

Terminals GalileoSky GPS v5.0

GalileoSky GLONASS v5.0

User's Manual



firmware 200

Quality

Reliability

Simplicity



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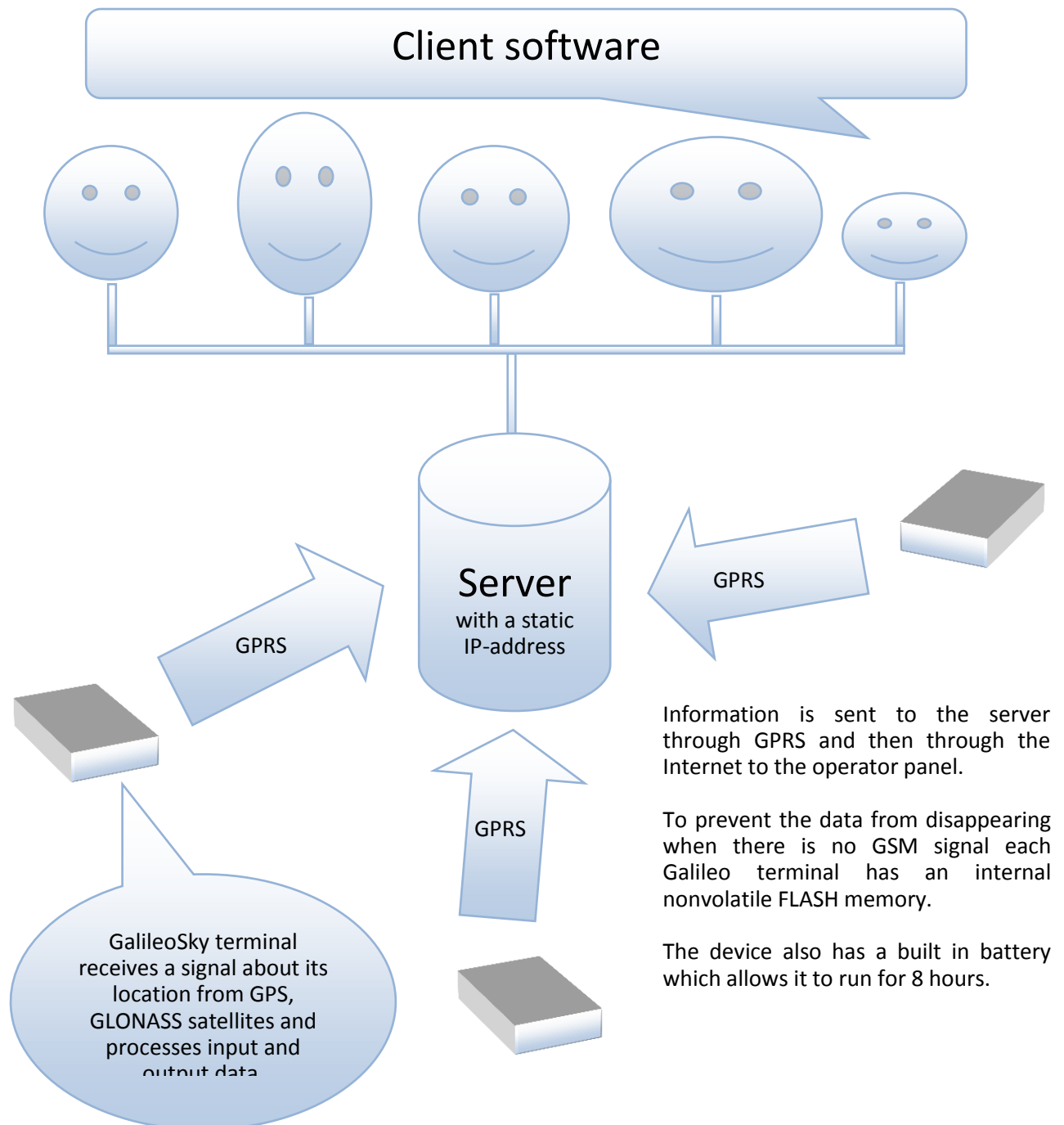
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Introduction

Galileo sky Ltd. produces GPS and GLONASS real time vehicles monitoring GalileoSky devices. The devices determine the mobile object location recording the time and route as points with geographical coordinates and send the data to the server to be further processed and sent to the traffic controller panel. In addition a number of other vehicle parameters are recorded: the state of analog and discrete inputs, the device state, the state of digital interfaces. The terminals can be used in any vehicle.



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The device provides the following opportunities:

- ✓ Vehicles monitoring in real time;
- ✓ A detailed turn by turn track (without any extra points in a straight track);
- ✓ Voice communication with the traffic dispatcher;
- ✓ GSM enabled remote software update;
- ✓ Continuous troubleshooting of the device through the USB port;
- ✓ Car alarm and a remote engine start;
- ✓ Securing facilities against intrusion;
- ✓ Automatic stops announcement;
- ✓ Adjusting the device through SMS, GPRS. USB;
- ✓ And others (see Terminal units performance and Connecting external peripherals).

The information sent by the terminal includes:

- ✓ The exact Greenwich time and date;
- ✓ Vehicle coordinates: latitude, longitude, height;
- ✓ Vehicles speed and direction;
- ✓ Vehicle acceleration;
- ✓ Inside temperature;
- ✓ Input (buttons) and analog sensors state;
- ✓ External digital sensors state (fuel, temperature sensors etc.);
- ✓ Discrete outputs state;
- ✓ And others (see details of transmitted data in GalileoSky protocol)

In addition the company provides warranty service and technical support on its site and forum.

Before starting the work study the instruction carefully.

Package

The standard package includes the Galileo terminal (hereinafter referred to as the terminal) and a pin connector. Everything extra should be bought separately.



Face:

1. Main connector
2. SIM 0
3. SIM 1



End (modification 2)

4. Mini USB (B-type)
5. GSM-aerial connector
6. GPS/GLONASS -aerial connector
7. microSD
8. Microphone socket
9. Loudspeaker socket



End (modification 11)

4. Mini USB (B-type)
5. GSM-aerial connector
6. GPS/GLONASS -aerial connector
7. microSD
10. Microphone and loudspeaker sockets

The terminal has 4LED indicators which show its current status: red (external power supply), yellow (microcontroller), green (GPS or GLONASS receiver), blue (GPRS modem). **See LED indicators.**

You will also need:

1. USB cable	1
2. GLONASS aerial	1
3. GSM aerial	1
4. Power supply unit	9-39V (15 W) 1

Technical specifications

Parameter	Modification 2	Modification 11
Discrete analog and pulse frequency inputs	8 pcs; voltage range 0-33V; Maximum frequency for pulse frequency inputs 2kHz; Input resistance of every input is 14 kOhm to the ground;	
Transistor outputs, open drain	4; maximum voltage 30V; maximum current 80mA	
Cell type	Li-Ion battery 560mA	
Average consumed power	1.6W	
ADC capacity in bits	10;	
FLASH memory capacity	up to 58000 points; up to 5000000 points when using microSD card	
1-Wire	Yes	
CANBUS	J1939,FMS, J1979, OBD II, 29-bit and 11-bit identifiers	
RS232	1	
RS485	1	
USB 2.0	Terminal troubleshooting, adjusting, reflashing	
MicroSD	Maximum memory of supported card is 32 gigabytes	
Speakerphone	yes	
Microphone and loudspeaker sockets	Jack 3.5	Jack 3,5 and Jack 2,5 for push-to-talk KMC-25
Speaker (Autoinformant)	built in	
The number of geographical areas for voice prompts	Limited by the microSD card capacity	
Speaker output	analogue (linear output) 250mW	
The size of a data packet sent by the device	GalileoSky protocol: variable size, tag format	
Accelerometer	built in	
Type of GLONASS receiver	MGGS2217	
Coordinates determination accuracy, 95% of time	within 5 m	
GSM modem	GSM 900/1800, GPRS class 10	
2 SIM-cards support	Yes	
Voice menu	Yes (when SD-card is used)	
Moisture protection	No	

Physical specifications

<i>Operating temperature range</i>	<i>-20...+45 °C</i>
<i>Storage temperature</i>	<i>-20...+45 °C</i>
<i>Relative humidity</i>	<i>0...90% (0...35 °C); 0...70% (35...55 °C)</i>
<i>Performance (height above the sea level)</i>	<i>0-2000 m</i>
<i>Storage</i>	<i>0-10000 m</i>
<i>Continuous work form battery</i>	<i>depends on the settings, 8hrs on average</i>
<i>External power supply</i>	<i>9-39V; is protected against voltage jumps in the vehicle power supply</i>
<i>Size</i>	<i>104,0 mm x 72,0 mm x 28,0 mm</i>
<i>Weight</i>	<i>within 300g</i>
<i>Body material</i>	<i>Metal</i>

<i>Warranty</i>	<i>2 year since the purchase date;</i>
<i>Average service</i>	<i>10 years</i>
<i>Internal Li-Ion battery life</i>	<i>500 charge/discharge cycles, two years maximum</i>

Safe maintenance rules

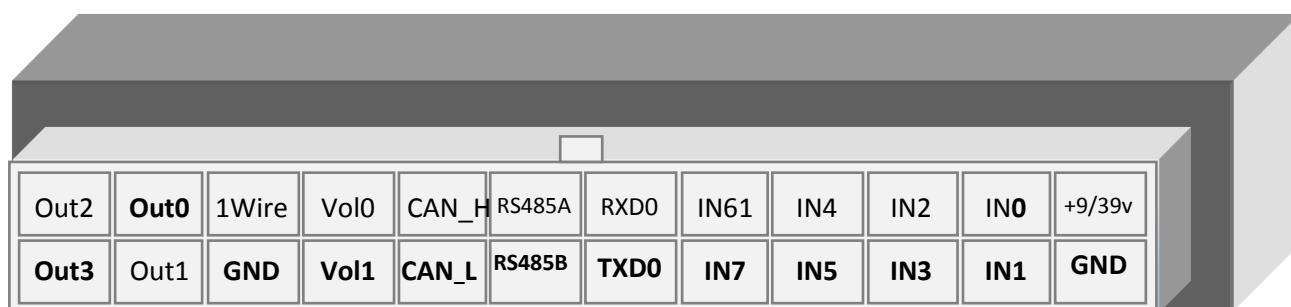
Before using the terminal study the instructions of GSM/GPRS devices safe maintenance.
Make sure the polarity is correct when connecting to the power supply.
The device should be connected straight to the vehicle battery, not to the vehicle power supply.

Caution! To avoid failure:

- **Make sure the contacts are connected correctly!**
- **Unused contacts must be well insulated!**

The ground is connected to the device body. In order not to damage the terminal or the vehicle's electronics it is necessary to separate the device body and the vehicle.

Contacts description



Contact	Description
+9/+39V	Positive supply voltage
GND	Negative supply voltage
IN0	Zero analog discrete input
IN1	First analog discrete input
IN2	Second analog discrete input
IN3	Third analog discrete input
IN4	4 th analog discrete input
IN5	5 th analog discrete input
IN6	6 th analog discrete input
RXD0	Zero channel RS232 RXD signal
TXD0	Zero channel RS232 TXD signal
RS485A	RS485 A signal
RS485B	RS485 B signal
1-Wire	1-Wire interface
GND	Ground to connect interfaces which need the ground contact
Vol0	Zero contact to connect an external speaker for signalling or autoinformer
Vol1	First contact to connect an external speaker for signalling/autoinformer funct
CAN_L	CAN interface CAN_L contact
CAN_H	CAN interface CAN_H contact
Out0	Zero transistor output (output 0/1)
Out1	First transistor output (output0/1)
Out2	Second transistor output (output0/1)
Out3	Third transistor output (output0/1)

Connecting

Connecting GLONASS aerial

Carefully screw the aerial to the terminal, the upper side above. To have a better view of the sky it is recommended that the aerial should be mounted on the vehicle roof, windscreen or under the dashboard.



If GLONASS aerial is mounted correctly, your coordinates will be found in 1.5 minutes. To be sure see that the green LED indicator is on. (*See' LED indicators'*).

Connecting GSM aerial

Carefully screw the aerial to the terminal.

The aerial should be mounted in such a way so as to prevent the GSM signal from fading because of the vehicle body, for example, under the dashboard or outside the vehicle.



To make sure the GPRS modem is sending data see that the blue LED indicator is on. (*see' LED indicators'*).

Inserting SIM-card

Use the card with activated GPRS and SMS services.

Insert the card carefully **without applying unnecessary force**.

- 1) To eject the SIM holder press the indicated place with something sharp (needle, toothpick);
- 2) Insert the card so that it is completely hidden in the holder cover.



Second SIM-card is inserted by analogy.

Connecting power supply to the device

Positive supply voltage should be connected to contact +9/+39V, supply voltage minus should be connected to GND. (See **Contacts description**). If the connection is correct, the red LED will be on. The supply circuit has to be protected by external fuse. The fuse current rating is 1A, ATO, automotive blade. We recommend 142.6185.4102 fuse, manufactured by Littelfuse.

LED indicators

❖ Red LED

Is on when the power unit is connected to the terminal.

❖ Yellow LED

Is on when the microcontroller is running (blinks with the frequency of 1 Hz).

It is also used to indicate the bootloader mode. (see **LED indicators during device flashing**)

❖ Green LED

Shows the GLONASS unit status.

Blinking frequency, times	Description
3	GLONASS unit is not found and is at the initialization state
2	GLONASS unit is found but coordinates are absent
1	GLONASS unit works properly, coordinates found and updated once a second

❖ Blue LED

Shows the GSM unit status.

Blinking frequency, times	Description
4	Stels mode (GSM unit is off and is set to be on according to schedule)
3	GSM unit is not found or is at the initialization stage
2	GSM unit is found but there is no server connection
1	GSM unit works properly, server is connected

Terminal units performance

Discrete analogue inputs (DAI)

To attach external sensors the terminal has 4 discrete analogue inputs which are pulse-frequency. Each input's function is set in terminal settings (see Discrete analogue inputs setting and [Inputs/outputs](#)). In [Contacts](#) description inputs are designated as IN0, IN1, IN2, IN3, IN4, IN5, IN6, IN7.

Each input saves its values to the nonvolatile memory, i.e. in case the channel is set to be a pulse one, the pulse number value will be restored after resetting the device.

Feature	Value
Maximum measured voltage	33 V
Analog inputs resolution	33 mV
Maximum transmitted signal frequency	2 kHz (synchronous measuring at 2 inputs) 1.5 kHz (measuring at 3 inputs) 1 kHz (measuring at 6 inputs)

DAI has the following settings:

Parameter	Explanation
Filter type (input function)	0 - mean arithmetic value (also discrete input state is generated); 1 - pulse count; 2 - frequency input; 3 - pulse count from two synchronous connected sensors.
Filter length to calculate the mean value	The greater this parameter, the more slowly the device responds to the input signal change. With filter length equal to 1 - averaging does not happen. Set this parameter to 1 for frequency inputs. It is necessary to set this parameter to 1 for pulse inputs. If the terminal counts an extra pulses, the filter length should be increased by one and accuracy estimated.
Ranges for response / nonresponse areas (logical 1 and 0)	To process discrete signals, discrete signal response/nonresponse range should be set where signals equal to one and zero. Discrete input statuses should be seen in the field Status Of Inputs, but not in the Input voltage. (Table 2. GalileoSky protocol tags). While counting pulses or frequency it is necessary to put the value equal to half the pulse value into all the fields of the given group. (example: the pulses' amplitude is 5000 mV, so all the fields must take the value 2500 mV) While counting pulses from 2 synchronous connected sensors, response zone limits must be the same and equal to half of pulse value at response of one of the sensors. Non-response zone limits are equal to half of pulse value at two sensors simultaneous response.

Pulse count

In case of a renewable counter the maximum pulse number can be 65535, after that the number is reset to zero.

If there is pulse at input, correspondent bit is set in Status Of Inputs field, and point is recorded. If there is no another pulse for 30 seconds, bit returns to 0.

Mean value and discrete event generation

Let us consider the example with the following zero input setting (see the left-hand figure):

Filter type is 0;
Filter length is 5;
Logical one zone range is 8-33V;
Logical zero zone range is 0-3V.

The mean value is calculated continuously and is put into the corresponding field IN0.

At the same time it is continuously checked whether the calculated value belongs to the given range.

If it is in the range 8-33V, the corresponding bit will find itself the Status Of Inputs field and point will be recorded.

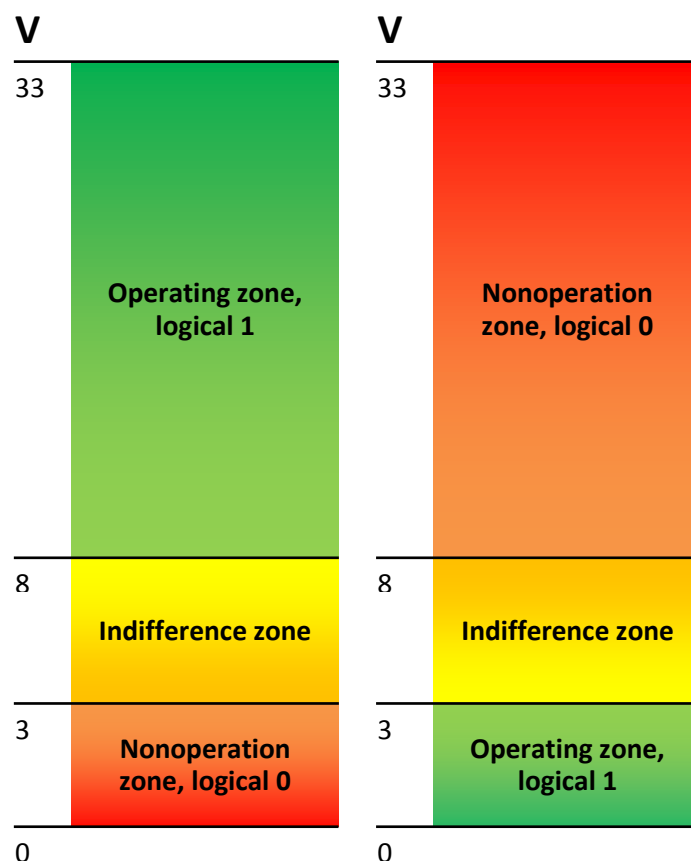
At value coming into the indifference zone (3V-8V), the former bit value will be saved to the Status Of Inputs field.

If the value is in the logical zero zone (0V-3V), the corresponding bit in the Status Of Inputs field is reset.

Thus we can see that the given bit changes its state only in the logical one/logical zero zone.

Example2.

In contrast to example 1 (see the right-hand figure) the logical one zone and the logical zero zone have changed places.



Frequency count

To measure frequency in some sensors it is necessary to connect the sensor frequency output to the sensor positive power supply via a 1kOhm resistor. Otherwise frequency count is impossible.

Frequency count from two synchronously connected sensors

Terminal allows connection of 2 pulse sensors on one input, in this case pulse fronts number is count, i.e. for each sensor response counter value increases for 2. Connection circuit details are given in section Connection of passengers flow registration gauge 112.

Determination of shock and incline

All devices beginning from version 1.9 can determine the terminal incline, and the devices equipped with digital accelerometer have possibility to determine shock.

Accelerometer axis directions:



To determine shock:

1. Install the terminal so as one of the accelerometer axis looks vertically, it will exclude false detections on road unevenness;
2. Turn on shock and incline determination by SHOCK command (see Track parameters setting). For example, if Z axis is vertical: SHOCK 3,90,5.

Shock is acceleration increase of 4g in horizontal plane, correspondent bit is put in the device state field (Table 3. Explanation of device state field) and shock coordinates are recorded.

To determine incline:

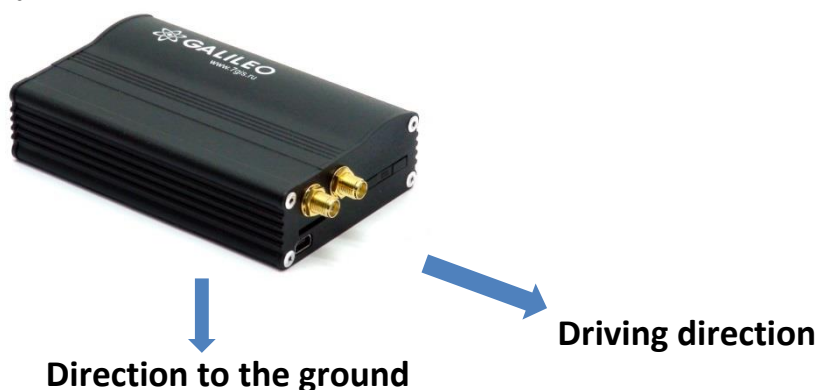
1. Install the terminal in vehicle;
2. By SHOCK command set maximum allowable incline angle and allowable time of this angle exceeding. For example, maximum angle is 20°, allowable exceed time is 5 seconds; SHOCK 3,20,5.

At the terminal peace position in vehicle change, SHOCK command should be given to adopt the terminal to new position.

Economical driving "EcoDrive" and determination of the driving style

The terminal can detect rapid acceleration, braking, harsh turns and shock on bumps. For correct operation of this function, the terminal must detect its orientation in space with respect to the vehicle (the vehicle's running direction and the direction in respect to the ground). The driving style data is stored only if dynamic archive is enabled (command FLASHARCHIVE 1).

The default orientation of the terminal:



If the terminal cannot be installed as illustrated by the picture, user-defined installation may be performed with the subsequent calibration of orientation.

To determine the position of the terminal in respect to the vehicle, perform the following steps:

1. Install the terminal to ensure its rigid link with the vehicle's body;
2. Ensure the horizontal position of the vehicle;
3. Execute the SHOCK 0 command, which will determine the direction of the terminal to the ground;
4. Start driving the vehicle at a speed exceeding 20 km/h; choose straight-line sections of the road while driving and keep performing acceleration and braking; in a few minutes the terminal will perform determination of the running direction.

Data on the driving style can be sent out using the "mainpackbit 174,1" command.

Data archiving to the external SD card

To create a backup on the external microSD card it is necessary to insert it into the device. If the need arises, it can be ejected from the terminal and the data can be read in a file manager or explorer with a card reader. It is also possible to send the archive to the server. CSV-files can be opened both with a text editor and Microsoft Excel. The saved data will be ordered in the following way:

```
MSD:\[track]
  20100201.csv
  20100202.csv
  ...
  20100331.csv
```

If there isn't enough space on the microSD card, (less than 12 MB) the device will delete the oldest files from the Track directory.

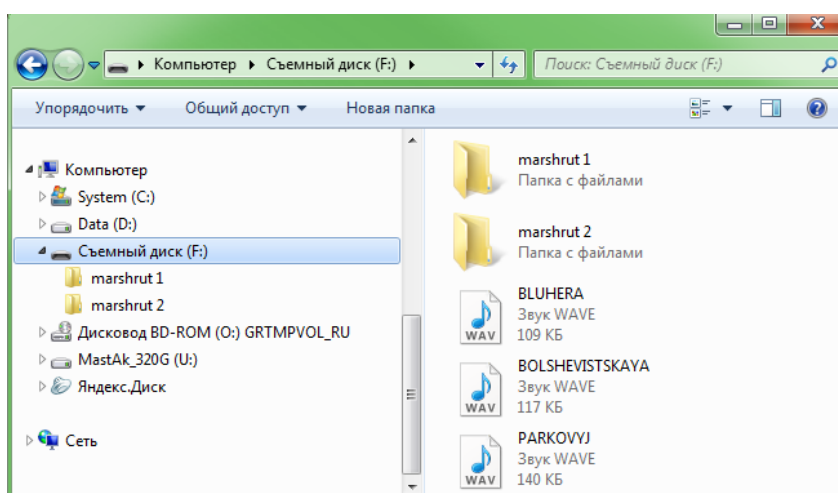
Autoinformers function

Autoinformers function may be used for automatic (without participation of the driver) public transport stops announcement with the use of satellite navigation system.

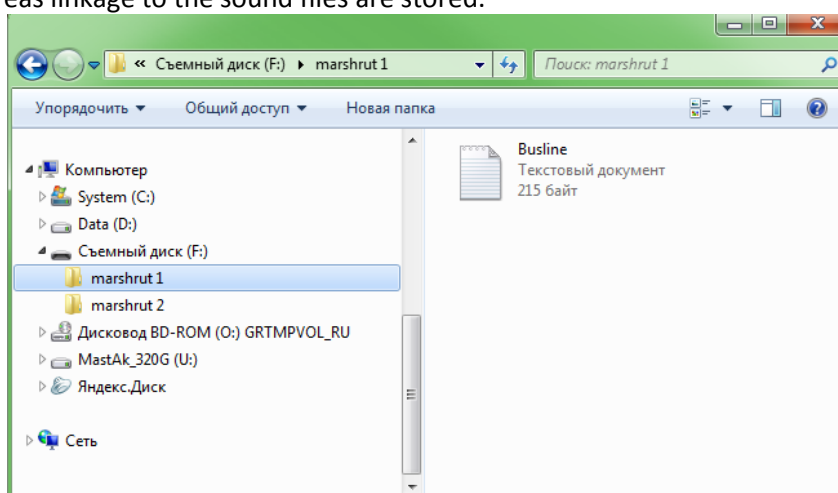
The main difference from analogous systems is taking into account vehicle movement direction, thereby excluding false operation at other stops located in the same geographic area.

To use autoinformers:

1. Attach the speaker to the terminal (see Connecting autoinformers speaker).
2. Set the microSD card:
 - a. Place sound files in format: wav, 16 kHz, mono, 16 bit to the card root folder. The file name must not exceed 20 symbols, including the extension, for example, PARKOVII.wav. The record length is recommended within 4 minutes (in case of exceeding, at the following file reproduction crackle may appear);
 - b. Create folders with routes names in the card root folder. The smallest number of routes is 1.



- c. It is necessary to place the BusLine.txt file to the route folders, where response areas and areas linkage to the sound files are stored.



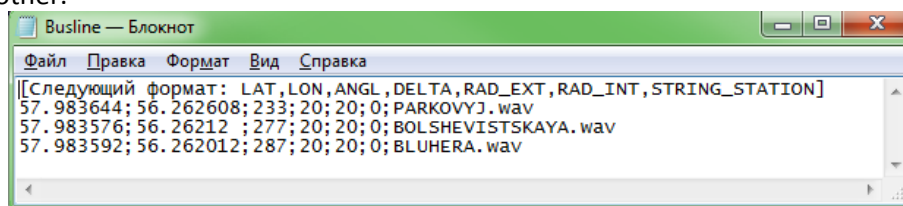
The format of each zone is the following:

- Latitude;
- Longitude;
- Direction angle α (the angle between the meridian and vehicle direction);
- Spread for the direction angle Δ (see the diagram below);
- Response (activation) zone outer radius R_{ext} ;
- Response (activation) zone inner radius R_{int} ;
- Sound file name corresponding to this zone.

It is convenient to fill in the information for zones from Device tab of Configurator while going along the route.

