

MIL-H-55535(KL)

23 January 1967

MILITARY SPECIFICATION

HEADSET-MICROPHONE KIT
MK-1039/G

1. SCOPE

1.1 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 presents a 500 ohm load to the earphone circuit.

1.2 Each MK-1039/G Kit is composed of the following components:

<u>Item name</u>	<u>Nomenclature</u>
1 each Switch Housing Assembly	SA-1552/G
1 each Upper Cordset	CX-10453/G
1 each Microphone and Boom Assembly	M-138/G
1 each Retractable Cord Assembly	CX-8650B/G
2 each Earphone Elements	H-269/G
2 each Cordset Earphones	CX-10454/G
1 each Ear Cushion Right Hand	
1 each Ear Cushion Left Hand	

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect, on the date of Invitation for Bids or Requests for Proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-T-97	Tape, Pressure-Sensitive Adhesive Filament Reinforced.
PPP-B-585	Boxes, Wood, Wirebound.
PPP-B-591	Boxes, Fiberboard, Wood-Cleated.
PPP-B-601	Boxes, Wood, Cleated.
PPP-B-621	Boxes, Wood, Nailed, and Lock-Corner.
PPP-B-636	Boxes, Fiber, Solid.

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MIL-P-116	Preservation, Methods of.
MIL-C-3885	Cable Assemblies and Cord Assemblies, Electrical for use in Electronic Communication and Associated Electrical Equipment.
MIL-B-10377	Box, Wood, Cleated, Veneer, Paper Overlaid.
MIL-C-10392	Cable, Special Purpose, Electrical (Miniature).
MIL-P-11268	Parts, Material and Processes Used in Electronic Communication Equipment.
MIL-M-13231	Marking of Electronic Items.
MIL-F-14072	Finishes for Ground Signal Equipment.

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	Marking for Shipment and Storage.
MIL-STD-169	Extreme Temperature Cycle.
MIL-STD-170	Moisture Resistance Test Cycle for Ground Signal Equipment.
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts.
MIL-STD-252	Wired Equipment, Classification of Visual and Mechanical Defects.

DRAWINGS

NAVY

SK-N-864	Simulated Gun Blast Producing Equipment.
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ELECTRONICS COMMAND

SC-A-362100	Preparation for Packaging and Packing.
SM-D-436079	Cord Assembly CX-8650B/GR.
SM-C-436361	Earphone Assembly.

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Copies of specifications, drawings, standards and publications required by suppliers in connection with specific procurements 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.

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Standards Association

ABA Z24.9-1949

Coupler Calibration of Earphones.

ABA Z24.4-1949

Pressure Calibration of Laboratory
Standard Pressure Microphone.

(Application for copies should be addressed to the American Standards Association, Inc., 10 East 40th Street, New York 16, New York.)

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3. REQUIREMENTS

3.1 Description. Headset-Microphone Kit MK-1039/G consists of the component parts listed in paragraph 1.2. The dynamic earphones H-269/G are waterproof and blast proof. The dynamic, noise cancelling 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 Construction.

Models. A model of the equipment will be available for inspection by prospective bidders and will be loaned to the contractor. Unless otherwise specified herein, or in the invitation for bids, physical construction of the equipment shall conform to the model and the equipment shall incorporate all features of the model. (NOTE: In case of conflict between specified performance characteristics for the equipment and the performance of the model, the specified performance characteristics govern.)

3.3 Parts, materials and processes; general. In addition to the requirements of this specification, the requirements of Specification MIL-P-11268 including the selection requirements therein, shall apply.

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 objectional 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.

3.4 Finish. Equipment shall be finished in accordance with Specification MIL-P-14072.

3.5 Marking. Marking shall conform to Specification MIL-M-13231.

3.5.1 Serial numbers. Serial numbers are not required.

3.6 Microphone.

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3.6.1 Microphone response. The frequency response of the microphone shall be essentially flat from 300 to 3500 Hz. The minimum power output of the microphone shall be -56 dBm at 1000 Hz when measured in accordance with 4.7.1. In addition the response shall fall within the envelope of 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 .0002 dynes per square centimeter over the frequency range of 300 to 3500 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. There shall be no evidence of insulation breakdown when the microphone is subjected to a voltage of 100 volts d.c. for 10 seconds applied between the terminals of the microphone and the insulated outer metal parts of the microphone. There shall be no decrease in insulation resistance below 1 megohm following the above test. (See 4.7.4)

