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MIL-PRF-0032381A (AR)

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MIL-PRF-32381 (AR)

20 May 2011

## PERFORMANCE SPECIFICATION

## ACOUSTIC HAILING DEVICE (Light)

This specification is approved for use by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification describes the performance requirements and verification procedures for the Acoustic Hailing Device, (Light) hereafter referred to as the AHD. The term AHD will be used when requirements or verifications apply to the entire system. The individual component name will be used for requirements or verifications that are unique to that part.

1.2 Integral components. The AHD is a system comprised of these integral components:

- a. An emitter head (directional speaker)
- b. An audio input device to store and play prerecorded sounds
- c. A microphone for live broadcast
- d. A visual aiming device
- e. A vehicle mounting kit, with associated brackets and hardware
- f. A tripod mounting kit, with associated brackets and hardware
- g. Power and interface cables as required
- h. AC-DC power inverter (if needed)
- i. Transportation case(s)

1.3 Associated accessories. Accessories that may be used in conjunction with the employment of the AHD, but that are not described in this specification are listed in 6.5.

Comments, suggestions, or questions on this document should be addressed to: Commander, U.S. Army ARDEC, ATTN: RDAR-EIQ-SA, Picatinny, New Jersey 07806-5000, or emailed to [usarmy.picatinny.ardec.list.ardec-stdzn-branch@mail.mil](mailto:usarmy.picatinny.ardec.list.ardec-stdzn-branch@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>.

AMSC N/A

FSC: 5830

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1.4 Requirement levels. This specification provides two values for certain performance parameters. The threshold value (T) is the minimum acceptable value, and the objective value (O) is a desired value that provides an operationally significant increase in capabilities. All requirements not annotated are threshold requirements.

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 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 (see 6.2).

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL- DTL-38999	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant with Crimp Removable Contacts or Hermetically Sealed with Fixed, Solderable Contacts, General Specification for
MIL-PRF-32143	Batteries, Storage: Automotive, Valve Regulated Lead Acid (VRLA)
MIL-S-901	Shock Tests, High Impact Shipboard Machinery, Equipment, and Systems, Requirements for

#### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-464	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1275	Characteristics of 28V DC Input Power to Utilization Equipment in Military Vehicles
MIL-STD-1916	DOD Preferred Methods for Acceptance of Product

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## DEPARTMENT OF DEFENSE HANDBOOKS

## DOD-HDBK-743 Anthropometry of U.S. Military Personnel (Metric)

(Copies of federal and military specifications, standards and handbooks are available online at <https://quicksearch.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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.

## U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC) DRAWINGS

19200:13014377	- Sleeve, Bearing
19200:13048308	- OGPK, MRAP, w/ Ammo Storage

(Copies of these drawings are available from U.S. Army ARDEC, ATTN: RDAR-EIS-PE, Picatinny, NJ 07806-5000, or e-mail [usarmy.pica.rdecom-ardec.list.drawing-request-help-desk@mail.mil](mailto:usarmy.pica.rdecom-ardec.list.drawing-request-help-desk@mail.mil))

## U.S. ARMY TANK – AUTOMOTIVE AND ARMAMENTS COMMAND (TACOM)

19207:14004653	- Kit, Turret, Armored, ITDS
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(Copies of these drawings are available from U.S. Army TACOM, ATTN: SFAE-CS/CSS-MRAP, Warren, MI 48397-5000, or e-mail Melissa Morgan at [melissa.b.morgan3.civ@mail.mil](mailto:melissa.b.morgan3.civ@mail.mil) or email RDAR-EIQ-SA at [usarmy.picatinny.ardec.list.ardec-stdzn-branch@mail.mil](mailto:usarmy.picatinny.ardec.list.ardec-stdzn-branch@mail.mil))

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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S3.2	Method for Measuring the Intelligibility of Speech over Communication Systems
ANSI S3.5	Methods for Calculation of the Speech Intelligibility Index

(Copies of these documents may be ordered from, [www.webstore.ansi.org](http://www.webstore.ansi.org).)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 has been obtained.

### 3. REQUIREMENTS

3.1 Production verification inspection. When specified (see 6.2), a sample of the AHD shall be subjected to production verification in accordance with Table I and 4.1.

3.2 First article inspection. When specified (see 6.2), a sample of the AHD shall be subjected to first article inspection in accordance with Table I and 4.2.

3.3 Conformance inspection. When specified (see 6.2), a sample of the AHD shall be subjected to conformance inspection in accordance with Table I and 4.3.

#### 3.4 Operating requirements.

3.4.1 Broadcast capability. The AHD shall be capable of broadcasting a focused acoustic beam with the following characteristics:

3.4.1.1. Voice Transmission. Clear, intelligible voice transmission at 300 meters (T), 1000 meters (O) with 88 dBA background noise present at target location of specified range.

3.4.1.2. Directionality. An acoustic beam width (defined as 3dB down points) relative to the axis of transmission at 300 meters not greater than  $\pm 77.5$  meters ( $\pm 15^\circ$ ) (T),  $\pm 5$  meters (O).

3.4.1.3. Warning tones. Warning tone clearly audible at 300 meters (T), 1000 meters (O) with 88 dBA background noise present at target location of specified range.

3.4.2 Power consumption. The AHD shall be capable of operating at low power for a period not less than 4 hours (T), 8 hours (O) using a rechargeable and/or vehicle/vessel battery. If the AHD system is supplied with its own rechargeable battery, it shall be tested using that, followed by the vehicle battery, if required.

3.4.3 Operator sound pressure level. The maximum sound pressure level (SPL) at the operator's position shall not exceed 108 dBA.

#### 3.5 Interface and interoperability requirements.

3.5.1 Weight. AHD emitter head weight (to include the AHD speakers and amplifier) shall be not greater than 20.41 kilograms (45 lbs) (T), 10.43 kilograms (23 lbs) (O). If an external VAC inverter is included, its weight does not count towards the AHD weight requirements.

3.5.2 Power input. The AHD shall be fully capable of operating with power input of both 12 and 24 Volts, Direct Current, (VDC), and 110/120 and 220/240 Volts, Alternating Current (VAC), in accordance with MIL-STD-1275. An external inverter is allowed for VAC power.

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Circuitry shall be protected such that no damage occurs to the AHD in the event of reversed input polarity.

3.5.3 Power pass-through outlet. The AHD shall provide a DC power pass-through connector with the following features:

- a. It shall be located on the outer surface of the emitter head to allow for connection of associated accessories that require input power.
- b. The output voltage shall match the input voltage (12 or 24V DC) of the AHD.
- c. The power pass-through shall support no less than 250 watts of power.
- d. The connector shall have an attached protective cover to provide sealing from environmental conditions when not in use.
- e. It shall comply with 3.5.4.a.

3.5.4 Cables and connectors. All AHD components shall interconnect/communicate via wired connections. The AHD system shall not transmit information wirelessly. The AHD cables and connectors shall have the following features:

- a. All cables and connectors shall be compliant with MIL-DTL-38999,
- b. The power cable shall be capable of direct connection to the vehicle battery or bus bar.
- c. All power cables shall be fused to provide surge protection to the system.
- d. Power cables shall not interfere with the operator or host platform function.
- e. The power input cable length shall be as specified in the contract or solicitation.
- f. All cables that can be employed through or above the turret shall provide breakaway capability to alleviate operator entanglement risks.
- g. Connectors shall come with attached protective covers to provide sealing from environmental conditions when not in use.

3.5.5 Associated accessory integration. The AHD shall provide hard mounting points on an external surface of the emitter head to allow for mounting of accessories (see 6.5).

3.5.6 Vehicle mounting kit. The AHD system shall include a vehicle mounting kit capable of interfacing with vehicles for mobile employment. The vehicle mounting kit shall be ruggedized to withstand the same environmental conditions and operating environments as the AHD and shall have the following features:

3.5.6.1. Vehicle mounting kit adjustments. Ability to manually pan left and right, tilt up and down, lock in a fixed position, and fold (T), operate utilizing remote control (O).

3.5.6.2. Vehicle mounting kit incremental stop. Provide for incremental stops by means of a manual pressure lock (T), electric motor gear stop (O) control.

3.5.6.3. Vehicle mounting kit hard stop. Provide the ability to set/adjust left and right limits.

3.5.6.4 Multiple platform integration. Provide an adaptable vehicle mounting kit for mounting on the following vehicles utilizing a standard vehicle turret mount/ring:

- a. High Mobility Multipurpose Wheeled Vehicles (HMMWV) models M998, M1114, M1025, M1026, and M1151 (T).

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- b. Light medium Tactical Vehicles (LMTV) models M1078 and M1079 (T).
- c. Unmanned Ground, Surface or Aerial Systems (UGV/USV/UAS) (O).

Note: See Sleeve, Bearing drawing 13014377, cage code 19200 and Combat Vehicle Turret Assembly drawing RIA154925 cage code 19204 for guidance.

3.5.6.5. Vehicle mount compatibility. Compatible with vehicle mounted guns and the Objective Gunner Protection Kit (OGPK) such that they remain in place and operational when the AHD is mounted for use.

Note: See OGPK, MRAP, w/ Ammo Storage drawing 13048308, cage code 19200 for guidance.

