METRIC

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PERFORMANCE SPECIFICATION FOR

BLAST SENSING AND BLAST DATA RECORDING SYSTEMS FOR USE IN U.S. MILITARY GROUND VEHICLES

Comments, suggestions, or questions on this document should be addressed to U.S. Army RDECOM, Tank Automotive Research Development and Engineering Center, ATTN: RDTA-SIE-ES-PLEP-PLDE-DIS, MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or sent by email to usarmy.detroit.rdecom.mbx.tardec-standardization@mail.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

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1. SCOPE

1.1 Scope. The Vehicle Blast Data Recorder (VBDR) specification defines the technical design restrictions and capabilities of the VBDR, which includes environmental considerations, electrical power and backup power criteria, event triggering and data collection capabilities, system status indicators, and bridge sensor requirements. The VBDR is a stand alone system not intended to interface with other vehicle systems. Analysis of collected data can be used to improve vehicle design, enhance occupant protection, reconstruct blast or other events, or for other purposes. This specification covers all U.S. Army military vehicle blast sensing and blast data recording systems. The intent of the requirements stated in this document are to generate standards to ensure adequate data is recorded, system functionality is maximized, and interoperability is maximized.

1.2 Classification. VBDR's are of the following types and compositions, as specified.

1.2.1 Types. The types of VBDR's are as follows:

Type I – For use in vehicle with 8 or less occupants to include the crew.

Type II – For use in vehicle with 9 to 20 occupants to include the crew.

1.2.2 Compositions. The compositions for VBDR's are as follows:

Composition A: Programmable to the number of occupants (8 or less) and number of sensors (up to 24), a total of 32 digital inputs and two digital outputs.

Composition B: Programmable to the number of occupants (9 to 20) and number of sensors (up to 24), a total of 44 digital inputs and two digital outputs.

Composition C: Programmable to the number of occupants (8 or less) and number of sensors (up to 24), a total of 32 analog inputs and two digital outputs.

Composition D: Programmable to the number of occupants (9 to 20) and number of sensors (up to 24), a total of 44 analog inputs and two digital outputs.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

FED-STD-313	-	Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities

COMMERCIAL ITEM DESCRIPTIONS (CID)

A-A-1812	-	Insecticide, Naphthalene
A-A-52557	-	Fuel Oil, Diesel; for Posts, Camps and Stations
A-A-52624	-	Antifreeze, Multi Engine Type
A-A-59117	-	Insecticide, Malathion, Emulsifiable Concentrate

(Copies of these documents are available online at http://quicksearch.dla.mil).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-2104	-	Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service
MIL-PRF-32033	-	Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature)
MIL-PRF-372	-	Cleaning Compound, Solvent (For Bore of Weapons)

(Copies of these documents are available online at http://quicksearch.dla.mil).

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1916	-	DOD Preferred Methods for Acceptance of Product

(Copies of these documents are available online at http://quicksearch.dla.mil).

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS

29 CFR1910.1200	-	Hazard Communication
29 CFR 1990	-	Identification, Classification, and Regulation of Potential Occupational Carcinogens
40 CFR 355	-	Emergency Planning and Notification
40 CFR 372.65 Sub D	-	Specific Toxic Chemical Listings

(Copies of these documents are available at https://www.gpo.gov/fdsys/search/submitcitation.action?publication=CFR).

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM D6210	-	Standard Specification for Fully-Formulated Glycol Base Engine Coolant for Heavy-Duty Engines
ASTM D460	-	Standard Test Methods for Sampling and Chemical Analysis of Soaps and Soap Products
ASTM D770	-	Standard Specification for Isopropyl Alcohol
ASTM D235	-	Standard Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D4814	-	Standard Specification for Automotive Spark-Ignition Engine Fuel
ASTM D975	-	Standard Specification for Diesel Fuel Oils

(Copies of these documents are available online at http://astm.org).

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption is obtained.

