GPS/GLONASS
Frequency bands	GSM/GPRS 900/1800 MHz
Antennas	External GPS/GLONASS antenna
	External GSM antenna
Flash-memory	16 MB
SIM card holder	Inside the case
Built-in accelerometer	Three-axis
Electrical Specifications	
Supply voltage	from 8 to 48 V
Current consumption in various modes (at 12V power voltage), not exceeding	<ul style="list-style-type: none"> ● 100 mA (operating mode, the battery is charged) ● 250 mA (operating mode, the battery is discharged) ● up to 10 mA (sleep mode)
Built-in battery	Li-Pol, 550 mAh
Connectors and Interfaces	
Microfit 10 connector	Device power
	RS485 interface
	4 multipurpose inputs (analog, discrete [logic], frequency, pulse)***
	2 outputs (open collector)***
FAKRA SMB connector	Connection of an external GPS/GLONASS antenna
FAKRA SMB connector	Connection of an external GSM antenna
SIM card	Mini SIM - standard SIM card (or SIM-chip**)
Micro USB connector (inside the housing)	Connection to a PC for configuration
Physical Specifications	
Dimensions	94 × 74 × 20 mm
Net weight net, not exceeding	90 g
Gross weight, not exceeding	120 g
Operating temperature	from -30°C to +80°C

* technical specifications are subject to change by the manufacturer without prior notice

** optional

*** total number of inputs/outputs amounts to 6



1.3. Package Contents

The delivery package of the iON FM navigation user terminal contains the following components*:

Indication	Name	Quantity
①	iON FM	1 pcs
②	GSM antenna	1 pcs
③	GPS/GLONASS antenna	1 pcs
④	10-pin interface cable	1 pcs

* the package collection and content are subject to change by the manufacturer without prior notice



1.4. Device Overview

1.4.1. Device Overview and Purpose

iON FM is a navigation user terminal (NUT) designed for installation on the object of observance, collection, storage and transmission of data to the server for further processing. The navigation terminal receives location and time data from the GPS/GLONASS satellites. The collected data is transmitted to the server over the GSM network using the GPRS packet-switched service. The data on the server is available to a user through the dispatching software.

It is necessary to remember that iON FM is just a part of the tracking system. The navigation terminal itself is responsible for data acquisition and transmission from the surveillance object to the server where the data is processed and provided to an end user.

Overall, the tracking system enables you to complete a wide range of tasks:

- safety issues — vehicle travel data, operating disturbances, etc.;
- efficiency improvement — control of a vehicle use only in authorized operations, efficiency analysis of the performed tasks;
 - ensuring operation transparency — all data on vehicle travels, fuel consumption and other data is transmitted to the server and available online;
 - statistical data collection — in the process of vehicle operation an end user is provided with various data which can simplify and even improve efficiency of performing tasks. Moreover, this data helps to make calculations of different economy-related measurements.

1.4.2. Navigation Terminal Functions

The iON FM navigation terminal as a part of the tracking system fulfils the following functions:

- fixes the vehicle location (space coordinates) using GPS/GLONASS module;
- determines overload, direction change, turns using the built-in accelerometer;
- collects data from the sensors:
 - digital sensors;
 - analog sensors.



1.4.3. The Tracking System Operation Diagram

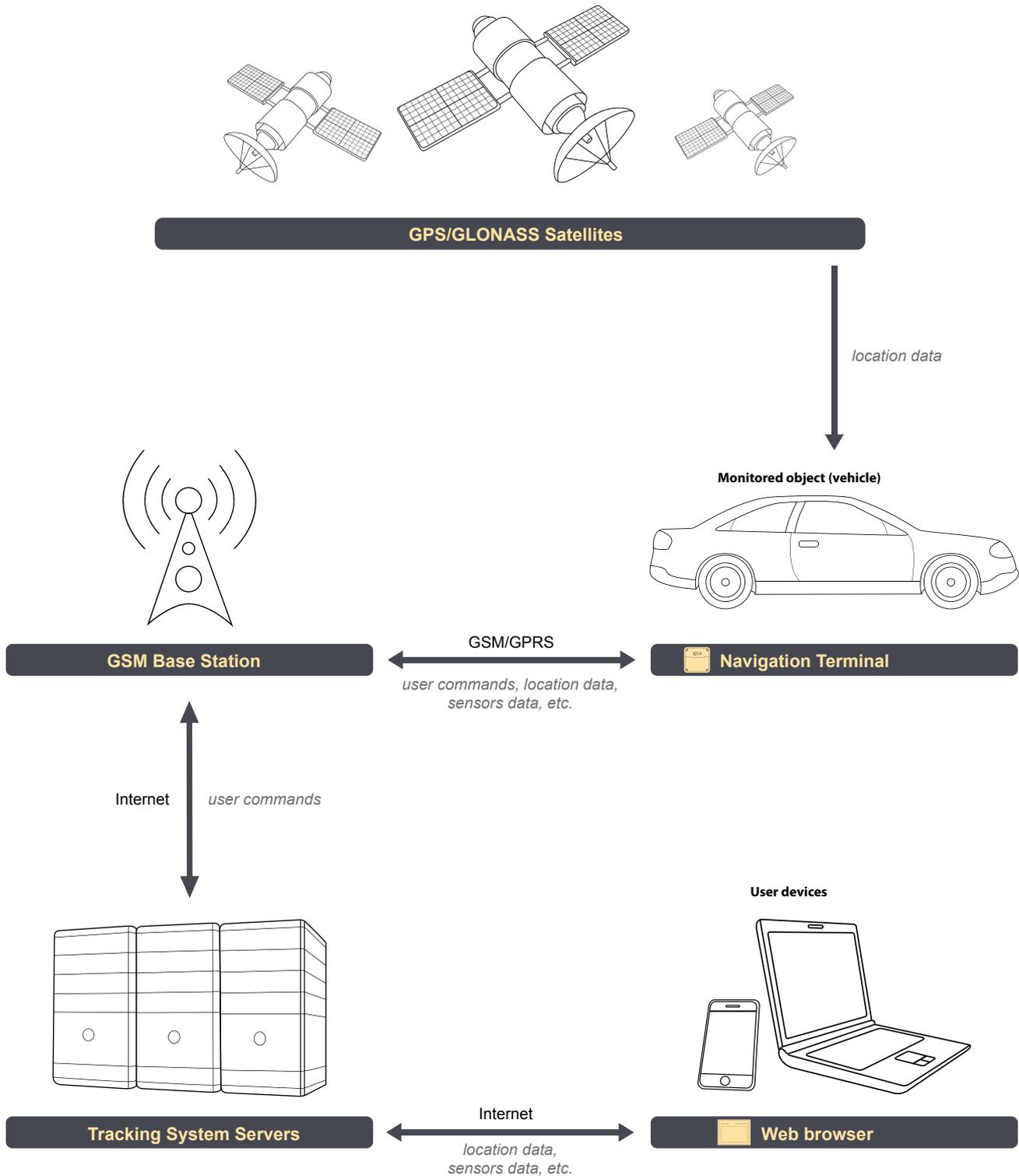


Fig. 1.1. The Tracking System Operation Diagram



1.4.4. Navigation Terminal Connectors

iON FM is a compact device encased in a plastic housing which supports connection to external power, as well as to various external devices and sensors.

Interface connector is situated outside of the casing, while SIM card access, Micro USB connector and a battery are fitted inside.

Navigation terminal connectors are shown in the figure:

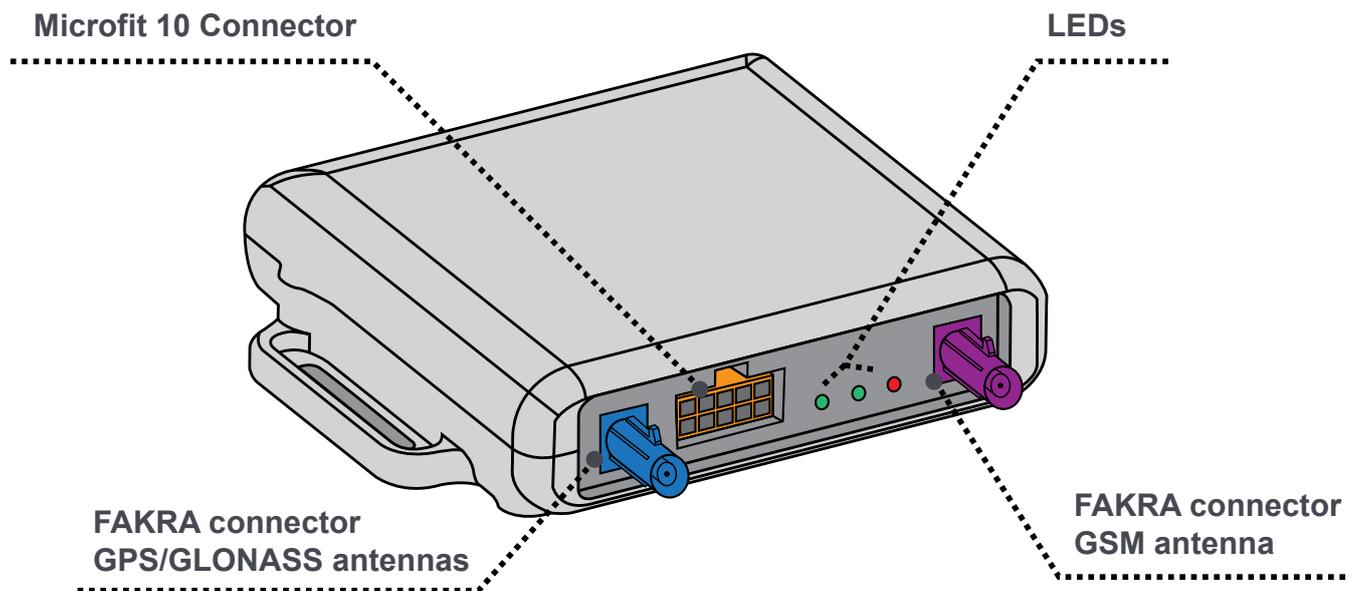


Fig. 1.2. iON FM navigation terminal connectors



1.4.5. Navigation Terminal System

Navigation terminal structure diagram:

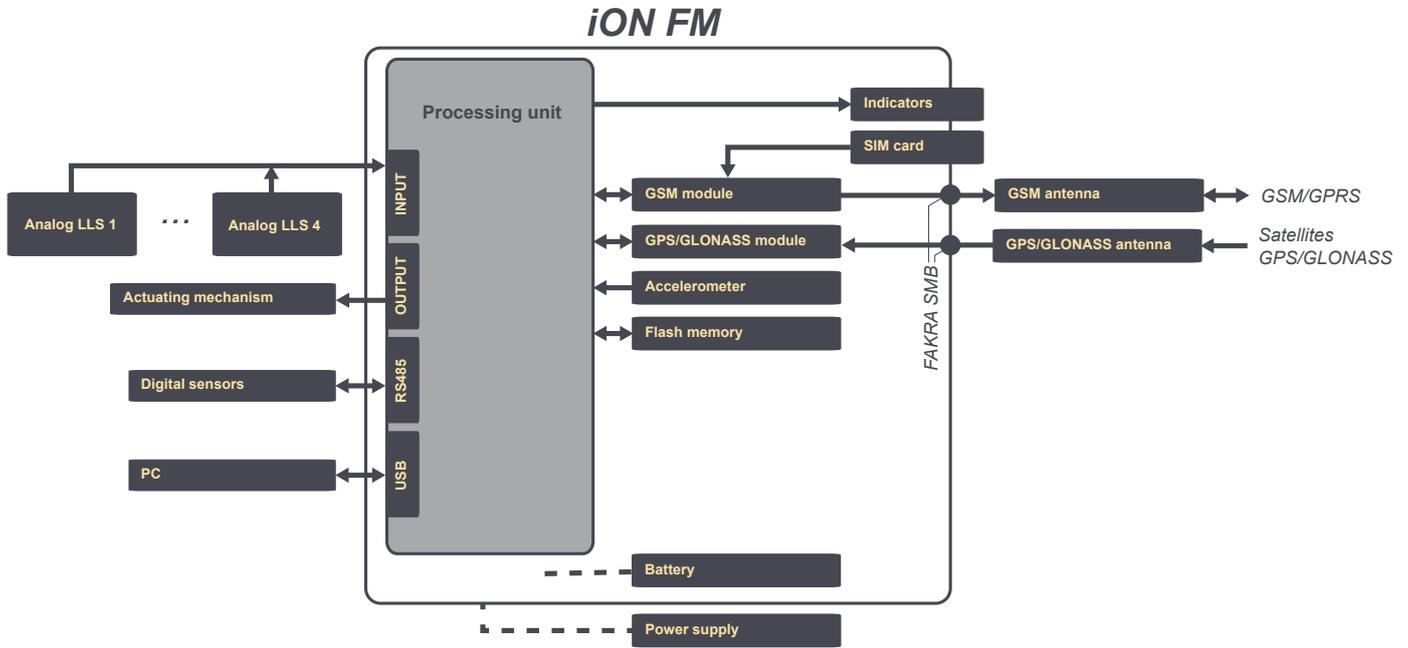


Fig. 1.3. iON FM navigation terminal structure diagram

1.4.6. Navigation Terminal Inputs/Outputs

Inputs:

Parameter	Value
ADC measurement range:	0 to 30 V
Trigger thresholds of discrete inputs	adjustable value*
Input resistance of inputs	~150 kΩ
Inputs pull-up voltage	4 V

* Levels of logical 1 and 0 can be adjusted. Minimal value is 0V, maximal — 30V

Outputs:

Parameter	Value
Maximal output load current	500 mA
Outputs polarity	coupled to negative

Inputs.

Inputs IN1-IN4 of Microfit 10 connector are multipurpose and are intended for reading external devices, connected to iON FM terminal. All the read data may be transmitted to web-monitoring server for the following processing.



Operating mode can be set for each of the physical inputs (IN1 - IN4). There are 4 types of inputs:

- frequency;
- pulse;
- analog;
- logic.

Correct operation of all input types, except analog, require the following parameters to be configured:

- set levels for logic 0 and logic 1;
- enable/disable pull-up resistors.

Configure input type, logic 1 and 0 levels via  **Conf_iRZ.exe** program, in **Multipurpose inputs** tab.

NOTE! To decrease GPRS traffic, iON FM is fitted with input readings filter: if the reading has not changed, the device does not transmit it to server. This allows for significantly economise GPRS traffic and funds at the user's SIM card.

Frequency input type.

Frequency input type is intended for measuring the frequency of periodic signal, received by input, and its subsequent transmitting to a server. The measured may also be read using control commands.

Electrical parameters of frequency input:

- form of the input signal may be of the following types: sine, rectangle, square;
- periodic signal frequency range: 0 (Hz) to 4 (kHz);
- maximum permissible voltage of input signal: 30 (V);
- recommended minimal voltage of the impulse signal: 0.5 (V);
- input pulse is determined by rising edge;
- maximal error of frequency measurement: 10%.

NOTE! Connecting input to the frequency generator with open collector requires enabling pull-up connection to this input.

Pulse input type.

Pulse input type is intended for injecting a singular pulse or a periodic pulse. The amount of such pulses will be counted and summarized for consecutive transmission of the resulting value to web-monitoring server. The resulting value may be read using the corresponding control commands. Functionally, pulse input type is a pulse counter.

Electrical parameters of the pulse input:

- pulse signal frequency range: 0 (Hz) to 4 (kHz);
- form of the input signal may be of the following types: sine, rectangle, square;
- maximum permissible voltage of input signal: 30 (V);
- recommended minimal voltage of the impulse signal: 0.5 (V);
- input pulse is determined by rising edge;



- maximal value of pulse counter: 65535. (after reaching that value, the calculation starts over);
- maximum counter error: 1%.

NOTE! Connecting input to the frequency generator with open connector requires enabling pull-up connection to this input. Zero the counter out only when it is necessary to reset previously accumulated values.

Analog input type.

iON FM terminal supports feeding analog signal of steady voltage that will be measured and averaged out for further transmission to a server.

Electrical parameters of analog input:

- maximum permissible voltage of input signal: 30 (V);
- recommended minimal voltage of the impulse signal: 0.5 (V);
- input signal level measurement is only taken when the voltage is positive in relation to negative power supply; negative voltage is ignored;
- maximum voltage error: 1% (300 mV).

NOTE! Disconnect pull-up resistors when configuring input to function as analog.

Logic input type.

Logic input type is used for feeding signal with steady voltage level. The voltage will be measured and interpreted as logic 1 or logic 0 for further transmission of the interpreted logic value to web-monitoring server. The measured may be read using corresponding control commands.

Electrical parameters of logic input:

- minimal level of logic 0: 500 (mV);
- maximal level of logic 1: 30000 (mV);
- constant component of voltage on input with enabled pull-up resistors: ≈ 4 (V);
- input signal's logical level is only determined only at positive voltage, negative is ignored;
- negative is ignored;
- maximum voltage error: 1% (300 mV).

Control outputs.

Control outputs OUT5 and OUT 6 are intended for controlling external devices connected via Microfit 10 connector. Output status is configured using the corresponding commands. These two outputs are fitted with open collector (OC) and commute (close) any connected external devices (e.g. a relay) to negative of power supply (return wire, mass).

Electrical parameters of OUT5 and OUT 6 outputs:

- maximal value of commutation current (load current): 0.5 (A);
- maximal voltage on collector at each output: 30 (V);
- there is no need to connect a fuse diode when commutating inductive load; there is a built-in one.



Default settings of multipurpose inputs/outputs.

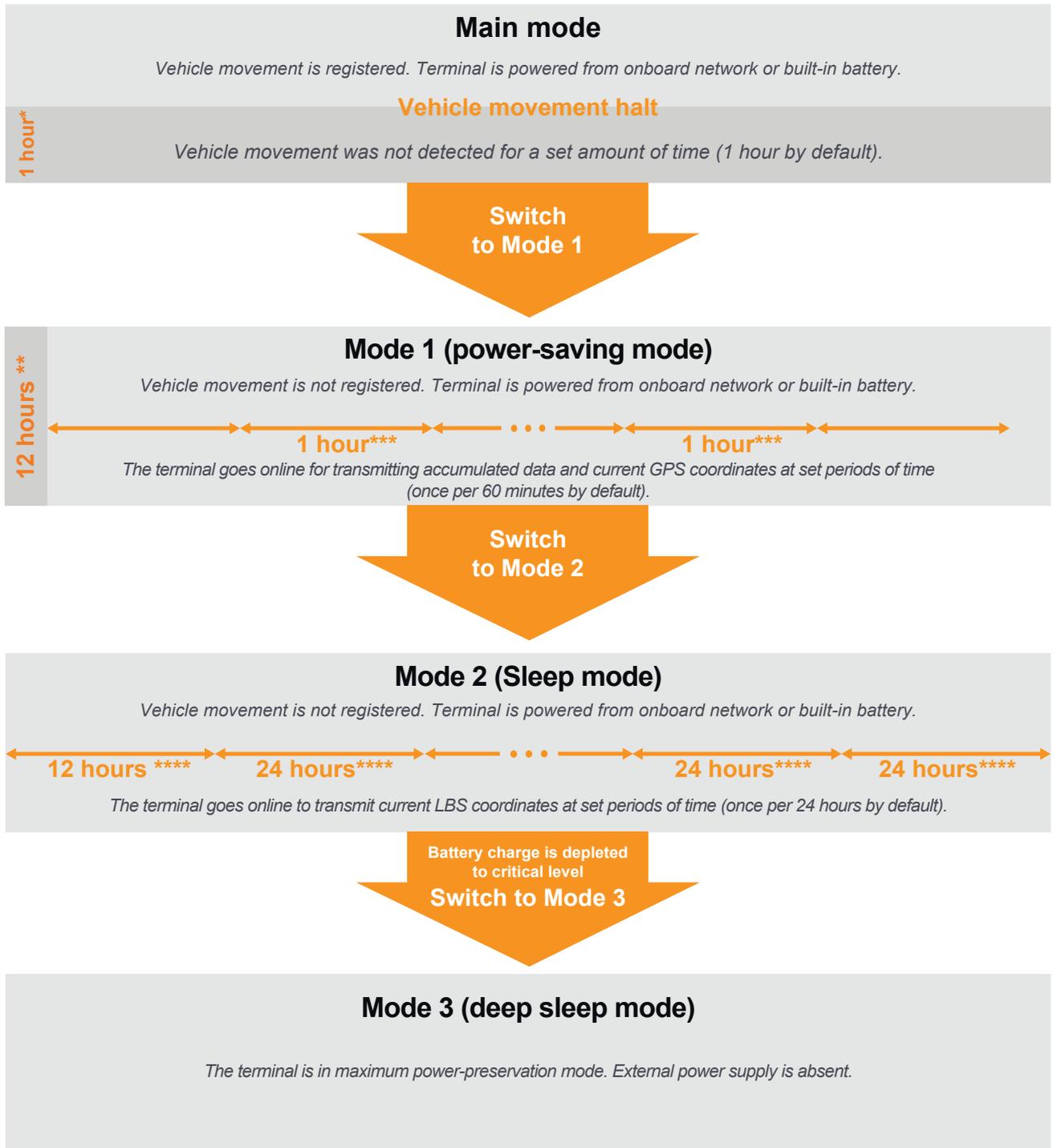
Inputs/Outputs	Default setting
IN1, IN2	analog
IN3, IN4	logic (logic 1 = 2.8 V, logic 0 - 2.2 V)
OUT5, OUT6	disabled

1.4.7. Terminal operating modes

iON FM terminal supports 5 operating modes, each assigned for different tasks as well as regulated within certain range of power consumption for power-saving modes. Power saving is achieved by disabling certain functional modules for prolonged intervals of time.

