Telematic terminal ADM300 GLONASS/GPS-GSM/GPRS

Operation manual

Edition 1.7

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This Operation manual relates to the terminal ADM300 (hereinafter referred as terminal) 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 terminal's proper work can be guaranteed if it is installed and set by qualified professionals. To use the terminal 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 Application and Operation principles

The terminal (picture1) is designed for being installed on a vehicle as an extra device identifying the vehicle location, speed, travel direction.

In addition, it records a number of vehicle parameters such as: analogue and discrete inputs condition and readings from fuel level sensors. Similarly, the terminal allows managing external equipment by means of a discrete output and with commands received via GPRS or SMS. All the events and conditions recorded by the terminal are stored in its energy-independent memory.

The accumulated data are transmitted through a mobile operator network of GSM 850/900/1800/1900 standard by means of GPRS batch data transmission to a dedicated server with static IP-address or domain name, which these data might be received from through the Internet for further analysis and processing in the operator's console.

The terminal equally allows installing voice-connection. When there is an incoming call, the terminal answers it automatically or by pressing the headset button (according to the settings). In this way, it installs voice-connection and allows talking to the driver. To implement this feature it is necessary to switch a headset or a microphone with a loudspeaker to the terminal.

The terminal might be set in any appropriate method: locally (via USB interface using the configuration program) or remotely (by means of commands sending via SMS or GPRS).

To secure data integrity while switching the power off and losing the GSM signal the terminal is equipped with the energy-independent memory. For the autonomous work the device is equipped with an inner battery. The working time with the completely charged battery is 4 hours in the full-featured mode and 1 extra hour in the data saving mode. The working time may change depending on the GSM connection condition. Data transmission is possible only if there is a mobile connection signal of the GSM 850/900/1800/1900 standard supporting the batch data transmission (GPRS).

Picture1 — General view of the terminal

The vehicle travel route is described in the form of separate points in time where all the information coming to the terminal from inner sensors and extra equipment is recorded. The route point is saved 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 and/or discrete inputs. In this way, route points might be saved 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 terminal 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 terminal 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 terminal 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 terminal's energy-independent memory and transmitted as soon as the connection is restored.

Data transmitted by the terminal:

- 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;
- values from pulse inputs;
- data about events occurred;
- data from fuel level sensors connected to the RS-485 interface;
- discrete outputs condition;
- device condition (Appendix A).

If allowed by settings, when there is an incoming call, the terminal installs voice connection. During the voice connection data transmission via GPRS is paused and after the first is finished, the latter will be reinitiated.

2 Technical features

— GLONASS/GPS receiver:

chipset: MT3333 (MediaTek);

frequency band: GLONASS – L1 (CT-code), GPS - L1 (C/A code);

sensitivity in cold start/tracking: -148 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+1 SIMchip (optional)

— Number of analogue inputs: 2

— Number of discrete (pulse) inputs: 2

— Number of “open collector” outputs: 1

— RS-485 interface: 1.

— Acceleration meter type: digital, three-axis

— Push-to-talk plug JACK 3.5 mm: 2.

— Battery: Li-Pol 1000mA/h 3.7 V (3.7 W/h).

— Memory card slot MicroSD: 1 (optional).

— Number of route records saved:

when using internal memory: 30000;

when using memory card MicroSD: 8000000 for each GB of memory

— PC connection interface: USB.

— Operation temperature:

without battery: -40..+85°C.

With battery: -40..+60°C.

— Power votage: +9..+40 V of unregulated direct current

— Current consumption (at the supply voltage 12 V):

maximum: 300 mA.

medium: 100 mA.

— Dimensions: 90x60x32 mm.

—Weight: not more than 125 g

3 Design

The terminal consists of a microcontroller, energy-independent memory, GLONASS/GPS-modules, a GSM-module, a digital interface RS-485, analogue (discrete) inputs, pulse (discrete) inputs, a discrete output, an acceleration meter, a memory card interface (optional).

GLONASS/GPS module is used for receiving signals from satellites of GLONASS/GPS systems and receiver's antenna positioning (latitude, longitude and altitude) as well the exact GMT time, travel speed and direction.

GSM/GPRS module installed in the terminal fulfills the following functions:

- setting and maintaining the outbound TCP/IP connection (receiving and transmitting data in GPRS mode);
- SMS messages receiving and sending;
- Incoming voice call receiving and voice connection installing.

For data transmission GSM/GPRS module installs and maintains connection to the server and from time to time transmits information packages. Time of data transmission to the server during the vehicle parking and movement is different and might be changed by the user.

For displaying the working condition the terminal has got 3 LED indicators: red, green and blue.

The red LED indicator displays presence/absence of the terminal's external power supply. When the external power supply is there, the light is always on.

The green LED indicator displays the GLONASS/GPS module condition:

– blinks four times: GLONASS/GPS module is switched off because of the low battery and the external power supply cutoff;

– blinks three times: GLONASS/GPS module is switched on but no data have been received from it yet;

– blinks twice: data from GLONASS/GPS module have been received but coordinates are not valid;

– blinks once: GLONASS/GPS module has defined the time and the valid coordinates.

Blue LED indicator displays the GSM/GPRS module condition:

— blinks four times: GSM module is switched off because of the low battery and the external power supply cutoff;

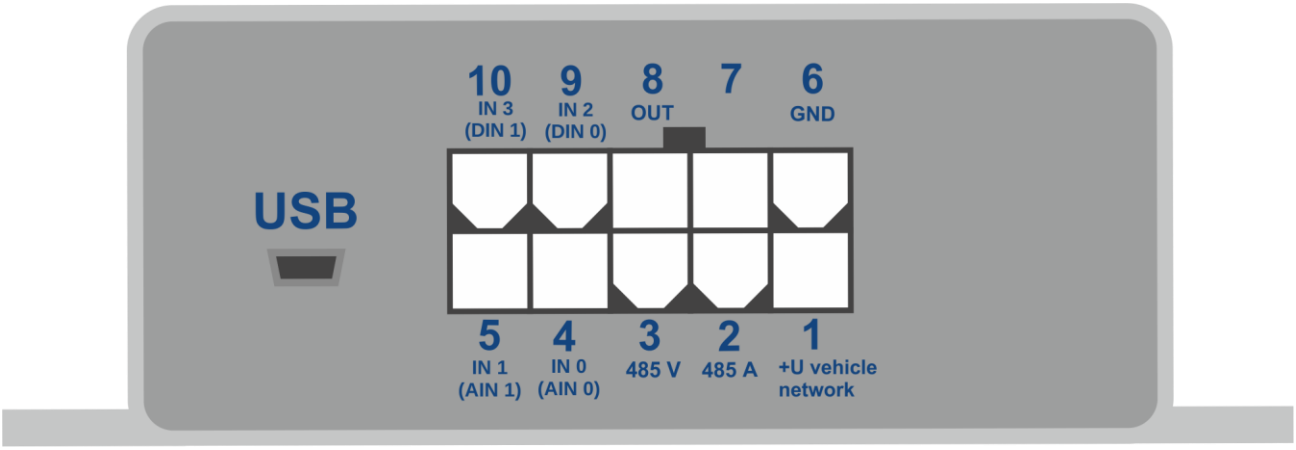
— blinks three times: GSM module is switched off for reinitialization;

— blinks twice: GSM module is switched on but there is no connection to the server;

— blinks once: the terminal has installed connection to the server and is successfully transmitting information packets;

— is always lighting up and switching off for short moments: SIM-card is not available.

See the contacts arrangement for MF-10F plug of the terminal at the picture 2.

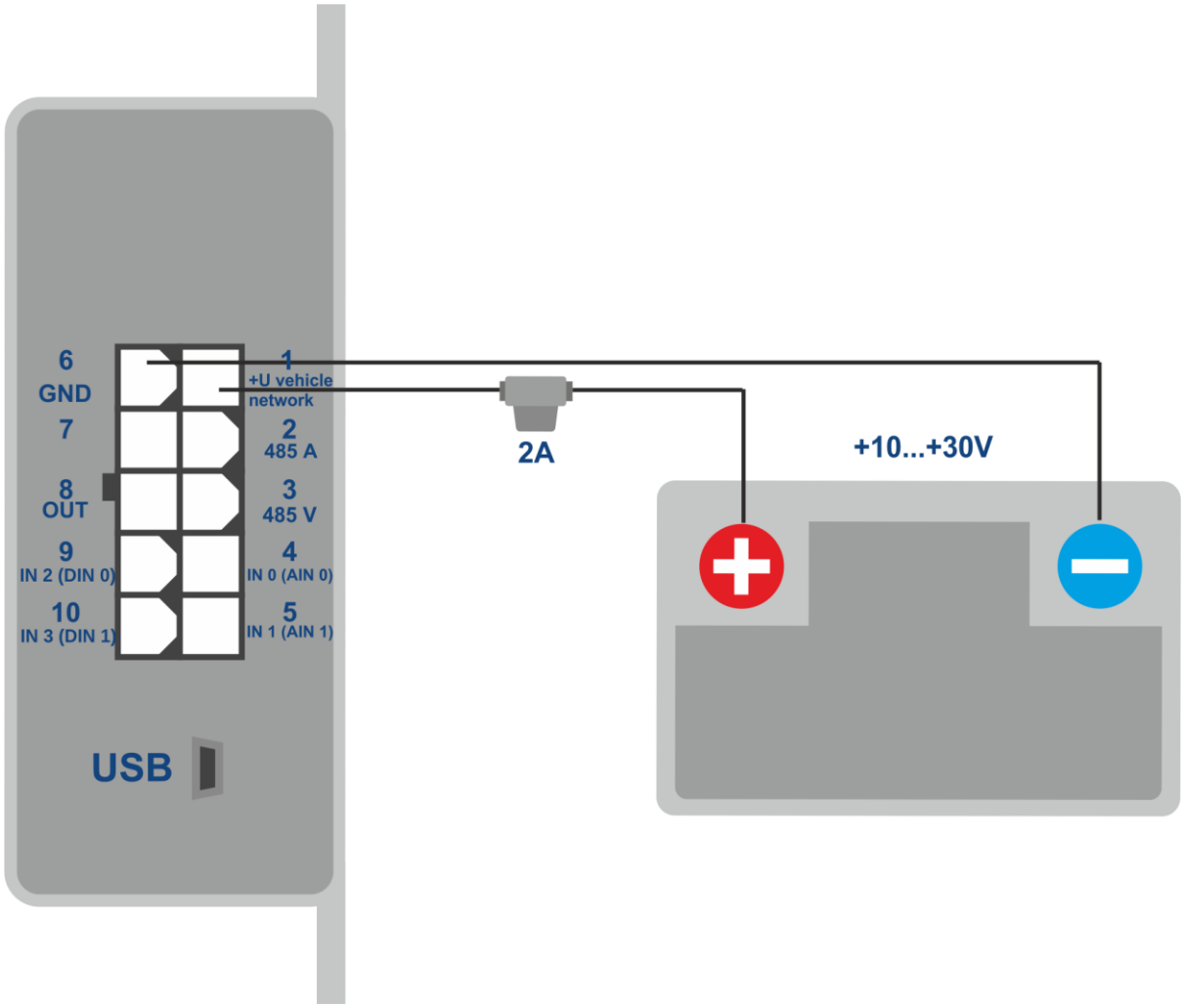


Picture 2 — Contacts arrangement

4 Installation procedure

The internal GLONASS/GPS and GSM antennas are used in the terminal, 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's metallic housing, since this may affect the terminal's work quality.

Connect the MF-10F plug cables to the power supply (see the picture 3). The plug contact 1 is connected to the positive voltage of the vehicle network, the plug contact 6 – to the negative voltage of the vehicle network (housing, GND). When connecting to the vehicle network, install a 2A fusible between the positive ground of the vehicle network and the terminal's 1 contact plug (see the picture 3). Install the fusible as close as possible to the vehicle network entry because this is very important when connecting to the battery terminal.



Picture 3 - Typical connection pattern for the terminal's power supply

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

When the power supply is properly connected, the green and blue LED will have been blinking many times during five seconds. When there are valid data from satellites and the connection to the server is installed, the terminal will identify time, coordinates and transmit information packets to the server, which will be announced by a single green and blue LED blinking.

It is strictly recommended to carry out a preliminary check of the terminal's operation condition under laboratory conditions using instead of the vehicle network a power source ensuring the output voltage from 10V to 40V of the direct current and at least the 1A current.

5 Terminal's setting

The terminal's handling is performed by means of commands sent via SMS, GPRS or USB.

General rules for writing commands:

- only Latin alphabetic characters and punctuation may be used in commands;
- character case does not matter;
- commands transmission syntax is the same for SMS, GPRS and USB;

All 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 whose parameters are separated by a colon.

