



INSTALLATION GUIDE

Navigation User Terminal

iON Pro





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1. Introduction

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

Version	Date	Prepared by	Revisions
1.0	05.08.2014	V. Golovin	Main document
1.1	18.11.2014	V. Golovin	Revisions: 4.1.3. - the document is extended by adding the installation directions for Windows 8.1, and section 4.1. "Driver Installation"
1.1.1	26.11.2014	V. Golovin	Minor corrections (marking)
1.1.2	03.04.2015	V. Golovin	Updated information on the configuration tool: 4.2, 4.3.1, 4.3.12
1.2	22.07.2015	V. Golovin	Added sections: "The Diagrams of Connecting Relay to an Output" (3.11), "Exporting Data to a Flash-Drive" (4.5). New front page.

1.1. Cautions and Recommendations

Before proceeding to the device use, please look through 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*

Key Features	
Navigation receiver	GPS/GLONASS
Frequency band	GSM/GPRS 900/1800 MHz; (850/900/1800/1900 MHz)**; 3G (2100 MHz)**
Antennas	GPS/GLONASS external antenna
	GSM external antenna
	built-in GPS/GLONASS antenna
	built-in GSM antenna
Flash memory	10 million records
SIM cards	dual SIM card support
	SIM chip**
	SIM card heating
Built-in accelerometer	3-axis
Additional features	remote firmware upgrade, WEB
	webcam support**
	external display support**
	transmitted data encryption
	CAN-log support
	case with the tamper sensors
Electrical Specifications	
Supply voltage	9 to 40 V
Maximum voltage rating in a long-term mode	50 V
Current consumption in various modes (at 12 V power voltage), max	<ul style="list-style-type: none"> ● 230 mA (operating mode, the battery is charged) ● 360 mA (operating mode, the battery is discharged) ● 200 μA (sleep mode)
Built-in battery	Li-Pol
Physical Specifications	
Dimensions	109 × 109 × 21 mm
Weight, max	220 g
Gross weight, max	660 g
Ingress protection	IP54
Operating temperature range	-40°C to +60°C

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

** optional



Connectors and Interfaces	
Connectors	main Microfit 14 interface connector
	additional Microfit 8 interface connector
	SMA connector for GSM antenna
	SMA connector for GPS/GLONASS antenna
	SIM card holder #1
	SIM card holder #2**
	Mini USB connector
Main interfaces	6 × multipurpose input***
	2 × multipurpose output***
	SAE bus (J1708)
	2 × RS-485 bus
	CAN bus (J1939 / FMS)
	2 × 1-Wire bus
	RS-232 bus**
	voice interface
	USB

* 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 supply package of the iON Pro navigation user terminal includes*:

Designation	Name	Quantity
1	Navigation user terminal	1 pce
2	GSM antenna	1 pce
3	GPS/GLONASS antenna	1 pce
4	8-pin interface cable	1 pce
5	14-pin interface cable	1 pce
6	Data Sheet	1 pce
7	Installation Quick Reference Card	1 pce
8	Seal integrity package	1 pce
	Packaging	1 pce
	SIM card	optional
	Alarm button	optional
	RS232 interface converter	optional

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



Fig. 1.1. iON Pro package contents



1.4. Device Description

1.4.1. Device Overview and Purpose

iON Pro is a navigation user terminal (NUT) designed to collect, store and transmit data from the sensors, various internal (GPS/GLONASS module, accelerometer) and external devices (alarm button) with subsequent data transmission to the server for its further processing. The terminal is designed for installation on monitored objects (for example, vehicles) and operates on the "black box" principle recording the object coordinates, travel speed, connected sensor readings, onboard computer data and registering event time.

The navigation terminal receives location and time data from the GPS/GLONASS satellites. The collected data is transmitted to the server via the GSM network using the GPRS batch communication. The data is transmitted in encrypted form. The information on the server is available to a user through the dispatching software.

It is necessary to remember that iON Pro 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 flow 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 Pro 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:
 - liquid level sensors;
 - fuel flow sensor;
 - regular liquid level sensor (analog output or CAN bus);
 - regular axle load sensor;
 - temperature sensors;
 - etc.



The navigation terminal functions (continued):

- data collection from multipurpose inputs;
- external devices control via multipurpose outputs;
- data collection over CAN bus and J1708;
- CAN-log support;
- data transmission from the terminal to a user server;
- transmitted data storage in case of connection break;
- data transmission to the server in the event of alarm button operation;
- SMS and user commands processing.

1.4.3. The Tracking System Operation Diagram

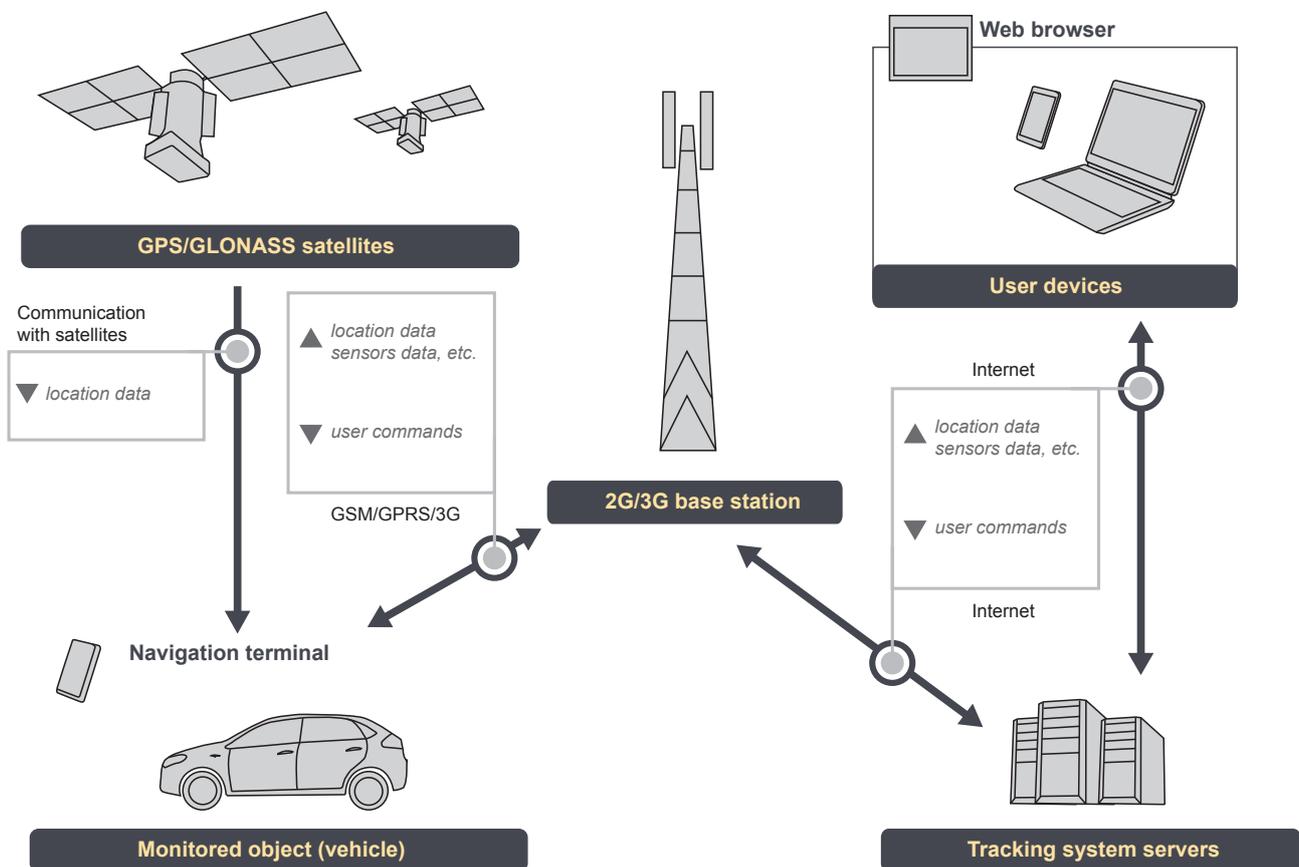


Fig. 1.2. The tracking system operation diagram



1.4.4. Navigation Terminal Connectors

iON Pro is a compact device encased in a plastic housing which supports connection to external antennas, external power, as well as to various external devices and sensors or to a vehicle onboard system.

All the main connectors and interfaces are inside the case. Remove the user compartment cover to get access to them. In turn, the compartment is supposed to be sealed to prevent from third party unauthorised access to the system interfaces. In addition to sealing, the internal sensors fixing the compartment openings operate as a supplementary access control measure for the compartment. The data from these sensors is recorded and transmitted to the server even with power switched off.

Navigation terminal connectors are shown in the figure:

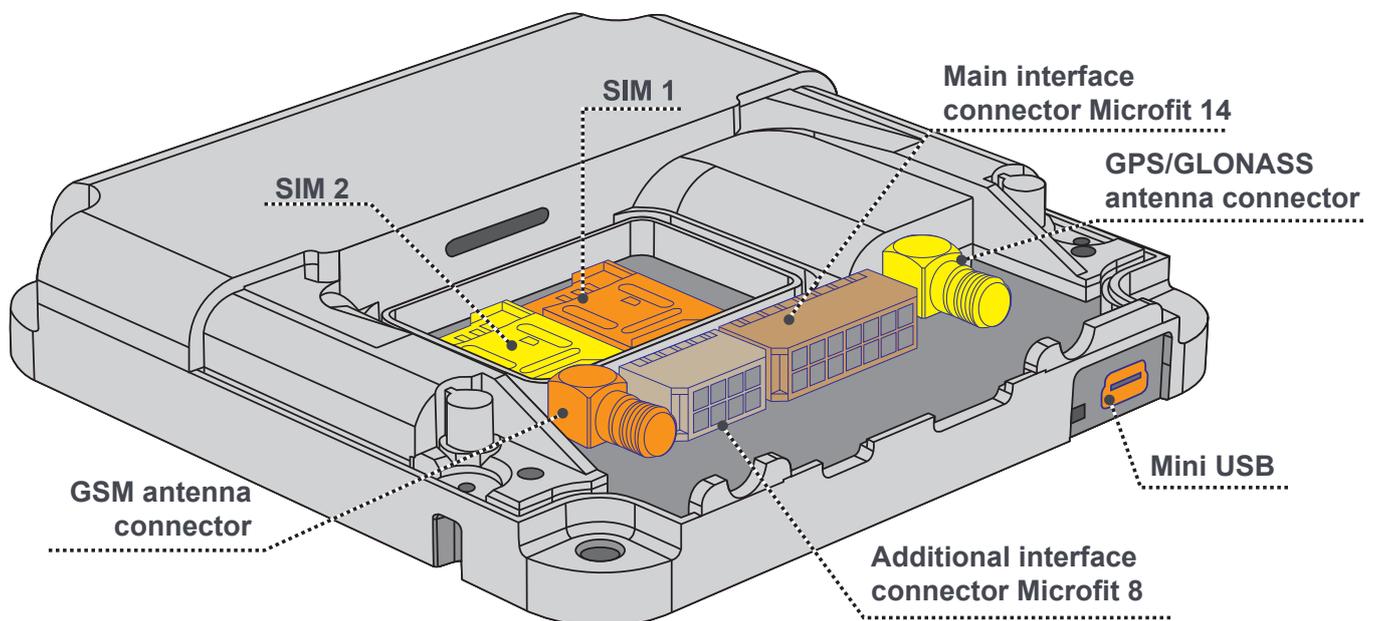


Fig. 1.3. iON Pro navigation terminal connectors



1.4.5. Navigation Terminal System

Navigation terminal structure diagram:

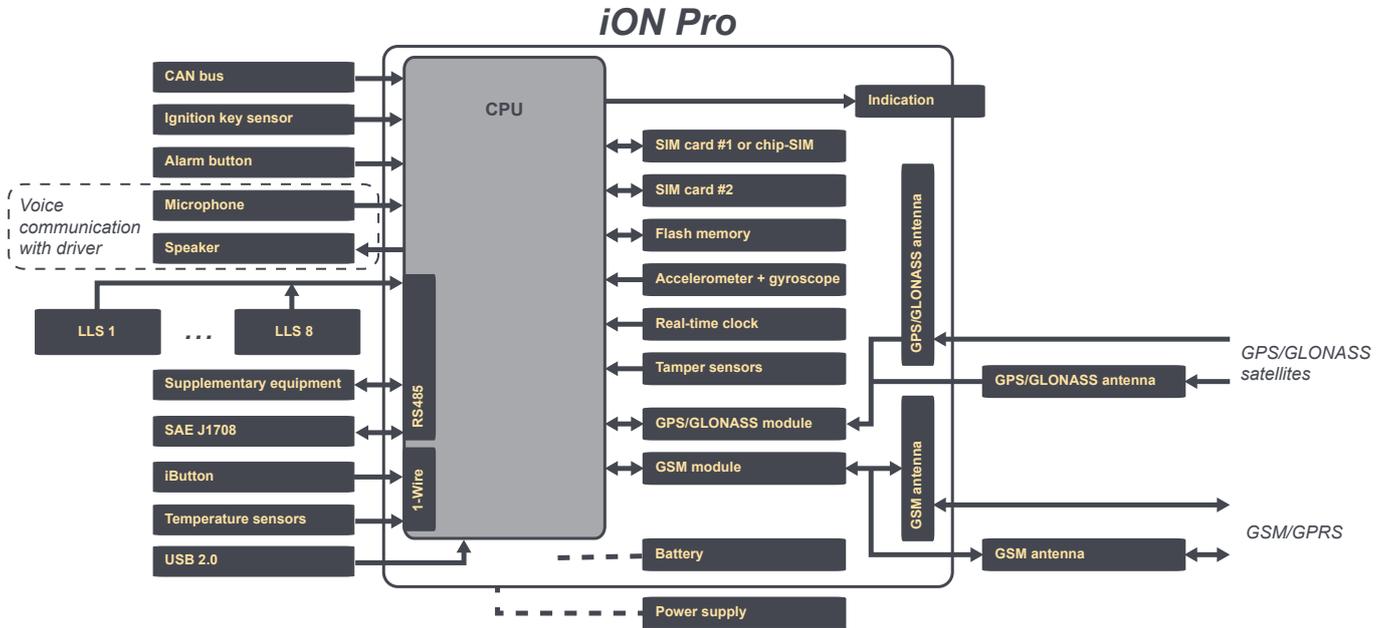


Fig. 1.4. Navigation terminal structure diagram

1.4.6. Navigation Terminal Inputs/Outputs

Navigation terminal input/output chart and assignment:

Connector	#	Type	Assignment
14-pin	6	Multipurpose inputs	Alarm button, ignition key, speed, fuel level, RPM sensors, etc. connection
14-pin, 8-pin	2	RS485 interface	Supplementary equipment connection
14-pin	2	Digital outputs	Freely controlled
14-pin	2	1-Wire interface	iButton and temperature sensors connection
8-pin	1	Voice communication with driver	Connection of microphone + speaker, or speakerphone

Parameters:

Parameter	Value
Maximum output load current	550 mA
Output polarity	shorted to negative power supply
ADC measurement range	0 – 36 V
Discrete input activation thresholds	configurable
Input impedance	~100 kΩ
Input pull-up voltage	1/2 of the terminal supply voltage



1.4.7. Power Consumption Modes and Built-in Battery

The iON Pro navigation terminal uses Li-Pol battery providing the system operation if no external power is supplied.

Current consumption depends on the terminal operation and some other factors (for example, battery charging) at 12 V power voltage:

- 230 mA (operation mode, the battery is charged);
- 360 mA (operation mode, the battery is discharged);
- 40 mA (sleep mode);
- 8 mA (deep sleep mode).

To reduce energy consumption the terminal has 3 power-saving modes:

"Power-saving mode" (Mode 1)	"Sleep mode" (Mode 2)	"Deep sleep mode" (Mode 3)
<i>Conditions for the switch to power consumption modes:</i>		
configured digital input triggered off (data from sensor, ignition key, etc.)	configured digital input triggered off (data from sensor, ignition key, etc.)	no external power (less than 9 V)
$U_{pwr} < U_{pwr1}$ (power voltage is less than the power level specified for this mode)	$U_{bat} < U_{bat_mode2}$ (battery power voltage is less than the battery voltage level for this mode)	$U_{bat} < U_{bat_mode3}$ (battery power voltage is less than the battery voltage level for this mode)
	$U_{pwr} < U_{pwr2}$ (power voltage is less than the power level specified for this mode)	
<i>Changes in the NUT components operation:</i>		
	built-in battery charging disabled	microcontroller switches to sleep mode
microcontoller switches to power-down mode		all components disabled, except accelerometer, tamper sensor, timer
GPS/GLONASS switches to recurrent sleep mode	GPS/GLONASS switches to sleep mode	
GSM switches to recurrent sleep mode	GSM switches to sleep mode	
	RS485, CAN, 1-Wire, DI pull-up, USB disabled	

The first two power-saving modes are configured with the configurator, also it is possible to switch the device to one of the modes forcibly or disable one of them.



Examples of using power-saving modes:

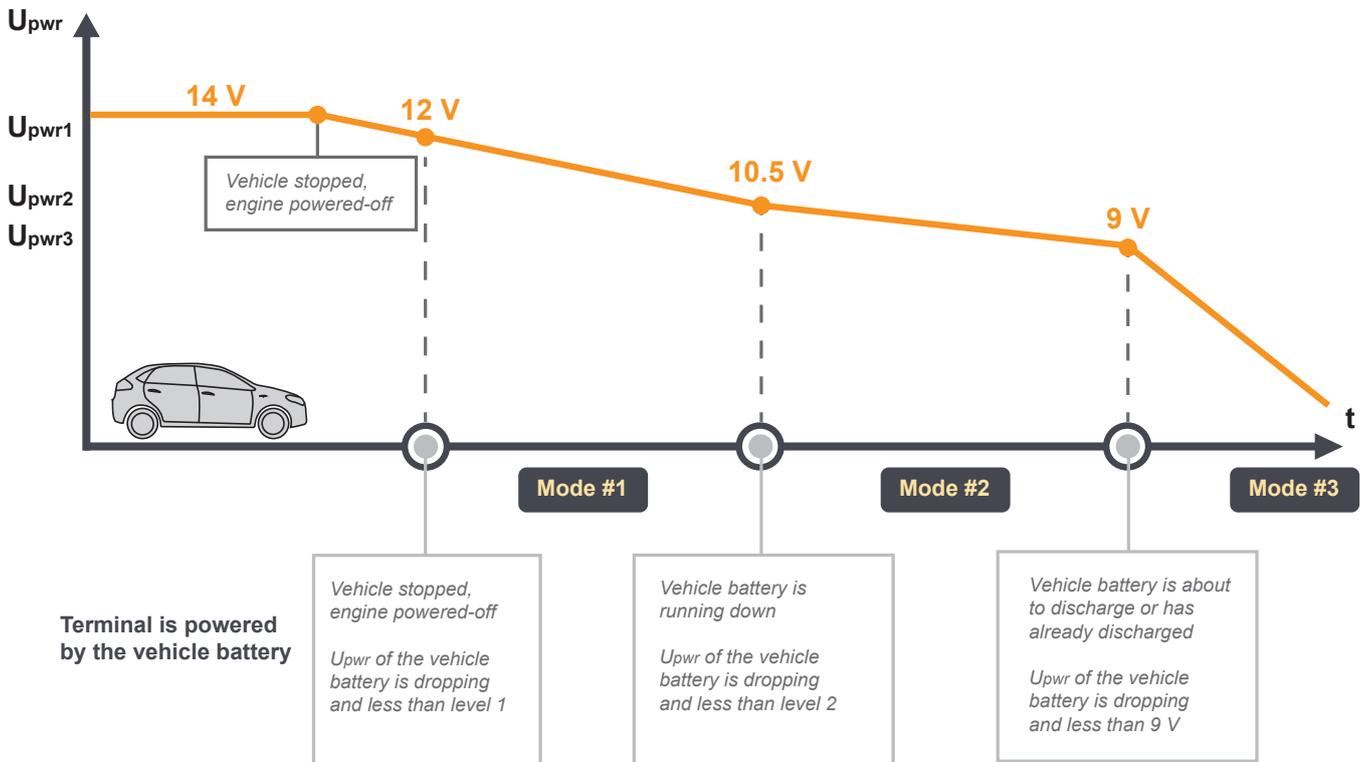


Fig. 1.5. Examples of power-saving modes operation

U_{pwr1} and U_{pwr2} parameters are set by a user using the configurator.

It is supposed that $U_{pwr1} > U_{pwr2} > 9\text{ V}$. It is essential to build the terminal power-saving operation according to the diagram featured above. However, a user can disable the selected power-saving modes and plot his own operation diagram.

1.4.8. Voice Communication

The iON Pro navigation user terminal supports voice communication set. The headset with a speakerphone and a microphone is connected to the device via the additional connector. Thus, communication between a driver and a dispatcher becomes possible.

For more detailed information on the supported voice communication sets and connection methods, contact the dealer.