List of iON FM terminal operating modes:

- "Main mode" — fully functional operating mode with maximal power consumption;
- "Power-saving mode" — power-saving mode, may also be designated as "Mode 1";
- "Sleep mode" — power-saving mode, may also be designated as "Mode 2";
- "Deep sleep mode" — power-saving mode, may also be designated as "Mode 3";
- "Active mode" — fully functional operating mode with maximal power consumption.



Notes:

* the time may be set using the configurator or PW#TW1 command

** the time may be set using the configurator or PW#TW2 command

*** the time may be set using the configurator or PW#TS1 command

**** the time may be set using the configurator or PW#TS2 command

Fig. 1.4. iON FM operating modes diagram



Main mode

In the “Main mode”, iON FM terminal performs all of its function in real time; all of its electronic peripherals are enabled to provide complete functionality. In this mode, the device determines GPS and LBS coordinates, reads multipurpose inputs and RS-485 bus, and transmits these readings to web-monitoring server via GPRS channel.

“Main mode” current consumption:

Built-in battery status	External power supply voltage	
	12 V	24 V
Charged	Max. 90 mA	Max. 50 mA
Discharged	Max. 250 mA	Max. 130 mA

“Main mode” is the only mode that is able to automatically switch to other operating modes for power preservation. iON FM is configured to switch to other modes in the following order:

- ① “Main mode”;
- ② “Power-saving mode” (Mode 1);
- ③ “Sleep mode” (Mode 2);
- ④ “Deep sleep mode” (Mode 3).

List of “Main mode’s” continuously operating peripheral modules:

- multipurpose inputs/outputs - data reading and controlling of connected devices;
- motion sensor - accelerometer for determining acceleration during motions.
- RS485 data bus - for processing LLS or CAN-LOG data;
- internal memory (black box) - for recording of all accumulated data;
- GPS module - for determining precise GPS coordinates;
- GSM module - for transmitting all of the accumulated date to monitoring and LBS location server.

By default (factory settings), iON FM terminal works in “Main mode” after external power supply over 9 V has been connected and OS has been launched. The terminal also switches to “Main mode” after waking from power-saving modes:

“Mode 1”, “Mode 2” and “Mode 3” (if the terminal has been previously set to work in “Main mode” 0.

“Main mode” is a default operating mode of iON FM, but may be switched to any other via PW#MODE control command.

iON FM terminal remains in “Main mode” while motion sensor detects motion. For example, when the terminal is installed in a vehicle. Once movement halts, movement timeout is initiated (configured via PW#TW1 and PW#TW2 commands or configurator program). After timeout expires, the terminal switches to a certain power-saving mode, depending on how much time has passed: “Mode 1” or “Mode 2”.

For operation in “Main mode”, it is not important, which power source is used. Regardless of whether it is external or built-in battery, the terminal will switch its power-saving modes in the order described above.

“Power-saving mode” (Mode 1)

While in “Power-saving mode”, iON FM keeps performing most of its functions in real time. However, only some of its electronic peripherals are enabled continuously - others are only activated periodically. For example, determination of GPS and LBS coordinates and their transmission to web-monitoring server over GPRS channel is not carried out continuously, but at periods of time, set using configurator or PW#TS1 control command. This interval is 60 minutes by default. While the connection is disabled, the terminal saves the data in



the internal memory (black box) for further transmission to monitoring server.

“Mode 1” current consumption:

Built-in battery status	External power supply voltage	
	12 V	24 V
Charged	Max. 40 mA	Max. 20 mA
Discharged	Max. 250 mA	Max. 130 mA

List of periodically transmitted data in “Mode 1”:

- GPS coordinates
- accumulated LLS and CAN-LOG data
- accumulated data from multipurpose inputs.

List of data, periodically received from server, in “Mode 1”:

- user commands.

List of continuously active peripheral modules in “Mode 1”:

- multipurpose inputs/outputs — data reading and controlling of connected devices;
- motion sensor — accelerometer for determining acceleration during motions.
- RS485 data bus — for processing LLS data;
- internal memory (black box) — recording of all accumulated data;
- GPS module — for determining GPS coordinates.

List of periodically active peripheral modules in “Mode1”:

- GSM module — determining LBS coordinates and transmission of all accumulated data to monitoring server.

iON FM terminal switches to “Power-saving mode” only if this mode is allowed by PW#EN1 command (allowed by default), and the following conditions are consecutively met:

- ① The terminal is at rest and motion sensor does not detect movement;
- ② Motion timeout set by control command PW#TW1 (60 minutes by default) has expired.

When setting timeout for switching to “Mode 1” via PW#TW1 command, make sure its value is less than that of PW#TW2 command (for “Mode 2”). Otherwise the value will not be accepted and user will receive an error message. Keep in mind, that timeout counter starts for PW#TW1 and PW#TW2 simultaneously, in other words, these intervals are not summarized.

The terminal remains in “Power-saving mode” until one of the following events occurs:

- motion sensor sends alerts upon movement detection (in this case the terminal switches to “Main mode”);
- timeout for switching to next power-saving mode - “Sleep mode” (“Mode 2”) - expires. Set with PW#TW2 command;
- built-in battery charge depletes to a critical level (with external power disabled). In this case the terminal switches to “Deep Sleep Mode” (“Mode 3”), i.e. the terminal automatically switched from “Mode 1” to “Mode 3”, bypassing “Mode 2”. Switching do “Mode 2” can be forbidden with PW#EN2 command (allowed by default).



To manually switch the terminal to “Mode 1”, send PW#MODE=2 command. Keep in mind, that if switched to “Mode 1” manually, the device will keep operating in this mode only. It will not switch to other modes except for “Mode 3”, since the terminal always switches to “Mode 3” when the built-in battery charge is depleted to a critical level.

If iON FM terminal has switched to “Mode 1” from “Main mode”, then power source is irrelevant — be it built-in battery or external source - since the terminal will follow the same order of switching from one power-saving mode to another to preserve energy.

“Sleep mode” (Mode 2)

In “Sleep mode”, iON FM terminals ceases to perform most of its functions and all of its electronic peripherals, except for motion sensor, is disabled for energy conservation. At set periods of time (set by configurator or PW#TS2 control command), the terminal wakes up for transmitting LBS coordinates via GPRS channel to monitoring server. By default, the period is set to 1440 minutes (24 hours). When configuring this interval, keep in mind, that timeout counter starts for PW#TW1 and PW#TW2 simultaneously, in other words, these intervals are not added up.

“Mode 2” current consumption:

Built-in battery status	External power supply voltage	
	12 V	24 V
Charged	Max. 9 mA	Max. 5 mA
Discharged	Max. 250 mA	Max. 130 mA

List of periodically transmitted data in “Mode 2”:

- location LBS coordinates (no other data is transmitted).

List of data, periodically received from server, in “Mode 2”:

- user commands.

List of continuously active peripheral modules in “Mode 2”:

- motion sensor — accelerometer for detecting acceleration during movement and for “waking up”.

List of periodically active peripheral modules in “Mode2”:

- GMS module — for determining LBS coordinates to transmit them to monitoring server.

The terminal switches to “Sleep mode” only if it is allowed by PW#EN2 command (allowed by default) and the following 2 conditions are met consecutively:

- 1 The terminal is at rest and motion sensor does not detect movement;
- 2 Motion timeout, set by control command PW#TW2 (720 minutes by default), has expired.

iON FM remains in “Sleep mode” until one of the following events occurs:

- motion sensor sends alerts upon movement detection (in this case the terminal switches to “Main mode”, if this mode has not already been set as operational);
- built-in battery charge is depleted to a critical level (with external power disabled); the terminal switches to “Deep Sleep Mode” (“Mode 3”).

To manually switch the terminal to “Mode 2”, send PW#MODE=3 command. Keep in mind, that if switched



to “Mode 2” manually, the device will keep operating in this mode only. It will not switch to other modes except for “Mode 3”, since the terminal always switches to “Mode 3” when the built-in battery charge is depleted to a critical level.

Power supply of the terminal is particularly important: external power or built-in battery. In this mode, the terminal will draw power supply from external source if such is available. This means that the terminal will remain in “Mode 2” indefinitely, until external supply’s voltage decreases to 9 V. For example, when the vehicle’s ignition is switched off. After that, the terminal will switch to built-in battery until its charge is depleted to a critical level, while remaining in “Mode 2”. After that, it will switch to “Deep Sleep Mode” (“Mode 3”).

NOTE! During prolonged parking, iON FM may completely discharge the vehicle’s AC battery. To avoid that, connect the terminal to the part of the fuse box that is de-energized when ignition is switched off. Alternatively, use battery disconnect switch.

“Deep Sleep Mode” (Mode 3)

In “Deep Sleep Mode”, the terminal disables all of its peripheral modules for maximal energy conservation. In this mode the device may only be powered from built-in battery.

For automatic switch to “Mode 3”, two conditions must be met:

- external power supply must be disconnected or its voltage must be below 9 V;
- internal power voltage of built-in battery must drop to a critical level (set by manufacturer).

The terminal cannot be switched to “Mode 3” by PW#MODE command. The terminal will remain in this mode until external supply is detected. The terminal periodically checks its presence.

After receiving power supply with voltage over 9 V, the terminal “wakes up” and switches to mode previously set to it by PW#MODE command; built-in battery will start charging up. No communication sessions are carried out in “Mode 3”.

Active mode

In “Active mode”, iON FM terminal performs all of its functions in real time; all of its electronic peripherals are enabled to provide complete functionality. In this mode, the device determines GPS and LBS coordinates, reads multipurpose inputs and RS-485 bus, and transmits these readings to web-monitoring server via GPRS channel.

“Active mode” is similar to “Main mode”, but has some significant differences. In this mode, the terminal is fully functional for as long as internal or external power allows it. As opposed to “Main mode”, the terminal cannot automatically switch to other power-saving modes (except for “Mode 3”).

Enable “Active mode” when continuous operation of the terminal is required or there is no need to conserve energy. With the exception of features listed above, list of peripheral modules, functions and energy consumption of “Active mode” is identical to that of “Main mode”.

The only way to switch the terminal to “Active mode” is manually via PW#MODE=1 command.

If iON FM terminal was switched to “Mode 3” from “Active mode”, then, after external power supply over 9 V has been connected, the device will switch to “Active mode” and the built-in battery will start charging up.

Power source is very important for operating in “Active mode”. Please keep in mind, that if voltage of external power is over 9 V (for example, vehicle’s AC battery), then the terminal will be powered from that external source as opposed to its built-in battery. This way, the terminal will remain in “Active mode” indefi-



nately, until external power voltage drops below 9 V. After that, the device will switch to built-in battery, while remaining in “Active mode”, until its charge is depleted to a critical level. In this case, the device will automatically switch to “Deep Sleep Mode” (“Mode 3”).

NOTE! During prolonged parking, iON FM may completely discharge the vehicle’s AC battery. To avoid that, connect the terminal to the part of the fuse box that is de-energized when ignition is switched off. Alternatively, use battery disconnect switch.



1.5. Dimensional Drawing

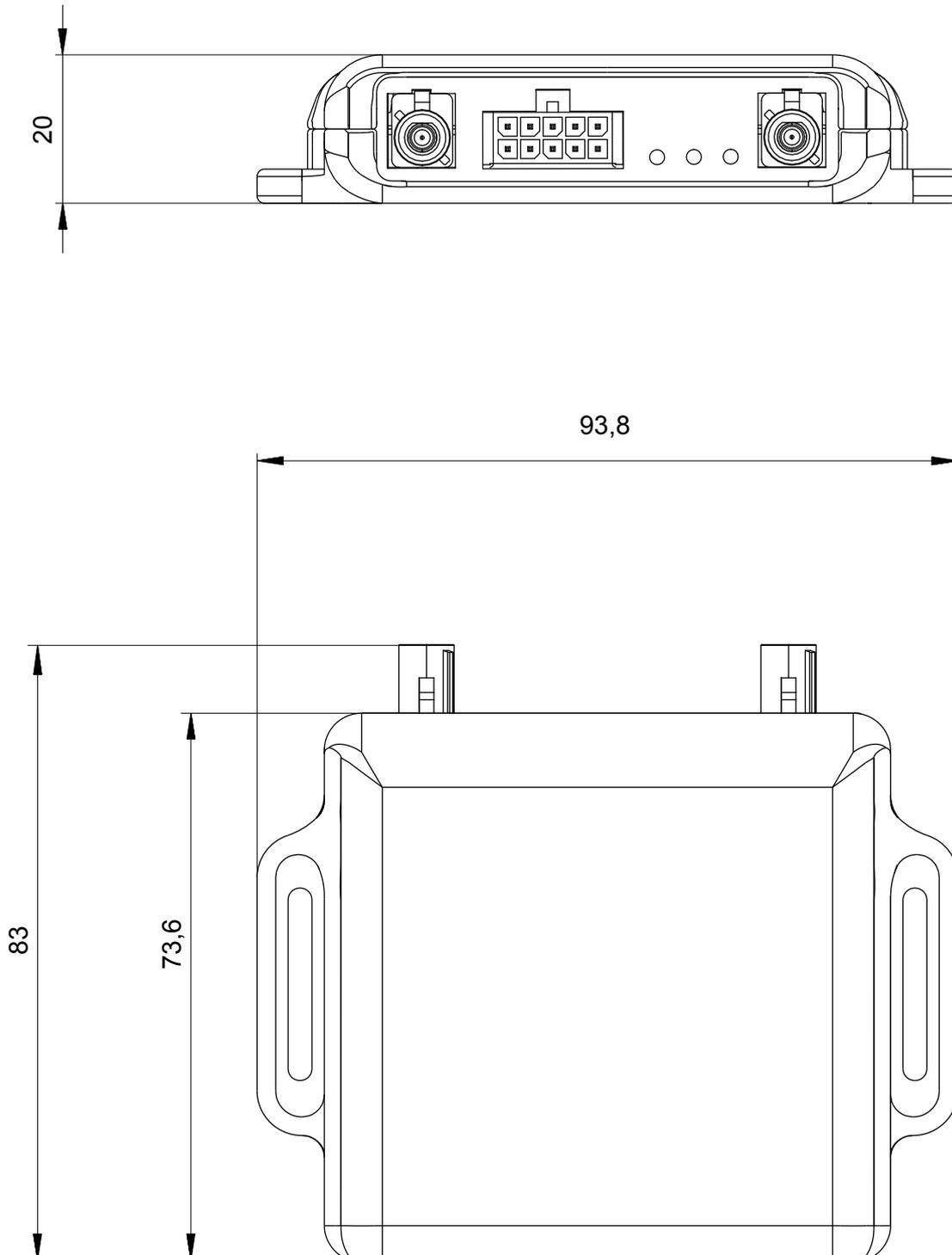


Fig. 1.5. iON FM navigation terminal dimensional drawing



2. Device Preparation Procedures

This section has information on the iON FM navigation user terminal preparation and installation on a vehicle.

Before the device installation on a vehicle, it needs to be configured using the configuration manager  **Conf_iRZ.exe**. The configuration may be carried out during installation. For example, using a laptop, connected to a device via USB interface fitted inside of the housing (see section 2.3). For more information on configurator, see section 4.

Preliminary device preparation is as follows:

- SIM card installation;
- setting parameters in configurator.

Device installation:

- power and external interfaces connection (if required);
- device testing;
- mounting.

Various diagrams of power and external devices connection can be found in Section 3.

The navigation terminal has an extended indication system (Section 2.2) helping to check the operation of different components.



2.1. Interface cable

For power connection, sensor and other device's data transmission the terminal is fitted with 10-pin cable supplied with the terminal.

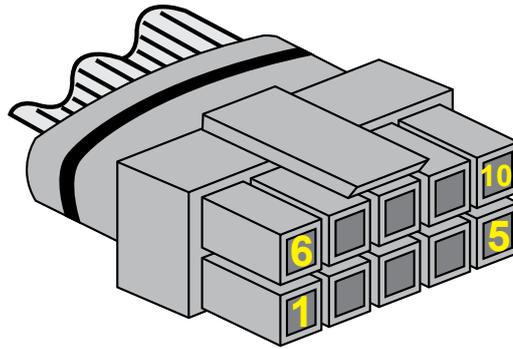
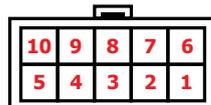


Fig. 2.1. 10-pin cable connector

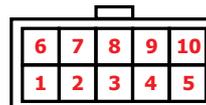
The identification of FFC connector pins is shown in the chart:

Pin	Color	Signal	Description
1	blue	IN4	Multipurpose input
2	white	IN3	Multipurpose input
3	pink	IN2	Multipurpose input
4	orange	IN1	Multipurpose input
5	black	GND	Power negative
6	green	RS485 A	RS485 interface
7	yellow	RS485 B	RS485 interface
8	brown	OUT6	Output
9	purple	OUT5	Output
10	red	VCC	Power positive

Board connector
(Microfit 10
interface connector)



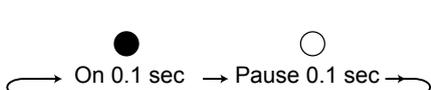
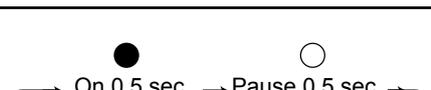
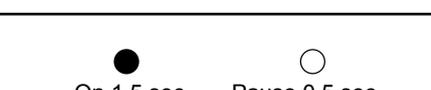
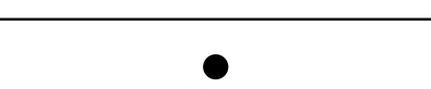
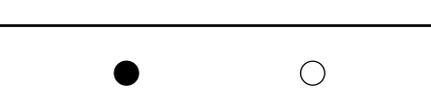
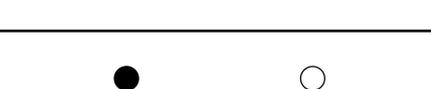
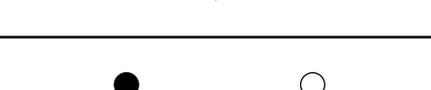
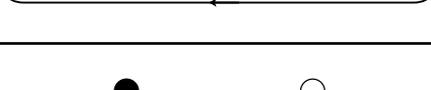
Cable connector
(Microfit 10
interface connector)





2.2. Indicators

iON FM indication is placed on face side next to GSM antenna connector and interface connector. More detailed information on the indication system is shown in the chart:

Indicators	SYS	GPS/GLONASS	GSM
	1	2	3
Color	red	green	green
	Device is off	No signal from positioning systems	Connection module is off or indication is off or the device is in the hibernation mode
	Loading (searching for network)		
	Searching for SIM card		
	Registration in the GSM network	Positioning system signal received	No network registration
	Registration in the GSM network complete, waiting for connection to the server		
	Registration in the GSM network is complete, device is connected to the server		
	Device is in "hibernation mode No.1" (LOW PWR 1)		
	Device is in "hibernation mode No.2" (LOW PWR 2)		
			Network registration complete
			Transmitting data

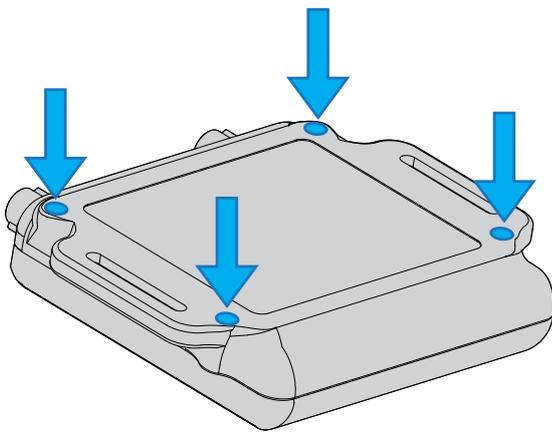


2.3. Replacing SIM card and connection to PC

Both SIM holder and Micro USB connector in iON FM terminal are fitted inside of its housing. Replacing SIM cards and connecting the device to PC requires disassembling the housing.