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

If the command parameters extend beyond the acceptable range, the terminal changes them to the nearest acceptable values. If it is not possible to change parameters or parameters are not enough, the terminal will answer with an error message. The command without parameters will restore to the current settings. To set the terminal via USB it is necessary to install the ADMConfigurator program available at the website http://en.neomatica.ru

To handle the terminal via SMS it is necessary to send the SMS command «**ADD ME 0**» to the SIM-card number installed in the terminal, where 0 is the default password. The phone number, which such a command will be sent from, will have been authorized in the terminal. To set a terminal, which has got a password established by «**PASS**» command, via USB, it is necessary to get authorized by the «**USB X**» command, where X is the current password. The «**USB X**» command might be sent by the “commands” tab of the «ADMConfigurator» program. The password might be inserted in the password input window on the tab «___». If the terminal works with a default password (“0”), «**USB 0**» command insertion is not required. For configuring via GPRS, no authorization is needed.

5.1 Server connection settings

Set APN parameters for the selected mobile operators by the «**SETGPRS0**» command for SIM card and «**SETGPRS1**» for SIM-chip.

Set the IP-address and the server port (host) by the «**SETHOST0**» command or «**DN0**».

Identify the data set sent by the terminal to the server by the «**PROTOCOL**» command.

5.2 Data transmission settings

Navigation data and the data collected from different sensors, which are sent from the terminal to the server, are divided into blocks. Depending on the functions used the set of transmitted data is defined by the **«PROTOCOL»** command**.**

Data block compliance with the command parameters values are provided below in the Table 1. If it is necessary to transmit data from several blocks, **«PROTOCOL»** command parameter is calculated based on addition. It is possible to use any variants.

For saving traffic it is recommended to activate only necessary data blocks.

For example:

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

basic data(0)+analogue inputs(8)+outputs, events as per inputs(4)=PROTOCOL 12

basic data(0)+pulse inputs(16)+odometer values(128)=PROTOCOL 144

Table 1. Basic parameters values for PROTOCOL command

Data block name		**Parameter value**
Basic data	NAVIGATION DATA	0
Outputs, events per inputs	OUTS	4
Analogue inputs	IN_A	8
Pulse inputs	IN_D	16
Fuel level sensors	FUEL	32
CAN	CAN	64
Odometer value	ODOMETR	128

5.3 Coordinates freezing during a 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 there is no vibration (installed by default), or when the discrete level is changed in the analogue input (setting is needed).

The acceleration meter measures the current level of vibration (accelerations sum in three axis). If the vibration level below the threshold continues more than a minute and half, the terminal records the last valid coordinates received from GLONASS/GPS module and transmits them to the server in all further packets. When the vibration level threshold increases more than by 5 seconds, the coordinates freezing mode is deactivated, and the valid coordinates received from GLONASS/GPS module are transmitted. The vibration level threshold is installed by the «**MAXACC**» command. This mode activation is performed by the INSTATIC 15,1 command.

To enable the freezing coordinates function when the vehicle ignition is switched off, it is necessary to connect to the analogue input a circuit being under voltage when the ignition is on. This mode activation and input selection are performed by the «**INSTATIC**» command. For the analogue input used it is necessary to set values of the logical unit «**INTRUE**» and the logic zero

«**INFALSE**». In this way, when the ignition is off, an event will be formed in the input and the coordinates freezing will be initiated.

Swithing coordinates freezing on and off during short-term stops is performed by the «**PSTATIC**» command. This method does not require extra signal connection to the terminal but does not exclude a slight coordinates dispersion in adverse conditions for receiving signals from satellites.

5.4 Using the microSD memory card as a “black box”

The terminal allows using the microSD memory card as a “black box” for saving data transmitted to the telematic server. For this, it is necessary to put the memory card in the holder and send the «**SDLOG**» command. After this, the terminal will be rebooted. It is possible to save 8 millions events per each 1 GB of the card. Therefore, it alllows saving almost an unlimited route. The procedure of data extraction to the server is feasible depending on time and relevance. The procedure is set by the «**SERIAL»** command.

6. Extra equipment connection

6.1 Analogue inputs

Analogue inputs IN0(AIN0), IN1(AIN1) might be used for analogue sensors connection and voltage level measuring.

Each analogue input might be interpreted as a discrete one.

Voltage measurement range: 0..36,3 V

Discreteness (sensitivity): 35 mV

The minimum input resistance: 110 kOhm

It is prohibited to supply voltage to the input if it exceeds the upper measurement range threshold more than by 20%.

The current voltage value in the analogue input is displayed in response to the «**INPUT**» command.

When it is necessary to smooth the measured voltage fluctuations, it is possible to set the time of readings averaging by the «**INFILTER»** command.

When there is a need for recording the fact of a certain voltage presence, for example, in the ignition activation circuit, it might be necessary to set for the selected analogue input voltage levels for the logical “0” by the «**INFALSE**» command and for the logical “1” by the «**INTRUE**» command.

Commands description:

INFALSE IN,X0,Y0

IN – number of the analogue input (0 or 1)

X0 – the lower logical 0 range threshold

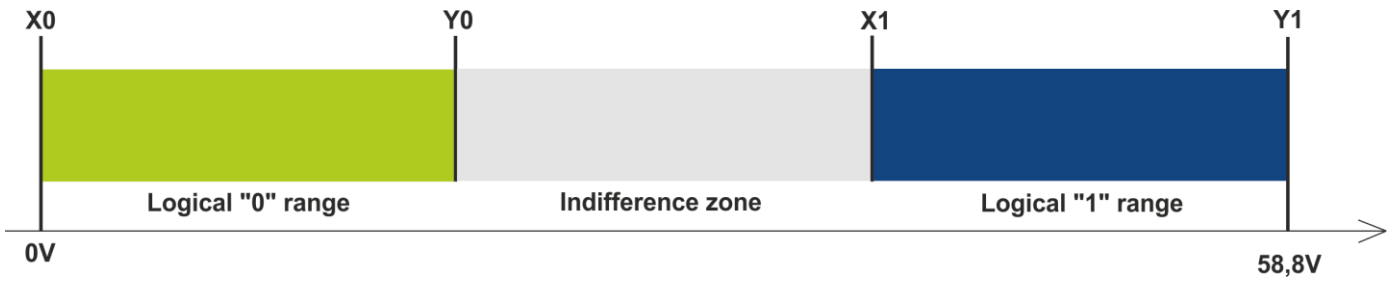
Y0 – the upper logical 0 range threshold

INTRUE IN,X1,Y1

IN – number of the analogue input (0 or 1)

X1 – the lower logical 1 range threshold

Y1 – the upper logical 0 range threshold



Picture 4 — Discrete states ranges

If the voltage level is in the indifference zone, the previous discrete state will be saved until the level is beyond the indifference zone.

The measured voltage levels values are registered by the terminal and transmitted to the server in the data block IN_A with a common periodicity.

When the discrete state is changed, an extraordinary packet is sent, and the discrete state is transmitted in the OUTS data block.

It is necessary to enable the required data blocks transmission with the «**PROTOCOL»** command.

6.2 Discrete (pulse) inputs

Inputs IN2(DIN0), IN3(DIN1) are used for connecting frequency sensors, flowmeters, including differential ones, to the terminal. These inputs might be set as discrete inputs with an inner pull-up to the plus.

Discrete (pulse) inputs operation mode is set by the «**IMPULSE X,Y»** command

X – DIN0 input mode, Y – DIN1 input mode

Examples:

IMPULSE 0,0 – pulse inputs in the “Frequency meter” mode

IMPULSE 1,1 – pulse inputs in the “Flowmeter” mode

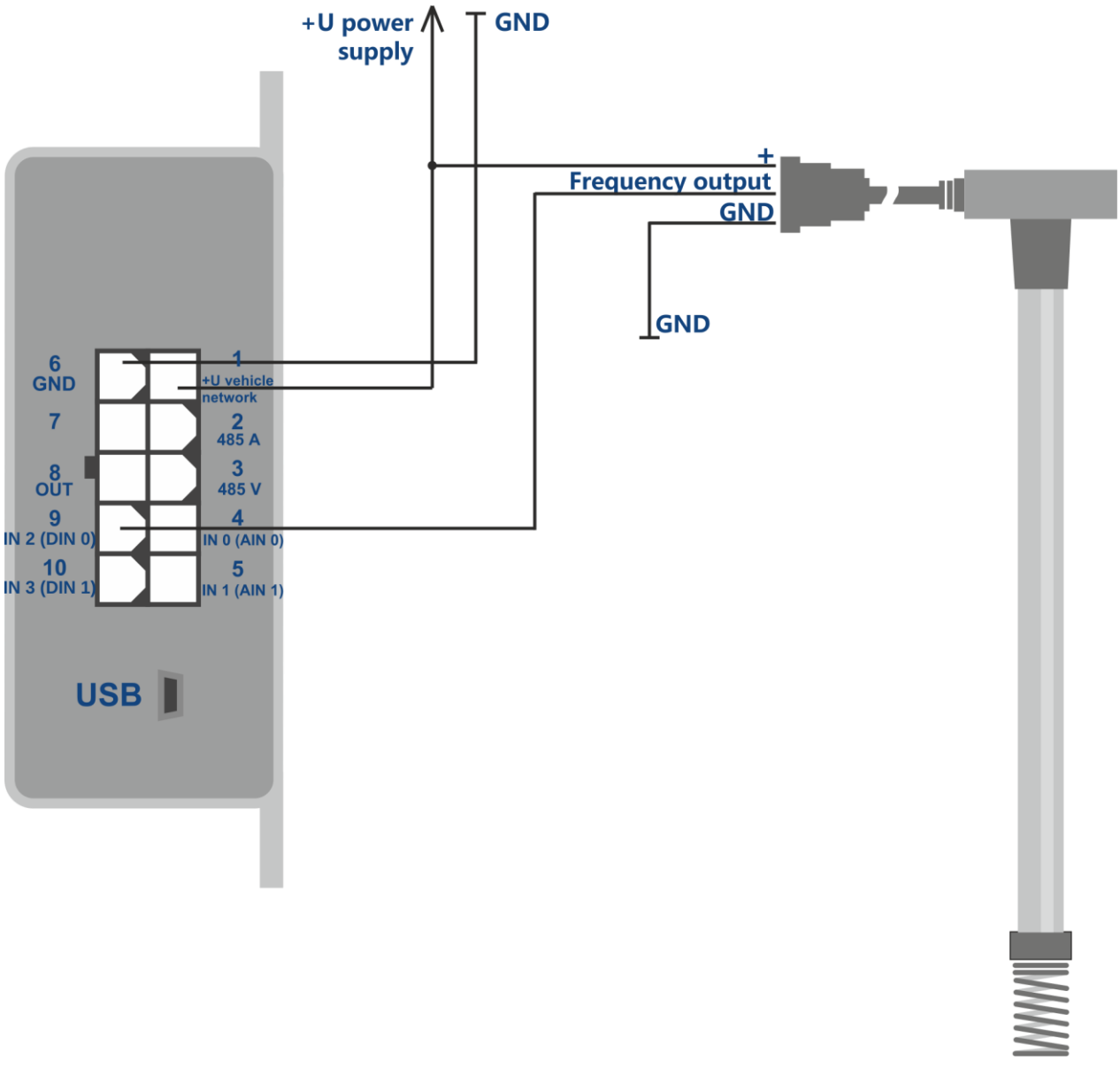
IMPULSE 1,2 – pulse inputs in the “Differential flowmeter” mode

IMPULSE 3,3 – pulse inputs in the “Discrete input” mode

«Frequency meter», «Flowmeter» and «Discrete input» modes might be chosen in any combination. The «Differential flowmeter» mode works with both inputs. To transmit data from discrete (pulse) inputs to the srerver it is necessary to activate the «IN_D» data block with the «**PROTOCOL**» command. Depending on the operation mode selected, the response to the «**INPUT**» command will contain frequency, flowmeter accumulated values or current state of the discrete input.

