

INCH-POUND

MIL-DTL-5898H
5 November 2012
SUPERSEDING
MIL-DTL-5898G
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DETAIL SPECIFICATION

CORDS, ELECTRICAL (WF-5/U, WF-14/U, WD-34/U, WM-53/U, WM-85/U)

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

1. SCOPE

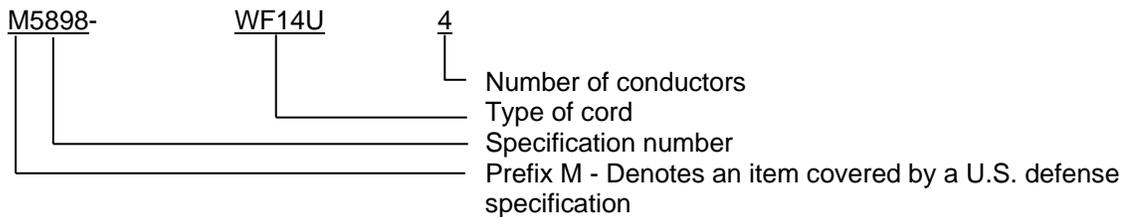
1.1 Scope. This specification covers conductor-insulated, jacketed, electrical cords used to fabricate combination headset-microphone extension cords and microphone extension cords for installation in defense aircraft equipped with intercommunication sets.

1.2 Classification. Cords are of the types specified in [table I](#).

TABLE I. Types of cords.

| Type | Number of conductors |
|---------|----------------------|
| WF-5/U | 4 |
| WF-14/U | 4 |
| WD-34/U | 2 |
| WM-53/U | 5 |
| WM-85/U | 5 |

1.2.1 Part or Identifying Number (PIN). The PIN consists of the following form:



Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: DSCC-VAI, P.O. Box 3990, Columbus, Ohio 43218-3990, or email to WireCable@dsc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4 or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARD

FED-STD-228 - Cable and Wire, Insulated; Methods of Testing

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-C-572 - Cord, Yarns and Monofilaments Organic Synthetic Fiber

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-104 - Limits for Electrical Insulation Color

MIL-STD-130 - Identification Marking of U.S. Military Property

(Copies of these documents are available online at <https://assist.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the in the solicitation or contract.

ASTM INTERNATIONAL

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

ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

(Copies of these documents are available online at <http://www.astm.org> or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NCSL INTERNATIONAL

NCSL-Z540.3 - Requirements for the Calibration of Measuring and Test Equipment

(Copies of this document are available from <http://www.ncsli.org> or from NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA-WC 70 - Standard for Non-shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

(Copies of these documents are available online at <http://www.nema.org> or from the National Electrical Manufacturer's Association, 1300 North 17th Street, Suite 1752, Rosslyn, VA 22209.)

UNDERWRITERS LABORATORIES, INCORPORATED (UL)

UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords

(Copies of these documents are available online at <http://www.ul.com> or from the Underwriters Laboratories, Inc., Publication Stock, 333 Pfingsten Road, Northbrook, IL 60062-2096.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.4.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Materials. The material for each part shall be as specified herein. When a definite material is not specified, a material shall be used which enables the electrical cord to meet the requirements of this specification. Acceptance or approval of any constituent material shall not be construed as acceptance of this finished product.

3.3.1 Flammable, explosive or toxic materials. In normal usage, materials shall be non-flammable, non-explosive, and nontoxic over the operating temperature range of this specification. Materials used in construction of these cords shall not emit fumes, powder or particles visible to the naked eye when cut, bent or otherwise manipulated during installation or normal use.

3.3.2 Coatings, jackets and other coverings. Materials used for coatings, jackets or coverings shall not exhibit defects such as checks, cracks, splits, blisters, pimples, embedded materials or pinholes when examined visually.

3.3.3 Material integrity. Materials and component parts of these cords shall exhibit no abnormalities or defects such as decomposition, separation or deterioration when examined visually.

3.4 Insulated conductors.

3.4.1 Individual strands. The individual strands shall be American Wire Gauge (AWG) 40 cadmium copper (cadmium bronze) wire and shall be tinned in accordance with [ASTM B33](#) before bunching. The minimum tensile strength of the strands after tinning shall be 90,000 pounds per square inch and shall be of at least 80 percent conductivity grade.

