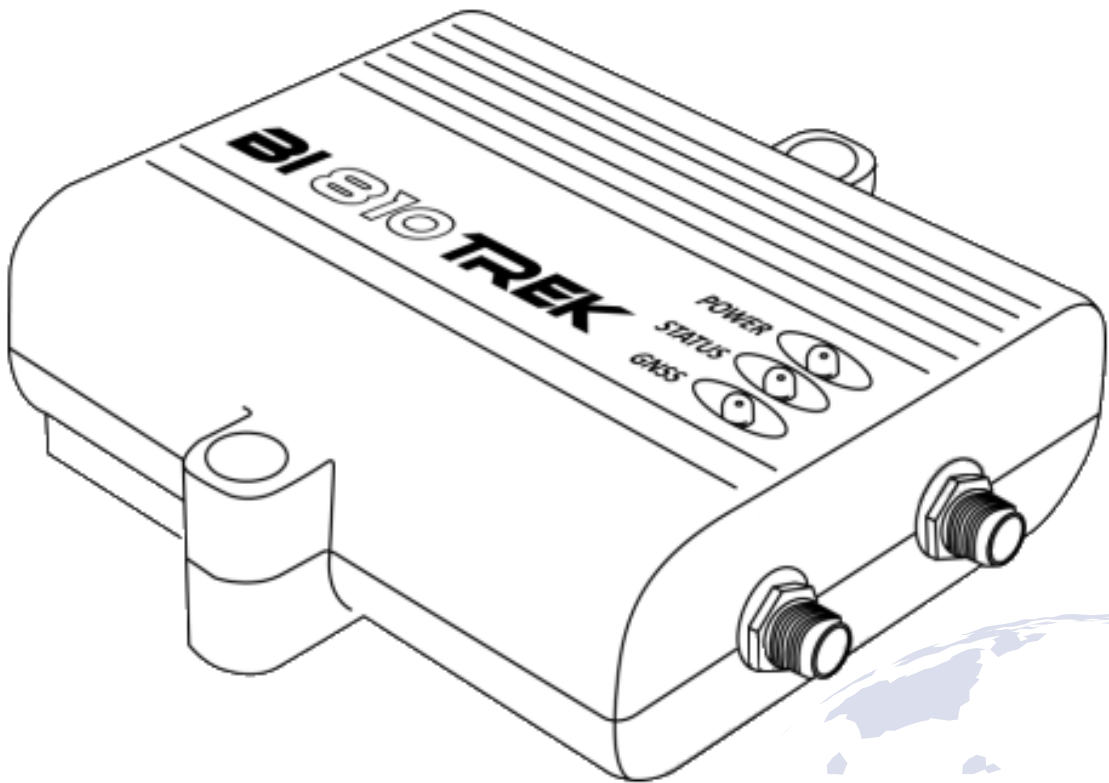


Vehicles Tracking Device

BI-810 TREK



Operating Manual

Version 2019.09.1

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Introduction

Safety Requirements for Installation and Maintenance of Tracking Device "BI-810 TREK"

Compliance with the safety precautions is the responsibility of technical personnel installing the tracking device, as well as employees in charge of equipment on site.

To avoid damage to the device, please, keep it in a stress-resistant case. Before using the device, please, place it so that its status LED indicators are clearly visible. Prior to dismantling outputs of the device, please, disconnect its power supply unit.

Transportation and Storage

The tracking device in the manufacturer's package can be transported by any closed land and sea transport mode (in railroad cars, containers, closed trucks, cabins, etc.). It can also be transported in heated aircraft cabins.

When transporting and storing the device, the package instructions on the labels must be observed.

Warranty

The warranty period for the tracking device shall be 12 months of the date of commissioning. The commissioning date must be recorded per requirements set forth in the certificate for the tracking device; if no such data are available in the certificate, the warranty period shall be counted starting with the tracking device shipment to the customer.

Manufacturer's warranty shall only be valid provided that the customer complies with the requirements of this Manual. In the event of their violation, or in the presence of mechanical or electrical damage caused by the factors that are not covered in this Manual, the Warranty shall be deemed void.

Device

Intended Use of the Device

Tracking device BI-810 TREK is used for navigation tasks, remote control and monitoring of a vehicle or other remote object.

The tracking device is intended for installation to any mobile or remote stationary object in order to:

- determine geographical coordinates, speed and direction of movement;
- collect data coming from the external devices;
- control actuators;
- voice communication;
- transfer the data to a dispatch center.

GSM 900/1800 or GSM 850/900/1800/1900 mobile carrier network is used as a medium for data transfer. To determine the coordinates, NAVSTAR GPS system is used. To detect vehicle movement, the data obtained from GPS or GPS/GLONASS and internal acceleration meter are used.

The device must be installed in a spot unavailable to a driver.

Principle of Operation

In real time, the tracking device:

- using an in-built GPS or GPS/GLONASS receiver, determines the location and motion parameters of an object (time, geographical coordinates, speed, direction of travel);
- collects and processes information coming from analog and discrete sensors;
- controls actuators upon the command from the operator panel.

The data obtained are recorded and stored in the internal log that is based on a non-volatile memory chip. Records from this log are transferred to the operator panel through a GSM channel with a predetermined frequency or on an event basis. Information exchange is done via GPRS and SMS. Voice communication is also supported.

On-line terminal operation is only possible provided there is GSM coverage. Beyond the GSM network coverage area, the tracking device is in the mode of a "black box", i.e. it records all logged information to the non-volatile memory and transfers it when a vehicles enters into a GSM coverage area.

Specifications

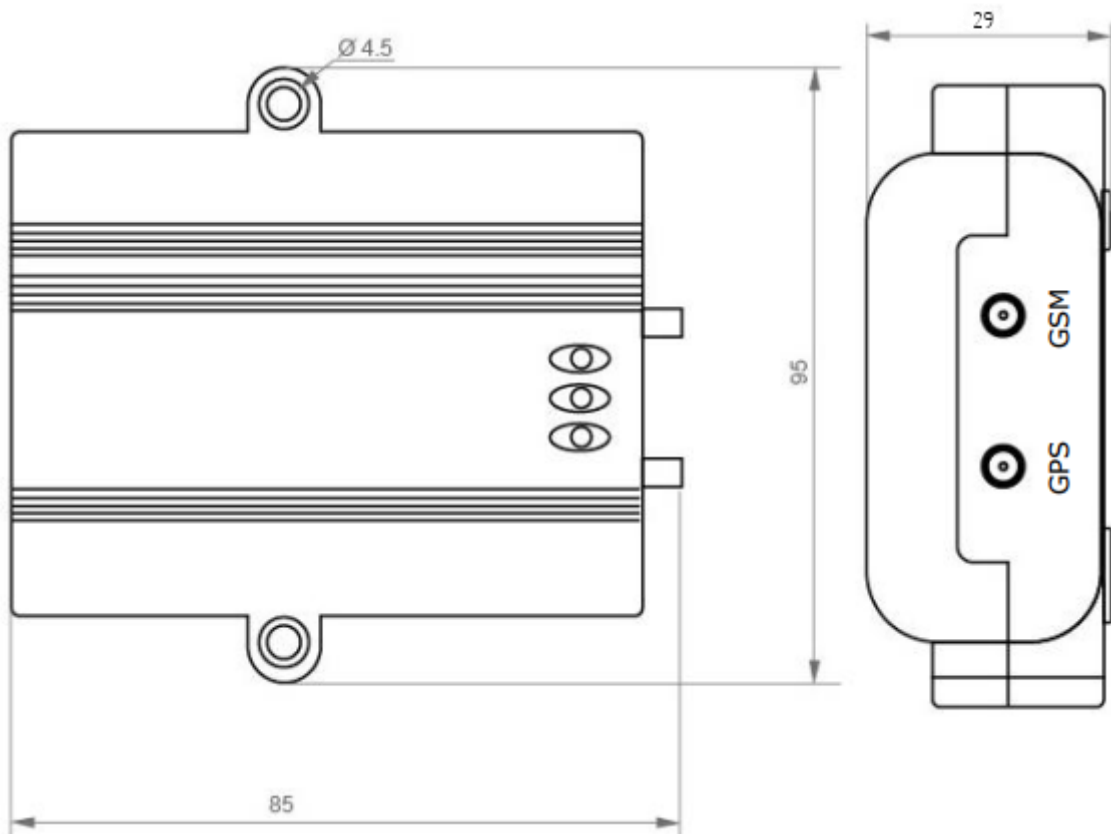
Table 1. Device Specifications

No.	Item	Specifications
1	Data transfer standard	GSM 900/1800 or GSM 850/900/1800/1900
2	GSM network communication channel	GPRS, SMS, voice communication
3	GPRS grade	10
4	Navigation system types	GPS or GPS/GLONASS
5	GPS and GSM antennas	External
6	Auxiliary digital interfaces	RS-485
7	Motion sensor	Acceleration meter

