

INCH-POUND

MIL-DTL-55535A  
 28 February 2007  
 SUPERSEDING  
 MIL-H-55535(EL)  
 23 January 1967

## DETAIL SPECIFICATION

## HEADSET-MICROPHONE KIT MK-1039/G

Inactive for new design after February 28, 2007

This specification is approved for use by all  
 Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers Headset-Microphone Kit MK-1039/G. This Headset-Microphone Kit is designed to fit both the regular and large size Combat Vehicle Crewman's Helmet. The electrical characteristics of the kit are compatible with Tactical Radio Systems, such as the VRC-12. The impedance of the microphone circuit is 150 ohms, and the earphone elements are transformer matched and present a 500-ohm load to the earphone circuit.

1.2 Classification. Each MK-1039/G kit is composed of the following components:

a. Switch Housing Assembly	SA-1552/G (80063 / SM-D-700882)	1 each
b. Upper Cord set	CX-10453/G (80063 / SM-C-317800)	1 each
c. Microphone and Boom Assembly	M-138/G (81349 / MIL-PRF-26542/10)	1 each
d. Retractable Cord Assembly	CX-8650B/G (80063 / SM-D-436079)	1 each
e. Earphone Elements	H-269/G (80063 / SM-C-436361)	2 each
f. Cord set Earphone	CX-10454/G (80063 / SM-D-700914)	2 each
g. Ear Cushion Right Hand		1 each
h. Ear Cushion Left Hand		1 each

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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, 4, or 5 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.

Comments, suggestions, or questions on this document should be addressed to: Defense Supply Center, Columbus, Attn: VAI, P.O. Box 3990, Columbus, Ohio, 43218-3990 or emailed to [sound@dsccl.dla.mil](mailto:sound@dsccl.dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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## DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-C-3885 - Cable Assemblies and Cord Assemblies, Electrical for use in Electronic Communication and Associated Electrical Equipment.
- MIL-C-10392 - Cable, Special Purpose, Electrical (Miniature).
- MIL-F-14072 - Finishes for Ground Based Electronic Equipment.

## DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-252 - Wired Equipment, Classification of Visual and Mechanical Defects.
- MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests
- MIL-STD-13231 - Marking of Electronic Items.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> 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.

## DRAWINGS

## U.S. ARMY

- SC-D-10598 - Microphone Test Equipment, ARL-174-A, Calibration & Test Set-Ups

## NAVY

- SK-N-864 - Simulated Gun Blast Producing Equipment

## ELECTRONICS COMMAND (CAGE 80063)

- SM-D-436079 - Cord Assembly CX-8650B/GR
- SM-C-436361 - Earphone Assembly
- SC-D-621083 - Microphone & Earphone Test Chamber

(Copies of the above drawing required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated, when requesting copies.)

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.

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AMERICAN NATIONAL STANDARDS INSTITUTE

[ANSI S1.15/Part 2](#) - Measurement Microphones – Part 2: Primary Method for Pressure Calibration of Laboratory Standard Microphones by the Reciprocity Technique

(Copies of these documents are available from <http://www.ansi.org> or the American National Standards Institute (ANSI), 25 West 43<sup>rd</sup> Street, 4<sup>th</sup> floor, New York, NY 10036).

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCLS)

[NCSL-Z540.1](#) - Calibration Laboratories and Measuring and Test Equipment - General Requirements-Replaces Mil-Std-45662

(Copies of these documents are available from <http://www.ncsli.org> or to National Conference of Standards Laboratories (NCSL), 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404.)

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 has been obtained.

3. REQUIREMENTS

3.1 Description. Headset-Microphone Kit MK-1039/G consists of the component parts listed in 1.2. The dynamic earphones H-269/G are waterproof and blast proof. The dynamic, noise canceling microphone and boom assembly M-138/G is waterproof and blast proof. Switching facilities are provided, which permit the user to communicate over the vehicle intercommunication system or over the vehicle tactical radio system. Headset-Microphone Kit MK-1039/G will fit both the regular and large size Combat Vehicle Crewman's Helmet.

3.2 First article (see 4.3). When specified (see 6.2), a sample shall be subjected to first article inspection.

3.3 Parts, materials and processes; general.

3.3.1 Magnetized materials. The materials used in the magnetic circuit shall be of such a character and shall be so processed and assembled that the microphone and earphone elements will not suffer objectionable degradation in performance, due to loss in magnetization over long periods of storage or service.

3.3.2 Diaphragm and air gap. The stability of diaphragm material and the concentricity of the air gap shall not be affected by extended aging and exposure to environmental conditions. There shall be no foreign material present in the air gap.

3.3.3 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of loudspeaker components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.8).

3.3.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable 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.

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3.4 Finish. Equipment shall be finished, as specified in MIL-F-14072, type I.

3.5 Marking. Marking shall conform to MIL-STD-13231.

3.5.1 Serial numbers. Serial numbers are not required.

3.6 Microphone.

3.6.1 Microphone response. The frequency response of the microphone shall be essentially flat from 300 to 3,500 Hz. The minimum power output of the microphone shall be – 56 dBm (the term “dBm” is used, when a power of one milliwatt is the reference level) at 1,000 Hz, when measured in accordance with 4.7.1. In addition, the response shall fall within the envelope on figure 1. During this test, the microphone shall be terminated with a non-inductive load of 150 ohms.

3.6.2 Distortion. Total harmonic distortion shall not exceed 5 percent at a sound pressure level of 115 dB referenced at 20  $\mu$ Pa (micropascal) over the frequency range of 300 to 3,500 Hz (see 4.7.2).

3.6.3 Signal to noise ratio. The signal-to-noise ratio of the microphone shall be at least 15 dB (signal over noise), when measured in accordance with 4.7.3.

3.6.4 Dielectric strength, and insulation resistance (see 4.7.4). There shall be no evidence of insulation breakdown. There shall be no decrease in insulation resistance below 1 megohm following this test.

