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MIL-PRF-87819A(USAF)  
30 January 1997  
SUPERSEDING  
MIL-H-87819(USAF)  
11 March 1985

## PERFORMANCE SPECIFICATION

### HEADSET-MICROPHONE, (HEARING PROTECTIVE TYPE, HIGH AND MODERATE AMBIENT NOISE LEVELS), GENERAL SPECIFICATION FOR

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

#### 1. SCOPE

1.1 Scope. This specification covers the requirements for headset-microphone with rigid headband. These parts meet established United States Air Force requirements for communications equipment used to protect against hazardous noise exposure, and are approved for use in certain high and moderate ambient noise level applications (see 6.1). The term headset is to be used interchangeably for headset-microphone and is used when referring to any of the articles covered in this specification.

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommend for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

##### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: 88 LOG/LGME, 4170 Hebble Creek Road, Bldg 280, Door 4, Wright-Patterson AFB, OH 45433-5653, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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### SPECIFICATIONS

#### DEPARTMENT OF DEFENSE

- MIL-I-3930 - Insulating and Jacketing Compounds, Electrical (For Cables, Cords, and Wires), General Specification for.
- MIL-C-55668 - Cord, Electrical, Audio, Subminiature (Retractable And Straight).
- MIL-C-9177/2 - Connector, Audio, Airborne Plug, Miniature, 4 Contact.
- MIL-PRF-26514 - Polyurethane Foam, Rigid or Flexible, For Packaging.

### STANDARDS

#### DEPARTMENT OF DEFENSE

- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office, Building 4D, Customer Service, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

**2.2.2 Other Government documents, drawings, and publications.** The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

### DRAWINGS

#### U.S. Air Force

- 57B12662 - Connector Assembly.
- 67B1854 - Microphone Boom Assembly
- 9312801 - Earcushion, Headset.

(Application for copies should be addressed to 88 LOG/LGME, 4170 Hebble Creek Road, Bld 280, Door 4, Wright-Patterson AFB, OH 45433-5653.)

**2.3 Non-Government publications.** The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

### AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- S3.2 - Method for the Measurement the Intelligibility of Speech over Communication Systems.
- S3.7 - Method for Coupler Calibration of Earphones.
- S12.42 (1995) - Microphone-in-Real-Ear and Acoustic Testing Methods for the measurement of Insertion Loss of Circumaural Hearing Protection Devices.

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ISO 10012-1: - Quality Assurance Requirements for Measuring Equipment - Part 1: Metrological Confirmation System for Measuring Equipment

ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Testing Equipment - General Requirements

(Application for copies should be addressed to the American National Standards Institute (ANSI), West 42nd Street, New York, NY 10036-8002, telephone (212) 642-4900, fax (212) 302-1286.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D3574 - Standard test methods for flexible cellular materials - slabs, bonded, and molded urethane foams.

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the document. These documents also may be available in or through libraries or other information services.)

**2.4 Order of precedence.** In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications, specification sheets, or MS sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

**3.1 Specification sheets.** The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

**3.2 Qualification.** Headsets furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3).

**3.3 Materials.** Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the product to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

#### 3.4 Interface requirements.

**3.4.1 Earphone elements.** Earphone elements shall be as specified (see 3.1).

**3.4.1.1 Earphone element mounting.** The element shall be firmly mounted in the earcup. The mounting mechanism shall hold the earphone element in the center of the earcup, facing and directly parallel to the ear opening without shifting under specified conditions. It shall be reusable after repair and allow easy replacement of the earphone element by skill level 3 repair technicians. The earphone surface shall not protrude more than 0.75 in from the uncompressed face of the earcushion.

**3.4.2 Microphone elements.** Microphone elements shall be as specified (see 3.1).

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3.4.2.1 Microphone boom assembly. The microphone boom assembly shall be as specified (see 3.1).

3.4.2.2 Microphone protective shield. The microphone protective shield shall be as specified (see 3.1).

3.4.3 Cable and cord assemblies. The cable and cord assemblies shall conform to the requirements of MIL-C-55668, for consistency with established Air Force repair procedures regarding conductor color-coding. Other electrically-compatible audio-communications cord may be supplied, given that it has equivalent or superior performance with respect to extremes of temperature, ozone-resistance, flame-retardant, tensile-strength, retractability and extension range, when approved by the qualifying activity. Terminations of the 4-conductor cord at (1) the entry to the earcup and (2) the U-174/U connector shall include a mechanism to resist slippage of the cable conductors from the associated connector due to twist and pull during normal use, when tested in accordance with 4.7.12.

- a. Two-conductor cords shall be shielded overall, for electrical-isolation, and have a jacket diameter of  $.140 \pm .015$  in, for interface to connectors, and for adherence to the flex-life requirements of this specification.
- b. The jacket compound and insulation materials shall be in accordance with MIL-I-3930, or shall be materials having equivalent or superior performance with respect to ozone-resistance, flame-retardant, brittleness-resistance, temperature extremes, and air-pressure aging, as specified.
- c. The 4-conductor (console) cord shall be integrated with the 2-conductor (earcup-to-earcup) cord in a manner which allows replacement of either section individually during repair (see 3.5.18), while also meeting the attenuation and twist-pull requirements of this specification.

3.4.4 Headset-microphone. The configuration for products covered by this specification shall be as specified (see 3.1).

3.4.5 Finish. The finish shall be a nonreflective, lusterless, dark color having low contrast with colors in operational clothing and gear, such as black, grey, dark blue, or green. The finish shall be uniform in color. The use of any protective coating that will crack, chip, or scale with age, normal use, or extremes of atmospheric conditions shall be avoided.

3.4.6 Rigid materials. The materials used shall be of sufficient durability and hardness to provide the required strength and rigidity with maximum strength to weight ratio. Any metals shall be of a corrosion resistant type.

3.4.7 Earcup shells. The earcup shall conform to the overall dimensional envelope of figure 1, in order to avoid obstructions to the emergency oxygen mask harness. The earcup shell material shall resist breakages at the yoke attachment, at the seams (if any), and at points where cable and volume control holes have been drilled, when tested in accordance with 4.7.6. Treatments used to process the device shall not cause skin irritation.