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

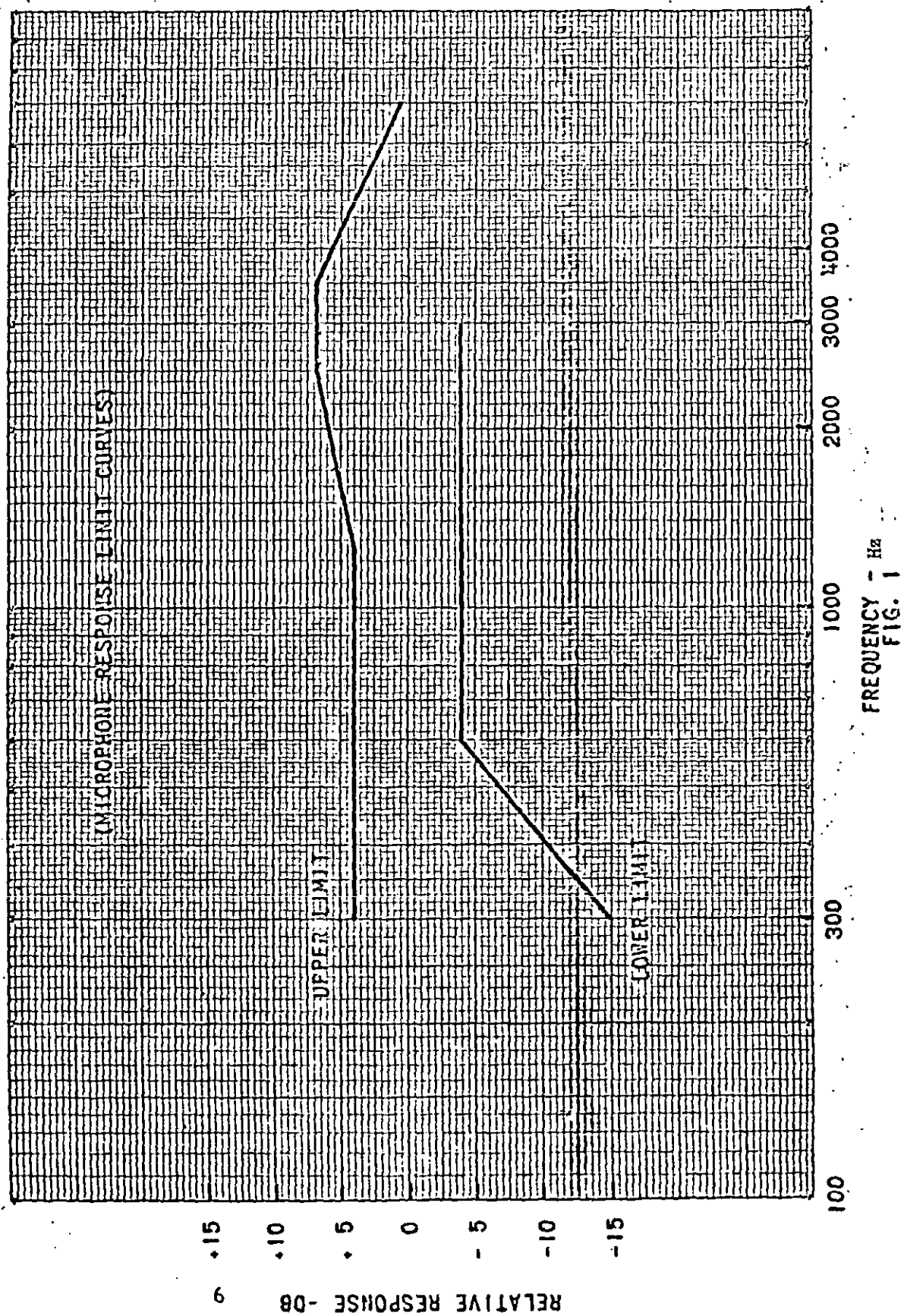
3.7.1 Earphone response (see 4.8.1). The output of the earphone shall be not less than 103 dB above a reference level of 0.0002 dyne per square centimeter when 1 milliwatt rms power at 1000 Hz is applied to the earphone terminals. The response of the earphone at any frequency shall not deviate from the 1000 Hz response by more than the values shown in table 1. (See Figure 2.)

Table I.

Frequency (in Hz)	Deviation from 1000 Hz (in dB)	
	Min.	Max.
300 - 1000	-3.5	+1.5
1000 - 3500	-5	+5