3.4.2 Conductors. The conductors shall be bunch stranded and the lay of the strands shall be approximately one-half inch. The nominal area of each conductor shall be 442 circular mils and the minimum area shall be 430 circular mils.

3.4.3 Wrap. Wrapping material shall in accordance with [MIL-C-572](#). The yarn may be omitted provided the conductors in the finished cords are free stripping and free from any detrimental effects that will interfere with normal soldering of the strands of the conductors in the finished cord.

3.4.4 Insulation. The insulation compound for the individual conductors shall be formulated to provide a material that meets the electrical, air-aging, and bending requirements specified herein.

3.4.4.1 Physical requirements. The insulation shall show no evidence of cracking or other damage, and the insulated conductor shall be flexible and resilient throughout the temperature range from -55 to 85°C. The thickness of the insulation at any point along the conductor shall be not less than .010 inch (.254mm).

3.4.4.2 Outside diameter of insulated conductor. The outside diameter of the insulated conductor shall be .060 inch (1.52mm) nominal.

3.4.5 Insulation color. The insulation of individual conductors shall be colored as specified in [table II](#). The colors shall be class 1, nominal chip, shall be in accordance with [MIL-STD-104](#).

TABLE II. Insulation color of individual conductors.

| <u>Conductor number</u> | <u>WF-5/U</u> | <u>WF-14/U</u> | <u>WD-34/D</u> | <u>WM-53/U</u> | <u>WM-85/U</u> |
|-------------------------|---------------|----------------|----------------|----------------|----------------|
| 1 | White | Red | Red | White | Red |
| 2 | Red | Green | Green | Red | Green |
| 3 | Green | White | - | Green | White |
| 4 | Black | Black | - | Black | Black |
| 5 | - | - | - | Yellow | Yellow |

3.5 Copper braid. Copper braid, where used, shall be fabric cored and shall be composed of eight carriers of AWG 36 tinned copper wire, three ends per carrier, having a height of spiral of .200±.020 inch (5.08 ±.508mm). The tinned copper wire shall be in accordance with [ASTM B33](#). The fabric core shall be fungus-resistant cotton, and the finished braid shall be capable of 2,000 flexing cycles without causing electrical discontinuity.

3.6 Staycord. Staycord shall be braided of fungus-resistant cotton threads. The staycord for all cords except type WD-34 shall have a diameter of .052±.010 inch (1.32 ±.254mm) and shall have a

breaking strength of not less than 30 pounds. The staycord for cord type WD-34 shall have a maximum diameter of .055 inches (1.4mm) and shall have a breaking strength of not less than 15 pounds. The staycord shall not damage the insulation of the conductors when the cord is bent or stretched.

3.7 Cabling.

3.7.1 Cabling of WF-14/U cord.

- a. The red and green conductors shall be twisted together with a left-hand lay of approximately .750 inch (19mm). The white and black conductors shall be twisted together with a left-hand lay of approximately 1.250 inches (31.8mm).
- b. A close wind consisting of a minimum of 32 ends of conducting cotton shall be applied over each twisted pair. The conducting-cotton wind shall be constructed of fungus-resistant number 60, 2-ply yarn having a maximum resistance of 1.2 megohms per inch. The maximum resistance of the wind in the completed cord shall be 1.5 megohms per foot.
- c. The two conducting-cotton-wrapped pairs shall be twisted together with a right-hand lay of approximately 1.500 inches (38.1mm) with a copper braid in one interstice and a staycord in the other interstice. Fungus-resistant cotton filler shall be used in each interstice to give the cord a reasonably circular cross section. The two pairs and the copper braid shall be twisted in such a manner as to assure contact between the braid and both conducting-cotton wraps.

3.7.2 Cabling of WM-85/U cord. The cabling of cord WM-85/U shall be as specified in 3.7.1a through 3.7.1c, except that a yellow conductor shall be used in the interstice with the staycord.