No.	Item	Specifications
8	Secure power supply input	yes
9	Number of SIM cards	1
10	Number of 0-active discrete inputs	2
11	Number of 1-active discrete inputs	1
12	Number of discrete outputs	1
13	Discrete inputs voltage range	from 0 V to 40 V
14	Type of discrete outputs	open collector
15	Full-load amperage of discrete outputs	0.5 A
16	Number of analog inputs	2
17	Analog input voltage range	from 0 V to 27 V
18	Power	DC
19	Voltage	from 6 v to 40 V
20	Normal input current (12 V)	60 mA
21	Max. current (12 V)	350 mA
22	Non-volatile memory capacity	2 MB (or 65,000 entries)
23	Internal battery Li-Ion	1,000 mAh
24	Operating temperature	from -30°C to +80°C
25	RH	80 ± 15%
26	Dimensions (W x L x H)	85 x 95 x 29 mm
27	Weight	175 g
28	Body	IP 65 (plastic PA 6)

Tracking device design

Fig. 1. Appearance and Dimensions of Tracking Device BI-810 TREK.



Scope of Delivery

1. Tracking Device BI-810 TREK - 1 pc.
2. GPS antenna - 1 pc.
3. GSM antenna - 1 pc.
4. Certificate - 1 pc.
5. Warranty sheet - 1 pc.
6. Packing box - 1 pc.

Preparation for Operation

Inserting SIM-Card

To operate on a GSM network, a SIM-card has to be inserted into the device. Contacts of the SIM-card must not be saved, PIN-code must be disabled (a SIM-card with an enabled PIN-code can be used provided that the PIN-code has been entered into the device settings).

To insert a SIM-card all device connectors must be disconnected and its top cover must be removed. There is a slot on the top of the circuit board. Then the device has to be reassembled in the reversed order.



ATTENTION! The manufacturer does not supply a SIM-card necessary for connecting to a GSM network!

Connection of the Power Supply, Discrete and Analog Sensors, as well as Extra Devices

Fig. 2. BI-810 TREK Contact Pins

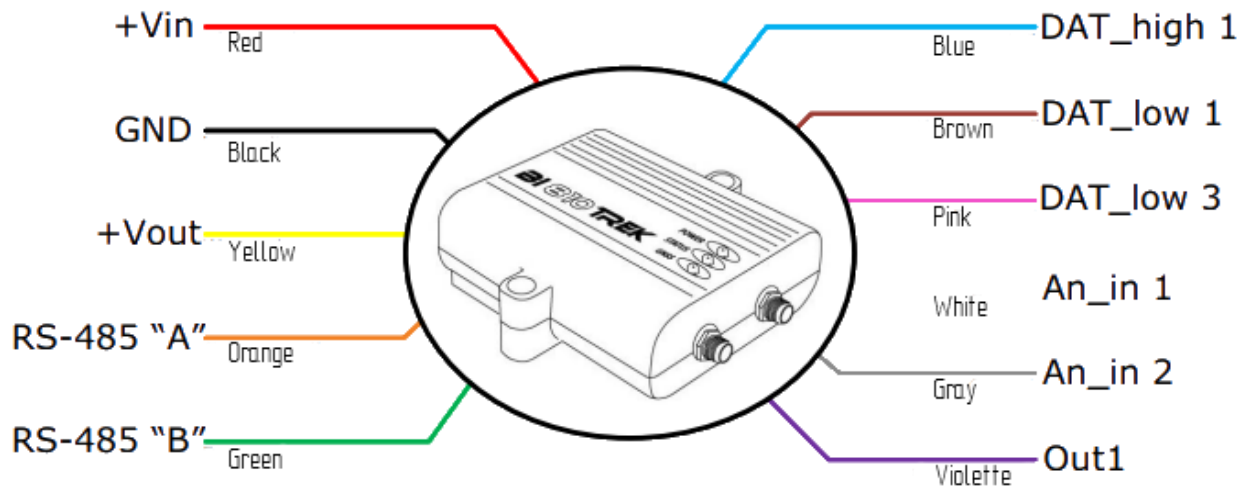


Table 2. Pin legends

No.	Color	Pin legend	Signal type	Pin purpose
1	Red	+ Vin	Power	"+" on-board power terminal (nominal voltage is 12 VDC or 24 VDC)
2	Black	GND	Power	Ground (earth)
3	Yellow	+ Vout	Power	Secure power input for extra sensors. Voltage + Vin (350 mA max)
4	Oragnge	A	Input/Output	"A" signal RS-485
5	Green	B	Input/Output	"B" signal RS-485
6	Blue	Ignition	Input	1-active discrete input Reserved for ignition
7	Brown	DAT_low 1	Input	0-active discrete input
8	Pink	DAT_low 3	Input	0-active discrete input
9	White	A_in 1	Input	Analog input No.1
10	Gray	A_in 2	Input	Analog input No.2
11	Violette	Out 1	Output	Discrete output

Installation and Commissioning

Installation Guide

Tracking device location must ensure connections of sockets and avoid potential of accidental damage; it also must eliminate exposure to direct sunlight, moisture, etc. Recommended location of installation in a vehicle is the empty space under the dashboard inside a vehicle.

GPS and GSM antennae shall also be located in the empty space under the dashboard of a vehicle.

Antennae cables must be located and clamped along the entire length with straps clamped to the clamping sites. Cabling must be done so as to avoid any damage during the operation, when closing doors/hatches.

Electrical Connections

Power cable shall be passed through special ports in a vehicle body from the normal battery location to the location where the tracking device is to be installed. Power cables shall be connected to respective battery terminals.



ATTENTION! When performing welding operations during repairs of a vehicle, **MAKE SURE** to disconnect power cable and periphery cables!

Discrete inputs with active "0" respond to connection of these inputs to GND (ground). This input is inactive when it is not connected (input is 'blank').

Discrete inputs with active "1" respond to the voltage of over 8 V on them (connection of the input to the "+" terminal of vehicle network). This input is inactive when it is not connected (input is 'blank').

Voltage on the analog input may vary from 0 to 24 VDC.

Discrete output is "open collector" type. Load must be connected into the open between the discrete output and power supply "+" terminal. When the output is activated it closes to the GND. Max. load current of the discrete output should not exceed 0.5 A! If high-amperage currents need to be switched, the discrete outputs must be connected using additional relay.

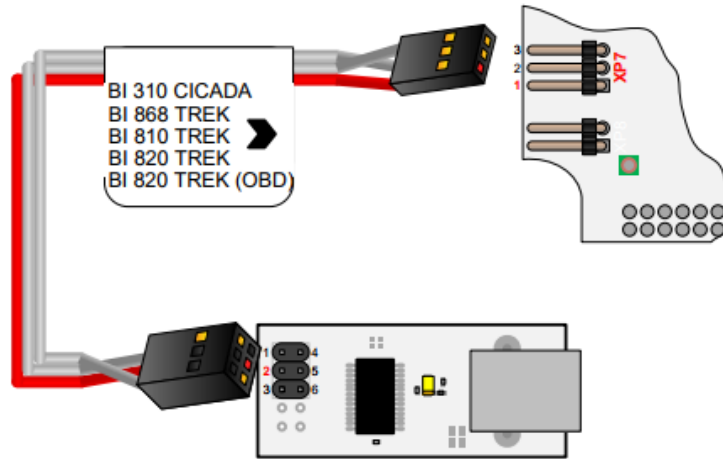


ATTENTION! Voltage on the discrete inputs and outputs should not exceed 30 V.
Voltage on the analog inputs should not exceed 30 V.
Device input voltage should not exceed 36 V.
Otherwise, the device can be damaged.

