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3 January 1985
SUPERSEDING
MIL-M-49199(CR)
30 May 1980

MILITARY SPECIFICATION

MICROPHONE, LINEAR M-162/AIC

GENERAL SPECIFICATIONS FOR

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

1. SCOPE

1.1 Scope. This specification covers DC powered, high gain, linear noise-cancelling microphones, designated Microphone, Linear M-162/AIC, which is a component of the Airborne Communications System. This microphone is designed for use with the C-10414/ARC Communications System Control.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

L-P-378	-	Plastic Sheet and Strip, Thin Gauge, Polyolefin.
NN-P-71	-	Pallet, Material Handling, Wood, Stringer Construction, 2 Way And 4 Way (Partial).
QQ-S-781	-	Strapping, Steel, And Seals.
PPP-B-566	-	Box, Folding, Paperboard.
PPP-B-601	-	Boxes, Wood, Cleated Plywood.
PPP-B-621	-	Box, Wood, Nailed and Lock-corner.
PPP-B-636	-	Box, Shipping, Fireboard.
PPP-B-676	-	Boxes, Setup.

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MIL-P-116	-	Preservation, Methods of.
MIL-C-572	-	Cords, Yarns and Monofilaments Organic Synthetic Fiber.
MIL-I-4997	-	Insulating and Jacketing Compounds For Use in Cords, Cordages, and Cables.
MIL-E-5400	-	Electronic Equipment, Aerospace, General Specification for.
MIL-F-14072	-	Finishes for Ground Electronic Equipment.
MIL-C-27072	-	Cable, Special Purpose, Electrical, Multiconductor.
MIL-C-55668	-	Cord, Electrical; Audio, Subminiature (Retractile and Straight).

STANDARDS

FEDERAL

FED-STD-228	-	Cable and Wire, Insulated, Methods of Testing.
FED-STD-595	-	Colors.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Communications - Electronics Command, ATTN: DRSEL-ED-TO, Fort Monmouth, New Jersey 07703 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	-	Marking for Shipment and Storage.
MIL-STD-147	-	Palletized Unit Loads.
MIL-STD-202	-	Test Methods for Electronic and Electrical Component Parts.
MIL-STD-461	-	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
MIL-STD-462	-	Electromagnetic Interference Characteristics, Measurement of.
MIL-STD-781	-	Reliability Design Qualification and Production Acceptance Test: Exponential Distribution.
MIL-STD-794	-	Part And Equipment, Procedures for Packaging and Packing of.
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines.
MIL-STD-831	-	Test Reports, Preparation of.
MIL-STD-1285	-	Marking of Electrical and Electronics Parts.
MIL-STD-45662	-	Calibration Systems Requirements.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

DRAWINGS

ARMY

D6 001 626	-	Plug, Microphone.
DL D6 001 613	-	Cord Assembly.

NAVY

DS-AF0200C(A)	-	Appendix A, Nuclear Survivability.
SK-N-864	-	Simulated Gun Blast Producing Equipment.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S3.2 - 1960 - Monosyllabic Word Intelligibility.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018).

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 General. The requirements of MIL-E-5400 for class 1 equipment apply as requirements of this specification with the exceptions and additions called out herein. When the two specifications conflict, this specification shall govern.

3.1.1 Approval of nonstandard parts and materials. The requirement of MIL-E-5400 for category III equipment shall apply.

3.2 First article. When specified, the contractor shall furnish sample units for first article inspection and approval (see 4.5, 6.2, and 6.3).

3.3 Standard model. When stated in the contract or purchase order, a model equipment, Microphone, Linear M-162/AIC, will be made available to the contractor on loan to be used as a general guide except in instances where specific improvements are detailed herein or where requirements dictate changes. The model equipment shall not be subjected to any destructive tests nor shall any part or component (with the exception of subassemblies retained by machine screws, or the like) be removed or disassembled.

Item	Description	Quantity
1	Microphone, Linear M-162/AIC	2
2	Helmet, Flyers SPH-4	2

3.4 Component parts. The microphone shall be supplied with the following components which are part of headset microphone kit MK-1564()/AIC:

a. One each Microphone and Boom Assembly (standard "ball and socket" type).
b. One each Cord Assembly (14 inches in length) per Army drawing DL D6 001 613.

3.5 Design. The microphone shall be stable in mechanical construction, electrical characteristics, and acoustical performance.

3.5.1 Aging. The microphone shall not contain parts fabricated from materials known to change their properties appreciably because of aging.

3.5.2 Nuclear survivability. Nuclear survivability shall be considered in the selection of materials to be utilized in the fabrication of M-162/AIC microphones. The microphones shall be designed toward withstanding the nuclear environment specified in appendix A to DS-AF-0200C(A).

3.6 Construction.

3.6.1 Reduction on material. Natural rubber or natural rubber cement shall not be used in the microphone. Rubber substitutes and plastic materials shall not be used as wedges and fillers.

3.6.2 Microphone material. The voltage generating element shall be an electret condenser, piezoelectric ceramic, polyvinylidene fluoride (PVF_2), or equivalent material giving demonstrated similar results.

3.6.3 Microphone amplifier, internal. The internal microphone amplifier shall be capable of accepting impressed power from the intercommunication systems at a maximum supplied power level of 10 V dc at 8 milliamperes (mA). The internal microphone amplifier shall incorporate a bridge circuit to preclude the need for polarization of the microphone connector. The amplifier will reflect sufficient gain to provide a nominal 18 millivolts (mV) audio output when connected to a 150 ohm load when subjected to 105 decibels (dB) re. 20 micropascals (uPa), one-fourth inch from the face of the microphone.

3.6.4 Cement. To insure uniform adhesion and strength characteristics, any cement used shall be properly and uniformly controlled and cured throughout production.

3.6.5 Microphone shield. To preclude the effects of electromagnetic interference or susceptability, the microphone transducer and amplifier shall be shielded.

3.6.6 Cord assembly.

3.6.6.1 Conductors. The nominal area of each of the two conductors shall be AWG 25. Each conductor shall consist of bunch-stranded AWG No. 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 inch squared (lb/in^2) and have a conductivity grade of at least 80 percent. The two conductors shall be twisted together to have a length of lay of 3/8 inch ±1/4 inch.

3.6.6.2 Insulation. The insulation shall consist of extruded Teflon not less than 0.006 inch thick. The insulation shall withstand a potential of 1,000 volts of a commercial line frequency when applied in accordance with method 6211 of FED-STD-228.

3.6.6.3 Shield. A shield of closely woven braid of coated copper strands shall be applied to provide coverage of not less than 90 percent (see MIL-C-27072 shield requirement). The strands shall conform to the requirements for conductors (see 3.6.5.1). The metallic coating of the shield shall be similar to the metallic coating of the conductors of the wire to which the shield is applied. The braided shield shall not increase the maximum diameters of the type specified by more than 0.030 inch. The shield shall provide both electrostatic and electromagnetic protection for the internal conductors.

3.6.6.4 Color code. The insulation for the two conductors shall consist of one green and one red for circuit identification.

3.6.6.5 Staycord. Staycord shall consist of a fiber conforming to MIL-C-572, type PAA. The cord shall have a minimum breaking strength of 20 pounds for cords of 2, 3, and 4 conductors. The filaments of the staycord shall be bonded together with a fungus-inert adhesive in order to facilitate knotting during termination of the finished cord.

3.6.6.6 Jacket. The cable assembly shall be covered with a vulcanized rubber jacket in accordance with MIL-C-55668.

3.6.6.7 Plug, microphone. The microphone plug shall be in accordance with U.S. Army drawing no. 06 001 626.

3.7 Performance.

3.7.1 Magnetic.

3.7.1.1 Effect of external magnetic field (see 4.7.2.1). The sensitivity of the microphone to an external 400 Hertz (Hz) magnetic field shall be not more than 25 percent of that of a coil consisting of 123 turns of no. 34 enameled wire closely wound in a single-layer solenoid upon a nonconductive, nonmagnetic mandrel 0.500 inch in diameter, placed in the same magnetic field.

3.7.1.2 Stray magnetic field of the microphone (see 4.7.2.2). The stray magnetic field of the microphone shall cause no more than a 5-degree deflection of a magnetic compass at a distance of 12 inches.

3.7.1.3 Effects of electromagnetic interference (see 4.7.2.3). When tested as specified, the effects of electromagnetic interference on microphones shall be in accordance with MIL-STD-461 in the following areas of concern:

a. Conducted emissions.
b. Radiated emissions.
c. Radiated susceptibility.