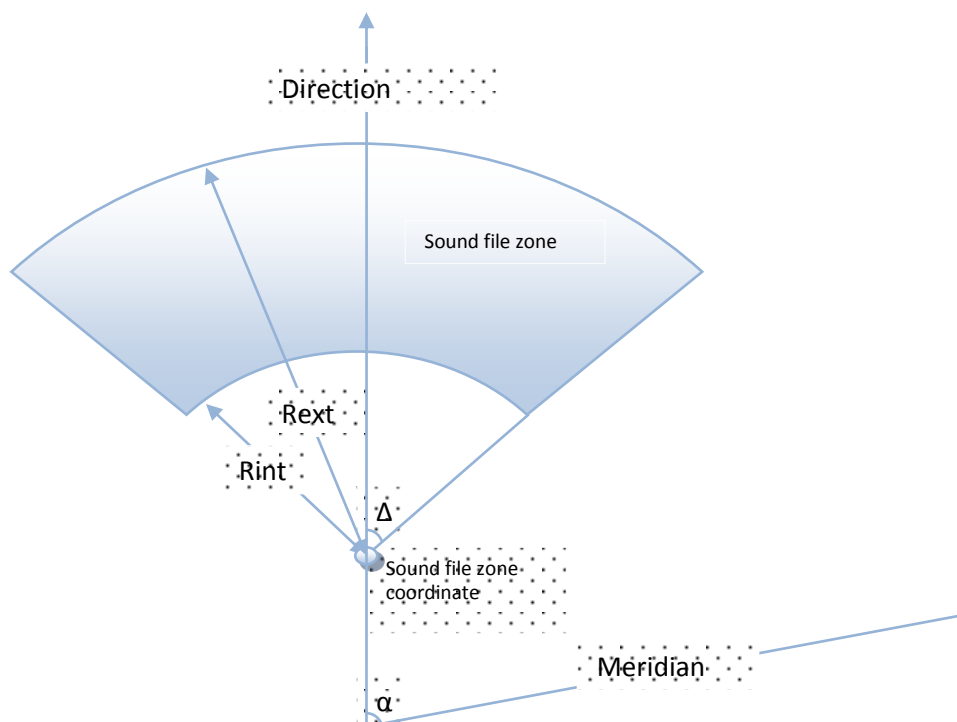
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At route forming it is necessary to indicate separate zones for stops in both directions even if stops are opposite each other.



Latitude and longitude values are input with point "." (for example: 57.9842) where value after point – is degree fractions. To transfer minutes into degree fractions (Xdegr.Ymin.) use the following expression $X_{degr.} = Y_{min.}/60$. For example: 57 degr. 55.4513min = 57.924188 degr.

Explanatory diagram



3. Activate the autoinformer function with the Autoinformer command. (see Autoinformer setting).
4. Insert the microSD card into the terminal and reset it with the command Reset. After the terminal resetting the function will be activated.

During sound files playing there is a 5 seconds pause between adjacent files.

To test sound files:

- 1) Unscrew GLONASS aerial from the terminal;
- 2) Enter into file BusLine.txt the following lines:
[the following format: LAT,LON,ANGL,DELTA,RAD_EXT,RAD_INT,STRING_STATION]
0.0;0.0;12.0;180;500;0;TEST.wav
- 3) Create in the microSD card root file TEST.wav. This file after the terminal resetting will be played again and again.

Signaling function

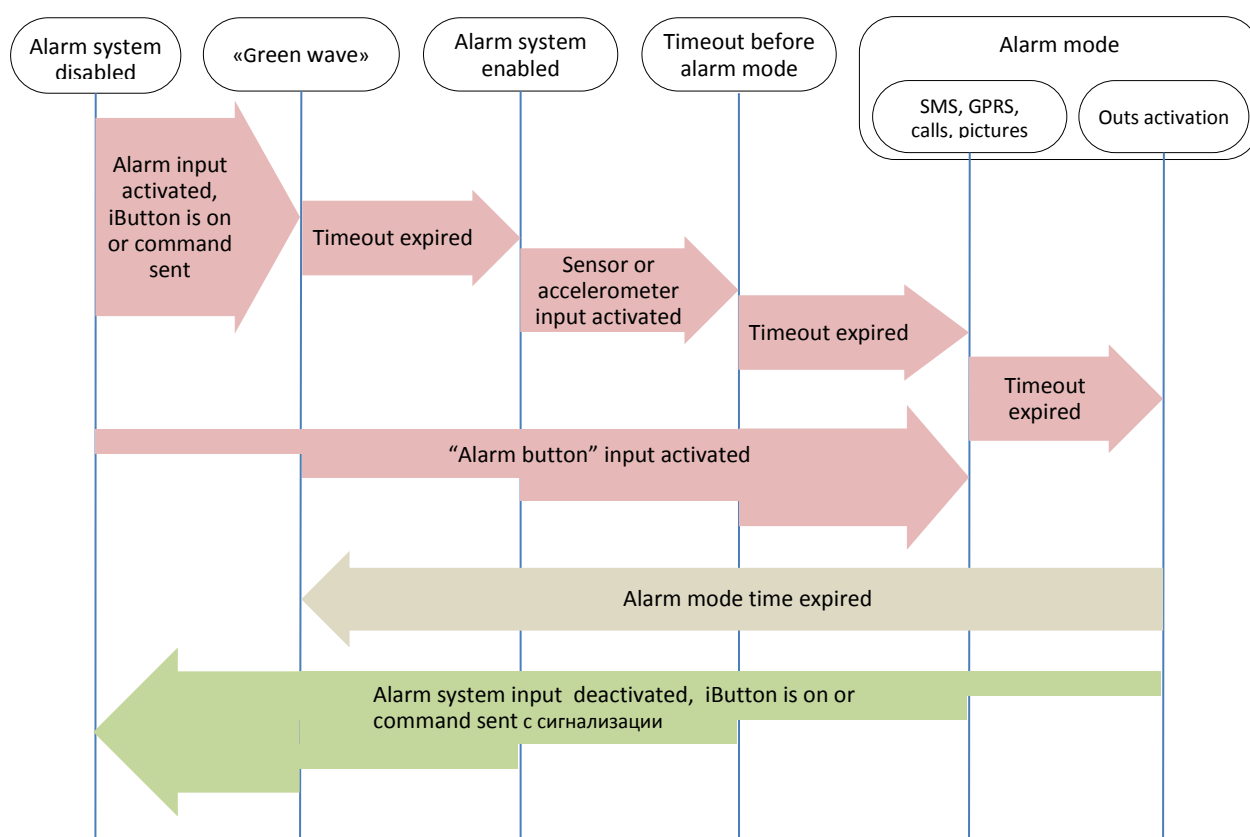
Signaling function allows assigning the response to:

1. analog input status change;
2. shocks and inclines (accelerometer data);
3. location change;
4. speeding; http://www.multitran.ru/c/m.exe?t=278852_1_2
5. iButton or RFID CARD connection.

The terminal can react by inverting input status, sending an output pulse, sending SMS, making a preset number(s) telephone call, taking a picture or recording the point.

The settings that users can change are as follows:

1. the time when input signals are not processed ("green wave"), with signaling enabled;
2. the maximum time of alert mode after which the Terminal will automatically change into an alarm system mode;
3. the time between activation and change to the alert mode individual for each input;
4. an SMS text message when changing to the alert mode individual for each input;
5. the time between enabling the alert mode and status change individual for each input.



Alarm mode states change diagram

Alarm system activation and deactivation can be made by input, SMS or server message, using the iButton key previously programmed in the Terminal (see Digital inputs setting). Commands prevail over inputs states. Input activation depends on the settings given by the InCfg command (see Discrete analogue inputs setting), the level outputs are inverted with respect to is set by the Out command (see Transistor outputs setting).

Monitoring data transmission

Terminal allows to specify the list of preferred GSM-networks. The main priority is given to network from the beginning of the list. Every network is specified with country's code and network operator's code. Terminal supports up to 30 networks (OPSO command, [Data transmission settings](#) section). If it's impossible to connect with one of the preferred GSM-networks, terminal connects to any network but don't establish connection with the server, thus voice communication and SMS will be available according to tariff of installed SIM-card.

The terminal allows data transmission to the main and backup monitoring server. If only transfer to the main server is set, continuous connection is maintained. If transfer to both servers is set, the terminal is connected to the main server and then after the set period of time expiration it brakes the communication and connects to the backup server etc. The terminal accounts transmitted data separately for each server, thus both will receive full archive with the track.

Transmitted data may be coded, algorithm XTEA3 (<http://tomstdenis.tripod.com/xtea.pdf>) is used for coding. Commands, responses and photos are not coded. Data are archived in internal flash-memory by default. During long periods without connection the oldest records of internal flash-memory may be erased by the new ones. In this case it is recommended to insert microSD card and to adjust archive transmission from it (Archive command, section Service command). If the archive is stored in the internal flash-memory, data are sent deep into the history, i.e. the most actual first, then – more old. If archive is on microSD card, data are transmitted in chronological order.

Internal Archive Structure

Data archive can be stored on the internal flash memory or micro-SD card. The internal flash memory card is used by default.

The Terminal stores data from all the inputs and interfaces, even when they have no connected sensors, in the internal flash memory archive. If storing all the data is unnecessary, the dynamic archive can be used (command FLASHARCHIVE, see Service commands). In this case only the data selected in configuration of the head and main packets will be saved (commands HEADPACK and MAINPACK, see Server exchange protocol settings).

Any change of configuration of the head and main packets when the dynamic archive is on can cause flash memory formatting and data loss.

Use of dynamic archive can increase considerably the maximum number of kept pixels up to 58000.

By using the internal flash memory it is possible to choose the order in which pixels are sent to the server. By default, data are saved in the depth of the data store, i.e. current data are saved before older data. Transfer in chronological order can be set by command FLASHARCHIVE. After changing the direction of memorizing data the flash memory will be formatted and data lost.

By using micro SD card the data are always stored in chronological order. Note, that only current data are used for the first packet.

Operation with two SIM-cards

Terminal has 2 slots for installation of SIM-cards. Only one SIM-card can be active and support registration in GSM-network at the same time. Each SIM-card has its own APN. If PIN code is used, it must be the same for both SIM-cards. The Terminal supports the following algorithm of SIM-card operation:

1. Only one SIM0 card is always active.
2. Automatic switching to the other card, if the data cannot be sent on the server within 9 minutes. Switching occurs in cycles, i.e. first SIM0 is used, then SIM1, and after this SIM0 again.
3. Switching between SIM-cards according to the list of preferred GSM networks. If the Terminal detects the availability of one of the predetermined GSM networks, it switches to the corresponding SIM card. If both nets predetermined for SIM0 and SIM1 are available at a time, the preference will be given to SIM0.

When updating firmware remotely, the second algorithm is always used; the Terminal attempts to get the connection to the server with firmware through SIM 0, and if it fails - through SIM 1.

GPRS traffic costs optimization

GPRS-traffic costs decrease at online monitoring may be reached by following these advices:

1. Turn off transmission of unused data, for example temperature, acceleration, analogue and digital inputs values which have no connected sensors. It can be made in Configurator tab Settings\Protocol or by commands MainPack and HeadPack (see [Server exchange protocol settings](#)).
2. Increase points record period. It can be made in Configurator tab Settings\Track or by command WrPeriod (see [Track parameters settings](#)).
3. Increase turning angle at which the device record point, and distance at exceed of which the point is recorded. It can be made in Configurator tab Settings\Tracks or by command Turning (see [Track parameters settings](#)).
4. Find out from server software developers time of disconnection due to the terminal activity absence. This parameter should be taken into account at points record period setting or traffic increases due to costs of restoring connection with the server. Example: points record period at stop is 1200 seconds (20 minutes), server disconnection due to the terminal inactiveness is 180 seconds (3 minutes). The terminal determines that vehicle stops and switches on timer for the next point record in 20 minutes, in 3 minutes the server disconnects as it hasn't received data from the terminal. The terminal tries to reconnect the server at once. It happens 6 times and only in 20 minutes the terminal sends the next point. As a result of which traffic costs considerably exceeds savings from points record interval increase.
5. Set coordination filtering at stop so as the terminal can correctly chose points record period. The terminal can determine stop according to several elements:
 - accelerometer data (command AccSens section [Track parameters setting](#));
 - external supply voltage (command MHours section [Track parameters setting](#));
 - ignition sensor indications (command Ignition section [Track parameters setting](#)).

If continuous online monitoring is not necessary it is possible to set packet data transmission (see [Stels mode and package transmission](#)). In this case the device is periodically communicates, sends data from blackbox and disconnects from the server. Savings due to decrease of costs for one data packet transmission as at data sending from archive packet size may be up to 1000 byte, and at online monitoring usually one point is sent (tenths of bytes). At the same time the terminal operation from the battery increases as during server disconnection periods the device switches GSM-modules off.

Operation in international roaming

The terminal allows setting special parameters of data transmission in the international roaming (command [Roaming](#), section [Data transmission settings](#)). After registration in GSM-networks the terminal receives from base station code of the country and compares it with the set one, if they do not match the terminal is in roaming. ... Being in roaming the terminal constantly supports registration in GSM-network but initializes GPRS-session only according to the schedule, thus it is always possible to make a call to the terminal or send SMS with command and decrease GPRS-traffic costs. For GPRS-session the maximum volume of transmitted data in bytes is determined. Each cell operator has minimum tariffing interval in roaming, it is recommended to set maximum data volume equal to half of this interval (the second half is for official traffic TCP/IP which volume depends on connection quality). At archive transmission from internal flash-memory, the terminal always unloads the most actual data. At archive transmitting from SD-card it is recommended to set coordinates transmission and sensors indications in the first packet, thus the terminal sends one point with current vehicle coordinate and the oldest unloaded archive part. Data from SD-card are unloaded in chronological order.

Stels mode and packet transmission

In this mode the Terminal switches GSM unit off and communicates only according to strict schedule, which allows decreasing Internet traffic and power consumption.

Stels mode settings command: "stels pday,phours,minGSMon" where

- *pday* – device communication is enabled every *p days* since the beginning of the month, in other words on *pday*- multiple days;
- *phours* –device communication is enabled every *p hours* since midnight GMT, in other words at *phours* -multiple time.
- *minGSMon* –GSM unit is enabled for *minGSMon minutes since the beginning of the hour*.

Packet transmission also can be set in Configurator on tab Settings/Data transmission.

To disable these modes use the «stels0,0,0» command.

Settings examples:

- 1) – communication once a day;
– communication at 14.00 GMT;
– staying in network for 15 minutes.

Setting command: stels 1,14,15

To enable communication once a day *phours* must be greater than 11, i.e. it can be enabled at 11 and at 22 o'clock. At communication every 12 hours, communication is enabled at 12.00 and the next must be at 24.00, but this is another day, i.e. it is not realized.

- 2) – communication once a day;
– communication every 2 hours GMT;
– staying in network for 15 minutes.

Setting command: stels 1,2,15

- 3) – communication once in three days;
– communication at 23.00 GMT;
– staying in network for 15 minutes.

Setting command: stels 3,23,15

Note.

- communication at 0 o'clock GMT cannot be enabled whatever the settings;
- if the device is in the stels mode, remote commands will work only when the radio silence mode is disabled, i.e. GSM unit is on;
- do not set the communication time less than five minutes, otherwise the device will not have time enough to establish a link with server and tell its location

Geographical areas

The terminal allows setting areas where coordinates are not updated, GSM unit is switched off. It is also possible to set periodical camera shooting (PhotoCfg command, section Photo camera settings). Each area is described by coordinates of the center and radius. Geographical areas setting commands are given in section Track parameters setting.

Power saving

To reduce power consumption of the Terminal in the operating mode, perform the following steps:

1. For unused RS232ports, execute RS2320 0 or RS2321 0 command, or specify "nothing" as the "RS232 function" in the Configurator.
2. Turn off the integrated CAN-controller if the Terminal is not connected to a CAN-bus. This can be performed using CANREGIME command with the first parameter set to 0, or by specifying "CAN disabled" as the "Filter type" in the Configurator.
3. Turn off the Autoinformer when not in use. This can be done by sending AUTOINFORMER command with the first parameter set to 0, or by unticking the "Autoinformer" section of the Configurator.
4. Reduce the degree of track details. The lower is this degree, the less is the power consumption.

To reduce power consumption of the Terminal at stop, perform the following steps:

1. Set up the shutdown of the GPS/GLONASS module at stop, this can be performed using SLEEPMODE command ([Service commands](#) section) or in the "Power saving" tab in the Configurator.

Enable the "deep sleep" mode at stop. The "deep sleep" mode is turned on at the end of a pre-specified time period at stop. In this mode the Terminal disables the specified modules (GPRS, CAN, RS232, microSD), reduces the ADC sampling rate, does not sample 1Wire sensors and does not charge the battery. The behaviour in the "deep sleep" mode can be configured using SLEEPMODE command or in the "Power saving" tab of the Configurator. It is possible to setup a period of connection to a server in "deep sleep" mode.

Remote configuration

Remote configuration can be performed through several data transfer channels:

1. SMS. The terminal has a list of 4 authorized phone numbers, the messages from which are treated as configuration commands. The commands available are described in the section "SMS enabled settings". A phone number can be added to the list of authorized numbers either through the Configurator, or by sending a message with the command "AddPhone".
2. GPRS. Commands can be sent from the monitoring data processing server. The format of the commands is described in the section "Server communication protocols".
3. GPRS. Commands can be sent via the Configurator and the remote configuration server of "GalileoSky" Ltd. In this case, the Terminal supports two parallel connections: the first – with the monitoring data processing server, and the second – with the remote configuration server. Remote configuration can be enabled using "RemoteConfig 1" command ("Service commands" section). It is possible to send commands to the Terminal, to receive current information from the sensors connected and to receive diagnostic messages, when working with the remote configuration server. Using Configurator it is possible to create a command pack to configure the Terminal and to save it on the server. These commands will be sent to the Terminal when it establish connection to the server.

Connecting external peripherals

CAN-interface

The terminal allows to extract information from the CAN bus.

The following protocols are supported:

– J1939 (FMS). According to this protocol the Terminal is not a device transmitting to CAN bus, the device does not change vehicle operation, it also doesn't send confirmations to vehicle units packets and there are no electrical noise in CAN bus. In some cases at connection to troubleshooting socket for correct information reading from bus it is necessary to send confirmations to vehicle units packets, for this give the terminal command ActiveCAN 1 (see [CAN settings](#)).

– J1979 (OBD II). This protocol works according to the question-answer mode, the Terminal transmits data to CAN bus.

Available performance modes:

J1939_SCANER – the bus scanner sending bus reports to the configurator.

FMS – standard FMS protocol filter. (see www.bus-fms-standard.com).

J1939_USER_29bit – configured user filter. Identifier length is 29 bits.

J1939_USER_11bit – configured user filter. Identifier length is 11 bits.

J19379_SCANER – the bus scanner defining bus speed and identifier capacity.

J1979_USER_29bit – standard protocol filter J1979 for 29 bits identifiers.

J1979_USER_11bit – standard protocol filter J1979 for 11 bits identifiers.

J1939_SCANER mode

Is intended to study CAN bus reports, according to protocol J1939.

Supported rates from 10000 bit/s up to 500000 bit/s (typical values: 62500, 12500, 250000, 500000).

11 and 29 bit identifiers are supported.

The scanning mode works as follows:

1. The **CAN.Startscan.** message is displayed;
2. CAN bus reports are displayed with a delay indicated by the CAN Regime command. (see [CAN settings](#)).

29bit identifiers are displayed in the following format:

ID= 00000009 (8) 06 07 08 09 00 CC DD EE

where

ID - is a 29bit message identifier;

(8) - is the number of received bus bytes.

01 02 03 04 05 AA BB FF - is an 8byte message. (the lower byte is on the left, the high byte is on the right),

11bit identifiers are displayed as

ID=009 (8) 06 07 08 09 00CCDDEE

where

ID - is an 11bit message identifier;

(8) - is the number of received bus bytes;

01 02 03 04 05 AABBBFF is an 8byte message. (the lower byte is on the left, the high byte is on the right).

3. After all the identifiers have been displayed in the diagnostic window you can see the **CAN.Endscan** message.

To enable this mode:

- 1) attach the terminal to the vehicle CAN interface;
- 2) in Configurator tab Settings/CAN select bus rate and delay time (time of message waiting time);
- 3) push Start Scanning J1939. Received data are displayed in the right panel.

FMS mode

This mode is by default included in all terminals, it allows retrieving and decoding messages corresponding FMS protocol:

- total petrol consumption: the petrol the vehicle has used since it was made;
- tank fuel level: in percents. 0%-empty, 100%- full;
- coolant temperature;
- engine revolutions;
- total kilometrage.

Attention! Many car manufacturers partially support FMS or do not support it at all.

To enable this mode:

- 1) attach the terminal to the vehicle's CAN interface;
- 2) give the CanRegime 2,25000,2000 command (see CAN settings) or in Configurator on tab Settings/CAN select filter type FMS;
- 3) make sure the device receives bus data and sends them to Device tab in Configurator;
- 4) set the right data transmission to the server using the MainPack command (see Server exchange protocol settings) or in Configurator tab Settings/Protocol.

J1939_USER_29bit mode

This mode enables us to receive 29bit identifiers messages from the vehicle CAN-bus, according to J1939 protocol.

To enable this mode:

- 1) connect the terminal to vehicle CAN interface;
- 2) in Configurator tab Settings/CAN select filter type Custom filter (29bit identifiers), set bus rate and delay time or give CanRegime command with necessary parameters (see CAN settings);
- 3) set filters for CAN bus messages.
- 4) set received data sending to the server with the use of MainPack command (see Server exchange protocol settings) or in Configurator on tab Settings/Protocol.

Notes:

- 1) In protocol of the first and the main packet of the terminal (Table 2. GalileoSky protocol tags) there are 1-byte, 2-bytes and 4-bytes tags for this mode operation, i.e. if the necessary ID needs only one byte from all data, better choose 1-byte tag.

- 2) Any of these tags can correspond to the right CAN message ID

Attention! The data should be recorded in the terminal in the decimal system. The hexadecimal notation is used for convenience only.

We can choose the bytes to fill the tag from the information with this ID by means of shifting.

Let us see an example:

The CAN message identifier is ID=0x18F00300.

We need only the first byte of all the sent content with this ID.

As we need only one byte we shall choose the tag CAN_R0 as an example.

That is the command to set the tag is as follows: CAN8BITRO ID,Shift

- 1) The tag number ID=0x18F00300 will look as 419260256 in the decimal system.
- 2) The byte we need is shifted by one byte, that is the second parameter is equal to 1

So we have the following filter settings: CANBITRO 419360256,1.

Now that the message in question is passing through the bus, the first effective load byte will automatically be placed to the tag R0 and sent to the server.

These settings are easier to make in Configurator:

- 1) Bus scanning;
- 2) Indicate identifier in the first column;
- 3) Select correspondent tag;
- 4) Visually by mouse indicate shift. Column Value will display number transmitted to the server.

J1939_USER-11bit mode is set similarly.

J1979_SCANER mode

This mode is used to define data transfer rate and Identifier length according to protocol J1979. If parameters of transfer are known, it is recommended to use the J1979_29bit and J1979_11bit modes, having specified necessary rate of the bus.

The rate of 250000 bits per second and 500000 bits per second and 11 and 29 bit identifiers are supported.

To enable this mode:

- 1) connect the terminal to vehicle CAN interface;
- 2) push "Test OBD II". Received data are displayed in the right panel.
- 3) If scanning finished successfully, data transfer rate and Identifier length will be set automatically.

Attention! Scanning can cause failures of board equipment operation. GalileoSky Ltd bears no responsibility for failures after CAN bus scanning.

J1979_USER_29bit mode

This mode allows to extract and decode automatically the messages with 29 bit identifiers, transferred according to J1979 protocol:

- tank fuel level: measured in percents. 0%-empty, 100%- full;
- coolant temperature;
- engine rpm speed |;
- error codes.

Attention! Many car manufacturers partially support J1979 or do not support it at all.

To enable this mode:

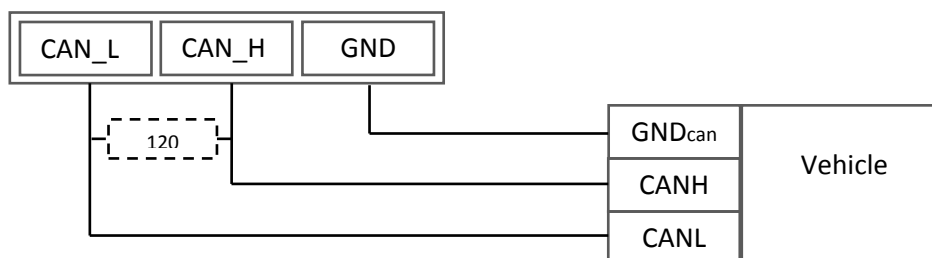
- 1) attach the terminal to the vehicle CAN interface;
- 2) give the CanRegime command (see [CAN settings](#)) or in Configurator on tab "Settings/CAN" select filter type "OBD II 29bit";
- 3) make sure the device receives bus data and sends them to Device tab in Configurator;
- 4) set the right data transmission to the server using the MainPack command (see [Server exchange protocol settings](#)) or in Configurator tab Settings/Protocol.

J1979_USER-11bit mode is set analogous.

Attention! If vehicle doesn't support J1939 protocol, J1979_USER-29bit and J1979_USER-11bit modes operation can cause failures of board equipment operation. GalileoSky Ltd bears no responsibility for failures after operation I this modes.

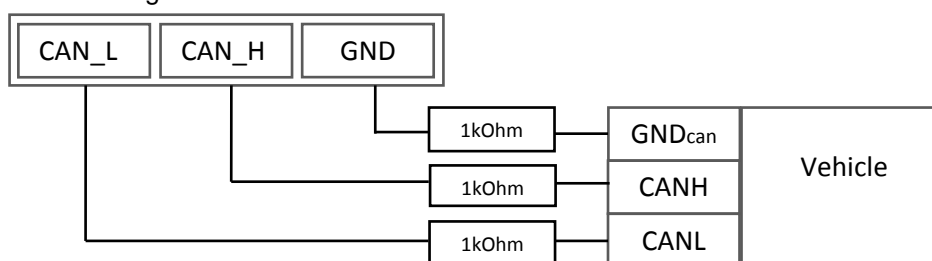
Device CAN-bus connection options

1. Direct connection.



Attention! If the terminating resistor (is shown with a dotted line in the diagram) is not installed on the vehicle side, it should be installed. Its presence can be checked with a multimeter: it is necessary to measure the resistance between CAN_H and CAN_L with the vehicle electronics off. If the resistance is about 60 Ohm, the terminating resistor is not needed. If the resistance is 120 Ohm, an ordinary 120Ohm resistor should be placed between the CAN_H and CAN_L wires.

2. With current-limiting resistors



To plug the device into the troubleshooting socket it is necessary to use the first connection option. *The second option is recommended to attach the device directly to the vehicle CAN bus.*

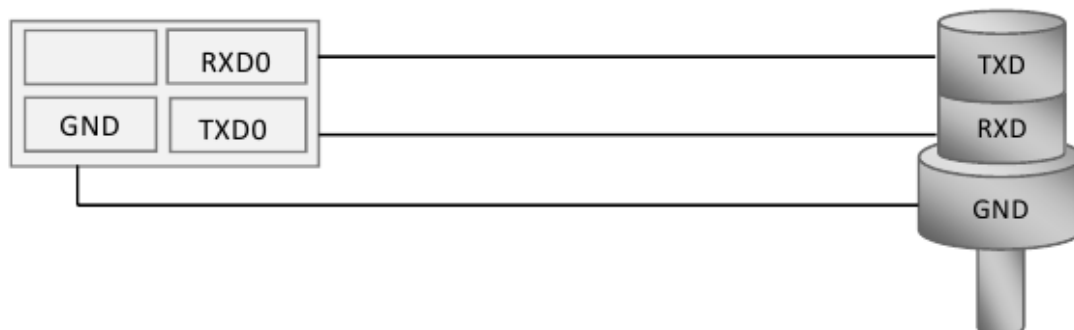
Connecting digital fuel sensors using RS232 interface

The order of connection:

1. Connect sensor's contacts RXD, TXD and GND to terminal's contacts TXD0, RTD0 and GND (see [Contacts description](#)).

Attention! The device and sensor grounds must be connected!