3.7 Earphone. The earphone element shall be constructed in accordance with ECOM Drawing SM-C-436361.

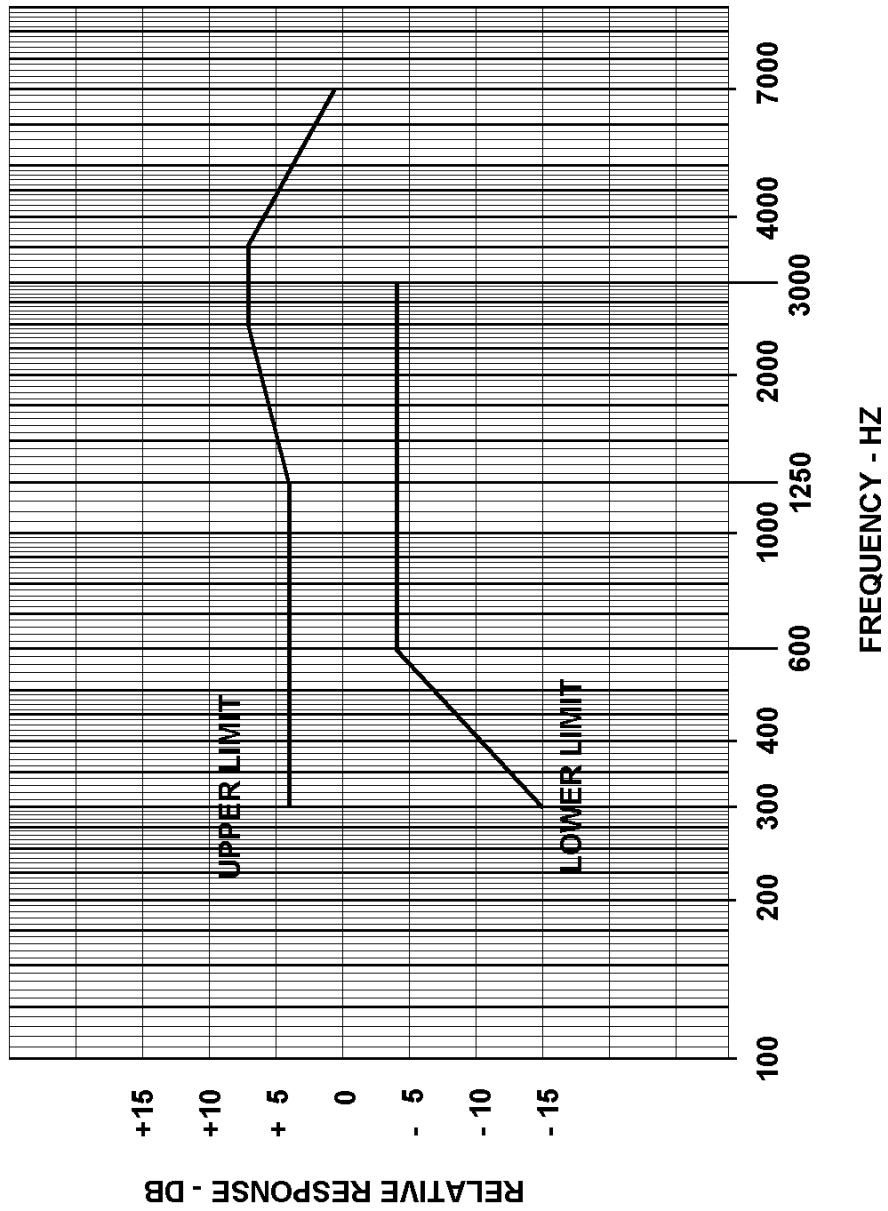
3.7.1 Earphone response (see 4.8.1). The output of the earphone shall be not less than 103 dB above a reference level of 20  $\mu$ Pa, when 1 milliwatt rms power at 1,000 Hz is applied to the earphone terminals. The response of the earphone at any frequency shall not deviate from the 1,000 Hz response by more than the values shown in table I (see figure 2).

TABLE I. Earphone response.

Frequency (Hz)	Deviation from 1,000 Hz (dB)	
	Min.	Max.
300 - 1,000	-3.5	+1.5
1,000 - 3,500	-5	+5

3.7.2 Distortion. The acoustic output of the earphone shall have no more than 5 percent total harmonic distortion over the audio frequency range of 300 to 3,500 Hz, when measured as specified in 4.8.3.

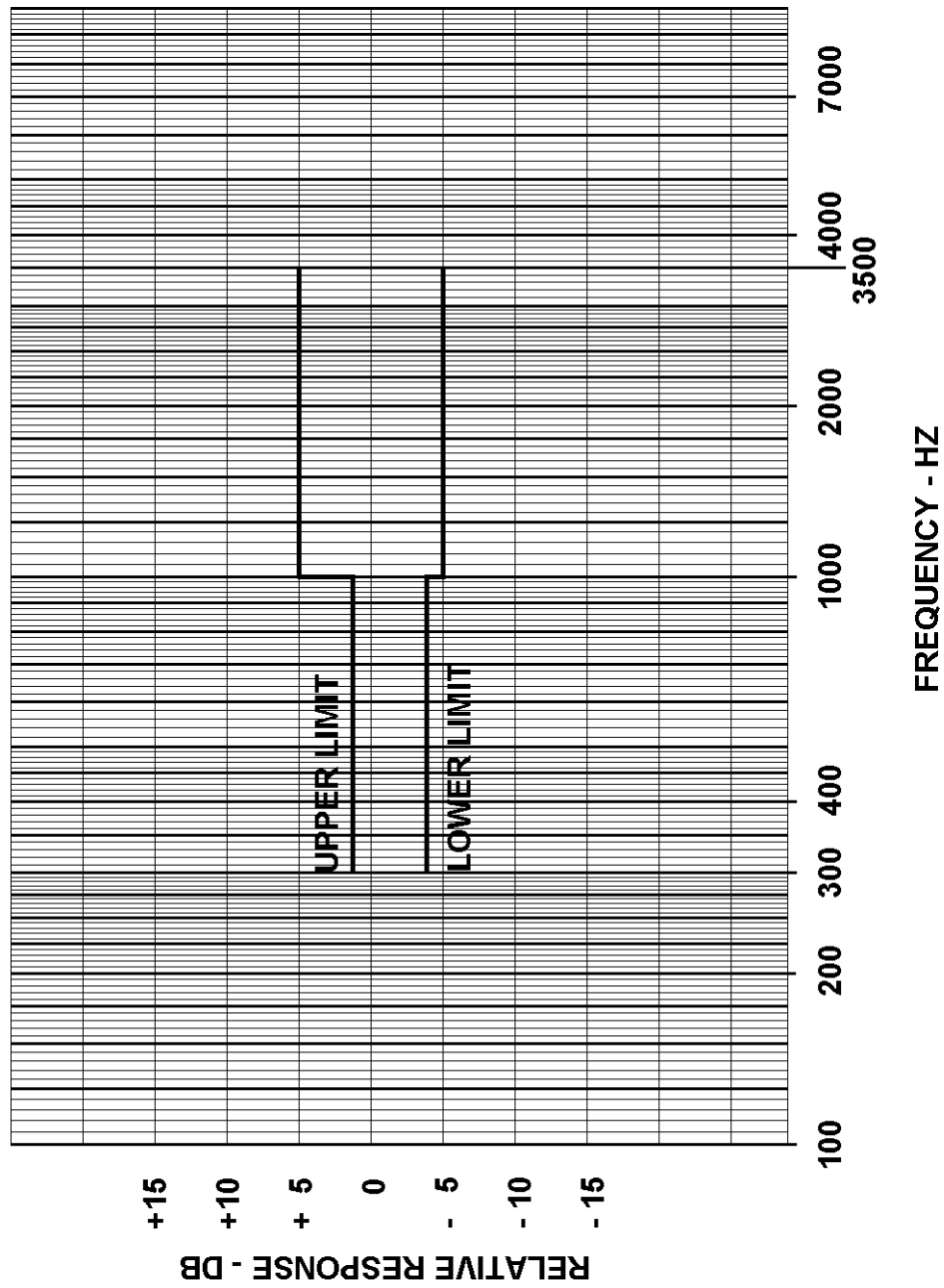
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Frequency points	300 Hz	600 Hz	2,500 Hz	3,500 Hz	7,000 Hz
Upper limits (dB)	+4.0	+4.0	+7.0	+7.0	+0.5
Lower limits (dB)	-15.0	-4.0	-4.0	--	--

FIGURE 1. Microphone response limit curves (see 3.6.1).

