



**NEOMATICA**

**Telematic terminal  
ADM007BLE  
GLONASS/GPS-GSM/GPRS**

**Operation manual**

**Edition 1.1**

**EAC CE**

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This Operation manual extends to the ADM007 BLE tracker (hereinafter referred as tracker) and describes the procedure of its installation and connection as well as its function and settings.

The Operation manual is designed for professionals who have familiarized themselves with the rules of repair and installation works execution in vehicles and who have special professional knowledge in electronic and electric equipment used on various transport means.

The tracker's proper work can be guaranteed if it is installed and set by qualified professionals. To use the tracker properly it is necessary to familiarize with the monitoring system work principles in general and to understand the function of all its components. For this reason, it is strictly recommended to get basic knowledge on GLONASS and GPS global navigation satellite systems functioning, GSM network, issues related to data transmission by means of short message service (SMS), GPRS and Internet.

# 1 Purpose and Function

The tracker is intended for installation on a vehicle as an additional device that records the location of the vehicle, its speed, and travel direction. View of the tracker is shown in Figure 1.

Additionally, the voltage level in the analog input and data received from supported sensors via Bluetooth Low Energy radio channel are recorded. All events and conditions fixed by the tracker are stored in its non-volatile memory.

The accumulated data is transmitted through the GSM 850/900/1800/1900 cellular network operator using packet data transmission technology GPRS to a dedicated server with a static IP address or domain name from which it can be received via the Internet for further analysis and processing in a monitoring center.

The tracker can be configured in any convenient way: locally (via Bluetooth, using the configurator) or remotely (by sending commands via SMS or GPRS).

To ensure data security, when the external power is turned off and the GSM network is lost, the tracker has non-volatile memory. Data transmission is possible only if there is a GSM 850/900/1800/1900 cellular network supporting a packet data service (GPRS).



Figure 1 - View of the tracker (the wires are not shown)

The vehicle travel route is described in the form of separate points in time. The route point is recorded when at least one event occurs, such as:

- travel direction changes by an angle which is greater than the pre-set one;
- the straight-ahead travel is performed at a distance, which is longer than the pre-set one;
- the pre-set acceleration limit is broken;
- the time for putting the point while traveling (parking) is expired;
- device status change (see the Appendix A);
- an event occurs in analogue input.

In this way, route points might be recorded with the time interval from one second to several minutes allowing for a quality routing, recording any changes without a surfeit of information saved in the “black box” and increase in GPRS traffic.

The tracker with the GLONASS/GPS module ensures time and navigation parameters measuring based on GLONASS and/or GPS satellites. After being connected to the power supply, the tracker starts receiving data from satellites, locating itself, identifying speed, time, measuring voltage in inputs and connecting to the server. After being connected to the server, the tracker transmits thereto the data packets with the pre-set frequency or when an event occurs. If for any reason the connection to the server fails, all the information will be saved in the tracker nonvolatile memory and transmitted as soon as the connection is restored. If there is no signal from GLONASS and/or GPS satellites and there is GPRS connection then time will be synchronized via NTP protocol with one of the available public time servers. In such a case the route points will be recorded without location data.

**Data transmitted by the tracker:**

- GMT date and time;
- coordinates (latitude, longitude, altitude);
- speed, acceleration and travel direction;
- number of satellites when fixing a navigation problem;
- precision loss factor in a horizontal plane;
- voltage values in analogue inputs;
- data about events occurred;
- device status;
- values from sensors connected via Bluetooth Low Energy radio channel

## **2 Technical specifications**

- GLONASS/GPS receiver:  
chipset: MT3333 (MediaTek);  
frequency bands: GLONASS - L1 (CT-code), GPS - L1 (C/A code);  
sensitivity in cold start/tracking, dBm: -149 dBm/-161dBm;  
number of tracking/picking-up channels: 33/99;  
positioning precision, 95% of time, not worse: 3 m
- Connection standard: GSM 850/900/1800/1900, GPRS Multi-slot Class 12
- GSM transmitter power: 2 W
- Number of SIM-cards: 1 or 1 SIM-chip (optional, upon request)

- Number of analogue inputs:1
- Analogue input features:  
voltage measurement range: 0..58,8 V  
discreteness (sensitivity): 57,4 mV  
input resistance: 200 kOhm
- Number of route records saved: at least 24 000
- PC connection interface: Bluetooth
- Wireless sensors connection interface: Bluetooth Low Energy
- Operation temperature: -40..+85°C
- Power voltage: +8..+45 V of unregulated direct current
- Current consumption (at the supply voltage 12 V):  
maximum: 200 mA  
average: 30 mA
- Dimensions: 45x25x12mm
- Weight: not more than 30 g

### 3 Design

Functionally, the tracker consists of a microcontroller, non-volatile memory, a combined GLONASS / GPS-, GSM-, Bluetooth module, analog input.

**The GLONASS / GPS unit of the combined module** is designed to receive signals from the GLONASS / GPS satellites and determine the geographical coordinates of the receiver antenna (latitude, longitude and altitude), as well as the exact time (GMT), speed and direction of travel.

**GSM / GPRS unit of the combined module** performs the following functions:

- establishment and maintenance of outgoing TCP / IP connection (data reception and transmission in GPRS mode);
- receiving and sending SMS messages.

For information transmission, the GSM / GPRS unit of the combined module establishes and maintains connection to the server, periodically transmitting information packets. The period of data transfer to the server during the parking and during the movement of the vehicle is different and can be changed by user.

**Bluetooth unit of the combined module** provides connection to the PC, as well as wireless information exchange between the tracker and the configurator program ADM Configurator.

To display the operating status, the tracker has 2 LED indicators: green and blue.

**The green LED** indicates the status of the GLONASS / GPS unit of the combined module:

- flashes three times - the GLONASS / GPS unit is on, but there is no data from it;
- flashes twice - data from the GLONASS / GPS unit received, but the coordinates are invalid;
- flashes once - the GLONASS / GPS unit has determined the time and the actual coordinates.

**The blue LED** indicates the status of the GSM / GPRS unit of the combined module:

- flashes three times - the GSM / GPRS unit is disabled for re-initialization;
- flashes twice - the GSM / GPRS unit is on, but there is no connection to the server;
- flashes once - the tracker has established a connection to the server and successfully transmits the information packets;
- constantly shines, briefly turning off - SIM card is not available.

Three wires are put out of the tracker: red - plus, black - minus, yellow - analog input.

The color marking of the tracker wires is shown in Figure 2.

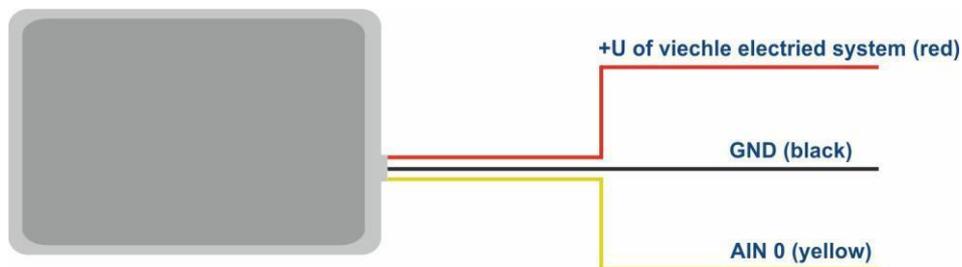


Figure 2 - Color marking of the tracker wires

## 4 Installation

The internal GLONASS/GPS and GSM antennas are used in the tracker, which allow for its installation almost in any place of the vehicle. However, it is not recommended to install it in the places where the received signals will be attenuated by the vehicle metallic housing, since this may affect the tracker work quality. For a proper function of the receiver GLONASS/GPS, put the tracker so that its sticker would be directed upwards.