3.7.3 Cabling of WM-53/U cord. Five conductors in the order specified in [table II](#) shall be spiraled around a central core with a lay of approximately .531 inch (13.5mm). The central core shall contain a staycord. The conductors shall be wrapped around the central core in such a manner as to provide relatively free movement of the conductors over the staycord when the finished cord is bent or stretched.

3.7.4 Cabling of WF-5/U cord. The cabling of cord WF-5/U shall be as specified in 3.7.3, except the yellow conductor shall not be used.

3.7.5 Cabling of WD-34/U cord.

- a. The two conductors as specified in [table II](#) shall be twisted together with two staycords with approximately .500 inch (12.7mm) left-hand lay.
- b. A close wrap of fine fungus-resistant cotton shall be applied with a right-hand lay over the cabled assembly.

3.8 Jacket. After cabling, the assembly shall be covered overall and shall be centered in a jacketing compound formulated so as to fulfill the requirements specified herein. The jacketing material shall not adhere to the conductor insulation. Optionally, a thin, fungus-resistant, cotton wrapping may be applied over the assembly before the jacket is applied, provided flexibility is maintained in the finished cord. After jacketing, the cord shall be reasonably smooth, firmly bound, tough, elastic, and a homogeneous mass.

3.8.1 Jacketing compound. The jacketing compound shall be a low-temperature polychloroprene, crosslinked polyolefin, or polyurethane, and shall meet the material and physical property as specified in [table III](#) and the operating temperature range and cold bend requirements specified herein.

TABLE III. Physical property requirements for jacketing compounds of finished cord.

| Jacket wall thickness inch/(mm) | Less than .020/(.51) | .020 to .030 (.51 to .762) | Greater than .030/(.76) |
|---|-------------------------|-------------------------------|----------------------------|
| Unaged: | | | |
| Tensile strength, minimum, lbf/in ² | 1200 | 1500 | 1800 |
| Elongation, minimum, percent | 250 | 250 | 300 |
| Set, maximum, inch(mm) | - | - | .375(9.52) |
| After 166 hours of air-aging at 70°C: | | | |
| Tensile strength, minimum, percent of original | 75 | 75 | 75 |
| Elongation, minimum, percent of original | 75 | 75 | 75 |
| After oil immersion: | | | |
| Tensile strength, minimum, percent of original | 50 | 50 | 50 |
| Elongation, minimum, percent of original | 50 | 50 | 50 |

3.8.2 Jacket wall thickness. The minimum wall thickness of the jacket shall be as specified in [table IV](#).

3.9 Outside diameter of cord. The outside diameter of the finished cord shall be as specified in [table IV](#).

TABLE IV. Jacket wall thickness and cord outside diameter.

| Cord type: | WF-5/U | WF-14/U | WD-34/U | WM-53/U | WM-85/U |
|--|-------------|-------------|-------------|-------------|-------------|
| Jacket minimum thickness, inch (mm) | .025 (.635) | .025 (.635) | .012 (.305) | .025 (.635) | .025 (.635) |
| Cord outside diameter, ±.010 inch (mm) | .280 (7.11) | .300 (7.62) | .160 (4.06) | .280 (7.11) | .305 (7.75) |

3.10 Flexing. The finished cord shall be capable of withstanding at least 25,000 flexing cycles without showing evidence of serious damage to the jacket such as splits or ruptures, damage to the insulation of the individual conductors, or electrical discontinuity or short circuit.

3.11 Fungus-resistance. Materials used that are not fungus-inert shall be treated so as to render the material fungus-resistant. The fungicide used shall have no detrimental effects on the finished cord.

3.12 Electrical requirements of finished cord.

3.12.1 Dielectric strength. The insulation on conductors shall withstand the application of 500 V ac at 60 Hz for 5 seconds without flashover or breakdown.

3.12.2 Insulation resistance. The insulation resistance shall be not less than 100 megohms per 1,000 feet at 15.6 °C.

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3.12.3 Conductor resistance. The resistance per conductor per 100 feet shall not exceed 4.0Ω.

