Terminals GalileoSky GPS Lite User's Manual

firmware 192

Quality

Reliability

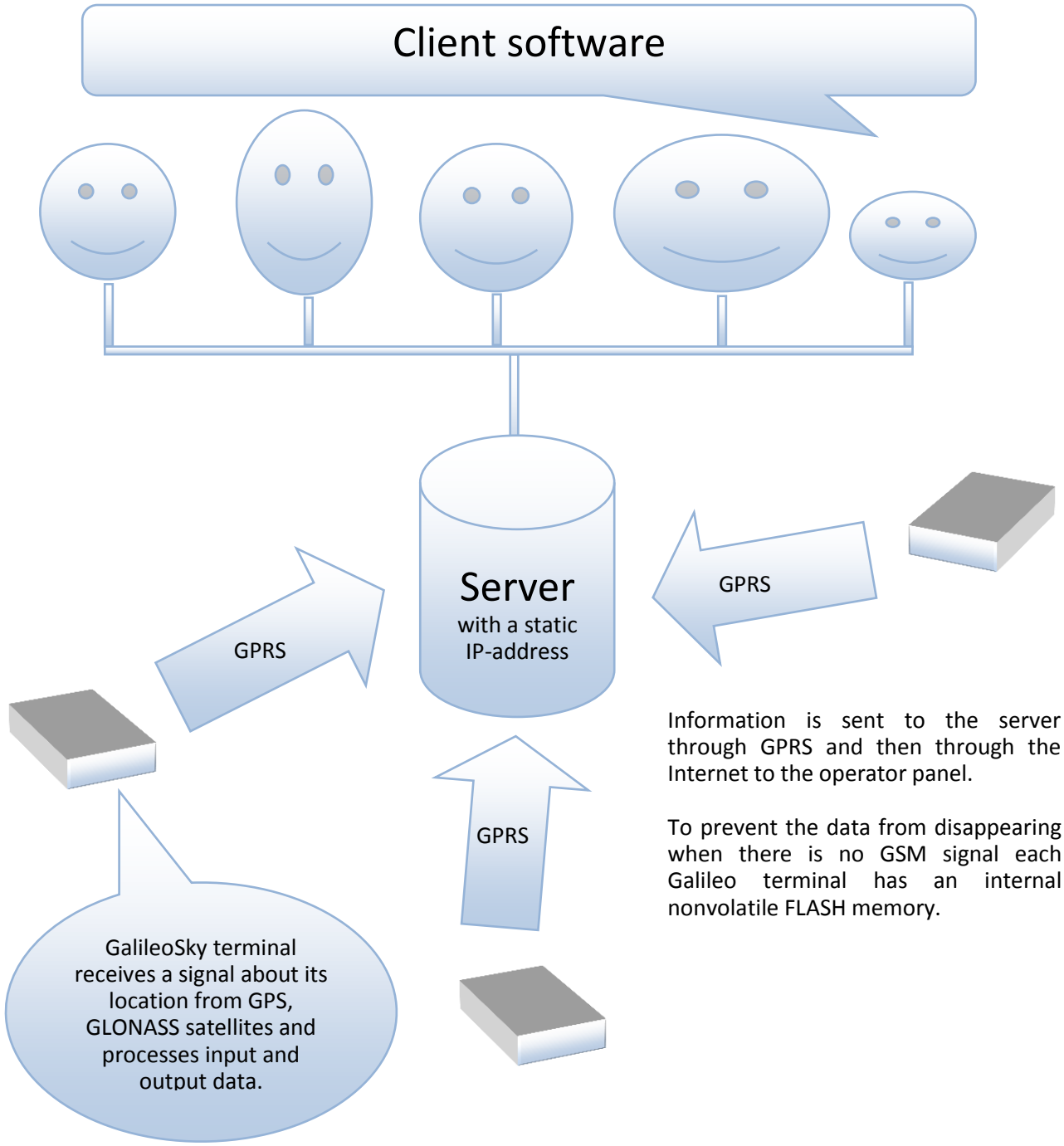
Simplicity

GALILEOSKY

Contents

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.



Information is sent to the server through GPRS and then through the Internet to the operator panel.

To prevent the data from disappearing when there is no GSM signal each Galileo terminal has an internal nonvolatile FLASH memory.

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);
- ✓ GSM enabled remote software update;
- ✓ Continuous troubleshooting of the device through the USB port;
- ✓ Remote engine start;
- ✓ 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;
- ✓ Discrete outputs state;
- ✓ And others (see details of transmitted data in GalileoSky protocol)

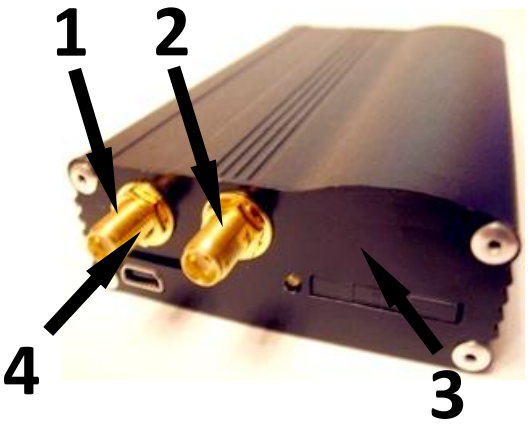
In addition the company provides warranty service and technical support on its site and forum.

Before starting the work study the instruction carefully.

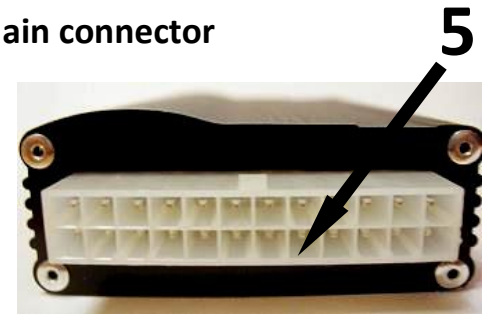
Package

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

The device appearance:



1. GSM aerial socket
2. GPS/GLONASS aerial socket
3. SIM holder
4. USB slot
5. Main connector



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	***Description***
Discrete analog and pulse frequency inputs	*2 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 (output 0/1)	*1;* *maximum voltage supply 30V;* *maximum current supply 80mA*
Average consumed power	*1.2 W*
ADC capacity in bits	*10;*
FLASH memory capacity	up to 58000 points;
Interfaces	*USB 2.0 (Terminal troubleshooting, adjusting, reflashing)*
Speakerphone	no
The size of a data packet sent by the device	*GalileoSky protocol: variable size, tag format*
Accelerometer	*built in*
Type of GPS receiver	*MTK, 66 channels*
Coordinates determination accuracy, 95% of time	*within 5 m*
GSM modem	*GSM 900/1800, GPRS class 10*
Moisture protection	*No*

Physical specifications

Operating temperature range	*-30...+60 °C*
Extended temperature range	*-40...+85 °C*
Storage temperature	*-40...+85 °C*
Relative humidity	*0...90% (0...35 °C); 0...70% (35...55 °C)*
Performance (height above the sea level)	*0-2000 m*
Storage	*0-10000 m*
External power supply	10-30V; is protected against voltage jumps in the vehicle power supply
Size	103,0 mm x 65,0 mm x 28,0 mm
Weight	*within 300g*
Body material	*Metal*

Warranty	*2 year since the purchase date;*
Average service	*10 years*

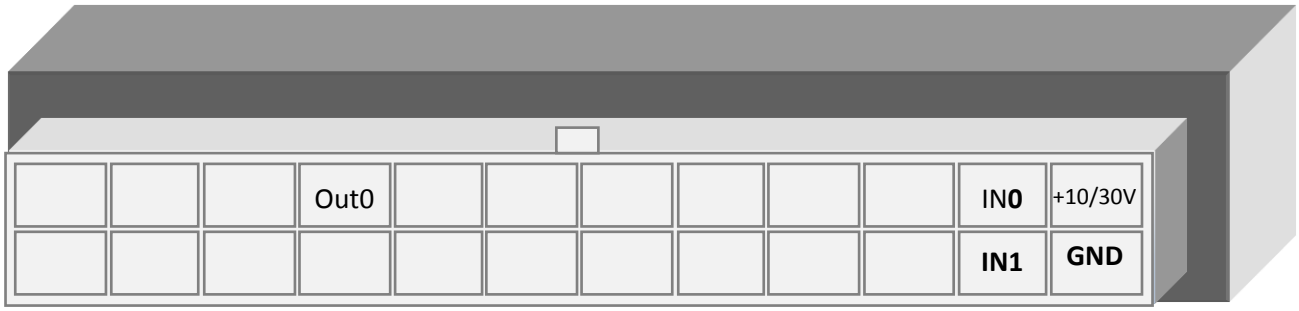
Safe maintenance rules

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
Out0	Zero transistor output (output 0/1)

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.

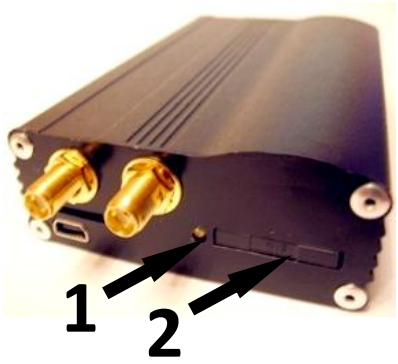
To make sure the GPRS modem is sending data see that the blue LED indicator is on. (***see' LED indicators')***.

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.



Connecting power supply to the device

Positive supply voltage should be connected to contact +10/+30V, supply voltage minus should be connected to GND. (See ***Contacts description).*** If the connection is correct, the red LED will be on.

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.
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.