1.5. Dimensional Drawing

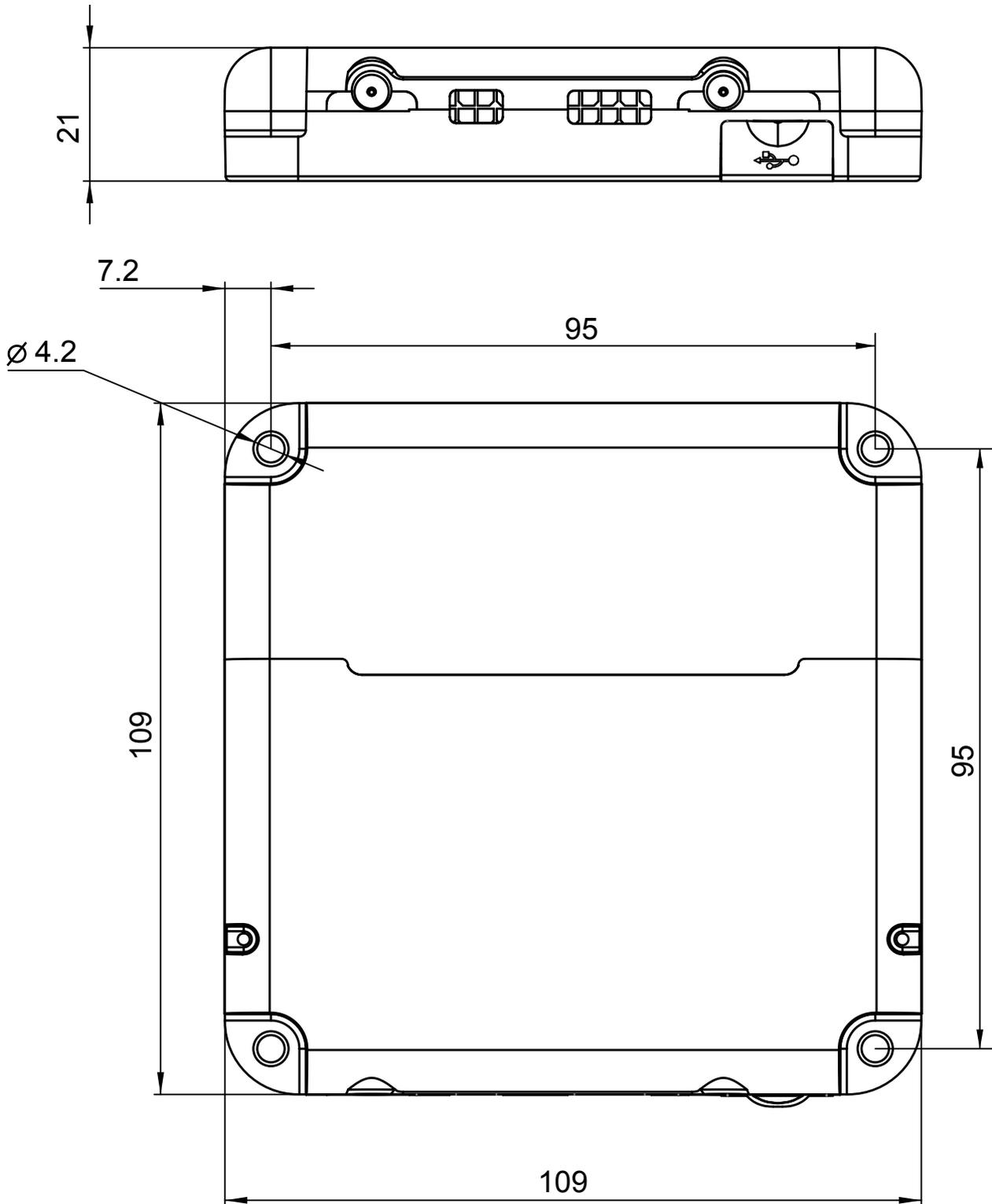


Fig. 1.6. iON Pro navigation user terminal dimensional drawing



2. Device Preparation Procedures

This section has information on the iON Pro 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 device can be configured during the mounting process, for example using a laptop connected to the device via USB connector. For more details about the configurator, see Section 4.

Preliminary device preparation is as follows:

- SIM card(s) installation;
- setting parameters in configurator.

Device installation:

- power and external interfaces connection (sensors, CAN bus, alarm button, etc.);
- antennas mounting and connection;
- device testing;
- sealing;
- mounting.

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

The navigation terminal has an extended indication system (Section 2.5) helping to check the operation of different components. You can check the terminal operation using the configuration manager, tab "Diagnostics" (Section 4).



2.1. Disassembling the Device Housing

The navigation user terminal housing is designed so that to separate the device functional components to several compartments. Thus, each compartment is provided with its own tamper sensor.

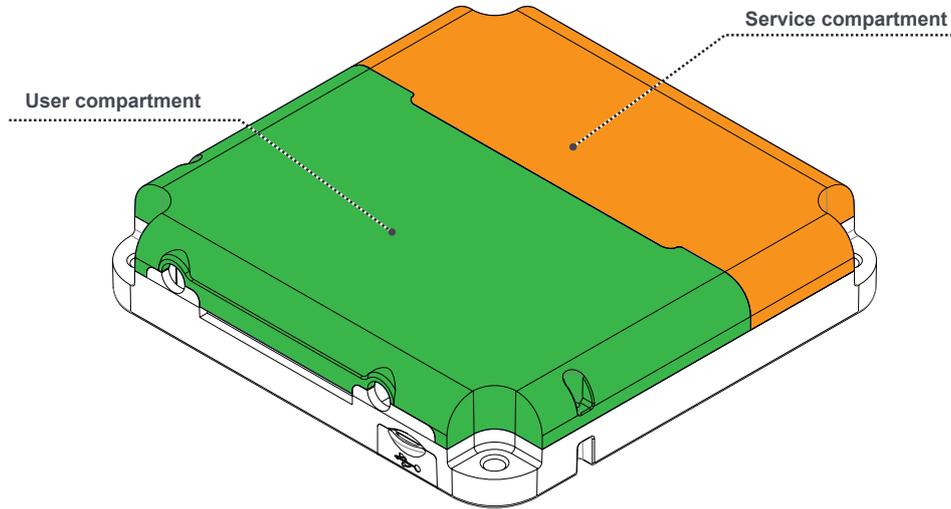


Fig. 2.1. iON Pro navigation terminal compartments

The **user compartment** contains all the connectors and components necessary for the device connection and operation settings. They include antenna and interface connectors, SIM card holders and indicators.

The **service compartment** contains the components with the access necessary only in case of maintenance or repair. They include the built-in battery, internal antennas, GSM module, etc.

To obtain access to a relevant compartment, remove the screws as shown in the picture, then remove the cover. To obtain access to the service compartment remove the user compartment screws. Before dismantling the case, take into account that the compartments might be sealed and the screws covered with special stickers.

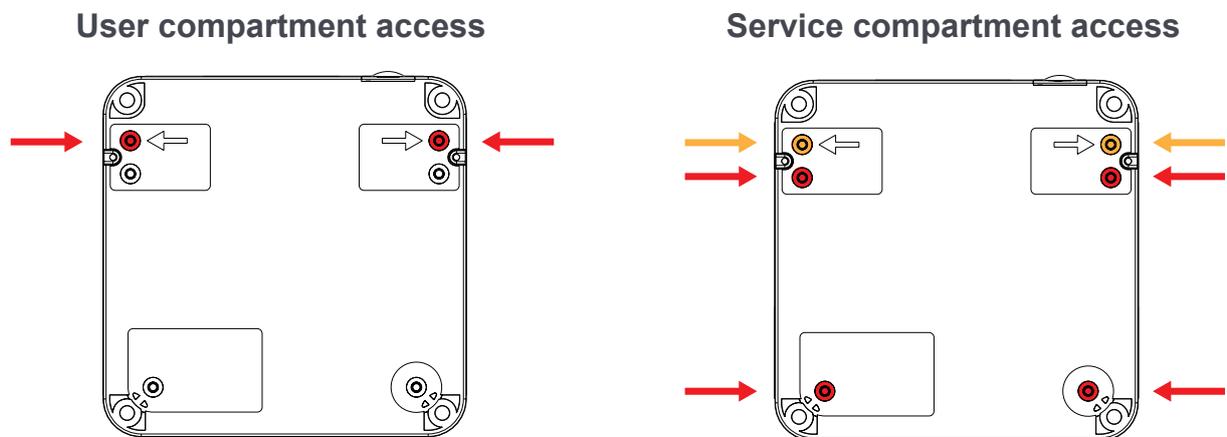


Fig. 2.2. Diagram of removing screws



2.2. SIM Card Installation

Some iON terminals have a built-in SIM chip instead of SIM card holder 1, and so the installation of the main SIM card in such devices is not required. For SIM card installation, remove the user compartment cover (see Section 2.1).

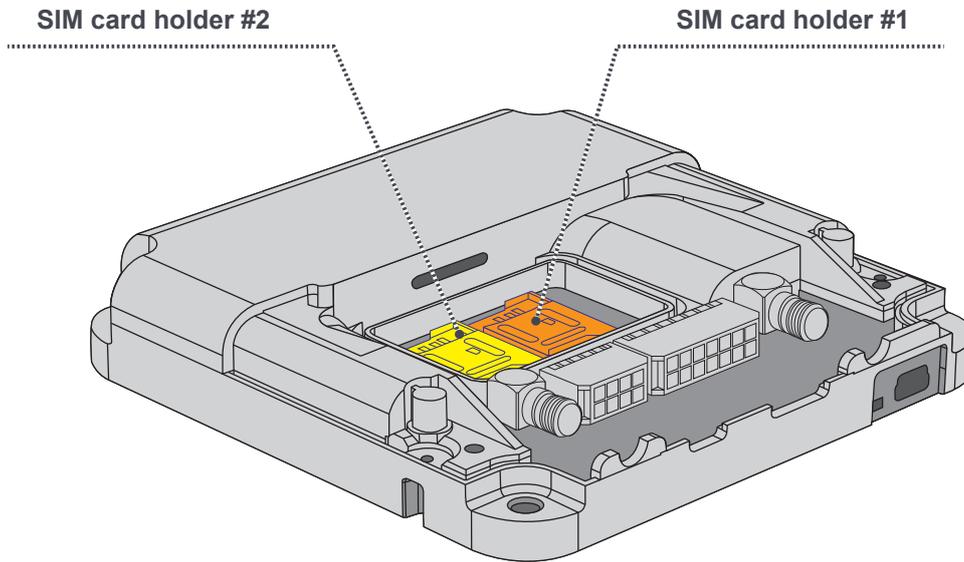


Fig. 2.3. SIM card holder positions in iON navigation user terminal

The main SIM card is installed into SIM card holder 1, the additional one – into holder 2. The additional SIM card can be used for operation in a roaming area or as a fallback connection depending on the terminal use strategy. The installation of the main SIM card is enough for the system operation.

Procedures	Directions
	<p>1 Unlock the SIM card holder moving the strip to arrow</p>
	<p>2 Throw back the holder side</p>
	<p>3 Place the SIM card into the tray</p>
	<p>4 Close the holder turning down the strip</p>
	<p>5 Lock the holder, moving the strip to arrow</p>
<p>Check for security of fixing, SIM card must not drop out.</p>	



2.3. Device Connection to Vehicle Onboard Power System

For power connection, data transmission from sensors and other devices, the terminal uses 2 cables (main 14-pin and additional 8-pin flexible flat cable (FFC)) coming with the device package.

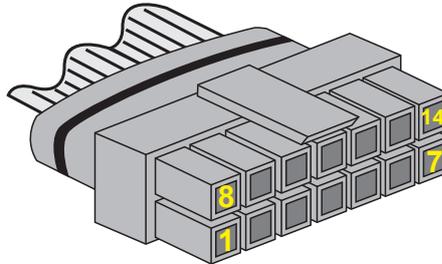


Fig. 2.4. Connector of 14-pin interface cable

2.3.1. Main Interface Connector (Microfit 14)

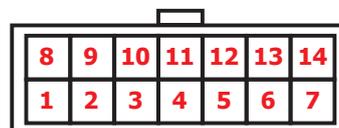
The identification of FFC connector pins is shown in the chart:

Pin	Color	Marking	Function
1	green	1-Wire #1	1-Wire bus (1)
2	brown	RS485 A	RS485 interface (1)
3	pink	I/O 6	Multipurpose input/output
4	green + yellow	IN4	Multipurpose input
5	yellow + white	IN2	Multipurpose input
6	black	GND	Ground (negative power supply)
7	blue + white	CAN-L	CAN-L bus
8	green + white	1-Wire #2	1-Wire bus (2)
9	brown + white	RS485 B	RS485 interface (1)
10	white	I/O 5	Multipurpose input/output
11	black + white	IN3	Multipurpose input
12	yellow	IN1	Multipurpose input
13	red	PWR	Power supply
14	blue	CAN-H	CAN-H bus

Board connector
(main interface
connector Microfit 14)



Cable connector
(14-pin interface
cable)





2.3.2. Additional Interface Connector (Microfit 8)

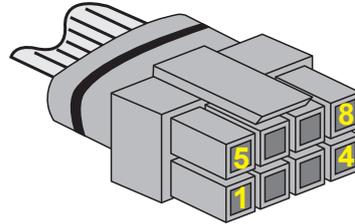
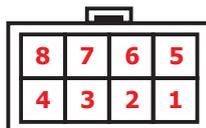


Fig. 2.5. Connector of 8-pin interface cable

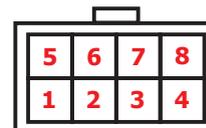
The identification of FFC connector pins is shown in the chart:

Pin	Color	Marking	Function
1	orange	A	RS485 interface (2)
2	gray	MIC+	Microphone "+"
3	gray + white	MIC-	Microphone "-"
4	black	GND	Ground (negative)
5	orange + white	B	RS485 interface (2)
6	purple + white	SPK 2	Speaker
7	purple	SPK 1	Speaker
8	red + white	PWR OUT	Power supply of expansion unit

Board connector
(additional interface
connector Microfit 8)



Cable connector
(8-pin interface
cable)





2.4. Antenna Connection

The tracking system uses two external antennas (GSM and GLONASS/GPRS) connected via SMA connectors. The required antennas are in the device package. To install antennas, remove the user compartment cover (see Section 2.1).

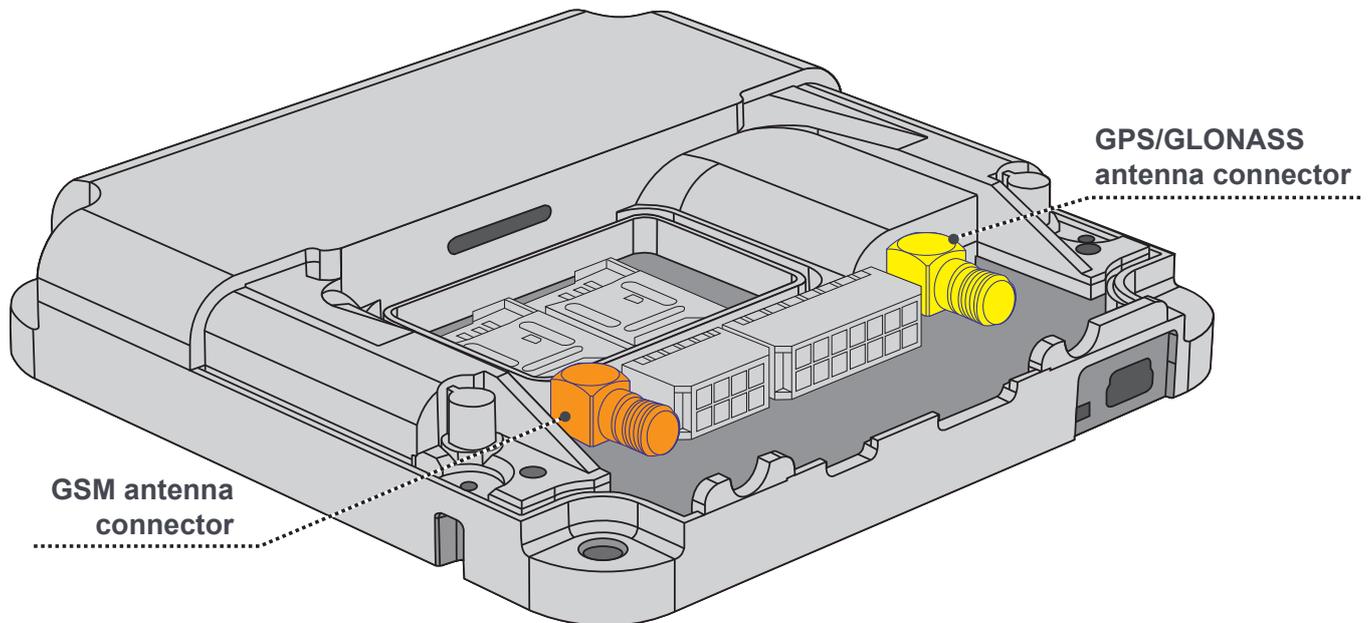


Fig. 2.6. Positions of antenna connectors in iON Pro terminal

To ensure better communication quality when installing antenna, comply with the following requirements:

- antennas should be placed in a vertical position with the top end looking upwards;
- when choosing a mounting place give preference to the open-space ones (for example, in the area of windscreen or rear screen in the interior of vehicle);
- if possible, do not mount antennas to large vehicle metal parts, as they can shield the signal.

NOTE: Use antennas supplied with the terminal. If you wish to use other accessories, contact your dealer for a list of compatible hardware.



2.5. Indication

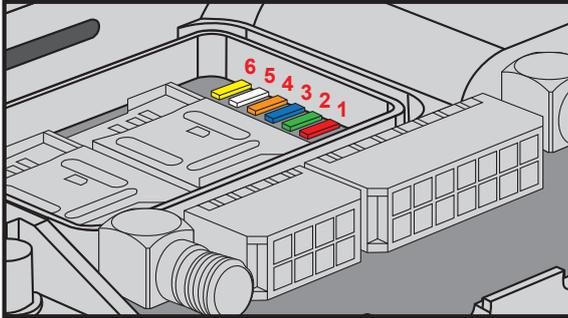


Fig. 2.7. iON Pro Navigation User Terminal Indication

iON Pro indication is placed on board next to the SIM card tray 1. Six LEDs have each their own color and can operate in seven various modes. More detailed information on the indication system is shown in the chart:

NOTE: Indication operates only with the connectors cover removed and within twenty minutes after its closing.

Indication	Power	GSM	GPS/ GLONASS	SIM/GSM antenna	Configurable for external interface	Buttons
	1	2	3	4	5	6
Color	red 	green 	blue 	orange 	white 	yellow
Light off	No power	Off/ (sleep mode)	Off/ (sleep mode)	GSM modem is off		Case is closed (built-in battery powered)
Continuously on	Vehicle onboard network voltage does not correspond to 9-36 V	Network registration	Satellites are not detected	No SIM cards		Decapsulated
Single flash	Vehicle onboard network operation	Connected to server	External antenna operation	SIM card #1 and external antenna are active		Case is closed (external power supply)
Short double flashing	Built-in battery operation	Connected to Internet	Internal antenna operation	SIM card #2 and external antenna are active		User compartment is opened
Continuous single flashing	Faulty built-in battery	Registered in network		SIM card #1 and internal antenna are active		
Single flashing at long intervals	Terminal is in sleep mode					
Long double flashing				SIM card #2 and internal antenna are active		



2.6. Sealing the Housing

The iON housing is sealed using the stickers supplied with the device. The package contains two stickers (A) and two other ones are attached by the manufacturer (B, C):



Fig. 2.8. Terminal sealing stickers

The stickers are attached to the appropriate parts of the case bottom side to close the access to the screws:

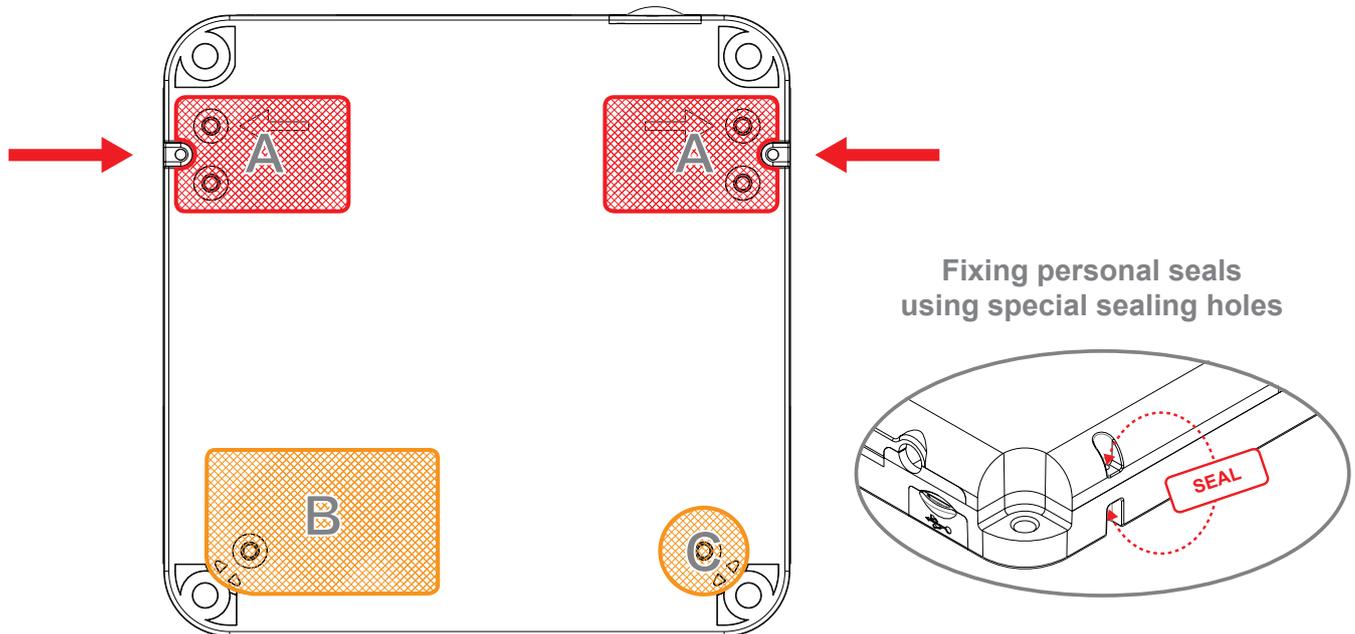


Fig. 2.9. Terminal sealing methods

To gain access to the user compartment, remove stickers A. The service compartment is sealed with stickers A, as well as with B and C ones. Note that stickers A are damageable, so they cannot be resticked.

