NAVTELECOM
TELEMATICS SYSTEMS

GPS/GLONASS TRACKING EQUIPMENT

SMART S-2423

Operations manual

Installation and connection of the device

v1.0

MOSCOW
2020

Dear customer!

This Operations manual provides information about main issues relating to the functioning, installation, and operation of the device.

Customers are strongly advised to study this document carefully before the installation and operation of the device.

Navtelecom LLC is interested in constantly improvement of the manufactured products quality.

Please, contact our technical support by email address: support@navtelecom.ru should you have any questions or problems with the device.

It is possible to download software, documentation and get detailed information on the manufacturer's website https://navtelecom.ru.en

We thank you for purchasing of our product! We are sure that if operation of the equipment is correct, it will reliably serve you for a long time.

CONTENTS

1. BASIC CHARACTERISTICS

1.1 Purpose of the system

The equipment is a GPS-GSM Based Vehicle Tracking System. It is allowed to use the following terms in relation to this device: "system", "product", "equipment", "device" "terminal", "tracker".

The system is designed for:

- vehicle monitoring: its location, track, mileage, fuel consumption, engine hours;
- driving style determination (EcoDriving);
- emergency informing about vehicle hijacking;
- emergency informing about attacks on the driver or passengers and other accidents;
- processing and transmitting of data to the server from devices such CAN bus adapters, RFID tag reader, fuel level sensors;
- monitoring the temperature using temperature sensors;
- remote control of connected devices and vehicle systems, such as a siren, engine and door lock system, etc.

Recipients of information from the system can be:

- centralized dispatch centers;
- end-users (corporate and private car owners, proxy persons, etc.)

1.2 System tasks

The system operation consists of the following tasks:

- telemetering record of vehicle location, speed, direction and mileage according to the GPS/GLONASS satellite information;
- telemetering record from the contact, impulse, analog connected sensors and CAN bus; monitoring of vehicle battery voltage and device built-in battery voltage;
- fuel consumption, drains and fills monitoring; mileage monitoring; stoppage time and off-track monitoring; places of cargo loading/unloading monitoring;
- events data record to the nonvolatile memory, possibility of its remote reading and analyzing;
- sustained or specified time period transmission of information about current and past events on the vehicle via GPRS-channel to the telematics server for further analyzing, visualization and report formation;
- customer SMS informing on sensors activation;
- connected external devices control (for example, siren on/off) by SMS command or by preset settings in automatic mode;
- control of cargo safety by comprehensive measures; improving driver and passenger's safety.

1.3 Operational principles

The device during its operation continuously monitors the status of the connected sensors, vehicle battery voltage, built-in device battery voltage, GSM modem signal level, operational capability of navigational sensor (GPS/GLONASS), etc.

At power-up or USB connection to a computer the device automatically turns on. At power-off or USB disconnection the device continues its operation from built-in battery. The device turns off when the built-in device battery is discharged to 3V.

Upon the occurrence of an event set by the device logic (set by the user or device manufacturer), the telematics information is recorded into nonvolatile memory and is sent to tracking platform as a message with a set of parameters. Events for messages formation can be change of direction, timer activation in motion or in stand, activation of input sensor, value changes of analog or digital sensor, etc. Each message is recorded with its sequence number and has its own code that determines the reason for its formation. When sending message packets after reconnecting to tracking platform, the earlier messages are sent first. Some messages generated by "alarm" events (pressing the panic button, impact sensor detection, etc.) are sent out of turn, immediately after the "alarm" event has happened. After message packet sending to the server, the device is waiting for server answering. If there is no answering from the server, the device will try to send message again until it receives answering about data transferred, in this case the next packets from the queue will not be sent. This algorithm set in the data transfer protocol ensures reliable sending of all messages to the server, even in case of data transmitting failure.

The device operation parameters are configured using proprietary software, the NTC Configurator program. For proper software operation there is a requirement for a computer with MS Windows 7 or higher operating system.

It is also possible to perform basic settings via Bluetooth, USB, GSM channels using the NTC Control program - a mobile application for smartphones and tablets running the Android operating system.

1.4 Basic technical characteristics

Tab 1

	S-2423
GSM/GPRS/Bluetooth	
GSM frequency bands	GSM 850, EGSM 900, DCS 1800, PCS 1900
GPRS class	B, multislot class 12
Transmitter power	Class 4 (2W) в GSM 850 и EGSM 900; Class 1 (1W) в DCS 1800 и PCS 1900
Maximum speed of data transfer/reception, kbit/s	85,6
SIM card holder 1	external with the plug, miniSIM
SIM card holder 2	no
GSM-signal jammer detector	yes
Bluetooth	yes, v 4.0
GNSS	
Supported navigation systems	GLONASS/GPS/Galileo/QZSS
Number of channels	tracking: 33, picking-up: 99
Sensitivity (in laboratory conditions)	tracking: -167 dBm cold start: -149 dBm
Time of first coordinates determination (for GPS and GLONASS systems with a signal of -130 dBm)	cold start: 29 sec warm start: 22 sec hot start: <1 sec
Coordinates error, (50% CEP, 24 hours in static mode, with signal levels -130 dBm), m	2.5 (in plan), 5 (in height)
Coordinate update rate, Hz	1
GNSS jammer detector	yes
Power supply	
Operation supply voltage, V[1]	9,5…47
Current consumption at 12 V voltage in operation mode on Average[2], mA	80
Current consumption at 12 V voltage with turned off GLONASS and GSM modules is no more than, mA	20
Maximum current consumption at 12 V voltage in the operation with the charge of the battery is not more than, mA	200
Protection against polarity reversal	yes
Protection against prolonged overvoltage up to 500 V	yes
Battery[3]	Li-Po 3,7 V, at least 110 mAh
Battery protection from recharge, full discharge, short circuit[4]	yes
Quartz crystal unit	yes
Backup battery of the RTC clock and the navigation module	yes
Time of keeping of the RTC clock rate and ephemeris in a navigation module (with the power off and discharging of the battery) is at least, days	5
Battery charging from USB	no
Interfaces/sensors	
Inputs against power surges, V	up to 200
Total number of universal (analog, discrete, pulse-frequency) inputs	3
Built-in pull-up resistor for discrete or pulse-frequency inputs	yes
Measuring range by inputs, set up as analog, V	0…31
Working range with frequency fuel level sensors, Hz	1 - 3000
USB interface for settings, control, data transfer and diagnostics	yes
RS-485 digital interface	yes
RS-232 digital interface	no

1-Wire interface	yes
Number of outputs of the "open collector" type for the external devices control	2
Maximum switching current by the control outputs, mA	500
Maximum switching voltage by the control outputs, V	48
Built-in 3-axis accelerometer	yes
Maximum impact loading measured by the device, g	8
Performance specifications	
Enclosure protection level	IP54
Maximum allowable overload during impacts, g	24
Storage temperature with the battery[5] ,°C	0 … +40
Storage temperature without the battery, °C	-40 … +85
Operating temperature with the battery, °C	-20 … +60
Operating temperature without the battery, °C	-40 … +85
Temperature at which the battery is possible to charge, °C	0 … +50
Maximum allowable humidity level at 35 °C, %	95
Device dimensions with connectors, mm	102x57x22
Device weight, kg	0,086

1. *If maximum operating voltage is exceeded the power protection is activated. The device continues to work, but is powered by the battery.*
2. *If GPRS operates in poor communications, peak consumption (10 ms), consumption of the device can accede 500 mA.*
3. *Attention! Lithium polymer battery (Li-Po) is used in the device. The following rules must be observed during its operation: not to heat, keep away from sources of heat, not to throw the battery into the fire, not to expose to direct sunlight. The device, for power of which Li-Po battery is used, cannot be used in high humidity, high and low ambient temperatures. Operation is permitted under the conditions specified by the manufacturer. Not to hit, not to deform, not to disassemble, not to close contacts.*
4. *Protection against battery charge while it is overcooled or overheated.*
5. *When the device is stored and used outside the specified temperatures, it is recommended to turn it off and remove the battery from the device to avoid damage to the battery and to the device.*

1.5 Appearance of the device

On the front part of the device unit (figure1) is located:

- 14-pin connector of Microfit-14 type for connection of power supply, digital and analog sensors and control lines.

On the side of the device unit (figure2) is located:

- MiniUSB connector for connection with a computer;
- SIM card holder slot with ejector (yellow button).

In the upper part of the device unit (figure3) there are three indicators:

- system indicator (SYS)
- modem operation indicator (GSM);
- navigation receiver indicator (NAV).

