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ON STANDARDIZATION, METROLOGY AND CERTIFICATION
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GOST
33466-2015

Global navigation satellite system

ROAD ACCIDENT EMERGENCY RESPONSE SYSTEM

Test methods for verification of in-vehicle emergency call device/system conformity to requirements of electromagnetic compatibility, environmental and mechanical resistance

Official Edition
English Version Approved by Interstandard

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Foreword

The purposes, main principles and basic order of work on interstate standardization are established by GOST 1.0-2015 "Interstate system for standardization. Basic principles" and GOST 1.2-2015 "Interstate System for Standardization. Interstate standards. Rules for development, taking over, renovation and cancellation"

Details

1 DEVELOPED by Non-Commercial Partnership "For Promotion of Navigation Technologies Development and Application" and Joint Stock Company "Research and Technical Centre of Advanced Navigation Technologies" "Internavigation" (JSC "Internavigation RTC")

2 INTRODUCED by Federal Agency on Technical Regulating and Metrology

3 ADOPTED by Interstate council for standardization, metrology and certification by means of correspondence (protocol No. 82-П, dated 12.11.2015)

Votes in favour:

Short name of the country according to IC (ISO 3166) 004—97	Country code according to IC (ISO 3166) 004—97	Abbreviated name of national standards body
Armenia	AM	Ministry of Economics of Republic of Armenia
Belarus	BY	Gosstandart of Republic of Belarus
Kyrgyzstan	KG	Kyrgyzstandart
Russian Federation	RU	Rosstandart
Tajikistan	TJ	Tajikstandart

4 Interstate Standard GOST 33466-2015 is introduced as a national standard of the Russian Federation by Order No. 2036-ст, dated 15.12.2016, of Federal Agency on Technical Regulating and Metrology from 01.01.2017.

5 This Standard developed on based GOST R 54618-2011*

6 INTRODUCED FOR THE FIRST TIME

The information on the amendments to this Standard is published in the annually issued information index "National standards", and the text of the amendments and corrections is published in the monthly issued information indices "National standards". In case of revision (replacement) or cancellation of this Standard the appropriate notice will be published in the monthly issued information index "National standards". The appropriate information, notice and texts are also placed in the general-use information system — on official site of Federal Agency on Technical Regulating and Metrology in the Internet (www.gost.ru)

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National standard GOST R 54618-2011 withdrawn from 01.06.2017 by Order No. 2036-ст, dated 15.12.2016, of Federal Agency on Technical Regulating.

Contents

Introduction

The Road Accident Emergency Response System is meant to mitigate the consequences of road accidents and other emergencies on the roads by reducing the time required to report such accidents to emergency services. This System is called "ERA-RB" in the Republic of Belarus, "EVAK" in the Republic of Kazakhstan and "ERA-GLONASS" in the Russian Federation. The System is analogous to the European eCall System currently under development, and is harmonised with it in regard to its main functional features (the use of in-band modem as the main data transmission tool; unified content and format of mandatory data transmitted in the minimum set of data pertaining to road accidents; uniform procedures for initiation and termination of duplex voice connection with the persons in the vehicle cabin, etc.).

According to the requirements of the Technical Regulation "On Safety of Wheeled Vehicles" (TR CU 018/2011) [1] of the Customs Union, emergency call devices and systems intended for installation on vehicles of categories M and N shall provide for generation of the minimum set of vehicle data, its transmission to the Road Accident Emergency Response System and establishing duplex voice connection with emergency services in the case of a road accident or an emergency of other kind.

Along with other standards included in the set "Global Navigation Satellite System. Road Accident Emergency Response System," this Standard has been developed to form an evidentiary basis for compliance with the requirements of the Technical Regulation "On Safety of Wheeled Vehicles" in part of equipping the relevant vehicles with in-vehicle emergency call devices and systems.

I N T E R S T A T E S T A N D A R D

Global navigation satellite system

ROAD ACCIDENT EMERGENCY RESPONSE SYSTEM

Test methods for verification of in-vehicle emergency call device/system conformity to requirements of electromagnetic compatibility, environmental and mechanical resistance

Date of Introduction — 2017— 01— 01

1 Scope

This Standard applies to in-vehicle emergency call devices and systems manufactured both in standard and auxiliary equipment configuration and intended for installation on wheeled vehicles of Categories M and N in accordance with the requirements of the Technical Regulation [1].

The Standard sets out the methods that shall be used to test such devices and systems for their conformity to the requirements of electromagnetic compatibility, environmental and mechanical resistance established in GOST 33464 in order to ensure that the requirements of [1] are observed.

2 Normative references

The following standards are referred to in this Standard:

GOST 9.311-87 Unified system of corrosion and ageing protection. Metal and non-metal inorganic coatings. Method of corrosion damage evaluation

GOST 12.1.030-81 Occupational safety standards system. Electric safety. Protective conductive earth, grounding

GOST 12.3.019-80 Occupational safety standards system. Electrical tests and measurements. General safety requirements

GOST 14254-96 (IEC 529:1989) Degrees of protection provided by enclosures (IP code)

GOST 16019-2001 Equipment for land mobile radio communication. Requirements for mechanical and environmental resistance and test methods

GOST 28751-90 Electrical equipment for vehicles. Electromagnetic compatibility. Electrical disturbance by conduction along supply lines. Technical requirements and tests

GOST 29157-91 Electromagnetic compatibility of technical means. Vehicle electrical equipment. Disturbances in control and signal lines on board vehicle. Requirements and test methods

GOST 30630.0.0-99 Environment stability test methods for machines, instruments and other industrial products. General requirements

GOST 33464-2015 Global navigation satellite system. Road accident emergency response system. In-vehicle emergency call device/system. General technical requirements

GOST 33467-2015 Global navigation satellite system. Road accident emergency response system. Functional test methods for in-vehicle emergency call device/system and data transfer protocols

N o t e — When using this standard it is expedient to check the validation of the reference standards in the general-use information system — on official site of Federal Agency on Technical regulating and Metrology in Internet or according to the annual information index "National standards" which is published as of January, 1st, of current year, and according to releases of monthly issued information index "National standards" in the current year.

Official Edition

If a reference standard which the dated reference is provided to is replaced, it is recommended to use a version of this standard with the above specified year of approval (acceptance). If after the approval of this standard an amendment is inserted in a reference standard which the dated reference is provided to, and this amendment regards the provision referred to, it is recommended to apply this provision without regard to this amendment. If a reference standard is cancelled without a replacement, it is recommended to apply the provision which refers to it to a part which does not engage this reference.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

The following terms with their respective definitions are used for the purposes of this Standard:

3.1.1 **conducted man-made radio interference:** Electromagnetic interference such that its energy is transferred through one or several conductors.

3.1.2 **strength of equipment:** Equipment capability of retaining its parameters within the established tolerances after the exposure to environmental (mechanical) effects.

3.1.3 **in-vehicle emergency call system;** IVS: System supporting the functions of an in-vehicle emergency call device and providing for automatic transmission of vehicle data messages when a road accident or an accident of other kind occurs.

N o t e s

1 In addition, an in-vehicle emergency call system may be used for manual transmission of vehicle data messages in the case of road accidents or accidents of other type.

2 Categories of vehicles that shall be equipped with in-vehicle emergency call systems are specified in [1].

3.1.4 **Road Accident Emergency Response System:** Automated geographically distributed Federal and State Information System that uses the signals of the GLONASS Global Navigation Satellite System and of other active GNSS to provide for prompt collection of data related to road accidents or other emergencies on motor roads as well as for processing, storage and transmission of such data to emergency services, and to enable access to the said data for the concerned governmental or local authorities, officials, legal and natural persons.

N o t e — The Road Accident Emergency Response System is called "ERA-RB" in the Republic of Belarus, "EVAK" in the Republic of Kazakhstan, and "ERA-GLONASS" in the Russian Federation. These systems are analogous to the European eCall System currently in development, and are harmonised with it in regard to the main functional features (the use of in-band modem as the main data transmission tool, unified content and format of mandatory data transmitted in the MSD for road accidents, uniform procedures for initiation and termination of duplex voice connection with the persons in the vehicle cabin, etc.).

3.1.5 **rigidity degree of (interference immunity) tests:** Nominal degree established in the normative documents related to interference immunity tests of equipment in order to describe the intensity of interference acting upon the test item, the interference parameters being specified for each rigidity separately.

3.1.6 **resistance of equipment:** Equipment capability of retaining its parameters within the established tolerances during and after the exposure to environmental (mechanical) effects.

3.1.7 **immunity of equipment:** Equipment capability of retaining its parameters within the established tolerances during the exposure to environmental (mechanical) effects.

3.1.8 **in-vehicle emergency call device;** IVD: Device used for measurement and evaluation of vehicle coordinates, speed and direction of movement based on the signals from at least two active Global Navigation Satellite Systems, for manual transmission of vehicle data messages when a road accident or an accident of other kind occurs, and for duplex voice communication with emergency services over wireless mobile communication networks.

N o t e s

1 In addition, an in-vehicle emergency call device may be used for automatic transmission of vehicle data messages in the case of road accidents or accidents of other type. The types of road accidents detected automatically and the time frames for implementation of the function for automatic transmission of vehicle data messages in the device are established in [1].

2 Categories of vehicles that shall be equipped with in-vehicle emergency call devices are specified in [1].

3.2 Abbreviations

The following abbreviations are used for the purposes of this Standard:

CAN — Controller Area Network (the standard for industrial networks that integrate various actuators and sensors including on-board automatic devices into a unified network);
CWP — Check Workplace;
GNSS — Global Navigation Satellite System;
IVDS — In-Vehicle Emergency Call Device/System;
MSD — Minimum Set of Data;
OD — Operating Documentation;
PC — Personal Computer;
RTA — Road Traffic Accident;
USB — Universal Serial Bus.
VH — Vehicle;

4 General

4.1 The test item shall be an in-vehicle emergency call device/system.

The number of IVDS samples shall be at least three. Each IVDS sample submitted for tests shall be subjected to tests (checks) within the scope specified in sections 5 — 7.

4.2 Test conditions

The IVDS tests for electromagnetic compatibility and under exposure to mechanical impacts shall be carried out in normal climatic conditions:

- air temperature: (25 ± 10)°C;
- relative air humidity: from 45% to 80 %;
- atmospheric pressure: from 84.0 to 106.7 kPa (from 630 to 800 mm Hg).