3.5.7 Tripod mounting kit. The AHD system shall include a tripod and mounting kit capable of interfacing with the emitter head for stationary ground employment. Where specified in stationary tests, the tripod kit shall be ruggedized to withstand the same environmental conditions and operating environments as the AHD, and shall have the following features:

3.5.7.1. Tripod mounting kit adjustments. Ability to manually pan left and right, tilt up and down, lock in a fixed position, and fold (T), operate utilizing remote control (O).

3.5.7.2. Tripod mounting kit incremental stop. Provide for incremental stops by means of a manual pressure lock (T), electric motor gear stop (O) control.

3.5.7.3. Tripod mounting kit hard stop. Provide the ability to set/adjust left and right limits.

3.5.7.4. Tripod height. The AHD, when in an installed configuration on a tripod, shall have a height from ground to the midpoint of the AHD system no less than 60 inches.

3.5.7.5 Tripod manipulation. The tripod shall allow for no less than 6 inches of additional vertical height.

3.5.8 Visual aiming. The AHD shall be provided with an attached fixed aiming device (T), telescopic range finding (O) to assist operator in orienting the device.

3.5.9 Audio input capability. The AHD shall include an audio input capability that is ruggedized to withstand the same environmental conditions and operating requirements as the AHD. The system shall accommodate all three inputs (audio file player, microphone, and auxiliary input) being connected to the system simultaneously, while providing the following features:

3.5.9.1 Audio file player.

- a. Capable of storing not less than 1 Giga-Byte (GB) (T), 10 GB (O) of files.
- b. Capable of playing MP3, WMA and WAV file formats.
- c. Provide the user an interface to select and play audio files.
- d. Provide an audio file upload capability by means of a USB port.

3.5.9.2 Microphone. Include an independent microphone to provide operator voice input capability.

3.5.9.3 Auxiliary input. Provide an auxiliary input to allow for connection of additional audio devices, such as a handheld translation device, via analog 3.5 mm connector.

3.5.10 Human factors. The AHD and audio input capabilities of 3.5.9 shall be able to be safely, rapidly, and reliably operated by the 5<sup>th</sup> through the 95<sup>th</sup> percentile soldier, in accordance with percentile values specified in DOD-HDBK-743, while wearing Arctic or MOPP IV gloves/clothing.

3.5.11 Transportation case. The AHD shall be supplied with transportation case(s) with the following features:

3.5.11.1 Main package.

- a. Accommodates the emitter head, audio input device, microphone, all power and interface cables, and user manuals.
- b. Securely packages the electronics and provides protection from accidental drops when not employed or mounted.
- c. Allow for 3 packed cases to be stacked three high in storage conditions.
- d. Incorporate an automatic pressure relief valve with a 3.44 kPa (0.5 psig) release.
- e. Reusable and waterproof.

3.5.11.2 Kit package(s) (as needed).

- a. The tripod mounting kit and AC-DC power inverter (if needed) shall be packaged together in a case.
- b. The vehicle mounting kit may be packaged in a separate case or combined with other items, as necessary.
- c. Kit packages shall be reusable and of similar construction to the main package.

3.6 Environmental requirements. The AHD and all components shall meet all specified performance and safety requirements during or after exposure to the following environmental conditions as stated.

3.6.1 Operating temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure throughout the temperature range from -20°C to +60°C.

3.6.1.1 Hot operational temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure while operating at 60°C.

3.6.1.2 Ambient operational temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure while operating at 20°C.



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3.6.1.3 Cold operational temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure while operating at -20°C.

3.6.2 Storage temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure at all operating temperatures after exposure to the storage temperatures ranging from -33°C to +71°C in its transportation case.

3.6.2.1 Hot storage temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure after storage at 71°C.

3.6.2.2 Cold storage temperature. The AHD shall be fully functional, meet all performance requirements, and show no evidence of material degradation, damage, or failure after storage at -33°C.

3.6.3 Solar ultra-violet (UV) radiation. The AHD shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure during or after a combination of ambient temperatures up to +49°C and solar radiation exposure with an intensity of 1120 W/m<sup>2</sup>.

3.6.4 Rain/blowing rain. The AHD shall be fully functional, operate reliably and show no evidence of material degradation, damage or failure after exposure to the effects of 1.7mm/min of rain accompanied by winds of 18 m/sec with droplet sizes in the range of 0.5 mm to 4.5 mm in diameter.

3.6.5 Humidity. The AHD shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure after exposure to a high temperature of 60°C and relative humidity of 95 %.

3.6.6 Salt-fog. The AHD shall be fully functional, meet all performance requirements and show no evidence of material degradation, corrosion, damage or failure that affects performance after being subjected to salt/fog with a 5 +/-1% salt solution concentration for not less than four 24-hour periods (two wet and two dry).

3.6.7 Sand. The AHD in the installed configuration shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure after 9 hours of exposure to blowing sand with particles sizes of 150 µm to 850 µm and with velocities up to 29 m/s.

3.6.8 Dust. The AHD in the installed configuration shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure after exposure to blowing dust with particle sizes of <149 µm with velocity of up to 8.9 m/s for 12 hours.



### 3.6.9 Vibration.

3.6.9.1 Operational vibration. The AHD in the installed configuration on a vehicle mounting kit shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure during or after being subjected to ground platform and watercraft platform operational vibration environments.

3.6.9.2 Transportation vibration. The AHD in the transportation case shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure after truck and trailer platform transportation vibration environments in its transportation case in accordance with the packaging provisions of the contract.

3.6.10 Mechanical Shock. The AHD shall withstand the shock levels associated with ground platform and watercraft platform operational environments as well as transportation handling.

3.6.10.1 Shipboard Shock. The AHD in the installed configuration on a vehicle mounting kit shall withstand ship shock environments. The AHD shall remain intact and not become a safety hazard (T); show no signs of damage and remain functional without degradation in performance (O).

3.6.10.2 Crash hazard shock. The AHD in the installed configuration on a vehicle mounting kit shall not become a safety hazard after being subjected to a Crash Hazard Shock.

3.6.10.3 Transit Drop (2.1 meter). After exposure to 2.1 meter drops in the transportation case, the AHD shall be fully functional, meet all performance requirements and show no evidence of material degradation or damage.

3.6.11 Gunfire shock. The AHD in the installed configuration on a vehicle mounting kit shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure; and shall function normally after experiencing gunfire vibration levels normally encountered during operation from the M249, M240, M2, and MK 19.

3.6.12 Electromagnetic environmental effects (E<sup>3</sup>). The AHD shall operate in the intended operational electromagnetic environment without causing or suffering unacceptable degradation.

a. The AHD shall not cause unacceptable degradation and it shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure during or after exposure to electromagnetic interference (EMI) including conducted and radiated emissions and radiated susceptibility.

b. The AHD, in the installed configuration shall be fully functional, meet all performance requirements and show no evidence of material degradation, damage or failure after exposure to E<sup>3</sup> environments such as: ground electromagnetic environments (EME), and personnel electrostatic discharge (ESD).

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c. The AHD shall be electromagnetically compatible with military equipment commonly found in ground vehicles, including but not limited to, Single Channel Ground Airborne Radio System (SINCGARS) radio, military Global Positioning System (GPS) receivers, and Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW) 2.5 systems.

3.6.13 Wind resistance. The AHD, in the installed configuration on a vehicle mounting kit shall be fully functional, operate reliably and show no evidence of material degradation, damage or failure after exposure to wind/vehicle speeds up to 31.3 meters/sec (70 miles per hour).

3.7 Support and ownership requirements.

3.7.1 Reliability. The AHD shall have an 80% confidence that it has a 90% (T), 95% (O) probability of completing a 96-hour mission without an Essential Function Failure (see 4.7.1.1).

3.7.2 Maintainability. The AHD field level Maintenance Ratio (MR) shall be not greater than 0.013 (T), 0.012 (O) Maintenance Man Hours/Operating Hours (MMH/OH).

3.7.3 Storage life. The AHD shall be fully functional, meet all performance requirements, and show no evidence of damage or failure after one (1) year in a non-humidity controlled storage and five (5) years in humidity controlled storage in the transportation case.

3.7.4 Operational life. The AHD shall be fully functional and meet all performance requirements, for not less than ten (10) years of operational life given field level maintenance that complies with 3.7.2.

3.7.5 AHD color. The AHD and all component colors shall be dull and non-reflective. The specific color and gloss shall be specified at the time of order.

3.7.6 Marking. Each AHD shall have item unique identification (IUID) marking in accordance with MIL-STD-130. The AHD shall be permanently and legibly marked in a clearly visible area. The marking color shall provide a clear contrast from the AHD color. The AHD nomenclature marking shall be in compliance with the commercial manufacturer's standard practice and shall include the following human readable information (HRI), in addition to the manufacturer's own nomenclature. Letter height shall be 12mm +/- 0.5mm. A machine readable information (MRI) marking in accordance with MIL-STD-130 shall also be included.

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NSN XXX

IUID NO. XX-YY

3.8 Workmanship. All parts and assemblies shall be free of burrs, chips, sharp edges, cracks, crazes, unblended radii, porosity, warpage, burn marks, checks, chipped edges, blisters, excess flash, dirt and other defects and foreign matter. The cleaning methods used shall not be injurious to any part, nor shall the parts be contaminated by the cleaning agent(s). Exterior surface coating shall be continuous except for a few light scratches not exposing base material.

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## 4. VERIFICATION

TABLE I. Requirement/verification cross reference matrix.

