

Limited liability company
«Santel-Navigatsiya»



Approved by MPCB.464514.007-18 ЛП

Accident Emergency Call Device
(AECD)
7.18

USER MANUAL

MPCB.464514.007-18 P3

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CHANGE REGISTRATION SHEET

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This User Manual is designed for familiarization with the AECD 7.18, its operation modes and intended use.

This User Manual provides sufficient information for the training of service personnel.

The Device operator does not need any special radio technical training.

The Device does not pose any danger to the environment.

This Manual is considered up to date at the time of its composition and cannot entirely reflect changes to the Device or its firmware that were enacted at a later date.

When changes are made to this Manual related to the Device design and/or firmware update, the Manual must be reconciled.

This document uses the following definitions and abbreviations:

GPRS	—	An add-on over GSM mobile communication technology that implements packet data transmission
GPS	—	Global Positioning System
GSM	—	A global standard for digital mobile cellular communications including time division multiple access (TDMA) and frequency division multiple access (FDMA)
ICCID	—	Unique serial number of the SIM-chip
IMEI	—	Unique serial number of the GSM modem
LTE	—	A wireless high-speed data transmission standard for data terminals.
QR-code	—	Matrix barcode containing information about the object
UMTS	—	Universal Mobile Telecommunication System
BIP	—	User Interface Block
GNSS	—	Satellite navigation system
GLONASS	—	Global navigation satellite system
MDS	—	Minimal Data Set
RTA	—	Road Traffic Accident
TCU	—	Embedded device on board a vehicle that controls the tracking of the vehicle (electronic unit)
AECD	—	Accident Emergency Call Device
ERA-GLONASS	—	Russian state emergency response system
MEMS	—	Microelectromechanical Systems

1. DESCRIPTION AND OPERATION

1.1. Device Description and Operation

1.1.1. Device Designation

AECD 7.18 MPCB.464514.007-18 is an accident emergency call device, further in the text – Device. It can also be part of the accident emergency call system (AECS). The Device is intended for automatic (in case of an accident) or manual call to the emergency response service operator, MDS transmission including the vehicle characteristics, location coordinates, time and direction of movement; the Device also provides hands-free communication between the vehicle users and operator of the ERA-GLONASS state automated system.

The Device is made in the configuration of standard equipment installed on M1, M2, M3, N1, N2, N3-class vehicles in accordance with the international classification system.

1.1.2. Technical Specifications

1.1.2.1. General characteristics of the GLONASS/GPS receiver:

- numbers of channels – at least 16;
- location data update rate – 1 Hz;
- GLONASS/GPS antenna type – internal.

1.1.2.2. The Device works in the following ranges: GSM-900/1800, UMTS-900/2000, LTE-800/1800/2600. Transition from one range to another is performed automatically.

1.1.2.3. Transmitter power levels:

- GSM 900 – class 4, 2 W (33 dBm);
- GSM 1800 – class 1, 1 W (30 dBm);
- UMTS 900/2000 – class 3, 0.25 W (24 dBm);
- LTE 800/1800/2600 – class 3, 0.25 W (24 dBm).

1.1.2.4. GSM/UMTS/LTE antenna type – internal, planar inverted F-antenna (PIFA).

1.1.2.5. SIM-card type – resident (non-removable) multi-profile SIM-card installed on a printed circuit board using SMD technology (SIM-chip).

1.1.2.6. Identification of the moment of accident is performed automatically by the internal sensor.

1.1.2.7. The Device operates from an on-board power system with a rated voltage of 12 or 24 V. In case of disconnection from the power source, the Device runs on a built-in battery.

The ignition input line is intended for the logical control signal. Logical zero (when ignition is off) is 0 to +2 V voltage, while logical unit (ignition is on) is +9 to +27 V voltage.

1.1.2.8. Connecting the device to an external power supply with an output voltage other than that specified above is not permitted.

The power supply system of the Device should meet the following requirements:

- over/under voltage protection;
- protection against reverse polarity of the supply voltage;
- impulse noise protection;
- automatic Device switch on upon being connected to a power supply net;
- automatic correct shutdown of the Device when power is turned off.

1.1.2.9. Limiting temperature:

- minimum: - 40 °C;
- maximum: + 85 °C.

