MILITARY SPECIFICATION
HEADSET-MICROPHONE KIT MK-1564( )/AIC
(Components of)

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1. SCOPE

1.1 This specification covers *Headset-Microphone* Kit MK-1564( )/AIC. The kit is designed to fit both the regular and extra large size Helmet, Flying Type SPH-4.

1.2 Each MK-1564( )/AIC is composed of the following components:

1 each Microphone, cord and boom assembly
2 each Earphone
1 each Kit Cord Assembly, one end terminated in Plug U-174/U and opposite end branched to attach the earphone elements and Connector U-172/U
Necessary grommets and hardware for attaching the Kit to the helmet.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

NN-P-71	Pallet, Material-handling, Wood (General construction requirements)
QQ-S-781	Strapping, Steel, Flat and Seals
PPP-B-566	Box, Folding, Paperboard
PPP-B-585	Boxes, Wood, Wirebound
PPP-B-601	Boxes, Wood, Cleating
PPP-B-621	Boxes, Wood, Nailed, and Lock-Corner
PPP-B-636	Boxes, Fiber, Solid
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock (container grade) and cut Shapes
PPP-P-291	Paperboard, Wrapping Cushioning
PPP-T-45	Tape Gummed, Paper, Reinforced and Plain, for Sealing and Securing
PPP-T-76	Tape, Pressure-sensitive Adhesive Paper, Water Resistant (for carton sealing)
PPP-T-97	Tape, Pressure-Sensitive Adhesive Filament Reinforced

MILITARY

MIL-P-116	Preservation, Methods of
MIL-I-4997	Insulating and Jacketing Compounds for use in Cords, Cordages and Cables
MIL-C-5898	Cord, Electrical
MIL-C-10392	Cord, Electrical (Audio, Miniature)
MIL-P-11268	Parts, Material and Processes Used in Electronic Communication Equipment
MIL-M-13231	Marking of Electronic Items
MIL-B-43014	Boxes, Water Resistant, Paperboard, Folding, Set-up and Metal-stayed
MIL-C-45662	Calibration System Requirements
MIL-C-55668	Cord, Electrical: Audio, Retractile, Subminiature

STANDARDS

FEDERAL

FED-STD-228	Federal Test Method Standard

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized and Containerized Unit Loads 40" x 48" Pallets, Skids, Runners, or Pallet Type Base
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-252	Wired Equipment, Classification of Visual and Mechanical Defects
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-810	Environmental Test Methods

DRAWINGS

NAVY

SK-N-864	Simulated Gun Blast Producing Equipment

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

ASA Z24.9-1949	Coupler Calibration of Earphones
ASA 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)

American Society of Testing and Materials

B33-63	Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

3. REQUIREMENTS

3.1 Description. Headset-Microphone Kit MK-1564( )/AIC consists of the component parts listed in 1.2. The dynamic earphones are waterproof and blast proof. The dynamic, noise cancelling microphone and boom assembly is waterproof and blast proof. Headset-Microphone Kit MK-1564( )/AIC shall fit both the regular and extra large size Helmet, Flying Type SPH-4.

3.2 Model. 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 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 Marking. Marking shall conform to MIL-M-13231.

3.3.2.1 Serial numbers. Serial numbers are not required.

3.4 Construction. The construction of parts for the assembly of the Headset-Microphone Kit MK-1564( )/AIC shall conform to the requirements specified herein and shall be suitable for extended service use in military aircraft.

a. Moisture barrier seal. A moisture barrier shall be provided as part of microphone. The moisture barrier shall serve both as a breath-blast shield and a shield to prevent entrance of moisture into the microphone.

b. Moisture barrier guard. The moisture barrier guard shall be so constructed that it can be easily replaced by another moisture barrier guard without the use of any special mechanical equipment.

c. Microphone positioning adjustment. The microphone positioning adjustment shall provide a non-critical adjustment to obtain a torque of 30 to 50 ounce inches. From an initial setting of 40 ounce inches, the torque shall not change in excess of 20 percent after subjection to any or all of the environmental tests, including the endurance test for the microphone adjustment bearing specified herein.

3.5 Microphone.

3.5.1 Microphone response. The frequency response of the microphone with the moisture barrier guard in its place shall be essentially flat from 300 to 5000 Hz. The minimum power output of the microphone shall be -64 dBm (.00025V) 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 5 ohms.