METHOD OF VERIFICATION		CLASSES OF VERIFICATION							
1 – Analysis 2 – Demonstration		3 - Examination 4 - Test	A – Production verification C - Conformance B – First article						
Section 3 Requirement	Description	Section 4 Method	Verification Method				Verification Class		
			1	2	3	4	A	B	C
3.1	Production verification inspection	4.1	X	X	X	X	X		
3.2	First article inspection	4.2	X	X	X	X		X	
3.3	Conformance inspection	4.3	X	X	X	X			X
3.4.1.1	Voice transmission	4.4.1.1	X			X	X	X	X
3.4.1.2	Directionality	4.4.1.2	X			X	X	X	X
3.4.1.3	Warning tones	4.4.1.3	X			X	X	X	X
3.4.2	Power consumption	4.4.2				X	X	X	X
3.4.3	Operator sound pressure level	4.4.3				X	X	X	X
3.5.1	Weight	4.5.1			X		X	X	X
3.5.2	Power input	4.5.2		X		X	X	X	X
3.5.3	Power pass-through outlet	4.5.3		X		X	X	X	X
3.5.4	Cables and connectors	4.5.4		X	X		X	X	X
3.5.5	Associated accessory integration	4.5.5		X	X		X	X	
3.5.6	Vehicle Mounting Kit	4.5.6		X	X		X	X	X
3.5.7	Tripod mounting kit	4.5.7		X	X		X	X	X
3.5.8	Visual aiming	4.5.8		X	X		X	X	X
3.5.9	Audio input capability	4.5.9		X	X		X	X	X
3.5.10	Human factors	4.5.10		X			X	X	
3.5.11	Transportation case	4.5.11			X		X	X	X
3.5.11.1	Main package	4.5.11.1		X	X	X	X	X	
3.5.11.2	Kit package(s)	4.5.11.2		X	X		X	X	
3.6.1.1	Hot operating temperature	4.6.1.1				X	X	X	
3.6.1.2	Ambient operating temperature	4.6.1.2				X	X	X	X
3.6.1.3	Cold operating temperature	4.6.1.3				X	X	X	
3.6.2.1	Hot storage temperature	4.6.2.1				X	X	X	
3.6.2.2.	Cold storage temperature	4.6.2.2				X	X	X	
3.6.3	Solar (UV) radiation	4.6.3				X	X		
3.6.4	Rain/blowing rain	4.6.4				X	X		
3.6.5	Humidity	4.6.5				X	X		
3.6.6	Salt/fog	4.6.6				X	X		
3.6.7	Sand	4.6.7				X	X		
3.6.8	Dust	4.6.8				X	X		
3.6.9.1	Operational vibration	4.6.9.1				X	X	X	
3.6.9.2	Transportation vibration	4.6.9.2				X	X	X	X
3.6.10.1	Shipboard shock	4.6.10.1				X	X		

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TABLE I. Requirement/verification cross reference matrix. (Continued)

Section 3	Description	Section 4	Ver. Method				Ver. Class		
3.6.10.2	Crash hazard shock	4.6.10.2				X	X		
3.6.10.3	Transit Drop	4.6.10.3				X	X	X	
3.6.11	Gunfire shock	4.6.11				X	X		
3.6.12	Electromagnetic effects (E <sup>3</sup> )	4.6.12				X	X		
3.6.13	Wind resistance	4.6.13				X	X	X	
3.7.1	Reliability	4.7.1				X	X	X	
3.7.2	Maintainability	4.7.2				X	X		
3.7.3	Storage life	4.7.3	X		X	X	X		
3.7.4	Operational life	4.7.4	X		X	X	X		
3.7.5	AHD color	4.7.4.1			X		X	X	X
3.7.6	Marking	4.7.6			X		X	X	X
3.8	Workmanship	4.8			X		X	X	X

4.1. Production verification inspection. A sample shall be subjected to production verification inspection (PVT) by demonstration, examination and tests in accordance with Table I and Table II.

4.1.1 Product rejection. If any sample fails to comply with any of the requirements or verifications, the product shall be rejected.

4.2. First article inspection. A sample shall be subjected to first article inspection (FAT) by demonstration, examination and tests in accordance with Table I and Table II.

4.2.1 First article rejection. If any sample fails to comply with any of the requirements or verifications, the sample shall be rejected and result in failure of first article.

4.3 Conformance verification. A sample shall be subjected to conformance inspection (lot acceptance testing (LAT)) by demonstration, examination and tests in accordance with Table I and Table II.

4.3.1 Lot formation. Lot formation shall be in accordance with the lot formation and identification requirement as specified in MIL-STD-1916. Additionally, lots shall contain individual components from not more than one manufacturer and one configuration.

4.3.2 Lot Rejection. If any sample fails to comply with any of the requirements or verifications, the lot shall be rejected.

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Table II. Production verification, first article and conformance test quantity matrix.

Description	Section 3 Requirement	Section 4 Verification	Test quantity		
			Production verification <u>1/</u>	First article <u>2/</u>	Conformance <u>3/</u>
Broadcast capability	3.4.1	4.4.1	10	5	3
Intelligibility test	3.4.1.1	4.4.1.1.1	10	5 <u>5/</u>	
Audio characterization test	3.4.1.1	4.4.1.1.2	10 <u>5/</u>	5	3
Directionality	3.4.1.2	4.4.1.2	10	5	3
Audibility test	3.4.1.3	4.4.1.3.1	10	5 <u>5/</u>	
Tone characterization test	3.4.1.3	4.4.1.3.2	10 <u>5/</u>	5	3
Power consumption	3.4.2	4.4.2	5	3	2
Operator sound pressure level	3.4.3	4.4.3	10	5	3
Weight	3.5.1	4.5.1	10	5	3
Power input	3.5.2	4.5.2	10	5	3
Power pass-through outlet	3.5.3	4.5.3	10	5	3
Cables and connectors	3.5.4	4.5.4	10	5	3
Associated accessory integration	3.5.5	4.5.5	10	5	
Vehicle mounting kit	3.5.6	4.5.6	10	5	3
Vehicle mounting kit adjustments	3.5.6.1	4.5.6.1	10	5	
Vehicle mounting kit incremental stop	3.5.6.2	4.5.6.2	10	5	
Vehicle mounting kit hard stop	3.5.6.3	4.5.6.3	10	5	
Multiple platform integration	3.5.6.4	4.5.6.4	10		
Vehicle mount compatibility	3.5.6.5	4.5.6.5	10		
Tripod mounting kit	3.5.7	4.5.7	10	5	3
Tripod mounting kit adjustments	3.5.7.1	4.5.7.1	10	5	
Tripod mounting kit incremental stops	3.5.7.2	4.5.7.2	10	5	
Tripod mounting kit hard stop	3.5.7.3	4.5.7.3	10	5	
Tripod height	3.5.7.4	4.5.7.4	10	5	
Tripod manipulation	3.5.7.5	4.5.7.5	10	5	
Visual aiming	3.5.8	4.5.8	10	5	3
Audio input capability	3.5.9	4.5.9	10	5	3
Audio file player	3.5.9.1	4.5.9.1	10	5	
Microphone	3.5.9.2	4.5.9.2	10	5	
Auxiliary input	3.5.9.3	4.5.9.3	10	5	
Human Factors	3.5.10	4.5.10	10	5	
Transportation Case	3.5.11	4.5.11	10	5	3
Main package	3.5.11.1	4.5.11.1	10	3	
Kit package(s)	3.5.11.2	4.5.11.2	10	3	

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Table II. Production verification, first article and conformance test quantity matrix – Continued.