3.4.8 Earcup fillers. If the earcup is supplied with a filler material, it shall be flame-retardant, and meet the environmental requirements (see 3.5.5, 3.5.6, 3.5.8, 3.5.9, 3.5.10, 3.5.15) of this specification. It shall neither obstruct the auditory path of the transducer, nor be permanently attached to the earphone element. Fillers shall allow clearance of at least 0.750 in from the uncompressed face of the earcushion.

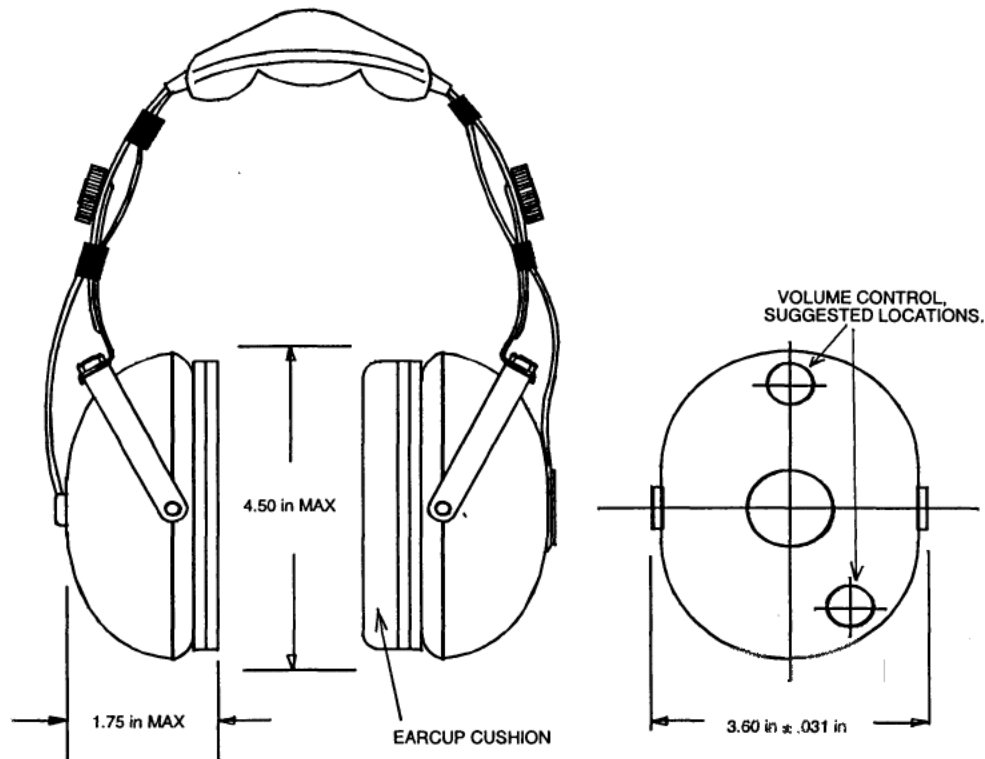
3.4.8.1 Earcup shell cushion (earcushion). The earcup shall be supplied with a cushion, meeting the human interface dimensional requirements of Air Force Drawing 9312801. It shall be replaceable without causing damage to the earcup. The cushion shall have a filler material which meets the noise-attenuation requirements of this specification, with a density which supports the comfort requirements of the headset's

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intended use, not less than 5.7 lbs/ft<sup>3</sup>. The fillers and cushion surface material shall be flame-retardant, and shall not crack, tear or otherwise degrade under the environmental conditions of this specification (see 3.5.5, 3.5.6, 3.5.8, 3.5.9, 3.5.10, 3.5.15). The color shall be black. The fillers shall not leak in the event of puncture to the cushion surface.

3.4.8.2 Microphone protective shell cushion. The microphone protective shell cushion shall be as specified when required (see 3.1).

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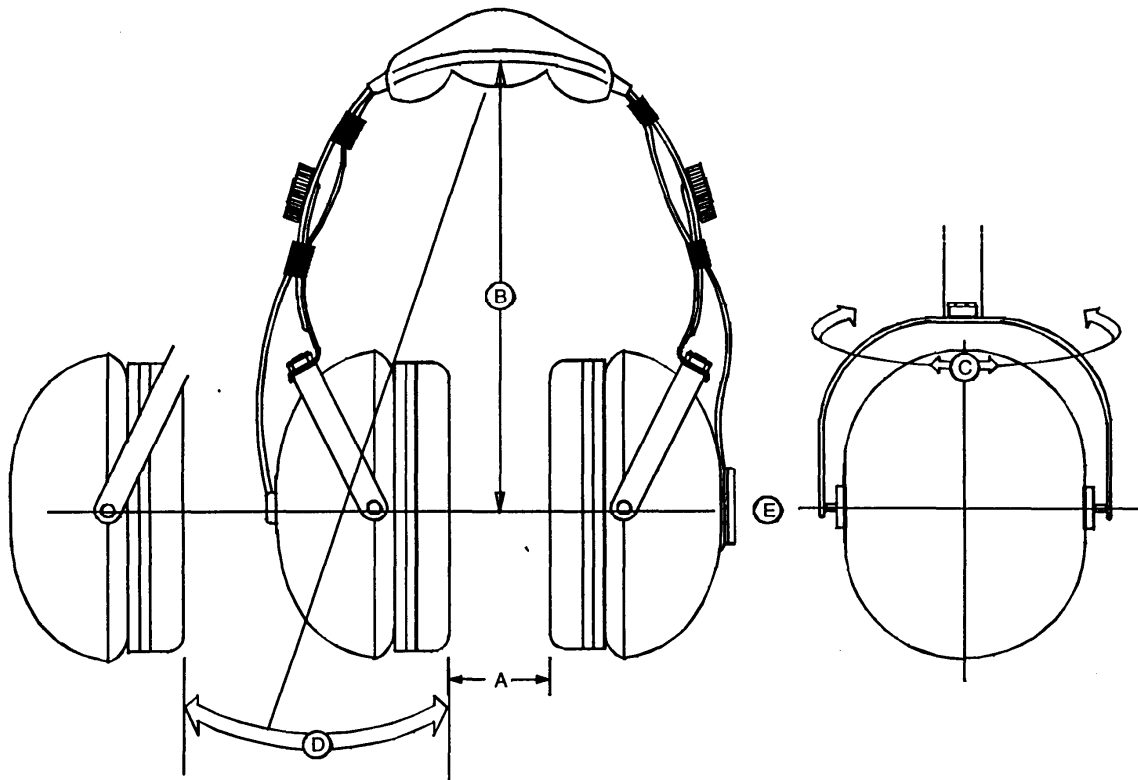