The IVDS tests under exposure to climatic factors shall be carried out in climatic conditions governed by the parameter values of such factors specified in the respective clauses of test techniques as per section 6.

IVDS components operating in different conditions shall be tested separately as appropriate for the operating conditions established for each component. Testing an IVDS in full package is permitted if the most rigid test modes are selected.

No IVDS maintenance shall be carried out during the tests.

4.3 Test safety requirements

The requirements of GOST 12.1.030 and GOST 12.3.019 as well as the safety requirements detailed in operating documents for the measuring instruments and testing equipment in use shall be observed when the IVDS parameters are measured during the tests.

Measuring instruments and testing equipment may be turned on only after their external grounding is connected. Connection of protective grounding clamps to the grounding grid shall be made prior to other connections, and disconnection thereof, after any other disconnections.

Connection and disconnection of cables, devices and measuring instruments to the IVDS under test is only permitted when the power for all devices included in the testing apparatus is turned off, and the IVDS is disconnected from its power circuits.

4.4 All testing equipment used in the tests shall be certified in accordance with the established procedure.

All measuring instruments shall be of an approved type, and shall be calibrated before the tests.

4.5 The IVDS functionality during the tests shall be checked using a special diagnostic program (called the "IVDS testing software" below).

4.5.1 The testing software is developed by the IVDS manufacturer and provided at a separate request.

4.5.2 The IVDS testing software shall support the following functions:

- selecting diagnostic tests by the user;
- completing test operations (test sequence, test start-up and termination, setup of IVDS diagnostic parameters, etc.) in manual and automatic modes;
- selecting automatic test cycles in the range from 1 to 10000;
- providing brief description of the results (all tests succeeded; any errors detected) displayed on the PC screen and written in a text file (its data presentation format to be determined by the IVDS manufacturer);
- providing detailed description of the results (test result and additional data specified for each test by the IVDS manufacturer) displayed on the PC screen and written in a text file (its data presentation format to be determined by the IVDS manufacturer);
- testing IVDS in accordance with the requirements of GOST 33464 (subsection 7.6);
- creating data files (arrays) with the test results for their transmission over wireless mobile communication networks in accordance with GOST 33464 (clauses 7.6.13 and 7.6.14);
- access to the versioning data of the hardware platform and the software for all IVDS components including the hardware/software versions of the GNSS receiver, GSM/UMTS modem, in-band modem and control processor;
- reading and clearing internal memory of the IVDS;
- reading and setting IVDS setup parameters;
- mandatory test procedure where the "Emergency call" button is pressed to check manual actuation of both in-vehicle emergency call devices and in-vehicle emergency call systems.

4.5.3 If any converters of electric signals (e.g., USB-CAN converters) are required for operation of the IVDS testing software, such converters shall be supplied by the IVDS manufacturer along with the program itself.

4.6 For IVDS installed in standard equipment configuration (on the assembly line of the vehicle manufacturer), the content of delivery packages submitted for tests is defined by the vehicle manufacturer.

For IVDS installed in auxiliary equipment configuration (in service/installation centres or on the dealer's premises of the vehicle manufacturer after vehicle production), the content of delivery packages is defined by the IVDS manufacturer in accordance with GOST 33464 (sections 5 and 21).

4.7 Reporting based on test results

Based on the IVDS test (check) results, a test/measurement report with the following information shall be compiled:

- name, location, telephone, fax and e-mail of the testing laboratory (centre);
- identification parameters of the test item;
- test conditions;
- information on the test and measurement techniques selected in accordance with this Standard;
- list of testing equipment and measuring instruments used in the tests;
- list of sections (subsections, clauses and sub-clauses) of GOST 33464 and of other normative documents that contain the requirements targeted for conformity verification, and the results of conformity assessment against each individual requirement;

- conclusion on conformity of the test item to the established requirements
- title, name and signature of the person responsible for tests and measurements;
- title, name and signature of the head of the testing laboratory (centre), to be certified by the seal of the testing laboratory (centre);
- date of tests and measurements; date of issue and registration number of the report.

5 Test methods for verification of in-vehicle emergency call device/system conformity to requirements of electromagnetic compatibility

5.1 Test scope and conditions

5.1.1 The list and order of IVDS tests (checks) against the requirements of electromagnetic compatibility stated in [1], [2] and GOST 33464 (subsection 13.4) are given in Table 1.

Table 1

Test (check) name	Clause No. and figure No.
Checking OD completeness	5.2.1
Checking IVDS completeness	5.2.2
Checking normal IVDS operation at rated power supply voltage	5.2.3, Figure A.2
Checking normal IVDS operation at changing power supply voltage	5.2.4, Figure A.2
Checking normal IVDS operation after applying power supply voltage of reverse polarity	5.2.5, Figure A.2
Checking protection of external IVDS electric circuits from short-circuiting to poles of power supply source	5.2.6, Figure A.2
Checking IVDS immunity to conducted interferences along power circuits	5.2.7, Figure A.3
Checking level of self-generated IVDS emission to on-board network	5.2.8, Figure A.4
Checking IVDS immunity to interferences in control and signal circuits	5.2.9, Figure A.3
Checking IVDS immunity to interferences from electrostatic discharges	5.2.10, Figure A.2
Checking conformity to requirements for voltage of radio interferences on IVDS power supply terminals	5.2.11, Figure A.5
Checking conformity to requirements for electromagnetic field strength created by IVDS	5.2.12, Figure A.5
Checking IVDS immunity to electromagnetic emissions in frequency range from 20 to 2000 MHz	5.2.13, Figure A.6
Notes 1 The order of the tests (checks) may be changed. 2 The completeness of the IVDS and of its accompanying OD as well as the IVDS operation at the rated power supply voltage and at changing power supply parameters should preferably be checked at the start of the tests.	

5.1.2 The tests are carried out in the climatic conditions specified in 4.2.

5.1.3 The testing and auxiliary equipment and measuring instruments listed in Table 2 are used in the tests.

Table 2

Name of equipment	Required specifications of instruments and equipment
Test generator of impulse interference in on-board network	Generation of conducted interference impulses as per GOST 28751
Dummy on-board network	As per GOST 28751
Connecting terminal (capacity clamps)	As per GOST 29157
V-shaped dummy network	As per GOST 30805.16.1.2 (subsections 4.4 and A.4 of Appendix A)
Oscilloscope	Frequency band: up to 100 MHz; Error: not exceeding 3 %
Power supply	Output voltage: from 0 to 30 V; Maximum load current: 10 A
PC	External interface: USB 2.0; OS: Windows 2000/XP
System for equipment immunity tests to electrostatic discharges	Voltage range of electrostatic discharges: (0—5) kV
System for equipment immunity tests to electromagnetic emissions	Frequency range: (20—2000) MHz
System for electromagnetic field measurements of man-made interferences	Frequency range: (0.009—1000) MHz

5.2 Procedures of electromagnetic compatibility tests

5.2.1 Checking completeness of operating documentation

When the completeness of the OD supplied with the IVDS is checked, the documentation submitted for the tests is verified against the requirements of GOST 33464.

An in-vehicle emergency call system in auxiliary equipment configuration is deemed to have passed the check if the content of the document package submitted for the tests conforms to the requirements of GOST 33464 (subsection 21.2), and its preparation, to the requirements of GOST 33464 (subsection 22).

An in-vehicle emergency call system in standard equipment configuration is deemed to have passed the check if the content of the document package submitted for the tests conforms to the requirements established by the vehicle manufacturer.

5.2.2 Checking IVDS completeness

The IVDS completeness is checked by comparison with the one described in GOST 33464.

An in-vehicle emergency call system in auxiliary equipment configuration is deemed to have passed the check if the IVDS delivery package complies with GOST 33464 (subsection 21.1), and the IVDS controls bear the logos specified in GOST 33464 (section 22).

An in-vehicle emergency call system in auxiliary equipment configuration is deemed to have passed the check if the IVDS delivery package conforms to the requirements established by the vehicle manufacturer.

5.2.3 Checking normal IVDS operation at rated power supply voltage

5.2.3.1 Prior to checking the IVDS operation, prepare the check workplace using the wiring diagram of Figure A.2 (Appendix A) and the following procedure:

- install the testing software for IVDS operation checks (see 4.5) on the PC (if not installed before);

- set the output voltage of (12.0 ± 0.1) V or (24.0 ± 0.1) V for power supply source G1 to match the voltage of the power supply system used on the vehicle;

- connect all required devices to the IVDS as shown in the wiring diagrams in Figures A.2—A.6 depending on the test type. All connected devices shall be switched off;

- turn on the PC and wait until the operating system is loaded;

- launch the testing software on the PC;

- switch on power supply G1 and power on the connected devices; then, the status indicators in the main dialog window of the testing software should notify that the interface unit and the IVDS under test are now interacting with the PC. If an error is indicated, switch off the power sources and check that the devices are connected properly;

- check that the IVDS self-test completes successfully as described in GOST 33464 (clause 6.17).

5.2.3.2 The IVDS functional check during the tests consists in verification that the IVDS is capable of making a correct "Emergency call" over the wireless mobile communication network in GSM 900 mode.

The following procedure shall be used:

- select all tests on the "Tests" tab of the testing software (e.g., press the "Select all" button);

- make sure that the "Run in cycle" mode is switched off;

- press the "Start" button to launch the selected tests;

- monitor the progress of automatic tests.

N o t e — The test of IVDS manual activation for initiation of an emergency call shall involve pressing the "Emergency call" button.

5.2.3.3 The IVDS under test is considered functional and deemed to have passed the tests if no messages on testing errors have been output by the testing software during the check.

5.2.4 Checking normal IVDS operation at changing power supply voltage

5.2.4.1 Prepare the CWP following the requirements of 5.2.3.1 and using the wiring diagram of Figure A.2 (Appendix A).

5.2.4.2 Set the rated voltage for power supply G1 and complete the checks as per 5.2.3.2.

5.2.4.3 Set the minimum output voltage of the power supply and complete the checks as per 5.2.3.2.

5.2.4.4 Set the maximum output voltage of the power supply and complete the checks as per 5.2.3.2.

5.2.4.5 The IVDS is deemed to have passed the tests if all checks of its operation in accordance with 5.2.4.2 — 5.2.4.4 have succeeded.