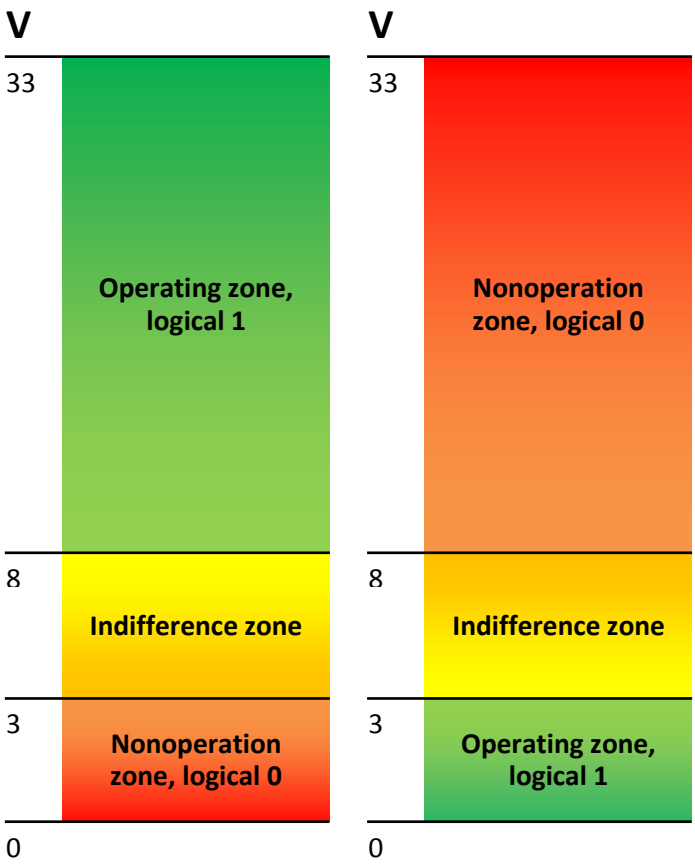
Mean value and discrete event generation

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

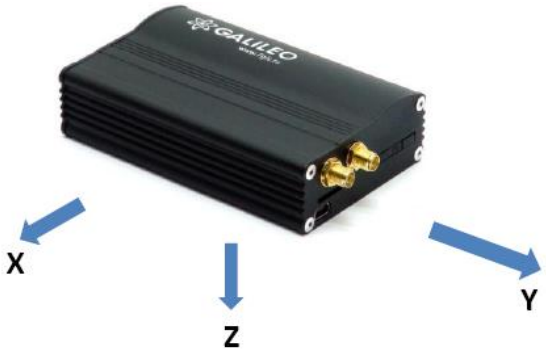
To measure frequency in some sensors it is necessary to connect the sensor frequency output to the sensor positive power supply via a 1kOhm resistor. Otherwise frequency count is impossible.

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 Ш2.

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 unevens;
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.

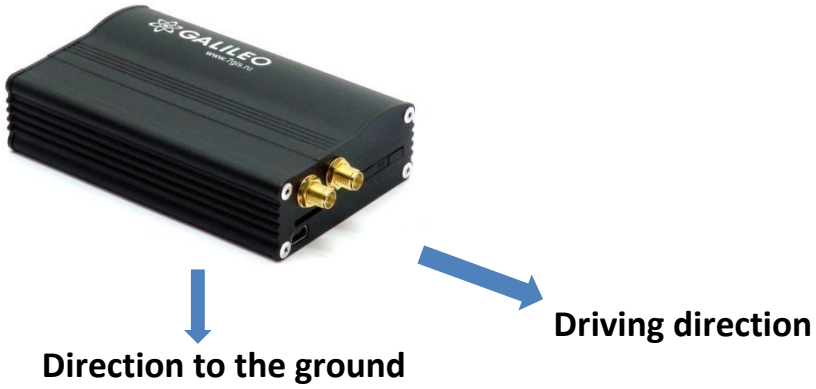
To determine incline:

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 20º, 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. At each point, the data on the maximum acceleration for the period since the moment of the previous point recording, is saved. 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 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.

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 (OPS0 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 breaks 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.

Internal Archive Structure

Data archive is stored on the internal flash memory. 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.
Note, that only current data are used for the first packet.

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.

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. 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, 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 (**Service commands** section) or in the "Power saving" tab of the Configurator.

Remote configuration

Remote configuration can be performed through several data transfer channels:

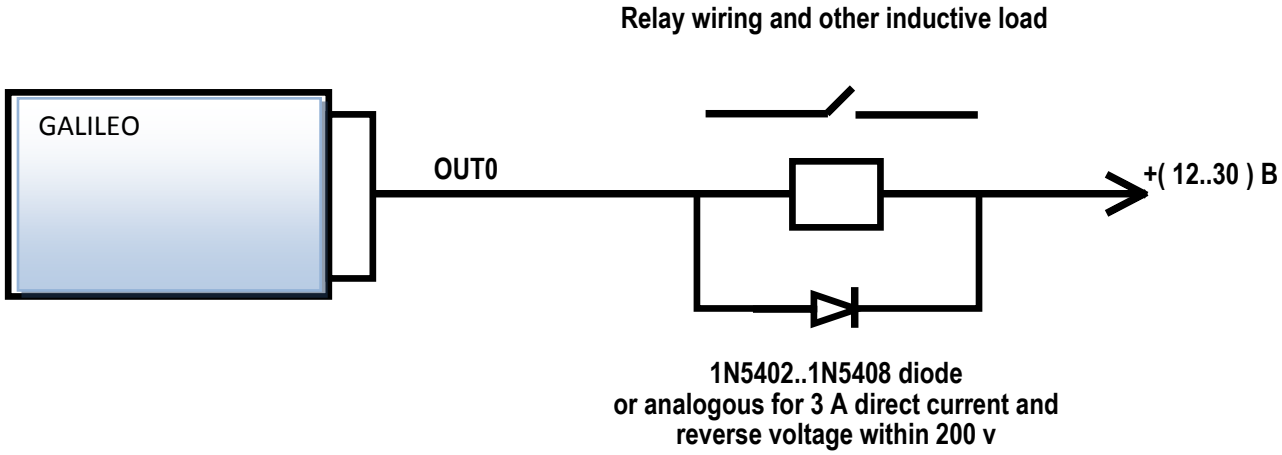
1. SMS. The terminal has a list of 4 authorized phone numbers, the messages from which are treated as configuration commands. The commands available are described in the section "SMS enabled settings". A phone number can be added to the list of authorized numbers either through the Configurator, or by 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

Transistor outputs (0/1)

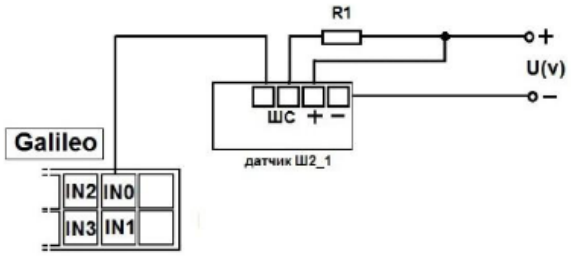
To operate external devices there 3 discrete «on collector» outputs (see Contacts description).The maximum output voltage is -+30V, each output current is within 80mA.
The output values are stored in the nonvolatile memory, so the device sets the stored values even after being reset.
To operate outputs use Out command (see Transistor output settings) or the Settings/Input/Output tab in the Configurator**.**

Outputs relay connection circuit

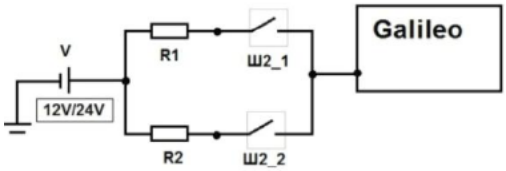


Connecting passenger flow registration sensors Ш2

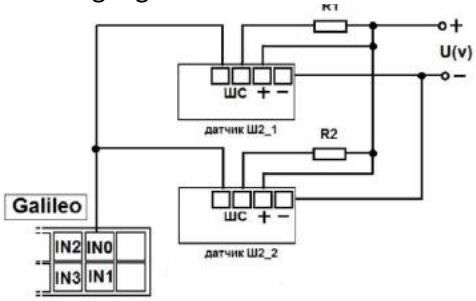
The terminal supports connection up to 16 Ш2 sensors through 8 discrete analogue-inputs (DAI) IN0, IN1 (Contacts description).
Connection order of one Ш2 sensor through resistor to one DAI inputs of the terminal.



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:

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

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.

Configurator

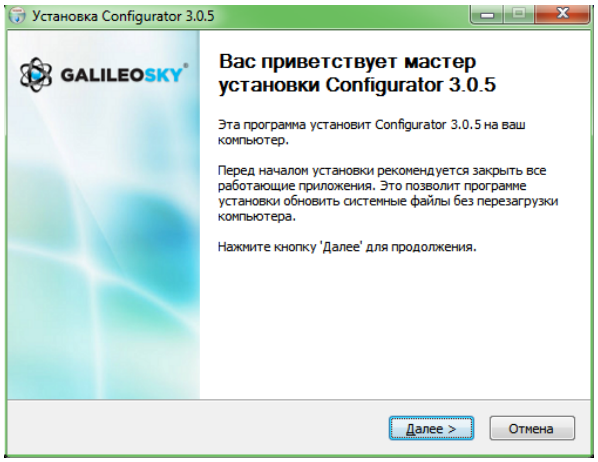
Configurator is a PC program allowing us

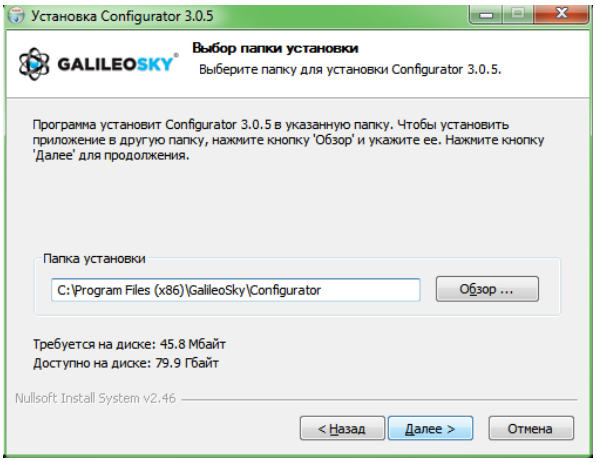
- to configure the device via graphic interface and with the help of commands;
- to troubleshoot the device saving results to a log-file;
- to see the device units state in real time;
- to copy monitoring data to a file from the internal memory;
- to send the copied data to the server;

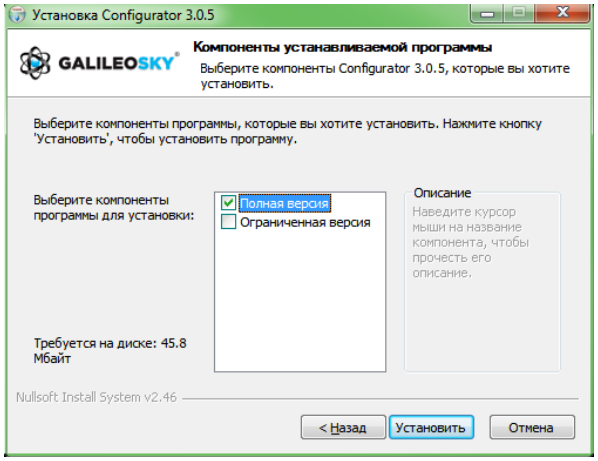
32 and 64 bit OS are supported: Windows 2000, Windows XP, Windows Vista, Windows 7.