## NOTES:

1. Envelope dimensions shall be as shown, to provide interface to the emergency oxygen mask harness.
2. All cable entry or other holes in the earcup shall be strengthened to meet the environmental and shock (drop) requirements of this specification.
3. Each earcup shall be secured to its yoke in a manner which prevents inadvertent detachment, per the Foreign Object Debris requirements of this specification (see 3.5.16), while allowing replacement of the earcup during repair.
4. When specified (see 3.1), the volume control knob shall not restrict the movement of the microphone boom assembly, the earcup or yoke, and shall be located on the left earcup in an easily accessed position, such as one of the two suggestions positions shown here.

FIGURE 1. Earcup Shell Dimensions.

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## NOTES:

1. Metric equivalents are in parentheses.
2. Metric equivalents are given for general information only.
3. Headband minimum adjustment range with the headband pad removed. With dimension "A" set at 5.12 in (130 mm) dimension "B" shall be adjustable to 5.1 in (116.1 mm) maximum. With dimension "A" set at 6.10 in (155.0 mm) dimension "B" shall be adjustable to 6.1 in (142.0 mm) minimum.
4. The force required to maintain dimension "A" of 6.10 in (155.0 mm) shall be as specified (see 3.1).
5. Angular deflection "C"  $\pm 5$  degree with respect to axis "E".
6. Angular deflection "D", the earcup plane shall be freely movable between vertical and angle of 5 degree (top out - bottom in) at all settings of dimension "A".
7. Angular displacement from 0 degree or neutral position shall not generate couples causing uneven earseal pressure.
8. The earcup shall be suspended by yokes (stirrups) from the headband to allow quick adjustments and suitable pressure to the head of the user.

FIGURE 2. Anthropometric headband adjustment requirements.

**3.4.9 Headband and headband parts** . The headband material shall provide sufficient pressure of the earcups against the user's head to meet or exceed the noise-attenuation requirements of this specification. It shall also conform to the environmental, headband flexing, and shock (drop) requirements of this specification. It shall include an adjustment mechanism which can be used to easily and smoothly modify,



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and firmly set, the earcup position for the typical Air Force user head size, in accordance with figure 2. The adjustment shall not loosen inadvertently during use. There shall be no protruding hardware or excess wire which could become entangled with other parts of the headset or other equipment. The headband shall not separate from the earcup yoke during normal use, including the use of quick-don oxygen mask assemblies. The use of any parts to secure the yoke to the earcup which may become inadvertently detached shall not be used. This includes but is not limited to "c-clips" or "e-clips". Neither the headband nor any attachments to it (pad, support, etc.) shall obstruct the normal adjustability of the headband and earcups.

**3.4.9.1 Headband pad.** The headband pad shall protect the user's head from the weight of the headset, displacing no less than 0.165 lbs/in<sup>2</sup> of force. The pad surface material shall resist puncturing, and shall not tear, crack or otherwise degrade under the environmental conditions specified (see 3.5.5, 3.5.6, 3.5.8, 3.5.9, 3.5.10, 3.5.15). Any fillers used in the pad shall not leak from the pad in the event of puncture to the surface. The pad shall be removable during normal maintenance without damaging the headband, and shall not become detached inadvertently during use.

**3.4.9.2 Headband pad support.** If the headset is supplied with a support for the headband pad, it shall provide a firm foundation for the headband pad across the pad's full dimensions, shall be firmly attached, and shall not become inadvertently detached from the headband during normal use.

**3.4.10 Connectors.** The connectors to be used shall be U-174/U in accordance with MIL-C-9177/2(USAF), for interface to the console, and U-173/U in accordance with Air Force drawing 57B12662, for interface to the emergency oxygen mask. Electrically and mechanically compatible connectors may be used, if they meet or exceed the performance requirements specified. All other connectors used shall be as specified (see 3.1).

### **3.5 Performance characteristics.**

**3.5.1 Acoustic quality (see 4.7.2).** There shall be no buzzing, rattles, or other spurious noises which would impair the quality of the reproduced signal.

**3.5.2 Attenuation (see 4.7.3).** For the purpose of qualification testing, attenuation characteristic requirements shall be in accordance with 3.5.2.1. For the purpose of quality assurance testing, attenuation characteristics shall be determined in accordance with 3.5.2.2

**3.5.2.1 Qualification attenuation (see 4.7.3.1)** The individual attenuation at each test center frequency shall meet the requirements as specified (see 3.1). Mean attenuation values shall be rounded to the nearest whole number.

**3.5.2.2 Quality conformance inspection (see 4.7.3.2)** The minimum attenuation requirements shall meet or exceed the attenuation values determined at the time of initial qualification testing.

**3.5.3 Speech intelligibility (see 4.7.4).** The intelligibility scores shall meet or exceed the percentages listed in table I for the corresponding sound pressure test levels.

TABLE I. Speech intelligibility requirements

| Sound pressure level of pink noise (OASPL) | 75 | 95 | 105 | 115 |
|--|----|----|-----|-----|
| Minimum score (percent correct)            | 95 | 90 | 85  | 80  |



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3.5.4 Headset system sensitivity. The headset system sensitivity shall meet or exceed the output dB SPL listed in table II for the corresponding frequencies.

TABLE II. Headset system sensitivity.

| Frequency for test                      | 400 Hz | 1.0 kHz | 3.0 kHz |
|---|--------|---------|---------|
| Output in dB SPL with 1 volt rms input. | 95.4   | 98.5    | 104     |

3.5.5 Shock (drop) (see 4.7.6). The product shall completely resist failures due to excessive dropping from typical-use heights onto a hard surface, showing no evidence of physical or electrical defects except minor chipping or scratches. Following the dropping, the acoustic quality shall be as specified in 3.5.1.