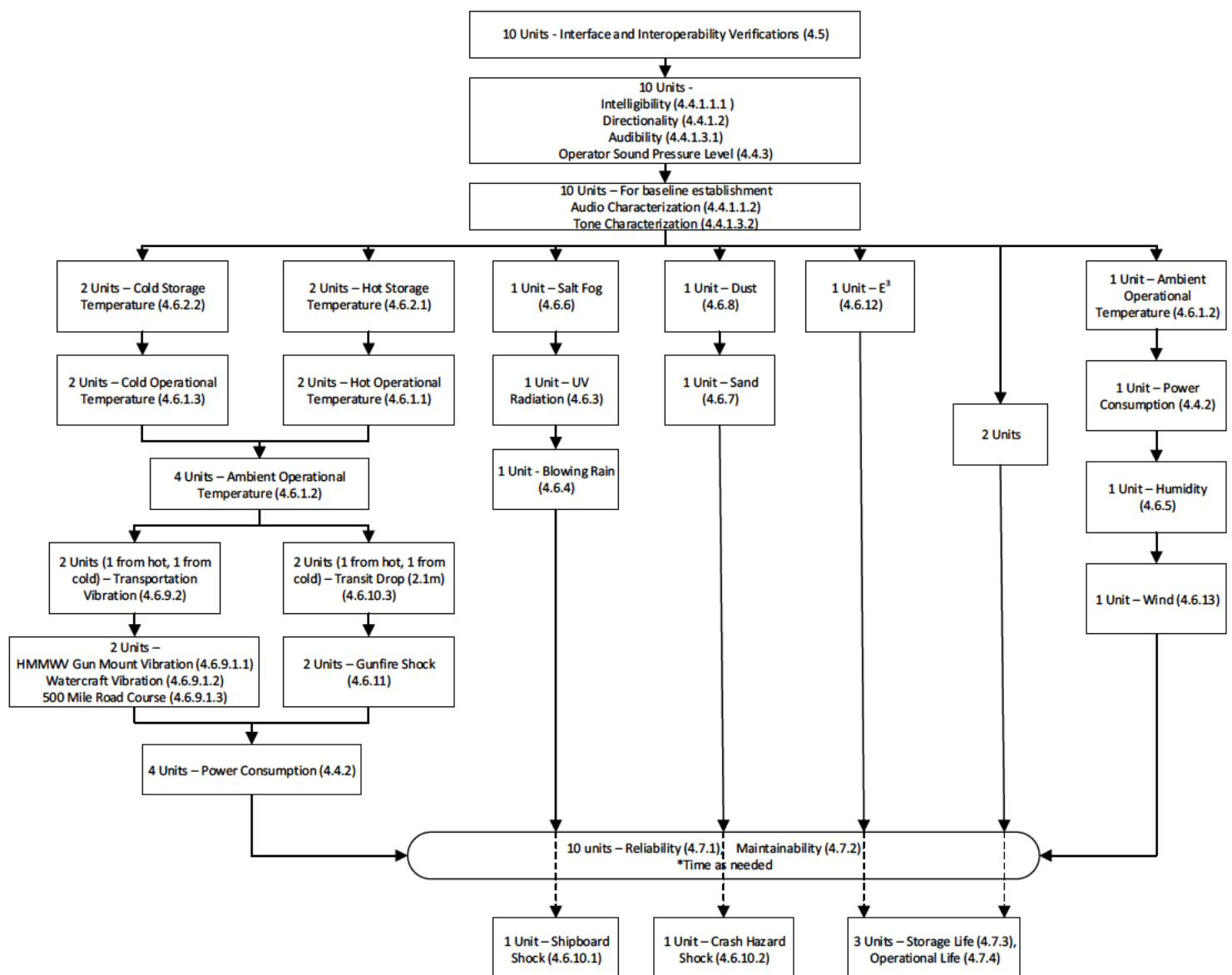
	Section 3 Requirement	Section 4 Verification	Production verification <u>1/</u>	First article <u>2/</u>	Conformance <u>3/</u>
Hot operational temperature	3.6.1.1	4.6.1.1	2	1	
Ambient operational temperature	3.6.1.2	4.6.1.2	5	5	3
Cold operational temperature	3.6.1.3	4.6.1.3	2	1	
Hot storage temperature	3.6.2.1	4.6.2.1	2	1	
Cold Storage temperature	3.6.2.2	4.6.2.2	2	1	
Solar ultra-violet (UV) radiation	3.6.3	4.6.3	1		
Rain/blowing rain	3.6.4	4.6.4	1		
Humidity	3.6.5	4.6.5	1		
Salt/fog	3.6.6	4.6.6	1	1	
Sand	3.6.7	4.6.7	1		
Dust	3.6.8	4.6.8	1		
HMMWV gun mount vibration	3.6.9.1	4.6.9.1.1	2	2	
Watercraft Vibration	3.6.9.1	4.6.9.1.2	2		
500 Mile road course	3.6.9.1	4.6.9.1.3	2		
Transportation vibration	3.6.9.2	4.6.9.2	2	2	1
Shipboard shock	3.6.10.1	4.6.10.1	1		
Crash hazard shock	3.6.10.2	4.6.10.2	1		
Transit drop	3.6.10.3	4.6.10.3	2	2	
Gunfire shock	3.6.11	4.6.11	2		
Electromagnetic environmental effects (E <sup>3</sup> )	3.6.12	4.6.12	1	-	-
Wind resistance	3.6.13	4.6.43	1	1	-
Reliability	3.7.1	4.7.1	10 <u>4/</u>	5 <u>4/</u>	-
Maintainability	3.7.2	4.7.2	10 <u>4/</u>	-	-
Storage life	3.7.3	4.7.3	3	-	-
Operational Life	3.7.4	4.7.4	3	-	-
AHD Color	3.7.5	4.7.5	10	5	3
Marking	3.7.6	4.7.6	10	5	3
Workmanship	3.8	4.8	10	5	3

Notes:

All requirements listed are Major Characteristics

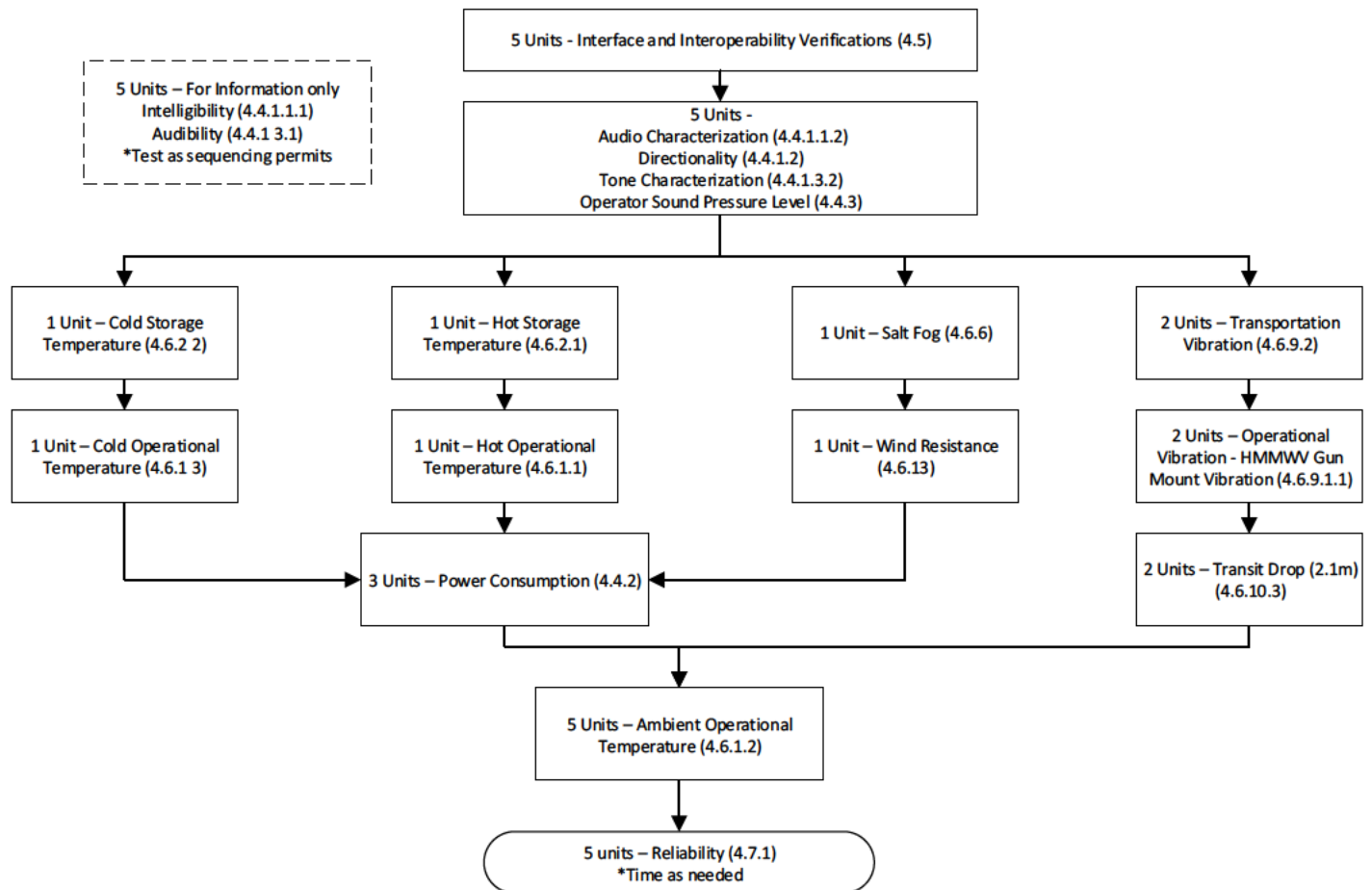
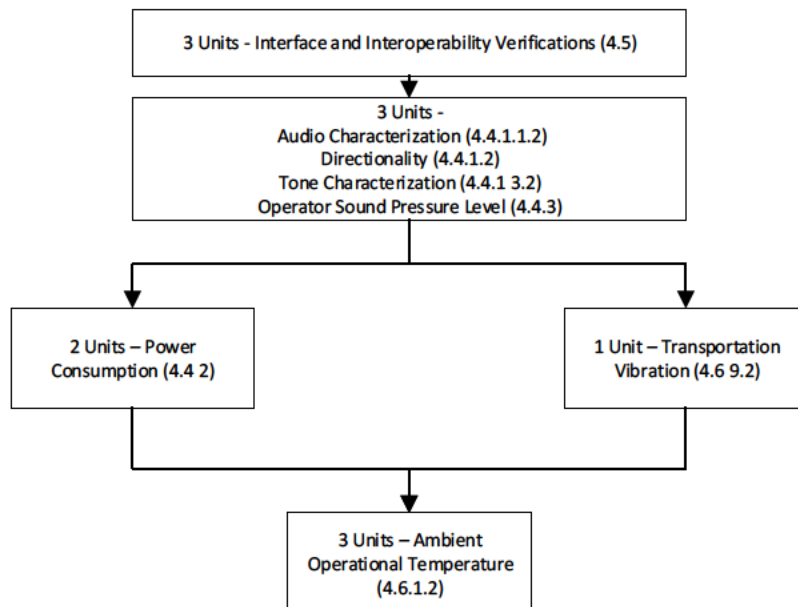
1/ - See Figure 1 for PVT test sequence.2/ - See Figure 2 for FAT test sequence.3/ - See Figure 3 for LAT test sequence.4/ - Unit time spent in other tests & examinations may be counted towards this requirement.5/ - For informational purposes or baseline generation only

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Figure 1: Production verification test series.