Connection to a Computer

The tracking device can be connected to a computer for configuration and servicing. The device has UART output interface for that purpose. In order to connect the device to a computer a USB-UART adapter should be used that can be purchased from the dealer as an option.

Fig. 3. BI-810 TREK Connection Diagram



A terminal program can be used for data exchange with the device. Terminal configuration settings: bit rate – 115,200 bps, data bit – 8, stop bit – 1, without parity check, without stream control.

Once the link is up, the device will start sending its status data to the terminal. Using the terminal program, a user can send commands to the device and receive responses to them. But the device first needs to send access password to the terminal in the following format:

TPASS: password;

where *password* is an access password for the terminal (by default, 11111 is used).

Once sent, the password will be valid for 60 seconds. After this timeout, the password needs to be sent again so that the data can be exchanged with the device.

Indicators Description

The top panel of the tracking device has 3 LEDs that indicate current status of the device.

No.	LED mode	Red	Yellow	Green
1	Permanently on	External power is on	The devices is connected to the server and the data are transmitted	-
2	Off	No external power	-	No satellites available
3	Blinks once every 0.5 seconds	-	Trying to connect to the server	
4	Blinks once every 0.1 seconds	-	Failure to connect to the server, the attempt will be repeated in 2 minutes	-
5	Blinks once every 2 seconds	-	-	Satellites are available, coordinates have been established

List of SMS Commands

SMS commands are used for getting current state of the device, troubleshooting potential errors, configuring the settings, etc. An SMS command should be sent together with login and password; the sender's number must be included to the list of authorized contacts (when such list is used).

Structure of the SMS Commands

Any SMS with commands includes login/password pair (when configured) and a list of different commands. The commands are delimited with **semicolon** delimiter.

SMS commands entered to the tracking device should be of the following format:
<login><space><password><space><command1>;<space><command2>;<space><commandN>;

*Example of an SMS command:
abcd 1234 getgps; getstatus;*



ATTENTION! Total length of an SMS command string should not exceed 160 Latin characters. Number of commands per one SMS is only limited by the maximum length of an SMS.

It is also essential to observe the order of the commands, when they are sent in one SMS message. The device reads and performs the commands in sequential order. E.g.,: once the *cpureset*; command is received the device processor will reset and the commands will not be further performed.

Correct:

```
setparam 0242 <APN>;
setparam 0245 <HOST>;
setparam 0246 <PORT>;
cpureset;
```

Incorrect:

```
setparam 0242 <APN>;
cpureset;
setparam 0245 <HOST>;
setparam 0246 <PORT>;
```

When login and passwords pairs are configured for access using SMS, they must be included to each SMS with the commands. If a login/password pair is enabled, but not included to an SMS with the commands, such SMS will be ignored. If a login/password pair option is not enabled, it will not be checked.

In the event that one of the authorized phone numbers is enabled, SMS commands will only be performed provided that they have been sent from one of the authorized phone numbers (login/password is also required, if enabled). If there is no authorized phone number enabled, SMS with commands will be received from any phone number.

Configuring the Device

The BI-810 TREK Tracking Device can be configured by one of the methods below:

1. Using a direct connection between the device and a computer.
2. Remotely, using SMS commands.

Configuration of the device by any of the methods available only requires configuring necessary device parameters. Each parameter has its own unique ID. Special commands are used to read/record the values of a selected parameter.

In case of remote configuration of the device using SMS, one should bear in mind that the total length of an SMS should not exceed 160 Latin characters. Number of commands per one SMS is only limited by the maximum length of an SMS.

All commands for device manipulation can be divided into the controlling and information ones.



Table 3. List of Information Commands

No.	Command	Description	Response
1	getstatus	Information about current device status	yes
2	getgps	Current GPS coordinates and time of the device	yes
3	getmap	Request for the link with device coordinates	yes
4	getver	Request for device firmware version	yes
5	getio	Getting the readings from internal device sensors	yes
6	flush	Request for device profile parameters	yes
7	getparam ####	Get a parameter by its ID	yes

Table 4. List of Controlling Commands

No.	Command	Description	Response
1	cpureset	Reset of the device CPU	none
2	rstallprof	Reset to default profile parameters	none
3	deleterecords	Deletion of all records saved	none
4	setparam ####	Set a parameter by its ID	yes
5	boot #,#,#	Update of device firmware	yes
6	setdigout #	Set digital output Out 1 operating mode	yes
7	ignitionoff	Disabling safety lock with the ignition	yes
8	ignitionon	Enabling safety lock with the ignition	yes

Detailed Description of Information Commands

Retrieval of current status of the device – *getstatus;*

No.	Parameter name	Description
1	Data Link	Current link status between the device and server: 0 – not connected, 1 – connected
2	GPRS	GPRS status: 0 – not connected, 1 – connected
3	GPRS IP	IP address of the device when GPRS-connected
4	GSM	GSM signal level [0-5]
5	Roaming	0 – home network, 1 – roaming network

Example of a response:

Data Link: 1 GPRS: 1 IP: 46.133.143.201 GSM: 5 Roaming: 0

Retrieval of current location of the device – *getstatus;*

No.	Parameter name	Description
1	GPS	Valid data - 1; Invalid data - 0
2	Sat	Number of visible satellites
3	Lat	Latitude (previous known latitude)
4	Long	Longitude (previous known longitude)
5	Alt	Altitude, m
6	Speed	Speed, km/h
7	Dir	Direction, degrees
8	Date	Date
9	Time	Current GMT time

Example of a response:

GPS: 1 Sat: 7 Lat: 50.2535 Long: 30.2622 Alt: 147 Speed: 0 Dir: 77
Date: 2018/4/30 Time: 12:33:45

Command of request for link with device coordinates – *getmap;*

Example of a response:

"www.biakom.com/maps/q=50.420209,30.428448,12,0"

Command of request of device software version – `getver;`*Example of a response:*

BI-810 VER 4.3.5

Get device sensor readings – `getio;`

No.	Parameter name	Description
1	DI#	Digital input status
2	DO#	Digital output status
3	AI#	Analog input status

*Example of a response:*DL1: 0 DL3: 0 DH1: 0 DO1: 1 AIN1: 0mV AIN2: 0mV PSV: 12.134 mV
VBAT: 4.126 mV**Request for device profile parameters – `flush;`**

No.	Parameter name	Description
1	IMEI	Modem ID number
2	APN	GPRS access point
3	LOGIN	GPRS access login
4	PASS	GPRS access password
5	IP	IP address of the server
6	PORT	Server port
7	MODE	Operating mode (always = 0 - TCP/IP)

Example of a response:

353976012555151, internet, none, none, 212.47.99.62, 12050, 0

Get the readings by parameter ID – `getparam #####;`

ID consists of 4 digits – the first digit is a profile number, the last three specify ID of a parameter.

Command example => request value of ID=0242 parameter: `getparam 0242;`

No.	Parameter name	Description
1	Param ID	Parameter ID
2	Value	Parameter value

Example of a response to the "getparam 0242" command:

Param ID 0242 Val: internet

Detailed Description of Controlling Commands

Command of complete device CPU reset – **cpureset;**

There is no response to this command. Once the command is received, all processes of the device reset.

Restoration of profile parameters defaults – **rstallprof;**

There is no response to this command. Once the command is received, all profile parameters are restored to their default values.

Command for deletion of all records saved – **deleterecords;**

There is no response to this command. Once the command is received, all data packets are removed from the device memory.

Set parameter values by their ID – **setparam #### #;**

ID consists of 4 digits – the first digit is a profile number, the last three specify ID of a parameter (refer to [Addendum 1](#)).

Command example => set the ID=0242 parameter value: setparam 0242 www.kyivstar.net;

No.	Parameter name	Description
1	Param ID	Parameter ID
2	New Value	New value of a parameter

Example of a response to the "setparam 0242 www.kyivstar.net" command - setting an APN:

Param ID 0242 New Val: www.kyivstar.net

Device firmware update – **BOOT #,#,#;**

Command parameters:

HOST – IP address of the server containing the update;

PORT – Port of the server containing the update;

PATH – Path to the firmware update file on the server;

Example of the command:

BOOT fw.bitrek.ua,80,*.bin;

Where * is a version of the firmware, .bin – file format extension.