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NOTES:

1. Minimum sensitivity at 1 KHz: 103 dB minimum.
2. Impedance: 15 Ohms.
3. Sensitivity Reference: 0 dB = 20  $\mu$ Pa (micro-Pascal).

FIGURE 2. Earphone response limit curves.

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3.7.3 Overload. The earphone shall show no more than 3 dB change from its original response curve, after being subjected to the test specified in [4.8.4](#).

3.7.4 Dielectric strength, and insulation resistance. There shall be no evidence of insulation breakdown. There shall be no decrease in insulation resistance below 1 megohm following the test (see [4.8.5](#)).

3.7.5 Impedance. The impedance of the earphone at 1,000 Hz shall be 15 ohms  $\pm$  20 percent, as determined by the test (see [4.8.2](#)).

3.8 Service conditions. The equipment shall meet the following service conditions. Where a test is referenced, meeting the test shall be considered as compliance with requirement.

3.8.1 Temperature (see [4.13.1](#)).

- a. Operating: Ambient temperature in the range of + 150° to – 40° F (Fahrenheit). (The + 150° F temperature includes affect of sun-load). Exposure at the high temperature extreme not to exceed 4 hours, and at the low temperature extreme not to exceed 72 hours, at any one time.
- b. Non-operating: Exposure in the range of + 160° to – 80° F; exposure at the high temperature extreme not to exceed 4 hours and at the low temperature extreme not to exceed 24 hours.

3.8.2 Moisture resistance. Equipment shall meet specified performance after subjection to the test in [4.13.2](#). The equipment shall meet the microphone and earphone response requirements of [3.6.1](#) and [3.7.1](#) with degradation not to exceed 3 dB. There shall be no evidence of cracking, warping, or other mechanical deterioration.

3.8.3 Altitude (see [4.13.3](#)). The response characteristics of the earphone and microphone shall be measured, and shall not exhibit degradation in performance in excess of 5 dB from the requirements of [3.6.1](#) and [3.7.1](#) after being subjected to the following tests.

- a. Operating: Up to 15,000 feet (16.7 inches of mercury) above sea level.
- b. Non-operating: Up to 50,000 feet (3.4 inches of mercury) above sea level.

3.8.4 Immersion (see [4.13.4](#)). After completion of an immersion in water at a depth of three feet for 2 hours, any evidence of water in the switch cavity shall be cause for rejection. The microphone and earphone shall then meet the requirements of [3.6.1](#) and [3.7.1](#), respectively.

3.8.5 Salt atmosphere (see [4.13.5](#)). Upon completion of the test, there shall be no evidence of harmful corrosive action or damage due to the salt spray. The earphone and microphone shall not suffer any degradation in response in excess of 3 dB from their initial performance values of [3.6.1](#) and [3.7.1](#).

3.8.6 Blast (see [4.13.6](#)). Following the blast test, the earphone and microphone units shall not suffer any degradation in their response of more than 3 dB from the initial performance values of [3.6.1](#) and [3.7.1](#).

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3.8.7 Vibration (see 4.13.7). The amplitude of vibration of any part, sub-assembly, or structural member of the equipment shall not exceed twice the amplitude of the vibration applied to the equipment at any frequency between 10 and 55 Hz. Tests of the earphone element and the microphone element shall be made to determine compliance with 3.6.1 and 3.7.1, respectively, prior to, and after the cycling. Upon completion of the vibration test, the equipment shall exhibit no evidence of loosening of parts or other mechanical damage and shall meet full specification requirements.

3.8.8 Bounce. The equipment shall meet specified performance, with no physical damage allowed, after being subjected to the test of 4.13.8. At the conclusion of the test, the equipment shall meet the requirements of 3.6.1 and 3.7.1, with degradation not to exceed 3 dB.

3.8.9 Shock drop. The equipment shall be operable after the test of 4.13.9. Any physical damage shall be minor only.

3.9 Switch life. The switch shall continue to operate properly following 100,000 complete cycles of operation, when tested as specified in 4.12.

3.10 Cord assemblies. Cord assemblies shall be as specified in MIL-C-3885. The earphone cords, CX-10454/G shall be 2 (two) conductor stranded WD-27A/U and shall meet the requirements of MIL-C-10392. The upper cord set, CX-10453/G shall be five-conductor tinsel with one microphone lead shielded. Cord set CX-8650B/G shall be constructed as specified in drawing SM-D-436079.

3.10.1 Cord dielectric strength and insulation resistance. The end item equipment specified shall be tested (see 4.14). During the test there shall be no evidence of insulation breakdown and at the conclusion of the test, the insulation resistance shall not have decreased to a value below 1 megohm.

3.11 Operational requirement. Units shall be tested, as indicated in 4.9. The unit under test shall perform in accordance with all requirements of this specification.

3.12 Interchangeability. Like units, assemblies, subassemblies, and replaceable parts shall be physically and functionally interchangeable without modification of such items or of the equipment (see 4.11). Individual items shall not be hand-picked for fit or performance. Reliance shall not be placed on any unspecified dimension, rating, characteristic, etc. Non-interchangeability of these parts constitutes failure.

3.13 Preconditioning. The equipment shall be capable of meeting the requirements herein, without subsequent processing, after subjection to the bounce preconditioning of 4.6 (also see 4.5).

3.14 Workmanship (see 4.10). The equipments shall be manufactured and assembled in accordance with the applicable portions of 3.3.1 and 3.3.2:

#### 4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Inspection covered by subsidiary documents (see 4.4).
- c. Conformance inspection of equipment (see 4.5).



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4.2 Inspection conditions. Unless otherwise specified herein, the examinations and the tests specified herein shall be performed under the following standard test conditions:

- a. Temperatures between + 59° and + 95° F.
- b. Normal ground altitude.
- c. Prevailing room ambient humidity.
- d. No vibration.

4.3 First article inspection. This inspection shall be performed by the contractor and witnessed by a Government inspector. It shall consist of groups A, B, and C inspections (see [table II](#), [table III](#), and [table IV](#) respectively) on 20 samples. The first article samples will be inspected in this order: group A, group B and divided up for group C inspection as follows: 2 units (MK-1039/G) for each of the ten (10) group C tests listed in [table IV](#). After the completion of group C testing, all acceptable units shall be subjected to and pass all group A inspections.