3.12.4 Isolation. The minimum isolation of cords WF-14/U and WM-85/U shall be as specified in table V.

TABLE V. Isolation.

| Frequency (Hz) | Electrostatic | | Electromagnetic | |
|-------------------|---------------|---------|-----------------|---------|
| | WF-14/U | WM-85/U | WF-14/U | WM-85/U |
| | (dB minimum) | | (dB minimum) | |
| 20,000 | 62.0 | 60.0 | 48.0 | 45.0 |
| 15,000 | 63.0 | 60.5 | 49.0 | 45.0 |
| 10,000 | 64.0 | 61.0 | 50.0 | 45.0 |
| 5,000 | 65.0 | 61.5 | 51.0 | 45.0 |
| 1,000 | 66.0 | 62.0 | 51.0 | 46.0 |

3.13 Identification. The cord shall be marked for identification in accordance with MIL-STD-130 on the jacket at 12 to 24 inch intervals throughout the entire length. The identification marking shall read lengthwise along the cord as specified in table VI.

3.14 Insulation shrinkage. When tinning the wire of the finished cord, the insulation shall not shrink more than .031 inch lengthwise and shall not expand outward from the wire.

3.15 Ozone resistance. The finished cord shall be ozone-resistant.

TABLE VI. Markings for identification.

| Cord type | PIN | Defense specification no. | Manufacturer name or CAGE Code ^{1/} |
|-----------|--------------|---------------------------|--|
| WF-5/U | M5898-WF5U4 | MIL-DTL-5898 | * |
| WF-14/U | M5898-WF14U4 | MIL-DTL-5898 | * |
| WD-34/U | M5898-WD34U2 | MIL-DTL-5898 | * |
| WM-53/U | M5898-WM53U5 | MIL-DTL-5898 | * |
| WM-85/U | M5898-WM85U5 | MIL-DTL-5898 | * |

^{1/} Applicable information to be supplied by the manufacturer.

3.16 Flammability. When subjected to an open flame, insulation shall not burn for more than the specified time nor release flaming particles, and the flame shall not travel more than the distance specified in the VW-1 flame test of UL 1581.

3.17 Cold bend. The cord shall show no evidence of cracked jacket or conductor insulation when subjected to cold bending at -55+0, -5 °C.

3.18 Workmanship. The electrical cord supplied to this specification shall be of high quality workmanship. It shall be homogenous throughout its length, free of irregularities and free of defects that affect its life, serviceability, or appearance. The cord shall be uniform in shape and free of kinks, splints, cuts, cracks, abrasions, peeled surfaces, or other imperfections.

4. VERIFICATION

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

- a. First article inspection (see [4.4](#)).
- b. Conformance inspection (see [4.5](#)).

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 inspections shall be used. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with [NCSL-Z540.3](#) or equivalent.

4.3 Test conditions. Unless otherwise specified in the applicable test method, inspections shall be conducted under the following environmental conditions.

- a. Temperature: 15 to 35 °C.
- b. Pressure: Normal atmospheric.
- c. Humidity: Prevailing ambient (25 to 90 percent relative).

4.4 First article inspection. When required (see [6.2](#)), first article inspection shall consist of the tests specified in [table VII](#).

4.5 Conformance inspection. Conformance inspection shall consist of group A (see [4.5.2](#)) and group B (see [4.5.3](#)) inspections, and shall be performed on every lot of cord procured under this specification.

4.5.1 Lot. Unless otherwise specified (see [6.2](#)), a lot shall consist of all cord of the same PIN, produced under essentially the same conditions, and presented for inspection at one time.

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TABLE VII. First article inspection.