NOTE: Conducted susceptibility test does not apply to 2-wire devices because signal and power are on the same conductors.

3.7.2 Electrical.

3.7.2.1 Impedance (see 4.7.3.1). The electrical impedance of Microphone M-162/AIC at any frequency over the range of 400 to 6,000 Hz shall be such that the output voltage shall remain 18 mV ±3 dB when connected to a 150 ohm load impedance.

3.7.2.2 Insulation resistance (see 4.7.3.2). The insulation resistance between the conductors and case shall be not less than 10 megohms.

3.7.2.3 Dielectric withstanding voltage (see 4.7.3.3). The microphone shall withstand, without flashover or breakdown, the application of a 100 volt alternating potential of commercial line frequency when tested as specified herein.

3.7.3 Acoustical.

3.7.3.1 Sensitivity.

3.7.3.1.1 Sensitivity at ground level (see 4.7.4.1.1). When measured as specified herein, the sensitivity of the microphone at ground level shall be 18 mV ±3 dB. After subjection to any or all environmental tests, sensitivity shall not vary by more than 3 dB from the initial reading.

3.7.3.1.2 Sensitivity at altitude (see 4.7.4.1.2). At a simulated altitude of 15,000 feet, the sensitivity shall be within ±3 dB relative to the sensitivity measured at ground level.

3.7.3.2 Frequency response.

3.7.3.2.1 Frequency response at ground level (see 4.7.4.2.1). The frequency response characteristic of the microphone at ground level, with moisture barrier in place, between 400 and 6,000 Hz, shall be within the response envelope shown on figure 1 herein. After subjection to any or all environmental tests, the frequency response shall not vary by more than 3 dB from the initial readings

3.7.3.2.2 Frequency response at altitude (see 4.7.4.2.2). The frequency response characteristics of the microphone at a simulated altitude of 15,000 feet shall be within 3 dB of the figure measured at ground level.

3.7.3.2.3 Frequency response under pressure differential (see 4.7.4.2.3). The frequency response characteristic of the microphone, with moisture barrier in place and subjected to an internal pressure of ±1/8 pound per square inch of air, shall not differ appreciably from the frequency response characteristic of the microphone with no pressure difference between the interior and exterior of the moisure barrier.

3.7.3.3 Psychoacoustic (see 4.7.4.3). The microphones shall enable the listeners to achieve a score of 90 percent or better.

3.7.3.4 Noise-immunity characteristic (see 4.7.4.4). The noise-immunity characteristic of the microphone shall intersect the zero axis at 2,500 Hz minimum, and have a slope of at least 6 dB per octave (see figure 2).

3.7.3.5 Linearity (see 4.7.4.5). The output of the microphone shall be a linear function of the sound pressure input to the microphone in the range of inputs from 74 to 124 dB inclusive, relative to 20 µPa at any frequency between 400 and 6,000 Hz.

3.7.3.6 Harmonic distortion (see 4.7.4.6). The harmonic distortion in the output of the microphone at any frequency between 400 and 6,000 Hz shall not exceeed 1 percent with an input sound pressure level of 110 dB single propellant loading (spl) and shall not exceed 5 percent with a spl input of up to 125 dB, relative to 20 µpa.

3.7.4 Cord, cordage, and cables.

3.7.4.1 Temperature range (see 4.7.5.1). The cable shall be flexible and resilient throughout the temperature range of -55°C to +85°C and shall show no evidence of cracking or any other damage as a result of exposure to the temperature range specified herein.

3.7.4.2 Flexing life (see 4.7.5.2). The unterminated cable shall have a mean flex life of 300,000 flexes without showing evidence of the following

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

3.7.4.3 Cord anchorage (see 4.7.5.3). The cord and its anchorage in the two connector plugs shall withstand an 8-pound pull applied to the connector plug for a period of 30 minutes without damage to the cord and anchorage.

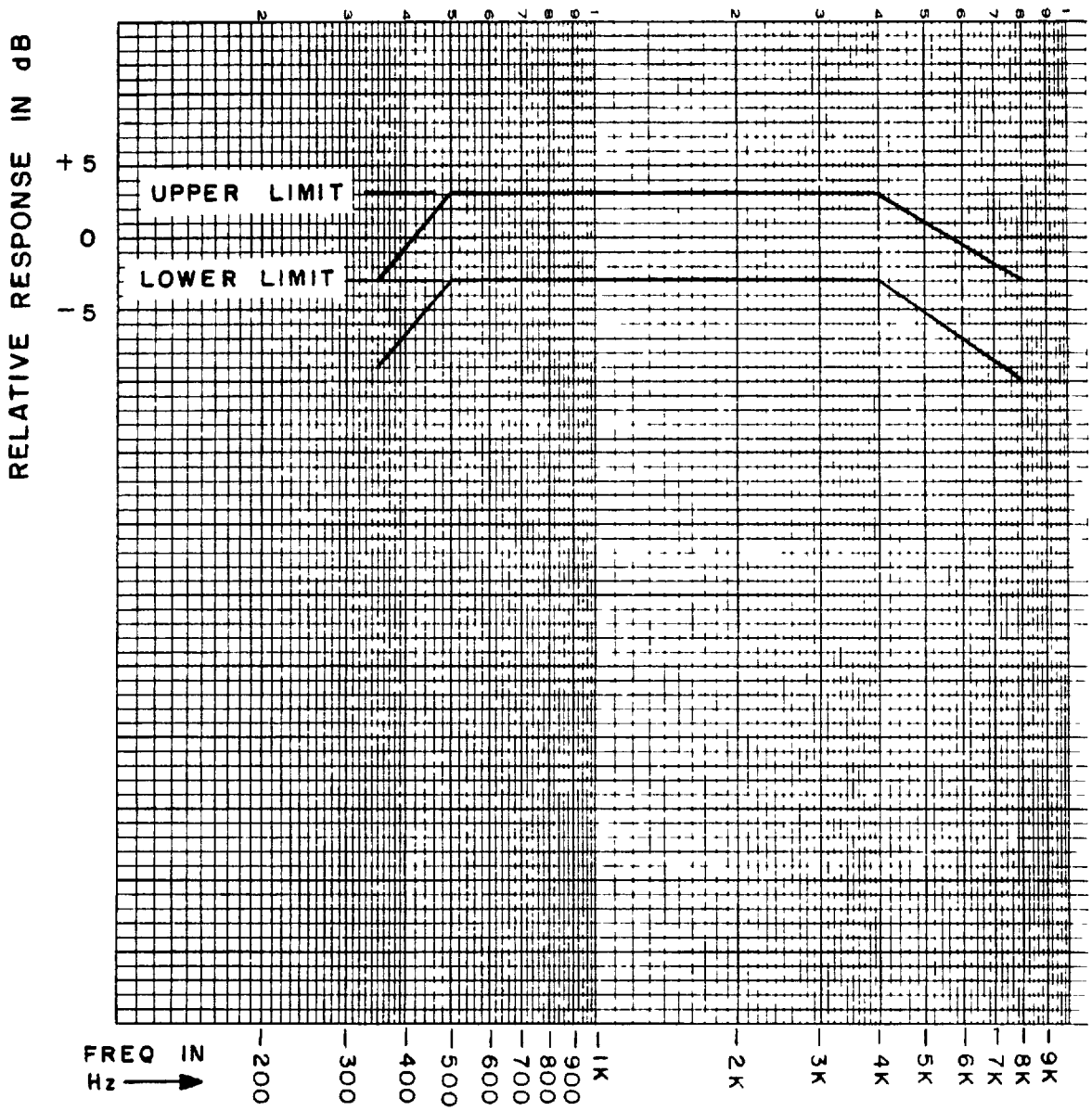

FIGURE 1. Frequency response - limit curves.