You can also use your own sealing methods using the special holes in the case.



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
The diagram of connecting the LLS sensors via RS485 (1)
Tachometer connection
Connecting an alarm button and any contact sensor
CAN bus connection
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
The diagrams of connecting relay to an output



3.1. Power Connection Without a Battery Cutoff Switch

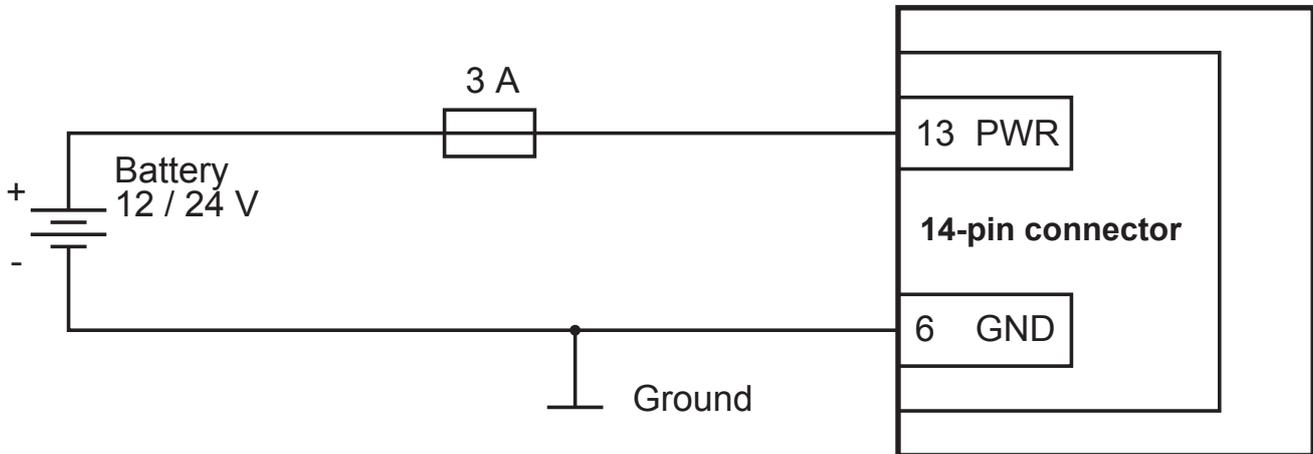


Fig. 3.1. The diagram of connecting power without a battery cutoff switch

3.2. Power Connection With a Battery Cutoff Switch

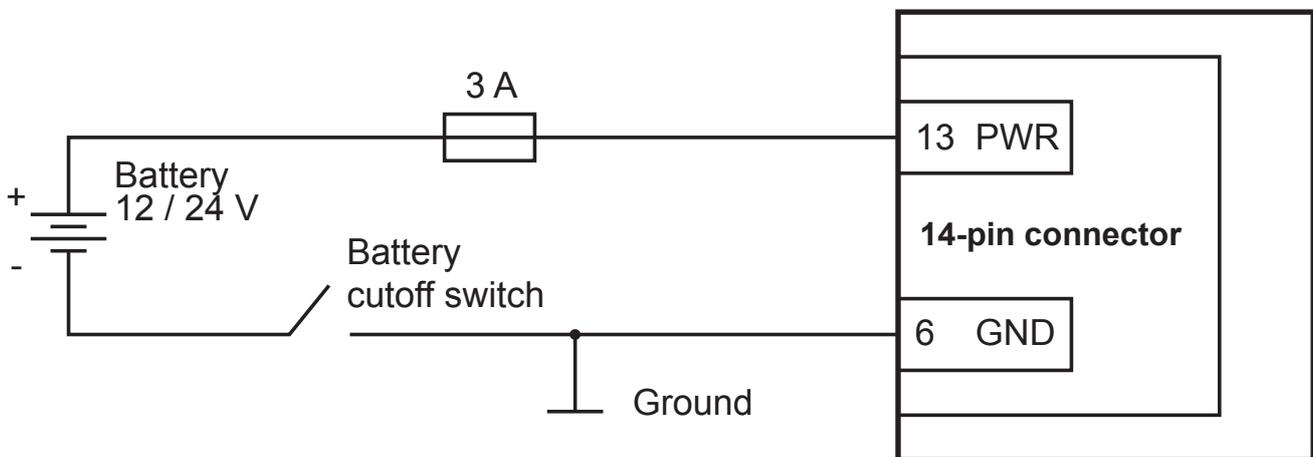
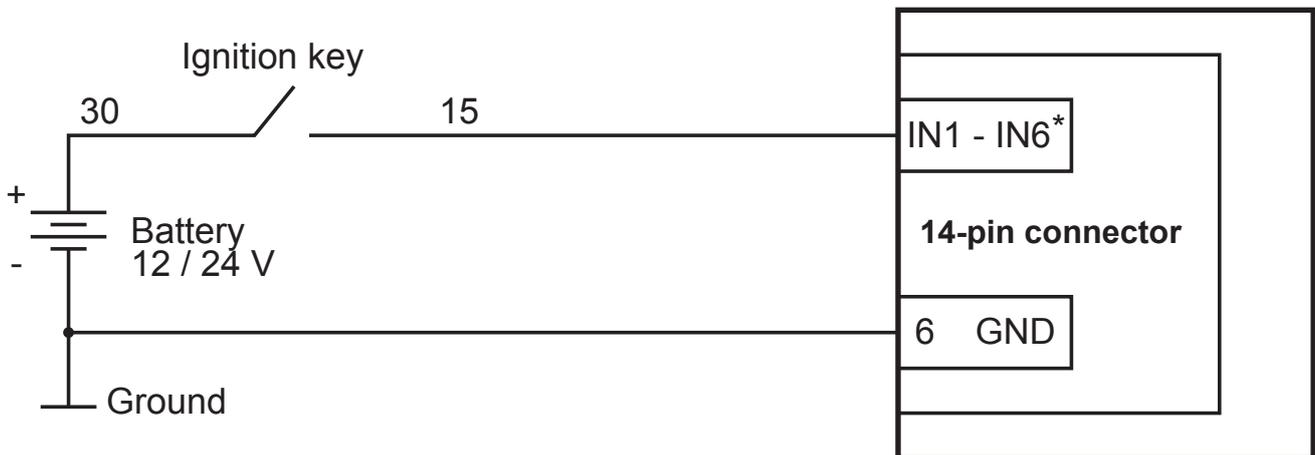


Fig. 3.2. The diagram of connecting power with a battery cutoff switch



3.3. Ignition Circuit Connection

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



* - any of multipurpose inputs (3 - 5, 10 - 12)

Fig. 3.3. Ignition circuit connection diagram

3.4. Connecting the LLS via RS485 (1)

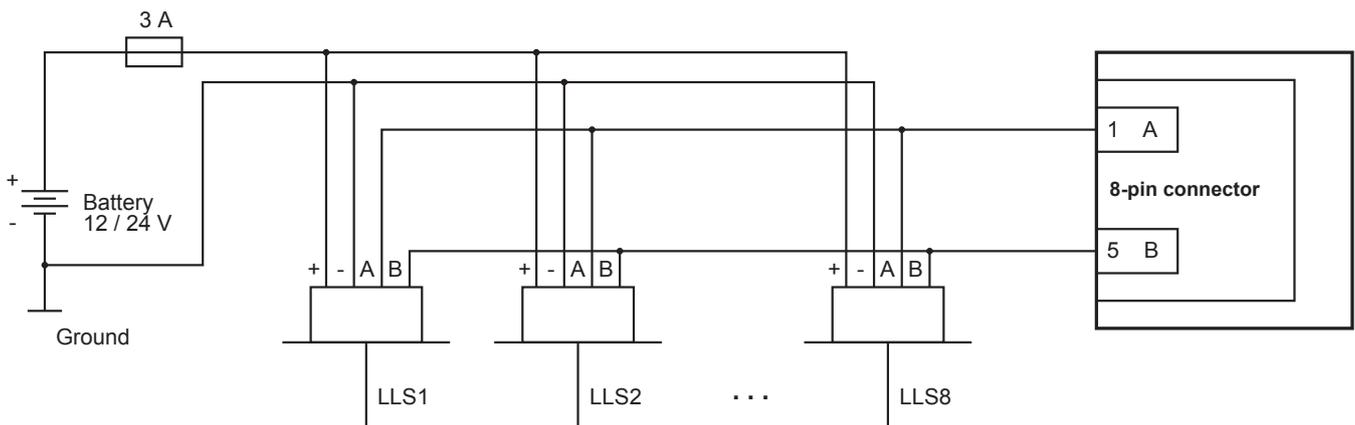
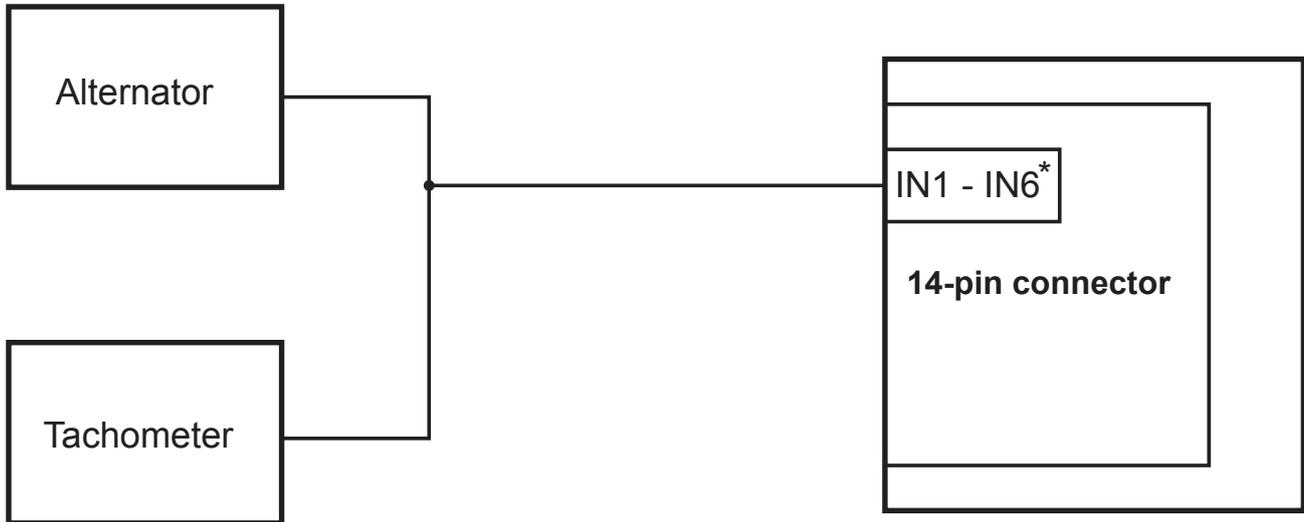


Fig. 3.4. The diagram of connecting the LLS sensors via RS485 (1)



3.5. Tachometer Connection

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

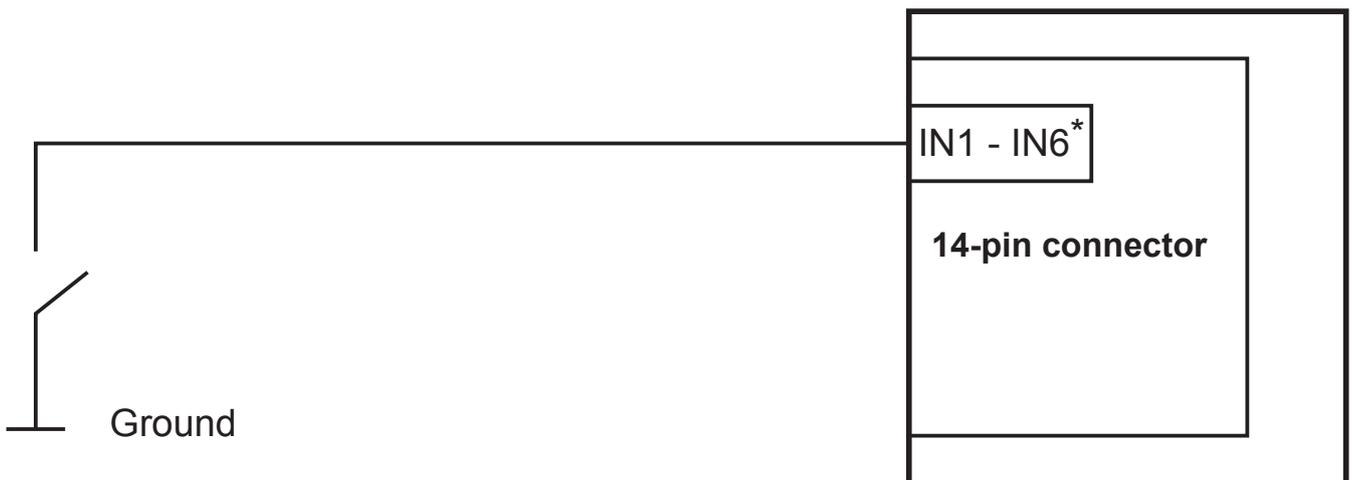


* - any of multipurpose inputs (3 - 5, 10 - 12)

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 multipurpose inputs (3 - 5, 10 - 12)

Fig. 3.6. Alarm button connection diagram



3.7. CAN Bus Connection

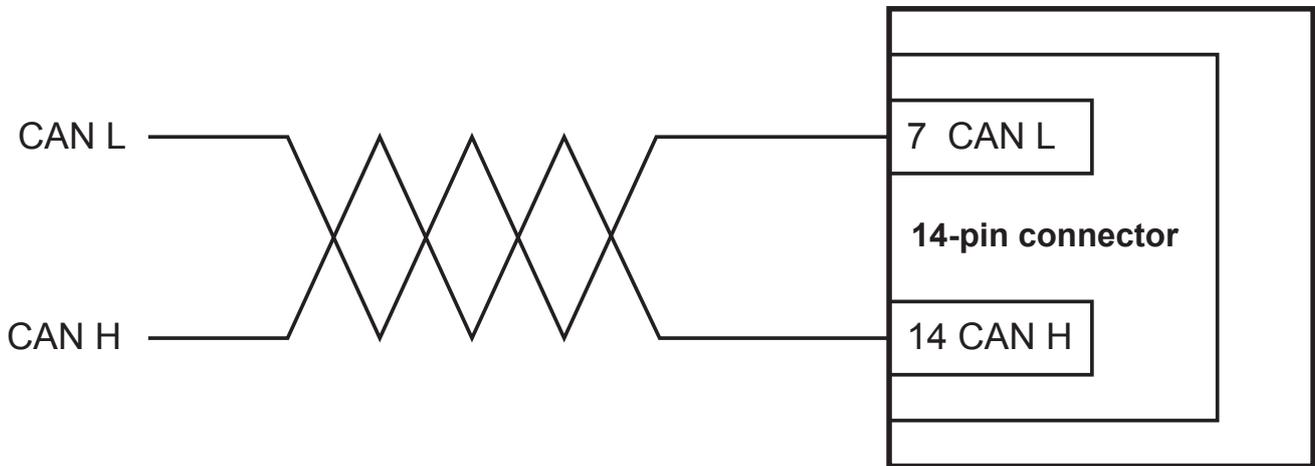
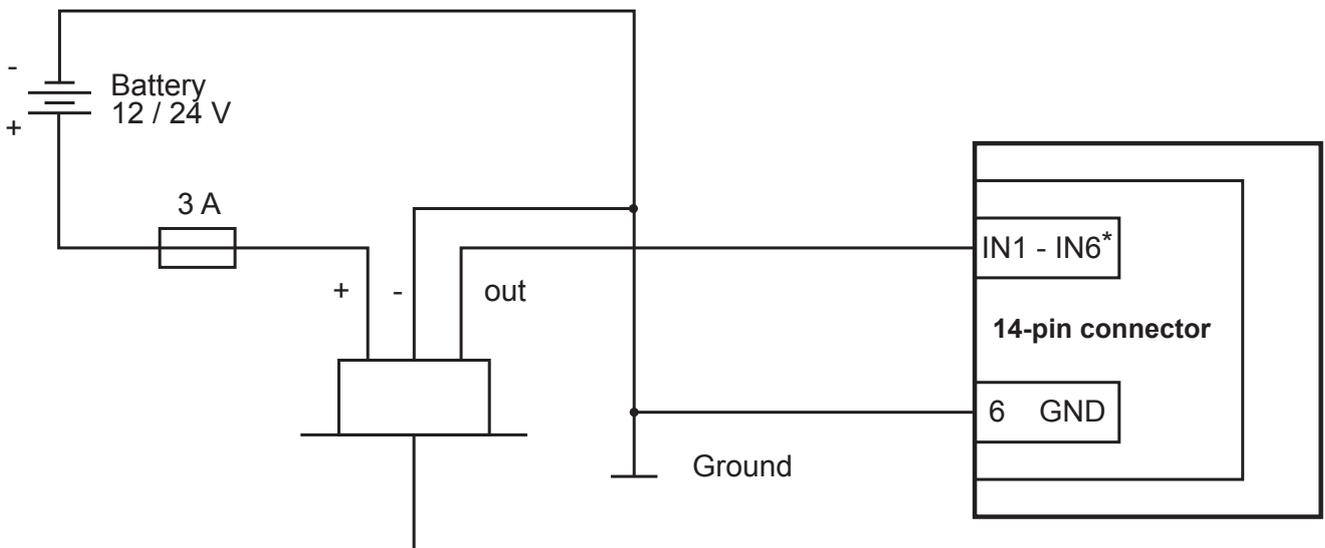


Fig. 3.7. CAN bus connection diagram

3.8. Connecting the LLS Sensor with a Frequency or Analog Output

When connecting by this diagram, select the "frequency" input operation mode for the frequency LLS and "analog" for the analog LLS in the configuration manager ("Settings"/"Inputs").