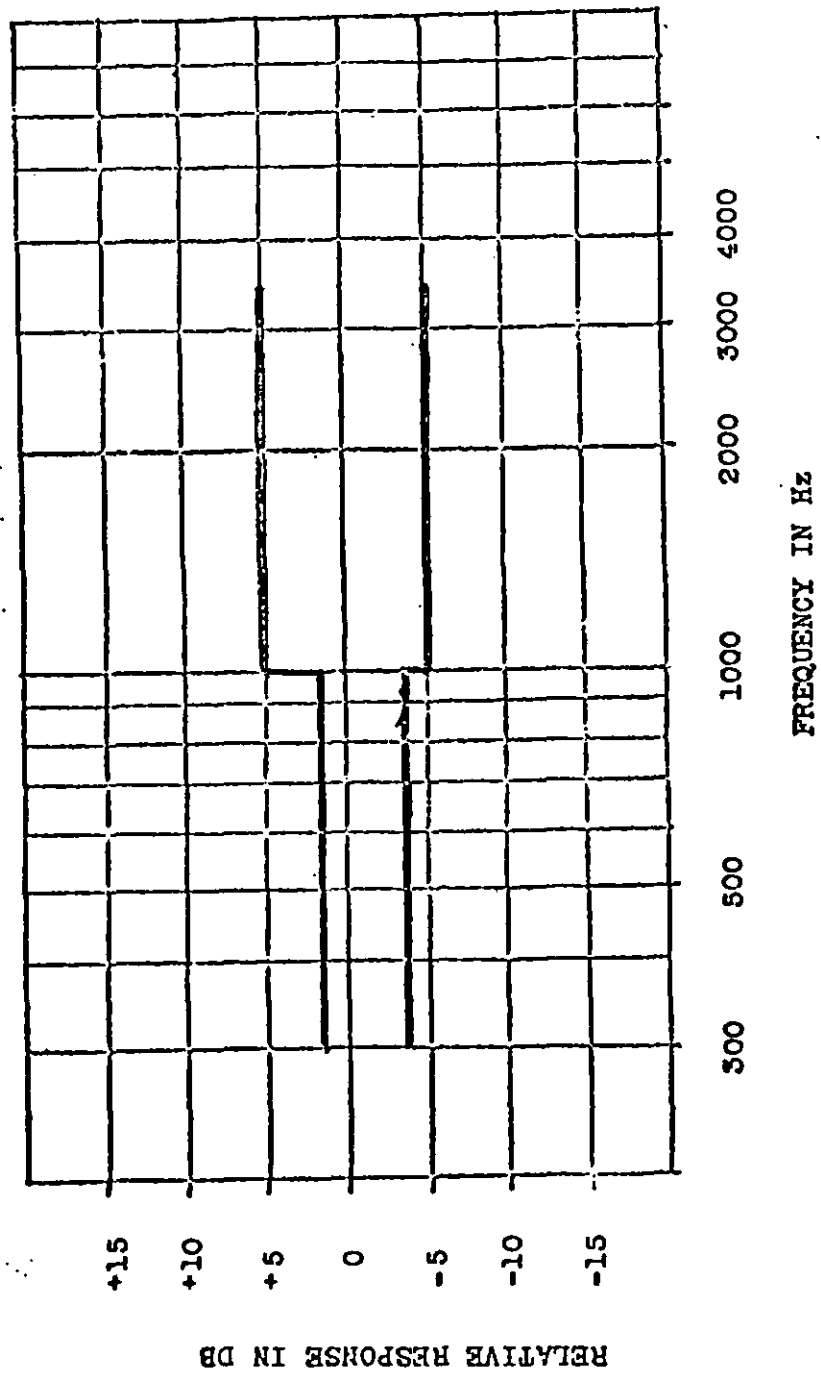
3.7.2 Distortion. The acoustic output of the earphone shall have no more than 5% total harmonic distortion over the audio frequency range of 300 to 3500 Hz, when measured as specified in 4.8.3.

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EARPHONE RESPONSE LIMIT



MINIMUM SENSITIVITY AT 1 KHz : 103dB MIN.

IMPEDANCE : 15 OHMS

SENSITIVITY REFERENCE: 0dB = 0.0002 DYNES / cm²

FIGURE 2

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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 when the earphone is subjected to a voltage of 100 volts d.c. for 10 seconds applied between the terminals of the earphone and the insulated outer metal parts of the earphone. There shall be no decrease in insulation resistance below 1 megohm following the above test (see 4.8.5).

3.7.5 Impedance. The impedance of the earphone at 1000 Hz shall be 15 ohms plus or minus 20%, as determined by the test of 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°F to -40°F. (The 150°F temperature includes affect of sunload). 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) Nonoperating: Exposure in the range of +160°F 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 paragraph 4.13.2.

3.8.3 Elevation (see 4.13.3).

(a) Operating: Up to 15,000 feet above sea level.

(b) Nonoperating: Up to 50,000 feet above sea level.

3.8.4 Immersion (see 4.13.4). Three feet of water for 2 hours.

3.8.5 Salt spray (see 4.13.5). Twenty percent salt solution for 48 hours.

3.8.6 Blast (see 4.13.6). Thirty rounds of blast at a peak pressure of 9.5 pounds per square inch with no more than 3 dB degradation in performance.