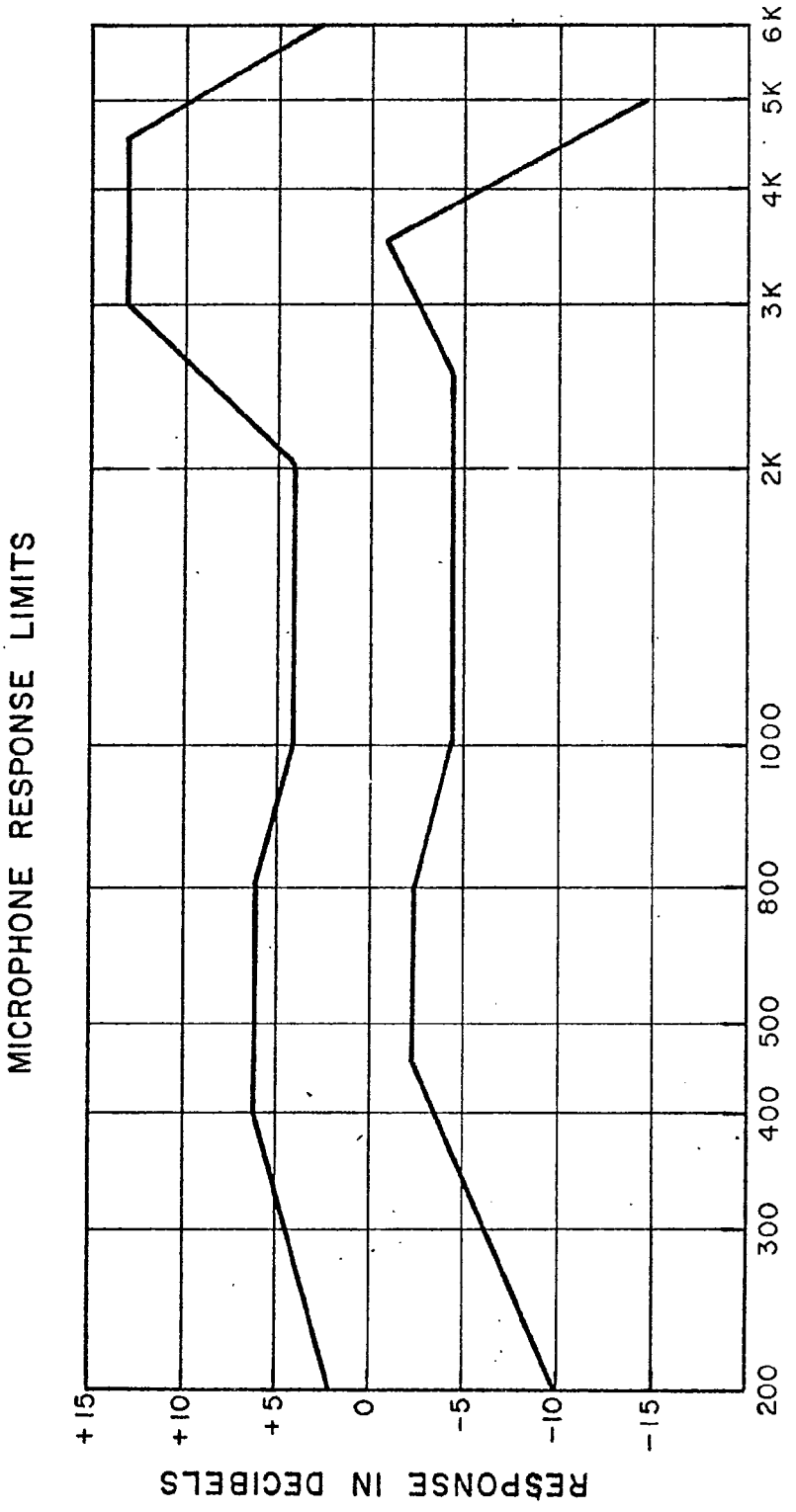

MICROPHONE RESPONSE LIMITS
RESPONSE IN DECIBELS
+15
+10
+5
0
-5
-10
-15
200
300
400
500
800
1000
2K
3K
4K
5K
6K
FREQUENCY IN HERTZ PER SECOND

FIGURE I

3.5.2 Distortion. Total harmonic distortion shall not exceed 6 percent at a sound pressure level of 125 dB referenced at .0002 dynes per square centimeter over the frequency range of 700 to 5000 Hz. (See 4.7.2)

3.5.3 Signal-to-noise ratio. The signal-to-noise ratio of the microphone shall be at least 18 dB (signal over noise) when measured in accordance with 4.7.3.

3.5.4 Dielectric strength, and insulation resistance. There shall be no evidence of insulation breakdown when the microphone is subjected to a voltage of 100 VAC 60 Hz 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)

3.5.5 Impedance. The impedance of the microphone at 1000 Hz shall be within the limits of 3 ohms and 7 ohms. (See 4.7.5)

3.5.6 Microphone moisture barrier. The microphone shall be equipped with a moisture barrier for protection against icing, dust and wind. The specified response curve and output level of the microphone shall be measured with the moisture barrier guard in place on the microphone.

3.6 Earphone.

3.6.1 Earphone response (see 4.8.1). The output of the earphone shall be not less than 102 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 1000 Hz response by more than the values shown in Table 1. (See Figure 2).

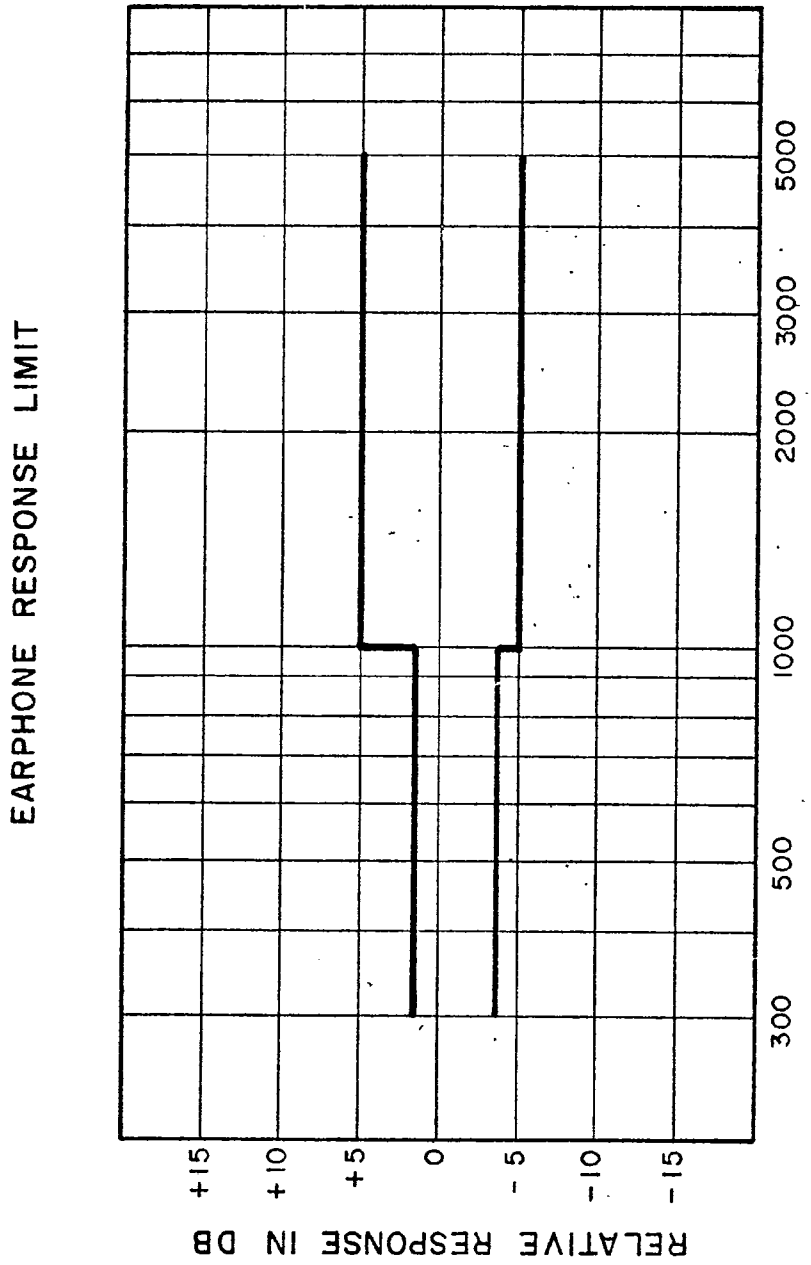

EARPHONE RESPONSE LIMIT
RELATIVE RESPONSE IN DB
+15
+10
+5
0
-5
-10
-15
300
500
1000
2000
3000
5000
FREQUENCY IN HZ
MINIMUM SENSITIVITY AT 1KHz : 102 dB MIN.
IMPEDANCE: 17 OHMS
SENSITIVITY REFERENCE: 0 dB = 0.0002 DYNES / cm 2