* - any of multipurpose inputs (3 - 5, 10 - 12)

Fig. 3.8. The diagram of connecting the LSS with a frequency or analog output



3.9. Connecting Analog Sensor with a Current Output

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

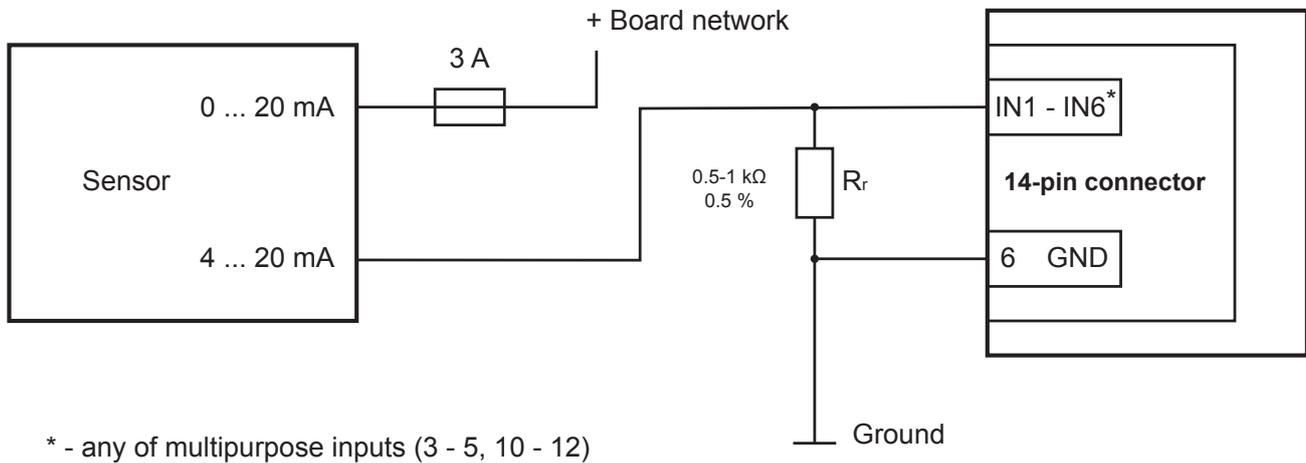


Fig. 3.9. The diagram of connecting an analog sensor with a current output

3.10. Connecting Analog/Pulse Sensor with an Open-Collector Output

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

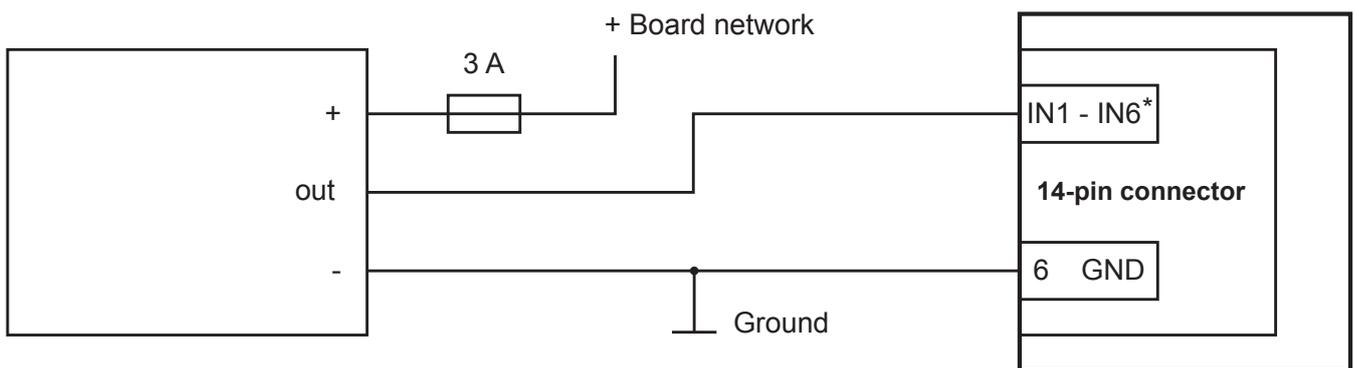


Fig. 3.10. The diagram of connecting an analog/pulse sensor with an open collector output



3.11. The Diagrams of Connecting Relay to an Output

Two options of connecting relay to an output (with 12V and 5V power supply) are given below.

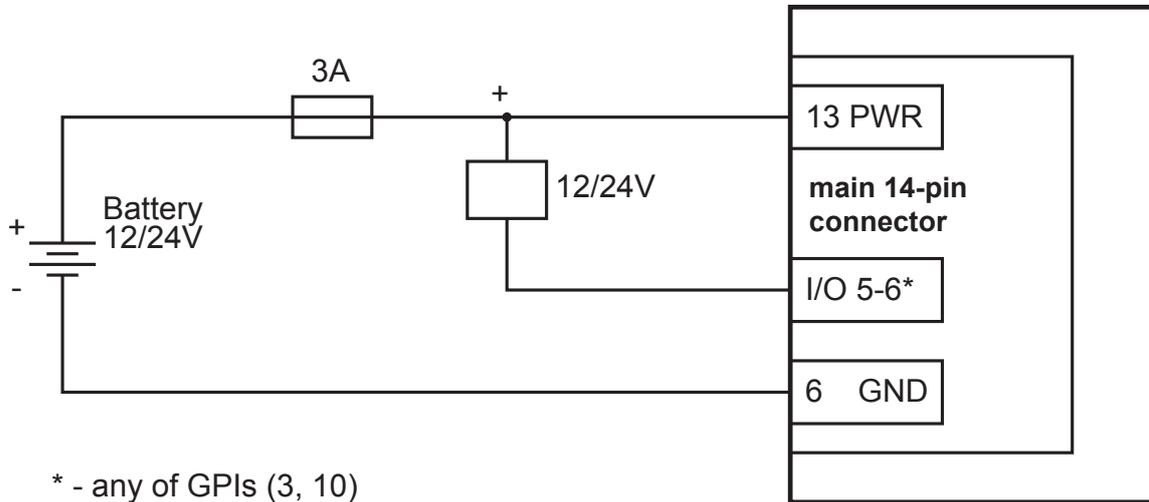


Fig. 3.11. The diagram of connecting relay to an output (12V)

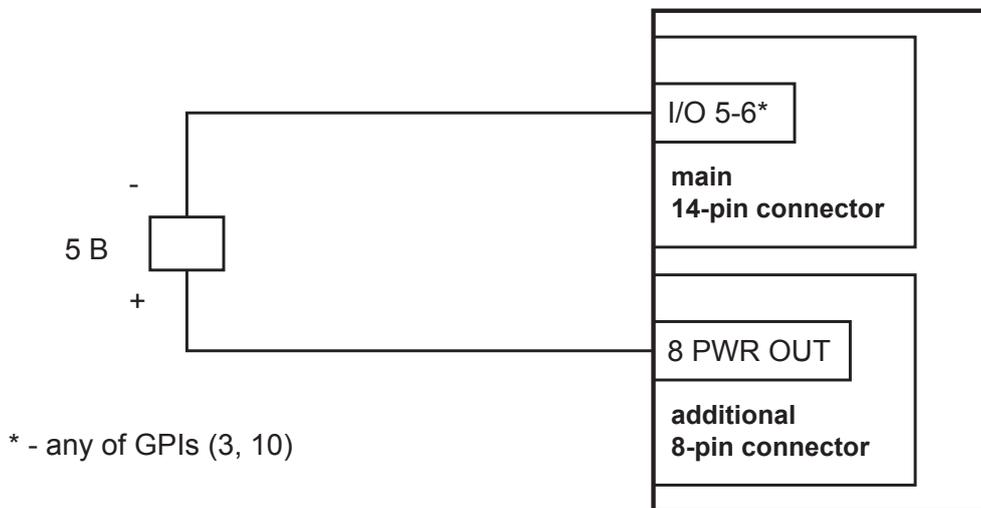


Fig. 3.12. The diagram of connecting relay to an output (5V)



4. Device Configuration Using Configurator

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

4.1. Driver Installation

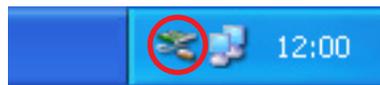
For operation of the  **Conf_iRZ.exe** application with the iON Pro user navigation terminal, download and install the **iON Pro CDC** driver.

4.1.1. Installing Drivers on Windows XP

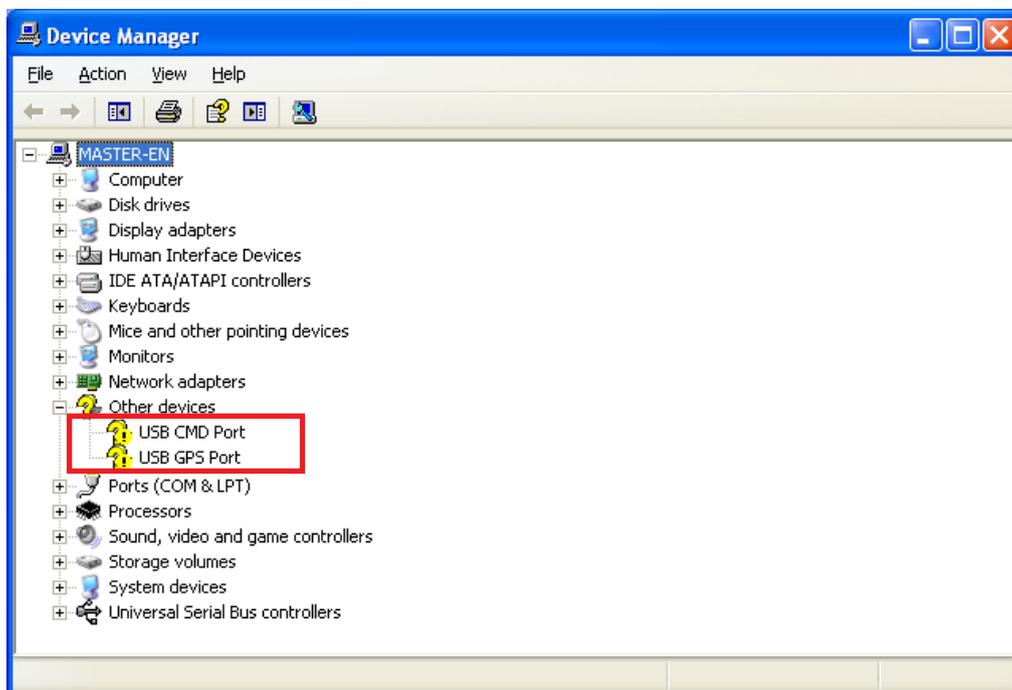
1 Download and extract the **iON_Pro_CDC_driver.rar** file containing the drivers for iON Pro to a folder in your computer. For example, to the **C:\drivers** location.

2 Plug iON Pro 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 Found New Hardware Wizard icon appears on the taskbar:

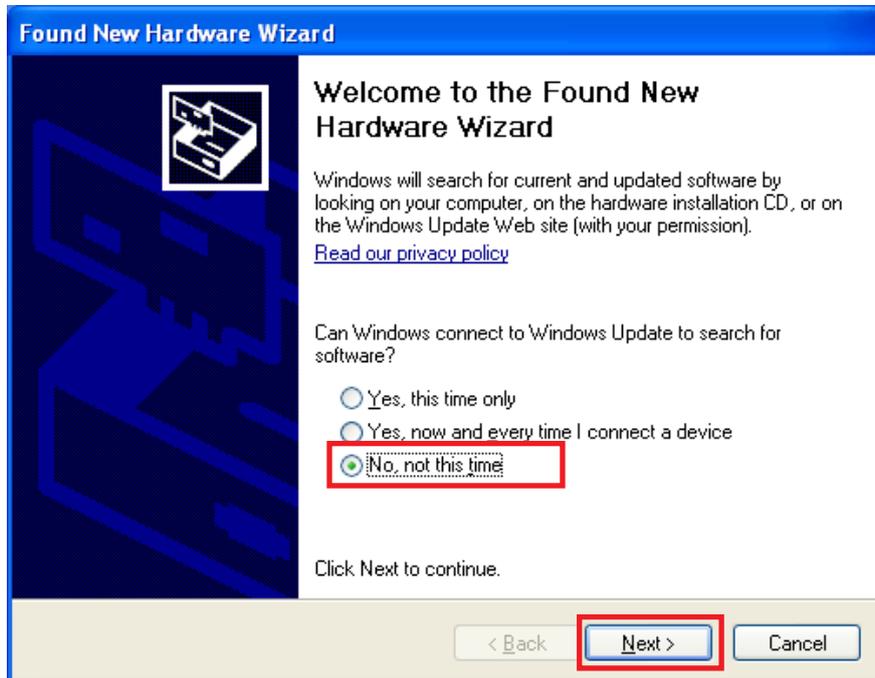


In addition, two unknown devices will appear in Device Manager (My Computer ► Properties ► Hardware tab ► Device Manager):

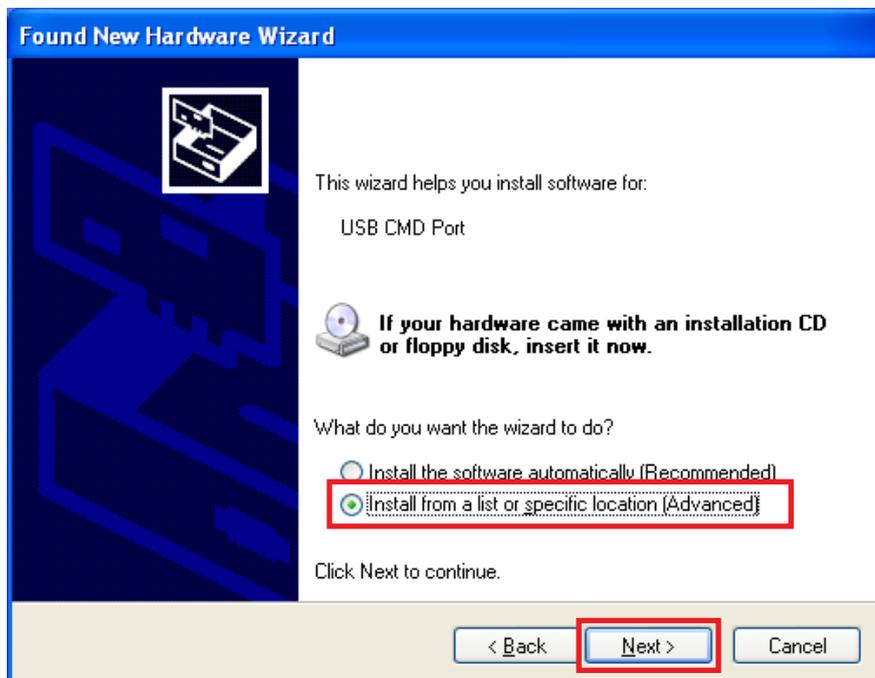




- 3 In the **Found New Hardware Wizard** dialog box select an option "**No, not this time**" and click **Next**:

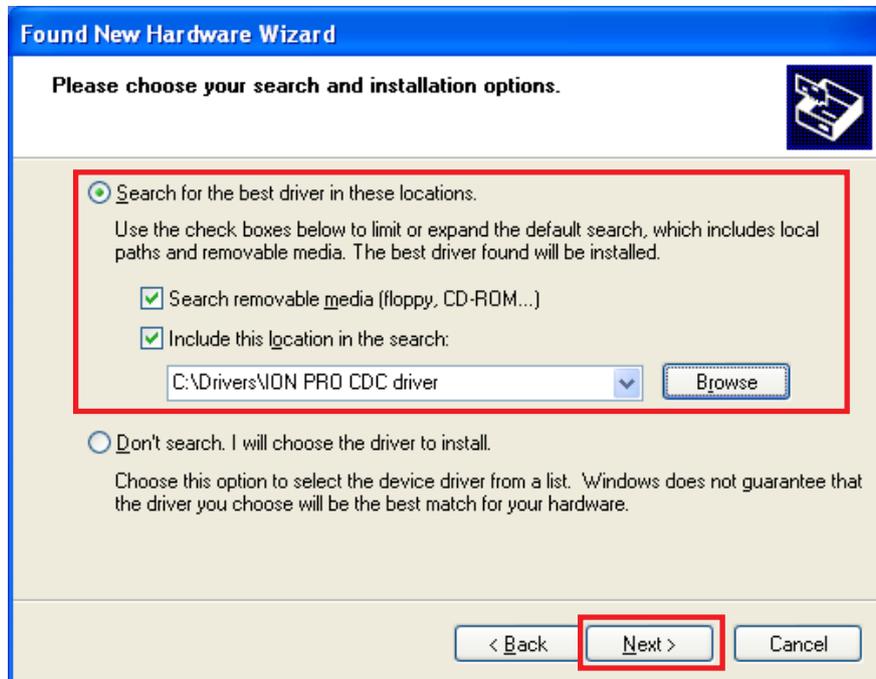


- 4 On the next screen select the "**Install from a list or specific location (Advanced)**" option and click **Next**:





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 PRO CDC driver**
Then click the **Next** button:



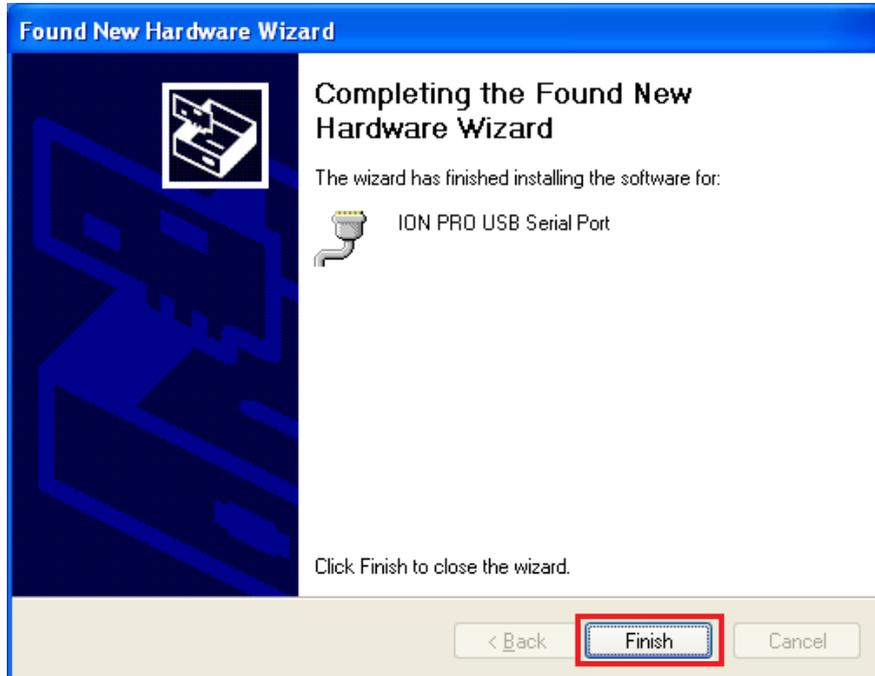
As a result, the driver installation process will launch. If the wizard prompts "The software you are installing... has not passed Windows Logo testing...", select option **Continue Anyway**.





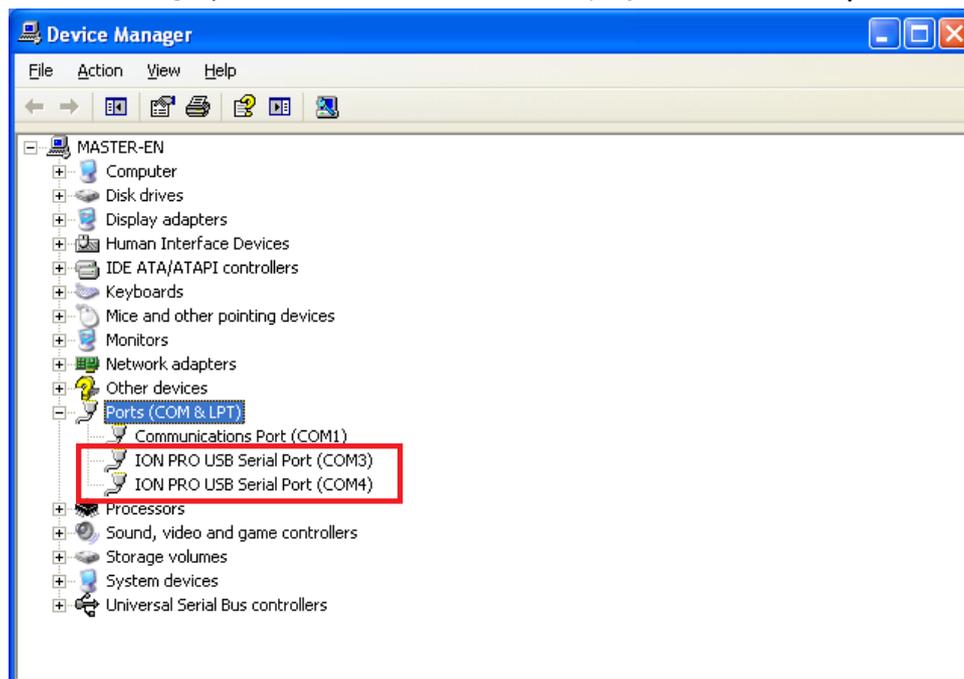
As a result, the driver for one device will be installed.

6 Click **Finish**:



Follow the steps from **3** to **6** to install the driver for the second device.