Options of response to the attempted update download:

BOOT: UPDATE DOWNLOAD OK – downloading was a success;

BOOT: WAITE ERROR – wait timeout was exceeded during update download;

BOOT: HOST CONNECT ERROR – failed to connect to the server;

BOOT: PAGE LOAD ERROR – failed to download the file;

BOOT: UPDATE DOWNLOAD ERROR – failed to update the firmware;

Setting Operating Mode of Digital output OUT1 – **setdigout #;**

Example for enabling Out 1: *setdigout 1;*

When the output needs to be enabled, its value must be set to "1".

When the output needs to be disabled, its value must be set to "0".

No.	Parameter name	Description
1	DOx New Val: y	When OUTx status changes
2	DOx Old Val: y	When OUTx status does not change

Example of an SMS response:

DO1 Old Val: 0 DO1 New Val: 1

Basic Device Configuration

Once a mobile carrier SIM-card is inserted and power supply is connected, the device needs to be configured for transferring data to the server. When the *Bitrek Configurator* is used, all configuration settings will be divided into groups:

- Server and GPRS
- Tracking
- Safety
- Service
- Voice communication
- Roaming

The settings required for the basic operation of the device include data transfer and tracking settings. They are included to the "Server & GPRS" and "Tracking" groups. Once the appropriate settings are configured, the device will start transmitting the data of its current location to the server.

All configurable settings are given in [Addendum 1](#).

Security Settings

To comply with the security regulations, access to the device configuration settings may be restricted.

When connecting the device to a computer by means of USB-UART adapter, the device access password must be entered every time, when sending the commands to the device.

Default password is 11111. The password is valid for 60 seconds once sent. Once this time lapses, the password needs to be entered again. Access password can be changed by a user.

The default password must be sent to the device in the following format –
TPASS: 11111;

Example of a response:

"TASK COM TERM: PASSWORD OK" – the password is correct;

"TASK COM TERM: INCORRECT PASSWORD" – the password is incorrect;

When sending the commands using SMS, access login and password can be enabled. To set login, the ID 0252 parameter is used, while for the password the ID 0253 is used.

When login and password are enabled, any SMS command should have the following structure before sending it:

<Login><space><Password><space><Command1>;<space><Command2>;<space><Command3>;

Example of a command: *abcd 1234 getgps; getstatus;*

Apart from setting a login and a password, authorized phone numbers can be used. To record phone number to the device memory, the ID 0261 – ID 0269 parameters are used (refer to [Addendum 1](#)). In total, up to 9 phone numbers are supported by the device. If this feature is used, the device will receive only SMS from the authorized phone numbers saved to its memory.

If SMS login and password are enabled, they must be included in each SMS with the commands.

Configuring I/O Components

The BI-810 TREK Tracking Device can collect, process and send data obtained from different sensors to the server. Each sensor is an I/O component and has a group consisting of 6 parameters for configuration.

E.g., to configure data transfer of voltage level from the power supply unit to the server the ID 0410/0411/0412/0413/0414/0415 parameter group is used. These parameters have the following structure:

0410/0411/0412/0413/0414/0415

The first three digits (highlighted with green) specify the number of the group of parameters for configuration of an I/O component.

The last digit (highlighted with gray) is a parameter number. There are 6 parameters (from 0 to 5) per an I/O component. Possible values for these parameters are shown in Table 5.

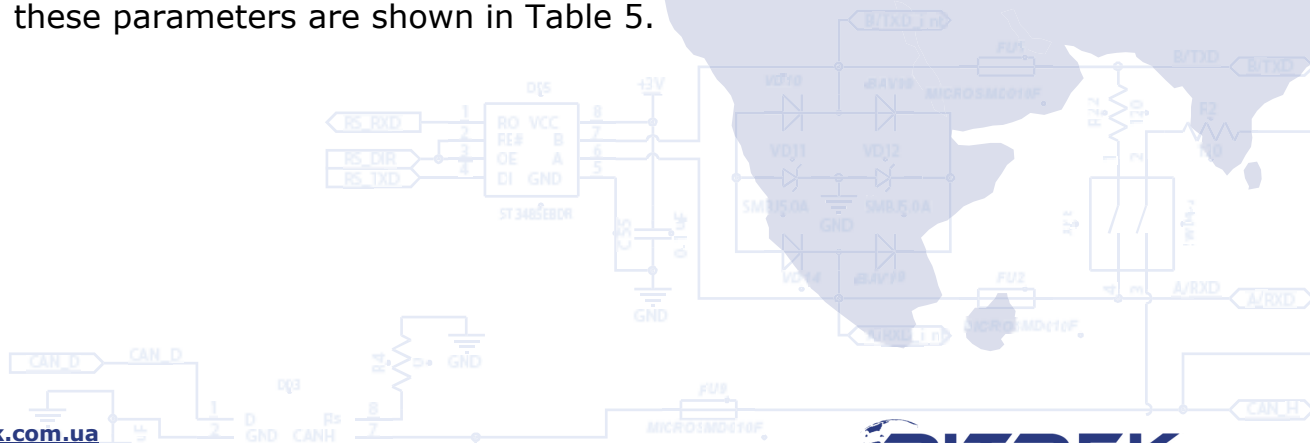


Table 5. List of Parameters for I/O Components

Parameter No.	Description	Possible values
0	Enabling / disabling an I/O component	0 – disabled; 1 - enabled
1	Priority of an I/O component during sending	0 – low; 1 - high
2	Upper threshold	(depends on I/O component type)
3	Lower threshold	(depends on I/O component type)
4	Setting the type of trigger event	0 – going within range; 1 – going beyond range; 2 – going back within/beyond range; 3 – monitoring; 4 – monitoring + going within range; 5 – monitoring + going beyond range; 6 – monitoring + going within/beyond range; 7 – event generation by change of an input by a preset value; 8 – event generation by change of an input by a preset value + monitoring.
5	Averaging constant	0+

Clarifications to Table 5:

Parameter 0 – enabling / disabling I/O component transmission to the server.

Parameter 1 - Priority: low/high. When selecting the "Priority: low" option, the data from the sensor will be sent to the server with the next data packet. When selecting the "Priority: high" option, the data will be sent to the server whenever possible;

Parameter 2 - Upper threshold – setting the upper threshold of the I/O component;

Parameter 3 - Lower threshold – setting the lower threshold of the I/O component;

Parameter 4 – Setting the type of trigger event generated:

0 - Going back within range.

If a certain range is configured for the values of a sensor (sensor value ranges are set as follows: the lower range threshold is recorded to a respective parameter – *Lower Threshold*, the upper threshold is recorded to the *Upper Threshold* parameter respectively), then the event will be generated, when actual value of the sensor readings comes within such configured range. In all other cases the event will not be generated and no information will be sent to the server.

Example: Lower threshold of input voltage is set to 0 V, the upper threshold is 10 V (10000 mV). If the input voltage decreases lower than 10 V, the event will be generated (Figure 4).