6.2.1 «Frequency meter» mode

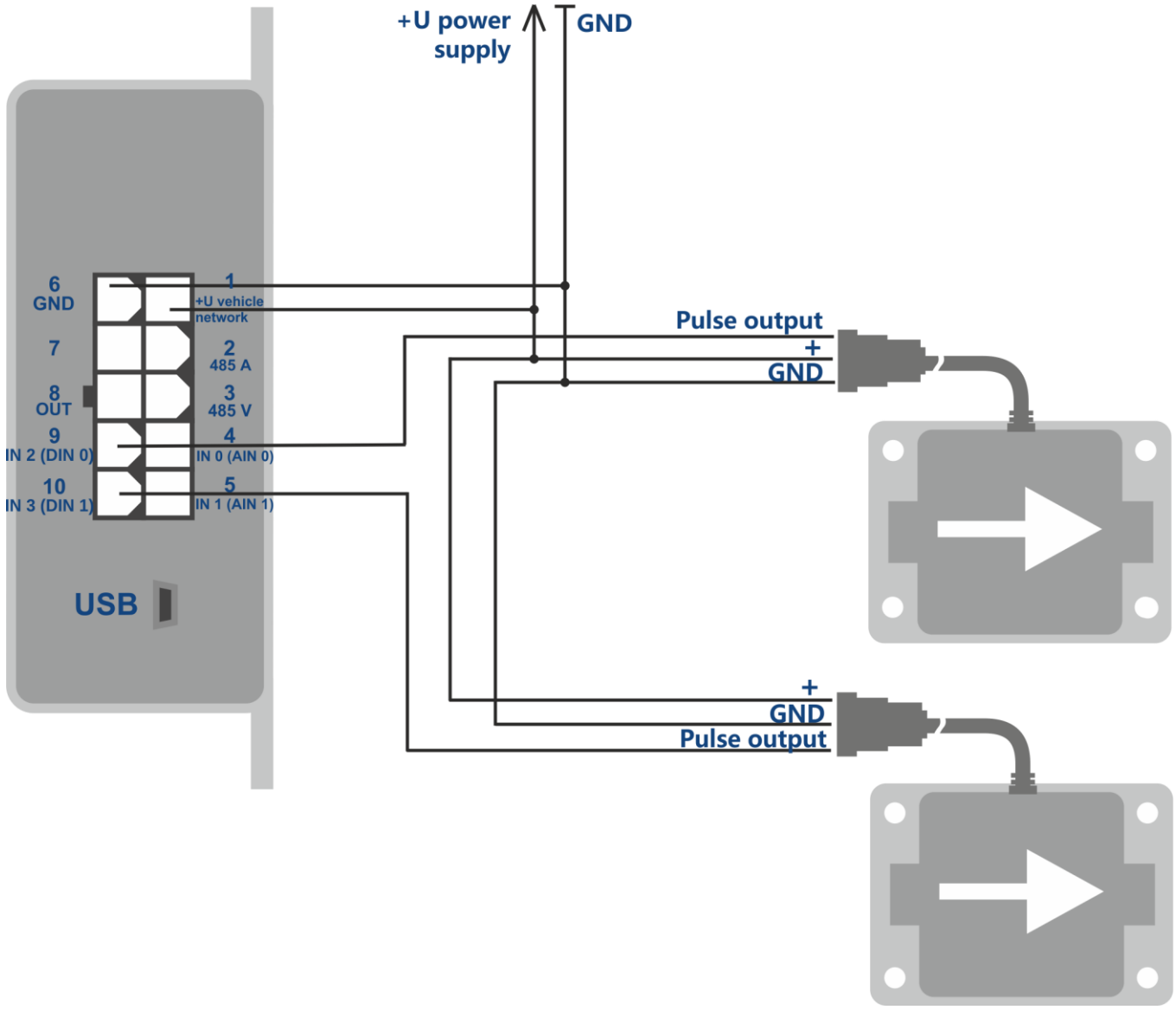
The «Frequency meter» mode allows measuring the current signal frequency based on frequency output sensors used during connection.



Picture 5 — Connection layout for fuel level frequency output sensor

6.2.2 «Flowmeter» mode

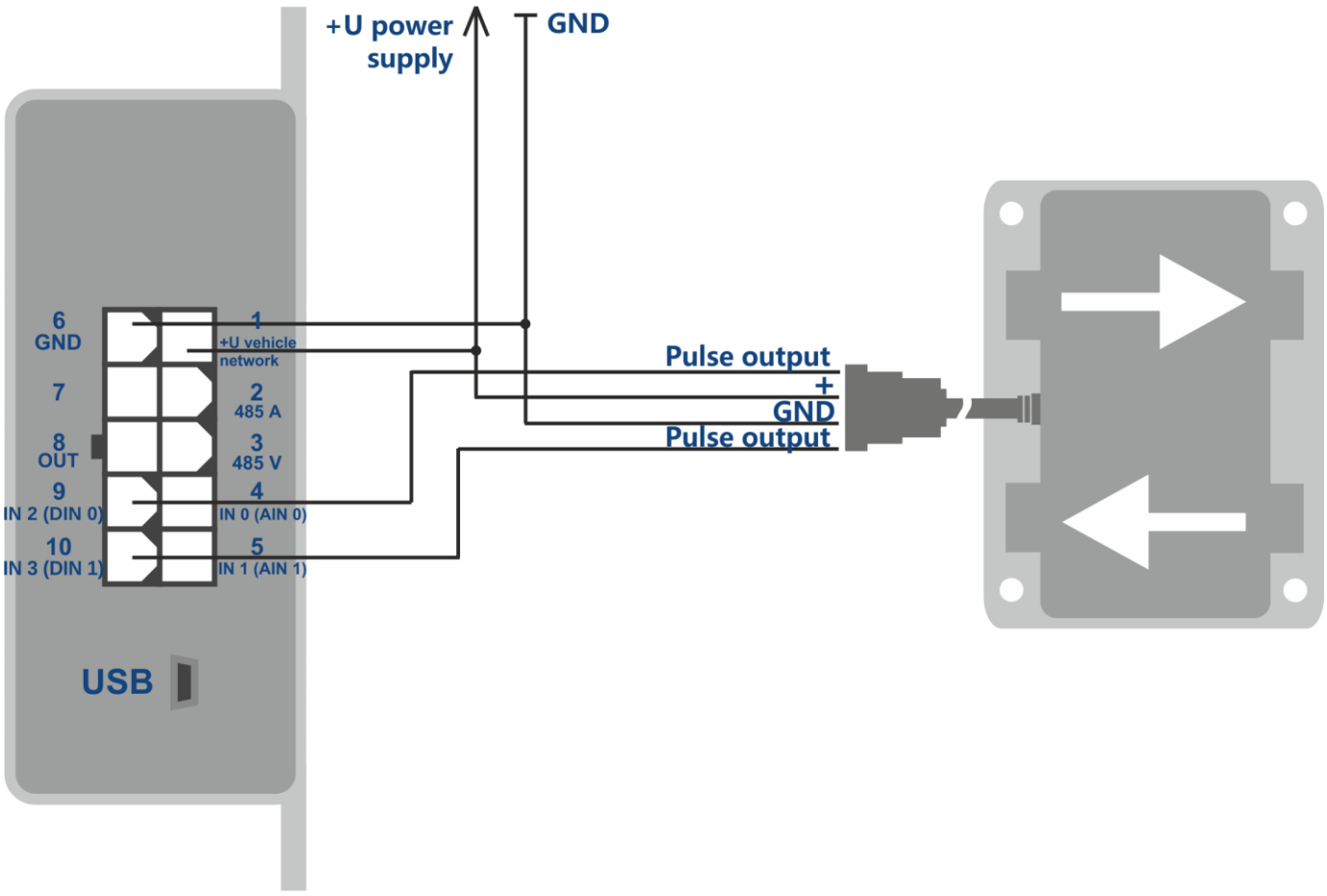
«Flowmeter» mode allows counting pulses and in the meantime saving data in the energy-independent memory.



Picture 6 — Connection layout for two fuel direct supply flowmeters

6.2.3 «Differential flowmeter» mode

Differential mode is used when connecting two flowmeters installed in direct and reverse fuel supply line. The direct supply flowmeter should be connected to the input DIN0, and the reverse supply flowmeter – to the input DIN1. Calculation is made according to the formula DIN0 = DIN0 - DIN1 (the difference is transmitted to the server instead of DIN0). DIN1 is transmitted without change.

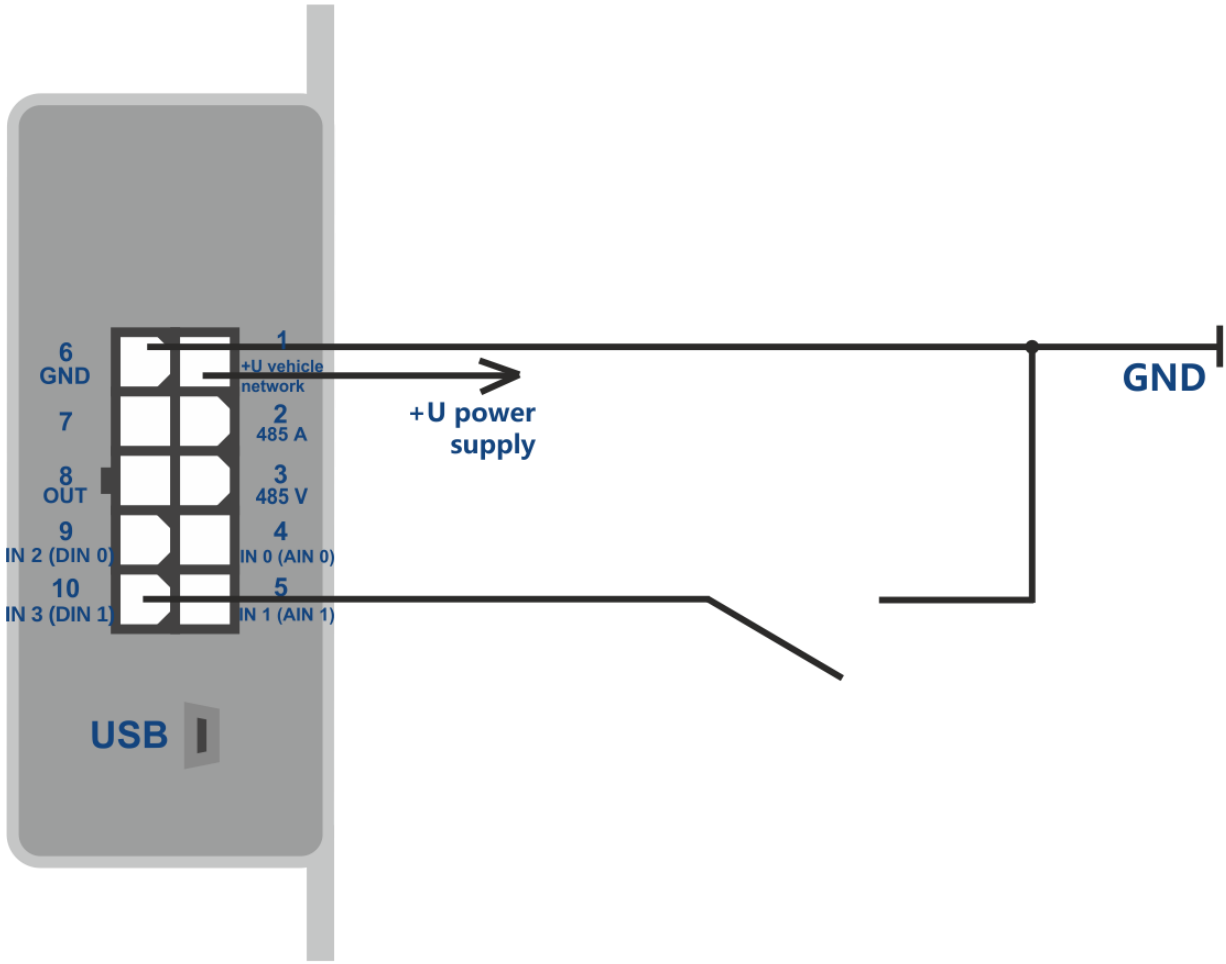


Picture 7 - Connection layout for a differential flowmeter

6.2.4 Discrete input

The «discrete input» might be used to control condition of equipment having the “open collector” type output, or to control condition of equipment switched on and off according to the ground.

Discrete inputs have an inner pull-up to the plus. When connecting the discrete input to the variable voltage circuit, the logical “0” level will be defined based on voltage fewer than 1 V, and the logical “1” level – based on the voltage greater than 5 V. When connecting to the circuit having both open or close circuit to ground states, the logical “1” is transmitted during the open circuit state (in a disconnected condition), the logical “0” - during the close to ground state (vehicle network minus).