4.4 Inspection covered by subsidiary documents. The finish (see [3.4](#)) and marking (see [3.5](#)) shall be inspected under the applicable documents, as part of the inspection of equipment before preparation for delivery:

4.5 Conformance inspection of equipment. The contractor shall perform the inspections specified in [4.4](#), [4.5.1](#), [4.5.2](#), [4.5.3](#) and [4.5.4](#). This does not relieve the contractor of his responsibility for performing any additional inspection, which is necessary to control the quality of the product and to assure compliance with all specification requirements. The Government inspector will review and evaluate the contractor's inspection records. Each unit, which will be subjected to group A inspection, except first article samples, shall be preconditioned after final assembly (see [3.13](#)).

4.5.1 Group A inspection. This inspection, including sampling, shall be specified in [table II](#). Group A inspection shall consist of 100 percent of each lot. If one or more defects are found, the defective microphone unit(s) shall be removed. All failures occurring during testing shall be documented and investigated to determine root cause. Acceptance of the product shall be discontinued until corrective action, which is acceptable to the procuring activity, has been taken. After the corrective action has been taken, the group A inspections shall be repeated (all inspections, or the inspection which originally failed, at the option of the procuring activity). Approval shall be withheld until the inspection has shown that the corrective action was successful. If one or more defects are found during the second inspection, the lot shall be rejected and shall not be supplied to this specification.

4.5.1.1 Order of inspection with group A. Group A inspection shall be performed in any order, which is satisfactory to the Government.

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TABLE II. Group A inspection.

Inspection	Requirement paragraph	Inspection paragraph
<u>Visual and Mechanical Microphone</u>	3.14	4.10
Response	3.6.1	4.7.1
Distortion	3.6.2	4.7.2
Signal-to-noise ratio	3.6.3	4.7.3
<u>Earphone</u>		
Response	3.7.1	4.8.1
Distortion	3.7.2	4.8.3
<u>Headset-Microphone Kit</u>		
Operational	3.11	4.9

4.5.2 Group B inspection. Group B inspection shall consist of the inspections specified in group B in [table IV](#) and shall be made on samples, which have been subjected to and have passed group A inspection.

4.5.2.1 Order of inspection within group B. Group B inspection shall be performed in any order, which is satisfactory to the Government.

4.5.2.2 Sampling plan. A sample of parts shall be randomly selected in [table III](#). If one or more defects are found, the lot shall be rescreened and defects removed. All failures occurring during testing shall be documented and investigated to determine root cause. Acceptance of the product shall be discontinued until corrective action, which is acceptable to the procuring activity, has been taken. After corrective action has been taken, a new sample of parts shall be randomly selected in [table III](#) and the group B inspection repeated. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

TABLE III. Group B sampling plan.

Lot size	Sample size group B
2 to 25	2
26 to 50	3
51 to 90	4
91 to 150	5
151 to 280	6
281 to 500	7
501 to 1,200	8
1,201 to 3,200	9
Over 3,200	5 per thousand

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TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Inspection paragraph
<u>Microphone</u>		
Dielectric strength	3.6.4	4.7.4
<u>Earphone</u>		
Overload	3.7.3	4.8.4
Impedance	3.7.5	4.8.2
Dielectric strength	3.7.4	4.8.5
<u>Switch with cord</u>		
Dielectric strength	3.10.1	4.14
<u>Headset-Microphone Kit</u>		
Interchangeability	3.12	4.11

4.5.3 Group C inspection. This inspection shall consist of the inspection specified in [table V](#) and shall be performed on sample units that have been subjected to and met group A and B inspections.

4.5.3.1 Sampling for inspection of equipment. Sampling comprises two phases.

4.5.3.1.1 Initial sampling. Ten (10) samples of the complete headset-microphone kit and six (6) samples of the switch assembly shall be selected at random from the first 1,000 units produced on the order or contract. These samples comprise the first conformance inspection lot. The ten samples of the headset-microphone kit shall be subdivided into 5 (five) pairs and designated as C-1 through C-5. These pairs shall be subjected to group C inspection, as shown in [table V](#). The six samples of the switch assembly shall be designated as C-6 and subjected to the switch life test, as specified in [table V](#).

4.5.3.1.2 Production sampling. Subsequent to the initial sampling, 6 (six) samples of the complete headset-microphone kit and 2 (two) samples of the switch assembly shall be selected at random from each subsequent 1,000 units produced on the order or contract. These samples comprise production conformance group C inspection lots. The 6 (six) samples of the headset-microphone kit shall be subdivided into 3 (three) pairs (as before) and designated as C-3 through C-5. These pairs shall be subjected to group C inspection, as shown in [table V](#). The 2 (two) samples of the switch assembly shall be designated as C-6 (as before) and subjected to the switch life test, as specified in [table V](#).

4.5.3.1.3 Orders for less than 1,000 units. Orders for less than 1,000 units shall be subject to sampling and group C testing in the same manner as is required on orders for more than 1,000 units. The number of units constituting the basis of such inspection, however, is reduced from 1,000 to 100. An equal sampling and group C inspection is also required on the last 100 units produced on the order.

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4.5.3.2 Noncompliance. If a sample unit fails group C inspection evaluation, the contractor shall immediately investigate the cause of failure and report to the Government inspector the results thereof and details of the corrective action taken on the process and all units of product, which were manufactured with the same conditions, materials, processes, etc. If the Government inspector does not consider that the corrective action will enable the product to meet specified requirements, or if the contractor cannot determine the cause of failure, the matter shall be referred to the contracting officer.

TABLE V. Group C inspection.

Pair numbers	Inspection	Requirement paragraph	Inspection paragraph
	<u>Headset-Microphone Kit</u>		
C-1	Salt atmosphere	3.8.5	4.13.5
C-2	Blast	3.8.6	4.13.6
C-3	Temperature	3.8.1	4.13.1
	Immersion	3.8.4	4.13.4
C-4	Moisture resistance	3.8.2	4.13.2
	Elevation	3.8.3	4.13.3
C-5	Vibration	3.8.7	4.13.7
	Bounce	3.8.8	4.13.8
	Shock drop	3.8.9	4.13.9
	<u>Switch</u>		
C-6	Life	3.9	4.12

4.5.4 Reinspection of conforming group B and C sample units. Unless otherwise specified, sample units, which have been subjected to and passed group B or C inspection or both, may be accepted on contract, provided that they are re-subjected to and pass group A inspection after repair of all damages. Switches that have been subjected to the life test, as herein specified, shall not be acceptable.

4.6 Bounce preconditioning. The unit shall be placed in its normal operating position on the table of the Package Tester, Type 1000-SC, as made by L.A.B. Corporation, Skaneateles, New York, or equal. The package tester, shafts in phase, shall have a speed such that it is just possible to insert a 0.031 (1/32) inch-thick strip of material under one corner or edge of the unit to a distance of 3 inches as the unit bounces. The unit shall be subjected to this preconditioning for 1 minute. After bounce preconditioning, the unit shall not be repaired, aligned, cleaned, or otherwise changed prior to subjection to quality conformance inspection.

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#### 4.7 Microphone tests.