Disassembling the housing:

- 1 Unscrew 4 bolts at the lower part of the housing (from the label side)



- 2 Remove part of the housing and pull the board out

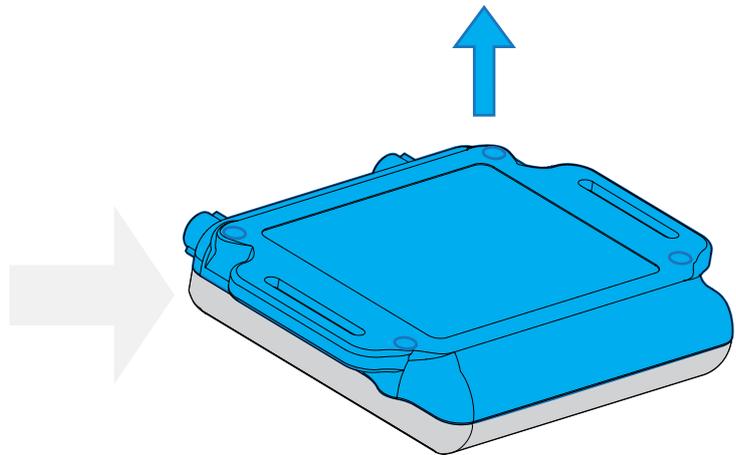


Fig. 2.2. Disassembling the Housing

Connecting to PC:

- 1 pull the board out of the casing;
- 2 connect Micro USB cable to the connector;
- 3 connect the other side of the cable to a PC.

For device configuration, see section 4.

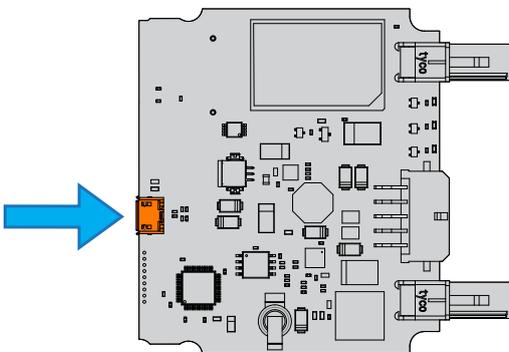


Fig. 2.3. Micro USB connector



Installing SIM card into the device:

- 1 pull the board out of the casing;
- 2 insert SIM card into SIM holder on the board;
- 3 push SIM card in until you hear a click; this means it is secured in the tray.

Removing SIM card from the device:

- 1 pull the board out of the casing;
- 2 push at the end of SIM card in the tray, until you hear a click, to release it;
- 3 remove SIM card from the SIM holder.

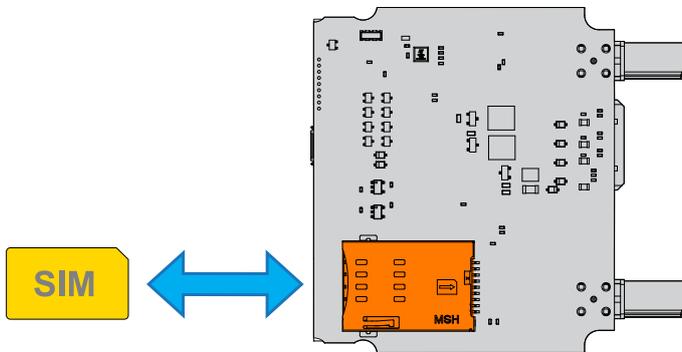


Fig. 2.4. Inserting and ejecting SIM card



3. Device Connection

This section provides the diagrams with the device connection to power, connection of sensors and other external devices.

Diagrams:

Connecting power without a battery cutoff switch
Connecting power with a battery cutoff switch
Ignition circuit connection
LLS connection via RS485
Tachometer Connection
Connecting an alarm button and any contact sensor
Connecting the LSS with a frequency or analog output
Connecting an analog sensor with a current output
Connecting an analog/pulse sensor with an open collector output



3.1. Connecting Power without Battery Cutoff Switch

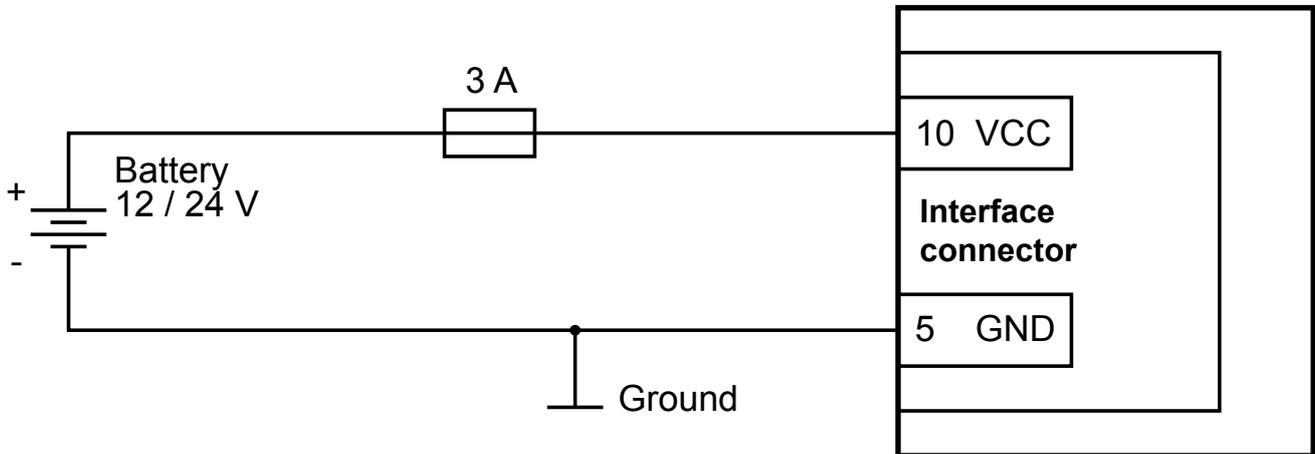


Fig. 3.1. Connecting Power without Battery Cutoff Switch diagram

3.2. Connecting Power with a Battery Cutoff Switch

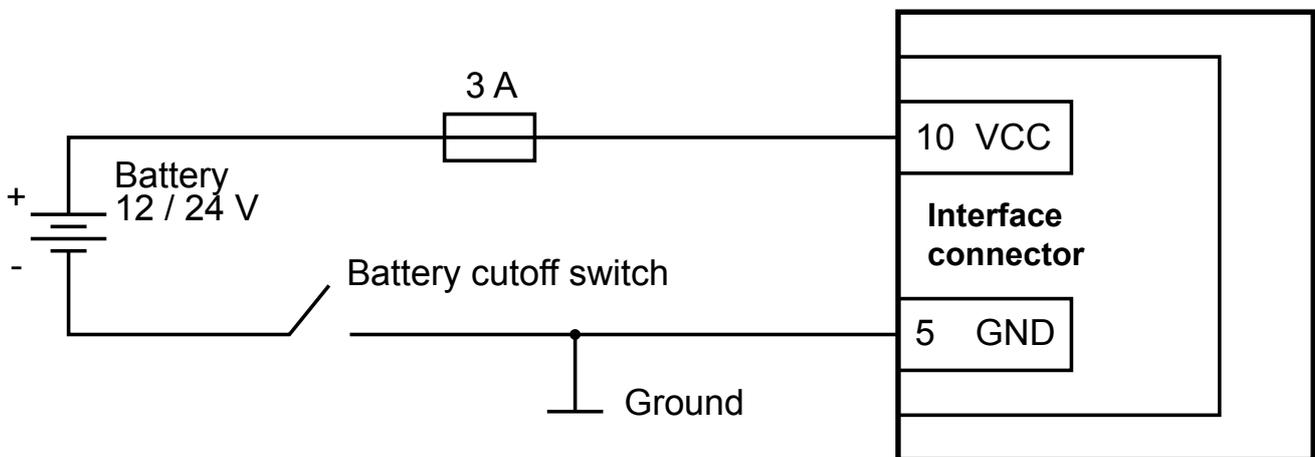
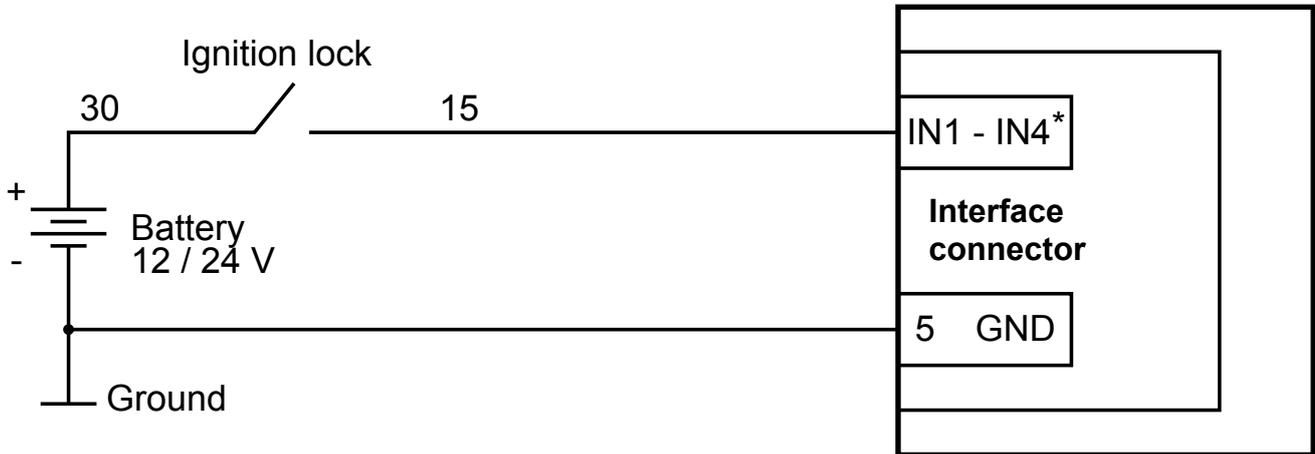


Fig. 3.2. Connecting Power with a Battery Cutoff Switch diagram



3.3. Ignition Circuit Connection

When connecting by this diagram, select the “logic” input operation mode in the configuration manager (Settings/Inputs).



* - any of the multipurpose inputs (1-4)

Fig. 3.3. Ignition Circuit Connection diagram

3.4. LLS connection via RS485

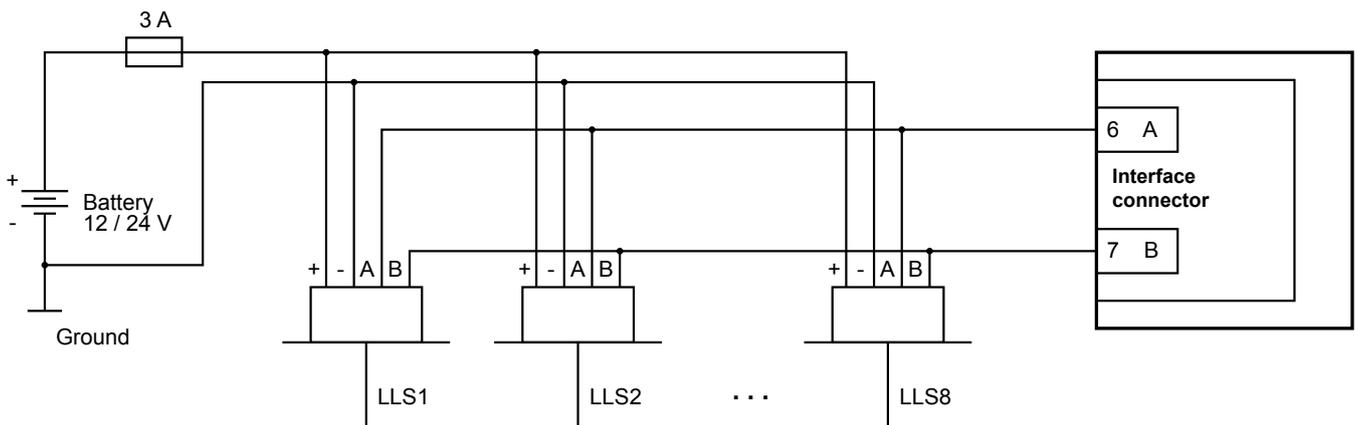
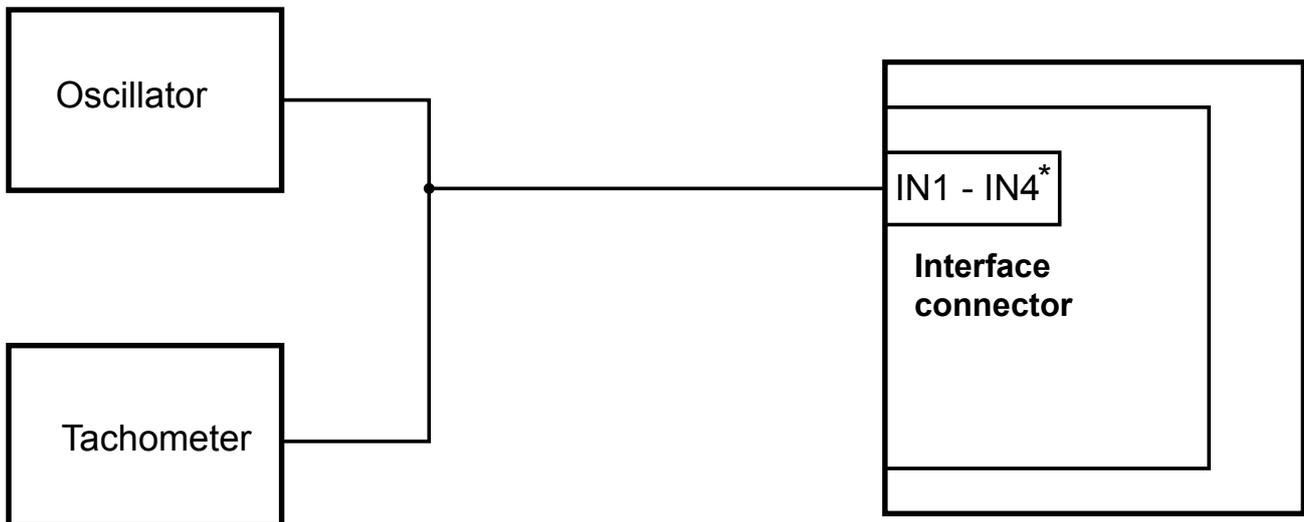


Fig. 3.4. LLS connection via RS485 diagram



3.5. Tachometer Connection

When connecting by this diagram, select the “frequency” input operation mode in the configuration manager (Settings/Inputs).

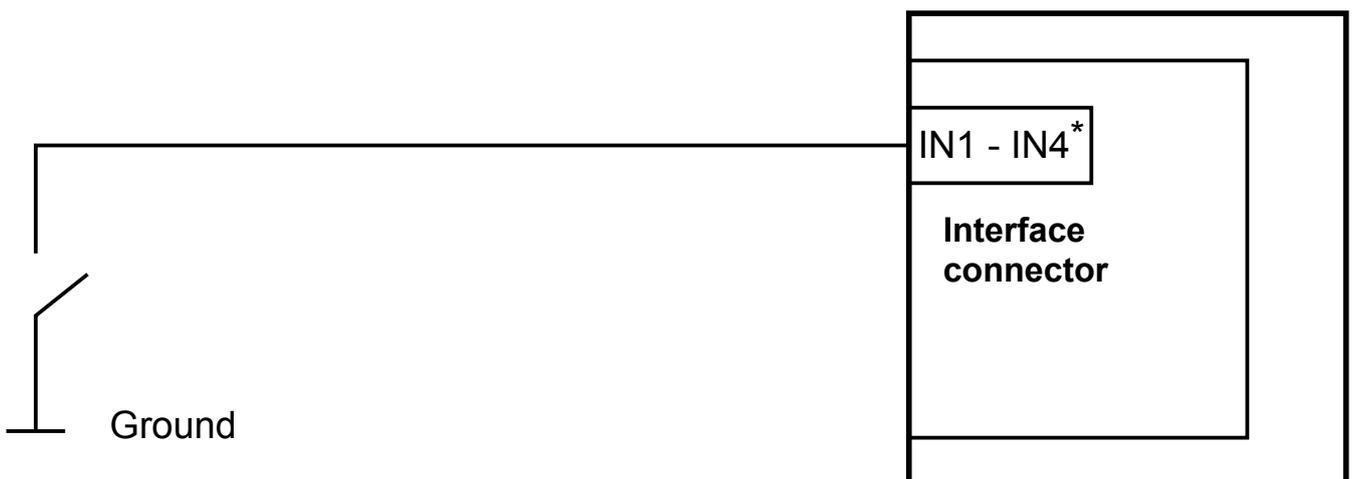


* - any of the multipurpose inputs (1-4)

Fig. 3.5. Tachometer Connection diagram

3.6. Alarm Button and Any Contact Sensor Connection

When connecting by this diagram, select the “logic” input operation mode in the configuration manager (“Settings”/“Inputs”) and switch on pull-up.



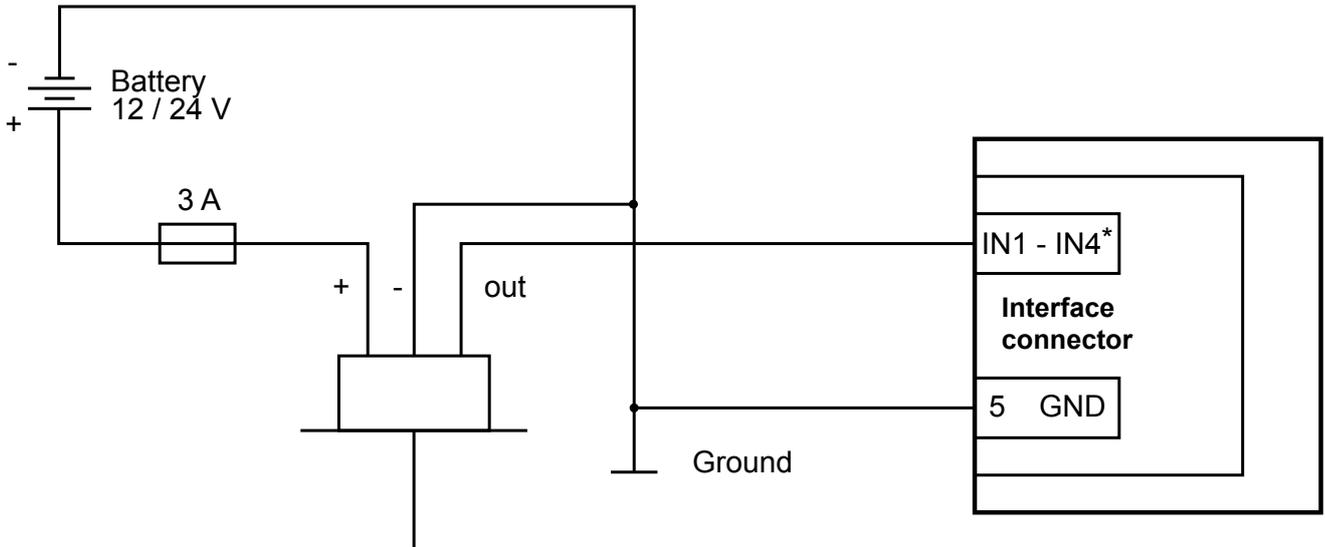
* - any of the multipurpose inputs (1-4)

Fig. 3.6. Support for alarm button connection



3.7. Connecting the LLS with an Analog Output

When connecting by this diagram, select the “analog” input operation mode in the configuration manager (Settings/Inputs).

