

INCH-POUND
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SUPERSEDING
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DETAIL SPECIFICATION

ATTENUATORS, VARIABLE (COAXIAL AND WAVEGUIDE), GENERAL SPECIFICATION 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 variable (continuously and variable in steps) attenuators for use as attenuating elements in coaxial lines and waveguides. These attenuators are used for armed services application in the transmission lines of radar, radio, and associated equipment (see 6.1).

1.2 Classification. Attenuators consist of the following classes, as specified (see 3.1 and 6.2):

<u>Class</u>	<u>Type of rf connector</u>	<u>Connector specification</u>
5	SMA	MIL-PRF-39012
7	BNC	MIL-PRF-39012

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 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 documents cited in sections 3 or 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 cited in the solicitation or contract (see 6.2).

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: DSCC-VAT, Post Office Box 3990, Columbus, OH 43218-3990 or emailed to TubesAmps@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 <http://assist.daps.dla.mil>.

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DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-DTL-3922 - Flanges, Waveguide, General Purpose, General Specification for.
- MIL-F-14072 - Finishes for Ground Based Electronic Equipment.
- MIL-DTL-24044 - Flanges, Coaxial Line, Rigid Air Dielectric, General Specification for.

See supplement 1 for list of associated specification sheets.

FEDERAL STANDARDS

- FED-STD-H28 - Screw-Thread Standards for Federal Services.

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-129 - Military Marking for Shipment and Storage.
- MIL-STD-202 - Electronic and Electrical Component Parts.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.
- MIL-STD-2073-1 - DOD Standard Practice for Military Packaging.

(The above specifications, standards, and handbooks are available online at <http://assist.daps.dla.mil> or from the Document Automation and Production Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, 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 solicitation or contract (see 6.2).

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

- NCSL-Z540.1 - Calibration Laboratories and Measuring and Test Equipment (DoD adopted).

(Copies are available online at <http://www.nclsi.org> or from National Conference of Standards Laboratories (NCSL), 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404.)

ASTM INTERNATIONAL (ASTM)

- ASTM-A582/A582M - Free-Machining Stainless Steel Bars (DoD adopted).
- ASTM-B194 - Copper-Beryllium Alloy (DoD adopted).
- ASTM-B196/B196M - Copper-Beryllium Alloy Rod and Bar (DoD adopted).
- ASTM-B197/B197M - Copper-Beryllium Alloy Wire (DoD adopted).
- ASTM-B700 - Electrodeposited Coatings of Silver for Engineering Use.
- ASTM-B783 - Materials for Ferrous Powder Metallurgy Structural Parts.
- ASTM-G21 - Determining Resistance of Synthetic Polymeric Materials to Fungi (DoD adopted).

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

SAE INTERNATIONAL (SAE) AEROSPACE MATERIALS SPECIFICATIONS (AMS)

- SAE-AMS-QQ-S-763 - Corrosion Resistant Steel Bars, Wire, Shapes and Forgings (DoD adopted).

(Copies are available online at <http://www.sae.org> or from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

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 specification 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.

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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 First article inspection. A first article sample of the attenuator shall be tested as specified in 4.5.

3.3 Material. The material shall be as specified. When a definite material is not specified, a material shall be used which will enable the attenuators 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.

3.3.1 Fungus. All material shall be inert or fungus resistant in accordance with ASTM-G21.

3.4 Design and construction. Attenuators shall be of the design, construction, and physical dimensions specified (see 3.1). Attenuators shall be of the lightest practicable weight consistent with the strength required for sturdiness, safety, and reliability. Mechanical stops shall be provided at the minimum and maximum attenuation positions to prevent damage to the attenuator cards. Bearing surfaces and gears shall be made of a durable metal that shall resist wear. A cam or detent shall be used on step attenuators that provides a positive step at each position. End play in shafts and bearings shall be kept to a minimum and gear mesh shall be such that the backlash requirement is complied with. Control knobs, or dials, or stub-shafts with screwdriver slot, shall be so designed that attenuator adjustment may be readily made. The adjustment shall not change in setting as a result of shock and vibration tests.