The sensor is powered separately.



2. To set for the terminal channel RS232 receiving relative fuel level or frequency from the sensor. It can be done by sending command RS2320 (see Digital inputs settings) or through Configurator tab Settings/Digital inputs. By default all terminal channels RS232 are set to receive relative fuel level.

3. If discharges filtering is necessary adjust filter length by DFILTER command (see Digital inputs settings) or by Configurator tab Settings/Digital inputs.

4. To set transfer of received data to the server by mainpack command (see Server exchange protocol settings) or by Configurator tab Settings/Protocol. These data transmission is on by default.

5. To reset the terminal by Reset command or from Configurator tab Device.

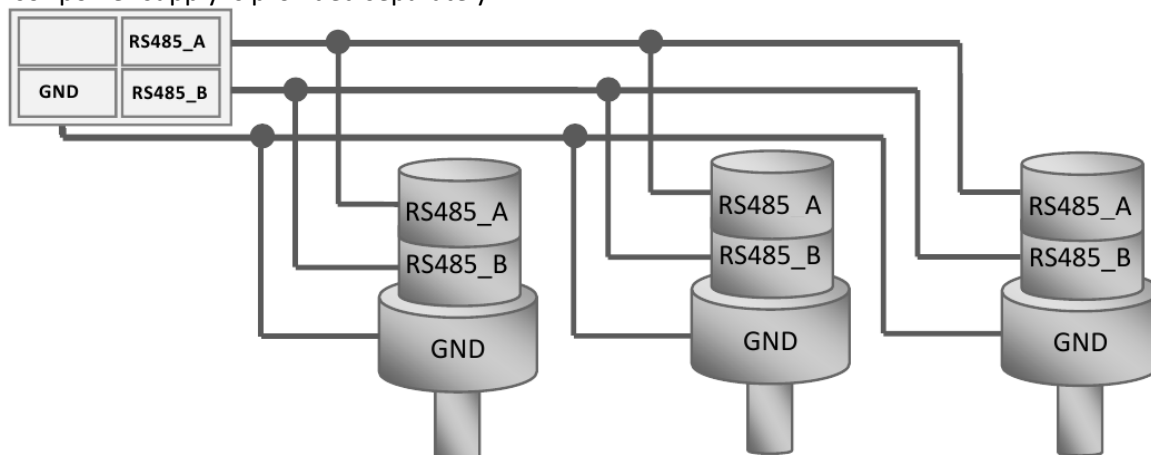
6. Make sure that the terminal receives data from the sensor. It may be done in Configurator tab Device. If for 18 seconds the terminal receives no messages from the sensor the field RS232 comes to zero. In this way it is possible to detect sensor rupture or failure.

Connecting digital fuel sensors using RS485 interface

The order of connection:

1. Connect sensor contacts RS485_A; RS485_B , GND to terminal contacts RS485_A; RS485_B , and GND (see [Contacts description](#)).



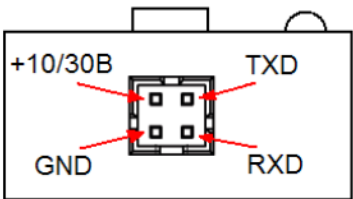
Sensor power supply is provided separately.



2. Adapt transfer of received data to the server by MAINPACK command (see [Server exchange protocol settings](#)) or by Configurator tab Settings/Protocol. These data transfer is switched on by default.
3. Make sure that the terminal receives data from the sensor. This can be done in Configurator, "Device" tab.

Terminal can support up to 16 sensors simultaneously. Sensors should have addresses from 0 to 15 respectively. If the terminal receives no messages from the sensor within 18 seconds, the field RS485 comes to zero. Thereby sensor rupture or failure can be detected.

Connecting GalileoCam photocamera to the device

GalileoSky v3.0.0	GalileoSky v3.0.3 waterproof version
	
Data interface: RS232	Data interface: RS232 or RS485
	<p>Wires (RS232):</p> <ol style="list-style-type: none"> 1. Brown: +10/30B 2. Black: GND 3. Blue: TXD 4. White: RXD <p>Wires(RS485):</p> <ol style="list-style-type: none"> 1. Brown: +10/30B 2. Black: GND 3. Blue: RS485_A 4. White: RS485_B
Dimensions: 45,0 x 30,0 x 15,0 mm.	Dimensions: 54,0 x 38,0 x 21,0 mm

Camera technical specifications:

- Supply voltage: 10-30V.
- Average power consumption in standby mode: 0.17W.
- Average power consumption in record mode: 0.53W.
- Operating temperature range: -30...+60°C.
- Size: 45.0x30.0x15.0mm.
- Body material: plastic.
- Turn on time: less then 2s.
- Camera mode announcement

Optical characteristics:

- Focal distance: 4mm.
- Observation angle: 64 degrees.
- Distortion: 0,38%.
- Infrared filter: yes.
- Manual focusing: yes.
- Matrix diagonal: ¼".

Picture characteristics:

- Color depth:24bit.
- Picture format:JPEG.
- Picture resolution: 640x480 dots and 320x240.
- Picture size: 6-65kB.
- Average picture size: 25kB
- Time of one picture receiving: 2-10s.
- Time of transmission to the server: more than 1 minute (depends on picture size and GSM connection quality).

User's Manual GalileoSky GPS/GLONASS v5.0(0200)

How to connect cameras via RS232 interface:

1. The camera RXD, TXD, GND should be connected to the device TXD0, RXD0, GND (see Contacts description).

Attention! The device and photocamera grounds should be connected!

Camera has separate power supply.

2. Insert a microSD card into the device slot.

3. To make the right settings of terminal channel RS232[0] for operation with camera, give RS2320 command (see Digital inputs settings), or through Configurator tab Settings\Digital inputs.

4. Reset the terminal by Reset command or from Configurator tab Device.

5. Make sure that the terminal operates with camera correctly, in Configurator give command makephoto 1 (see Photocamera operation settings) and turning to Troubleshooting tab select with ticks RS232[0] and RS232[0] detailed. When the terminal receives picture from camera, troubleshooting displays message RS232[0].cam. rx pic. Green LED on camera rarely blinks in standby mode, quickly – during picture transmission.

6. Take microSD card out of the terminal and evaluate picture quality. Pictures from camera connected to zero port RS232 are saved in catalogue Pic\RS0. Separate catalogue is created for each date, files name is formed by pictures time.

7. Reinsert the microSD card into the device slot.

How to connect cameras via RS485 interface:

1. Connect respectively the RS485_A, RS485_B, GND camera contacts and the RS485_A, RS485_B, GND terminal contacts (section "Contacts description").

Attention! The Terminal and the camera grounds must be connected!

The camera is powered separately.

2. Insert a microSD card into the Terminal slot.

3. Make sure that the Terminal operates correctly with the camera. For this, in the Configurator give the command "makephoto 2" and, after switching to the "Troubleshooting" tab, tick "RS485". When the Terminal receives a picture from the camera, the "Troubleshooting" will display a message "RS485[0].cam. rx pic.". Green LED on the camera blinks rarely when in standby mode and quickly during picture transfer.

4. Perform evaluation of the picture quality in the Configurator or take the microSD card out of the Terminal and connect it to the computer. Pictures from the camera are saved in the catalogue Pic\RS4850. A separate catalogue is created for each date; file names reflect the time when the shots were taken.

5. Reinsert the microSD card back into the slot.

Connecting 1Wire sensors

It is possible to attach different sensors working through 1-Wire interface, and they can operate simultaneously.



Connecting iButton (DS1990, DS1982) identification key

There are several identification key applications:

- driver identification;
- trailer turning off identification;
- doors opening identification.

In the same way it is possible to connect devices emulating iButton, for example, RFID-tags readers.

The terminal can support up to 8 identification keys with set identifiers or two identification keys with random identifier.

During identification key applying to 1-Wire and GND contacts (Contacts description) key number is entered into the memory, point is recorded and further four lower bytes are sent to the server without checksum.

At key disconnection number turns to zero, point is recorded and message is sent to the server. Keys having code less than 100000 are stored in iButton[1] field.

Up to eight key identifiers may be set through iButtons command (see Digital inputs settings) or in Configurator on tab Settings\Digital inputs. Lower 4 bytes of iButton key number should be entered without checksum in hexadecimal system.

For example, full hexadecimal key number:

09 00 00 00 91 02 0C 5C, where

09 – kind of device (in this case DS1982, for DS1990 is 01),

00 00 00 91 02 0C – unique number,

5C – checksum.

In this case 00 91 02 2C should be entered.

At identification key applying with one of set identifiers, correspondent bit is set in field iButton connection status. You may control it on tab Device in Configurator.

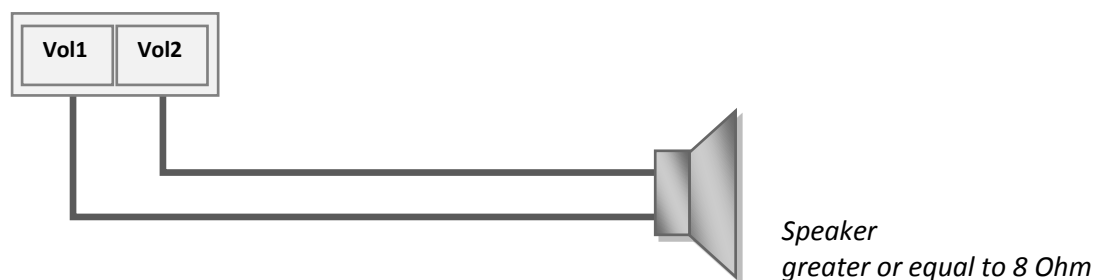
Connecting DS18S20 (DS1820, DS18B20) thermometers and temperature and humidity sensors (DS1923)

It is possible to attach up to 8 thermometers DS18S20 and 8 humidity sensors DS1923. To use the sensors connect them to 1-Wire and GND contacts (Contacts description) and activate the corresponding protocol items (Server exchange protocol settings, Table 2, GalileoSky protocol tags). There is not any linkage between a thermometer or humidity sensor and a certain tag cell. All thermometer data are stored in memory cells in a definite order: from a lower tag to a high tag. If the number of cells exceeds the number of thermometers, the extra high cells will contain data corresponding to sensor disconnection.

At temperature sensor turning off the thermometer field shows disconnection (-128°C).

At humidity sensor turning off the thermometer field shows disconnection (0%).

Connecting Autoinformers speaker



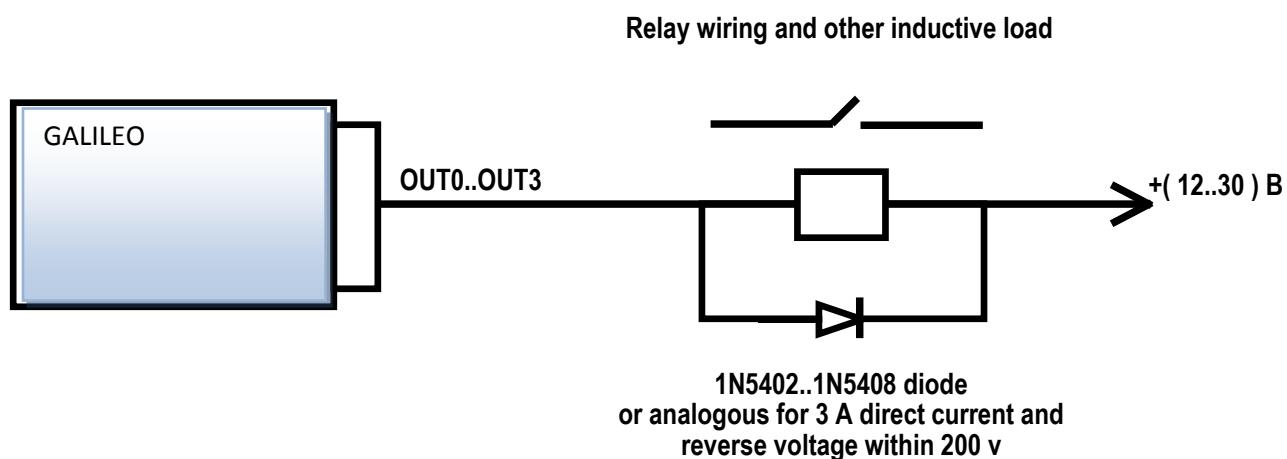
Transistor outputs (0/1)

To operate external devices there are 4 discrete «on collector» outputs (see Contacts description). The maximum output voltage is +30V, each output current is within 80mA.

The output values are stored in the nonvolatile memory, so the device sets the stored values even after being reset.

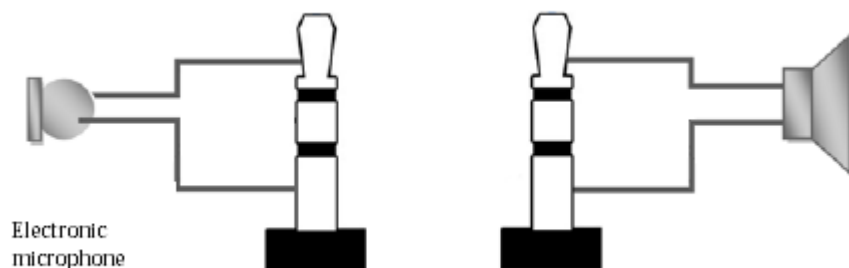
To operate outputs use Out command (see Transistor output settings) or the Settings/Input/Output tab in the Configurator.

OUT0...OUT3 outputs relay connection circuit



Connecting audio equipment for modification 2

Connectors Jack 3,5" are used for microphone or speaker connection. Using Jack 3,5" Mono is inadmissible.



Microphone specifications

Parameter	Min. value	Mean value	Max. value
Operating voltage, V		1.60	2.2
Operating current, uA	70		300
Load resistance, kOhm	1.2	2.2	

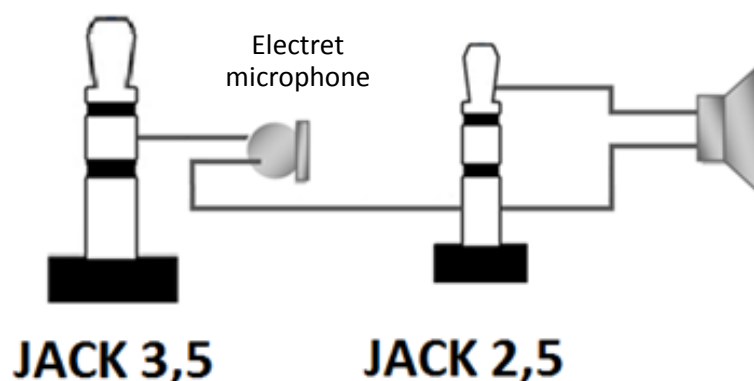
Speaker specifications

Parameter	Min. value	Mean value	Max. value
Connected speaker resistance, Ohm	8		
Operating current, mA			+250
Power with a 320ohm speaker, mW		250	

Connecting a push-to-talk button KMC-25 for modification 11

A push-to-talk button KMC-25 or another compatible one can be connected to the Terminal.

A speaker and a microphone can be connected separately. A speaker may have Jack 2,5 Stereo or Jack 2,5 Mono connector.

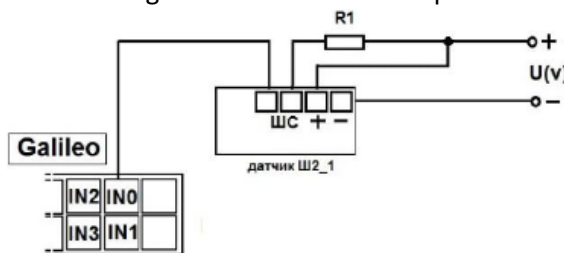


Permissible parameters for a speaker and a microphone are similar to those of Galileo GLONASS v5.0 modification 2.

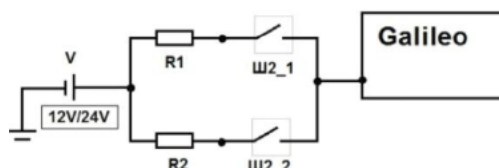
Connecting passenger flow registration sensors Ш2

The terminal supports connection up to 16 Ш2 sensors through 8 discrete analogue-inputs (DAI) IN0-IN7 (Contacts description).

Connection order of one Ш2 sensor through resistor to one DAI inputs of the terminal.



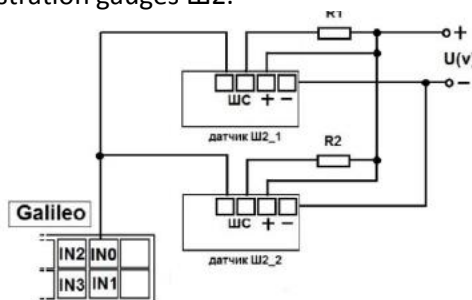
To connect 2 Ш2 sensors to one of DAI use divisor on two resistors. Calculation principle is realized on voltage level change at sensors triggering.



V – power supply (battery/ vehicle power supply);

R1, R2 – resistors;

Ш2_1, Ш2_2 – passenger flow registration gauges Ш2.



Connection order of 2 Ш2 sensors through resistors to one DAI inputs of the terminal.

Set input to pulse count from two sensors through the Configurator or by command **incfg0 3,2,X,X,Y,Y** (where Y – one sensor triggered; X – two sensors triggered).

Parameter X and Y depending on supply voltage and R1,R2 resistors resistance takes different values, for example:

U(v)=12, R1=10k, R2=10k, then X=3500, Y=7921

U(v)=12, R1=14k, R2=14k, then X=3000, Y=7000

U(v)=24, R1=10k, R2=10k, then X=7000, Y=15842

U(v)=24, R1=14k, R2=14k, then X=6000, Y=14000

It is calculated by formula:

$$X = \left(\frac{7 * U}{14 + R1 * 0.001} \right) * 1000; \quad Y = \left(\frac{14 * U}{28 + R1 * 0.001} + \frac{7}{14 + R1 * 0.001} \right) * 1000;$$

Attention! To avoid false operation at sensors connection and further operation use stable voltage power supply.

Terminal operation result will be pulse fronts count from each sensor, i.e. when one person passes one door total pulse number increases by 2. Correspondingly to count passengers number passed through sensors divide pulse count result by 2.

Connecting Garmin navigators supporting FMI protocol

The terminal can serve as gateway for Garmin FMI protocol packets transmission to the server and back. Garmin FMI protocol allows:

- drivers identification by code number (driver enters his/her number into navigator, the number is transmitted to the server);
- driver status transmission to the server (driver selects his/her status on navigator display);
- text messages exchange between Garmin navigator and the server;
- transmission from the server to navigator route end points (in this case navigator calculates optimum way to the set points and displays it on the map);
- speeding control and the server informing about it;
- geographical areas transmission from the server to navigator and displaying them.

Protocol abilities description can be found on <http://www8.garmin.com/solutions/pnd>.

The terminal only transmits packets from navigator to the server and back, so packets are analyzed at the server.

To connect Garmin navigator:

1. Purchase interface cable Garmin FMI (for example, Garmin FMI 10), cable is chosen according to the navigator model. Cable has from one side mini-USB socket to connect to navigator, from the other side – supply and interface RS232 contacts.
2. Connect interface RS232 contacts to the terminal zero port RS232; RX cables to the terminal TXD0; TX cables to the terminal RXD0; obligatory connect contact GND RS232 cable to the terminal GND.
3. Connect cable supply.
4. Connect cable to navigator.
5. In the terminal set RS232[0] port for operation with navigator. It could be done by command RS2320 5 or through the Configurator on tab Settings\Digital inputs.
6. Reset the terminal.

To make sure that the terminal and navigator connection works properly select in troubleshooting messages from necessary port RS232. If connection is correct messages periodically will displayed
RS2320. Garmin FMI. Enable FMI.

RS2320. Garmin FMI. ACK.

If connection is right, the navigator interface changes, left-hand icon turns into truck, it gives access to messages sending and receiving functions.

Connecting REP-500 electricity meter

The REP-500 is an electricity meter which can be connected to the Terminal via RS232 interface. To connect the REP-500, perform the following steps:

1. Connect respectively the RXD0, GND contacts of the Terminal with TX, Ground of the REP-500.
2. In the Terminal, configure the RS232 [0] port for operation with the meter. This can be performed using the command "RS2320 10" or via the Configurator on the tab "Settings"\ "Digital inputs".
3. Reboot the Terminal.
4. Set the transfer of counter measurements to the server with the command "MainPackBit 171,1".

Connecting CAN-LOG

Device CAN-LOG is used for CAN bus data reading. It allows to get data about:

- total time of engine work
- total kilometerage of vehicle
- whole fuel consumption of vehicle
- fuel level in % or liters
- engine speed;
- coolant temperature;
- vehicle speed
- axle load

CAN-LOG support was added to secure compatibility with installed board equipment. At initial installation it is recommended to use the built-in functions for CAN bus operation ([CAN interface](#)).

Advantages of using built-in functions of the device:

- no extra costs
- possibility of scanning CAN bus
- possibility of reading all the data of CAN bus, and not just listed for CAN-LOG

Connection of CAN-LOG:

1. Connect correspondingly contacts RXD0, TXD0, GND and RS232 TX, RS232 RX, CAN-LOG's mass.
2. Set RS232[0] port for operation with the navigator In the Terminal . It can be done by command RS2320 5 or through the Configurator on tab "Settings"\ "Digital inputs".
3. Disconnect the Terminal built-in functional for operation with CAN bus. It can be done by command CANREGIME 0,250000,2000 or through Configurator "Settings"\ "CAN" tab .
4. Specify the parameters transferred to the server ([Table 2. GalileoSky protocol tags](#)). Also the MAINPACK OR HEADPACK commands can be used (see [Server exchange protocol settings](#)) or in through Configurator " Settings"/"Track" tab.
5. Reset the terminal.

Connecting CUB5B indicator

CUB5B indicator is a segment 8-bit indicator, which can be connected to the Terminal using RS232 interface. It can display current sensors data, CAN bus data, mileage and so on. Information updates every second.

Connection:

1. If indicator was set for operation with other equipment, it is necessary to reset to factory settings. If indicator is new, it is unnecessary.
2. Connect correspondingly Terminal contacts RXD0, TXD0, GND and TX, RX and CUB5B ground.
3. Set RS232[0] port for operation with indicator in the terminal, it can be done by command RS2320 7 or through the Configurator on "Settings"\ "Digital inputs " tab .
4. Choose the displayed parameter , it can be done by CUB5 command or through the Configurator on "Settings"\ "Digital inputs" tab.
5. Reset the terminal.

Connecting weight indicator CI5010A

The weight indicator CI-5010A is designed to measure, control and indicate electrical signals produced by weight measuring resistance strain gages. It can be connected to the Terminal via interface RS232.

Procedure of CI-5010A connection:

1. Adjust the indicator to constant indication of measure value.
2. Connect the contacts RXD0, TXD0, GND of the Terminal with TX, RX, Ground CI-5010A respectively.
3. Adjust the port RS232[0] in the Terminal to operation with the indicator. It can be performed by the command RS2320 12 or via the configuration tool in the tab "Settings\Digital inputs".
4. Reset the Terminal.

Data from the indicator are rounded up to a whole number. Maximum value that the Terminal can handle is 65535.

Connecting RFID reader Matrix 5 using RS485 interface

Procedure of Matrix5 connection:

1. Connect the contacts RXD0, TXD0, GND of the Terminal with TX, RX, Ground of Matrix5 respectively.
2. Adjust the port RS485 in the Terminal to operation with the reader. It can be performed by the command RS485FN 1 or via the configuration tool in the tab "Settings\Digital inputs".
3. Reset the Terminal.

The keys readed from Matrix5 are stored in iButton[1] field.

Configurator

Configurator is a PC program allowing us

- to configure the device via graphic interface and with the help of commands;
- to troubleshoot the device saving results to a log-file;
- to see the device units state in real time;
- to copy monitoring data to a file from the internal memory and SD card;
- to send the copied data to the server;
- to specify autoinformer's areas.

32 and 64 bit OS are supported: Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8.

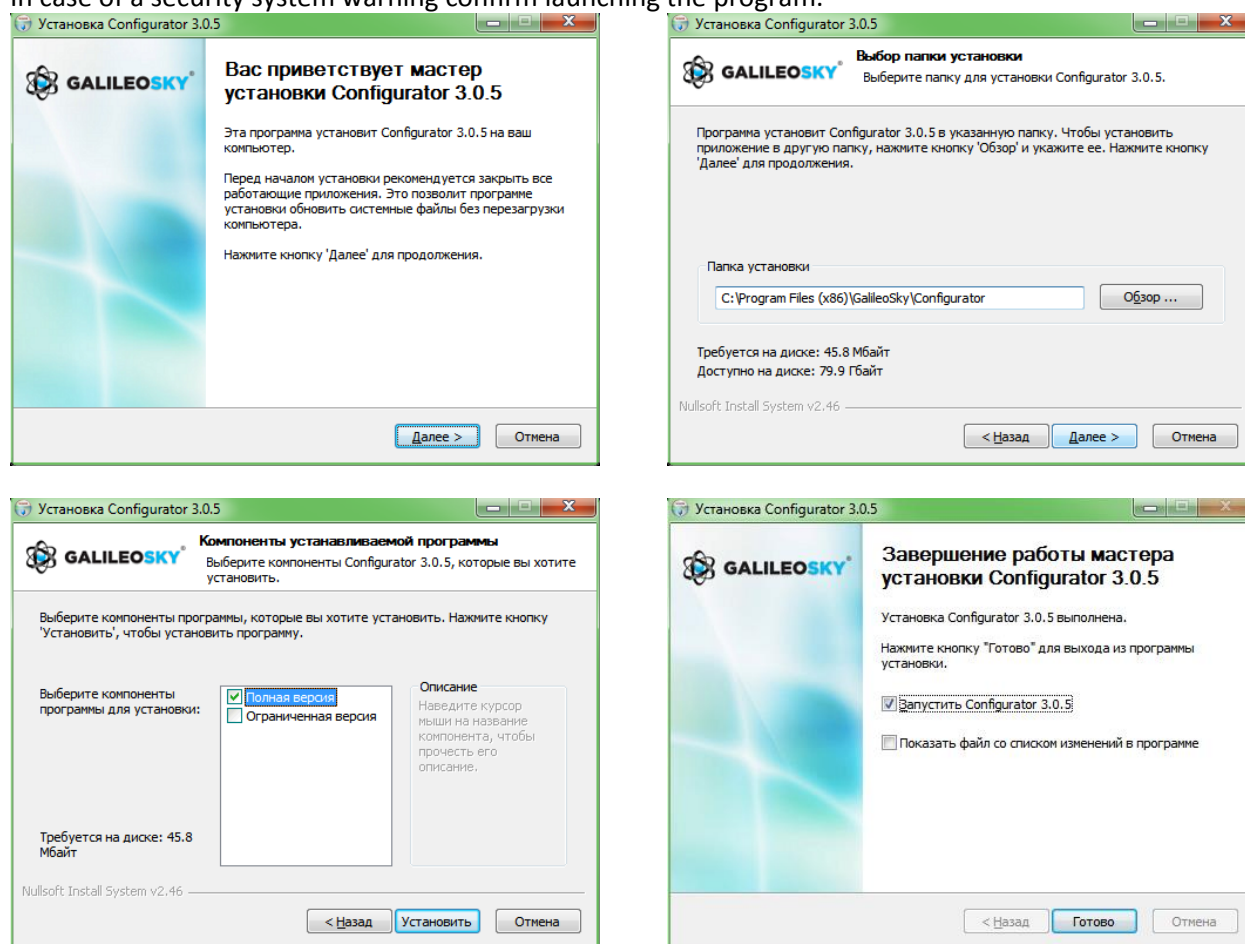
It is possible to configure and troubleshoot terminal as connected locally by USB as connected remotely by GPRS. There is no need to reconfigure terminal which connected by GPRS. PC with installed Configurator must not have static IP-address.