FIGURE 2

TABLE I

Frequency (in Hz)	Deviation from 1000 Hz (in dB) Min.	Max.
300 - 1000	-3.5	+1.5
1000 - 5000	-5	+5

3.6.2 Distortion. The acoustic output of the earphone shall have no more than 5% total harmonic distortion over the audio frequency range of 300 to 5000 Hz, when measured as specified in 4.8.3.

3.6.3 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.

3.6.4 Dielectric strength, and insulation resistance. There shall be no evidence of insulation breakdown when the earphone is subjected to a voltage of 100 VAC 60 Hz 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).

3.6.5 Impedance. The impedance of the earphone at 1000 Hz shall be 17 ohms plus or minus 2 ohms as determined by the test of 4.8.2.

3.7 Service conditions. The equipment shall meet the following service requirements:

3.7.1 Temperature. The equipment shall operate at ambient air temperatures ranging from -40°F to 150°F, and shall withstand storage at temperatures from -70°F to 160°F.

3.7.2 Humidity. The equipment shall be operable without degradation in specified performance, and shall sustain no physical damage, during and after prolonged exposure to relative humidities as high as 100 percent at all ambient air temperatures to 80°F, high absolute humidity corresponding to a dew point of 86°F occurring at an ambient temperature of 100°F, and low relative humidity of 5 percent at 125°F.

3.7.3 Altitude. The equipment shall operate without degradation in specified performance at altitudes up to 15,000 feet above sea level, and shall withstand air transport at 50,000 feet.

3.7.4 Immersion. The equipment shall be immersion proof to a covering depth of 3 feet of water for a period of not less than 2 hours.

3.7.5 Salt fog. The equipment shall be resistant to the corrosive effects of salt-sea atmosphere.

3.7.6 Blast (see 4.13.9). Thirty rounds of blast at a peak pressure of 9.5 pounds per square inch with no more than 3 dB degradation in performance.

3.7.7 Sand and dust. The equipment shall withstand exposure to fine sand and dust particles with wind speeds of 35 knots.

3.7.8 Fungus. The equipment shall be resistant to fungus growth as encountered in tropical climates.

3.7.9 Shock and vibration. The equipment shall withstand shock and vibration induced during service usage and rough handling.

3.8 Cord assembly.

3.8.1 Construction (general).

3.8.1.1 Conductors. The nominal area of the conductor shall be 320 circular mils and the minimum area 310 circular mils. Each conductor shall consist of bunch stranded AWG Nr. 40 (0.003145 inch diameter) tinned cadmium bronze wire. The strands shall be twisted to have a right hand lay of approximately one half inch. The individual strands, before bunching and plating, shall have a minimum tensile strength of 90,000 pounds per square inch and have a conductivity grade of at least 80 percent.

3.8.1.1.1 Conductor insulation. The insulation shall consist of extruded teflon not less than 0.005 inches thick. The insulation shall withstand a potential of 1000 volts commercial line frequency when applied in accordance with Method 6211 of FED-STD-228.

3.8.1.1.2 Tin-coating. Each strand shall be tin-coated with commercially pure tin. The tin coating, continuity, adherence and finish shall meet the requirements of ASTM Standard B33-63.

3.8.1.1.3 Conductor color code. For circuit identification, the insulation for the six-conductor cord assembly shall be colored white, black, red, green, black, and white in that order. The insulation for the two-conductor cord assembly shall be one colored black and the other white.

3.8.1.2 Stay cords. The stay cords shall be composed of extra strength rayon threads braided together; they shall not abrade or otherwise damage the insulation of the conductors when the cord assembly is bent or stretched.

3.8.1.3 Jacket. The cord shall be covered with a braided jacket composed of black nylon, 210 denier, 3 ends, 20 carrier, approximately 30 picks per inch.

3.8.2 Physical characteristics.

3.8.2.1 Temperature range. The cord shall be flexible and resilient throughout the temperature range of minus 55°C to plus 85°C and shall show no evidence of cracking or other damage as a result of exposure to this temperature range.

3.8.2.2 Flexing life. The 6-conductor cord shall have a mean flex life of 300,000 flexes without showing evidence of:

a. Damage to the outside jacket.
b. Damage to the insulation of the individual conductors.
c. Electrical discontinuity.

3.8.3 Electrical characteristics.

3.8.3.1 Dielectric strength. For each finished cord assembly, the insulation shall withstand, without flash over or breakdown, the application of 500 VAC, 60 Hz for 5 seconds.

3.8.3.2 Insulation resistance. The insulation resistance of the cord shall be not less than 100 megohms, when measured at or corrected to 15.5°C.

3.8.4 Isolation. The electromagnetic and electrostatic isolation between the headset circuit and microphone circuit of the cord assembly shall not be less than that shown in Table II.

TABLE II

Frequency (Hz)	Electrostatic Isolation Less Connectors	Electromagnetic With Connectors	Isolation Less Connectors
20,000	115 db	86 db	94 db
10,000	121 db	92 db	92 db
5,000	127 db	98 db	98 db

3.8.5 Conductor strain relief. The cable shall be anchored at the plug connectors in such a way that the cable can withstand the strain relief test specified herein.

3.8.6 Microphone cord. The cord shall be WD-34/U in accordance with MIL-C-5898, or cord WD-27A/U in accordance with MIL-C-10392 may be used upon approval of the contracting officer.