| Inspection | Requirement | Verification paragraph |
|---------------------------------|---------------------|------------------------|
| Conductor: | 3.4 | - |
| Strands, conductors, wrap | 3.4.1, 3.4.2, 3.4.3 | 4.6.1 |
| Insulation | 3.4.4 | 4.6.1 |
| Material | 3.3, 3.4.1, 3.4.3 | 4.6.1 |
| Physical requirements | 3.4.4.1 | 4.6.1 and 4.6.12 |
| Insulation thickness | 3.4.4.1 | 4.6.1 |
| Outside diameter | 3.4.4.2 | 4.6.1 |
| Color | 3.4.5 | 4.6.1 |
| Copper braid | 3.5 | 4.6.1 and 4.6.7.3 |
| Staycord: | 3.6 | - |
| Material | | 4.6.1 |
| Breaking strength | | 4.6.8 |
| Dimensions | | 4.6.1 |
| Conducting cotton | 3.7.1b | 4.6.1 |
| Cabling: | 3.7.1 through 3.7.5 | 4.6.1 |
| Conductors | | |
| Lay | | |
| Filler | | |
| Wrap | | |
| Jacket | 3.8 | 4.6.1 |
| Jacketing compound | 3.8.1 | 4.6.1 and 4.6.12 |
| Jacket wall thickness | 3.8.2 | 4.6.1 |
| Cord: | - | - |
| Outside diameter | 3.9 | 4.6.1 |
| Identification | 3.13 | 4.6.1 |
| Wrap | 3.4.3 | 4.6.1 |
| Environmental | - | - |
| Tensile strength/elongation/set | | |
| Unaged | 3.8.1 | 4.6.4.1 |
| Air-aged | 3.8.1 | 4.6.4.2 |
| Oil immersion | 3.8.1 | 4.6.4.3 |
| Flammability | 3.16 | 4.6.5 |
| Ozone resistance ^{1/} | 3.15 | 4.6.11 |
| Flexing, cord | 3.10 | 4.6.7.2 |
| Flexing, braid | 3.5 | 4.6.7.3 |
| Fungus resistance | 3.11 | 4.6.3 |
| Insulation shrinkage | 3.14 | 4.6.10 |
| Cold bend | 3.17 | 4.6.12 |
| Electrical; cord: | 3.12 | - |
| Conductor resistance | 3.12.3 | 4.6.6.1 |
| Insulation resistance | 3.12.2 | 4.6.6.3 |
| Dielectric strength | 3.12.1 | 4.6.6.2 |
| Isolation | 3.12.4 | 4.6.9 |
| Workmanship | 3.18 | 4.6.1 |

^{1/} The ozone-resistance test is not required if polyurethane or a crosslinked-polyolefin material is used for the jacketing compound.

4.5.1.1 Unit of product. The unit of product shall be a continuous length of cord, not to exceed 550 feet in length.

4.5.2 Group A inspection. Group A inspection shall consist of the inspections specified below. Group A inspection may be performed at an appropriate stage of the manufacturing operation rather than on the finished cord.

- a. Conductor resistance.
- b. Dielectric strength.
- c. Insulation resistance.
- d. Workmanship.

4.5.3 Group B inspection. Group B inspection shall consist of the inspections in [table VIII](#) conducted on a sampling basis.

TABLE VIII. Group B inspection.

| Inspection | Requirement | Verification |
|-------------------------------|-------------------------|-----------------------|
| Identification | 3.13 | 4.6.1 |
| Outside diameter of conductor | 3.4.4.2 | 4.6.1 |
| Outside diameter of cord | 3.9 | 4.6.1 |
| Staycord, diameter | 3.6 | 4.6.1 |
| Staycord, breaking strength | 3.6 | 4.6.8 |
| Isolation | 3.12.4 | 4.6.9 |

4.5.3.1 Sampling. A random sample shall be selected from each lot. The sample size shall be based on the lot size from which the sample was selected. Sampling inspection shall be as specified in [table IX](#).

TABLE IX. Inspection sample.

| Lot size ^{1/} | Sample Size |
|------------------------|-------------|
| 1 to 8 | 2 |
| 9 to 90 | 3 |
| 91 to 150 | 12 |
| 151 to 280 | 19 |
| 281 to 500 | 21 |
| 501 to 1,200 | 27 |
| 1,201 to 3,200 | 36 |
| 3,201 to 10,000 | 38 |
| 10,001 to 35,000 | 46 |

^{1/} Lot size is based on the number of units of product (see [4.5.1.1](#)).

4.5.3.2 Specimen length. Unless otherwise specified herein, the specimen shall be of the length specified in the applicable test method.

4.5.4 Rejected lot. Failure of a lot to pass any test or inspection constitutes failure of the lot and the lot shall be rejected. If an inspection lot is rejected, the contractor may rework the lot to correct the defects, or screen out the defective units and resubmit the lot for re-inspection. Such lots shall be separated from new lots and shall be identified as re-inspected lots.