1.1.2.10. Working temperature:

- when powered by the on-board power system – from -40 °C to +85 °C;
- when powered by internal backup battery – from -20 °C to +85 °C.

1.1.2.11. The Device is designed taking into account the requirements of GLONASS and GLONASS/GPS satellite navigation and meets the following requirements:

- the Device body provides protection against dust and water penetration as per IP-40, GOST 14254;
- the connectors used for actuators and/or power connectors are protected against short circuiting;
- in the event of failure, the Device does not emit heat energy sufficient to ignite the standard equipment of the vehicle; and in event of a fire, the Device does not emit substances that can negatively affect human health.

1.1.2.12. In terms of resistance to climatic and mechanical influences, as well as electromagnetic compatibility and resistance to electromagnetic interference, the Device meets the requirements of technical conditions stated in MPCB.464514.007 TU.

1.1.2.13. Each Device undergoes production tests at LLC «Santel-Navigatsiya». The purpose of the tests is to ensure reliability, quality, functionality of Devices and to verify the correct operation of the firmware.

1.1.3. Device Components and Accessories

1.1.3.1. The Device has basic configuration listed in Table 1.

Table 1 – Basic configuration of the Device

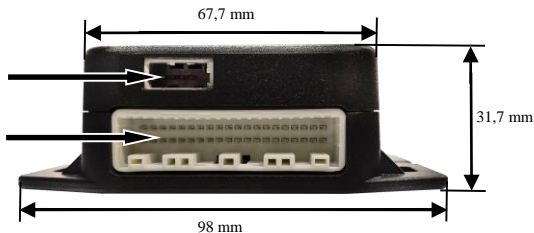
Name	Quantity
TCU (Electronic unit)	1
BIP (User Interface Block)	1
Remote speaker	1
Cable harness	1
Data Sheet	1

Any item from the kit can be supplied upon separate orders.

1.1.3.2. External views of the TCU are shown in Pictures 1, 2.



Picture 1 – Top view of the TCU

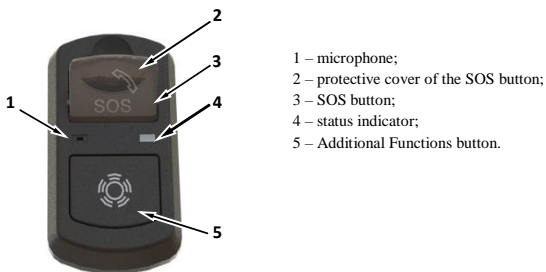


- 1 – USB connector;
 2 – power supply and interface cable connector

Picture 2 – Side view of the TCU

1.1.3.3. Picture 3 presents the BIP and its main elements.

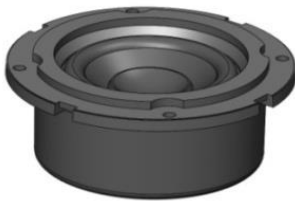
The orientation of the BIP button icons depends on the location of the BIP inside the vehicle (vertically or horizontally).



Picture 3 – BIP MPCB.468624.003-01

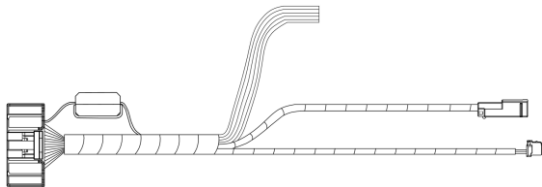
1.1.3.4. Pictures 4 show the view of the remote speakers.

The following models can be used as a remote speaker: MPCB.467282.005 or MPCB.467282.004.

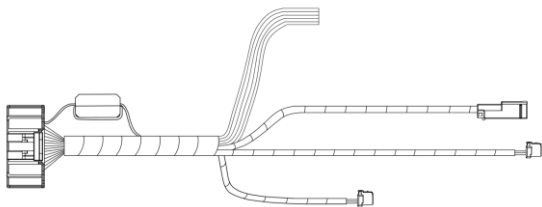


Picture 4 – Remote speaker MPCB.467282.005

1.1.3.5. The cable harness appearance is shown in Pictures 5, 6.



Picture 5 – Cable harness MPCB.468349.718-02



Picture 6 – Cable harness MPCB.468349.718-04

1.1.3.6. By agreement with the car manufacturer, the kit contents and the design of individual components can be changed.