3. REQUIREMENTS

3.1 First article inspection. When specified in Table II, first article inspection shall be accomplished.

3.2 Lot formation. Formation of a lot shall be in accordance with the requirements as specified in MIL-STD-1916. Lots shall also be comprised of like items for vehicle specific applications.

3.3 Lot rejection. If any *sample* fails to comply with the specified performance requirements, the lot shall be rejected.

3.4 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.5 Hazardous material. Material Safety Data Sheets (MSDS) shall be provided to the Government Procuring Agency (GPA) in accordance with (IAW) FED-STD-313. The finished product shall not contain Class I or Class II ozone-depleting substances, asbestos, beryllium, radioactive materials, cadmium (electroplating processes), hexavalent chromium (electroplating, and coatings processes), or other toxic or carcinogenic materials as defined in 29 CFR1910.1200, 29 CFR 1990, 40 CFR 355, 40 CFR 372.65 Subpart D.

3.6 Design of VBDR/VBDR system. Unless otherwise specified, one new VBDR system (to include sensors as specified by the vehicle specific TDP or contract), from every lot shall be tested for the following requirements. The contractor/manufacturer shall supply the required number and types of sensors as specified in the Technical Data Package (TDP) for a specific vehicle type and the following:

a. The size of the VBDR shall not exceed 40 cm (L) by 20 cm (W) by 10 cm (H).

b. With sensors connected to the VBDR, no component of the system shall impede ingress or egress of the occupants.

c. The VBDR recorder (less cabling and sensors) weight shall not exceed 5 kilograms.

d. The VBDR recorder, cabling and sensors shall be removable using common tools found in a military standard general mechanics tool kit.

e. The VBDR system shall be programmable by Depot Level maintenance personnel.

f. An automatic offset correction of ±1 percent from the initial (factory) reading to allow correct sensor output when there is sensor reading drift(s) shall be incorporated into the VBDR programing.

3.6.1 Diagnostic requirements. The VBDR system shall have software which interfaces with industry software:

a. Self-diagnostics capable of detecting if the system is incapable of sending or receiving data (fatal error).

b. The self-diagnostic program to include the automatic offset correction and detection of a fatal error, shall commence upon engine start and be completed within one (1) minute.

c. If a fatal error is detected in the VBDR system (to include any sensor) or no power is detected by the VBDR, a fatal error warning shall blink at a rate of one time per second for not less than 10 or more 30 seconds viewable from the operator's position.

3.6.2 Power requirements for VBDR/VBDR system. The following are power requirements:

a. The primary input power for the VBDR (recorder), shall be 24 ±6 VDC.

b. The input power shall be internally conditioned to run the VBDR and sensors.

c. Power consumption (amps) requirements shall not exceed 20 amps.

d. Secondary power shall be internal to the VBDR or VBDR housing.

e. Secondary power shall be rechargeable from vehicle system power.

f. Secondary power shall have enough power to enable data recording from all sensors to non-volatile memory for 2 minutes ± 10 seconds after the loss of primary power.

3.6.3 Recording.

3.6.3.1 Normal operation. A total of 3 minutes ± 10 seconds of data shall be recorded on the non-volatile memory.

3.6.3.2 Recording after event signal sent. The following recording requirements are as follows after an event signal (digital output signal) has been sent:

a. Apply power, which may be from a bench source regulated to 24 VDC vehicle power equivalent, sending an event signal triggering the countdown timer.

b. After initiation of the event countdown timer, the VBDR system shall record data without loss or degradation of data for 2 minutes ± 10 seconds, stop recording, and shut itself off.

c. Repeat "a" and "b" above, except send the event signal and turn source power off.

NOTE: If the endurance test exceeds 50 days, the test may be restarted with a new initial start date with the *same* VBDR system. Days may or may not be consecutive.