3.9 Calibration system. The contractor shall establish and maintain a calibration system per MIL-C-45662 to control the accuracy of the measuring and test equipment used in testing of equipment procured under this specification.

3.10 Operational requirement. Each unit shall be tested as indicated in 4.10.

3.11 Interchangeability. Like units, assemblies, subassemblies, and replaceable parts shall be physically and functionally interchangeable, without modification of such items or of the equipment. (See 4.12). Individual items shall not be hand-picked for fit or performance. Reliance shall not be placed on any unspecified dimension, rating, characteristics, etc.

3.12 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).

3.13 Workmanship. The equipment shall be manufactured and assemblied in accordance with Requirement 9 of MIL-STD-454.

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 III, IV and V, respectively) on 25 samples. The preproduction samples will be inspected in this order: Group A, Group B, and divided up for Group C inspection (see table V) as follows:

20 units will be tested in accordance with test sequence of table VIII.

5 unassembled cords will be tested in accordance with 4.9 including all subparagraphs thereof.

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:

Item	Where required
Marking	3.3.2
Cord WD-34/U	3.8.6
Workmanship	3.13

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 3.12).

4.5.1 Group A inspection. This inspection, including sampling, shall conform to table III and the ordinary inspection procedures of 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 III - Group A Inspection

Inspection	Requirement Paragraph	Inspection Paragraph	AQL Major	AQL Minor
Visual and Mechanical	3.13	4.11	1.0%	4.0%
Microphone				
Response	3.5.1	4.7.1	1.0% for the group	*
Distortion	3.5.2	4.7.2		
Signal-to-noise ratio	3.5.3	4.7.3		
Earphone				
Response	3.6.1	4.8.1	1.0% for the group	*
Distortion	3.6.2	4.8.3		
Headset-Microphone Kit				
Operational	3.11	4.10	1.0%	*

*All electrical and operational defects are considered major.

4.5.2 Group B inspection. This inspection, including sampling, shall conform to table IV and to the special procedures for small sample inspection of 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 IV - Group B Inspection

Inspection	Requirement Paragraph	Inspection Paragraph	AQL
Microphone			
Dielectric strength	3.5.4	4.7.4	6.5%*
Impedance	3.5.5	4.7.5	6.5%
Earphone			
Overload	3.6.3	4.8.4	6.5%*
Impedance	3.6.5	4.8.2	6.5%*
Dielectric strength	3.6.4	4.8.5	6.5%*
Headset-Microphone Kit			
Interchangeability	3.11	4.12	6.5%*

*Normal inspection level shall be S-4.

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 meet group A and B inspection.

4.5.3.1 Sampling for inspection of equipment. Twelve (12) samples per every 1,000 units produced shall be randomly selected by the Government. The contractor shall submit three (3) samples for each unit to be tested as specified in table VIII.

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

Inspection	Requirement Paragraph	Inspection Paragraph
Headset-Microphone Kit		
Temperature	3.7.1	4.13.1, 4.13.2
Humidity	3.7.2	4.13.3
Altitude	3.7.3	4.13.4
Immersion	3.7.4	4.13.5
Salt spray	3.7.5	4.13.7
Blast	3.7.6	4.13.9
Sand and dust	3.7.7	4.13.6
Fungus	3.7.8	4.13.8
Shock and vibration	3.7.9	4.13.11, 4.13.10

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 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.

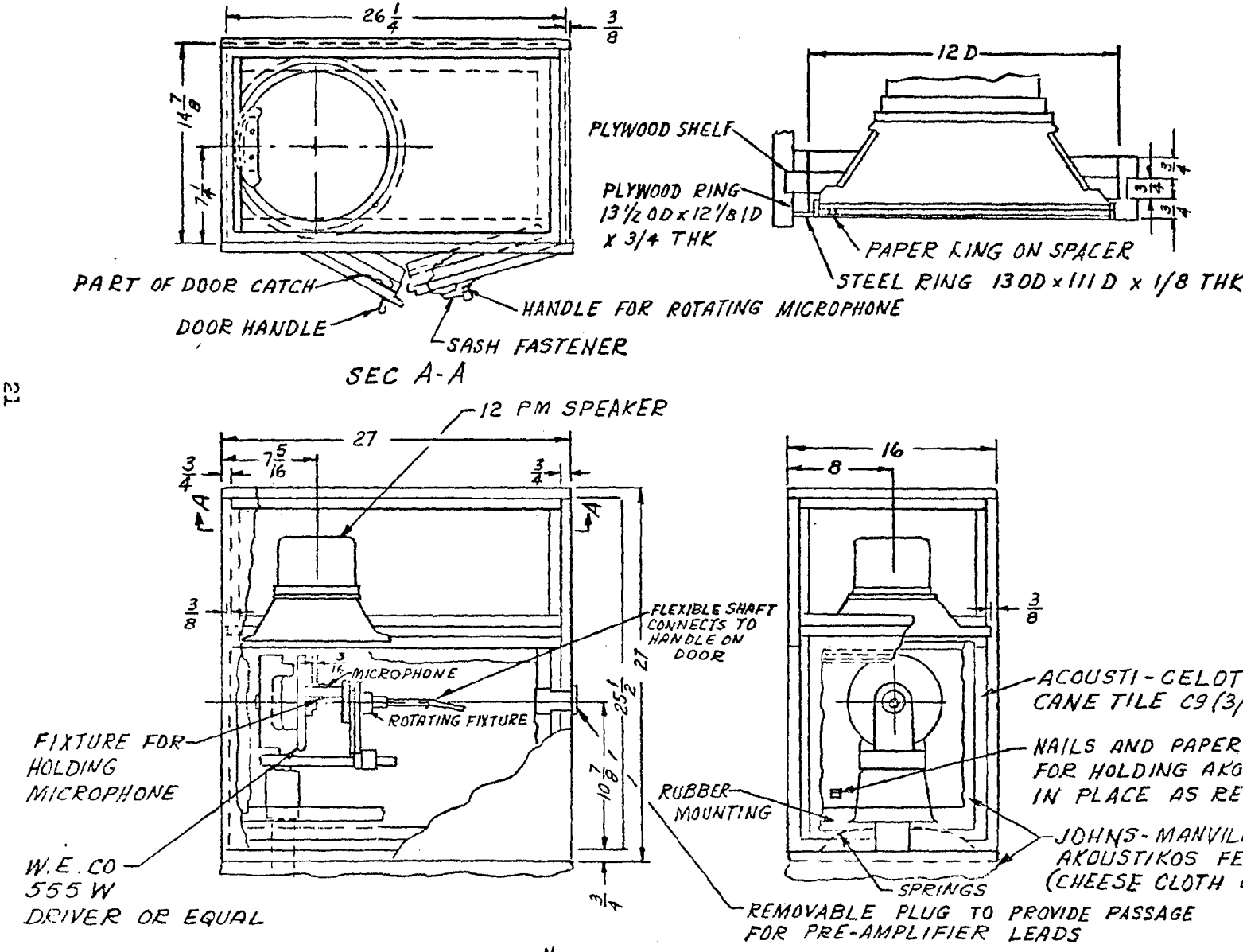
4.7 Microphone tests.