Insert the SIM card in the holder with a deactivated PIN code request, activated data transmission service via GPRS, SMS and sufficient balance for these services.

Supply the power to the wires according to the layout in Figure 3: for the red wire - plus of the vehicle network, for the black - minus of the vehicle network (housing, GND). When connecting the plus of the vehicle network to the tracker, install a 2A fusible as close as possible to the point of

connection to the vehicle network, which is especially important when connecting directly to the battery clamp.

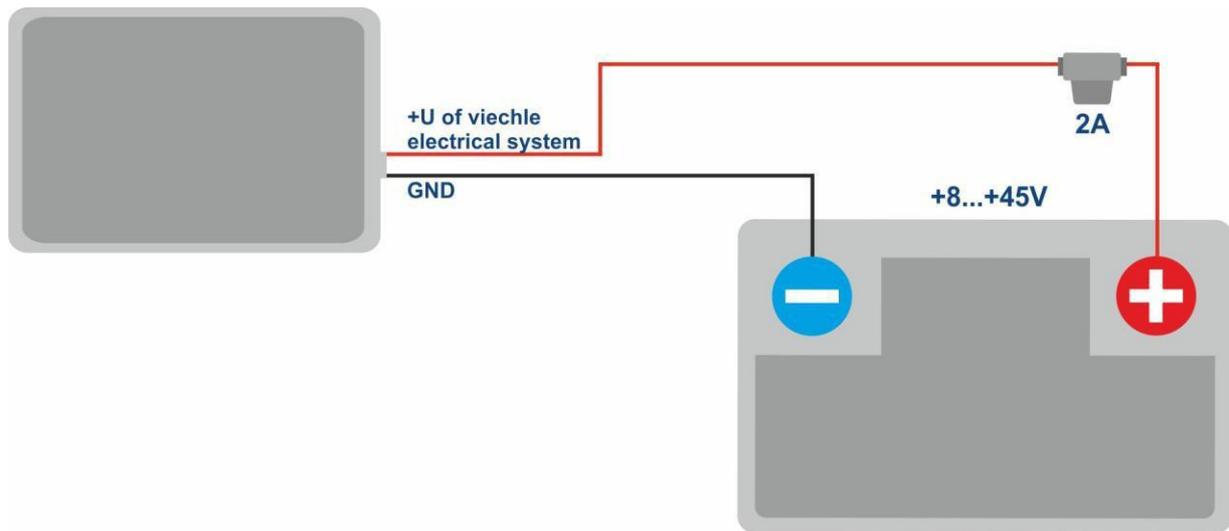


Figure 3 - Standard connection layout of the tracker

If there is valid satellite data and an established connection to the server, the tracker will determine the time, coordinates and transmit information packets to the server, which will be marked by a single flashing of the green and blue LEDs.

It is highly recommended to conduct a preliminary test of the tracker performance in the laboratory, using a power supply instead of the vehicle network, providing an output voltage of 8 to 45 VDC and a current of at least 1A.

## 5 Setting up the tracker

### 5.1 Connecting to the Configurator

To connect the ADM007 BLE tracker to a personal computer using Bluetooth wireless technology, you should do the following:

- 1) Bring the Bluetooth adapter of the PC to the working state;
- 2) Start the ADM Configurator program version no later than 2.4 (available for download at <http://neomatica.com>);
- 3) Turn the configurator to the Bluetooth radio connection mode. To do this, you need to select the way to connect the device by clicking on the Bluetooth icon in the upper left corner of the configurator, as shown in Figure 4;

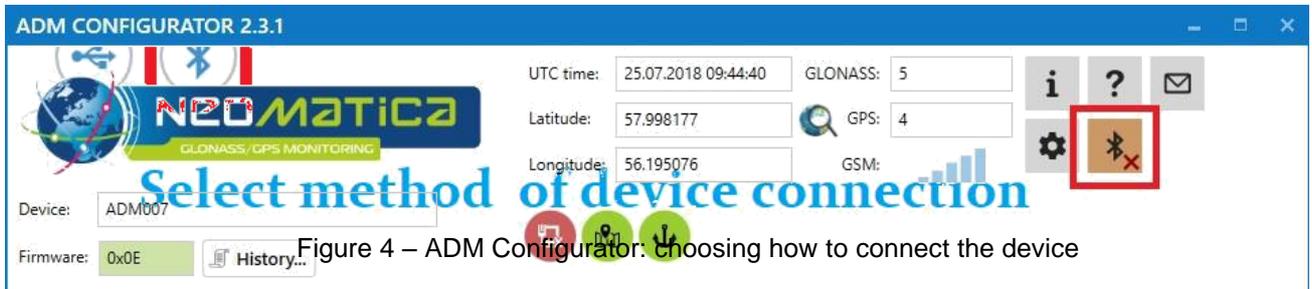


Figure 4 – ADM Configurator: choosing how to connect the device

- 4) Supply power to the tracker;
- 5) If there are several active ADM007 BLE trackers within the reach of the Bluetooth adapter of the personal computer, select the "Select device" flag and enter the last 4 digits of IMEI in accordance with Figure 5. If there is only one active ADM007 BLE tracker within the reach of the Bluetooth adapter of the personal computer, you may remove the "Select device" flag. In this case, a random tracker will be connected from all detected;

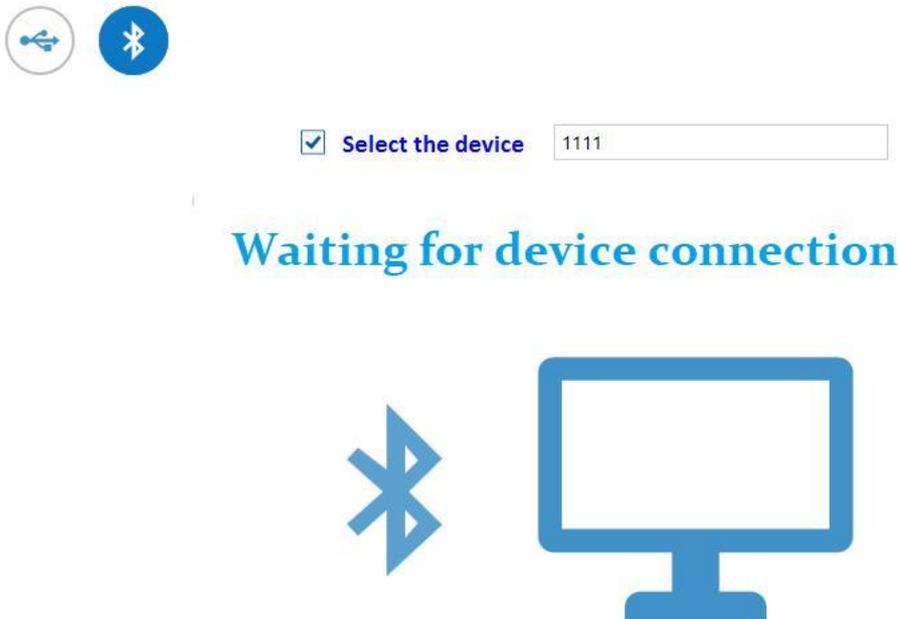


Figure 5 - ADM Configurator in device connection standby mode

- 6) After a few seconds the connection between the tracker and the ADM Configurator program will be installed and the settings window will be displayed;
- 7) After the device is set or, if connection of another tracker is required, click "disable device" in the upper right corner of the ADM Configurator program. The configurator will go into a standby mode, as shown in Figure 6.