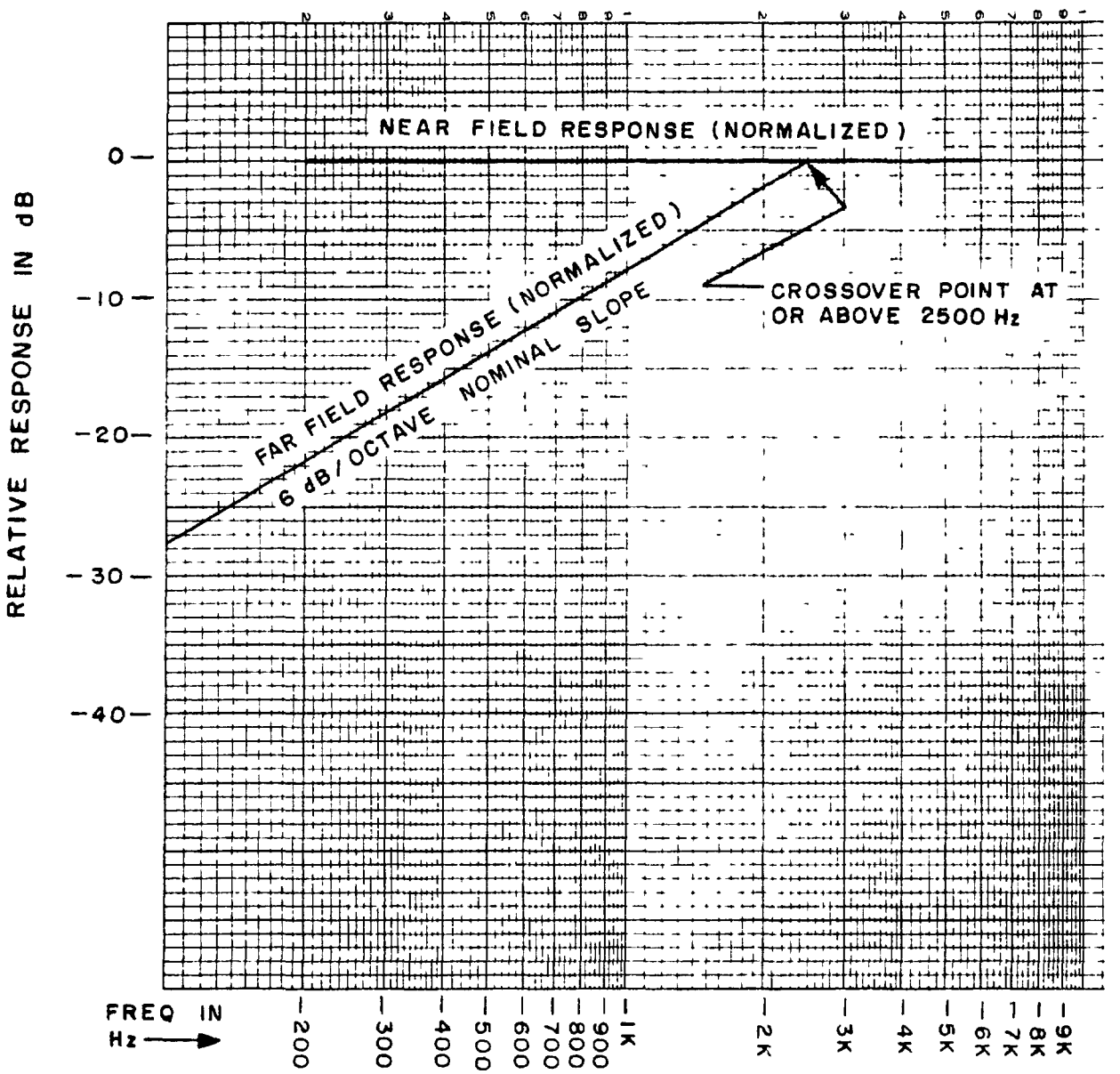

FIGURE 2. Noise-immunity chracteristic limits.

3.7.4.4 Conductor strain relief and twist relief (see 4.7.5.4). The cord shall be anchored in the two connector plugs so as to provide strain relief for the conductors. Means shall be provided to prevent twisting or inward movement of the cord in the connector plug.

3.7.4.5 Dielectric withstanding voltage of cord assembly (see 4.7.5.5). The finished cord assembly shall meet the dielectric strength requirements of MIL-I-4997.

3.7.4.6 Insulation resistance of cord assembly (see 4.7.5.6). The insulation resistance of the finished cord assembly shall be in accordance with MIL-C-55668.

3.7.5 Environmental.

3.7.5.1 Pressure equalization (see 4.7.6.1). Provisions shall be made to equalize the pressure between the ambient outside the microphone and the interior of the microphone including the space inclosed by the moisture barrier. The microphone shall meet the requirements of 3.7.2.1, 3.7.3.1.1, and 3.7.3.2.1.

3.7.5.2 Microphone positioning adjustment (see 4.7.6.2). The microphone positioning adjustment shall provide a noncritical adjustment to obtain a torque of 30 to 50 inch-ounces. From an initial setting of 40 inch-ounces, 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.

3.7.5.3 Temperature altitude (see 4.7.6.3). The microphone shall meet the requirements of 3.7.3.1.2 and 3.7.3.2.2.

3.7.5.4 Humidity (see 4.7.6.4). The microphone shall meet the requirements of 3.7.3.1.1.

3.7.5.5 Immersion (see 4.7.6.5). The microphone shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

3.7.5.6 Dust (see 4.7.6.6). The microphone shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

3.7.5.7 Salt fog (see 4.7.6.7). The microphone shall show no corrosion of finishes and metals. 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 of metal surface.

3.7.5.8 Fungus (see 4.7.6.8). The microphone assembly shall pass, if after 28 days, based on visual examination, it shows no more than only sparse microbial growth with restricted tuberal growth development in an area of 1 to 10 percent or less of the total area and no more than six unrelated minute colonies with mycelical development in areas only in other than critical circuit portions, such as terminal spacing, printed circuit boards, etc., with sparse growth due to random contamination or traces of unmixed material ingredients. The equipment shall fail if it shows more than the growth specified above.

3.7.5.9 Blast (see 4.7.6.9). The microphone shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

3.7.5.10 Vibration (see 4.7.6.10). The microphone shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

3.7.5.11 Shock-drop (see 4.7.6.11). The microphone shall meet the requirements of 3.7.2, 3.7.3.1.1, and 3.7.3.2.1. There shall be no evidence of breaking, cracking, or other structural damage.

3.7.5.12 Rain (see 4.7.6.12). The microphone shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

3.8 Weight. The weight of the microphone including boom and cord assembly shall not exceed 50 grams.

3.9 Color. The exterior surface of the microphone shall be colored a semigloss black, 27038, in accordance with FED-STD-595. Exterior finish shall be in accordance with MIL-F-14072.

3.10 Identification of product. The identification marking on the microphone shall include the following information only.

MICROPHONE, LINEAR M-162/AIC
MANUFACTURER'S NAME OR FSCM
ORDER NO. * (Government order number)

* Data to be inserted by the contractor per MIL-STD-1285. Marking shall be done in accordance with MIL-STD-1285.

3.11 Reliability. θ_1 = 2,500 hours with a duty cycle of 1 minute on to 12 seconds off. Test conditions for temperature, vibration, and moisture shall be as required by paragraph 50.5, Appendix B of MIL-STD-781.

3.12 Workmanship. Microphones shall be processed in such a manner as to be uniform in quality and shall be free from loose or deposited foreign material or other defects that will affect life, serviceability, or appearance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsible for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.2.1 Test fixtures. The fixtures used to position the calibrating microphone or the test microphone element with respect to the sound source shall be designed to minimize any possible error in acoustical measurements owing to vibration, sound transmitted from the voice tube, unstable positioning of microphone elements, reflections from fixtures or environment (such as the interior of an altitude chamber), and ambient noise. No baffles shall be used near the sound sensitive parts of the microphone elements, the test fixtures shall be so designed that there is no possibility of error in acoustical measurements owing to sound reflection from surfaces of the test fixture.

4.3 Classification of inspection. The inspections specified herein shall be classified as follows.

a. First article inspection (see 4.5).
b. Quality conformance inspection (see 4.6).

4.4 Test conditions. Unless otherwise specified (see 6.2), the microphone shall be tested under the following conditions

a. Temperature: Room ambient, (+15°C to +35°C).
b. Pressure: Normal atmosphere.
c. Humidity: Prevailing ambient up to 90 percent relative humidity.

4.4.1 Close sound source.

4.4.1.1 Simulator microphone signal (artifical voice). An artifical voice such as a Bruel & Kyaer (B&K) type 4219 shall be used as the sound source in performing the sensitivity and close-response frequency characteristic measurement specified herein. The artificial voice shall be calibrated with a B&K type 4133 1/2-inch microphone or demonstrated equivalent, which shall have calibration traceable to National Bureau of Standards.