Program installation and running

Download the Configurator program from the [site](#) and launch it.

Attention! Program installation may require changes of crucial OS elements. Do not let your antivirus program block the installer operation.

In case of a security system warning confirm launching the program.



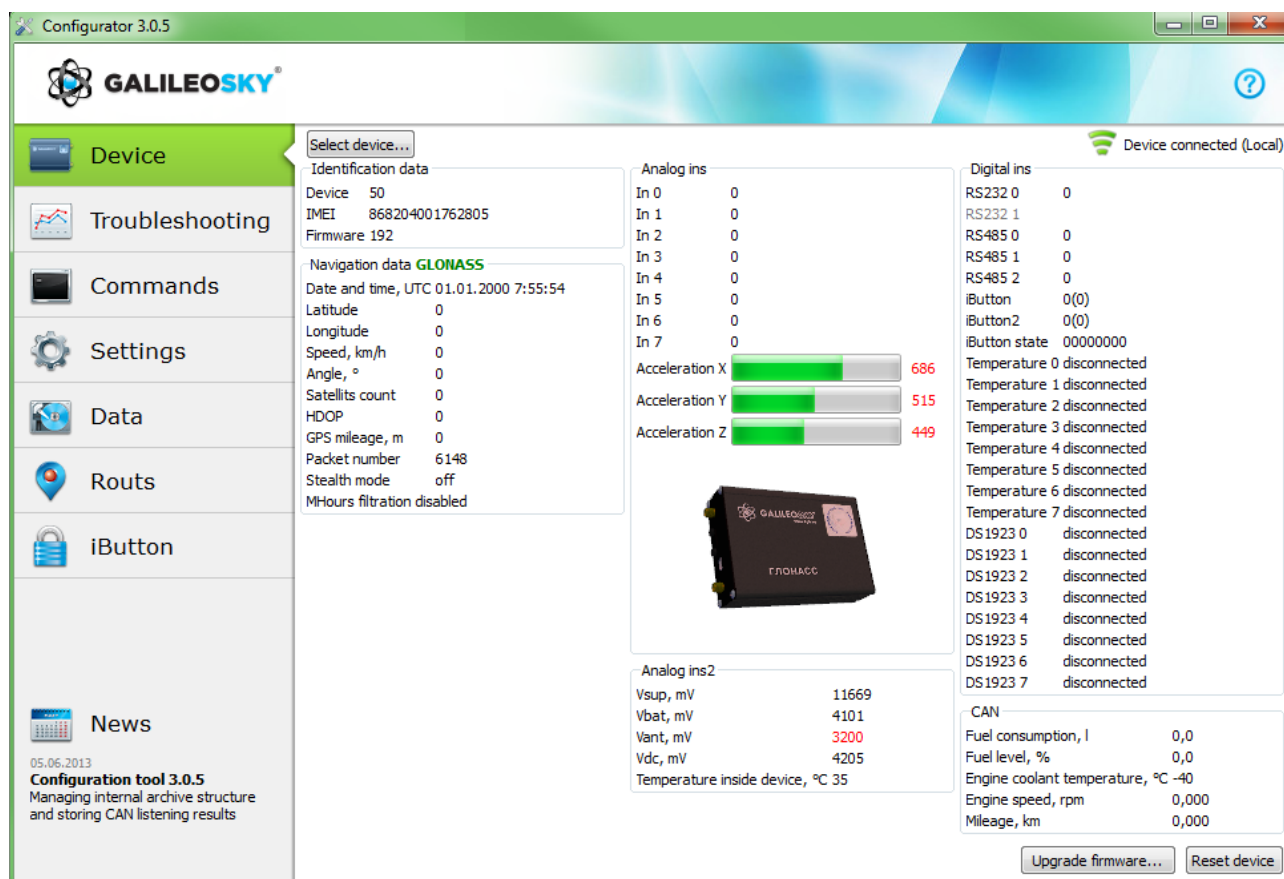
During the installation old drivers will be deleted and new drivers will be installed. Installation of the full-function or limited version of the Configurator is possible. The latter allows to unload archive and to receive the current parameters of sensors, but not to change settings.

Start the Configurator program (from Start menu\Programs\GalileoSky\Configurator). Turn the power on and attach the device to the computer via a USB cable.

After the terminal connection the program automatically copies all the device settings parameters. If the program identifies the device, all the buttons on the vertical left-hand panel will be active.

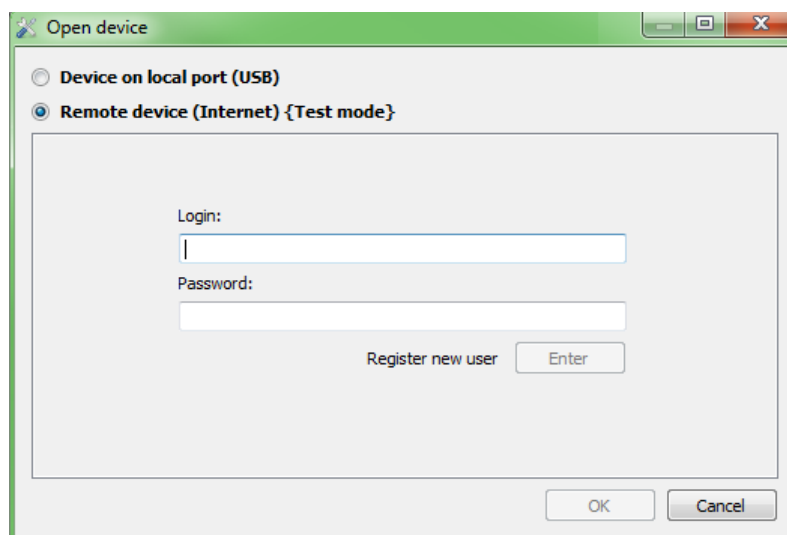
Device tab

Displays information about the device state and allows resetting the device. This tab contains the terminal model, oriented in space according to accelerometer indications. Model is rotated by mouse. Parameter values which are beyond limits, wrong coordinates and exceeding of maximum incline angle are shown in red.

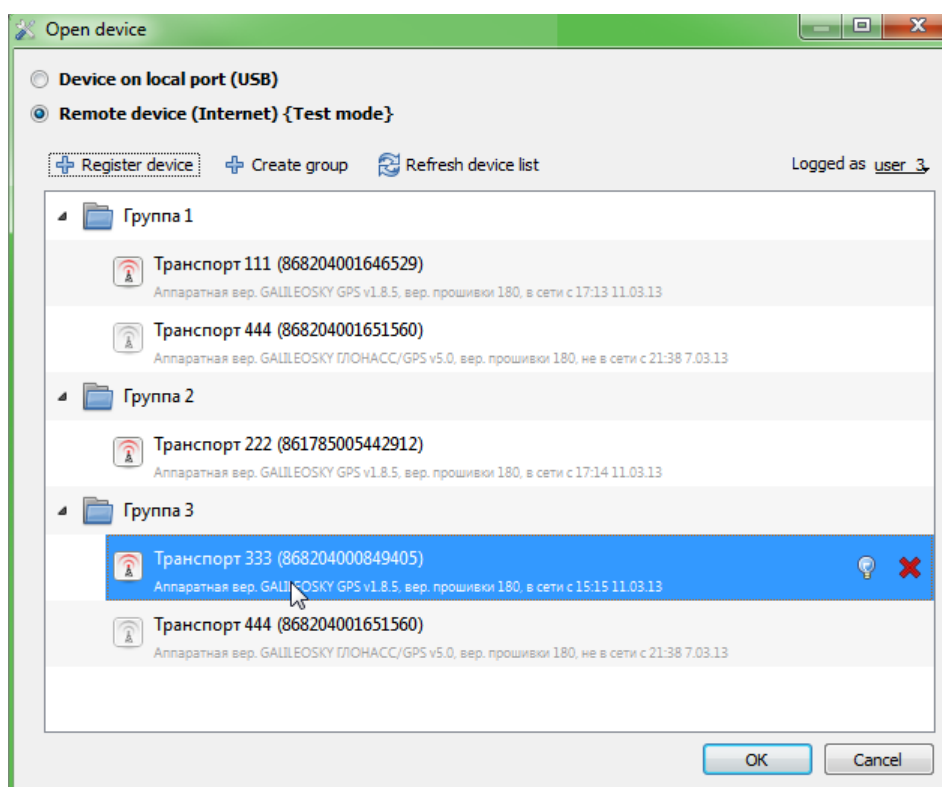


If there is a PIN code in the device, the program will request it to access the settings. At wrong code entering the terminal disconnects from computer, resets, connects to the Configurator again and waits for the right code enter.

For remote configuration and diagnostics of the Terminal, click "Select device..." button. In the window appeared, enter your login and password to get the access to the remote configuration server. The login and password can be obtained by the "GalileoSkay" Ltd. technical support team or by clicking the "Register new user" button under input fields.



After successful authorization on the server, the form of terminal list management will become available. After first connection, the list of the controlled terminals will be empty. To add a Terminal to the list, click "Register Device" button. During registration the Configurator will request a password for a particular Terminal, a default password corresponds to IMEI of the Terminal; this can be later changed by the user through the Configurator. Terminals may be arranged in groups.



After selection of a specific Terminal, this can be controlled through the Configurator, the same way as it occurs with the USB connection.

Troubleshooting tab

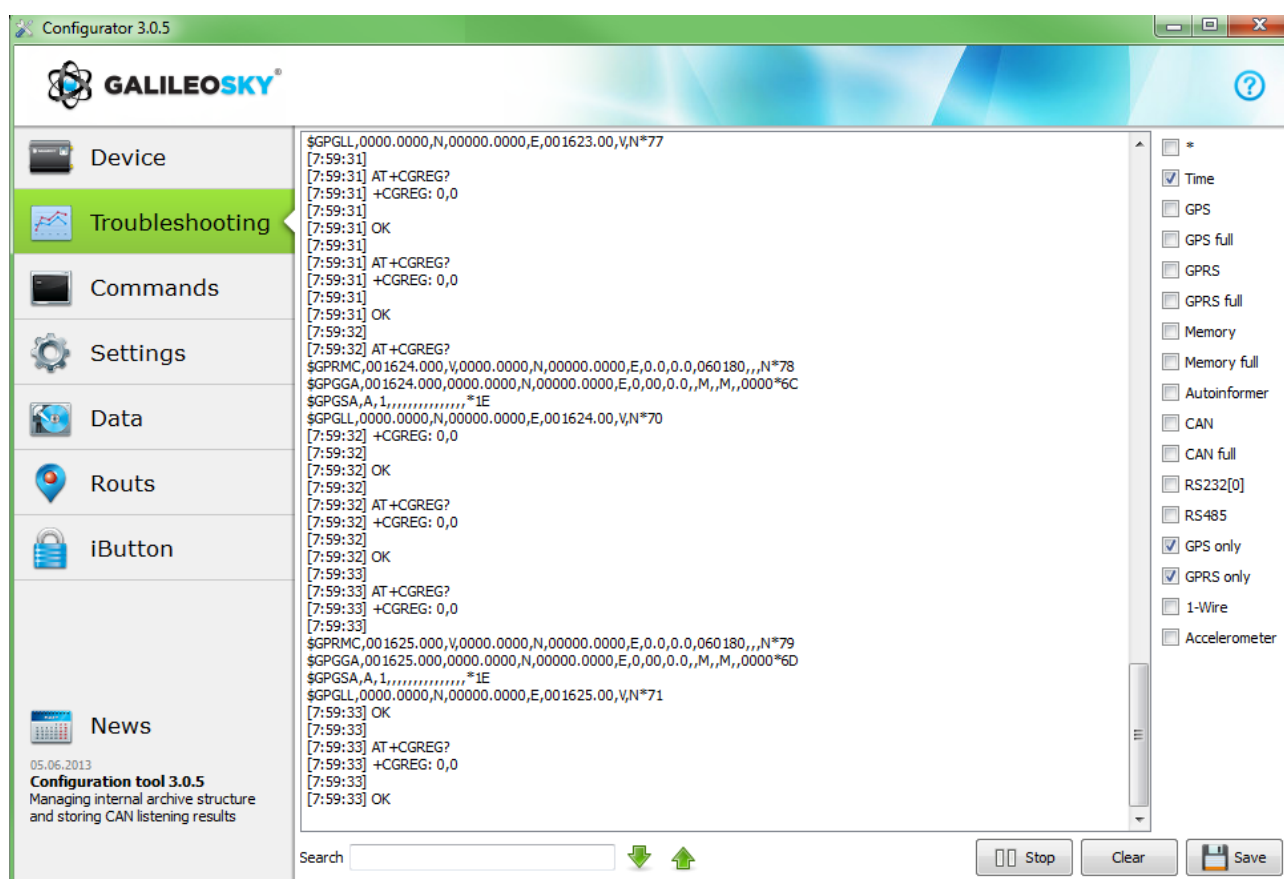
This tab allows us to see the current device state through the device troubleshooting reports. The troubleshooting mode has the following buttons:

- 1) **Start /Stop**
With a 10 sec interval the time scale displays information about the server connection, packet recording, updating coordinates etc.
- 2) **Clear troubleshooting window**
- 3) **Save** troubleshooting results to a log-file which can be opened by any text editor
- 4) **Search** through troubleshooting history

GSM unit troubleshooting information

Attention!

If the service has already been registered by the terminal, another GPRS connection is only possible through switching off the GSM modem (troubleshooting report: sim300gotopowdown). That is no money will be lost due to the minimum paid time interval.



Troubleshooting messages	Description	Possible causes
GSM. Success turn on.	GSM unit powered. Turning on successful.	
GSM. Not success turn on!	GSM unit powered. Turning on denied by unit.	
GSM. Success init.	GSM unit activated.	
GSM. Not success init!	GSM unit activation failed.	
GPRS. Activated.	GPRS successfully activated.	
GPRS. Not activate.	GPRS activation failed.	GPRS is not activated on this SIM card. Not enough money in the account. GSM network overloaded.

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GPRS. Success connect to server.	Device server connection successful	
GPRS. Not success connect to server.	Device server connection failed	Server access denied or wrong server settings for the device.
GPRS. Reconnect Number=#	Number of server reconnections. # - reconnection number	
GPRS. Firstpack OK.	First packet sent to server	
GPRS. Firstpack False.[0]	The device has sent the first packet, but there is no confirmation in terms of TCP/IP.	GSM network overloaded. The packet has been blocked by device firewall.
GPRS. Firstpack False.[1]	The device has sent the first packet, but there is no confirmation in terms of the application.	GSM network overloaded. The server is not handling the first packet

SMS troubleshooting information

Troubleshooting message	Description
SMS. RX SMS.	New SMS message received
SMS. TelNum: +79112299922	received from a given phone number
Command: ID	ID command received
SMS. TX OK.	Message successfully sent
SMS delfromslot 1	delete handled SMS (from SIM card first slot)
Not reply SIM. Slot 1	no SIM card reply (from SIM card first slot)
GSM. No SIM-card	no SIM card reply (the card is most likely not inserted)

Internal Flash memory troubleshooting information

Troubleshooting message	Description
MEM. Inp-s	Point record reason is inputs state change;
MEM. Turn,dist	Point record reason is change of distance between previous and new place or angle of motion direction;
MEM. Time	Record reason is time;
MEM. Write point - 200	Write point with ordinal number 200 is recorded.

GPS-unit troubleshooting information

Troubleshooting information	Description	Possible causes
SAT. Coord refresh.	Current record coordinates updated by GPS unit. Vehicle considered to be moving, packet has not been filtered off.	
SAT. Coord not refresh.	Current record coordinates not updated. Filtering off while parking activated.	
SAT. Temper is low than -40	Device temperature is lower than -40°C. Unit operation at lower temperatures is impossible.	
SAT. Temper is high than 65	Device temperature is higher than +65°C. Unit operation at higher temperatures is impossible.	
SAT. Time out. Restart MCU.	No GPS data for 60 seconds. Device reset.	GPS unit out of order. GPS unit failure.
GLONASS. Message received. Len = 401	Device received information from GLONASS unit. 401 byte received.	
GPS. Message received. Len = 172	Device received information from GPS unit. 172 byte received.	
GPS. Change baud rate = 1	Attempt to set GPS unit rate. Attempt № 1.	
SAT. Fix = 1	Current position fixed (0 – not fixed);	
SAT. SatInUse = 7	7 satellites are used for navigation;	
SAT. Valid = 1	Coordinates are right (they can be used for location determination). This Valid has nothing common with valid in packet and status.	

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Galileo uses GLONASS	Terminal uses GLONASS system.	
Galileo uses GPS	Terminal uses GPS system.	
SAT. Incorrect data from GLNS/GPS module	Wrong data received from the used unit (probably due to processor overload)	
SAT. Time out. Restart MCU	Device gets no data from receivers (GLNS/GPS)	
SAT. High Speed = 200	Navigation speed data filter turns on (this data will be skipped by the unit).	
SAT. HDOP is high = 6	Navigation HDOP data filter turns on (this data will be skipped by the unit).	
SAT. Jump = 5000	Navigation coordinate data filter turns on (leap to large distance occurred).	
SAT. First start OK. Sat count >= MIN	At the terminal turning on the unit must get more than MIN satellites (only then data is reliable).	

Other troubleshooting messages are not described, but they have intuitive names. If there are any questions, you will find the answer at our forum.

Command mode tab

This tab is intended to run single command or a set of commands.

The command mode has the following buttons:

- 1) **Run commands;**
- 2) **Run single command;**
- 3) **Open from file;**
- 4) **Save to file.**

The commands will be identified whether you use capital or lower-case letters or both in turn.

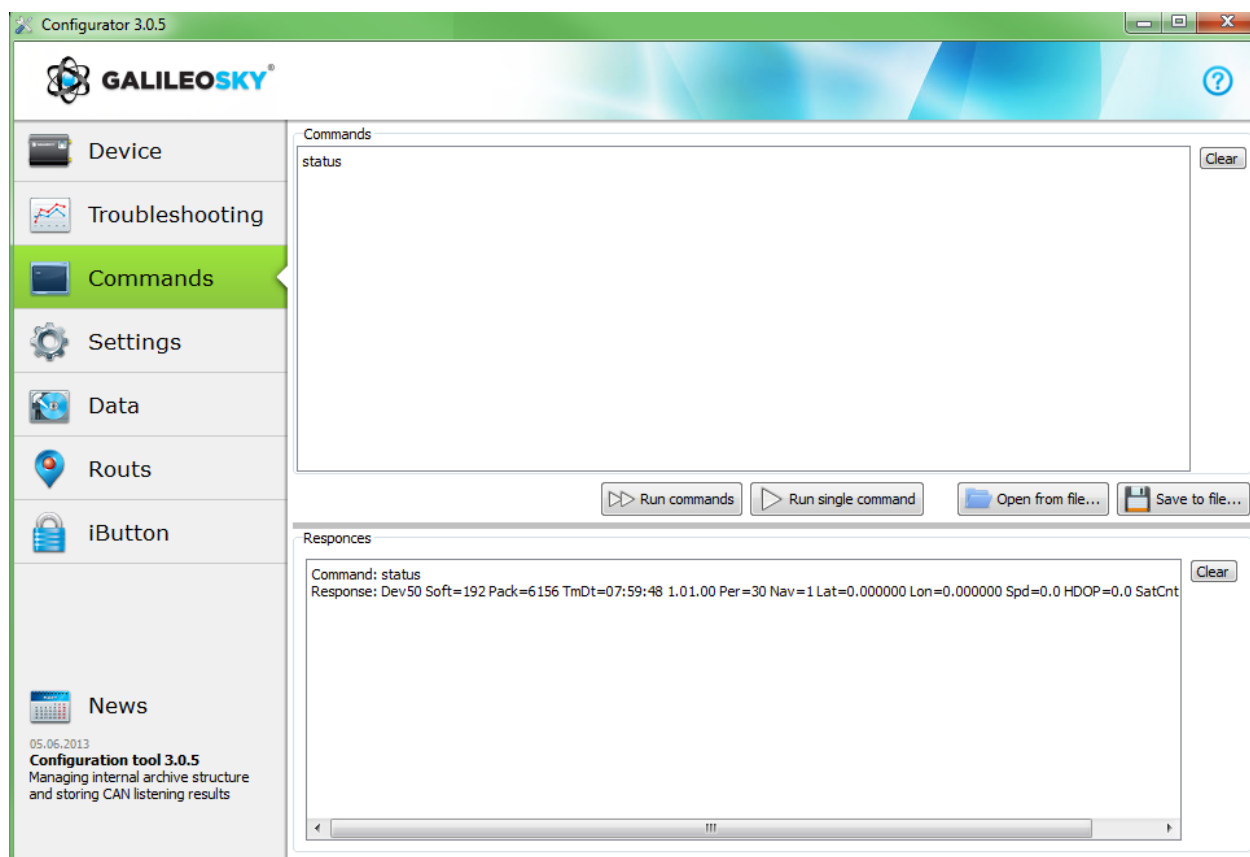
Attention!

There are no spaces in command name!

Spaces between parameters are not allowed!

Commands and parameters are separated by space.

Commands are separated by Enter.



Single command example

An example of a parametric command

Enter APN internet.beeline.ru,beeline,beeline as shown on the figure above and press **Run single command**. The command and response will be displayed in the Responses window.

Command: APN internet.beeline.ru,beeline,beeline

Response: GPRS: APN=INTERNET.BEELINE.RU, user=BEELINE, pass=BEELINE

To access parameters in the device memory you should use a command without parameter!

A example of command without parameter:

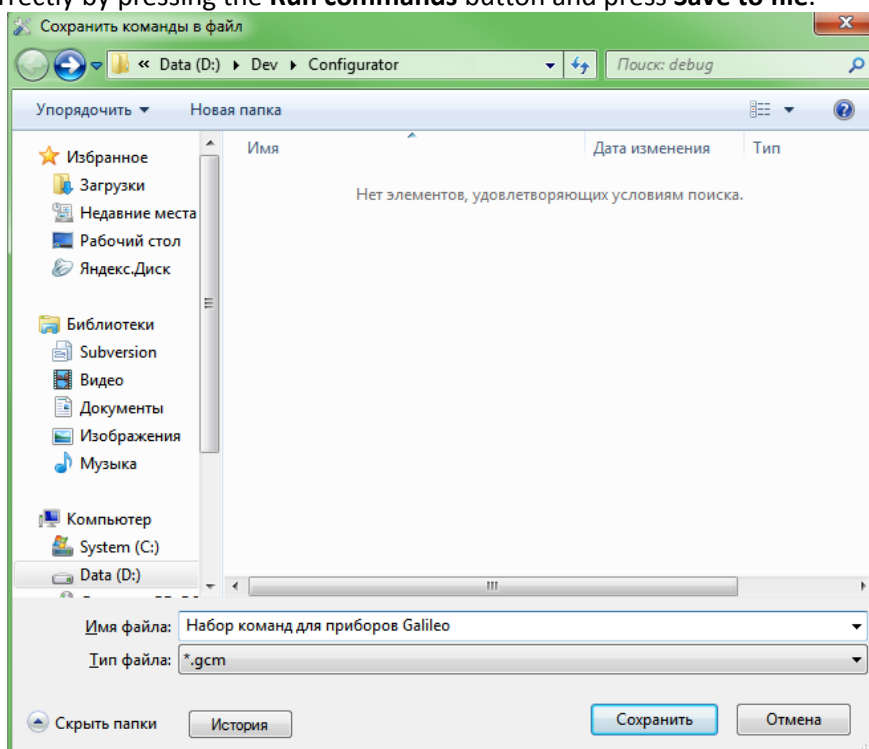
"APN" command	Request: APN Response: GPRS:APN=INTERNET.BEELINE.RU,user=BEELINE,pass=BEELINE
---------------	--

Saving and downloading parameter set

To quickly configure several devices with the same set of commands it is recommended that commands should be run from a pre-saved file. To do this, enter a list of commands to the command window. Make sure whether they are typed in correctly by pressing the **Run commands** button and press **Save to file**.

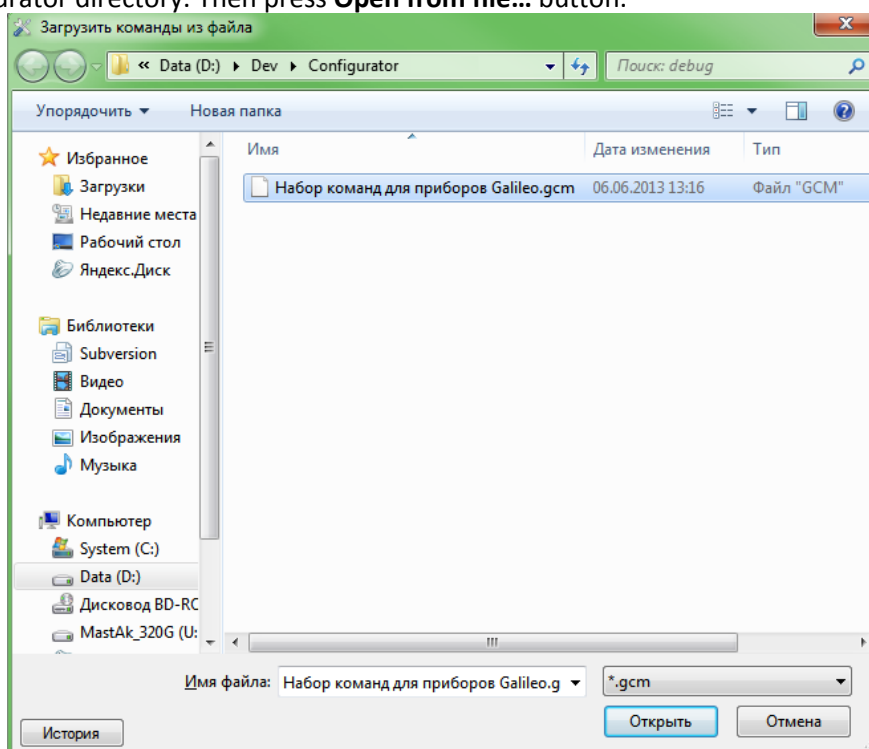
In the opened window you will be offered to save the file in log configurator directory.

Type file name and push Save button as shown on the figure



The file will be saved in log configurator directory. Then press **Open from file...** button.

Select the necessary file and push Open button, as shown in the figure.



For simultaneous running of several commands push **Run commands** button.