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Figure 2: First article test series.Figure 3: Conformance test series.

4.4 Operating verifications. Operating verifications shall be performed as follows:

4.4.1 Broadcast capability.

4.4.1.1. Voice transmission. Voice transmission shall be verified using intelligibility tests (4.4.1.1.1) on an open range during Production Verification. This speaker performance shall then be baselined using audio characterization tests (4.4.1.1.2) to establish acceptance criteria for First Article and Lot Acceptance.

4.4.1.1.1 Intelligibility Test (PVT & FAT<sup>1</sup>). The AHD shall be tested in accordance with ANSI S3.2 (or see 6.10). All test personnel shall understand and speak English, and the test shall be performed with pre-recorded and/or live spoken male English voice. The test shall be executed at a range starting at 300 meters, and then increasing up to a distance of 1000 meters at increments of 100 meters. The AHD shall be mounted on a vehicle or tripod and directed across an open area. The listening targets shall all be positioned on the axis of transmission directly in front of the AHD. A background noise of 88 dBA at the target location shall be used in all test runs. The farthest distance that an average of 70% of the test phrases or words are intelligible for each test run shall be judged as the effective distance. Note the optimal audio settings for use in future tests. (<sup>1</sup> For informational purposes only)

In addition to the test procedures conducted in accordance with ANSI S3.2 or ANSI S3.5, Table III contains the list of 40 test phrases that shall be used when testing voice intelligibility. The test shall consist of using 25 of the 40 test phrases (25 test runs), chosen at random and tested in random order. The phrases used, and the order they were used in, shall be observed. The farthest distance that an average of 70% of the test phrases are intelligible for each test run shall be judged as the effective distance.

Table III. Test Phrases.

Intelligibility Phrase Words	
1	You Are In A Restricted Area.
2	Do Not Move.
3	We Will Fire Across The Bow Of Your Ship.
4	Your Cooperation Will Be Necessary.
5	You Are Released To Proceed Directly To Your Destination.
6	We Would Like To Inspect Your Cargo.
7	Please Remain Calm To Help Avoid Any Misunderstanding Or Confrontation.
8	Drop Your Weapons.
9	We Intend No Harm to Your Ship Your Cargo Or Your Crew.
10	You May Be Shot If You Enter This Area Illegally.
11	Stop Your Engines.
12	We Are Authorized To Search Your Vessel.
13	Muster The Crew On The Fantail.
14	Lethal Force May Be Used Against You.

Table III. Test Phrases - Continued.

Intelligibility Phrase Words	
15	Exit In An Orderly Fashion.
16	You Are Not Authorized To Proceed To Your Intended port.
17	We Are Here To Help You.
18	Put Your Arms To Your Sides.
19	Raise Your Hand If You Can Hear Me.
20	Stop And Prepare To Be Boarded.
21	Let Us Pass.
22	Deadly Force Is Authorized In This Area.
23	Please Establish Radio Communications.
24	Hold Your Fire.
25	Move Along. There Is Nothing More To See.
26	Do As We Say Or You Will Be Arrested.
27	Stay Clear Of The Building.
28	We Will Disable Your Vessel By Firing At The Stern.
29	What Is Your Next Port Of Call?
30	You Are In A Naval Vessel Exclusion Zone.
31	Thank You For Your Cooperation.
32	This Is An Illegal Assembly.
33	Do Not Approach The Fence.
34	This Is The United States Navy.
35	Slowly Kneel Down One Leg At A Time.
36	You Are Approaching An Army Checkpoint.
37	This Is United States Property.
38	Step Away From The Vehicle.
39	Help Will Be Here Soon.
40	Clear The Road.

4.4.1.1.2 Audio Characterization Test (PVT<sup>2</sup>, FAT, LAT). After passing the test requirements using 4.4.1.1.1, the AHD acoustic signature shall be characterized. The AHD shall be mounted on a tripod, aimed horizontally, and positioned in an anechoic test room with wall-to-wall dimensions of at least 5 times the largest diameter (or diagonal) of the AHD's driver array, or other suitable government-approved location. A sound pressure level meter shall be placed at a distance of 4 meters from the face of the AHD, aligned with the central axis of the driver array, and aimed perpendicularly and directly to the AHD's center. At ambient, using the same audio settings that produced optimal results in 4.4.1.1.1, a standardized audio tone that encompasses the range of human hearing shall be played over the AHD to determine the maximum sound pressure level and frequency response. The results of this testing from 10 units during PVT shall be used to establish the nominal SPL and frequency response product baseline and acceptance criteria for future environmental conditioning tests, FAT, and LAT. Once characterized in PVT, AHD units shall not vary from the baseline more than +/-3dB over 500 Hz to 5000 Hz. (<sup>2</sup> For baseline establishment)

4.4.1.2. Directionality (PVT, FAT, LAT). The AHD shall be tested for horizontal noise falloff by setting the AHD to play a standard 2 kHz tone continuously with the elevation angle set to zero. This test shall be performed in an anechoic test room with wall-to-wall dimensions of at least 5 times the diameter (or diagonal) of the test unit's driver array, or other suitable government-approved location. The AHD output shall be measured at various angles off the zero line at a distance of not less than 10 meters. The observed data then shall be extrapolated to a beam width at a distance of 300 meters (angle).

4.4.1.3. Warning tones. Warning tones shall be verified using audibility tests (4.4.1.3.1) with live personnel as listening targets on an open range during Production Verification. This speaker performance shall then be baselined using tone characterization tests (4.4.1.3.2) to establish acceptance criteria for First Article and Lot Acceptance.

4.4.1.3.1 Audibility test (PVT, FAT<sup>1</sup>). Verify by test that the AHD system clearly broadcasts discernible warning tones at a distance of 300 meters (T), 1000 meters (O). Test personnel shall have the same qualifications as required in 4.4.1.1.1. The test shall be executed at a range starting at 300 meters, and then increasing up to a distance of 1000 meters at increments of 100 meters. The AHD shall be mounted on a vehicle or tripod and directed across an open area, and the included warning tone shall be played. A background noise of 88 dBA at the target location shall be used in all test runs. The farthest distance that a warning tone is perceived for each test run shall be judged as the effective distance. (<sup>1</sup> For informational purposes only)

4.4.1.3.2 Tone characterization test (PVT<sup>2</sup>, FAT, LAT). After passing the test requirements using 4.4.1.3.1, the AHD warning tone shall be characterized. At ambient, using the same audio settings that produced optimal results in 4.4.1.3.1, the AHD shall be tested using the procedures of 4.4.1.1.2 to determine the SPL and frequencies of the warning tone. The results of this testing from 10 units during PVT shall be used to establish the nominal SPL and frequency response product baseline and acceptance criteria for future FAT and LAT. Once characterized in PVT, AHD units shall not vary from the baseline more than +/-3dB over the frequency range of the warning tone. (<sup>2</sup> For baseline establishment)

4.4.2 Power consumption. Verify by demonstration that the AHD is capable of being operated at low power (65% duty cycle at 25% volume level) for 4 hours (T), 8 hours (O) while powered by an independent, fully charged 24V vehicle/vessel battery source. Two 12V, 120 Amp-hr batteries that conform to MIL-PRF-32143, Type I shall be wired in series for test use. If the AHD system is supplied with its own rechargeable battery, it shall be tested using that, followed by the 24V vehicle battery, if required.

4.4.3 Operator sound pressure level. The AHD shall be mounted on a tripod and positioned in an anechoic test room or other suitable government-approved location. Sensors shall be placed at the center, left, and right sides of the back face 1 meter behind the emitter. Using the worst case (maximum) audio settings for both warning tone and voice files the AHD shall be tested to ensure the SPL does not exceed the safe limit for an operator.

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4.5 Interface and interoperability verifications. Interface and interoperability verifications shall be performed as follows:

4.5.1 Weight. The weight shall be verified using standard measuring equipment.

4.5.2 Power input. The AHD shall be powered by each specified power source of 3.5.2 in accordance with MIL-STD-1275. Audio characterization testing (4.4.1.1.2), shall be used to compare maximum sound pressure level (SPL) and frequency response of various power sources. The polarity of the inputs shall be reversed and the AHD power cycled; upon correctly reconnecting the inputs, verify the AHD operates properly.

4.5.3 Power pass through outlet. A visual examination shall be performed to verify the AHD provides a DC power pass through connector with cover and a test shall be performed utilizing standard measuring equipment to verify that the output voltage matches the input voltage and that sufficient power supplied.

4.5.4 Cables and connectors. Verify by demonstration and examination that the required AHD cables and connectors plug in, transmit, and comply with the requirements specified. Verify protective covers are present.

4.5.5 Associated accessory integration. A visual examination shall be performed for the presence of hard mounting points and a demonstration shall verify the AHD has the ability to affix accessories (see 6.5).

4.5.6 Vehicle mounting kit. A visual examination shall be performed for the presence of a vehicle mounting kit.

4.5.6.1 Vehicle mounting kit adjustments. A demonstration shall be performed to verify the AHD ability to pan left and right, tilt up and down, lock in a fixed position, and fold.