5.2.5 Checking normal IVDS operation after applying power supply voltage of reverse polarity

5.2.5.1 Prior to checking the IVDS operation after applying the power supply voltage of reverse polarity, prepare the CWP as described 5.2.3.1 using the wiring diagrams of Figure A.2 (Appendix A).

5.2.5.2 Turn off power supply G1.

5.2.5.3 Disconnect cables 2 and 3 from the power supply.

5.2.5.4 Connect the "+" terminal of cable 1 to the negative terminal of power supply G1 and the "-" terminal of cable 1 to the positive terminal of power supply G1.

5.2.5.5 Switch on power supply G1 for at least 5 min.

5.2.5.6 Switch off power supply G1.

5.2.5.7 Complete the IVDS check as per 5.2.3 using the diagram of Figure A.2 (Appendix A).

5.2.5.8 The IVDS under test is deemed to have passed the check if it operates normally after its exposure to the voltage of reverse polarity.

5.2.6 Checking protection of external IVDS electric circuits from short-circuiting to poles of power supply source

5.2.6.1 Prepare the test bench in accordance with 5.2.3.1.

5.2.6.2 Disconnect the X1 connector of cable 1 from module A.2 as shown in the diagram of Figure A.2 (Appendix A).

5.2.6.3 Use a jumper or employ any other appropriate means for a short-time (at most 3 s) short-circuiting of each X1 contact of cable 1 in succession to "+" and "-" terminals of d.c. power supply G1.

5.2.6.4 Use a jumper or employ any other appropriate means for a short-time (at most 3 s) short-circuiting of contacts 1 — 7 of the "DAT" connector to "+" and "-" terminals of d.c. power supply G1.

5.2.6.5 Connect the X1 connector of cable 1 to module A.2 and check if the IVDS operates normally.

5.2.6.6 The IVDS under test is deemed to have passed the test if the checks of its normal operation after each successive short-circuiting of IVDS contacts to the poles of the power supply have succeeded.

5.2.7 Checking IVDS immunity to conducted interferences in power circuits

5.2.7.1 This check is carried out using the technique described in GOST 28751 (section 3).

5.2.7.2 The check makes use of a test generator ИГА 12-24.1 that creates impulse interferences in the on-board networks of motor vehicles.

N o t e — The IVDS immunity to conducted interferences in the on-board network may be checked using apparatus of other types provided that they are capable of generating test impulses 1, 2, 2a, 3a, 3b and 4 in accordance with GOST 28751.

5.2.7.3 Prepare the CWP following the requirements of 5.2.3.1 and using the wiring diagram of Figure A.3 (Appendix A).

5.2.7.4 Expose the IVDS to test impulses.

5.2.7.5 The number of impulses and the duration of tests are as follows:

- for each test impulse 1 and 2: not less than 5000 at 0.5 s intervals;
- for each test impulse 3a and 3b: duration of at least 1 h, with 0.1 s intervals between the impulses;
- for each test impulse 4: one or more impulses at 1 min intervals.

5.2.7.6 The parameters of test impulses shall conform to rigidity degree IV as per GOST 28751 for 12(24) V on-board networks.

5.2.7.7 Normal IVDS operation shall be periodically checked as detailed in 5.2.3.2 during the exposure to test impulses:

- for test impulses 1 and 2: after 2500 impulses of each type;
- for test impulses 3a and 3b: after each 30 min of exposure to test impulses of each type;
- for test impulses 4: after exposure to impulses of this type.

5.2.7.8 No error messages should appear in the "Report" window of the testing software during and after the exposure to test impulses, as required for functional class A as per GOST 28751.

5.2.7.9 The IVDS under test is deemed to have passed the check if it conforms to the requirements of GOST 28751 for rigidity degree IV of functional class A under exposure to test impulses 1, 2, 2a, 3a, 3b and 4.

5.2.8 Checking level of self-generated IVDS emission to on-board network

5.2.8.1 This check is carried out using the technique detailed in GOST 28751 (section 3).

5.2.8.2 Prepare the CWP as per 5.2.3.1 using the diagram of Figure A.4 (Appendix A).

5.2.8.3 Perform the IVDS check as per 5.2.3.2 using the oscilloscope to control the interferences voltages created by the IVDS in the on-board network. The voltages of each interference types as per GOST 28751 for 12(24) V on-board networks shall not exceed the following values:

- peak voltage of interference type 1: minus 15(35) V;
- peak voltage of interference type 2: minus 15(15) V;
- peak voltage of interference type 3: from minus 15(25) to plus 15(25) V.

These values correspond to emission degree I as per GOST 28751.

5.2.8.4 The IVDS under test is deemed to have passed the check if is deemed to have passed the check if the voltages of all interference types created by the IVDS do not exceed those stated in 5.2.8.3.

5.2.9 Checking IVDS immunity to interferences in control and signal circuits

This check is carried out using the technique of GOST 29157 (section 2).

The check makes use of a test generator ИГА 12-24.1 that creates impulse interferences in the on-board networks of motor vehicles.

N o t e — The IVDS immunity to interferences in control and signal circuits may be checked using apparatus of other types provided that they are capable of generating test impulses in accordance with GOST 29157.

Prepare the CWP following 5.2.3.1 and using the wiring diagram of Figure A.3 (Appendix A).

Connect the generator to the terminal (capacity clamps) as described in GOST 29157.

Put the wire cords connecting the IVS with the adjustment (control) bench and discrete inputs of the terminal (capacity clamp) in accordance with GOST 29157 (section 2). Connect the load (or its equivalent) to the end of the wire cord using the discrete inputs.

Apply test impulses of the types 1, 2, 3a, and 3b to the IVS. The parameters of the test impulses shall conform to rigidity degree IV established in GOST 28751 for 12 V (24 V) on-board networks.

Normal IVDS operation shall be periodically checked as detailed in 5.2.3.2 during the exposure to test impulses.

No error messages should appear in the "Report" window of the testing software during and after the exposure to test impulses, as required for functional class A and rigidity degree IV in GOST 29157.

The IVDS under test is deemed to have passed the check if it meets the requirements of 5.2.3.2.

5.2.10 Checking IVDS immunity to interferences from electrostatic discharges

5.2.10.1 This check is carried out using the technique detailed in [4].

5.2.10.2 The check makes use of a test generator creating electrostatic discharges complying with the requirements of [4].

5.2.10.3 The IVDS under test shall be immune to test impulses from electrostatic discharges of rigidity degree IV with the following test voltage values:

- contact discharge: ±4; ±6; ±7 kV;
- air discharge: ±4; ±8; ±14; ±15 kV.

5.2.10.4 The minimum number of discharges for each voltage shall be three, and the minimum time interval between them shall be 5 s.

5.2.10.5 Place the IVDS under test on an insulation support at the centre of the grounding plane.

5.2.10.6 Prepare the CWP following 5.2.3.1 and using the wiring diagram of Figure A.2 (Appendix A).

5.2.10.7 Set the "Run in cycle" flag in the testing software.

5.2.10.8 Press the "Start" button to launch the selected tests (the button name will change to "Stop" after that).

5.2.10.9 Use the following procedure to check the IVDS immunity to contact discharges:

- put the discharge probe of the test generator into direct contact with the IVDS body;
- test each discharge point (among the three arbitrary points in different parts of the IVDS body) at all voltages stated in 5.2.10.3 for contact discharges.

5.2.10.10 Use the following procedure to check the IVDS immunity to air discharges:

- put the discharge probe at a right angle (with the tolerance of ±15°) to the discharge section;
- move the discharge probe slowly (at a rate not faster than 5 mm/s) in direction to the IVDS discharge point until the first discharge occurs;
- test each discharge point at all voltages stated in 5.2.10.3 for air discharges.

N o t e — If no discharge occurs, continue moving the discharge probe until it contacts with the discharge point. If no discharge occurs still, the check shall be terminated for the current voltage level at this probe position.

5.2.10.11 The IVDS under test is deemed to have passed the check if the functional checks as per 5.2.3.2 have succeeded after each exposure to test discharges.

5.2.11 Checking conformity to requirements for voltage of radio interferences created by IVDS

The voltage of RF interferences from the IVDS shall be measured as per [3] (clause 6.2).

Prepare the CWP following 5.2.3.1 and using the wiring diagram of Figure A.5 (Appendix A). The CWP shall be in a screened room with the instruments arranged as recommended in [3] (Figure 7).

The RF interference voltage shall be measure in the frequency range of (0.009—100) MHz at the clamps of the IVDS power supply circuits only.

A dummy network A3 described in [3] (Appendix E) shall be used in these measurements.

The IVDS under test is deemed to have passed the check if the IVDS radio interference voltage does not exceed the values established for Class 3 devices in [3] (clause 6.2).

5.2.12 Checking conformity to requirements for electromagnetic field strength created by IVDS

The electromagnetic field strength created by the IVDS shall be measured in the frequency range of (30—1000) MHz in accordance with [2] (clause 6.6).

Prepare the CWP following 5.2.3.1 and using the wiring diagram of Figure A.5 (Appendix A). The CWP shall be in a screened anechoic room or at an approved outdoor site, with the instruments and equipment arranged as specified in [2].

The IVDS under test is deemed to have passed the check if the electromagnetic field strength from the IVDS does not exceed the ratings established in [2] for narrowband interferences from electric or electronic assemblies.

5.2.13 Checking IVDS immunity to electromagnetic emissions

5.2.13.1 This test is carried out using one of the test methods selected in accordance with [2] (clause 6.7 and Appendix 9).

5.2.13.2 Prepare the CWP following 5.2.3.1 and using the wiring diagrams of Figure A.5 (Appendix A), then check normal operation of the IVDS as described in 5.2.3.2 using the selected technique in accordance with [2].

5.2.13.3 Switch to "Run in cycle" mode in the "Tests" tab of the testing software.

5.2.13.4 Press the "Start" button to launch the selected tests.

5.2.13.5 Expose the switched-on IVDS to electromagnetic emissions while changing the emission frequency from the lower limit of 20 MHz to the upper limit of 2000 MHz.

The test duration at each discrete frequency shall be at least 2 s in order to make allowance for the time of IVDS response to the influencing factor.

5.2.13.6 The IVDS under test is deemed to have passed the check if all tests specified in 5.2.13.5 have completed without any errors.