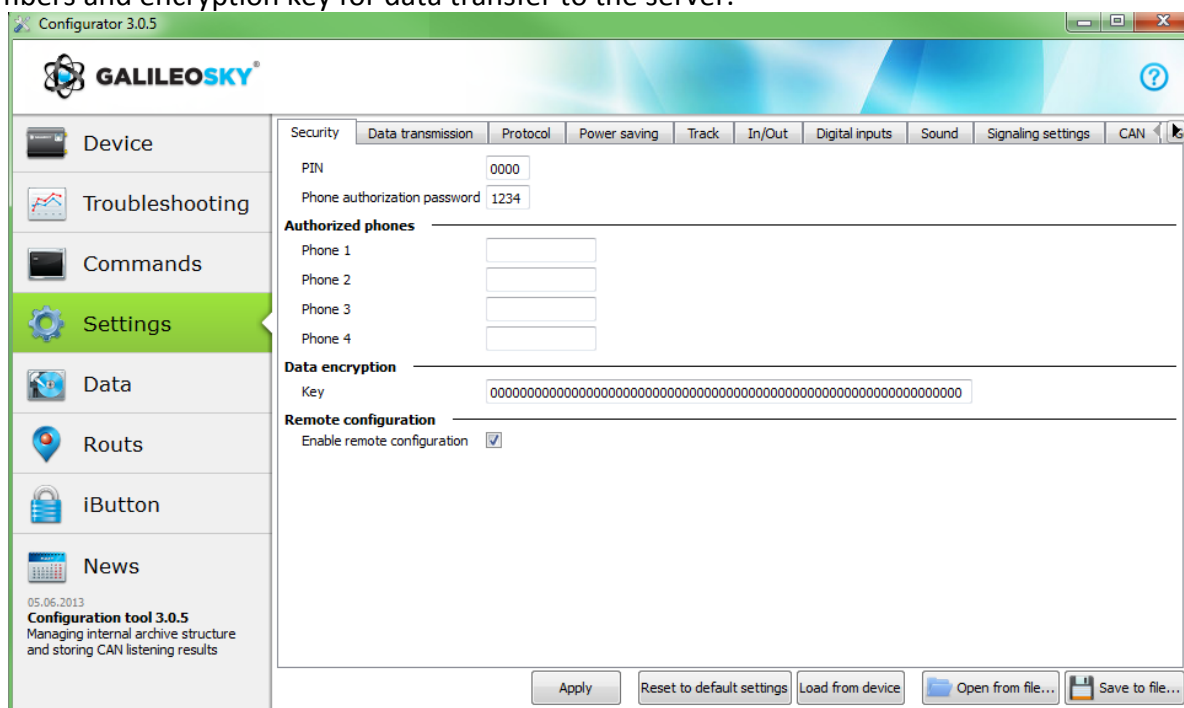
To run one command it is necessary to move to it in Commands window and push **Run single command** button.

Graphic user interface settings

All the main settings are situated in tabs in the program upper part.

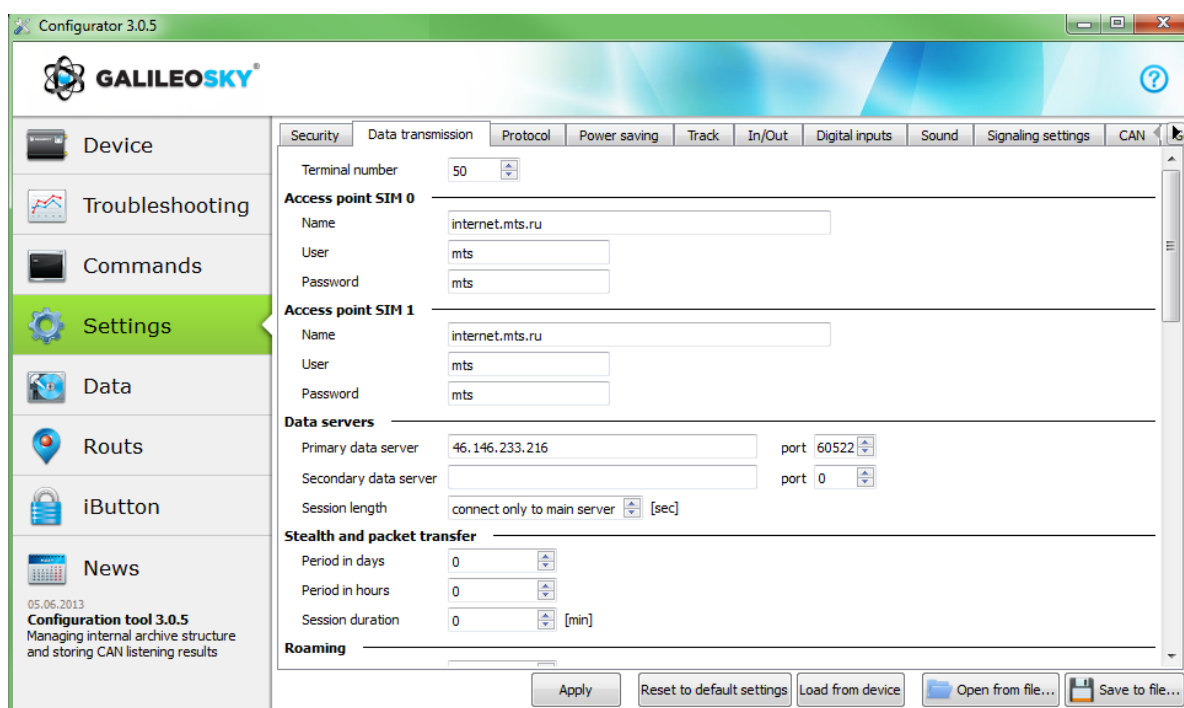
Security

This tab allows to set SIM-cards PIN code, phone authorization password, list of authorized phone numbers and encryption key for data transfer to the server.



Data transmission

This tab allows to set SIM-card PIN code, APN for Internet connection, monitoring data processing servers, packets data transmission and international roaming.



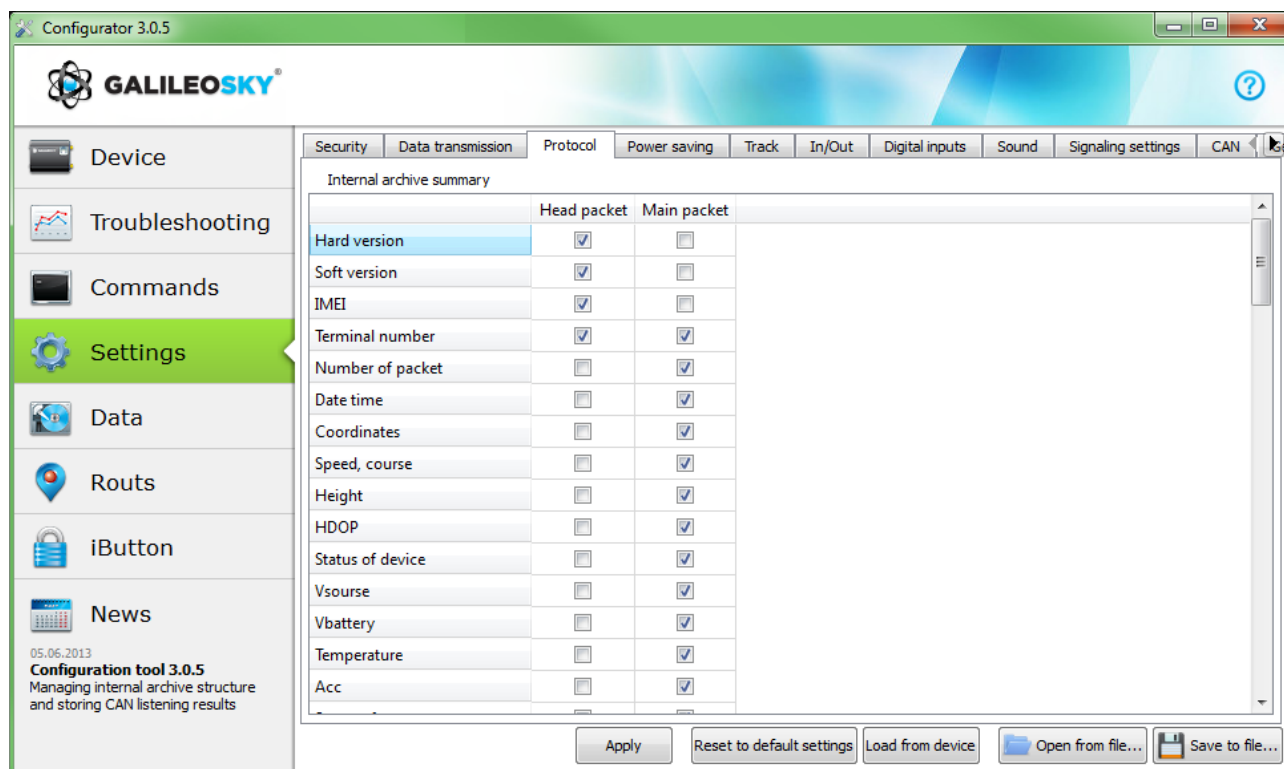
Protocol

The device has its own data transmission protocol developed by GalileoSky Ltd.

During device operating and data sending to the server, the following stages are possible:

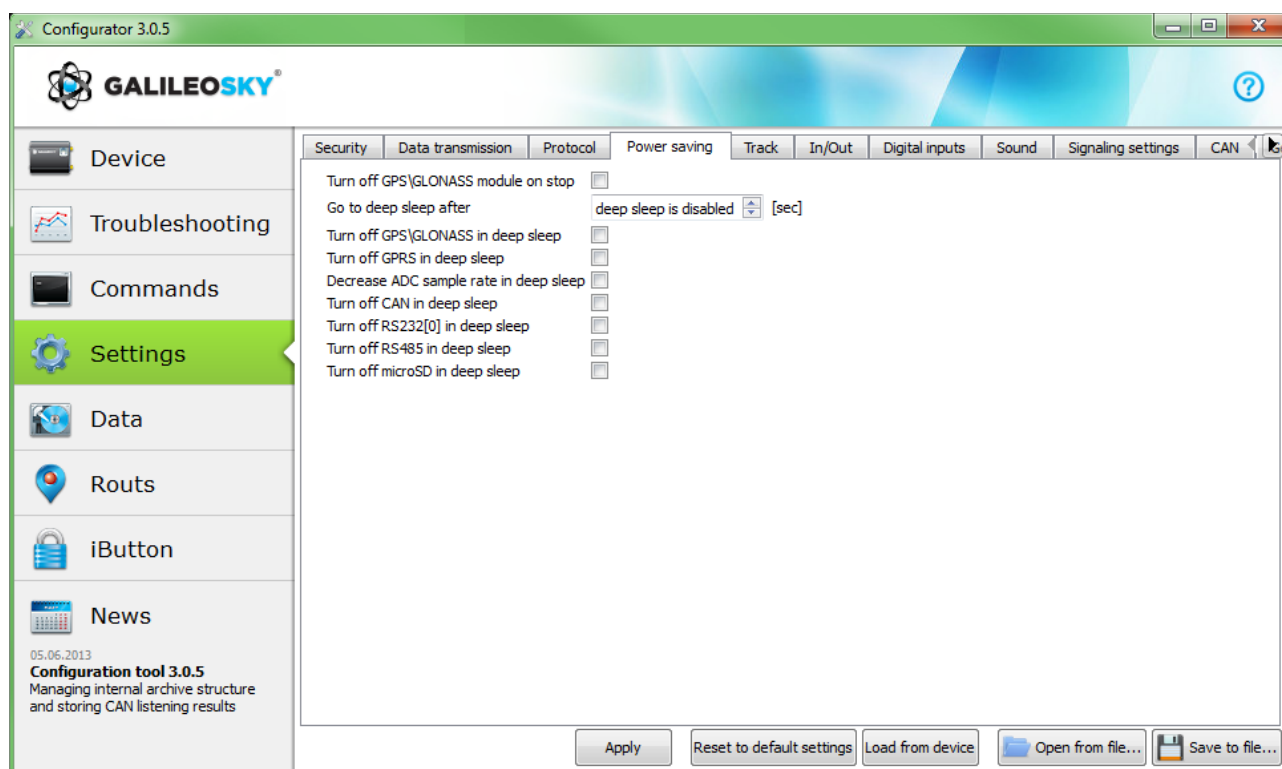
- 1) Establishing a TCP/IP connection (does not need additional settings);
- 2) Sending connection data described in the Head packet column (the data to be sent to the server are marked in the first column);
- 3) If the device has gone through the first two stages, it starts sending accumulated packets according to format described in the Main packet column.

To send data the modem establishes a server link and keeps it active even after sending the packet. It is done to save server connection traffic used to establish connection.



Power saving

This tab allows to set shutdown options of the Terminal units at stop, to reduce power consumption.



Track

This tab allows to set archive saving place and periods of coordinates recording at stops and in motion, details of track and filtering false coordinates.

The device filters coordinates by speed, acceleration, passed distance, horizontal accuracy, satellites number.

In addition the terminal allows filtering of coordinates taper during stops by supply voltage at vehicles battery (Mhours command).

Parameters:

- supply voltage at stopped engine;
- supply voltage at started engine;

The first parameter is selected in the following way:

- 1) engine is stopped for 5 minutes;
- 2) Vpit voltage parameter is saved in Device tab.

The second parameter is selected in the following way:

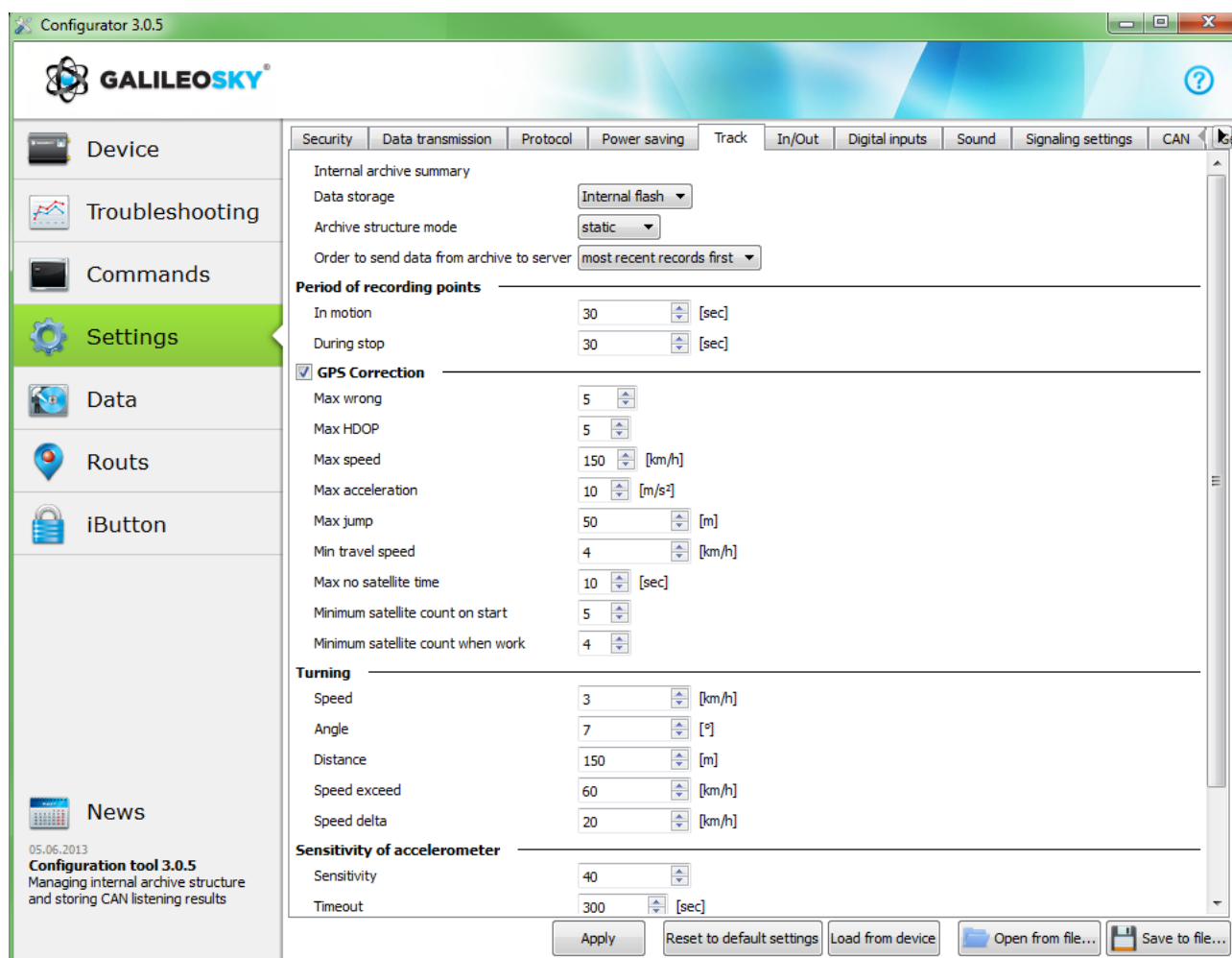
- 1) engine is started;
- 2) Vpit parameter is saved;
- 3) mhours command parameters are filled and sent to the terminal.

When engine is started, the 9th bit is set in the device status ([Table 3. Device status field explanation](#)).

Each terminal is equipped with accelerometer which allows filtering coordinates taper during stops based on vehicles vibration.

Parameters:

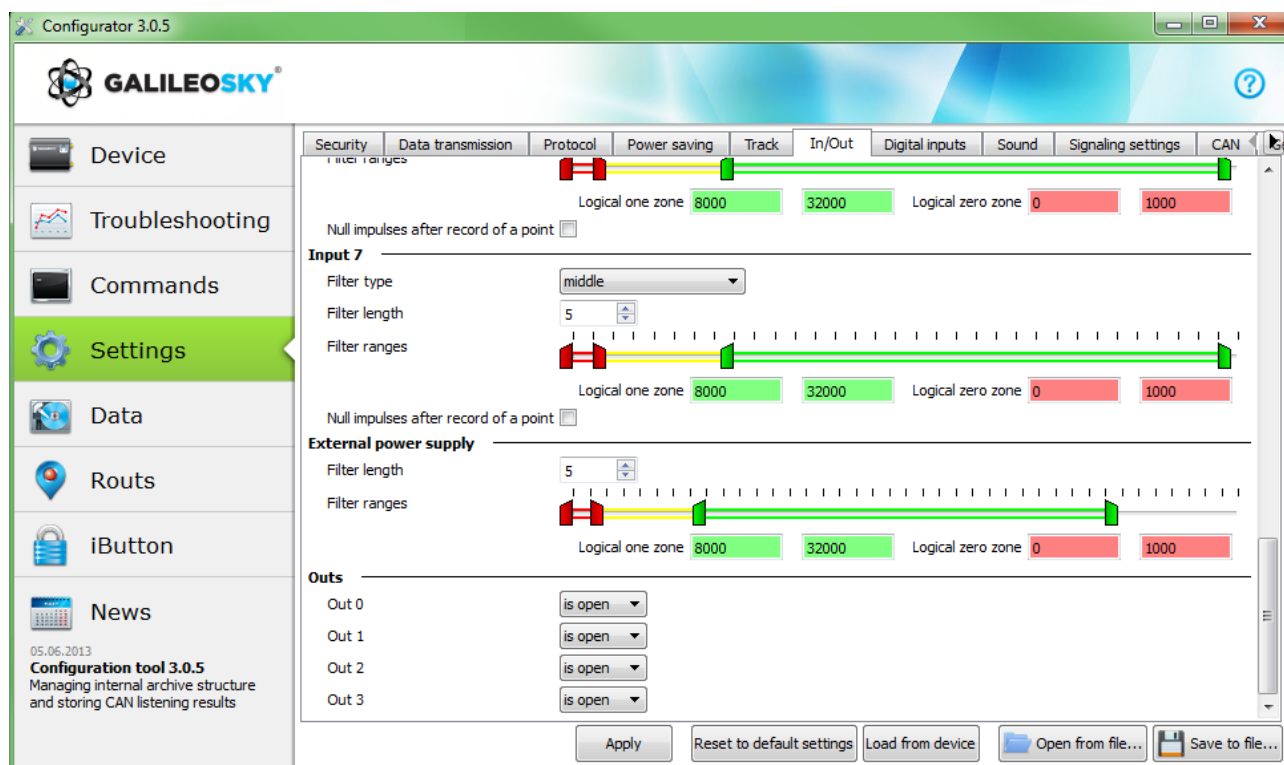
- Sensitivity– conventional unit, where 600 units sensitivity corresponds to 1g (gravitational acceleration)
- Time parameter. This filter is enabled when there is no vibration within a predefined time period. The filter operates until the necessary amplitude acceleration is reached.



Inputs/Outputs

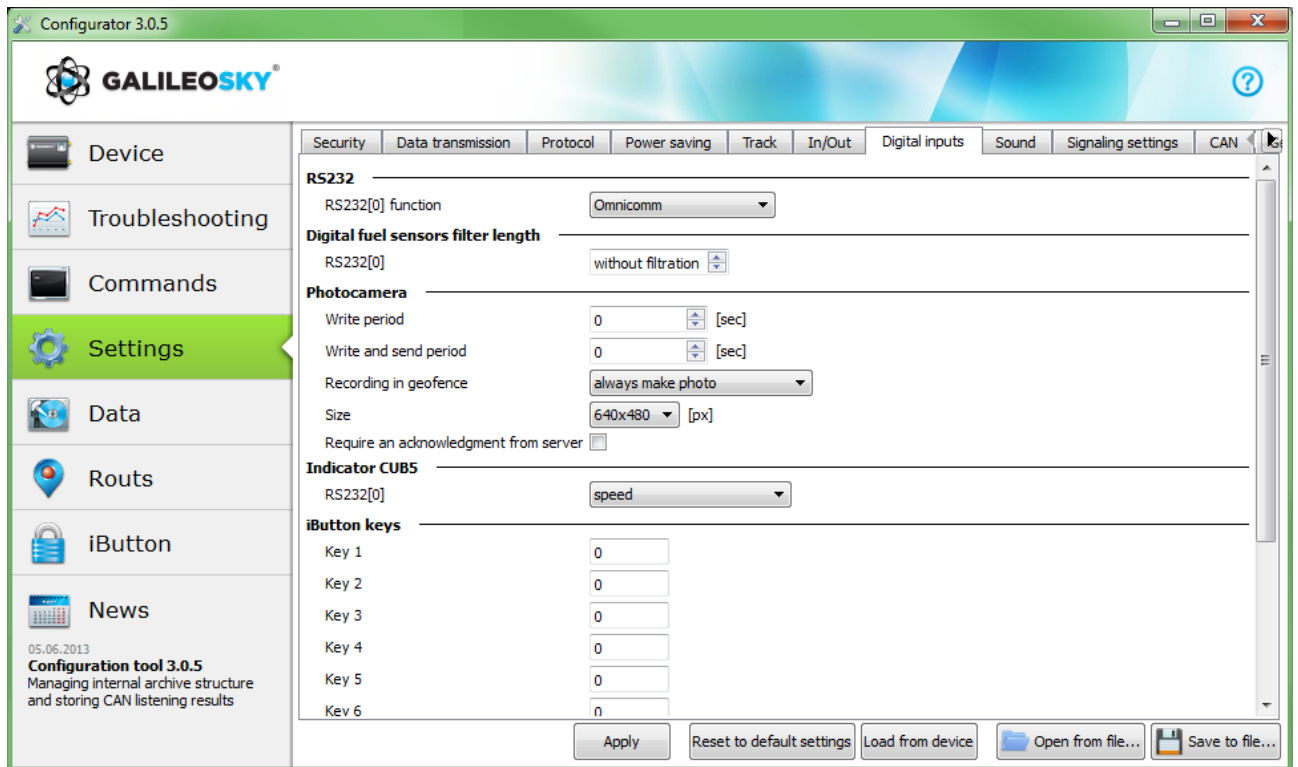
For input's operation's principles see [Discrete analog input \(DAI\) operation](#).

For discrete inputs' description see [Transistor outputs \(0/1\)](#).



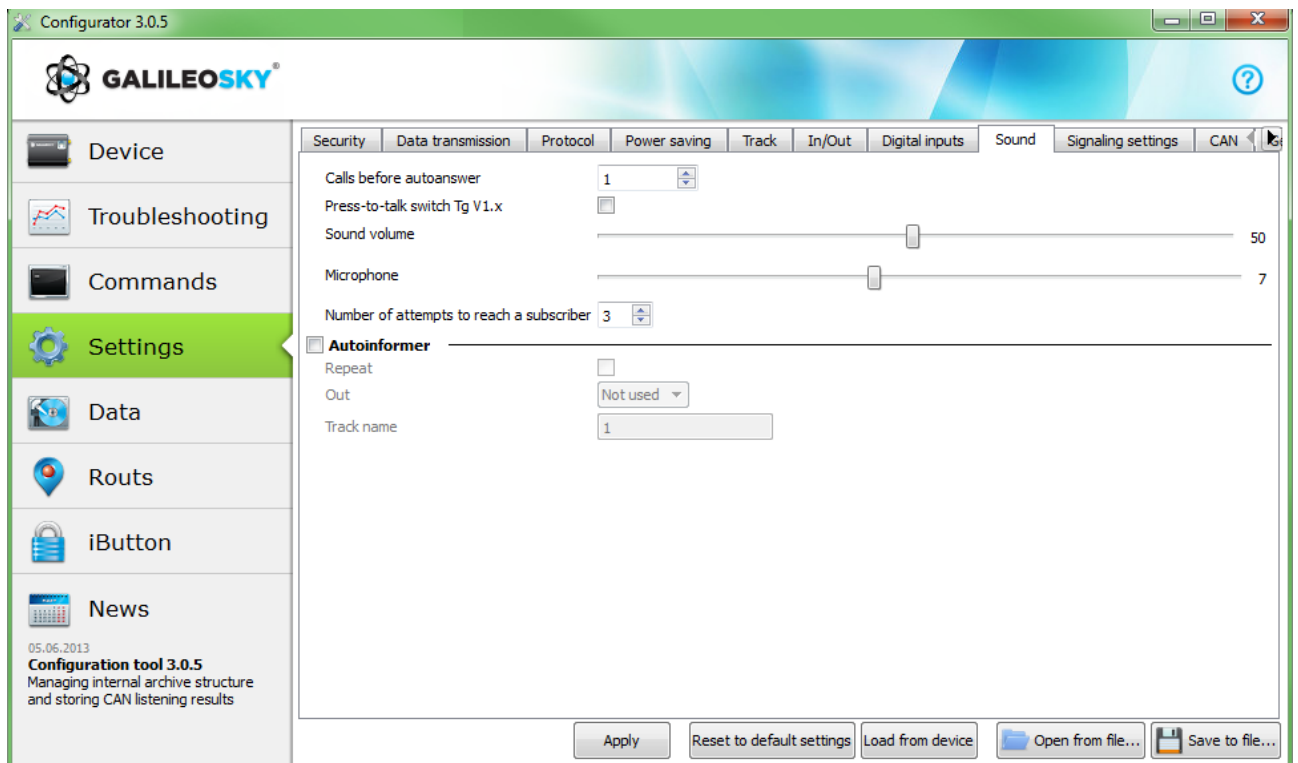
Digital inputs

This option allows to choose the type of peripherals connected to RS232 inputs, to set iButton keys, to adjust periodical photocamera shooting.