3.6.3.3 Endurance. The following tests shall be on 4 samples; a new VBDR system, a VBDR system which has undergone temperature resistance (see 3.7.1), vibration resistance (see 3.7.3), and sand exposure testing (see 3.7.8).

a. Power shall be applied for 24 consecutive hours and turned off. Repeat for 30 days (see note above).

b. Download the last recorded data at the end of each 24 hour period when power has been applied.

3.6.4 Safety. The data recorder unit, sensors and cables shall be installed as to not hinder the operators or passengers from ingress or egress of the vehicle.

3.6.5 Physical interface. Interface between the VBDR, sensors, and vehicle power is as follows:

a. The sensor cables shall have the type of interface plugs which connect the sensors to the exterior of the VBDR or VBDR enclosure.

b. The plugs shall have a locking mechanism to prevent accidental unplugging from either personnel movement in or on the vehicle.

c. The data recorder system shall interface with the power, data, and sensor cables with EMR/EMI shielded cables capable of withstanding stray vehicle emissions of not less than 2 times the maximum emissions from the vehicle specific electronics/cabling.

3.6.6 Performance.

3.6.6.1 Event recognition. The VBDR system shall utilize a blast detection algorithm which relies upon at least 2 separate inputs from blast sensors and sends a signal to the event timer to initiate the event timer countdown.

3.6.6.2 Sampling. All readings from the following shall be written to the comma separated value (CSV), file format at a rate of a Nyquist–Shannon sampling model at a bandwidth of $1/10^{th}$:

a. The speed of signal acquisition rate for blast detection and occupant sensors (e.g. accelerometers, pressure sensors, g-force sensors…) shall be a minimum of 10,000 samples per second (10 kHz).

b. The minimum sampling rate is 20 samples per second (sps) for the all other vehicle sensors (e.g., temperature, canbus, GPS).

3.6.7 Data retrieval. The data download method shall use a standard open source interface such as an SD card, USB, or serial cable. The specific type of data retrieval interface shall be specified in the vehicle specific TDP.

3.6.8 Sensors.

3.6.8.1 Sensor mounting. Sensors shall not be mounted on a Low Frequency Foam Isolator (LOFFI) mount.

3.6.8.2 Sensor range. The following ranges shall be used for the specific sensor data recording applications.

a. Underbody accelerations: ± 20,000g

b. Underbody pressure: ±10,000 psi

c. Occupant injury: ±500 g

3.6.8.3 Sensor accuracy. The accuracy of any sensor shall be within 2 percent of the manufactures stated accuracy level. The contractor shall calibrate the sensors to the VBDR system.

3.7 Testing of VBDR/VBDR system. Unless otherwise specified, one new VBDR system (to include sensors as specified by the vehicle specific TDP or contract), from every lot shall be tested IAW the following requirements and all inspections shall be conducted under ambient environmental conditions of:

Temperature: 20C ± 15C
Barometric pressure: facility ambient
Humidity: Up to 95% relative humidity

3.7.1 Temperature resistance testing. The VBDR system sample shall be cycled a minimum of 4 times through both the “High” and “Low” temperature test methods listed in “a” and “b” below, IAW MIL-STD-810. Apply vehicle power (may be a bench source regulated to 24 VDC vehicle power equivalent) for 5 minutes after each temperature test, and download data within 1.5 minutes.

a. High Temperature - Test Method 501, Procedures I and III.

b. Low Temperature - Test Method 502, Procedures I and III.

3.7.2 Freeze/thaw cycling. Use the same VBDR system used in temperature resistance testing (see 3.7.1) and cycle a minimum of 4 times IAW MIL-STD-810, Method 524, Procedure III. Apply vehicle power (may be a bench source) for 5 minutes after each temperature test, remove power, and download data within 1.5 minutes.

3.7.3 Vibration resistance. The VBDR system shall be tested IAW MIL-STD-810, Method 514, Procedure I; General Vibration. After completion of test, apply vehicle power and download data.