6 Test methods for verification of in-vehicle emergency call device/system conformity to requirements for resistance to climatic effects

6.1 Test scope and conditions

6.1.1 The IVDS tests against the requirements for resistance to climatic effects include the tests of IVDS immunity to climatic factors and the tests of its strength under exposure to them.

6.1.2 The list and order of the IVDS tests against the requirements for resistance to climatic effects established in [1] (Appendix 10, clause 118) and GOST 33464 (subsection 13.2) are specified in Table 3.

Table 3

Test (check) name	Clause No. and figure No.
Checking OD completeness	5.2.1
Checking IVDS completeness	5.2.2
Checking IVDS marking	6.2.1
Test under exposure to low ambient temperature	6.2.2, Figure A.2
Test under exposure to high ambient temperature	6.2.3, Figure A.2
Test under exposure to ambient temperature changes	6.2.4, Figure A.2
Test under exposure to humidity at high ambient temperature in continuous operation	6.2.5, Figure A.2
Tests for assessment of IVDS protection degree from ingress of foreign objects as per GOST 14254	6.2.6, Figure A.2
Tests under exposure to water for assessment of protection degree as per GOST 14254	6.2.7, Figure A.2
Notes 1 The order of the tests (checks) may be changed. 2 The conformity of the IVDS marking to the established requirements is checked after each test type.	

6.1.3 The testing and auxiliary equipment listed in Table 4 are used in the tests.

Table 4

Name of equipment	Required specifications of equipment
Moisture chamber	Temperature: from 25 °C to 40 °C; Relative humidity: from 80 % to 95 %
Heat chamber*	Temperature: up to 90 °C; Inaccuracy of temperature maintenance in useful volume of chamber: at most 3 °C
Cold chamber*	Temperature: from plus 5 °C to minus 70 °C; Inaccuracy of temperature maintenance in useful volume of chamber: at most 3 °C
Dust chamber	As per GOST 14254 (section 13, Figure 2)
Vessel for water drops	As per GOST 14254 (section 14, Figure 3)
Water reservoir	As per GOST 14254 (section 14, Table 8)
IVDS adjusting/control bench	Figure A.1 (Appendix A)
* The use of two-section heat and cold chambers is permitted provided that they are capable of maintaining the specified limits of low and high temperatures with the stated inaccuracy of temperature maintenance.	

6.1.4 The testing equipment shall provide for the required IVS control (switching-on/switching-off, changing operating modes, etc.) and for reading indications of the tested IVS under exposure to the respective climatic factors if such operations are used in the test technique.

6.2 Test procedures

6.2.1 Checking IVDS marking

The IVS marking shall be checked after each type of IVDS tests for resistance to climatic factors specified in Table 3.

The IVDS under test is deemed to have passed the check if its marking complies with the requirements of GOST 33464 (section 19) after each type of tests.

6.2.2 Test under exposure to low ambient temperature

6.2.2.1 Checking IVDS immunity to decreased operating temperature of minus 40 °C

Assemble the circuit shown in Figure A.2 (Appendix A) for checks of normal IVDS operation.

Place the IVDS in the cold chamber.

Switch on the IVDS and check its functionality using the technique of 5.2.3.

Switch off the IVDS power supply.

Decrease the temperature in the cold chamber to minus 40 °C.

Switch on the IVDS power supply and check normal IVDS operation using the technique of 5.2.3.

Keep the IVDS switched on for 3 h checking its normal operation periodically (each hour).

Switch on the IVDS power supply after the last check (after expiration of 3 h).

Increase the temperature in the cold chamber to the normal value (see 4.2) and keep the IVDS switched off for 1 h at this temperature.

Switch on the IVDS power supply and check the IVDS functionality using the technique of 5.2.3.

Remove the IVDS under test from the cold chamber and inspect it visually.

The IVDS is deemed to have passed the test under exposure to a decreased ambient temperature of minus 40 °C if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables, and all checks of normal IVDS operation during and after the test have succeeded.

6.2.2.2 Checking IVDS strength under exposure to decreased operating temperature of ambient air of minus 40 °C

Assemble the circuit shown in Figure A.2 (Appendix A) for checks of normal IVDS operation.

Place the IVDS in the cold chamber.

Switch on the IVDS and check its functionality using the technique of 5.2.3.

Switch off the IVDS power supply.

Decrease the temperature in the cold chamber to minus 40 °C, and keep the IVDS switched off for 3 h.

Increase the temperature in the cold chamber to the normal value (see 4.2), open the chamber, and keep the IVDS for 1 h at this temperature.

Switch on the IVDS power supply check the IVDS functionality using the technique of 5.2.3.

Remove the IVDS under test from the cold chamber and inspect it visually.

The IVDS is deemed to have passed the strength test under exposure to a decreased operating temperature if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables, and the check of normal IVDS operation after the tests has succeeded.

6.2.2.3 Checking normal operation at decreased operating temperature when powered from backup power supply (if available)

Assemble the circuit shown in Figure A.2 (Appendix A) for checks of normal IVDS operation.

Place the IVDS in the cold chamber.

Switch on the IVDS and check its functionality using the technique of 5.2.3.

Decrease the temperature in the cold chamber to minus 20 °C and keep the IVDS switched on for 1 h. Switch off the external power supply of the IVDS.

Check normal IVDS operation using the technique of 5.2.3.

Increase the temperature in the cold chamber to the normal value (see 4.2) and keep the IVDS for 1 h at this temperature.

Switch on the IVDS power supply check the IVDS functionality using the technique of 5.2.3.

The IVDS is deemed to have passed the IVDS test at a decreased operating temperature of minus 20 °C when operating from the backup power supply if all checks of normal IVDS operation during and after the test have succeeded.

6.2.2.4 The IVDS is deemed to have passed the tests under exposure to low ambient temperatures if the tests as per 6.2.2.1 — 6.2.2.3 have succeeded.

6.2.3 Test under exposure to high ambient temperature

6.2.3.1 Checking IVDS immunity to increased operating temperature of 85 °C

Assemble the circuit shown in Figure A.2 (Appendix A) for checks of normal IVDS operation.

Place the IVDS in the heat chamber.

Switch on the IVDS and check its functionality using the technique of 5.2.3.

Switch off the IVDS power supply.

Increase the temperature in the heat chamber to 85 °C.

Switch on the IVDS power supply and check normal IVDS operation using the technique of 5.2.3.

Keep the IVDS switched on for 3 h, checking its normal operation periodically (each hour).

Switch on the IVDS power supply after the last check (after expiration of 3 h).

Decrease the temperature in the heat chamber to the normal value (see. 4.2) and keep the IVDS switched off for 1 h at this temperature.

Switch on the IVDS power supply check the IVDS functionality using the technique of 5.2.3.

Remove the IVDS under test from the heat chamber and inspect it visually.

The IVDS is deemed to have passed the test under an increased operating temperature of 85 °C if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables,, and all checks of normal IVDS operation during and after the test have succeeded.

6.2.3.2 Checking IVDS strength under exposure to increased operating temperature of ambient air of 85 °C

Assemble the circuit shown in Figure A.2 (Appendix A) for checks of normal IVDS operation.

Place the IVDS in the heat chamber.

Switch on the IVDS and check normal IVDS operation using the technique of 5.2.3.

Switch off the IVDS power supply.

Increase the temperature in the heat chamber to 85 °C and keep the IVDS switched off for 3 h.

Decrease the temperature in the heat chamber to 50 °C and keep the IVDS for 2 h.

Switch on the IVDS power supply. Check the functionality of the IVDS under test using the test technique of 5.2.3 Check the functionality of the IVDS under test using the test technique of 5.2.3.

Switch off the IVDS power supply.

Decrease the temperature in the heat chamber to the normal value (see 4.2), open the chamber and keep the IVDS at a normal temperature for 1 h.

Switch on the power supply. Check the IVDS functionality using the test technique of 5.2.3.

Remove the IVDS from the heat chamber and inspect it visually.

The IVDS is deemed to have passed the test at an increased operating temperature of 85 °C if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables,, and all checks of normal IVDS operation during and after the test have succeeded.

6.2.3.3 The IVDS is deemed to have passed the tests under exposure to high ambient temperatures if the tests as per 6.2.3.1 and 6.2.3.2 have succeeded.

6.2.4 Test under exposure to ambient temperature changes

6.2.4.1 This test involves checking the IVDS strength under exposure to cyclic changes of the ambient temperature in the range of operating temperatures established in GOST 33464 (subsection 13.2):

- from maximum decreased temperature of minus 40 °C;
- to maximum increased temperature of plus 85 °C.

6.2.4.2 The tests are carried out in two-section climatic chambers or in temperature-cycling chambers consisting of a cold section/chamber, a heat section/chamber and a device that moves the test item from one section to another.

N o t e — Separate heat and cold chambers may be used, but the test item transfer time from one climatic chamber to the other shall not exceed 5 min.

6.2.4.3 Three temperature change cycles are used in the tests. Each cycle consists of two stages. First, the IVDS under test is placed in the climatic cold section/chamber and the in the climatic heat section/chamber. The IVDS under test is held for 3 h in each climatic chamber at the maximum operating temperature for the respective section/chamber indicated in 6.2.4.1.

The hold time in the chamber is counted from the moment when the required air temperature is achieved in the chamber after the test item is loaded.

The transfer time of the IVDS under test from one climatic section/chamber to another shall be at most 5 min.

6.2.4.4 Prior to testing, the following operations shall be completed:

- assemble the circuit for IVDS functionality checks shown in Figure A.2 (Appendix A);
- switch on the IVDS and check its functionality using the technique of 5.2.3.

6.2.4.5 Checking IVDS strength under exposure to ambient temperature changes

In both sections/chambers, set the ambient temperature parameters corresponding to normal operating conditions described in 4.2.

Switch off the IVDS and place it in the cold section/chamber.

Decrease the temperature in the section/chamber to minus 40 °C and wait for 3 h.

Place the IVDS under test in the heat section/chamber.

Increase the temperature in the section/chamber to plus 85 °C and wait for 3 h.

Move the IVDS under test to the cold section/chamber.

N o t e — The recommended temperature change rate shall be at least:

- 1 °C/min in the range from the normal temperature stated in 4.2 to minus 40 °C;
- 2 °C/min in the range from the normal temperature stated in 4.2 to plus 85 °C.