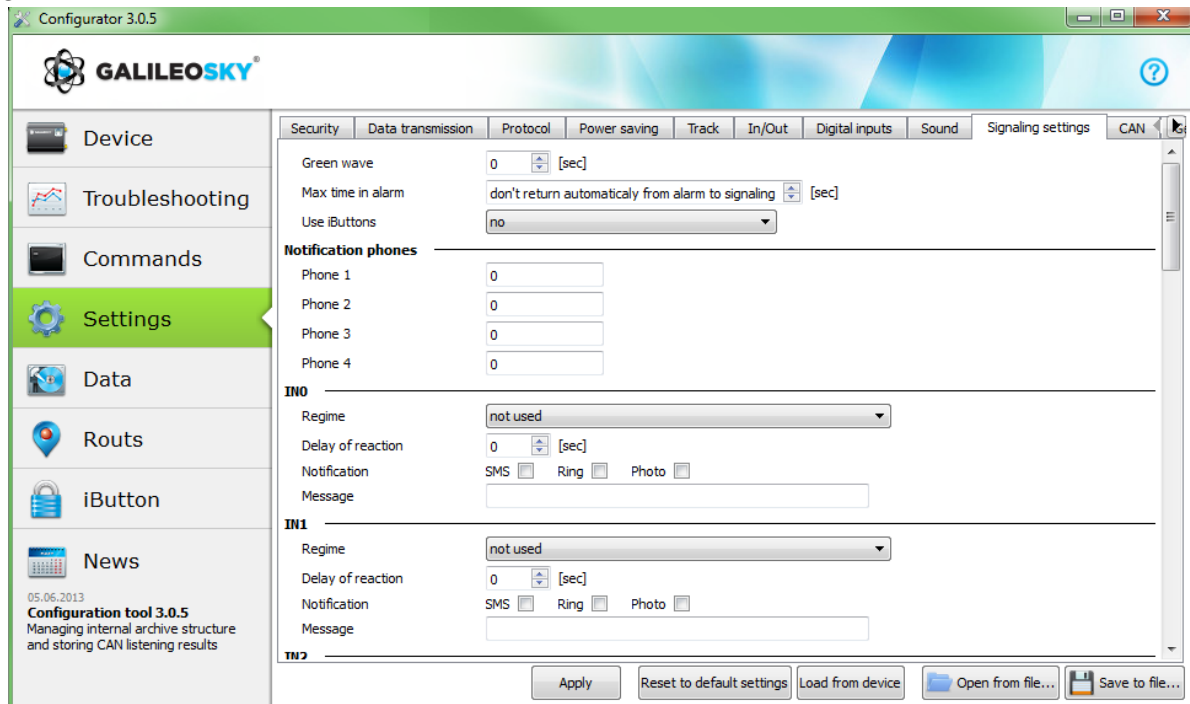
Sound

This option allows to set a microphone and sound gain via a GSM channel, number of calls before they are answered by the device, autoinformer performance parameters.



Signaling

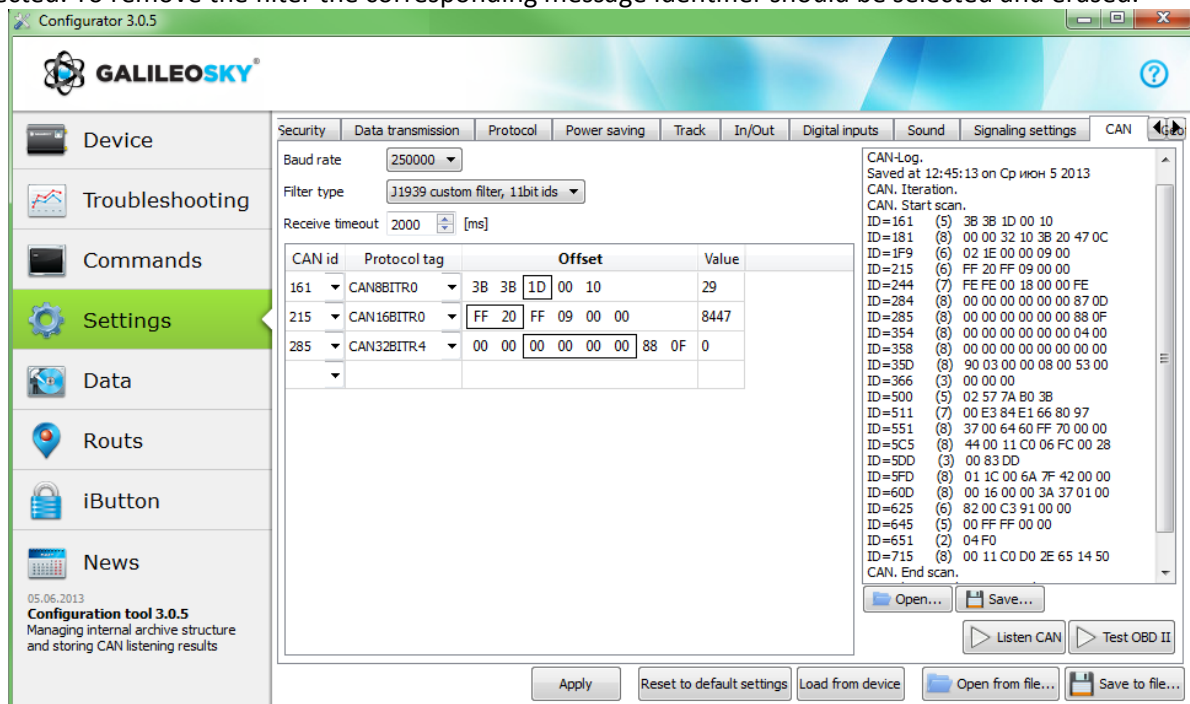
This option allows to set device response to input state, speed and coordinate change, telephone numbers for SMS or telephone call in case of signaling activation. Shock and incline determination is also can by set here.



CAN

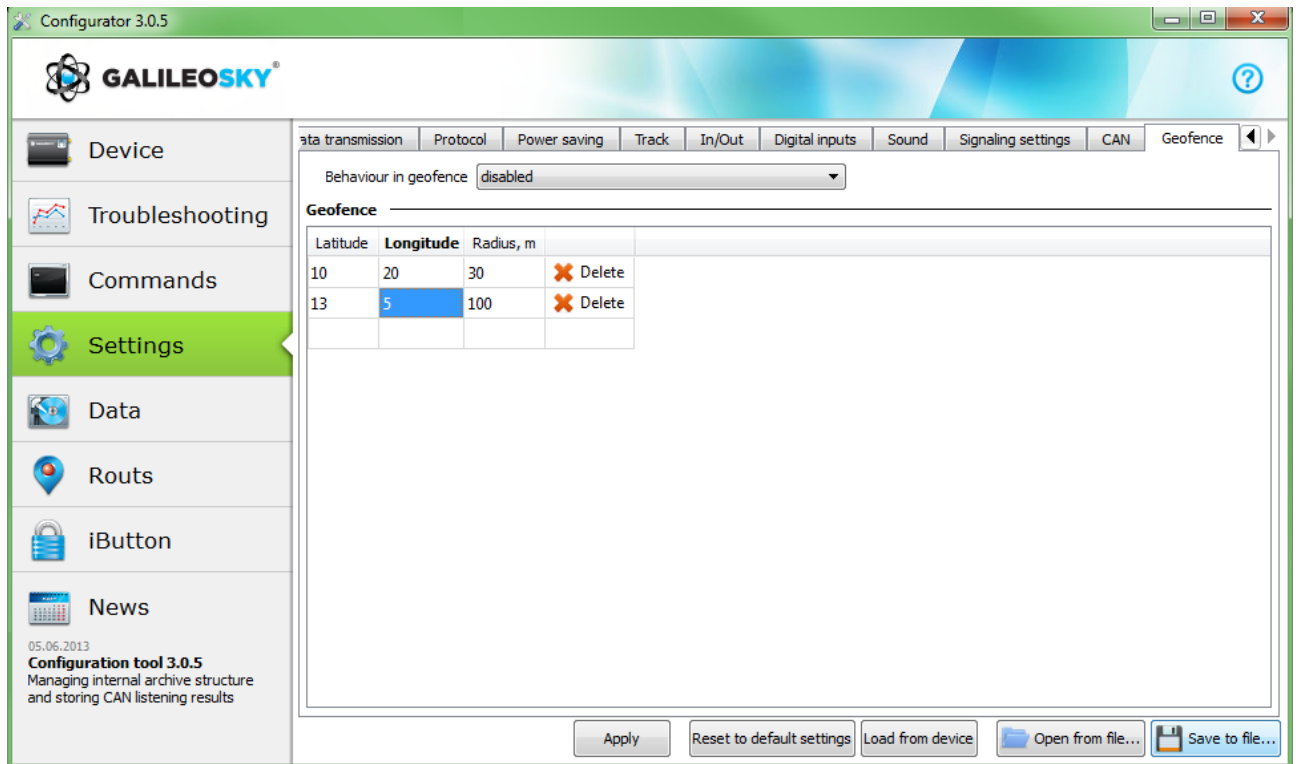
This option allows to set CAN filter and to scan CAN bus for identifiers being used.

After pressing Listen scan the CAN scanner will be activated and received messages will be displayed in the right-hand panel. When scanning is completed it is possible to set tags in the protocol where bus data to be sent. To do this CAN identifier and tag should be chosen and the message part to be sent should be selected. To remove the filter the corresponding message identifier should be selected and erased.



Geographical areas

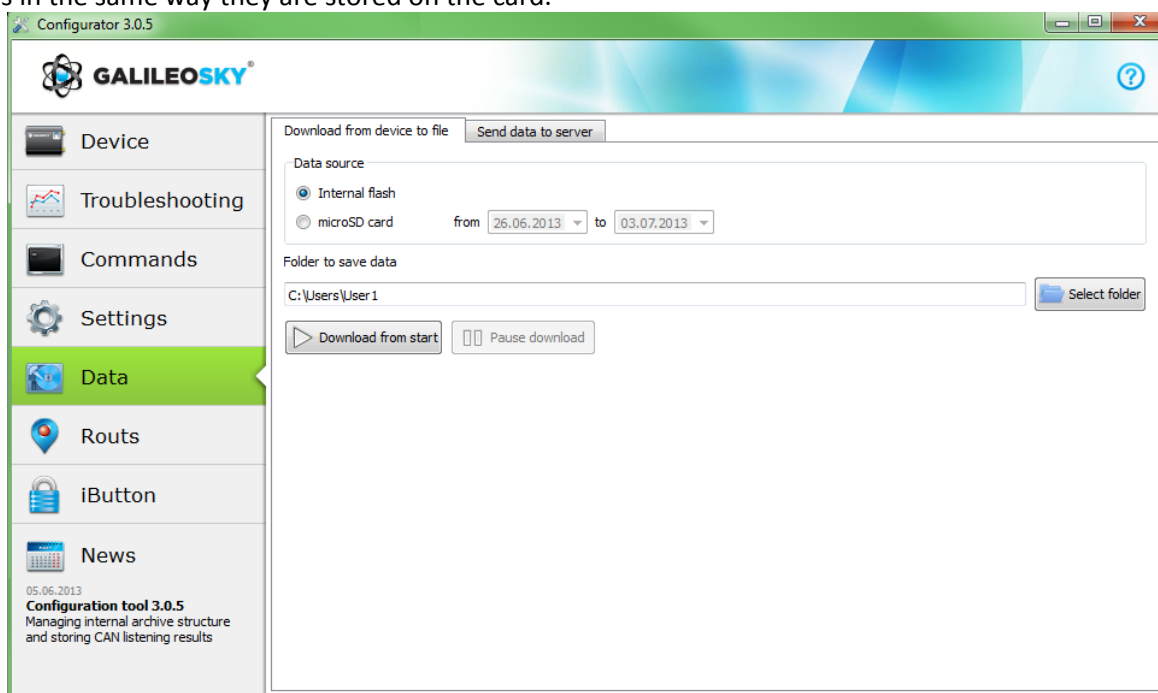
On this tab it is possible to set list of geographical areas and the terminal operation inside and outside them.



Transferring and sending data

Data transfer from device to file

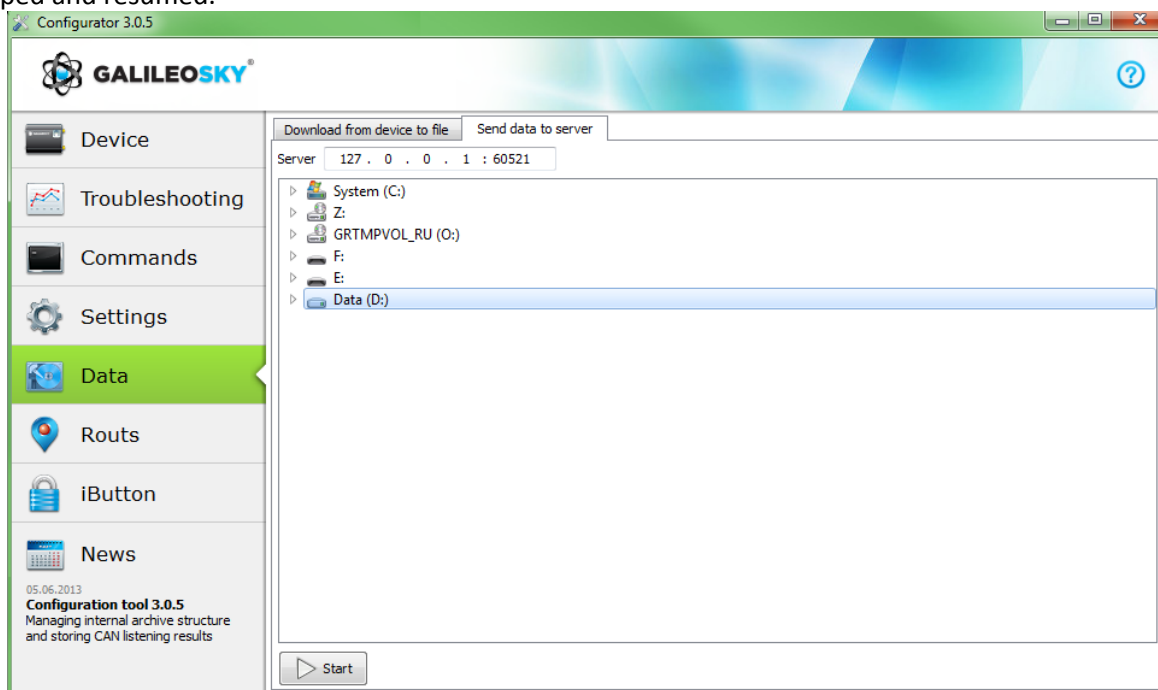
This option allows to transfer data from the internal memory or SD-card to computer files via a USB cable. In the former case one InternalFlash.csv file is created, in the latter there will be several files sorted by dates in the same way they are stored on the card.



Data transfer from the internal memory can be stopped and resumed; data transfer from the SD card can be stopped only by disconnecting the USB cable.

Sending data to server

This option allows to send data previously transferred from the device to any server emulating the device GalileoSky protocol. To send it the IP address and server port must be specified and the file or catalogue to be sent must be chosen. If a catalogue is chosen, the program will send all its data files. The process can be stopped and resumed.

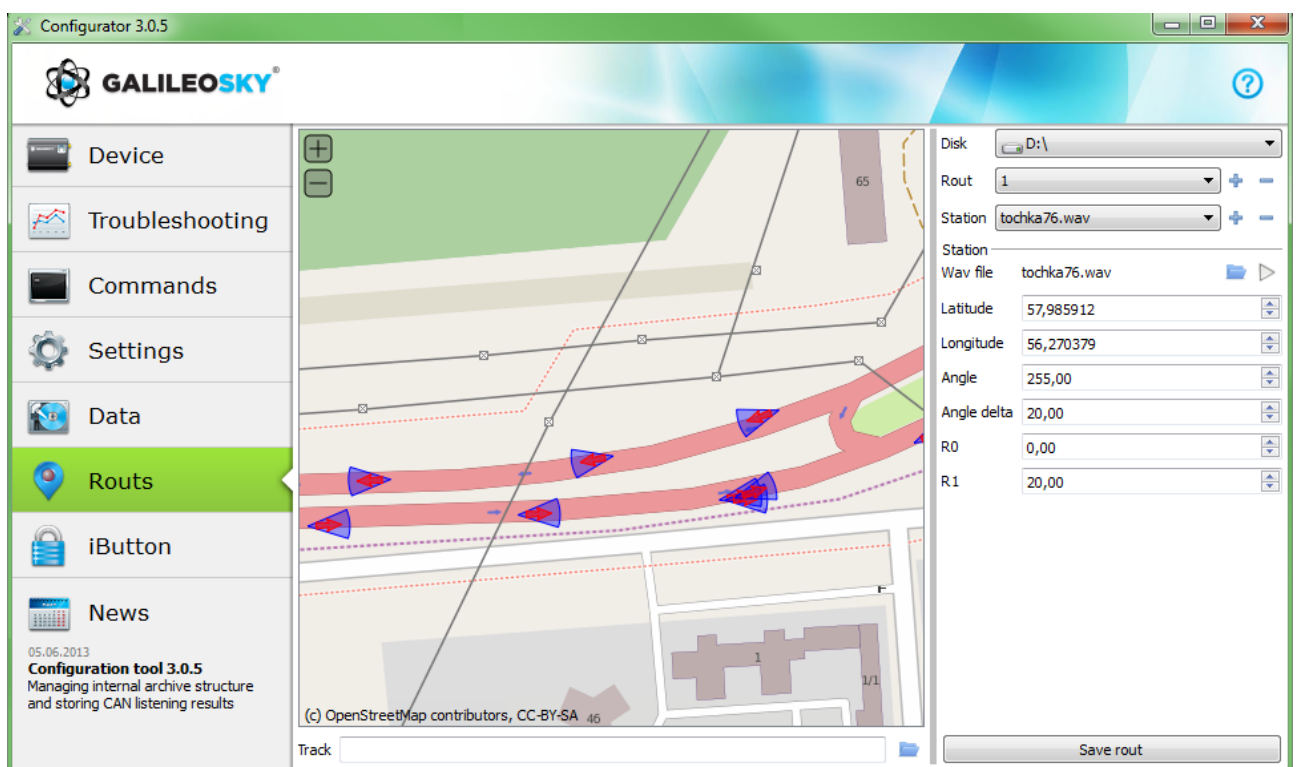


Routes for autoinformator

On this tab there is a graphic editor of zones of autoinformator (see [Autoinformator function](#)). Internet access is required to display the map.

To edit zone:

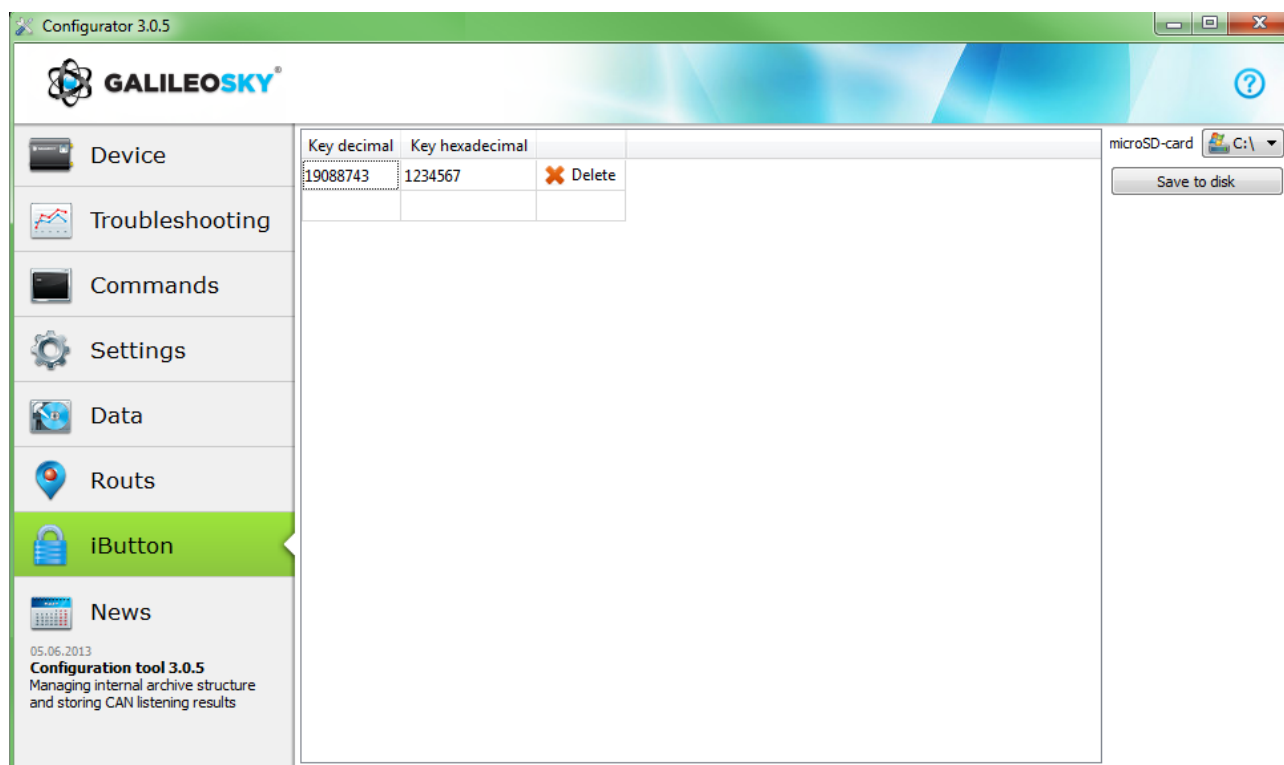
- 1) Insert Micro-SD card in computer, chose the disk in the drop-down list. The route list and track list will be loaded automatically.
- 2) Choose edited route or create new one by button "+" to the right of route list. All stops will be loaded automatically, the map being moved to the first stop.
- 3) Edit zone parameters. It can be done on the right panel as well as visually by moving red points.
- 4) Create new zones. Press the button "+" to the right of stops list. New zone appears in the middle of the map, then it can be edited.
- 5) Choose audio track for zone. It can be done in the drop-down list "Audio track", or new file can be loaded by button "+" to the right of stops list. Formats wav,mp3, ogg, raw, gsm are supported. Configurator converts file in format appropriate for Terminal and copies it on the micro-SD card.
- 6) Press "Save route" to save changes on the micro-SD card.



To make sure all zone are correct, load track after trip. Configurator supports Terminal memory csv-tracks or tracks stored on the micro-SD card.

Trusted iButton keys

This tab contains the editor of a trusted iButton keys list.



The list is stored on a microSD card; to edit the list, perform the following:

1. Remove the microSD card from the Terminal.
2. Insert the microSD card in the computer and select the disk from a drop-down list; the list of trusted iButton keys will be loaded automatically.
3. Keys may be entered either in decimal or in hexadecimal form; the corresponding value in another column will be converted automatically.
4. Click "Save to disk" to save the changes to the microSD card.

The list of keys is stored in the "keys.bin" file; it can be copied and used in microSD cards of other Terminals.

Commands list

To request a current parameter(s) value you need run command without parameter.

SMS management enabling settings

Command format **AddPhone xxxx[,n]**

Parameters	xxxx - is a 4 digit password, 1234 by default n – slot number (0-3) where telephone number will be saved.
Explanation	While using a mobile to make settings it must first be authorized with the above command. Up to 4 telephone numbers can be authorized.
Example	Request: AddPhone 1234 Reply: Phones (0) = 890101243456 (1) = (2) = (3) =

Command format **ChangePass aaaa**

Parameters	aaaa - is initial four-digit password;
Explanation	Changing and viewing current password.
Example	Request: ChangePass 5678 Reply: Password changed to '5678'

Command format **Phones P1,P2,P3,P4**

Parameters	P1,P2,P3,P4 – authorized phone numbers written in international format
Explanation	Getting list of authorized phones
Example	Request: Phones +7901012345,,, Reply: Phones (0)=+790101243456 (1)= (2)= (3)=

Data transmission settings

Command format **APN a,u,p**

Parameters	a – access point name u – user p – password
Explanation	Access point settings for SIM0
Example	Request: APN internet.beeline.ru,beeline,beeline Reply: GPRS:APN=internet.beeline.ru,user=beeline,pass=beeline

Command format **APN2 a,u,p**

Parameters	a – access point name u – user p – password
Explanation	Access point settings for SIM1
Example	Request: APN internet.beeline.ru,beeline,beeline Reply: GPRS:APN=internet.beeline.ru,user=beeline,pass=beeline

Command format **OPS0 n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14,n15**

Parameters	n1-n15 – GSM-networks connection to which is preferred.
Explanation	A list of the GSM-nets preferred for SIM0. The net is defined by a mobile country code and a mobile operator code (the list of codes is given at http://www.itu.int/dms_pub/itu-t/opb/sp/T-SP-E.212A-2010-PDF-E.pdf), for example, the Russian Federation area code is 250.
Example	Request: OPS0 25001,25099 Reply: OPS0:25001,25099,,,,,,,,,,,,;

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Command format	OPS1 n16,n17,n18,n19,n20,n21,n22,n23,n24,n25,n26,n27,n28,n29,n30
Parameters	n16-n30 – GSM-networks connection to which is preferred..
Explanation	A list of the GSM-networks preferred for SIM0. The network is defined by a mobile country code and a mobile operator code (the list of codes is given at http://www.itu.int/dms_pub/itu-t/opb/sp/T-SP-E.212A-2010-PDF-E.pdf), for example, the Russian Federation area code is 250.
Example	Request: OPS0 25001,25099 Reply: OPS0:25001,25099,,,,,,,,,,,,;

Command format	SIMSwitch mode
Parameters	mode – SIM switching algorithm: 0 – only SIM 0 is used 1 – cycle switching between SIM-cards, when transmission data fails after 9 minutes 2 – according to the list of mobile operator's codes
Explanation	Switching between SIM-cards settings.
Example	Request: SIMSwitch 1 Reply: SIMSwitch:1;

Command format	Serverip host,port
Parameters	host – is server domain name or its IP-address; port – is server port. Old command syntax is also supported for indication of IP-address: Serverip ip1,ip2,ip3,ip4,port ip1, ip2, ip3, ip4 - is IP server address.
Explanation	Main server parameters where monitoring data transmitted.
Example	Start from firmware 92 Request: Serverip m.7gis.ru,60521 Reply: SERVERIP=m.7gis.ru:60521 Request: Serverip 46.146.233.216,60521 Reply: SERVERIP=46.146.233.216:60521 All firmware Request: Serverip 46.146.233.216,60521 Reply: SERVERIP=46.146.233.216,60521

Command format	Serverip2 ip1,ip2,ip3,ip4,port
Parameters	host – is server domain name or its IP-address; port – is server port. Old command syntax is also supported for indication of IP-address: Serverip2 ip1,ip2,ip3,ip4.port ip1, ip2, ip3, ip4 - is IP server address.
Explanation	Additional server parameters.
Example	Request: Serverip2 m.7gis.ru,60521 Reply: Serverip2=m.7gis.ru:60521

Command format	ServersCfg t
Parameters	t – time of connection with one server, [sec]. If equal to 0 data are transmitted only to the main server.
Explanation	Sets server connection session time.
Example	Request: ServerCfg 120 Reply: SERVERCFG:SeansTime=120;

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Command format	ID n
Parameters	n is terminal number
Explanation	Changes device number.
<i>Example</i>	Request: ID 123 Reply: ID=123

Command format	Roaming MCC_MNC,Size,Interval
Parameters	MCC_MNC – mobile code of the country where data can be transmitted without limitations (codes list is given in http://www.itu.int/dms_pub/itu-t/opb/sp/T-SP-E.212A-2010-PDF-E.pdf), for example Russian Federation code is 250. Zero means that special roaming settings are not used; Size – maximum number of bytes which can be transmitted during one connection session in roaming, with 0 only the first packet is transmitted; Interval – communications interval in hours.
Explanation	Data transmission settings in international roaming.
<i>Example</i>	Request: Roaming 250,10000,24 Reply: ROAMING:Home=250,MaxBytes=10000,Interval=24;

Command format	DataKey Key
Parameters	key – data coding hexadecimal key, if equal to 0 data are not coded.
Explanation	Sets key by which transmitted data are coded.