Picture 8 - Connection layout for a limit switch

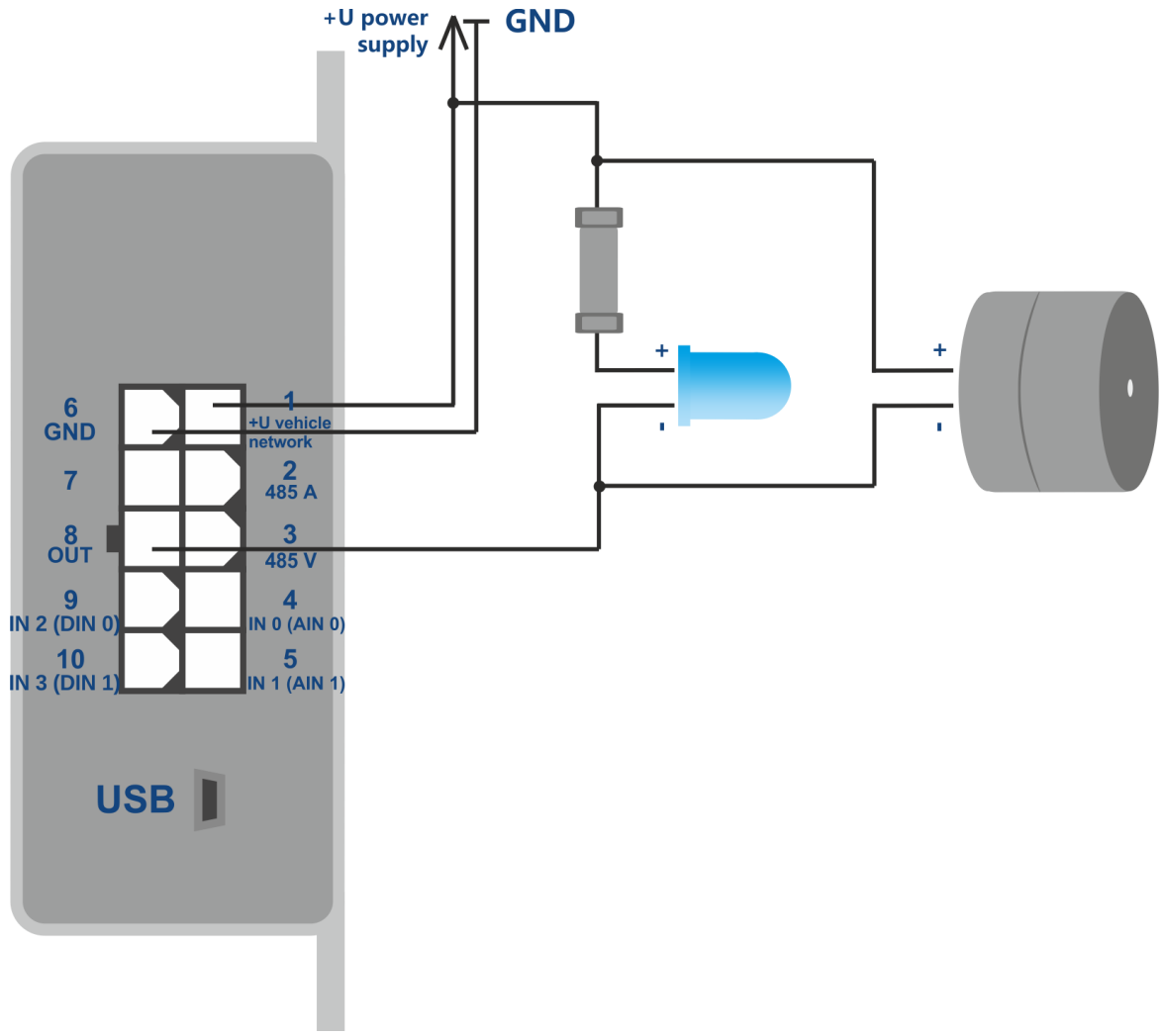
6.3 Discrete output

Output type – open collector

Maximum voltage – 40 V

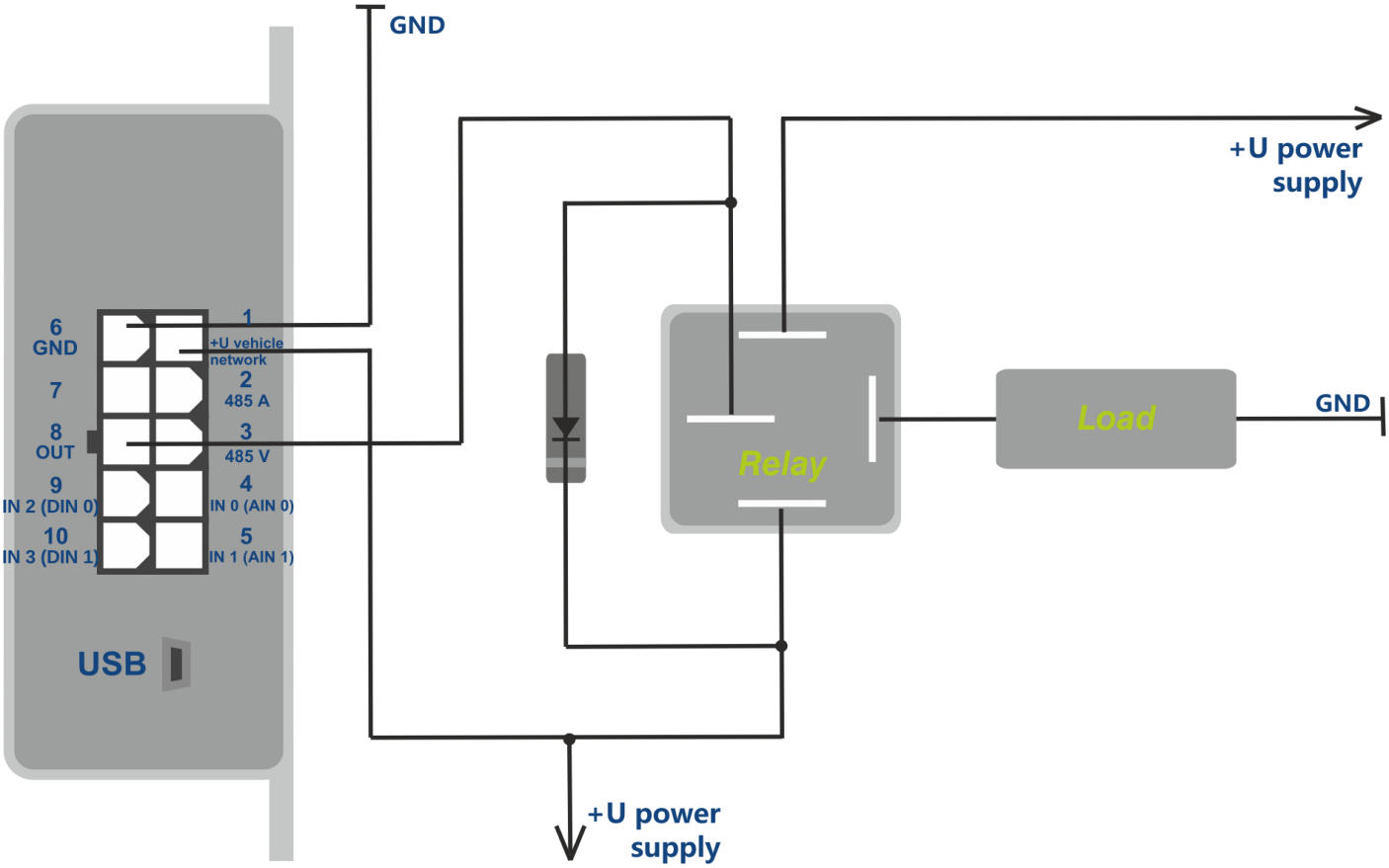
Maximum commutated current - 100 mA.

Discrete output (OUT) allows handling extra equipment. When switched on, the output is connected to the minus of the terminal external power supply, and the connection should be performed according to the picture 9.



Picture 9 — Connection layout for loading with current consumption not exceeding 100 mA

It is allowed to connect devices with the maximum current consumption not exceeding 100mA, otherwise there is a risk to damage the terminal. When a more powerful load commutation is needed, it is necessary to use a relay.



Picture 10 — Connection layout for load with consumption current exceeding 100 mA

To prevent the terminal's exposure to self-induction pulses, which appear after switching off the inductive load, including the relay coil, it is necessary to connect a diode parallelly to the relay coil in the opposite direction.

It is possible to control the output condition with the «**OUTPUT X»** command.

X=1 – switch on (close the output to ground),

X=0 – switch off (open the output to ground).

Over-speed and over-acceleration alarm connection

To enhance driving safety, it is possible to use the terminal output for connecting a light and a sound alarm, which work off during an over-speed, a rapid acceleration and braking.

With the «**SPEEDALARM»** command set the speed value, whose violation should be notified to the driver.

With the «**ACCELALARM**» command set the acceleration and braking values, whose violation should be notified to the driver.

6.4 RS-485 Interface

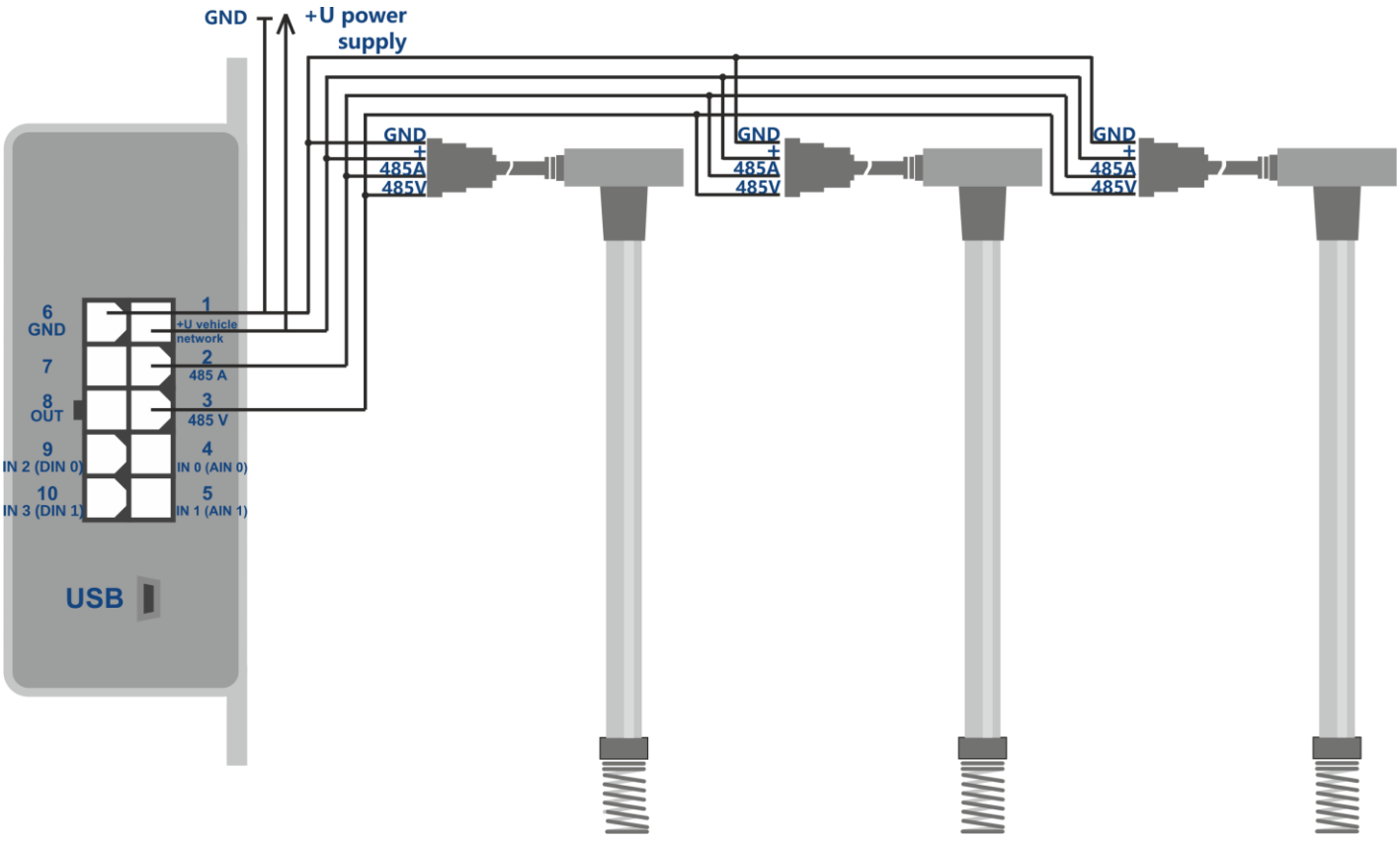
6.4.1 Working with a digital fuel level sensor

The terminal allows a simultaneous connection of three fuel level sensors to the RS-485 bus. The terminal interrogates sensors one by one and transmits fuel level and temperature values in the “FUEL” data block.

Before connecting to the terminal, it is necessary to set the sensors:

- set the network address (addresses 0,1,2 will be interrogated by the terminal by default);
- select the interface speed;
- switch off the automatic data output.

Connect sensors to the contacts 2,3 of the MF-10F plug (see the picture 11). It is necessary to activate the “FUEL” data block with the PROTOCOL command. The current fuel level value is displayed in the response to the «**FUEL**» command. If necessary, the addresses of the sensors interrogated might be changed by the LLS485 X,Y,Z command.