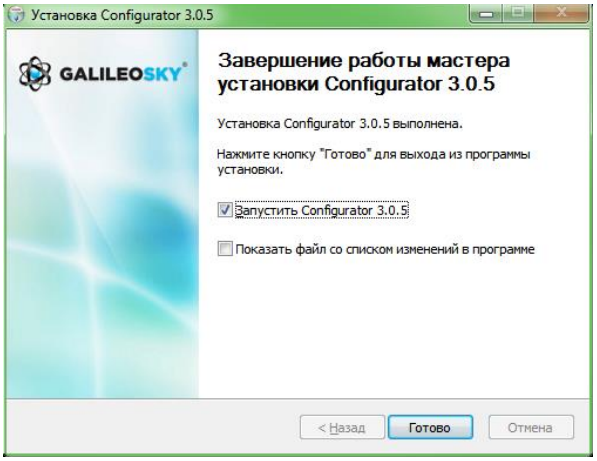
Program installation and running

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.





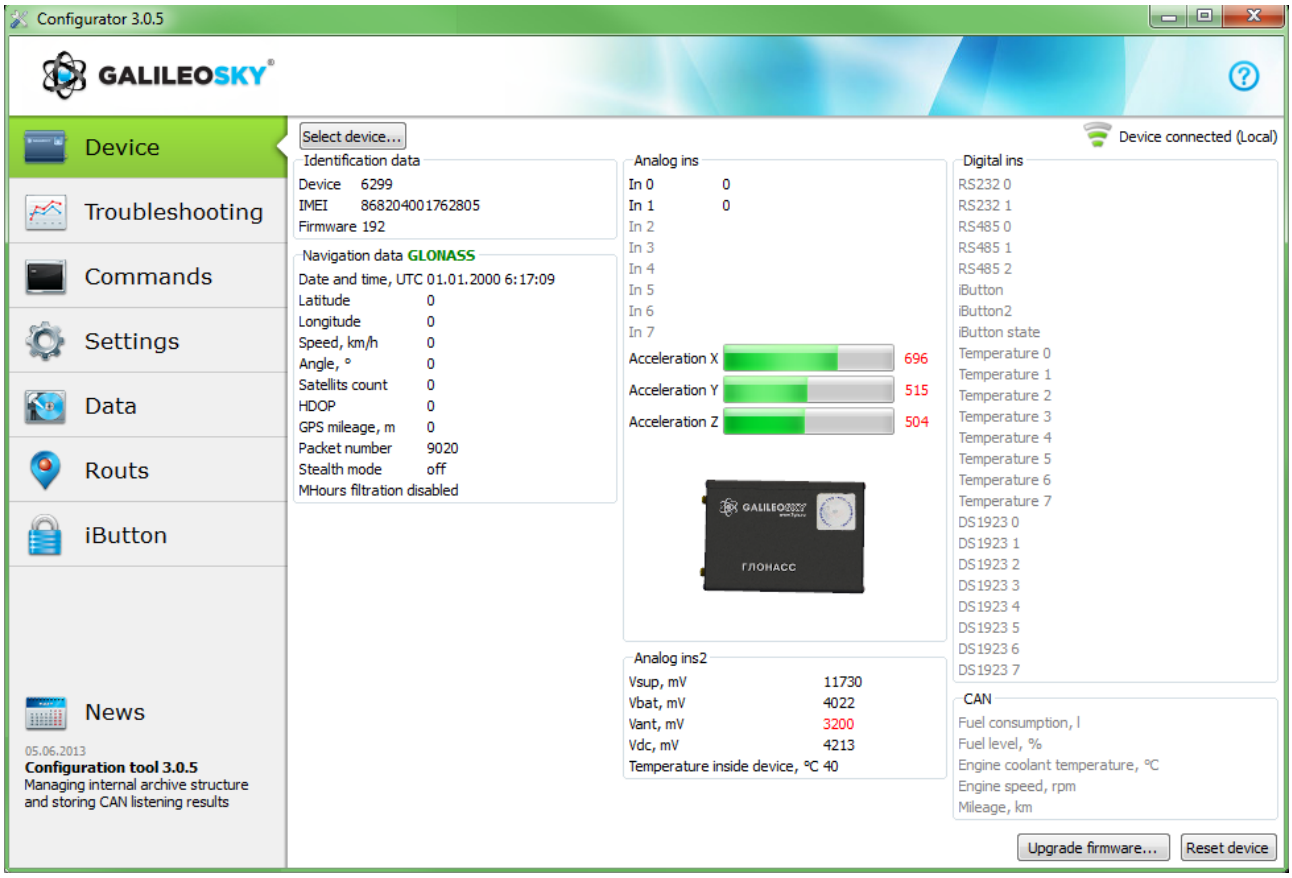




During the installation old drivers will be deleted and new drivers will be installed. Installation of the full-function or limited version of the Configurator is possible. The latter allows to unload archive and to receive the current parameters of sensors, but not to change settings.
Start the Configurator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

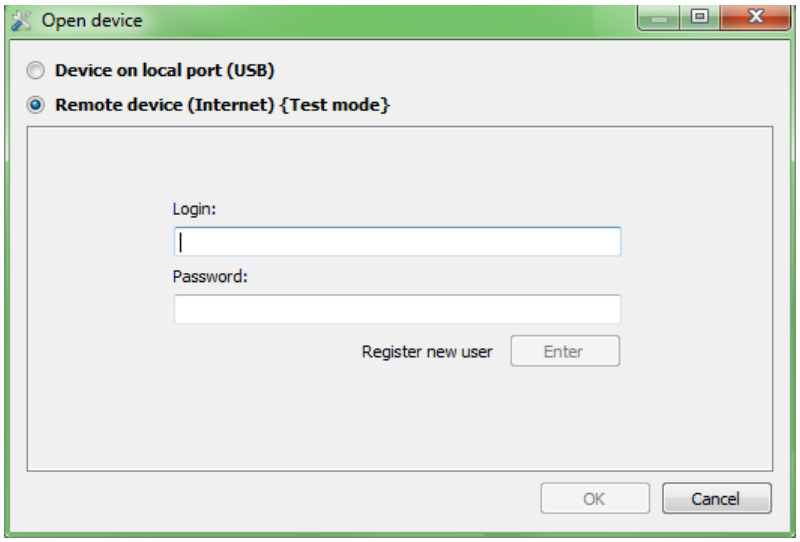
Device tab

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.

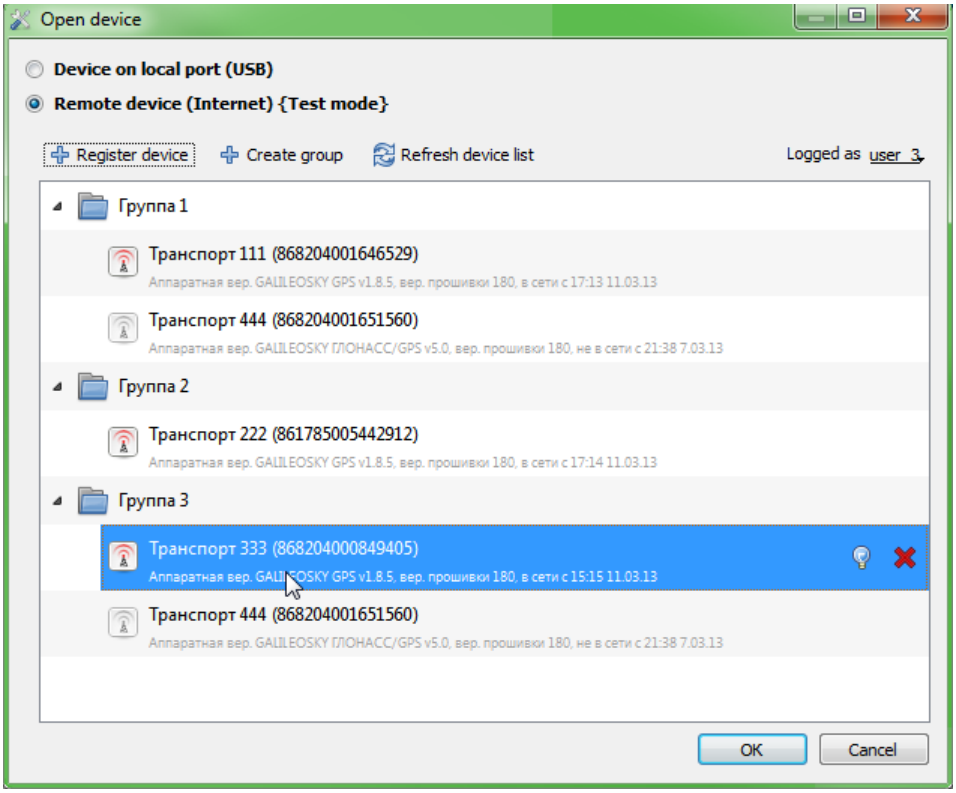


If there is a PIN code in the device, the program will request it to access the settings. At wrong code entering the terminal disconnects from computer, resets, connects to the Configurator again and waits for the right code enter.

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.