6.2.4.6 Repeat the test procedure of 6.2.4.5 three times.

6.2.4.7 After the three test cycles as per 6.2.4.5 and 6.2.4.6, keep the IVDS under test for 2 h in the normal conditions specified in 4.2.

6.2.4.8 Remove the IVDS from the chamber. Inspect the IVDS visually and check its functionality using the technique of 5.2.3.

6.2.4.9 The IVDS is deemed to have passed the strength test under exposure to cyclic temperature changes if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables, and the results of all IVDS functionality checks are positive.

6.2.5 Test under exposure to humidity at high ambient temperature in continuous operation

6.2.5.1 This test involves the verification of IVDS conformity to the resistance and strength requirements of GOST 33464 (subsection 13.2) under exposure to air humidity at an increased ambient temperature:

- relative air humidity: 95 %;
- ambient temperature: 40 °C;
- duration of exposure: 96 h.

6.2.5.2 Checking IVDS immunity and strength under exposure to air humidity at increased ambient temperature

Place the IVDS in the moisture chamber.

Check the IVDS functionality using the wiring diagram (see Figure A.2, Appendix A) and following the test technique of 5.2.3.

Switch off the IVDS power supply.

Increase the temperature in the moisture chamber to 40 °C at relative air humidity of 95 %.

Keep the IVDS under test in these conditions for 96 h.

Switch on the IVDS periodically to check its normal operation using the technique of 5.2.3.

At the end of the last test cycle after the specified hold time is achieved, switch on the IVDS power supply, check the IVDS functionality using the technique specified in the OD for the product, and switch off the power supply.

Remove the IVDS from the moisture chamber, keep it for at least 2 h in the normal climatic conditions specified in 4.2 and check the functionality of the test item using the technique of 5.2.3.

6.2.5.3 Following GOST 9.311, evaluate any corrosive damages of product parts.

6.2.5.4 The IVDS under test is deemed to have passed the test if the evaluation score as per GOST 9.311 is not less than 8, and all IVDS functionality checks during the tests have succeeded.

6.2.6 Tests for assessment of IVDS protection degree from ingress of foreign objects as per GOST 14254

6.2.6.1 This test is carried out in order to check the conformity to the requirements of GOST 33464 (subsection 13.2.3) for IVDS protection from ingress of foreign objects as described by the first digit of the IP code as per GOST 14254:

- IP 40: for IVDS components located in the vehicle cabin (compartment);
- IP 64: for IVDS components designed as external devices that are connected to the main IVDS unit and located outside the vehicle cabin (compartment);
- IP 67: for the external RTA detector installed outside the vehicle cabin (compartment) (for IVS in auxiliary equipment configuration and those installed on vehicles of Categories M1 and N1).

6.2.6.2 Prior to testing, inspect all IVDS components (units) visually and check the IVDS functionality using the test technique of 5.2.3.

6.2.6.3 A rigid probe with the specifications detailed in GOST 14254 (Table 7) is used in ingress protection tests for IP 40. The probe is pressed against each hole in the enclosure at a force of 1 N ± 10 %.

N o t e — The probe used in the tests is intended for modelling the ingress of solid objects, e.g., spherical ones. If the enclosure has non-straight or twisting passages and a spherical object can not otherwise advance, the check may require drawing the probe or its special passage under the above rated force to the hole being checked.

6.2.6.4 IVDS components rated for protection degree IP 40 are deemed to have passed the test if the largest cross-section of the probe does not pass through any hole in the enclosure, and the functionality check as per 5.2.3 has succeeded after the tests.

6.2.6.5 The dust penetration tests of items rated for protection degrees IP 64 and IP 67 as per GOST 14254 are completed as follows:

a) perform the tests as per GOST 14254 (section 13.4) in a dust chamber with on pressure decrease inside the IVDS components under test as compared to their enclosure (of category 2 as per GOST 14254) in the medium of abrasive non-conducting dust in the following conditions:

- air temperature: (35 ± 2) °C;
- relative air humidity: at most 60 %;
- dust content in air: (1.4 ± 1) g/m^3 (or 0.1% of the working volume of the chamber);
- air circulation rate: from 10 to 15 m/s.

N o t e — The design features of the dust chamber are given in GOST 14254 (Figure 2);

b) switch off the IVDS and place it in the dust chamber so that the distance from IVDS units to the chamber walls and to the adjacent units (if multiple units are tested at the same time) is at least 10 cm;

c) after the tests, keep the test items in the chamber for 1 h to let the dust settle without air circulation; then, remove them from the chamber, clean them of the remaining dust, and inspect visually;

d) check the IVDS functionality using the technique of 5.2.3.

6.2.6.6 Assessment of test results for IVDS units with protection degrees IP 64 and IP 67 as per GOST 14254

The IVDS units (components) are deemed to have passes the tests as per 6.2.6.5 if:

- no defects of the paint coating or marking are observed after the test;
- no traces of dust penetration are observed on the internal surfaces of bodies and printed circuits after the IVDS units under tests are opened;
- all IVDS functionality checks as per 5.2.3 have succeeded.

6.2.7 Tests under exposure to water for assessment of protection degree as per GOST 14254

6.2.7.1 This test is carried out in order to check the conformity to the requirements of GOST 33464 (subsection 13.2.3) for IVDS protection from ingress of foreign objects as described by the second digit of the IP code as per GOST 14254:

- IP 64: for IVDS components designed as external devices that are connected to the main IVDS unit and located outside the vehicle cabin (compartment);
- IP 67: only for automatic RTA detectors designed as an independent component part that is included in the IVDS in auxiliary equipment configuration for vehicles of Categories M1 and N1.

N o t e — No tests for IVDS components rated for protection degree IP 40 are carried out.

6.2.7.2 The equipment used in the tests, its specifications and the overall test conditions for the check of IVDS protection degrees stated in 6.2.7.1 shall conform to GOST 14254 (subsection 14.2 and Table 8).

6.2.7.3 Prior to testing, inspect all IVDS components (units) visually and check the IVDS functionality using the test technique of 5.2.3.

6.2.7.4 The IVDS test under exposure to water is carried out with the IVDS switched off.

6.2.7.5 The checks of IVDS water protection degrees are carried out for:

- IVDS components rated for protection degree IP 64: according to GOST 14254 (subsection 14.2.4);
- IVDS components rated for protection degree IP 67: according to GOST 14254 (subsection 14.2.7).

6.2.7.6 After the tests, check the IVDS functionality using the technique of 5.2.3, then open the IVDS units under test and inspect them for any water penetrated inside.

N o t e — Partial condensation of moisture inside the enclosure of the IVDS units under test may occur in the tests. The accumulated condensate should not erroneously be taken for the water penetrated inside the enclosure during the tests.

6.2.7.7 The IVDS units (components) are deemed to have passed the tests if the amount of water penetrated inside the enclosure has not resulted in IVDS malfunctions.

N o t e — If drainage holes are provided for by the manufacturer and specified in the OD for the design of individual IVDS units (components), then a visual examination is required to ensure that the penetrating water does not accumulate inside and may freely come out through those holes without causing any malfunctions of the relevant IVDS units (components).

7 Test methods for verification of in-vehicle emergency call device/system conformity to requirements for resistance to mechanical impacts

7.1 Test scope and conditions

7.1.1 The IVDS tests against the requirements for resistance to mechanical impacts include the tests of IVDS immunity to such impacts and the tests of its strength under exposure to them.

7.1.2 The list and order of tests for verification of the in-vehicle emergency call device/system conformity to the requirements for resistance to the mechanical impacts specified in [1] (clause 118, Appendix 10) and in GOST 33464 (clause 13.3.1) are given in Table 5.

Table 5

Test (check) name	Clause No. and figure No.
Checking OD completeness	5.2.1
Checking IVDS completeness	5.2.2
Checking IVDS marking	7.2.1
Checking IVDS immunity to sinusoidal vibration	7.2.2, Figure A.2
Checking IVDS strength under exposure to sinusoidal vibration	7.2.3, Figure A.2
Checking IVDS immunity to multiple mechanical shocks	7.2.4, Figure A.2
Checking IVDS strength under exposure to multiple mechanical shocks	7.2.5, Figure A.2
Checking IVDS immunity to single mechanical shocks*	7.2.6, Figure A.2
Checking IVDS strength under exposure to mechanical shocks in transportation	7.2.7, Figure A.2
Checking IVDS resistance to overloads in vehicle collisions	7.2.8
* The tests are carried out for in-vehicle emergency call systems in auxiliary equipment configuration. Notes 1 The order of the tests (checks) may be changed. 2 The conformity of the IVDS marking to the established requirements is checked after each test type.	

7.1.3 The tests shall be carried out in climatic conditions specified in 4.2.

7.1.4 The testing and auxiliary equipment listed in Table 6 are used in the tests.

Table 6

Name of equipment	Required specifications of instruments and equipment
Vibration bench	Frequency range: from 10 to 100 Hz; Maximum vibration acceleration amplitude: at least 98 m/s^2 (10 g); Inaccuracy of vibration acceleration amplitude: at most ±2 m/s^2 (0.2 g)
Multiple-shock testing arrangement	Shock impulse duration: not less than 5 ms; Number of shocks per minute: from 40 to 80; Peak shock acceleration: from 49 m/s^2 (5 g) to 250 m/s^2 (25 g).

Table 6 (continued)

Name of equipment	Required specifications of instruments and equipment
Shock testing arrangement	Single shocks; peak shock acceleration: up to 100 g
IVDS adjusting/control bench	Figure A.1
N o t e — The list and specifications of testing equipment used for the IVDS resistance tests under overloads in frontal collisions of vehicles (see 7.2.8) shall conform to GOST 33467 (clause 5.4.2) and UNECE Regulation [5] (section 6).	

7.1.5 The IVDS test items shall be installed on the platform of the shock testing arrangement (vibration bench) in accordance with the guidelines given in the vibration bench documents and in the IVDS installation and setup manuals taking into account the requirements of GOST 30630.0.0 (section 5).

As a rule, the IVDS should be anchored to the platform of the shock testing arrangement (vibration bench) using the fastening mechanisms included in the IVDS delivery package. Given this, the methods used for IVDS anchoring to the platform shall not result in additional reinforcement as compared to IVDS installation on the vehicle.