1.1.4. Design and Operation

1.1.4.1. TCU

The TCU is designed to determine the location of the vehicle using GNSS data and, in the event of an accident, transmitting data via cellular mobile communication channels to the server of the automated system «ERA-GLONASS».

TCU components:

- a multifunctional module allowing custom firmware, including:
 - receiver of navigation radio signals of GLONASS or GLONASS/GPS satellite constellation;
 - receiver/transmitter of cellular mobile communication radio signals supporting GSM/GPRS and UMTS standards;
 - tonal (in-band) modem for data transmission within the frequency band of the voice channel;
- resident (non-removable) multi-profile SIM-card installed on a printed circuit board using SMD technology (SIM-chip);
- a backup battery with capacity required to maintain active voice communication for 10 minutes and work in standby mode for at least 1 hour in the absence of external power;
- internal GSM/UMTS/LTE - antenna;
- internal GPS/GLONASS - antenna;
- voltage stabilizer with backup battery charge manager for powering the electronic components;
- CAN data bus connected to the vehicle's on-board information bus for communication with other electronic systems;
- electrical connector for connecting to the vehicle's on-board network and communicating with the interface module of the Device;
- internal crash and overthrow sensor.

TCU has the following weight and size characteristics:

- size, mm – 91,4x98x31,7;
- weight, g – 140.

1.1.4.2. BIP

The BIP is installed in the accessibility zone of the driver or passenger of the vehicle and is designed to provide communication with the contact center operator, as well as indicate the operability of the Device.

BIP composition:

- Additional Functions button – illuminated in white;
- SOS button – illuminated in white and used to make an emergency call;
- protective cover of the SOS button – used to protect against accidental pressing, opens manually;
- microphone;
- status indicator.

BIP has the following weight and size characteristics:

- size, mm – 30x53x25;
- weight, g – 17.

The BIP uses a MEMS CMM-2718AB-38108-TR microphone.

The Device operation is indicated by the BIP status indicator.

1.1.4.3. Remote speaker

The remote speaker is installed in the driver's cabin of the vehicle and is designed to communicate with the contact center operator.

Remote speaker MPCB.467282.005 has the following technical characteristics:

- impedance, Ohm – 4;
- rated power, W – 10;
- maximum power, W – 12;
- frequency response, Hz – 260-15000;
- signal to noise ratio, dB – 84±3/ 1W 0.5m;
- dimensions, mm – 70x70x26,5;
- weight, g – 55.

1.1.5. Marking and sealing

TCU is marked with:

— a single mark of Device circulation on the market of the Member States of the Customs Union;

- Device name
- serial number of the Device (SN);
- Device modification (HF);
- IMEI (unique serial number of the GSM-modem);
- ICCID (unique serial number of the SIM-chip);
- QR-code containing SN, HF, IMEI and ICCID;
- barcode containing ICCID;
- decimal number of the TCU;
- Device manufacture country;
- name of the manufacturer;
- Device manufacturing date;
- mark of compliance with the requirements of UNECE regulations.

BIP and remote speaker are marked with name, designation, date of manufacture.

The markings are applied to labels that are attached to the TCU, BIP and remote speaker housings. Device marking meets the requirements of technical specifications set forth in MPCB.464514.007 TU.

Container and packaging material marking meets the requirements of technical specifications in MPCB.464514.007 TY.

The cable harness is marked with the designation and date of manufacture.

The marking is applied to a label that is attached to the cable harness next to the main connector.

The Device is sealed with a tamper-evident label by the manufacturer upon leaving production.

Sealing of the Device provides protection against unauthorized access on a physical level.

Maintaining the seals intact throughout the course of operation is a prerequisite for accepting notices of complaint in the event of device failure during the warranty period.

1.1.6. Packaging

Device packaging complies with the requirements of the technical specifications set in MPCB.464514.007 TY.

Multiple packaging of Devices for individual orders is possible.