Figure 1. Device unit (front view).
14-pin connector of Microfit-14

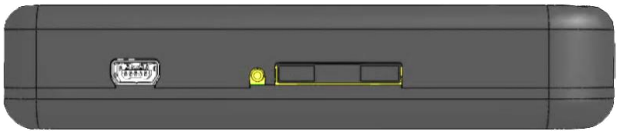

Figure 2. Device unit (side view).
MiniUSB connector and SIM card slot with ejector

Figure 3.Device unit (top view).
SYS, GSM, NAV indicators

1.6 Standard equipment set

Tab. 2

№	Name	Number of pieces	Version of complete set	
			A	B
1	Device unit	1	+	+
2	14-pin connector of Microfit-14 with two power wires	1	+	+
3	Cable set of 5 installation wires	1	+	+
4	Interface cable with MiniUSB connector	1	+	
5	Passport	1	+	+
6	Package	1	+	

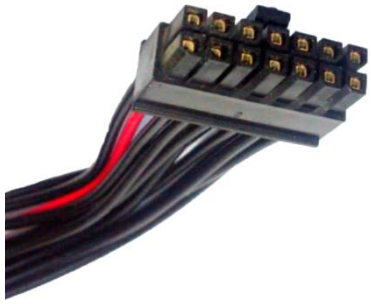

Figure 4. 14-pin connector of Microfit-14

Figure 5. Interface cable with MiniUSB connector

Some cases may require connection of additional equipment not included in the standard equipment set, for example:

- fuse and fuse holder;
- fuel level sensor;
- external LED;
- temperature sensor;
- TouchMemory contact key reader.

Figure 6. Fuse and fuse holder

Figure 7. Fuel level sensor

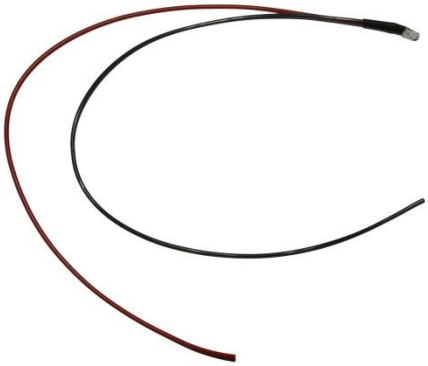

Figure 8. External LED

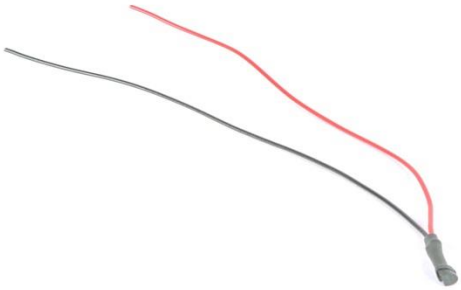

Figure 9. Temperature sensor

Figure 10. TouchMemory contact key reader

The manufacturer reserves the right to complete the devices with equipment whose set, appearance and characteristics differ from those shown in the figures.

1.7. Device components

The device consists of the following elements (see figures 11-14):

1) front cover;
2) fixing hole;
3) system LED indicator;
4) GSM LED indicator;
5) GLONASS / GPS LED indicator;
6) 14 pin connector;
7) MiniUSB connector;
8) SIM-card 1 ejector holder;
9) SIM-card holder 1 (external);
10) back cover;
11) fixing screw of the back cover - 4 pcs.

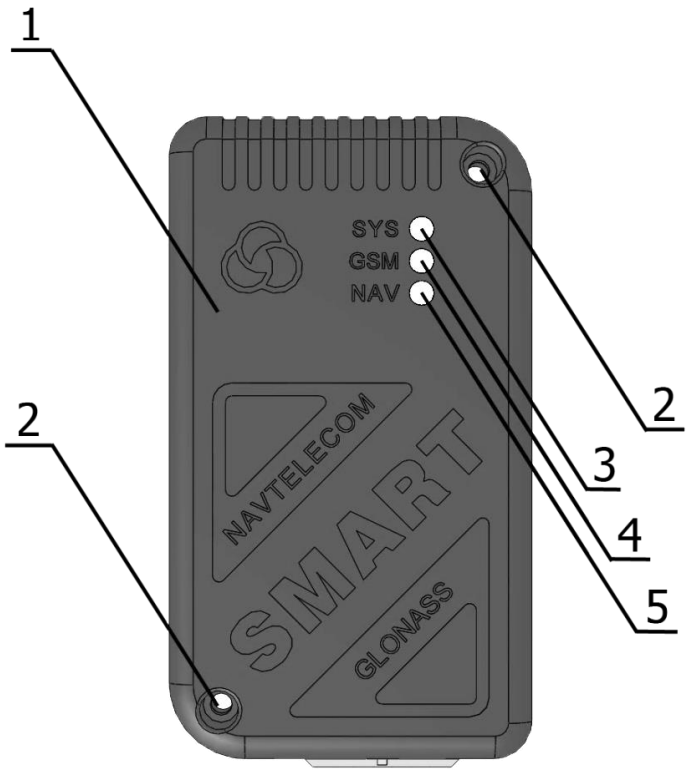

Figure 11

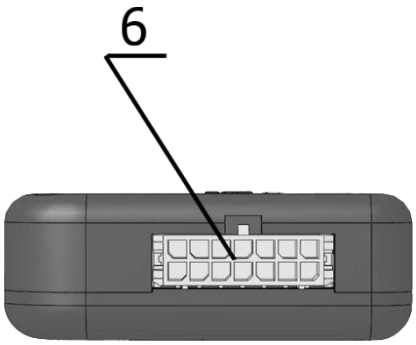

Figure 12

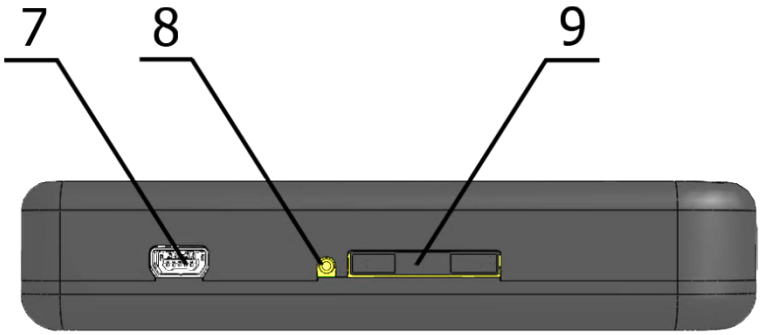

Figure 13

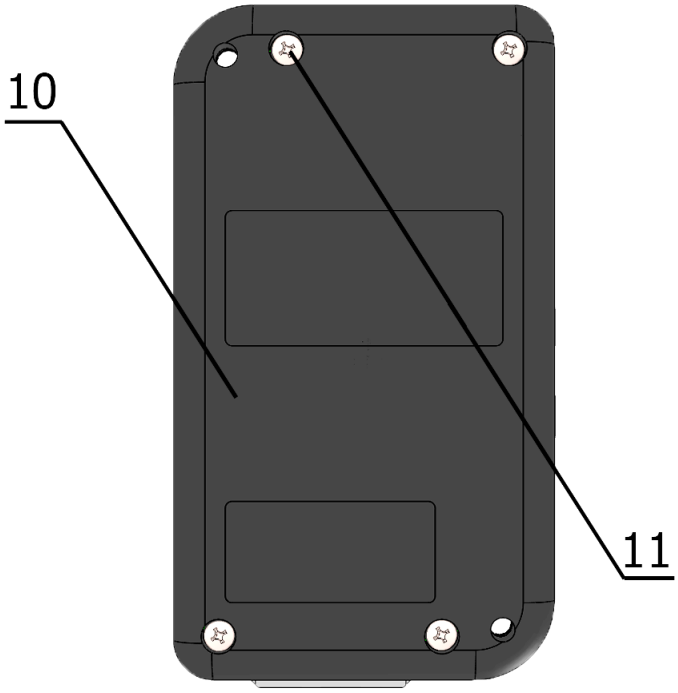

Figure 14

1.8 Device interface connector

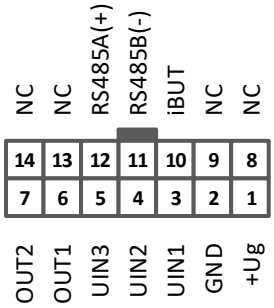

Figure 15. System 14-pin interface connector

1 - Power "Plus" (+ U_G)
2 – "Ground" (GND)
3 - Universal input 1 (UIN1)
4 - Universal input 2 (UIN2)
5 - Universal input 3 (UIN3)
6 – Output 1 "open collector" (OUT1)
7 – Output 2 "open collector" (OUT2)
8 – Not used
9 – Not used
10 - 1-Wire Interface Line (iBUT)
11 - RS-485 interface line (RS-485B (-))
12 - RS-485 interface line (RS-485A (+))
13 – Not used
14 – Not used

"Plus" of the main power supple +U_6 should be connected via an external fuse.