4.5.6.2 Vehicle mounting kit incremental stop. A demonstration shall be performed to verify the AHD ability for incremental stops by means of manual lock or remote electric stop.

4.5.6.3 Vehicle mounting kit hard stop. A demonstration shall be performed to verify the AHD ability to set/adjust left and right limits.

4.5.6.4 Multiple platform integration. A demonstration shall be performed to verify the AHD can be mounted on all specified service vehicles with the use of a standard vehicle ring mount without modifications, adjustments or shimming.

4.5.6.5 Vehicle mount compatibility. A demonstration shall be performed to verify the AHD and mount ability to fit on vehicles of 3.5.6.4 using an Objective Gunner Protection Kit (OGPK) and applicable weapons of 3.6.12 such that all components remain operable.

4.5.7 Tripod mounting kit. A visual examination shall be performed for the presence of a tripod mounting kit.

4.5.7.1 Tripod mounting kit adjustments. A demonstration shall be performed to verify the AHD ability to manually pan left and right, tilt up and down, lock in a fixed position, and fold.

4.5.7.2 Tripod mounting kit incremental stop. A demonstration shall be performed to verify the AHD ability for incremental stops by means of manual lock or remote electric stop.

4.5.7.3 Tripod mounting kit hard stop. A demonstration shall be performed to verify the AHD ability to set/adjust left and right limits.

4.5.7.4. Tripod height. The height of the tripod mounted AHD systems shall be verified using standard measuring equipment.

3.5.7.5 Tripod manipulation. The extension of the tripod shall be verified using standard measuring equipment.

4.5.8 Visual aiming. A visual examination shall be performed for the presence of a visual aiming device and its ability shall be verified by demonstration during broadcast testing of 4.4.1.1.1.

4.5.9 Audio input capability. Verify by demonstration that all three inputs (audio file player, microphone, and auxiliary input) can be connected simultaneously. Verify that all audio input components remain operable after the environmental verification tests of 4.6 and support and ownership verifications of 4.7.

4.5.9.1 Audio file player. Verify that the AHD system has an audio input device or MP3 player with the following abilities:

- a. Verify by demonstration that the player is capable of storing at least 1 Giga-Byte (GB) of digital audio files comprised of tones, sound and voice utilizing internal memory or removable storage media.
- b. Verify by demonstration that the player is capable of playing MP3, WMA and WAV files.
- c. Verify by demonstration that various files can be viewed, selected, and played on the device.
- d. Verify by demonstration that the AHD audio input device has upload capability by means of a USB port.

4.5.9.2 Microphone. Verify by demonstration that the AHD includes a microphone capable of interfacing with the AHD.

4.5.9.3 Auxiliary input. A visual examination shall be performed for the presence of an auxiliary input and a demonstration shall be performed to verify the auxiliary input functionality with an additional audio device.

4.5.10 Human factors. The following demonstrations are to be performed when wearing Arctic or MOPP IV gloves/clothing without use of any special tools, excessive force, or

damaging the object: The transportation containers shall be able to be opened and closed and contents removed; assemble the AHD system in its installed configuration on a tripod; remove the AHD from the tripod and assemble in its installed configuration on a vehicle mounting kit; operate the electronic functions of the AHD.

4.5.11 Transportation case. A visual examination shall be performed for the presence of transportation case(s).

4.5.11.1 Main package. The main transportation case shall be inspected to verify the specified AHD components are securely packaged within their designated location. After successful completion of the inspection unpack each container, remove all items, and repack all components in their designated location in the transportation case. After successful completion of repack, stack three cases high and verify cases stack securely. Finally, the case seal and pressure relief valve shall be tested using Procedure I – Storage/Air transport, method 500.6 in MIL-STD-810; the pressure shall be reduced from 0 to 1.0 psig over 2 hr. The case shall be opened and closed while at 1.0 psig reduced pressure, then the pressure returned to ambient, and case opened and closed again. Inspect for signs of damage to the case, seals, or pressure valve.

4.5.11.2 Kit package(s). The kit transportation case(s) shall be inspected to verify the specified AHD components are securely packaged within their designated location. After successful completion of the inspection unpack each container, remove all items, and repack all components in their designated location in the transportation case.

4.6 Environmental verifications. The following procedures shall be performed as pre-test and post-test procedures executed before and after exposure to each specified environment;

a. Pre-test. The following pretest procedures shall be conducted:

1. Perform audio characterization testing at room ambient condition ( $\sim 22^{\circ}\text{C}$ ); in accordance with 4.4.1.1.2.
2. Inspect the unit for any signs of damage and or structural problems, such as loose fasteners, and connectors.
3. Perform functional checks on microphone and MP3 player corresponding to the unit.

b. Post-test. Post-test results may substitute for Pre-test results in a sequence of testing. After the unit is removed from the test chamber:

1. Inspect the unit for any signs of damage and/or structural problems, such as loose fasteners, connectors, etc.
2. Ensure all assemblies still fit together.
3. Ensure all weather seals are still intact and functional.
4. At room ambient condition ( $\sim 22^{\circ}\text{C}$ ), perform audio characterization testing (4.4.1.1.2) on the test unit with reference to the baseline and pre-test results.
5. Perform functional test on microphone and MP3 player corresponding to the unit.
6. Ensure the AHD is able to be placed, aimed, moved, and locked on its mount.



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c. Installed configuration. Defined as the full AHD system mounted on either the tripod or vehicle mounting kit. For all tests, unless explicitly noted as (no tripod), regardless of what the AHD is installed on, the other item shall be placed alongside the system to be exposed to the test conditions.

4.6.1 Operating temperature. The AHD in its installed configuration on a tripod shall be tested in its operational mode. Acceptance shall be in accordance with the applicable section of MIL-STD-810 for the test cited. Temperature ramps may not be more than 3°C per min, to prevent temperature shock. The AHD shall be capable of functioning during and after being subjected to the following temperatures:

4.6.1.1. Hot operational temperature. The AHD in the installed configuration on a tripod shall be tested in accordance with Procedure II – Operation, Method 501.6 of MIL-STD-810. The AHD shall be conditioned not less than 24 hours at constant temperature of 60°C +/- 2°C (140°F +/- 4°F) and operated at that temperature after its temperature stabilizes. The AHD shall operate with a 65% duty cycle (see 6.9) track at full power for a not less than 96 hours. After the 96-hour test duration, the temperature shall be lowered to ambient conditions (~20 °C) and once temperature has stabilized for not less than 2 hours, conduct the post-test procedure (see 4.6.b).

4.6.1.2. Ambient operational temperature. The AHD in the installed configuration on a tripod shall be conditioned not less than 24 hours at constant temperature of 20°C +/- 10°C (68°F +/- 18°F) and operated at that temperature after its temperature stabilizes. The AHD shall operate with a 90% duty cycle track at full power for not less than 96 hours. After the 96-hour test duration, conduct the post-test procedure (see 4.6.b).

4.6.1.3. Cold operational temperature. The AHD in the installed configuration on a tripod shall be tested to Procedure II – Operational, Method 502.6 of MIL-STD-810. The AHD shall be conditioned not less than 24 hours at constant temperature of -20°C +/- 2°C (-4°F +/- 4°F) and operated with arctic gloves at that temperature after its temperature stabilizes. The AHD shall operate with a 65% duty cycle track at full power for a not less than 96 hours. After the 96-hr test duration, the temperature shall be ramped up to ambient conditions (~20°C) and once the temperature has stabilized for not less than 2 hours, conduct the post-test procedure (see 4.6.b).

4.6.2 Storage temperature. The AHD in its transportation case(s) shall be conditioned at each of the required storage temperatures for 3 days. Acceptance shall be in accordance with the applicable section of MIL-STD-810 for the test cited. Temperature ramps may not be more than 3°C per min, to prevent temperature shock. The AHD shall be capable of functioning without degradation after being subjected to the following temperatures:

4.6.2.1. Hot storage temperature. The AHD in the transportation case(s) shall be tested in accordance with Procedure I – Storage, Method 501.6 of MIL-STD-810. The AHD shall be conditioned not less than 72 hours at constant temperature of 71°C +/- 2°C (160°F +/- 4°F). After the 72-hour test duration, the temperature shall be lowered to ambient conditions (~20 °C) and once temperature has stabilized for not less than 2 hours, conduct the post-test procedure (see 4.6.b).

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4.6.2.2. Cold storage temperature. The AHD in the transportation case(s) shall be tested in accordance with Procedure I – Storage, Method 502.6 of MIL-STD-810. The AHD shall be conditioned not less than 72 hours at constant temperature of  $-33^{\circ}\text{C} \pm 2^{\circ}\text{C}$  ( $-27^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ). After the 72-hour test duration, the temperature shall be raised to ambient conditions ( $\sim 20^{\circ}\text{C}$ ) and once temperature has stabilized for not less than 2 hours, conduct the post-test procedure (see 4.6.b).

4.6.3 Solar ultra-violet (UV) radiation. The AHD in the installed configuration on a tripod shall be tested to Procedure I – Cycling, Method 505.6 of MIL-STD-810. High temperature diurnal cycle A1 shall be used and the test item shall be exposed to at least 3 continuous 24-hour cycles of controlled simulated solar radiation, in accordance with Figure 505.6-1 from Method 505.6 of MIL-STD-810. Use full spectrum lamps that conform to Table 505.6-I. During the test, the AHD shall operate with a 65% duty cycle (see 6.9) track at full power. After the test, return AHD to ambient conditions and conduct the post-test procedure (see 4.6.b).