3.7.4 Cold impact. The VBDR system shall be subjected to a cold impact test. Test the VBDR system using the following procedures:

a. Individual components of the VBDR system, Type I, Composition A (if Type I is being produced) or Type II, Composition B (if Type II is being produced), shall be mounted

and orientated in a horizontal plane on a durable steel test stand so the normally exposed side is facing up.

b. The uppermost side of each component shall be subjected to impact.

c. Test samples (to include test stand) shall be conditioned for 24 hours at 23° C at 50% ± 5% relative humidity prior to testing.

d. Test samples (to include test stand) shall then be placed in a cold chamber for 4 hours at -23° C.

e. Using appropriate thermal resistant gloves to avoid transferring heat to specimens, remove (to include test stand) from chamber.

f. Drop a 25.4 mm spherical radius with a mass of 454 ± 1 grams from a height to allow an impact measurement of not less than 10 and not more than 15 g's.

g. Once all of the VBDR system components have been impacted, allow the components to stabilize in ambient conditions for 24 hours.

h. Connect all sensors to the VBDR.

i. Apply vehicle power for 5 minutes and download data.

3.7.5 Shock test. The VBDR system shall be tested IAW MIL-STD-810, Method 516, Procedure V; Crash Hazard. Test specimens shall not detach from its mountings as to cause a secondary hazard as a projectile.

3.7.6 Ballistic shock. The VBDR and sensors shall be mounted on a platform/test stand in the intended installation method and orientation in a vehicle as specified in the TDP, apply vehicle power just prior to start of test and test IAW MIL-STD-810, Method 522; Procedure IV, Mechanical Shock Simulator.

3.7.7 Mud slurry exposure. The following procedures apply when performing a mud slurry exposure test:

a. Test shall use a mud slurry. Mud slurry shall consist of not more than 35 and not less than 25 weight percent of solids.

b. Testing of a VBDR system shall be conducted IAW MIL-STD-810, Method 512, Procedure I; Immersion.

c. The VBDR system (to include sensors and cabling), shall be submersed at a depth of not less than 20 centimeters (cm) and not more than 50 cm.

d. Apply 24 VDC just prior to immersion.

e. At the conclusion of this testing, remove the VBDR system from the slurry with power still applied.

f. Rinse system just enough to gain access to the memory.

g. Remove power and download data from the memory as soon as possible, not to exceed 1.5 minutes after power has been removed.

3.7.8 Sand exposure. This VBDR system test shall be conducted IAW MIL-STD-810, Method 510, Procedure II; Blowing Sand. Apply vehicle power just prior to start of test.

3.7.9 Contamination by fluids. This VBDR system test shall have all sensors connected and test IAW MIL-STD-810, Method 504; Procedure I for each fluid in Table I (any order). Decontaminate after each fluid has been used and proceed through the list of fluids until all fluids have been used. After last fluid has been decontaminated, apply vehicle power (24 VDC) for 5 minutes.

TABLE I. Fluids Used in Testing

Fluids	Corresponding Source Documents*
Motor Oil	MIL-PRF-2104
Penetrating Oil	MIL-PRF-32033
Dexron III	NSN 9150-00-698-2382
Hydraulic fluid, Flame Retardant	MIL-H-19457D
Antifreeze, Multi-Engine	GSA A-A-52624A
Antifreeze (Ethylene Glycol [Type I])	ASTM D6210
Antifreeze (Propylene-Glycol [Type II])	ASTM D6210
Rifle Bore Cleaner	MIL-PRF-372
Soap, Detergent	ASTM D460
Isopropyl Alcohol	ASTM D770
Naphtha (Stoddard, Dry Cleaning)	ASTM D235
Gasoline	ASTM D4814
Insecticide, Naphthalene	A-A-1812
Insecticide, Malathion, Emulsifiable	A-A-59117
Diesel Fuel (DL-2)	A-A-52557, ASTM D975
* All source documents referenced shall be latest revisions.	

4. VERIFICATION

4.1 First article inspection. The results of first article inspection shall be documented and filed for review and disposition by Government inspectors.