7.2 Test procedures

7.2.1 Checking IVDS marking

The IVS marking shall be checked after each type of IVDS tests for resistance to mechanical impacts specified in Table 5.

The IVDS under test is deemed to have passed the check if its marking complies with the requirements of GOST 33464 (section 19) after each type of tests.

7.2.2 Checking IVDS immunity to sinusoidal vibration

7.2.2.1 The test is performed in three mutually orthogonal positions.

7.2.2.2 Inspect the IVDS under test visually and secure it to the vibration bench platform in one of the three mutually orthogonal positions.

7.2.2.3 Make use of the wiring diagrams (see Figure A.2 in Appendix A) to check normal IVDS operation in accordance with the technique of 5.2.3.

Expose the switched-on IVDS to sinusoidal vibration of the following parameters:

- frequency range: from 10 to 70, Hz;
- acceleration amplitude: 39.2 m/s^2 (4 g);
- duration of exposure: 30 min.

Change the vibration frequency gradually in the specified range to detect structural resonances. During the test, make periodic IVDS functionality checks using the technique of 5.2.3.

The IVDS shall remain functional, and no error messages shall be displayed.

7.2.2.4 After the specified test duration, check the IVS functionality using the technique of 5.2.3.

Switch off the IVDS power supply.

7.2.2.5 Change the IVDS position on the vibration bench and repeat the operations described in 7.2.2.3 and 7.2.2.4 for the other two mutually orthogonal positions.

7.2.2.6 The IVDS is deemed to have passed the immunity test to sinusoidal vibration if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables,, and all checks of normal IVDS operation during and after the test have succeeded.

7.2.3 Checking IVDS strength under exposure to sinusoidal vibration

7.2.3.1 The test is performed in three mutually orthogonal positions.

7.2.3.2 Inspect the IVDS under test visually and secure it to the vibration bench platform in one of the three mutually orthogonal positions.

7.2.3.3 Make use of the wiring diagrams (see Figure A.2 in Appendix A) to check normal IVDS operation in accordance with the technique of 5.2.3.

7.2.3.4 The IVDS vibration strength is checked with the power supply switched off and the following parameters of exposure selected:

- frequency range: from 10 to 70, Hz;
- acceleration amplitude: 39.2 m/s^2 (4 g);
- duration of exposure: 160 min.

During the test, change the vibration frequency periodically from the upper to lower limits of the frequency range.

7.2.3.5 Remove the IVDS from the vibration bench, inspect it visually, and check the IVDS functionality using the technique of 5.2.3.

7.2.3.6 Change the IVDS position on the vibration bench and repeat the operations detailed in 7.2.3.4 and 7.2.2.5 for the other two mutually orthogonal positions.

7.2.3.7 The IVDS is deemed to have passed the strength test under exposure to sinusoidal vibration if no mechanical defects are found in the IVDS body (bodies of IVDS components), connectors and connecting cables, and the IVDS functionality check after the tests has succeeded.

7.2.4 Checking IVDS immunity to multiple mechanical shocks

7.2.4.1 The IVDS immunity to multiple mechanical shocks is checked with the IVDS switched on.

The IVDS is exposed to shocks in each of the three mutually orthogonal positions with the following parameters of exposure:

- peak shock acceleration: 98 m/s^2 (10 g);
- shock repetition rate: at most 80 shocks/min;
- shock duration: (10 ± 5) ms;
- number of shocks in each direction: 333 (with the total number of shocks equal to 1000).

7.2.4.2 Inspect the IVDS visually and secure it in one of the three positions with the platform fastening device of the shock testing arrangement.

7.2.4.3 Make use of the wiring diagrams (see Figure A.2 in Appendix A) to check the IVS functionality using the technique of 5.2.3.

7.2.4.4 Expose the IVDS to mechanical shocks with the parameters specified in 7.2.4.1.

7.2.4.5 During the test, make periodic checks using the technique of 5.2.3.

The IVDS shall remain functional, and no error messages shall be displayed.

7.2.4.6 After the test, check the IVS functionality using the technique of 5.2.3.

Switch off the IVDS power supply.

7.2.4.7 Change the IVDS position on the shock testing arrangement and repeat the operations detailed in 7.2.4.3—7.2.4.5 for the other two mutually orthogonal positions.

7.2.4.8 Remove the IVDS from the shock testing arrangement, inspect it visually, and check the IVDS functionality using the technique of 5.2.3.

7.2.4.9 The IVDS is deemed to have passed the test of immunity to multiple mechanical shocks if no mechanical damages, paint coating defects or loosening of IVDS components are observed after the tests, and all functionality checks have succeeded.

7.2.5 Checking IVDS strength under exposure to multiple mechanical shocks

7.2.5.1 The test is carried out in three mutually orthogonal positions of the IVDS.

7.2.5.2 Inspect the IVDS under test visually and secure it in one of the three mutually orthogonal positions on the platform of the shock testing arrangement.

7.2.5.3 Make use of the wiring diagrams (see Figure A.2 in Appendix A) to check normal IVDS operation using the technique of 5.2.3.

7.2.5.4 The IVDS strength under exposure to multiple mechanical shocks is checked with the IVDS switched off at the following parameters of exposure:

- peak shock acceleration: 98 m/s^2 (10 g);
- shock repetition rate: at most 80 shocks/min;
- shock duration: from 5 to 15 ms (10 ms is preferable);
- number of shocks in each direction: 3333 (with the total number of shocks equal to 10000).

7.2.5.5 Remove the IVDS from the shock testing arrangement, inspect it visually, and check the IVDS functionality using the technique of 5.2.3.

7.2.5.6 Change the IVDS position on the shock testing arrangement and repeat the operations detailed in 7.2.5.3 — 7.2.5.5 for the other two mutually orthogonal positions.

7.2.5.7 The IVDS is deemed to have passed the strength test under exposure to multiple mechanical shocks if no mechanical damages, paint coating defects or loosening of IVDS components are observed after the tests, and all functionality checks have succeeded.

7.2.6 Checking IVDS immunity to single mechanical shocks

7.2.6.1 Inspect the IVDS under test visually and secure it on the platform of the shock testing arrangement in a special device simulating actual fastening conditions on the vehicle.

7.2.6.2 Make use of the wiring diagrams (see Figure A.2 in Appendix A) to check the IVS functionality using the technique of 5.2.3.

7.2.6.3 Expose the switched-on IVDS to three single mechanical shocks with peak shock acceleration of 735 m/s^2 (75g) and shock acceleration duration of (3 ± 2) ms.

7.2.6.4 Remove the IVDS from the shock testing arrangement, inspect the fastening visually, and check the IVDS functionality using the technique of 5.2.3.

7.2.6.5 The IVDS is deemed to have passed the immunity test to single mechanical shocks with the acceleration of 75 g if no mechanical damages and loosening of IVDS components are observed after the check, and all functionality tests have succeeded.

7.2.7 Checking IVDS strength under exposure to mechanical shocks in transportation

7.2.7.1 The tests are carried out for IVDS conformity verification against the requirements of GOST 33464 (clause 13.3.1, Table 12) and GOST 16019 (Table 2, item 8) in regard to the strength under exposure to mechanical shocks during transportation in packaging.

7.2.7.2 The test is carried out for each of the three mutually orthogonal IVDS positions.

7.2.7.3 Inspect the IVDS visually and secure it in its packaging on the platform of the shock testing arrangement.

Expose the IVDS in each of the three mutually orthogonal positions to mechanical shocks with the peak shock acceleration of 250 m/s^2 (25 g) and shock acceleration duration from 5 to 10 ms (the value of 6 ms is preferable). The number of shocks in each position shall be 4000, and the shock repetition rate shall not exceed 80 per minute.

7.2.7.4 Remove the IVDS from the shock testing arrangement and inspect the packaging container visually. The packaging shall expose no damages.

7.2.7.5 Remove the IVDS from the packaging and inspect the IVDS visually. The bodies and external connectors of the IVDS shall be free of damages.

7.2.7.6 Check the IVDS functionality using the technique of 5.2.3.

7.2.7.7 The IVDS is deemed to have passed the strength test under exposure to mechanical shocks in transportation if the packaging box (container) and the IVDS are free of mechanical damages after the test, and the IVDS functionality check has succeeded.

7.2.8 Checking IVDS resistance to overloads in vehicle collisions

7.2.8.1 The tests are carried out for IVDS conformity verification against the requirements of the Technical Regulation [1] (clause 118, Appendix 10) and of GOST 33464 (clause 13.3.3) in regard to functionality preservation of the IVDS and its fastening on the vehicle under overloads that arise in vehicle collisions and are defined in the UNECE Regulation [5]. In these tests, the vehicle conformity is also checked against the IVDS installation requirements [1] (clause 16, Appendix 3) and [1] (clause 118, Appendix 10) in part of the IVDS functioning after an RTA.

7.2.8.2 The IVDS is tested in the following conditions, in the order detailed in the UNECE Regulation [5] (section 6):

a) test method: bench test with simulation of shock impacts that occur in vehicle collisions, in accordance with [5] (clause 1, Appendix 7);

b) shock impact parameters:

1) shock direction: lateral horizontal;

2) acceleration profile: as per [5] (Supplement to Appendix 9);

c) testing tools: test carriage with the vehicle body or its fragment secured on it in accordance with the requirements of [5] (clause 1, Appendix 7).

N o t e s :

1 In accordance with the UNECE Regulation [6] (clause 2.16), the testing carriage is a testing device manufactured and used for reproduction of the RTA dynamics in the case of a frontal collision.

2 The vehicle body fragment is understood as a vehicle part comprising those structural components that are used as a base for IVDS mounting.

3 If the vehicle body (vehicle body fragment) can not be secured on the testing carriage, the IVDS may be fastened to the platform of the testing carriage provided that the mechanisms and tools for IVDS fastening on the vehicle body are used. In this case, the mechanisms used for IVDS fastening on the platform of the specified testing equipment shall not reinforce the fastening as compared to IVDS installation on the vehicle body.

d) instruments for measurements of shock impact parameters: in accordance with the requirements of [5] (clause 1, Appendix 7);

e) availability of electric power supply on the vehicle body, of voltage matching the rated one of the vehicle targeted for installation of the IVDS;

f) IVDS operation after a shock impact to be initiated by pressing the "Emergency call" button.