To verify that the drivers are installed, open the Device Manager window (My Computer ► Properties ► Hardware tab ► Device Manager). Two new devices will be displayed in the **Ports (COM & LPT)** section:



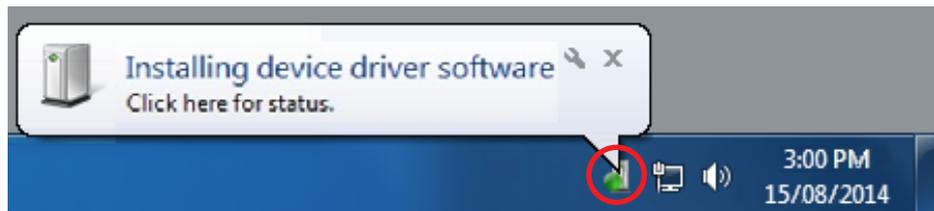


4.1.2. Installing Drivers on Windows 7

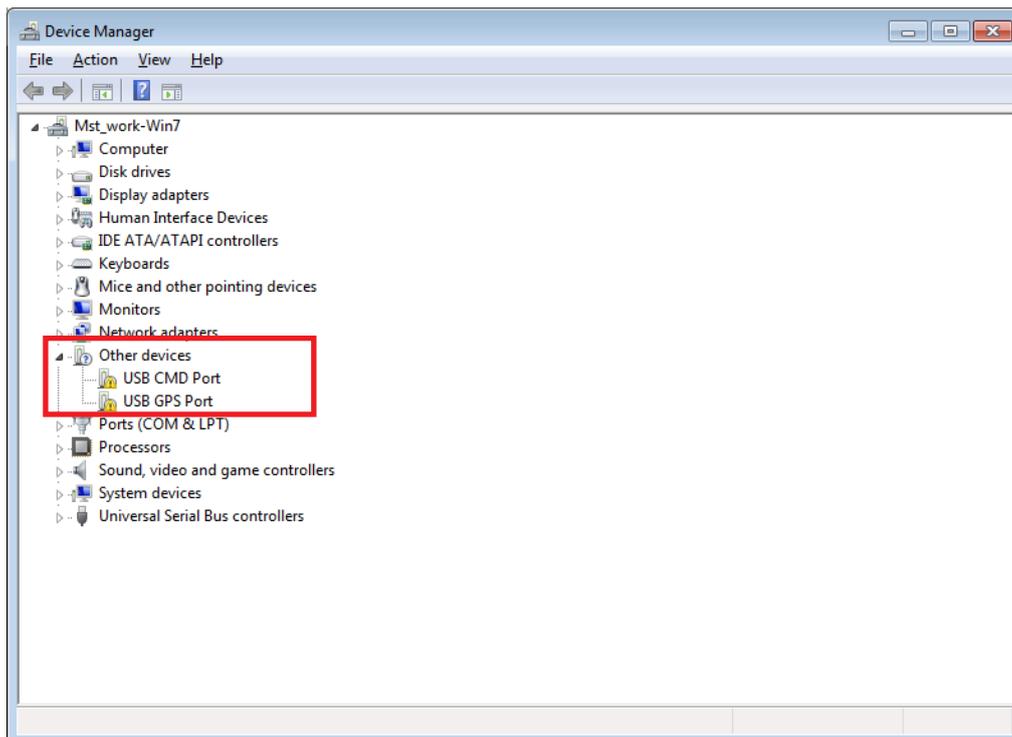
1 Download and extract the **iON_Pro_CDC_driver.rar** file containing the drivers for iON Pro to a folder in your computer. For example, to the **C:\drivers** location.

2 Plug iON Pro 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:



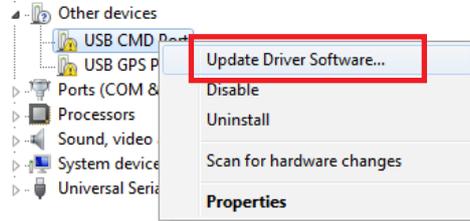
In addition, two unknown devices are supposed to appear in the Device Manager (My Computer ► Properties ► Device Manager):



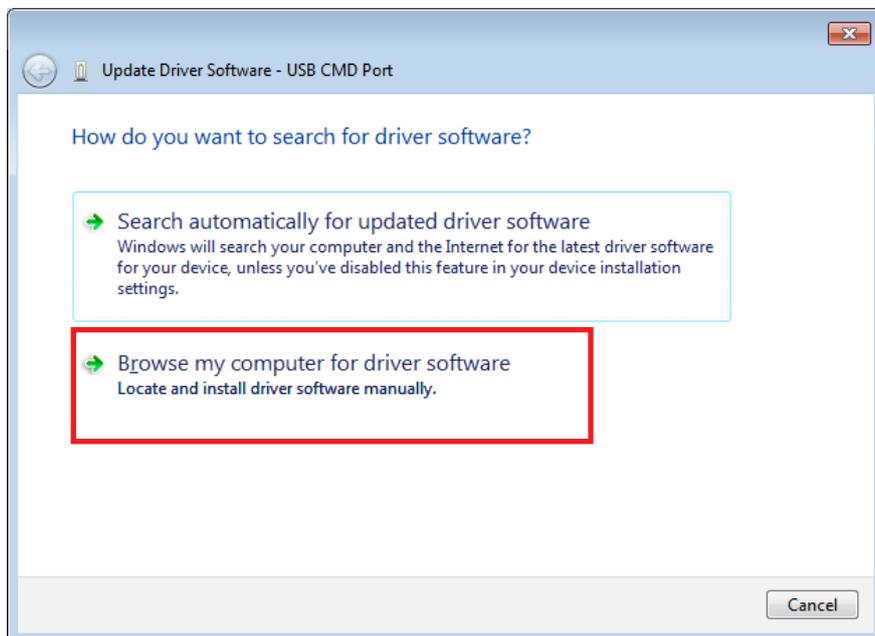
If the driver automatic installation fails, it can be performed in the Task Manager.



3 In this case open the Task Manager, highlight one of the unknown devices (USB CMD Port or USB GPS Port) and by the right-click on this device select "**Update Driver Software...**".

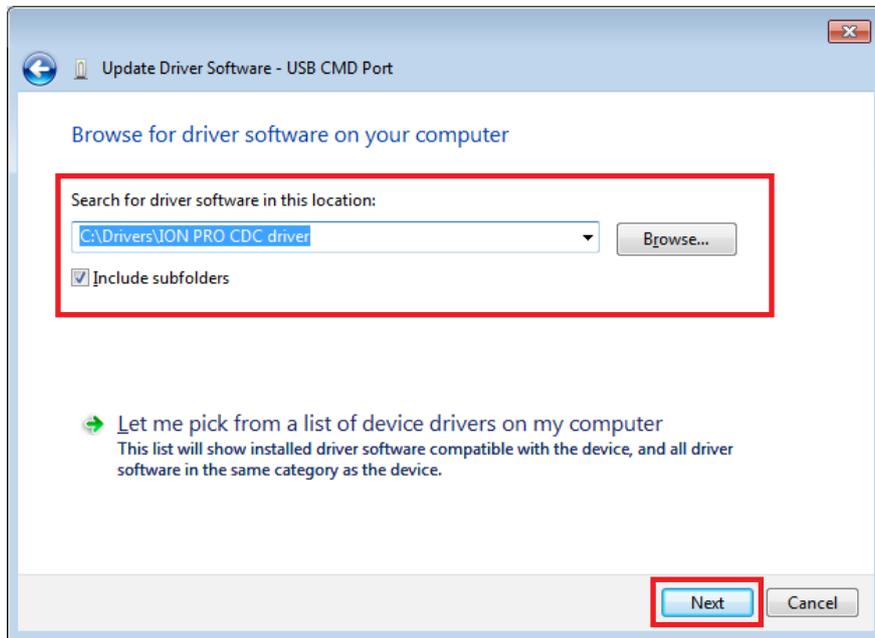


4 The Update Driver Software window will appear. Select the "**Browse my computer for driver software**" option:

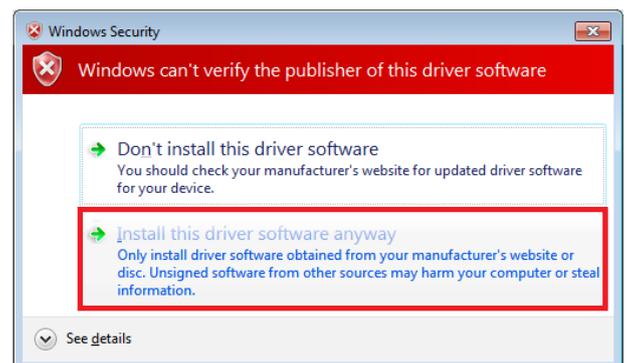
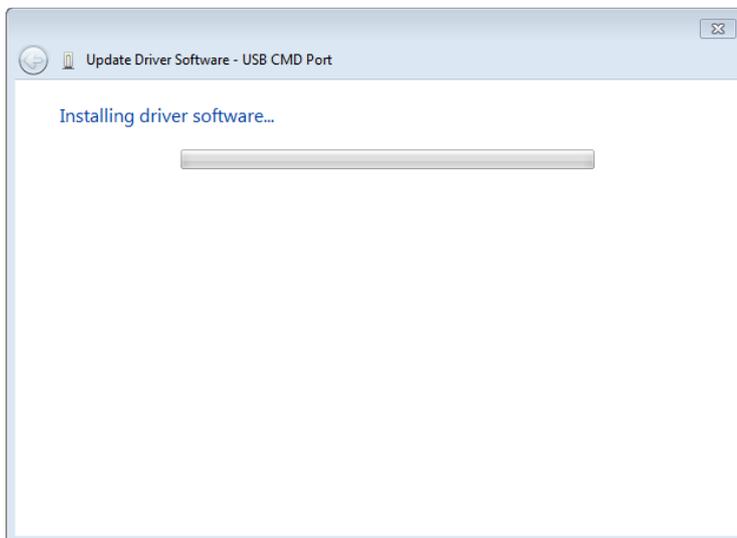




5 Using the **Browse** button navigate to the folder that contains the driver files. For example, `C:\drivers\ION PRO CDC driver\`
Then click the **Next** button:

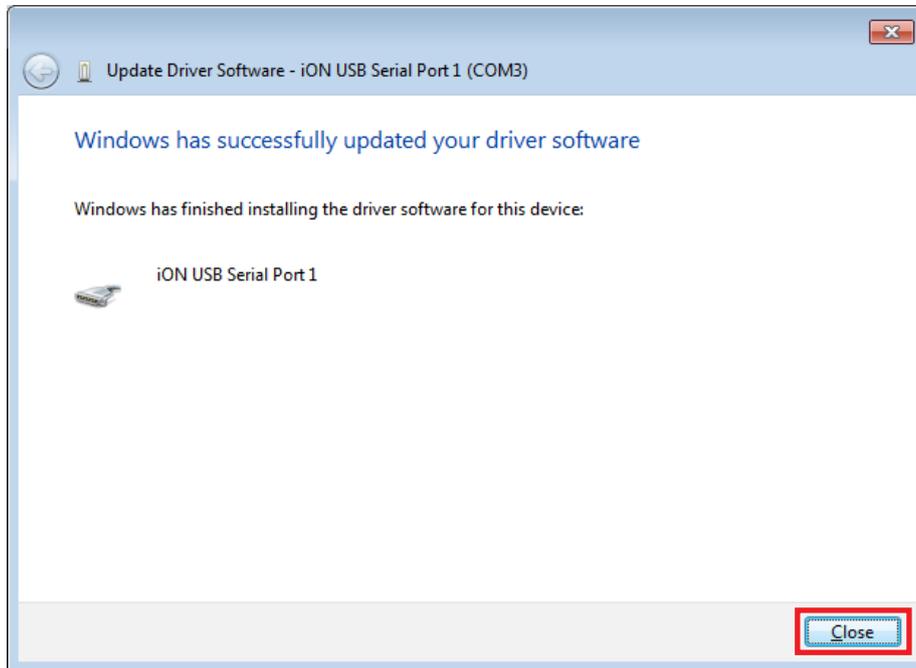


As a result, the driver installation process will launch. If you are prompted "Windows can't verify the publisher of this driver software", select "**Install this driver software anyway**" in the Windows Security dialog box.





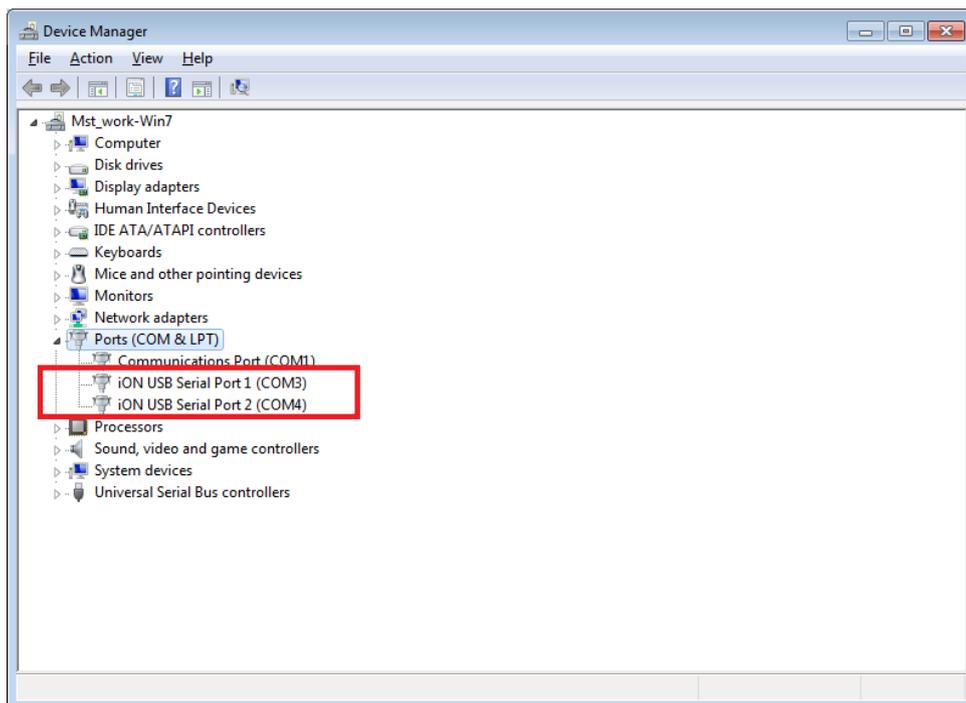
As a result, the driver for one device will be installed.



6 Click **Close**:

Follow the steps from **3** to **6** to install the driver for the second device.

To verify that the drivers are installed, open the Device Manager (My Computer ► Properties ► Device Manager). Two new devices should be displayed in the **Ports (COM & LPT)** section:





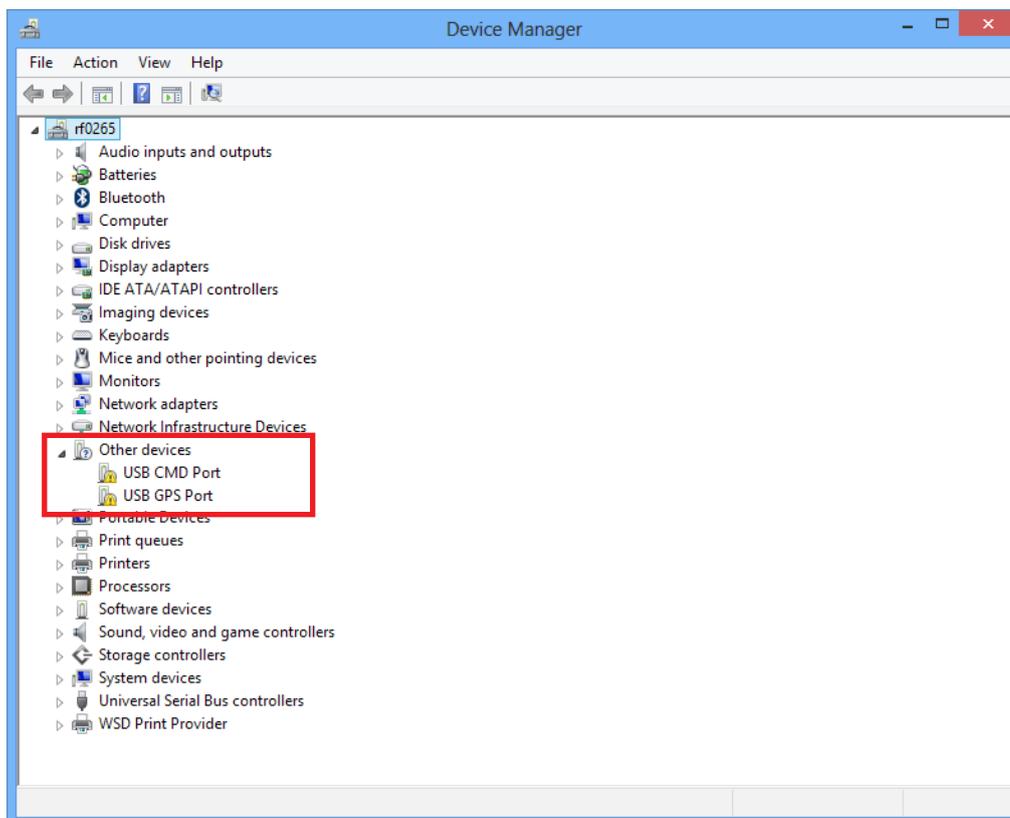
4.1.3. Installing Drivers on Windows 8

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

2 Plug iON Pro 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, two unknown devices will appear in the Device Manager (open the Settings charm ► Control Panel ► System and Security ► System ► Device Manager):

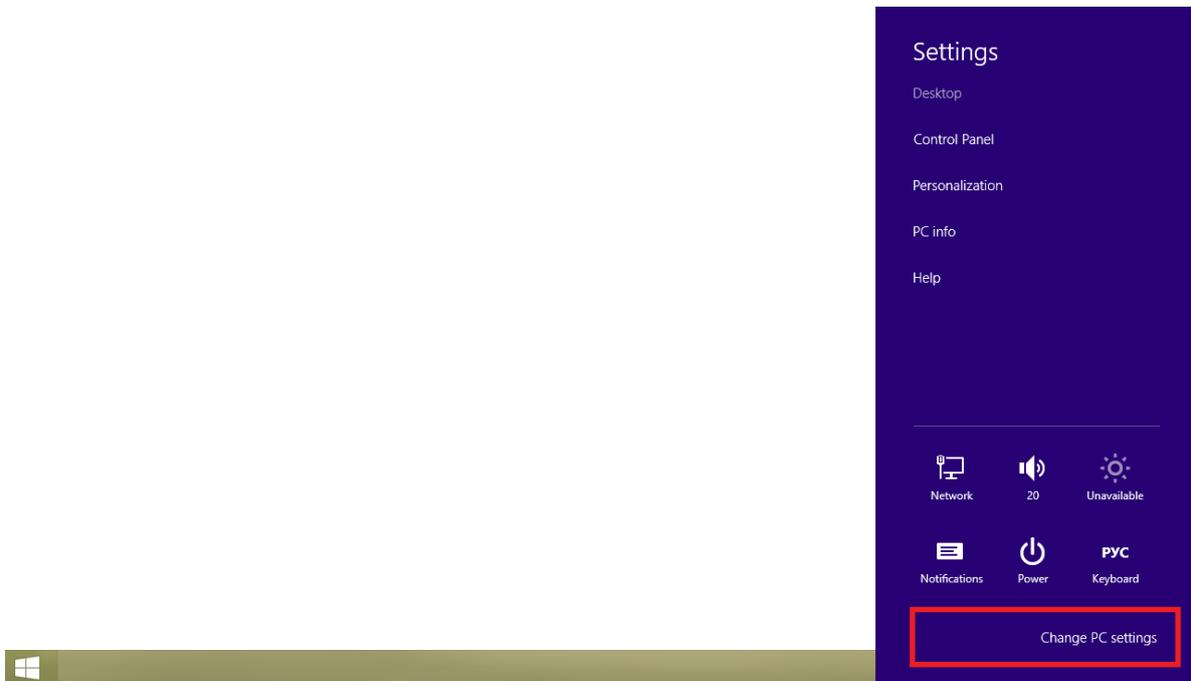




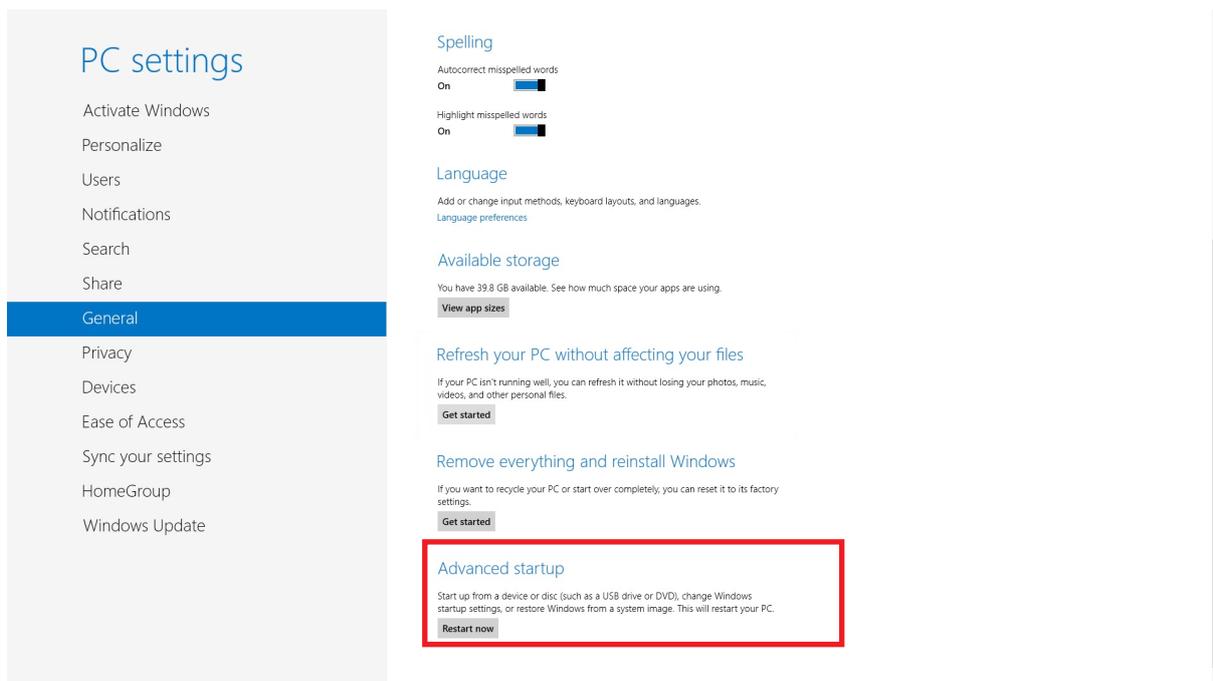
Since Windows 8 does not allow administrators to install drivers without digital signature by default, you will have to download the system in a special mode.