4.5.5 Non compliance. If a sample fails to pass group B inspection ([see 4.5.3](#)), the contractor shall notify the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, on all units of the product. Acceptance and shipment of the product shall be discontinued until corrective action has been taken. After the corrective action has been taken, sampling inspection shall be repeated on replacement articles. (This includes all tests and examinations, or only the test that the original sample failed, at the option of the cognizant inspection activity.) Final acceptance and shipment will be withheld until group B inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure shall be provided to the cognizant inspection activity.

4.6 Methods of inspection.

4.6.1 Visual and dimensional inspection. The finished cords shall be given a visual and dimensional inspection for:

- a. Color of conductors.
- b. Identification.
- c. Workmanship.
- d. Outside diameter of insulated conductors.
- e. Thickness of conductor insulation.
- f. Minimum wall thickness of jacketing material.
- g. Outside diameter of finished cords.
- h. Staycord diameter and material.
- i. Wrap.
- j. Cabling (conductors, lay, filler, wrap, and conducting cotton).
- k. Braid.
- l. Insulated conductors (strands, conductors, and insulation).

4.6.2 Air-aging and bending. A specimen of insulated conductor shall be selected from each 20,000 feet of cord or one month's production, whichever is less, and shall be air-aged in an oven and tested in accordance with [NEMA-WC 70](#), except that the aging period and temperature shall be as specified in [table III](#). After aging, the specimen shall be wrapped five times around a .156-inch (3.96mm) diameter mandrel.

4.6.3 Fungus resistance. A cord specimen shall be selected from each 250,000 feet of cord or six months' production, whichever is less, and shall be subjected to a fungus test in accordance with [ASTM G21](#).

4.6.4 Jacket tensile strength, elongation, and set.

4.6.4.1 Unaged. An unaged jacket shall be tested for tensile strength using method 3021 of [FED-STD-228](#) and for elongation using method 3031 of FED-STD-228. Set, when required, shall be tested using method 3161 of FED-STD-228.

4.6.4.2 Air-aged. A sample of the jacket shall be air-aged for 166 hours at 70 °C and then tested for tensile strength and elongation using the methods listed in 4.6.4.1.

4.6.4.3 Oil immersion. The jacket shall be subjected to the oil immersion test in accordance with method 4223 of [FED-STD-228](#).

4.6.5 Flammability. Insulation flammability testing shall be performed in accordance with the VW-1 flame test method of [UL 1581](#).

4.6.6 Electrical tests.

4.6.6.1 Conductor resistance. The resistance of each conductor of the cord shall be measured in a bridge circuit. The arithmetical average of the measured values shall be used to calculate the conductor resistance.

4.6.6.2 Dielectric strength. An alternating potential as specified in [3.12.1](#) shall be applied between two terminals, one being each conductor in turn and the other terminal being all the remaining conductors tied together. The voltage source shall have a capacity of not less than 3 kilovolt ampere.

4.6.6.3 Insulation resistance. Immediately after successfully passing the dielectric strength test, the insulation resistance shall be measured using a galvanometer with shunts and a dc voltage source of not less than 125 V dc. The connections shall be as specified in [4.6.6.2](#). The test may be terminated when the galvanometer indicates a steady insulation resistance value has been obtained. The measured insulation resistance values shall be corrected to 15.6 °C if measurements are made at temperature other than 15.6 °C.

4.6.7 Flexing test. Sample lengths of cord shall be selected from each 100,000 feet or one month's production, whichever is less, and subjected to the following:

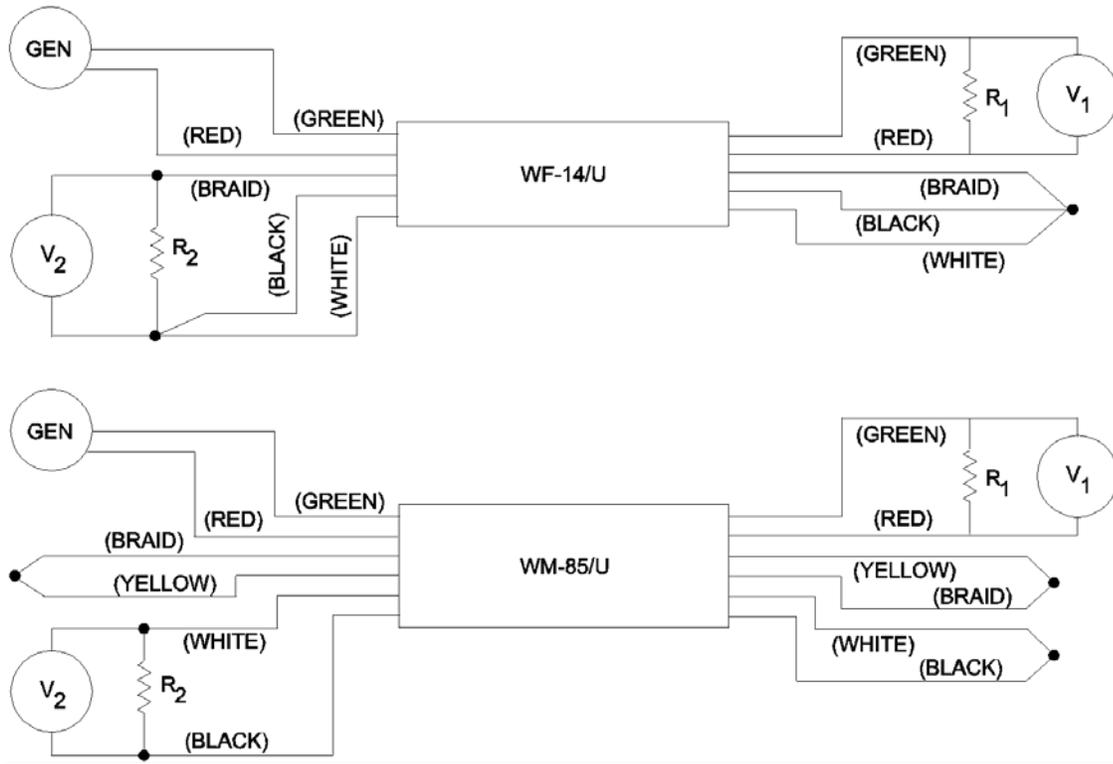
4.6.7.1 Preparation. Five specimens, each approximately 1.5 feet long, shall be clamped and suspended through holes in a rectangular .500x.625 inch (12.7mm x 15.9mm) metal bar. The diameter of the .625-inch (15.9mm) through holes shall be .005 inch (.13mm) to .010 inch (.254mm) greater than the diameter of the cord undergoing the test. The through holes shall incorporate a .125-inch (3.17mm) radius at the end from which the cords emerge (bending point). The cords shall be clamped in such a manner that they will not turn in the holes during flexing. The clamping points shall be immediately above the metal bar and cord clamps shall rest on top of the metal bar. A knot shall be tied near the free end of each cord and a 3-pound weight shall be suspended from each knot, except for type WD-34/U, which shall have a 1-pound weight suspended from each knot. The metal bar, supported horizontally, shall be positioned in a test jig that will enable oscillation about its longitudinal axis through an angle or 120° (60°each side of vertical).

4.6.7.2 Cord flexing life. The conductors of each specimen shall be connected in series with a 6-volt lamp and a suitable power supply to indicate electrical continuity. The metal bar shall then be oscillated at approximately 85 cycles per minute until electrical discontinuity occurs. The cord flexing life shall be calculated by summing the total number of flexing cycles for each specimen and dividing by the total number of specimens.

4.6.7.3 Braid flexing life. Where used, the copper braid of each specimen shall be connected in series with the circuit described in 4.6.7.2. The metal bar shall be oscillated at approximately 85 cycles per minute until electrical discontinuity occurs. The arithmetical average of the number of flexing cycles per specimen shall be taken as the braid flexing life.

4.6.8 Staycord strength. A suitable device shall be used to determine the breaking strength of the staycord.

4.6.9 Isolation tests. A specimen of 55 feet \pm 2 inches (16800 \pm 50.8 mm) shall be tested in the appropriate circuit as shown on figure 1 for both electrostatic and electromagnetic isolation. Calculations shall be as shown on figure 1.