Figure 6 – ADM Configurator: the "disable device" button

## 5.2 Setting using commands

The tracker is managed by commands sent via SMS, GPRS or Bluetooth. Commands syntax is the same for any way of transmission.

### General rules for writing commands:

- only Latin characters and punctuation may be used in commands;
- character case does not matter;
- commands transmission syntax is the same for SMS, GPRS and Bluetooth;
- commands syntax: «CMD X1,...,X3», where CMD is a command, X1..X3 are commands parameters.
- Commands are separated by a SPACE. Parameters are separated by commas, except for the **DN0** command which parameters are separated by a colon.

After receiving a command, the tracker executes it and sends a feedback.

If the command parameters extend beyond the acceptable range, the tracker changes them to the nearest acceptable values. If it is not possible to change parameters or parameters are not enough, the tracker will answer with an error message. A command without parameters returns the current settings.

- **Sending commands using ADM Configurator**

To configure the tracker via Bluetooth, you should use the "ADM Configurator" program. If a password different from "0" was set in the tracker then the Configurator will ask to enter the password.

- **Sending commands using SMS messages**

To manage the tracker using SMS, it is necessary to send the SMS command "**ADD ME 0**" to the number of the SIM card installed in the tracker, where 0 (zero) is the default password (if the password has been changed, you should enter it instead of 0). The phone number from which this command was sent will be authorized in the tracker. An authorization is done only once, afterwards the tracker saves the telephone number in a non- volatile memory within its whole service life. The tracker can save up to 4 numbers. Resetting settings to the factory ones clears the list of phone numbers.

- **Sending commands from the server via TCP connection**

To configure via GPRS, authorization is not required. The tracker receives commands from the server via TCP connection used for data transmission.

## 5.3 Setting the connection to the server

Configure the APN settings for the selected cellular operators using «**SETGPRS0**» command.

Configure the IP address and port of the server (host) using «**SETHOST0**» or "**DN0**" command.

## 5.4 Setting data transmission

Navigation data and data received from different sensors being transmitted from the tracker to the server, are divided by data packets. Depending on the functionality used, it is necessary to activate the transmission of the necessary data packets.

The setting is done in the graphic interface of the ADM Configurator or by **PROTOCOL** command.

Table 1 shows the correspondence of data packets to the values of **PROTOCOL** command. If data transmission is required to be transmitted from several packets then calculate **PROTOCOL** command parameter by addition. To save the traffic it is recommended to set only the transmission of necessary data packets.

For example:

Main data (0) +analogue inputs (8) +fuel level sensors (32) = PROTOCOL 40

Table 1. Values of the main parameters for PROTOCOL command

Data packet name		Parameter value
Main data	NAVIGATION DATA	0
Analogue inputs	IN_A	8
Fuel level sensors	FUEL	32
Can	CAN	64

## 5.5. Setting route (track) drawing

### 5.5.1 Selecting presets of route drawing quality

To facilitate the process of setting the route drawing quality there are several factory presets. The preset can be selected in ADM Configurator (version 2.4.5 at least) or by **TRACKSET** command. The presets contain several sets of parameters. In total 5 presets are available. All presets allow to get a drawing of the travel path, the differences are in the degree of route details. The more detailed route is the more route points will be transmitted to the server, this increases the traffic consumption. Less detailed route reduces traffic consumption.

- **TRACKSET command description:**

**TRACKSET X**

X –number of route drawing preset

X = 0..4

In response a total list of set parameters will be displayed.

Answer example: TRACK 4,1000,100; (1):3,5; (2):3,5; (3):3,5

Command without parameters displays current route settings.

- **Presets description:**

## **TRACKSET 0**

Satisfactory tracking quality, money-saving variant as regards route points and traffic consumption. The quality is enough to monitor the movement path. The drawing of road turns is simplified. Slight route changes are not drawn (expected points per km are twice less than in preset 2).

## **TRACKSET 1**

A good tracking quality. The drawing of slight changes of direction and road turns is simplified (expected points per km are 1.3 times less than in preset 2)

## **TRACKSET 2**

Set by default. A good tracking quality. The variant suits to the most of tasks. Is an average variant as regards tracking drawing quality and traffic consumption. Slight direction changes and road turns are drawn with details.

## **TRACKSET 3**

Slight changes in direction are drawn with more details (expected points per km are 1.3 times more than in preset 2)

## **TRACKSET 4**

High tracking detalization. Slight changes in direction are drawn with many details. (expected points per km are 1.6 times more than in preset 2)

### **5.5.2 Expert setting of tracking parameters.**

It is recommended to use this method of setting only if none of the presets fit the task. The change of these parameters can lead to an increase of traffic consumption or to a decrease of the route drawing quality.

#### **• Setting using TRACK command**

To set all the parameters send TRACK command twice. The degree of road turns detalization is set by sending TRACK command with three parameters. Command format: TRACK M,A,B

The threshold values of additional circumstances of route points drawing in movement are set by sending TRACK command with four parameters. Command format: TRACK 255,X,Y,Z

#### **• Setting the degree of road turns drawing detalization. Setting threshold values of angle change and deflection.**

A route point is drawn when the thresholds are exceeded.

#### **TRACK M,A,B**

M – number of speed mode.

M=255 – apply the same parameters for all the modes

M=0 – slow movement

M=1 – medium -speed movement

M=2 – fast movement

A – angle for speed mode with M number.

B – deflection for speed mode with M number.

The threshold values of angle change and deflections are set separately for three speed modes. If the same values should be set for all speed modes then the command should be sent once, M parameter in this case equals to 255. If different threshold values should be set for three speed modes then the command should be sent 3 times, choose speed mode using M parameter.

Example

• **Setting same parameters for all speed modes:**

TRACK 255,10,6 – Set 10 degrees for the threshold value of route change and 6 for deflection

• **Setting different parameters for all speed modes:**

TRACK 0,20,7 – Set 20 degrees for the threshold value of route change and 7 for deflection of slow speed mode.

TRACK 1,10,6 – Set 10 degrees for the threshold value of route change and 6 for deflection of medium speed mode.

TRACK 2,5,6 – Set 5 degrees for the threshold value of route change and 6 for deflection of fast speed mode.

• **Setting minimum speed, distance and acceleration.**

If the set threshold values are exceeded, a route point will be recorded.

TRACK 255, X,Y,Z –

First parameter should always be equal to 255. For all speed modes these parameters are set the same.