4.4.1.2 Reference sound pressure level. All measurements shall be made at such a sound pressure level that the harmonic distortion or the noise produced in the test microphone by the air pumped through the orifice of the artifical voice at low frequencies shall be sufficiently small so as not to introduce a significant measurement error. For the purpose of this specification, all sensitivity data, regardless of the actual sound pressure level used in the measurements, shall be referred to a sound pressure level of 105 dB relative to 20 μPa.

4.4.1.3 Calibration of close sound source. The sound source shall be calibrated to produce a desired sound pressure at the grid of the B&K type 4133 microphone over the frequency range of 400 to 6,000 Hz. The microphone will have been previously calibrated using a B&K type 4220 piston-phone, or equal. The grid of the type 4133 microphone shall be spaced one-quarter inch from and coaxial with the mouth of the artifical voice during calibration. The sound source shall be calibrated at each altitude at which it is used.

4.4.2 Plotting of frequency response characteristic. The frequency response characteristic of the microphone shall be plotted on a graphic level recorder (B&K type 2305, or equivalent) using semi-ogarithmic coordinate paper with the response in dB on the linear ordinate scale and the frequency in Hz on the logarithmic abscissa scale. The length of a 100-to-1 frequency interval on the abscissa scale shall equal the length of 50 dB on the ordinated scale (graphic level recorder paper B&K type QP1124, or equivalent).

4.5 First article inspection. First article inspection shall be performed by the contractor after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production.

4.5.1 Sample size. Ten microphones shall be subjected to first article inspection. Additionally, 10 unterminated cables shall be provided for flexing life testing.

4.5.1.1 Test sample for the contracting activity. When first article inspections are conducted at a location other than the laboratory of the contracting activity, an additional quantity of three untested samples shall be furnished to the contracting activity for such additional inspections as may be desired.

4.5.2 Data to accompany test samples. Test sample quantities specified in 4.5.1 and 4.5.1.1 shall be accompanied by the following data.

a. A compilation of the extent of compliance with each requirement in section 3. This shall be done paragraph by paragraph with no omission.
b. A compilation of the contractors' intentions with regard to any variation or deviation which may appear in the compilation of 4.5.2a.

4.5.3 Test program and report. When first article tests are to be conducted at a location other than the laboratory of the contracting activity, the contractor shall furnish the following:

a. Test program for approval.
b. Test report.

4.5.3.1 Test program. Prior to any formal first article testing, the contractor shall submit a Proposed First Article Test Program for approval consisting of the following items:

a. A list of all tests to be performed.
b. Complete procedures for each test to be performed including block or schematic diagrams.

c. A list of test equipment to be used identified by manufacturer and model number in case of standard test equipment or described by parameters and characteristics in the case of nonstandard test equipment.
d. Copies of all data record forms to be used in recording and reporting test data.

4.5.3.2 Test report. Upon completion of preproduction testing in accordance with an approved test program, the contracting activity shall be provided with three copies of a test report in accordance with MIL-STD-831.

4.5.4 Inspection routine. The sample shall be subjected to the inspections specified in table I, in the order shown. All sample units shall be subjected to the inspections of group I. The sample shall then be divided equally into two groups and subjected to the inspections for their particular group.

4.5.5 Failures. More than one failure in group I and any failure in group II or III shall be cause for refusal to grant first article approval.

TABLE I. First article inspection.

Inspection	Requirement paragraph	Test method paragraph
Group I		
Visual and mechanical inspection	3.4, 3.5, 3.6, 3.8, 3.9, 3.10, and 3.12	4.7.1
Effect of external magnetic field	3.7.1.1	4.7.2.1
Stray magnetic field of the microphone	3.7.1.2	4.7.2.2
Impedance	3.7.2.1	4.7.3.1
Insulation resistance	3.7.2.2	4.7.3.2
Dielectric withstanding voltage	3.7.2.3	4.7.3.3
Sensitivity at ground level	3.7.3.1.1	4.7.4.1.1
Sensitivity at altitude	3.7.3.1.2	4.7.4.1.2
Frequency response at ground level	3.7.3.2.1	4.7.4.2.1
Frequency response at altitude	3.7.3.2.2	4.7.4.2.2
Frequency response under pressure differential	3.7.3.2.3	4.7.4.2.3
Group II		
Psychoacoustic	3.7.3.3	4.7.4.3
Noise immunity	3.7.3.4	4.7.4.4
Linearity	3.7.3.5	4.7.4.5
Harmonic distortion	3.7.3.6	4.7.4.6
Cord, cordage and cable		
Temperature range	3.7.4.1	4.7.5.1
Flexing life (cable unterminated)	3.7.4.2	4.7.5.2
Cord anchorage	3.7.4.3	4.7.5.3
Conductor strain relief and twist relief	3.7.4.4	4.7.5.4
Dielectric withstanding voltage of cord assembly	3.7.4.5	4.7.5.5
Insulation resistance of cord assembly	3.7.4.6	4.7.5.6
Group III Environmental		
Subgroup A (2 samples)		
Pressure equalization	3.7.5.1	4.7.6.1
Temperature altitude	3.7.5.3	4.7.6.3
Humidity	3.7.5.4	4.7.6.4
Blast	3.7.5.9	4.7.6.9
Subgroup B (2 samples)		
Microphone positioning adjustment	3.7.5.2	4.7.6.2
Effects of electromagnetic interference (EMI)	3.7.1.3	4.7.2.3
Rain	3.7.5.12	4.7.6.12
Salt fog	3.7.5.7	4.7.6.7
Subgroup C (1 sample)		
Dust	3.7.5.6	4.7.6.6
Vibration	3.7.5.10	4.7.6.10
Shock-drop	3.7.5.11	4.7.6.11
Immersion	3.7.5.5	4.7.6.5
Fungus	3.7.5.8	4.7.6.8

4.6 Quality conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspections. Except as specified in 4.6.1.4.4, delivery of products which have passed groups A and B inspections shall not be delayed pending the results of group C inspection.

4.6.1.1 Inspection lot. An inspection lot shall consist of all microphones of the same type, produced under essentially the same conditions, and offered for inspection at one time.

4.6.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table II, in the order shown.

4.6.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level (AQL) shall be as specified in table II. Major and minor defects shall be as defined in MIL-STD-105. (Classification of major and minor defects for visual and mechanical inspection is shown in table V.)

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	AQL (percent defective)	
			Major	Minor
Visual and mechanical inspections	3.4, 3.5, 3.6, 3.8, 3.9, 3.10, and 3.12	4.7.1	1.0	4.0
Impedance	3.7.2.1	4.7.3.1	1.0	
Sensitivity at ground level	3.7.3.1.1	4.7.4.1.1	1.0	
Frequency response at ground level	3.7.3.2.1	4.7.4.2.1	1.0	

4.6.1.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.6.1.3 Group B inspection. Group B inspection shall consist of the tests specified in table III and shall be made on sample units which have been subjected to and have passed group A inspection.

4.6.1.3.1 Sampling plan. The sampling plan shall be in accordance with MIL-STD-105 for special inspection level S-4. The AQL shall be 6.5 percent defective.

TABLE III. Group B inspection.

Inspection	Requirement paragraph	Test method paragraph
Noise immunity	3.7.3.4	4.7.4.4
Linearity	3.7.3.5	4.7.4.5
Harmonic distortion	3.7.3.6	4.7.4.6
Temperature range	3.7.4.1	4.7.5.1
Flexing life (unterminated cable)	3.7.4.2	4.7.5.2
Conductor strain relief and twist relief	3.7.4.4	4.7.5.4

4.6.1.3.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.6.1.3.3 Disposition of sample units. Sample units which have passed the group B inspection may be delivered on the contract or purchase order if the lot is accepted and the sample units are still within specified electrical tolerances.

4.6.1.4 Group C inspection. Group C inspection shall consist of the tests specified in table IV, in the order shown. Group C inspection shall be made on sample units which have passed groups A and B inspections.

4.6.1.4.1 Sampling plan.

4.6.1.4.1.1 Sample size. Ten samples of the complete equipment shall be selected at random, 5 samples for each subgroup 1 and subgroup 2 in table IV. The samples shall be selected at the start of the contract from the first quality conformance inspection lot. These samples shall constitute the group C requirement for the first 1,000 units produced. Thereafter, 3 samples of the complete equipment shall be selected at random for subgroup 1 in table IV. These samples shall be selected once each month, or every 1,000 units, whichever occurs first.