3.4.1 Operating frequency range. The frequency range shall be as specified (see 3.1).

3.4.2 Nominal impedance. The nominal impedance for coaxial-line attenuators shall be as specified (see 3.1).

3.4.3 Threaded parts. All threaded parts shall be in accordance with FED-STD-H28.

3.4.4 Plastic parts. All plastic parts shall be free from visible cracks or flaws.

3.4.4.1 Plastic caps. The waveguide flange and rf connector ends of the attenuators shall be sealed with push-on plastic caps to prevent damage and the entrance of moisture and foreign material during storage.

3.4.5 Metal parts. All metal parts shall be free from chips, burrs, and scratches in accordance with good commercial practice. Metal parts shall be inherently corrosion resistant or treated to resist corrosion.

3.4.6 Connectors. The connectors shall be as specified (see 3.1). The material and gauging for receptacle connectors shall conform to the requirements of the applicable specification.

3.4.6.1 Connector metal parts. Unless otherwise specified, the connectors and the male center contact pins shall be made of corrosion resisting steel, type 302 or 304 in accordance with SAE-AMS-QQ-S-763, or type 303 in accordance with ASTM-B783 and ASTM-A582/A582M. The female center contact pins shall be made of beryllium copper conforming to ASTM-B196/B196M, ASTM-B197/B197M and ASTM-B194, silver plated in accordance with ASTM-B700.

3.4.7 Flange. Flanges shall be designed and manufactured to provide the mating characteristics of the flange specified (see 3.1) in accordance with MIL-DTL-3922 or MIL-DTL-24044.

3.4.8 Waveguide. Waveguides used in the manufacturing of the attenuators shall be as specified (see 3.1).

3.4.9 Weight. The weight for attenuators shall be as specified (see 3.1).

3.4.10 Finish. The attenuators shall be given a protective coating in accordance with MIL-F-14072. Unless otherwise specified (see 3.1), all exterior surfaces except flange mating surfaces, connectors, dials, knobs, and working parts shall be painted with enamel in accordance with MIL-F-14072, as specified (see 3.1).

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3.4.10.1 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of variable attenuator components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.6).

3.5 Performance.

3.5.1 Insertion loss. When tested as specified in 4.7.2, the value of attenuation at the minimum attenuation position, across the operating frequency range, shall be no greater than specified (see 3.1).

3.5.2 Voltage standing wave ratio (VSWR). When tested as specified in 4.7.2, the VSWR of the attenuator, at any attenuation position, at the frequencies specified, shall be no greater than specified (see 3.1).

3.5.3 Dial calibration (when applicable, see 3.1). When tested as specified in 4.7.2, the calibration of the dial assembly, if included with the attenuator, shall be checked and shall be within the specified limits (see 3.1).

3.5.4 Frequency sensitivity. When tested as specified in 4.7.2, the total variation in attenuation value across the operating frequency range shall be no greater than specified (see 3.1).

3.5.5 Attenuation range. When tested as specified in 4.7.2, the attenuation range shall be as specified and shall be variable as specified (see 3.1).

3.5.6 Temperature coefficient (when required, see 3.1). When tested as specified in 4.7.10, the temperature coefficient shall be as specified (see 3.1).

3.5.7 Backlash. The variable control mechanism used shall have provisions to eliminate backlash to the point that the accuracy of the dial calibration is applicable when approaching an attenuation value from either direction (see 4.7.2).

3.5.8 Power capability. When tested as specified in 4.7.3, at the specified maximum power (see 3.1), the VSWR and dial calibration requirements shall be met (see 3.5.2 and 3.5.3).

3.5.9 Repeatability. When tested as specified in 4.7.4, the attenuators shall meet the requirements of 3.5.1 through 3.5.8 (see 3.1) after 500 cycles of operation.

3.5.10 Shock. When tested as specified in 4.7.5, attenuators shall meet the requirements for VSWR and attenuation (see 3.1).

3.5.11 Vibration. When tested as specified in 4.7.6, attenuators shall meet the requirements for VSWR and attenuation (see 3.1).

3.5.12 Salt spray (corrosion). When tested as specified in 4.7.7, attenuators shall show no evidence of corrosion or pitting (see 3.1).

3.5.13 Temperature cycling. Attenuators shall withstand the temperature cycling specified in 4.7.8.

3.5.14 Pressurization-waveguide type attenuators (when required). There shall be no evidence of escaping bubbles when the attenuator is tested as specified in 4.7.11.