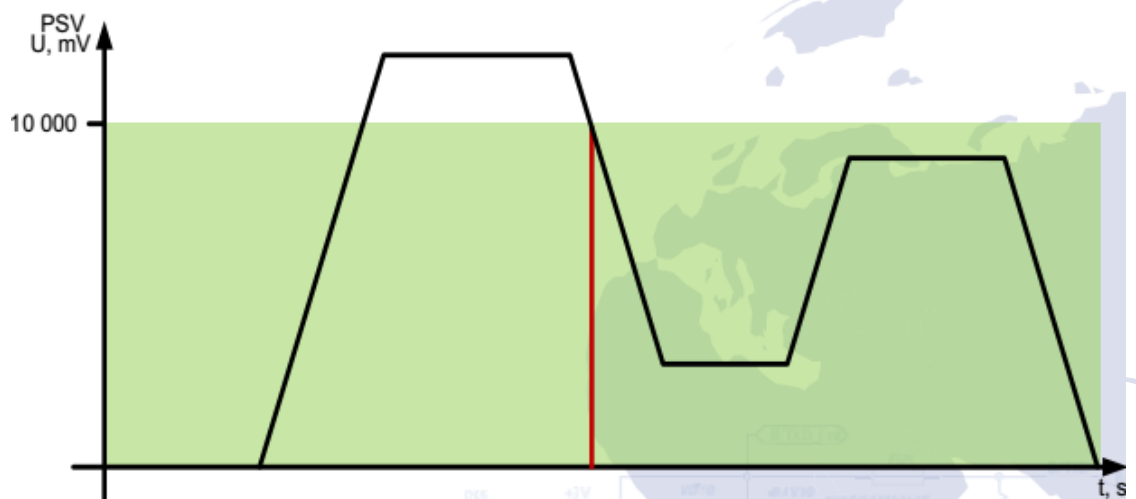
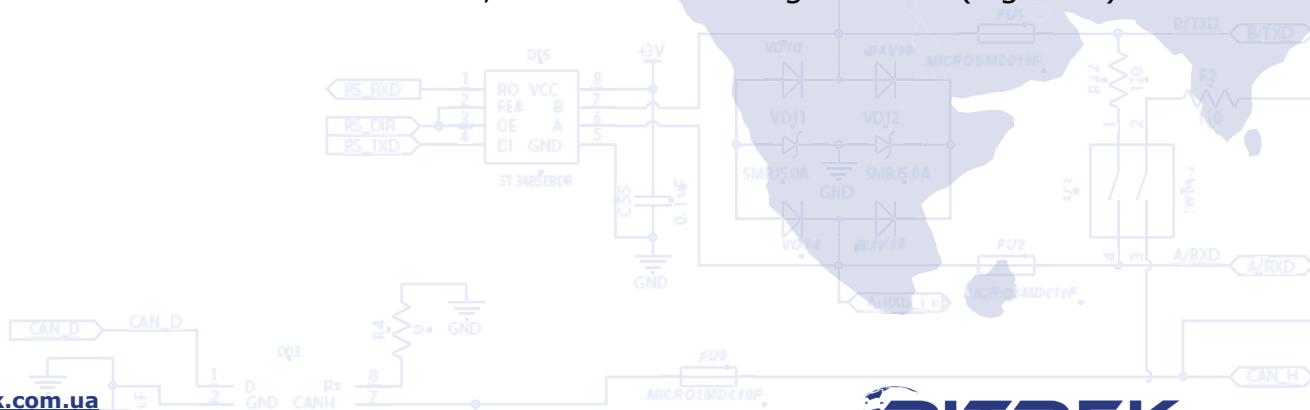


Fig. 4. Generation of the Event by Going Within Range.

1 - Going beyond range.

An event will be generated, when actual value of sensor readings goes beyond a configured range.

Example: Lower threshold of input voltage is set to 0 V, the upper threshold is 10 V (10000 mV). If the input voltage increases over 10 V, the event will be generated (Figure 5).



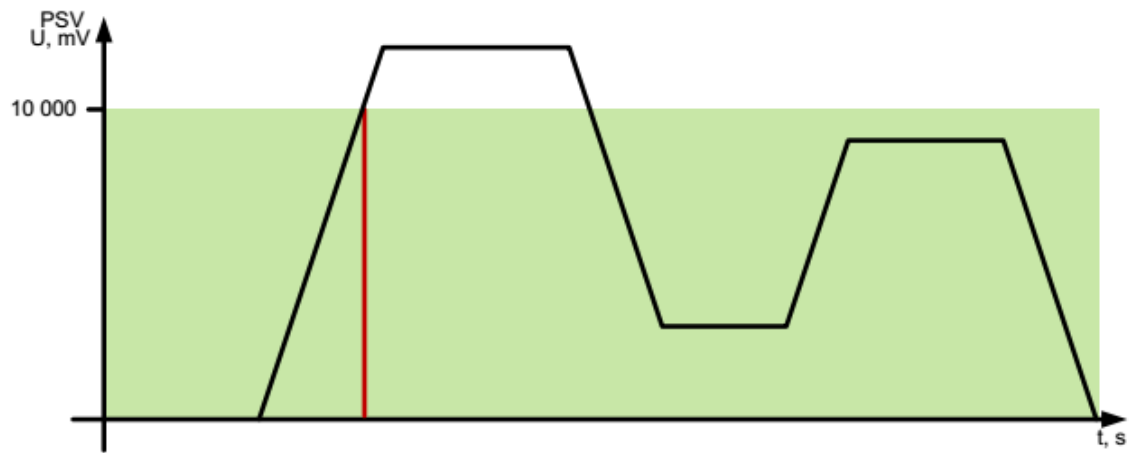


Fig. 5. Generation of the Event by Going Beyond Range.

2 - Going within/beyond range.

An event will be generated each time when actual value of sensor readings crosses the limits of a configured range.

Example: Lower threshold of input voltage is set to 5 V (5,000), and the upper threshold is 10 V (10,000 mV). When actual input voltage goes off the limits of a configured range, the event is generated (Figure 6).

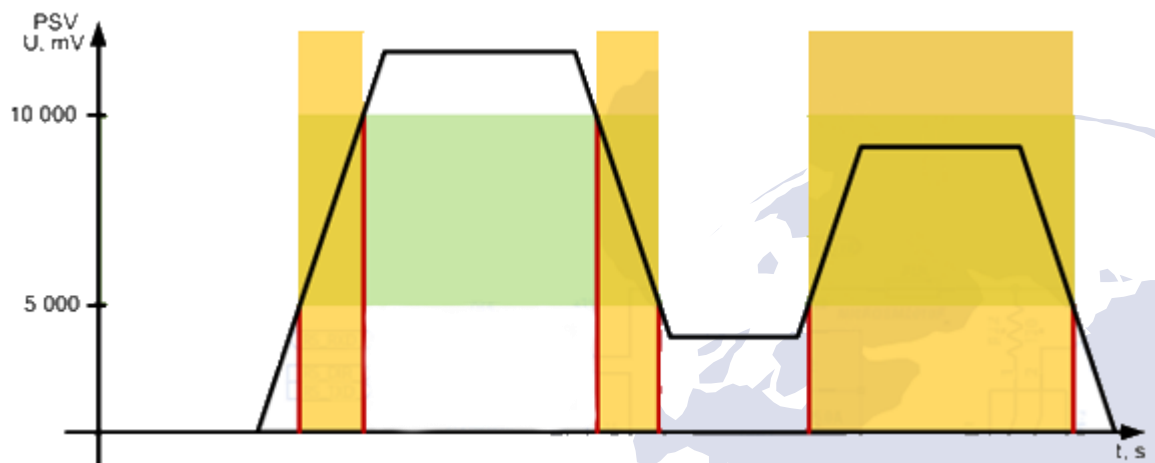


Fig. 6. Generation of the Event by Going Within/Beyond Range.

3 - Monitoring.

When this mode is selected, the data will be transmitted continuously, and no events will be generated.

4 - Monitoring + Going Within Range.

When a *Going Within Range* event is generated, actual value from the sensor starts to be transmitted to the server in the monitoring mode.

5 - Monitoring + Going Beyond Range.

When a *Going Beyond Range* event is generated, actual value from the sensor starts to be

transmitted to the server in the monitoring mode.

6 - Monitoring + Going Within/Beyond Range.

When one of the events is generated, actual value from the sensor starts to be transmitted to the server.

7 - Change of Input by a Preset Value.

When an input value changes increasingly or decreasingly by a preset value, respective event will be generated. Value of the setting is specified by the *Upper Threshold* parameter.

8 - Monitoring + Change of Input by a Preset Value.

When the events is generated, actual value from the sensor starts to be transmitted to the server.

Parameter 5 – Averaging Constant.

It is the time during which an I/O component must be within a particular state in order to generate an event. This setting is specified in milliseconds ($X*50$ msec, i.e. when setting the value to 10, the constant will be $10*50=500$ msec).

The list of all I/O components of the device available for configuration is given in [Addendum 2](#).

Configuring Alarms

The device can be configured so as to make an outbound call if a particular condition is met. Activation of a particular I/O component constitutes such condition. Voice calls must be enabled in general configuration settings of the device. I/O component must be enabled, configured to one of the events (going within range, going beyond range, going within/beyond range), its ID must be set as a trigger for outbound calls, and an authorized phone number Phone0 must be configured.

Note

Outbound call can only be made or an SMS message can only be sent to a phone number specified in parameter 0261 (Phone0).