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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.

3.8.8 Bounce (see 4.13.8). The equipment shall meet specified performance, with no physical damage allowed, after subject to the test of 4.13.8.

3.8.9 Shock drop (see 4.13.9). 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 be capable of 100,000 complete cycles of operation when tested as specified in 4.12.

3.10 Cord assemblies. Cord assemblies shall be in accordance with Specification MIL-C-3885. The earphone cords, CX-10454/G shall be two-conductor stranded WD-27A/U and shall meet the requirements of MIL-C-10392. The upper cordset, CX-10453/G shall be five-conductor tinsel with one microphone lead shielded. Cordset CX-8650B/G shall be constructed in accordance with ECOM Drawing SM-D-436079.

3.10.1 The end item equipment specified shall meet the requirements of 4.14.

3.11 Operational requirement. Units shall be tested as indicated in paragraph 4.9.

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.

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 the following paragraphs:

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(a) In specification MIL-P-11268:

General requirements of plastic
material and parts.
Wiring and cabling, including
Clearance
Splicing
Connections, general
Grounding, general
Flux and cleaning agents for soldering.

Process for soldering
Cleaning of equipment
Riveting
General Process for
securing parts

(b) In this specification:

- 3.3.1 Magnetized materials.
- 3.3.2 Diaphragm and air gap.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the contractor may utilize his own facility or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspection is deemed necessary to assure that supplies and services conform to the prescribed requirements.

4.2 Classification of inspection. Inspection shall be classified as follows:

- (a) Preproduction inspection (does not include preparation for delivery) (see 4.3).
- (b) Inspection covered by subsidiary documents (see 4.4).
- (c) Quality conformance inspection.
 - (1) Quality conformance inspection of equipment before preparation for delivery (see 4.5).
 - (2) Quality conformance inspection of preparation for delivery (see 4.15).

4.3 Preproduction inspection. This inspection will be performed by the contractor and witnessed by a Government representative unless otherwise specified in the contract. It shall consist of group A, B and C inspections (see Tables II, III and IV, respectively) on 20 samples. The preproduction 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.

4.4 Inspection covered by subsidiary documents. The following shall be inspected under the applicable documents as part of the inspection of equipment before preparation for delivery:

<u>Item</u>	<u>Where required</u>
Finish	3.4
Marking	3.5

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4.5 Quality conformance inspection of equipment before preparation for delivery. The contractor shall perform the inspection specified in 4.4 and 4.5.1 through 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 will review and evaluate the contractor's inspection records. Each unit which will be subjected to Group A inspection, except preproduction samples, shall be preconditioned after final assembly (see 3.13).

4.5.1 Group A inspection. This inspection, including sampling, shall conform to table II and the ordinary inspection procedures of Military Standard MIL-STD-105.

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.

Table II. Group A inspection

Inspection	Requirement paragraph	Inspection paragraph	A Q L	
			Major	Minor
<u>Visual and Mechanical</u>	3.14	4.10	1.0%	4.0%
<u>Microphone</u>				
Response	3.6.1	4.7.1 }	1.0% for the group	*
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 }	1.0% for the group	*
Distortion	3.7.2	4.8.3 }		
<u>Headset-Microphone Kit</u>				
Operational	3.11	4.9	1.0%	*

*All electrical and operational defects are considered major.

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4.5.2 Group B inspection. This inspection, including sampling, shall conform to table III and to the special procedures for small sample inspection of Military Standard MIL-STD-105. Group B inspection shall be performed on inspection lots that have passed group A inspection and on samples selected from units that have been subjected to and met the 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.

Table III. Group B inspection

Inspection	Requirement paragraph	Inspection paragraph	A Q L
<u>Microphone</u>			
Dielectric strength	3.6.4	4.7.4	6.5*
<u>Earphone</u>			
Overload	3.7.3	4.8.4	6.5*
Impedance	3.7.5	4.8.2	6.5*
Dielectric strength	3.7.4	4.8.5	6.5*
<u>Switch with cord</u>			
Dielectric strength	3.10.1	4.14	6.5*
<u>Headset-Microphone Kit</u>			
Interchangeability	3.12	4.11	6.5*

*Normal inspection level shall be B-4.

4.5.3 Group C inspection. This inspection shall consist of the inspection specified in table IV and shall be performed on sample units that have been subjected to and met group A and B inspection.

4.5.3.1 Sampling for inspection of equipment. Ten (10) samples per every 1,000 units produced shall be randomly selected by the Government. The contractor shall submit one sample for each of the group C tests.

