

# **SAT-LITE 4**

## **User manual**



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## Introduction

Navigational controller «SAT-LITE 4» (“Tracker” further in text) is designed for remote moving objects monitoring and can be used in complex with any compatible software pack. The tracker is a compact electronic device in a plastic case which has internal GPS/GLONASS and GSM modules and can be used in passenger vehicles with 12V voltage mains, heavy vehicles with 24V voltage mains and any other vehicles with mains voltage from 8 to 40V.

After being installed to a vehicle and setting the needed parameters Tracker detects current location, speed and direction of vehicle’s motion by using global positioning systems GPS or GLONASS, and also collect information about vehicle’s and its part’s status by using additionally installed sensors. All collected information is being real-time sent to a remote server by GSM net and can be shown on a dispatcher’s PC.

Also, Tracker can be used for additional vehicle and driver’s security. For this purpose Tracker has an ability of installing it to the ignition circuit (or alarm) and notification the vehicle’s owner about turning on the ignition circuit or triggering the alarm. Also there’s an ability to connect a panic button to tracker, and dispatcher can see an alarm notification on a PC when a driver presses this button.

In further parts of this guide there’s a detailed information about technical features of the Tracker, and how to prepare it for work, set up its parameters and connect additional sensors and other devices to it.

In case of other questions about using the Tracker, here’s the contacts of technical support:

**Russia, St.Petersburg**

**ph:** +7 (800) 222-07-13, +7 (812) 607-64-62

**e-mail:** support@satsol.ru, info@satsol.ru

All information about different models of trackers and using it can be found on a website:

[www.satsol.ru](http://www.satsol.ru)

## 1. Packaging

Tracker set contains:

| Components                         | Number, pcs | Notes                                    |
|------------------------------------|-------------|------------------------------------------|
| Navigational controller SAT-LITE 4 | 1           |                                          |
| System connector                   | 1           | System connector is plugged into tracker |
| Additional wires                   | 7           |                                          |
| Screws                             | 1           |                                          |
| Passport                           | 1           |                                          |

## 2. Technical specifications

| Feature                                                  | Value                          | Notes                        |
|----------------------------------------------------------|--------------------------------|------------------------------|
|                                                          |                                |                              |
| Power voltage, V                                         | 8 - 40                         |                              |
| Impulse surge protection                                 | provided                       | under 500 V                  |
| Polarity reversal protection                             | provided                       |                              |
| Internal battery                                         | included                       | Li-Pol<br>capacity 250 mA    |
|                                                          |                                |                              |
| Dimensions, mm                                           | 80 x 62 x 20                   |                              |
| Weight, not more, g                                      | 100                            | Excluding additional devices |
| Operating temperature range, °C                          | -40 to +55                     |                              |
| Storage temperature range, °C                            | -40 to +60                     |                              |
| Humidity, %                                              | 0 to 95                        | Not condensed                |
|                                                          |                                |                              |
| Average lifetime, years                                  | 8                              |                              |
| Average lifetime of an internal battery                  | 800 charge/discharge<br>cycles | Not more than 1 year         |
| Guarantee, years                                         | 5                              | From purchase date           |
|                                                          |                                |                              |
| Navigational module                                      | Quectel MC60                   |                              |
| GNSS-antenna                                             | Internal                       |                              |
| Supported navigational systems                           | GPS/GLONASS                    |                              |
| Channels                                                 | 33                             |                              |
| Positioning precision, 95% of time, not worse<br>than, m | 2.5                            |                              |

| Feature                                           | Value               | Notes                                                                           |
|---------------------------------------------------|---------------------|---------------------------------------------------------------------------------|
| Navigational module sensitivity (cold start), dBm | -148                |                                                                                 |
| Cold start, sec                                   | 35                  |                                                                                 |
|                                                   |                     |                                                                                 |
|                                                   |                     |                                                                                 |
|                                                   |                     |                                                                                 |
| GSM module                                        | Quectel MC60        |                                                                                 |
| GSM-antenna                                       | internal            |                                                                                 |
| Data channel                                      | GSM/GPRS (class 10) | Frequency ranges<br>850/900/1800/1900                                           |
| SIM-cards                                         | 1                   | mini-SIM (2FF)                                                                  |
|                                                   |                     |                                                                                 |
| Analog inputs, pcs                                | 1                   |                                                                                 |
| Discrete inputs, pcs                              | 1                   |                                                                                 |
| RS-485, pcs                                       | 1                   |                                                                                 |
| 1-Wire, pcs                                       | 1                   |                                                                                 |
| Bluetooth                                         | 1                   | For tracker setting and connecting fuel level sensor (not more than 10 m range) |
|                                                   |                     |                                                                                 |
| Supported protocols                               |                     |                                                                                 |
| LLS                                               | +                   | Digital fuel sensors                                                            |
| 1-Wire                                            | +                   | Temperature sensors                                                             |
|                                                   |                     |                                                                                 |
| Non-volatile memory                               | +                   | Up to 150 000 points                                                            |
|                                                   |                     |                                                                                 |
| Internal accelerometer                            | +                   |                                                                                 |

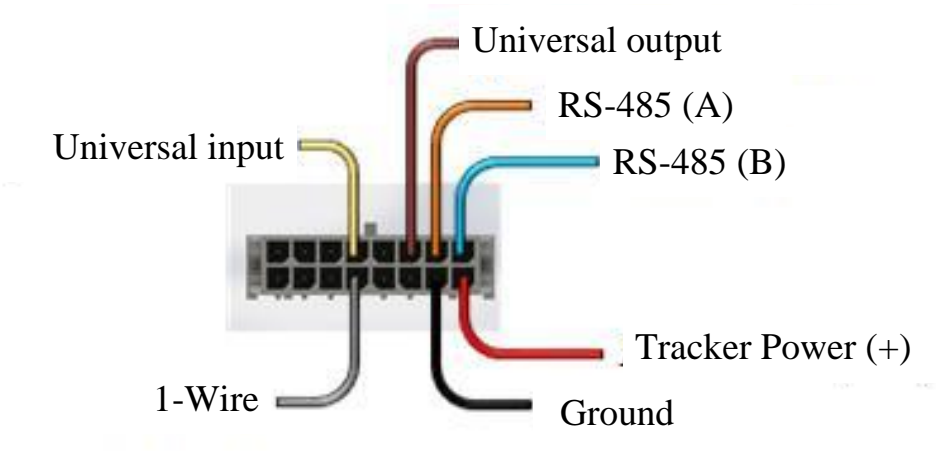
| Feature                                 | Value | Notes |
|-----------------------------------------|-------|-------|
|                                         |       |       |
| Driving quality rating<br>(ECO Driving) | +     |       |



3. Device's appearance



Pic.1. Appearance



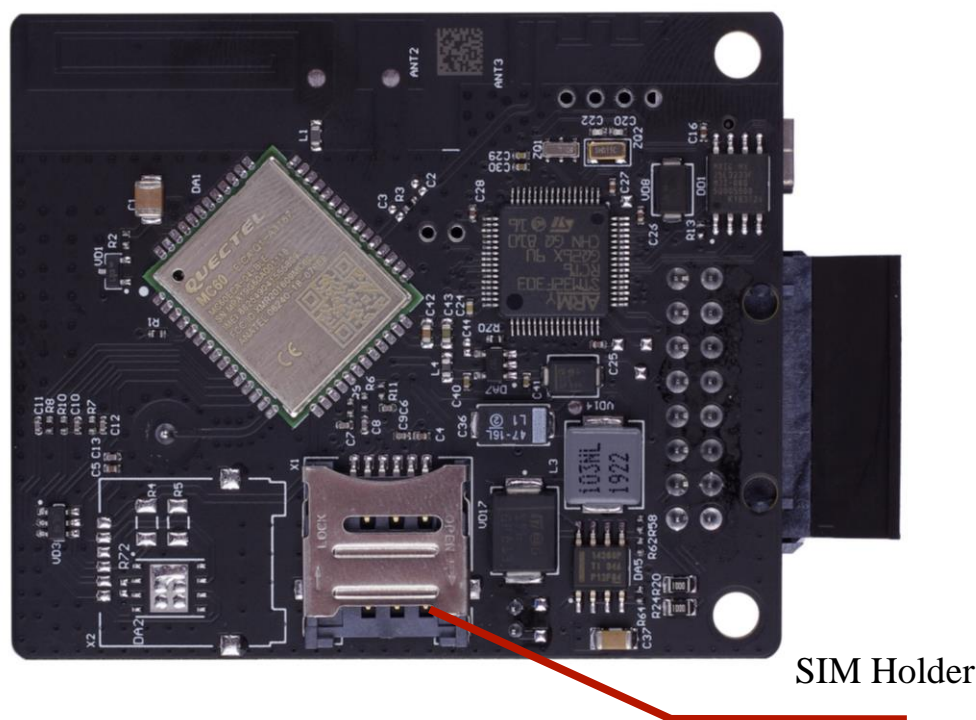
2. Main connector pinout

## 4. Installation

### 4.1 Preparing for installation

Before starting to work with the tracker it is required to install a SIM-card (obligatory). To do this:

- Open a tracker case by unscrewing the 4 screws from lower side of the case;
- Put the SIM-card into a SIM-holder (see pic. 3);
- Close the tracker case in reverse order.



Pic. 3. SIM-holder location on tracker board

**WARNING.** Tracker supports only micro-SIM (3FF) formatted SIM-cards. Nano-SIM (4FF) formatted SIM-cards can be used **ONLY** with a specific adapter.

**WARNING.** Before using a SIM-card get sure that it is working well (SIM-card must be able to provide incoming/outcoming calls, able to send/receive SMS and support a stable Internet connection by 2G, and have a positive account balance).

This tracker model contains an internal GNSS-antenna, so external antennas are not required.

**WARNING.** Having metallic boards (or huge metallic objects) close to tracker can decrease the quality of GPS/GLONASS signals.

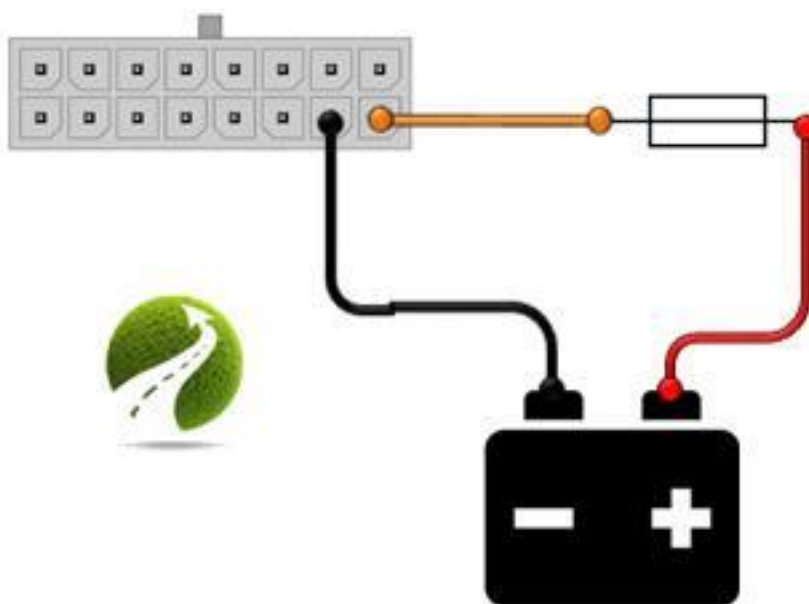
## 4.2 Connecting tracker to vehicle mains

**WARNING.** While executing installing works pay attention for technical security rules for works with electric devices.

**WARNING.** Keep the polarity while connecting the power. Tracker power circuits should be protected by safety fuse (recommended parameters for the safety fuse are in table 1).

This model can be connected to vehicle mains by 2-wires-using scheme seen on pic.

4.



Pic. 4. Installing scheme

Table 1

Recommended parameters for the safety fuse

| Parameter          | Value | Notes                                                 |
|--------------------|-------|-------------------------------------------------------|
| Material           | any   | Using the standard automobile safety fuse is possible |
| Nominal voltage, V | 32    |                                                       |
| Nominal current, A | 3     |                                                       |

### 4.3 Indication

There are 4 LED indicators to show the current status of the tracker (see pic. 1). The list of possible tracker's states with corresponding indication mode can be seen in table 2. More detailed information about current state of the tracker can be get by connecting tracker to PC (see section 5).

Table 2

List of possible tracker's states

| State                            | LED                                                 |                                                        |        |                                                                  |
|----------------------------------|-----------------------------------------------------|--------------------------------------------------------|--------|------------------------------------------------------------------|
|                                  | Blue                                                | Green                                                  | Yellow | Red                                                              |
| Not glowing                      | Error of GNSS module                                | Error of GSM module                                    |        | External sensors not connected                                   |
| 3 short flash, 1 time per second | No receiving signal from GPS and GLONASS satellites | SIM card missing<br><br>No registration in GSM network |        |                                                                  |
| 2 short flash, 1 time per second |                                                     |                                                        |        | No answer from one of the external sensors (possible wire break) |

Table 2 (continue)

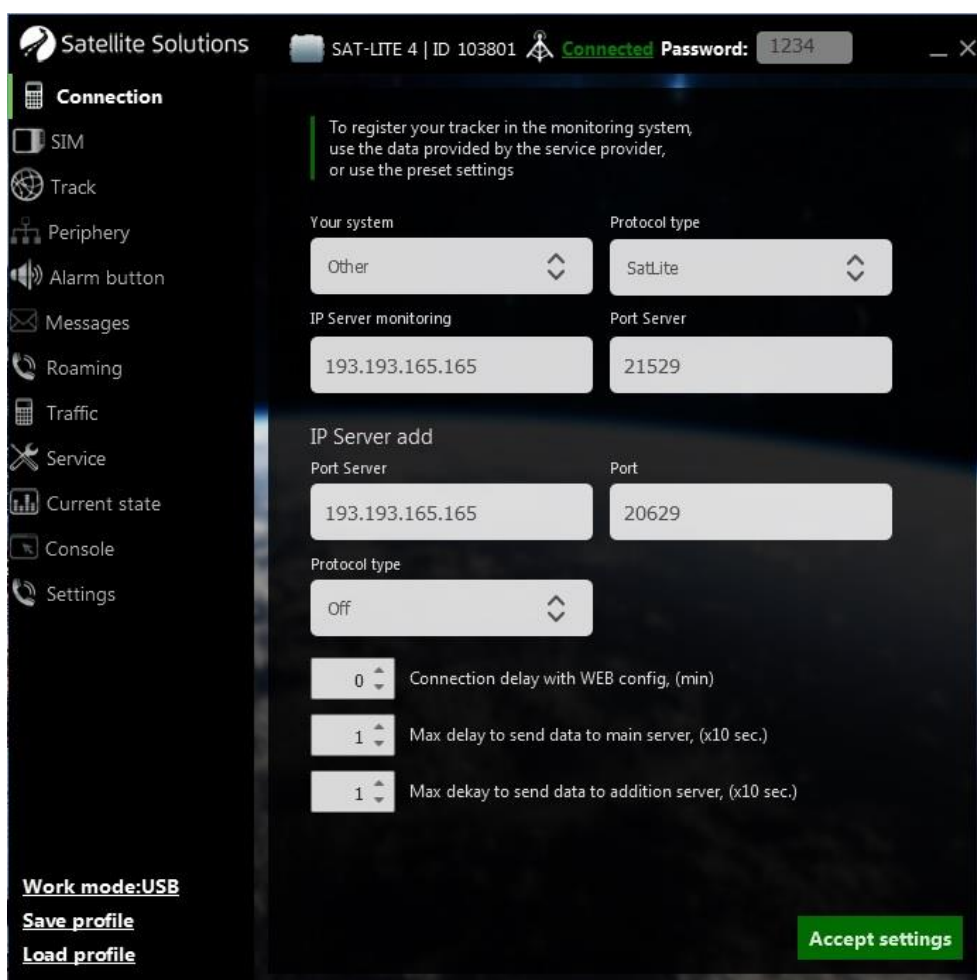
| State                            | LED                                          |                                                                    |                           |                                                           |
|----------------------------------|----------------------------------------------|--------------------------------------------------------------------|---------------------------|-----------------------------------------------------------|
|                                  | Blue                                         | Green                                                              | Yellow                    | Red                                                       |
| 1 short flash, 1 time per second | Bad quality of receiving GPS/GLONASS signals | Internet connection is missing<br><br>No answer from remote server | Turns to sleep mode       | One of external sensors gives result out from state range |
| Glows permanently                | Tracker works appropriately                  | Tracker works appropriately                                        | Tracker is in active mode | All external sensors work appropriately                   |
| 1 long blink, 1 time per second  |                                              |                                                                    |                           | ID-mark found (iButton)                                   |

## 5. Setting up the tracker

Setting up can be done locally (by connecting to PC) and remotely (by using TCP-connection with tracker or by SMS-commands).

### 5.1 Local configuration

Local setting needs tracker to be connected to PC by USB cable (see pic. 1) or by Bluetooth and using a special software (Configurator), screenshot of a configurator appearance can be seen a pic. 6.

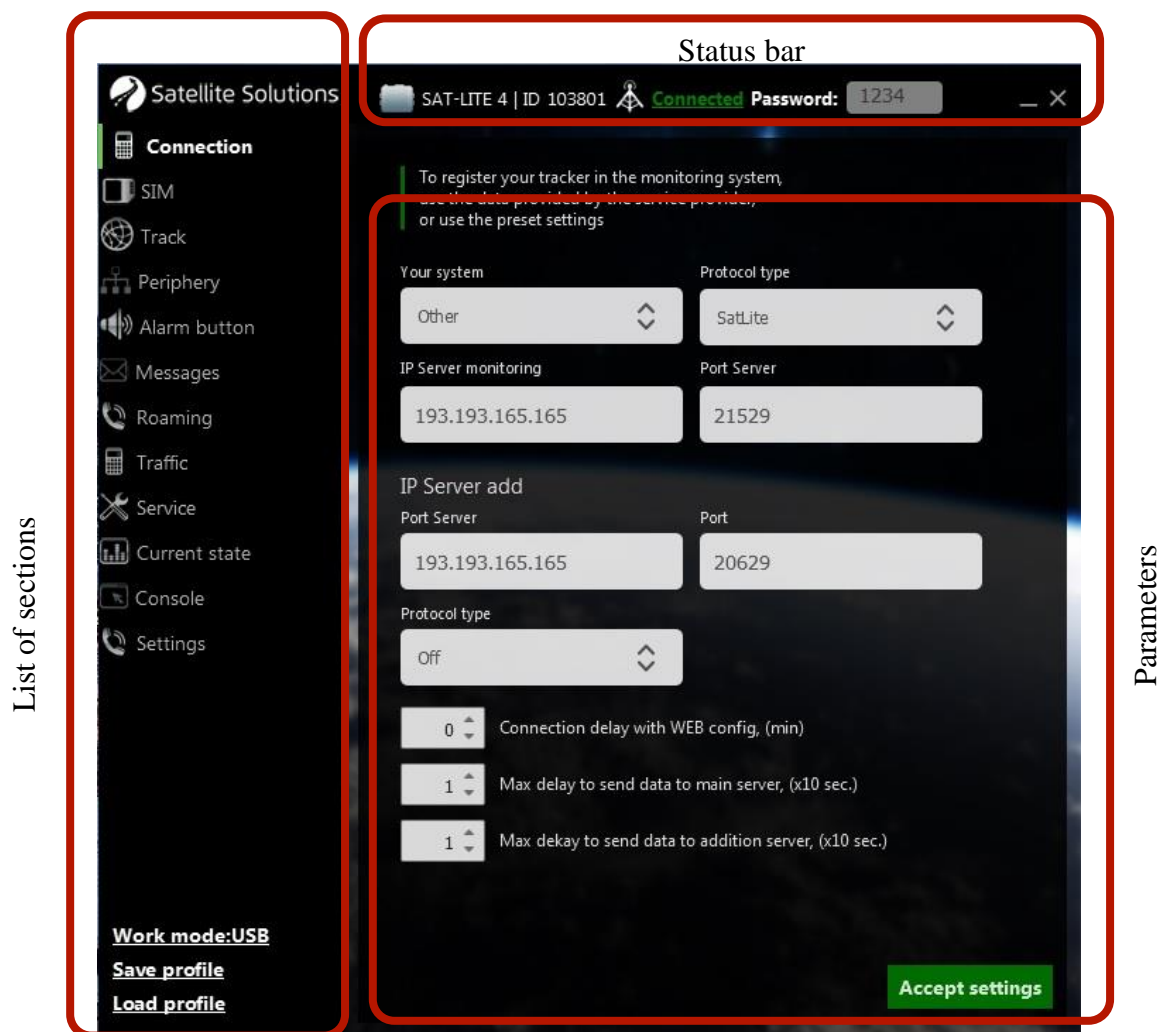


Pic. 6. Configurator main window

**WARNING. Configurator works only with Windows operational system.**

**WARNING. Correct configurator work needs the previous installation of the drivers (USB VCP). Actual version of Configurator can be downloaded from the official website of a company ([www.satsol.ru](http://www.satsol.ru)).**

Configurator's main window contains three general parts (see pic. 7): status bar, list of the sections, parameter group.



