

MIL-A-24215A  
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 SUPERSEDING  
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## MILITARY 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 shall be 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>
1	N	MIL-C-39012
2	1-5/8 in.	MIL-F-24044
3	7/8 in.	MIL-F-24044
4	TNC	MIL-C-39012
5	SMA	MIL-C-39012
6	SMC	MIL-C-39012
7	BNC	MIL-C-39012
8	SC	MIL-C-39012
9	C	MIL-C-39012
10	LC	MIL-C-3850
11	LT	MIL-C-26637
12	6-1/8 in.	MIL-F-24044
13	HN	MIL-C-3643
14	Waveguide flange	MIL-F-3922

#### 2. APPLICABLE DOCUMENTS

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

#### SPECIFICATIONS

##### FEDERAL

NN-P-71	- Pallets, Materials Handling, Wood, Double Faced, Stringer Construction.
QQ-C-530	- Copper-Beryllium Alloy Bar, Rod, and Wire (Copper Alloy Numbers 172 and 173).
QQ-S-365	- Silver Plating, Electrodeposited; General Requirements for.
QQ-S-763	- Steel Bars, Wire, Shapes, and Forgings - Corrosion-Resisting.
QQ-S-764	- Steel Bar, Corrosion Resisting, Free Machining.
QQ-S-781	- Strapping, Steel, Flat and Seals.
PPP-B-565	- Boxes, Folding, Paperboard.
PPP-B-585	- Boxes, Wood, Wirebound.
PPP-B-601	- Boxes, Wood, Cleated-Plywood.
PPP-B-621	- Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636	- Boxes, Shipping, Fiberboard.
PPP-B-676	- Boxes, Setup.

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- PPP-T-60 - Tape: Packaging, Waterproof.  
 PPP-T-76 - Tape, Pressure-Sensitive Adhesive Paper, (For Carton Sealing).

## MILITARY

- MIL-W-85 - Waveguides, Rigid, Rectangular, General Specification for.  
 MIL-P-116 - Preservation-Packaging, Method of.  
 MIL-C-3643 - Connectors, Coaxial, Radio Frequency, Series HN, and Associated Fittings, General Specification for.  
 MIL-C-3650 - Connectors, Coaxial, Radiofrequency, Series LC.  
 MIL-F-3922 - Flanges, Waveguide, General Purpose, General Specification for.  
 MIL-F-14072 - Finishes for Ground Signal Equipment.  
 MIL-F-24044 - Flanges, Coaxial Line, Rigid Air Dielectric, General Specification for.  
 MIL-C-26637 - Connectors, Coaxial, Radio Frequency, Series LT, General Specification for.  
 MIL-C-39012 - Connectors, Coaxial, Radiofrequency; General Specification for.  
 MIL-C-45662 - Calibration System Requirements.

See supplement 1 for list of associated specification sheets.

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
 MIL-STD-129 - Marking for Shipment and Storage.  
 MIL-STD-147 - Palletized Unit Loads on 40" x 48" Pallets.  
 MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.  
 MIL-STD-454 - Standard General Requirements for Electronic Equipment.  
 MIL-STD-1285 - Marking of Electrical and Electronic Parts.

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

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

## NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

## 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern (see 6.2).

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 requirement 4 of MIL-STD-454.

**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 which shall resist wear. A cam or detent shall be used on step attenuators which 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, etc., 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 Handbook 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 gaging 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 QQ-S-763, or type 303 in accordance with QQ-S-764. The female center contact pins shall be made of beryllium copper conforming to QQ-C-530, silver plated in accordance with QQ-S-365, type II, grade A.

**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-F-3922 or MIL-F-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).

**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).

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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).
- (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 1/8 inch high.

**3.7 Workmanship.** Surfaces shall be free from burrs, die marks, chatter marks, scratches, grease, scale, splinters, and other defects which will affect life, serviceability, or appearance.

#### 4. QUALITY ASSURANCE PROVISIONS

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

**4.1.1 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 MIL-C-45662.

**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) Quality 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	MIL-STD-454
Silver	3.4.6.1	QQ-S-365
Copper-beryllium	3.4.6.1	QQ-C-530
Steel bars, shapes and forgings	3.4.6.1	QQ-S-763 or QQ-S-764

**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 which 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.

**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 Quality conformance inspection.

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

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TABLE II. First article inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical examination - - - -	3. 1, 3. 3 thru 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	AQL (percent defective)	
			Major	Minor
Visual and mechanical examination- -	3. 1, 3. 3 thru 3. 4. 10, 3. 6, and 3. 7	4. 7. 1	1. 0	4. 0
Operating frequency range - - - - -	3. 4. 1	4. 7. 2	} 1. 0	} ---
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		

4. 6. 1. 2. 1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for ordinary inspection. The acceptable quality level (AQL) shall be as specified in table III. Major and minor defects shall be as defined in MIL-STD-105.

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 IV, in the order shown, and shall be made on sample units which have been subjected to and have passed the group A inspection.

TABLE IV. 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 which 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, processes, etc., 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 inspection, 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.

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 quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129.

#### 4.7 Methods of 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 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  $\pm 0.1$  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



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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. Measurements shall be made over the 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  $\pm 0.1$  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.