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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 IV. Group C inspection

Inspection	Requirement paragraph	Inspection paragraph
<u>Headset-Microphone Kit</u>		
Temperature	3.8.1	4.13.1
Moisture resistance	3.8.2	4.13.2
Elevation	3.8.3	4.13.3
Immersion,	3.8.4	4.13.4
Salt spray	3.8.5	4.13.5
Blast	3.8.6	4.13.6
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>		
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 and passed group B or C inspection, or both, may be accepted on contract, provided that they are resubjected to and pass group A inspection after repair of all damages.

4.6 Bounce preconditioning. The unit shall be placed in its normal operation position on the table of the Package Tester, Type 1000-SC, as made by the 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 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

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preconditioning for 1 minute. After bounce preconditioning, the unit shall not be repaired, aligned, cleaned, or otherwise changed prior to subsection to quality conformance inspection.

4.7 Microphone tests.

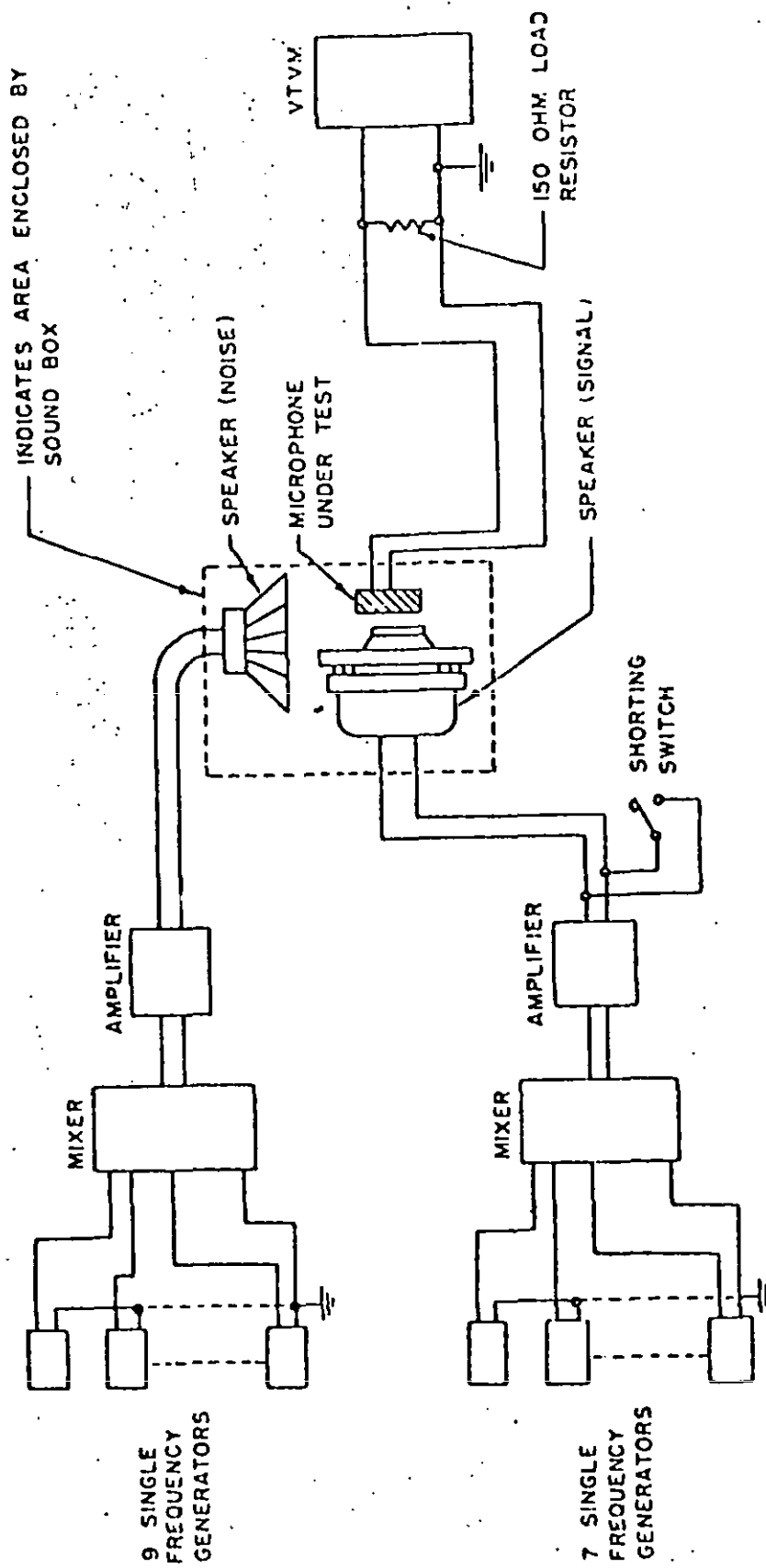
4.7.1 Response test. The response of the microphone shall be measured by means of a suitable a-c electronic voltmeter, having an input impedance of at least 1/2 megohm. The response of this microphone shall be determined using a constant sound pressure of 28 dynes per square centimeter at the point where 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 A.S.A. Standard Z24.4-1949 "Pressure Calibration of Laboratory Standard Pressure Microphones".) The sample dynamic microphone shall be positioned with its face 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 in the frequency range of 300 to 3500 Hz at approximately the following increments: 100 Hz increments from 300 to 1000 Hz and 250 Hz increments from 1000 to 3500 Hz. The microphone shall meet the requirements of 3.6.1.