Pic. 7. Configurator main windows' structure

### Status bar

Status bar (upper string in configurator, pic.7) contains basic information about tracker's connection information. This bar shows if tracker connected/disconnected, unique ID, user password for command execution.

## List of sections

To simplify the setting all tracker's parameters are grouped by its purpose to different sections (see table. 3).

Table 3

List of configurator's sections

| Section name   | Description                                                        |
|----------------|--------------------------------------------------------------------|
| Connection     | Setting the parameters of monitoring system                        |
| SIM settings   | Setting the SIM-card parameters                                    |
| Track          | Setting the parameters of sending messages to server               |
| Periphery      | Setting the parameters for external sensors connection             |
| Panic button   | Setting the action executed by pressing the alarm button           |
| Messages       | Setting the list of parameters to be sent to server                |
| Roaming        | Setting the tracker's work in roaming                              |
| Traffic        | Setting the parameters to decrease the Internet traffic            |
| Utilities      | Section contains service commands                                  |
| Running status | Section contains detailed information about current device's state |
| Console        | Console which allows to send commands to tracker in text format    |
| Settings       | Setting the parameters for connection to tracker                   |

## Parameters

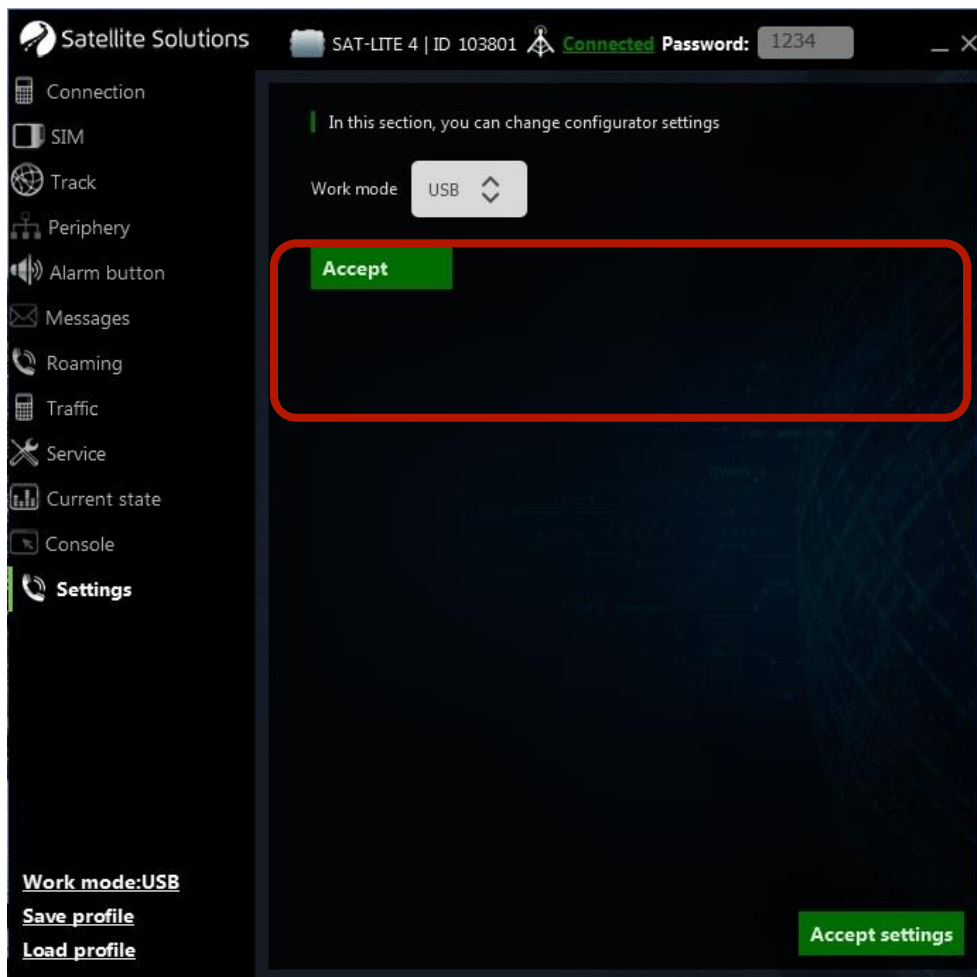
General part of the configurator's main window is used for setting tracker's parameters. This part may vary its view depending on selected section.



### 5.1.1 Connecting to PC

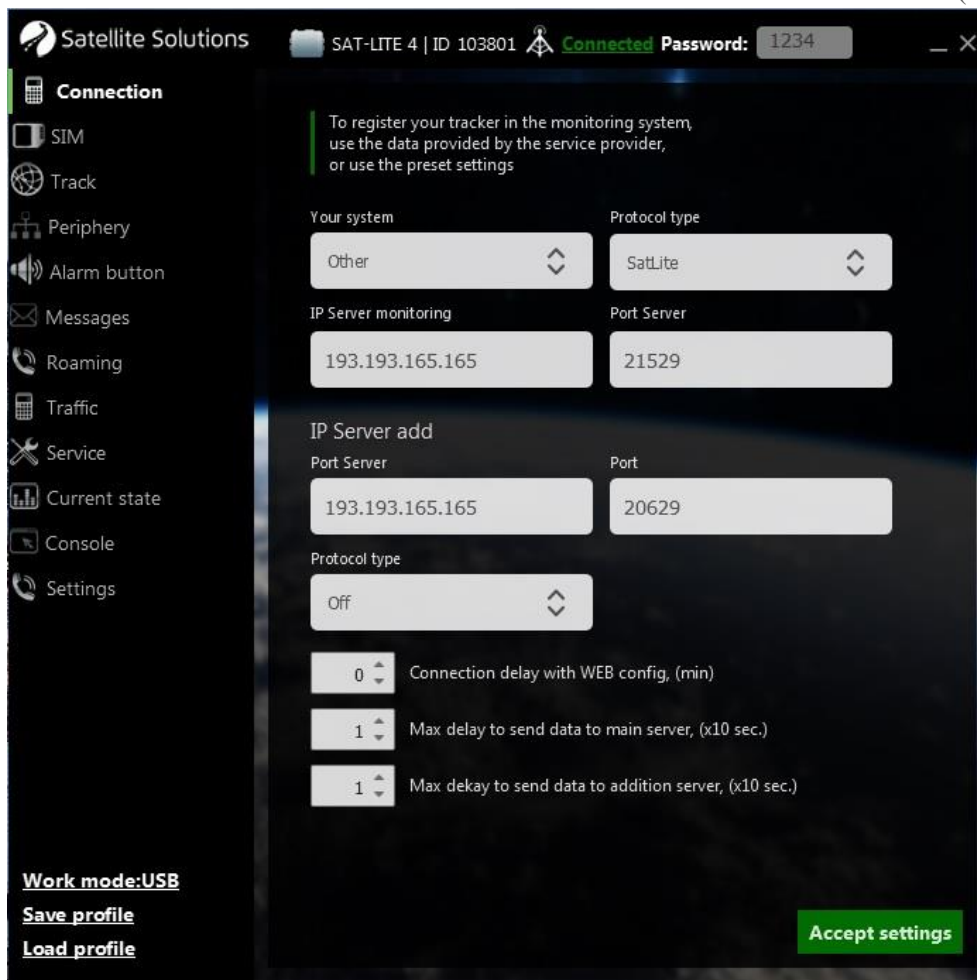
#### USB connection

To connect tracker to PC by USB cable select “USB” in “Settings” section of configurator (see pic. 8), and then connect tracker to PC by USB cable (see pic. 1).



Pic. 8. Choosing a connection type

If connection is done correctly, configurator detects the tracker automatically, and main window would look like it's shown on pic. 9. Also configurator checks current parameters of the tracker and shows its values in corresponding fields.



Pic. 9. Main configurator window with connected tracker

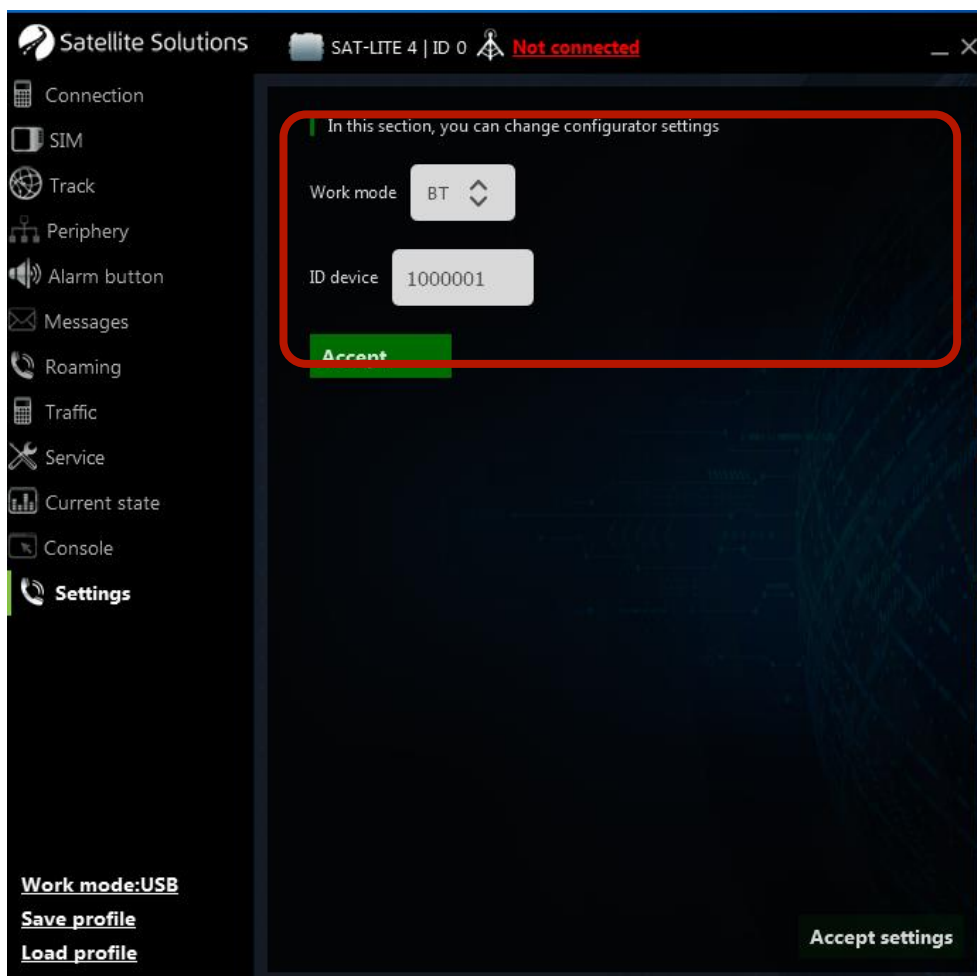
After all needed settings press the “accept settings” button in lower right corner of the main configurator window (see pic. 9), to apply all the changes to tracker and save them to a non-volatile memory for the following use.

### Bluetooth connection

Also tracker can be connected to PC by using Bluetooth type of connection. To do this select “BT” in the “settings” section of configurator and input a serial number of a tracker to connect (see pic.10).

After this Windows will show a message with an offer to set a connection (add a device)<sup>1</sup> between PC and tracker. It is required to allow a connection and wait for a successful installation.

If connection is done correctly, configurator detects the tracker, and main window would look like it's shown on pic. 9. Also configurator checks current parameters of the tracker and shows its values in corresponding fields



Pic. 10. Choosing a connection type

**WARNING. Correct Bluetooth connection needs tracker's firmware not lower than 29 version, and configurator not lower than 2.10 version.**

<sup>1</sup> The appearance of this notification may vary depending on the OS type. More detailed information can be seen in help guide for the corresponding OS version and also on the website of Microsoft company

### 5.1.2 Section“ Connection”

Main window of configurator is shown on pic. 9.

This section contains settings of main and secondary monitoring servers and also the intervals for transmitting data to the server.

Monitoring server settings contain IP-address (or domain name) of a monitoring server in the field “IP address monitoring system”, access port in the field “Port monitoring system” and data transfer protocol (field “protocol type”). Setting the secondary server is not strictly required, but can be used for the duplication of transmitting data.

**WARNING. In case of using domain name as a server address the domain name should start with a letter. Domain names like 1data.yandex.ru would not work correctly.**

Configurator has specific preset profiles for such monitoring systems as Wialon and SAT-CONTROL. In case of using one of these systems one can choose a system in the drop-down list, so the corresponding fields are filled automatically with the following values:

Table 4

Monitoring system parameters

| System name    | Domain name       | Port  |
|----------------|-------------------|-------|
| SAT-CONTROL    | data1.satsol.info | 9877  |
| Wialon hosting | 193.193.165.165   | 21529 |

Tracker supports two data transfer protocols: SatLite or EGTS (binary data transfer protocol described in the Order of the Transport Ministry of Russia from 31.07.2012 № 285”).

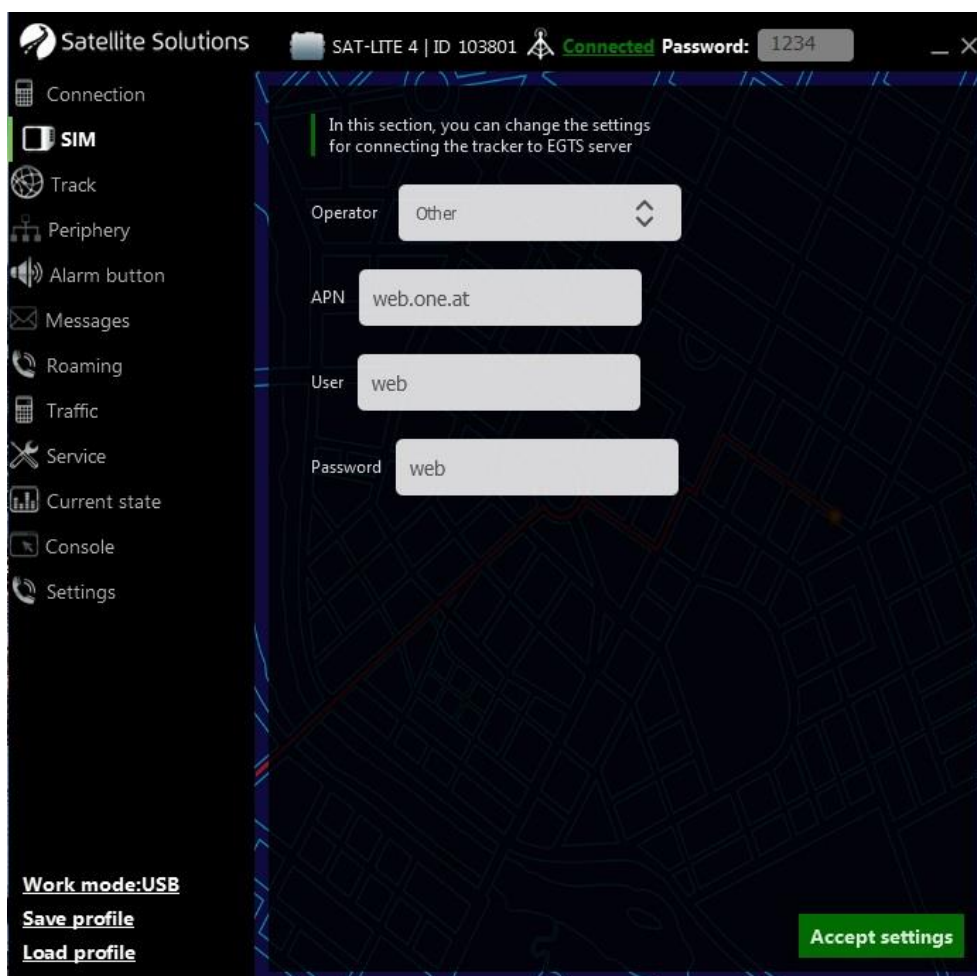
Contact with configurator delay determines an interval of sending a request from tracker to configuration server to check if there any requests for remote connection to tracker. Interval is set in minutes. With zero value tracker doesn't automatically send requests to configuration server.

Data transfer delays for main and secondary servers determine the intervals for collecting data before sending it to server. With value "1" in these parameters data is sent immediately after it's formed on tracker.

**WARNING.** In case of problems with data transfer to the main or secondary servers and collecting data more than 1.5 kB data transfer is done automatically independently from set intervals.

### 5.1.2 Section“ SIM settings”

Main window of configurator for this section is shown on pic. 11.



## Pic. 11. Section “SIM settings”

To set the data transfer to monitoring server it is necessary to set parameters of the access point (fields “APN”, “user name”, “password”) for the currently using SIM-card.

**Attention. Parameters of the access point can be found out from the mobile net operator. These parameters are required for getting the access to Internet. Remote setting by SMS-commands (see section 5.2) doesn’t require these settings.**

Configurator has some specific preset profiles for three mobile operators: MTS, Beeline, Megafon. In case of using SIM-cards of one of these operators one can choose an operator in the drop-down list, so the corresponding fields are filled automatically with the following values:

Table 5

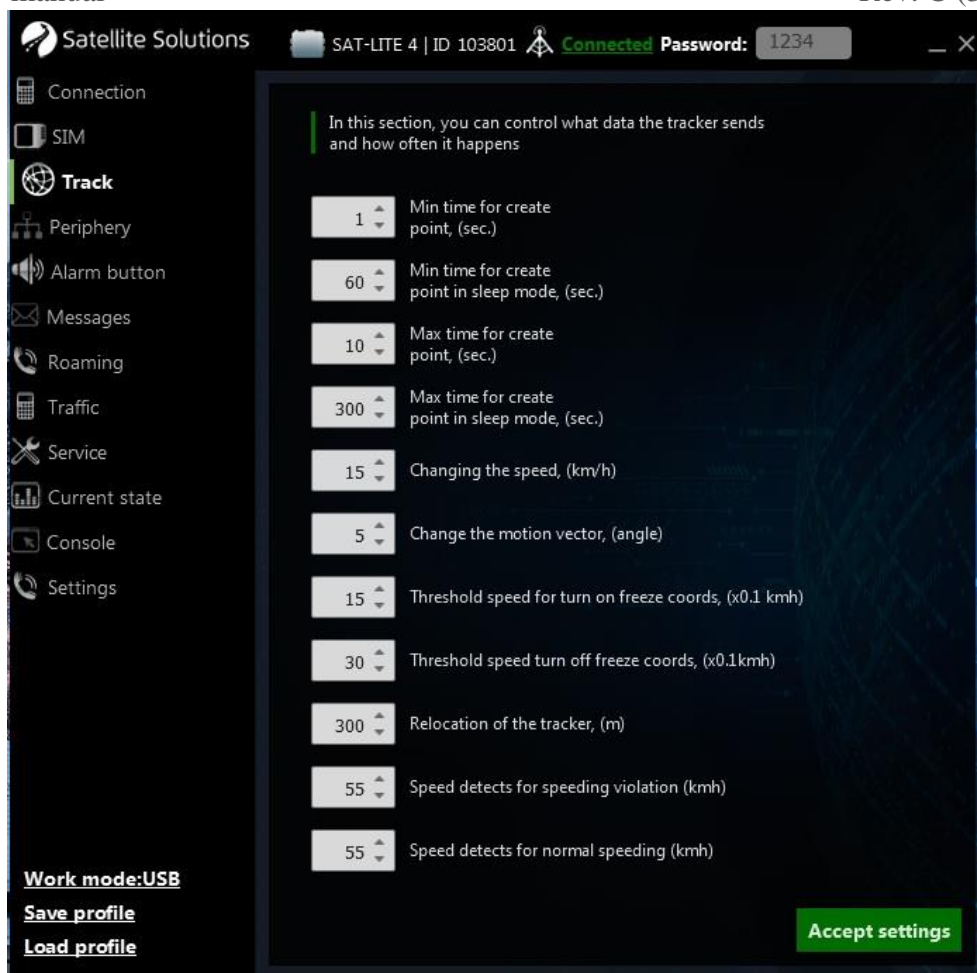
Access point parameters for mobile operators

| Mobile operator | APN                 | User name | Password |
|-----------------|---------------------|-----------|----------|
| MTS             | internet.mts.ru     | mts       | mts      |
| Beeline         | internet.beeline.ru | beeline   | beeline  |
| Megafon         | internet            | gdata     | gdata    |

### 5.1.3 Section“ Track”

Main window of configurator is shown on pic. 12.

This section contains parameters which determine the periodicity of data transfer to monitoring server. Here follow the descriptions of each parameter.