7.2.8.3 Prior to bench tests as per 7.2.8.4 — 7.2.8.15, the check procedures of 5.2.1 and 5.2.2 shall be completed successfully.

7.2.8.4 Inspect the IVDS visually and secure it on the testing carriage (see the enumerated list in 7.2.8.2) taking into account the requirements of 7.1.5.

7.2.8.5 Assemble the IVDS testing circuit using the connection diagram of IVDS components that is included in GOST 33467 (Appendix A).

7.2.8.6 Switch on the power supply and the ignition, and then make sure that the IVDS self-diagnostic procedure has completed successfully as required in GOST 33464 (clause 6.17).

N o t e — The requirements for and the scope of the IVDS self-diagnostic procedure are established in GOST 33464 (subsection 7.6).

7.2.8.7 Switch the IVDS to Test mode in accordance with the instructions given in the operating documents for the IVDS under test, and check the IVDS operation in accordance with GOST 33467 (subsection 6.9).

7.2.8.8 Following the instructions provided in the operating documents for the IVDS, make sure that the IVDS is in ERA mode after the check of its operation (see GOST 33464, section 7).

7.2.8.9 Switch on a vehicle audio system simulator that is included in the bench and described in GOST 33467 (Appendix A), and configure this simulator for audio playback.

N o t e — If technically feasible, an audio program may be reproduced by radio or using optical medium for storage of audio recordings in a digital format.

7.2.8.10 Check that the interface for viewing of the received RTA data is configured on the side of the simulator of the Road Accident Emergency Response System.

7.2.8.11 Using the testing carriage, expose the IVDS to a single mechanical shock with the parameters conforming to item b) of 7.2.8.2.

N o t e — The IVDS shall be switched on during the tests.

7.2.8.12 Inspect all IVDS components and their fastening devices visually for possible mechanical damages or breakdown (loosening) of fastenings.

Include the check results in the test report.

7.2.8.13 Initiate an emergency call by pressing the "Emergency call" button and using the techniques of GOST 33467 (clauses 6.2.1 and 6.2.2), and check the IVDS functionality after the RTA as regards the IVDS ability to transfer an MSD and to ensure duplex voice communication.

7.2.8.14 During the checks as per 7.2.8.13, make sure that the following holds true:

a) sound reproducing devices included in the standard vehicle configuration switch off during the emergency call;

b) while transferring the MSD message in "Emergency call" mode, the IVDS has notified the persons occupying the vehicle compartment (cabin) on the MSD transfer, using the optical IVDS status indicator or by playback of a relevant sound signal or voice message, as required in GOST 33464 (subsection 7.5.3.6);

c) after the MSD transfer and prior to connecting the voice channel, the IVDS has notified the persons in the vehicle compartment (cabin) that the connection of the voice channel is to be established, by playback of a relevant sound signal or voice message, as required in GOST 33464 (subsection 7.5.3.7);

d) after connecting the voice channel, the IVDS has reported that to the persons present in the vehicle compartment (cabin) using the optical IVS status indicator, in accordance with the requirements of GOST 33464 (subsection 7.5.3.8);

e) during the dial-up initiated using the simulator UI of the Road Accident Emergency Response System (within the communication session established upon manual actuation of the device under test), the IVDS has notified the persons present in the vehicle cabin on such dialling, either using the optical IVDS status indicator, or by playback of a relevant sound signal or voice message, as required in GOST 33464 (subsection 7.5.3.5).

7.2.8.15 After the check as per item d) of 7.2.8.14, one of the testers located next to the IVDS shall perform duplex voice communication with the other tester who is located next to the simulator of the Road Accident Emergency Response System and is simulating actions of the emergency service operator in order to check that the vehicle (in regard to the IVDS installation) and the IVDS conform to the requirements of the Technical Regulation [1] (clause 16 in Appendix 3, and clause 118 in Appendix 10).

7.2.8.16 Include the results of the tests as per 7.2.8.4 — 7.2.8.15 in the test report.

7.2.8.17 The IVDS is deemed to have passed the tests for resistance to overloads in vehicle collisions if no mechanical damages of the IVDS and no loosening (breakdown) of fastenings securing IVDS components to the vehicle body have been observed, and all functional tests have completed successfully.

7.2.8.18 The recommended practice is to combine the IVDS tests against the requirements of 7.2.8.1 with the tests of vehicle conformity to the requirements of the UNECE Regulation [5] carried out during the type approval of the vehicle category intended for installation of the IVDS, in accordance with [1].

N o t e — The decision on possible completion of the above tests in combination shall be agreed with the vehicle manufacturer and with the certification body responsible for vehicle type approval activities.

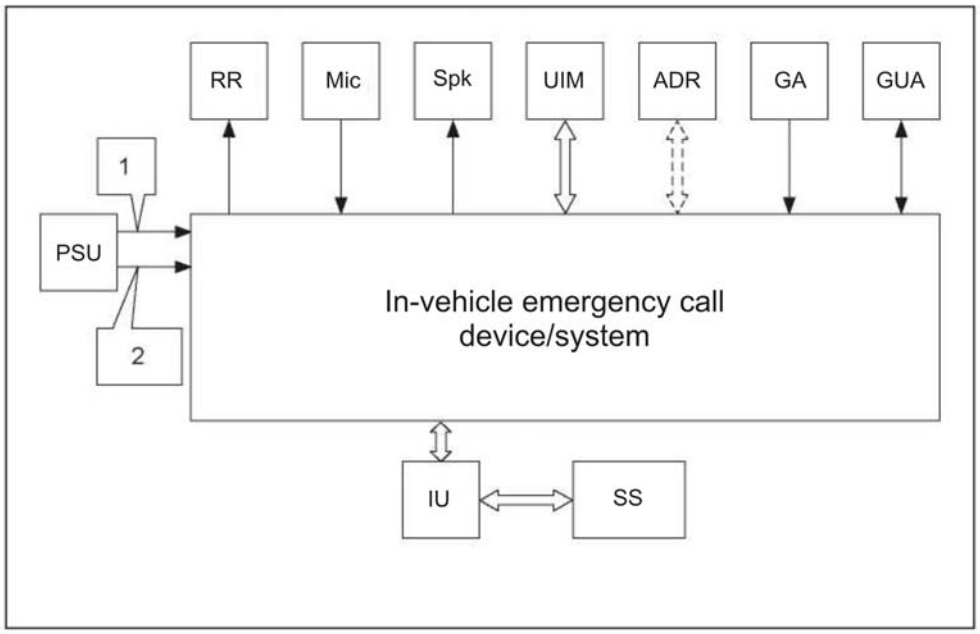
7.2.8.19 If the combined tests described in 7.2.8.18 are carried out, and the vehicle manufacturer takes a decision following [5] (see clause 6.3.5) that the vehicle is to be field tested against the requirements of UNECE Regulation [5] (collision of the whole vehicle in service order with an immobile obstacle) as detailed in [4] (Annex 7, clause 2), then the IVDS conformity to the requirements listed in 7.8.2.1 may be verified during the said field tests of the vehicle.

7.2.8.20 The checks during the field tests specified in 7.2.8.19 shall be carried out in accordance with the requirements of 7.2.8.4 — 7.2.8.15.

7.2.8.21 The IVDS test method (bench tests or field tests) shall be reflected in the test report.

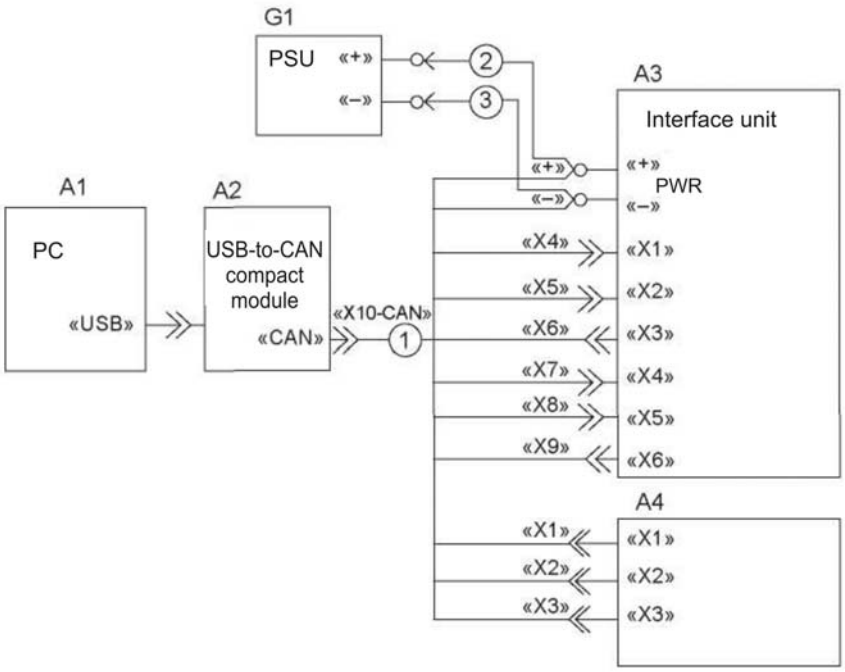
Appendix A
(mandatory)

Block diagrams of test benches and wiring diagrams used in tests of in-vehicle emergency call system/device