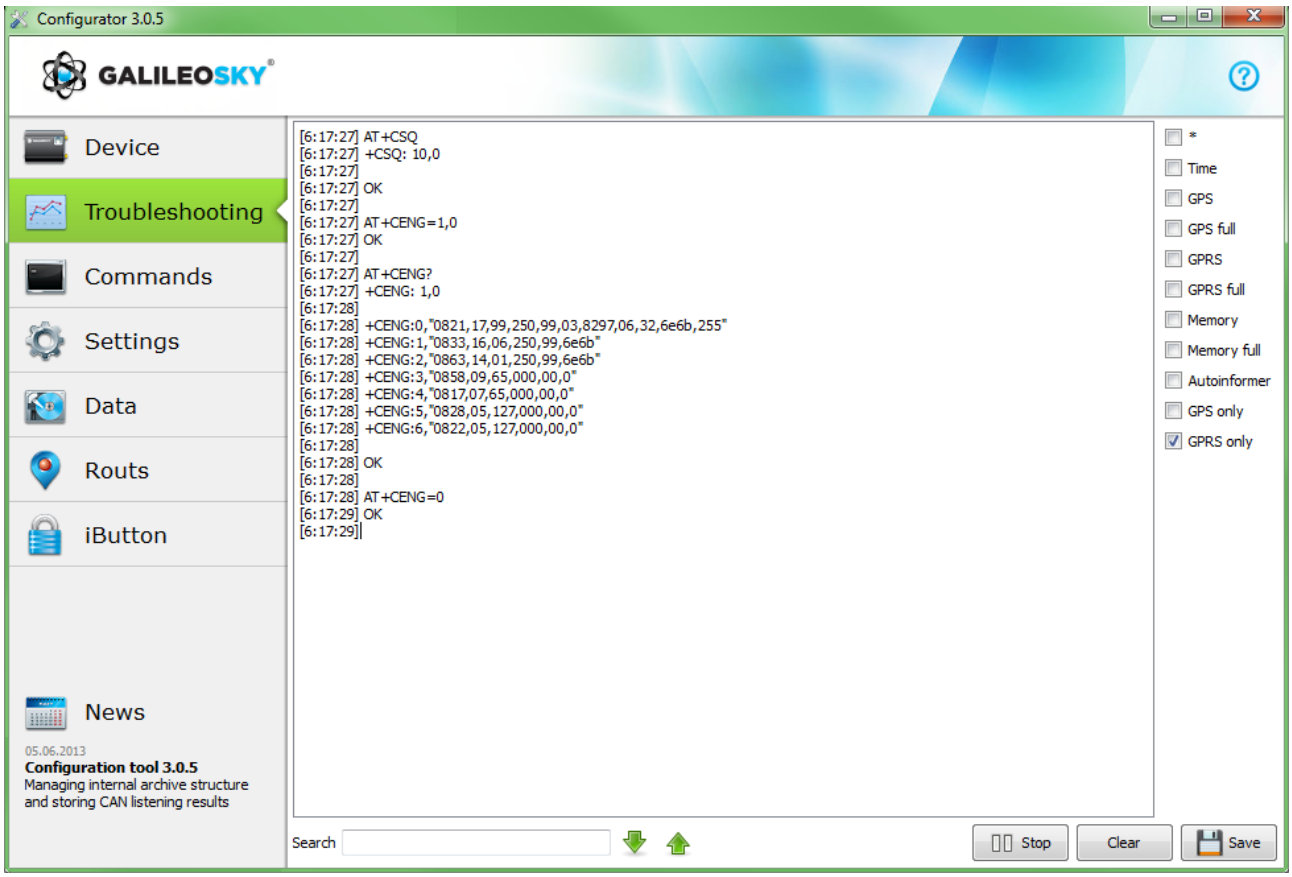
Troubleshooting tab

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: sim300 gotopowdown). 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.

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 -40ºC. Unit operation at lower temperatures is impossible.	
SAT. Temper is high than 65	Device temperature is higher than +65ºC. 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.	
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.

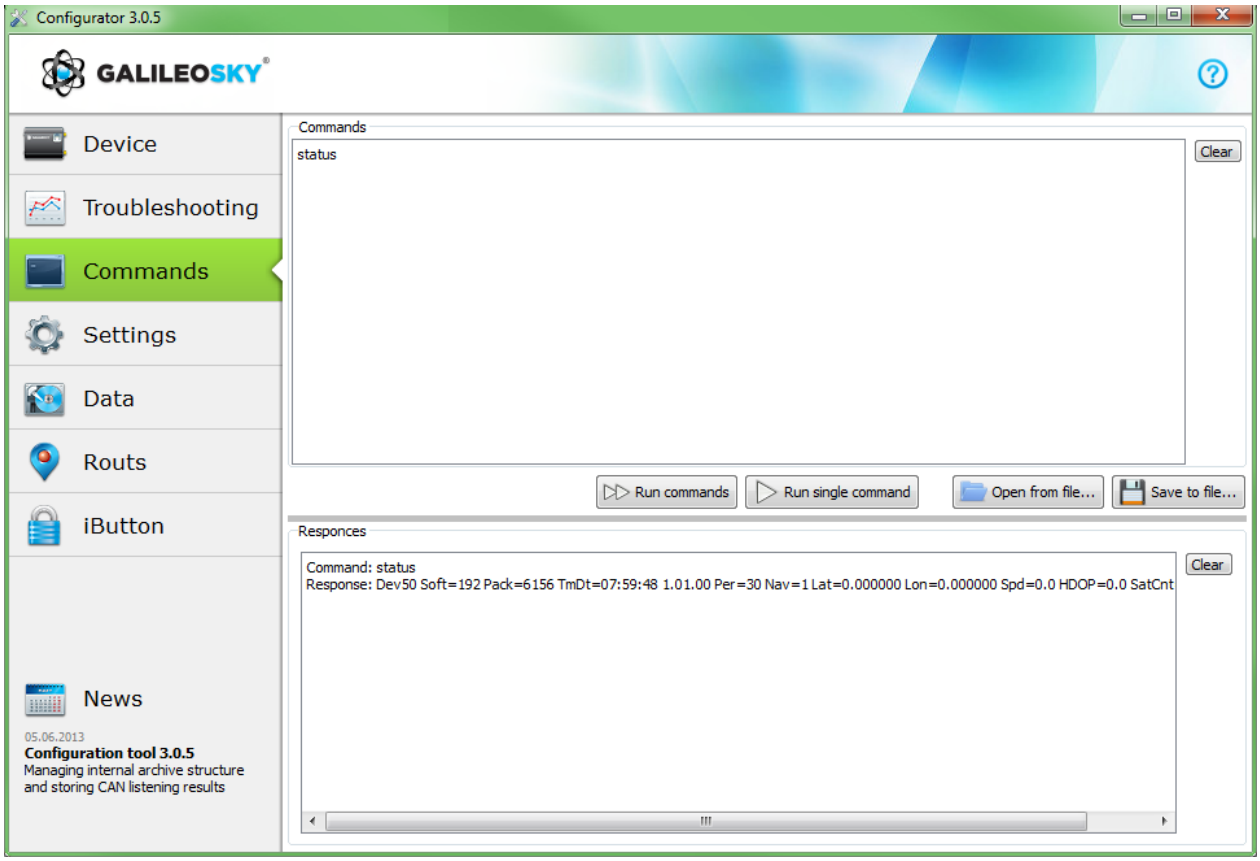
Command mode tab

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**

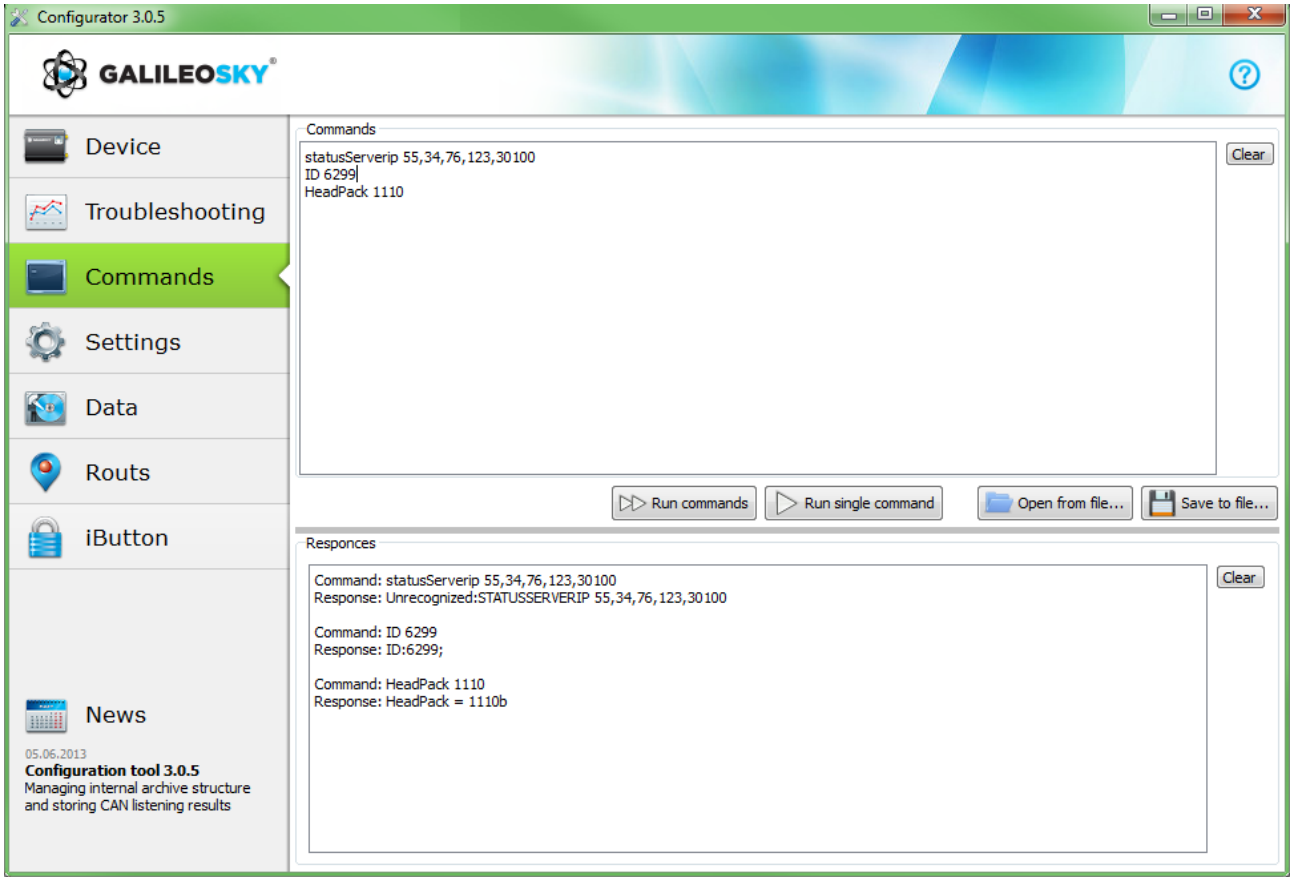
Set of commands example

Enter in necessary commands in Command window, each starting a new line, as shown on the figure below and press the **Run commands** button.

Example: Serverip 55,34,76,123,30100
ID 6299
HeadPack 1110

The given commands and results will be displayed in the Command results window.