4.7.2 Distortion. 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 .0002 dynes per square centimeter 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%. Measurements will be made from 300 Hz to 1000 Hz inclusive, at 100 Hz increments and from 1000 to 3500 Hz inclusive at 500 Hz increments.

4.7.3 Signal-to-noise ratio.

4.7.3.1 Noise spectrum. By means of apparatus detailed in Figure 3, and the test circuit of Figure 4, provision shall be made for the production of the noise spectrum, Table V, at an rms sound pressure of 115 dB above a reference level of 0.0002 dyne per square centimeter 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 0.0002 dyne per square centimeter 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, 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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MICROPHONE SIGNAL-TO-NOISE RATIO TEST CIRCUIT
FIGURE 4

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Table V. 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
1000	-13
2000	-17
3000	-19
4000	-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, table VI at an rms sound pressure of 115 dB above a reference level of 0.0002 dyne per square centimeter. The "signal" source shall be the driver unit. The calibrating condenser microphone shall be positioned 1/4 inch directly in front of the driver unit.

Table VI. Signal spectrum

Frequency in Hz	Sound pressure in dB relative to Sound pressure at 130 Hz
130	0
300	+7
600	+8
1000	+5
2000	-3
3000	-7
4000	-9

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4.7.3.3 Measurement of the signal-to-noise ratio. The microphone shall be mounted in its test rig with its front grid 1/4-inch from the mouth of the "signal" speaker. The microphone shall be connected to the test circuit shown in 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 test. The microphone shall be tested for compliance with 3.6.4.

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 3500 Hz, in sufficient detail to establish definitely the shape of the curve. Response measurements shall be made in accordance with "Coupler Calibration of Earphones," "A.S.A. Standard Z24.9-1949." 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 in Figure 5. The output from the oscillator at each test frequency shall be adjusted to 0.245 volts rms as measured by VTVM #1. The output from the calibrated microphone and pre-amplifier unit shall be measured as indicated by the reading of VTVM #2. This reading shall be converted to the equivalent dB value above 0.0002 dyne per square centimeter 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 1000 Hz, inclusive, with measurements of increments of 100 Hz, and from 1000 Hz to 3500 Hz inclusive, with measurements of increments of 250 Hz. 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. 640AA condenser microphone, or equal, shall be used for measuring sound pressure. It should be calibrated by the reciprocity method in accordance with A.S.A. Standard Z24.4-1949 Pressure Calibration of Laboratory Standard Pressure Microphones.