3.5.6 Fungus (see 4.7.7). The product shall be constructed of fungus-inert materials per MIL-STD-454, and shall show no evidence of fungus or other corrosion which may cause a mechanical or electrical failure.

3.5.7 Vibration (see 4.7.8). The product shall not exhibit loosened components or any other mechanical failure due to the repeated application of high-frequency vibration. Following such vibration, the acoustic quality shall be in accordance with 3.5.1.

3.5.8 Temperature (see 4.7.9). The product shall not exhibit cracking or any other deformation of major or minor components due to extremes of temperature. Following such extreme temperatures, the acoustic quality shall be in accordance with 3.5.1.

3.5.9 Temperature shock (see 4.7.10). The product shall not exhibit cracking or any other deformation of major or minor components due to repeated and extreme changes in temperature. Following such wide temperature swings, the acoustic quality shall be in accordance with 3.5.1.

3.5.10 Humidity (see 4.7.11). The product shall not exhibit failure due to moisture or corrosion when subjected to excessively high levels of humidity for long periods of time. Following such exposure, the acoustic quality shall be in accordance with 3.5.1.

3.5.11 Twist and pull. The terminal components (U/172, U/173, U/174), termination points to the earcup, and any other terminations (see 3.1) shall not part from the conductor when subjected to excessive twisting and pulling. After twisting and/or pulling there shall be no more than .0312 inch (0.793 mm) slippage of the cable jacket from the connector, nor shall there be separation of the bond on molded terminations, molded bend reliefs, and molded strain reliefs, or any kind of slippage of the cable from its entry into the earcup which would create an air gap in the earcup shell.

3.5.12 Headband pressure (see 4.7.13). The headband shall maintain the specified pressure (see 3.1) when stretched to a position specified as representing the Air Force user head breadth.

3.5.13 Headband flexing (see 4.7.14). The headband force shall not degrade more than  $\pm 10$  percent from its pressure in accordance with 3.5.12 when subjected to excessive amounts of flexing from the closed to open position.

3.5.14 Cable isolation (see 4.7.15). The cable assembly with connectors shall demonstrate at least 60 dB of electromagnetic and electrostatic isolation between the microphone and earphone circuits when subjected to the frequencies as specified.

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3.5.15 Salt fog (see 4.7.16). The product shall completely resist failure of any kind due to corrosion when subjected to extremes of salt-atmosphere. Following exposure to such conditions, the acoustic quality shall be in accordance with 3.5.1.

3.5.16 Foreign object Damage (FOD) hazards. The headband shall be designed to avoid any and all FOD hazards. It shall not use any small parts which may become fully detached during normal military use, including, but not limited to: c-clips at the earcup yoke attachment, nuts which can come loose from their bolt, and non-secured cable retaining clips.

3.5.17 Cable retention. All cabling shall be restrained such that it does not protrude to a distance from which the cable could become entangled with surrounding equipment during normal use.

3.5.18 Repairability. Headsets shall be designed so that components which are expected to fail are accessible and replaceable, without damaging other components in the process. The replaceable components shall be: headband pad, earcushion, entire microphone boom assembly (when specified), earphone elements, 4-conductor cord assembly (console cord), 2-conductor cord (earcup-to-earcup), earcup shells, and volume control potentiometer and knob. The headset shall be designed such that the removal and replacement (see 6.1) of replaceable components does not necessarily degrade the pre-repair performance of the headset.

3.5.19 Interchangeability. All parts having the same manufacturer's part number or military part or identifying number (PIN) shall be directly and completely interchangeable with each other with respect to installation and performance to the extent specified herein.

3.6 Marking. Marking shall be in accordance with MIL-STD-1285. Location shall be as specified (see 3.1) and shall consist the following:

- a. NSN.
- b. Military PIN in accordance with 6.4
- c. Manufacturers' CAGE and PIN.
- d. Contract number.

3.7 Workmanship. The products shall be processed as to be uniform in quality and shall be free from loose or deposited foreign materials and other defects that will affect life, serviceability, or appearance.

#### 4. VERIFICATION

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

- a. Qualification inspection (see 4.4).
- b. Verification of qualification (see 4.5).
- c. Conformance inspection (see 4.6).

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

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4.3 Test equipment and inspection facilities. The supplier shall establish and maintain calibration system in accordance with ANSI/NCSL Z540-1, ISO-10012-1, or equivalent system, as approved by the qualifying activity.

4.3.1 System requirements. The system requirements including all parts necessary to conduct the measurements of physical ear attenuation and ensure calibration of the system shall be in accordance with ANSI S12.42.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the government (see 6.3) on headset-microphone units produced with equipment and procedures normally used in production. Attenuation, speech intelligibility, and headset system sensitivity shall be tested at a government laboratory designated by the preparing activity of this specification.

4.4.1 Sample size. Ten headset-microphone units shall be subjected to qualification inspection.

4.4.1.1 Disposition of samples. Four headset-microphone units shall be retained by the procuring activity as qualification samples. The remaining six headset-microphone units shall be returned to the manufacturer. At least one unit that is assembled and one that is disassembled shall be retained by the manufacturer as production standards.

4.4.2 Inspection routine. The samples shall be subjected to the inspections specified (see 3.1). All ten samples shall be serialized and subjected to the inspections of subgroup I prior to submittal to the government laboratory. The results of subgroup I flat plate attenuation shall also be provided. The six samples returned by the government laboratory shall be divided equally into two groups and subjected to the inspections of subgroup II and III. Upon completion of these subgroups, three units selected at random shall be disassembled and subjected to subgroup IV.

4.4.3 Failures. One or more failures in group I, group II, group III, or group IV (see 3.1) shall be cause for failure of qualification.

4.5 Verification of qualification. Every 12 months the manufacturer shall provide verification of qualification to the qualifying activity. Continuation of qualification is based on meeting the following requirements.

- a. Design of the headset-microphone has not been modified.
- b. Group A and group B .
- c. Periodic group C inspection requirements are met.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A and group B inspections (see 3.1).

4.6.1.1 Inspection lot. An inspection lot shall consist of all products 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 inspection specified (see 3.1).