Pic. 12. Section “Track”

### Minimum time for create point

In active mode tracker generates messages (information of every point of path) not more frequent then the value in this parameter.

This period measures in seconds.

### Minimum time for create point in sleep mode

While tracker is in sleep mode, it generates messages not more frequent than the value in this parameter.

This period measures in seconds.

### Maximum time for create point

In active mode tracker generates messages not less frequent than the value in this parameter.

This period measures in seconds.

### **Maximum time for create point in sleep mode**

While tracker is in sleep mode, it generates messages not less frequent than the value in this parameter.

This period measures in seconds.

### **Changing the speed**

When a vehicle's speed is changed by this value an extra message is sent to server. Pay attention that data transfer by this criterion is happening not more frequent than the minimum transmission interval.

This parameter measures in km/h.

### **Change the motion vector**

When a vehicle's motion direction is changed by an angle set in this parameter's value an extra message is sent to server. Pay attention that data transfer by this criteria is happening not more frequent than the minimum transmission interval.

This parameter measures in degrees.

### **Threshold speed for turn on freeze coords**

When vehicle's speed is lower than the value in this parameter tracker turns into a sleep mode and the last location freezes (coordinates don't change).

### **Threshold speed turn off freeze coords**

When vehicle's speed is higher than the value in this parameter tracker gets out of a sleep mode and turns off the location freezing.

### **Relocation of the tracker**



When a vehicle travels a distance more than value set in this parameter (from the last sent message location), an extra message is sent to server. Pay attention that data transfer by this criteria is happening not more frequent than the minimum transmission interval.

This parameter measures in meters.

### **Speed detects for speeding violation**

When speed is higher than this value, a fact of an overspeed is fixing and an extra message is sent to a server.

Measures in km/h.

### **Speed detects for normal speeding**

When speed becomes equal to this value tracker fixes the fact that the speed has reduced to a normal level and sends an extra message to a server.

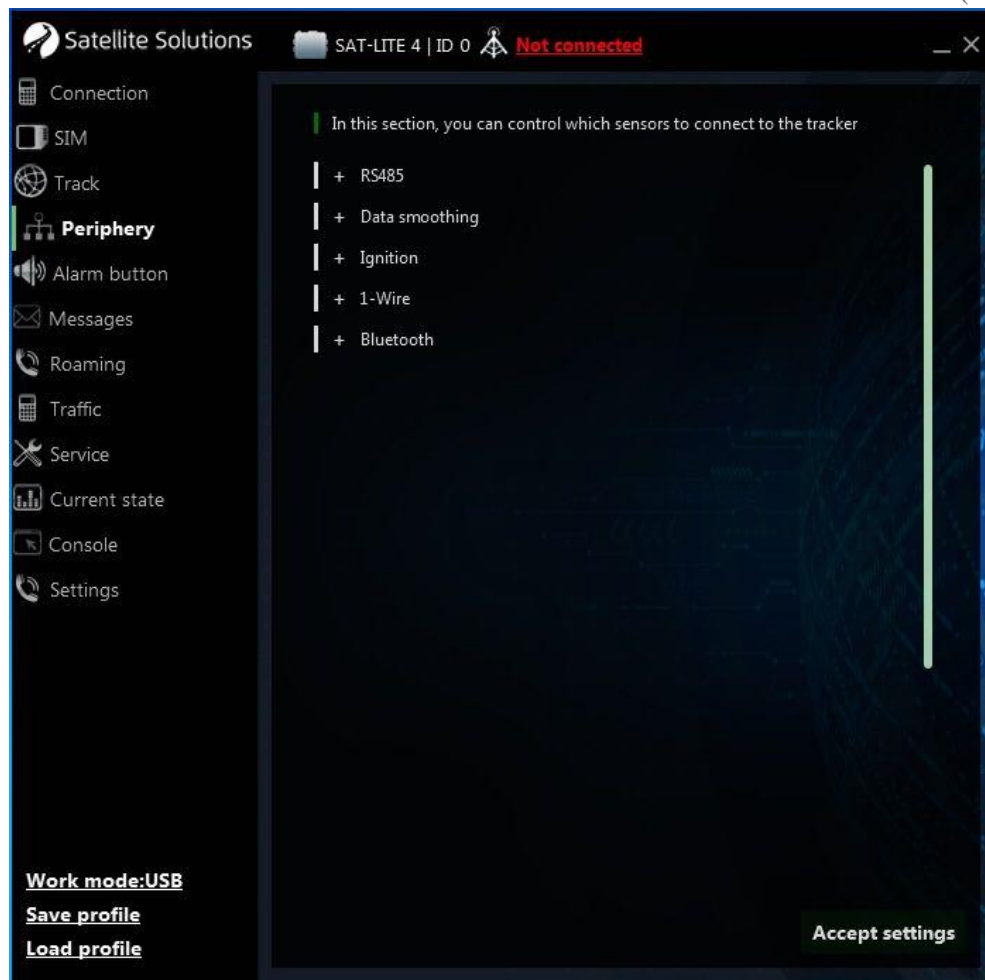
Measures in km/h.

**WARNING. If this threshold has a zero value (default), the normalisation of a speed is detected by the level of 10 kmh lower than the previous parameter's value (over speeding threshold). In this case tracker doesn't send an extra message. Zero value is set as default.**

## **5.1.4 Section“ Periphery”**

Main window of configurator for this section is shown on pic. 13.

“Periphery” section contains parameters for setting external sensors, connected to tracker. To simplify the view of this section and more comfortable use the parameters are grouped into several lists (see table 6).



Pic. 13. Section “Periphery”

Table 6

Parameter lists of Section “Periphery”

| Group name     | Description                                                                                             | Notes             |
|----------------|---------------------------------------------------------------------------------------------------------|-------------------|
| RS485          | Settings for the digital sensors or other devices connected by RS-485 interface (eg. fuel level sensor) | see section 6.4.1 |
| Data smoothing | Settings for analog and frequency inputs and also the parameters for signals processing                 |                   |
| Ignition       | Settings for internal ignition sensor                                                                   | see section 6.3   |
| 1-Wire         | Settings for digital sensors or other devices connected by 1-Wire interface                             | see section 6.4.2 |

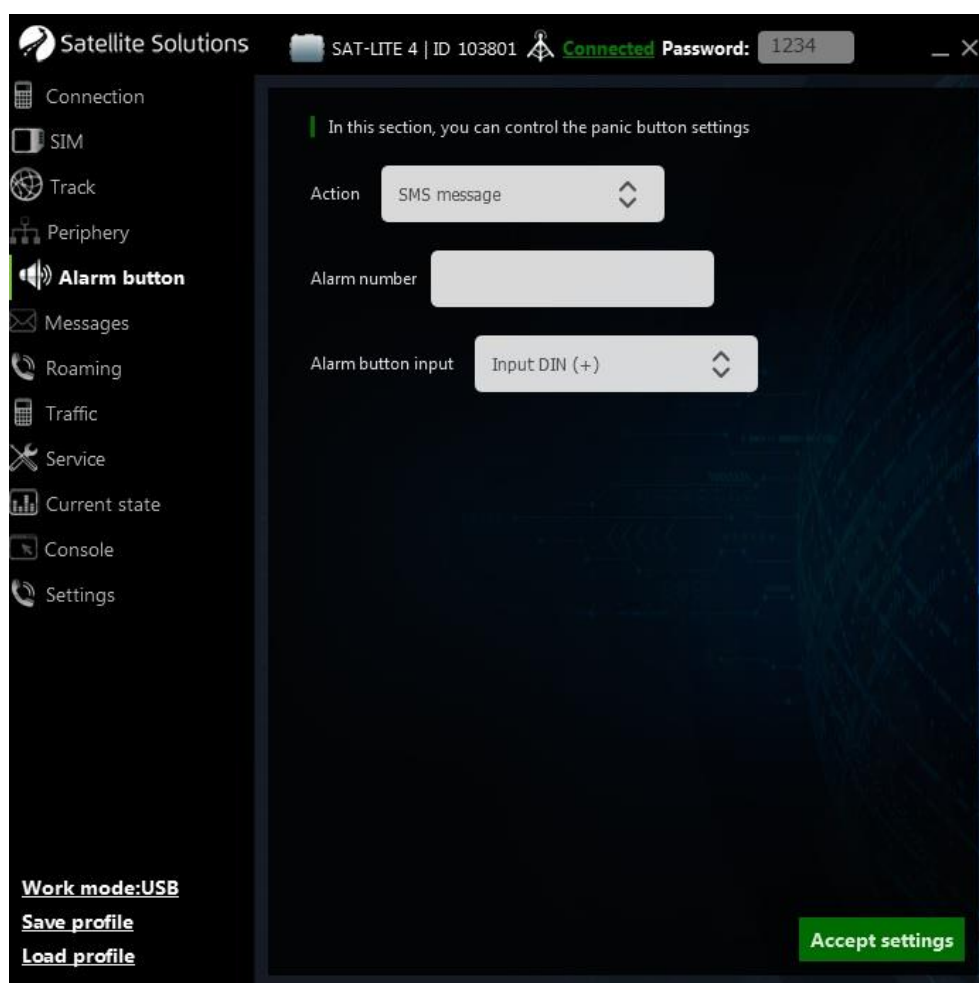
|           |                                                           |  |
|-----------|-----------------------------------------------------------|--|
| Bluetooth | Setting the connection with external devices by Bluetooth |  |
|-----------|-----------------------------------------------------------|--|

### 5.1.5 Section “Alarm button”

Main window of configurator for this section is shown on pic. 14.

This section allows to customise different actions for the alarm button. In case the button was pressed tracker can execute one of the following actions (chosen in the drop-down list “Action”):

- send alarm message to the monitoring server;
- send alarm SMS (or call) to the phone number;
- send alarm messages to server and phone number at the same time.



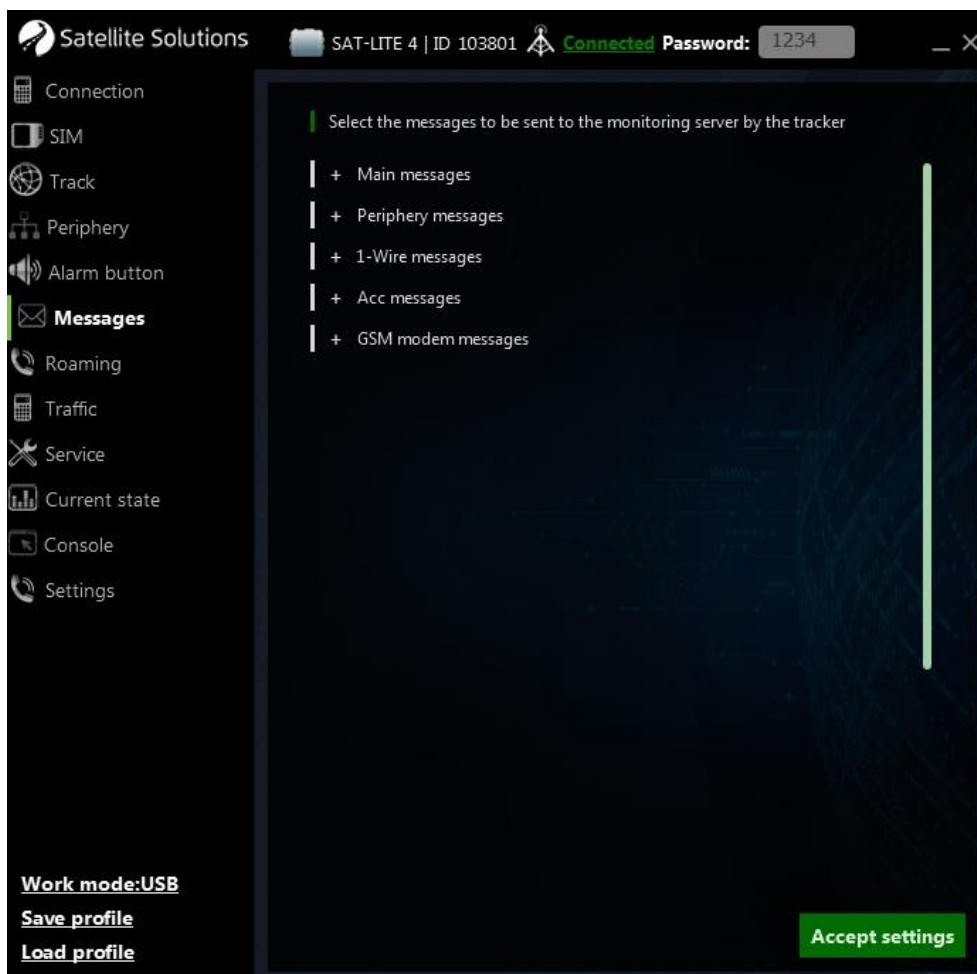
Pic. 14. Section “Alarm button”

Tracker allows to set one phone number to send messages or call to.

**WARNING. Phone number should start with country code (eg., +7 for Russia).**

### 5.1.6 Section“ Messages”

Main window of configurator for this section is shown on pic. 15.



Pic. 15. Section “Messages”

“Messages” section allows customising the list of data to be sent to monitoring server (this data will be shown on dispatcher’s PC). To make settings more comfortable, parameters of this section are grouped into several lists. Short description of these lists can be seen in table 7 and pictures from 15-a to 15-e.

**WARNING. “Messages” section allows customising additional data. Information about vehicle’s location, speed and direction of motion will be sent independently from these settings.**

**WARNING. Settings from this section directly affect the information shown on dispatcher’s PC. In case some data isn’t available to dispatcher the first action is to check if the transfer of this data is allowed in this section.**

Table 7

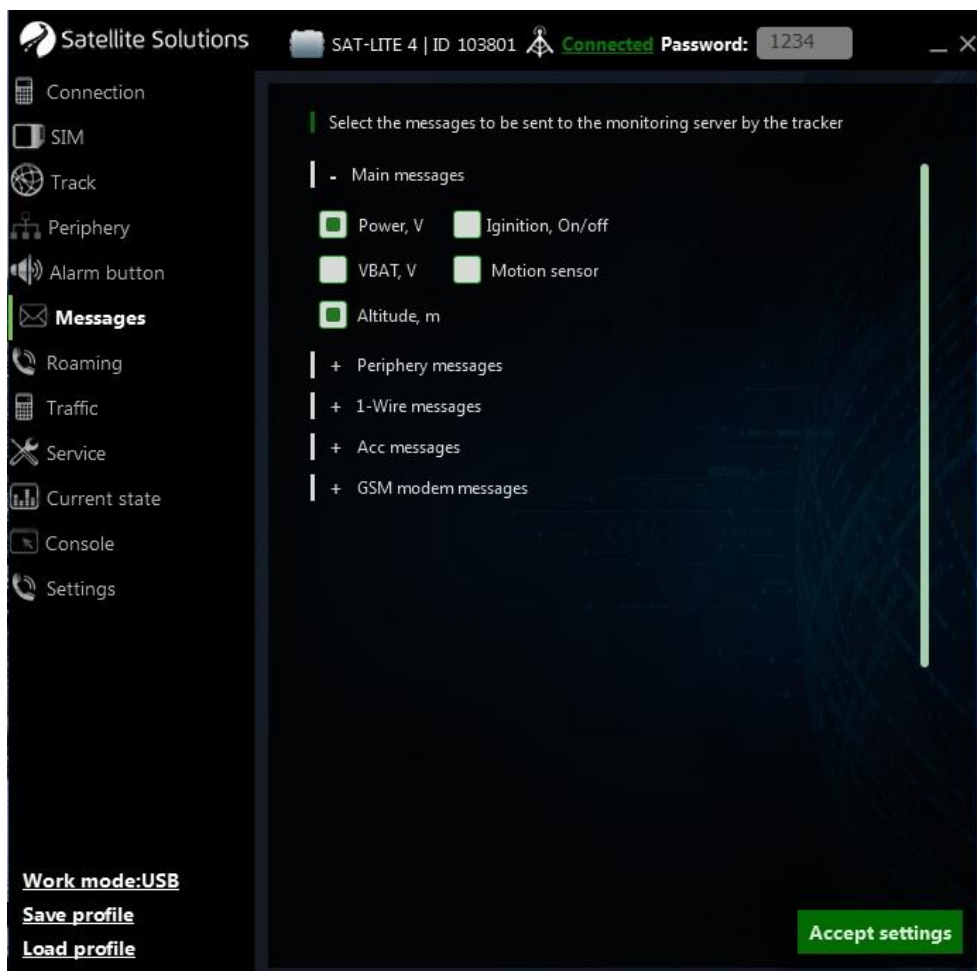
Parameter groups of section”Messages”

| Group name         | Description                                                                                 | Notes                       |
|--------------------|---------------------------------------------------------------------------------------------|-----------------------------|
| Main messages      | Basic information (Reserve battery voltage, ignition sensor status, etc) transfer to server | See pic. 15-a               |
| Periphery messages | Setting the transfer of external sensors measures                                           | See pic. 15-b and section 6 |
| 1-Wire messages    | Selection of temperature sensors which data should be sent to server                        | See pic. 15-c and section 6 |
| Acc messages       | Setting the internal accelerometer data transfer                                            | See pic. 12-d               |
| GSM modem messages | Selection of the additional information from GSM modem to be sent to server                 | See pic. 12-e               |

“Main messages” list (see pic.12-a) allows turning on/off the transfer of such information as:

- voltage of the ignition circuit;
- voltage of the reserve internal tracker’s battery;
- ignition sensor’s status (on/off). This state is determined by result of measuring the ignition circuit voltage analysis, (see section 6);

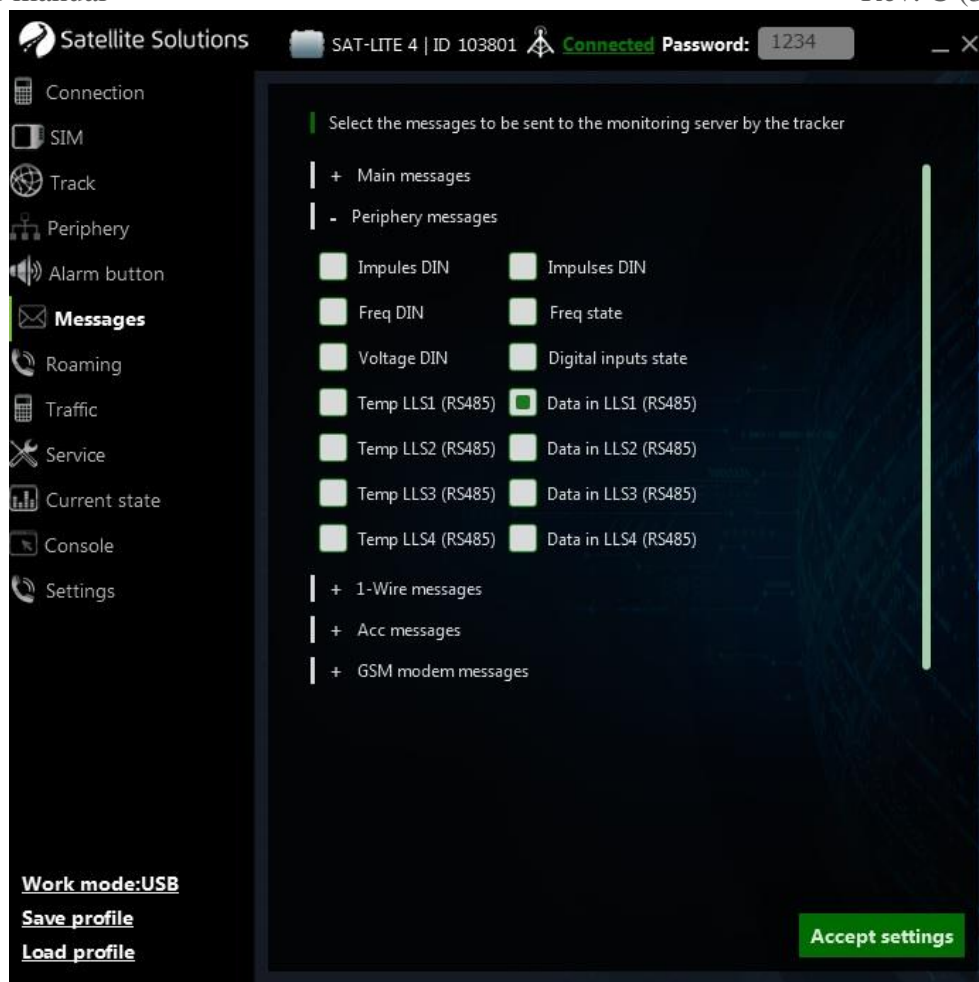
- motion sensor's status (moving/static). This state is determined by the internal accelerometer data analysis;
- height over the sea level.



Pic. 15-a. “Main messages” list

These parameters are not required for tracker's work, but can provide additional information about vehicle to dispatcher.