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 ½ 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 3/16 inch directly in front of the driver unit with the face 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 5 ohms. The response of the microphone shall be tested in the frequency range of 300 to 5000 Hz at approximately the following increments: 100 Hz increments from 300 to 1000 Hz and 250 Hz increments from 1000 to 5000 Hz. The microphone shall meet the requirements of 3.5.1.

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 125 dB referenced at .0002 dynes per square centimeter and the output of the microphone terminated in 5 ohms shall be connected to a Hewlett-Packard Distortion Analyzer Model 330C, or equal, for distortion measurements. The distortion shall not be greater than 6%. Measurements will be made from 700 Hz to 1000 Hz inclusive, at 100 Hz increments and from 1000 to 5000 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 VI, 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, 3/16 inch from the mouth of the driver unit (signal source), which shall be short-circuited during adjustments of the noise spectrum.



"SIGNAL TO NOISE RATIO" TEST BOX FOR DIFFERENTIAL MICROPHONES

FIGURE 3

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
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 VII 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 3/16 inch directly in front of the driver unit.

Table VII - 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

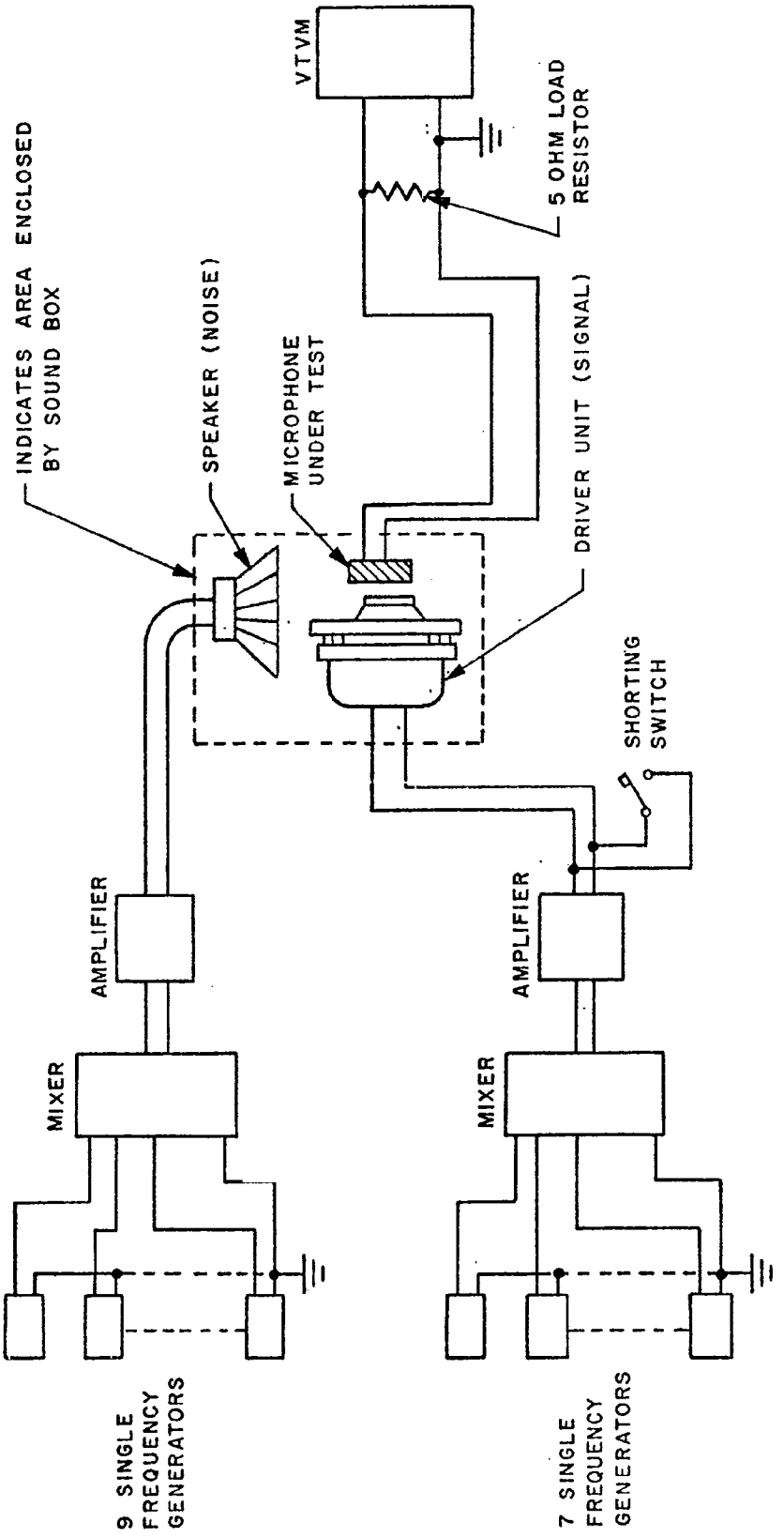
4.7.3.3 Measurement of the signal-to-noise ratio. The microphone shall be mounted in its test rig with its face 3/16-inch from the mouth of the driver unit. The microphone shall be connected to the test circuit shown in Figure 4. The noise spectrum shall be applied for 3 seconds, and the output of the 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 3.5.3.