4.6.1.2.1 Sampling plan. A sample of parts shall be randomly selected in accordance with table III. If one or more defects are found, the lot shall be rescreened and defects removed. After screening and

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removal of defects, a new sample of parts shall be randomly selected in accordance with table III. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

TABLE III. Group A, and B zero defect sampling plan.

| Lot size        | Sample size<br>for group A | Sample size<br>for group B |
|-----------------|----------------------------|----------------------------|
| 2 to 13         | 100 percent                | 5                          |
| 14 to 25        | 13                         | 5                          |
| 26 to 50        | 13                         | 5                          |
| 51 to 90        | 13                         | 7                          |
| 91 to 150       | 13                         | 11                         |
| 151 to 280      | 20                         | 13                         |
| 281 to 500      | 29                         | 16                         |
| 501 to 1,200    | 34                         | 19                         |
| 1,201 to 3,200  | 42                         | 23                         |
| 3,201 to 10,000 | 50                         | 29                         |

4.6.1.3 Group B inspection. Group B inspection shall consist of the inspections specified (see 3.1) and shall be made on samples which have been subjected to and have passed group A inspection.

4.6.1.3.1 Sampling plan. A sample of parts shall be randomly selected in accordance with table III. If one or more defects are found, the lot shall be rescreened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table III. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.6.1.3.3 Disposition of samples. Samples which have passed the group B inspection may be delivered on the contract if the lot is accepted and the samples are still within specified electrical tolerances.

4.6.1.4 Periodic group C inspection. Group C inspection shall consist of the inspections specified (see 3.1). Group C inspection shall be made on sample units selected from inspection lots which have passed group A and group B inspections. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.6.1.4.4), delivery of products which have passed group A and group B shall not be delayed pending results of these periodic inspections.

4.6.1.4.1 Sampling plan. Six samples shall be selected every 6 months or every 1000 units. All six samples shall be subjected to the tests of subgroup I as required (see 3.1). The samples shall then be divided equally into two groups and subjected to subgroups II and III. Upon completion, three units shall be randomly selected and subjected to subgroup IV. Once every 12 months, an additional 3 units shall be subjected to the Attenuation (MIRE) test as specified in paragraph 4.7.3.1.

4.6.1.4.2 Failures. If one or more samples fail to pass group C inspection, the sample shall be

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considered to have failed.

4.6.1.4.3 Disposition of samples. Samples 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 (see 3.1), 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 were manufactured under essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action that is 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). Group A and group B inspections (see 3.1) 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.

#### 4.7 Methods of inspection.

4.7.1 Visual and mechanical inspections. Products shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (3.3, 3.4, 3.6, and 3.7).

4.7.2 Acoustic quality (see 3.5.1). A constant voltage having a value of 1.5 V rms  $\pm$ 0.1 V rms shall be applied at the proper contacts of the connector such that the voltage will be applied to the voice coil terminals of the earphone elements and the frequency shall be continuously varied from 100 Hz to 4,500 Hz and back to 100 Hz.

#### 4.7.3 Attenuation (see 3.5.2).

4.7.3.1 Qualification attenuation (see 3.5.2.1) The attenuation of the device under test shall be measured in accordance with the ANSI S12.42. The Microphone-in-Real-Ear (MIRE) test shall be conducted with additional measurements at test frequencies of 63, 80, and 100 Hz. Attenuation measurements shall be made on three randomly chosen headsets. Three fittings and measurements using each headset shall be made for ten subjects. The mean of all measurements shall be calculated for each test frequency and compared with the requirements of 3.5.2.1 for compliance. This test shall be accomplished with and without military eyeglasses. Eyeglasses shall be HGU-4/P Sunglasses, or equal.

4.7.3.2 Quality conformance inspection (see 3.5.2.2). The baseline attenuation values for quality conformance shall be measured using the same headsets that pass the test of 4.7.3.1. The test shall be conducted using a Type 1 artificial ear, acoustic coupler and flat plate as described in the American National Standard Institute, Method for Coupler Calibration of Earphones, S3.7. The recommended test fixture is a B&K 4152 Artificial Ear, DB 0909 coupler with a brass flat plate that is flush with the top of the coupler and maintains the 6.0 cm<sup>3</sup> volume of the coupler. A diffuse pink or white noise of 90 dB overall SPL shall be used as the ambient noise. The open noise field shall be measured using the unoccluded test fixture. The headset shall be placed on the test fixture and measurements shall be made of the noise field with the occluded test fixture. The measurements shall be made at the test frequencies of 4.7.3.1 with the exception that measurements at test frequencies of 63, 80, and 100 Hz are not required. The occluded values shall be subtracted from the unoccluded values to yield the attenuation values. These attenuation values shall be averaged to yield the baseline attenuation performance.

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4.7.4 Speech intelligibility (see 3.5.3). The intelligibility test shall be performed using the modified rhyme test under the guidelines of the ANSI S3.2. An AIC-25 Intercommunication System, or equivalent, as approved by the qualifying activity, shall be used for this test. Both the talker and the listener are to be in a pink noise environment with the overall sound pressure levels as specified in table II. Minimum performance levels (in percent correct), as a function of sound pressure level, shall be checked for compliance with the requirements of 3.5.3.

4.7.5 Headset system sensitivity (see 3.5.3). The sensitivity of the device under test shall be measured in accordance with the ANSI S3.7. The headset shall be placed on a Type-1 earphone coupler with a brass flat plate. The recommended test fixture is a B&K 4152 Artificial Ear, DB 0909 coupler with a brass flat plate that is flush with the top of the coupler and maintains the 6.0 cm<sup>3</sup> volume of the coupler. The input voltage at the specified frequencies, in accordance with table II, shall be 1 Volt RMS. The acoustic output of the headset on the artificial ear with a 1 kilogram weight shall be as specified in Table II.

4.7.6 Shock (drop) (see 3.5.5). The assembly shall be dropped at least six times from a height of six feet on a concrete floor when specified (see 3.1). The assembly shall strike at least once on the microphone protective shield, microphone boom assembly and once on each earcup. Following the test, the assembly shall be examined for damage to the product due to breaking or cracking and the product shall be subjected to the acoustic quality test as specified in 4.7.2.