4.2 Lot formation. The contractor shall verify lots are formed IAW requirement as specified in MIL-STD-1916. The required information from MIL-STD-1916 shall be documented and filed for review and disposition by Government inspectors.

4.3 Lot rejection. The contractor shall at no time make repairs to a rejected VBDR/VBDR system without specific approval from the contracting officer. The contractor shall verify lots which are rejected are clearly marked as rejected and physically separated from acceptable lots. This is to prevent defective parts/VBDR systems do not end up in the supply chain. The contractor shall document all lots rejected and filed for review and disposition by Government inspectors.

4.4 Recycled, recovered, environmentally preferable, or biobased materials. Verify, when used, recycled, recovered, environmentally preferable, or biobased materials are documented with respect to cost savings. A part/system which does not show a cost savings shall not be used. Send the results for analysis and disposition to the Government contracting officer.

4.5 Hazardous material. The contractor shall document compliance with FED-STD-313, 29 CFR1910.1200, 29 CFR 1990, 40 CFR 355, 40 CFR 372.65 Subpart D and file for review and disposition by Government inspectors.

4.6 Design of VBDR/VBDR system. Verify, document, and file for review and disposition by Government inspectors and the design characteristics of a VBDR/VBDR system specified in this section:

a. Verify the size of the VBDR does not exceed the dimensions specified in 3.6.

b. Verify the VBDR recorder (less cabling and sensors) weighs less than or equal to 5 kilograms.

c. Verify VBDR system (which includes; recorder, cabling and sensors) can be removed using common tools found in a military standard general mechanics tool kit.

d. Verify programmability as specified so Depot Level maintenance personnel may program any changes which may be needed.

e. Analyze the software to confirm the automatic offset correction for sensors are reset ±1 percent from the initial (factory) readings.

4.6.1 Diagnostic requirements. The contractor shall verify the VBDR has software which interfaces with industry software, document results, and forward to the Government contracting officer and the following:

a. Self-diagnostic test which detects fatal errors and the automatic offset output readings corrects any sensor drift readings to within ±1 percent from the initial (factory) reading.

b. Functions when the ignition of the vehicle is switch on (main power applied) and completed within one (1) minute.

c. Visual warnings if a fatal error is detected for not less than 10 or more 30 seconds viewable from the operator's position.

4.6.2 Power requirements for VBDR/VBDR system. The following verifications shall be documented, and filed for review and disposition by Government inspectors:

a. Verify the voltage connected to the VBDR input is 24 VDC (optimal)

b. Verify the input power is internally conditioned to operate the VBDR and sensors.

c. Verify power consumption does not exceed 20 amps.

d. Verify secondary power is either internal to the VBDR or VBDR housing.

e. Verify secondary power is able to be charged from vehicle system power.

f. Verify recording of sensor data to non-volatile memory for a period of 2 minutes ± 10 seconds after the loss of primary power.

4.6.3 Recording.

4.6.3.1 Normal operation. Verify a total of 3 minutes ± 10 seconds of data is recorded on the non-volatile memory.

4.6.3.2 Recording after event signal sent. Document results and file for review and disposition by Government inspectors:

a. Verify event signal triggered the event countdown timer.

b. Verify the VBDR system recorded data without loss or degradation of the data for 2 minutes ± 10 seconds, stop recording, and shut itself off *with power being applied*.

c. Verify the VBDR system recorded data without loss or degradation of the data for 2 minutes ± 10 seconds, stop recording, and shut itself off *after power has been removed*.

4.6.3.3 Endurance. Document results for the 4 samples and file for review and disposition by Government inspectors:

a. Verify each of the 4 VBDR systems being tested has had power applied for 24 consecutive hours and turned off, for a period of 30 days.

b. Verify the VBDR system recorded data without loss or degradation of the data for 3 minutes ± 10 seconds at the end of each shift when power was applied for 24 hours.

4.6.4 Safety. Verify the VBDR, sensors, and cables do not hinder the operators or passengers from ingress or egress of the vehicle. Document results and file for review and disposition by Government inspectors.