X – minimum speed

Y – distance (meters)

Z – acceleration (km/h per second)

• **Viewing set parameters**

TRACK – Display current settings.

The response displays minimum speed, distance, acceleration, angle and deflection for three speed modes.

Response format:

TRACK X,Y,Z; (M) A1,B1; (M) A2,B2; (M) A3,B3

X – minimum speed

Y - distance (meters)

Z - acceleration (km/h per a second)

M=0 – slow movement

M=1 – medium speed movement

M=2 – fast movement

A – angle for speed mode with M number

B – deflection for speed mode with M number

Answer example: TRACK 4, 1000, 15; (0):5,6; (1):10,6; (2):20,6

## 5.6 Setting the fixation (freezing) of coordinates during the parking

The margin of error might cause a slight coordinates dispersion during a long-term parking of the vehicle. To prevent this effect the coordinates freezing function might be used in the beginning of the parking. This mode is activated automatically when the discrete level is changed at the analog input, or at a speed below the set level. The function is disabled by default. Simultaneous use of both ways of coordinates fixation is impossible. The tracker records the coordinates in the mode that was last configured.

### 5.6.1 Coordinates fixation by the ignition

To activate the function of fixing the coordinates with the vehicle ignition off, it is necessary to connect to the analog input a circuit being under voltage when the ignition is on. Activate a discrete mode for this analogue input and set the values range of voltage level for the logical one as "**INTRUE**" and for the logical zero as "**INFALSE**". Afterwards select coordinates fixation mode "by the ignition". Thus, when the ignition is off, coordinates fixation will be initiated by an event formed at the input.

- Examples of using **INSTATIC** command:

Coordinates fixation at 0 in the input AIN0 **INSTATIC 0,0**

The function is disabled by the command «**INSTATIC 255**».

### 5.6.2 Coordinates fixation by speed

In such a mode the coordinates fixation is done automatically if the tracker registers the speed beyond the set threshold. The precision of this function depends on the precision of the coordinates determination. Thus, in case of bad signal receipt from GLONASS/GPS satellites, the coordinates fixation by the speed might be not stable.

The function of fixing coordinates by speed is activated by the command «**SPEEDSTATIC X**», X is the speed (km / h), below which the coordinates are fixed. The function is disabled by the «**SPEEDSTATIC 255**» command.

**SPEEDSTATIC 3** is set by default.

Selecting rather high-speed threshold may result in improvement of function performance during parking, but may cause data loss when driving at the beginning or when driving at a low speed.

## 5.7 Operation mode

The tracker has got two modes of routes record: «Tracker» and «Beacon». The working mode is set by **BMODE** command. Mode “Tracker” is set by default.

### **BMODE X**

X=0 - «Tracker» mode.

X=1 - «Beacon» mode.

### 5.7.1 “Tracker” operation mode

This mode is used to create (draw) exact path of travel.

The routes record is done using all possible criteria:

- change of speed;
- acceleration threshold exceeding;
- distance passage;
- direction change;
- regarding the period of movement;
- regarding the period of parking;
- regarding alarm period;
- at tracker start up;
- change of discrete state at input;
- change of device status

### 5.7.2 “Beacon” operation mode

This mode is used to record routes at a given time period and is not suitable for the creation of exact path of travel. Time period of routes record equals to the period of routes record while parking.

The routes record is done only using the following criteria:

- at tracker start up;
- change of discrete state at input;
- regarding the parking period;
- regarding alarm period;
- change of device status

## 6 Connection of additional equipment

### 6.1 Analog input

The analog input IN0 (AIN0) can be used to connect analog type sensors and voltage level measurement, and can also be interpreted as discrete.

Voltage measurement range: 0..58.8 V.

Discreteness (sensitivity): 57.4 mV.

Minimum input resistance: 200 kOhm.

Do not apply voltage exceeding the upper limit of the measuring range.

If it is necessary to record a certain voltage level, for example, in the ignition switching circuit, the voltage levels of the logical "0" with the "INFALSE" command and the logical "1" with the "INTRUE" command must be set for the selected analog input.

### Commands description:

INFALSE IN, X0,Y0

IN - number of the analog input (always specify 0)

X0 - the lower limit of the logical range "0" (fixed value 0mV)

Y0 - upper limit of the logical range "0" (variable value)

INTRUE IN, X1, Y1

IN - number of the analog input (always specify 0)

X1 - the lower limit of the logical range "1" (variable value)

Y1 - the upper limit of the logical range "1" (fixed value of 60000 mV) When entering these commands, the voltage must be specified in millivolts.

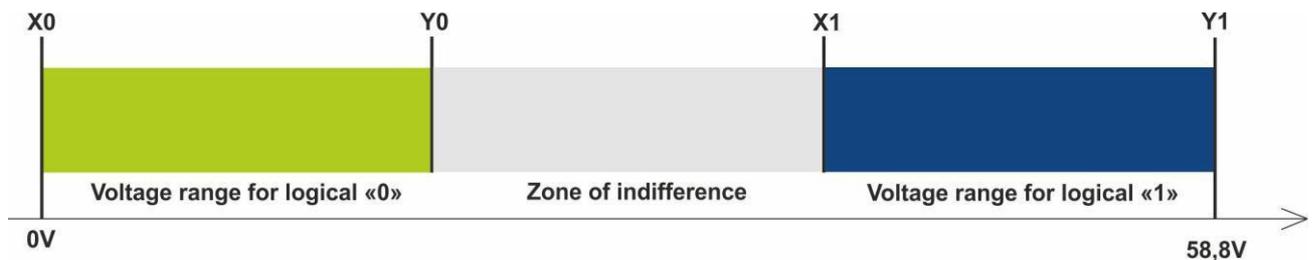


Figure 7 - Bands of discrete states

If the voltage level is in the zone of indifference, the previous discrete state is maintained until the level goes beyond the zone of indifference.

The measured voltage levels are registered by the tracker and transmitted to the server.

When changing the discrete state, an extraordinary packet is sent.

## 6.2 Connecting devices via Bluetooth Low Energy radio channel

Connection of extra devices to the tracker assumes a set of actions: to configure the device under connection, the tracker and PC at the side of the server.

The server receives correct values from the connected sensors provided all steps are performed correctly:

- Configuring the sensor/devices (in case of necessity).
- Setting communication between the tracker and the sensor. Ways of supported sensors connection are given in clause [6.2.1](#).
- Activation of necessary data transmission from a tracker to a server. For description and data transmission choice see clause [5.4](#) and clause [7.1](#).

- Setting transformation of received data on the server side. (in case of necessity). See detailed description in clause [7.1.1](#).

## 6.2.1 Ways of BLE sensors connection

Setting the interaction of the sensor with the tracker is performed in ADM Configurator or by sending commands to the tracker via Bluetooth, GPRS or SMS. It is possible to connect up to 5 sensors ADM31/ADM32 and up to 3 BLE fuel level sensors.

There are two ways of binding the sensor to the tracker - manual and automatic.

In manual mode, you need to enter the addresses of each of the sensors. This method is suitable for the situation when in the Bluetooth receiving area of the tracker there are working sensors which shouldn't be connected to this tracker.