«Ground» GND is connected to the "ground" of the car.

The universal inputs UIN1, UIN2 и UIN3 can be set up as discrete, analog, counting or frequency. It allows to connect to them a wide range of different sensors, for example, frequency (frequency from 1 Hz to 2000 Hz) and analog (voltage from 0 V to 31 V) FLS, impulse fuel consumption sensors (DRL), buttons or switches.

Attention!
It is prohibited to apply a voltage more than 50 V to the device universal inputs, because it may lead to the failure of the device.

Outputs OUT1 and OUT2 «open collector» type are designed to control low-current loads up to 500 mA. When activated, a negative signal ("Ground") is formed on these lines. Connection of external executive devices with a load current higher than the maximum allowed should be made using additional switching relays. The relay type is selected based on the requirements for the value of the switched current, voltage, and also depending on the power of the connected device.

The interface line **1-Wire (iBUT)** is used to connect the contact pads of TouchMemory keys, Proximity-card readers and digital heat-sensing device.

The digital interface RS-485 is designed for connection of various devices transmitting and receiving information on this interface, for example, fuel level sensors (up to 6 pcs.), CAN bus adapter, RFID.

2. DEVICE CONNECTION

2.1 Installation

Before the system installation, first of all, it is necessary to determine the type and number of the connecting sensors, the identification system and other additional equipment. It is also necessary to be sure that all the additional equipment connected to the terminal are operable.

The device has internal sensitive GSM and GLONASS/GPS antennas, however, just before system installation and equipment connection it is necessary to be sure that at the proposed location, the selected cellular operator provides satisfactory communication quality.

The device should be installed in such a way as to ensure maximum "visibility" of the navigation satellites in the upper hemisphere. The device must be oriented in space so that the internal GLONASS/GPS antenna is on top. That is, when the device is placed vertically, the Microfit-14 interface connector should be located on the bottom, and on the horizontal position, the SYS, GSM and NAV indicators should be on the top.

Attention!

In order to avoid overheating of the device and failure of the Li-Po battery, it is prohibited to install the tracker in places with an ambient temperature more than +60 ° C, for example, near heating systems, etc. It is also prohibited to place the device in a sealed container without heat dissipation.

It is prohibited to install tracker in places with high humidity and in places where there is a risk of possible ingress of liquid or large amount of dust into the case.

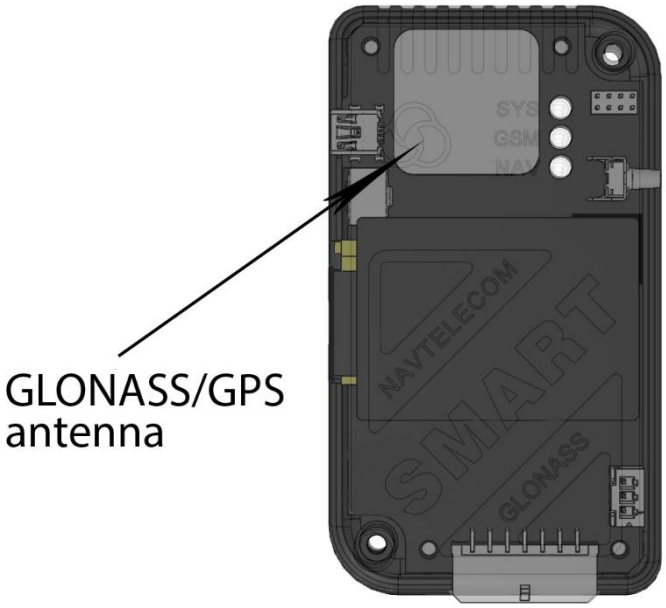

Figure 16. Device unit. Location of GLONASS/GPS-antenna

When the device is connected to the Microfit-14 connector harness, the connector itself should not be connected to the device. Each pin of this connector has a numeric code. The purpose of each pin on the Microfit-14 system connector is shown in Figure16

At the stage of checking the correctness of the connection and settings of the device, it is not recommended to directly include actuating devices in the output circuits. It is advisable to do this at the final stage of verification.

The power supply of digital and analogue fuel sensors must be connected through the fuses supplied with the sensors directly to the power supply.

The power supply "-" ("ground") of all connected external sensors must be combined with the power supply "-" (contact "G") of the device.

The interface lines of fuel sensors should be connected directly to the device without additional elements. Switches must be made with the power off.

Connection to the car CAN bus should be carried out with the car ignition off.

2.2 SIM-card installation and operation

The device supports using of one SIM-card. The SIM card (external) installation is carried out without the use of special tools.

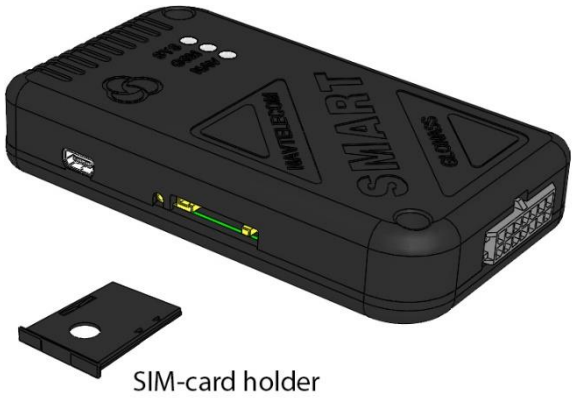

Figure 17. SIM-card installation to the device

Remove the SIM card holder from the device by pressing the yellow ejector button with a pen or a pencil. Place the SIM card in the holder with the gold contacts facing out. Carefully insert the holder along with the SIM card back into the device.

Attention!

If the SIM-card is locked with a PIN code, it is necessary to unlock it by inserting the SIM card into a mobile phone or specify the PIN-code of this card in the device settings in the "Data transmission" tab.

The balance of funds on SIM-cards should be sufficient for the device to operate on GPRS.

2.3 Power connection

The power supply of the system is carried out from the on-board network of the car, which should within the limits indicated in Table 1, in the section "Basic technical characteristics", or from the built-in rechargeable battery when the main power is disconnected.

When voltage surges, which is more than the specified ratings, occur, the built-in overvoltage protection system will operate in the device. It is strongly recommended to connect the device to the power supply through a 1 A fuse (not included in standard equipment set). During installation the power supply should be connected the last turn when all the other equipment is already connected. Connection of the power supply minus contact (GND) is carried out to the vehicle "ground".

Note:

On vehicles with disconnection of the "ground" in order to ensure uninterrupted operation, it is allowed to connect the device power supply to the "+" and "-" circuits of the vehicle battery. In this case, it is not allowed to connect any sensors, signal circuits or power supply circuits through which the device can be connected to the car body. Also, when the car is powered by the battery in which the "ground" is disconnected, sensors cannot be connected to the device, the "-" power supply of which is connected to the car body, without the use of galvanic isolation devices.

With an operation supply voltage and with the observance of the temperature mode of charging the built-in battery (see the Table 1, in the section "Basic technical characteristics"), the built-in battery is constantly recharged through the circuit of the device.

When the system operates only from the built-in battery, 1-Wire (IButton) do not function due to insufficient voltage. Power supply from the built-in battery is sufficient for operation of universal inputs, RS-232 and RS-485 interfaces, built-in accelerometer, GSM modem, GLONASS / GPS receiver and for the implementation of control outputs.

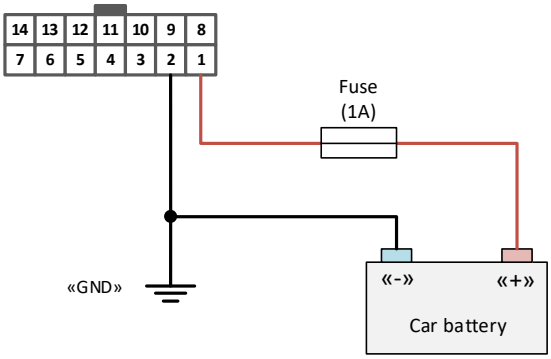

Figure 18. Power connection

2.4 Universal inputs connection

2.4.1 Analog sensors connection

The device allows to measure the voltage applied to the inputs in the range of 0 ... 31 V.