4.6.5 Physical interface. Document results and file for review and disposition by Government inspectors:

a. Verify the sensors are connected to the exterior of the VBDR via plugs on the exterior of the VBDR or VBDR enclosure.

b. Verify plugs have a locking mechanism to prevent accidental unplugging.

c. Verify the power, data, and sensors cables are an EMR/EMI shielded capable of withstanding stray vehicle emissions not less than 2 times the maximum emissions from the vehicle specific electronics/cabling.

4.6.6 Performance. The following performance verification characteristics shall be documented and filed for Government inspection and disposition.

4.6.6.1 Event recognition. Verify the VBDR software initiated the event timer countdown via 2 separate inputs from the blast sensors.

4.6.6.2 Sampling. Verify the following sampling characteristics and data is written to the CSV file at rate of a Nyquist–Shannon sampling model at a bandwidth of $1/10^{th}$.

a. Verify the speed of signal acquisition rate is a minimum of 10 kHz for blast detection and occupant sensors.

b. Verify a minimum of 20 sps for all other vehicle sensors.

4.6.7 Data retrieval. Verify the standard open source interface is compatible to transfer/download data to a computer.

4.6.8 Sensors.

4.6.8.1 Sensor mounting. Verify sensors are not mounted on the LOFFI.

4.6.8.2 Sensor range. Verify the vehicle specific recording ranges for each sensors.

4.6.8.3 Sensor accuracy. Verify contractor has calibrated each sensor.

4.7 Testing of VBDR/VBDR system. Verify the conditions for each test in section 3 and file for Government inspection and disposition. If any sample fails the test as specified in 3.7.1 through 3.7.9 the lot shall be rejected.

4.7.1 Temperature resistance testing. Verify data recorded for the last 3 minutes ± 10 seconds of each temperature test.

4.7.2 Freeze/thaw cycling. Verify downloaded data recorded for the last 3 minutes ± 10 seconds after the completion of the freeze/thaw cycling test.

4.7.3 Vibration resistance. Verify downloaded data recorded for the last 3 minutes ± 10 seconds after the completion of the vibration resistance test.

4.7.4 Cold impact. Verify each sensor downloaded data for the last 3 minutes ± 10 seconds of recording time.

4.7.5 Shock test. Verify VBDR/sensors did not detach from their mountings.

4.7.6 Ballistic shock. Verify sensors downloaded data for the last 3 minutes ± 10 seconds of recording time. One sensor may fail without invalidating test if the null value is written to the appropriate CSV space it was intended to write to.

4.7.7 Mud slurry exposure. Verify the data has recorded IAW paragraph 3.6.3 “a” and “b”, document and file for Government inspection and disposition.

4.7.8 Sand exposure. Verify sensors downloaded data for the last 3 minutes ± 10 seconds of recording time. One sensor may fail without invalidating test if the null value is written to the appropriate CSV space it was intended to write to.

4.7.9 Contamination by fluids. Verify the VBDR downloaded the sensor data for the last 3 minutes ± 10 seconds of recording time. One sensor may fail without invalidating test if the null value is written to the appropriate CSV space it was intended to write to.

4.8 Verification. Below specify what type of processes are performed to verify requirements. The Government reserves the right to witness any or all of the inspections, demonstrations, examination and/or tests.

a. Analysis – the abstract separation of a whole into its constituent parts in order to study the parts and their relations.

b. Demonstration – An element of verification that involves the actual operation of an item to provide evidence the required functions were accomplished under specific scenarios. The items may be instrumented and performance monitored.

c. Examination – An element of verification which is generally nondestructive and typically includes the use of sight, hearing, and touch; simple physical manipulation; and mechanical and electrical gauging and measurement.

d. Test – An element of verification in which scientific principles and procedures are applied to determine the properties or functional capabilities of items.