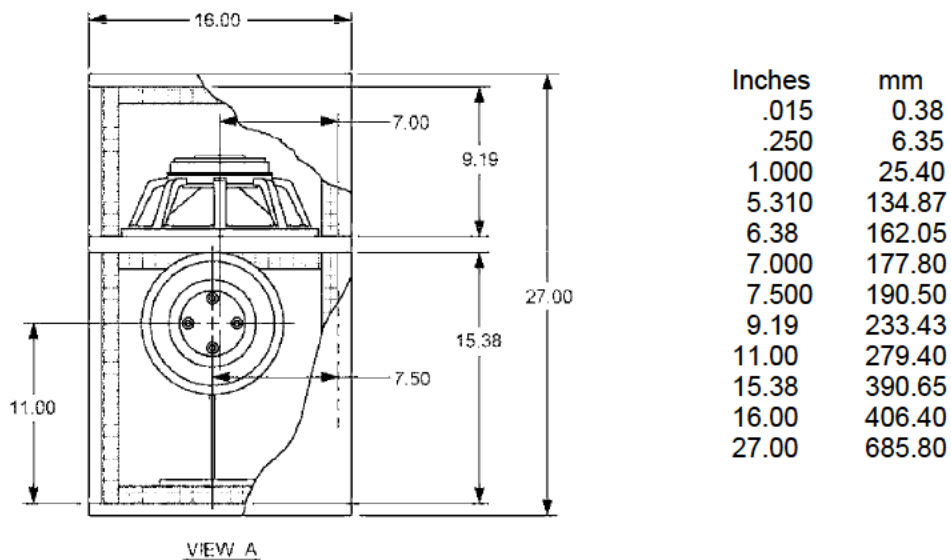
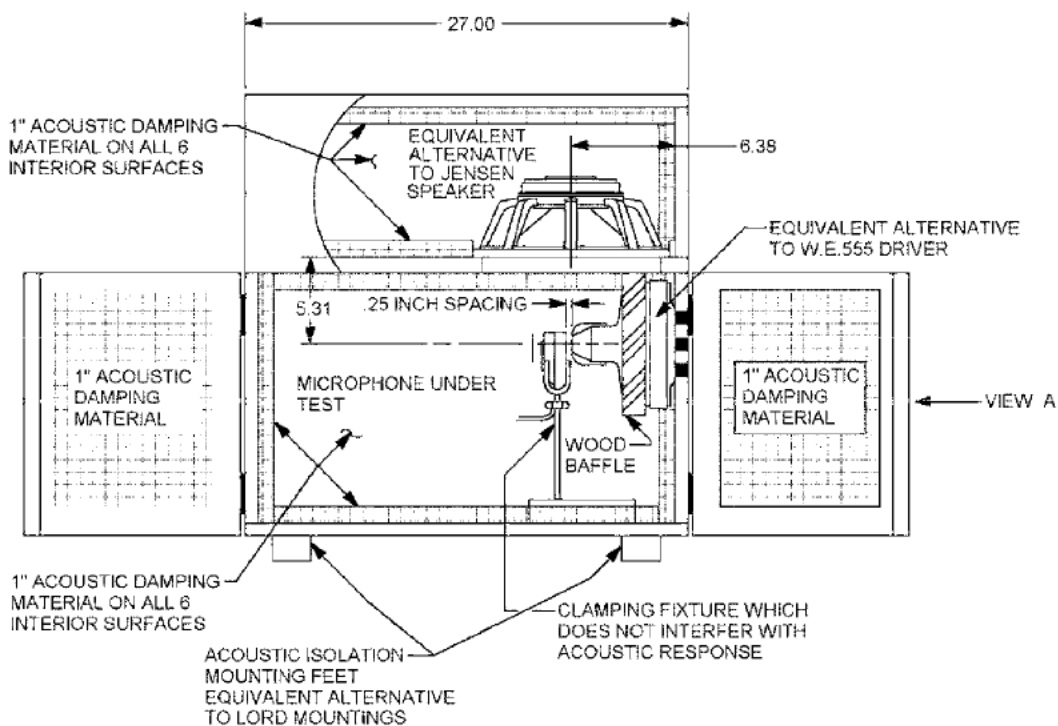
4.7.1 Response test. The response of the microphone shall be calibrated and tested using the setup in accordance with CECOM Drawing SC-D-10598 and measured by means of a suitable ac-electronic voltmeter, having an input impedance of at least 0.5 ( $\frac{1}{2}$ ) megohm. The response of this microphone shall be determined using a constant sound pressure of 2.8 Pa (Pascals), at the point where the microphone is to be placed. The driver unit used to obtain the desired sound pressure input, (Western Electric Co., Type No. 555W, or equal) shall have been previously calibrated by means of a condenser microphone such as Western Electric Co. 640AA, or equal, (calibrated by "reciprocity method" in accordance with ANSI S1.15/Part 2). The sample dynamic microphone shall be positioned with its face 0.25 ( $\frac{1}{4}$ ) inch directly in front of the driver unit with the diaphragm of the microphone parallel to the driver unit. The voltage-frequency response of the microphone shall be measured across a non-inductive load resistance of 150 ohms. The response of the microphone shall be tested across the frequency range of 300 to 3,500 Hz at approximately the following increments: 100 Hz increments from 300 to 1,000 Hz and 250 Hz increments from 1,000 to 3,500 Hz. The microphone shall meet the requirements of 3.6.1.

4.7.2 Distortion (see 3.6.2). Harmonic distortion shall be determined using the same equipment and circuitry as used in 4.7.1 except that the constant sound pressure shall be 115 dB referenced at 20  $\mu$ Pa (micro-Pascals) and the output of the microphone terminated in 150 ohms shall be connected to a Hewlett-Packard Distortion Analyzer Model 330C, or equal, for distortion measurements. The distortion shall not be greater than 5 percent. Measurements will be made from 300 Hz to 1,000 Hz inclusive, at 100 Hz increments and from 1,000 to 3,500 Hz inclusive at 500 Hz increments.

#### 4.7.3 Signal-to-noise ratio.

4.7.3.1 Noise spectrum. By means of apparatus specified on figure 3, and the test circuit on figure 4, provision shall be made for the production of the noise spectrum, in table VI, at an rms sound pressure of 115 dB above a reference level of 20  $\mu$ Pa, as measured at the microphone diaphragm. The "Noise" source shall incorporate a loudspeaker capable of producing a sound pressure of 115 dB above a reference level of 20  $\mu$ Pa at the rear, as well as the front of the microphone. The loudspeaker shall be located as far away from the microphone as practicable. The calibrating condenser microphone shall be mounted in the test rig, in the box, 0.25 ( $\frac{1}{4}$ ) inch from the mouth of the signal speaker, which shall be short-circuited during adjustments of the noise spectrum.

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NOTES:

1. Dimensions are in inches. Unless otherwise specified, tolerances shall be  $\pm .015$  inch.
2. Metric equivalents are given for information only.
3. All acoustic damping material will be equivalent or better than Akoustikos felt and Acousti-celetox.
4. See drawing SC-D- 621083 (CAGE 80063), for more details.