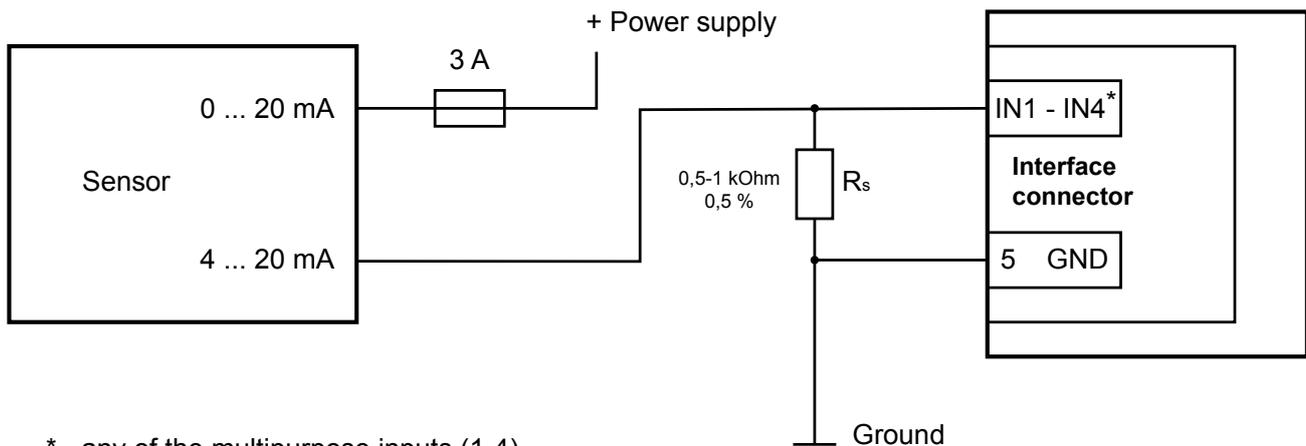


* - any of the multipurpose inputs (1-4)

Fig. 3.7. Connecting the LLS with an Analog Output diagram

3.8. Current Output Analogue Sensor Connection

When connecting by this diagram, select the “analog” input operation mode in the configuration manager (Settings/Inputs).



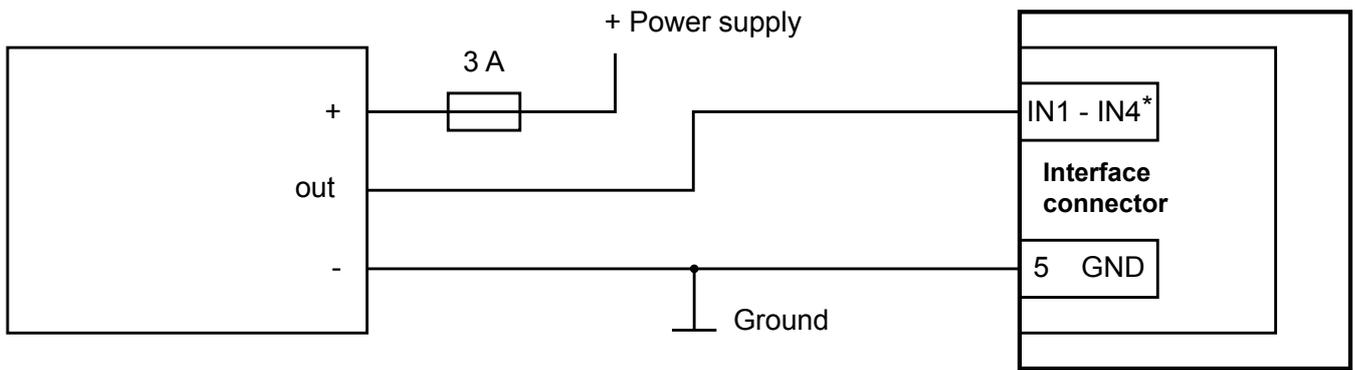
* - any of the multipurpose inputs (1-4)

Fig. 3.8. Current Output Analogue Sensor Connection diagram



3.9. Open Collector Output Analogue/Pulse Sensor Connection

When connecting by this diagram, select the “analog” input operation mode in the configuration manager (Settings/Inputs) for analog sensor and “impulse” for impulse sensor.



* - any of the multipurpose inputs (1-4)

Fig. 3.9. Open Collector Output Analogue/Pulse Sensor Connection Diagram



4. Device Configuration Using Configurator

To configure iON FM user terminal, plug it into your computer using a micro USB port and run the application  **Conf_iRZ.exe**

4.1. Driver Installation

For operation of the  **Conf_iRZ.exe** application with the iON FM user navigation terminal, download and install the iON Virtual COM Port driver.

4.1.1. Installing Drivers for Windows XP

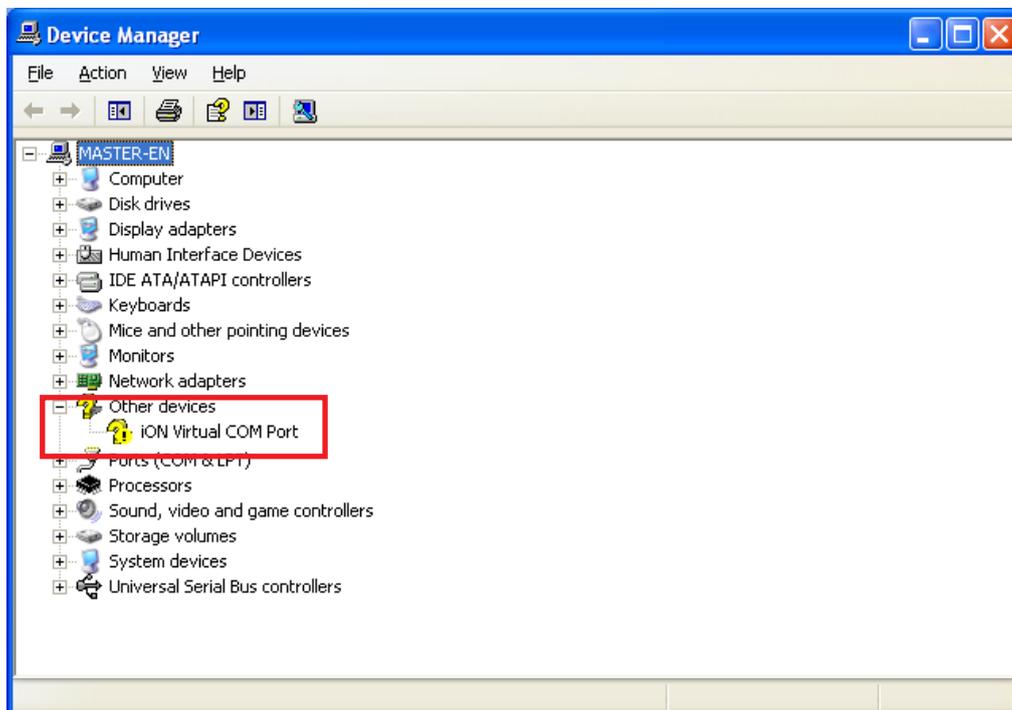
① Download and extract the iON_Virtual_COM_Port_driver.zip file containing the drivers for iON FM to a folder in your computer. For example, to the **C:\drivers** location

② Plug iON FM into your computer using a USB port. Make sure the device is getting enough power - the device indicators should light up.

At that, the **Update Driver Software** icon will appear on the taskbar:

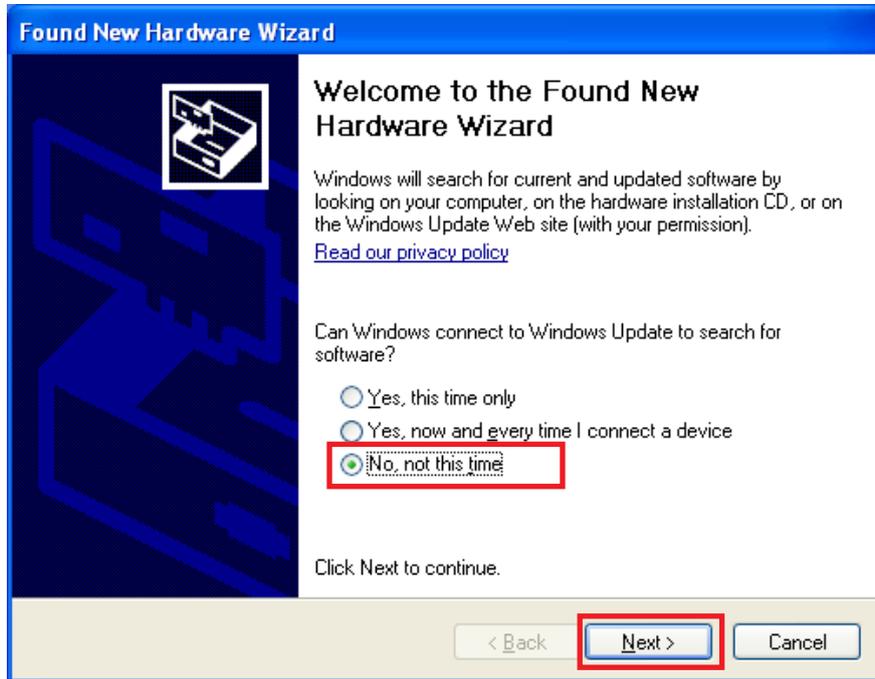


In addition, an unknown device will appear in Device Manager (My Computer ► Properties ► Hardware tab ► Device manager):

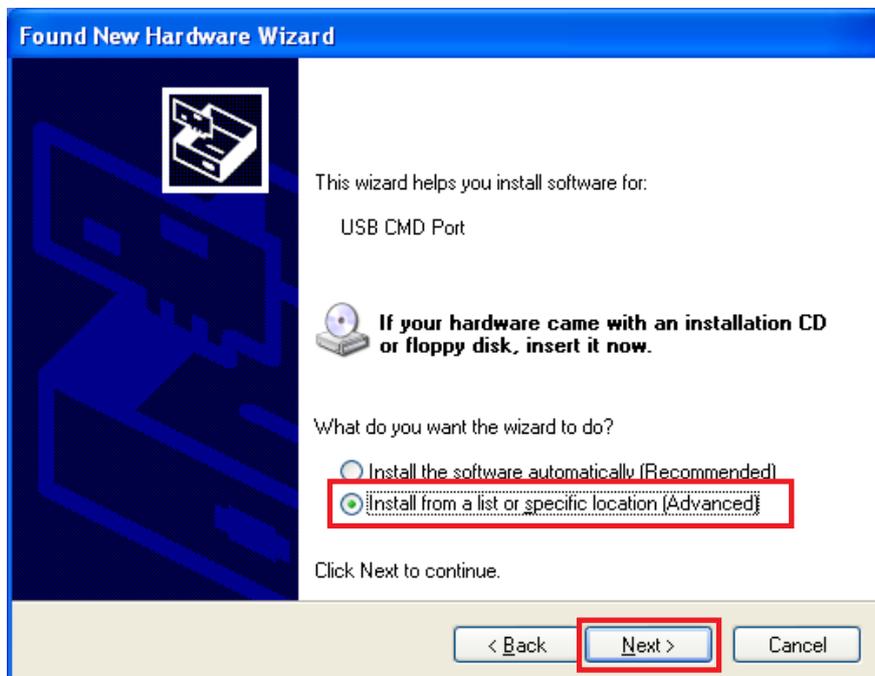




- 3 In the **Found New Hardware Wizard** dialog box select an option “**No, not this time**” and click **Next**:

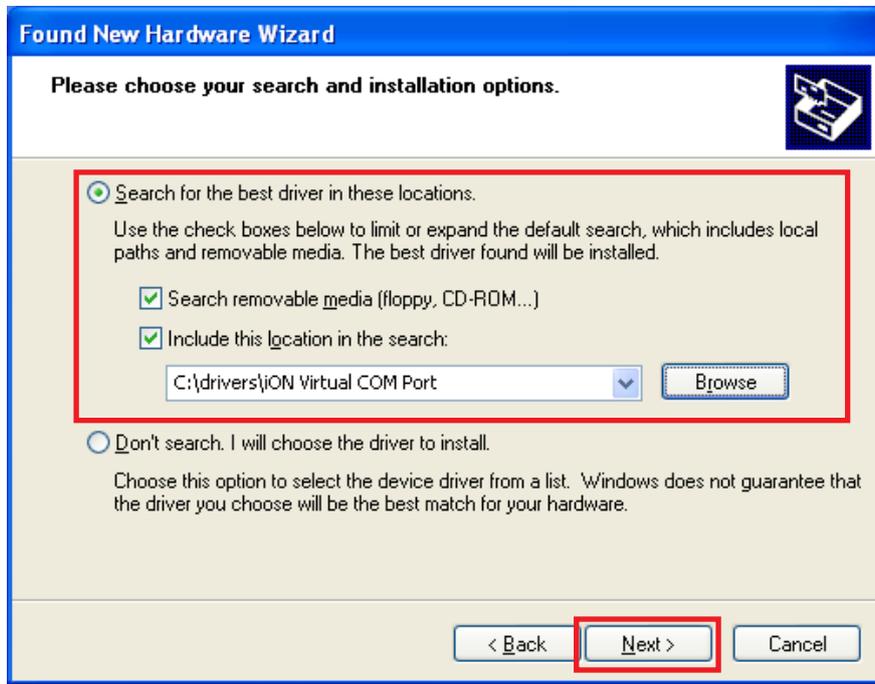


- 4 On the next screen select the “**Install from a list or specific location (Advanced)**” option and click **Next**:

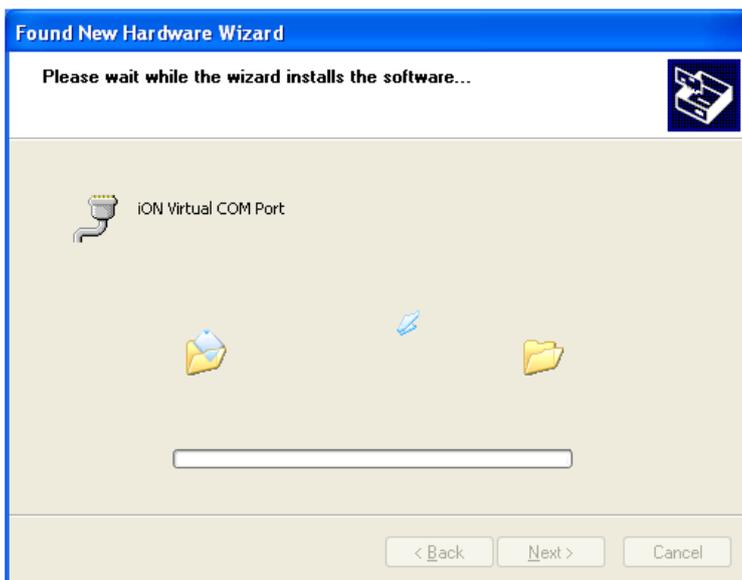




5 Select “**Search for the best driver in these locations**” and using the **Browse** button navigate to the folder that contains the driver files. For example, **C:\drivers\iON Virtual COM Port**
Then click the **Next** button:



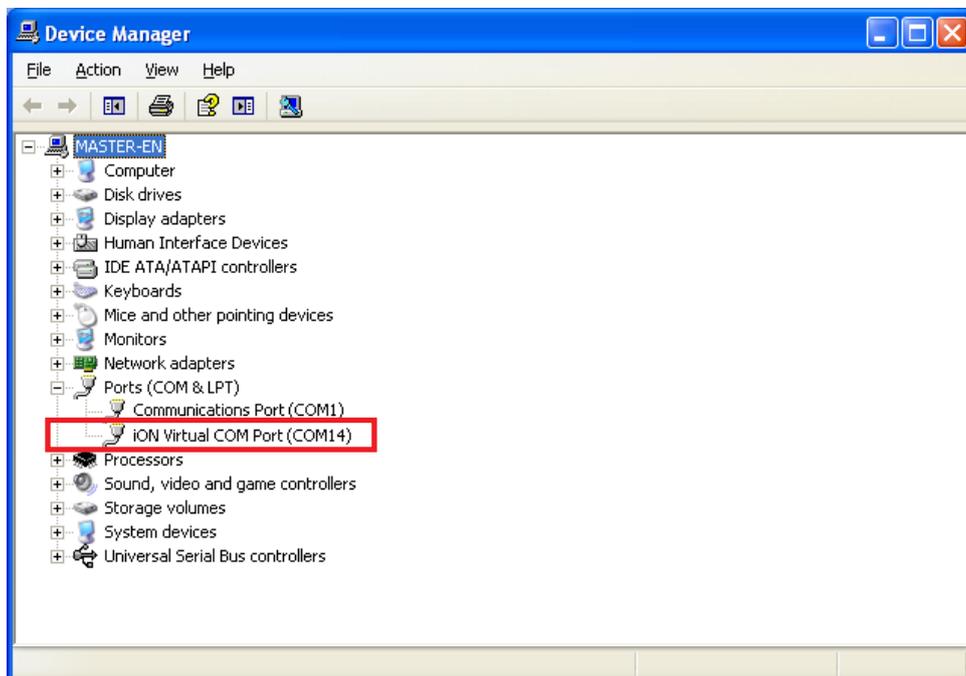
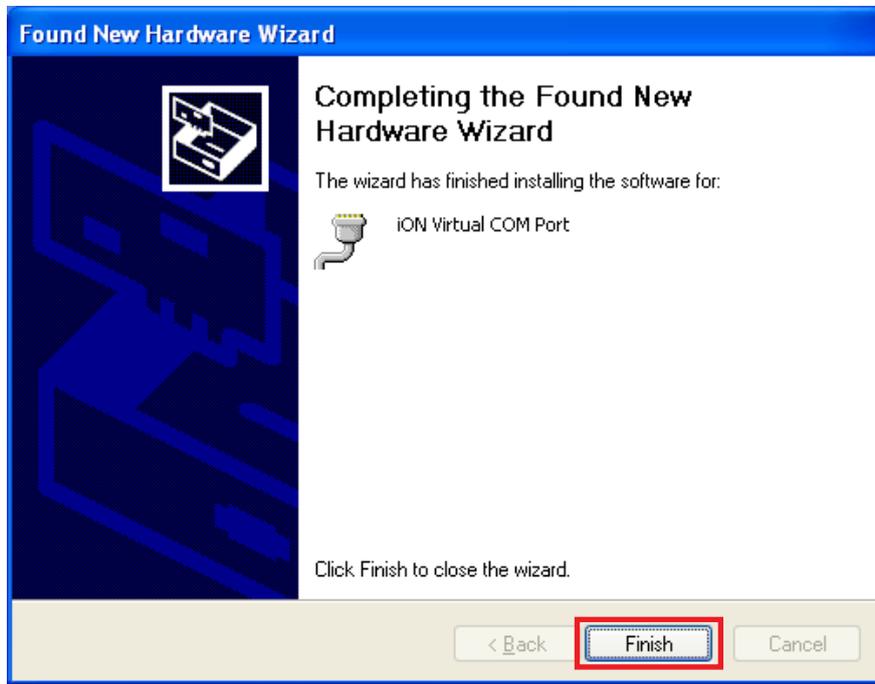
As a result, the driver installation process will launch. If the wizard prompts “The software you are installing... has not passed Windows Logo testing...”, select option **Continue Anyway**.





As a result, the driver for one device will be installed.