3.5.15 Seal-coaxial type attenuators (when required). There shall be no evidence of escaping bubbles when the attenuator is tested as specified in 4.7.12.

3.5.16 Humidity (when required). When tested as specified in 4.7.9, the VSWR and attenuation range shall be within the limits specified (see 3.1).

3.6 Marking. Attenuators shall be marked in accordance with MIL-STD-1285, with the following information:

- a. Class, part number, and manufacturer's code symbol.
- b. Attenuation, in decibels (dB) as specified (see 3.1).

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- c. Frequency range, as specified (see 3.1).
- d. Average power rating, in watts (see 3.1).

Marking shall be in permanent lettering at least .125 inch (3.18 mm) high.

3.7 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. All components supplied shall be new and unused.

3.8 Workmanship. Surfaces shall be free from burrs, die marks, chattermarks, scratches, grease, scale, splinters, and other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 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 supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL-Z540.1.

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

- a. Materials inspection (see 4.3).
- b. First article inspection (see 4.5).
- c. Conformance inspection (see 4.6).

4.3 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials listed in table I, used in fabricating the attenuator, are in accordance with the applicable referenced specifications or requirements prior to such fabrication.

TABLE I. Materials inspection.

Material	Requirement paragraph	Applicable specification
Fungus	3.3.1	ASTM-G21
Silver	3.4.6.1	ASTM-B700
Copper-beryllium	3.4.6.1	ASTM-B196/B196M, B197/B197M, B194
Steel bars, shapes and forgings	3.4.6.1	SAE-AMS-QQ-S-763 or ASTM-B783, A582/A582M

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

4.5 First article inspection. First article inspection shall be performed by the supplier after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units that have been produced with equipment and procedures normally used in production. First article approval is valid only on the contract or purchase order under which it is granted, unless extended by the Government to other contracts or purchase orders. First article inspection shall consist of the tests specified in table II, in the order shown.

4.5.1 Sample. One attenuator from each 50, or fraction thereof produced, shall be subjected to first article inspection as specified in table II.

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4.5.2 Failures. Failures in any of the examinations or tests shall be cause for refusal to grant first article approval of the attenuators represented by the sample unit.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B.

TABLE II. First article inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical examination	3.1, 3.3 through 3.4.10	4.7.1
Operating frequency range	3.4.1	4.7.2
Insertion loss	3.5.1	4.7.2
Voltage standing wave ratio	3.5.2	4.7.2
Dial calibration (when applicable)	3.5.3	4.7.2
Frequency sensitivity	3.5.4	4.7.2
Attenuation range	3.5.5	4.7.2
Backlash	3.5.7	4.7.2
Power capability	3.5.8	4.7.3
Repeatability	3.5.9	4.7.4
Shock	3.5.10	4.7.5
Vibration	3.5.11	4.7.6
Salt spray (corrosion)	3.5.12	4.7.7
Temperature cycling	3.5.13	4.7.8
Temperature coefficient (when required)	3.5.6	4.7.10
Pressurization (when required)	3.5.14	4.7.11
Seal (when required)	3.5.15	4.7.12
Humidity (when required)	3.5.16	4.7.9
Marking	3.6	4.7.1
Workmanship	3.7	4.7.1

4.6.1.1 Inspection lot. An inspection lot shall consist of all the attenuators of the same class and part number, 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 examinations and tests specified in table III, in the order shown.

TABLE III. Group A inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical examination	3.1, 3.3 through 3.4.10, 3.6, and 3.7	4.7.1
Operating frequency range	3.4.1	4.7.2
Insertion loss	3.5.1	4.7.2
Voltage standing wave ratio	3.5.2	4.7.2
Dial calibration (when applicable)	3.5.3	4.7.2
Frequency sensitivity	3.5.4	4.7.2
Attenuation range	3.5.5	4.7.2
Backlash	3.5.7	4.7.2
Power capability	3.5.8	4.7.3
Repeatability	3.5.9	4.7.4

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4.6.1.2.1 Group A sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis with a random sample of components selected in accordance with table IV. The acceptance levels shall be based upon the zero defective sampling plan. No failures shall be permitted.

TABLE IV. Group A sampling plan.

Lot size	Sample size
1-13	100 percent
14-150	13
151-280	20
281-500	29
501-1,200	34
1,201-3,200	42
3,201-10,000	50

4.6.1.2.2 Disposition of sample units. Sample units which have passed the group A inspection may be delivered on the contract or order if the lot is acceptable.