FIGURE 3. Signal to noise ratio test box for differential microphones.

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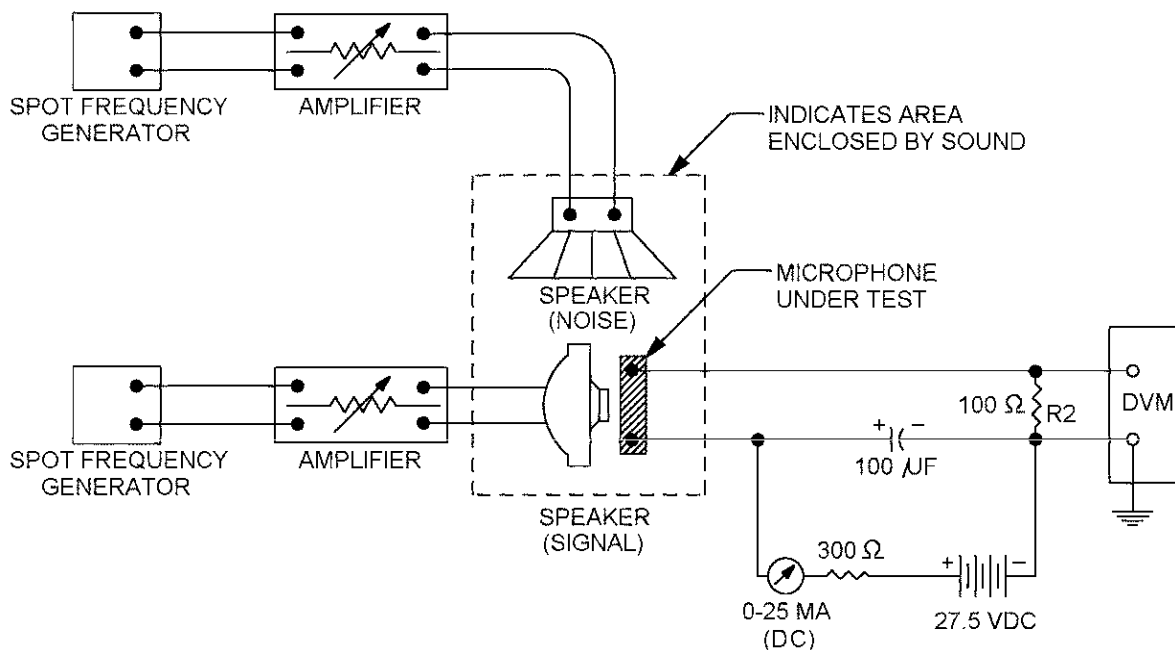


FIGURE 4. Microphone signal to noise ratio test circuit.

TABLE VI. Noise spectrum.

Frequency in Hz	Sound pressure in dB relative to sound pressure at 130 Hz
40	0
70	0
130	0
300	-5
600	-9
1,000	-13
2,000	-17
3,000	-19
4,000	-21

4.7.3.2 Signal spectrum. By means of the apparatus as set up previously, provision shall also be made for the production of the following signal spectrum, in table VII at an rms sound pressure of 115 dB above a reference level of 20  $\mu$ Pa. The "signal" source shall be the driver unit. The calibrating condenser microphone shall be positioned 0.25 (¼) inch directly in front of the driver unit.

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TABLE VII. Signal spectrum.

Frequency in Hz	130	300	600	1,000	2,000	3,000	4,000
Sound pressure in dB relative to sound pressure at 130 Hz	0	+ 7	+ 8	+ 5	- 3	- 7	-9

4.7.3.3 Measurement of the signal-to-noise ratio. The microphone shall be mounted in its test rig with its front grid 0.25 (¼)-inch from the mouth of the "signal" speaker. The microphone shall be connected to the test circuit shown on [figure 4](#). The noise spectrum shall be applied for 3 seconds, and the output of the microphone shall be measured. The noise spectrum shall be removed, and the signal spectrum shall be applied for 3 seconds. The output of the microphone shall be measured. The dB difference between the "signal" value and the "noise" value is the signal-to-noise ratio, and shall be in accordance with [3.6.3](#).

4.7.4 Dielectric strength and insulation resistance. The microphone shall be subjected to a voltage of 100 volts dc for 10 seconds, which is to be applied between the terminals of the microphone and the insulated outer metal parts of the microphone. The microphone element shall be tested for compliance with [3.6.4](#), before final assembly.

#### 4.8 Earphone tests.

4.8.1 Earphone response test. Available power frequency response measurements shall be made starting at 300 Hz and extending through 3,500 Hz, in sufficient detail to establish definitely the shape of the curve. Response measurements shall be made in accordance with NCSL-Z540.1. The contractor shall supply a 6 cc coupler. The outside dimensions of the coupler shall be such as to provide the proper seating and sealing of the earphone.