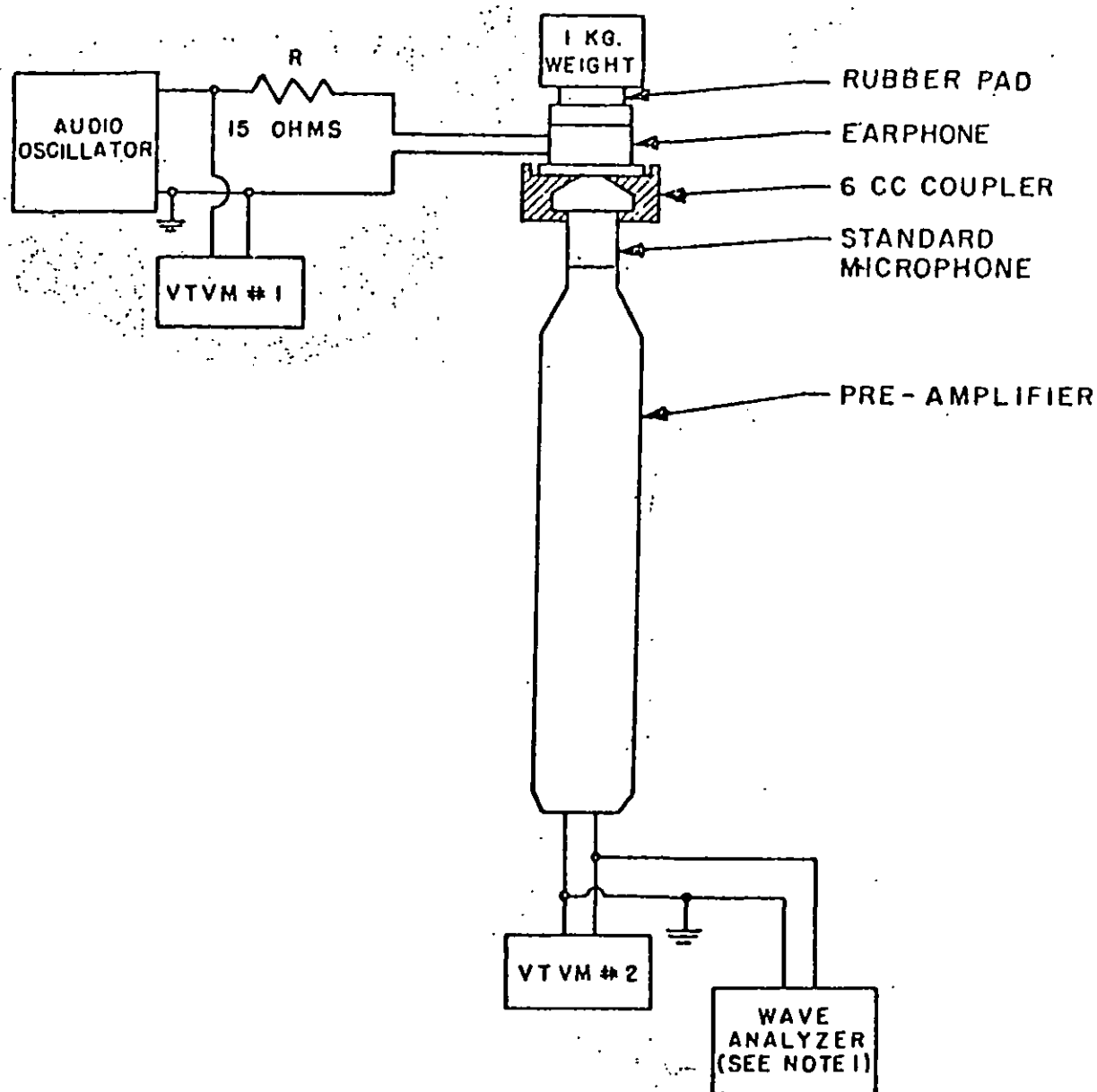
(b) Audio oscillator. The audio oscillator shall have a frequency range of at least 100 to 10,000 Hz, shall have a high degree of stability in both output voltage and frequency, and shall have a waveform distortion of less than 2 percent.

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(c) Vacuum-tube voltmeter. The vacuum-tube voltmeters used must have flat frequency response (± 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 (± 1 dB) over a frequency range of at least 100 to 10,000 Hz, shall have a high degree of stability, and shall have distortion of less than 2 percent.

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NOTE 1: WAVE ANALYZER REQUIRED FOR DISTORTION TEST ONLY.
 EARPHONE FREQUENCY RESPONSE TEST CIRCUIT

FIGURE 5

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4.8.2 Impedance. The impedance of the earphone shall be measured with 0.122 volt at 1000 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 described 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 3500 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 1000 Hz, the response shall be tested per 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 tested for compliance with 3.7.4.

4.9 Operational test. 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 listed in Standard MIL-STD-252.

4.11 Inspection for dimensional interchangeability. Each replaceable part listed below in the selected Transducer Equipments shall be interchanged with the corresponding part in the approved preproduction sample in sequential order. At the completion of this inspection, the interchanged parts shall be reassembled in their original transducer equipments. Noninterchangeability of these parts constitute failure.

Switch housing.
Microphone boom.
Earphone elements.

4.12 Switch life. The switch shall be tested to determine compliance with 3.9. 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. One cycle of switch operation test shall consist of the following, in sequence:

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- (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.

4.13 Service conditions tests.

4.13.1 Temperature test. The equipment shall be subjected to the temperature cycle shown on Standard MIL-STD-169. The test of 4.9 shall be performed at step 3 and step 8. At step 10, 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.

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 $130^{\circ} \pm 5^{\circ}\text{F}$ for 24 hours.
- (b) Condition at $77^{\circ} \pm 5^{\circ}\text{F}$ 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 MIL-STD-170. 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 $77^{\circ} \pm 5^{\circ}\text{F}$ at 40 to 60 percent relative humidity. The equipment shall meet the 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.

4.13.3 Altitude test.

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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 ground level shall be obtained at 300, 600, 1000, 2000, and 3500 Hz. Pressure inside the chamber shall then be reduced to that corresponding to an altitude of 15,000 feet. 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 Nonoperating. The microphone and earphone shall be subjected to 5 varying pressure cycles. Each pressure cycle shall consist of 30 minutes at 3.4 inches of mercury. The pressure transition shall be approximately 5000 feet per minute. The response characteristics of the earphone and microphone shall be measured, and shall not exhibit a 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. 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.