When connecting analog FLS or other sensors for which the output voltage has to be monitored, the voltage measurement profile must be set in the inputs setting. In this case, the function of adjustable averaging of measured values and the setting of the threshold level for fixing the voltage measurement event become available.

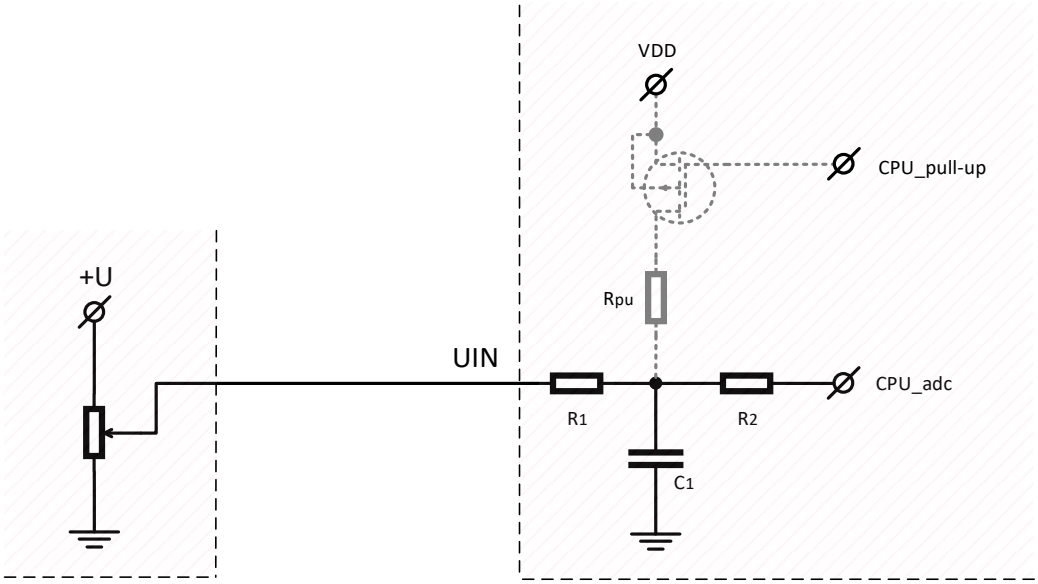

Figure 19. Connection of analog sensors

2.4.2 Discrete sensors connection

The device allows to connect any type of sensors that have two steady states: "on" ("activated") and "off" ("normal").

The voltage thresholds at which the device fixes the sensor on (activating) or off (switching to normal) depend on the line profile setting and the set levels on the voltage scale. In order to operate with discrete sensors, the "Discrete NO +", "Discrete NC +", "Discrete NO-", "Discrete NC-" profiles must be specified in the settings.

"Discrete N3 -", "Discrete NO-" allow to operate with sensors which close the input to "ground" ("-" power) when they are turned on or off.

Note:

With these profiles voltage is applied to the input through the built-in pull-up resistor Rpu. This allows not to use an external "pull-up" resistor when operating with sensors which operates on "-" (by "ground").

Attention!

Due to the technological specifications of the device, the UIN1 is designed without taking into account the built-in

pull-up. Accordingly, the "Discrete NO-", "Discrete NC-" profiles will not be available for the UIN1. Therefore, connecting sensors operating by "ground", their connection scheme to the device via the UIN1 will differ from the scheme used to connect to the UIN2 and UIN3.