“Periphery messages” list (see pic. 15-b) allows turning on/off the transfer of data from additional external sensors connected to tracker. These parameters are described in more detail in section 6 about connection additional devices to analog and digital interfaces of tracker.

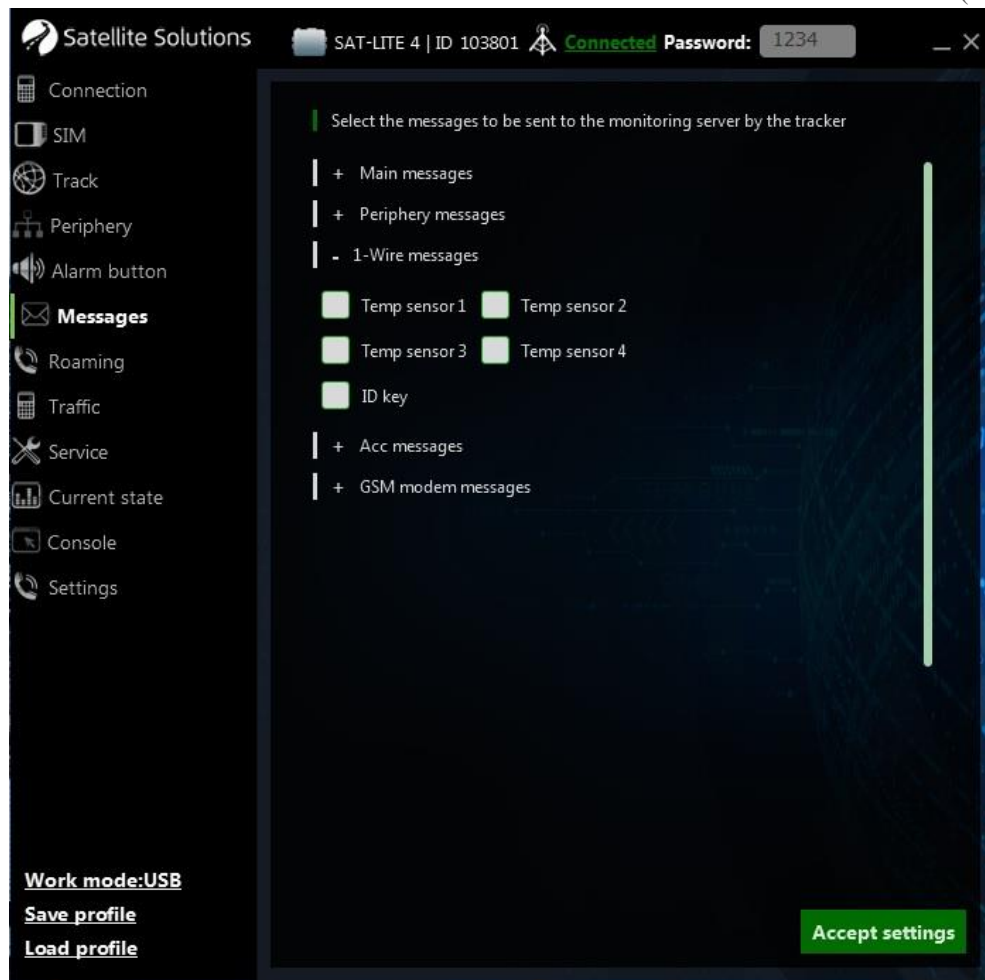


Pic. 15-b. “Periphery messages” list

Tracker is able to work with four temperature sensors connected by 1-Wire interface (see section 6.5.2) and send the results of their measures to monitoring server. Results are sent in celsius degrees. Also 1-Wire interface allow connecting the ID-mark scanner (see section 6.5.2). In this case transferred data contains unique ID of the mark/key.

**WARNING. ID-mark scanner has a higher priority than temperature sensors. In case when data transfer is allowed both for temperature sensors and ID-mark scanner, tracker sends data only from ID-mark scanner.**

To customise transferred data there are checkboxes in this section, which allow turning on/off data transfer from one or another device (see example for temperature sensor 1 on pic. 15-c )

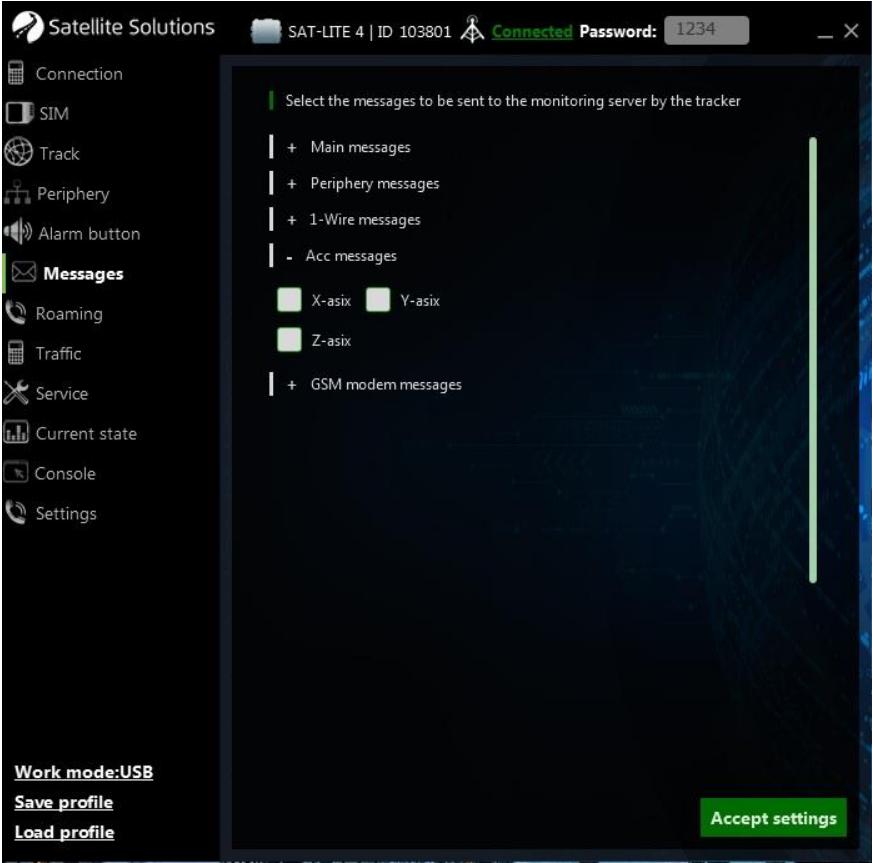


Pic. 15-c. "1-Wire messages" list

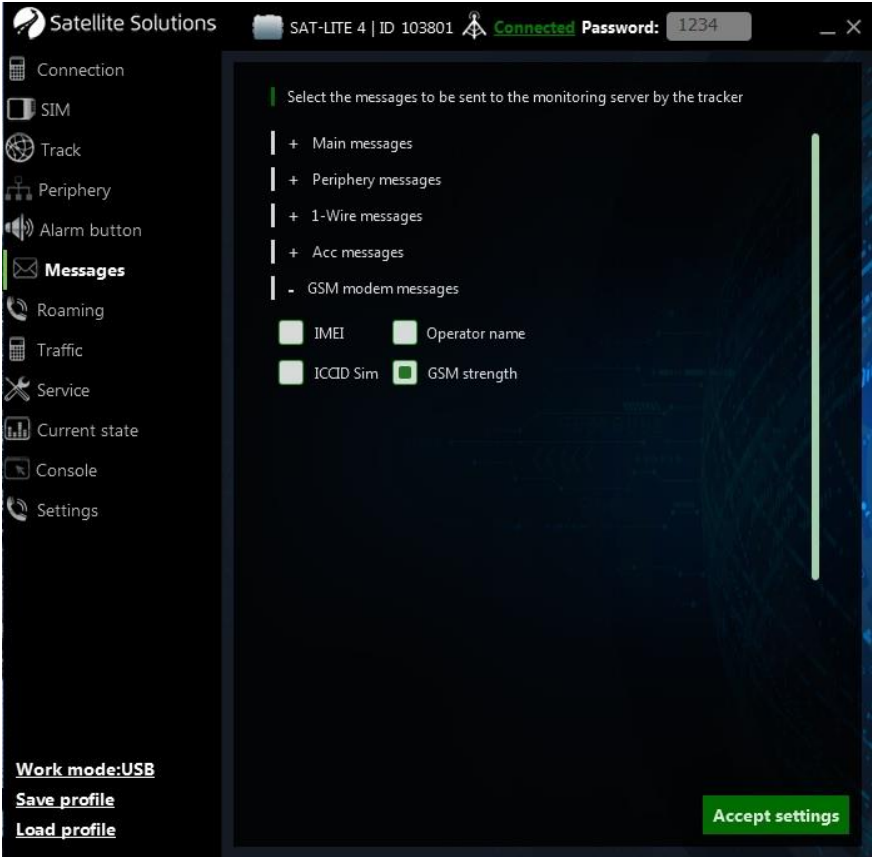
Last two lists shown on pic.15-d and 15-e allow turning on/off the transfer of the following data:

- acceleration along the X, Y, Z axis;
- unique IDs of internal GSM modem (IMEI) and inserted SIM-card (ICCID);
- mobile operator name and GSM signal quality (0 to 100%).





Pic.15-d. “Acc messages” list



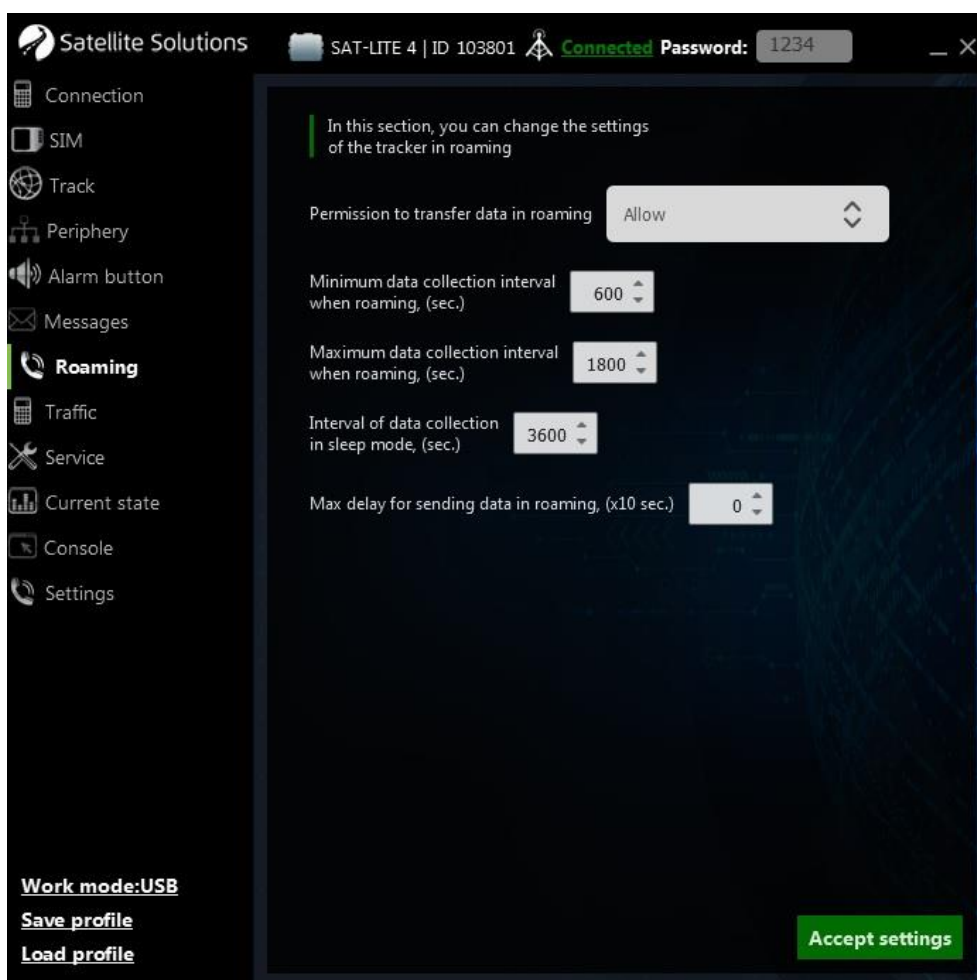
Pic.15-e. “GSM modem messages” list

**WARNING.** “GSM modem messages” list parameters are not strictly required to be sent to server, but it’s strongly recommended to allow sending messages with GSM signal level and number of an active SIM-card, because this information is very helpful for remote diagnostics of tracker.

### 5.1.7 Section “Roaming”

Main window of configurator for this section is shown on pic. 16.

This section contains settings for tracker’s work in roaming.



Pic. 16. Section “Roaming”

Tracker’s work in roaming can be:

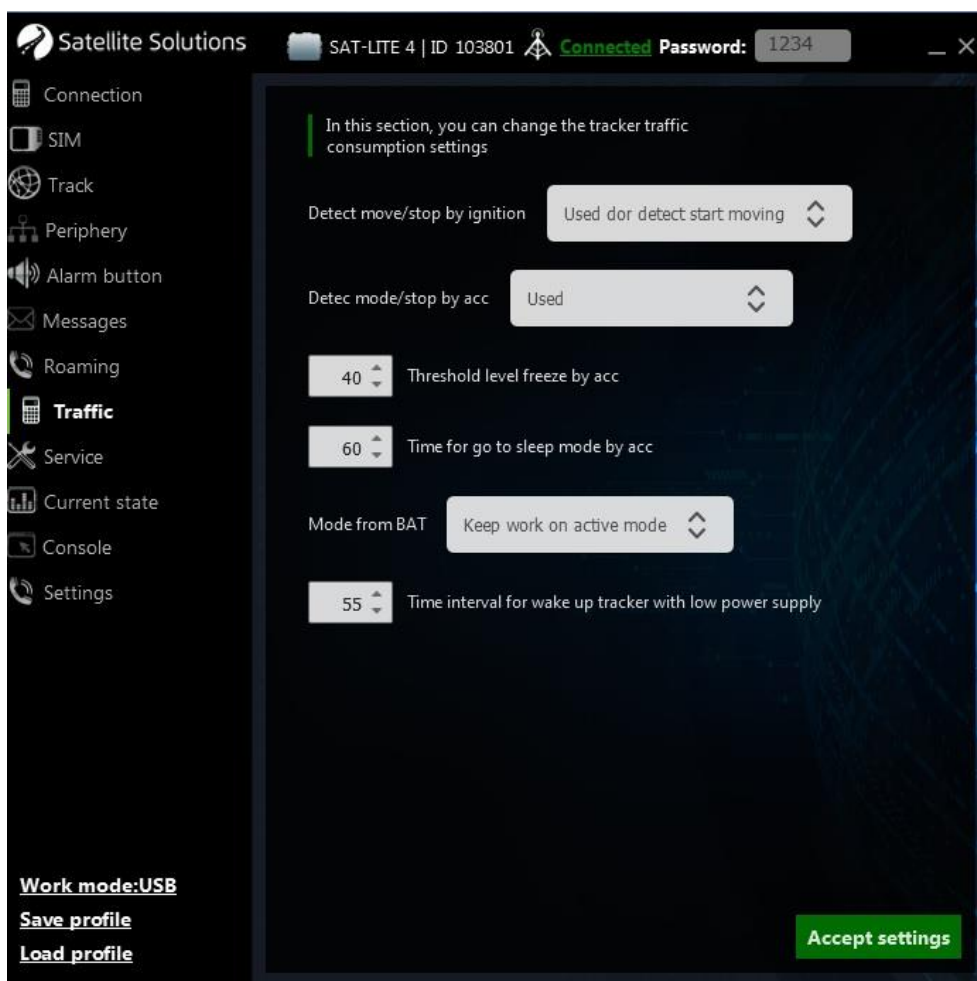
- Entirely forbidden, in this case all generated messages are saving to a non-volatile memory until device comes back to a home GSM network;

- Allowed with a set of parameters of data transfer periodicity (coordinates to a home network parameters from section 5.1.3).

**WARNING. Internal memory is organised as a circle buffer with capacity of 150 000 points. In case of an overflow new messages are recorded over the oldest ones.**

### 5.1.8 Section“ Traffic”

Main window of configurator for this section is shown on pic. 17.



Pic. 17. Section “Traffic”

To decrease a number of sent messages while the vehicle’s stop there’s an ability to turn into a sleep mode. This section of configurator allows setting the criteria of turning into a sleep mode and also a frequency of data transfer in the mode of a low power usage.

#### **Detecting a motion/stop by the ignition signal**

Allows a tracker to turn into a sleep mode by an ignition signal. When tracker detects the ignition signal is off, it turns into a sleep mode.

### **Detecting a motion/stop by accelerometer**

Allows a tracker to turn into a sleep mode automatically by detecting a stop by data from internal accelerometer.

### **Threshold of a freezing by accelerometer data and time of being in rest**

Threshold of a freezing by accelerometer data and time of being in rest allow setting the criteria of turning into a sleep mode while using accelerometer as a stop sensor.

### **Working mode while powered from internal battery**

This parameter specifies a working mode for tracker when there's no external power.

### **Working interval after detecting a signal from motion sensor or tilt sensor**

A time for active tracker's work after detecting a motion by signal from one of the motion sensors (ignition signal or accelerometer data) and by exceeding a preset tilt angle (see the following parameter)

### **Changing of the tilt angle to wake the tracker**

A tilt angle threshold to wake the tracker when it's exceeded.

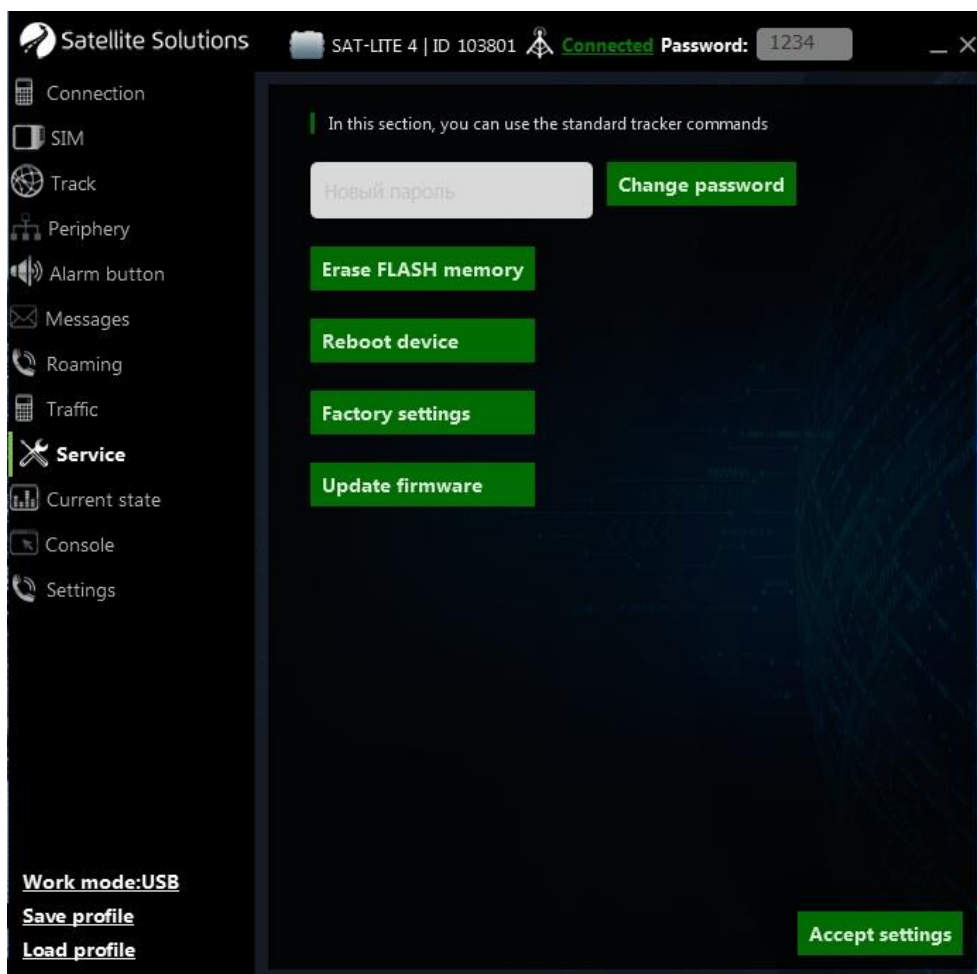
### **Wake periodicity while powered from internal battery**

In case of using a sleep mode tracker can automatically turn back into an active mode with set periodicity for vehicle parameters control and transfer this data to a server. This parameter allows setting the periodicity of waking up the tracker while it's powered from internal battery.

### **Wake periodicity while powered from extremely low battery**

This parameter is the same to the previous one, but can be used when tracker works with internal battery with extremely low charge.

Main window of configurator for this section is shown on pic. 18.