In the automatic mode, sensors are searched for and the addresses of all found sensors are automatically recorded. This method is suitable for a situation when only the required sensors are in the receiving area of the Bluetooth of the tracker.

### 6.2.2. Adding BLE sensors in automatic mode

The **BLEAUTOCATCH** command starts the search and automatic record of the addresses of the found sensors into the BLESENSOR and BLEFUEL sensors list. By default the search is performed within two minutes with the filter according to radio signal minus 60 dBm. Such a filter mode allows adding the sensors located from the tracker at a distance of 0 up to 0.5 meter.

Examples of the command use:

**BLEAUTOCATCH** – automatic search by default, with the filter according to the signal

**BLEAUTOCATCH 255,0** – automatic search of all supported sensors, without filters

**BLEAUTOCATCH 0** - stop current scan.

#### 6.2.2.1 Additional parameters of automatic sensors search

In case of necessity the criteria of automatic search can be changed by entering certain parameters. **BLEAUTOCATCH** command has 4 parameters D, F, R, T.

Description of parameters of **BLEAUTOCATCH D,F,R,T** command :

- D – sensor type.

When entering such a parameter only the sensors of the indicated type will be added. Table 2. shows the correspondence of values to the BLE sensors types. In case several sensors types should be binded simultaneously then add several needed parameter values.

Table 2. Types of supported BLE sensors.

Sensor type	Parameter value
ADM31, ADM32	1
ESCORT fuel level sensor (BLE)	2
Technoton fuel level sensor BLE (DUT-E)	4
Technoton axis load sensor BLE (GNOM)	8
All types of the supported sensors	255

- F-filter  
 F=0 – search without a filter by radio signal level  
 F=1 – search with the filter by radio signal level

- R –RSSI level  
 Acceptable filter range from minus 1 to minus 127 dBm.  
 Entering value without a character from 1 to 127 is acceptable.

- T – search time in seconds.  
 Acceptable range of search duration is from 10 seconds to 120 seconds

### 6.2.2.2 Options of «BLEAUTOCATCH» command use

- Search within 120 seconds, with the filter according to radio signal level minus 60 dBm.

#### BLEAUTOCATCH

- Search with the opportunity to choose the sensor type (D), with the filter according to radio signal level minus 60 dBm, search time is 120 seconds.

#### BLEAUTOCATCH D

- Search with the opportunity to choose the sensor type (D), to switch off the filter according to radio signal level (F), search time is 120 seconds.

#### BLEAUTOCATCH D,F

- Search with the opportunity to choose the sensor type (D), to set the filter according to the distance (R), search time is 120 seconds.

#### BLEAUTOCATCH D, F, R

- Search with the opportunity to choose the sensor type (D), to set the filter according to the distance (R), to choose the search time (T).

**BLEAUTOCATCH D,R,T**

### **6.2.3 Adding sensors ADM31, ADM 32 in manual mode, viewing added sensors list**

The **BLESENSOR** command allows adding sensor addresses, as well as viewing the list of added addresses. The sensor address is marked on the label placed on the housing.

Don't enter a colon when entering the address.

**BLESENSOR X,Y** - add address Y to the cell X, where X=0..4;

**BLESENSOR X,0** - clear cell X, where X = 0..4;

**BLESENSOR Y** - add address Y to the end of the list;

**BLESENSOR 0** - clear the list;

**BLESENSOR** – display the list of addresses added to the tracker.

Example of commands input:

**BLESENSOR 0,FC61CFEF5E31** – add address FC:61:CF:EF:5E:31 to the cell 0;

**BLESENSOR FC61CFEF5E31** – add address FC:61:CF:EF:5E:31 to the end of the list.

#### **6.2.3.1 Receiving information from binded sensors ADM31/32**

The **BLESENSORINFO** command allows to request the latest data received by the tracker from the sensor.

**BLESENSORINFO X** – display information from the sensor under number X,

where X = is the sensor from the sensors list **BLESENSOR**.

**BLESENSORINFO** -the command without parameter displays information about all the configured sensors.

Example of the answer:

**BLESENSORINFO: [0]:DD9DD495C467; DT:2; PT:1; F:1; V:3.2; A:1; R:-35; LMT:20; S:0; [1]:EE53F61FCC05; DT:0; PT:0; F:0; V:25.5; T:-300.00; L:655.35; H:255; R:0; LMT:0; S:32768;**

Description of answer parameters:

Fields, general for all types of sensors ADM3x.

Sensor address

DT – type of the device.

PT – type of the packet.

F – software version.

V – battery voltage.

R – level of RSSI in dBm.

LMT – time of sensor data update. Values: 0...120 seconds. When exceeding 120 seconds maximum value of 120 will be set.

S – sensor status.

#### ADM31

T - temperature.

L - illumination.

H - humidity.

#### ADM32

A – angle value in degrees

### 6.2.3.2 Setting the acceptable readings range for ADM31/32 sensors

When the readings are beyond the acceptable range the tracker will switch to the route points record at an alarm period.

Setting the acceptable temperature range.

#### **TEMPRANGE X, Y, A, B**

Parameter X – device number (from BLESENSOR sensors list).

Parameter Y – number of temperature sensor (only 0)

Parameters A and B – limits of the acceptable temperature range.

Parameters A and B can be omitted- current range will be displayed.

Setting the acceptable humidity range.

#### **HUMIDRANGE X, A, B**

Allows to set the acceptable humidity range of the sensor.

Parameter X - device number (from sensors list).

Parameters A and B – limits of the acceptable humidity range.

Parameters A and B can be omitted- current range will be displayed

Setting the acceptable illumination range.

#### **LIGHTRANGE X, A, B**

Parameter X – device number (from BLESENSOR sensors list).

Parameters A and B - limits of the acceptable illumination range.

Parameters A and B can be omitted- current range will be displayed

Setting upper and lower sensor states. When there is a changeover between the states an extra point is drawn.

## **ANGLERANGE X, A, B, C, D**

X - device number (from BLESENSOR sensors list).,

A, B – lower and upper limits for “lower” sensor state.

C, D – lower and upper limits for “upper” sensor state.

### **6.2.4 Adding BLE fuel level sensor in a manual mode, viewing added sensors list**

«**BLEFUEL**» command allows to add sensors addresses as well as to view the list of added sensors. No need to enter a colon when entering an address.

**BLEFUEL X,Y** – add address Y to cell X, where X=0..2;

**BLEFUEL X,0** – clear cell X; where X=0..2;

**BLEFUEL Y** - add address Y to the end of the list,

**BLEFUEL 0** – clear the list.

**BLEFUEL** - display the list of addresses added to the tracker.

Example of commands input:

**BLEFUEL 0,E5F2A9527B1D** – add address E5:F2:A9:52:7B:1D to cell 0;

**BLEFUEL E5F2A9527B1D** – add address E5:F2: A9:52:7B:1D to the end of the list.

#### **6.2.4.1 Data receipt from connected fuel level sensors**

**BLEFUELINFO** command allows to require the latest data, received by the tracker from the sensor.

**BLEFUELINFO X** – data display from the sensor under number X, where X – device number from the BLEFUEL sensors list.

**BLEFUELINFO** – command without parameters displays the data from all set sensors.

Answer example: BLEFUELINFO: [0]:0018E9C64433; DT:4; F:7; L:27; T:23; DTC: 0; LMT:5; R:-67

#### **Decoding of the answer for ESCORT TD-BLE:**

DT – device type

T - temperature

L – fuel level

V – current battery voltage value of the fuel level sensor

F – software version

LMT – time passed since the last message from the sensor was received

R - RSSI

#### **Decoding of the answer for DUT-E:**

DT - device type

F - software version

L - fuel level

T - temperature

DTC – failure mask. Fields of the mask are described in the sensor protocol

LMT - time passed since the last message from the sensor was received

R - RSSI

### **Decoding of the answer for GNOM:**

DT - device type

F - software version

P - pressure characteristics in the pneumatic system

T - temperature

DTC – failure mask. Fields of the mask are described in the sensor protocol

LMT – time passed since the last message from the sensor was received

R - RSSI.