Additional prerequisites include device being within the GSM carrier coverage area and sufficient balance. In case the device is beyond the coverage area, the call will be postponed until such time when the device returns back to the coverage area. The device takes one attempt to make an outbound call per each trigger activation.

Alarm configuration settings are specified in the *Security* section of [Addendum 1](#). Authorized phone number Phone0 is specified as the ID 0261 parameter.

Apart from the voice call, the device can send SMS messages to an authorized phone number, when events are triggered. The IDs of an I/O components by which SMS messages are sent should be configured as a trigger for outbound SMS messages. A user-defined text may be included with an SMS message, but it should not be more than 30 Latin

characters.

Description of Operator Selection Modes

0 – PARAM ID=0917=0

The device tries to register on the home network, the operators list is not used

1 - PARAM ID=0917=1

Both SIM cards are trying to register with the entire list of operators

Mode 0 (Operator Selection Enable ID=0917 0)

In this mode, the device tries to register on the home network, the list of operators is not used. If the SIM-card has not been detected within a certain timeout, or it has been detected, but has failed to register on the network, the device puts the modem to the sleep for a particular timeout. Once such timeout is reached, the process is repeated.

Mode 1 (Operator Selection Enable ID=0917 1)

In this mode, the device tries to register on the enabled network set by the entire list of enabled networks (parameters ID = 0020-0059).

If the SIM-card is detected and ready, the list of enabled operators is checked.

The device scans for available networks. If networks are detected that are included to the list of enabled ones, the device tries to register on one of the enabled networks. If the device has failed to register on any of the enabled networks detected, it switches the modem to sleep for a particular timeout. Once such timeout is reached, the process is repeated.

Configuring Roaming Settings

For the device to appropriately operate on roaming networks, respective operating mode must be configured and the list of enabled networks must be specified.

Select respective mode:

```
setparam 0917 1;
```

APN, Username, Uspass should be unfilled:

```
setparam 0242 < >;
```

```
setparam 0243 < >;
```

```
setparam 0244 < >;
```

Specify the list of enabled carriers:

```
setparam 0020 <MNC Code>;
```

```
setparam 0021 <MNC Code>;
```

...

```
setparam 0099 <MNC Code>;
```

APN, GPRS login, GPRS password need to be configured for each enabled network individually. The following parameters are used for that matter:

No.	Parameter name	ID for configuration	Capacity	Parameter purpose
1	UsAPNTable	0060...0099	string	List of APNs of enabled carriers
2	UsLoginTable	0100...0139	string	List of GPRS logins of enabled carriers
3	UsPassTable	0140...0179	string	List of GPRS passwords of enabled carriers

Specify APNs of enabled networks:

```
setparam 0060 <APN>;
```

```
setparam 0061 <APN>;
```

...

```
setparam 0099 <APN>;
```

Specify GPRS logins of enabled networks:

```
setparam 0100 <GPRS login>;
```

```
setparam 0101 <GPRS login>;
```

...

```
setparam 0139 <GPRS login>;
```

Specify GPRS passwords of enabled networks:

```
setparam 0140 <GPRS password>;
```

```
setparam 0141 <GPRS password>;
```

...

```
setparam 0179 <GPRS password>;
```



ATTENTION! If you specify the list of enabled operators, but do not specify APN, GPRS login, GPRS password for each of them, the device will not work in roaming.

Configuring the Device for Operation with RFID Readers

The BI-810 TREK Tracking Device is compatible with RFID readers via the RS-485 bus.

To configure the reader correctly, please, read its manual carefully first. To transfer the number of a card read to a server, respective I/O component needs to be configured.

Apart from transfer of the card number, there is also a feature for control of discrete output Out 1 depending on the cards being read. For this, the device is capable of storing up to 20 card numbers in non-

volatile memory.

If a number of a card being read matches one of the card numbers saved to the memory, the device activates one of the discrete outputs.

Network addresses 3, 9, and 10 are reserved for operation with RFID readers. They cannot be changed, which is why a reader must be configured with one of these addresses to operate correctly.

Configuring the Device for Operation with Fuel Meter RS-485

The BI-810 TREK Tracking Device is compatible with fuel meter supporting RS-485 bus. In total, up to four fuel meters can be connected.

Respective I/O component must be enabled in the configuration settings of the device.

Besides, the fuel meters must be pre-configured with respective network address. Network addresses 1, 2, 5, and 6 are reserved on the BI-810 TREK Tracking Device for operation with fuel meters.

The tracking device has a feature of transmitting unprocessed (raw) data from the level meters, as well as the data processed with Kalman filter. Optimal filtration factors for Kalman filter are set by default.

Filtered and non-filtered values are transmitted by different I/O components.

Moreover, if the level meters are equipped with an in-built temperature sensor, data from it can be retrieved and transmitted to a server.

Also, when fuel level meters are used on special machinery with GND conductor that can be switched off, a situation may occur when fuel level readings are reset to zero if the chassis GND conductor is switched off, which results in false fuel level drop being registered in the monitoring software. In order to avoid this situation, the ID=0819 parameter must be enabled, which is disabled by default.

Enabling the use of values of the last valid fuel level:

setparam 0819 1;

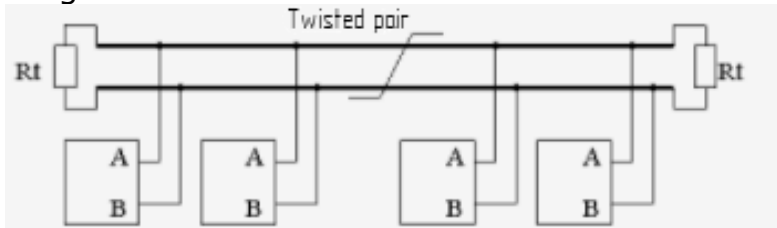
If the cable length from the fuel meter to the tracker is over 12 meters, which, ultimately, results in failure to transmit the data from the sensor, the device circuit board has jumper No.1 (Figure 7) that is intended for enabling pull-up resistor and 'A' & 'B' lines conditioning.

Switch No.2 is not used.

Fig. 7. Line Conditioning Jumper



Fig. 8. A & B Communication Line Connection and Configuration Diagram.



Use of Backup Server

The BI-810 TREK Tracking Device supports the use of a backup server (Host2 Port2). The ID=196 parameter is used for this case and by default is set to 0.

If 0196 is set to 0, only Host1 and Port1 are used.

If 0196 is set to 1, the device, at first, tries to connect to Host1 and Port1 several times. If it fails, then the device tries to connect to a backup server (Host2 Port2) when a configured timeout is reached.

Configuration example:

Enabling the use of a backup server:
`setparam 0196 1;`

IP Host2:
`setparam 0188 111.1.111.11;`

Port2:
`setparam 0189 11;`

Configuring Engine Lock

The BI-810 TREK Tracking Device together with a normally-closed relay can be used to lock the engine of the vehicle. Lock is enabled by sending an SMS message to the device.

Example of the SMS command for locking engine DOUT1:
setdigout 1;

To unlock the engine, the following command needs to be sent:
setdigout 0;

The device also has a feature of secure ignition lock.
Controlling commands: **ignitionoff; ignitionon;**
Controlled output: **DOut 1**

To lock the ignition, the **ignitionon;** command needs to be sent. This command will be performed only when minimum vehicle travel speed according to GPS is less than 5 km/h.

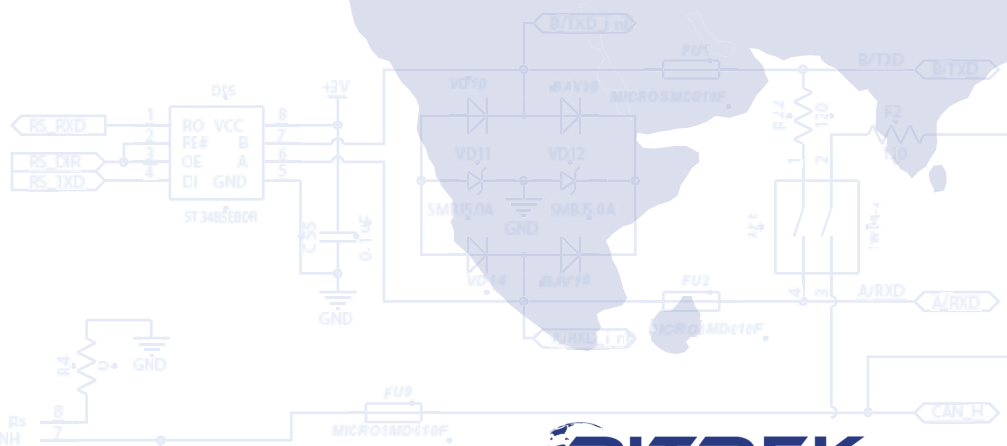
When the lock is enabled, the device will send the response:
ignitionon;

To disable the ignition lock, the following command is used:
ignitionoff;

When the lock is disabled, the device will send the response:
ignitionoff;



ATTENTION! The *ignitionon;* *ignitionoff;* commands will be performed by the device provided that they have been received via SMS message.