4.7.7 Fungus (see 3.5.6). At the option of the contractor, the contractor shall certify that the materials are fungus resistant materials, or test method 508 of MIL-STD-810 shall be performed. Upon completion, the unit shall be examined for compliance to the requirements of 3.5.6.

4.7.8 Vibration (see 3.5.7). The headset-microphone shall be tested in accordance with test method 201 of MIL-STD-202. Upon completion of the test, the acoustic quality test in accordance with 4.7.2 and the visual and mechanical examination shall be performed in accordance with 4.7.1.

4.7.9 Temperature (see 3.5.8). The headset-microphone shall be tested in accordance with method 502.3 of MIL-STD-810, procedure 1 with a storage temperature of -55 °C and an operating temperature of -40°C and method 501.3 of MIL-STD-810, procedure 1 with a storage temperature of +70 °C and an operating temperature of +65 °C. Upon completion of the test the acoustic quality test in accordance with 4.7.2 and the visual and mechanical examination shall be performed in accordance with 4.7.1.

4.7.10 Temperature shock (see 3.5.9). The headset-microphone shall be tested in accordance with method 503 of MIL-STD-810. Upon completion of the test, the acoustic quality test in accordance with 4.7.2 and the visual and mechanical examination shall be performed in accordance with 4.7.1.

4.7.11 Humidity (see 3.5.10). The headset-microphone shall be tested in accordance with method 103 of MIL-STD-202, test condition B. Upon completion of the test, the acoustic quality test in accordance with 4.7.2 and the visual and mechanical examination shall be performed in accordance with 4.7.1.

4.7.12 Twist and pull test. The cable assembly pull test shall consist of the twist test (4.7.12.1) followed by the pull test (4.7.12.2) performed three times. Upon completion of the tests specified, the cable assembly shall meet the requirements of 3.5.11.

4.7.12.1 Twist test. The twist test shall be applicable to all ends of the cable assembly that are terminated with a connector only. Each connector shall be secured in a holding device in such a way that it can not rotate. The twist shall be applied about the axis of the cable to cause a point on the cable 3 inches from the connector to twist 180 degrees from the starting position and held there for 30 seconds. The cable shall then be twisted in the opposite direction such that the point on the cable has twisted 180 degrees past the original starting position, and be held there for 30 seconds.



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4.7.12.1.1 Twist test (short cable). The twist test (short cable) shall be applicable to the short cable terminating into the headset on one end and terminating with a connector on the other end. The connector shall be secured in a holding device in such a manner that it can not rotate. The twist shall be applied about the axis of the cable to cause a point on the cable to twist 90 degrees from the starting point and held for 30 seconds. The cable shall be twisted in the opposite direction such that the point on the cable has twisted 90 degrees past the original starting position, and be held there for 30 seconds.

4.7.12.2 Pull test. The pull test shall be applied to all connectors and the physical locations where the cables are attached. The component of the cable assembly to be tested shall be secured in a stationary holding device and the cable gripped 6 inches to 12 inches from the component of the cable assembly under test. The grips shall not slip or damage the cable during the test. The static force shall be applied for 30 seconds with a pull force of 20 pounds. Connectors that are potted or molded with bonded bend reliefs or bonded strain reliefs shall have a pull force of 30 pounds applied.

4.7.13 Headband pressure (see 3.5.12). The headset-microphone shall be tested in accordance with the example shown on figure 4. With the "A" dimension, in accordance with figure 3 of the headset-microphone maintained at 6.10 inches (155.0 mm) by the strain gauge, the force shall meet the requirements of 3.5.12.

4.7.14 Headband flexing. The headset-microphone shall be tested in accordance with the following procedures. Upon completion, the headset-microphone shall meet the requirements of 3.5.13.

- a. Measure and record the headband pressure in accordance with 4.7.13.
- b. The headset-microphone shall be mounted in a flexing device providing essentially sinusoidal relative movement between two parallel plates (the outline of an example is shown on figure 4).
- c. Set the cups/headband to the mid-point of the range of their adjustment. If the cups/headband setting tends to change, the adjustment position shall be secured (for example, by means of adhesive tape). Such means shall not interfere with the normal pivoting of the cups on the headband.
- d. Place the headset or headset-microphone on the apparatus and secure the cups to the plates. The method used to secure the cups shall not interfere with the test.
- e. Adjust the minimum separation of the plates to correspond with the free state separation of the headset cushions, or to 1 inch (25 mm), whichever is the greater.
- f. Adjust the maximum separation of the plates to  $7.09 \pm .20$  (180 mm  $\pm$  5 mm).
- g. Cycle the headset between the minimum and maximum separation for 1,000 cycles at a rate of 10 to 12 cycles per minute.
- h. Measure and record the headband pressure in accordance 4.7.13.

NOTE: Ensure that throughout the test no part of the headband touches any object that will interfere with its mechanical action.