4.7.4 Dielectric strength and insulation resistance test. The microphone shall be tested for compliance with 3.5.4.

4.7.5 Impedance. The microphone shall be placed in front of the driver unit as specified in 4.7.1 with a calibrated variable resistor switch in the open circuit position, replacing the 5 ohm resistor in Fig. 4, and the electronic voltmeter connected across the terminals of the microphone. Increase the sound pressure of the driver unit at 1000 Hz until the output of the microphone is 0.0001 volt. Introduce resistance across the microphone until the output is reduced to 0.00005 volt. The resistance thus determined shall be taken as the electrical impedance of the microphone and shall comply with 3.5.5.

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 5000 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.



MICROPHONE SIGNAL-TO-NOISE RATIO TEST CIRCUIT

FIGURE 4

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 5000 Hz inclusive. with measurements of increments of 250 Hz. The response of the earphone shall meet the requirements specified in 3.6.1.

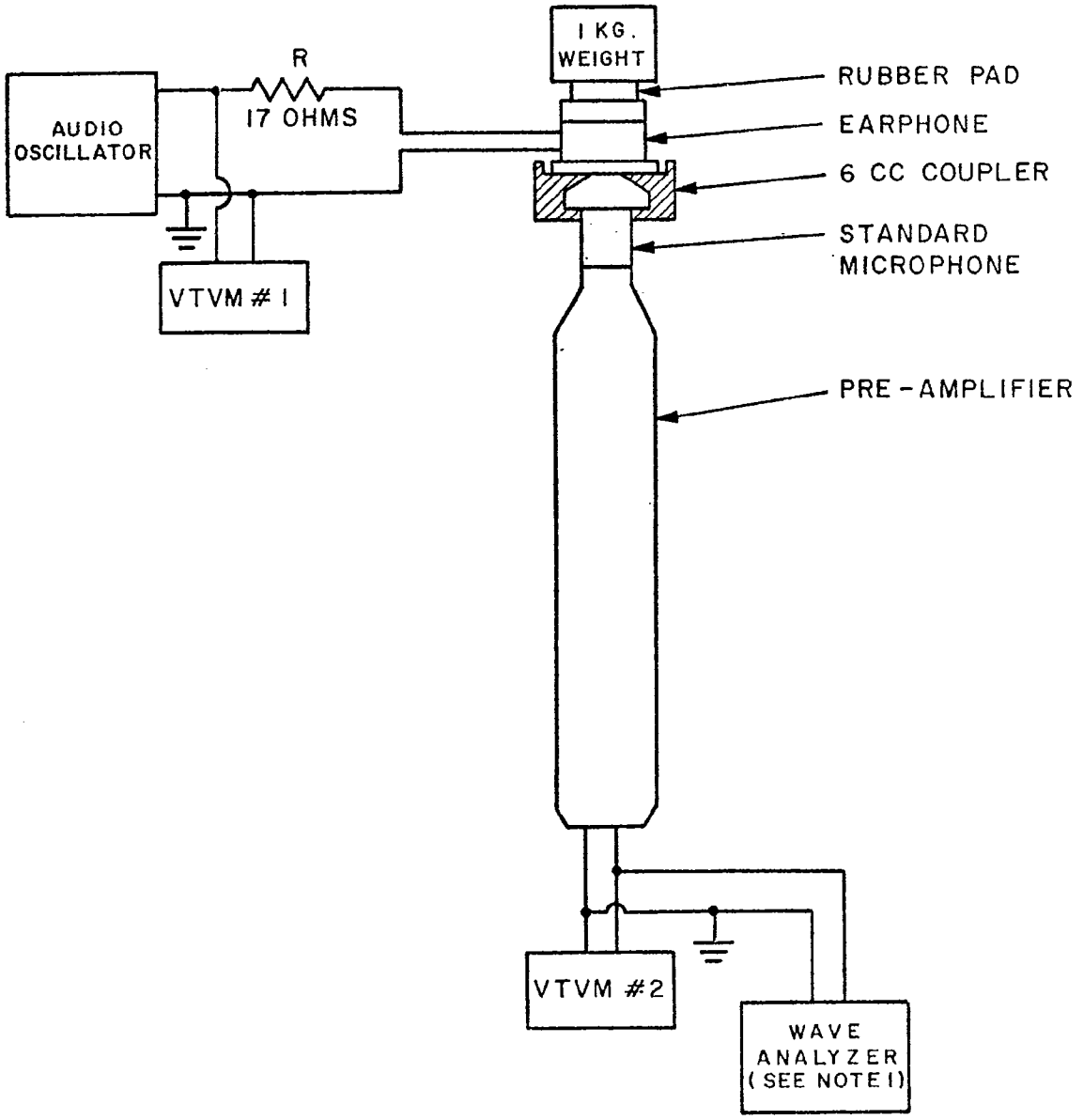
4.8.1.2 Test equipment. The test equipment used for the response test shall meet the following requirements:

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.

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.



NOTE 1: WAVE ANALYZER REQUIRED FOR DISTORTION TEST ONLY.

EARPHONE FREQUENCY RESPONSE TEST CIRCUIT

FIGURE 5

4.8.2 Impedance. The impedance of the earphone shall be measured with 0.13 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 3.6.5.

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 0.26 volts rms at 300 Hz across the series combination of the 17 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 4.8.1.1. The distortion measurement shall be repeated at 400 Hz and at sufficient points between 400 and 5000 Hz to determine the frequency where maximum distortion exists. Total harmonic distortion shall comply with the requirements of 3.6.2.

4.8.4 Overload. After operation of the earphone for 8 hours with 300 milliwatts input power (2.3 volts) at 1000 Hz, the response shall be tested per 4.8.1 to establish compliance with the requirements of 3.6.3.

4.8.5 Dielectric strength and insulation resistance test. The earphone shall be tested for compliance with 3.6.4.

4.9 Cord test.

4.9.1 Cord assembly tests.

4.9.1.1. Temperature range. The unterminated cord shall be placed within a test chamber wherein a temperature of plus 85°C (plus 185°F) is maintained for a period of 4 hours. The cord shall be wrapped about a mandrel while at this temperature without damage to the cord jacket or conductor insulation. The diameter of the mandrel shall be the same as the nominal cable diameter. The cord shall be attached to the mandrel and suspended vertically with the lower end weighted sufficiently to keep the specimen taut and to permit wrapping without handling. The cord shall be inspected for damage or deformation and then subjected to a test chamber wherein a temperature of minus 55°C (-67°F) is maintained. After 20 hours of storage at -55°C, the cord shall be wrapped about the mandrel, while at this temperature, in the same manner as it was at the positive extreme temperature. The cord shall be examined for cracks or any other damage to the jacket or conductor insulation.