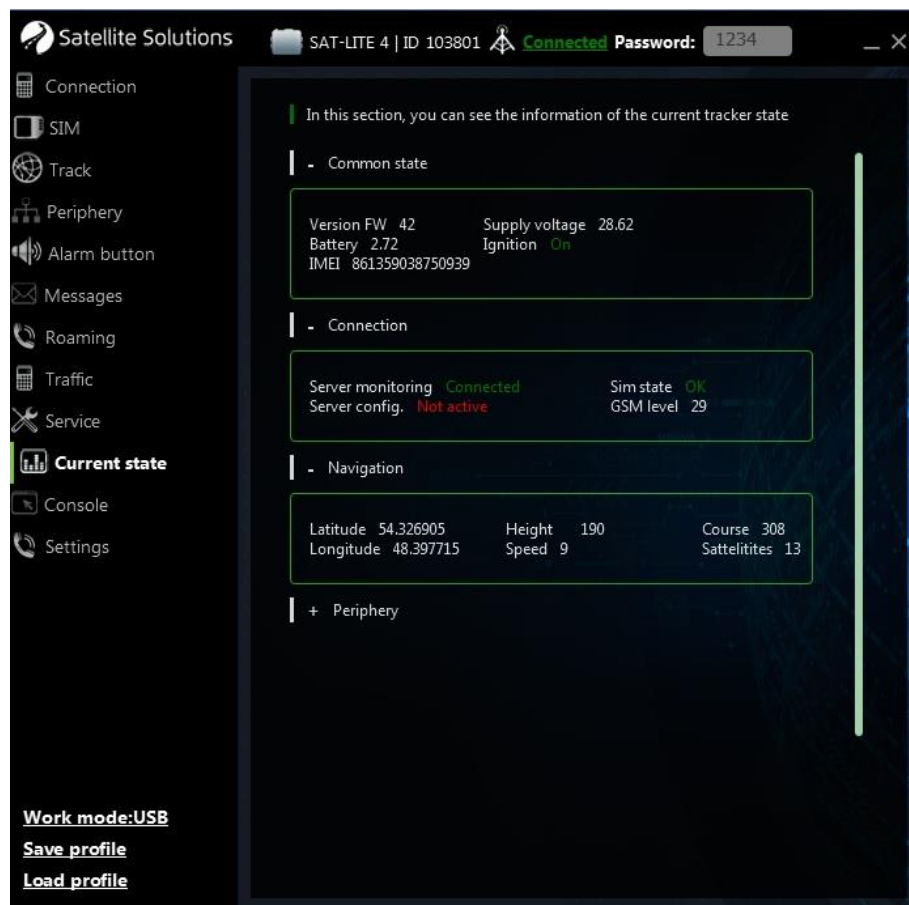
Pic. 18. Section “Service”

This section allows sending to tracker some of the following service commands:

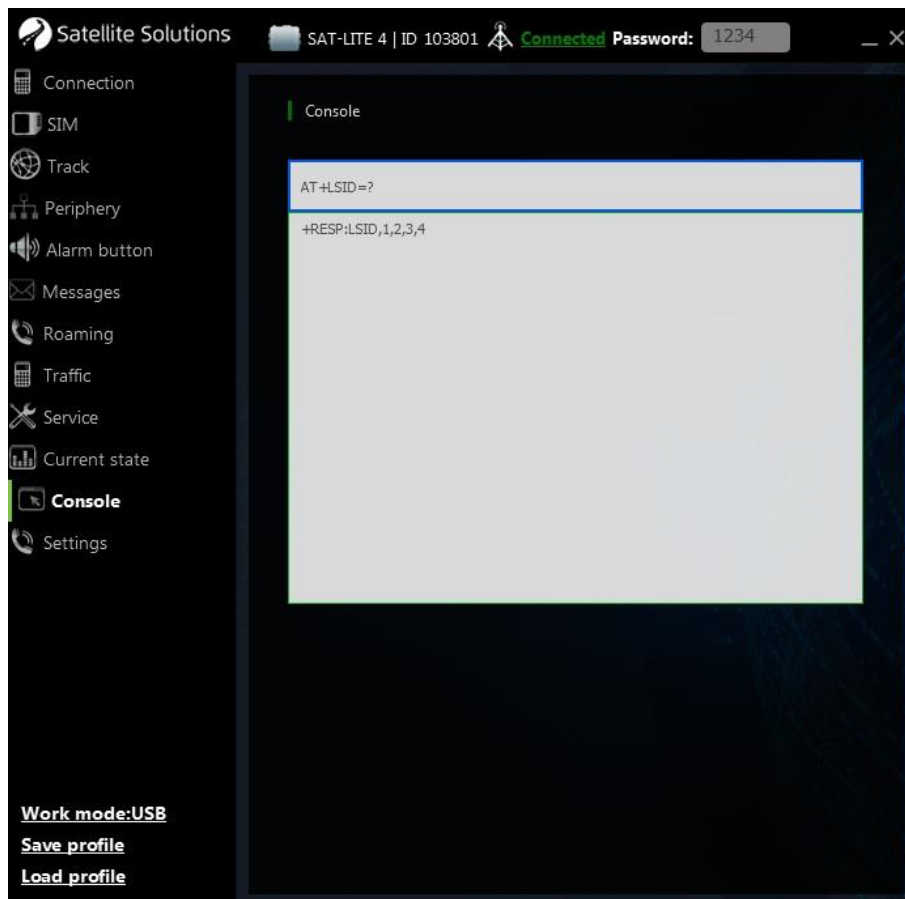
- “Change password” allows to change a user password to work with tracker;
- “Erase FLASH memory” allows clearing the internal non-volatile memory which stores messages to send to server (eg. messages collected while working in roaming when data transfer is forbidden);
- “Reboot device” executes full reboot of a tracker;
- “Factory settings” skips all the user settings and restores the default settings of a tracker;
- “Update firmware” turns the tracker to a firmware updating mode.

### 5.1.10 Sections “Current state” and “Console”

Main window of configurator for these sections are shown on pic. 19 and 20.



Pic. 19. Section “Current state”



Pic. 20. Section “Console”

“Current state” section allows getting full information about current state of tracker and its nodes (battery, GSM module, GNSS module etc) and connected external sensors.

“Console” section allows sending text commands to tracker for fast setting.

## 5.2 Remove configuration

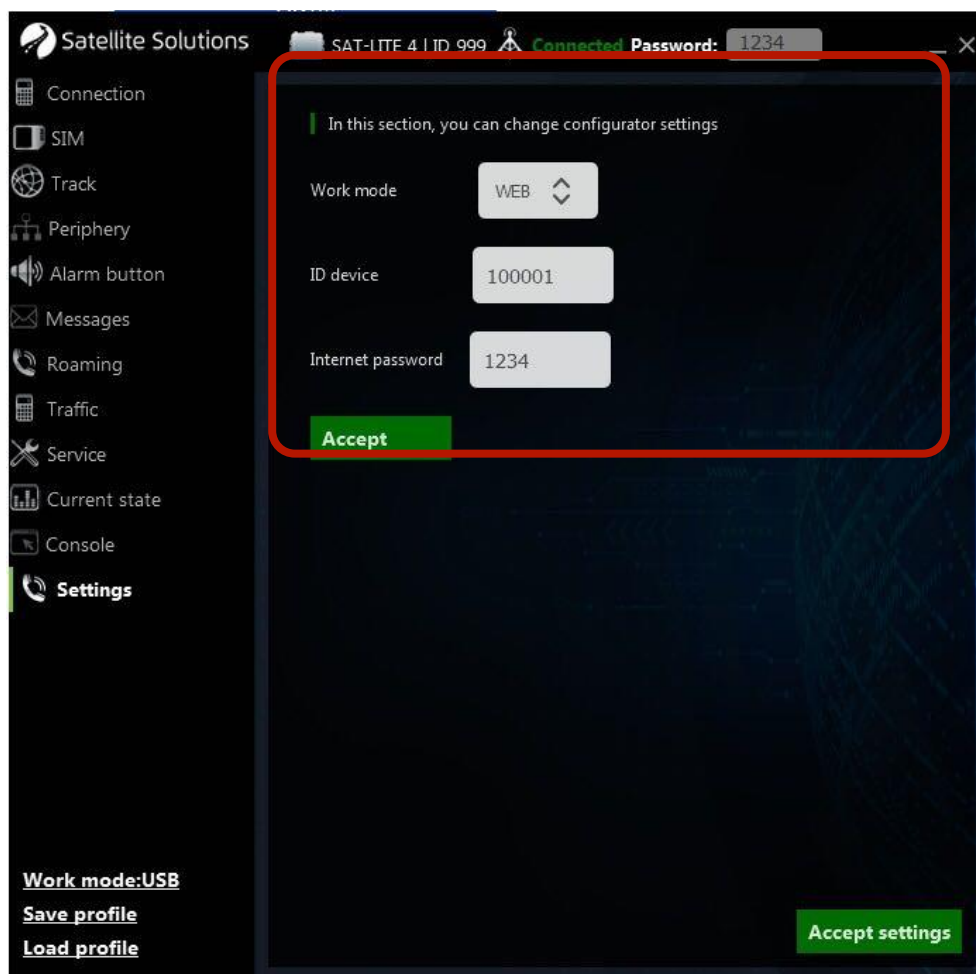
Remote setting of a tracker can be done by configurator and by sending SMS to the device.

**WARNING.** Each remote command requires a user password input. If password is wrong, command will be ignored.

**WARNING.** Default user password is 1234. It is strongly recommended to customise a password before working with tracker.

### 5.2.1 Setting by using Configurator

Remote setting by configurator uses the TCP-connection with tracker. To do this select “WEB” mode in the “Settings” section of configurator, then indicate a serial number of device and user password (see pic.21). After some time tracker connects to configurator.



Pic. 21. Choosing a connection type

In case of successful connection configurator checks current parameters of the tracker and shows its values in corresponding fields. Main window looks like it's shown on pic. 9.

The following setting is the same to the previous sections.

### 5.2.2 Setting by using SMS

**WARNING.** “Space” symbol is forbidden in all SMS commands.



## Connection parameters setting

The following commands are used to set the connection parameters:

|                       |                       |                                                                                                                             |
|-----------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Setting an APN</b> | AT+SGDT=PSW,p1,p2,p3, | <b>PSW</b> – user password<br><br><b>p1</b> – mobile operator's APN<br><br><b>p2</b> - username<br><br><b>p3</b> - password |
|-----------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|

**WARNING.** If the parameters **p1**, **p2** and **p3** are left empty, the access point choosing will be done automatically depending on the network tracker is registered in.

Examples of using the command of choosing the access point:

```
AT+SGDT=1234,internet.beeline.ru,beeline,beeline,
```

```
AT+SGDT=1234,
```

where

- 1234 — user password;
- internet.beeline.ru — APN host name;
- beeline — APN user name;
- beeline — APN password.

| Setting the server IP-address |                      |                            |
|-------------------------------|----------------------|----------------------------|
| main server                   | AT+SMSD=PSW,p1,p2,p3 | <b>PSW</b> – user password |

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| secondary server                              | AT+SASD=PSW, p1, p2, p3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p><b>p1</b> – domain name or IP-address</p> <p><b>p2</b> – port number</p> <p><b>p3</b> – protocol type</p> <ul style="list-style-type: none"><li>• Off – data transfer to this server is forbidden (only for command AT+SASD);</li><li>• SLT – SatLite protocol;</li><li>• EGTS – EGTS protocol.</li></ul> |
| Server connection periodicity                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                              |
| AT+SSPR=PSW, p1, p2, p3                       | <p><b>PSW</b> – user password</p> <p><b>p1</b> – Configurator TCP connection delay, min</p> <ul style="list-style-type: none"><li>• 0 – only by user command</li><li>• 10080 – maximal value</li></ul> <p><b>p2</b> – Maximal main server transfer delay, x10 sec</p> <ul style="list-style-type: none"><li>• 0 – default value: 10 sec;</li><li>• 17280 – maximal value</li></ul> <p><b>p3</b> – maximal secondary server transfer delay, x10 sec</p> <ul style="list-style-type: none"><li>• 0 – default value: 10 sec;</li><li>• 17280 – maximal value</li></ul> |                                                                                                                                                                                                                                                                                                              |
| Setting the working period in deep sleep mode |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                              |
| AT+BPWR=PSW, p1, p2, p3, p4, p5               | <p><b>PSW</b> – user password</p> <p><b>p1</b> – Tracker waking periodicity when powered from vehicle mains with critically low voltage or from internal battery with state charge, x10 min:</p> <ul style="list-style-type: none"><li>• 0 — waking is forbidden;</li></ul> <p>(continue on the next page)</p>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                              |

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+BPWR=PSW,p1,p2,<br/>p3,p4,p5</p> | <ul style="list-style-type: none"> <li>• 12 – default value;</li> <li>• 255 – maximal value.</li> </ul> <p><b>p2</b> — reserved</p> <p><b>p3</b> – tracker waking periodicity when powered from internal battery with critically low charge, x60 min:</p> <ul style="list-style-type: none"> <li>• 0 — waking is forbidden (default value);</li> <li>• 255 — maximal value.</li> </ul> <p><b>For firmware 40 or higher:</b></p> <p><b>p4</b> – tracker's behavior with a normally charged battery:</p> <ul style="list-style-type: none"> <li>· 0 – do not abort working</li> <li>· 1 – turn to energy saving mode for a p1 time</li> <li>· 2 – turn to energy saving mode for a p1 time or until motion sensor triggers</li> <li>· 3 - turn to energy saving mode for a p1 time or until motion sensor or incline sensor triggers</li> </ul> <p><b>p5</b> – incline sensor threshold, degree</p> <ul style="list-style-type: none"> <li>· 1 – 180 – value range</li> <li>· 3 – default value</li> </ul> <p><b>For firmware lower than 40:</b></p> <p><b>p4, p5</b> — reserved</p> |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**WARNING.** In case of using domain name as a server address the domain name should start with a letter. Domain names like 1data.yandex.ru would not work correctly.

Examples of using the commands for server IP-address setting:

AT+SMSD=1234,data.yandex.ru,3498,SLT

AT+SASD=1234,data1.google.com,13265,EGTS

where

- 1234 — user password;
- data.yandex.ru and data1.google.com — server domain name;
- 3498 and 13265 — access ports;
- STL and EGTS — data transfer protocol types.

### Setting the data transfer parameters

The following commands are used to set the criteria for sending data to server (current location, speed, motion direction, sensor data, etc.):

| Setting the parameters of data generating criteria |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SMTD=PSW,p1,p2,p3,<br>p4,p5,p6,p7,p8,p9,        | <p><b>PSW</b> – user password</p> <p><b>p1</b> — In active mode tracker generates messages not more frequent than the value in this parameter, sec</p> <p><b>p2</b> – While tracker is in sleep mode, it generates messages not more frequent than the value in this parameter, sec</p> <p><b>p3</b> – In active mode tracker generates messages not less frequent than the value in this parameter, sec</p> <p><i>(continue on the next page)</i></p> |

|                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Firmware lower than 40:</b></p> <p>AT+SMTD=PSW,p1,p2,p3,p4,p5,p6,p7,p8,p9,</p> | <p><b>p4</b> – While tracker is in sleep mode, it generates messages not less frequent than the value in this parameter, sec</p> <p><b>p5</b> — When a vehicle's speed is changed by this value an extra message is generated, but not more frequent than the minimum transmission interval, km/h</p> <p><b>p6</b> - When a vehicle's motion direction is changed by an angle set in this parameter's value an extra message is generated, but not more frequent than the minimum transmission interval, degrees</p> <p><b>p7</b> – When speed is lower than this parameter's value location fixation turns on, x0.1 km/h</p> <p><b>p8</b> - When speed is higher than this parameter's value location fixation turns off, x0.1km/h</p> <p><b>p9</b> – When a vehicle travels a distance more than value set in this parameter (from the last sent message location), an extra message is sent to server, but not more frequent than the minimum transmission interval, m</p> |
| <p><b>Generating an immediate message while overspeeding</b></p>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>AT+OVSP=PSW,p1,p2</p>                                                             | <p><b>PSW</b> – user password</p> <p><b>p1</b> – speed threshold to generate an immediate message when speed is higher than, km/h:</p> <ul style="list-style-type: none"> <li>· 100 – default value</li> <li>· 300 – maximal value</li> </ul> <p style="text-align: right;"><i>(continue on the next page)</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                     |                                                                                                                                                                                                                                                |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+OVSP=PSW, p1, p2 | <p><b>p2</b> – speed value, when speed is equal to this, an immediate message showing that speed has normalised is generated, km/h:</p> <ul style="list-style-type: none"> <li>• 100 – default value</li> <li>• 300 – maximal value</li> </ul> |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**WARNING.** An event of over speeding is formed 1 time when speed becomes higher than a threshold. To form a next over speeding message speed must become lower to a p2 level (AT+OVSP command).

**WARNING.** If p2 value (AT+OVSP command) is set equal to 0, a normalising level is meant to be equal to (p1 – 10) km/h, but the message about speed normalising is not generating.

Example of using the command of data transfer parameters setting (send a message in a sleep mode once a 10 sec):

AT+SMTD=1234,,10,,10,,,,

where

- 1234 — user password;
- 10 — (p2) — in sleep mode messages are generated not more frequent than 1 time per 10 sec;
- 10 — (p4) — in sleep mode messages are generated not less frequent than 1 time per 10 sec.

### Setting the connection parameters for roaming

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+SRMN=PSW,p1,p2,p3,<br/>p4,p5,p6,p7,p8,</p> | <p><b>PSW</b> – user password</p> <p><b>p1</b> – data transfer permission in roaming:</p> <ul style="list-style-type: none"> <li>• 0 – roaming transfer is forbidden;</li> <li>• 1 – roaming transfer is allowed;</li> </ul> <p><b>p2-p4</b> – reserved</p> <p><b>p5</b> — in active mode messages from device are generated not more frequently than the value of this parameter, sec</p> <p><b>p6</b> — in active mode messages from device are generated not less frequently than the value of this parameter, sec</p> <p><b>p7</b> — in sleep mode messages from device are generated with periodicity equal to the value of this parameter, sec</p> <p><b>p8</b> – maximal data transfer delay, x10 sec:</p> <ul style="list-style-type: none"> <li>• 0 – default value: 10 sec;</li> <li>• 17280 – maximal value.</li> </ul> |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Setting the location freezing criteria

|                                      |                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+SSLP=PSW,p1,p2,<br/>p3,p4,</p> | <p><b>PSW</b> – user password</p> <p><b>p1</b> – permission of turning into a sleep mode by ignition signal</p> <p><b>p2</b> – permission of turning into a sleep mode by internal accelerometer value</p> <p style="text-align: right;"><i>(continue on the next page)</i></p> |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                |                                                                                                                                                                   |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SSLP=PSW,p1,p2,<br>p3,p4,                                                   | <p><b>p3</b> – accelerometer threshold value to turn on the location freezing</p> <p><b>p4</b> – time of being in rest after which the freezing turns on, sec</p> |
| <b>Setting the list of messages to send to server</b>                          |                                                                                                                                                                   |
| AT+MSG1=PSW,p1,p2,p3,<br>p4,p5,p6,p7,p8,p9,p10,<br>p11,p12,p13,p14,<br>p15,p16 | <p><b>PSW</b> – user password</p> <p>See description below</p>                                                                                                    |
| AT+MSG2=PSW,p1,p2,p3,<br>p4,p5,p6,p7,p8,p9,p10,<br>p11,p12,p13,p14,<br>p15,p16 |                                                                                                                                                                   |

Each parameter is a part of a bit mask. Every bit mask contains high and low octets. Inside an octet there is a bit number for each parameter. List of parameters with indicated octet and bit number is in table 9.

To include several parameters summarise their bit numbers inside one octet and convert this number into a hexadecimal. Then substitute these numbers into bit masks of commands AT+MSG1 and AT+MSG2.