TABLE IV. Group C inspection.

Inspection	Requirement paragraph	Test method paragraph
Subgroup 1 (5 sample units)		
Sensitivity at altitude	3.7.3.1.2	4.7.4.1.2
Frequency response at altitude	3.7.3.2.2	4.7.4.2.2
Psychoacoustic	3.7.3.3	4.7.4.3
Harmonic distortion	3.7.3.6	4.7.4.6
Pressure equalization	3.7.5.1	4.7.6.1
Humidity	3.7.5 4	4.7.6.4
Dust	3.7.5.6	4.7.6.6
Vibration	3.7.5.10	4.7.6.10
Subgroup 2 (5 sample units)		
Sub-Subgroup A (2 samples)		
Temperature altitude	3.7.5.3	4.7.6.3
Blast	3.7.5.9	4.7.6.9
Sub-Subgroup B (2 samples)		
Rain	3.7.5.12	4.7.6.12
Salt fog	3.7.5.7	4.7.6.7
Sub-Subgroup C (1 sample)		
Shock-drop	3.7.5.11	4.7.6.11
Immersion	3.7.5.5	4.7.6.5
Fungus	3.7.5.8	4.7.6.8

4.6.1.4.2 Failures. If one or more sample units fail to pass group C inspection, the sample shall be considered to have failed.

4.6.1.4.3 Disposition of sample. Sample units which have been subjected to group C inspection shall not be delivered on the contract or purchase order.

4.6.1.4.4 Noncompliance. If a sample fails to pass group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which are manufactured under essentially the same materials and processes, and which are considered subjected to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, group C inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Groups A and B

inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the group C inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.6.1.4.5 Defects in items already accepted. The investigation of a test failure could indicate that defects may exist in items already accepted. If so, the contractor shall fully advise the contracting activity of all defects likely to be found and the method of correcting them.

4.6.2 Inspection of packaging. The sampling and inspection of the preservation and interior pack marking shall be in accordance with the group A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129.

4.7 Methods of inspection.

4.7.1 Visual and mechanical inspection. The microphone shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.4, 3.5, 3.6, 3.8, 3.9, 3.10 and 3.12). Unless otherwise specified (see 6.2), the defects shall be classified as specified in table V. Particular attention shall be paid to the following:

a. Soldering operations.

b. Shield.

c. Diaphragm.

d. Uniformity and strength of cementing.

e. Connections to FET amplifier.

f. Security and cleanliness of microphone terminal connections to cable terminals.

g. Construction of microphone cord assembly.

h. Vent in microphone case for pressure equalization.

i. Cleanliness of vent holes throughout the microphone structure.

j. Workmanship regarding the fit and sealing of the microphone case and fit and sealing of the moisture barrier to the microphone.

k. Set screws holding the microphone plug to the microphone. (They shall be slotted, headless screws.)

4.7.2 Magnetic.

4.7.2.1 Effect of external magnetic field (see 3.7.1.1). The sensitivity of the microphone to an external ac magnetic field shall be measured by comparing the induced open-circuit voltage across the terminals of the microphone when placed in a 400 Hz magnetic field with the induced open-circuit voltage across the terminals of a calibrating coil of known sensitivity placed in the same magnetic field.

4.7.2.1.1 Field coil. The magnetic field for this test may be produced by a coil of about 700 turns of No. 18 enameled wire 6 inches by 6 inches in cross section or 6 inches in diameter and winding length of 10 inches.

4.7.2.1.2 Calibrating coil. The calibrating coil shall consist of a single-layer solenoid wound with 123 turns of No. 34 enameled wire on a nonconductive, nonmagnetic mandrel 0.5 inch in diameter.

TABLE V. Classification of defects for visual and mechanical inspection.

Defect type	Classification	
	Major	Minor
Dimensions	Dimensions not as specified	---
Materials and finish	Materials not as specified. Wrong or incomplete finish. Large amounts of flaking, peeling, or chipping of finish.	Scratches, cuts, abrasions, etc., causing exposure of base metal, or relatively small amounts of flaking, peeling, or chipping.
Parts	Missing parts. Inoperative, improperly assembled, or defective parts which could cause the unit to fail in service. Wrong parts.	Defective parts which would reduce efficency of use, but not cause failure in service. Cracks or chipped surfaces having no effect on the functioning, assembly, maintenance, or life of the unit.
Marking	Marking missing, illegible, or incorrect.	Markings dirty or smudged, but legible.
Foreign objects	Any metallic foreign object, not firmly attached 1/, which could cause a short circuit, or acoustical malfunctioning of the unit. Any nonmetallic foreign object such as insulation, dirt, or phenolic chips which could cause acoustical malfunctioning of the unit.	Any metallic or nonmetallic foreign object which affects appearance but which could not cause acoustical malfunctioning of the unit.
Soldering	Improper wrap - Less than 1/2 turn. Unsoldered joint - Solder not applied where intended. Insufficient solder - Minimum dimension of solder bridge less than twice the diameter of the wire or less than 3/32 inch, whichever is greater. Entire area of contact between wire and terminal not jointed by solder bridge. Cold solder joint - Chalky appearance, lacks metallic luster, presents rough "pile-up" appearance, movement of wire or solder upon pick application. Rosin joint - Presence of excess rosin; relative movement of wire or solder upon pick application. Insulation in terminal hole - Solder over insulation; no appearance of visible wire contour.	Improper wrap - 1/2 turn or more, but less than one turn. Excess solder - Build-up solder on joint greater than necessary for good soldering, usually resulting in obliteration of wire contour. Cold solder joint - Chalky appearance, lacks metallic luster, presents rough "pile-up" appearance, no relative action between wire and solder upon pick application.
Wiring	Wiring not in accordance with schematic diagram. Broken strands - More than 20 percent; except in a 7-strand conductor, more than 2 broken strands. Insulation burned, abrased, pinched, or deteriorated between two or more conductors, resulting in a potential short circuit. Taut wire - Wire exhibits no slack and subsequent breakage may occur due to stress on terminal or part. Insulation frayed to the extent that a potential short circuit exists.	Broken strands - 20 percent or less. In a 7-strand conductor, 2 broken strands. Insulation burned, abrased, pinched, or deteriorated, with exposure of bare wire, but short circuit not possible. Taut wire - Slight stress on conductor, but no possibility of subsequent breakage.

1/ Foreign objects that cannot be dislodged by the moderate application of pressure with a pick or spud shall be considered to be firmly attached.

4.7.2.1.3 Measurement procedure. Excite the field coil with about 250 mA or 400 Hz alternating current. Connect the microphone to an electronic voltmeter. Closely twist the leads from the microphone to the voltmeter. Orient the microphone in the center of the field coil for maximum output voltage and record this value. Then substitute the calibrating coil for the microphone. Orient the calibrating coil for maximum output voltage in that portion of the field coil previously occupied by the microphone and record the output voltage.

4.7.2.2 Stray magnetic field of microphone (see 3.7.1.2). The stray magnetic field of the microphone shall be determined using a Kauffel and Esser Type No. 5600 compass, or its approved equivalent. The microphone transducer shall be placed with its geometric center 12 inches from the pivot point of the compass needle and on the perpendicular bisector of the needle in the plane of rotation of the needle. The microphone shall be oriented in all directions and the maximum deflection of the compass observed. This test shall be in a location substantially free from stray magnetic disturbances.

4.7.2.3 Effects of electromagnetic interference (EMI) (see 3.7.1.3). Microphones shall be subjected to the following test procedures of MIL-STD-462, Notice 3.

a. Conducted emissions - Method CE05.
b. Radiated emissions - Method RE02.
c. Radiated susceptibility - Methods RS01 and RS03.

4.7.3 Electrical.

4.7.3.1 Impedance (see 3.7.2.1). The microphone shall be placed in front of the sound source as specified in 4.4.1. The microphone shall be supplied with 10 volts dc from a regulated dc power supply (the power supply current shall be maintained at a level not to exceed the maximum value of 8 mA) connected to a load resistance (1 percent) and to a sensitive graphic recorder as shown on figure 3. The response of each microphone shall be run with load resistors of 150, 180, and 120 ohms, respectively, at each of the four test frequencies. The output of the sound source at each test frequency shall be adjusted to set the output level Eo to 18 mV for a 1,500 ohm load. The criteria for acceptance will be that the level must fall above 0.560 Eo for a 180 ohm load and below 0.540 Eo for a 120 ohm load. This measurement shall be repeated at frequencies of 400, 1,000, 2,500, and 6,000 Hz.