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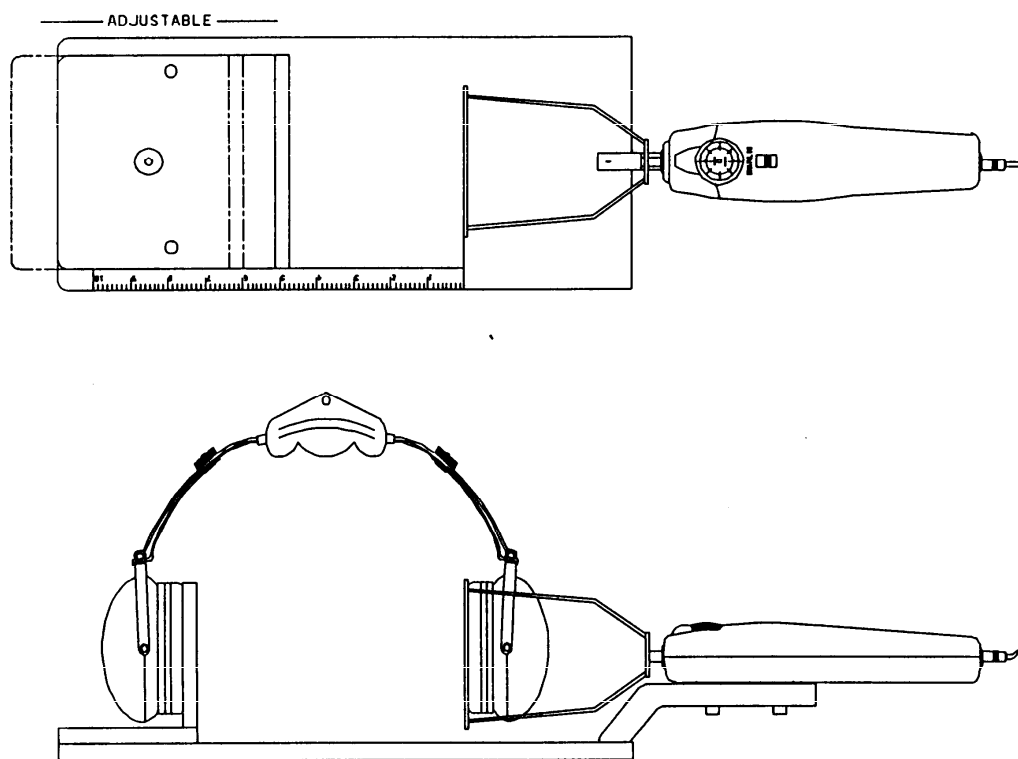
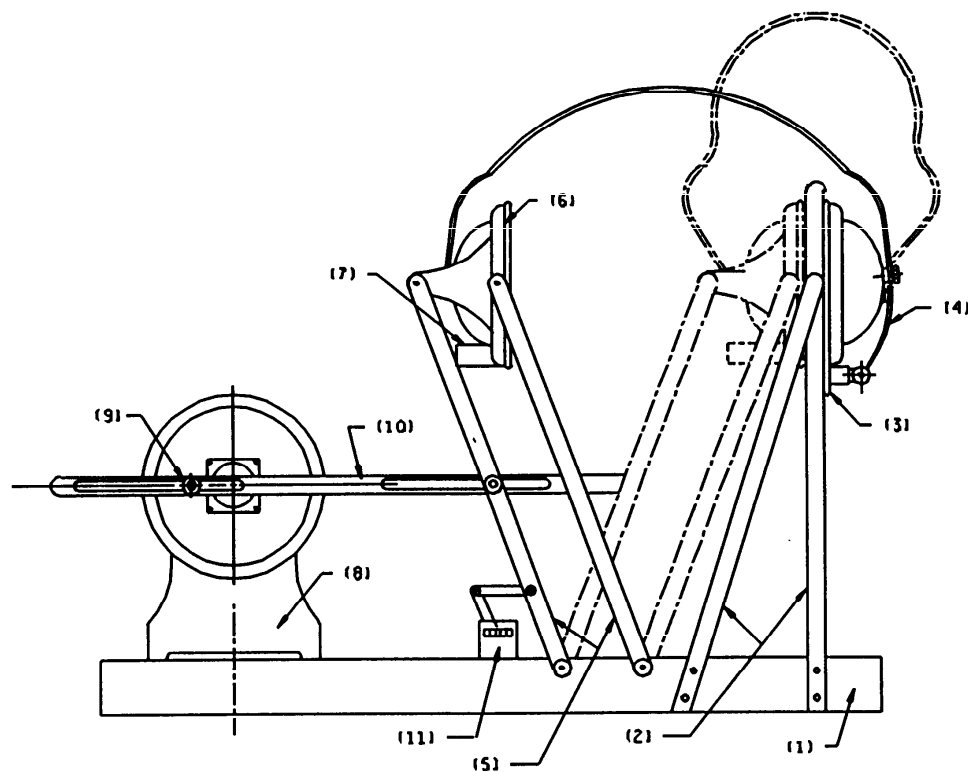


FIGURE 3. Example of headband pressure device .

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- |                                      |   |
|--------------------------------------|---|
| 1. Base                              | 7. Locating bracket for free earcup                           |
| 2. Fixed mounting arm                | 8. Motor with reduction gearbox (position adjustable on base) |
| 3. Fixed mounting platform           | 9. Crank on slow speed shaft                                  |
| 4. Earcup clamps only one shown      | 10. Connecting rod (adjustable)                               |
| 5. Rocking arms with parallel motion | 11. Counter   |
| 6. Moving platform                   |   |

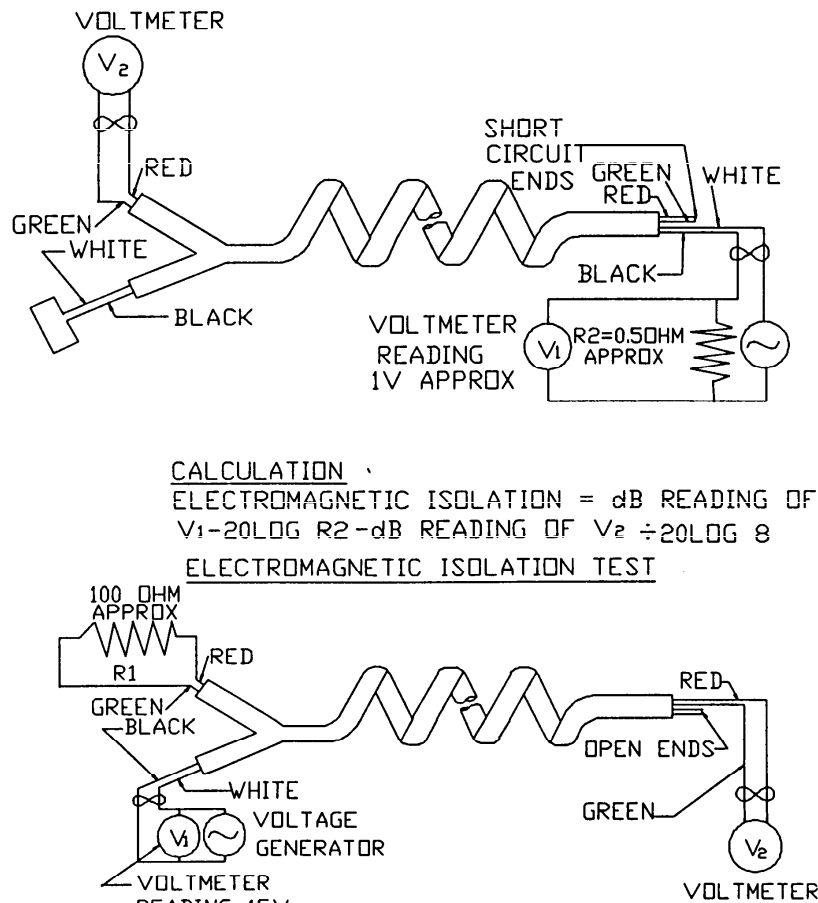
NOTES:

1. For headsets with earcups that have restricted cup articulation, it may be necessary to hinge the moving platform.
2. This diagram is not to scale.