Command: Serverip 55,34,76,123,30100
Response: ServerIp=55.34.76.123:30100
Command: ID 6299
Response: ID: 6299
Command: HeadPack 1110
Response: HeadPack = 00000000000000000000000000000000000000000000000000000000000001110b

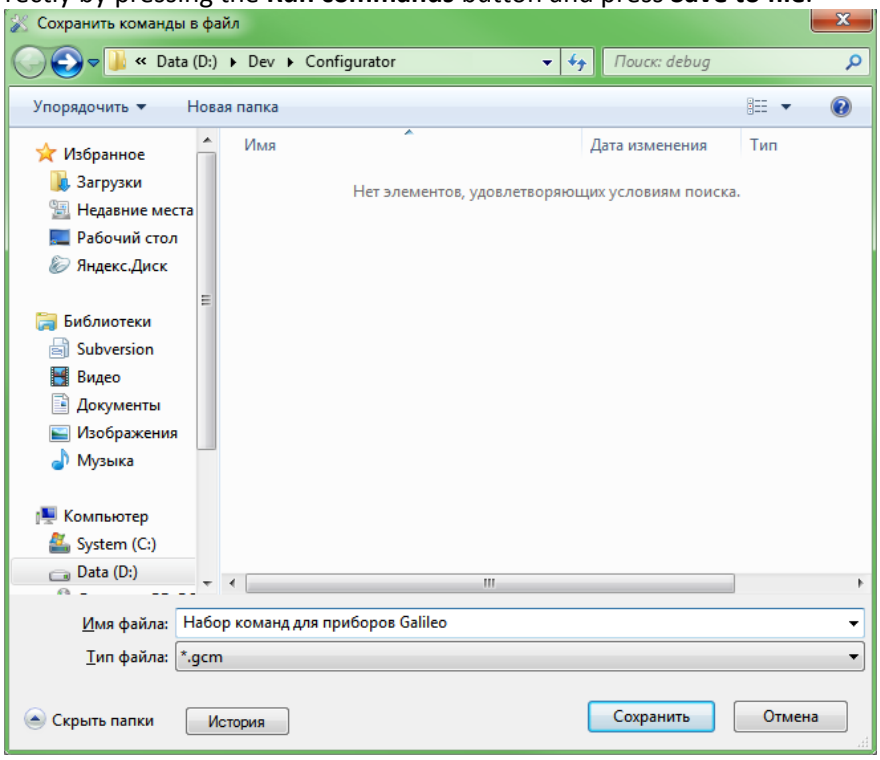


Saving and downloading parameter set

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**.

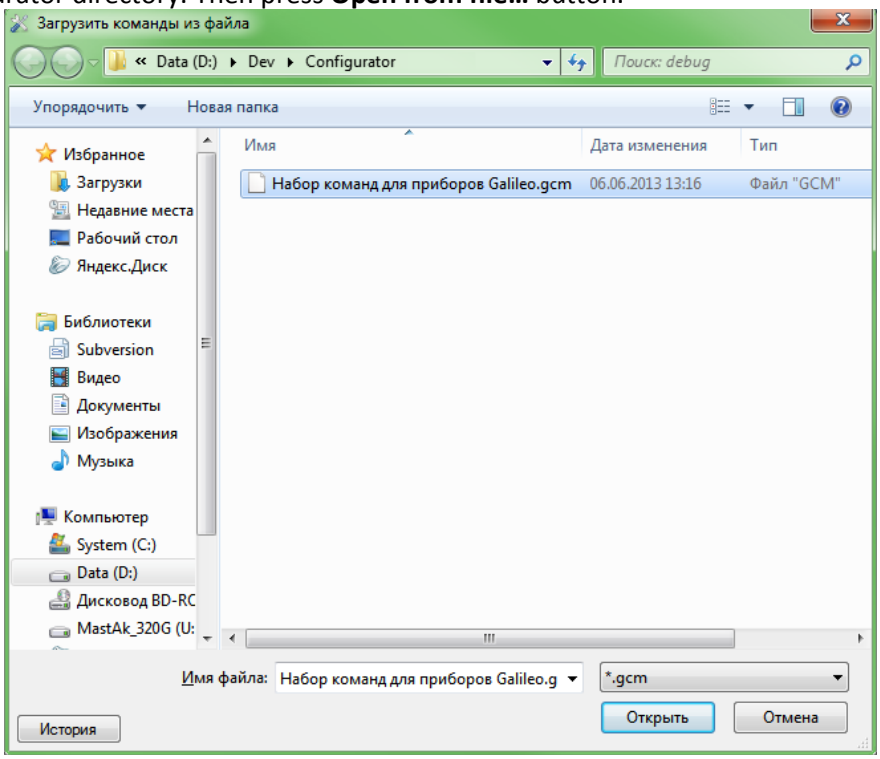
In the opened window you will be offered to save the file in log configurator directory.

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.



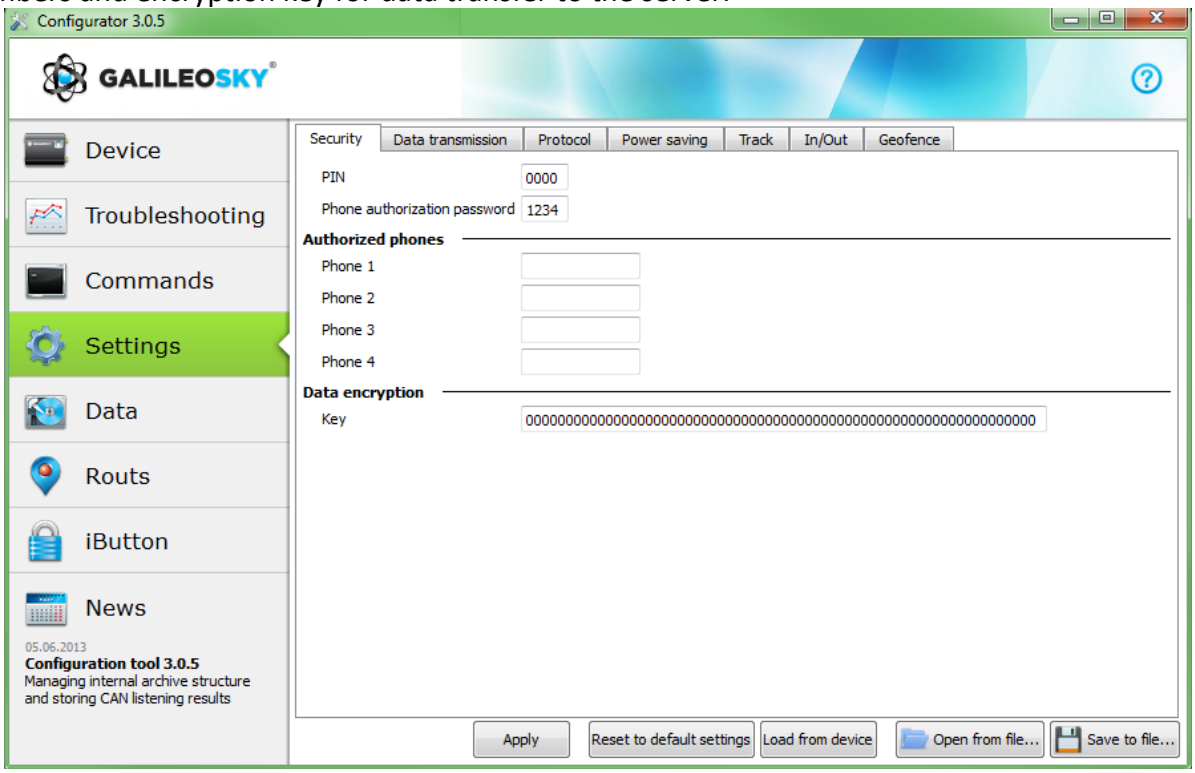
For simultaneous running of several commands push **Run commands** button.
To run one command it is necessary to move to it in Commands window and push **Run single command** button.

Graphic user interface settings

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

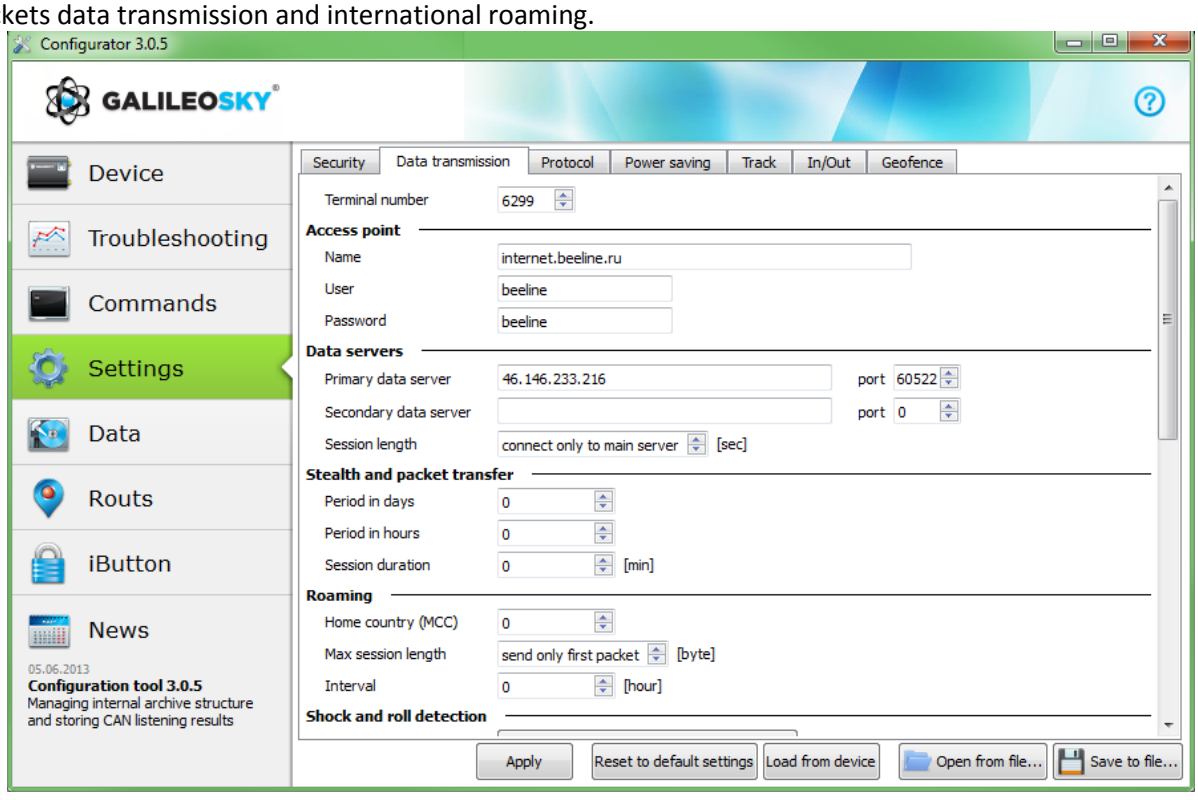
Security

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.