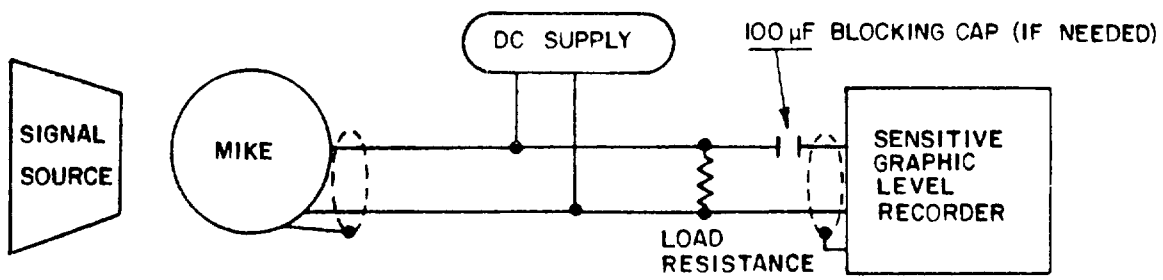

FIGURE 3. Impedance measurement schematic.

4.7.3.2 Insulation resistance (see 3.7.2.2). The microphone shall be tested in accordance with method 302, test condition B of MIL-STD-202. There shall be no evidence of arcing or insulation breakdown during the test.

4.7.3.3 Dielectric withstanding voltage (see 3.7.2.3). The microphone shall be tested in accordance with method 301 of MIL-STD-202. The following details shall apply

a. Test voltage - 100 volts.
b. Nature of potential - 60 Hz ac.
c. Points of application - Between one terminal and the external surface of the microphone case.
d. Measurements after test - Impedance at 1,000 Hz.

4.7.4 Acoustical.

4.7.4.1 Sensitivity.

4.7.4.1.1 Sensitivity at ground level (see 3.7.3.1.1). The sensitivity of the microphone at ground level shall be measured by means of an electronic voltmeter, having an input impedance of not less than 0.5 megohm. The sensitivity of the microphone shall be determined by using a sound pressure of 3.6 pascals at 1/4 inch from the close sound source.

4.7.4.1.1.1 Sensitivity and frequency response characteristic measurements, close sound source.

4.7.4.1.1.2 Sensitivity to a close sound source. Position the microphone under test with its face one-fourth inch on axis to the driver unit of an artificial voice (B&K type 4219, or equal) with the diaphragm of the microphone parallel to the driver unit. The artifical voice shall have been previously calibrated by means of a condenser microphone (B&K type 4133, or equal, certified traceable to National Bureau of Standards). This calibration will be conducted with an applied constant sound pressure of (3.6 pascals per square centimeter) (105 dB sound pressure level, Re. 20 µPa). (A regulated dc power supply shall be used to power the internal microphone amplifier). Determine the microphone output readings using the HP334A Distortion Analyzer, or equal, set for voltage measurement (or a suitable electronic voltmeter, having an input impedance of at least 0.5 megohm connected across a noninductive load resistance of 150 ohms). The senstivity shall be 10 mV ±3 dB at 500, 1,000, 2,500, and 4,000 Hz.

4.7.4.1.2 Sensitivity at altitude (see 3.7.3.1.2). The sensitivity of the microphone at a simulated altitude of 15,000 feet shall be measured by means of an electronic voltmeter having an input impedance of not less than 0.5 megohm. The sensitivity of the microphone shall be determined by using a sound pressure of 3.6 pascals at one-fourth inch from the close sound source.

4.7.4.2 Frequency response.

4.7.4.2.1 Frequency response at ground level (see 3.7.3.2.1). The near field frequency response characteristic shall be measured at ground level in the form of a continuous curve in accordance with the test procedure specified in 4.7.4.1.1. The frequency response characteristic shall be checked against limits which assure that the microphone meets the close frequency response requirements as specified in 3.7.3.2.1.

4.7.4.2.1.1 Frequency response to a close sound source (near field). The response of the microphone shall be determined using a constant sound pressure of 3.6 pascals (105 dB spl) at the point where the microphone is to be placed. The driver unit used to obtain the desired sound pressure input (B&K type 4219 Artificial Voice, or equal) shall have been previously calibrated by means of a condenser microphone (B&K type 4133, or equal, traceable to National Bureau of Standards). The sample microphone shall be positioned with its face one-fourth inch directly in front of the driver unit with the diaphram of the microphone parallel to the driver unit. The response of the microphone shall be tested in the frequency range of 400 to 6,000 Hz with a

pure tone linear sweep from an audio oscillator (B&K type 1024, or equal) or at each 1/3 octave frequency between 400 and 6,300 Hz. The resultant plot of the "near field" frequency response of the sample microphone shall fall with the limits as given on figure 1.

4.7.4.2.2 Frequency response at altitude (see 3.7.3.2.2). The frequency response characteristic of the microphone at a simulated altitude of 15,000 feet shall be obtained over the frequency range 400 to 6,000 Hz in accordance with the procedure specified in 4.7.4.2.1. The frequency response characteristics shall be checked against limits which assure that the microphone meets the close frequency response requirements specified in 3.7.3.2.2.

4.7.4.2.3 Frequency response under pressure differential (see 3.7.3.2.3). The frequency response characteristic of the microphone when subjected to an internal pressure of ±1/8 pound per square inch of air shall be obtained over the frequency range of 400 to 6,000 Hz in accordance with the procedure specified in 4.7.4.2.1. The response characteristics shall be checked against the requirements as specified in 3.7.3.2.3.

4.7.4.3 Psychoacoustic (see 3.7.3.3). The microphones shall be subjected to a series of psychoacoustic tests using the Harvard phonetically balanced words in accordance with ANSI Standard S3.2-1960. The noise environment for the talkers shall be pink noise at 100 dB spl presented in a difuse field environment. The listeners shall be in a quiet room (less than 60 dB spl).

4.7.4.4 Noise-immunity characteristic (see 3.7.3.4). The noise-immunity characteristic of the microphone shall be determined by a comparison of the frequency response characteristic to a close sound source and frequency response characteristic to a distant sound source in a free field (a field in which the effects of the boundaries are negligible over the frequency range and distance used, e.g., an anechoic chamber in which sound falls off at a rate of 6 dB per doubling of the distance for a sound source of 200 Hertz for up to a separation greater than 1 meter).

4.7.4.4.1 Sensitivity and frequency response characteristic to a close sound source for noise-immunity characteristic measurement. The frequency response characteristics to a close sound source shall be established as previously specified herein. The sensitivity of the microphone to the close sound source specified herein shall be determined by measuring the voltage developed by the microphone across a 150 ohm resistive load at a mean frequency of 1,000 Hz.

4.7.4.4.2 Sensitivity and frequency response characteristic to distant sound for noise-immunity characteristic measurements. The frequency response characteristic and sensitivity to a distant sound source shall be determined by measuring the voltage output of the microphone developed across a 150 ohm resistive load when the microphone is placed on axis 1 meter from a sound source in the free field.

4.7.4.4.2.1 Calibration of the sound field. Place the microphone under test proximate to a condenser microphone (B&K type 4133, or equal, certified calibration traceable to National Bureau of Standards) in the free field 1 meter from the sound source. (Eight-inch speaker capable of handling 100 dB spl of pure tone from 200 to 6,000 Hz at continuous output. Enclosure shall not have any dimension greater than one-half of a meter to ensure that the microphone is in the far field of the sound source.)

4.7.4.4.2.2 Sensitivities to distant sound source. The sound source shall produce a sound pressure of 3.6 pascals (105 dB spl, Re: 20 µPa) measured at 1,000 Hz by the condenser microphone.

4.7.4.4.3 Frequency response characteristic to a distant sound source. The response of the condenser microphone (B&K type 4133, or equal) shall be recorded in the range of 400 to 6,000 Hz with a pure tone linear sweep (narrow-band analysis) from an audio oscillator (B&K type 1024 plus power amplifier, if necessary) or at each 1/3 octave frequency between 400 and 6,300 Hz. This data will be used to correct the uncontrolled frequency response of the loudspeaker at each 1/3 octave band (or narrowband) to the 105 dB spl measured at 1,000 Hz. These "correction factors" will be used to normalize the loudspeaker. (If narrow-band analysis method is chosen, a computer can be used to normalize the loudspeaker to the required 105 dB spl.