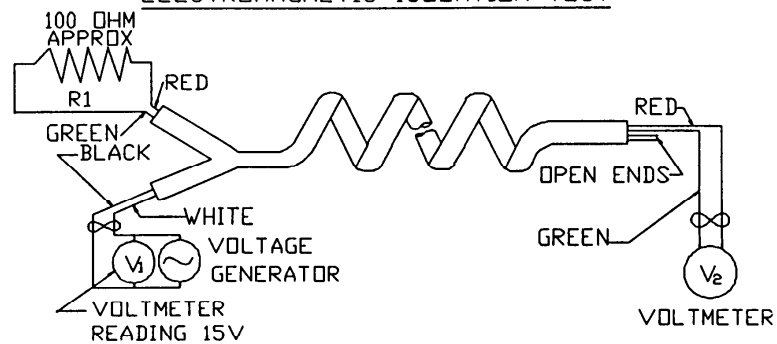
FIGURE 4. Example of flexing device .

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4.7.15 Cable isolation. The cable assembly shall be tested for electromagnetic and electrostatic isolation at 5kHz, 10 kHz and 20 kHz in accordance with figure 5. Upon completion, the cable assembly shall meet the requirements of 3.5.14.

CALCULATION

ELECTROMAGNETIC ISOLATION = dB READING OF  
V<sub>1</sub> - 20 LOG R<sub>2</sub> - dB READING OF V<sub>2</sub> ÷ 20 LOG 8

ELECTROMAGNETIC ISOLATION TESTCALCULATION

ELECTROSTATIC ISOLATION = dB READING OF  
V<sub>1</sub> - dB READING OF V<sub>2</sub> ÷ 20 LOG R<sub>1</sub> - 20 LOG 2.5

NOTE:

IN USE, THE RED AND GREEN LEADS ARE  
SHUNTED BY ABOUT 2.5 OHMS

ELECTROSTATIC ISOLATION TEST

FIGURE 5. Isolation test setup.

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4.7.16 Salt fog (see 3.5.15). The headset or headset-microphone shall be tested in accordance with test method 101 of MIL-STD-202, test condition B. Upon completion of the test, the acoustic quality test in accordance with 4.7.2 and the visual and mechanical examination shall be performed in accordance with 4.7.1.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order(see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

6.1 Intended use. Products delivered under this specification are intended for use in high and moderate ambient noise level environments. These environments are areas where the ambient noise levels are between 105 dB SPL and 125 dB SPL (i.e., groundcrew and aircrew). All hearing-protective requirements in this document and its slash sheets (intelligibility, noise-attenuation, sensitivity) were developed by the Air Force agency having sole responsibility for the approval of such products intended for use by Air Force personnel (Air Force Materiel Command, Human Systems Center, Armstrong Laboratory, Biological Acoustics and Biocommunications division (AL/CFB), Wright-Patterson Air Force Base, Ohio 45433, in cooperation with guidelines established by the United States Air Force Office of the Surgeon General). These field-reparable parts are repaired in accordance with Air Force Technical Order 12R2-2AIC-222CL-1, which is available from the Air Force Custodian upon request. Products are expected to be effectively used for a period not less than 4 years, including authorized maintenance and repair.

6.2 Acquisition requirements. Acquisition documents must specify the following:

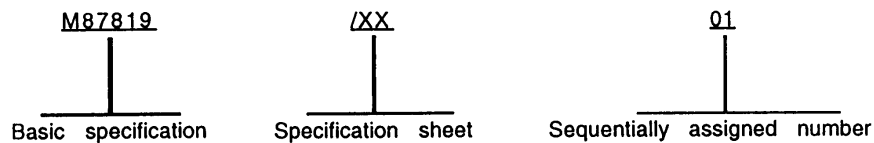
- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).
- c. Packaging requirements.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at time of award of contract, qualified for inclusion in Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Qualifying Activity, 88LOG/LGME, Bd 280, Door 4, 4170 Hebble Creek Road, Wright-Patterson AFB, OH 45433-5653. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" .

6.4 Military Part or Identifying Number (PIN). The term Part or Identifying Number (PIN) is equivalent to

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the term (part number, identification number, and type designator) which was previously used in this specification. The products specified herein (see 3.1) are identified by military PIN's which consist of the basic specification number, slash number of the specification sheet, and a sequentially assigned number as shown in the following example.

6.5 Subject term (key word) listing.

Acoustic quality  
 Attenuation  
 Speech intelligibility

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

## CONCLUDING MATERIAL

Custodian:  
 Air Force - 85

Preparing activity:  
 Air Force - 85

Review activity:  
 DLA - CC

(Project 5965-0239)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-PRF-87819A(USAF)

2. DOCUMENT DATE (YYMMDD)

### 3. DOCUMENT TITLE

HEADSET-MICROPHONE, (HEARING PROTECTIVE TYPE, HIGH AND MODERATE AMBIENT NOISE LEVELS) GENERAL SPECIFICATION  
FOR

### 4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED  
(YYMMDD)

(1) Commercial

(2) AUTOVON  
(If applicable)

### 8. PREPARING ACTIVITY

a. NAME  
88 LOG/LGME

b. TELEPHONE (Include Area Code)  
(1) Commercial (2) AUTOVON  
(513) 476-2581 986-2581

c. ADDRESS (Include Zip Code)  
4170 Hebble Creek Road  
Bldg 280, Door 4  
Wright Patterson AFB, OH 45433-5653

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5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466  
Telephone (703) 756-2340 AUTOVON 289-2340