Addendum 1. Device parameters

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Server and GPRS							
ipsHost0	0245	none	String	Primary server IP address	none	IP or DNS	31.28.163.20
ipsPort0	0246	none	2 byte	Primary server PORT	none	PORT	20127
Switching Host 2 Port 2	0196	none	1 byte	Enabling backup server	none	0 - disabled; 1 - enabled;	0
ipsHost1	0188	none	String	Backup server IP address	none	IP or DNS	31.28.163.20
ipsPort1	0189	none	2 Byte	Backup server PORT	none	PORT	20127
APN	0242	none	String	GPRS access point	none	APN	gps.utel.ua
Username	0243	none	String	GPRS access login	none	User Name	none
Uspass	0244	none	String	GPRS access password	none	User Password	none
Send Period	0270	none	2 byte	Transmission-to-server time	sec.	0 - 65535	60
Connect Try Amount	0904	none	1 byte	Number of attempts to connect to server	pcs.	1 - 256	3
Connect Try Interval	0905	none	2 byte	Time between connection attempts	sec.	0 - 65535	60
Connect Serial Interval	0906	none	2 byte	Time between serial attempts to connect	sec.	0 - 65535	300

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Send Amount Del	0356	none	1 byte	Number of attempts to send data to the server before deletion	pcs.	1 - 256	3
Send Confirm Time	0357	none	1 byte	Time to wait for a response from the server	sec.	1 - 256	60
Tracking							
Enable Time Period	0900	none	1 Byte	Enabling time of retrieval	none	0 - disabled; 1 - enabled;	1
Enable Dist Period	0901	none	1 Byte	Enabling distance of retrieval	none	0 - disabled; 1 - enabled;	1
Enable Angle Period	0902	none	1 Byte	Enabling azimuth of retrieval	none	0 - disabled; 1 - enabled;	1
Day Period	0903	none	2 byte	Enabling time of retrieval with the ignition on	sec.	0 - 65535	30
Night Period	0011	none	2 byte	Enabling time of retrieval with the ignition off	sec.	0 - 65535	30
Dist Period	0012	none	2 byte	Retrieval period by distance	meters	0 - 65535	500
Angle Period	0013	none	1 byte	Retrieval period by azimuth	degrees	1 - 180	10
Record Amount	0232	none	2 byte	Number of records per packet	pcs.	0 - 65535	0
Delta X	0281	none	1 byte	Acceleration meter X-direction deviation angle	c.u.	1 - 256	5

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Delta Y	0282	none	1 byte	Acceleration meter Y-direction deviation angle	c.u.	1 - 256	5
Delta Z	0283	none	1 byte	Acceleration meter Z-direction deviation angle	c.u.	1 - 256	5
Start Move Timeout	0284	none	2 byte	Timeout for movement start by acceleration meter	0.1 sec.	0 - 65535	50
Stop Move Timeout	0285	none	2 byte	Timeout for movement stop by acceleration meter	0.1 sec.	0 - 65535	200
Axel Sleep Enable	0911	none	1 byte	Enabling sleep by acceleration meter	none	0 - disabled; 1 - enabled;	0
Wait Sleep TM	4007	none	2 byte	Timeout for sleep by acceleration meter	minutes	5 - 65535	15
Sleep TM	4008	none	2 byte	Sleep timeout by acceleration meter	minutes	0 - 65535	720
Min GPS speed	0918	none	1 byte	Minimum speed according to GPS for movement detection	km/h	1 - 256	5
GPS Source Select	4016	none	1 byte	Selecting geopositioning system	c.u.	0 or 3 - GPS+GLONASS; 1 - GPS only; 2 - GLONASS only;	3

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Safety							
Phone0	0261	none	String	Authorized phone number 0	-	+xxxxxxxxxxxxx	-
Phone1	0262	none	String	Authorized phone number 1	-	+xxxxxxxxxxxxx	-
Phone2	0263	none	String	Authorized phone number 2	-	+xxxxxxxxxxxxx	-
Phone3	0264	none	String	Authorized phone number 3	-	+xxxxxxxxxxxxx	-
Phone4	0265	none	String	Authorized phone number 4	-	+xxxxxxxxxxxxx	-
Phone5	0266	none	String	Authorized phone number 5	-	+xxxxxxxxxxxxx	-
Phone6	0267	none	String	Authorized phone number 6	-	+xxxxxxxxxxxxx	-
Phone7	0268	none	String	Authorized phone number 7	-	+xxxxxxxxxxxxx	-
Phone8	0269	none	String	Authorized phone number 8	-	+xxxxxxxxxxxxx	-
SMS Login	0252	none	String	SMS access login	-	Login	-
SMS Password	0253	none	String	SMS access password	-	Password	-
Terminal Password	0910	none	String	Device access password	-	-	11111
SIM_PIN	0818	none	1 byte	Enabling SIM-card carrier's PIN-number	-	-	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Service							
Reboot Per	0186	none	1 byte	Period of regular device reboot	hour	1 - 256	24
Reboot Type	0187	none	1 byte	Type of device reboot	-	0 - complete; 1 - modem only;	0
ErrSatNum	0992	none	1 byte	Enabling configuration of satellite number when GPS signal is lost	pcs.	1 - 256	0
GPRS_stay alive	0907	none	2 byte	GPRS session lifetime	min.	1-65535	480
Voice communication							
Input Call Trigger	0994	none	1 byte	Response to incoming call with digital inputs	-	0 - disabled; 1 - 6 - ID of I/O component (digital input) used for response to incoming call	0
RingNum	0912	none	1 byte	Number of rings prior to auto phone pickup	pcs.	1 - 256	3

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
Alarms							
RingEnable	0913	none	1 byte	Enabling outbound voice calls	-	0 - disabled; 1 - enabled;	0
OutCall Trigger	0914	none	2 byte	ID of I/O component triggering outbound voice call	-	ID	-
SMSTrigger	0816	none	2 byte	ID of I/O component triggering SMS to be sent to an authorized phone number in cases of event generation	-	ID	-
SMSText	0817	none	String	Text added to SMS (NMT 30 Latin characters)	-	Text	-
Roaming							
Operator Selection Enable	0917	none	1 byte	Enabling carrier selection	-	0 - disabled; 1 - enabled	0

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
UsIpTable	0020... 0059	none	String	List of enabled carriers	-	xxxxxx	-
UsAPNTable	0060... 0099	none	String	List of APNs of enabled carriers	-	APN	-
UsLogin Table	0100... 0139	none	String	List of GPRS logins of enabled carriers	-	Login	-
UsPassTable	0140... 0179	none	String	List of GPRS passwords of enabled carriers	-	Password	-
Parameters for I/O Component Configuration							
FuelCounter Mode	0993	none	1 byte	Fuel meter mode	none	0 - absolute fuel economy; 1 - instantaneous fuel economy;	0
AIN1_filter period	0959	none	2 byte	Period of data retrieval by AIN1 median filtering	(X+1) *50m S	-	19
AIN2_filter period	0980	none	2 byte	Period of data retrieval by AIN2 median filtering	(X+1) *50m S	-	19