## 7 Data transmission to the server from connected sensors

### 7.1 Description of ADM31 sensors parameters transmitted to the server

Data from ADM31/32 sensors is transmitted in CAN data packet together with other data in each message. There are 5 CAN fields for each sensor. The correspondence of CAN fields to the transmitted data type is given in table 3.

Table 3. Description of transmitted data from ADM31 sensors

Sensor 0	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Parameter
can1	can6	can11	can16	can21	Temperature
can2	can7	can12	can17	can22	Humidity
can3	can8	can13	can18	can23	Illumination level
can4	can9	can14	can19	can24	Battery voltage
can5	can10	can15	can20	can25	Hall sensor

Table 4. Description of transmitted data from ADM32 sensors

Sensor 0	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Parameter
can1	can6	can11	can16	can21	Angle
can4	can9	can14	can19	can24	Battery voltage

#### 7.1.1 Conversion of incoming data at the server side

Since CAN data packet is universal, calculation formulas are not applied to these fields on the servers.

To convert values to a readable format, the following calculation formulas described below should be applied to the incoming values.

To prevent values jumps when there is no communication with the sensors, it is recommended to set a range of permissible values on the software side. Or apply other filters supported by the software you use.

- **Temperature**

Use 2 formulas to calculate two ranges of incoming values:

For the range values from 0 to 32767 – apply formula  $X*0.01$

For the range values from 32768 to 65535 - apply formula  $X*0.01-655.36$

To display negative and positive values correctly use both formulas for the corresponding ranges.

Acceptable values range after formula calculation is -39...+150

-300 value (after formula calculation) is considered as an error code «no signal from sensor».

- **Humidity level**

Conversion is not needed.

Acceptable values range 0 – 100

- **illumination level**

- Shortened format (by default).

There is no need for conversion in case of using a shortened format.

Acceptable values range is 0 – 65534.

65535 value is considered as an error code «no signal from sensor».

- Full format.

When using a full format apply formula  $X*0.01$ .

Acceptable values range after calculations is 0.00 – 83866.00

42949672.95 value (after formula calculation) is considered as an error code «no signal from sensor».

Setting the format of illumination level transmission is described in clause [7.3 Selecting the transmission format of the illumination level](#).

- **Battery voltage**

Apply formula  $X*0.1$ .

Acceptable values range after calculations is 0 – 4

25.5 value (after formula calculation) is considered as an error code «no signal from sensor».

- **Hall sensor (magnetic field detector)**

Conversion is not needed.

Acceptable values range is 0 – 1.

## 7.2 Selecting data to be transmitted to the server from ADM31/32 sensors

Depending on the functionality use of the BLE sensors ADM31/32, it is possible to disable the transmission of unnecessary fields to the server. Correspondence of the fields to parameter values of **BLEPROTOCOL** command is given in table 5. If you want to transmit data from several packets, the X parameter of the **BLEPROTOCOL X** command is calculated by addition. It is possible to use any options.

Transmission of all fields are set by default.

To save the traffic activate only the transmission of necessary fields.

Table 5. Value of BLEPROTOCOL parameter

Data packet	Fields name at the server	Parameter value
All data		255
Temperature	CAN1, CAN6, CAN11, CAN16, CAN21	1
Humidity	CAN2, CAN7, CAN12, CAN17, CAN22	2
Illumination	CAN3, CAN8, CAN13, CAN18, CAN23	4
Battery voltage	CAN4, CAN9, CAN14, CAN19, CAN24	8

Hall sensor	CAN5, CAN10, CAN15, CAN20, CAN25	16
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### 7.3 Selecting the transmission format of the illumination level

To save the traffic consumption a shortened range of illumination level values is transmitted by default. In case of necessity to use full range, activate it. Setting is done by **LIGHTPROTOCOL X** command.

#### **LIGHTPROTOCOL X**

X = 0,1 – transmission format of illumination values

##### **0 – shortened value format:**

Discreetness: integer value

Values range: 0...65534.

Sensor data greater than 65534 are considered to be equal to this value.

65535 value is considered as an error code «no signal from sensor».

##### **1 – full value format**

Discreetness: two decimal places

Values range: 0.00 - 83865.60

42949672.95 value (after calculation under the formula) is considered as an error code «no signal from sensor».

## 8 Commands description

Table 6. Description of commands

	Command	Answer	Parameters	Description
1	Name X Example: Name bus8	Device Name 'X' Example: Device Name 'bus8'	X – tracker name	Set the name of the tracker. The name can contain only letters of the Latin alphabet and numbers. The name cannot exceed 10 characters in length. The tracker name is added to the alarm SMS messages
2.1	ADD ME X, Y (only via SMS) Example: ADD ME 1234 ADD ME 1234,2	PHOES (0) = (1) = (2) = (3)= Example: PHONES (0)= +7xxxxxxxxxx (1)= (2)= (3)= PHONES (0)= (1)= (2)= +7xxxxxxxxxx (3)=	X – password, by default is «0». Y=0..3 – number of the memory cell to store the number.Optional parameter.	Authorize the phone number from which the SMS was received and write it to the memory cell Y. The command is needed only to create a list of numbers for controlling the tracker via SMS.
2.2	ADD ME X,Y (only via Bluetooth и GPRS) Example: ADD ME +7xxxxxxxxxx,1	PHOES (0)= (1)= (2)= (3)= Example: PHOES (0)= (1)= +7xxxxxxxxxx (2)= (3)=	X – phone number Y=0...3 – number of the memory cell to store the number	Adding a phone number from which you plan to manage the tracker via SMS.

	Command	Answer	Parameters	Description
3	PHONES X Example: PHONES 1234	PHONES (0)= (1)= (2)= (3)= Example: PHONES (0)= (1)= +7xxxxxxxxxx (2)= (3)=	X – password, by default is «0»	Request a list of authorized phone numbers.
4	PASS X,Y Example: PASS 0,86974543	Pass=X,Y Example: Pass=86974543	X - the old password by default X=0.  Y - new password.	Change the password from the old X to the new Y. The password is a number from one to eight characters.
5	STATUS	Example: ID=1 Soft=0x1A GPS=9291 Time=11:21:39 25.02.10 Nav=0 Lat=57.2359 Lon=56.2593 Speed=0.0 SatCnt=5 Stat=0x0000	Command without parameters.	Current tracker condition. ID – the number of the tracker, Soft – the software version, GPS – the current number of the information packet, Time – current time and date according to Greenwich Mean Time Nav – coordinates validity, Lat – latitude, Lon – longitude, Speed – speed, SatCnt – number of satellites, Stat – status.