Track parameters setting

Command format	Turning V,A,D,S,dS
Parameters	V – minimum speed that enables detailed turn by turn track, [km/h]; A – minimum turn angle for device to record track point, [°]; D – when this distance is exceeded another packet is saved to device memory, [m]; S – when this speed is exceeded for dS-multiple amount another track point is recorded, [km/h]; dS – speed exceeding step, [km/h].
Explanation	Configures track detail representation.
Example	Request: Turning 3,10,300,60,20 Reply: TURNING:Speed=3,Angle=10,Distance=300,SpeedEx=60,SpeedDelta=20;

Command format	WrPeriod x,y
Parameters	x – packet memory record time in motion, [sec.]; y – packet memory record time when the vehicle stops, [sec.].
Explanation	Packet memory record time when the vehicle is moving or when it stops.
Example	Request: WrPeriod 60,180 Reply: WRPERIOD move=60 parking=180

Command format	GPS.Correct OnOff,MaxWrong,MaxHDOP,Spd,Acc,Jump,TravelSpeed
Parameters	OnOff – GPS data filter on(1) or off(0); MaxWrong – the number of wrong coordinates to be filtered (the recommended number is 5). This parameter accounts errors of acceleration exceed and jump, for other parameters coordinates are always filtered; HDOP – Maximum HDOP. When it is exceeded coordinates are not updated; Spd – Maximum speed. When it is exceeded coordinates are considered false and are not updated, [km/h]; Acc –GPS or GLONASS data based acceleration; Jump – Maximum coordinate jump in the nearest 2 seconds, [m]; TravelSpeed – Minimum speed for coordinates to be updated, [km/h]. This function is not suitable for low speed vehicles (tractors, asphalt placing machines)
Explanation	Allows filtering false coordinates: when the vehicle stops, is in or out of tunnels, near high-rise buildings
Example	Request: GPS.CORRECT 1,5,2,150,3,50,3 Reply: GPS.correct: OnOff=1, MaxWrong=5, MaxHDOP=2, MaxSpd=150, MaxAcc=3, MaxJump=50, MaxTravelSpeed=3;

Command format	GPS.Correct2 MaxNoSatTime,MinSatStart,MinSatWork
Parameters	MaxNoSatTime – maximum time without satellite connection when no disconnection is registered, [sec.]; MinSatStart – minimum satellite number to be connected to when the device is on; MinSatWork – minimum satellite number in operation mode. If the number is smaller a disconnection will be registered.
Explanation	These settings affect coordinates updating, if filtering is on by GPS.Correct command.
Example	Request: GPS.CORRECT2 10,5,4 Reply: GPS.correct2:MaxNoSatTime=10,MinSatStart=4,MinSatWork=3;

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Command format	AccSens Sens,TO
Parameters	Sens – accelerometer sensitivity. TO – operating time after the vehicle stops, during which coordinates are updated, [sec].
Explanation	This function results in reducing reflected signal effect after the vehicle stops. Default value is 40,300. Sens value equal to 600 is 1g (g –gravitational acceleration)
Example	<i>Request: AccSens 40,300</i> <i>Reply: Accelerometer sensitive: sens = 40, time out=300</i>

Command format	Ignition N
Parameters	N – input used as ignition sensor: 0 – ignition sensor is not used; 1 – input 0 is used as ignition sensor; 2 – Input 1 is used as ignition sensor; 3 – Input 2 is used as ignition sensor; 4 – Input 3 is used as ignition sensor; 5 – input 4 is used as ignition sensor; 6 – input 5 is used as ignition sensor; 7 – input 6 is used as ignition sensor; 8 – input 7 is used as ignition sensor.
Explanation	At no set input triggering, vehicle is considered not started, and coordinates are not updated. It allows avoid reflected signal effect after the vehicle stops. Triggering on input is determined by limits set by InCfg command (see Discrete analogue inputs settings).
Example	<i>Request: Ignition1</i> <i>Reply: IGNITION:1;</i>

Command format	Shock Mode,Angle,Timeout,ShockSens
Parameters	Mode – shock determination mode: 0 – shock determination is switched off; 1 – shock determination is switched on, X axis is in vertical position; 2 – shock determination is switched on, Y axis is in vertical position; 3 – shock determination is switched on, Z axis is in vertical position; Angle – maximum incline angle [0°-180°], value equal to 180 switches incline determination off; Timeout – maximum allowable time when incline angle exceeded, [sec.]. ShockSens – maximum acceleration at exceed of which shock is detected. 600 points – free fall acceleration.
Explanation	Enabling shock and incline determination mode.
Example	<i>Request: Shock 3,30,5</i> <i>Reply: Shock: Mode=3,MaxAngle=30,RT=5;</i>

Command format	Mhours LoLevel,HiLevel
Parameters	LoLevel – input voltage +Vpit at stopped engine, [mV]; HiLevel – input voltage +Vpit at started engine, [mV];
Explanation	Allows filtering reflected signal effect after the vehicle stops.
Example	<i>Request: mHours 12000,14500</i> <i>Reply: Mclock: lolevel=12000,hilevel=14500;</i>

Geographical areas settings

Command format **Dzone Mode**

Parameters	Mode – operation mode inside geographical area: 0 – geographical areas processing is switched off; 1 – coordinates updating prohibition inside geographical area; 2 – GSM unit disabling inside geographical area, 3 – updating prohibition and GSM unit disabling at the same time.
Explanation	Allows setting of terminal behavior inside geographical area.
Example	Request: Dzone 3 Reply: Dzone:3;

Command format **DzoneAdd Lat,Lon,R**

Parameters	Lat – geographical area center latitude; Lon – geographical area center longitude; R – geographical area radius in meters.
Explanation	Parameter adds geographical areas, each of which is a circle with the determined center and radius.
Example	Request: DzoneAdd 55.9999,66.123456,100 Reply: DzoneAdd:lat=55.9999,lon=66.123456,rad=100;

Command format **DzoneDel Lat,Lon**

Parameters	Lat – geographical area center latitude; Lon – geographical area center longitude.
Explanation	Parameter delete geographical area, set by its center coordinates.
Example	Request: DzoneDel55.9999,66.123456 Reply: DzoneDel:lat=55.9999,lon=66.123456;

Command format **DzoneClear**

Explanation	This parameter clears all geographical areas.
Example	Request: DzoneClear Reply: Dead zones are cleared

Command format **DzoneCount**

Explanation	This parameter gets all geographical areas quantity.
Example	Request: DzoneCount Reply: DZONECOUNT:2;

Command format **DzoneInfo N**

Parameters	N – ordinal number of geographical area beginning with 0.
Explanation	This parameter gives access to geographical area's data.
Example	Request: DzoneInfo 0 Reply: DZONEINFO:Lat=10.000000,Lon=20.000000,Rad=30;

Information commands

Command format **Status**

Explanation	Allows finding device status for the moment of sending a command Dev№ – this device number; Soft=№ – current firmware version number; Pack – Last recorded serial packet number; TmDt – Current time and date; Per – Current packet saving time (different when the vehicle is moving or stops); Nav – Coordinates accuracy. 0 – coordinates found. Lat – Latitude; Lon – Longitude; Speed – Linear speed (vehicle speed); HDOP – Horizontal accuracy (The closer to one, the better); SatCnt – Number of available satellites; A – Directional angle of movement direction
<i>Example</i>	Request: Status Reply: Dev50 Soft=91 Pack=17230 TmDt=10:58:6 20.6.9 Per=60 Nav=0 Lat=60.4007 Lon=31.0070 Speed=0.0194 HDOP=0.8800 SatCnt=10 A=27.55

Command format **imei**

Explanation	Allows us to obtain a unique GSM unit identifier, 15byte
<i>Example</i>	Request: IMEI Reply: IMEI 123456789012345

Command format **imsi**

Explanation	Allows us to obtain a unique IMSI identifier of SIM-card
<i>Example</i>	Request: IMSI Reply: IMSI 123456789012345

Command format **inall**

Explanation	Allows analog input values in0..in7, to be obtained as well as fuel level sensor (RS232) value and temperature, and accelerometer values with respect to three axes (10bit for each axis starting with the zero bit).
<i>Example</i>	Request: inall Reply: INALL: in0=0, in1=0, in2=0, in3=0, in4=0, in5=0, in6=0, in7=0, RS232=10, 1, Acc=3329438 91;

Command format **insys**

Explanation	Allows us to obtain external source voltage, internal battery voltage, GPS aerial voltage, the main power bus voltage and also the device inside temperature.
<i>Example</i>	Request: insys Reply: INSYS: Pow=12438, Vbat=4196, Vant=2921, Vdc=4115, Temper=37

Command format **RS485**

Explanation	Allows to receive value of the digital fuel level sensor connected on the RS485 interface. For each sensor the command prints fuel level and temperature.
<i>Example</i>	Request: RS485 Reply: RS485 100,0;100,1;100,2;100,3;100,4;100,5;100,6;100,7;100,8;100,9;100,10; 100,11;100,12;100,13;100,14;100,15;

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Command format Temex0	
Explanation	Allows finding temperature of the first four external thermometers DS18S20. Format: the lower byte is the thermometer identifier, the high byte the temperature itself. To find the temperature the obtained value must be divided by 256 and truncated to integer, with the fractional part deleted.
Example	Request: temex0 Reply: TemEx0: DS0=0,DS1=0,DS2=0,DS3=0
Command format Temex1	
Explanation	Allows finding temperature of the second four external thermometers DS18S20. Format: the lower byte is the thermometer identifier, the high byte the temperature itself. To find the temperature the obtained value must be divided by 256 and truncated to integer, with the fractional part deleted.
Example	Request: temex1 Reply: TemEx1: DS4=0,DS5=0,DS6=0,DS7=0
Command format Hum0	
Explanation	Allows to find temperature of the first four humidity detectors DS1923. ID – sensor identifier; T – temperature in Celsius degrees H – humidity in %.
Example	Request: Hum0 Reply: ID0=1,T0=20,H0=20.0,ID1=2,t1=30,H1=30.0,ID2=3,T0=25,H2=40.0,ID3=5,T3=15,H3=50.0
Command format Hum1	
Explanation	Allows to find temperature of the second four humidity detectors DS1923. ID – sensor identifier; T – temperature in Celsius degrees H – humidity in %.
Example	Request: Hum0 Reply: ID0=1,T0=20,H0=20.0,ID1=2,t1=30,H1=30.0,ID2=3,T0=25,H2=40.0,ID3=5,T3=15,H3=50.0
Command format Canibut	
Explanation	Allows current CAN bus state (Table 2. GalileoSky protocol tags) and iButton decimal value to be obtained.
Example	Request: canib Reply: CAN_Ib: CANA0=0,CANA1=0,CANB0=0,CANB1=0,iBut=0
Command format statall	
Explanation	Allows device, inputs, outputs decimal status to be obtained (Table 3. Device status field explanation) and mileage according to GPS/GLONASS.
Example	Request: statall Reply: StatAll: Dev=1,Ins=2,Outs=7,Mileage=152;
Command format AccType	
Explanation	Allows obtaining accelerometer type. Returns “analog” for analogue type and “digital” for digital type.
Example	Request: AccType Reply: AccType: digital

Service commands

Command format **PIN N**

Parameters	N – four-digit PIN-code of SIM card.
Explanation	SIM card PIN-code setting and password for access to settings in the Configurator. By default 0. At wrong code entering through Configurator the terminal is blocked for 25 seconds and then reset. PIN-code is identical for both SIM-cards.
Example	Запрос: PIN 1234 Ответ: PIN:1234;

Command format **Archive type**

Parameters	type – data source for sending to the server: 0 – archive from internal flash memory; 1 – archive from microSD card.
Explanation	Selection of data source for sending to the server. After command execution it is necessary to restart the terminal. Before microSD card selection, it is necessary to delete archive created by earlier firmwares (EraseTrackSD or delete file from Track catalogue through the Card-Reader).
Example	Запрос: ARCHIVE 0 Ответ: ARCHIVE:0;

Command format **FLASHARCHIVE Dynamic,SendOrder**

Parameters	Dynamic – is dynamic archive structure off or on: 0 – dynamic archive structure is off, all data saved in archive; 1 – dynamic archive structure is on, only transmitted to the server data is saved to archive SendOrder – order of data transmission: 0 – the most actual data are sent first 1 – data are sent in chronological order
Explanation	Set the archive structure and data transmission order to the server
Example	Запрос: FLASHARCHIVE 1,1 Ответ: FLASHARCHIVE: Dynamic=1,StraightSendOrder=1;

Command format **EraseCfg**

Explanation	Restoring default configuration.
Example	Запрос: EraseCfg Ответ: ERASECFG

Command format **EraseTrack**

Explanation	Deleting all tracks from memory.
Example	Request: EraseTrack reply: ERASETRACK

Command format **EraseTrackSD**

Explanation	Deleting all tracks from SD memory
Example	Request: EraseTrackSD Reply: ERASETRACKSD

Command format **GlonassColdStart**

Explanation	GLONASS unit cold start on Galileo GLONASS terminals.
Example	Request: GlonassColdStart Reply: GLONASS cold start

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Command format	GPSColdStart
Explanation	GPS unit cold start on Galileo GPS terminals.
Example	Request: GpsColdStart Reply: GPS cold start

Command format	Reset
Explanation	Allows to reset remote device.
Example	Request: Reset Reply: Reset of device. Please wait 15 seconds...

Command format	Upgrade
Explanation	See bootloader section.
Example	Request: Upgrade 47 Reply: UPGRADE 47

Command format	SleepMode OffOnStop,DST,GNSS,GPRS,ADC,CAN,RS232,RS485,SD,WakeUp,ST
Parameters	OffOnStop – 0 – do not turn GPS\GLONASS unit off at stop; 1 – turn GPS\GLONASS unit off at stop. DST – Time duration at stop, after which the Terminal will switch to the deep sleep mode; GNSS – turn GPS\GLONASS unit off in the deep sleep mode; GPRS –turn GSM unit off in the deep sleep mode; ADC – reduce ADC sampling rate in the deep sleep mode, whereby the maximum measured frequency that can be measured at inputs undergoes 2-fold reduction and the minimum impulse period that can be at measured inputs undergoes 2-fold increase; CAN – turn off CAN in the deep sleep mode; RS232 – turn off RS232 in the deep sleep mode; RS485 – turn off RS485 in the deep sleep mode; microSD – turn off microSD in the deep sleep mode, the reading of trusted iButton keys is supported; WakeUp – a period in seconds between connections to a server in power saving mode; ST – a length of connection to a server in deep sleep mode.
Explanation	Power saving mode control. In the deep sleep mode no 1Wire sensors sampling and no battery charging are performed.
Example	Request: SLEEPMODE 1,60,1,1,1,1,1,1,3600,600 Reply: SLEEPMODE:OffGNSSOnStop=1,DSTimeout=60, GNSS=1,GPRS=1,ADC=1,CAN=1,RS232=1,RS232_1/RS485=1,SD=1, GSMWakeUp=3600, SessionLen=60;

Command format	RemoteConfig OnOff
Parameters	OnOff – turns on the remote configuration function: 0 – remote configuration is off; 1 – remote configuration is on.
Explanation	Turns the remote configuration on and off ("Remote configuration " section).
Example	Request: RemoteConfig 1 Reply: REMOTECONFIG:1;

Command format	LastCmd N
Parameters	N – record number starting from 0. Record are stored in cyclic array, so record 0 is not always the earliest record.
Explanation	Log of commands send to the Terminal. The log can store up to 10 commands.
Example	Запрос: LastCmd 1 Ответ: USB 10:10:10 2013.01.01 REMOTECONFIG 1

Voice communication settings

Command format	GSMVolume k,m
Parameters	k – GSM-channel sound gain [1÷100]. m – GSM-channel microphone gain [1÷15]. The greater the parameter, the greater the gain.
Explanation	Allows speakerphone sound gain parameters to be customized.
Example	Request: GSMVolume 75,15 Reply: GSMVOLUME=75,15

Command format	AutoAnswer n
Parameters	n – number of calls before autoanswer. [0÷10] If the parameter is equal to 0, the function is disabled.
Explanation	An incoming call results in a device automatic answer.
Example	Request: AutoAnswer 1 Reply: AUTOANSWER=1

Command format	Calls N
Parameters	N – number of call attempts
Example	Request: Call 3 Reply: CALL:3;

Command format	RingTo N
Parameters	N –telephone number
Explanation	This command results in the device dialing the given number.
Example	Request: RingTo 89119988899 Reply: RINGTO=89119988899

Command format	SendSMS Tel,Msg
Parameters	Tel – telephone number to which SMS will be sent Msg – SMS template. It may contain parameters to insert current data: %IMEI – device's IMEI, %LAT – latitude, %LON – longitude.
Explanation	This command results in the device sending SMS on the given number.
Example	Request: SendSMS 89119988899, Test Reply: SMS sheduled

Discrete-analog input setting

Command format	InCfg_num_in ft,fl,up_low,up_hi,down_low,down_hi,imp_null
Parameters	num_in – input number, beginning from 0; ft – filter type 0 – mean value computation; 1 – pulse count; 2 – frequency count 3 – pulse count from two synchronous connected sensors. fl – filter length [1÷50]. It is used for average and discrete signal function; up_low – discrete signal triggering lower limit, [mV]; up_hi – discrete signal triggering upper limit, [mV]; down_low – discrete signal failure lower limit, [mV]; down_hi – discrete signal failure upper limit, [mV]; imp_null – pulses counter behaviour: 1 – counter is set to zero, 0 – counter is continued operation.
Explanation	Allows one of 8 analog/discrete inputs to be configured.
Example	Request: InCfg0 0,10,8000,15000,0,3000,0 Reply: INCFG0:FiltType=0,FiltLen=10,UpLow=8000,UpHi=15000,DownLow=0,DownHi=3000, ImpNull=0;

Command format	PowInCfg fl,up_low,up_hi,down_low,down_hi
Parameters	fl – length of the averaging filter [1÷50]; up_low – lower limit of a discrete signal response, [mV]; up_hi – upper limit of a discrete signal response, [mV]; down_low – lower limit of a discrete signal non-response, [mV]; down_hi – upper limit of a discrete signal non-response, [mV];
Explanation	Allows configuration of the response limits for external power input.
Example	Request: PowInCfg 10,8000,15000,0,3000 Reply: POWINCFG:FiltLen=10,UpLow=8000,UpHi=15000,DownLow=0,DownHi=3000;

Command format	AccVal
Explanation	Obtaining filtered accelerometer mean-square value by three axes. Accelerometer sensitivity: min = 555mV/g; average = 600mB/g; max = 645mB/g; where g is free fall acceleration ($g \approx 9.8 \text{ m/c}^2$).
Example	Request: AccVal Reply: ACCVAL = 625 ----- AccVal = 0.625B. As can be seen, the accelerometer is affected by the gravity force only.

Transistor output setting

Command format **Out v,s**

Parameters	v – output ordinal number (starting with the zero); s – desired state (0 – on-state transistor output; 1 –off-state transistor output).
Explanation	Transistor output control. With one output being controlled, the others outputs' state remains unchanged. Transistor outputs are off by default.
Example	Request: Out 1,1 Reply: OUT(3..0) = 0010 All outputs except 1 are seen to be on.

Autoinformer setting

Command format **Autoinformer OnOff,Repeat,Out,FileName**

Parameters	OnOff – enable/disable autoinformer function: 1 – the function is enabled, 0 – the black box function is enabled (navigation data is backed up and saved to the external microSD card). Repeat – determines whether the file should be replayed when device is in the playback zone. If the value is 0, the file is played only once on entering the zone. FileName – route name. The route is understood as the number of zones to be announced.
Explanation	For more information see Autoinformer section.
Example	Request: Autoinformer 1,0,Marshrut 1 Reply: AUTOINFORMER OnOff=1,Repeat=0,Route=Marshrut 1;.

Digital inputs settings

Command format **RS2320 nf**

Parameters	nf – function number <ul style="list-style-type: none"> • 0 – no function on RS232[0]; • 1 – digital fuel gauge (relative level N); • 2 - digital fuel gauge (frequency F); • 3 – attaching external GLONASS unit; • 4 – photocamera Galileo • 5 – Garmin navigator • 6 – CAN-LOG • 7 – CUB5 indicator • 9 – RS232-RS485 converter; • 10 – meter REP-500; • 12 – weight indicator CI-5010A.
Explanation	Zero port RS232 function setting.
Example	Request: RS2320 1 Reply: RS232_0: NumFunc=1;

Command format **DFilter RS2320,0**

Parameters	RS2320 – filter length for fuel gauge connected to the zero port RS232, number of successive indications from sensor which are averaged. Value equal to 1, there is no filtration;
Explanation	Digital fuel gauge indications filtering.
Example	Request: DFILTER 1,0 Reply: DFILTER:RS2320=1,RS2321=0;

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Command format	iButtons ib1,ib2,ib3,ib4,ib5,ib6,ib7,ib8
Parameters	ib1-ib8 – four lower bytes of iButton identification hexadecimal number without checksum. For example, full key hexadecimal number: 09 00 00 00 91 02 0C 5C, where 09 – device type (in this case DS1982, for DS1990 – 01), 00 00 00 91 02 0C – unique number, 5C – checksum. In this case “00 91 02 2C” must be entered.
Explanation	List of iButton identifiers which state will be monitored by terminals.
Example	Request: iButtons 0091022C,0,0,0,0,0,0 Reply: IBUTTONS:0091022C,0,0,0,0,0,0

Command format	CUB5 N0,0
Parameters	N0 – parameter number displayed on the indicator connected to RS232[0] Parameters: 0 – speed, accurate within 0.1, [km/h]; 1 – directional angle accurate within 0.1 [°]; 2 – external supply voltage [mV]; 3 – external accumulator voltage [mV]; 4 – temperature inside Terminal [°C]; 5 – kilometrage according to GPS/GLONASS data, accurate within 0.1, [km] 6 – input IN0; 7 – input IN1; 8 – input IN2; 9 – input IN3; 10 – RS232[0]; 12 – temperature sensor 0 [°C]; 13 – temperature sensor 1 [°C]; 14 – temperature sensor 2 [°C]; 15 – temperature sensor 3 [°C]; 16 – temperature sensor 4 [°C]; 17 – temperature sensor 5 [°C]; 18 – temperature sensor 6 [°C]; 19 – temperature sensor 7 [°C]; 20 – CAN. Total fuel consumption [l] 21 – CAN. Tank fuel level: in percents, accurate within 0.1 [%] 22 – CAN. Coolant temperature [°C]; 23 – CAN. Engine revolutions; 24 – CAN. Kilometrage, accurate within 0.1 [km] 25-39 – CAN8BITR0 - CAN8BITR14; 40-44 – CAN16BITR0 – CAN16BITR4; 45-49 – CAN32BITR0 – CAN32BITR4; 50 – RS485[0]; 51 – RS485[1]; 52 – RS485[2].
Explanation	Display parameters settings on the CUB5 indicator
Example	Request: CUB5 1,0 Reply: CUB5:RS2320=1, RS2321=0;

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Command format	AddKey key1,...,key25
Parameters	<p>key – the lower 4 bytes of the iButton identification number excluding the control total in hexadecimal form.</p> <p>For example, the full key number of the in hexadecimal form is: 09 00 00 00 91 02 0C 5C, where</p> <p>09 – the device type (in this case, DS1982, for DS1990 to be 01) 00 00 00 91 02 0C – the unique number 5C – the control total.</p> <p>In this case, the number to be entered is 00 91 02 2C. The command can contain a list of up to 25 keys.</p>
Explanation	Add the key to the list of trusted iButton identifiers on a microSD-card.
Example	<p>Request: AddKey 0091022C,0091022D</p> <p>Reply: Added 2 keys</p>

Command format	DelKey key1,...,key25
Parameters	<p>key – the lower 4 bytes of the iButton identification number excluding the control total in hexadecimal form.</p> <p>For example, the full key number of the in hexadecimal form is: 09 00 00 00 91 02 0C 5C, where</p> <p>09 – the device type (in this case, DS1982, for DS1990 to be 01) 00 00 00 91 02 0C – the unique number 5C – the control total.</p> <p>In this case, the number to be entered is 00 91 02 2C. The command can contain a list of up to 25 keys.</p>
Explanation	Remove the key from the list of trusted iButton identifiers on a microSD-card.
Example	<p>Request: DelKey 0091022C,0091022D</p> <p>Reply: Deleted 2 keys</p>

Command format	KeyCount
Explanation	The number of trusted iButton keys on a microSD card.
Example	<p>Request: KeyCount</p> <p>Reply: KEYCOUNT:12;</p>

Command format	ShowKey N
Parameters	N – the order number of a iButton key in the list on a microSD-card. Numbering starting with 1.
Explanation	Show an identifier for a trusted iButton key on a microSD-card.
Example	<p>Request: ShowKey 1</p> <p>Reply: SHOWKEY 1:9503276 (0x0091022C)</p>

Command format	RS485FN nf
Parameters	<p>nf – function number:</p> <p>0 – fuel level sensors and digital cameras GalileoSky; 1 – RFID readed MATRIX 5.</p>
Explanation	RS485 settings.
Example	<p>Request: RS485FN 1</p> <p>Reply: RS485FN: 1;</p>

Signaling mode setting

Command format **SIGN GWTime,DropAlarmTimeout,UseIB**

Parameters	GWTime – duration of the "green wave" which is the time after the signalling start during which no sampling of sensors takes place, [sec]; DropAlarmTimeout – time in the alarm mode, after which an automatic switching to the alarm mode will be performed. At zero, the Terminal will stay in the signalling mode until the respective command is sent or until it is disabled using the input, [sec]; UseIB – should iButton keys be used for arming and disarming: 0 – no; 1 – arming and disarming through the short put of one of trusted iButton keys; 2 – arming only in the presence of one of trusted iButton keys, if no key was put, the Terminal is disarmed; 3 – arming only in the presence of any of iButton keys, if no key was put, the Terminal is disarmed. 4 – disarming only in the presence of any of iButton keys, if no key was put, the Terminal is armed; 5 – arming through the short put of one of trusted iButton keys, no disarming after disconnecting the key.
Explanation	General configuration of signalling.
Example	Request: SIGN 40,60,0 Reply: SIGN:GWTime=40,DropAlarmTimeout=60 ,UseIB=0;

Command format **S**

Explanation	Signaling enabling.
Example	Request: S Reply: Signaling is enabled

Command format **DS**

Explanation	Signaling disabling.
Example	Request: DS Reply: Signaling is disabled

Command format **ST**

Explanation	Signaling status. Possible Status: Signaling is disabled – signaling is off, Signaling is enabled – signaling is on, Alarm – alarm mode.
Example	Request: ST Reply: Signaling is disabled.