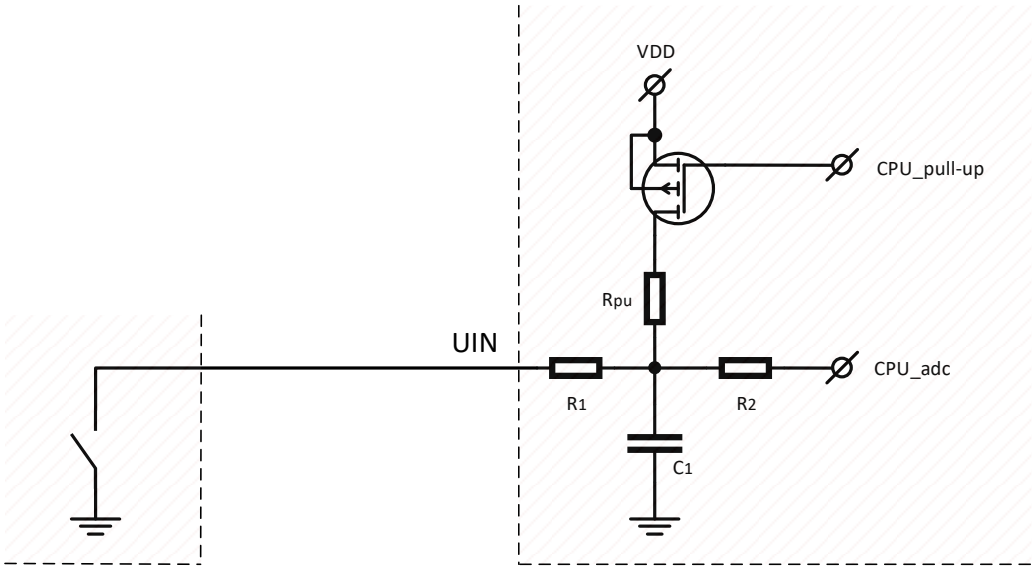

Figure 20. Connection of normally open (NO-) sensors to UIN2, UIN3

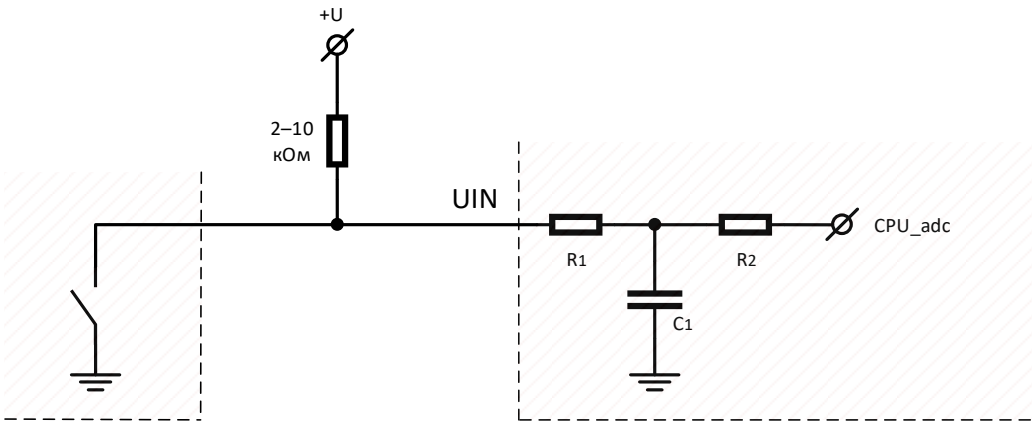

Figure 21. Connection of normally open (NO-) sensors to UIN1

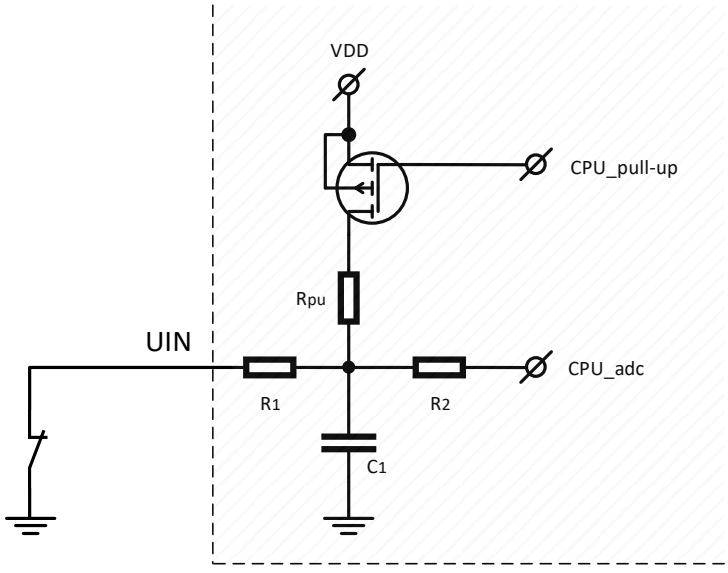

Figure 22. Connection of normally closed (NC-) sensors to UIN2, UIN3

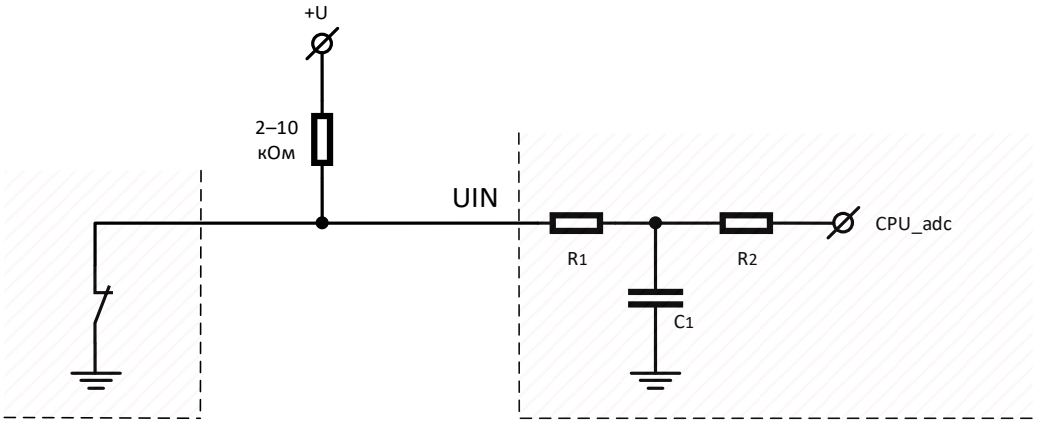

Figure 23. Connection of normally closed (NC-) sensors to UIN1

Profiles "Discrete NC+" and "Discrete NO+" allow to work with sensors, which, when turned on or off, close the input to "+" supply voltage.

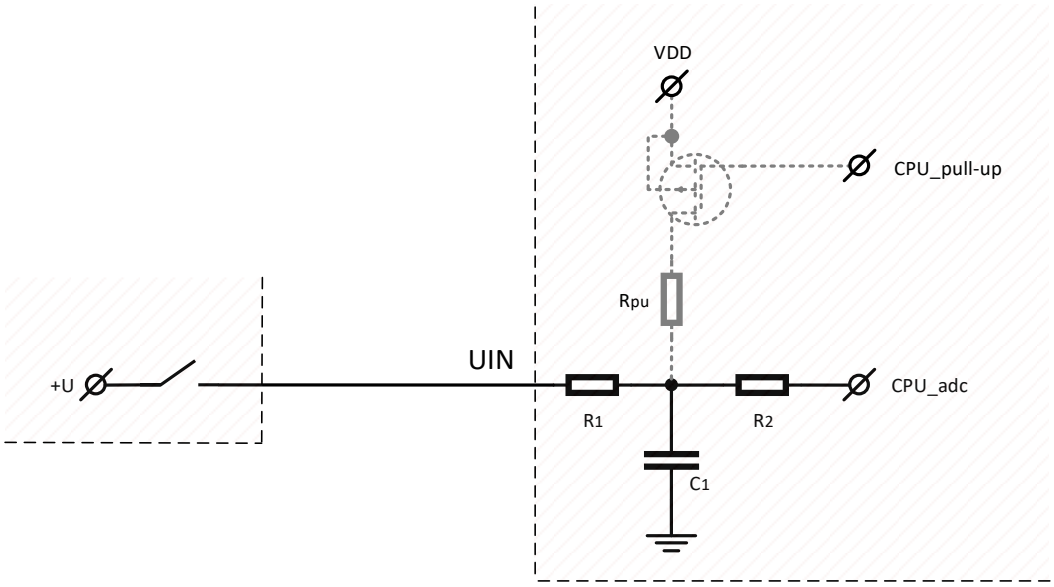

Figure 24. Connection of normally open (NO+) sensors

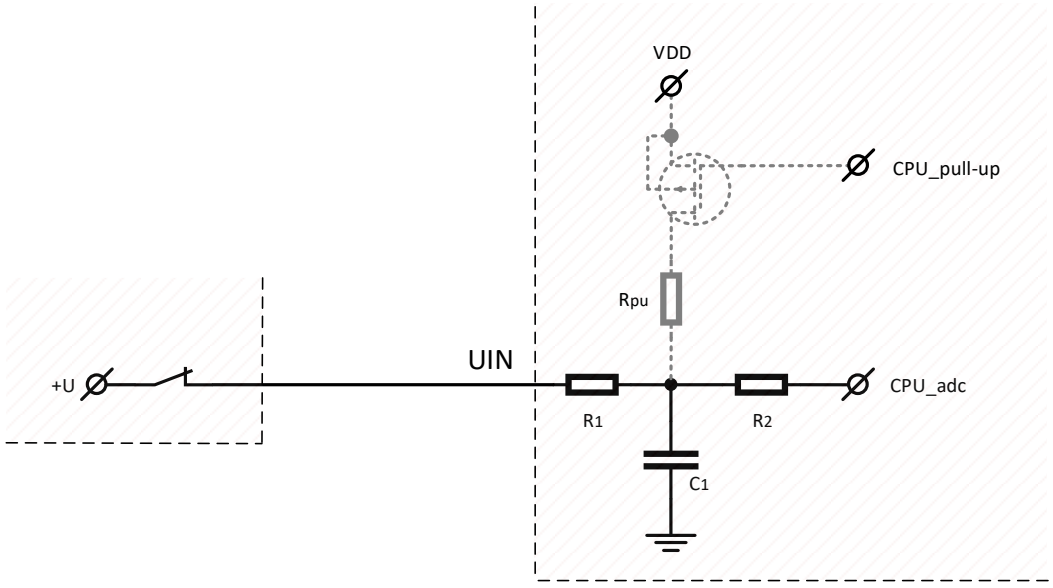

Figure 25. Connection of normally closed (NC+) sensors

Note:

*It is recommended to connect one of the universal input (usually **UIN1**) to the vehicle **ignition line** and make the appropriate setting in the configuration. However, such connection is not mandatory.*

In addition to the source of notifications about turning on and turning off events, the input is used in coordinate processing algorithms (for example, when they are averaged at parking lots), energy saving, when calculating engine hours and in some other device algorithms.

Any input which configured for operation with a discrete sensor can be used as an ignition.

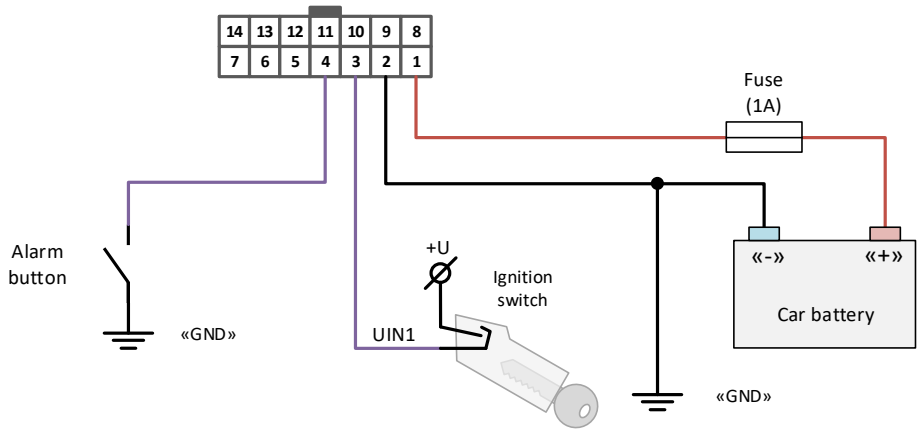

Figure 26. Connection of the ignition lock and alarm button

Digital inputs are configured in the "Input lines" tab of the NTC Configurator program.

2.4.3 Pulse frequency sensors connection

Connecting frequency or pulse sensors, it is necessary to consider how the output signal is generated in these sensors. Further setting of the input depends on this.

It is necessary to set the threshold level of fixation correctly, in order the device correctly determine the frequency or calculate the pulses.

Connecting pulse or frequency sensors, the output of which is implemented according to the "open collector" (OC) circuit with pull-up resistor, it is not necessary to turn on the Pull-UP circuit in the device by the setting.