4.6.1.2.3 Rejected lots. If an inspection lot is rejected, the supplier may withdraw the lot, and may then rework it to correct the defects, or screen out the defective units, as applicable. Such lots shall be kept separate from new lots and shall be clearly identified as reinspected lots. Such lots shall be inspected using tightened inspection.

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

TABLE V. Group B inspection.

Test	Requirement paragraph	Method paragraph
Shock	3.5.10	4.7.5
Vibration	3.5.11	4.7.6
Salt spray (corrosion)	3.5.12	4.7.7
Temperature cycling	3.5.13	4.7.8
Temperature coefficient (when specified)	3.5.6	4.7.10
Pressurization (when required)	3.5.14	4.7.11
Seal (when required)	3.5.15	4.7.12
Humidity (when required)	3.5.16	4.7.9

4.6.1.3.1 Sampling plan. One sample unit shall be selected from every 100 production units of each type, or fraction thereof, for the group B inspection. If one or more fails to pass the group B inspection, the lot shall be considered to have failed.

4.6.1.3.2 Disposition of sample units. Sample units that have been subjected to group B inspection shall not be delivered on the contract or order.

4.6.1.3.3 Noncompliance. If a sample fails to pass group B inspection, the supplier shall take corrective action on the materials, process, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action, acceptable to the Government, has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the Government). Group A inspection may be reinstated; however, final acceptance shall be withheld until the group B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and corrective action taken shall be furnished to the contracting officer.

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4.6.2 Inspection of preparation for delivery. The sampling and inspection of the preservation-packaging and interior package marking shall be in accordance with the group A and B conformance inspection requirements of MIL-STD-2073-1. 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 examination or test.

4.7.1 Visual and mechanical examination. Attenuators shall be examined to verify that the material, design, construction, physical dimensions, finish, marking, and workmanship are in accordance with the applicable requirements (see 3.3, 3.4.4 through 3.4.10, 3.6, and 3.7).

4.7.2 Electrical tests for attenuators (3.5).

4.7.2.1 Electrical tests for attenuators with attenuation values of 60 dB or less. The attenuators shall be tested for electrical requirements using the applicable measuring system shown on figure 1 or figure 2. The attenuator may be tested for electrical requirements using swept frequency techniques and a network analyzer. The attenuation measurement system shall have an accuracy of 0.1 dB per 10 dB or better. Frequency shall be monitored to within ± 0.1 percent for compliance with the frequency range requirement. Unless definite frequencies are specified, the minimum number of measurements shall be at midband and both extremes of the frequency range. With the frequency and power level appropriately adjusted, the attenuator, set at the minimum attenuation position, shall be inserted into the measurement line and the insertion loss and VSWR measured. Calibration of the dial shall then be checked, or the maximum attenuation measured, whichever is applicable. These measurements shall be repeated at the required frequencies. Calibration of the dial shall be checked, at least at one frequency, starting at the maximum attenuation position for compliance with the backlash requirement. When applicable, non-dial type of attenuators shall be checked for attenuation at both ends of the attenuator, at minimum, 50 percent, and maximum attenuation. VSWR shall be measured at both ends of the attenuator, at minimum, 50 percent, and maximum attenuation. The requirements of 3.5.1 through 3.5.7 shall be met.

4.7.2.2 Electrical tests for attenuators with attenuation values greater than 60 dB. The attenuators shall be tested for electrical requirements using the measuring system shown on figure 1, or equivalent. Measurements shall be made continuously over the entire specified frequency range. The attenuation measurement system shall have an accuracy of 0.1 dB per 10 dB or better. Frequency shall be monitored to within ± 0.1 percent for compliance with the frequency range requirement. With the frequency and power level appropriately adjusted, the attenuator, set at the minimum attenuation position, shall be inserted into the measurement line and the insertion loss and VSWR measured. Calibration of the dial shall then be checked, or the maximum attenuation measured, whichever is applicable. These measurements shall be repeated at the required frequencies across the frequency range. Calibration of the dial shall be checked, at least at one frequency, starting at the maximum attenuation position for compliance with the backlash requirement. When applicable, non-dial type of attenuators shall be checked for attenuation at both ends of the attenuator, at minimum, 50 percent, and maximum attenuation. VSWR shall be measured at both ends of the attenuator, at minimum, 50 percent, and maximum attenuation. The requirements of 3.5.1 through 3.5.7 shall be met.