2. INTENDED USE

2.1. Operational Limits

2.1.1. The Device is connected to a direct power source (vehicle on-board power supply system) with a voltage of 12 or 24 V. The TCU is equipped with a lithium-titanate (LTO) battery that does not need to be replaced during the entire life of the Device.

2.1.2. It is not allowed to connect the Device to external power supplies with voltage different from the specified above.

2.1.3. Installation of the Device on a vehicle with a malfunctioned on-board power supply system is not permitted.

2.1.4. Reception of navigation signals from satellites may be hindered if the TCU is installed inside the vehicle compartment that screens radio signals.

Time required to determine vehicle location may be increased if the Device has been in a zone with poor GLONASS/GPS satellite signal reception for an extended period of time.

2.2. Device Use

2.2.1. Turning the Device on

The Device is turned on when external power is supplied (plus, minus, ignition).

When the Device is first powered up¹ by connecting to the vehicle power supply system, regardless of the ignition state (on or off), the Device turns on and enters a self-diagnosis «ERA» state (see «ERA» indication mode in Table 2).

The Device status indication is determined visually using an indicator located on the BIP housing.

The Device mode indication at the first power-up has the following sequence:

- 1) lights up red (3 to 10 seconds);
- 2) lights up green (40 to 45 seconds);
- 3) blinks red 2 times.

If the ignition is turned on, the Device will remain in «ERA» mode until the ignition switches off.

If the ignition is turned off, the Device will exit the «ERA» mode and turn «Off» after a while.

On subsequent switching on, if the external power has not been turned off, the Device will switch to the «ERA» mode.

IMPORTANT: If you disconnect the Device from external power, the following powering up of the Device will lead to the mode indication corresponding to the first power supply.

¹ When installing the Device at the car manufacturer's factory and/or disconnecting the external power supply (for example, in case of battery replacement)

2.2.2. Operating modes

The Device has the following operating modes:

- «Off» mode;
- «ERA» mode;
- «Emergency call» mode;
- «Service» mode;
- «Test» mode.

2.2.2.1. «Off» mode

The Device is in the «Off» mode when the vehicle ignition is off. The Device exits the «Off» mode when the ignition is turned on. When the ignition is on and there is no power, the Device switches to the «Off» mode when its backup battery is fully discharged.

2.2.2.2. «ERA» mode

In the «ERA» mode, the Device detects and registers vehicle parameters, detects accident events in automatic mode and provides a response to the user's control actions. The Device is in «ERA» mode when the vehicle's ignition is turned on for the first time, as well as after the end of the «Test» mode or termination of the «Emergency call» mode.

If the Device is ready for use, the BIP indication will blink red twice.

2.2.2.3. «Emergency call» mode

The «Emergency call» mode is designed to transmit MDS and establish a voice connection between vehicle users and the contact center operator. The «Emergency call» mode is performed automatically when the ignition is on and there is a signal from the road traffic incident identification module². Emergency call can be performed in manual mode by pressing and holding the SOS button for at least 3 seconds.

The road traffic incident identification module determines the moment of the accident in case of:

- frontal collision;
- side collision;
- rear collision;
- rollover.

To exit the «Emergency call» mode initiated in manual mode, press the «SOS» button once at the stage of establishing a connection (if the connection with the contact center operator has not yet been established), and the emergency call will be terminated.

² To determine the moment of the vehicle rollover in automatic mode, the «Overthrow sensor» function must be enabled in the Device settings.

When the «Emergency call» mode is initiated automatically, the Device will enter the «ERA» mode after the call is terminated by the emergency contact center operator.

In case the external power supply switches off during the call, the Device continues operating on the backup battery which is enough for 10 minutes of a voice call and for at least 1 hour of operation in standby mode.

2.2.2.4. «Service» mode

The «Service» mode is designed to disable all functions of the Device while the vehicle is in the service center and/or to do repair work.

The «Test» mode is entered by pressing the SOS button 5 times within 5 seconds and then pressing the SOS button following the voice prompt.

If the SOS button is not pressed within 5 seconds after the voice prompt, the Device will enter the «Test» mode.

In the «Service» mode, the BIP status indicator lights up green, blinks red 3 times every 2 seconds, and the remote speaker emits audible signal sounds every 7 seconds.