Table 9

List of parameters for AT+MSG1 и AT+MSG2<sup>2</sup> commands

| Parameter name | Short name | Index number | Command | Bit mask | Bit number |
|----------------|------------|--------------|---------|----------|------------|
| Height         | alt        | 0            | AT+MSG1 | p1 (L)   | 1          |

<sup>2</sup> In the column “Bit mask” symbol “L” describes lower octet, symbol “H” describes high octet



|                 |           |   |         |        |   |
|-----------------|-----------|---|---------|--------|---|
| Input voltage   | v_in      | 1 | AT+MSG1 | p1 (L) | 2 |
| Ignition sensor | ign_state | 2 | AT+MSG1 | p1 (L) | 4 |

Table 9 (continue)

| Parameter name                       | Short name | Index number | Command | Bit mask | Bit number |
|--------------------------------------|------------|--------------|---------|----------|------------|
| Battery voltage                      | vbat       | 3            | AT+MSG1 | p1 (L)   | 8          |
| Universal input voltage              | adc1       | 4            | AT+MSG1 | p1 (H)   | 1          |
| Universal input frequency            | freq1      | 5            | AT+MSG1 | p1 (H)   | 4          |
| Universal input impulse number       | counter1   | 8            | AT+MSG1 | p2 (L)   | 1          |
| Stop sensor                          | stop_state | 11           | AT+MSG1 | p2 (L)   | 8          |
| Discrete inputs states               | d_state    | 12           | AT+MSG1 | p2 (H)   | 1          |
| Minimal sensitivity                  | snr_min    | 13           | AT+MSG1 | p2 (H)   | 2          |
| Maximal sensitivity                  | snr_max    | 14           | AT+MSG1 | p2 (H)   | 4          |
| 1-Wire temperature sensor. Sensor N1 | ts_data0   | 16           | AT+MSG1 | p3 (L)   | 1          |
| 1-Wire temperature sensor. Sensor N2 | ts_data1   | 17           | AT+MSG1 | p3 (L)   | 2          |
| 1-Wire temperature sensor. Sensor N3 | ts_data2   | 18           | AT+MSG1 | p3 (L)   | 4          |
| 1-Wire temperature sensor. Sensor N4 | ts_data3   | 19           | AT+MSG1 | p3 (L)   | 8          |
| ID-mark (iButton)                    | ibut_id    | 21           | AT+MSG1 | p3 (H)   | 2          |

|                                                           |           |    |         |         |   |
|-----------------------------------------------------------|-----------|----|---------|---------|---|
| Fuel temperature from RS-485 fuel level sensor. Sensor N1 | milage    | 24 | AT+MSG1 | p4 (L)  | 1 |
| Fuel temperature from RS-485 fuel level sensor. Sensor N2 | fueltemp1 | 95 | AT+MSG1 | p12 (H) | 8 |

Table 9 (continue)

| Parameter name                                            | Short name | Index number | Command | Bit mask | Bit number |
|-----------------------------------------------------------|------------|--------------|---------|----------|------------|
| Fuel temperature from RS-485 fuel level sensor. Sensor N3 | fueltemp3  | 97           | AT+MSG1 | p13 (L)  | 2          |
| Fuel temperature from RS-485 fuel level sensor. Sensor N4 | fueltemp4  | 98           | AT+MSG1 | p13 (L)  | 4          |
| Fuel level from RS-485 fuel level sensor. Sensor N1       | fueldata1  | 100          | AT+MSG1 | p13 (H)  | 1          |
| Fuel level from RS-485 fuel level sensor. Sensor N2       | fueldata2  | 101          | AT+MSG1 | p13 (H)  | 2          |
| Fuel level from RS-485 fuel level sensor. Sensor N3       | fueldata3  | 102          | AT+MSG1 | p13 (H)  | 4          |
| Fuel level from RS-485 fuel level sensor. Sensor N4       | fueldata4  | 103          | AT+MSG1 | p13 (H)  | 8          |

|                               |            |     |         |         |   |
|-------------------------------|------------|-----|---------|---------|---|
| Accelerometer data.<br>Axle X | acc_data_x | 109 | AT+MSG1 | p14 (H) | 2 |
| Accelerometer data.<br>Axle Y | acc_data_y | 110 | AT+MSG1 | p14 (H) | 4 |
| Accelerometer data.<br>Axle Z | acc_data_z | 111 | AT+MSG1 | p14 (H) | 8 |
| GSM modem IMEI                | imei       | 200 | AT+MSG2 | p10 (L) | 1 |
| SIM card ICCID                | iccid1     | 201 | AT+MSG2 | p10 (L) | 2 |
| Mobile operator name          | op_name    | 205 | AT+MSG2 | p10 (H) | 2 |
| GSM signal level              | gsm_power  | 208 | AT+MSG2 | p10 (H) | 1 |

### Setting the external interfaces of a tracker

The following commands are used to set the parameters for analog and digital inputs and digital interfaces of a tracker to work with external devices (fuel level sensors, 1-Wire, etc.):

| Setting RS-485 interface                     |                                                                                                                                                |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+S485=PSW,p1,                              | <b>PSW</b> - user password<br><br><b>p1</b> - driver type: <ul style="list-style-type: none"> <li>• LLS - digital fuel level sensor</li> </ul> |
| Fuel level sensors network addresses setting |                                                                                                                                                |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+LSID=PSW,p1,p2,<br/>p3,p4,</p> | <p><b>PSW</b> – user password</p> <p><b>p1</b> – Sensor №1 ID when connected to RS-485:</p> <ul style="list-style-type: none"> <li>• 0 – not to poll the sensor;</li> </ul> <p><b>p2</b> – Sensor №2 ID when connected to RS-485:</p> <ul style="list-style-type: none"> <li>• 0 – not to poll the sensor;</li> </ul> <p><b>p3</b> – Sensor №3 ID when connected to RS-485:</p> <ul style="list-style-type: none"> <li>• 0 – not to poll the sensor;</li> </ul> <p><b>p4</b> – Sensor №4 ID when connected to RS-485:</p> <ul style="list-style-type: none"> <li>• 0 – not to poll the sensor;</li> </ul> |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

When using AT+LSID command mention that:

- ID for wired fuel level sensor with LLS protocol should contain a number from 0..255 range (LLS bus address);
- ID for wireless (BLE) sensor should contain a prefix of a sensor type (see table 10) and a number equal to the sensor's serial number.

Table 10

#### Wireless sensors ID prefixes

| Sensor type   | Prefix | Example |
|---------------|--------|---------|
| Escort TD-BLE | T      | T12345  |

#### Universal input data smoothing setting

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+SFUL=PSW,p1,p2,<br/>p3,p4,p5,p6,p7,</p> | <p><b>PSW</b> - user password</p> <p><b>p1</b> – analog sensor data smoothing, sec:</p> <ul style="list-style-type: none"> <li>• 0 – default value – 1 sec;</li> <li>• 60 – maximal value</li> </ul> <p><b>p2</b> - frequency sensor data smoothing, sec:</p> <ul style="list-style-type: none"> <li>• 0 – default value – 2 sec;</li> <li>• 60 – maximal value</li> </ul> <p><b>p3</b> - digital sensor data smoothing, sec:</p> <ul style="list-style-type: none"> <li>• 0 – default value – 10 sec;</li> <li>• 300 – maximal value</li> </ul> <p><b>p4</b> – minimal working value for analog sensor, x0.01 V</p> <p><b>p5</b> - maximal working value for analog sensor, x0.01 V (maximal value - 3650)</p> <p><b>p6</b> - minimal working value for frequency sensor, Hz</p> <ul style="list-style-type: none"> <li>• 0 – default value – 1 Hz;</li> <li>• 2500 – maximal value</li> </ul> <p><b>p7</b> - maximal working value for frequency sensor, Hz</p> <ul style="list-style-type: none"> <li>• 0 – default value – 2100 Hz;</li> <li>• 3650 – maximal value</li> </ul> |
| <p><b>Panic button setting</b></p>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>AT+C1WM=PSW,p1,p2,</p>                                      | <p><b>PSW</b> – user password</p> <p><b>p1</b> – action type:</p> <ul style="list-style-type: none"> <li>• OFF – panic button is not used;</li> <li>• SMS – sending an SMS</li> <li>• SRV – sending a message to server</li> <li>• SMSSRV – sending an SMS and a message to server</li> </ul> <p><b>p2</b> – phone number</p> <p><b>p3</b> – Input used for panic button:</p> <ul style="list-style-type: none"> <li>• INP1 – first universal input (active level – plus)</li> <li>• INP2 – 1-Wire input (active level – ground)</li> </ul> |
| <p><b>1-Wire interface setting</b></p>                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>AT+C1WR=PSW,p1</p>                                          | <p><b>PSW</b> - user password</p> <p><b>p1</b> – input working mode:</p> <ul style="list-style-type: none"> <li>• 1WIRE –input is used for 1-wire protocol sensors;</li> <li>• INP2 – input is used as a universal input</li> </ul>                                                                                                                                                                                                                                                                                                         |
| <p><b>ID-mark scanner setting (IButton)</b></p>                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>AT+IBTN=PSW,p1</p>                                          | <p><b>PSW</b> - user password</p> <p><b>p1</b> – server message sending mode:</p> <ul style="list-style-type: none"> <li>• CARD – ID marks are sent to server only during connection with the mark;</li> <li>• KEY – ID mark is sent during connection with the mark and after</li> </ul>                                                                                                                                                                                                                                                   |
| <p><b>Execute scanning the 1-Wire devices indentifiers</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>AT+TSSCN=PSW,</p>                                           | <p><b>PSW</b> - user password</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Request for results of 1-wire devices scanning</b></p>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                                       |                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+TSSCN=? ,                                          |                                                                                                                                                                                                                                                                                                                    |
| <b>1-Wire temperature sensors identifiers setting</b> |                                                                                                                                                                                                                                                                                                                    |
| AT+TSID=PSW , p1 , p2<br>p3 , p4                      | <p><b>PSW</b> – user password</p> <p><b>p1</b> – ID of the temperature sensor N1 (HEX-version of a 64-bit identifier, example - A30000092AB13128))</p> <p><b>p2</b> – ID of the temperature sensor N2;</p> <p><b>p3</b> – ID of the temperature sensor N3;</p> <p><b>p4</b> - ID of the temperature sensor N4;</p> |
| <b>Bluetooth setting</b>                              |                                                                                                                                                                                                                                                                                                                    |
| AT+BTCTF=PSW , p1 ,                                   | <p><b>PSW</b> – user password</p> <p><b>p1</b> –Bluetooth work permission:</p> <ul style="list-style-type: none"> <li>• 0 - forbidden;</li> <li>• 1 - allowed</li> </ul>                                                                                                                                           |
| <b>Bluetooth devices scanning start</b>               |                                                                                                                                                                                                                                                                                                                    |
| AT+BTSC=PSW                                           | <b>PSW</b> - user password                                                                                                                                                                                                                                                                                         |
| <b>Connecting with Bluetooth device</b>               |                                                                                                                                                                                                                                                                                                                    |
| AT+BTPR=PSW , p1                                      | <p><b>PSW</b> – user password</p> <p><b>p1</b> – Bluetooth external device ID</p>                                                                                                                                                                                                                                  |

| Vehicle mains type setting                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SPWR=PSW,p1,p2                             | <p><b>PSW</b> – user password</p> <p><b>p1</b> – mains type:</p> <ul style="list-style-type: none"> <li>12 – 12 V mains (12.95 V – minimal voltage level while ignition is considered to be turned on; 11.9 V – minimal battery voltage threshold, that coordinates to a strong discharge, so tracker turns to a sleep mode);</li> <li>24 – 24 V mains (25.9 V – minimal voltage level while ignition is considered to be turned on; 23.8 V – minimal battery voltage threshold, that coordinates to a strong discharge, so tracker turns to a sleep mode);</li> <li>USR – manual setting of the thresholds for ignition detecting and going to sleep mode (see command AT+SUPWR)</li> </ul> <p><b>p2</b> – ignition detecting:</p> <ul style="list-style-type: none"> <li>0 – by vehicle mains' voltage</li> <li>1 – by analog input voltage</li> </ul> |
| Setting the thresholds for ignition detecting |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| AT+SUPWR=PSW,p1,p2,                           | <p><b>PSW</b> – user password</p> <p><b>p1</b> – voltage that coordinates the strongly low vehicle's battery, x0.01 V</p> <p><b>p2</b> – minimal voltage to consider ignition turned on, x0.01 V</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Getting odometer value                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| AT+ODO=?                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Setting odometer                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



|                |                                                                  |
|----------------|------------------------------------------------------------------|
| AT+ODO=PSW, p1 | <b>PSW</b> - password<br><br><b>p1</b> – odometer value, meters. |
|----------------|------------------------------------------------------------------|

## Other Tracker commands

Here are the commands not included in previous sections.

|                                                         |                     |                                                                                            |
|---------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------|
| <b>Changing the user password</b>                       | AT+SUPW=PSW, p1,    | <b>PSW</b> - user password<br><br><b>p1</b> - new use password                             |
| <b>Request for tracker ID</b>                           | AT+STID=?,          |                                                                                            |
| <b>Request for current firmware version</b>             | AT+FWVR=?,          | Firmware version is in third parameter of the respond                                      |
| <b>Updating the firmware</b>                            | AT+UPFW=PSW,        | <b>PSW</b> - user password                                                                 |
| <b>Request for immediate connection to Configurator</b> | AT+CONF=PSW,        |                                                                                            |
| <b>Tracker reboot</b>                                   | AT+SRBT=PSW,        |                                                                                            |
| <b>Clearing the internal Flash memory</b>               | AT+FRST=PSW,        |                                                                                            |
| <b>Setting a PIN code for current SIM card</b>          | AT+SPIN=PSW, p1,    | <b>PSW</b> - user password<br><br><b>p1</b> - PIN-code for для SIM card                    |
| <b>Sending an SMS</b>                                   | AT+SMSA=PSW, p1, p2 | <b>PSW</b> - user password<br><br><b>p1</b> - phone number<br><br><b>p2</b> - message text |

|                                          |               |                              |
|------------------------------------------|---------------|------------------------------|
| <b>Request for current Tracker state</b> | AT+STAT=p1,p2 | <i>See description below</i> |
|------------------------------------------|---------------|------------------------------|

AT+STAT command parameters are a bit-masks. To request several parameters summarise their bit numbers and convert this number into a hexadecimal. Then substitute it as parameters of command AT+STAT. Bits purposes are in table 11.

Table 11

Parameters of AT+STAT command

| Parameter                                                                                                                                  | Short name | Bit mask | Bit number |
|--------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|------------|
| Firmware version<br>Power voltage<br>Internal battery voltage<br>Used of Flash memory %<br>Ignition state<br>Sleep state<br>Freezing state | ST:IF      | p1       | 0          |
| Current time<br>Data authenticity flag<br>Longitude, latitude, speed<br>Azimuth, height<br>HDOP                                            | ST:NV      | p1       | 1          |

|                                              |       |    |   |
|----------------------------------------------|-------|----|---|
| Satellites number in detection               | ST:GN | p1 | 2 |
| Visible satellites number                    |       |    |   |
| Satellites number in decision                |       |    |   |
| Average SNR of the visible satellites        |       |    |   |
| Minimal SNR of the visible satellites        |       |    |   |
| Maximal of the visible satellites            |       |    |   |
| Average SNR of satellites in decision        |       |    |   |
| Minimal SNR of the satellites in decision    |       |    |   |
| Maximal of the satellites in decision        |       |    |   |
| Minimal elevation of satellites in detection |       |    |   |
| Minimal elevation of satellites in decision  |       |    |   |
| Maximal elevation of satellites in detection |       |    |   |

Table 11 (continue)

| Parameter                                               | Short name | Bit mask | Bit number |
|---------------------------------------------------------|------------|----------|------------|
| ICCID                                                   | ST:SI      | p1       | 3          |
| SIM-card state                                          |            |          |            |
| Mobile operator code                                    |            |          |            |
| GSM modem IMEI                                          | ST:GS      | p1       | 4          |
| Current network registration state                      |            |          |            |
| GSM signal level                                        |            |          |            |
| Mobile operator code                                    |            |          |            |
| Mobile tower parameters (LAC, CellID, srv1, srv2, srv3) |            |          |            |
| Universal input state                                   | ST:DI      | p1       | 5          |
| Universal input voltage, x10 mV                         | ST:AI      | p1       | 6          |
| Counter state                                           | ST:CN      | p1       | 7          |

|                                                                                                                                                                                             |       |    |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|----|
| Frequency input state, Hz                                                                                                                                                                   | ST:FR | p1 | 8  |
| Accelerometer data for axles X, Y, Z<br>SQRT mG<br>SQRT1 mG<br>Motion<br><br><i>SQRT1 value compares to p3 value of a SSLP command and if it's higher that the fact of motion is fixing</i> | ST:AC | p1 | 9  |
| Fuel level from fuel level sensors 1, 2, 3, 4                                                                                                                                               | ST:LL | p1 | 10 |
| Temperature from fuel level sensors 1, 2, 3, 4, degrees                                                                                                                                     | ST:LT | p1 | 11 |
| Tilt angle<br>Accelerometer data for axles X, Y, Z                                                                                                                                          | ST:1W | p1 | 12 |
| Connection with mark<br>Mark ID                                                                                                                                                             | ST:AG | p1 | 13 |
| Universal input state                                                                                                                                                                       | ST:1B | p1 | 14 |

Table 11 (continue)

| Parameter                                                      | Short name | Bit mask | Bit number |
|----------------------------------------------------------------|------------|----------|------------|
| ICCID<br>SIM-card in second slot state<br>Mobile operator code | ST:S2      | p1       | 16         |
| Track algorithm state                                          | ST:TR      | p1       | 17         |
| Track algorithm state                                          | ST:TQ      | p1       | 18         |

|                                                                                                                                                                                                                                                                                        |       |    |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|---|
| Clock generator state<br>RTC state<br>ACC connection state<br>FLASH connection state<br>GSM modem connection state<br>SIM-card connection state<br>GNSS-module connection state                                                                                                        | ST:DG | p2 | 0 |
| Universal input voltage x10 mV without smoothing                                                                                                                                                                                                                                       | ST:AD | p2 | 1 |
| Frequency input state without smoothing                                                                                                                                                                                                                                                | ST:FD | p2 | 2 |
| Fuel level sensor state without smoothing or connection errors                                                                                                                                                                                                                         | ST:LD | p2 | 3 |
| Unprocessed data from temperature sensor on 1-Wire bus                                                                                                                                                                                                                                 | ST:1D | p2 | 4 |
| IP-connection parameters<br><br><i>Response includes 11 counters (p1..p11) which increase from 0 to 255 while trackers work</i><br><br><i>p1 – GSM-modem reboots counter</i><br><br><i>p2 – GSM registration (CREG: 1-home, 5 – roaming)</i><br><br><i>(continue on the next page)</i> | ST:MD | p2 | 5 |

Table 11 (continue)

| Parameter | Short name | Bit mask | Bit number |
|-----------|------------|----------|------------|
|-----------|------------|----------|------------|

|                                                                |       |    |   |
|----------------------------------------------------------------|-------|----|---|
| <i>p3 – forced GSM registration tries counter</i>              |       |    |   |
| <i>p4 – GSM network search tries counter</i>                   |       |    |   |
| <i>p5 – GPRS registration (CGREG: 1- home, 5 – roaming)</i>    |       |    |   |
| <i>p6 – GPRS registration (CGATT)</i>                          |       |    |   |
| <i>p7 – forced GPRS registration tries counter</i>             | ST:MD | p2 | 5 |
| <i>p8 – GPRS session activation tries counter</i>              |       |    |   |
| <i>p9 – connection with configuration server tries counter</i> |       |    |   |
| <i>p10 – connection with main server tries counter</i>         |       |    |   |
| <i>p11 – connection with secondary server tries counter</i>    |       |    |   |

Table 12 contains error codes.

Table 12

### List of error codes and Tracker states

| Error code                          | Description                        |
|-------------------------------------|------------------------------------|
| <b>SIM card states/errors codes</b> |                                    |
| 0                                   | State not detected                 |
| 1                                   | SIM-card missing                   |
| 2                                   | Error of connection with SIM-card  |
| 3                                   | PUK-code needed                    |
| 4                                   | PIN-code needed (two tries failed) |

| Error code                                                      | Description                                                                                    |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 5                                                               | Wrong PIN (one try left)                                                                       |
| 6                                                               | SIM-card is using, PIN-code input not needed                                                   |
| 7                                                               | SIM-card is using after PIN input                                                              |
| <b>Sensors and nodes connection errors codes (ST:DG string)</b> |                                                                                                |
| 0                                                               | No errors, state work                                                                          |
| 1                                                               | No response from external device                                                               |
| 2                                                               | Connection interface error (packets from external devices don't match the supported protocols) |
| 3                                                               | Reserved                                                                                       |
| 4                                                               | Value out of state range                                                                       |
| 5                                                               | Configuration error                                                                            |
| 6                                                               | Short circuit in antenna                                                                       |
| 7                                                               | Antenna break                                                                                  |
| 8                                                               | SIM-card missing                                                                               |
| 9                                                               | PIN-code input error                                                                           |
| 10                                                              | PUK-code input error                                                                           |
| 11                                                              | No signal                                                                                      |
| 12                                                              | Work is temporary unavailable                                                                  |
| <b>Server connection states codes (ST:GS string)</b>            |                                                                                                |
| 0                                                               | Server connection was not tuned                                                                |
| 2                                                               | Server connection tuned but not activated                                                      |
| 3                                                               | Server connection activated (may appear after temporary connection break)                      |

|    |                                                  |
|----|--------------------------------------------------|
| 4  | Server IP-address received                       |
| 6  | TCP IP connection in process                     |
| 8  | TCP IP connection set, waiting for authorization |
| 10 | Server connection is fully set                   |



## 6. Functional abilities of a Tracker

Except for positioning the current location of a vehicle, its speed and direction tracker allows controlling the different parameters of the vehicle (ex. open/close the doors), and also the devices installed on a vehicles (eg. temperature inside a refrigerator container). To do this tracker should be connected to main electric circuits of a vehicle, or additional external sensors connected to a tracker.