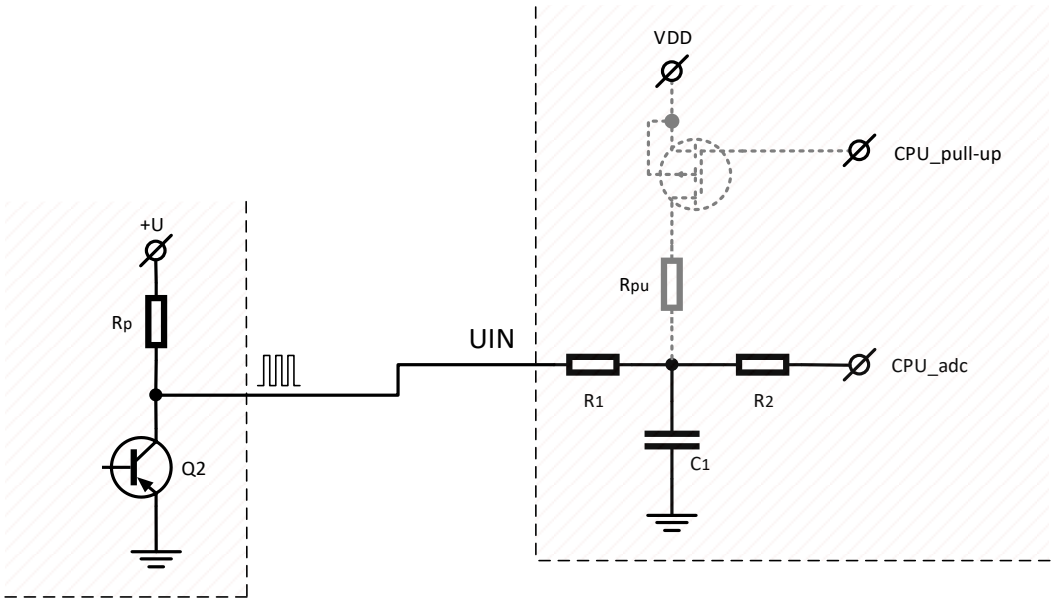

Figure 27. Connection of sensors with an "OC" type output circuit with a pull-up resistor in the sensor

When pulse flow meters with a reed sensor is connected, one contact of which is connected to the "ground", it is necessary to include an internal pull-up resistor in the device setup.

Attention!

Due to the technological specifications of the device, the UIN1 is designed without taking into account the built-in pull-up. Accordingly, the "Discrete NR-", "Discrete NZ-" profiles will not be available for the UIN1. Therefore, connecting sensors operating by "ground", their connection diagram to the device via the UIN1 will differ from the diagram used to connect to the UIN2 and UIN3.

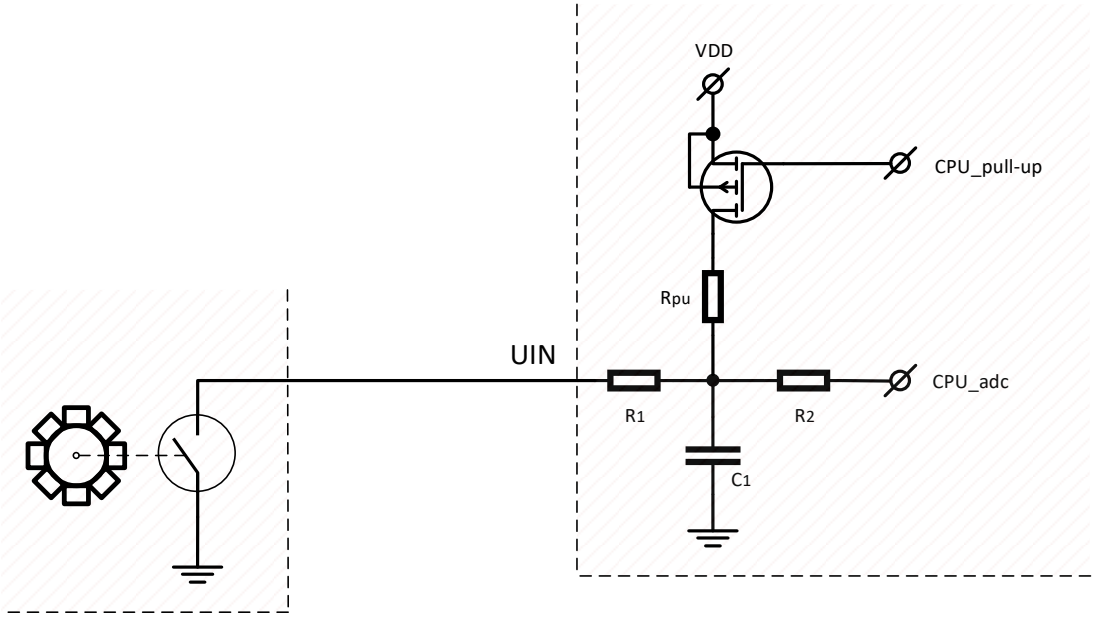

Figure 28. Connection of flow meter with a reed sensor to UIN2, UIN3

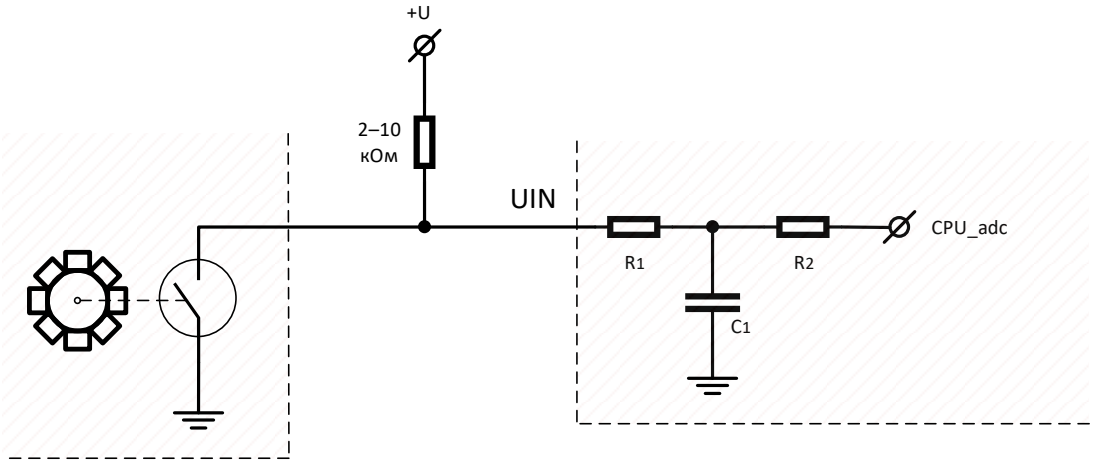

Figure 29. Connection of flow meter with a reed sensor to UIN1

2.5 Built-in accelerometer

There are virtual sensors based on the built-in accelerometer (three-axis acceleration sensor): soft and strong impact sensors, displacement sensor and tilt sensor in the device. They can be used for alerts as well as external lines. Accelerometer is also involved in the coordinate averaging algorithm during stops, and the correct display of the track depends on its settings. In addition to virtual sensors, accelerometer is used for such functions as EcoDriving. For proper operation of these functions, the accelerometer must be calibrated after installing the device on the vehicle.

2.6 Control outputs connection

OUT1 and OUT2 open collector outputs are designed to control low-current loads up to 500 mA. When the output is activated (turned on), it connects the external load to the "-" power supply (to the "ground").

The character of the controlling signal depending on the chosen mode can be permanent, signal or periodic.

Settings of the outputs are made in the "Output lines" tab of the NTC Configurator program.

One of the outputs can be used for control of sound signal emitting with help of the buzzer, for warning or EcoDriving function indication and for reminding about TM-key attaching (or RFID card).

Buzzers may be different in operating voltage, in the presence or absence of a built-in generator. A buzzer with a built-in generator can emit a sound signal independently when a constant supply voltage is applied.

In order buzzer operates without built-in generator, supply voltage modulation is required.

Buzzer without built-in generator can be connected only to OUT1, because only this line has opportunity to modulate the control signal for the buzzer.

Buzzer with built-in generator can be connected to any output. Connection diagrams for buzzer with build-in generator and for buzzer without build-in generator have no difference.

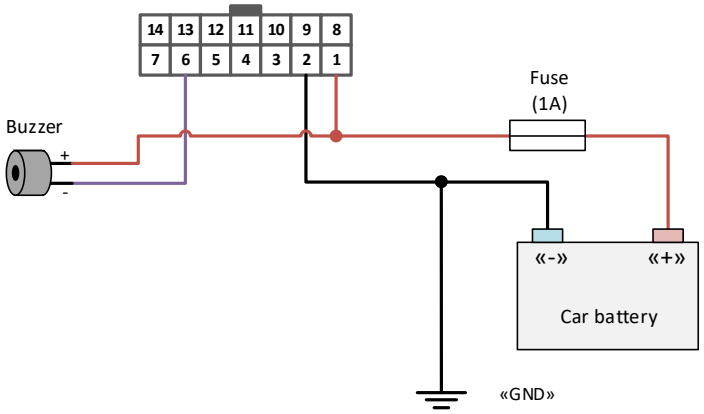

Figure 30. Connection diagram of buzzer

It is possible to connect LED for indication of device operation mode and security mode state.