6 Click **Finish**:



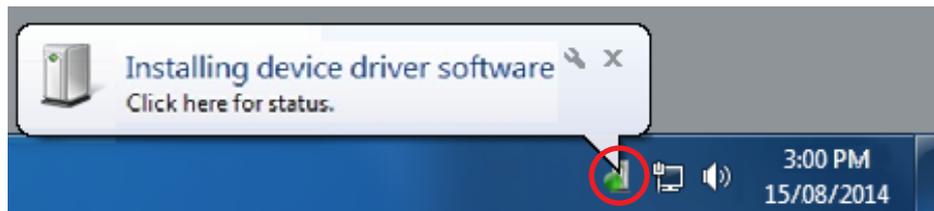


4.1.2. Installing Drivers on Windows 7

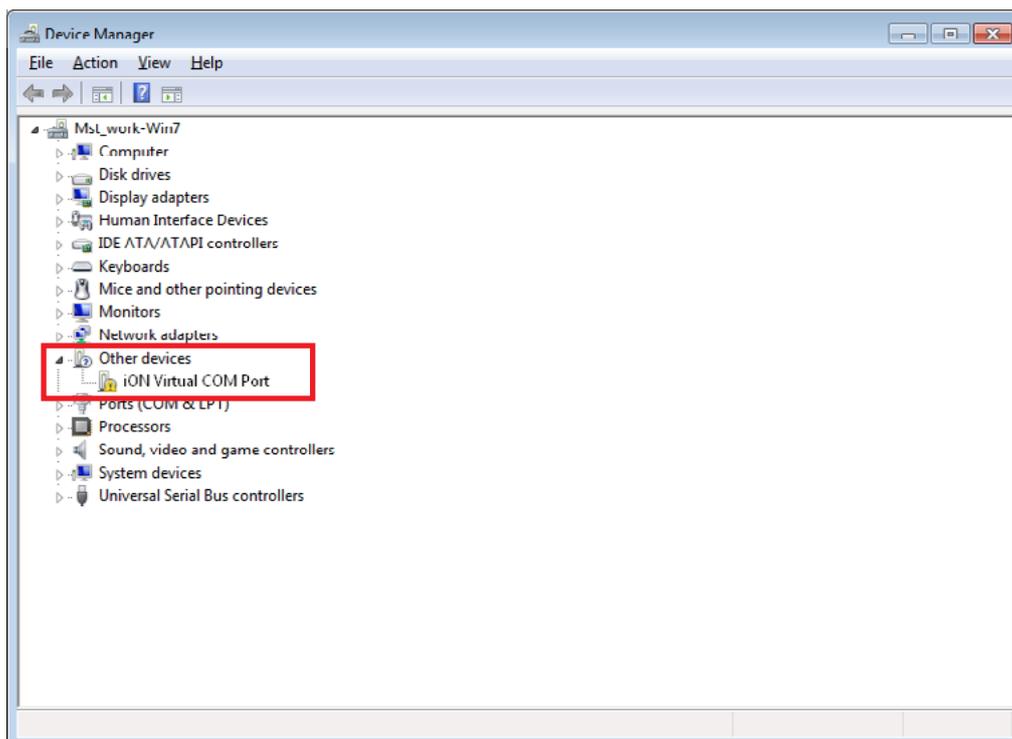
① Download and extract the **iON_Virtual_COM_Port_driver.zip** file containing the drivers for iON FM to a folder in your computer. For example, to the **C:\drivers** location

② Plug iON FM into your computer using a USB port. Make sure the device is getting enough power - the device indicators should light up.

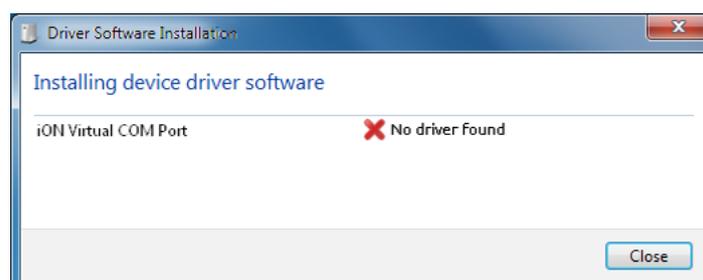
At that, the Update Driver Software icon will appear on the taskbar:



In addition, an unknown device is supposed to appear in the Device Manager (My Computer ► Properties ► Device Manager):

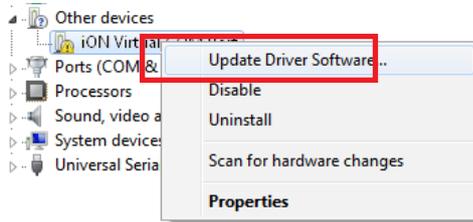


If automatic driver installation fails, the following prompt will appear:

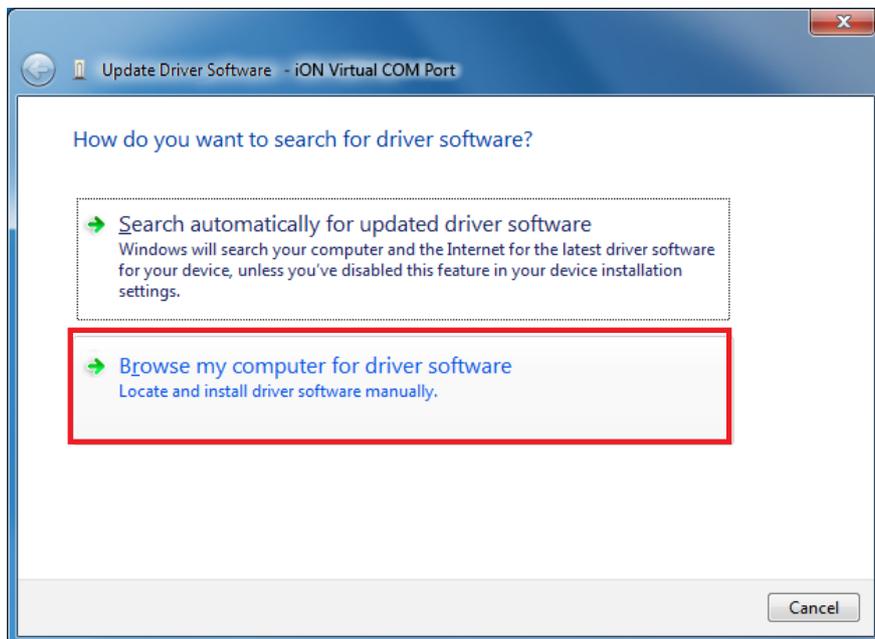




③ In this case open the Task Manager, highlight iON Virtual COM Port from the unknown devices and by the right-click on this device select “Update Driver Software...”.

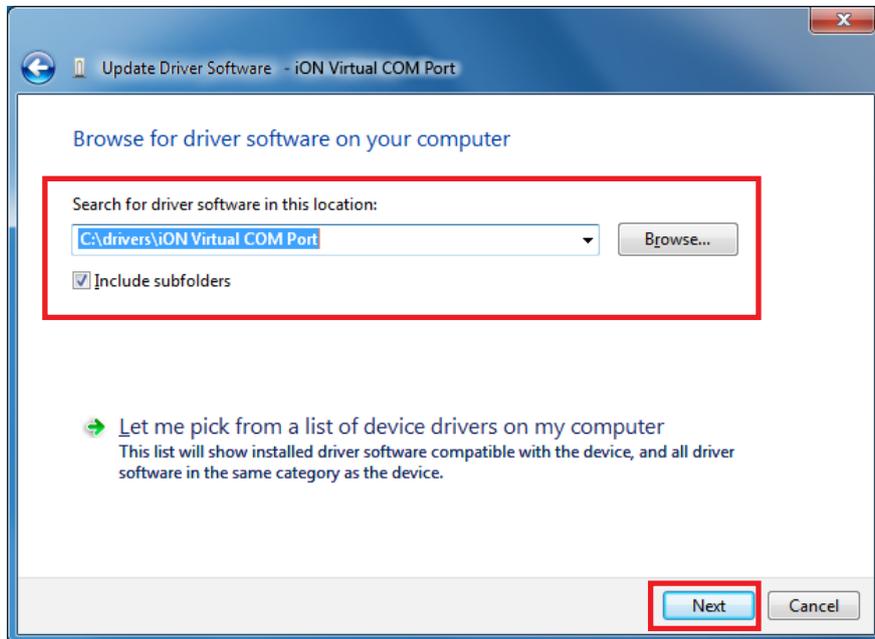


④ The Update Driver Software window will appear. Select the “Browse my computer for driver software” option:

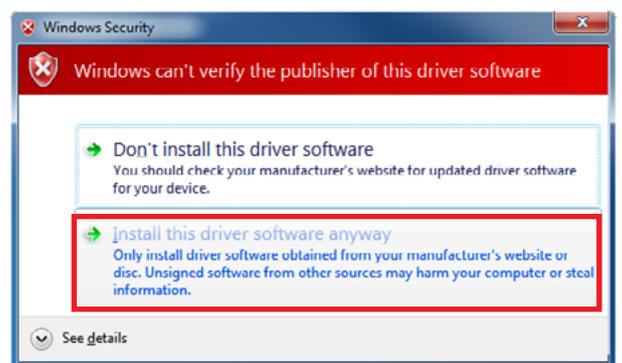
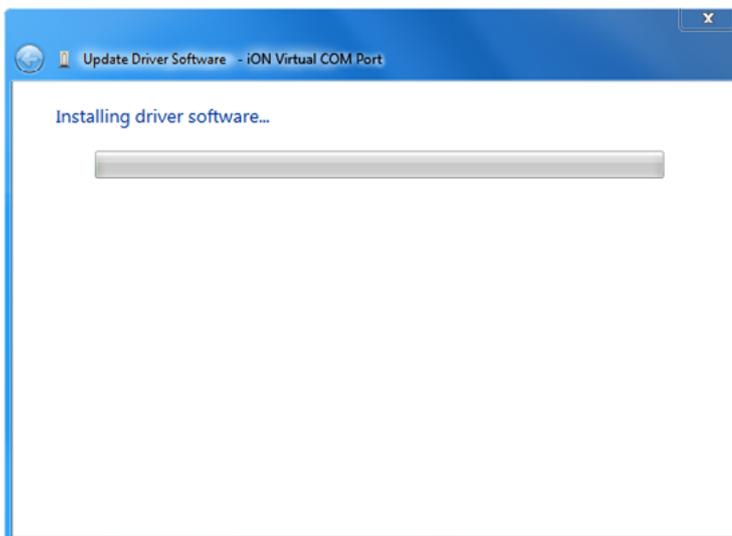




- 5 Using the Browse button navigate to the folder that contains the driver files. For example, `C:\drivers\iON Virtual COM Port\`
Then click the **Next** button:

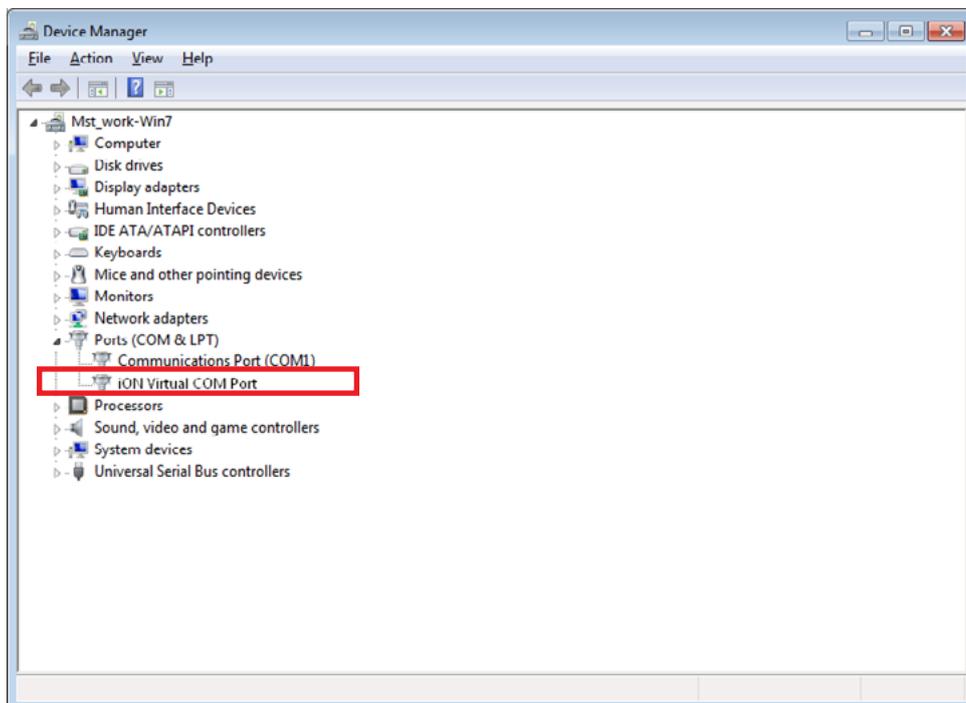
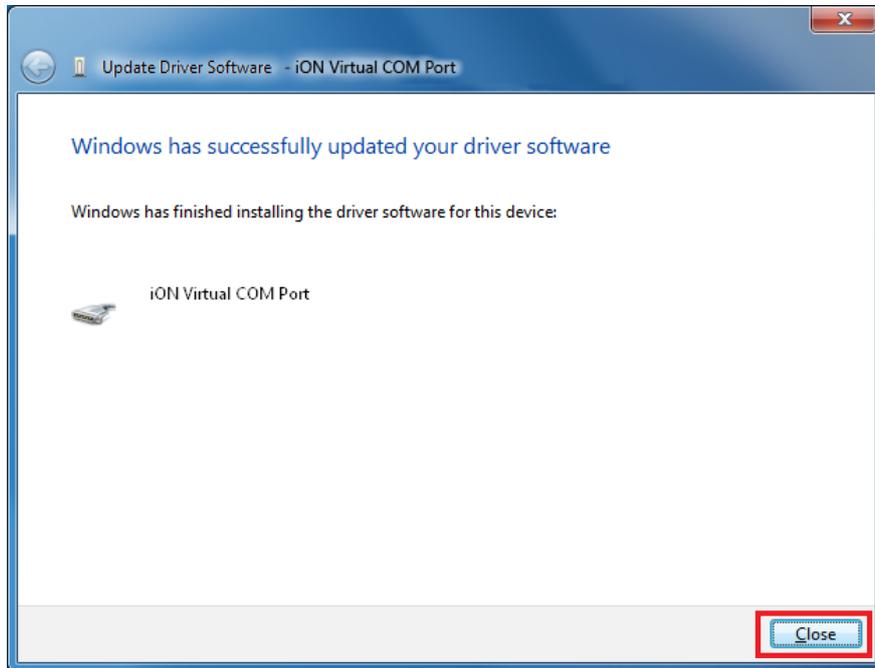


As a result, the driver installation process will launch. If you are prompted “Windows can’t verify the publisher of this driver software”, select “**Install this driver software anyway**” in the Windows Security dialog box.





As a result, the driver for one device will be installed:





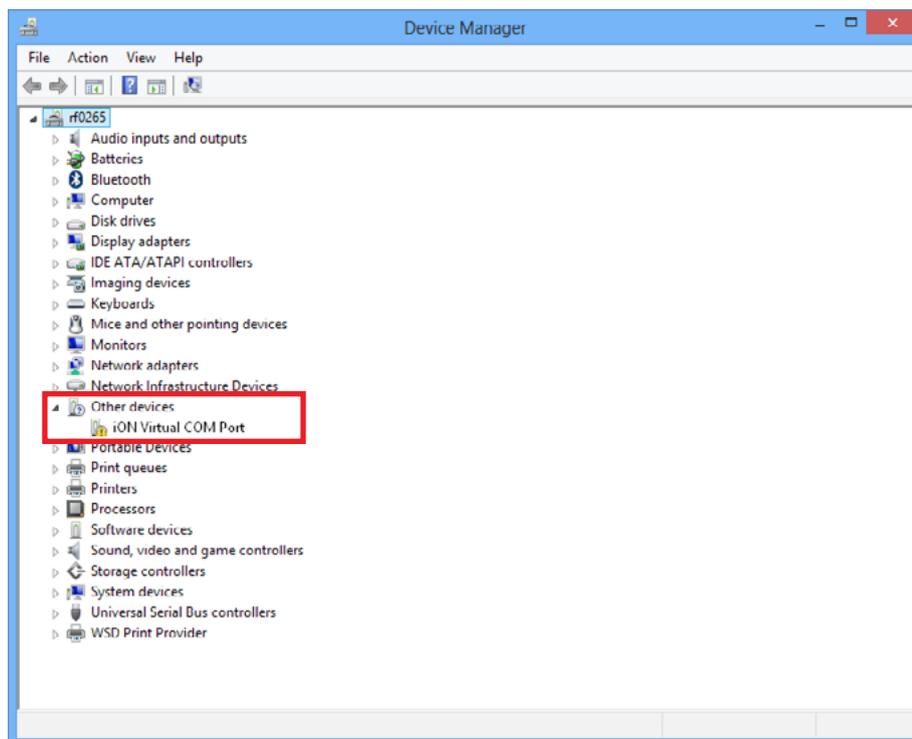
4.1.3. Installing Drivers on Windows 8

① Download and extract the iON_Virtual_COM_Port_driver.zip file containing the drivers for iON FM to a folder in your computer. For example, to the **C:\drivers** location

② Plug iON FM into your computer using a USB port. Make sure the device is getting enough power — the device indicators should light up.

In this case the **“Update Driver Software”** icon will appear on the taskbar.

In addition, an unknown device will appear in the Device Manager (summon Windows charms bar ► Settings ► System information ► Device manager):

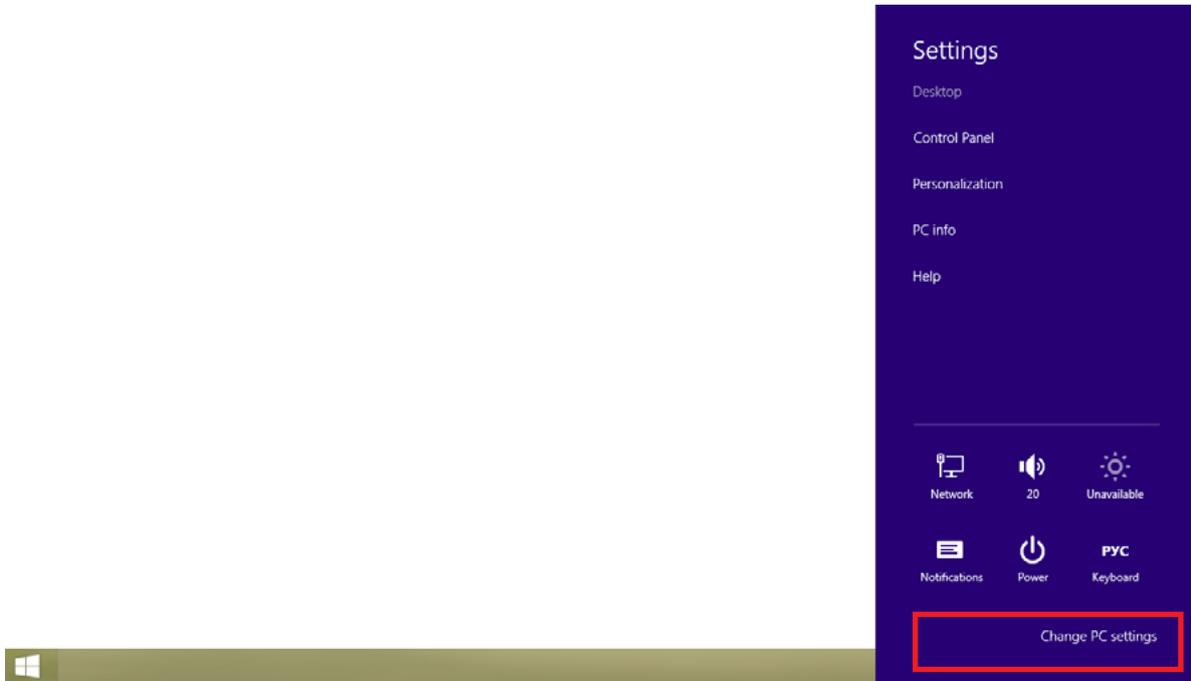




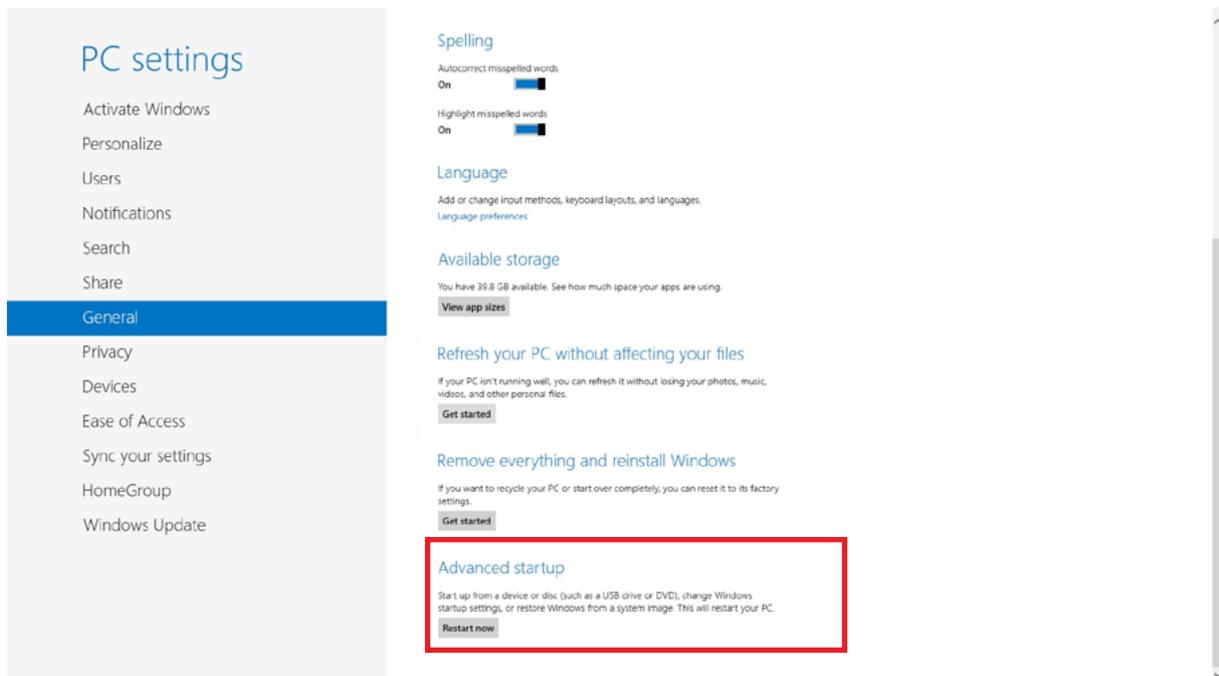
Since Windows 8 does not allow administrators to install drivers without digital signature by default, you will have to boot the system in a special mode.