4.7.4.4.4 Noise-immunity characteristic (see 3.7.3.4).

a. Measure and record the response of the test microphone at each 1/3 octave band (or narrowband) from 400 to 6,300 Hz.
b. Subtract the correction (or normalization) factors determined in 4.7.4.4.3 from the 1/3 octave (or narrowband) spls measured by the test microphone.
c. The resultant plot shall be the normalized far field (or noise cancelling) response of the test microphone. The far field response curve shall intersect the zero axis at 2,500 Hz minimum, and have a falling slope of at least 9 dB per octave as the frequency decreases, starting at the point of intersection. See figure 2 as an example of the crossover point ocurring at 2,500 Hz.

4.7.4.5 Linearity (see 3.7.3.5). The output voltage developed by the microphone across a 150 ohm resistive load shall be measured at any one frequency within each of the following ranges; 400 to 800 Hz, 800 to 2,500 Hz, and 2,500 to 4,000 Hz with an input sound pressure of 74 dB, 94 dB, 114 dB, and 124 dB, relative to 20 µPa, respectively. In performing linearity measurements, precautions shall be taken to insure that the sound pressure at the nontalking port has a level not less than 15 dB below the sound pressure level at the talking port.

4.7.4.6 Harmonic distortion (see 3.7.3.6). The percent harmonic distortion in the output of the microphone shall be determined by the following formula. The measurement shall be made over the frequency range of 200 to 6,000 Hz, with an acoustic input having a sound pressure level of 60 to 125 dB relative to 20 µPa at the talking port.

$$\text{Percent harmonic distortion} = 100 \sqrt{\frac{E_2^2+E_3^2+\ldots+E_N^2}{E_1^2+E_2^2+E_3^2\ldots+E_N^2}}$$

Where E_1, E_2, E_3, ..., E are the output voltages of fundamental frequency and the second, third, and higher harmonics, respectively, developed across a 150 ohm resistive load. In performing harmonic distortion measurements, precautions shall be taken to insure that the sound pressure at the nontalking port has a level not less than 15 dB below the sound pressure level at the talking port. Harmonic distortion values obtained at 10 dB steps over the 60 to 110 dB range and 5 dB steps over the 110 to 125 dB range shall comply with 3.7.3.6.

4.7.5 Cord, cordage, and cable.

4.7.5.1 Temperature range (see 3.7.4.1). The unterminated cable shall be placed within a test chamber wherein a temperature of +85°C (+185°F) is maintained for a period of 4 hours. The cable shall be wrapped around a mandrel while at this temperature without damage to the cable jacket or conductor insulation. The diameter of the mandrel shall be the same as the nominal cable diameter. The cable 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 cable shall be inspected for damage or deformation and then subjected to a test chamber wherein the temperature of -55°C (-67°F) is maintained. After 20 hours of storage at -55°C, the cable shall be wrapped about the mandrel while at this temperature in the same manner as it was at the positive extreme temperature. The cable shall be examined for cracks or other damage to the jacket or conductor insulation.

4.7.5.2 Flexing life (see 3.7.4.2). The samples of unterminated cable, each approximately 1-1/2 feet long, shall be subjected to the following test. Other flexing test methods which will subject the cable to flexing cycles equivalent to flexing cycles specified herein may be used upon approval by the contracting activity. The sample lengths shall be clamped and suspended through holes in a rectangular (1/2 by 5/8 inch) metal bar in the manner described below:

a. The clamping point shall be immediately above the metal bar, the cable clamp shall rest on top of the metal bar.
b. The cable shall be clamped in such a manner that it will not turn in the hole during the flexing test.
c. The length of the through holes in the metal bar shall be five-eights of an inch. The diameter of the through holes shall be 0.005 to 0.010 inch greater than the diameter of the cable undergoing test.
d. The through holes in the metal bar shall incorporate a 1/8-inch radius at the end from which the cable emerges (bending point).
e. A knot shall be tied near the free end of the cable and a 1/2-pound weight shall be hung from the knot.
f. The two center conductors plus shield of each sample length of cable, a small low-current drain, 6-volt/150 mA lamp, and a suitable power source shall be connected in series to indicate electrical continuity. 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 average of the number of flexes of each of the 5 sample lengths of cable, before electrical discontinuity occurs, shall be taken as the flexing life of the cable.

4.7.5.3 Cord anchorage (see 3.7.4.3). A pull of 8 pounds shall be applied to the cable in the direction of the axis of the microphone plug (D6 001 626) for a minimum of 30 minutes. The cord assembly shall be examined to determine whether any slippage has occured at the clamp and if any strain has been exerted on the conductors.

4.7.5.4 Conductor strain relief and twist (see 3.7.4.4). With the pins of one conductor plug anchored rigidly in the microphone and in a vertical position, a 5-pound weight shall be suspended from the pins of the other connector plug of the cord assembly for a period of at least 30 minutes. During the last 5 minutes of the pull test, the lower plug connector with the 5-pound weight suspended shall be twisted 3 turns clockwise and 3 turns counterclockwise from the normal resting position. The twisting cycle shall be repeated 3 times. The impedance of the microphone with cord assembly in place shall be measured at 1,000 Hz and a mechanical inspection shall be made before and immediately upon completion of the test. A dielectric withstanding voltage test shall be made on the cord assembly in accordance with the procedure specified in 4.7.5.5 after the impedance measurement and mechanical inspection have been made.

4.7.5.5 Dielectric withstanding voltage of cord assembly (see 3.7.4.5). The dielectric of the finished cord assembly shall be determined, in accordance with MIL-C-55668.

4.7.5.6 Insulation resistance of cord assembly (see 3.7.4.6). The insulation resistance of the finished cord assembly shall be determined in accordance with MIL-C-55668.

4.7.6 Environmental.

4.7.6.1 Pressure equalization (see 3.7.5.1). The microphone to be tested shall be placed within the test chamber and the absolute internal pressure of the chamber reduced to 3.44 inches of mercury (corresponding to an altitude of 50,000 feet above sea level) and the microphone shall be allowed to remain at the reduced pressure for 5 minutes. Again, the pressure shall be increased to that prevailing at ground level and the microphone shall be allowed to remain at atmospheric pressure for 5 minutes. The rate of change of pressure shall correspond to approximately 10,000 feet per minute. The microphone shall be subjected to three such pressure cycles. The impedance at 1,000 Hz, sensitivity, and frequency response characteristic of the microphone shall be measured and a mechanical inspection made before the test and after completion of the test.

4.7.6.2 Microphone positioning adjustment (see 3.7.5.2). The swivel part of the microphone positioning bracket shall be rotated 50,000 times from the normal operating position to the microphone standby position and the two friction joints in the boom assembly shall be flexed through a range of 180° for a total of 50,000 flexures each.

4.7.6.3 Temperature altitude (see 3.7.5.3). Apply Method 504, Procedure I, for Class 1B equipment in accordance with table 504-II of MIL-STD-810 with the exception that the temperature specified for step 1 and 5 shall be changed to -57°C and +71°C, respectively. Steps 2, 4, 7, 10, and 12 shall be omitted. Operation of the equipment is required during step 14 only and shall meet the requirements of 3.7.3.1.2 and 3.7.3.2.2. Step 14 shall be conducted at 15,000 feet. In addition, the procedure shall include a 1-hour exposure (nonoperating) to a pressure of 5.6 inches of height simulating air transport at 40,000 feet.

4.7.6.4 Humidity (see 3.7.5.4). The equipment shall be capable of meeting the test of Method 507, Procedure II of MIL-STD-810. In step 8, the equipment shall meet the requirements of 3.7.3.1.1.

4.7.6.5 Immersion (see 3.7.5.5). The equipment shall be capable of meeting the test of Method 512, Procedure I of MIL-STD-810. Following the immersion period, the equipment shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

4.7.6.6 Dust (see 3.7.5.6). The equipment shall be capable of meeting the test of Method 510, Procedure I of MIL-STD-810. In step 5, the equipment shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

4.7.6.7 Salt fog (see 3.7.5.7). The equipment shall be capable of meeting the test of Method 509, Procedure I of MIL-STD-810. Operation of the equipment shall not be required. The equipment shall meet the requirements of 3.7.3.2.1 and 3.7.2.1.