If the power source is vehicle's on-board network, the LED must be connected through current-limiting resistor. Such resistor is already installed inside the lamp in the automotive LED lamps. It is only necessary to select the LED lamp under the desired voltage of the on-board vehicle network.

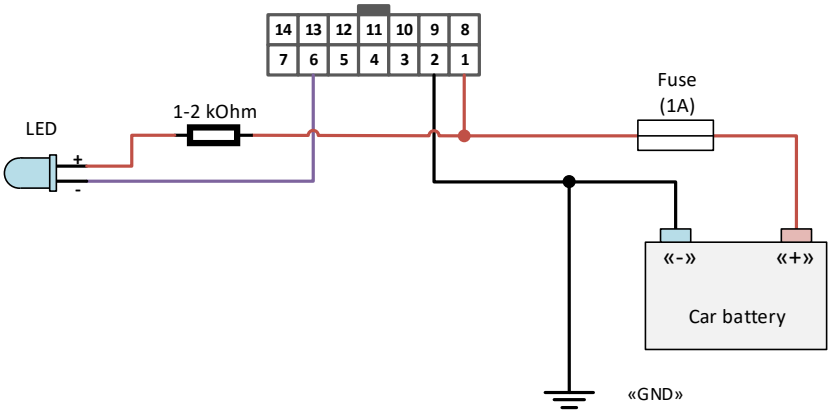

Figure 31. Connection diagram of LED

When security functions are used, it is possible to control the car siren. If the siren has a separate input, controlled by "-", then the output of the terminal can be connected to this input directly.

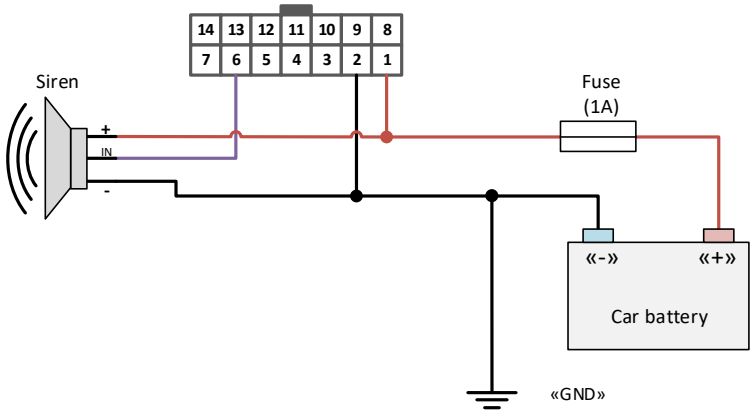

Figure 32. Connection diagram for car siren with control input by "-".

In order to connect car sirens without an additional control input, the inclusion of which is carried out by applying the supply voltage, it is necessary to use an additional relay, since the current consumed by such a siren may exceed the maximum allowable value for the output of the device.

The use of an additional relay is necessary for any load that can consume more than 500 mA.

There are relays with four and five contacts, but all relays have winding contacts (control contacts), these are 85 and 86 contacts (Figure33). One of these contacts is connected to the "+" of the power supply, and the second to any negative control output of the device (contacts 6 and 7 of the Microfit-14 connector). All connections must be made through the fuse.

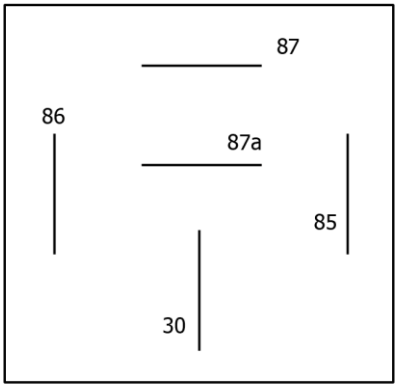

Figure 33. Designation of the external relay contacts

When voltage is applied to control contacts, relay is activated and closes or opens the electrical circuit with power contacts. Power contacts are always marked as 30, 87 and 87a. The 30th pin is always in the relay. Without applying voltage to the winding contacts, it is permanently closed to contact 87a. If a signal is applied to the winding, then the 30th contact is disconnected from 87a and connected to 87. 87a or 87 contacts may be absent, then the relay will only work to turn on or off (closing-opening) the power circuit.

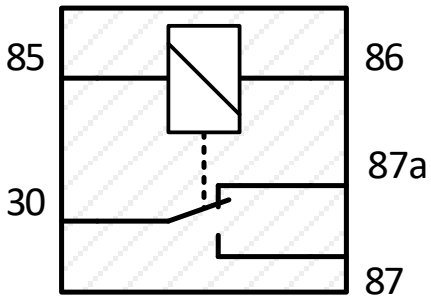

Figure 34. Five-contact relay diagram

Such relay can be used for example, when connecting an automotive electromechanical lock (figure 35).

Attention!

When controlling the inductive load, which is the winding of the relay, reverse currents with a potential of more than 200 V can occur. Such a voltage can destroy the control transistor of the device output. To limit backflow emissions, it is

necessary to connect an additional 1N4007 diode (1A, 1000V) in parallel to the relay coil, as indicated in Figure35

At the stage of correctness verification of the connection and settings of the device, it is not recommended to include actuators in the relay circuit directly. It is advisable to do this at the final stage of testing.

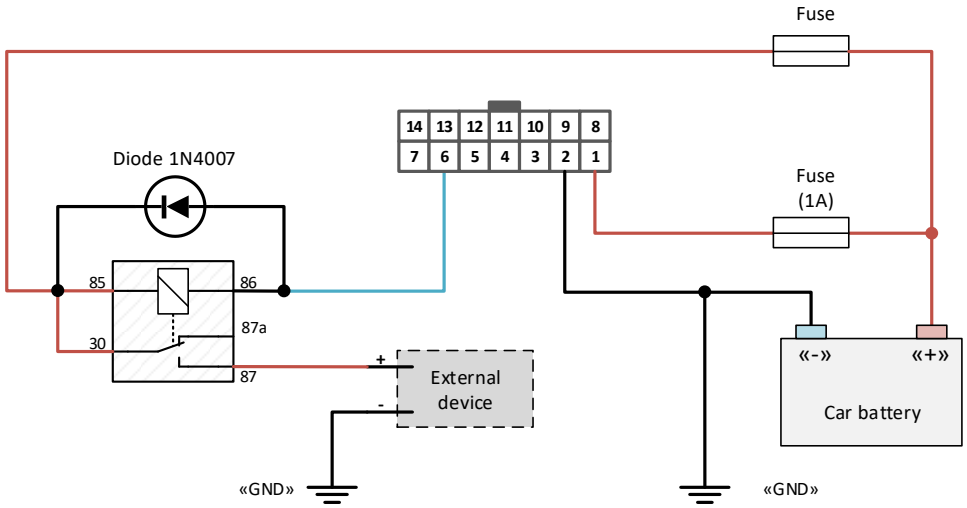

Figure 35. Connection diagram of the relay to the outputs of the device OUT1 and OUT2

2.7 1-Wire informational interface (IButton) connection

1-Wire controller interface (IButton) allows to connect up to 4 digital sensors like DS18S20 (DS18B20) to the device, and it can also operate with DS1990 keys or key / card readers that emulate DS1990 keys via interface 1- Wire.

Each DS1990 key is a chip with a unique identification number stitched into it at the manufacturing plant by which the device identifies this sensor.

Saving the key codes in the device's memory allows to use identification when changing the security mode, activating the output with the profile set: "TM registered key indicator" and "TM key indicator", and also necessary for operation of the "Immobilizer" function.

The maximum number of stored keys - 16.

It is also allowed to connect external readers of contactless Proximity-cards and keyfobs that have TouchMemory DS1990A key emulation interface. However, such readers, as a rule, do not operate together with thermal sensors connected to the same physical interface.

Figure36. TouchMemory System Key

Figure37. TouchMemory key contact reader

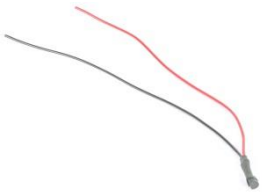

Figure38. Temperature sensor based on DS18S20 chip

Figure39. Appearance of Proximity-cards and keyfobs and possible variants of their readers

The terminal has the ability to connect temperature sensors to the 1-Wire interface using a two-wire circuit with "parasitic" power. Power is supplied through the same wire as the signal, therefore: the connection is made by two wires connected to the connector pins of the GND device ("ground") and IBUT 1-Wire (signal and power).