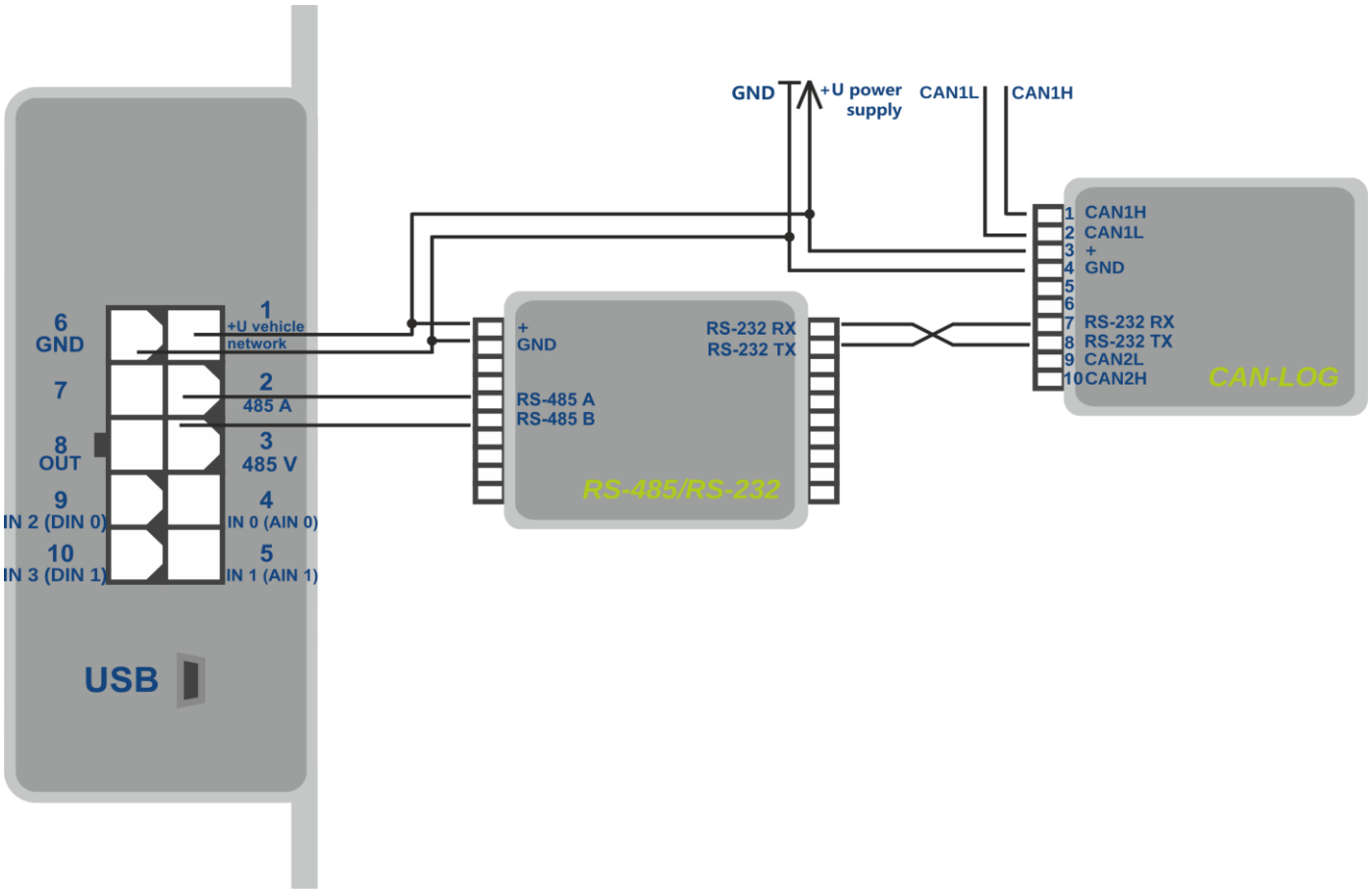


Picture 11 – Connection layout for fuel level sensors based on RS-485 interface

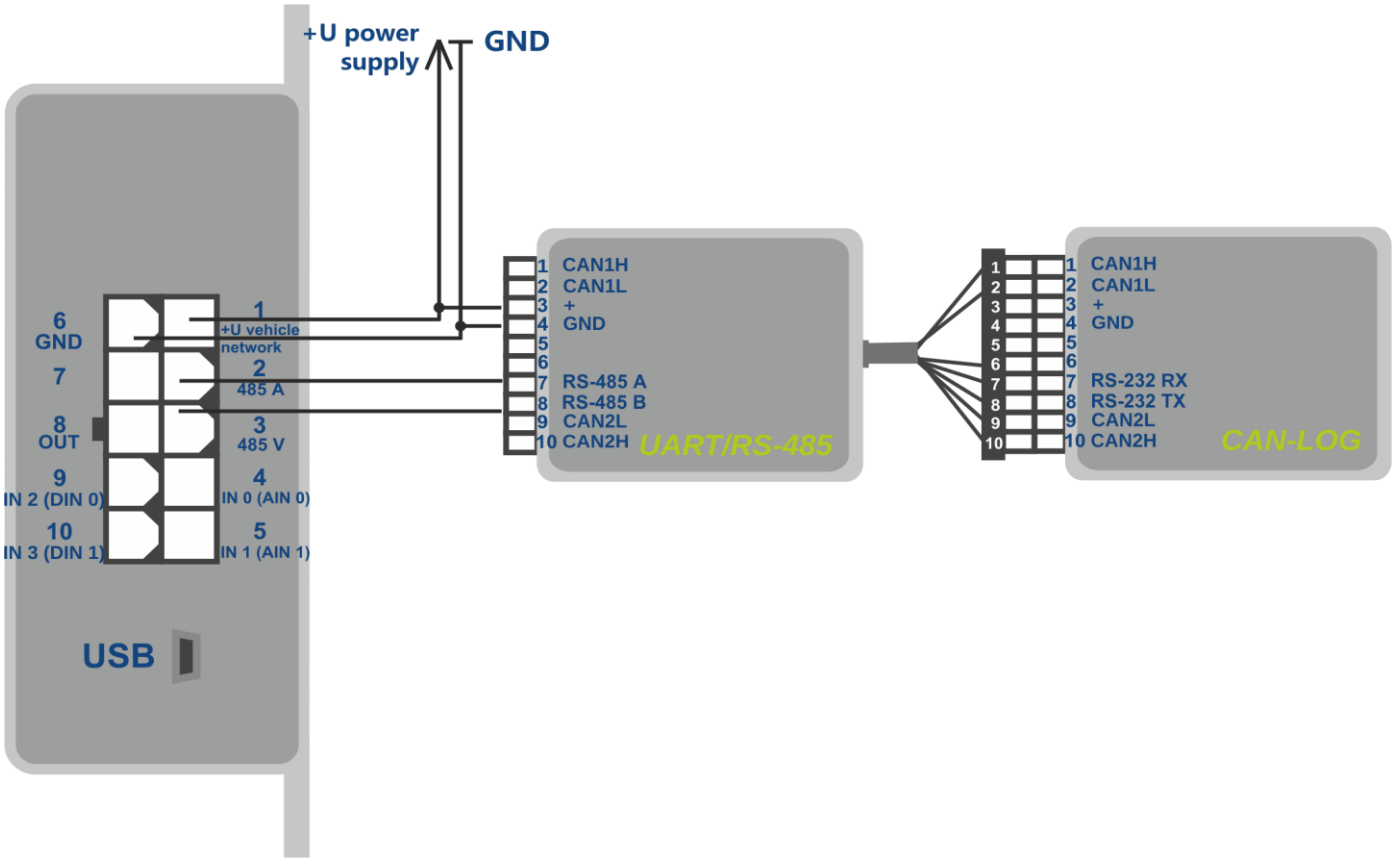
6.4.2 Working with a CAN-LOG controller

To connect the universal CAN-LOG CAN-bus controller a RS-232/RS-485 converter is used. Connect according to the layout (see picture 12). With the **«CANLOG 1»** command set the port in

the mode of receiving data from CAN-LOG. With the **«PROTOCOL»** command activate the CAN data block transmission.



Picture 12 –CAN-LOG connection layout using a universal interfaces converter



Picture 13 — CAN-LOG connection layout using a special interfaces converter

6.4.3 Working with the EUROSENS DELTA RS sensor

DELTA RS sensor connection is performed with the RS-485 interface. Sensor readings are transmitted instead of data from CAN-bus. It is necessary to activate the «CAN» data block with the **«PROTOCOL»** command. It is possible to transmit all data described in the Table 2. The command EUROSENSENABLED defines the data set requested from the sensor. It is necessary to indicate the requested data codes and fields separating them with commas. The repeated command rewrites the preset parameters.

Command parameters format:

EUROSENSENABLED X0,Y0,X1,Y1,X2,Y2….

X — requested data code

Y — field number

Y=3 – two fields simultaneous transmission

Example:

1 2 3 4

EUROSENSENABLED 0x00,1,0x10,2,0x14,2,0x15,3

1) Fuel amount since the sensor activation, 0.01 l

2) Accumulated fuel amount in normal condition, 0.01 l

3) Accumulated fuel amount in supply chamber in “cheat” mode, 0.01 l

4) Accumulated fuel amount in the backward chamber in idle mode, 0.01 l

4) Accumulated fuel amount in the backward chamber in nominal mode, 0.01 l

The **«EUROSENSVALUES»** command allows checking the preset parameters current values.

The **«EUROSENSADDRESS 255»** command deactivates the sensor request and parameters transmission to the server.

Table 2. EUROSENS DELTA RS sensor readings available for transmission

Requested data code	**Field 1**	**Field 2**
0x00	Fuel amount since the sensor activation, 0.01 l	Flow current speed, 0.1 l/h
0x01	Fuel amount in supply chamber since the sensor activation, 0.01 l	Flow current speed in supply chamber, 0.1 l/h
0x02	Fuel amount in the reverse chamber since the sensor activation, 0.01 l	Flow current speed in backward chamber, 0.1 l/h
0x10	Accumulated fuel amount in idle mode, 0.01 l	Accumulated fuel amount in nominal mode, 0.01 l
0x11	Accumulated fuel amount in “overload” mode, 0.01 l	Accumulated fuel amount in “cheat” mode, 0.01 l
0x12	Accumulated fuel amount in negative mode, 0.01 l	----------
0x13	Accumulated fuel amount in supply chamber in idle mode, 0.01 l	Accumulated fuel amount in supply chamber in nominal mode, 0.01 l
0x14	Accumulated fuel amount in supply chamber in “overload” mode, 0.01 l	Accumulated fuel amount in supply chamber in “cheat” mode, 0.01 l
0x15	Accumulated fuel amount in backward chamber in idle mode, 0.01 l	Accumulated fuel amount in backward chamber in nominal mode, 0.01 l
0x16	Accumulated fuel amount in backward chamber in “overload” mode, 0.01 l	Accumulated fuel amount in backward chamber in “cheat” mode, 0.01 l
0x17	Idle mode duration, sec	Nominal mode duration, sec.

Requested data code	Field 1	Field 2
0x18	«Overload” mode duration, sec	“Cheat” mode duration, sec
0x19	Negative mode duration, sec	----------
0x1A	Supply chamber idle mode duration, sec	Supply chamber nominal mode duration, sec
0x1B	Supply chamber “overload” mode duration, sec	Supply chamber “cheat” mode duration, sec
0x1C	Backward chamber idle mode duration, sec	Supply chamber nominal mode duration, sec
0x1D	Backward chamber “overload” mode duration, sec	Backward chamber “cheat” mode duration, sec
0x1E	“Intervention” mode duration, sec	Sensor work duration, sec

6.4.4 Tachograph connection

Connect tachograph to the RS-485 bus.

Select the type of the tachograph connected with the **«TACHOENABLED X»** command.

X=0 – VDO tachograph

X=1 – Tachograph SHTRIKH-M

X=255 – function disabled

To replace readings from an odometer integrated in the terminal by readings of the tachograph's odometer enter the **«TACHOTRODOMETR X»** command.

X=0 – readings from the terminal's odometer are being transmitted

X=1 – readings from the tachograph's odometer are being transmitted

The ODM command displays the current value of the active odometer, meters.

To transmit the driver card number instead of data from analogue inputs AIN4 and AIN5, insert the **«TACHOTRCARDNUMBER X»** command.

X=0 — transmission disabled,

X=1 — transmission enabled.

The **«TACHOGETCARDNUMBER X»** command displays the inserted card number,

X – tachograph slot number.

To start the DDD file downloading from the tachograph to the monitoring system via GPRS, the connection should send the **«TACHOGETDDD X»** command, where X is the card slot number.