For that, follow the steps below:

③ Open the charms bar in Windows 8 (or press the WIN+I keys), select **Settings** and tap or click **Change PC settings**:

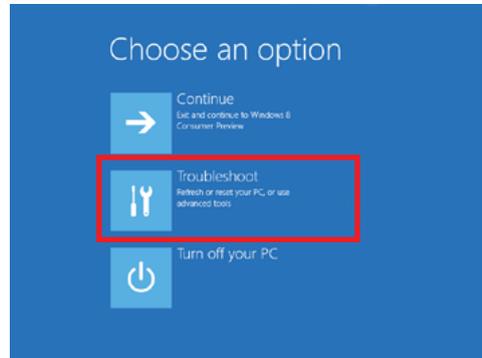


④ On the “PC settings” list select **General** (or **Update and Restore/Restore** in Windows 8.1), and in the right window in the “Advanced startup option” tap or click **Restart now**:

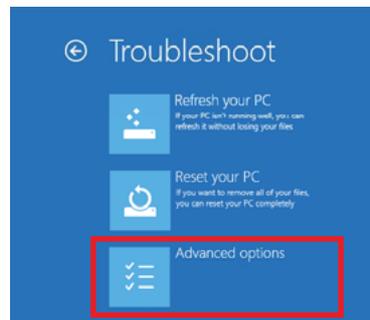




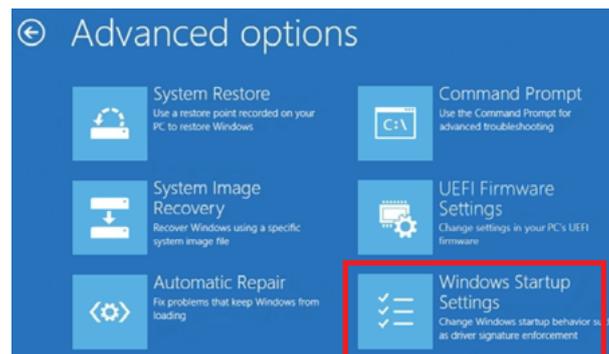
- 5 On the “Choose an option” screen select **Troubleshoot**:



- 6 On the “Troubleshoot” screen select **Advanced options**:

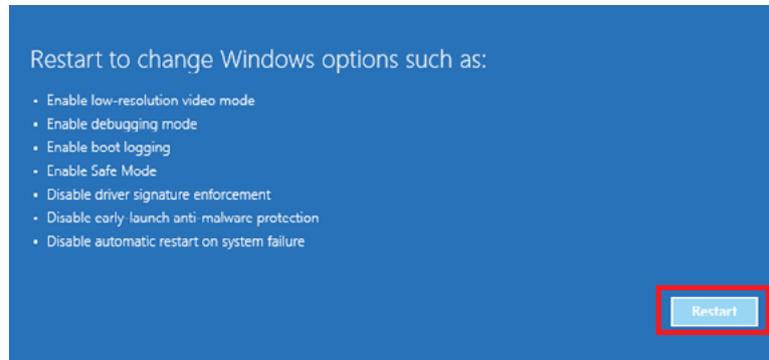


- 7 On “Advanced options” select **Windows Startup Settings**:



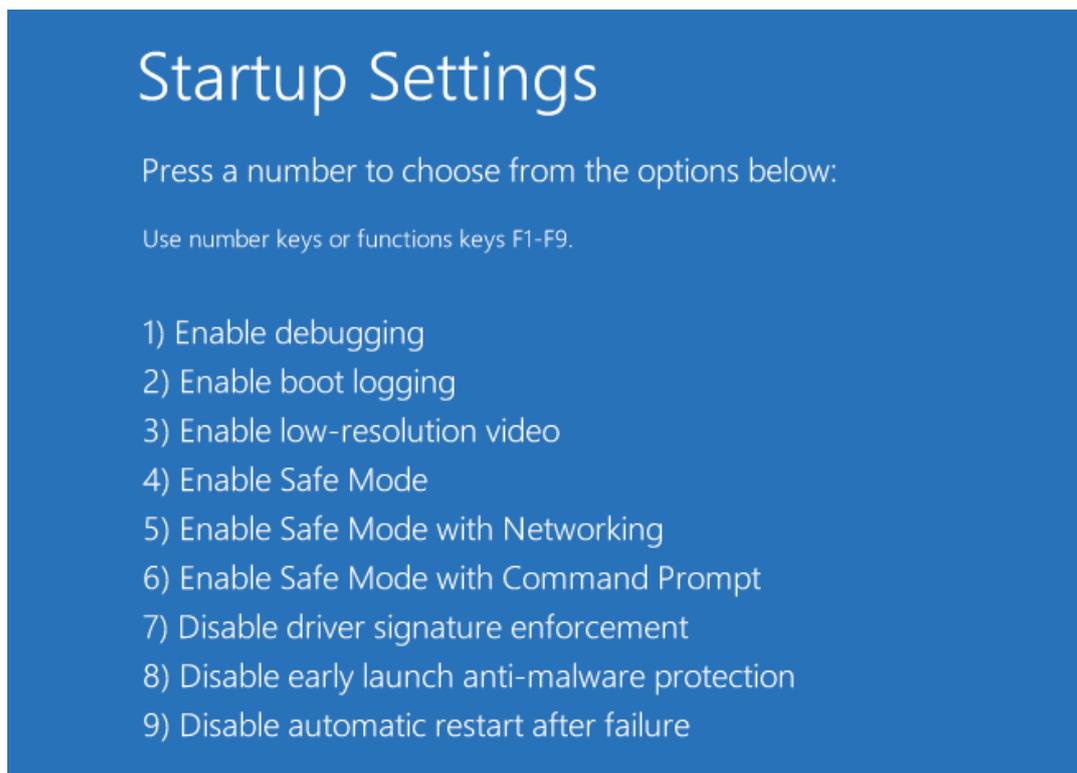


- 8 On “Window Startup Settings” tap or click **Restart**:



The PC will now reboot and you will be prompted with the startup settings before running.

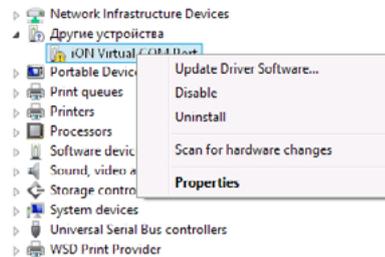
- 9 Press the number **7** (or **F7**) key to select the “**7) Disable driver signature enforcement**” option:



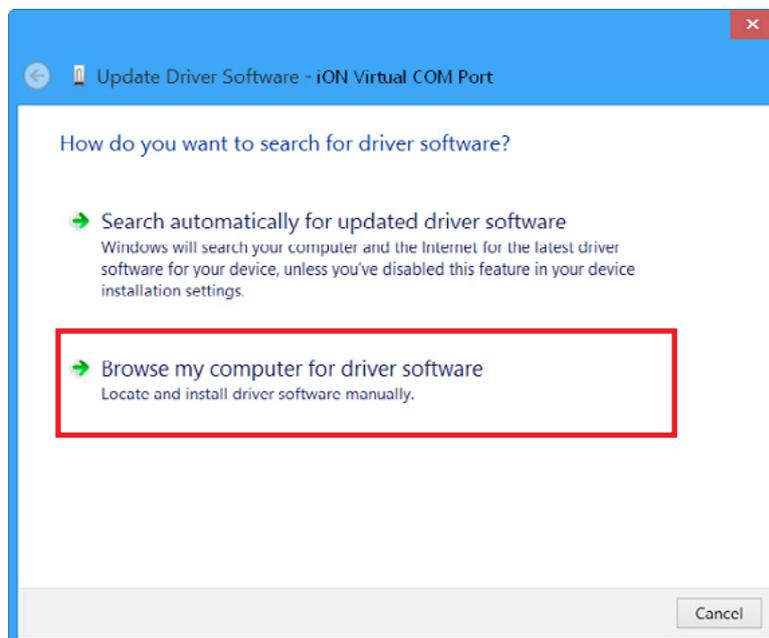
Then, Windows will reboot with the option to install unsigned drivers.



10 After Windows rebooting, open the Device Manager (open the Settings charm ► Control Panel ► System and Security ► System ► Device Manager) highlight iON Virtual COM Port from the unknown devices and by the right-click select **“Update Driver Software...”**.

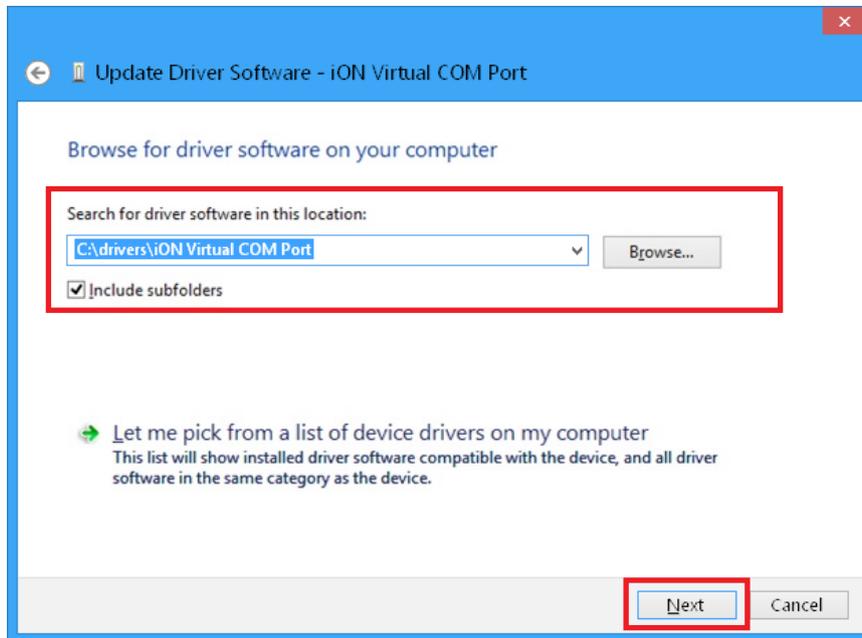


11 The Update Driver Software window will appear. Select the **“Browse my computer for driver software”** option:

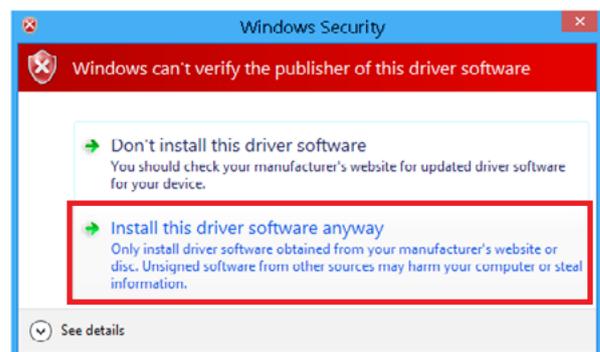
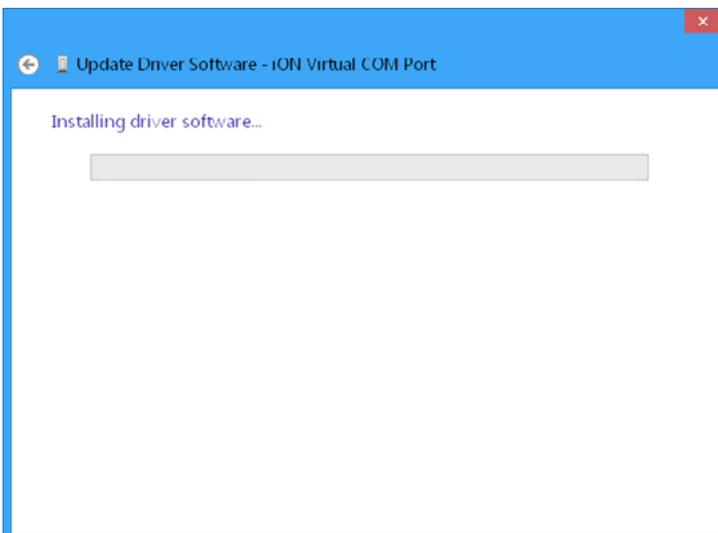




- 12 Using the **Browse** button navigate to the folder that contains the driver files. For example, **C:\drivers\iON Virtual COM Port**
Then click the **Next** button:

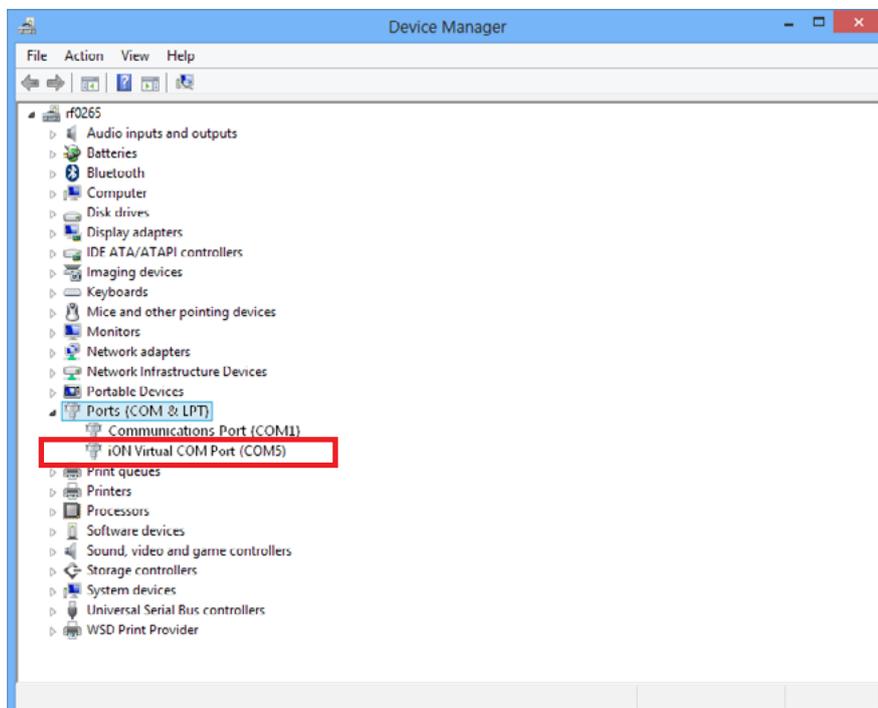
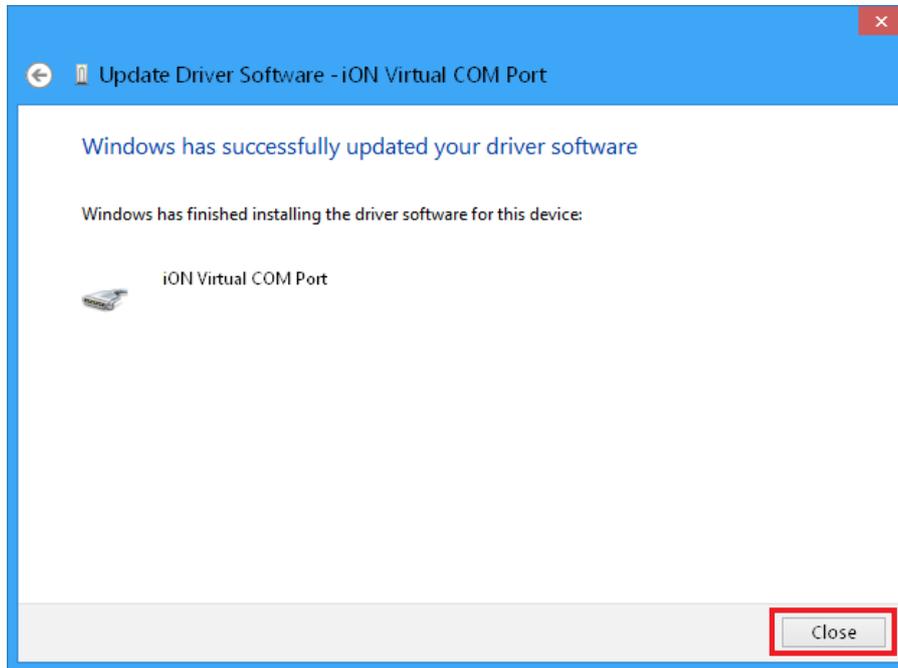


As a result, the driver installation process will launch. If you are prompted “Windows can’t verify the publisher of this driver software”, select “**Install this driver software anyway**” in the Windows Security dialog box.





As a result, the driver for the device will be installed. Click **Close**.





4.2. Overview

The configurator program is an application, in which all the managing elements are grouped by their tasks.

By default the device has a password, without which you can't save any changes in the configurator. For the terminal iON FM the default password is **123456**.