4.7.3 Power capability (see 3.5.8). Using the same type measuring system as in 4.7.2, the dial calibration and VSWR shall be checked with the specified maximum power applied to the attenuator. The frequency shall be adjusted to the high end of the frequency range (see 3.1).

4.7.4 Repeatability (see 3.5.9). The attenuators shall be tested as specified in 4.7.2 and 4.7.3. They shall then be operated from minimum through maximum attenuation the specified number of times in accordance with method 206 of MIL-STD-202. They shall then be tested as specified in 4.7.2 and 4.7.3.

4.7.5 Shock (see 3.5.10). Attenuators shall be tested in accordance with method 213 of MIL-STD-202. The following details shall apply:

- a. Unit shall be rigidly mounted.
- b. Reference surfaces: Applicable.
- c. Test condition letter: I.

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- d. Measurements - During each of the shock positions outlined, the attenuator shall be adjusted sequentially to mid range and at each extreme of the attenuation range. After each shock pulse, it shall be observed that the dial, knob or other type manual adjustment shall not have moved from its initial position and that the mechanics of the system are sound.

After test, VSWR and attenuation shall be measured.

4.7.6 Vibration (see 3.5.11). Attenuators shall be tested in accordance with method 204 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting: Rigid.
- b. Electrical load conditions: Not applicable.
- c. Test condition letter: A, except the cycle to be performed four times for a total period of 3 hours.
- d. Method of determining resonance: Not applicable.
- e. Measurements: During the test, the attenuator dial, knob or other type manual adjustment shall be adjusted to mid range and sequentially to each of the end limit positions at least once during each of the three directions of vibration. At the completion of each frequency excursion, it shall be observed that the dial, knob or other type manual adjustment shall not have moved from its initial position and that the mechanics of the attenuator are in satisfactory working condition.

After test, VSWR and attenuation as specified.

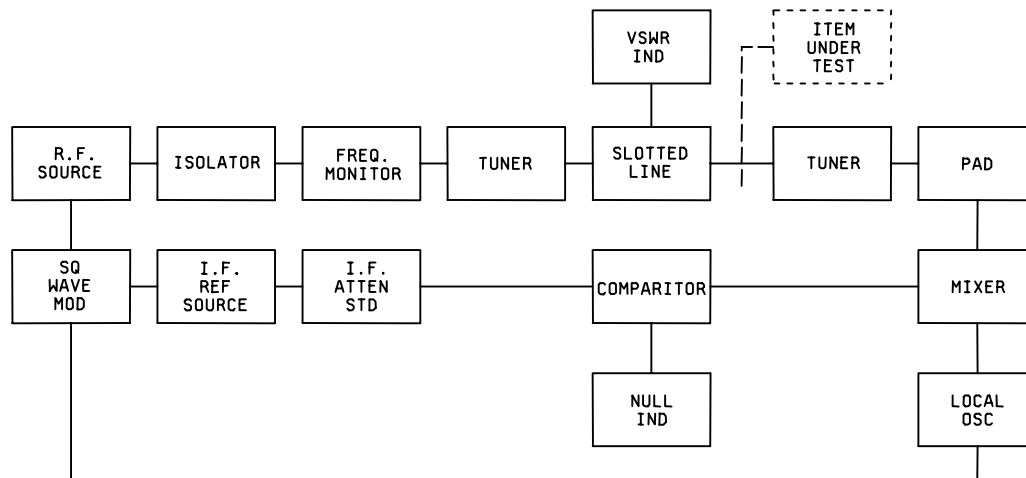


FIGURE 1. Parallel I.F. substitution for the measurement of 20 to 120 dB.