6.4.5 Working with RFID-reader ADM20

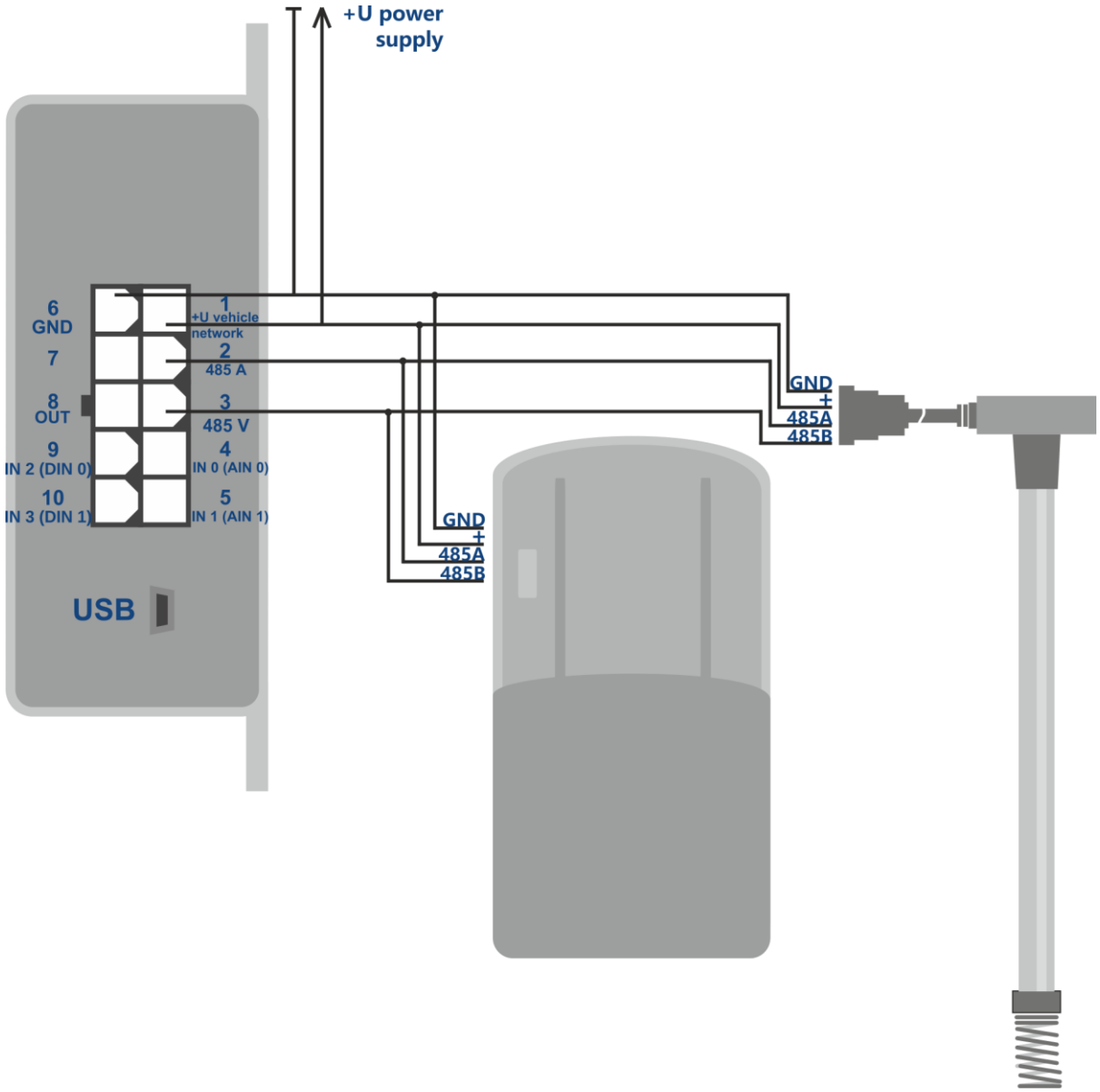
The Terminal allows for a simultaneous connection of up to 5 RFID-readers ADM20 to the RS-485 bus together with other devices. The example of a simultaneous connection of RFID-reader ADM20 and fuel level sensor to the terminal is provided in the picture 14.

Connection procedure and settings:

1. Set the RFID-reader ADM20 (setting procedure is described in the p. 4.3. of the Operation Manual “Receiver/transmitter combination ADM20”).

2. Connect RFID-reader ADM20 to the terminal's RS-485 bus.

3. Coordinate the work of the terminal and RFID-reader ADM20 (setting procedure is described in the p. 5 of the Operation Manual “Receiver/transmitter combination ADM20”)



Picture 14 – Connection layout for RFID-reader ADM20 and Fuel level sensor based on the RS-485 interface

6.5 Working with a headset

The terminal allows for giving outgoing calls to the pre-entered numbers. To give an outgoing call, it is necessary to press the headset button.

The numbers for outgoing calls are added with the **«EVENTLISTADD»** command. The outgoing call is given to the number, which is the first in the list. If connection fails, the terminal passes to the next number in the list. In case when no number is available, calling will be stopped.

The list of numbers is reviewed by the **«EVENTLISTSHOW»** command and cleared by the **«EVENTLISTCLEAR»** command.

The **«MAKECALLTIME»** command sets the time during which the terminal will be trying to call to each number.

The **«RINGS»** command sets the number of calls attempts, after which the autoreply to the incoming call will be initiated.

The call loudness is adjusted by the **«RINGVOLUME»** command, the interlocutor's voice loudness is set in the headset, and the microphone sensitivity – by the **«VOLUME»** command.

7 Extra functions setting

7.1 Mobile signal level transmission

The terminal allows transmitting the measured level of mobile signal (in per cent), instead of data of any analogue input. The transmission protocol previews six analogue inputs and there are two inputs installed in the terminal (AIN0 and AIN1). To transmit the mobile signal level it is recommended to use AIN2…AIN5. The **«GSMSIGNAL X»** command allows selecting the analogue input number. When using the **«PROTOCOL»,** it is necessary to activate IN_A data block transmission (analogue inputs).

7.2 Saving battery charge when parking

To reduce the power consumption by the terminal when parking, it is possible to automatically deactivate GLONASS/GPS and (or) GSM/GPRS modules.

Enabling energy-saving function and selecting modules to be disabled are made with the **«STATICPOWER»** command.

Modules are disabled together with coordinates freezing activation when parking. If coordinates freezing is set for the deactivated ignition, the modules will be deactivated at the same time as ignition.

If coordinates freezing is set for acceleration meter, modules activation/deactivation might be a bit delayed. It is necessary to take into account that this might affect the route drawing in the travel beginning.

7.3 Acceleration and braking values transmission

To assess driving quality, the terminal allows for transmitting speed change values (km/h) per second instead of data of any analogue input.

When using the «**ACCELALARM»** command, it is necessary to set the analogue input number. When using the «**PROTOCOL»** command — to activate IN_A data block transmission (analogue inputs).

7.4 Alarm system

The terminal is equipped with three alarm types:

— When the vehicle gets beyond the arming point and exceeds the pre-set distance. If there are valid coordinates, the point where the arming command was received should be considered as the arming point. In the absence of such coordinates, the first valid coordinates received after accepting the arming command, will be considered as the arming point.

— When the vehicle exceeds the pre-set speed limit. This alarm is not used for controlling vehicle driving speed but is used to record the fact of movement. Alarm parameters are set by the «**GPSGUARD**», «**GPSALARMTEXT**» when moving.

— When there is a voltage value within the pre-set range in the analogue input. For this function it is necessary to set SMS sending condition according to the event in the input by the «**INTRUESMS**» command and the message text by the «**INTRUESMSTEXT**» command.

When an alarming event occurs, the terminal might send up to four SMS messages to different phone numbers and activate the discrete output with the «**INTRUEOUT**» command.

For working with the list of alarm phone numbers, use the «**EVENTLISTADD**», «**EVENTLISTSHOW**», «**EVENTLISTCLEAR**» commands. Phone numbers of the EVENTLIST might be duplicated in the list of numbers authorized by the ADD ME command, but the SMS messages are sent only to the numbers from the EVENTLIST.

Arming and disarming are performed with the «**GUARD ON**», «**GUARD OFF**», «**ALARM OFF**» commands.

It is possible to perform arming based on the event in one of the analogue inputs. For this, it is necessary to select this input with the «**INGUARDMODE**» command and set a range for logical

«1» and logical “0” therefor. The terminal will pass to the guard mode if the voltage values in this input are set within the logical “1” range.

To exit the guard mode the voltage value in this input should be within the logical “0”. Deactivation of such an arming mode is performed by the «**INGUARDMODECLEAR**» command.

8 Commands description

Table 3. Commands description

№	Command	Response	Parameters	Description
1	Name X example: Name bus8	Device Name ‘X‘ example: Device Name ‘bus8‘	X – terminal name	Terminal name setting. The name might contain only latin letters and numbers. The name length should not exceed 10 characters. The terminal name is added by an alarm SMS message.
2	ADD ME X,Y (only through 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 “0” Y=0..3 – memory box number for the phone number saving. This parameter is not compulsory.	Authorization of the phone number, which the SMS was received from and saving it in the memory box Y. The command is necessary only for creating the list of numbers for handling the terminal via SMS.
2.1	ADD ME X,Y (только по USB 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 – memory box number for the phone number saving.	Adding phone number, which is supposed to be used for terminal handling via SMS.
3	PHONES X Example: PHONES 1234	PHOES (0)= (1)= (2)= (3)= Example: PHONES (0)= (1)= +7xxxxxxxxxx (2)= (3)=	X – password by default “0”	Authorized phone numbers request.

№	Command	Response	Parameters	Description
4	PASS X,Y Example: PASS 0,86974543	Pass=Y Example: Pass=86974543	X – the old password by default X=0. Y – new password	Changing password from X to Y. Password is the number from one to 8 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 terminal condition ID – terminal number Soft – software version GPS – current number of data package Time – current GMT time and date Nav – coordinates validity Lat – latitude Lon – longitude Speed – speed SatCnt – number of satellites Stat – status
6	IMEI Example: IMEI	IMEI Example: IMEI 359587013832624	Command without parameters	IMEI request for GSM-module installed in the terminal. The command works 20- seconds after terminal switching on or rebooting.
7.1	SETGPRS0 X,Y,Z Example: SETGPRS0 internet.mts.ru, mts,mts	GPRS0: APN=X, user=Y, pass=Z Example: GPRS: APN=internet.mts.ru, user=mts, pass=mts	X – access point by default X=internet.beeline.ru; Y — login by default Y=beeline; Z – password by default Z=beeline.	APN parameters setting for SIM-card. The command without parameters restores to the current settings GPRS for SIM-card.

№	Command	Response	Parameters	Description
7.2	SETGPRS1 X,Y,Z Example: SETGPRS0 internet.mts.ru, mts,mts	GPRS0: APN=X, user=Y, pass=Z Example: GPRS: APN=internet.mts.ru, user=mts, pass=mts	X – access point by default X=internet.beeline.ru; Y — login by default Y=beeline; Z – password by default Z=beeline.	APN parameters setting for SIM-chip if available. The command without parameters restores to the current settings GPRS for SIM-chip.
8	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 comma-separated numbers	Setting IP-address and server port, which the terminal is connected to for data transmission. The command without parameters restores to the current server address and port.
9	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 terminal is connected to for data transmission. The command without parameters restores to the current server address and port.
10	WAITTIME Y Example: WAITTIME 5	Wait Time = Y Example: Wait Time = 5	Y =1..30 – values in minutes By default Y=0.	Setting the time interval between the attempts of connection to the server via GPRS in absence of connection. Y=0 – sets the automatic terminal parameter regulation.
11	ERASE FLASH	ERASE FLASH	Command without parameters	Removal of all data packages stored in memory. After this command execution the current data packet number is reset to zero and the terminal is rebooted.

№	Command	Response	Parameters	Description
12	ERASE EEPROM	ERASE EEPROM	Command without parameters	Restoring to factory settings and terminal rebooting.
13	PERIOD X,Y Example: PERIOD 20,20	PERIOD min=X, max=Y Example: PERIOD min=20, max=120	X=10..3600 – timeframe for recording travel time in seconds, by default X=30. Y=10..3600 – timeframe for recording parking time in seconds, by default Y=300. X value should be less than Y	Setting the timefrom for recording in data packages memory during traveling and parking. The command without parameters restores to current settings.
14	INPUT X Example: INPUT 1	INPUTX = 0 Example: INPUT1 = 2374	X=0..1 – input number	Current value request in the input (voltage, mB, frequency, Hz, counter value, logical level «0», «1»).
15	FUEL	FUEL F0=234, T0=21; F1=871, T1=20; F2=0, T2=0;		Current readings request from a fuel level sensor connected based on RS-485 interface.

№	Command	Response	Parameters	Description
16	IMPULSE X,Y Example: IMPULSE 0,1	IMPULSE X,Y Example: IMPULSE 0,1	X=0,1 — operation mode of the discrete (pulse) input DIN0; Y=0..2 - operation mode of the discrete (pulse) input DIN1.	Setting operation modes for discrete (pulse) inputs X=0 (Y=0) — input activated in frequency meter mode X=1 (Y=1) — input activated in flowmeter mode X=1 и Y=2 — input DIN0 activated in differential flow meter mode, notably the fuel supply flowmeter is connected to the input DIN0, and the backward fuel supply flowmeter – to the input DIN1. In addition, readings difference is transmitted via the DIN0 input and flowmeter readings from the backward fuel supply – via DIN1. X=3 (Y=3) — input activated in discrete mode with pull-up to the plus.
17	INFILTER X,Y Example: INFILTER 1,1000	INPUT X FILTER TIME Y Example: INPUT 1 FILTER TIME 1000	X= 0..1 – input number Y =20..60000 – values in milliseconds By default Y=5000	Setting an averaging interval according to input. Voltage value according to input is averaged within the set time.
18	EventListAdd X Example: EventListAdd 7xxxxxxxxx	Number was added to the event list Example: Number was added to the event list	X – added phone number in «7xxxxxxxxx» format	Adding phone number in the list for sending SMS or voice calls execution. Not more than 4 phone numbers are stored.

№	Command	Response	Parameters	Description
19	EventListClear	Event list has been cleared		Removing all numbers from the list of phone numbers for SMS sending or voice calls execution.
20	EventListShow	Event list: (0)=79876543210 (1)=79876543211 (2)=79876543212 (3)=		Viewing the list of phone numbers for sending SMS messages or voice calls execution.
21	InTrue X,Ymin,Ymax Example: InTrue 0,10000,35000	InTrue X,Ymin,Ymax Example: InTrue 0,10000,35000	X= 0..1 – input number; Ymin – minimum range limit, mB; Ymax – maximum range limit, mB; Ymin<=Ymax X=0..1, Ymin =[0..36300], Ymax =[0..36300].	Setting voltage range of the logical “1” in analogue input.
22	InFalse X,Ymin,Ymax Example: InFalse 0,0,4000	InFalse X,Ymin,Ymax Example: InFalse 0,0,4000	X=0..1 – input number Ymin – minimum range limit, mB; Ymax – maximum range limit, mB; Ymin<=Ymax; X=0..1, Ymin =[0..36300], Ymax =[0..36300].	Setting voltage range of the logical “0” in analogue input.