Note:

In order to ensure better immunity with a significant length of the line connected to the 1-Wire interface, temperature sensors based on the DS18S20 can be connected by a three-wire circuit with a separate stabilizer supply voltage of 3.5 - 5V sensors. There is no such stabilizer in the device.

In order the 1-Wire interface operates, the device must be powered up with the main power supply or connected by USB. When it is powered by the built-in battery, the 1-Wire interface does not work.

The red wire of the temperature sensor and the center pad contact TouchMemory are connected to the 1-Wire interface (pin 10, "1-Wire"). The black wire of the temperature sensor and the side contact of the TouchMemory pad is connected to the negative contact of the device (pin 2, "GND") or to the vehicle "ground".

Connecting sensors and TouchMemory pads it is important to observe the topology of the common bus. This means that all sensors must be connected to one common two-wire cable (called as bus or trunk). It is important not to leave open the end of the bus that is opposite to the connected device, it should be closed by the last plug-in sensor.

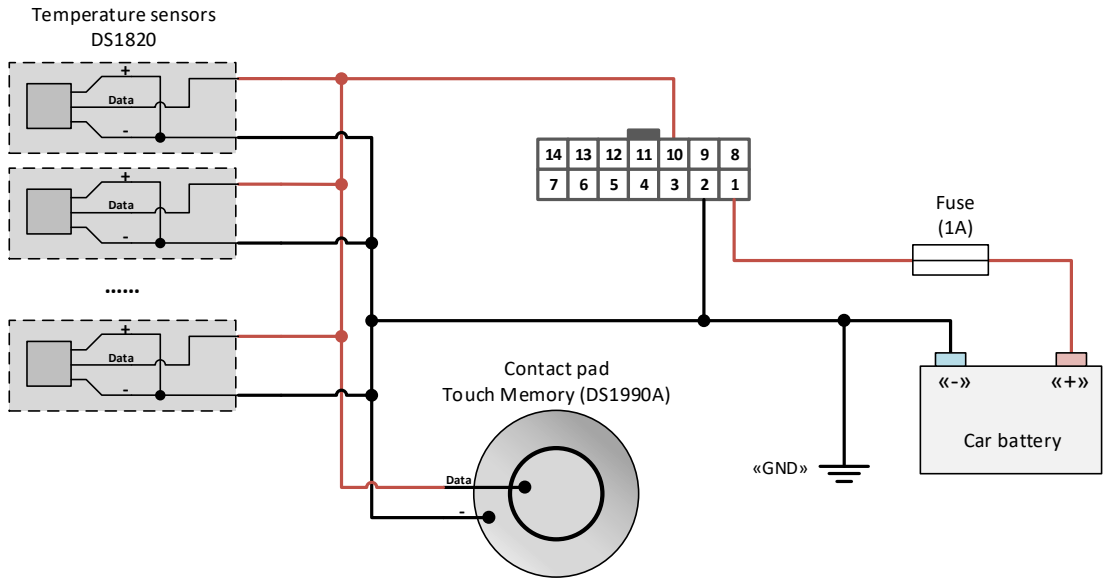

Figure 40. Connection diagram of digital temperature sensors and TouchMemory contact pad

For networks sensors construction it is necessary to choose a "twisted pair" cable, as this drastically reduces the effect of interference beat. It is recommended to use standard unshielded telephone wire with twisted pairs of category 5. This cable is available with two or four pairs of wires. During sensors network laying it is possible to use any cable wires. Unused wires should be left free at both ends, as their grounding increases the capacitive load. Guaranteed sensor operation is provided with a tire length of not more than 15 meters. With a further increase in the length of the line on the signal parameters, the electrical characteristics of the cable may be affected. If it is necessary to use a contact reader for DS1990 keys, it is advisable to connect it on the bus in front of temperature sensors, that is, closer to the device connector.

When contacting a key to the contact pad or Proximity-cards or keyfobs to their readers connected to the device in operation mode, the information with the key code and the time it was contacted will be sent to the telematics server (separate packet with this information).

Digital temperature sensor codes, keys, maps and keyfobs of the identification systems can be read in the NTC Configurator program in the "Telemetry" window with external power connected to the device

2.8 RS-485 interface connection

The digital interface RS-485 is designed to connect devices transmitting and receiving information via this interface, for example, fuel level sensors, CAN bus adapter, RFID.

As a rule, the interface is used to connect up to 6 digital fuel sensors. It is supposed to use digital LLS-compatible sensors.

The RS-485 + interface line of the device should be connected to the RS-485 + line of the sensor, usually designated as "A", and the RS-485 line of the device should be connected to the RS-485 line of the sensor, usually designated as "B". The RS-485 interface specifications practically do not limit the length of cables on a land vehicle (100m or more), since the interface is a differential bus and is well protected from the influence of external interference.

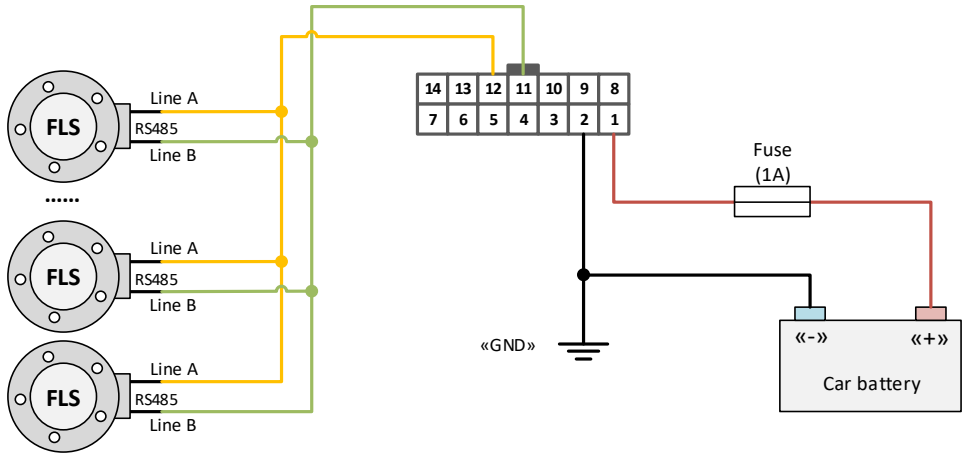

Figure 41. Connection diagram of fuel level sensors by RS-485 interface

In the fuel sensor, the periodic data output mode must be turned off, and the network address and data transfer rate must match the corresponding programmed parameters in the device itself.

3. LED INDICATION

In order to display the operation modes and the current state of the system, three LEDs on the device case are used: SYS, GSM and NAV.

The SYS system LED indicates the current status of the device. This LED indicates an alarm state if an alert is sent to subscribers by SMS, or an input is in the activated state. Also, the system LED can display the system operation in test mode (it is glowing for one second, is not glowing for one second).

Meaning of SYS LED indication

Tab. 3

Type of the signal light	Signal value
No indication	"Turn off " mode
1 flash in 4 seconds	"Energy saving" mode
2 flashes in 4 seconds	"Monitoring" mode
3 flashes in 4 seconds	"Security" mode
Continuous frequent flashes	"Alarm" mode

Meaning of GSM LED indication

Tab. 4

Type of the signal light	Signal value
No indication	Built-in GSM-module is turned off.
1 sec is glowing, 1 is not glowing	Built-in GSM-module is turned on. No registration in the operator's network
1 short flash 1 second off	There is a registration in the cellular network of the operator. Weak signal
2 short flashes 1 second off	There is a registration in the cellular network of the operator. Medium quality signal
3 short flashes 1 second off	There is a registration in the cellular network of the operator. High quality signal
Permanent short flashes	Open GPRS session. Attempts to establish communication with the telematics server
Constant glowing	Connected either to the telematics server by GPRS or by voice channel

Meaning of NAV LED indication

Tab. 5

Type of the signal light	Signal value
No indication	Built-in GLONASS/GPS module is turned off
1 sec is glowing 1 is not glowing	Built-in GLONASS/GPS module is turned on Navigation coordinates is not identified
1 short flash 1 second off	Built-in GLONASS/GPS module is turned on Navigation coordinates is identified. Small number of satellites
2 short flashes 1 second off	Built-in GLONASS/GPS module is turned on Navigation coordinates is identified. Average number of satellites
3 short flashes 1 second off	Built-in GLONASS/GPS module is turned on Navigation coordinates is identified. A large number of satellites