4.9.1.2 Flexing life.

4.9.1.2.1 Six-conductor cord. Samples of the 6-conductor unterminated cord shall be suspended through holes in a metal bar having a cross section of 1 inch by 1 inch. The cord shall be secured in such a manner that it will not turn in the hole during the flexing test. The diameter of the through holes shall be 0.005 to 0.010 inch greater than the diameter of the cord which is undergoing test. The thru hole shall incorporate a 1/8 inch radius at the end from which the cord emerges (bending point). A knot shall be tied near the free end of the cord and a one pound weight shall be hung from the knot to maintain the cord in a vertical position. The cord assembly shall be suspended thru the test bar in a manner to prevent flexing between the top of the one inch bar and the attachment point of the stay cord. The test apparatus shall provide an electrical potential of 6 VDC for each conductor under test. A control circuit shall be provided that will positively detect a current interruption of 5 milliseconds or less to prevent broken conductor from flexing with ends touching without detection. The metal bar, supported horizontally, shall then be rotated about its longitudinal axis back and forth through an angle of 120 degrees (60 degrees each side of vertical) at a rate of approximately 85 cycles per minute. The arithmetical mean of the flexing cycles of the sample of the cord before electrical discontinuity occurs shall be taken as the flexing life of the cord.

4.9.1.2.1.1 Tin-coating. The tin-coating on the conductor strands and the continuity, adherence and finish shall pass the applicable tests specified in ASTM Standard B33-63. (See 3.8.1.1.2).

4.9.1.3 Dielectric strength. Each length of finished cord shall be subjected to an alternating potential as outlined in 3.8.3.1. The voltage source shall have a capacity of not less than 3 kva.

4.9.1.4 Insulation resistance. Immediately after the cord has successfully withstood the dielectric strength test, the insulation shall be measured. Measurements shall be made using procedures indicated in 4.9.1.3. If the measurement is made at any other temperature, the contractor shall correct the measured value of insulation resistance to 15.5°C. The contractor shall demonstrate that the correction factor is accurate for his compound. In making the insulation resistance test, the test may be terminated in less than one minute if the galvanometer has ceased fluctuating and the reading indicates that a steady insulation resistance value has been obtained.

4.9.1.5 Isolation. The cable assembly shall be tested for electromagnetic and electrostatic isolation to determine compliance with the limits specified herein.

4.9.1.6 Conductor strain relief.

4.9.1.6.1 Pull test at cable clamp. A pull of 30 pounds shall be applied for a minimum of 2 minutes to the cable in the direction of the axis of the cable as it passes through the cable clamp mounted on the headset.

4.9.1.6.2 Pull test at telephone plug. A pull of 25 pounds shall be applied for a minimum of 2 minutes to the cable in the direction of the axis of Telephone Plug U-174/U.

4.9.1.6.3 Pull test at plug connector. A pull of 8 pounds shall be applied for a minimum of 30 minutes to the cable in the direction of the axis of Plug Connector U-172/U and U-173/U.

4.10 Operational test. Prior to acceptance, each completely assembled unit shall be tested by a talk test to insure correct wiring and satisfactory operation.

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

4.12 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.

Microphone element.
Microphone boom.
Earphone elements.

4.13 Service conditions tests. The service conditions tests shall conform to the test sequence of table VIII.

4.13.1 High temperature. The equipment shall be subjected to the test of Method 501, Procedure I, of MIL-STD-810. In step 4, the operating temperature shall be 65.5°C (150°F). The test of 4.10 shall be performed in Step 5. In Step 7, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with degradation not to exceed 3 dB.

4.13.2 Low temperature. The equipment shall be subjected to the test of Method 502, Procedure I, of MIL-STD-810. The storage temperature (Step 2) shall be -57°C (-70°F) and shall be maintained for a period of not less than 2 hours following stabilization of the test item. Low operating temperature (Step 4) shall be -40°C (-40°F). The test of 4.10 shall be performed in Step 5. In Step 7, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with degradation not to exceed 3 dB.

4.13.3 Humidity. The equipment shall be subjected to the test of Method 507, Procedure II, of MIL-STD-810. In Step 6, the test of 4.10 shall be performed during the last 5 hours of the last cycle. In Step 8, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with degradation not to exceed 3 dB.

4.13.4 Altitude.

4.13.4.1 Altitude test (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 5000 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 3.5.1 and 3.6.1.

4.13.4.2 Altitude test (non-operating). 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 (approximately 50,000 feet), and 30 minutes at 30 inches of mercury (approximately sea level). The pressure transition shall be approximately 5000 feet per minute. After the fifth cycle, 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 3.5.1 and 3.6.1.

4.13.5 Immersion. The equipment shall be subjected to the test of Method 512, Procedure I, of MIL-STD-810. Following the immersion period, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with no degradation in performance. This test shall be performed prior to and following vibration and shock testing of the same sample test item.

4.13.6 Sand and dust. The equipment shall be subjected to the test of Method 510, Procedure I, of MIL-STD-810. In Step 5, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with no degradation in performance.

4.13.7 Salt fog. The equipment shall be subjected to the test of Method 509, Procedure I, of MIL-STD-810. Operation of the equipment shall not be required and failure criteria shall be limited to corrosion of finishes and metals only. Such corrosion shall be defined as any visible degradation of the equipment surfaces that can be attributed to flakey, pitted, blistered, or otherwise loosened finish or metal surface.

4.13.8 Fungus. The equipment shall be subjected to the test of Method 508, Procedure I, of MIL-STD-810. Operation of the equipment is not required but examination at the conclusion of the exposure period shall reveal no evidence of viable fungus on any surfaces.

4.13.9 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 3.5.1 and 3.6.1.