4.6.4 Rain/blowing rain. The AHD in the installed configuration on a tripod shall be tested to Procedure I – Rain and Blowing Rain, Method 506.6 of MIL-STD-810. The test shall be performed at a temperature of  $23 \pm 2^{\circ}\text{C}$ . The test shall be 30 minutes in duration for each side; front, back, two sides, top and bottom. The wind speed during the test shall be at least 18m/s (40mph). The rainfall rate shall be 1.7mm/min (4in/hr), using a water sprinkler that produces droplets in the diameter range of 0.5mm to 4.5mm. After the test, conduct the post-test procedure (see 4.6.b).

4.6.5 Humidity. The AHD in its installed configuration on a tripod shall be tested to Procedure II – Aggravated Cycle, Method 507.6 of MIL-STD-810. The test shall begin at a temperature of  $30^{\circ}\text{C}$  and cycle to  $60^{\circ}\text{C}$  at constant 95% humidity, per Figure 507.6-7 and Table 507.6 IX. The item shall be exposed to at least 10 continuous 24-hour humidity cycles, and an operational checkout shall be performed every five cycles, in accordance with Method 507.6 of MIL-STD-810. After the test, conduct the post-test procedure (see 4.6.b).

4.6.6 Salt-fog. The AHD in its installed configuration on a vehicle mounting kit shall be subjected to a ninety-six (96) hour salt fog test as defined in MIL-STD-810, Method 509.6. The test shall be conducted with alternating 24-hour periods of salt fog exposure and drying conditions for not less than four 24-hour periods (two wet and two dry). The sample shall be rejected if corrosion is found anywhere on the AHD material that affects its performance. After the test, conduct the post-test procedure (see 4.6.b).

4.6.7 Sand. The AHD in the installed configuration on a vehicle mounting kit shall be tested to Procedure II – Blowing Sand, Method 510.6 of MIL-STD-810. The test shall be performed at a temperature of  $60 \pm 2^{\circ}\text{C}$ . Sand with particle size 150  $\mu\text{m}$  to 850  $\mu\text{m}$  shall be used in concentrations of  $1.1 \pm 0.3 \text{ g/m}^3$  with impact velocities of 18-29 m/s. The orientation of the test item shall be such that each side is tested at intervals of 90 minutes. After the test, clean the item and conduct the post-test procedure (see 4.6.b).

4.6.8 Dust. The AHD in the installed configuration on a tripod shall be tested to Procedure I – Blowing Dust, Method 510.6 of MIL-STD-810. The test shall be performed at ambient

temperature ( $20 \pm 2^{\circ}\text{C}$ ) for 6 hours and at a temperature of  $60 \pm 2^{\circ}\text{C}$  for 6 hours. The orientation of the test item shall be rotated such that each side is tested at intervals of 60 minutes per temperature. The dust composition shall be any available dust that conforms to Procedure I of 510.6. After the test, clean the item and conduct the post-test procedure (see 4.6.b).

4.6.9 Vibration. The AHD shall be tested according to MIL-STD-810. Upon completion of this tests, the item shall show no signs of damage and remain functional without degradation in performance.

4.6.9.1 Operational vibration. Operational Vibration on the AHD shall be verified using the following tests from method 514.7 of MIL-STD-810 with the unit operating and mounted in its installed configuration on a vehicle mounting kit (no tripod). After each test, conduct the post-test procedure (see 4.6.b).

4.6.9.1.1. HMMWV gun mount vibration. Procedure I General Vibration shall be tested in accordance with Category 20 (Ground Vehicles) of Table 514.7-I – Vibration environment categories for a wheeled vehicle. Vibration profiles (see 6.4) for the gun mount of a HMMWV shall be used to test for the equivalent of 500 miles per AHD. Using the unexaggerated profile, this is equivalent to a duration of 4.1 hours along each of 3 orthogonal axes, or a duration of 30 min/axis using the exaggerated profile.

4.6.9.1.2. Watercraft vibration. Watercraft vibration shall be tested in accordance with Procedure I, Category 21 (Watercraft – marine vehicles) of Figure 514.7D-9 – Category 21 – Shipboard random vibration exposure for a duration of two hours along each of the three axes per AHD.

4.6.9.1.3. 500 Mile road course. Procedure III Large Assembly Transportation shall be tested while mounted on a HMMWV for not less than 500 miles per AHD using various cross-country type road courses.

4.6.9.2 Transportation vibration. Transportation Vibration shall be tested on all AHD system components in the packaged configuration to Procedure I – General Vibration, method 514.7 of MIL-STD-810 using Category 4 (Secured Cargo). Composite two wheeled trailer vibration exposure profile from Table 514.7C-III shall be performed for 32 minutes on each of 3 axes per AHD. Composite wheeled vehicle vibration exposure profile from Table 514.7C-V shall be performed for 40 minutes on each of 3 axes per AHD. After the tests, conduct the post-test procedure (see 4.6.b).

#### 4.6.10 Mechanical Shock.

4.6.10.1 Shipboard shock. The AHD shall be tested in its installed configuration on a vehicle mounting kit (no tripod) in accordance with MIL-S-901, Lightweight category, shock grade B, Class I, test type A, Deck mounting. Upon completion of the test, conduct the post-test procedure (see 4.6.b) to evaluate safety and performance of the AHD.

4.6.10.2 Crash hazard shock. The AHD shall be tested in its installed configuration on a vehicle mounting kit (no tripod) in accordance with Procedure V – Crash Hazard Shock Test, Method 516.7 of MIL-STD-810. Crash Hazard Shock Test for Ground Equipment shall be performed using two shocks in each direction along each of 3 orthogonal axes. The AHD and its mounting components shall not break loose or become a safety hazard to nearby personnel or operators. Operation of the item is not required.

4.6.10.3 Transit Drop (2.1 meter). The AHD main package (3.5.11.1) shall be tested in the packaged configuration in accordance with ITOP 4-2-602 and Procedure IV – Transit Drop, Method 516.7 of MIL-STD-810, Tactical transport drop test (Packaged Handling) defined in Table 516.7-VIII. The packaged AHD shall be dropped from 2.1 meters (7 ft.) a total of 3 times. The 6 drop orientations below shall be divided amongst 2 different AHD units.

- a. Front
- b. Left side
- c. Top
- d. Bottom
- e. Back top edge
- f. Bottom right front corner

After the drops, post-test procedure (see 4.6.b) shall be conducted.

4.6.11 Gunfire Shock. The AHD in its installed configuration on a vehicle mounting kit (no tripod) shall be tested using live firing of M2 machine gun with 2400 rounds of ammunition per AHD. Rate of fire shall be altered to cover all possible firing modes. If live fire testing is not possible, as an alternate, the AHD shall be tested to equivalent conditions using Procedure I – Direct Reproduction of Measured Material Input/Response Data, Method 519.7 Gunfire Shock of MIL-STD-810. Upon completion of this test, post-test procedure (see 4.6.b) shall be conducted; the item shall show no signs of damage and remain functional without degradation in performance.

#### 4.6.12 Electromagnetic Environmental Effects (E<sup>3</sup>).

a. The AHD in its installed configuration on a vehicle mounting kit shall be tested in accordance with MIL-STD-461; Procedures CE102, RE102 using the limit for Army ground applications of Figure RE102-4, and RS103 using the limits for Army ground systems.

b. The AHD shall also be tested in accordance with MIL-STD-464, External RF EME procedure 5.3 using Table 4 for ground systems, and ESD procedure 5.8.4 Electrical and electronic subsystems. The AHD shall show no signs of permanent damage and remain functional after exposure to E<sup>3</sup>. Upon completion of this test, post-test procedure (see 4.6.b) shall be conducted.

c. Verify by demonstration that operation of the AHD has no adverse impact to the operation of specified radio and navigation equipment of 3.6.13.c.

4.6.13 Wind resistance. The AHD in its installed configuration on a vehicle mounting kit (no tripod) shall be tested by placing it in a wind stream for 2 continuous hours, with a wind velocity of 31.3 meters/sec (70 MPH). The AHD shall be oriented with the emitter facing the

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wind, perpendicular to the wind, and facing the ground, with time divided equally amongst the 3 orientations. Following the wind exposure, the post-test procedure (see 4.6.b) shall be conducted.

#### 4.7 Support and ownership verifications.

4.7.1 Reliability. Verify by test that the AHD system can complete a 96-hour mission (86.4 operational hours) with a 65% and/or 90% duty cycle track without an Essential Function Failure (EFF) (see 4.7.1.1). Unit time spent operating and resultant EFF in other tests shall be counted toward this requirement. As needed, AHDs shall be operated at ambient for additional time to meet the requirement (see 6.6). Following the reliability testing, the post-test procedure (see 4.6.b) shall be conducted.

4.7.1.1 Essential function failure (EFF). The AHD shall provide the following essential functions at the levels specified in the AHD CPD. The unacceptable degradation of, or the inability to perform, one of the following is defined as an essential function failure. Verification may be accomplished during applicable operational checks or post-test inspection (4.6.b.4 to 4.6.b.6).

a. Emplace. The AHD shall be capable of ground, vehicle, watercraft, or rooftop (building) emplacement. This essential function also includes the ability to provide power for the AHD.

b. Aim. The AHD shall be able to be aimed in the direction of the intended target and locked into position.

c. Broadcast. The AHD shall be able to broadcast intelligible voice, warning tones, and sounds, in a focused beam out to 300 meters.