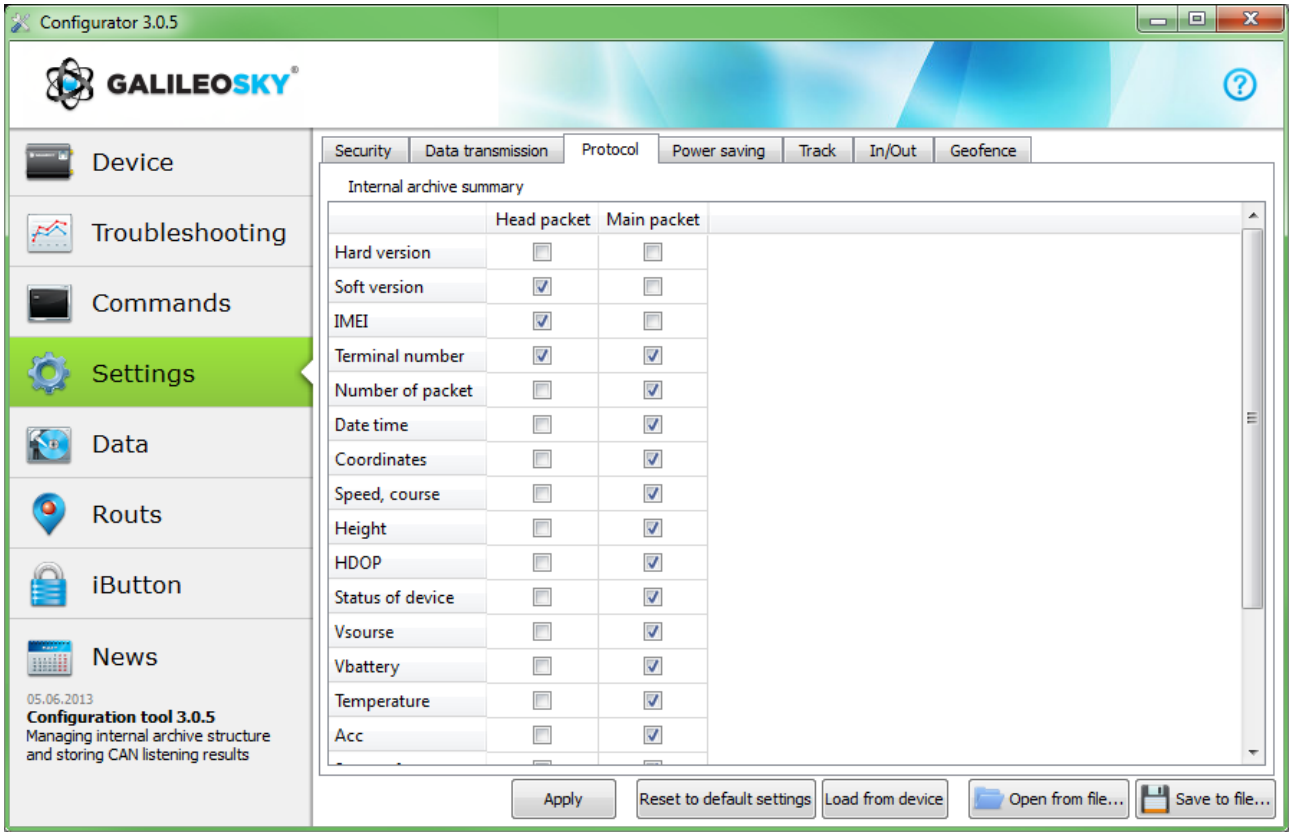


Protocol

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:

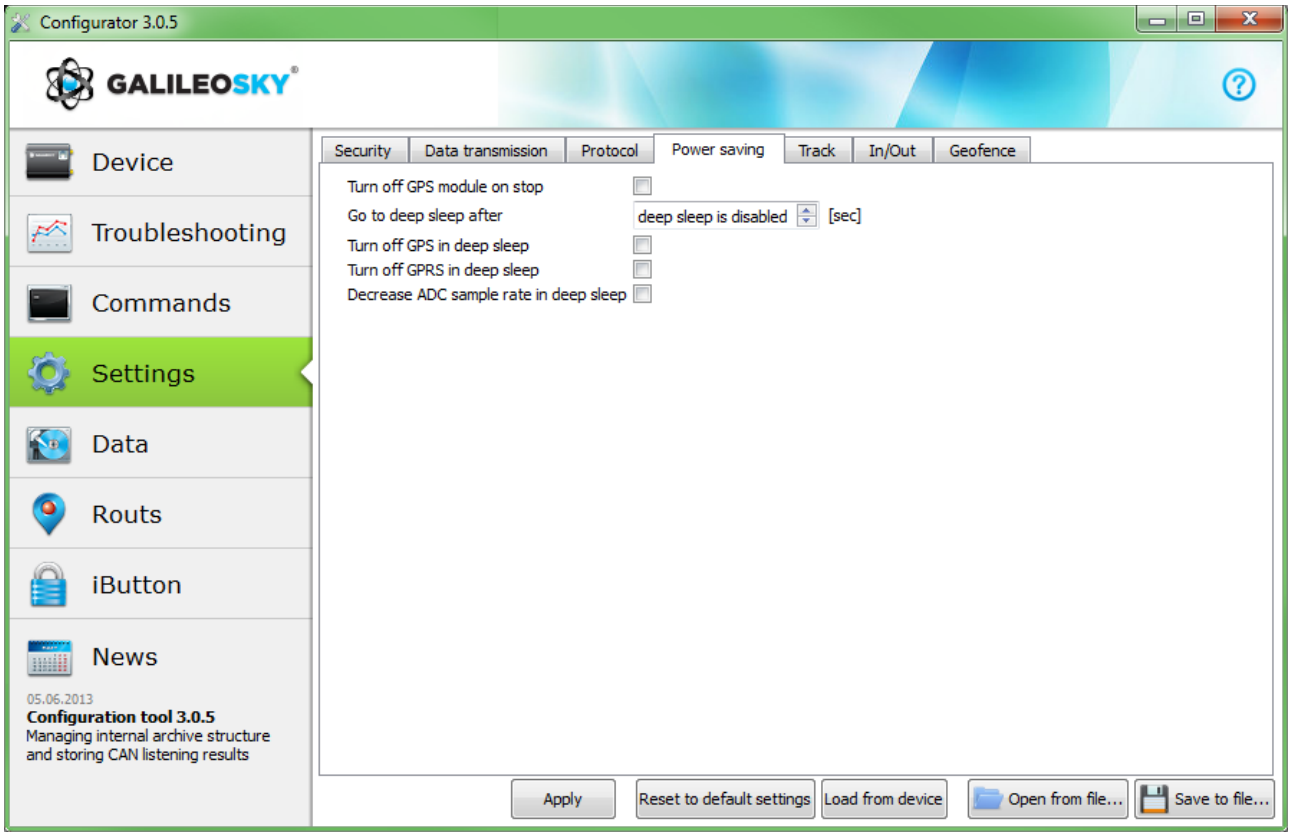
1) Establishing a TCP/IP connection (does not need additional settings);
2) Sending connection data described in the Head packet column (the data to be sent to the server are marked in the first column);
3) If the device has gone through the first two stages, it starts sending accumulated packets according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

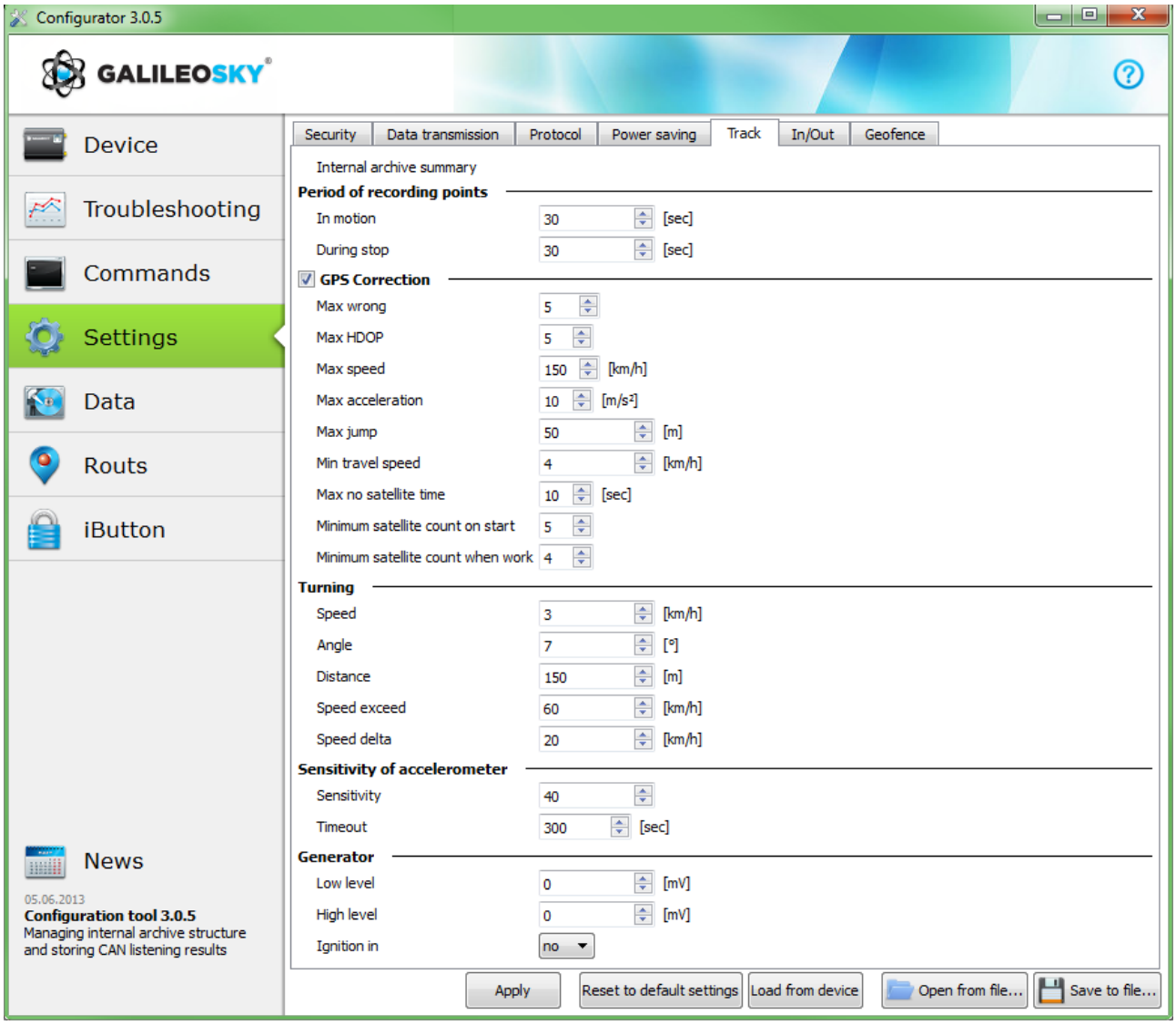
1) engine is stopped for 5 minutes;
2) Vpit voltage parameter is saved in Device tab.

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.