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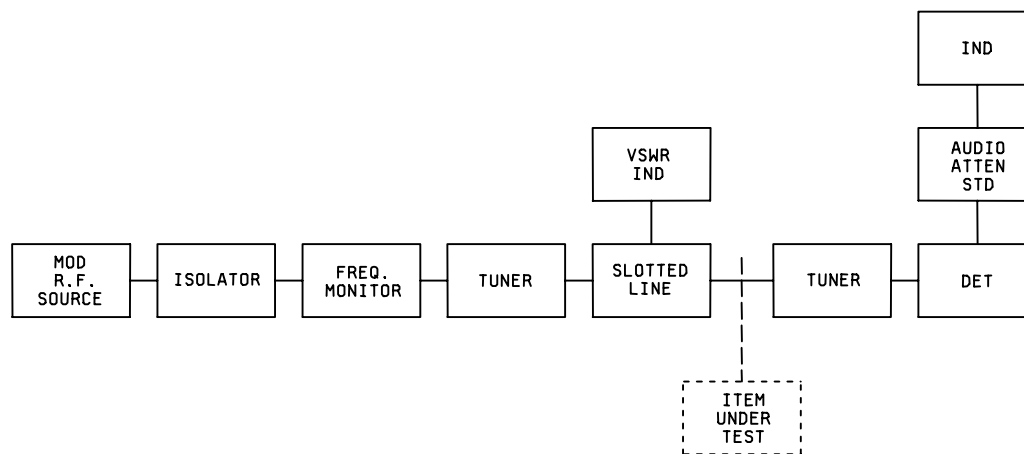


FIGURE 2. Single-channel audio substitution for measurements up to 30 dB.

4.7.7 Salt spray (corrosion) (see 3.5.12). Attenuators shall be subjected to method 101, test condition B, of MIL-STD-202. The following shall apply:

- a. Salt solution: 20 percent.
- b. Special mounting: Not applicable.
- c. Test condition letter: B.
- d. Measurements after exposure: Attenuators shall be washed, dried, and examined for corrosion or pitting.

4.7.8 Temperature cycling (see 3.5.13). Attenuators shall be subjected to method 102 of MIL-STD-202. The following shall apply:

- a. Special mounting: None.
- b. Test condition letter: D (unless otherwise specified).
- c. Measurements: During test, at both temperature extremes, normal operation of the dial assembly shall be maintained. After cycling, the dial calibration and VSWR shall be tested as specified in 4.7.2.

4.7.9 Humidity (see 3.5.16). Attenuators shall be tested in accordance with MIL-STD-202, method 103, test condition B. The following limits apply:

- a. At high humidity, the VSWR and attenuation range shall not deviate more than 10 percent from those specified in 3.5.2 and 3.5.5.
- b. After drying, the VSWR and attenuation range shall be as specified in 3.5.2 and 3.5.5.

4.7.10 Temperature coefficient (when required) (see 3.5.6). The temperature coefficient shall be determined during the temperature cycling test (see 4.7.8). The attenuator shall be measured at each temperature extreme at each setting for step type and at minimum and maximum setting for continuously variable types. The temperature coefficient shall be as specified.

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4.7.11 Pressurization-waveguide type attenuators (when specified) (see 3.5.14). Suitable end caps and gaskets shall be attached to each flange and the waveguide section pressurized with air to 30 psi. With pressure maintained, the attenuator will be completely submersed in fresh water, at ambient temperature, for no less than 3 minutes. Any visible escaping bubbles from any surface of the attenuator will be considered evidence of inadequate sealing.

4.7.12 Seal-coaxial type attenuators (when specified) (see 3.5.15). The attenuator shall be tested in accordance with MIL-STD-202, method 112, condition B.

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 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 activity within the Military Service or Defense Agency, or within the military service'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. The attenuators described herein are intended for use in microwave systems to reduce RF power by a known amount or to a required level. Calibrated precision attenuators may also be used to calibrate other attenuators having a lower order of accuracy.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification and the applicable specification sheet.
- b. Packaging requirements (see 5.1).
- c. Special marking, if required (see 6.3).

6.3 Marking. In addition to any special marking required by the contract or purchase order (see 6.2), each unit package, exterior container and unitized load is to be marked in accordance with MIL-STD-129.

6.4 Subject term (keyword) listing:

connector	radar
finish	radio
first article	sampling plan
flange	transmission line
frequency range	VSWR
insertion loss	

6.5 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table VI lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

TABLE VI. EPA top seventeen hazardous materials

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1, 1, 1, - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

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6.6 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers ([see 3.4.10.1](#)). For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

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

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

(Project 5985-2007-008)

Review activities:
Army - AV, MI
Navy - AS, CG, MC, OS
Air Force - 19, 99

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 <http://assist.daps.dla.mil>.