4.7.2 Maintainability. The test shall use 10 AHDs to assess the maintainability of the AHD system, observing the maintenance time for each unit during the test. Unit time spent operating and resultant failures in other tests shall be counted toward this requirement. As needed, AHDs shall be operated at ambient for additional time such that each AHD runs for approximately 500 hours with testing levels approximating those in Table IV. Total accumulated run time shall be not less than 5000 operational hours for 10 AHDs, unless otherwise specified.

Table IV. Maintainability test hours per AHD unit

Volume Level (%)	Duty Cycle (%)	Operation (hours)
100	65	50
75	90	200
50	90	200
25	65	50

4.7.3 Storage life. Objective evidence shall be examined to verify storage life. If historical evidence is not sufficient, accelerated aging testing may be conducted at elevated environmental conditions.

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4.7.4 Operational life. Objective evidence shall be examined to verify operational life. If historical evidence is not sufficient, accelerated aging testing may be conducted at elevated environmental conditions.

4.7.5 AHD Color. All AHD system components shall be visually inspected for compliance with specified requirement.

4.7.6 Marking. Each AHD shall be visually examined to verify marking.

4.8 Workmanship. Visually verify that all parts and assemblies meet 3.8.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). 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

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The AHD is a military unique system that will allow for long range acoustic hailing and warning using an input microphone and/or input audio devices that facilitate the use of pre-recorded warning tones and voice messages, as well as spontaneous voice commands.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification and all reference documentation cited in Section 2 and noted in Section 6 for information.

- b. Requirements for submission of design verification sample
- c. Requirements for submission of first article sample
- d. Requirements for submission of conformance inspection
- e. Requirement for submission of inspection equipment designs.
- f. Requirement and provisions for submission of test data as required.
- g. Requirement for certificates of conformance for each lot or shipment of product
- h. Government Furnished Material or Equipment
- i. Requirement for color and markings
- j. Requirements for cable lengths
- k. Requirements for packaging



6.3 Submission of inspection equipment designs for approval. Submit copies of designs as required to: Commander, US Army ARDEC, Attn: RDAR-EIQ-MG, Picatinny, NJ 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract.

6.4 Operational vibration HMMWV profile. Unless otherwise specified, operational vibration testing for 4.6.9.1.1 should use the profile for M1151 HMMWV gun mount profile in Table V. Either the exaggerated or unexaggerated schedules may be chosen based on testing needs; if the exaggerated levels are used, 500 miles is equivalent to 30 min per axis, if the unexaggerated levels are used, 500 miles is equivalent to 4.1 hours per axis.



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Table V. HMMWV sample vibration profile

Vertical			Transverse			Longitudinal		
Freq, Hz	Exaggerated PSD, g <sup>2</sup> /Hz	Unexaggerated PSD, g <sup>2</sup> /Hz	Freq, Hz	Exaggerated PSD, g <sup>2</sup> /Hz	Unexaggerated PSD, g <sup>2</sup> /Hz	Freq, Hz	Exaggerated PSD, g <sup>2</sup> /Hz	Unexaggerated PSD, g <sup>2</sup> /Hz
5	0.11535	0.06585	5	0.01411	0.00806	5	0.05260	0.03003
6	0.50757	0.28976	6	0.02377	0.01357	6	0.12644	0.07218
7	0.40522	0.23132	7	0.01533	0.00875	7	0.06746	0.03851
8	0.31592	0.18035	8	0.02062	0.01177	8	0.03049	0.01741
9	0.54499	0.31112	9	0.03557	0.02031	9	0.06063	0.03461
10	0.36856	0.21040	10	0.01686	0.00962	10	0.01788	0.01021
11	0.09542	0.05447	11	0.00780	0.00445	11	0.02773	0.01583
12	0.05800	0.03311	12	0.00540	0.00308	12	0.02522	0.01440
13	0.05597	0.03195	13	0.00521	0.00298	13	0.01224	0.00699
14	0.01157	0.00660	14	0.00361	0.00206	14	0.00653	0.00373
15	0.01502	0.00857	16	0.00899	0.00513	15	0.01025	0.00585
16	0.01484	0.00847	17	0.00771	0.00440	16	0.01210	0.00690
17	0.00782	0.00447	19	0.00295	0.00169	17	0.00889	0.00507
19	0.00568	0.00324	20	0.00233	0.00133	18	0.00469	0.00268
22	0.01502	0.00857	21	0.00197	0.00113	19	0.00374	0.00214
23	0.01350	0.00770	24	0.00553	0.00316	20	0.00357	0.00204
24	0.00957	0.00546	25	0.00540	0.00308	21	0.00463	0.00264
25	0.00464	0.00265	30	0.00097	0.00055	23	0.01533	0.00875
26	0.00417	0.00238	34	0.00278	0.00159	24	0.01533	0.00875
28	0.00663	0.00378	38	0.00142	0.00081	25	0.01012	0.00578
29	0.00655	0.00374	39	0.00169	0.00097	26	0.00615	0.00351
30	0.00935	0.00534	40	0.00143	0.00082	29	0.00594	0.00339
34	0.00655	0.00374	42	0.00204	0.00117	31	0.00966	0.00551
36	0.00293	0.00167	44	0.00156	0.00089	33	0.00789	0.00451
39	0.00289	0.00165	47	0.00238	0.00136	35	0.00594	0.00339
40	0.00239	0.00137	69	0.00540	0.00308	38	0.00848	0.00484
42	0.00269	0.00154	76	0.00580	0.00331	41	0.00509	0.00291
50	0.00132	0.00076	91	0.00799	0.00456	42	0.00630	0.00360
52	0.00168	0.00096	113	0.00878	0.00501	45	0.00630	0.00360
57	0.00091	0.00052	142	0.01314	0.00750	48	0.00480	0.00274
64	0.00093	0.00053	164	0.01268	0.00724	51	0.00497	0.00284
72	0.00279	0.00159	190	0.00497	0.00284	52	0.00677	0.00386
75	0.00303	0.00173	235	0.00169	0.00097	56	0.00497	0.00284
79	0.00158	0.00090	271	0.00127	0.00073	62	0.00753	0.00430
82	0.00286	0.00163	283	0.00078	0.00045	64	0.00528	0.00301
89	0.00362	0.00207	300	0.00066	0.00038	68	0.00808	0.00461
97	0.00413	0.00236	329	0.00114	0.00065	72	0.00669	0.00382
107	0.00358	0.00204	350	0.00250	0.00143	76	0.00889	0.00507
111	0.00234	0.00133	369	0.00107	0.00061	81	0.00250	0.00143
122	0.00349	0.00200	409	0.00152	0.00087	87	0.00145	0.00083
129	0.00184	0.00105	500	0.00070	0.00040	98	0.00325	0.00185
134	0.00310	0.00177				116	0.00421	0.00240
153	0.00193	0.00110	rms	1.378 g	1.041 g	136	0.00458	0.00261
160	0.00210	0.00120				148	0.00374	0.00214
167	0.00193	0.00110				153	0.00222	0.00127
177	0.00263	0.00150				162	0.00332	0.00190
196	0.00300	0.00171				205	0.00145	0.00083
217	0.00156	0.00089				221	0.00056	0.00032
234	0.00231	0.00132				232	0.00048	0.00027
252	0.00151	0.00086				242	0.00049	0.00028
267	0.00220	0.00126				287	0.00288	0.00165
293	0.00132	0.00076				324	0.00102	0.00058
304	0.00236	0.00135				348	0.00219	0.00125
321	0.00151	0.00086				382	0.00032	0.00018
357	0.00341	0.00195				411	0.00014	0.00008
371	0.00151	0.00086				451	0.00007	0.00004
415	0.00132	0.00076				500	0.00008	0.00005
444	0.00191	0.00109						
500	0.00103	0.00059				rms	1.212 g	0.916 g
rms	1.845 g	1.394 g						

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6.5 Additional authorized items. Additional authorized items for use with the AHD system include:

- a. Optical warning, distraction and suppression (OWDS) device
- b. High intensity spotlight
- c. Laser Range Finder, Class I
- d. Language translation device

6.6 Reliability operating time. In order to meet the 90% reliability requirement at 80% confidence, accumulated run time across the systems should meet or exceed the values in Table VI given the number of EFF encountered.

Table VI. Reliability operating time guidelines

Number of Essential Function Failures	Accumulated Run Time (hrs)
0	1320
1	2456
2	3509
3	4523
4	5512

6.7 Environmental verifications pretest. The manufacturer should conduct environmental verifications pre- tests as stated in paragraph 4.6.

6.8 Subject term (keyword) listing.

Sound  
Microphone  
Audio  
Voice transmission  
Warning tones  
Speaker  
Broadcast

6.9 Duty Cycles.

65% Duty Cycle Test File		90% Duty Cycle Test File	
Time (Sec)	Content	Time (Sec)	Content
5.3625	Tone	7.425	Tone
32.175	Voice	44.55	Voice
5.3625	Tone	7.425	Tone
23	Silent	6.6	Silent
Total Time: 65.9		Total Time: 66.0	

6.10 Alternate testing methods. The contractor may propose alternate acceptance methods based on ANSI S3.5, subject to government approval.

6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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Preparing activity:  
Army – AR  
(Project 5830-2014-001)

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>.