№	Command	Response	Parameters	Description
23	InTrueSmsText X,Y	Input X TrueSms=Y	X=0..1 – input number Y – text message no longer than 10 characters	Setting SMS text sent when the voltage falls within the logical “1” range.
24	InTrueSms X,Y Example: InTrueSms 1,1 InTrueSms 3	Input X send true sms Y Example: Input 1 send true sms 1 Input 3 send true sms 0	X=0..1 – input number; Y=0 – ban for sending SMS Y=1 – permission for sending SMS in guard mode, Y=2 – permission for sending SMS in any mode.	Setting SMS sending mode when the voltage falls within the logical “1” range in the input. Command without X parameter restores to the current SMS sending setting.
25	InTrueOut X,Y,Z Example: InTrueOut 0,3,2	Input X TrueOut Y Mode Z Example: Input 0 TrueOut 3 Mode 2	X=0..5 – input number; Y=0 – output number; Z=0 – output deactivated Z=1 – output activated in guard mode, Z=2 – output always activated	Binding output to the event in input.
26	InGuardMode X Example: InGuardMode 0	Input X on guard mode Example: Input 0 on guard mode	X=0..5 – input number	Setting the input number for guard mode activation, the command without X parameters restores to the current input number for guard mode activation. No input is set by default for guard mode activation.
27	InGuardModeClear	no input in guard mode		Clearing input number for the activated guard mode.

№	Command	Response	Parameters	Description
28	InInfo X Example: InInfo 2	Example: Input 2: InTrue 8000..15000, InFalse 0..3000, InGuardMode 0, InTrueSms 2, SmsTxt ‘ALARM‘	X=0..5 – input number	Information request about input settings
29	Guard on	Guard On		Arming
30	Guard off	Guard Off		Desarming
31	Alarm Off	Alarm Off		Alarm deactivation
32	GPSGuard X,Y,Z Example: GPSGuard 1,6,70	GPSguard=X, V=Y, L=Z Example: GPSguard=1, V=6, L=70	X=0 – off, X=1 – on; Y=5..25 – speed, km/h; Z=50..1000 – distance in meters	Notification activation during terminal's movement when it is in guard mode and when speed and/or distance limits are exceeded. Command without parameters restores to the current settings. Deafault values Y=5, Z=100.
33	GPSAlarmText X Example: GPSAlarmText The car moves	GPSAlarmText ‘X‘ Example: GPSAlarmText ‘The car moves‘	X – text message not exceeding 20 characters	Setting a text message transmitted during the movement of the terminal in guard mode.
34	RELOAD	Reloading…		Complete reboot of the terminal with GLONASS/GPS receiver reboot
35	RESET	Reloading…		Quick reboot of the terminal without GLONASS/GPS receiver deactivation
36	GPS3D Example: MODE 1	GPS3D=X Example: MODE 1	X=0 – mode 2D, X=1 – mode 3D, by default X=1.	Setting coordinates processing mode. In 3D mode all improperly determined coordinates will be transmitted as invalid.

№	Command	Response	Parameters	Description
37	SATHDOP X,Y Example: SATHDOP 3,5.5	MinSat=X MaxHDOP=Y Example: MinSat=3 MaxHDOP=5.5	X=1..10 – the minimum number of satellites Y=0..25 – the maximum HDOP. By default X=4, Y=1.	Setting the limit for the maximum HDOP with the minimum number of satellites. All coordinates with HDOP are bigger than Y, and when the number of satellites is fewer than X, they will be transmitted as invalid.
38	MAXHDOP Example: MAXHDOP 5.5	MAXHDOP=X Example: MAXHDOP=5.5	X – the maximum HDOP value By default X=50.0	Setting the limit for the maximum HDOP. All coordinates with HDOP bigger than the preset value will be transmitted as invalid.
39	SETPROTOCOL X Example: SETPROTOCOL 0	SETPROTOCOL X Example: SETPROTOCOL 0	X – protocol type for data transmission to the server X=0 – protocol ADM. X=1 – protocol EGTS.	Protocol type setting
40	PROTOCOL X Example: PROTOCOL 60	PROTOCOL X Example: PROTOCOL 60 (NAVIGATION DATA+OUTS+IN_A+IN_D+FUEL)	X – number determining protocol format X=1 - protocol ADM-5; for the ADM-6 protocol the number X is defined by the the sum of numbers corresponding to necessary blocks in the protocol, at least X=0 (NAVIGATION DATA).	Setting ADM protocol format. NAVIGATION DATA = 0 (basic data), OUTS = 4 (outputs, events by inputs), IN_A = 8 (analogue inputs), IN_D = 16 (p[ulse inputs), FUEL = 32 (fuel level sensors), CAN = 64 (Can-Log), ODOMETR = 128 (odometer value),

№	Command	Response	Parameters	Description
41	NUMBER X	IDN 1234 IMEI 354123456789012	X – phone number in «7xxxxxxxxxx» format	IMEI and device number request The answer is sent via SMS to the indicated number
42	INSTATIC X,Y Example: INSTATIC 1,0	INSTATIC X,Y Example: INSTATIC 1,0	X=0..1 – input number, X=255 – function disabled, Y=0, 1 – activation by zero or one	Setting input number for coordinates freezing mode activation. Command without parameters restores to the current setting. No input is set by default for coordinates freezing mode activation. .
43	STATICTOIN X Example: STATICTOIN 1	STATICTOIN X Example: STATICTOIN 1	X=0..5 – input number X=255 – function disabled	Activation of coordinates freezing status transmission to the server in the analogue input field and setting the number of this analogue input.
44	TRACK X,Y,Z,A Example: TRACK 5,15,500,10	TRACK X,Y,Z,A Example: TRACK 5,15,500,10	X=2..20 – minimum speed Y=5..180 – angle in degrees Z=50..5000 – distance in meters A=0..25 – speed change in km/h/s By default X=3, Y=10, Z=500, A=25	Setting the route drawing quality. A new point is put on the route if the travel direction changes more than by the angle Y or the distance to the previous point is bigger than Z or speed change per second is more than A. This mechanism is deactivated when the speed is fewer than X so that there wouldn't be too many points. This parameter change might cause improper function of the terminal.

№	Command	Response	Parameters	Description
45	STATMASK X Example: STATMASK 1	STATMASK X Example: STATMASK 1	X – the number determining events whose occurrence will initiate formation of extra packets. It is defined by the sum of mask values (see the point 4.3). By default X= 65535 (all events are included).	Setting device status mask for reducing traffic from the terminal to the server.
46	OUTPUT X Example: OUTPUT 1	OUTPUT X Example: OUTPUT 1	X=1 – output is active (linked to the ground) X=0 – output is not active (disconnected from the ground). By deafault =0.	Handling terminal's output. Command without parameters restores to the output current settings.
47	COM9 X Example: COM9 2	COM9 X Example: COM9 2	X=0..100 – the number of points recorded by the terminal after stopping based on the frequency set for movement. By default X=0	Short-term parkings recorded by means of extra points saving after vehicle's stop and based on the frequency set for movement.
48	PIN0 X Example:: PIN0 1234	PIN0=X Example:: PIN0=1234	X – PIN code	Setting SIM-card PIN code
49	USB X Example:: USB 1234	PASS OK Example:: PASS OK	X – access password for the terminal set by the PASS command	Entering temporary access password via configurator. Access is authorized before reboot.

№	Command	Response	Parameters	Description
50	NMEA485 X Example: NMEA485 1	NMEA485 enabled:X Example: NMEA485 enabled:1	X=0 — function disabled X=1 — function enabled	Setting the RS-485 port operation mode for NMEA-messages transmission from the terminal's GLONASS/GPS receiver.
51	CCID X		X=0 — SIM-card CCID number request; X=1 — SIM-chip CCID number request	SIM-card or SIM-chip CCID number request (if SIM-chip is not installed)
52	UPDATE	Start update		Firmware update via GPRS channel
53	PSTATIC X Example: PSTATIC 1	PSTATIC X Example: PSTATIC 1	X=1 — program statics function enabled; X=0 - program statics function desabled	Coordinates freezing function on/off during the parking in the program method
54	MODE X Example: MODE 1	MODE X Example: MODE 1	X=0 – GLONASS+GPS, X=1 – GLONASS, X=2 – GPS	Setting the navigation system type to fix a navigation problem
55	ODM	ODM 132168181		Odometer value request, meters 3
56	TRAFFIC X Example: TRAFFIC 0	TRAFFIC X Example: TRAFFIC 0	X=0..10. X=0 – without grouping, online monitoring	Setting the parameter defining data grouping to the server before sending for saving traffic between the terminal and the server.
57	LLS485 X,Y,Z Example: LLS485 3,20,55	LLS485 X,Y,Z Example: LLS485 3,20,55	X,Y,Z - Fuel level sensors addresses connected to the terminal via the RS485 interface	Installation of fuel level sensors addresses

№	Command	Response	Parameters	Description
58	RINGS X Example: RINGS 2	RINGS=X Example: RINGS=2	X=1..10 – number of calls till the automatic reply X=0 – automatic reply disabled (by default)	Setting the automatic reply during the voice call. Command without parameters restores to the current setting.
59	SDLOG X Example: SDLOG 1	SDLOG X Example: SDLOG 1	X=1 – using microSD card as a “black box”, X=0 – function disabled, value by default	Installing the track saving function onto microSD memory card.
60	SERIAL X Example: SERIAL 1	SERIAL X Example: SERIAL 1	X=1 – sending data to the server in a timely manner X=0 – sending data to the server according to their relevance - default value	Installing the procedure for data downloading from “black box” to the server. When using memory card as a “black box”, the data downloading procedure is only based on time (X=1).
61	ESCORT X Example: ESCORT 2	ESCORT X Example: ESCORT 2	X=0..5 – input number X=255 – input number is not identified (default value).	Installing the analogue input number whose data will be replaced by information read from the ESCORT tags reader
62	EGTSEVENTSRC X,Y Example: EGTSEVENTSRC 2,13	EGTSEVENTSRC X,Y Example: EGTSEVENTSRC 2,13	X=0..5 - input number Y=value put in the src. field	Installing the input number, which will initiate formation of an extraordinary packet with the filled SRC field when an event occurs thereon.
63	SPEEDALARM X,Y Example: SPEEDALARM 0,70	SPEEDALARM X,Y Example: SPEEDALARM 0,70	X=0 – activated output number Y – speed, km/h	Installing the speed limit activating the output

№	Command	Response	Parameters	Description
64	ACCELALARM X,Y,Z,A Example: ACCELALARM 3,15,10,0	ACCELALARM X,Y,Z,A Example: ACCELALARM 3,15,10,0	X=0..5 – input number*, whose data are replaced by acceleration and braking; Y – braking limit activating the output; Z – acceleration limit activating the output; A – activated output number (always 0).	Installing the analogue* input number, whose data will be replaced by acceleration and braking (speed change (km/h) per second). Installing acceleration and braking limits activating the terminal's output.
65	OPSGET	OPSGET: ("MTS","25001") ("MegaFon","25002") ("BeeLine","25099")	Command without parameters	Request for the list of available mobile operators base stations
66	OPSWHITELIST0 X,Y Example: OPSWHITELIST0 0,25099	OPSWHITELIST0 X,Y Example: OPSWHITELIST0 0,25099	X=0..9 – box number Y – mobile operator code Y=0 – remove entry	Put the mobile operator on the white list (for SIM-card). Boxes should be filled in order. Command without parameters displays the current list.
67	OPSWHITELIST1 X,Y Example: OPSWHITELIST1 0,25099	OPSWHITELIST1 X,Y Example: OPSWHITELIST1 0,25099	X=0..9 – box number Y – mobile operator code Y=0 – remove entry	Put the mobile operator on the white list (for SIM-chip if available). Boxes should be filled in order. Command without parameters displays the current list.

№	Command	Response	Parameters	Description
68	STATICPOWER X Example: STATICPOWER 1	STATICPOWER X Example: STATICPOWER 1	X=0 – function disabled X=1 – disabling GSM. X=2 – disabling GNSS. X=3 – disabling GSM and GNSS.	Disabling GSM and GNSS (GLONASS/GPS) modules during parking
69	SN X Example: SN 43676	SN X Example: SN 43676	X=1..65535.	ID number installation
70	GSMSIGNAL X Example: GSMSIGNAL 5	GSMSIGNAL IN_A:X Signal:70% Example: GSMSIGNAL IN_A:5 Signal:70%	X=0…5 – analogue* input number	Installing analogue* input number whose data will be replaced by the mobile signal level in per cent
71	ADM20 X,Y,Z Example: ADM20 2,1,6	ADM20[X] Y,Z ready Example: ADM20[2] 1,6 ready	X=0..4 – reader number Y – address on the RS485 canbus; Z – operation mode	Installing the reader's sequence number and choosing the operation mode therefor.
72	ADM20MODE X,Y,Z,A,B Example: ADM20MODE 0,2,0,2,0	ADM20MODE[X] Y,Z,A,B enabled Example: ADM20MODE[0] 2,n/a,2,n/a enabled	X=0..4 – number of the reader being set Y=0..2 – number of the mode being set; Z – card check time; A=0..5 – analogue* input number; B – output number (always 0)	Setting the selected reader operation mode. Installing card check time, enabling number transmission in the analogue* input field whose data will be replaced by the card/tag number.