For that follow the steps:

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

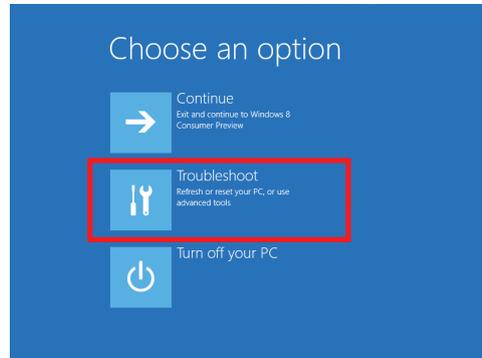


4 On the "PC settings" list select **General** (or **Update and Restore/Restore** in Windows 8.1), and in the right window in the "Advanced startup option" tap or click **Restart now**:

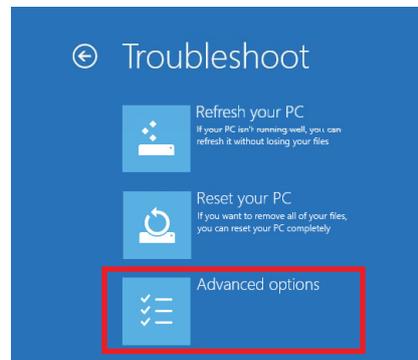




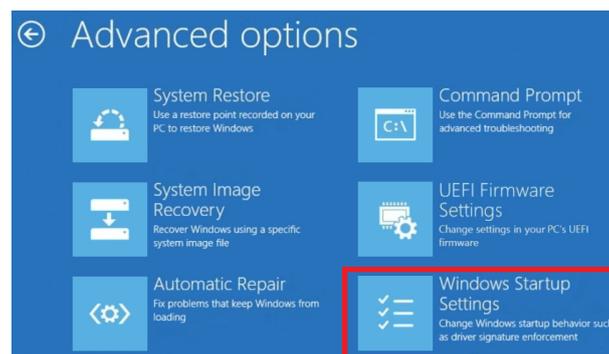
5 On the "Choose an option" screen select **Troubleshoot**:



6 On the "Troubleshoot" screen select **Advanced options**:

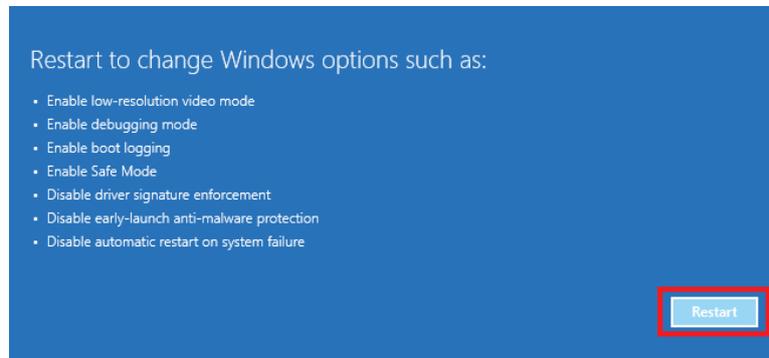


7 On "Advanced options" select **Windows Startup Settings**:



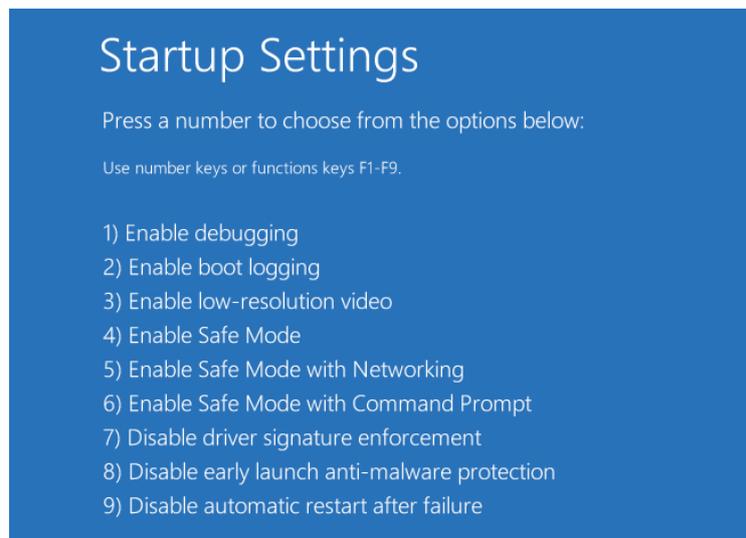


8 On "Window Startup Settings" tap or click **Restart**:



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

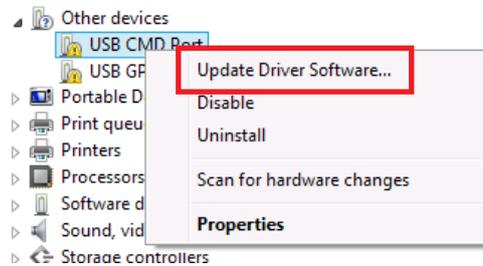
9 Press the number **7** (or **F7**) key to select the "**7) Disable driver signature enforcement**" option:



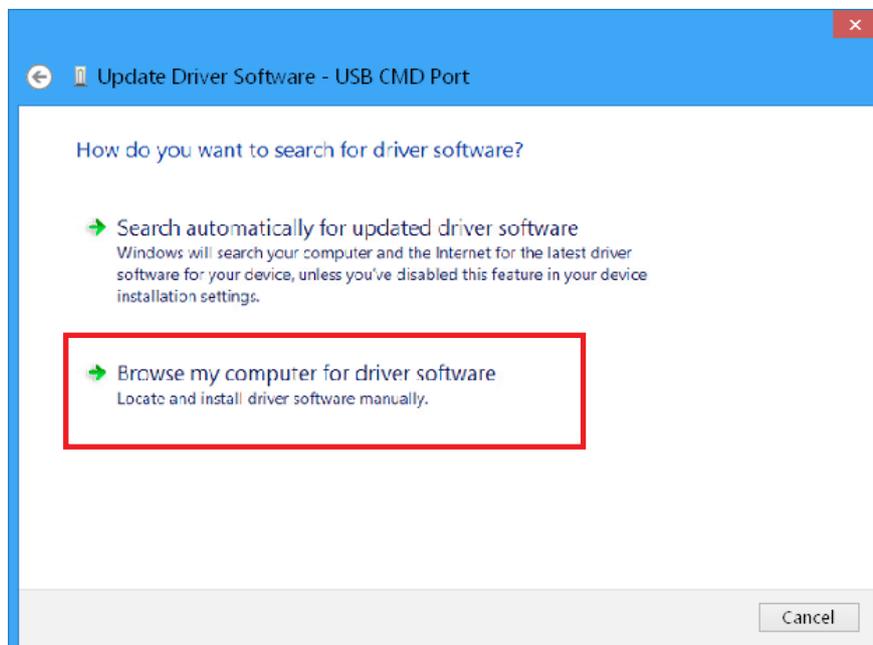
Then, Windows will reboot with the option to install unsigned drivers.



10 After Windows rebooting, open the Device Manager (open the Settings charm ► Control Panel ► System and Security ► System ► Device Manager) highlight one of the unknown devices (USB CMD Port and USB GPS Port) and by the right-click select "**Update Driver Software...**".

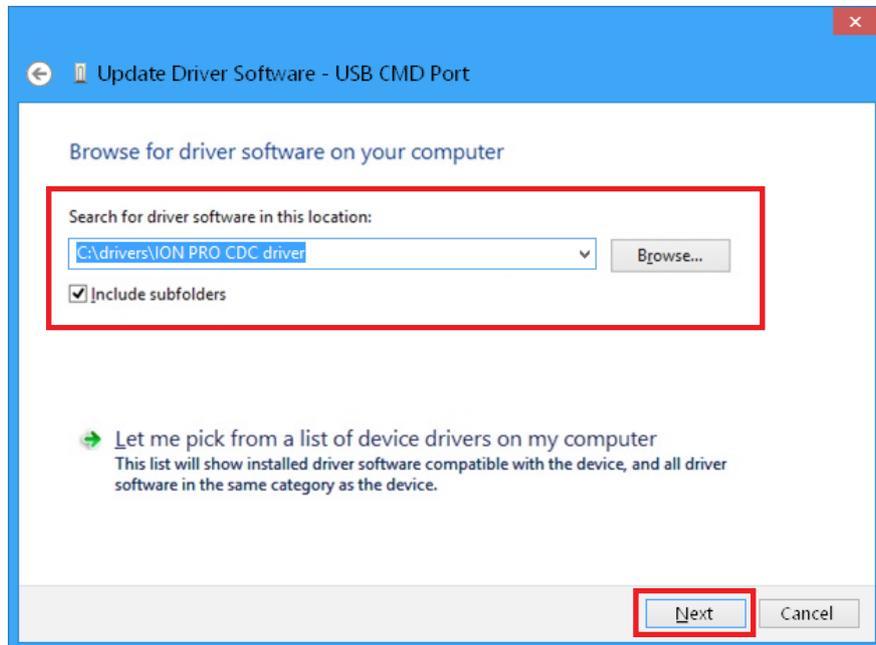


11 The Update Driver Software window will appear. Select the "**Browse my computer for driver software**" option:

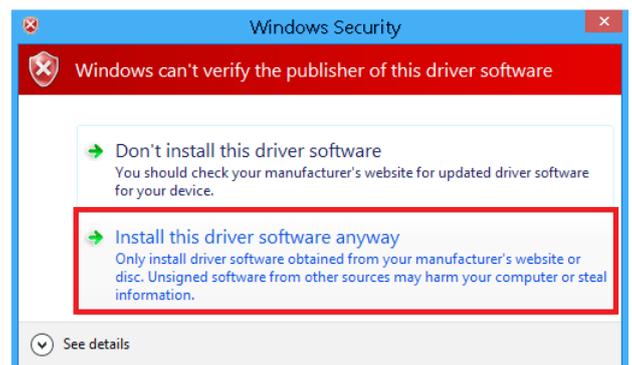
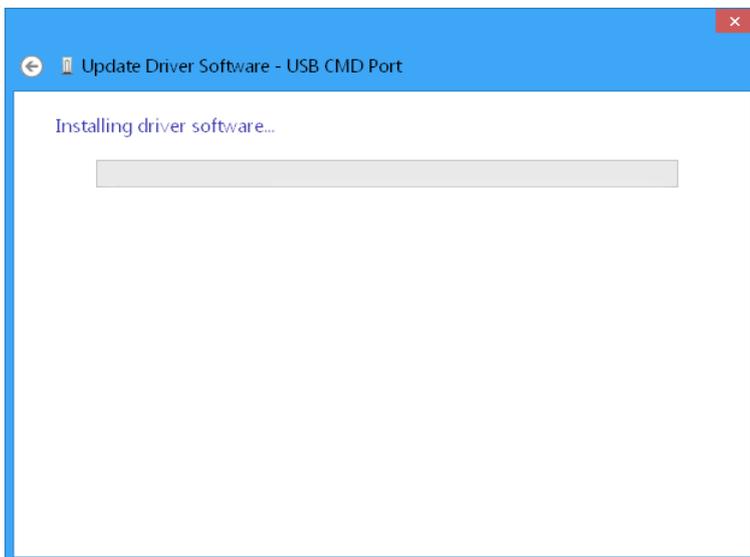




12 Using the **Browse** button navigate to the folder that contains the driver files. For example, `C:\drivers\ION PRO CDC driver\`
Then click the **Next** button:



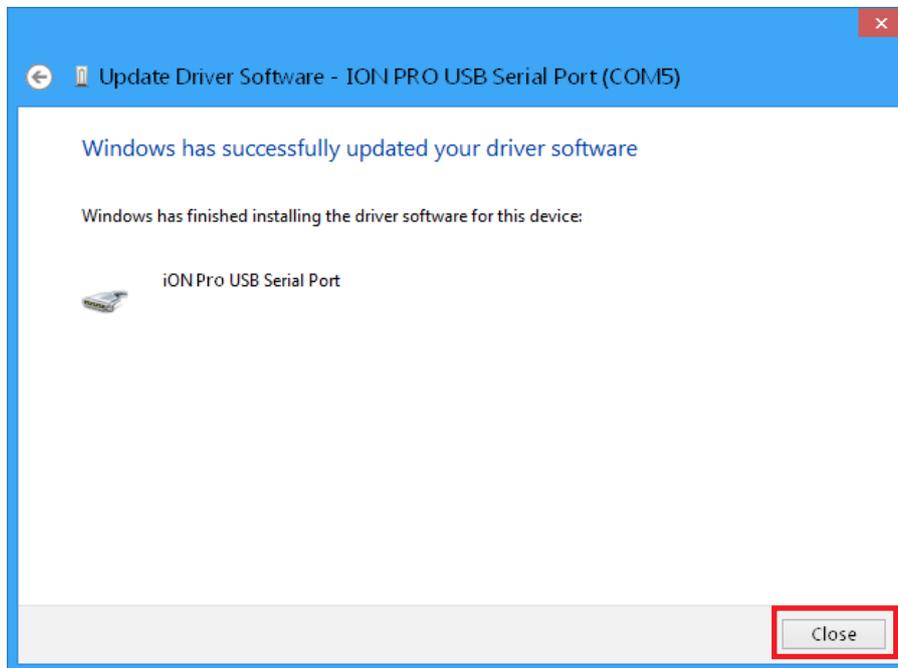
As a result, the driver installation process will launch. If you are prompted "Windows can't verify the publisher of this driver software", select "**Install this driver software anyway**" in the Windows Security dialog box.





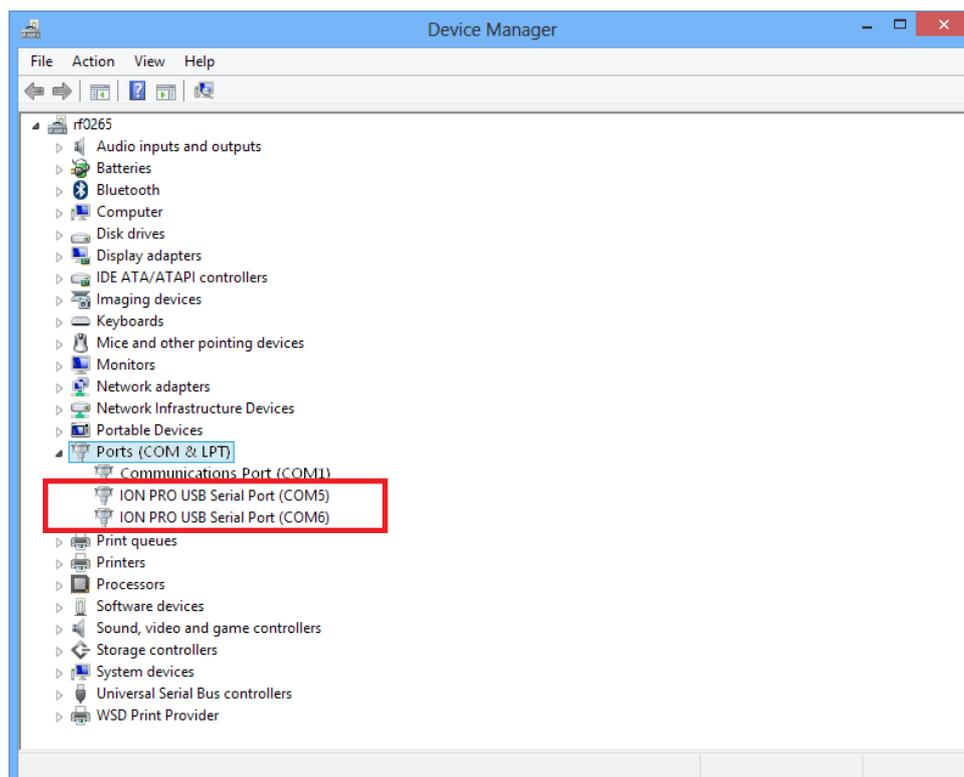
As a result, the driver for one device will be installed.

13 Click **Close**:



Follow the steps from **10** to **13** to install the driver for the second device.

To verify that the drivers are installed, open the Device Manager (open the Settings charm ► Control Panel ► System and Security ► System ► Device Manager). Two new devices will be displayed in the **Ports (COM & LPT)** section:





4.2. Overview

The configuration manager is an application with all the control components grouped by completing tasks.

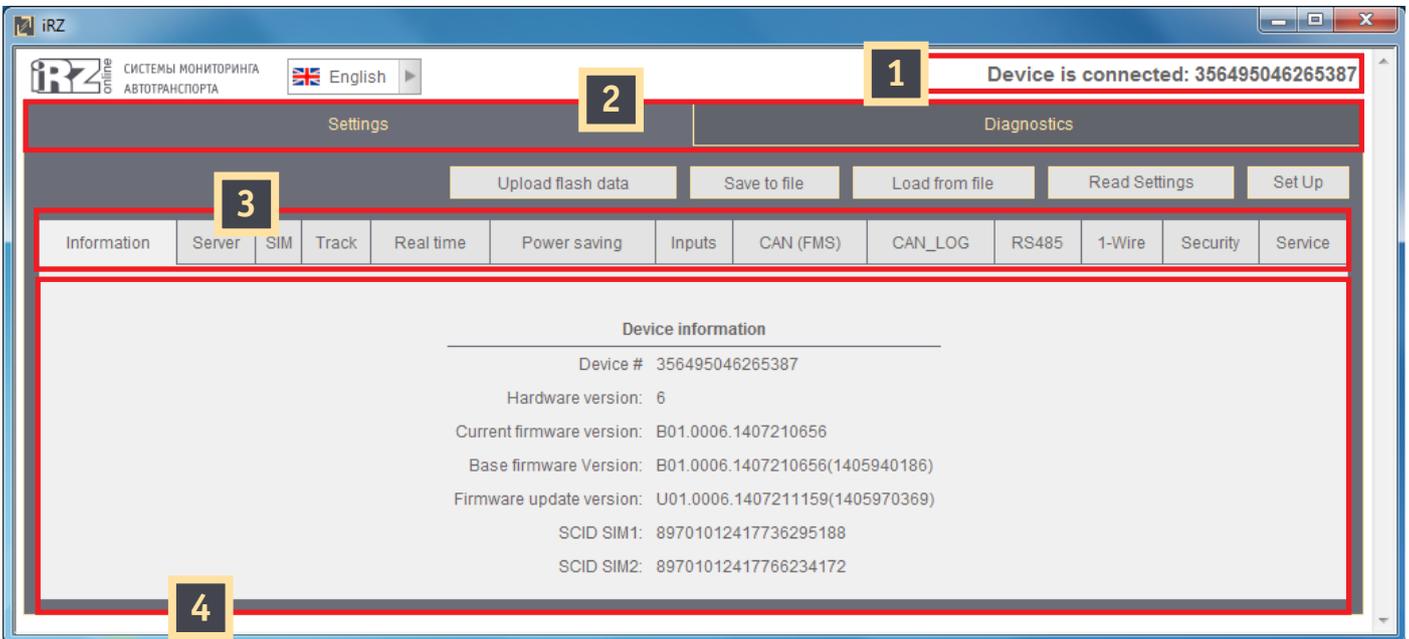


Fig. 4.1. Configuration Manager

Mark.	Name	Description
1	Device information	Connected device IMEI
2	Main operation mode tabs	Main tabs by task type: "Settings" and "Diagnostics"
3	Operational field tab	Additional tabs (in tab example of the "Settings" mode)
4	Operational field	Operational field of active additional tab

Buttons:

Name	Description
Upload flash data	Storing data (track, sensor data, etc.) from the terminal flash-memory
Save to file	Saving settings to a file
Load from file	Loading settings from a file
Read Settings	Updating data in the configuration tool when connecting a new terminal
Set Up	Recoding settings to the terminal specified in the configuration tool



4.3. Terminal Configuration

4.3.1. Tab "Information"

Tab "Information" contains various items for the navigation terminal configuration.