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
MIN_duration_of_fuel	0349	none	1 byte	Filter of digital input dlow3. Levels below the specified one will be filtered	10 mS	1 - 20	5
ValidFuel Level	0819	none	1 byte	Enabling the use of last valid fuel level (filtered and non-filtered levels)	none	0 - disabled; 1 - enabled;	0
polling_period_fuel	0197	none	2 byte	Polling period for four RS485-based fuel meters	0.1 sec.	-	100
polling_period_RFID	0198	none	2 byte	Polling period for RS485-based RFID	0.1 sec.	-	15
polling_period_radio module	0199	none	2 byte	Polling period of RS485-based wireless sensor of tailing equipment	0.1 sec.	-	100
polling_period_RFID_RKS	0201	none	2 byte	Polling period for RS485 RFID RKS (SOVA)	0.1 sec.	-	15
FactorF	0950	none	4 byte	F factor for Kalman filter	c.u.	-	1000000

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
FactorQ	0951	none	4 byte	Q factor for Kalman filter	c.u.	-	1000000
FactorH	0952	none	4 byte	H factor for Kalman filter	c.u.	-	1000000
FactorRs	0953	none	4 byte	R factor for Kalman filter with no movement	c.u.	-	20000000
FactorRm	0954	none	4 byte	R factor for Kalman filter with movement	c.u.	-	400000000
switchFilters	0209	none	1 byte	Switching between filter types for filtered fuel meters	none	1 - Kalman filter;	1
Ekey_num	0920... 0939	none	8 byte	ID of enabled electronic keys	none	-	-
GSM_Reg Timeout	4019	none	2 byte	Timeout for registration on the GSM network	sec	60 – 300	120
GPRS_Reg Timeout	4020	none	2 byte	Timeout for registration on the GPRS network	sec	60 - 300	120

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
EkeyEnable	0915	none	1 byte	Enabling support of electronic key and outputs control.	none	0 - disabled; RFID (network address 3): 5 - controlling DOUT1 RFID (network address 9): 13 - controlling DOUT1 RFID (network address 10): 17 - controlling DOUT1	0
RadioMod Ena	0808	none	1 byte	Enabling wireless sensor of tailing equipment	none	0 – disabled; 1 - enabled	0

Addendum 2. List of I/O Components

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
dLow1	0340... 0345	1	1 byte	Digital input responding to log. 0	none	0 – enabled, 1 – disabled	-
dLow3	0360... 0365	3	1 byte	Digital input responding to log. 0	none	0 – enabled, 1 – disabled	-
dHigh1 (Ignition)	0540... 0545	5	1 byte	Digital input responding to log. 1	none	0 – disabled, 1 – enabled	-
GSMCSQ	0470... 0475	21	1 byte	GSM signal level	none	0 - 5	-
Movement	0510... 0515	240	1 byte	Movement status	none	0 – no movement, 1 – movement	-
AIN1	0300... 0305	9	2 byte	Analog input 1	V	-	-
AIN2	0310... 0315	10	2 byte	Analog input 2	V	-	-
VBAT	0420... 0425	67	2 byte	Battery voltage	V	-	-
PSV	0410... 0415	66	2 byte	Power supply voltage	V	-	-
GPSSpeed	0490... 0495	24	2 byte	Speed per GPS	km/h	-	-
GPSPower	0450... 0455	69	1 byte	Availability of GPS signal	pcs.	0 – disabled, 1 – enabled	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
pcbTemp	0440... 0445	70	4 byte	Device temperature	C	-	-
realOdometr	0500... 0505	199	4 byte	Relative virtual odometer	km	-	-
Odometr	0710... 0715	200	4 byte	Absolute virtual odometer	km	-	-
fuelLevel1	0580... 0585	100	2 byte	Polling filtered fuel meter (network address 1)	c.u.	-	-
fuelLevel2	0590... 0595	101	2 byte	Polling filtered fuel meter (network address 2)	c.u.	-	-
fuelLevel5	0850... 0855	129	2 byte	Polling filtered fuel meter (network address 5)	c.u.	-	-
fuelLevel6	0860... 0865	130	2 byte	Polling filtered fuel meter (network address 6)	c.u.	-	-
fuelLevel Unfilt1	0690... 0695	112	2 byte	Polling non-filtered fuel meter (network address 1)	c.u.	-	-
fuelLevel Unfilt2	0700... 0705	113	2 byte	Polling non-filtered fuel meter (network address 2)	c.u.	-	-
fuelLevel Unfilt5	0870... 0875	131	2 byte	Polling non-filtered fuel meter (network address 5)	c.u.	-	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
fuelLevel Unfilt6	0880... 0885	132	2 byte	Polling non-filtered fuel meter (network address 6)	c.u.	-	-
fuelTemp1	0600... 0605	102	1 byte	Fuel temperature per fuel meter (network address 1)	°C	-	-
fuelTemp2	0610... 0615	103	1 byte	Fuel temperature per fuel meter (network address 2)	°C	-	-
fuelTemp5	0520... 0525	127	1 byte	Fuel temperature per fuel meter (network address 5)	°C	-	-
fuelTemp6	0530... 0535	128	1 byte	Fuel temperature per fuel meter (network address 6)	°C	-	-
OperCode	0680... 0685	111	4 byte	Transmission of carrier's code	none	-	-
modemStat	0750... 0755	117	1 byte	Transmission of device modem status	none	0 - not active; 1 - active;	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
SIM_Stat	0790... 0795	121	1 byte	SIM card status	none	0 - no SIM detected; 1 - SIM detected; 2 - SIM detected, but not ready; 3 - SIM detected and ready	-
GSM_Stat	0760... 0765	118	1 byte	GSM network registration status	none	0 - not registered and not searching for carriers; 1 - home network; 2 - not registered, but searching for carriers; 3 - registration disabled; 4 - status unknown; 5 - roaming;	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
GPRS_net Stat	0770... 0775	119	1 byte	GPRS network registration status	none	0 - not registered and not searching for carriers; 1 - home network; 2 - not registered, but searching for carriers; 3 - registration disabled; 4 - status unknown; 5 - roaming;	-
GPRS_content_stat	0780... 0785	120	1 byte	GPRS content activation status	none	0 - not activated; 1 - activated;	-
count_dLow1	0830... 0835	125	4 byte	Frequency input (transmission of number of pulses per 5 sec, dlow1)	c.u.	-	-
fast_dllow1	0320... 0325	155	4 byte	Instantaneous pulse counter (Upper bandwidth limit up to 20 kHz, dlow1)	c.u.	-	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
pulseCount_dllow3	3810... 3815	158	4 byte	Pulse counter saving the values to non-volatile memory. (dllow3)	c.u.	-	-
pulseCount_dllow1	3820... 3825	159	4 byte	Pulse counter saving the values to non-volatile memory. (dllow1)	c.u.	-	-
fuelCounter1	0180... 0185	136	4 byte	Direct flow pulse counter (dllow3)	c.u.	-	-
fuelCounter2	0190... 0195	137	4 byte	Reverse flow pulse counter (dllow1)	c.u.	-	-
Trailer Module	0390... 0395	135	8 byte	Module of identifier of trailing equipment (network address 4)	none	-	-
fuelCounter	0460... 0465	76	4 byte	Fuel meter (pulse counter on dllow3 and dllow1 inputs)	c.u.	-	-
RFID_3	0620... 0625	105	8 byte	RFID identifier (network address 3)	none	-	-
RFID_RKS_9	3800... 3805	157	8 byte	RFID RKS identifier (SOVA) (network address 9)	none	-	-
RFID_RKS_10	3830.. 3835	160	8 byte	RFID RKS identifier (SOVA) (network address 10)	none	-	-

Parameter name	ID for configuration	ID for transmission	Bit depth	Parameter purpose	Units	Possible values	Default values
TimeSaving	5000... 5005	190	4 byte	Device operation time	minutes	-	-
axesX	0720... 0725	114	1 byte	Actual value of X-direction elevation angle	degrees	0 - 255	-
axesY	0730... 0735	115	1 byte	Actual value of Y-direction elevation angle	degrees	0 - 255	-
axesZ	0740... 0745	116	1 byte	Actual value of Z-direction elevation angle	degrees	0 - 255	-
HDOP	0800... 0805	122	2 byte	Horizontal accuracy determination	c.u.	0 - 9999	-

Document version

Date	Version	Note
12.06.2018	Ver.2018.06.1	Basic document
09.07.2018	Ver.2018.07.1	Changed the firmware update port number
09.10.2018	Ver.2018.10.1	Added new I/O element IDconf 0907
02.09.2019	Ver.2019.09.1	Added description of ID_Send 136, 137, 159, 76