№	Command	Response	Parameters	Description
	ADM20OUTMODE X,Y Example: ADM20OUTMODE		X=0…4 – reader number Y=0..1 – Condition, which the discrete output will be switched to when detecting the card	Installing the condition, which the discrete output will be switched to when detecting the ADM20 reader card
73	TACHOENABLED X Example: TACHOENABLED 1	TACHOENABLED X Example: TACHOENABLED 1,2	X=0 – tachograph VDO, X=1 – tachograph STRIKH-M	Installing the tachograph type being connected
74	TACHOGETDDD X Example: TACHOGETDDD 1	TACHOGETDDD start upload Example: TACHOGETDDD start upload	X – driver's card slot number	DDD file download from tachograph to the GPRS connection monitoring system
75	TACHOGETCARDNUMBER X Example: TACHOGETCARDNUMBER 1	TACHOGETCARDNUMBER X: …. Example: TACHOGETCARDNUMBER 1: ….	X – driver's card slot number	Driver's card number request
76	TACHOTRCARDNUMBER X Example: TACHOTRCARDNUMBER 1	TACHOTRCARDNUMBER X Example: TACHOTRCARDNUMBER 1	X=0 - function disabled X=1 — function enabled	Including driver's card number transmission in the AIN4 and AIN5 analogue inputs field
77	TACHOTRODOMETR X Example: TACHOTRODOMETR 1	TACHOTRODOMETR X Example: TACHOTRODOMETR 1	X=0 - function disabled X=1 — function enabled	Including integrated odometer's readings replacement by tachograph odometer's readings
78	RINGVOLUME X Example: RINGVOLUME 20	RINGVOLUME X Example: RINGVOLUME 20	X=0..100 – volume level	Installing the volume level for incoming call signal

№	Command	Response	Parameters	Description
79	CALLANSWERTIME X Example: CALLANSWERTIME 30	CALLANSWERTIME X Example: CALLANSWERTIME 30	X=0 – function disabled X=1..255 – time in seconds	Installing answer timeout after which the incoming call is rejected.
80	MAKECALLTIME X Example: MAKECALLTIME 60	MAKECALLTIME X Example: MAKECALLTIME 60	X=0 – function disabled X=1..255 – time in seconds	Installing answer timeout after which the outgoing call is rejected.
81	CANLOG X Example: CANLOG 1	CANLOG X Example: CANLOG 1	X=0 - function disabled X=1 — function enabled	RS-485 port installation in the operation mode for CANLOG. Interface converter RS-232/RS-485 is necessary
82	REPLY X Example: REPLY 1	REPLY=X Example: REPLY=1	X=0 - function disabled X=1 — function enabled	Installing timeout for the terminal when waiting for packet delivery confirmation.
83	RINGS X Example: RINGS 2	RINGS X Example: RINGS 2	X=1..10 – number of calls until the automatic reply when there is a voice call X=0 – automatic reply disabled, default value	Automatic reply installation when there is an incoming voice call
84	VOLUME X,Y Example: VOLUME 75,10	VOLUME=X,Y Example: VOLUME=75,10	X=0..100 – Loudspeaker volume level Y=0..15 – microphone sensitivity	Installing loudspeaker volume level and microphone sensitivity. Command without parameters restores to the current values.

№	Command	Response	Parameters	Description
85	EUROSENSENABLED X0,Y0,X1,Y1 Example: EUROSENSENABLED 0x00,1,0x01,3	EUROSENSENABLED X0: Y0,X1:Y1 Example: EUROSENSENABLED 0x00:1,0x01:3	X – requested data code; Y – requested field	Including EUROSENSE DELTA RS sensor support, transmitted data set installation
86	EUROSENSADDRESS X Example: EUROSENSADDRESS 3	EUROSENSADDRESS X Example: EUROSENSADDRESS 3	X – sensor address X=255 – function disabled	EUROSENSE DELTA RS sensor address installation or sensor scanning disabling
87	EUROSENSVALUES			Request for current values of EUROSENSE DELTA RS sensor pre-set parameters

9 Terminal software upgrading

Terminal software upgrade (firmware) might be performed through the USB-interface by means of configuration program or via GPRS-channel.

9.1 Terminal software upgrading via USB

Configuration program checks the valid firmware version in the upgrade server, and if necessary downloads the firmware file.

To upgrade firmware, do the following:

- after having switched off the external power, connect USB cable (miniUSB/USB-A) to the terminal and Personal computer's USB port;
- supply the power to the terminal from the vehicle circuit or a laboratory power source;
- launch “ADMConfigurator” program on personal computer;
- if a more recent firmware version than the one installed on the terminal is detected, “ADMConfigurator” program will inform you of its presence;
- press “Upgrade available”;
- in the opened tab “Notifications” press “firmware upgrade via USB”;
- after being upgraded, the terminal will be rebooted and become available for work.

WARNING! Don't switch the terminal's power off when upgrading the terminal's firmware until the terminal 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.

9.2 Terminal's software upgrading via USB with a firmware file

Firmware file should be requested in technical support.

To upgrade the firmware via the USB interface with a firmware file, do the following:

- after having switched off the external power, connect USB cable (miniUSB/USB-A) to the terminal and Personal computer's USB port;
- supply the power to the terminal from the vehicle circuit or a laboratory power source;
- launch “ADMConfigurator” program on personal computer;
- after having connected the terminal to the program, open the “Settings” section in the “Device” tab, press “Flash the file”;
- press “Yes” in the popup;
- drag the firmware file in the respective field in the configurator window;
- after the firmware is upgraded, the terminal will be rebooted and become available for work.

WARNING! Don't switch the terminal's power off when upgrading the terminal's firmware until the terminal 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 Terminal software upgrade via GPRS

To upgrade the terminal software via GPRS, it is necessary to install an active SIM-card in the terminal, set the user's access point and mobile operator password (APN, user, pass). Otherwise, the terminal will have remained in the mode of firmware uploading from the server until connection attempts are over. The upgrading process will start after the terminal receives «**UPDATE**» command via one of the possible channels USB, GPRS, SMS. After having received the «**UPDATE**» command the terminal connects to the upgrade server and uploads the relevant firmware. After a successful upgrade the terminal passes to the standard operation mode with the access point and server address settings installed before upgrading. The remained settings should be checked after upgrade and if necessary, re-install them. Depending on the GSM-network the upgrading process takes on average from 2 to 5 minutes. If the upgrading upload is not possible, the terminal will continue working with the existing software.

10 Storage and transportation requirements

Terminals should be stored in a warehouse at a temperature of +5ºC to +40ºC and relative humidity at most 85 %.

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

11 Warranty

The manufacturer guarantees the terminal 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 terminal 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 terminal without housing;

— a terminal with signs of repair performed beyond the manufacturer's service center;
— a terminal 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 terminal;
— a terminal 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 http://en.neomatica.ru/upload/files/license.pdf

12 Marking and packaging

Marking is placed on the terminal housing. The terminals 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 4. Extent of delivery

Name of Item	Quantity	Serial number	Note
Terminal ADM300			
MF-10F connector for supplying power and sensors with wires			
Fuse holder			
Fuse for 2A current			
Datasheet			

Appendix A. Bits description for the «STATUS» field

Table A.1. «STATUS» field bits description

Bits	«Status» field description	Mask value
0	Terminal reboot indicator	1
1	Active SIM card number (0 – SIM0, 1 – SIM1)	2
2	No connection to the server	4
3	Guard mode enabled	8
4	Battery low voltage indicator	16
5	Invalid coordinates indicator (validity)	32
6	Coordinates are frozen during parking	64
7	Terminal external power supply off	128
8	Alarm went off	256
9	-	512
10	-	1024
11	Battery high voltage indicator	2048
12	Sign of using microSD card as “black box”	4096
13	Case opening detected	8192
14	Coordinates are defined by GSM base stations	16384
15	Headset button is pressed	32768

Appendix B. WIALON system parameters description

Table B.1. Description of basic parameters previewed by the ADM protocol and transmitted in the 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
adc1	Analogue input voltage value, A_IN0, мВ
adc2	Analogue input voltage value, A_IN1, мВ
adc3	Parameter to be set
adc4	Parameter to be set
adc5	Parameter to be set
adc6	Parameter to be set
count1	Frequency/flowmeter/D_IN0 input state value
count2	Frequency/flowmeter/D_IN1 input state value
fuel1	Fuel level value in sensor No. 0 connected via RS-485 interface
fuel2	Fuel level value in sensor No. 1 connected via RS-485 interface
fuel3	Fuel level value in sensor No. 2 connected via RS-485 interface
temp1	Temperature value in sensor No. 0 connected via RS-485 interface
temp2	Temperature value in sensor No. 1 connected via RS-485 interface
temp3	Temperature value in sensor No. 2 connected via RS-485 interface
I/O	Summary value of device status and inputs, outputs condition
vib	Current level of vibration
in1	Condition of discrete sensor set for A_IN0 input
in2	Condition of discrete sensor set for A_IN1 input
in3	-
in4	-
in5	-
in6	-
in7	Condition of discrete sensor set for D_IN0 input
in8	Condition of discrete sensor set for D_IN1 input
in9	Terminal reboot indicator
in10	Active SIM card number
in11	No connection to the server
in12	Guard mode enabled
in13	Battery low voltage indicator
in14	Invalid coordinates indicator (validity)

Parameter	Description
in15	Coordinates are frozen during parking
in16	Terminal external power supply off
in17	Alarm went off
in18	-
in19	-
in20	High power supply voltage indicator
in21	microSD card used as “black box”
in22	Case opened
in23	Coordinates are defined by GSM base stations
in24	Headset button is pressed
out1	Terminal output OUT0 activated
out2	-
out3	-
out4	-

Appendix C. CAN-LOG parameters description

Table C.1. Description of parameters transmitted in the Wialon system when connecting CAN-LOG to ADM300

Parameter	Name	Use	Unit of measurement
can0	E_cons	total fuel consumption	liter
can1	H_RPM	Engine rmp	50/min
can2	I_temp	Engine temperature	degree
can3	A_time	Total time of engine operation	0,1 hour
can4	C_distance	Total run	km
can5	G_level	Fuel level	0,1 liter (0,1 %)
can6	S_flag	Status flags	see below
can7	P_alarm	Aacident controllers	see below
can8	K_axis	load on axle 1	0,1t
can9	L_axis	load on axle 2	0,1t
can10	M_axis	load on axle 3	0,1t
can11	N_axis	load on axle 4	0,1t
can12	O_axis	load on axle 5	0,1t
can13	WB	harvesting time	0,1 hour
can14	WC	harvested area	0.1Ha
can15	WE	harvested crop volume	0,1t
can16	WF	grain moisture	0,20%
can17	WA	agricultural machines condition	see below
can18	Z	load on engine	%
can19	U_adblue	AdBlue	liter (%)

Production date:

Manufacturer: Neomatica LLC
24a Malkova, office 7, Perm 614087, Russia
Phone: +7 (342) 2-111-500 (ext. 42).
E-mail: international@neomatica.ru
Web-site: http://en.neomatica.ru

Appendix D. ISO 9001:2015

The certification system «Standart-Garant»

SYSTEM CERTIFICATION OF MANAGEMENT SYSTEM, WORKS AND SERVICES «STANDART-GARANT»

Registered with the Federal Agency for Technical Regulation and Metrology.
Registration number in the register of voluntary certification : РОСС RU. И556.04ЖЖ00
Body forming system : ANO Certification headquarter of quality management system «STANDART»
121374 , Moscow, Krasnih Zor street, 21, b.1
Leading certification body: LLC «Bureau conformity assessment and certification» 105187, Moscow, Tkatskaya street, 48A

CONFORMANCE CERTIFICATE

№ SMQ.RU/01.17. - 5520

Granted to:

"Neomatica" LLC

614033, Perm Region, Perm, str. Serginskoye, 38A, apartment 608
TIN 5904267825

THIS CERTIFICATE IS TO CERTIFY THAT:

THE QUALITY MANAGEMENT SYSTEM

With respect to
the implementation of scientific research, design, production and sale of electronic circuits, modules, equipment, including communications equipment, satellite monitoring, computer technology; development and implementation of software

CONFORMS WITH REQUIREMENTS OF

GOST R ISO 9001-2015 (ISO 9001:2015)

This Certificate obliges the company to maintain the state of works being executed in conformity with requirements of the above-said standard, and it will be under control of main authority of the system certification STANDART-GARANT and be confirmed at passing annual inspection control

ISO certification 012398

The Certificate was granted by virtue of Decision of Expert Committee No. 4376 of January 20, 2017

Its number in the unified register of the System: 5520

Date of registration: January 20, 2017

Valid until: January 20, 2020

Head of authority A.B. Veselkov Chairman of Committee I.B. Balash

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