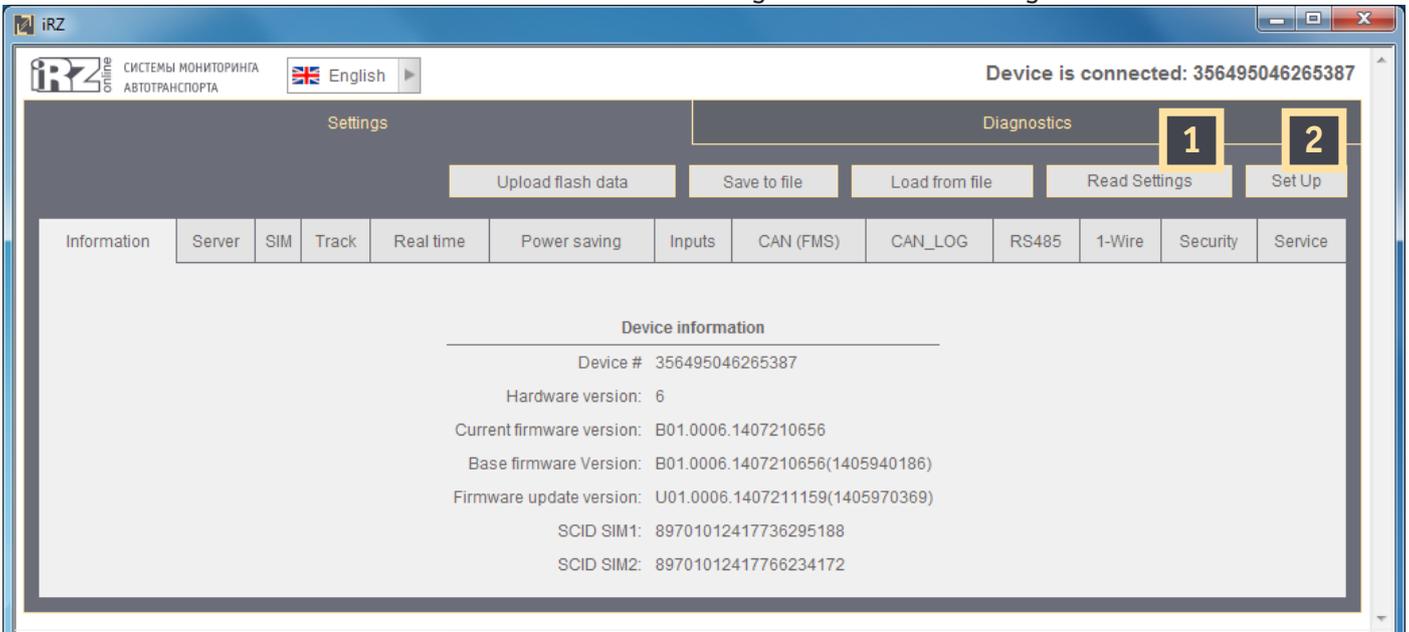


Fig. 4.2. Mode "Settings", tab "Information"

When connecting the terminal to the computer and running the configuration manager, the connected device configurations are automatically set in the application. If you connect a new device, update the configuration data or click **Read Settings** **1**, or restart the application.

To record the settings specified in the configurator, click **Install** **2**.

Tab functions and assignments in mode "Settings":

Tab	Assignment
Information	Information about connected device
Server	Server tracking systems connection settings
SIM	SIM cards setting in device
Track	Saving settings of track navigation points
Real time	Real-time data transmission settings
Power saving	Power consumption mode settings
Inputs	Multipurpose input settings
CAN (FMS)	CAN bus data settings
CAN_LOG	CAN-LOG settings
RS485	RS485 interface operation and connected sensors settings
1-Wire	1-Wire interface operation and connected sensors settings
Security	Device access level settings
Service	Function of sending system commands to the terminal



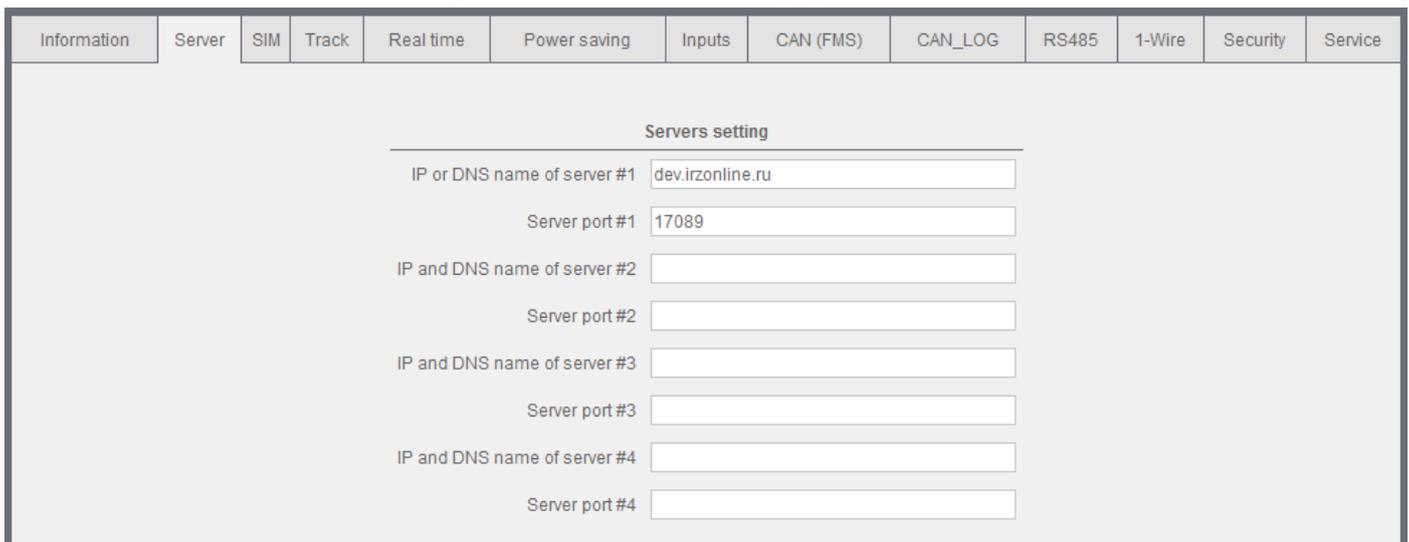
Data decoding in field "Device data":

Field	Assignment
Device #	IMEI
Hardware version	Device board version
Current firmware version	Device firmware operational version
Base firmware version	Base firmware version (determined by manufacturer)
Firmware update version	Updated firmware version (determined by user)
SCID SIM1	SIM card #1 identification number
SCID SIM2	SIM card #2 identification number

The device is supposed to have two versions of firmware installed: base firmware and firmware-update. In case of some problems with a new firmware, the terminal can be switched to base firmware.

4.3.2. Tab "Server"

Tab "Server" is used for setting connection with tracking system servers.



Information	Server	SIM	Track	Real time	Power saving	Inputs	CAN (FMS)	CAN_LOG	RS485	1-Wire	Security	Service
Servers setting												
IP or DNS name of server #1		<input type="text" value="dev.irzonline.ru"/>										
Server port #1		<input type="text" value="17089"/>										
IP and DNS name of server #2		<input type="text"/>										
Server port #2		<input type="text"/>										
IP and DNS name of server #3		<input type="text"/>										
Server port #3		<input type="text"/>										
IP and DNS name of server #4		<input type="text"/>										
Server port #4		<input type="text"/>										

Fig. 4.3. Mode "Settings", tab "Server"

Section "Server Configuration" is used for the configuration of device communication with the tracking system servers. A user can specify up to four servers, it is required in case of server connection loss. In this case the terminal can connect to one of the additional servers.

Each setting needs IP address or server DNS name and port to be specified.

For example:

IP address or server 1 DNS name	dev.irzonline.ru
Server 1 port	17089



4.3.3. Tab "SIM"

Tab "SIM" is used for SIM card configuration in the device.

Information	Server	SIM	Track	Real time	Power saving	Inputs	CAN (FMS)	CAN_LOG	RS485	1-Wire	Security	Service
<p>SIM card operation algorithm</p> <p>only SIM #2 <input type="button" value="v"/></p>												
<p>SIM1 settings</p>						<p>SIM2 settings</p>						
<input checked="" type="checkbox"/> Automatic mode						<input type="checkbox"/> Automatic mode						
APN			<input type="text"/>			APN			<input type="text"/>			
Login			<input type="text"/>			Login			<input type="text"/>			
Password			<input type="text"/>			Password			<input type="text"/>			
PIN code input			disabled <input type="button" value="v"/>			PIN code input			disabled <input type="button" value="v"/>			
PIN code			<input type="text"/>			PIN code			<input type="text"/>			

Fig. 4.4. Mode "Settings", tab "SIM"

Section "SIM card operating algorithm" is used for the selection of SIM card operating mode. As the terminal supports two SIM cards, it is required to specify the device principle of interaction with them.

Parameter	Description
only SIM #1 (#2)	terminal operates only with SIM card #1 (or 2), other SIM card is disabled
SIM #1 (#2) priority	terminal operates with two SIM cards, but SIM card #1 (or 2) is the main one, and other SIM card is enabled in case of no main SIM card

Sections "SIM settings" (1 and 2) are used for the first and second SIM card configuration respectively.

Parameter	Description
<input checked="" type="checkbox"/> Automatic mode	enable/disable SIM card automatic operational mode
APN	operator APN address (for example, internet.operator.ru)
Login	user account name
Password	account password
PIN code input	SIM card PIN code operation mode: <ul style="list-style-type: none"> ● disabled — SIM card does not request PIN code; ● enabled — SIM card requests PIN code, the code is entered in the field "PIN code"
PIN code	PIN code input field



4.3.4. Tab "Track"

Tab "Track" is used for configuration of track data transmission.

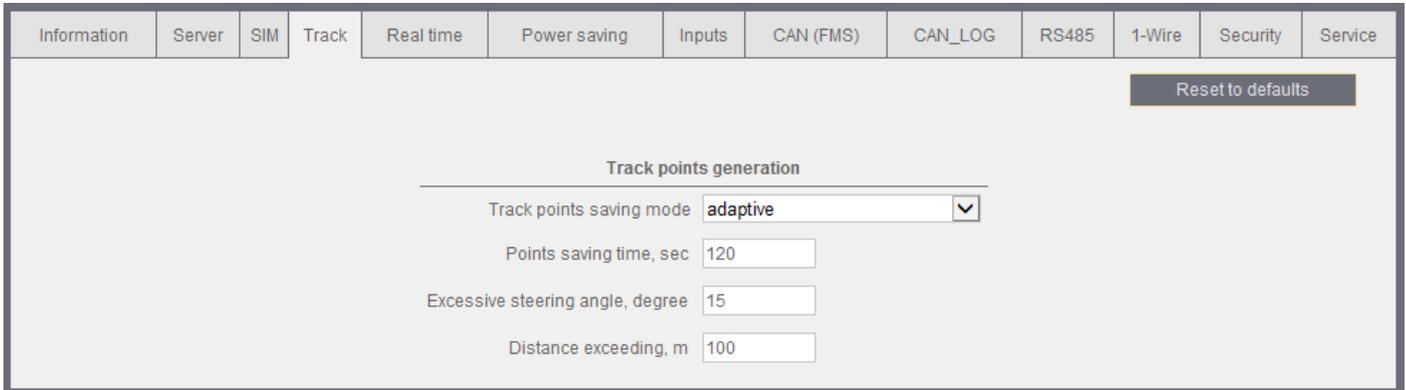


Fig. 4.5. Mode "Settings", tab "Track"

Parameter	Description
Track points saving mode	Mode selection: <ul style="list-style-type: none"> ● "adaptive" — data transmitted not only over time change, but other device data; ● "timed" — data transmitted only over time change. For example, every 10 seconds.
Points saving time, sec	Time interval in seconds for saving track points
Excessive steering angle, degree	Maximum steering angle interval in degrees with track point saving (available only for adaptive mode)
Distance exceeding, m	Maximum distance interval in meters for saving track points (available only for adaptive mode)

The **Reset to defaults** button returns the default settings in this section.

Adaptive mode.

Adaptive mode may be useful to reduce traffic with the received track no less accurate than the track in the "timed" mode.

For example, you can set a large time interval (40 seconds, 15 minutes and more), but add more parameters with data transmission when changing them: distance and/or direction change. When a vehicle is stopped, time runs, but the coordinates do not change. In this case the data is not transmitted, hence, the track accuracy in this interval remains unchanged, but the device traffic considerably slows down.



4.3.5. Tab "Real Time"

Tab "Real time" is used for specifying parameters of sensors and other external devices transmitted in a real time. The settings are grouped by interface types and each input or parameter can be enabled/disabled by a user using the "checkbox" element.

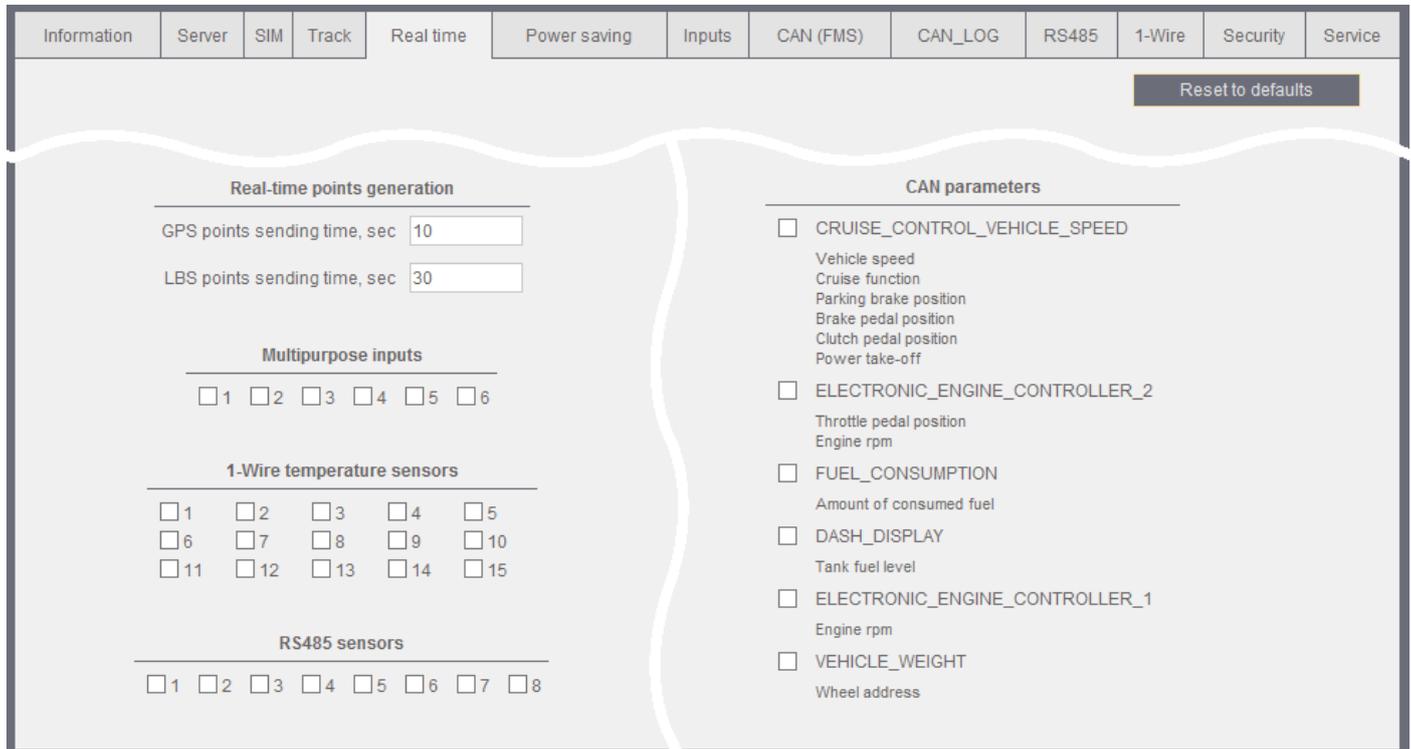


Fig. 4.6. Mode "Settings", tab "Real time"

Available parameters:

- multipurpose inputs (6 inputs);
- 1-Wire temperature sensors;
- RS485 sensors;
- CAN bus parameters.

Furthermore, a user can specify the interval of points transmission in seconds from the GPS/GLONASS and LBS systems in the "Real-time points group generation".

The **Reset to defaults** button returns the default settings in this section.



4.3.6. Tab "Power saving"

Tab "Power saving" is used to set the parameters of power saving modes.

Information	Server	SIM	Track	Real time	Power saving	Inputs	CAN (FMS)	CAN_LOG	RS485	1-Wire	Security	Service
-------------	--------	-----	-------	-----------	--------------	--------	-----------	---------	-------	--------	----------	---------

Power-saving mode (mode #1)

Switch to mode is enabled

Threshold value for vehicle onboard network voltage switch, mV

Threshold value for battery voltage switch, mV

Mode switch by multipurpose input event

Multipurpose input number for generating event

Multipurpose input controlled level

Sleep mode (mode #2)

Switch to mode is enabled

Threshold value for vehicle onboard network voltage switch, mV

Threshold value for battery voltage switch, mV

Mode switch by multipurpose input event

Multipurpose input number for generating event

Multipurpose input controlled level

Deep sleep mode (mode #3)

Switch to mode is enabled

Threshold value for battery voltage switch, mV

Fig. 4.7. Mode "Settings", tab "Power saving"

For the user terminal three power-saving modes are available:

- Power-saving mode (Mode #1);
- Sleep mode (Mode #2);
- Deep sleep mode (Mode #3).



To set power-saving modes the following parameters are used:

Parameter	Description
<input checked="" type="checkbox"/> Switch to mode is enabled	enable/disable the power-saving mode
Threshold value for vehicle onboard network voltage switch, mV	external supply voltage value in mV, below which the device switches to power-saving mode*
Threshold value for battery voltage switch, mV	battery supply voltage value in mV, below which the device switches to power-saving mode
<input checked="" type="checkbox"/> Mode switch by multipurpose input event	enable/disable switch to power-saving mode by multipurpose input event (input and event are specified optionally)
Multipurpose input number for generating an event	multipurpose input selection with switch performed in case of event occurrence
Multipurpose input controlled level	controlled event with switch to power-saving mode performed: <ul style="list-style-type: none"> ● switch to low level; ● switch to high level

* a user is allowed to set the parameters only for "Mode #1" and "Mode #2". For "Mode #3" they are specified as a constant value

Button **Reset to defaults** returns the default settings in this section.

4.3.7. Tab "Inputs"

Tab "Inputs" is used for configuration of device multipurpose inputs. The iON navigation user terminal is provided with 6 multipurpose inputs (IN1, IN2, IN3, IN4, I/O5, I/O6).

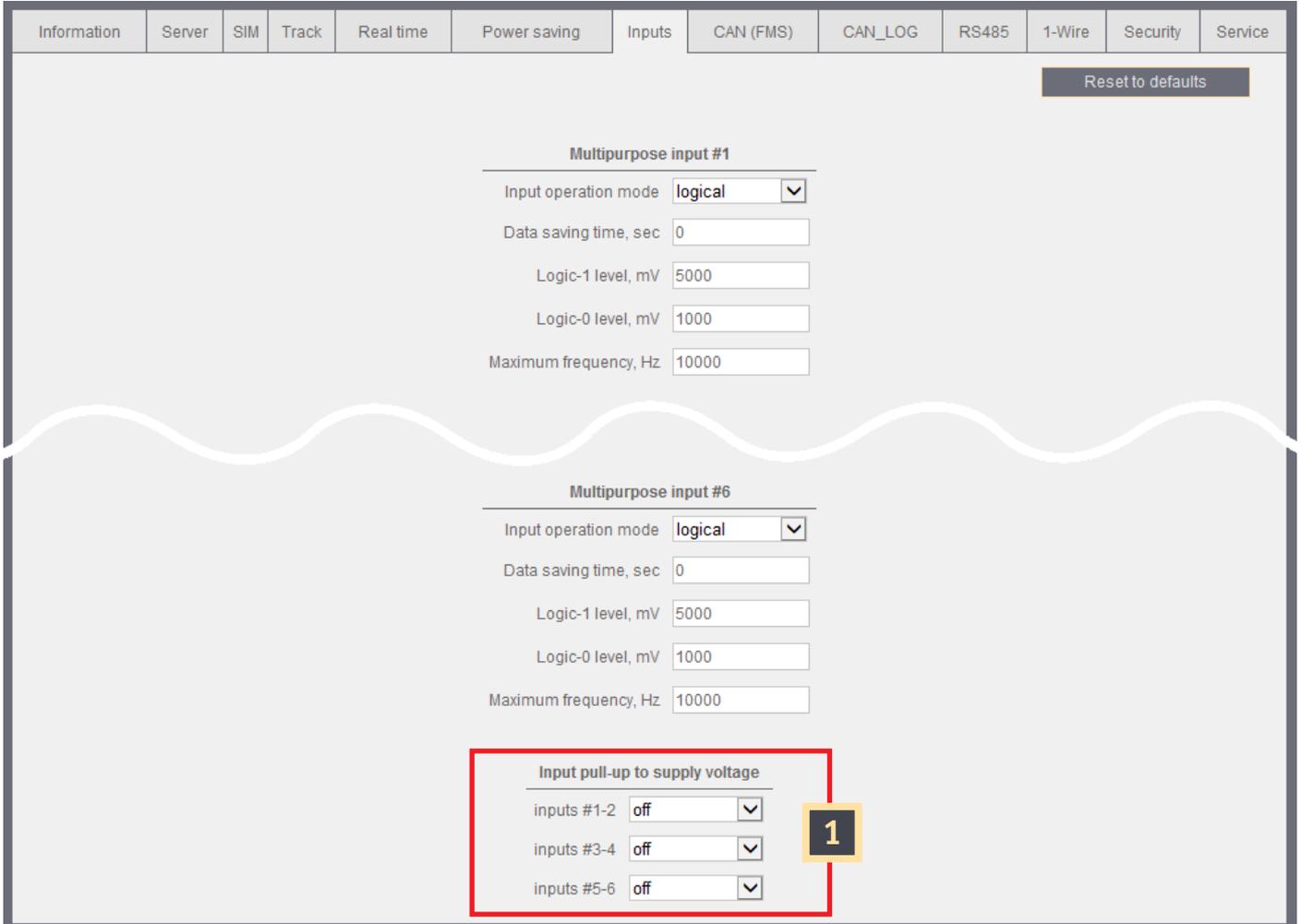
For configuration the following parameters are available:

Parameter	Description
Input operation mode	Multipurpose inputs can operate in the following modes: <ul style="list-style-type: none"> ● frequency — input signal frequency modifying mode; ● pulse — input pulse counter mode; ● analog — input voltage measurement mode; ● logic — input level detection mode (high - "1" or low - "0")
Data saving time, sec	Input data retention time in seconds
Logic-1 level, mV	Value at which the pulse state relates to logic 1 or zero
Logic-0 level, mV	
Maximum frequency, Hz	Maximum input frequency, Hz

The **Reset to defaults** button returns the default settings in this section.