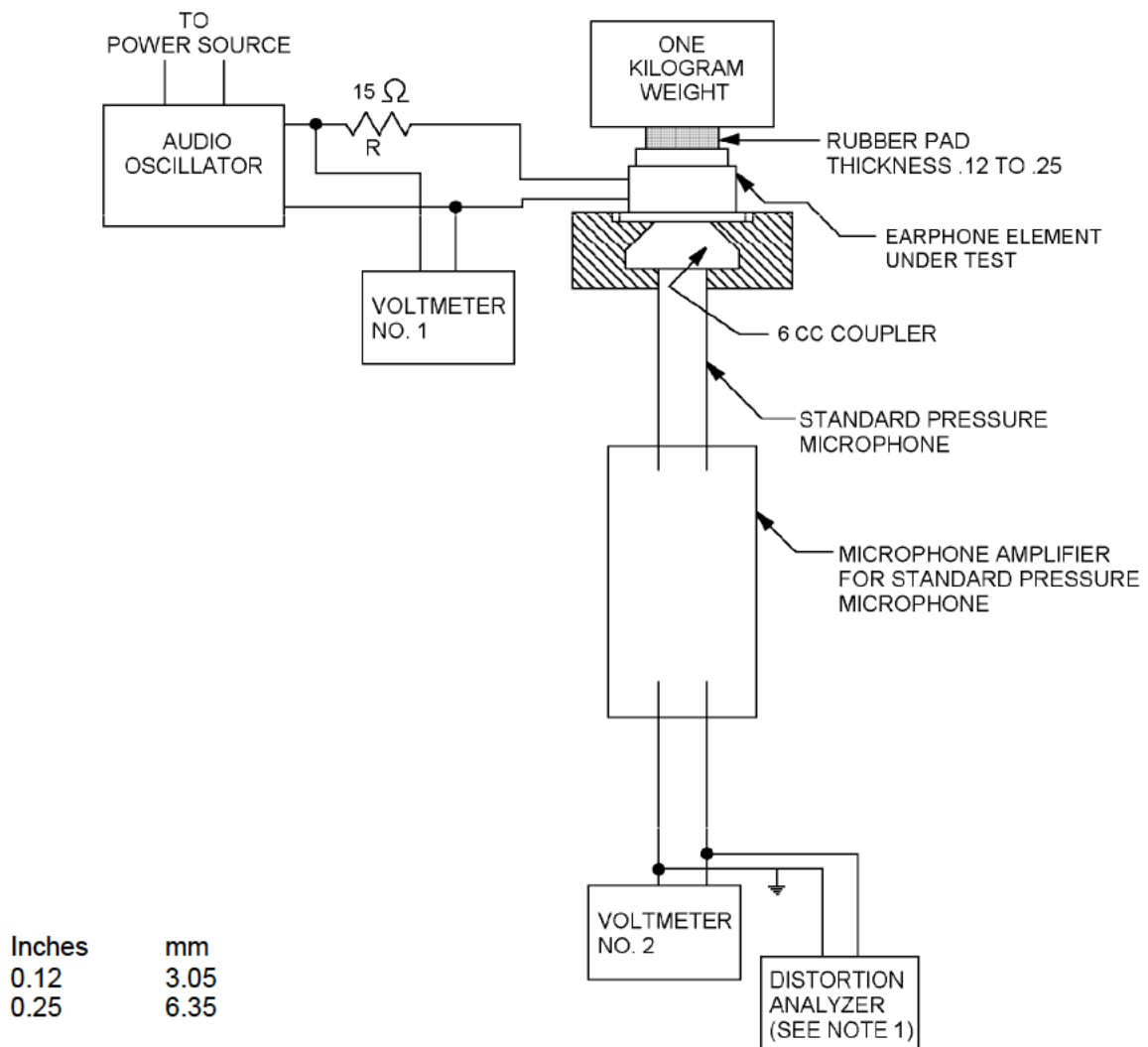
4.8.1.1 Testing procedure. The earphone under test shall be connected to the test circuit and shall be mounted on the 6 cc coupler as shown on [figure 5](#). The output from the oscillator at each test frequency shall be adjusted to 0.245 volts rms as measured by Voltmeter #1. The output from the calibrated microphone and pre-amplifier unit shall be measured as indicated by the reading of Voltmeter #2. This reading shall be converted to the equivalent dB value above 20 $\mu$  Pa using the most recent available calibration curve for the test microphone in use. The operations set forth above shall be performed from 300 Hz to 1,000 Hz, inclusive, at 100 Hz increments and from 1,000 Hz to 3,500 Hz, inclusive, at 250 Hz increments. The response of the earphone shall meet the requirements specified in [3.7.1](#).

4.8.1.2 Test equipment. The test equipment used for the response test shall meet the following requirements:

- a. Calibrating microphone. A Western Electric Co. Q40AA condenser microphone, or equal, shall be used for measuring sound pressure. It should be calibrated by the reciprocity method in accordance with ANSI S1.15/Part 2.
- b. Audio oscillator. The audio oscillator shall have a frequency range of at least 100 to 10,000 Hz, shall have a high degree of stability in both output voltage and frequency, and shall have a waveform distortion of less than 2 percent.
- c. Vacuum-tube voltmeter. The voltmeters used must have flat frequency response ( $\pm 1$  dB) from at least 100 to 10,000 Hz and must be capable of measuring voltage from 0.0005 volt rms to 10 volts or more.
- d. Microphone pre-amplifier. The microphone pre-amplifier shall have a flat response ( $\pm 1$  dB) over a frequency range of at least 100 to 10,000 Hz, shall have a high degree of stability, and shall have a distortion of less than 2 percent.



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## NOTES:

1. Distortion analyzer required for distortion test only.
2. Dimensions are in inches. Unless otherwise specified, tolerances shall be  $\pm .015$  inch.
3. Metric equivalents are given for information only.

FIGURE 5. Earphone frequency response test circuit.

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4.8.2 Impedance. The impedance of the earphone shall be measured with 0.122 volt at 1,000 Hz applied to the earphone terminals. The impedance shall be determined either by measuring the voltage across and the current through the earphone or with an impedance bridge. The impedance of the earphone, when mounted on the coupler, shall meet the requirements of 3.7.5.

4.8.3 Distortion test. The earphone shall be mounted on the 6 cc coupler, and shall be connected to the test circuit specified in 4.8.1.1. The output of the oscillator shall be adjusted to 2.12 volts rms at 300 Hz across the series combination of the 15 ohm resistor and the earphone. The rms harmonic distortion shall be measured with a Hewlett-Packard Model 330-C Total Noise Distortion Meter, or equal, connected across the output of the microphone referenced in 4.8.1. The distortion measurement shall be repeated at 400 Hz and at sufficient points between 400 and 3,500 Hz to determine the frequency where maximum distortion exists. Total harmonic distortion shall meet the maximum requirements of 3.7.2.

4.8.4 Overload. After operation of the earphone for 8 hours with 500 milliwatts input power (2.74 volts) at 1,000 Hz, the response shall be tested as specified in 4.8.1, to establish compliance with the requirements of 3.7.3.

4.8.5 Dielectric strength and insulation resistance test. The earphone shall be subjected to a voltage of 100 volts dc for 10 seconds applied between the terminals of the earphone and the insulated outer metal parts of the earphone. The earphone shall be tested for compliance with 3.7.4.

4.9 Operational test (see 3.11). Prior to packaging, completely assembled units shall be tested by a talk test to insure correct wiring and satisfactory operation.

4.10 Visual and mechanical inspection. The equipment shall be examined for the defects specified in MIL-STD-252.

4.11 Inspection for dimensional interchangeability (see 3.12). Each replaceable part listed below in the selected Transducer Equipments shall be interchanged with the corresponding part in the approved first article sample in sequential order. At the completion of this inspection, the interchanged parts shall be reassembled in their original transducer equipments.

- a. Switch housing.
- b. Microphone boom.
- c. Earphone elements.

4.12 Switch life. A series circuit shall be set up including a 24 volt dc supply, a resistive load, and the switch. During the test, one-half ampere shall flow in the control circuit, and 60 milliamperes shall flow in the microphone circuit of the switch. The switch shall be tested to determine compliance with 3.9, following 100,000 complete cycles. One cycle of switch operation test shall consist of the following, in sequence:

- a. Switch in mid-position.
- b. Switch in forward position.
- c. Switch in mid-position.
- d. Switch in back position.
- e. Switch in mid-position.

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4.13 Service conditions tests.

4.13.1 Temperature test (see 3.8.1). The equipment shall be subjected to the temperature shock, method 503 of MIL-STD-810. The test shall begin at + 77° F. The test in 4.9 shall be performed at + 150° F and – 40° F. Following these tests and after thermal equilibrium is attained at + 77° F, the equipment shall meet the requirements of 3.6.1 and 3.7.1, with degradation not to exceed 3 dB.