Next sections contain descriptions of main inputs/outputs of a tracker. Each section has a typical connection scheme and different options to be used on vehicles.

### 6.1 Universal input

Tracker has one universal input (see pic.2), which can be used as a discrete or analog input dependently on settings. Also using **firmware versions 0.31 or higher** 1-Wire input (see pic.2) can be used as a universal input.

#### 6.1.1 Discrete input mode

Mostly discrete inputs are used for getting information like “on/off” about vehicle’s working mode or devices installed on it. Also discrete inputs can be used for measuring the frequency of incoming signal and counting the impulses (function — impulse counter). Further this information can be used for:

- engine hours control;
- working time control for vehicle’s machinery;
- sending an alarm signal (eg., “panic button” or “open the door”);
- counting the passenger traffic;
- measuring the fuel level (fuel level sensor with frequency output which provides a frequency signal directly proportional to fuel level);
- and etc.

All this points are not the functions of a tracker only: the execution of these functions is provided by tracker and monitoring system together.

Table 13 contains technical features of a universal input working in discrete input mode.

Table 13

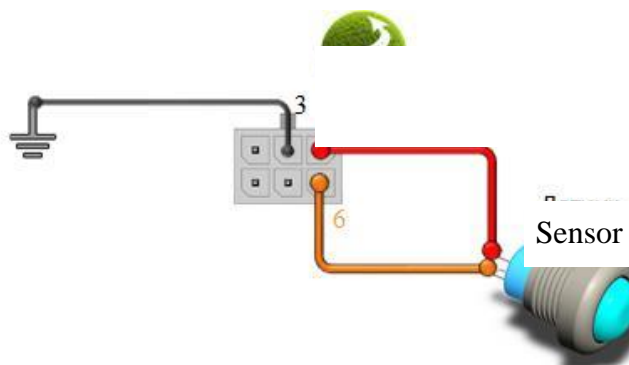
## Technical specification of discrete input

| Parameter                                          | Value                  | Notes                                                   |
|----------------------------------------------------|------------------------|---------------------------------------------------------|
| Input signal amplitude                             | from 7 to 40 V         | Relative to the “Ground” circuit                        |
| Maximal input amperage                             | 100 mA                 |                                                         |
| Polarity reversal protection                       | +                      |                                                         |
| Voltage overload protection                        | +                      |                                                         |
| Amperage overload protection                       | +                      |                                                         |
| Frequency range                                    | from 55 Hz to 2 000 Hz | Coordinates the measuring frequency range               |
| Maximal number of impulse in impulse counting mode | 65535                  | After reaching the maximal level counter resets to zero |

**WARNING. Discrete input can measure frequency only of meander incoming signal (rectangular periodic signal).**

**WARNING. In case tracker was turned off or rebooted impulse counter resets to zero.**

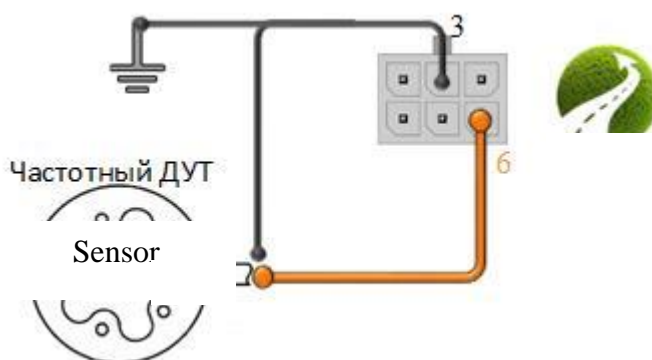
Pic. 22 shows a typical scheme of connection the sensors with frequency or impulse outcoming signal, and also sensors type “dry contact” to discrete inputs of tracker.



Pic. 22. Typical scheme of connection the sensor to discrete input

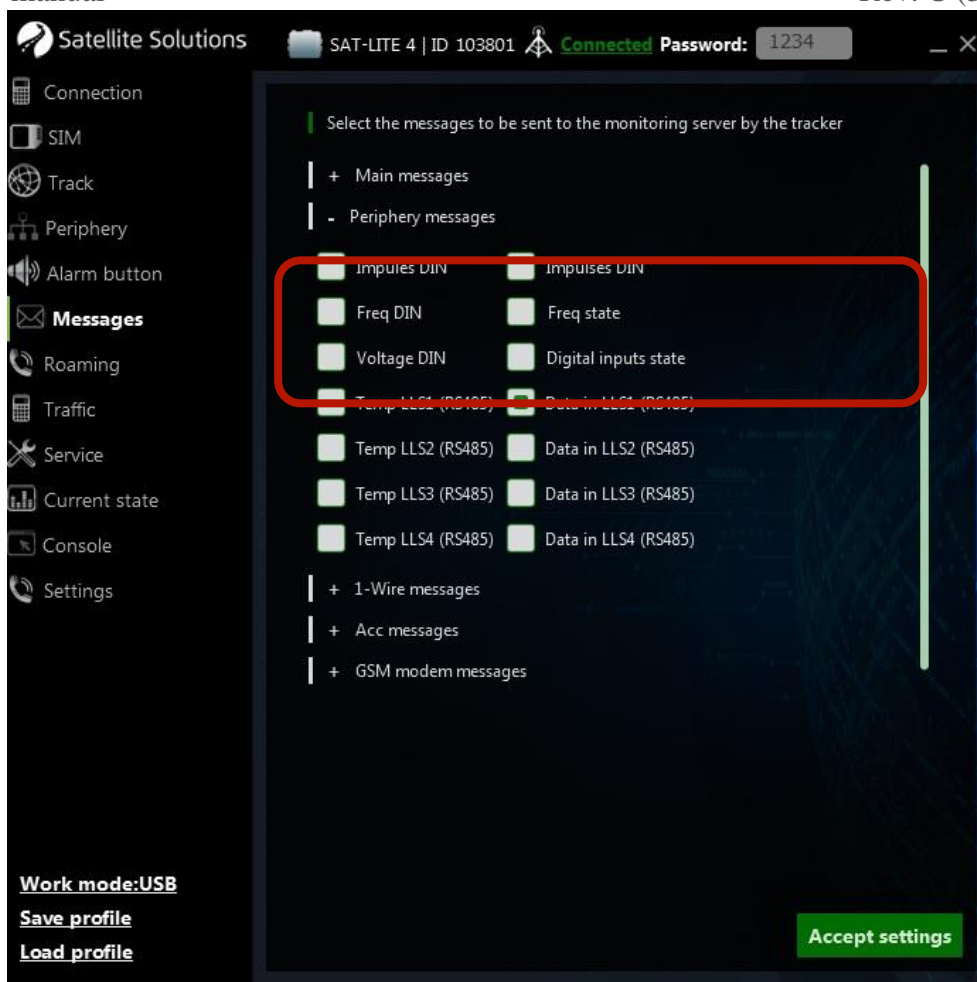
**WARNING.** Sensors should have an output with open collector providing the discrete inputs commutation (contacts 5 and 6 of a system connector) to a ground.

Pic. 23 represents a typical scheme of connection the fuel level sensor with a frequency output signal.



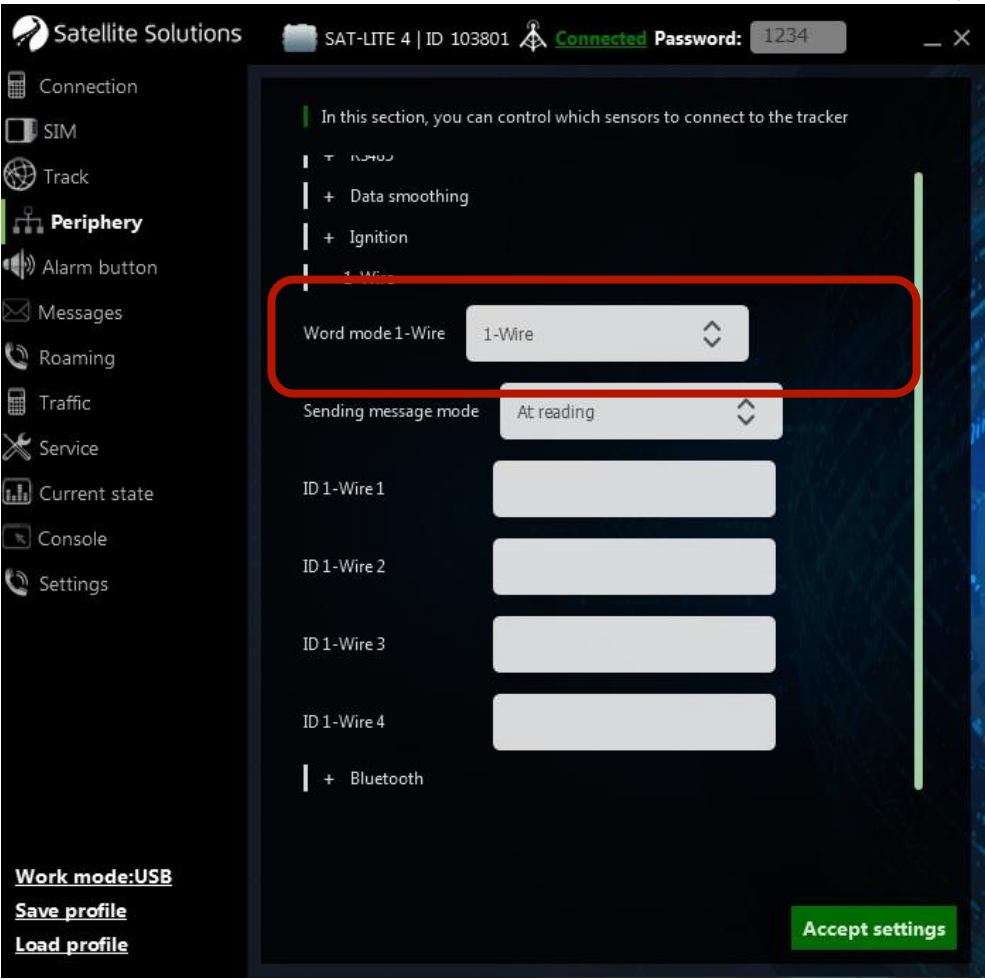
Pic. 23. Connection of a fuel level sensor with frequency output signal

Additional setting the discrete input is not required, except the permission of sending the information to server.



Pic. 24. Data transfer setting for discrete input

Additional setting is needed in case of connecting the panic button (see section 5.1.5), and also while using the 1-Wire input as a universal input. In this case use the 4<sup>th</sup> contact of a main connector, and specify the 1-Wire working mode in configurator settings:



Pic. 25. Setting the 1-Wire interface working mode

6.1.2 Analog input mode

Analog inputs of a tracker are designed for measuring the analog signals as a voltage of a direct current and can be used with vehicle circuits directly (ex. being connected to battery or ignition circuit) or by connecting the external sensors with analog output signal. Technical specifications of universal input working as an analog input are on table 14.

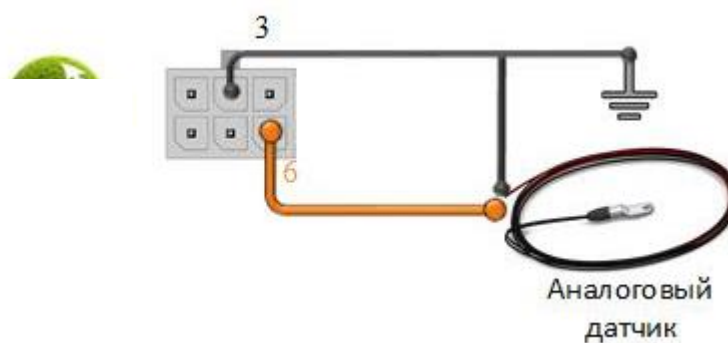
**WARNING. Measured analog input voltage is relative to the ground circuit.**

Table 14

Technical specifications of analog inputs

| Parameter                    | Value          | Comments |
|------------------------------|----------------|----------|
| Measure range, V             | from 0 to 40 V |          |
| Measurement uncertainty, %   | $\pm 2$        |          |
| Maximal input amperage       |                |          |
| Polarity reversal protection | +              |          |
| Amperage overload protection | +              |          |
| Voltage overload protection  | +              |          |

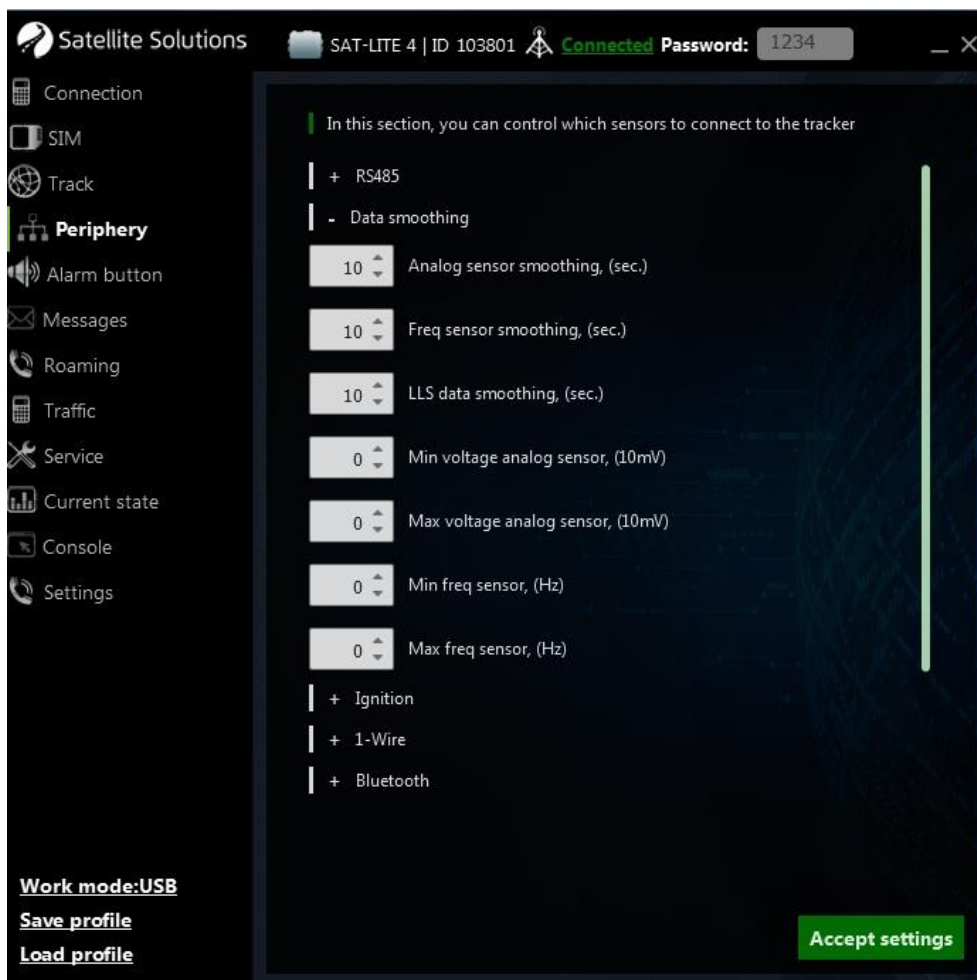
Pic. 26 represents a typical scheme of connecting a sensor to the analog input of a tracker (note – one of the vehicle's circuits can take a place of the sensor).



Pic. 26. Typical scheme of connecting an analog sensor to a tracker

Same as discrete inputs, analog inputs require to set the permission of data transmitting in the “Messages” section of configurator, and also choosing the 1-Wire working mode in case of using it as a universal input.

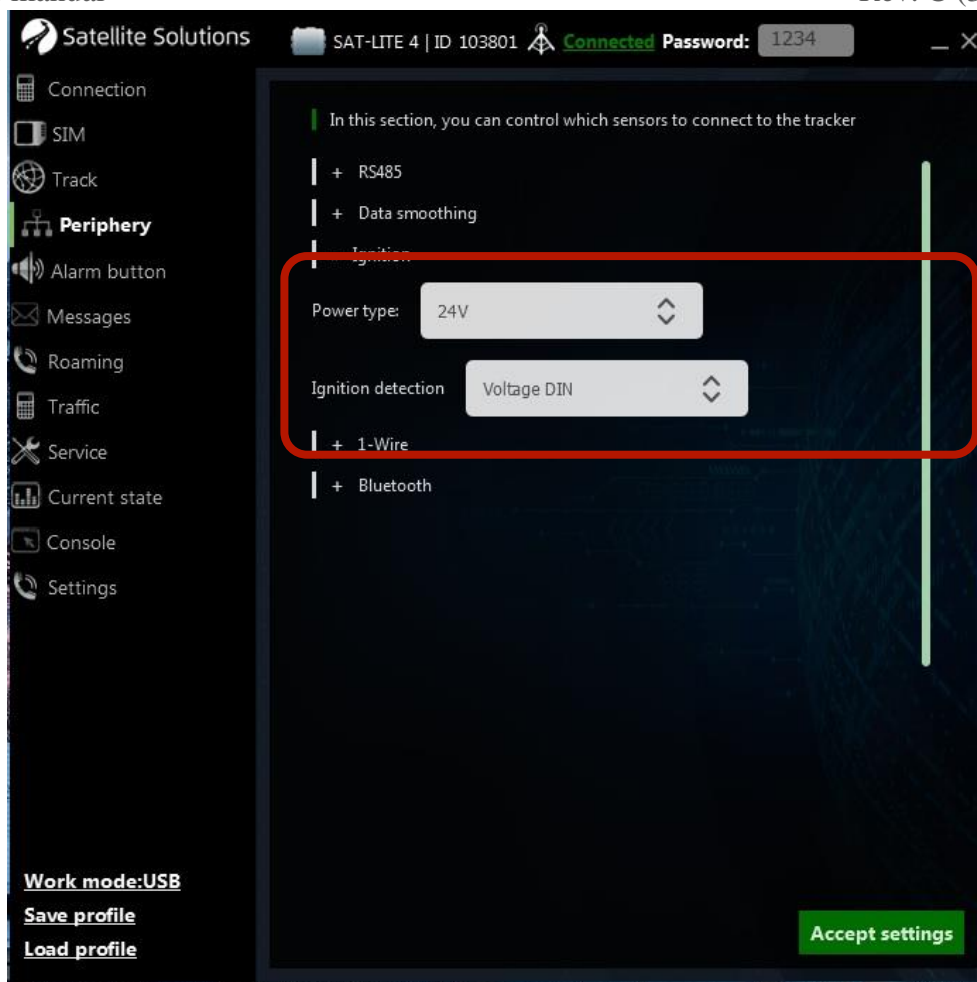
Tracker has an ability to do the measure results smoothing for analog and discrete inputs. This setting can be done in the corresponding section of configurator. Main window of this section is on pic. 27.



Pic. 27. Results smoothing setting

## 6.2 Ignition sensor

Tracker can use a universal input as an ignition sensor. In this case settings for this input are done in the corresponding section of configurator (see pic.28). There are default settings, but user can also customise minimal and maximal voltage levels for vehicle mains to detect if ignition is turned on/off.



Pic. 28. Setting an analog input as an ignition sensor

Also tracker allows measuring the incoming power voltage and use these results to detect if ignition is on/off.

## 6.3 Digital interfaces

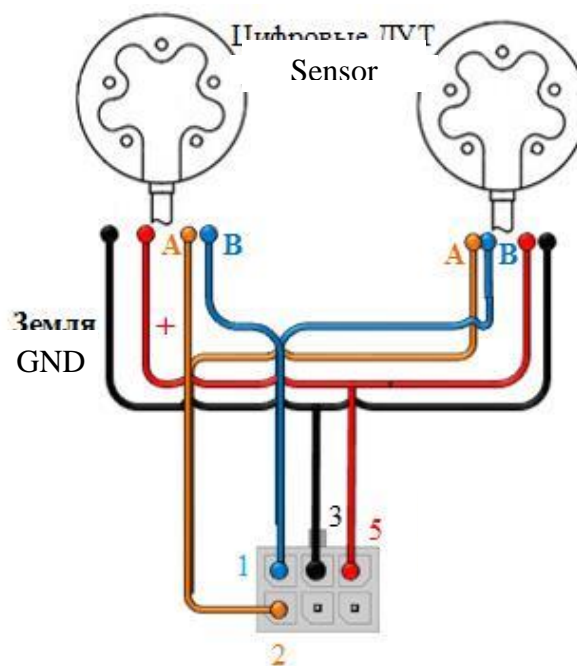
Tracker has two digital interfaces (RS-485 and 1-Wire), which can be used for connection the external devices with digital interfaces.