Exit from the «Service» mode is performed:

- after pressing the «SOS» button;
- when the external power is turned off;

Notes:

1. When the Device is in the «Service» mode, the critical overthrow angle determination is not performed.
2. When carrying out repair work or maintenance on cargo vehicles with the need to tilt the vehicle cab, the Device must be switched to the «Service» mode.
3. After completion of repair work or technical maintenance of the vehicle, the Device must be put into normal operation.

2.2.2.5. «Test» mode

The «Test» mode is intended to check the performance of the Device with an option to transmit the test results to the contact center operator.

The «Test» mode is entered by pressing the SOS button 5 times within 5 seconds. After the voice prompt offering to enter the «Service» mode, wait 10 seconds without pressing any buttons.

In the «Test» mode, the BIP status indicator lights up green and blinks red 3 times every 2 seconds.

To complete the test, follow the voice prompts.

Exit from the «Test» mode is performed:

- after transferring of MDS with the Device test results to the contact center operator;
- when the external power is turned off.

2.2.3. Indication of Device operating modes

The BIP status indicator (see Picture 3) is used to indicate the operation mode of the Device.

When the Device is powered up with external power supply and ignition is turned on, the status indicator lights up red for 3-10 seconds. If the self-test is passed successfully, the Device goes to the «ERA» mode.

If the self-test detects a malfunction of the internal components, the Device indication goes into the «AECD malfunction» mode, and the indicator lights up red continuously.

Possible Device status indications are listed in Table 2.

Table 2 - Device operating mode indication

Operating mode	Indication
AECD turning on after the ignition is turned on	Lights up red for 3 to 10 seconds.
«ERA» mode	Lights up green when internal diagnostics are successful. Lights up red if there is a malfunction.
AECD malfunction	Lights up red continuously. The malfunction code can be read via CAN bus or USB connection.
The cellular operator's network is temporarily unavailable	Five short red blinks (5 Hz) and an optional voice prompt «The cellular operator's network is temporarily unavailable».
Establishing connection in «Emergency call» mode	Slow blink red/green (1 Hz). Optional voice prompt informs about mode:
Sending MDS in «Emergency call» mode	— «Establishing a connection»; — «Transferring data to the system».
Voice connection in the «Emergency call» mode	Lights up green continuously. Optional voice prompt «Connection established».
«Test» mode	Lights up green, three short red blinks (5 Hz), 2 second pause, repeat.
«Service» mode	Lights up green, three short red blinks (5 Hz), 2 second pause, repeat. Every 7 seconds there is an audible signal

If the Device has diagnosed a malfunction of internal components, please contact the service technician for the Device maintenance, or the service representative of the manufacturer.

2.3. Safety Measures

The Device operates on the vehicle's on-board power supply system with a rated voltage of 12 or 24 V.

If there is a malfunction in the Device operation, please contact the service center. Do not try to repair the Device yourself.

3. TRANSPORTATION AND STORAGE

The Device must be transported in a packaged form, in closed containers, at an ambient temperature from minus 40 °C to plus 60 °C. Transportation conditions must correspond to the specifications set in Group C(2) in Table 2 of GOST R 51908.

The Device must be stored in a packaged form, in accordance with the storage conditions 2 of Table 1 of GOST R 51908 (stored in heated warehouses, at temperatures from 5 °C to 40 °C and relative humidity not exceeding 60%).

If the Device or the vehicle on which the product is installed is not in use, the battery of the Device must be charged every 6 months.

If the Device is NOT installed in the vehicle, the Device's battery is charged by connecting the Device to an external 12 or 24 V power source, with an output current of at least 500 mA per unit of Device.

If the Device is installed in a vehicle, to charge the battery of the Device, you must turn on the vehicle ignition for 4 hours.

The temperature of the battery and the environment during charging must be at least +5 °C.

4. DISPOSAL

The Device does not contain any hazardous or poisonous substances that can cause harm to human health or the environment, and does not pose a danger to human life and health or to the environment after the end of its service life.

Disposal of the Device is carried out in accordance with the current, in effect at the given time, rules for disposal of general industrial waste in your region (country).

Before disposal, remove the battery from the Device and send it to an appropriate collection point.