When you initialize the configurator the list of the devices connected to the computer will open:

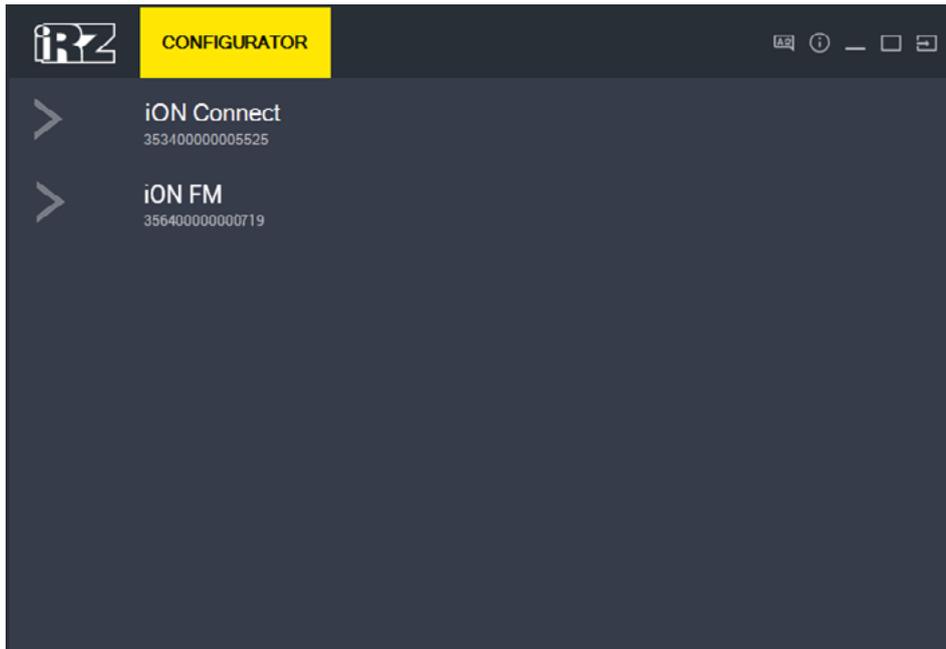


Fig. 4.1. List of Devices

To access the settings, click on the device from the list to which you want to connect.



After selecting the device, opens several tabs with information and configurations:

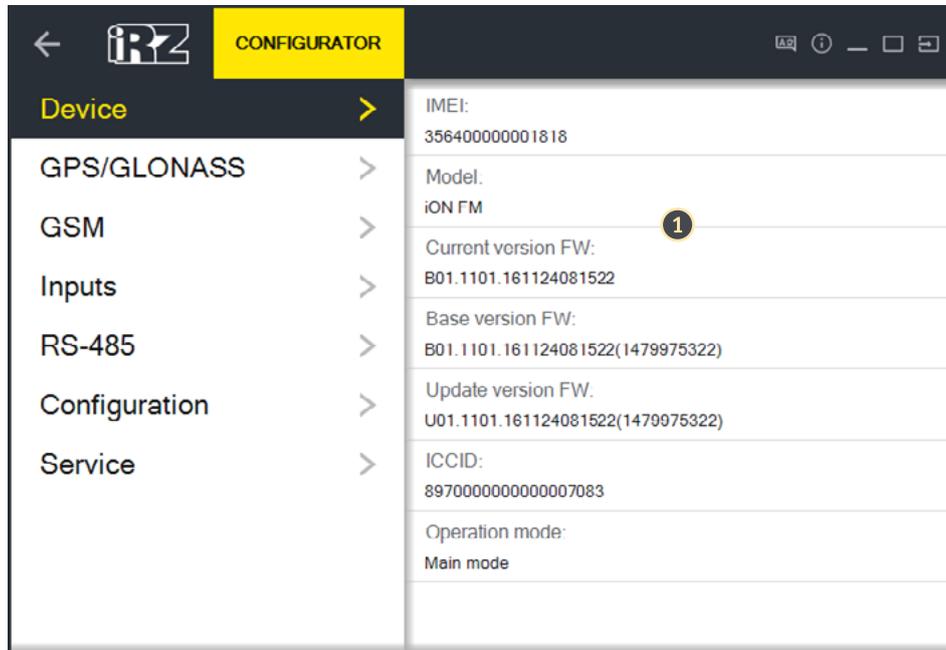


Fig. 4.2. "Devices" tab

Mark	Element	Description
	"Device" tab	General information about device: IMEI, model, firmware version, etc.
	"GPS/GLONASS" tab	Information about GPS/GLONASS module and antennas.
	"GSM" tab	Information about SIM card and functioning of GSM connection
	"Inputs" tab	Information about state of device's inputs and diagnostic information: device temperature, external and internal voltage.
	"RS-485" tab	The diagnostic information from the CAN-LOG sensors, that are connected through the RS495 interface
	"Configuration" tab	Configurations of the device
	"Service" tab	Firmware update, password change, execution of service commands for the device, loading and saving the configuration.
1	Working area	Working area of the selected tab.
	 Arrow to go back	Go back to the previous level.
	 Language selection	Change language.
	 About software	Information about the program
	 Language selection	Change the language.
	 Expand/Collapse	Change the parameters of the program's window
	 Exit	Exit from the program



4.3. Terminal Configuration

To access the configuration of the device, select the **Configuration** tab. In which the settings are grouped by topics:

Tab	Function
Server	Configuration of the connection with the servers of the monitoring system.
SIM configuration	Configuration of the SIM cards in the device.
Track points	Configuration of the tracking points saving.
Inputs	Inputs configuration
Outputs	Enabling/disabling of the outputs
RS-485	Configuration of the sensors or CAN-LOG connected through RS485 interface
Powersaving	Configuration of the power saving modes.
Data grouping	Configuration of data grouping.

The button  is used for the reading of the device configuration. The button **Save** is used to save the changes made in the configuration.

To change the parameters in the configuration of the device:

- ① Change the needed parameters (you can change parameters in several tabs at once);
- ② Click on the **Save** button;
- ③ Enter the password to access the configuration (if the password in the current session, it won't be necessary, the configuration will be saved after pressing the **Save** button).

4.3.1. "Server" tab

The **Server** tab is used for the configuration of the connection with the servers of the monitoring system.

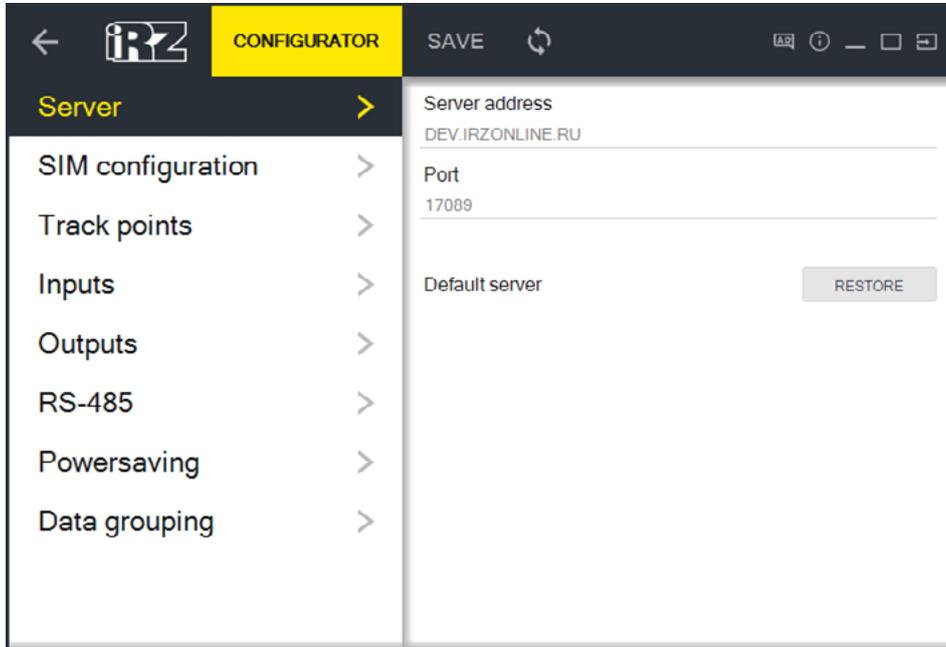


Fig. 4.3. "Server" tab

For the configuration of the connection you need to specify the IP address or the DNS name and its port.
Example:

Parameter	Example
Server address	dev.irzonline.ru
Port	17089

The **Restore** button installs the default server parameters.



4.3.2. "SIM configuration" tab

The **SIM Configuration** tab is used for the configuration of the SIM cards in the device.

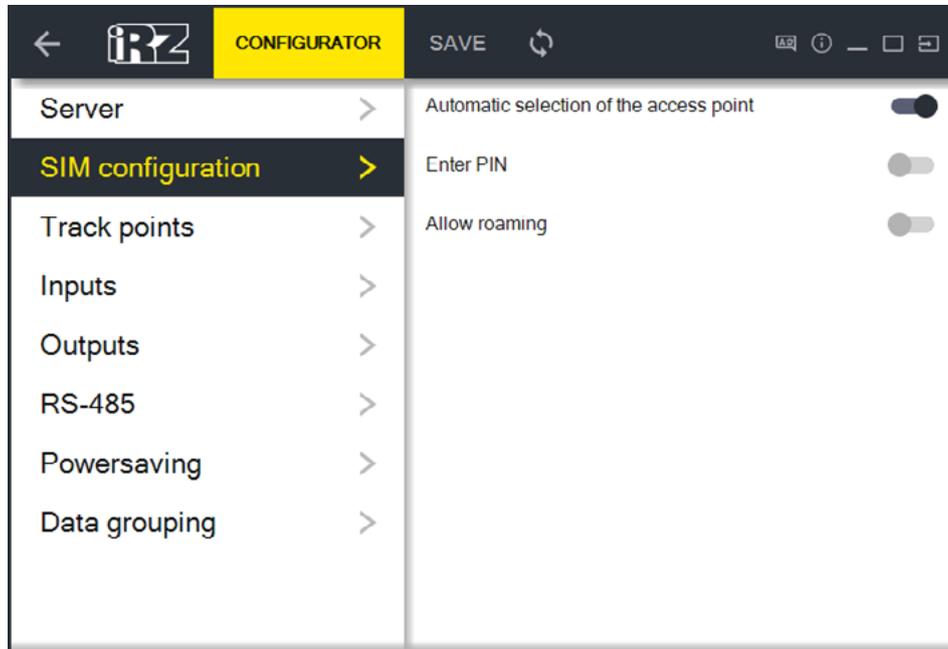


Fig. 4.4. "SIM configuration" tab

The following configurations are available:

Parameter	Description
Automatic selection of the access point	Enable/disable the automatic selection of the access point. If the parameter is disabled, then the APN, login and password need to be entered manually.
Enter PIN	Enable/disable the entry of the PIN code for the SIM card. If in the SIM card the PIN code is set, then it is needed to be enabled, and below will appear a window for its entry.
Allow roaming	Enable/disable the permission of the SIM card to work in roaming.



4.3.3. “Track points” tab

The **Track Points** tab is used for the configuration of the navigation tracking points.

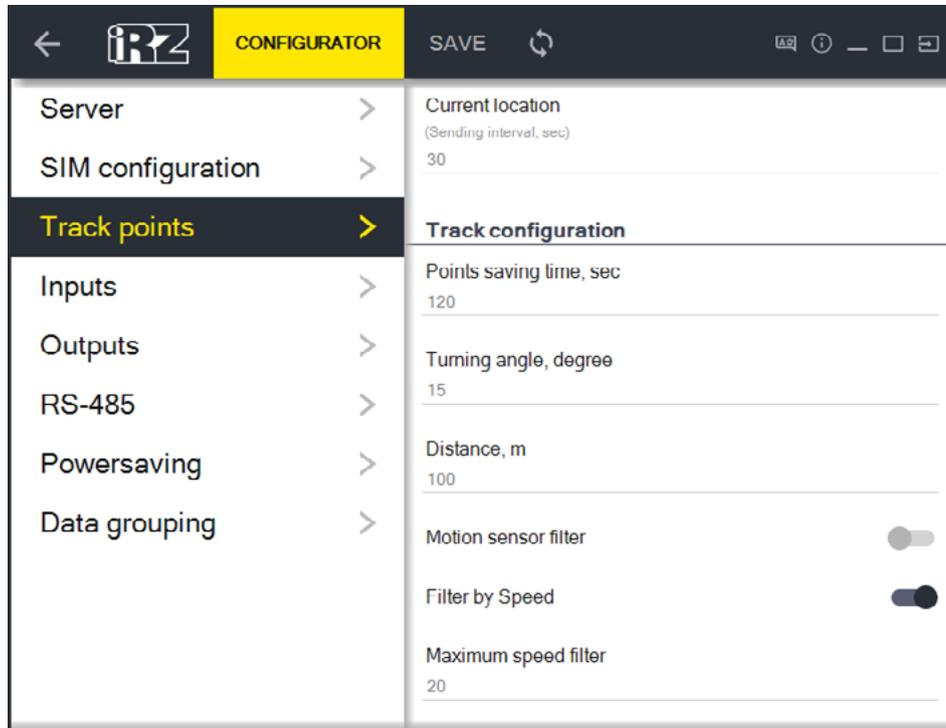


Fig. 4.5. “Track points” tab

The following configurations are available:

Parameter	Description
Current location	Period in seconds, which specifies the interval of time after which the terminal will send the data for the display of the location in real time. For example, 30 — every 30 seconds the coordinates of the current location will be sent to the server.
Track configuration:	
Points saving time	Period in seconds, which specifies the interval of time after which the device will save the coordinates of the current position. This information will be used for the construction of the track. For example, 120 — every 2 minutes the device will save the coordinate of the current position in its database.
Turning angle degree	Turning angle in degrees, above which a coordinate of the current position will be saved by the device. For example, 15 — when the direction is shifted by 15 degrees or more, the coordinate of the current position will be saved in the device’s database.
Distance	Distance in meters, above which a coordinate of the current position will be saved by the device. For example, 100 — every 100 meters the coordinate of the current position will be saved in the device’s database.
Motion sensor filter	Enable/disable of the data filter. When the filter is enabled, if the accelerometer has captures a parking event, then the data during the parking event will not be saved.



Parameter	Description
Filter by speed	<p>Enable/disable the filter of data by speed — setting new value for parameter responsible for enabling/disabling track point filtration by speed, when the speed is less than the threshold.</p> <p>If the parameter is set to 0, the filter is disabled. If the parameter is set for an allowed interval (for example, 20 km/h), if the vehicle is moving with less than 20 km/h the device will filter said coordinates, considering that it is the margin of error of the GPS/GLONASS positioning systems, on traffic lights and traffic jams.</p>

4.3.4. "Inputs" tab

The **Inputs** tab is used for the configuration of the universal inputs.

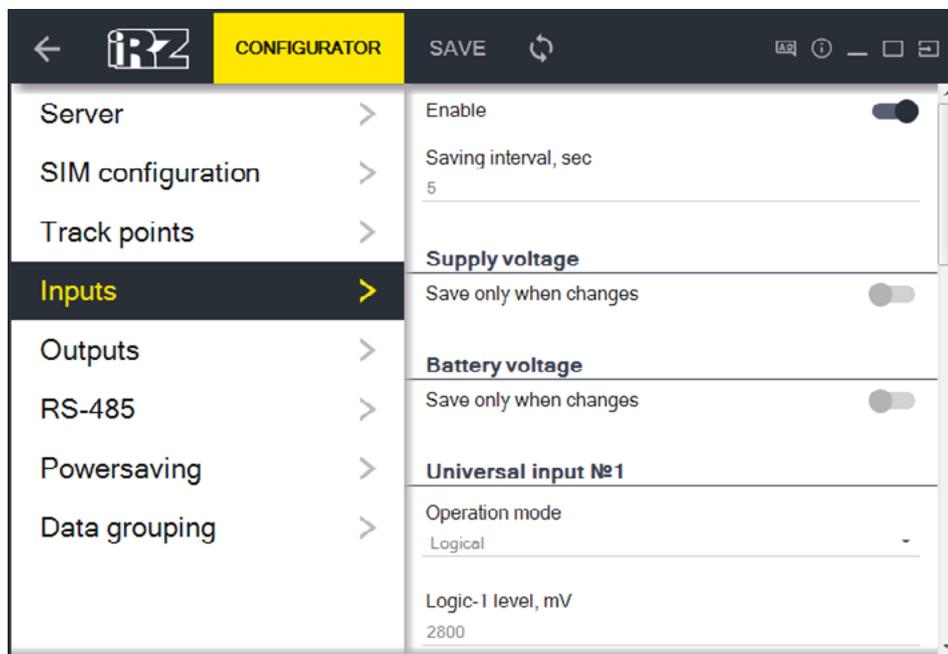


Fig. 4.6. "Inputs" tab

The terminal iON FM has 4 universal inputs (IN1, IN2, IN3, IN4).



The following configurations are available:

Parameter	Description
Enable	Enable/disable the universal inputs
Saving interval, sec	Time in seconds, after which the device saves data from the inputs
Supply voltage	
Save only when changes	Enable /disable the mode in which the supply voltage data will only be saved if the value changes. Enabling this option can save internet traffic.
Battery voltage	
Save only when changes	Enable /disable the mode in which the battery voltage data will only be saved if the value changes. Enabling this option can save internet traffic.
Universal input #1 – 4	
Operation mode	Select the mode in which the inputs will function: <ul style="list-style-type: none"> ● frequency – operation mode in which the frequency on the input is read; ● pulse – pulse counter on the input; ● analog – voltage measurement on an input; ● logical – operation mode in which the input measuring the logical HIGH and logical LOW (High – “1” or low – “0”); ● not used – input disabled.
Save only when changes	Enable /disable the mode in which the data from the inputs will only be saved if the value changes. Enabling this option can save internet traffic.

If the need arises the user can enable the pull-up resistor to supply voltage. The pull-up resistors are configured dually: IN1+IN2 and IN3+IN4.



4.3.5. "Outputs" tab

The **Outputs** tab is used to configure the outputs.

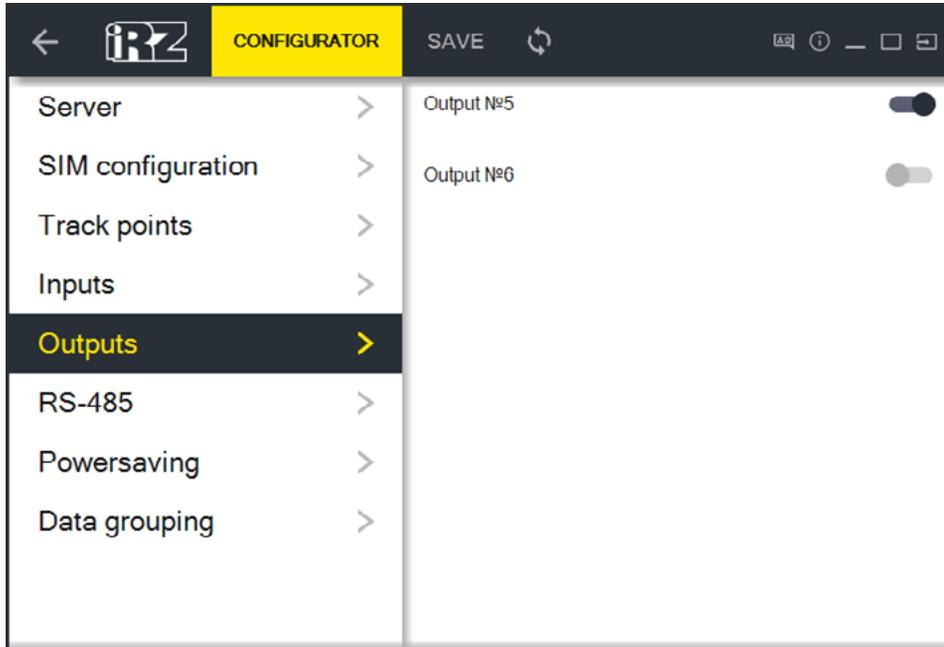


Fig. 4.7. "Outputs" tab

The terminal iON FM has 2 outputs (OUT5, OUT6). With the configurator you can enable/disable them.



4.3.6. "RS-485" tab

The **RS-485** is used to configure the RS485 Interface.