Command format **AddSigPhone phone[,n]**

Parameters	phone – phone number n – optional parameter, added phone number index.
Explanation	Notification phone setting
Example	Request: AddSigPhone 123456789 Reply: SignPhones 123456789;;;

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Command format	SINO type,delay,sms,ring,photo,msg
Parameters	type – input mode: <ul style="list-style-type: none"> 0 – is not used for signaling; 1 – input activation results in signaling mode on; 2 – input activation results in alert mode on if signaling mode was on; 3 – input activation results in alert mode on even if signaling mode was off. delay – post-activation delay before alert mode, [sec]. sms – enable SMS notification: 1 – yes, 0 – no ring – enable phone call notification: 1 – yes, 0 – no photo – take photo: 1 – yes, 0 – no msg – alert mode message. Message may contain parameters which are replaced by current data: %IMEI – IMEI terminal, %LAT – latitude, %LON – longitude.
Explanation	Signaling mode input setting.
Example	Request: SINO 3,0,1,1,Alarm %IMEI Reply: SINO:SignType=3,Adelay=0, SMS=1, Ring=1, Photo=0, Msg=Alarm %IMEI;

sin1, sin2, sin3, sin4, sin5, sin6, sin7 – similar to sin0 commands

Command format	SGPS type,speed,r,t,sms,ring
Parameters	type – operating mode <ul style="list-style-type: none"> 0 – is not used for signaling; 1 – alert mode when the speed is exceeded; 2 – alert mode if the vehicle is beyond the radius and the time interval; 3 – alert mode when speed is exceeded or if the vehicle is beyond the radius and the time interval. speed – maximum speed, [km/h]. r – maximum radius, [m]. t – maximum time interval staying beyond the radius, [s]. sms – enables SMS alert: 1 – yes, 0 – no ring – enables phone call alert: 1 – yes, 0 – no
Explanation	Signaling mode GPS data setting.
Example	Request: sgps 1,10,1,10,1,1 Reply: SGPS:SignType=1,Speed=10,R=1,T=10,SMS=0, Ring=0;

Command format	SACC type,sms,ring,photo,msg
Parameters	type – operation mode: <ul style="list-style-type: none"> 0 – is not used for signaling; 1 – only incline above given angle results in Alarm in Signaling mode; 2 – only acceleration exceeding (shock) results in Alarm in Signaling mode; 3 – both incline and shock results in Alarm in Signaling mode. sms – enables SMS notification: 1 – yes, 0 – no ring – enables phone call notification: 1 – yes, 0 – no photo – take photo: 1 – yes, 0 – no msg – alert mode message. Message may contain parameters which are replaced by current data: %IMEI – IMEI terminal, %LAT – latitude, %LON – longitude.
Explanation	Using accelerator data in signaling mode. Operation thresholds set by command SHOCK (see <u>Determination of shock and incline</u>)
Example	Request: SACC 2,1,1,0,Удар Reply: SACC:SignType=2,SMS=1, Ring=1, Photo=0, Msg=Удар;

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Command format	SOUT0 EMode,ElmpT,ElmpC,DMode,DlmpnP,T,DlmpC,AMode,AlmpT,AlmpC,ADelay
Parameters	<p>EMode – output mode for Signaling enabling: 0 – no answer, 1 – output inverted, 2 – output generates impulses, ElmpT – impulse time during Signaling enabling ElmpC – number of impulses during Signaling enabling DMode – output mode for Signaling disabling 0 – no answer, 1 – output inverted, 2 – output generates impulses, DlmpnP,T – impulse time during Signaling disabling, msec. DlmpC – number of impulses during Signaling disabling AMode – output mode for Alarm: 0 – no answer, 1 – output inverted, 2 – output generates impulses, AlmpT – impulse time during Alarm, msec AlmpC – number of impulses during Alarm. ADelay – activation delay after Alarm mode is on. Device round impulse duration to 0.1 sec</p>
Explanation	Signaling mode output setting.
Example	Request: SOUT0 2,1,1,2,2,2,1,0,1,20 Reply: SOUT0:EMode=2,ElmpT=1,ElmpC=1,DMode=2,DlmpnP,T=2,DlmpC=2, AMode=1,AlmpT=0,AlmpC=0,ADelay=20

sout1, sout2, sout3 – similar to sout0 commands

CAN settings

Command format	CanRegime Mode,BaudRate,TimeOut
Parameters	Mode – operating mode: <ul style="list-style-type: none"> 0 – CAN interface is off and is not used; 1 – CAN bus scanner; 2 – standard FMS filter; 3 – user filter 29 bit; 4 – user filter 11 bit BaudRate – bus rate. Must be the same as the vehicle bus rate. It can have the following values from 10000 up to 500000. Typical values: 62500, 125000, 250000, 500000. TimeOut – measured in msec. For CAN_SCANNER mode it is response latency. If it is too small, not all bus messages will be received. The recommended time for CAN_SCANNER is 2000 msec. For all the rest modes it is time to receive at least one message otherwise the value will be set to zero.
Explanation	General CAN bus control.
Example	Example: Enable scanner for a 250000 b/sec bus with the message (answer) latency equal to 2 sec. Request: CanRegime 1,250000,2000 Reply: CANREG: Mode=1,BaudRate=250000,TimeOut=2000;

Command format	ActiveCAN OnOff
Parameters	OnOff – operating mode: 0 – passive mode: packets receiving confirmations are not sent to CAN bus. It is a safe mode not introducing interferences into equipment; 1 – active mode: packets receiving confirmations are sent to CAN bus.
Explanation	Control of packets confirmation sending to CAN bus. Confirmation sending may be necessary at connection to troubleshooting socket if data can not be read in passive mode.
Example	Request: ActiveCAN 1 Reply: ACTIVECAN:1;

Command format	CAN8BitR0 ID,Shift
Parameters	ID – captured bus identifier: Shift – useful data shift in the received packet
Explanation	Single CAN-tag's content control.
Example	Request: Can8BitR 0419360256,1 Reply: CAN8BITR0:ID=419360256,Shift=1;

Commands: **CAN8BitR1, ..., CAN8BitR7, CAN16BitR0, ..., CAN16BitR4, CAN32BitR0, ..., CAN32BitR4** – are similar to CAN8BitR0 command.

Packet transmission, energy saving, Stels modes setting

Command format **Stels pday,phours, minutesGSMOn**. See [Stels mode and packet transmission](#) section.

Photocamera operation setting

Command format **GetPhoto d,t,n**

Parameters	d – photo date, format DDMMYY, where DD – day, MM – month, YY – year; t – photo time, format HHMMSS, where HH – hours, MM – minutes, SS – seconds; n – RS232 port number to which camera making photos is connected.
Explanation	Request to transmit to the server photo nearest to given time and data.
Example	Request: GetPhoto 050511,052030,0 Reply: Send of photo is scheduled

Command format **MakePhoto**

Explanation	Take a photo and send it to the server.
Example	Request: MakePhoto Reply: Photo ok

Command format **PhotoCfg t1,t2,mode,res,confirm**

Parameters	t1 –periodic shooting interval, [sec]. Photos are saved only to SD-card, 0 – shooting only by event; t2 – shooting interval [sec]. Photos are saved to SD-card and sent to the server, at 120 and less – shooting only by event; mode – periodical shooting in geographical areas: 0 – photos are taken irrespective of geographical areas; 1 – photos are taken only inside geographical areas; 2 – photos are taken only outside geographical areas. res – picture resolution: 0 – 640x480 points; 1 – 320x240 points. confirm – waiting for a confirmation from the server of a picture reception: 0 – no waiting; 1 – waiting.
Explanation	Settings of a periodical camera shooting, picture format and an image transfer protocol.
Example	Request: PhotoCfg 5,150,0,0,0 Reply: PHOTOCFG:WrPeriod=5,SendPeriod=150,Type=0,Size=0,Confirm=0;

Bootloader

The processor program (firmware) is a set of algorithms developed by GalileoSky Ltd specialists. Owing to this program the central processor receives data from different system units, processes them logically and mathematically and takes decisions for controller units control commands to be worked out depending on the situation.

Bootloader is a subroutine allowing the main program part to be updated. The firmware can be downloaded from the official site www.7gis.com. The main program can be downloaded via the USB or GPRS channel.

USB channel download

- 1) Attach the device to external power supply;
- 2) Connect the USB cable;
- 3) Launch Configurator and open the Command mode tab;
- 4) Type in upgrade 0 after which the device will be reset in 15-20 sec;
- 5) After resetting the device will enter the bootloader mode with the system storage device (flash memory) to be identified;
- 6) Download the right [firmware](#) version and rename it as firmware.bin;
- 7) Copy the downloaded version (firmware.bin) to the flash memory;
- 8) With flashing completed the device will be reset and enter the operating mode in 15 seconds.

GPRS channel download

- 1) Attach the device to external power supply;
- 2) APN settings must conform with the SIM card, otherwise the device flashing will not happen and it will return to the operating mode;
Using any available channel (SMS, GPRS, USB) give the following command: UPGRADE firmware#, where firmware# is the necessary [firmware](#) version. UPGRADE 0 initiates downloading the latest firmware;
- 3) You may see the flashing is in progress by LEDs blinking;
- 4) In 15-25 minutes (depending on connection conditions and GPRS terms of service by operator) upgrade is completed and the terminal automatically turns into operation mode.

Using analog inputs to enter bootloader mode

After the device power supply is off apply the voltage of $7.0V \pm 0.2V$ to all discrete-analog inputs (see Contacts description) until the device enters the bootloader mode. This function is used only during an improper device flashing. By improper we mean flashing intended for devices with a different set of functions.

LED operation during flashing.

Depending on the GSM modem and controller units activation stages the device will go through the following stages:

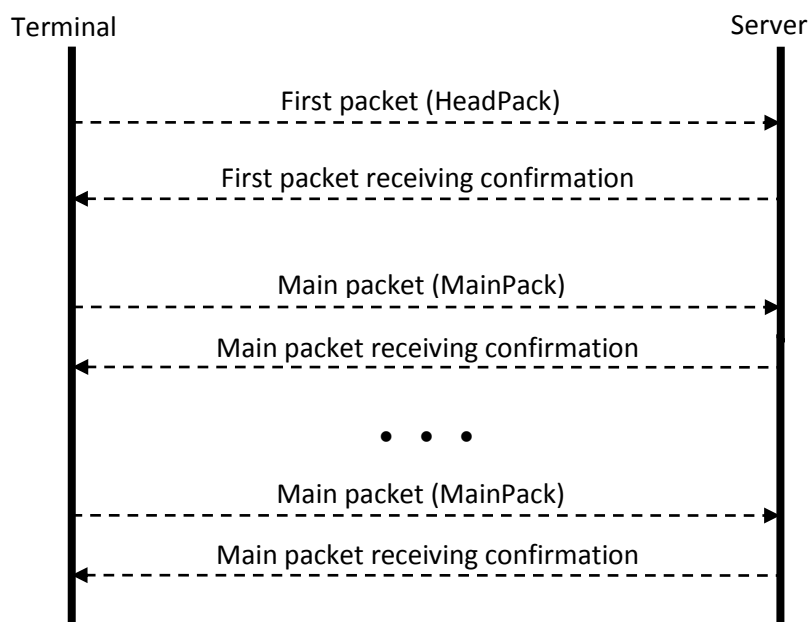
Yellow LED blinking, times	GSM Modem activation stage
6	GSM unit enabled successfully.
5	GPRS registered successfully.
4	Establishing server connection. Updating device software.
3	Downloading mode.
2	Server connection and downloading mode enabled.
1	First request sent successfully.

Blue LED blinking: each successfully received and recorded packet is accompanied by a blue LED light change.

Server communication protocols

This protocol supports bidirectional data exchange between the terminal and the server. Data are transmitted by GPRS channel with the use of TCP/IP protocol. The server must have static address and port for connecting terminals as clients.

Data transmission from the terminal to the server:



On establishing device-server connection the device sends head pack and then main packs with data. Each pack needs conformation from the server; if confirmation is not received the terminal sends the pack again.

Head pack structure:

Field	Size
Header 0x01	1 byte
Packet length	2 bytes
Tag 1	1 byte
Data corresponding tag 1	depends on tag type
...	
Tag N	1 byte
Data corresponding tag N	depends on tag type
Checksum	2 bytes

High-order bit is an indication of not transferred data in the archive, 15 least significant bits is the number of bytes in the packet. Maximum packet length is 1000 bytes.

Transmitted tags are set by HeadPack command. Packet length is calculated from the head tag to checksum beginning. Tags are in ascending order. Data and checksum are transferred in little-endian format.

Checksum is calculated for the whole packet including header, length field and indicator of unsent data.

Checksum is calculated by algorithm CRC-16 Modbus, you can find example of its realization on http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf.

Main pack structure is the same as the structure of head pack. Transmitted tags are set by MainPack command. Main pack may transmit several records from archive then the first record's tags goes then the second record's tag, etc.

Data may be coded, XTEA3 algorithm is used for coding (<http://tomstdenis.tripod.com/xtea.pdf>) with block length 128 bit, key length 256 bit and 32 rounds.

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In this case header, length and unsent data indicator stay unchanged, and archives records with tags are coded. If data length is not multiple to code block length, missing place is filled by zeros and then coded. Checksum is calculated for coded data packet.

Field	Size
Header 0x02	1 byte
Received packet checksum	2 byte

Table 1. Confirmation packet structure

Packet is transmitted again if its checksum does not correspond to checksum in confirmation packet.

№	Tag number	Designation	Parameter	
			Length, byte	Format
1	0x01	Hardware version	1	Unsigned integer.
2	0x02	Firmware version	1	Unsigned integer.
3	0x03	IMEI	15	ASCII string.
4	0x04	Device's identifier	2	Unsigned integer.
5	0x10	Number of archive record	2	Unsigned integer.
6	0x20	Time-stamp	4	Unsigned integer, number of seconds from 1.01.1970 by Greenwich time.
7	0x30	Coordinates in degrees, number of satellites, indication of coordinates determination correctness	9	4 lower bits: number of satellites. Next 4 bits: coordinates correctness, 0 – coordinates are correct. Next 4 bytes: integer with sign, latitude, value should be divided by 1000000, negative values correspond southern latitude. Last 4 bytes: integer with sign, longitude, value should be divided by 1000000, negative values correspond eastern longitude. For example, result: 07 C0 0E 32 03 B8 D7 2D 05. Coordinates correctness: 0 (coordinates are correct). Satellites number: 7 Latitude: 53.612224 Longitude: 86.890424
8	0x33	Speed in km/h and direction in degrees	4	Lower 2 bytes: unsigned integer, speed, value should be divided by 10. Higher 2 bytes: unsigned integer, direction, value should be divided by 10. For example, result: 5C 00 48 08. Speed: 9.2 km/h. Direction: 212 degrees.
9	0x34	Height, m	2	Integer with sign.
10	0x35	HDOP	1	Unsigned integer. Value should be divided by 10.
11	0x40	Status of device		Unsigned integer each bit corresponds separate unit state, see explanations below.
12	0x41	Supply voltage, mV	2	Unsigned integer.
13	0x42	Battery voltage, mV	2	Unsigned integer.
14	0x43	Terminal temperature, °C	1	Integer with sign.

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№	Tag number	Designation	Parameter	
			Length, byte	Format
15	0x44	Acceleration	4	Lower 10 bits: acceleration by X axis. Next 10 bits: acceleration by Y axis. Next 10 bits: acceleration by Z axis. 600 points correspond free fall acceleration. Example, result: AF 21 98 15. Acceleration X: 431, Y: 520, Z: 345.
16	0x45	Status of outputs	2	Each bit, beginning with the lower one, indicates state of correspondent output.
17	0x46	Status of inputs	2	Each bit, beginning with the lower one, indicates triggering on correspondent input.
18	0x50	Input voltage 0, mV Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
19	0x51	Input voltage 1, mV Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
20	0x52	Input voltage 2, mV Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
21	0x53	Input voltage 3, mV Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
22	0x58	RS232 0	2	Unsigned integer.
23	0x59	RS232 1	2	Unsigned integer.
24	0x70	Thermometer 0 identifier and measured temperature, °C	2	Lower byte: unsigned integer, identifier. Higher byte: integer with sign, temperature. Example, result: 01 10 Identifier: 01 Temperature: 16°C
25	0x71	Thermometer 1 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
• • •				
31	0x77	Thermometer 7 identifier and measured temperature, °C	2	Analogous to temperature sensor 0.
32	0x90	iButton first key identification number	4	
33	0xc0	FMS-Standard. Fuel used by vehicle from the date of manufacturing, l	4	Unsigned integer, value should be divided by 2.

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№	Tag number	Designation	Parameter	
			Length, byte	Format
34	0xc1	CAN. Fuel level in tank, %. Coolant temperature, °C. Engine rotations, rpm.	4	Lower byte: fuel level, value should be multiplied by 0.4. Second byte: coolant temperature, value should be deducted 40. Third and fourth bytes: engine rotations, values should be multiplied by 0.125. Example, result: FA 72 50 25. Fuel level: 100%. Temperature 74°C. Rotations: 1194 rpm.
35	0xc2	FSM-Standard. Kilometrage, m.		Unsigned integer, value should be multiplied by 5.
36	0xc3	CAN_B1	4	
37	0xc4	CAN8BITR0 Or vehicle speed from CAN-LOG, km/h	1	If speed is transmitted from CAN-LOG – the value is unsigned integer.
38	0xc5	CAN8BITR1 or 3 rd byte of prefix S CAN-LOG	1	
39	0xc6	CAN8BITR2 or 2 nd byte of prefix S CAN-LOG	1	
40	0xc7	CAN8BITR3 or lower byte of prefix S CAN-LOG	1	
41	0xc8	CAN8BITR4 or 3 rd byte of prefix P CAN-LOG	1	
42	0xc9	CAN8BITR5 or 2 nd byte of prefix P CAN-LOG	1	
43	0xca	CAN8BITR6 or 1 st byte of prefix P CAN-LOG	1	
44	0xcb	CAN8BITR7 or lower byte of prefix P CAN-LOG	1	
45	0xcc	CAN8BITR8 or 6 th byte of prefix WA CAN-LOG	1	
46	0xcd	CAN8BITR9 or 5 th byte of prefix WA CAN-LOG	1	
47	0xce	CAN8BITR10 or 4 th byte of prefix WA CAN-LOG	1	
48	0xcf	CAN8BITR11 or 3 rd byte of prefix WA CAN-LOG	1	
49	0xd0	CAN8BITR12	1	
50	0xd1	CAN8BITR13	1	
51	0xd2	CAN8BITR14	1	
52	0xd3	Second iButton key identification number	4	
53	0xd4	Total kilometrage according to GPS/GLONASS units, m.	4	Unsigned integer.
54	0xd5	iButton keys state which identifiers are set by iButton command.	1	Each bit corresponds one key. Example, result: 05 or 00000101 in binary system. It means that the first and the third keys are connected.
55	0xd6	Depending on settings: 1. CAN16BITR0 2. CAN-LOG, K prefix, 1 st axle load, kg 3. failure code OBD II	2	In case load is on CAN-LOG axle, value is unsigned integer, values should be divided by 2.

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№	Tag number	Designation	Parameter	
			Length, byte	Format
56	0xd7	Depending on settings: 1. CAN16BITR1 2. CAN-LOG, L prefix, 2 nd axle load, kg 3. failure code OBD II	2	In case load is on CAN-LOG axle, value is unsigned integer, values should be divided by 2.
57	0xd8	Depending on settings: 1. CAN16BITR2 2. CAN-LOG, M prefix, 3 rd axle load, kg 3. failure code OBD II	2	In case load is on CAN-LOG axle, value is unsigned integer, values should be divided by 2.
58	0xd9	Depending on settings: 1. CAN16BITR3 2. CAN-LOG, N prefix, 4 st axle load, kg 3. failure code OBD II	2	In case load is on CAN-LOG axle, value is unsigned integer, values should be divided by 2.
59	0xda	Depending on settings: 1. CAN16BITR4 2. CAN-LOG, O prefix, 5 th axle load, kg 3. failure code OBD II	2	In case load is on CAN-LOG axle, value is unsigned integer, values should be divided by 2.
60	0xdb	Depending on settings: 1. CAN32BITR0 2. CAN-LOG, A or B prefix, total time of engine operation, h	4	In case time of engine operation is on CAN-LOG, value is unsigned integer, values should be divided by 100.
61	0xdc	Depending on settings: 1. CAN32BITR1 2. CAN-LOG, R prefix, fuel level, l	4	In case fuel level is on CAN-LOG, value is unsigned integer, values should be divided by 100.
62	0xdd	CAN32BITR2	4	
63	0xde	CAN32BITR3	4	
64	0xdf	CAN32BITR4	4	
65	0x54	Input 4 value. Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
66	0x55	Input 4 value. Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
67	0x56	Input 4 value. Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.
68	0x57	Input 4 value. Depending on settings: 1.voltage, mV, 2.number of impulses; 3.frequency,HZ.	2	Unsigned integer.

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№	Tag number	Designation	Parameter	
			Length, byte	Format
69	0x80	Zero sensor DS232 Identifier, measured temperature °C and humidity %.	3	Lower byte: unsigned integer, identifier Second byte: integer, Higher bytes: humidity, values should be multiplied by 100 and divided by 225. Example, result: 01 10 20. Identifier: 01 Temperature 10°C. humidity: 7.84%
70	0x81	1 st sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
71	0x82	2 nd sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
72	0x83	3 rd sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
73	0x84	4 th sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
74	0x85	5 th sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
75	0x86	6 th sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
76	0x87	7 th sensor DS232 Identifier, measured temperature °C and humidity %.	3	The same with DS1923 sensor
77	0x60	RS485[0]. A value from fuel level sensor with address 0.	2	Unsigned integer.
78	0x61	RS485[1]. A value from fuel level sensor with address 0.	2	Unsigned integer.
79	0x62	RS485[2]. A value from fuel level sensor with address 0.	2	Unsigned integer.
80	0x63	RS485[3]. Fuel level sensor with address 3. Fuel level and temperature.	3	Lower 2 bytes: unsigned integer, fuel level. High byte: signed integer, temperature, °C
81	0x64	RS485[4]. Fuel level sensor with address 4. Fuel level and temperature.	3	Lower 2 bytes: unsigned integer, fuel level. High byte: signed integer, temperature, °C
Tags RS485[5] - RS485[14] (0x65-0x6E) are similar to RS485[4] with numbers 82-90				
91	0x6F	RS485[15]. ДУТ с адресом 15. Относительный уровень топлива и температура.	3	Lower 2 bytes: unsigned integer, fuel level. High byte: signed integer, temperature, °C
92	0x88	Temperature from fuel level sensors connected to RS232 port, °C.	1	Signed integer
94	0x8A	Temperature from fuel level sensors connected to RS485 port with address 0, °C.	1	Signed integer
95	0x8B	Temperature from fuel level sensors connected to RS485 port with address 1, °C.	1	Signed integer

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№	Tag number	Designation	Parameter	
			Length, byte	Format
96	0x8C	Temperature from fuel level sensors connected to RS485 port with address 2, °C.	1	Signed integer
129	0xA0	CAN8BITR15	1	Accessible only by a dynamic archive structure
Tags CAN8BITR16 - CAN8BITR29 (0xA1-0xAE) similar to CAN8BITR16 with numbers 130-143				
144	0xAF	CAN8BITR30	1	Accessible only by a dynamic archive structure
145	0xB0	CAN16BITR5	2	Accessible only by a dynamic archive structure
Tags CAN16BITR6 – CAN16BITR13 (0xB1-0xB8) similar to CAN16BITR5 with numbers 146-153				
154	0xB9	CAN16BITR14	2	Accessible only by a dynamic archive structure
161	0xF0	CAN32BITR5	4	Accessible only by a dynamic archive structure
Tags CAN32BITR6 – CAN32BITR13 (0xF1-0xF8) similar to CAN32BITR5 with numbers 162-169				
170	0xF9	CAN32BITR14	4	Accessible only by a dynamic archive structure
171	0x5A	REP-500 electricity meter readings	4	Unsigned integer
174	0x47	EcoDrive and driving style determination	4	Accessible only by a dynamic archive structure. Unsigned integer. Low byte: acceleration. Second byte: braking. Third byte: acceleration on turn. Fourth byte: shock on bumps. All accelerations are expressed in standard units, 100 = 1g = 9,8 m/s ²

Table 2. GalileoSky protocol tag

Bit number	Field explanation
0	0 – vibration level corresponds parking; 1 – driving (set by AccSens command).
1	0 – incline angle does not exceed the allowable one, 1 – incline level exceeds the allowable one.
2	---
3	0 – no SIM card, 1 – GSM modem can't determine SIM-card.
4	0 – terminal outside geographical area, 1 - terminal inside geographical area.
5	0 – voltage of internal source is normal; 1 – lower than 3.7 V.
6	0 - GPS aerial is connected; 1 – disconnected.
7	0 – voltage of internal terminal supply bus is normal, 1 – declined from normal.
8	0 – external supply voltage is normal, 1 - declined from normal.
9	0 – vehicle is stopped; 1 – vehicle is started (adjusted by mhours command).
10	0 – vibration level corresponds normal movement, 1 – vibration level corresponds shock.
11	0 – GPS operates; 1 – GLONASS unit operates.
12	Signal quality, range: [0-3]. The less value, the worse communication.
13	
14	0 – signaling mode is off; 1 – on.
15	0 – no alarm; 1 – alarm activated.

Table 3. Device status field explanation

[illegible]

In this case zeros have been omitted at once.

Field	Size
Header 0x01	1 byte
Payload length	2 bytes
Tag 0x03	1 byte
IMEI	15 bytes
Tag 0x04	1 byte
Device identifier	2 bytes
Tag 0xE0	1 byte
Command number, random number selected by the server	4 bytes
Tag 0xE1	1 byte
Command line length	1 byte
Command text in ASCII	
Checksum. Calculated for the whole packet beginning with header.	2 bytes

Field	Size
Header 0x06	1 byte
Garmin FMI packet length in bytes	2 bytes
Garmin FMI packet	
Checksum. Calculated for the whole packet beginning with header.	2 bytes

The server has to form ACK and NAK packets according to Garmin FMI protocol description, terminal doesn't form it.

FAQ

Question	Answer
When the vehicle is not moving the device records too many packets	When device, input, output status is changed the device records an out of turn packet. E.g. When input discrete state changes a packet is recorded when entering logical one zone from logical zero zone. And vice versa, when the state changes from logical one to logical zero a packet is recorded.

Additional information

1. Certifying

The device is certified to comply with GOST R.

2. Warranty

The below guarantees realization by the GalileoSky Ltd of consumers' rights provided by the local laws throughout Russia and the CIS.

GalileoSky Ltd guarantees the operability of the device on condition that the instructions in the above manual have been compiled with.

2.1. Warranty conditions

The warranty period is 24 months since the day of purchase.

Note: a defective device (with cracks and fissures, dents and impact marks etc.) due to consumer's fault resulting from inappropriate maintenance, storage and transportation is not liable to warranty. The above also holds for a device without the body or battery.

In case the guarantee document proving the device sale to the customer does not contain the date of purchase, the name and seller's seal the warranty period starts since the day of production.

The consumer has the right for free maintenance in the manufacturer's service centre if the device has developed a production or design defect. The consumer has the right for maintenance during the whole period of operation of the device. The consumer has all the other rights provided by the laws of the Russian Federation and the CIS.

If the failure cause cannot be found for the moment of application, a technical examination is held which cannot exceed 30 days since the moment of application.

The warranty does not apply in case of:

- Inappropriate transportation, storage or maintenance;
- Unauthorised opening the device during the warranty period;
- Repairing controller by someone or some organization not authorised by GalileoSky during the warranty period;
- Signs of electrical and/or other damage due to prohibitive mains parameter changes, misapplication and neglect of the device;
- Physical damage of the device body and board, SIM holder, aerials or wires break;
- Traces of oxidation of outer and inner parts or exposure of the device body to moisture;
- Theft or criminal damage of the external aerial or cable;
- Damages caused by foreign objects, substances, liquids, insects coming into body;
- Damage caused by exposure to high temperature or intense microwave radiation;
- Damage caused by elemental forces, fire, social factors, random external factors and accidents;
- Damage caused by parameters incompatibility or inappropriate attachment of additional devices or sensors to the terminal;
- Terminal usage with the vehicle power network voltage deviating from the range mentioned in technical specifications.

Attention! The company is not liable to consumer or any third party for any damages indirect, direct, incidental, consequential or otherwise (including in each case, but not limited to, damages for inability to use the equipment, loss of data, loss of business, loss of profit, loss of savings, loss of time or the like), arising out of the use or inability to use the equipment within legal limits.

Attention! The warranty does not affect consumer rights stipulated by law such as the guarantee of quality of work or conformity of the product to the purpose for which analogous products are used under normal conditions and service maintenance and also your rights with regard to the seller of the product resulting from the fact of purchase and contract of sale and purchase.

Attention! Conditions of warranty service which are in conflict with the current law have no legal effect and are subject to the current law.

Attention! In the event that the Buyer does not comply with warranty conditions the validity of the warranty is terminated.