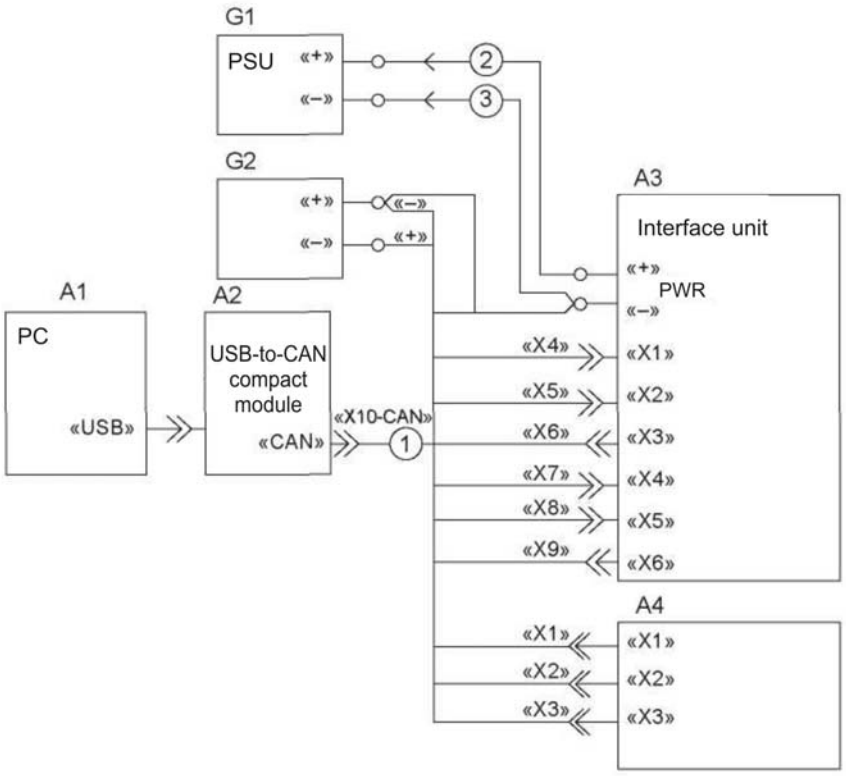
RR — radio recorder of vehicle; Mic — microphone; Spk — speaker; UIM — user interface module; ADR — automatic detector of RTA events; GA —GLONASS antenna; GUA — GSM/UMTS antenna; PSU — power supply unit (12/24 V); IU — interface unit; SS — simulator of road accident emergency response system; *1* — power cable; *2* — ignition circuit

Fig. A.1 — General block diagram of IVDS connection



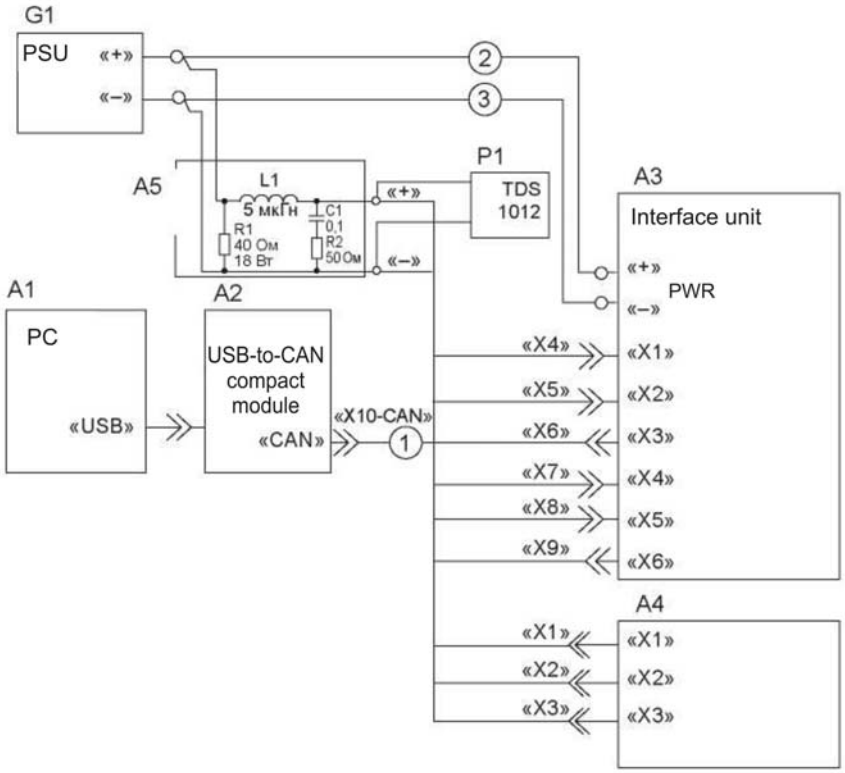
A1 — PC; A2 — USB-to-CAN module; A3 — interface unit; A4 — IVDS under test; G1 — power supply; *1* — cable; *2*, *3* — ML-4G wire

Fig. A.2 — Wiring diagram for IVDS functionality check



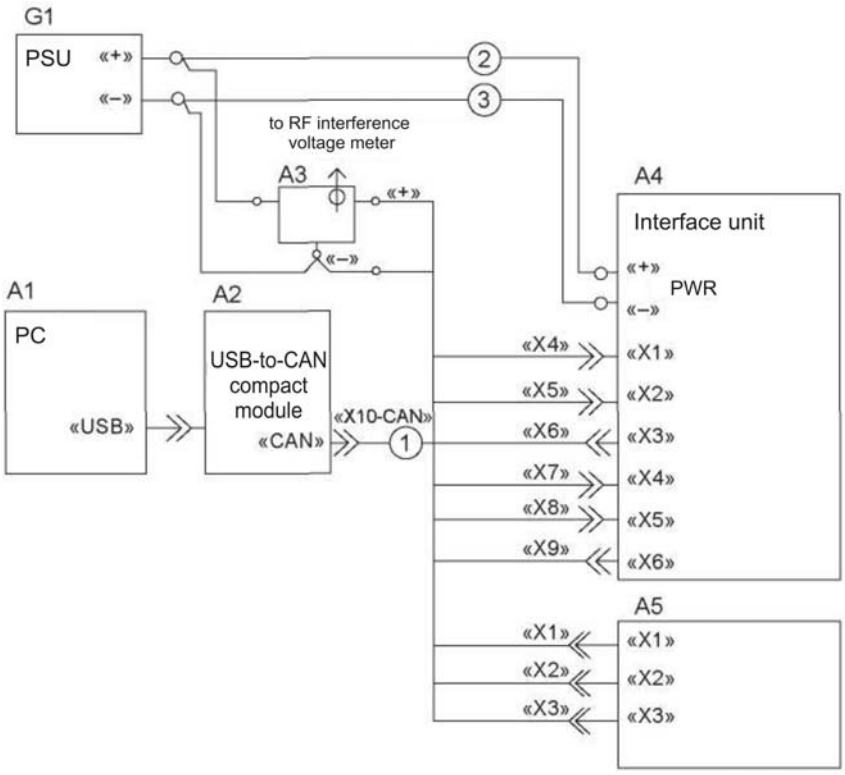
A1 — PC; A2 — USB-to-CAN module; A3 — interface unit; A4 — IVDS under test; G1 — power supply; G2 — test generator of impulse interference in vehicle on-board network;
1 — cable; *2*, *3* — ML-4G wire

Fig. A.3 — Wiring diagram for tests of IVDS immunity to conducted interferences in power circuits



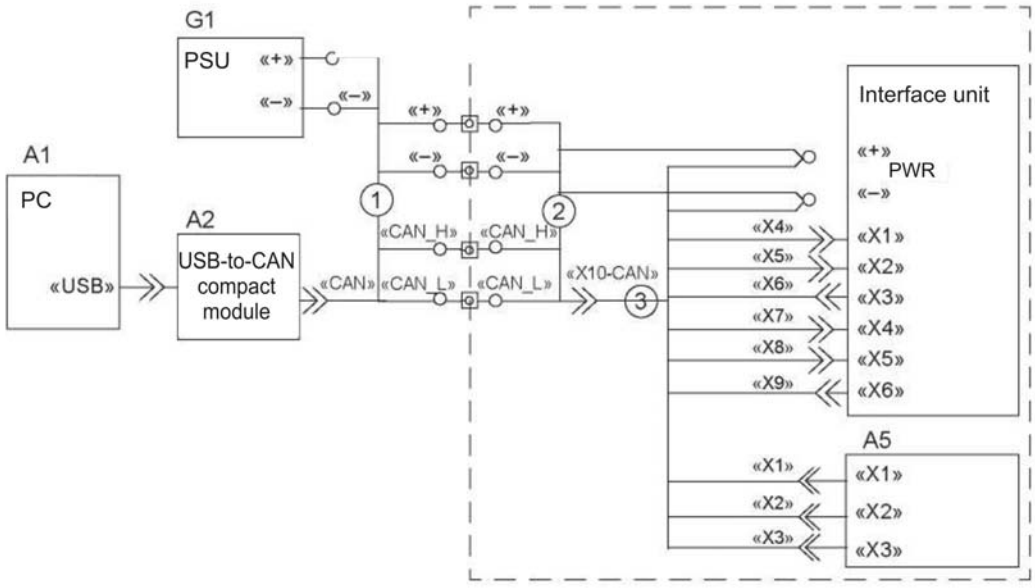
A1 — PC; A2 — USB-to-CAN module; A3 — interface unit; A4 — IVDS under test; A5 — dummy on-board network; G1 — power supply unit; L1 — 5A air-core inductance coil; P1 — oscilloscope;
1 — cable; *2*, *3* — ML-4G wire

Fig. A.4 — Wiring diagram for checks of self-generated IVDS interference in power circuits



A1 — PC; A2 — USB-to-CAN module; A3 — V-shaped dummy on-board network (see Table 2); A4 — interface unit; A5 — IVDS under test; G1 — power supply unit; L1 — 5A air-core inductance coil; P1 — oscilloscope; *1* — cable; *2*, *3* — ML-4G wire

Fig. A.5 — Wiring diagram for voltage and field strength measurements of radio interference from IVDS



A1 — PC; A2 — USB-to-CAN module; A3 — interface unit; A5 — IVDS under test; G1 — power supply unit; *1* — CAN-OUT cable; *2* — CAN-IN cable, *3* — cable

Fig. A.6 — Wiring diagram for checks of IVDS immunity to electromagnetic emissions

Bibliography

[1] Technical Regulation TR CU 018/2011 of the Customs Union "On Safety of Wheeled Vehicles", approved by Order No. 877 dated December 9, 2011, of the Customs Union Commission (in edition of the Eurasian Economic Commission No. 6 dated 30.01.201)

[2] UNECE Regulation No. 10-03 — Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility

[3] CISPR 25:2008 — Vehicles, boats and internal combustion engines — Radio disturbance characteristics — Limits and methods of measurement for protection of on-board receivers, including Amendment 1:2009

[4] ISO 10605:2008 — Road vehicles. Test methods for electrical disturbances from electrostatic discharge

[5] UNECE Regulation No. 17 — Uniform provisions concerning the approval of vehicles with regard to the seats, their anchorages and any head restrains

[6] UNECE Regulation No. 80 — Uniform provisions concerning the approval of seats of large passenger vehicles and of these vehicles with regard to the strength of the seats and their anchorages

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