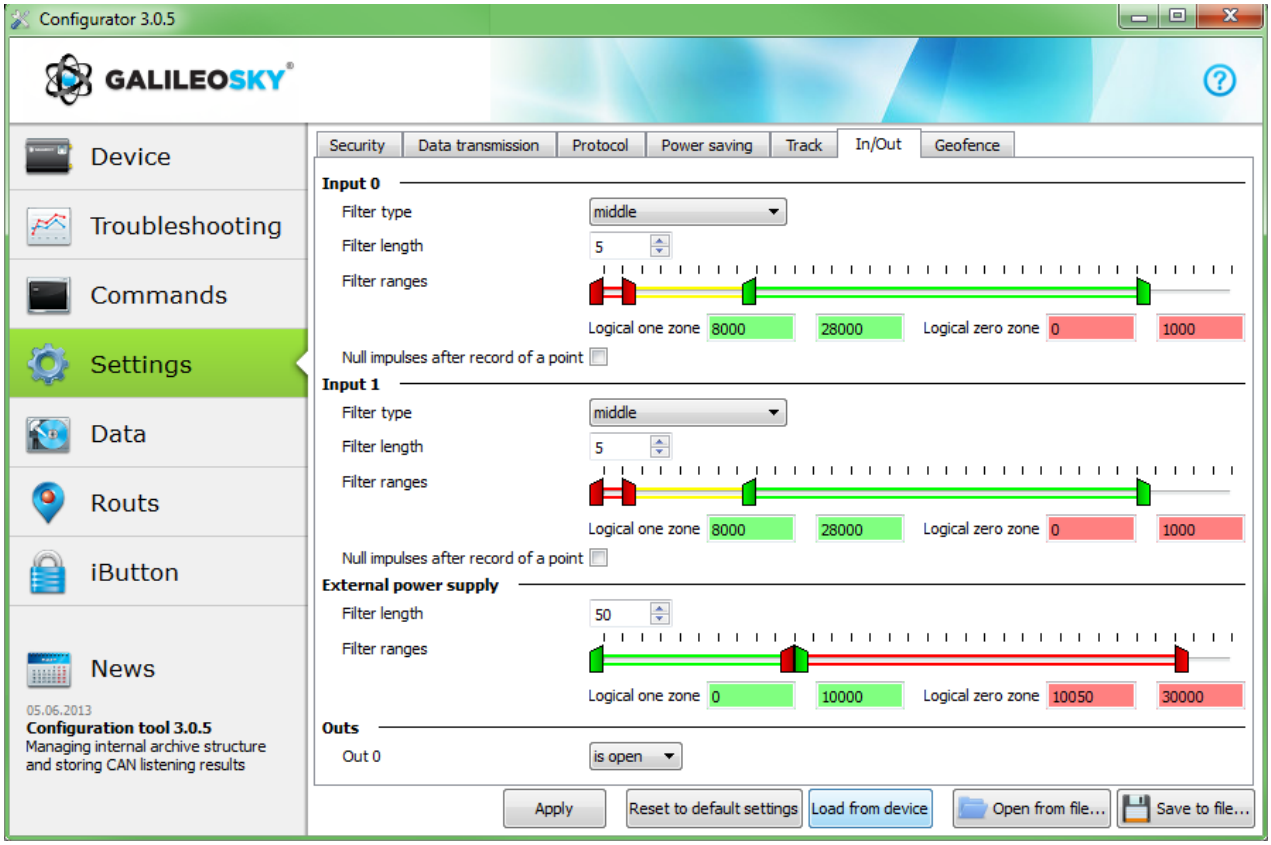
When engine is started, the 9th bit is set in the device status (Table 3. Device status field explanation).
Each terminal is equipped with accelerometer which allows filtering coordinates taper during stops based on vehicles vibration.
Parameters:

- 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.


Configurator 3.0.5
GALILEOSKY
Device
Troubleshooting
Commands
Settings
Data
Routs
iButton
News
05.06.2013
Configuration tool 3.0.5
Managing internal archive structure and storing CAN listening results
Security
Data transmission
Protocol
Power saving
Track
In/Out
Geofence
Internal archive summary
Period of recording points
In motion 30 [sec]
During stop 30 [sec]
GPS Correction
Max wrong 5
Max HDOP 5
Max speed 150 [km/h]
Max acceleration 10 [m/s²]
Max jump 50 [m]
Min travel speed 4 [km/h]
Max no satellite time 10 [sec]
Minimum satellite count on start 5
Minimum satellite count when work 4
Turning
Speed 3 [km/h]
Angle 7 [°]
Distance 150 [m]
Speed exceed 60 [km/h]
Speed delta 20 [km/h]
Sensitivity of accelerometer
Sensitivity 40
Timeout 300 [sec]
Generator
Low level 0 [mV]
High level 0 [mV]
Ignition in no
Apply
Reset to default settings
Load from device
Open from file...
Save to file...

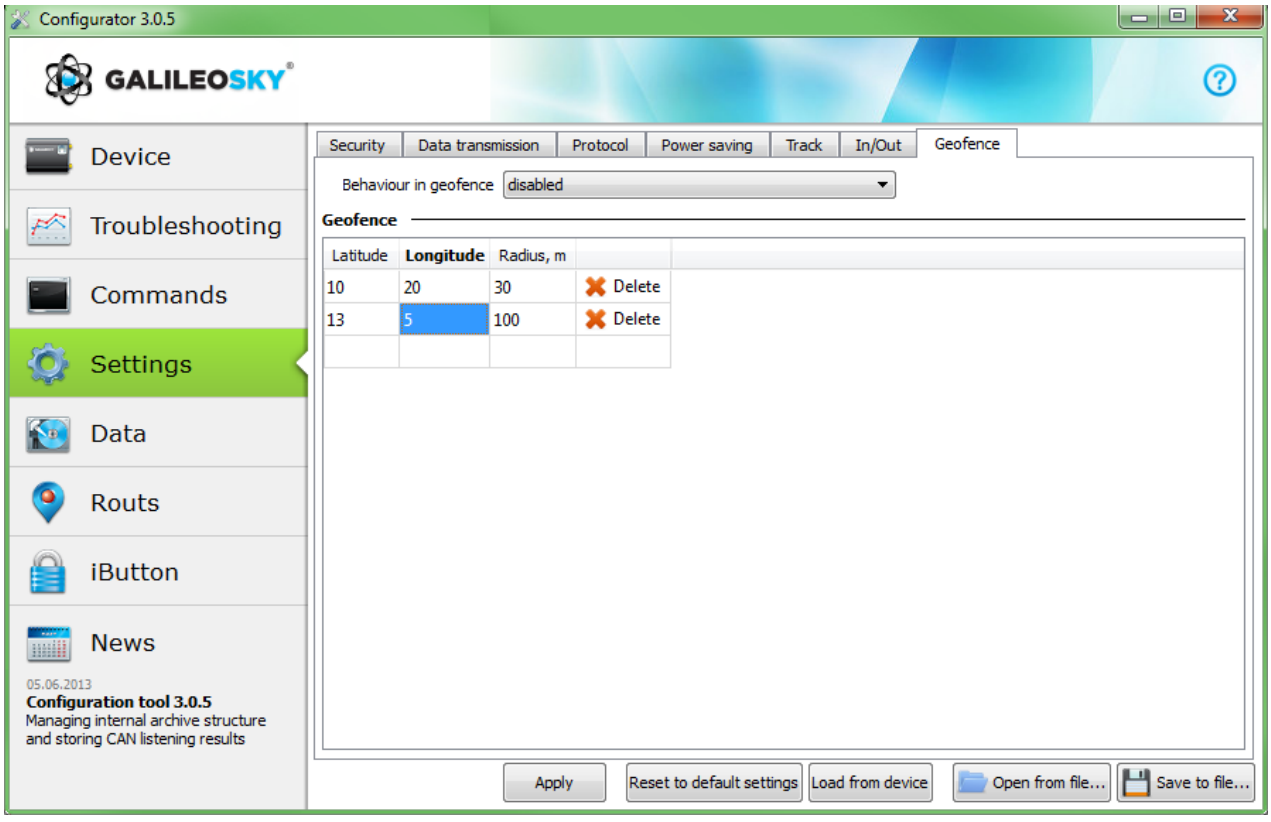
Inputs/Outputs

For input's operation's principles see Discrete analog input (DAI) operation.
For discrete inputs' description see Transistor outputs (0/1).



Geographical areas

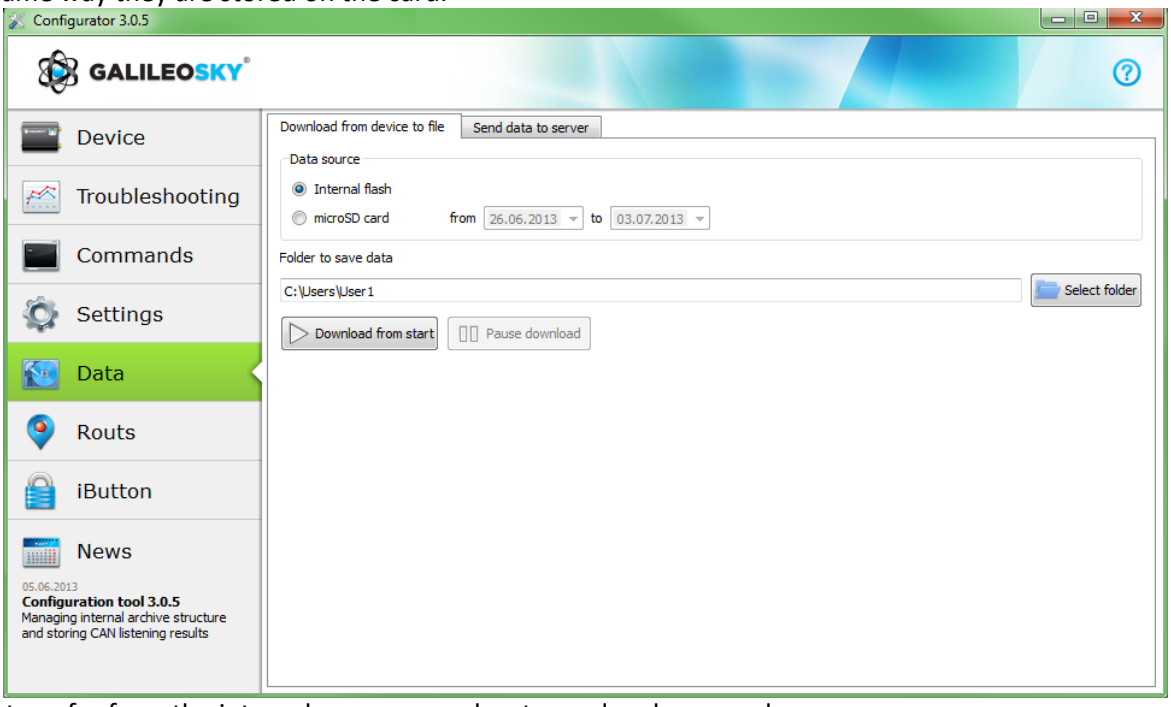
On this tab it is possible to set list of geographical areas and the terminal operation inside and outside them.