If necessary, a user can enable input pull-up **1**.



Information Server SIM Track Real time Power saving Inputs CAN (FMS) CAN_LOG RS485 1-Wire Security Service

Reset to defaults

Multipurpose input #1

Input operation mode

Data saving time, sec

Logic-1 level, mV

Logic-0 level, mV

Maximum frequency, Hz

Multipurpose input #6

Input operation mode

Data saving time, sec

Logic-1 level, mV

Logic-0 level, mV

Maximum frequency, Hz

Input pull-up to supply voltage

inputs #1-2

inputs #3-4

inputs #5-6

1

Fig. 4.8. Mode "Settings", tab "Inputs"



4.3.8. Tab "CAN (FMS)"

Tab "CAN (FMS)" is used to set CAN bus parameters.

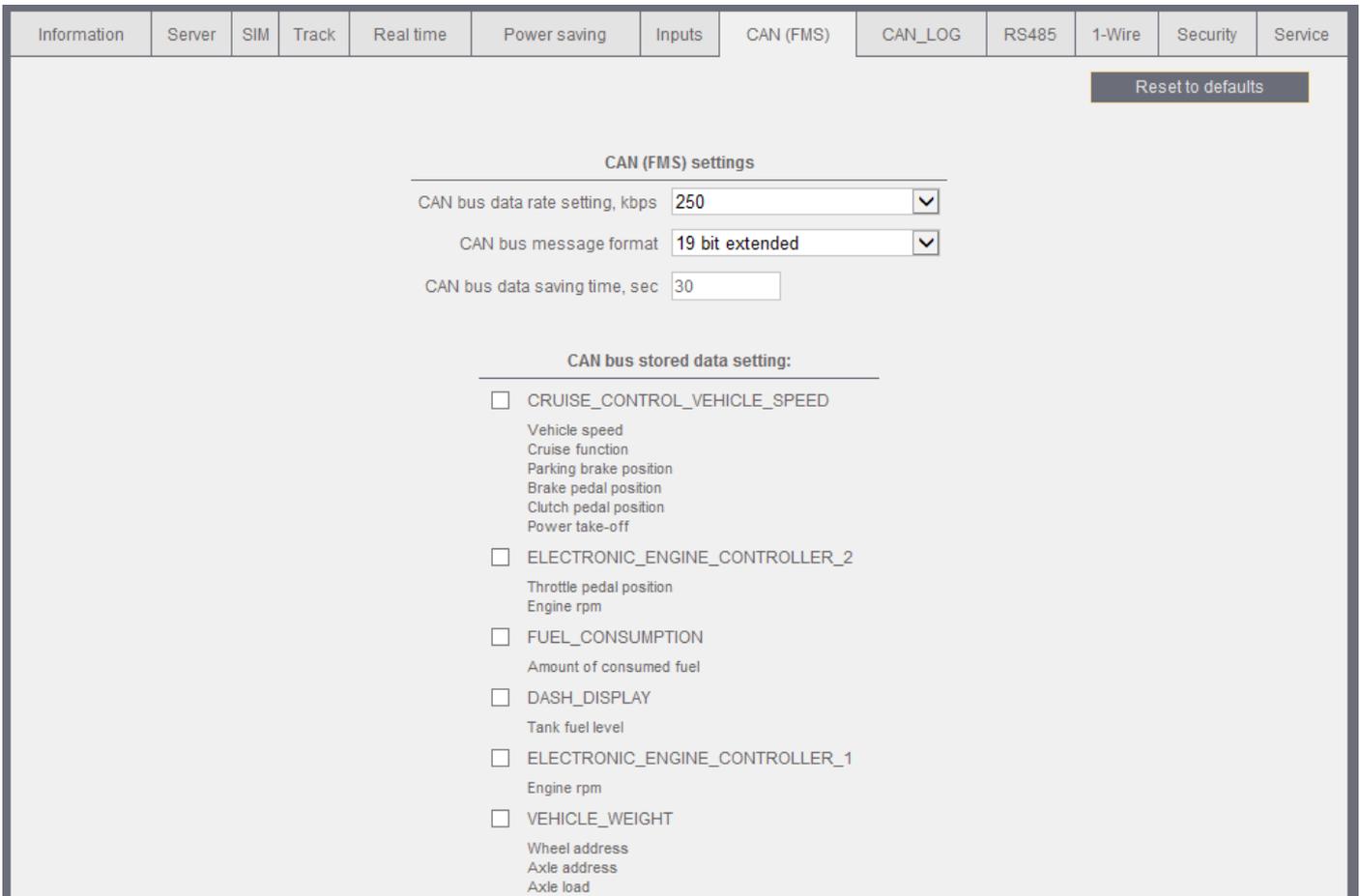


Fig. 4.9. Mode "Settings", tab "CAN (FMS)"

For interface configuration the following parameters are available:

Parameter	Description
CAN bus data rate setting, kbps	CAN bus data transmission rate, kbps
CAN bus message format	Message format transmitted over CAN bus
CAN bus data saving time, sec	CAN bus data retention time, sec

The **Reset to defaults** button returns the default settings in this section.



User can select CAN bus parameters to save:

Parameter	Description
CRUISE_CONTROL_VEHICLE_SPEED	Vehicle speed and various Cruise Control parameters
ELECTRONIC_ENGINE_CONTROLLER_2	Engine rpm, throttle pedal position
FUEL_CONSUMPTION	Amount of consumed fuel
DASH_DISPLAY	Tank fuel level
ELECTRONIC_ENGINE_CONTROLLER_1	Engine rpm
VEHICLE_WEIGHT	Axle load, wheel and axle addresses
ENGINE_HOURS_REVOLUTIONS	Engine total operation time
HIGH_RESOLUTION_VEHICLE_DISTANCE	High-precision travelled distance
Service Information	Remaining distance to maintenance service
ENGINE_TEMPERATURE_1	Coolant temperature
AMBIENT_CONDITIONS	Ambient temperature
FUEL_ECONOMY	The amount of fuel consumption in unit time, current fuel consumption in motion
PTO Drive Engagement	PTO box state
HIGH_RESOLUTION_FUEL_CONSUMPTION	High-precision fuel consumption
Air Supply Pressure	Air pressure in circuit 1 and 2
Combination Vehicle Weight	Vehicle total weight
Air Suspension Control 4	Tyre pressure
TCO	Driver cards and operation mode information, speed tachograph

To enable/disable data acquisition by mentioned parameters, select or clear the appropriate check box.



4.3.9. Tab "CAN_LOG"

Tab "CAN_LOG" is used to set CAN_LOG.

Information	Server	SIM	Track	Real time	Power saving	Inputs	CAN (FMS)	CAN_LOG	RS485	1-Wire	Security	Service
-------------	--------	-----	-------	-----------	--------------	--------	-----------	---------	-------	--------	----------	---------

CAN_LOG setting

Data saving time, sec 1

Stored data setting

- Security state flags
- Engine total operation time, h
- Vehicle total mileage, km
- Total fuel consumption, l
- Tank fuel level
- Engine speed
- Engine temperature, °C
- Vehicle speed, km/h
- Load on axle #1
- Load on axle #2
- Load on axle #3
- Load on axle #4
- Load on axle #5
- Accident controllers
- AdBLUE liquid level
- Agricultural machinery condition
- Reaper time, h

Fig. 4.11. Mode "Settings", tab "CAN_LOG"

In this tab you can configure data saving time in seconds 1, and type of data 2 you need to save.



4.3.10. Tab "RS485"

Tab "RS485" is used to set the RS485 bus rate, as well as various parameters of connected sensors.

Information	Server	SIM	Track	Real time	Power saving	Inputs	CAN (FMS)	CAN_LOG	RS485	1-Wire	Security	Service
RS485 settings												
RS485 speed #1 <input type="text" value="19200"/>												
RS485 speed #2 <input type="text" value="19200"/>												
Interface #1 operating mode <input type="text" value="sensors scanning"/>												
Interface #2 operating mode <input type="text" value="sensors scanning"/>												
Sensors												
No	Sensor type	Saving time, sec	Sensor network address	Interface number								
1	not 1	0 2	0 3	not specif 4								
2	not used	0	0	not specified								
3	not used	0	0	not specified								
4	not used	0	0	not specified								
5	not used	0	0	not specified								
6	not used	0	0	not specified								
7	not used	0	0	not specified								

Fig. 4.10. Mode "Settings", tab "RS485"

In this tab you can configure operation speed of RS485 buses presented in the form of specified values measured in baud (Bd).

To configure the sensor, do the following steps:

- 1** choose sensor type;
- 2** specify time interval for sensor data saving;
- 3** specify sensor network address;
- 4** select interface number connected to the sensor.



4.3.11. Tab "1-Wire"

Tab "1-Wire" is used to set sensor parameters connected to the 1-Wire interface.

Information
Server
SIM
Track
Real time
Power saving
Inputs
CAN (FMS)
CAN_LOG
RS485
1-Wire
Security
Service

1-Wire temperature sensors setting

Search (port #1)
1

Search (port #2)
1

#	Sensor ID	Sensor type	Port number	Saving time, sec	Delete
1	000000000000000000	-	-	0	⊗
2	000000000000000000	-	-	0	⊗
3	0000 2 000000	- 3	- 4	0 5	⊗
4	000000000000000000	-	-	0	⊗
5	000000000000000000	-	-	0	⊗
6	000000000000000000	-	-	0	⊗
7	000000000000000000	-	-	0	⊗
8	000000000000000000	-	-	0	⊗
9	000000000000000000	-	-	0	⊗
10	000000000000000000	-	-	0	⊗
11	000000000000000000	-	-	0	⊗

Fig. 4.12. Mode "Settings", tab "1-Wire"

To configure the temperature sensor, do the following steps:

- 1 search port #1 (or #2): chart shows sensor identifiers connected to an appropriate port and not added to the device settings;
- 2 specify sensor ID;
- 3 choose sensor type;
- 4 specify port number;
- 5 specify time interval in seconds for sensor data saving.



4.3.12. Tab "Security"

Tab "Security" is used for setting access level, setting and a device password changing.

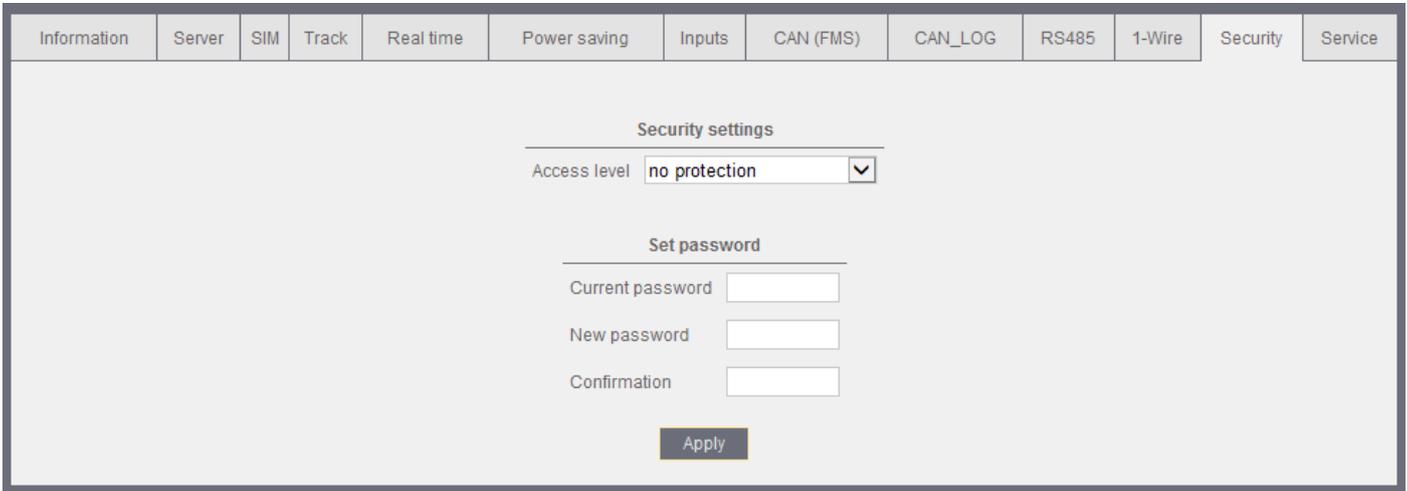


Fig. 4.13. Mode "Settings", tab "Security"

The device is provided with three access levels:

Access level	Description
no protection	all settings available without password request
server settings security	password requested when changing server settings in tab "Server"
complete security	password requested at any settings changes

Therefore, the access password is set in this tab.

To set the password (if password has not been set yet), do the following steps:

- 1 leave field **Current password** blank;
- 2 enter a new password;
- 3 enter the new password once more time in field **Confirmation**;
- 4 click **Apply**.

To change the password, do the following steps:

- 1 enter current password;
- 2 enter a new password;
- 3 enter the new password once more time in field **Confirmation**;
- 4 click **Apply**.



4.3.13. Tab "Service"

Tab "Service" is used to send service commands to the terminal.

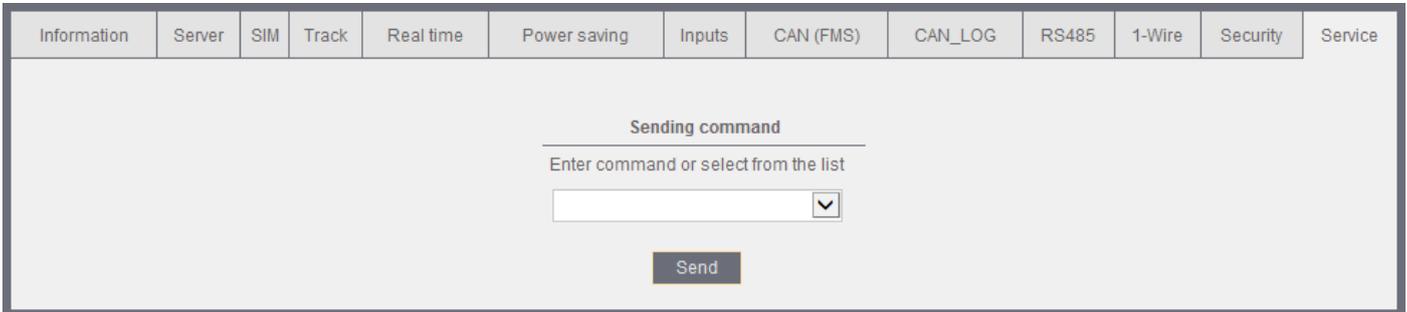


Fig. 4.14. Mode "Settings", tab "Service"

The following commands are available:

Commands	Description
Reset settings to default	all device settings are set by default (factory settings)
Delete records from device	all records stored in flash memory are deleted from the device



4.4. Terminal Diagnostics

Tab "Diagnostics" is intended for the terminal diagnostics. It displays technical data on the connected device. All data is grouped into three additional tabs: GPS/GLONASS, Inputs, RS485, 1-Wire, CAN.

 СИСТЕМЫ МОНИТОРИНГА АВТОТРАНСПОРТА

 English

Device is connected: 356495046265387

Settings	Diagnostics				
GPS/GLONASS	Inputs	RS485	1-Wire	CAN	CAN_LOG
<p>GPS/GLONASS diagnostics</p> <hr/> <p>Antenna: external Validity: no HDOP: - Date and time: 01/01/1970 00:00:00 Latitude: 0.0000,S Longitude: 0.0000,W Direction, degree: 0.00 Speed, knot: 0.00 Number of satellites: 0 Current power-saving mode: main mode</p> <p>GSM diagnostics</p> <hr/> <p>Current SIM card number: 1 Antenna: external Signal strength, dBm: - Logon flag: not connected Operator code: 0 State: GPRS: not connected State: Server #1: not connected State: Server #2: not connected State: Server #3: not connected State: Server #4: not connected Current power-saving mode: main mode</p>					

Fig. 4.15. Mode "Diagnostics"



4.5. Exporting Data to a Flash-Drive

The iON Pro navigation terminal features the built-in flash memory to store data. The user can unload this data later to a removable flash-drive to load it to the server using the configuration manager.

This requires:

- 1 navigation terminal connected to a power supply;
- 2 Mini USB–USB OTG adapter;
- 3 special compatible flash-drive (see information on the manufacturer's website);
- 4 key file to access the terminal (provided by the manufacturer) that needs to be placed in a flash-drive.

The procedure of exporting data to an external flash-drive:

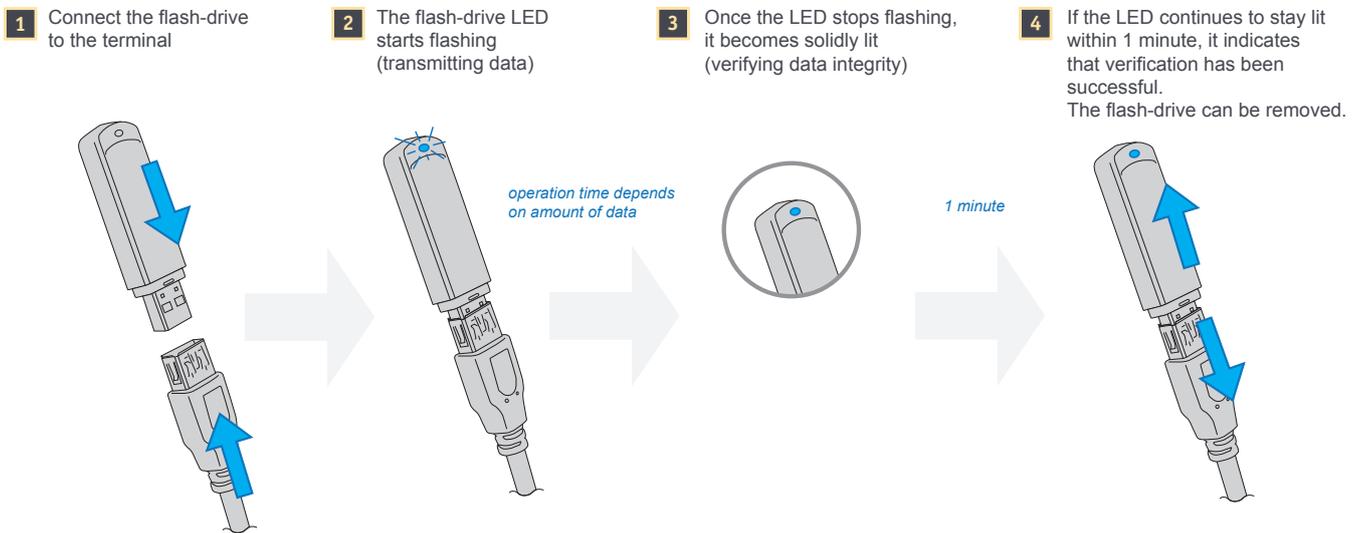


Fig. 4.16. The example of valid method for exporting data

Possible errors:

Event	Description
After connecting a flash-drive, the LED does not light up	Flash-drive is not found, or the terminal has an operational fault
After connecting a flash-drive, the LED flashes and goes off	No data to transmit, or no key to access the terminal
During the verification process, the LED goes off and then on again, etc.	Data cannot be transmitted correctly to the flash-drive

NOTE! The data unloading procedure is demonstrated for a compatible flash-drive, operation with other flash-drive models might be different. The manufacturer does not guarantee operation with other flash-drives.



Terms and Abbreviations

Abbreviations	Expansion
CAN	Controller Area Network, data communication bus
GLONASS	Global Navigation Satellite System
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
NUT	Navigation User Terminal
USB	Universal Serial Bus