TABLE II. Cross reference matrix

METHOD OF VERIFICATION 1 - Analysis 2 - Demonstration 3 - Examination 4 - Test						
Requirement		Verify	Verification Methods			
			1	2	3	4
3.1	First article inspection	4.1	X	X	X	X
3.2	Lot formation	4.2	X			
3.3	Lot rejection	4.3	X			
3.4	Recycled, recovered, environmentally preferable, or biobased materials	4.4	X		X	
3.5	Hazardous material	4.5	X		X	
3.6	Design of VBDR/VBDR system	4.6	X	X	X	X
3.6.1	Diagnostic requirements	4.6.1		X		X
3.6.2	Power requirements for VBDR/VBDR system	4.6.2		X		
3.6.3	Recording	4.6.3	X	X	X	
3.6.3.1	Normal operation	4.6.3.1		X		
3.6.3.2	Recording after event signal sent	4.6.3.2	X	X		
3.6.3.3	Endurance	4.6.3.3				X
3.6.4	Safety	4.6.4	X			X
3.6.5	Physical interface	4.6.5		X		
3.6.6	Performance	4.6.6				X
3.6.6.1	Event recognition	4.6.6.1	X			X
3.6.6.2	Sampling	4.6.6.2	X			
3.6.7	Data retrieval	4.6.7	X			X
3.6.8	Sensors	4.6.8	X			
3.6.8	Sensor mounting	4.6.8.1	X		X	
3.6.8	Sensor range	4.6.8.2	X			
3.7	Testing of VBDR/VBDR system	4.7	X			X
3.7.1	Temperature resistance testing	4.7.1	X			X
3.7.2	Freeze/thaw cycling	4.7.2	X			X
3.7.3	Vibration resistance	4.7.3	X			X
3.7.4	Cold impact	4.7.4	X			X
3.7.5	Shock Test	4.7.5	X			X
3.7.6	Ballistic shock	4.7.6	X			X
3.7.7	Mud slurry exposure	4.7.7	X			X
3.7.8	Sand exposure	4.7.8	X			X
3.7.9	Contamination by fluids	4.7.9	X			X

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order. When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

6.1 Intended use. This specification should be used in conjunction with the vehicle specific TDP which entails requirements tailored to the intended vehicle specific design, protection location(s) and associated geometry.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

6.3 Definitions.

a. A-A- – Standard designation for a Commercial Item Description (CID).

b. C – Celsius, a scale of temperature.

c. CSV – Comma separated value, a standard file format which allows data to be saved in a table structured format used in data acquisition.

d. g – Gravity, the attractive force which pulls a body toward the center of the earth, or toward any other physical body having mass.

e. GPS – Global positioning system, a space-based navigation system that provides location and time information.

f. IAW – Is an acronym defined as "in accordance with".

g. ID – Is an acronym defined as "Identification".

h. MIL – Military, relating to, or characteristic of armed forces.

i. PRF – Performance, action or process of carrying out or accomplishing an action, task, or function.

j. SD – Secure digital memory, designed to provide high-capacity memory.

k. TDP – Technical data package, the required design configuration and procedures to ensure adequacy of item performance.

l. USB – Universal serial bus, common interface enabling communication between devices and a host controller.

m. VBDR – Vehicle blast data recorder, a system designed to capture data caused by a blast event.

n. VBDR system – the system is comprised of a VBDR, all cabling, and sensors associated with a vehicle as specified in a TDP.

o. VDC – Voltage or volts direct current

6.4 Contractor notes.

a. The contractor may use off the shelf components provided they are capable of complying with the specified vehicle operating, storage, combat, and related conditions including consideration for blast, crash, rollover and interior fire related events.

b. Any parts/lots which are rejected do not incur any cost (direct or indirect) to the Government.

c. Properly destroy and dispose of any rejected parts/VBDR systems.

6.5 Subject term (key word) listing.

Black Box
Detection
Power
Sensors
Signal

Custodians:

Army – AT

Preparing activity:

Army – AT

(Project 7025-2016-001)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.