Transferring and sending data

Data transfer from device to file

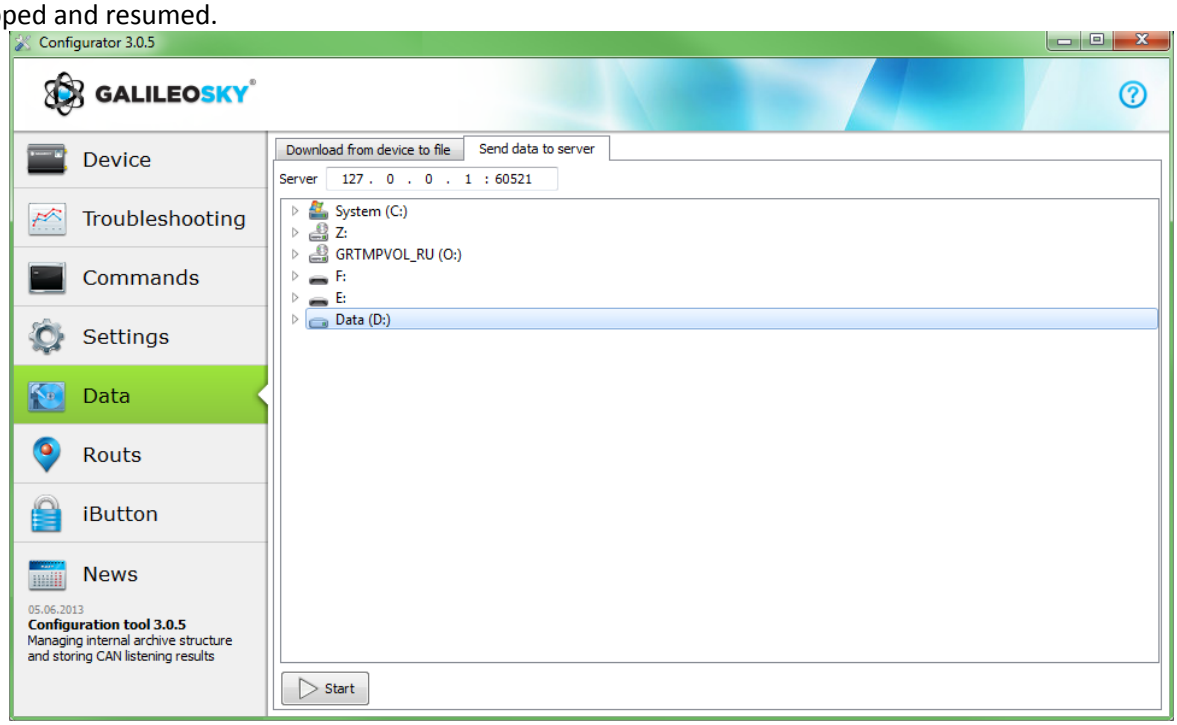
This option allows to transfer data from the internal memory to computer files via a USB cable. In the former case one InternalFlash.csv file is created, in the latter there will be several files sorted by dates in the same way they are stored on the card.



Data transfer from the internal memory can be stopped and resumed.

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.



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	**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,,,,,,,,,,,,;

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	**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;

Command format	**ID n**
Parameters	**n** is terminal number
Explanation	Changes device number.
Example	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.
Example	Request: Roaming 250,10000,24 Reply: ROAMING:Home=250,MaxBytes=10000,Interval=24;

Server exchange protocol settings

Command format **HeadPack bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** is tag set if b is replaced by 1,the tag is on. If b is replaced by 0, the tag is off. Tag numeration order is given in Table 2 GalileoSky protocol tags.
Explanation	Head packet configuring**.**
Example	*Request: HeadPack 1110* *Reply: HeadPack=* *00000000000000000000000000000000000000000000000001110b ,* *which means that tags from the second to the fourth inclusive are on and the first and the rest tags inclusive are off.*

Command format **HeadPackBit index, value**

Parameters	**index** – is tag number, which will be on or off for transmitted on server value – 1 if tag should be transmitted on server 0 if tag should not be transmitted on server Tag numeration order is given in Table 2 GalileoSky protocol tags.
Explanation	Head packet configuring.
Example	*The second tag is on:* *HeadPack=1100b* *Switch on this tag.* *Request: HeadPackBit 1,1* *Reply: HeadPack=1100b*

Command format **MainPack bbbbbbbbbbbbbb**

Parameters	**bbbbbbbbbbbbbb** – is tag set if b is replaced by 1, the tag is on. if b is replaced by 0 the tag is off. Tag numeration order is given in Table 2 GalileoSky protocol tags.
Explanation	Main packet configuring.
Example	*Request: MainPack 11111111111111111111110000* *Reply: MainPack= 00000000000000000000011111111111111111111110000b* *Which means that tags 1, 2, 3, 4 are on and tags 5-26 inclusive are off. All the next following tags are off.*

Command format **MainPackBit index,value**

Parameters	**index** – is tag number, which will be on or off for transmitted on server value – 1 if tag should be transmitted on server 0 if tag should not be transmitted on server Tag numeration order is given in Table 2 GalileoSky protocol tags.
Explanation	Main packet configuring.
Example	*The second tag is on:* *HeadPack=1100b* *Switch on this tag.* *Request: HeadPackBit 1,1* *Reply: HeadPack=1100b*

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, [º]; **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;

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	*Request: AccSens 40,300* *Reply: Accelerometer sensitive: sens = 40, time out=300*

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;
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	*Request: Ignition1* *Reply: IGNITION:1;*

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 [0º-180º], 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	*Request: Shock 3,30,5* *Reply: Shock: Mode=3,MaxAngle=30,RT=5;*

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	*Request: mHours 12000,14500* *Reply: Mclock: lolevel=12000,hilevel=14500;*

Information commands

Command format	**Status**
Explanation	Allows finding device status for the moment of sending a command DevNo – this device number; Soft=No – 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
Example	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
Example	Request: IMEI Reply: IMEI 123456789012345

Command format	**imsi**
Explanation	Allows us to obtain a unique IMSI identifier of SIM-card
Example	Request: IMSI Reply: IMSI 123456789012345

Command format	**inall**
Explanation	Allows analog input values in0..in7, to be obtained as well as Omnicomm sensors values and accelerometer values with respect to three axes (10bit for each axis starting with the zero bit).
Example	Request: inall Reply: INALL:in0=0,in1=0,in2=0,in3=0,in4=0,in5=0,in6=0,in7=0,omn0=0,Acc=332943891;

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.
Example	Request: insys Reply: INSYS: Pow=12438,Vbat=4196,Vant=2921,Vdc=4115,Temper=37

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	**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	**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 OffOnGNSSOnStop,DSTime,GNSS,GPRS,ADC**
Parameters	**OffGNSSOnStop** – 0 – do not turn GPS\GLONASS unit off at stop; 1 – turn GPS\GLONASS unit off at stop. **DSTime** – 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;
Explanation	Power saving mode control.
Example	Request: SLEEPMODE 1,60,1,1,1 Reply: SLEEPMODE:OffGNSSOnStop=1,DSTimeout=60, GNSS=1,GPRS=1,ADC=1;

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;

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 behavour: 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 = 600мВ/g; max = 645мВ/g; where g is free fall acceleration (g≈9.8м/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 0,s**
Parameters	**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.

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 ± 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:

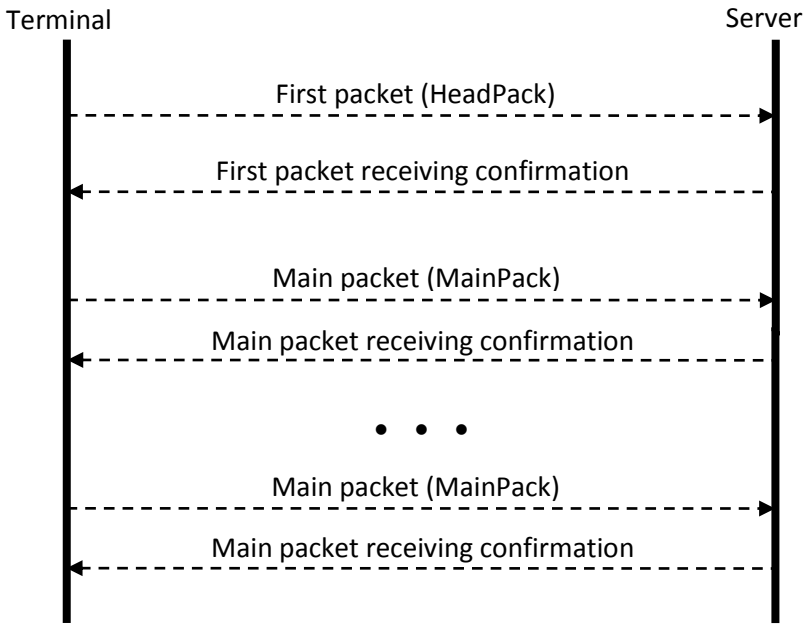
Yellow LED blinking, times	GSM Modem activation stage
6	GSM unit enabled successfully.
5	GPRS registered successfully.
4	Establishing server connection. Updating device software.
3	Downloading mode.
2	Server connection and downloading mode enabled.
1	First request sent successfully.

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.
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, ºC	1	Integer with sign.

№	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.
53	0xd4	Total kilometrage according to GPS/GLONASS units, m.	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/s2

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 cant determine SIM-card.
4	---
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	---
12	Signal quality, range: [0-3]. The less value, the worse communication.
13	
14	---
15	---

Table 3. Device status field explanation

Example1.
The terminal should be configured so that head pack (HeadPack) contains information about the device version (HardVersion), firmware version (SoftVersion), unique 15 digit GSM unit identity(IMEI), device user ID (ID device).
Correspondent tag mask: 00000000000000000000000000000001111.
To apply the settings we should use the following command
HeadPack 00000000000000000000000000000001111, or omitting zeros, HeadPack 1111

Example 2. It is necessary to configure the main packet (sent in normal mode) so that the device used ID (ID device), packet number (NumberOfPacket), date and time of packet record (TimeDate), coordinates are sent.

Correspondent tag mask: 00000000000000000000000000001111000

To apply the settings we should use the command: MainPack 1111000.
In this case zeros have been omitted at once.

The server can send commands to the device. After command receiving and its successful execution, the terminal sends packet with reply text.

Structure of packet with command:

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

Respond's structure is analogous to the command's packet, but reply text is sent instead of command text.

FAQ

Question	Ответ
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.