	Command	Answer	Parameters	Description
6	IMEI Example: IMEI	IMEI Example: IMEI 359587013832624	Command without parameters.	Request IMEI of the GSM module installed in the tracker. The command works 20 seconds after power on or after the tracker reboot.
7	SN X Example: SN 123456789	SN X Example: SN 123456789	X - settable tracker ID	Set the tracker ID.
8	PIN0 X Example: PIN0 1234	PIN0 X Example: PIN0 1234	X - SIM card PIN code	Set PIN code for SIM card
9	SETGPRS0 X,Y,Z Example: SETGPRS0 internet.mts.ru,mts,mts	GPRS0: pass=Z Example: GPRS: user=mts, pass=mts APN=internet.mts.ru,	APN=X, user=Y, X - access point, by default X=internet.beeline.ru; Y - login, by default Y=beeline; Z - password, by default Z=beeline.	Set APN parameters for a SIM-card. The command without parameters restores to the current GPRS settings for the SIM card.
10	SETHOST0 X,Y Example: SETHOST0 134,236,21,2,12300	HOST0=X,Y Example: HOST0=134.236.21.2:12300	X - IP-address, Y - server port. Five numbers separated by commas.	Setting IP-address and server port, which the tracker is connected to for data transmission. The command without parameters restores to the current server address and port.
11	DN0 X:Y Example: DN0 www.test.ru:1000	HOST0=X:Y Example: HOST0= www.test.ru:1000	X - server domain name, Y - server port.	Setting domain name and server port, which the tracker is connected to for data transmission. The command without parameters restores to the current server
12	PROTOCOL X			Set the data to be transmitted to the server (for more details see <a href="#">5.4 Setting data transmission</a> )

	Command	Answer	Parameters	Description
13	BMODE X		X=0 – mode "Tracker". X=1 – mode "Beacon".	Select tracker operation mode (mode of route points record).
14	ERASE FLASH	ERASE FLASH	Command without parameters.	Erase all information packets stored in memory. After executing this command, the current information packet number is reset, the tracker reboots.
15	ERASE EEPROM	ERASE EEPROM	Command without parameters.	Restore the tracker factory settings and restart the tracker.
16	PERIOD X,Y Example: PERIOD 20,120	PERIOD min=X, max=Y Example: PERIOD min=20, max=120	X - the recording period during the movement in seconds, default X=30. Y - the recording period during parking in seconds, by default Y=300. The value of X must be less than Y.	Set the recording period in the memory of information packets during driving and parking. A command without parameters returns the current settings.
17	TRACKSET X	The response displays a detailed configuration of all set parameters of track drawing	X= 0...4	Select preset of route drawing quality. For more see clause <a href="#">5.5.1 Selecting presets of route drawing quality</a>
18	InTrue X,Ymin,Ymax Example: InTrue 0,10000,60000	InTrue X,Ymin,Ymax Example: InTrue 0,10000,60000	X=0 - input number (always 0); Ymin - minimum range limit in mV; Ymax=60000 - the maximum range limit in mV (unchanged value).	Set the voltage range of the logical unit on the analog input.

	<b>Command</b>	<b>Answer</b>	<b>Parameters</b>	<b>Description</b>
19	InFalse X,Ymin,Ymax  Example: InFalse 0,0,4000	InFalse X,Ymin,Ymax  Example: InFalse 0,0,4000	X=0 - input number (always 0). Ymin - minimum range limit in mV; Ymax - maximum range limit in mV.	Set the voltage range of logical zero on the analog input.
20	InInfo X  Example: InInfo 0	example: Input 0: InTrue 8000..15000, InFalse 0..3000	X=0 - input number (always 0).	Request information about the input settings.

	Command	Answer	Parameters	Description
21	INPUT	INPUT0 = 12000	Command without parameters.	Request the current measured voltage level at the analog input (mV).
22	INSTATIC X,Y Example: INSTATIC 1,0	INSTATIC X,Y Example: INSTATIC 1,0	X=0 - input number, Y=0, 1 - inclusion by zero or one. X=255 -disabled function;	Set the input number to enable the fixation mode. A command without parameters returns the current setting. By default, no one input is set to enable the fixation mode.
23	SPEEDSTATIC X Example: SPEEDSTATIC 2	SPEEDSTATIC X Example: SPEEDSTATIC 2	X - the speed below which the fixation of coordinates takes place. X=255 - disabled function	Set the speed which reducing will initiate coordinates freezing.
24	RESET	reset...	Command without parameters.	Reboot the device.
25	UPDATE		Command without parameters.	Firmware Upgrade
26	BLEAUTOCATCH D,F,R,T	BLEAUTOCATCH is started. Time: 120 sec; Dev. type: 255; RSSI filter: 1 (-60dBm)	D – tracker type F – filter R –RSSI level T – time level	Start the search and automatic binding of all found sensors ADM31, ADM32. (detailed description in clause <a href="#">6.2.2 Adding BLE sensors in automatic mode</a> )
27	BLESENSOR X,Y	BLESENSOR:(0): D8A05B9BEF5B, (1): , (2): , (3): , (4): ,	X - cell number of sensors list Y - sensor address	Binding sensors ADM31, ADM32 to the tracker.  (for a detailed description, see clause 6.2.2)

	Command	Answer	Parameters	Description
28	BLESENSORINFO X	BLESENSORINFO: [0]:D8A05B9BEF5B; DT:1; PT:3; F:5; V:3.0; T:25.35; L:412.80; H:35; R:-51; LMT:6; S:0;	X=0..4 - sensor number (from the sensors list BLESENSOR)	Request of readings from binded sensors ADM31/32 (detailed description see in clause 6.2.3.1)
29	TEMPRANGE X,Y,A,B		X – sensor number from the sensors list BLESENSOR. Y-temperature sensor number (only 0). A и B – range limits of acceptable temperature.	Setting acceptable range for temperature sensor
30	LIGHTRANGE X,A,B		X - sensor number from the sensors list BLESENSOR. A и B -range limits of acceptable illumination	Setting acceptable range for illumination sensor
31	HUMIDRANGE X,A,B		X - sensor number from the sensors list BLESENSOR. A и B - range limits of acceptable humidity	Setting acceptable range for humidity sensor

	Command	Answer	Parameters	Description
32	ANGLERANGE X,A,B,C,D		X - sensor number from the sensors list BLESENSOR A,B – lower and upper limits for “low” sensor state. C,D – lower and upper limits for “upper” sensor state.	Setting ranges for lower and upper state of the sensor.
33	ALARMPERIOD X		X – time in seconds	Setting the time of information packets record into the memory at an alarm mode.
34	BLEFUEL X,Y		X – cell number of sensors list Y – sensor address	Binding BLE fuel level sensor to the tracker. (for more details see clause 6.2.4 Adding BLE fuel level sensor in a manual mode and viewing added sensors list)
35	BLEFUELINFO X		X – cell number from the sensors list BLEFUEL	Data request from binded fuel level sensors (for more details see clause 6.2 4. 1 Data receipt from connected fuel level sensors)
36	BLEPROTOCOL X		X – number detecting the set of data to be transmitted	Setting data to be transmitted from sensors ADM31/32. (for more information see clause 7.2 . “Selecting data to be transmitted to the server from ADM31/32 sensors”

	Command	Answer	Parameters	Description
37	LIGHTPROTOCOL X		X=0 – shortened protocol X=1 – full protocol	Select the format of illumination level transmission.