4.7.6.8 Fungus (see 3.7.5.8). The equipment model in the assembled and as ready for delivery condition, shall be capable of meeting 28 day test of Method 508, MIL-STD-810. The equipment test model shall not be specially cleaned for the fungus test, except for the cleaning it receives during or after production. If it is necessary for the manufacturer after assembly to remove accumulated production and handling contaminants by cleaning prior to packaging and delivery, the equipment shall not be tested for 3 days after cleaning to allow for complete evaporation of the cleaning compound. All inclosed or gasketed assemblies shall be opened and the interior sprayed with the specific mixed spore suspension. After 14 and 28 days of test, the control items per Method 508, MIL-STD-810 shall show profuse growth over at least 50 percent of the area of the control items. The test shall be repeated if the control items fail to show profuse growth after 14 and 28 days of test.

4.7.6.9 Blast (see 3.7.5.9). Each 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 microphone element in the test plane, and with its axis coincident with that of the explosion chamber. The microphone element shall be subjected to 30 rounds of blast at a nominal peak pressure of 9.5 pounds per square inch.

4.7.6.10 Vibration (see 3.7.5.10). The test item shall be attached to the vibration exciter table in a horizontal position, with the applied vibration in a direction perpendicular to the plane of the microphone. Subject the equipment to sinusoidal vibration over a frequency range of 5 to 20 Hz at a constant displacement (double amplitude) of 0.10 inch, and over a frequency range of 20 to 500 Hz at a constant acceleration of 2G (curve B, MIL-STD-810). The frequency of the applied vibration shall be swept logarithmically over the specified frequency range. One vibration cycle (5-500-5) shall consume 15 minutes. Total time of test shall be 2 hours. Repeat the above vibration in the fore/aft and side to side axis. Upon completion of the test, the equipment shall be undamaged and shall meet the requirements of 3.7.3.1.1 and 3.7.3.2.1.

4.7.6.11 Shock-drop (see 3.7.5.11). The microphone shall be dropped at random from a height of 6 feet, 12 times onto a concrete surface. At completion of the test, the microphone shall meet the requirements of 3.7.2, 3.7.3.1.1 and 3.7.3.2.1. There shall be no evidence of breaking, cracking, or other structural damage.

4.7.6.12 Rain (see 3.7.5.12). The equipment shall be subjected to the test of Method 506.1, Procedure I of MIL-STD-810. The equipment shall be operated during the last 10 minutes of the 30 minute period.

4.7.6.13 Reliability (see 3.11). The microphone shall be subjected to the test per MIL-STD-781 for Category 5 equipments, Test Plan XVII C.

5. PACKAGING

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

5.1.1 Level A.

5.1.1.1 Cleaning. Microphone shall be cleaned in accordance with MIL-P-116, process C-1.

5.1.1.2 Drying. Microphone shall be dried in accordance with MIL-P-116.

5.1.1.3 Preservative application. Preservatives shall not be used.

5.1.1.4 Unit packs. Each microphone shall be unit packed one each in accordance with submethod IA-15 of MIL-P-116 insuring compliance with the applicable requirements of that specification. The container shall conform to PPP-B-566 or PPP-B-676.

5.1.1.5 Intermediate packs. Intermediate packs are not required.

5.1.2 Level B. The requirements for level B shall be as specified for level A except that submethod IC-2 of MIL-P-116 shall be as the method of preservation.

5.1.3 Level C. The level C preservation of microphones shall conform to the MIL-STD-794 requirements for this level.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Microphones, preserved as specified in 5.1, shall be packed in wood boxes conforming to PPP-B-601, overseas type or PPP-B-621, class 2. Closure and strapping shall be in accordance with the applicable container specification except that metal strapping shall conform to QQ-S-781, type I, finish A. The requirements for level B packing shall be used when the total quantity of a stock numbered microphone for a single destination does not exceed a packed volume of 1 cubic foot.

5.2.2 Level B. Microphones, preserved as specified in 5.1, shall be packed in fiberboard containers conforming to PPP-B-636, class weather resistant, style optional, special requirements. The requirements for box closure, waterproofing and reinforcing shall be in accordance with method V of the PPP-B-636 appendix.

5.2.3 Level C. Microphones, preserved as specified in 5.1, shall be packed in fiberboard containers conforming to PPP-B-636, class domestic, style optional, special requirements. Closures shall be in accordance with the appendix thereto.

5.2.4 Unitized loads. Unitized loads, commensurate with the level of packing specified in the contract or order, shall be used whenever total quantities for shipment to one destination equal 40 cubic feet or more. Quantities less than 40 cubic feet need not be unitized. Unitized loads shall be uniform in size and quantities to the greatest extent practicable.

5.2.4.1 Level A. Microphones, packed as specified in 5.2.1, shall be unitized on pallets in conformance with the MIL-STD-147, load type I, with a wood cap (storage aid 5) positioned over each load.

5.2.4.2 Level B. Microphones, packed as specified in 5.2.2, shall be unitized as specified in 5.2.4.1 except that weather resistant fiberboard caps (storage aid 4) shall be used in lieu of wood caps.

5.2.4.3 Level C. Microphones, packed as specified in 5.2.3, shall be unitized as specified in 5.2.4.2 except that the fiberboard caps shall be class domestic.

5.3 Marking. In addition to any special or other identification marking required by the contract (see 6.2), each unit and exterior container and unitized load shall be marked in accordance with MIL-STD-129. The complete military or contractor's type or part number, as applicable (including the FSCM), shall be marked on all unit and supplementary packs in accordance with the identification marking provisions of MIL-STD-129.

5.4 General.

5.4.1 Exterior containers. Exterior containers (see 5.2.1, 5.2.2 and 5.2.3) shall be of a minimum tare and cube consistent with the protection required and shall contain equal quantities of identical stock numbered items to the greatest extent practicable.

5.4.2 Packaging inspection. The inspection of these packaging requirements shall be in accordance with 4.6.2.

5.4.3 Army acquisitions.

5.4.3.1 Level A and B packing. 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 container specification. Unitization shall be required when the containers specified in 5.2.1 and 5.2.2 do not require skids, quantities per destination exceed either a total of 250 pounds (excluding the pallet) or a volume of 20 cubic feet, and the container size permits use of one of the pallet patterns of MIL-STD-147. A quantity of containers, packed as specified, except that container strapping may be omitted, shall be placed on a pallet, load type I conforming to MIL-STD-147. For level B, unit containers which meet these requirements may be palletized without further packing. The pallet shall conform to NN-P-71, type IV, group I or II woods. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A, or shrink film conforming to L-P-378, type IV. Stretch wrap in accordance with MIL-STD-147 is authorized for shipments within the continental United States and for containerized shipments.

6. NOTES

6.1 Intended use. Microphone, Linear, M-162/AIC is a noise-cancelling dc powered, high gain microphone designed for use on a headband type headset at low altitudes or for use in a pressure type oxygen helmet, at altitudes where the use of an oxygen helmet is required. The microphone is intended for use as a part of the airborne communication system which will provide communication of high intelligibility under the extreme noise conditions encountered in military aircraft. The preservation, packing and marking specified herein are intended for direct shipments to the Government. However, this specification may also be used for the preparation of microphones for shipment from the parts contractor to the original equipment manufacturer.

6.2 Ordering data. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Levels of preservation and packing required (see 5.1 and 5.2).
c. If special or additional identification marking is required (see 5.3).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first article sample. The first article should consist of 10 units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations and test approval of the documents first article.

6.4 Engineering data. Microphone, Linear M-162/AIC replaces the microphone M-87A/AIC when used with the new Aircraft Intercom C-10414/AIC. (It is not electrically interchangeable with the M-87A/AIC.)

6.5 Conditions for use of level B preservation. When level B preservation is specified (see 5.1.2), this degree of protection should be used for the acquisition of microphones for resupply worldwide under known favorable handling, transportation and storage conditions.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government acquisition operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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1 DOCUMENT NUMBER	2 DOCUMENT TITLE
MIL-M-49199A	Microphone, Linear M-162/AIC General Specifications For

3a NAME OF SUBMITTING ORGANIZATION	4 TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)* _____

5 PROBLEM AREAS

a Paragraph Number and Wording

b Recommended Wording

c Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER *(Last, First, MI)* – Optional	b WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8 DATE OF SUBMISSION *(YYMMDD)*

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