Calculations: $\text{dB} = \text{dBm reading of } V_1 - \text{dBm reading of } V_2$

NOTES:

1. For electrostatic tests: $R_1 = R_2 = 1 \text{ megohm} \pm 5\%$.
2. For electromagnetic tests: $R_1 = 4.5\Omega \pm 1\%$
 $R_2 = 1 \text{ megohm} \pm 5\%$.
3. The waveform shall be sinusoidal, 15V rms minimum.

FIGURE 1. Isolation tests.

4.6.10 Insulation shrinkage. The outer jacket shall be stripped approximately 3 inches and each individual wire stripped approximately .250 inch (6.4mm) The bare wires shall be twisted by hand and remain at its minimum diameter in five twists or less and shall not spread or fray at the end. The wires shall be tinned and soldered in accordance with [FED-STD-228](#), method 8231.

4.6.11 Ozone resistance. The cord shall be wrapped around a mandrel that is four times the outside diameter of the specimen in such a manner that the cord is kept taut throughout the test. The mandrels and specimens shall be kept at room temperature for 2 days, after which these items shall be placed in an atmosphere containing 25±5 parts of ozone per one-hundred million parts of air. A temperature of 50°C shall be maintained and the test continued for a period of 7 days. After the test has been completed, the jacket of the specimen shall be inspected for cracking through a magnifying glass of at least three diameters magnification.

4.6.12 Cold bend. The cord shall be attached to the proper size mandrel as specified in table X and suspended vertically with the lower ends weighted sufficiently to keep the cord taut and to permit bending without handling. The cord and mandrel shall be placed in a chamber at -55±0, -5 °C for a minimum of 20 hours. While maintaining the cord at -55 °C, the cord shall be bent for 5 close turns around the mandrel at the rate of approximately 15 turns per minute. The jacket shall then be examined for cracks using a magnifying glass of at least 3 diameters magnification. After examination of the jacket, the jacket shall be removed and the conductor insulation examined for cracks using the same magnifying glass.

TABLE X. Mandrel size for cold bend test.

| Cord type | Maximum mandrel size |
|------------------------------|----------------------|
| WF-5/U WD-34/U WM-53/U | 1 times cord OD |
| WF-14/U WM-85/U | 3 times cord OD |

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see [6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The cords covered by this specification are used to make up combination headset-microphone extension cords and microphone cords for installation in specific defense aircraft with intercommunication sets. These cords are defense unique because they are configured for use only in defense aircraft.

- a. WM-85/U is used with plug connector U-94() U to make up combination headset-microphone extension cords with portable microphone switch.
- b. WD-34/U is used as a microphone cord with the M-3A/A, M-32() AIC, and M-33() AIC microphones.
- c. WF-5/U is used with jack U-61/U to make up headset-microphone extension cords.
- d. WM-53/U is used with jack U-82/U to make up combination headset-microphone extension cords with a portable microphone switch.
- e. WF-14/U is used with jack U-92()/U to make up combination headset-microphone extension cords.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type designation and PIN (see 1.2 and 1.2.1).
- c. If required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. Whether first article inspection is required (see 3.1 and 4.4). Invitations for bids should provide that the government reserves the right to waive the requirement for samples for first article inspection for those bidders offering a product that has been previously acquired or tested by the government, and that bidders offering such products who wish to rely on such production or test must furnish evidence with the bid that prior government approval is presently appropriate for the pending contract.
- e. Packaging requirements (see 5.1). The cords should be furnished on spools, in spool or reel-type packages, or on reels. Each spool, package, or reel should contain not less than 450 feet and not more than 550 feet. The maximum number of continuous lengths per spool, package, or reel should be 3. The length of any one piece thereof should not be less than 50 feet.

6.3 Material handling and disposal. Caution should be taken during handling and disposal of all insulation and jacket materials in accordance with ASTM C930 and FED-STD-313.

6.4 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Included in the list of 31 priority chemicals are cadmium, lead, and mercury. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

6.5 Subject term (key word) listing.

Flexible
Headset
Microphone

6.6 Changes from previous issue. The margins of this specification are marked with a vertical line to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes to liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

CONCLUDING MATERIAL

Custodians:
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC
(Project 6145-2012-028)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.