4.13.2 Moisture resistance (see 3.8.2).4.13.2.1 Test conditions.

- a. Do not remove equipment from the humidity chamber for measurements.
- b. Start measurements not more than 5 minutes after power is applied to the equipment. Complete measurements as rapidly as possible. Do not leave power on after measurements have been completed.

4.13.2.2 Test procedure. The equipment shall be tested as follows:

- a. Dry at + 130° ± 5° F for 24 hours.
- b. Condition at + 77° ± 5° F and 40 to 50 percent relative humidity for 24 hours.
- c. Perform the test of 4.9.
- d. Subject to continuous cycling for five 48-hour cycles. Temperature, relative humidity, and period of time for each portion of the cycle shall conform to method 507 of MIL-STD-810. Perform the test of 4.9 at the times specified on the standard.
- e. After cycling has been completed, condition the equipment for 24 hours at + 77° ± 5° F at 40 to 60 percent relative humidity.

4.13.3 Altitude test (see 3.8.3).

4.13.3.1 Operating. The microphone and earphone units shall be placed in an altitude chamber. The response of the microphone and earphone units at sea (ground) level (30 inches of mercury) shall be obtained at 300, 600, 1,000, 2,000, and 3,500 Hz. Pressure inside the chamber shall then be reduced to that corresponding to an altitude of 15,000 feet (16.7 inches of mercury). The response of the microphone and earphone units shall be taken again at the same frequencies as mentioned above. The degradation in response of either unit shall be not more than 5 dB from the requirements of 3.6.1 and 3.7.1.

4.13.3.2 Non-operating. The microphone and earphone shall be subjected to 5 varying pressure cycles. Each pressure cycle shall consist of 30 minutes at 50,000 feet (3.4 inches of mercury) above sea level. The pressure transition shall be approximately 5,000 feet per minute. The response characteristics of the earphone and microphone shall be measured, and shall not exhibit degradation in performance in excess of 5 dB from the requirements of 3.6.1 and 3.7.1 after being subject to five pressure cycles.

4.13.4 Immersion (see 3.8.4). The equipment shall be immersed to a depth of 3 feet of fresh water at room temperature for 2 hours. After completion of the 2 hour period of immersion, evidence of water in the switch cavity shall be cause for rejection. Shake any excess water from the earphone and microphone. The microphone and earphone shall then meet the requirements of 3.6.1 and 3.7.1, respectively.

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4.13.5 Salt atmosphere (see 3.8.5). The completely assembled equipment shall be exposed to a 20 percent salt spray solution, in accordance with method 101 of MIL-STD-202 for a period of 48 hours.

4.13.6 Blast test (see 3.8.6). Each earphone and microphone element being tested shall be mounted on the carriage of the U. S. Navy Simulated Gun Blast Equipment, in accordance with Bureau of Ships Drawing SK-N-864 with the front edge of the earphone or microphone element in the test plane, and with its axis coincident with that of the explosion chamber. The earphone and microphone element shall be subjected to 30 rounds of blast at a peak pressure of 9.5 pounds per square inch.

4.13.7 Vibration test (see 3.8.7). The complete equipment shall be subjected to the vibration test in accordance with method 201 of MIL-STD-202. The equipment shall be mounted in a horizontal position, and shall be vibrated in a direction perpendicular to the plane of the earphone and microphone for a period of 5 hours.

4.13.8 Bounce test (see 3.8.8). The equipment shall be tested on the package tester, as made by the L.A.B. Corporation, Skaneateles, New York, or equal, as follows:

- a. Cover the tester bed with a panel of 0.5 (½) inch plywood, with the grain parallel to the drive chain. Sixpenny nails with the heads below the surface shall be spaced at 6-inch intervals around all four edges and at 3-inch intervals in a 6-inch square in the center.
- b. Place the equipment on the bed of the package tester. Limit the lateral motion, by wooden fences, to not more than 3 inches and not less than 1 inch. Additional barriers may be used to prevent tumbling, provided that the fore-and-aft motion of the equipment against the back stop is not restrained.
- c. Operate the package tester, shafts in phase, for a total of 3 hours at  $284 \pm 2$  rpm. Turn the equipment at the end of each 30 minutes so it will rest on a new face.
- d. At the conclusion of the test, the equipment shall meet the requirements of 3.6.1 and 3.7.1 with degradation not to exceed 3 dB.

4.13.9 Shock drop test (see 3.8.9). The shock drop test shall be performed as follows:

4.13.9.1 Microphone: The microphone M-138/G shall be dropped at random 12 times, from a height of 6 feet, onto a concrete floor.

4.13.9.2 Earphone elements. The earphone elements H-269/G, mounted in the ear-cushions, shall be dropped at random 12 times, from a height of 6 feet, onto a concrete floor.

4.13.9.3 Switch microphone. The switch housing assembly SA-1552/G mounted on a CVC helmet shall be dropped at random 6 times, from a height of 4 feet, onto a concrete floor.

4.13.9.4 Reassembled equipment. The equipment shall operate satisfactorily after being dropped and shall not suffer any degradation in performance of more than 3 dB for the microphone element and the earphone, when tested in accordance with 3.6.1 and 3.7.1 respectively. There shall be no evidence of breaking, cracking, or physical damage. Minor chipping shall not be considered a failure.

4.14 Dielectric strength and insulation resistance (see 3.10.1). A potential of 500 volts (rms) 60 cycles shall be applied between any exposed metal parts of the switch (including the mounting screws and plate if used) and control circuit contacts of the terminating plug-connector. The duration of voltage application shall be 10 seconds. During the test there shall be no evidence of insulation breakdown and at the conclusion of the test, the insulation resistance shall not have decreased to a value below 1 megohm.

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## 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 personnel or in-house, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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 equipment covered in this specification is intended for use in audio accessories, for the Combat Vehicle Crewman's Helmet.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title number, and date of the specification.
- b. Type required.
- c. Marking and shipping of samples.
- d. First article inspection, when required (see 3.2).
- e. Place of final inspection.
- f. Packaging (see 5.1).

6.3 Nomenclature. The parentheses in the nomenclature will be deleted or replaced by a letter identifying the particular design; for example: MK-1039W/G. The contractor should apply for nomenclature in accordance with the applicable clause in the contract.

6.4 Group C inspection. Approval to ship may be withheld, at the discretion of the Government pending the decision from the contracting officer on the adequacy of corrective action.

6.5 Verification inspection. Verification by the Government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product.

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6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table VIII lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated, unless needed to meet the requirements specified herein (see [3.3](#)).

TABLE VIII. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

## 6.7 Subject term (key word) listing.

Audio accessories  
 Boom assembly  
 Combat vehicle crewman's helmet  
 Cordset  
 Ear cushion  
 Intercommunication system  
 Radio system  
 Retractable cord assembly  
 Switch

6.8 Tin whisker growth (see [3.3.3](#)). The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to [ASTM-B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.9 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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CONCLUDING MATERIAL

Custodians:  
Army – CR  
DLA - CC

Preparing activity:  
DLA - CC

(Project 5965-0358-000)

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 <http://assist.daps.dla.mil>.