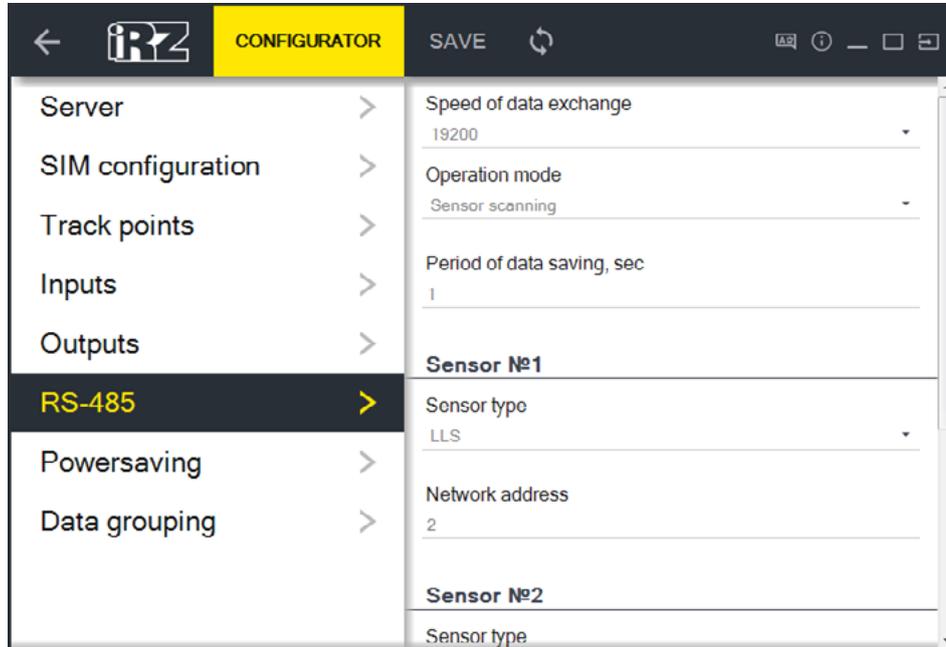


Fig. 4.8. "RS-485" tab ("Sensor scanning" mode)

The following configurations are available:

Parameter	Description
Speed data exchange	Operation speed of the RS485 interface, which is presented by fixated values in baud
Period data saving, sec	Time interval in seconds, after which the data from RS485 should be saved

The interface RS485 can function in two modes:

- Sensor Scanning;
- CAN-LOG iRZ Online.

Sensor Scanning.

This mode is used for the configuration of the liquid level sensors. The terminal iON FM can work with up to four sensors, connected through the RS485.

For the configuration of the sensor do the following steps:

- ① Select the type of sensor;
- ② Enter the network address of the sensor.



CAN-LOG iRZ Online.

The operation mode **CAN-LOG iRZ Online** is used when the device CAN-LOG iRZ Online is connected. This device is used to get data from the CAN bus of the vehicle and transfer it to the terminal. After selecting the **CAN-LOG iRZ Online** operation mode, the data that needs to be saved and sent to the monitoring system has to be selected.

Saved information configuration:

- Security state flags
- Total time of engine operation , h;
- Total distance travelled, km;
- Total fuel consumption, l;
- Fuel level in the tank;
- Engine speed, RPM;
- Engine temperature, °C;
- Vehicle speed, kmph;
- Load on axle 1;
- Load on axle 2;
- Load on axle 3;
- Load on axle 4;
- Load on axle 5;
- Alarm controllers;
- AdBLUE liquid level;
- Agricultural vehicle condition;
- Reaper time, h;
- Harvested area, Ha;
- Productivity, 0.01 Ha/hour;
- Harvested crop, t;
- Grain moisture;
- Beater drum speed;
- Concave clearance at the output, mm;
- Acceleration pedal position;
- Engine load.



Saved security state flags:

- Ignition status;
- Stock alarm state;
- Vehicle is locked with stock fob;
- Key is in ignition lock;
- Dynamic ignition 2 is engaged;
- Driver's door is open;
- Passenger's door is open;
- Trunk is open;
- Hood is open;
- Handbrake is engaged;
- Brake pedal is engaged;
- Engine is running;
- Webasto is running;
- Vehicle is locked with stock fob;
- Vehicle is unlocked with stock fob;
- Trunk unlocked with stock fob;
- Module switched to "sleep mode".



Saved accident controllers flags:

Icon	Description	Icon	Description
	Stop		ABS (anti-blocking system)
	Pressure / level of oil		Low fuel level
	Temperature / level of coolant		ESP (electronic stability program)
	Handbrake system		Ignition fuse indicator
	Battery charge		FAP (particulate filter)
	Safety bag		Electrical pressure configuration
	Check the engine		Tail lamps
	Lighting malfunction		Low beam
	Low tire air pressure		High beam
	Worn brake plates		Passenger seatbelt
	Warning		Driver seatbelt



4.3.7. "Powersaving" tab

The **Powersaving** tab is used for the configuration of the power saving modes.

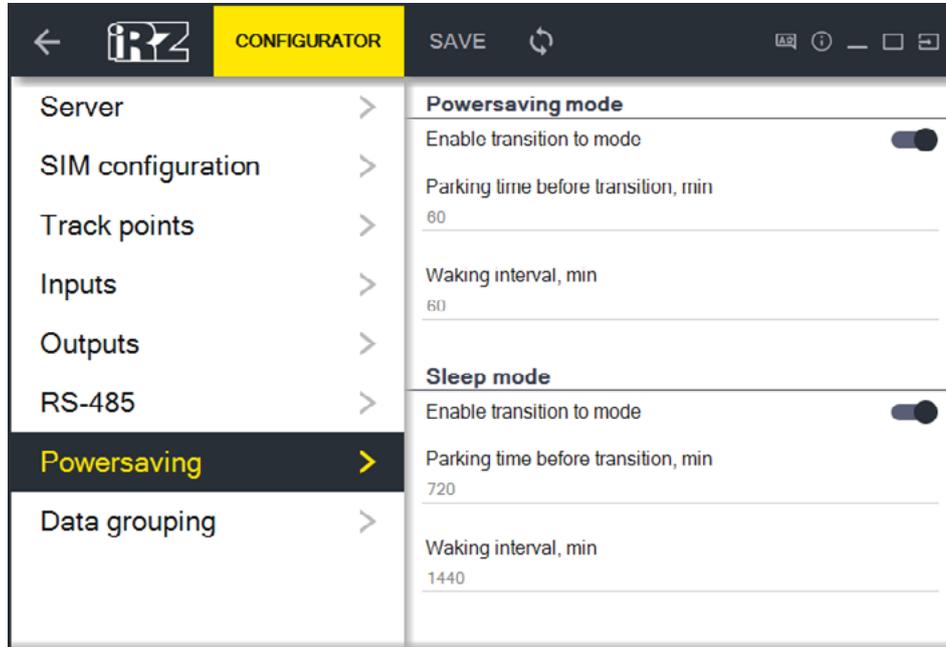


Fig. 4.9. "Powersaving" tab

The following configurations are available:

Parameter	Description
Powersaving mode:	
Enable transition to mode	Enable/disable the transition of the device to "Power saving mode".
Parking time before transition	Time of parking event in minutes, after which the device will switch to power-saving mode.
Waking interval	Time of waking of the device form the powersaving mode in minutes, after which the device will go online to transfer the main data to the server.
Sleep mode:	
Enable transition to mode	Enable/disable the transition of the device to "Sleep mode".
Parking time before transition	Time of parking event in minutes, after which the device will switch to Sleep mode.
Waking interval	Time of waking of the device form the Sleep mode in minutes, after which the device will go online to transfer the main data to the server.



4.3.8. "Data Grouping" tab

The **Data Grouping** tab is used for the configuration of data grouping, before their sending to the monitoring server. This function can be useful when working with monitoring systems that support grouping of data.

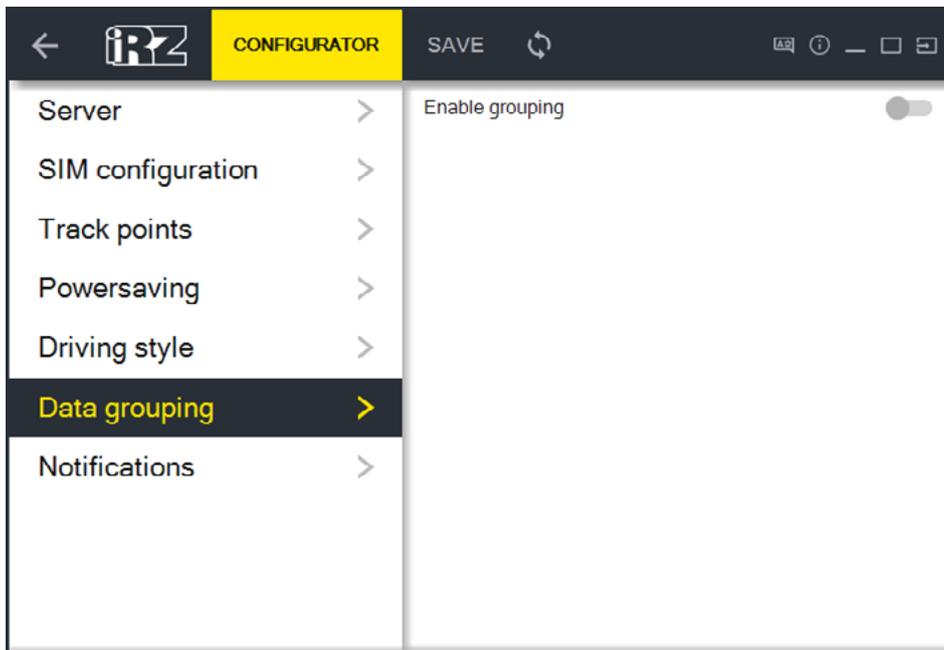


Fig. 4.10. "Data Grouping" tab

To enable the data grouping, move the switch **Enable grouping** to the right.

CAUTION! The use of data grouping increases the internet traffic from the device!



4.4. Service configuration of the terminal

In the **Service** tab can be configured different service configuration of the terminal – installation and changing of the password, firmware update, sending of service commands and other.

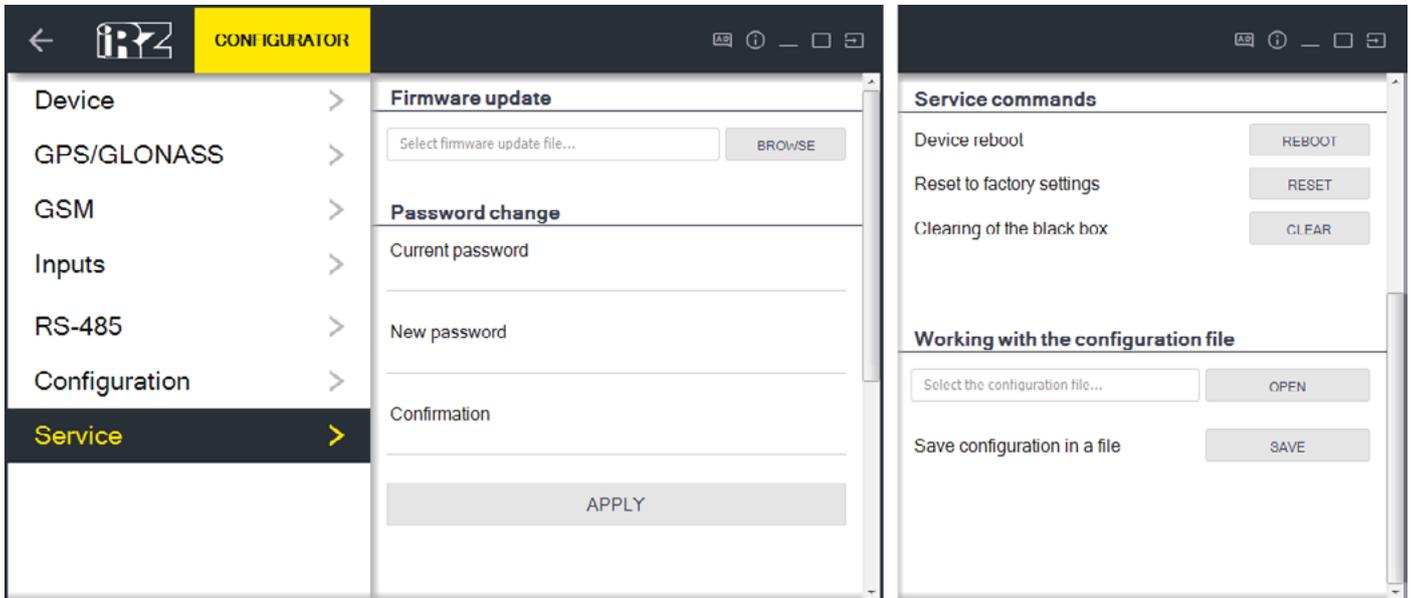


Fig. 4.11. “Service” tab

4.4.1. Firmware Update

To update the firmware:

- ① Click on the **Browse** button in the **Firmware update** section;
- ② Select the file with the update, which you want to install in the device;
- ③ Click on the **Update** button.

WARNING! While the firmware of the device is being updated, you must wait until the update finished before unplugging it, otherwise the device might get damaged!

The application checks for updates automatically for the firmware of the connected device. If an update for the device’s firmware is available, in the **Device** tab in front of the **Current version FW** tab will appear the icon  **New Version**, after pressing which you could update the device’s firmware.



4.4.2. Password Change

To change the password, do the following steps:

- ① Enter the current password of the device in the designated field;
- ② In the next field enter the new password;
- ③ Enter again the new password in the **Confirmation** field;
- ④ Click on **Apply** button.

4.4.3. Service Commands

Also in the **Service** tab are available several important service commands:

Parameter	Description
Device reboot	Reboots the device
Reset to factory settings	Resets the settings of the device to defaults
Clearing of the black box	Delete the accumulated data from the black box (internal memory) of the device
Driving style configuration	Resets the settings of the driving style to defaults (leads to the device recalibration)

4.4.4. Working with the Configuration File

The settings made in the configurator program can be saved in a separate file, to quickly restore them from this file.

To save the settings:

- ① Click on the **Save** button in front of the **Save Configuration in a File** field;
- ② Name the file and select the saving path;
- ③ Click the **Save** button.

To load the settings:

- ① Click on the **Open** button;
- ② Select the file with the settings, which need to be installed in the device;
- ③ Click on the **Open** button.



4.5. CAN-LOG iRZ Online Diagnostic

Варианты подключения для диагностики CAN-LOG iRZ Online:

Test of the device with a test program	Test of data received from CAN bus
<ol style="list-style-type: none"> 1 Connect the iON FM terminal to power supply; 2 Connect CAN-LOG iRZ Online to power supply (“+12/24 V” and “-”); 3 Connect the iON FM RS485 interface cables (A and B) to the CAN-LOG (twisted pair). 	<ol style="list-style-type: none"> 1 Connect the iON FM terminal to power supply; 2 Connect CAN-LOG iRZ Online to power supply (“+12/24 V” and “-”) and CAN bus (twisted pair) of the vehicle; 3 Connect CAN-LOG to the iON FM terminal (through Microfit 10, twisted pair: RS485 A and RS485 B).

Configure the device iON FM with the configurator to function with CAN-LOG:

- In the tab **Configuration/RS-485** in the field **Operation Mode** select **CAN-LOG iRZ Online**;
- In the tab **Configuration/RS-485** in the field **Speed of Data Exchange** select **9600**;
- In the tab **Configuration/RS-485** in the field **Period of Data Saving, sec** select a period, after which the data from CAN-LOG should be saved (for example, 10 seconds);
- Press the button **Save**, to save the selected configuration.

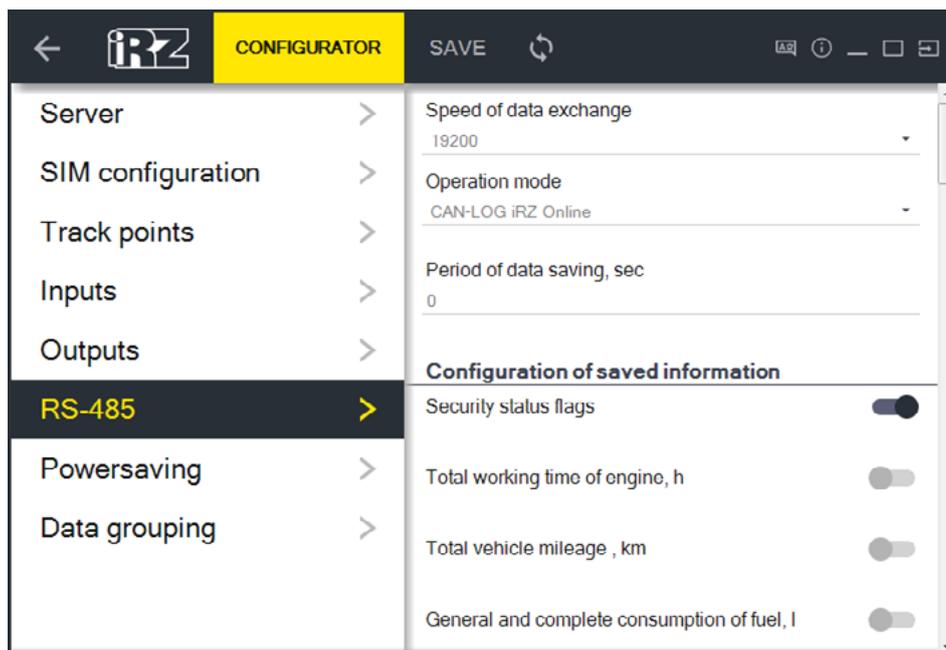


Fig. 4.12. “RS-485” tab (“CAN-LOG iRZ Online’ mode)

After this in the **RS-485** tab, enter the number of the program that functions with CAN-LOG iRZ Online, which is different for every vehicle manufacturer. The number for each vehicle is provided by the CAN-LOG manufacturer.

Enter the number of the program:

- In the field **Program number** in the **RS-485** tab and press and enter the number of the program (supported only 3-digits program number);
- Press (On the right of the field with the number) and save the result.

If the CAN-LOG is connected and the selected configuration are correct, in the **RS-485** tab in the **CAN-LOG Data, Security State Flags** and **Accident Controller** will appear information. The values that are active in the **RS-485** tab can be selected to be processed by the terminal. For this select the needed fields in the **Configuration/RS-485** tab (which are corresponding to the 3 fields in the information tab).

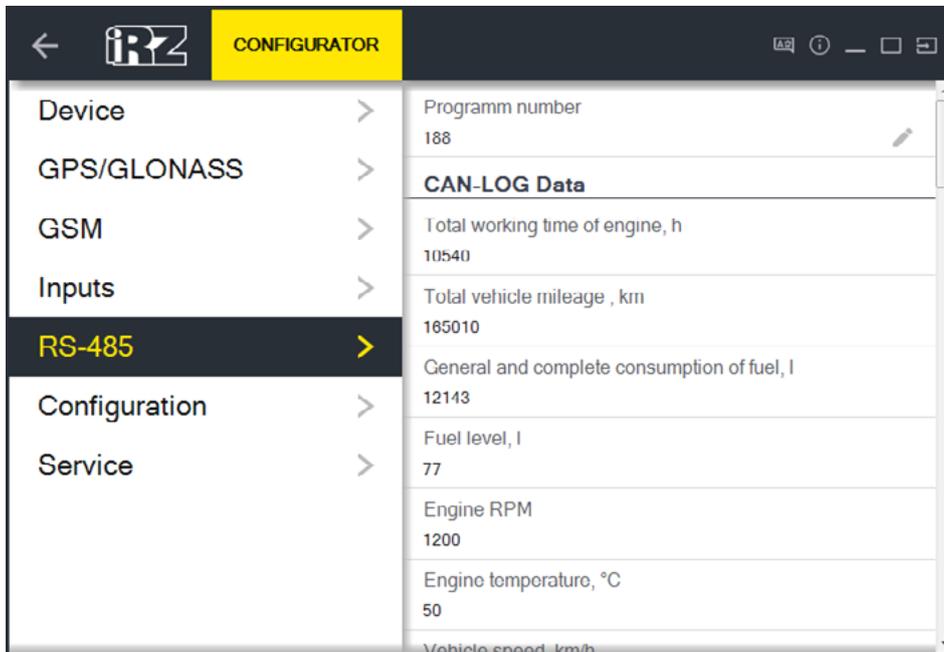


Fig. 4.13. "RS-485" tab (interface operation information)



Terms and Abbreviations

Abbreviations	Expansion
Battery	accumulator battery
GLONASS	Global Navigation Satellite System
LLS	Liquid Level Sensor
NUT	Navigation User Terminal
VEH	vehicle
GPRS	General Packet Radio Service, a packet-based mobile data service for cellular communications
GPS	Global Positioning System, global navigation satellite system
GSM	Global System for Mobile Communications
LBS	Location-based service
Li-Pol	Lithium-ion polymer battery
LLS	Liquid Level Sensor
USB	Universal Serial Bus