4.13.10 Vibration. The equipment shall be subjected to sinusoidal vibration over a frequency range of 5 to 20 cps at a constant displacement of 0.10 inches, and over a frequency range of 20 to 500 cps at a constant acceleration of 2 g's. One vibration cycle (5 to 500 to 5) shall consume 15 minutes and shall be at a linear rate such that the sweep time for the 5-20-5 range is 6 minutes, the 20-110-20 range is 5 minutes, and the 110-500-110 range is 4 minutes. The test items shall be mounted in a horizontal position and cycled as above with vibration in a direction perpendicular to the plane of the earphone and microphone for a period of 2 hours. Upon completion of the test, the equipment shall be undamaged and shall meet the requirements of 3.5.1 and 3.6.1 with degradation not to exceed 3 dB.

4.13.11 Shock, drop. The microphone and earphone elements shall be dropped at random from a height of 6 feet, 12 times on a concrete floor. At completion of the test, the equipment shall meet the requirements of 3.5.1 and 3.6.1 with degradation not to exceed 3 dB. There shall be no evidence of breaking, cracking, or physical damage. Minor chipping shall not be considered a failure.

Table VIII- Test Sequence

	Unit 1	Unit 2	Unit 3	Unit 4
Altitude	1			
Low Temperature		1		
High Temperature			1	
Sand & Dust				1
Immersion				2 & 5
Humidity	2			
Vibration				3
Shock, drop				4
Blast		2		
Salt fog		3		
Fungus			2	

4.14 Government verification of calibration system. All operations performed by the contractor in compliance with MIL-C-45662 will be subject to government verification at unscheduled intervals.

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

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified. (see 6.2).

5.1.1 Level A.

5.1.1.1 Cleaning. Headset, Microphone Kit MK-1564( )/AIC shall be cleaned in accordance with C-1 of MIL-P-116.

5.1.1.2 Drying. Headset, Microphone Kit MK-1564( )/AIC shall be dried in accordance with the applicable procedure of MIL-P-116.

5.1.1.3 Preservation application. None required.

5.1.1.4 Unit packaging. Unit packaging shall be in accordance with the methods prescribed in MIL-P-116 as specified herein.

5.1.1.4.1 Technical literature. Each technical literature shall be packaged method 1C-1.

5.1.1.4.2 Headset, Microphone Kit MK-1564( )/AIC. Each Headset, Microphone Kit MK-1564( )/AIC shall be individually packaged method III as follows: Cushion each kit by wrapping in paperboard conforming to PPP-P-291, type 1 and secure with tape conforming to PPP-T-45, type III, grade A. Place the cushioned kit with the technical literature packaged as specified in 5.1.1.4.1 within a close-fitting box conforming to PPP-B-566, variety 2, style II. Closure shall be in accordance with the box specification.

5.1.1.4.3 Intermediate container. A quantity of 25 each kits shall be placed in a close-fitting box conforming to MIL-B-43014A, style II, type A. Fill all voids with paperboard conforming to PPP-P-291, type 1, to prevent movement. Closure shall be in accordance with the appendix of the box specification.

5.1.2 Level C. Headset, Microphone Kit MK-1564( )/AIC, shall be preserved and packaged in a manner that will afford adequate protection against physical and environmental damage during shipment, handling and limited intransit storage.

5.2 Packing. Packing shall be level A, B or C as specified. Shipping containers for all levels shall be capable of stacking and supporting superimposed loads during shipment and storage without damaging the container or its contents. (See 6.2).

5.2.1 Level A.

5.2.1.1 Consolidation. A quantity of intermediate containers packaged as specified in 5.1.1.4.3 shall be packed within a close-fitting fiberboard box conforming to PPP-B-636, type CF, class weather-resistant. Box closure shall be as specified in the appendix of the box specification. To facilitate palletization, fiberboard boxes shall be uniform in size and contain equal quantities of the packaged items to the greatest extent practicable.

5.2.1.2 Palletized load. A quantity of containers, packed as specified in 5.2.1.1, shall be placed on a pallet, load type 1, conforming to MIL-STD-147 except that the pallet shall be soft wood conforming to NN-P-71, type IV, size 2. A fiberboard cap shall be employed over the load having two sides extending down the stacked load at least 12 inches to accommodate marking requirements. The cap shall be fabricated of fiberboard conforming to PPP-F-320, class weather-resistant, W5s or V3c. The load shall be "bonded" to the pallet by strapping.

5.2.1.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.1.1 shall be waterproofed with tape conforming to PPP-T-76, in accordance with the taping requirements of the appendix of the box specification. A quantity of the waterproofed containers shall be placed within a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621,style 4, class 2; or PPP-B-585, style 2 or 3, class 3. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids, laid flat, shall be applied in accordance with the requirements of the specification or if not specified in the specifications in a manner which will adequately support the item and facilitate the use of material handling equipment, closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type 1, class B.

5.2.2 Level B.

5.2.2.1 Consolidation. A quantity of intermediate containers packaged as specified in 5.1.1.4.3 shall be packed as specified in 5.2.1.1.

5.2.2.2 Palletized load. A quantity of containers, packed as specified in 5.1 shall be palletized as specified in 5.2.1.2.

5.2.2.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.2.1 shall be reinforced by pressure-sensitive filament tape conforming to PPP-T-97, type IV as specified in the appendix of the box specification. No further packing shall be required.

5.2.3 Level C.

5.2.3.1 Consolidation. A quantity of intermediate containers packaged as specified in 5.1.1.4.3 shall be packed as specified in 5.2.1.1, except that the fiberboard boxes shall be class domestic.

5.2.3.2 Palletized load. A quantity of containers, packed as specified in 5.2.3.1, shall be palletized as specified in 5.2.1.2 except that the fiberboard cap shall be domestic.

5.2.3.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.3.1 shall be used as the shipping container. No further packing shall be required.

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 MIL-STD-129.

6. NOTES

6.1 Intended use. The equipment covered in this specification is intended for use as audio accessories for regular and extra large Helmet, Flying Type SPH-4.

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. Levels of preservation and packaging and packing (see section 5).

d. When rough handling and functional tests are required.

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 parenthese in the nomenclature will be deleted or replaced by a letter identifying the particular design; for example: MK-1564W/AIC. 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 or the adequacy of corrective action.

Custodian:

ARMY-EL

Preparing Activity:

ARMY-EL

Project No. 5965-A107