4.13.5 Salt spray test. The completely assembled equipment shall be exposed to salt spray in accordance with Method 101 of MIL-STD-202 for 48 hours. 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 a degradation in response in excess of 3 dB from their performance values of 3.6.1 and 3.7.1.

4.13.6 Blast test. 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. The earphone and microphone units shall not suffer a degradation in their response of more than 3 dB from the performance values of 3.6.1 and 3.7.1.

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4.13.7 Vibration test. 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. 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.

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

(a) Cover the tester bed with a panel of 1/2-inch plywood, with the grain parallel to the drive chain. Space sixpenny nails, with the heads below the surface, 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 ± 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. The shock drop test shall be performed as follows:

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

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

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

4.13.9.4 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 paragraph 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.

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4.14 Dielectric strength and insulation resistance. 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.

4.15 Quality conformance inspection of preparation for delivery. Preparation for delivery shall be inspected in accordance with Specification MIL-P-116 to determine conformance to the requirements of section 5.

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5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.

5.1.1 Level A. The Electro-Acoustical Transducer Equipments shall be preserved, packaged and tested in accordance with the applicable provisions of Specification MIL-P-116 and in a manner that will afford adequate protection against corrosion, deterioration and damage during worldwide shipment, handling and open storage.

5.1.2 Level C. The Electro-Acoustical Transducer Equipments shall be afforded preservation and packaging in accordance with the suppliers' normal commercial practice.

5.2 Packing. The Electro-Acoustical Transducer Equipments packaged as specified, shall be packed in shipping containers conforming to the requirements of the specifications referenced below for the designated level. The gross weight shall not exceed the weight shown unless an individually packed item exceeds that amount. Closure and strapping shall be as prescribed in the applicable box specification or appendix thereto, except that bands of reinforced, pressure-sensitive adhesive tape, 1/2 inch wide and conforming to Specification PPP-T-97 for Grade IV, shall be used for fiberboard boxes in lieu of metal strapping.

5.2.1 Level A.

<u>Box Specification</u>		<u>Max. Gross Wt.</u>
Fiberboard (Type 1, Class 2)	PPP-B-636	Table VI
Nailed Wood (Style 4, Class 2)	PPP-B-621	200 lbs.
Wirebound (Style 2 or 3, Class 2)	PPP-B-585	200 lbs.
Wood Cleated Fiberboard (Overseas)	PPP-B-591	200 lbs.
Wood Cleated Plywood (Overseas)	PPP-B-601	200 lbs.
Wood Cleated, Veneer, Paper Overlaid (Overseas)	MIL-B-10377	200 lbs.

5.2.2 Level B.

<u>Box Specification</u>		<u>Max. Gross Wt.</u>
Fiberboard (Type 1, Class 1)	PPP-B-636	Table I
Nailed Wood (Style 4, Class 1)	PPP-B-621	200 lbs.
Wirebound (Style 3, Class 1)	PPP-B-585	200 lbs.
Wood Cleated Fiberboard (Domestic)	PPP-B-591	200 lbs.
Wood Cleated Plywood (Domestic)	PPP-B-601	200 lbs.
Wood Cleated, Veneer, Paper Overlaid (Overseas)	MIL-B-10377	200 lbs.

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5.2.3 Level C. The Electro-Acoustical Transducer Equipments shall be packed in shipping containers of the type, size and kind commonly used for the purpose in a manner that will insure acceptance by common carrier and safe delivery at destination. Shipping containers shall comply with the rules or regulations of the common carrier, applicable to the mode of transportation.

5.2.4 Pilot pack. When Level "A" packaging and packing is specified above, one acceptable model of the equipment will be pilot packed in a manner that will pass the preproduction tests prescribed in Specification MIL-P-116. Illustrations of the packaging and packing procedure, together with Bills of Material, will be prepared and furnished in accordance with the provisions of Electronics Command Drawing Number SC-A-362100.

5.3 Marking. In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with the applicable provision of Standard MIL-STD-129.

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6. NOTES

6.1 Intended use. The equipment covered in this specification is intended for use as audio accessories for the Combat Vehicle Crewman's Helmet.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title number, and data of this specification and any amendment thereto.
- (b) Type required.
- (c) Level of packaging and level of packing required for shipment. (Level A, level B, or level C.)
- (d) The specific paragraphs of section 5 which are applicable to the particular procurement.
- (e) Preproduction pack(s) as follows:
 - Makeup of pack(s).
 - Number of each kind of pack to be submitted.
 - Inspection to be performed thereon.
- (f) Marking and shipping of samples.
- (g) Place of final inspection.

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.

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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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Project Number 5965-A065