## 9 Upgrading tracker software

The tracker software (firmware) can be updated via the Bluetooth radio channel using a configurator program or via a GPRS channel.

### 9.1 Updating the tracker software via the ADM Configurator

The configurator program, if the computer has access to the Internet, checks the current firmware version on the update server, and, if necessary, downloads the firmware file.

**To update the firmware, do the following:**

1. establish connection between the ADM007 BLE tracker and the ADM Configurator program using the procedure described in 5.1 "Connecting to the Configurator";
2. if ADM Configurator detects the firmware that is more updated than the one installed in the tracker then it will inform about this - the notification will be displayed in the lower left corner;
3. click "Update available";
4. In the opened "Notifications" tab, click "Update";
5. after the update, the tracker will reboot and become available for configuration.

**ATTENTION!** Do not switch off the tracker during the firmware upgrade process until the tracker is detected by the setup program. Otherwise, it is possible to damage the software, which must be restored in the service center of the manufacturer

### 9.2 Updating the tracker software via the configurator using the firmware file

**The firmware file must be requested from the technical support.**

To update the firmware via Bluetooth using the firmware file, do the following:

- 1.
2. establish connection between the ADM007 BLE tracker and the ADM Configurator program using the procedure described in section 5.1 "Connecting to the Configurator";
3. open the "Settings" section in the "Device" tab, click - "Flash file";
4. click Update in the pop-up window;
5. drag the firmware file to the appropriate field in the configurator window;
6. after updating the firmware, the tracker will reboot and become available for operation.

**WARNING!** Don't switch the tracker power off when upgrading the tracker firmware until the tracker is detected by the setting program. Otherwise there is a risk of damaging the software whose recovery can be performed only in the manufacturer's office.

### 9.3 Updating the tracker software via GPRS

To update the tracker software via GPRS, install the active SIM card in the tracker, enter the APN, user, pass of the cellular operator. Otherwise, the tracker will be in the firmware download mode from the update server until all connection attempts are exhausted. The update process starts after the tracker receives the "**UPDATE**" command via one of the possible channels: Bluetooth, GPRS, SMS. After receiving the "**UPDATE**" command the tracker connects to the update server and downloads the current firmware. After a successful upgrade, the tracker switches to the basic mode of operation with the access point settings and server addresses that were installed before the update. The remaining settings after the update should be checked and, if necessary, reinstalled. Depending on the status of the GSM network, the upgrade process takes an average of 2 to 10 minutes. If there is no possibility to download the update, the tracker will return to work with the available software.

## 10 Handling and transport regulations

Trackers should be stored in a warehouse at a temperature of  $+5^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$  and relative humidity at most 85 %.

After trackers' transportation in sub-zero temperatures they should be stored at room temperature within 24 hours.

## 11 Warranty obligations

The manufacturer guarantees the tracker proper function within 12 months from the day of its sale if consumer meets all the requirements and follows all the rules of transportation, storage, installation and handling.

The warranty does not cover:

- a tracker with mechanical damages and defects (cracks and chips, dents, signs of impacts, etc.) caused by consumer as a result of handling, storage and transportation rules violation. When there are signs of oxidation or other proofs of liquid penetration in the device housing;
- a tracker without housing;
- a tracker with signs of repair performed beyond the manufacturer's service center;
- a tracker with signs of electrical and/or other damages caused as a result of unacceptable changes in external power network parameters or improper use of the tracker;
- a tracker disabled because of an unauthorized software upgrade.

The device software is licensed, terms related to the manufacturer's limited liability in the framework of the License Agreement are provided at the web site:

[https://neomatica.com/upload/docs/license\\_en.pdf](https://neomatica.com/upload/docs/license_en.pdf)

## 12 Marking and packaging

Marking is placed on the tracker housing. The trackers are packed in individual boxes, which protect them during transportation and storage. Multipack is possible.

## 13 Disposal

Device recycling is performed according to national and local norms and requirements.

## 14 Scope of supply

Table 7. Scope of supply

Device name	Quantity	Serial number	Comments
Tracker ADM007 BLE			
Datasheet			

## 15 Acceptance certificate

Trackers ADM007 BLE GLONASS/GPS-GSM/GPRS in quantity of \_\_\_\_\_ pcs. correspond to SHAIF.464512.001 and are valid for use.

Manufacture date:



*Manufacturer: Neomatica LLC  
24a Malkova, office 7, Perm 614087, Russia  
Phone: +7 (342) 2-111-500 (ext. 42).  
E-mail: [sales@neomatica.com](mailto:sales@neomatica.com)  
Web-site: <http://neomatica.com>*

## Appendix A. Description of the field bits «STATUS»

Table A.1. Description of the field bits «Status»

Bits	Field description «Status»	Mask value
0	Symptom reload tracker	1
1	-	2
2	No connection to the server	4
3	-	8
4	-	16
5	Sign of invalidity of coordinates (validity)	32
6	Coordinates are fixed in the absence of movement	64
7	-	128
8	-	256
9	Satellite signal distortion is detected	512
10	Satellite jamming is detected	1024
11	-	2048
12	-	4096
13	-	8192
14	Time is synchronized via GPRS	16384
15	-	32768

## Appendix B. Description of transmitted parameters in Wialon

Table B.1. Description of transmitted parameters in Wialon system

Parameter	Description
acc	Current point acceleration module, km/h/s
sats_glonass	Number of GLONASS satellites involved in fixing a navigation problem
sats_gps	Number of GPS satellites involved in fixing a navigation problem
hdop	Precision reduction on a horizontal plane
pwr_ext	External power voltage value, mV
pwr_int	Voltage in built-in battery, mB
adc1	Analogue input voltage value, A_IN0, mB
adc2	GSM signal level, %
adc3	
adc4	
adc5	
adc6	
fuel1	Fuel level value in sensor №0
fuel2	Fuel level value in sensor №1
fuel3	Fuel level value in sensor №2
temp1	temperature level value in sensor №0
temp2	temperature level value in sensor №1
temp3	temperature level value in sensor №2
I/O	Value of device status
in1	
in2	
in3	
in4	
in5	
in6	
in7	
in8	
in9	Sign of tracker restart
in10	
in11	No connection with server
in12	
in13	
in14	Sign of invalidity of coordinates
in15	Coordinates are fixed in the absence of movement

in16	
in17	
in18	Satellite signal distortion is detected
in19	Satellite jamming is detected
in20	
in21	
in22	
in23	Time is synchronized according to GSM
in24	
Can1-Can25	Fields are used to transmit data from BLE sensors. Fields description
Can26	Battery voltage, BLE fuel level sensor 0
Can27	Battery voltage, BLE fuel level sensor 1
Can28	Battery voltage, BLE fuel level sensor 2