### 6.3.1 RS-485

In case of using the RS-485 interface there's an ability to connect digital fuel level sensors (ex. sensors by SAT-FUEL, Omnicomm, Italon).

Pic. 29 represents a typical scheme of connection fuel level sensor to RS-485.





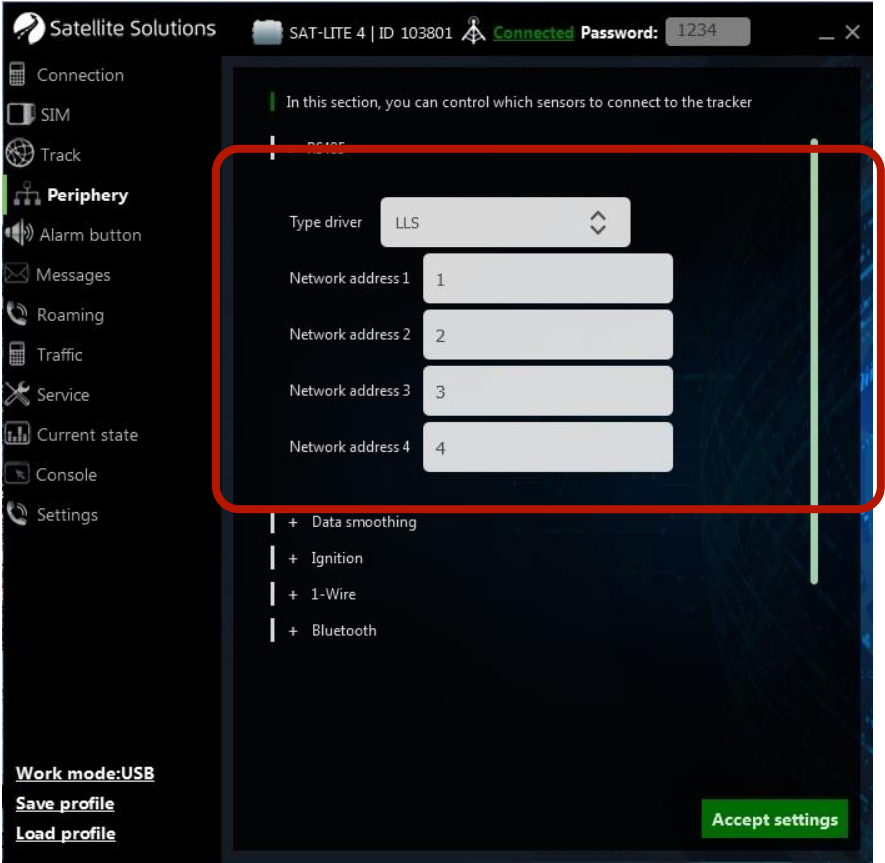
Pic. 29. Typical scheme of connection device to RS-485

In most general case the following steps are required to connect a device with RS-485 to tracker:

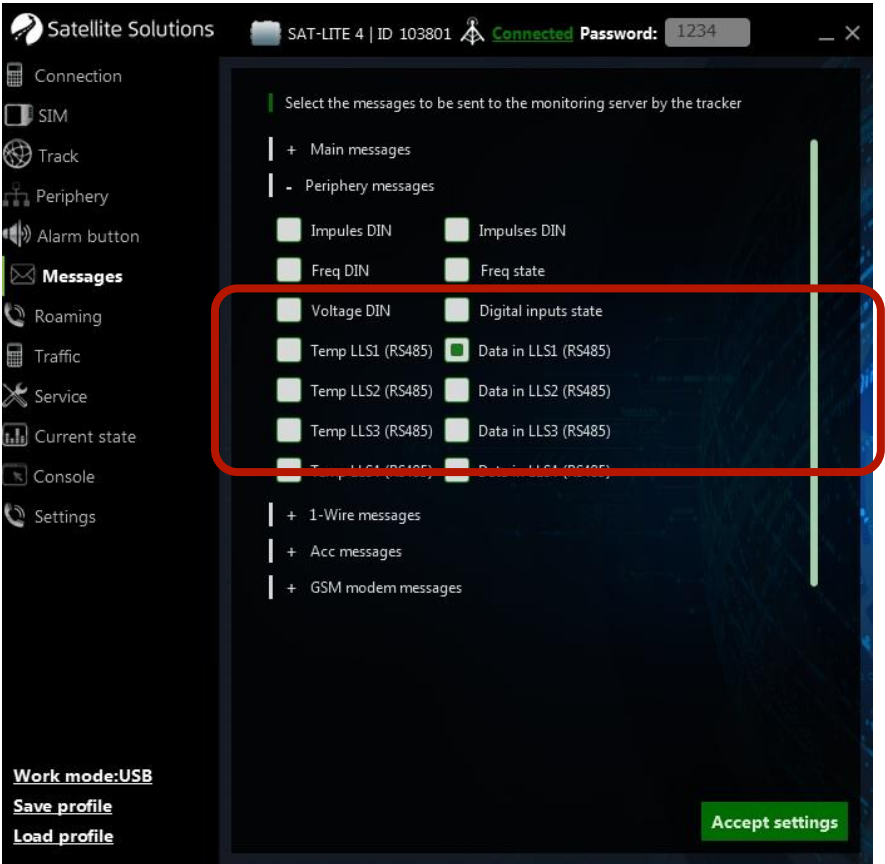
- connect an A line of device to contact №2 of tracker's system connector;
- connect a B line of device to a contact №1 of tracker's system connector;
- connect a "GND" contact of device to a contact №3 of tracker's system connector.

For external device's power can be used an external power source, which can also provide power to the tracker.

RS-485 require additional setting (indication of network addresses of the connected sensors, data transmission permissions – see pic. 30 and 31).



Pic. 30. Setting the network addresses of connected sensors



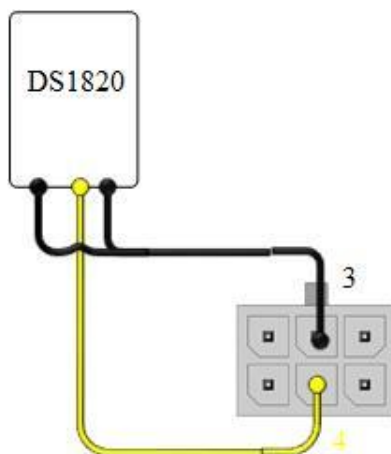
Pic. 31. Setting the data transmission for digital sensors

### 6.3.2 1-Wire

1-Wire is a digital interface designed mostly for connecting the temperature sensors type DS18B20 (with **firmware version 0.40 or higher** tracker supports working with temperature sensors DS1921G) and scanning devices like iButton.

Pic. 32 represents a typical scheme of connection the temperature sensor by using the “parasitic” power (in this case contacts 1 and 3 of sensor are connected to ground circuit). iButton devices can be connected the similar way.

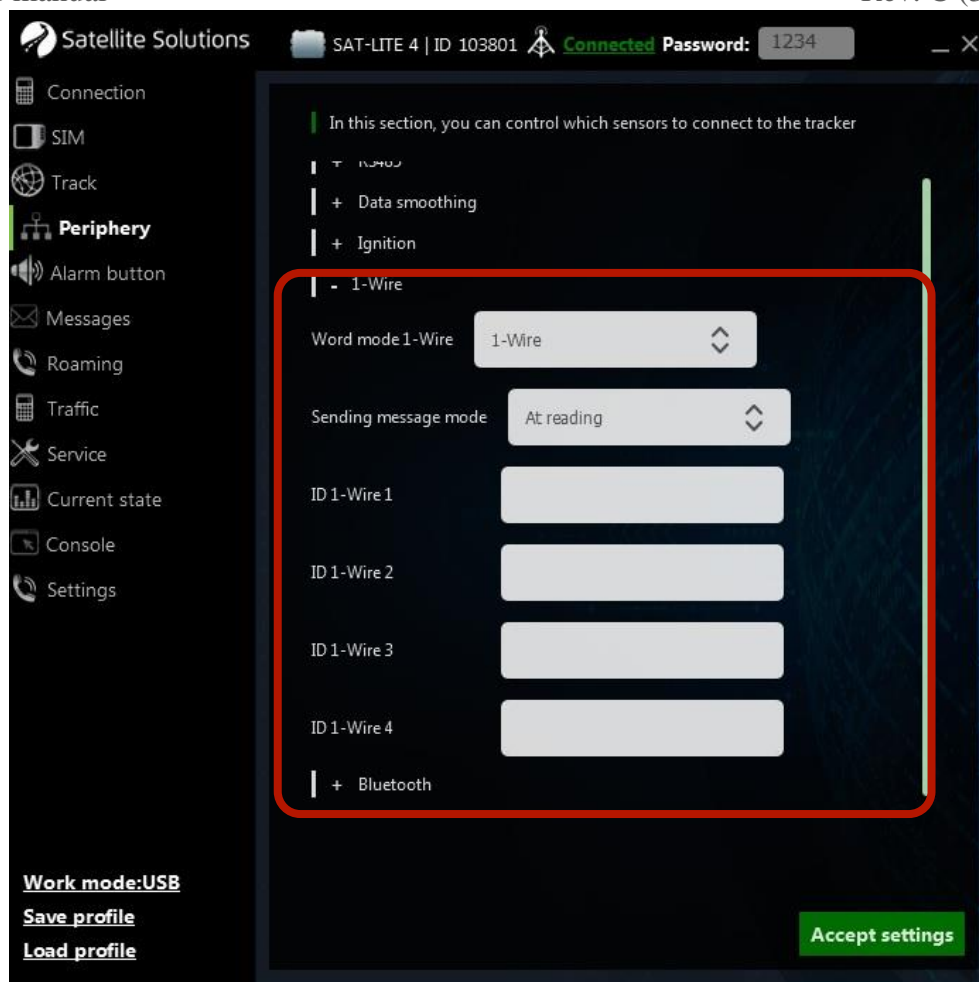
**WARNING. Using the scheme with “parasitic” power is not obligatory. The external power source can be used as well.**



Pic. 32. Typical scheme of connecting the 1-wire temperature sensor

1-Wire doesn't require additional setting except permissions for data transfer of the corresponding data to server in “messages” section of configurator (see section 5.1.6). However, tracker allows setting the mode of sending messages to server when ID-mark scanner is connected, and show unique IDs of temperature sensors, if necessary. These settings can be done in the “Periphery” section of configurator (see pic. 33)

While using **firmware version 0.31 or higher** 1-Wire can be used as a universal output (see section 6.1). Choosing the working mode for this output can be done in “Periphery” section of configurator (see pic.33)



Pic.33 1-Wire interface settings

**WARNING. 1-Wire output in a mode of a universal input works in an inverse mode (active when short to the ground). Also this input doesn't support the voltage measuring. Maximal incoming voltage must not be higher than 5 V.**

## 6.4 Bluetooth

Starting from **firmware version 0.40** tracker allows working with “Escort” fuel level sensor with BLE module and a voice headset.

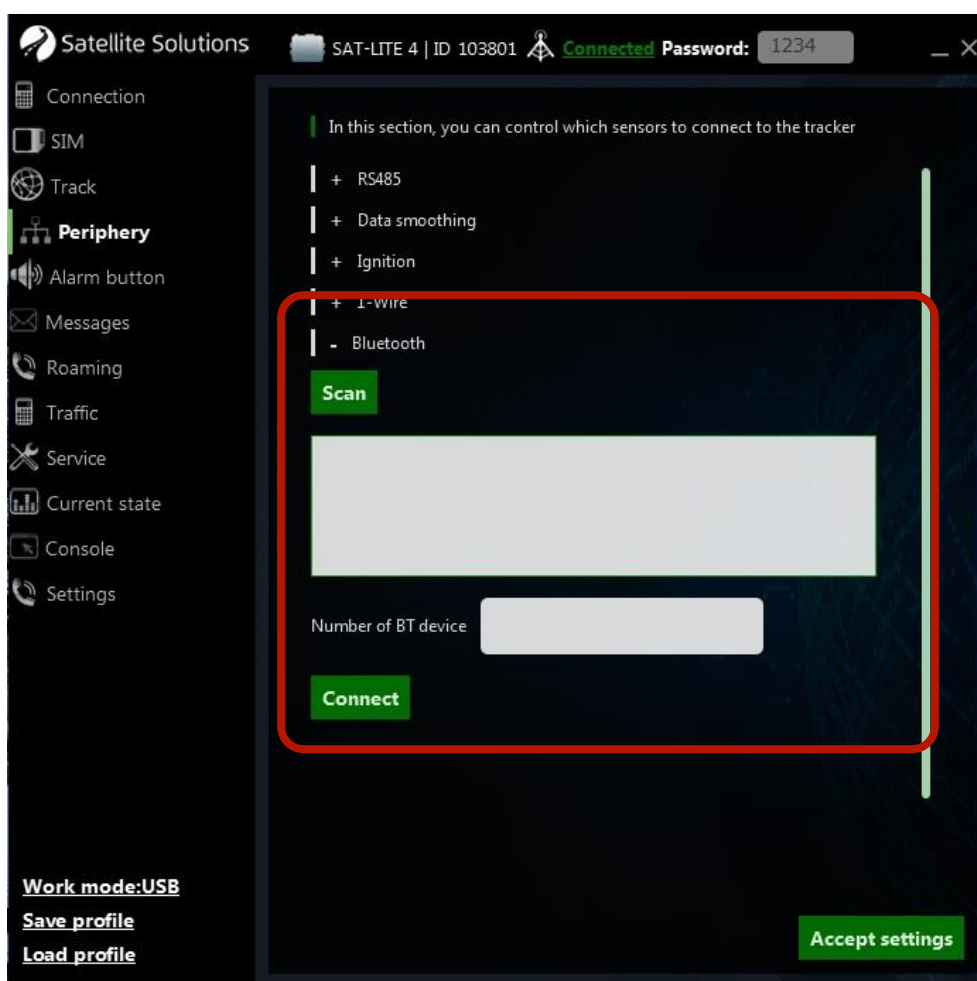
In case of using a voice headset together with tracker it allows receiving voice calls to a tracker. Setting for this work can be done in 2 steps:

### Step 1. Scanning the Bluetooth devices

Select the “Scan” command in the “periphery” section of configurator (see pic.34). After finishing the scanning there will be shown a list of available devices with its serial numbers.

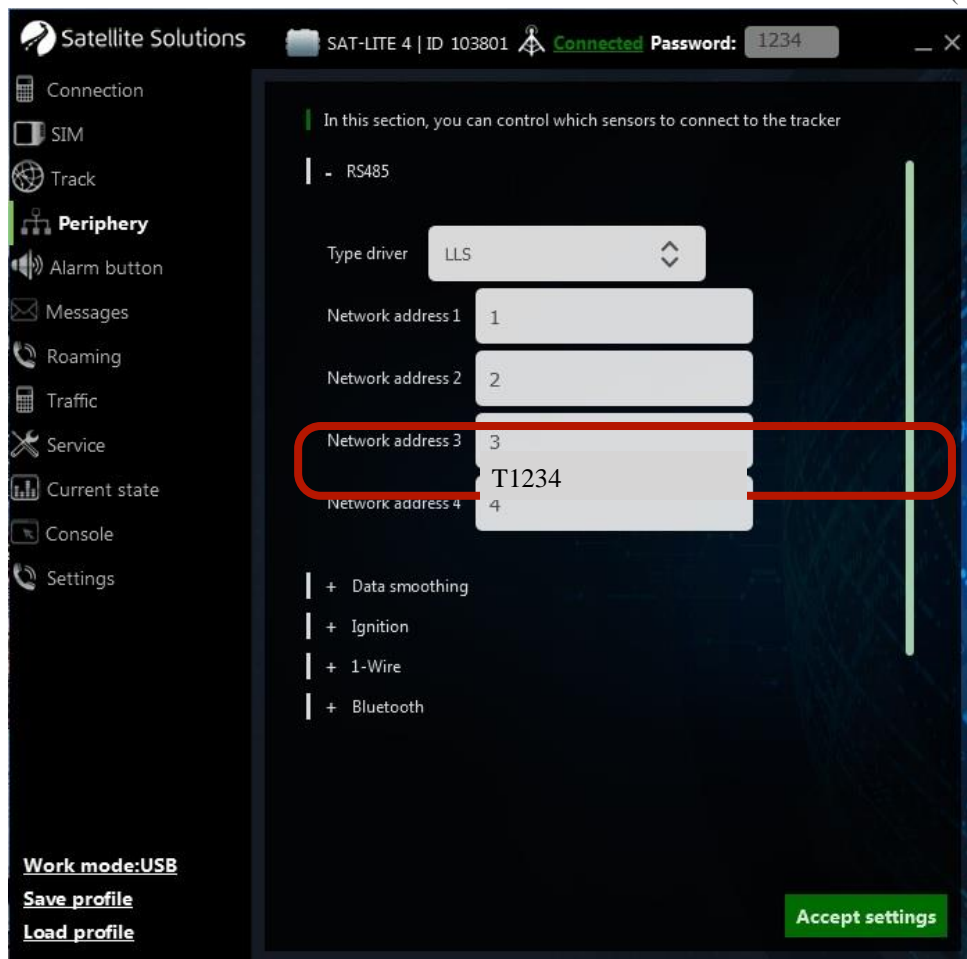
## Step 2. Setting a connection

After the scanning specify the number of a needed device from the list in the “BT device number” field, and execute the “connect” command.



Pic. 34. Search and setting the Bluetooth headset

Setting the work with an “Escort” sensor with BLE module can be done the same way as any other fuel level sensor in the corresponding section of configurator (see pic.35):



Pic.35 Setting network address for wireless sensor

The general difference is that the serial number of sensor is needed to be specified in a “network address” field. It should start with a prefix. List of available prefixes is shown in a table 15.

Table 15

## Wireless sensors ID prefixes

| Sensor type                     | Prefix | Example       |
|---------------------------------|--------|---------------|
| Escort TD-BLE                   | E      | T123456       |
| Escort DU-BLE                   | EU     | EU123456      |
| Technoton Bluetooth Fuel-Sensor | E      | E123456       |
| ADM31                           | A      | AAABBCCDDEEFF |

**WARNING. Trackers SAT-LITE 4 with serial numbers from 100000 to 109999 have a standard Bluetooth module (not BLE), so these trackers do not support working with Escort sensors. To work with Escort sensors use only trackers with serial numbers 110000 and higher.**

## Appendix 1. List of software and hardware updates of a Tracker

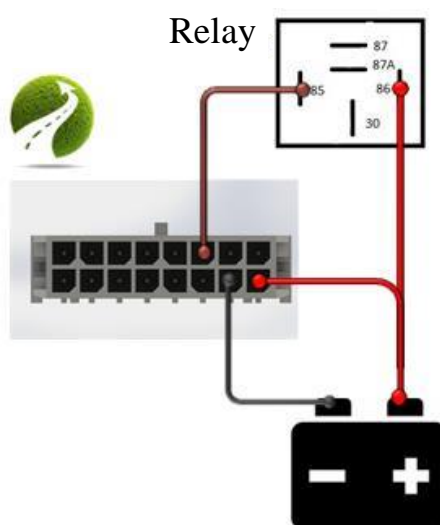
SAT-LITE 4 have discrete output, which can be used for external devices control. Technical specifications of this discrete output are in table A1.

Discrete output has a relatively low outcoming amperage, so it is usually used with the external electro-mechanic or solid-state relays which provide the circuit commutations with essentially higher amperage. Pic. A2 represents the typical scheme of connecting the standard automobile relay to a discrete output of a tracker.

Table A1

Technical specifications of the discrete output

| Parameter                    | Value                 | Comments |
|------------------------------|-----------------------|----------|
| Output type                  | open drain transistor |          |
| Voltage, not more, V         | 44                    |          |
| Current, mA                  | 200                   |          |
| Polarity reversal protection | +                     |          |
| Overcurrent protection       | +                     |          |
| Overvoltage protection       | +                     |          |



Pic. A2. Typical scheme of connecting the automobile relay to discrete output of a tracker



Additional setting is not required. The state control for discrete output can be done from server or also by SMS-commands:

| State control for discrete output |                                                                                                                                                                                                                           |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+SREL=PSW,p1,                   | <p><b>PSW</b> – user password</p> <p><b>p1</b> – setting the mode of discrete output</p> <ul style="list-style-type: none"><li>· ON – turn on the discrete output;</li><li>· OFF – turn off the discrete output</li></ul> |

**WARNING.** The impulse duration for the discrete output is measured with low precision, so it is not recommended to set the duration under 0.1 sec

Except the discrete output, trackers with serial numbers **110 000** and higher have a BLE module to work with wireless fuel level sensors (see section 6.4).