4.7.3 Power capability (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 (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 (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.
- (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 (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



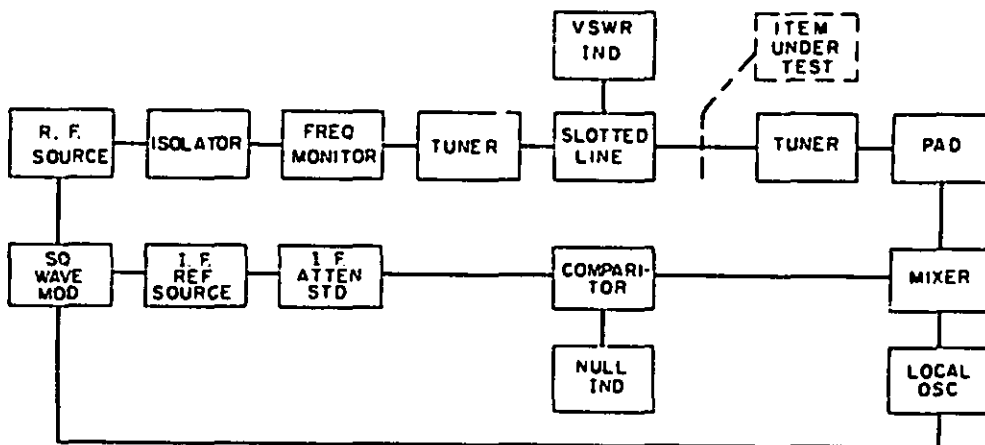


FIGURE 1. Parallel I. F. substitution for the measurement of 20 to 120 dB.

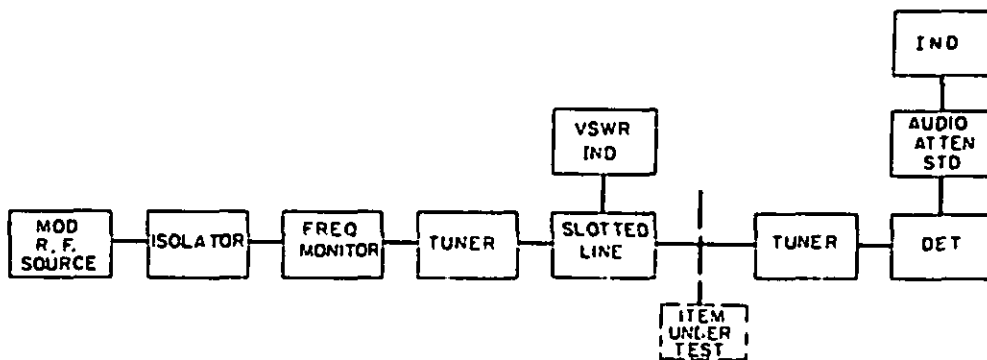


FIGURE 2. Single-channel audio substitution for measurements up to 30 dB.

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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.

4.7.7 Salt spray (corrosion) (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 (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 (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) (3.5.6). The temperature coefficient shall be determined during the temperature cycling test (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.

4.7.11 Pressurization-waveguide type attenuators (when specified) (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 submerged 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. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in Section 2 do not apply unless specifically stated in the contract or order. Preparation for delivery requirements for products procured by contractors shall be specified in the individual orders.)

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

5.1.1 Level A.

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

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

5.1.1.3 Preservative application. Preservatives shall not be used.

5.1.1.4 Unit packaging. Attenuators shall be individually packaged in accordance with the submethods of MIL-P-116 specified herein insuring compliance with the general requirements paragraph under methods of preservation (unit protection) and the physical protection requirements paragraph therein.

5.1.1.4.1 Attenuators up to one cubic foot or ten pounds. These attenuators shall be packaged in accordance with submethod IIe. The container shall conform to PPP-B-566, PPP-B-676 or PPP-B-636.

5.1.1.4.2 Attenuators equal to or exceeding one cubic foot or ten pounds. These attenuators shall be packaged in accordance with submethod IIb. The unit container shall conform to PPP-B-636, class weather resistant.

5.1.1.5 Intermediate packaging. Not required.

5.1.2 Level C. Attenuators shall be clean, dry and packaged in a manner that will afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the first receiving activity.

5.2 Packing. Packing shall be level A, B or C, as specified (see 6.2). Unit containers conforming to 5.1.1.4.2 may be used as shipping containers provided the requirements for the applicable level of packing specified herein are met.

5.2.1 Level A. The packaged attenuators shall be packed in fiberboard containers conforming to PPP-B-636, class weather resistant, style optional, special requirements. In lieu of the closure and waterproofing requirement in the appendix of PPP-B-636, closure and waterproofing shall be accomplished by sealing all seams, corners and manufacturer's joint with tape, two inches minimum width, conforming to PPP-T-60, class 1 or PPP-T-76. Banding (reinforcement requirements) shall be applied in accordance with the appendix to PPP-B-636 using nonmetallic or tape banding only.

5.2.2 Level B. The packaged attenuators shall be packed in fiberboard containers conforming to PPP-B-636, class domestic, style optional, special requirements. Closures shall be in accordance with the appendix thereto.

5.2.3 Level C. The packaged attenuators shall be packed in shipping containers in a manner that will afford adequate protection against damage during direct shipment from the supply source to the first receiving activity. These packs shall conform to the applicable carrier rules and regulations.

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

5.2.4.1 Level A. Attenuators, packed as specified in 5.2.1, shall be unitized on pallets in conformance with MIL-STD-147, load type I, with a fiberboard cap (storage aid 4) positioned over the load.

5.2.4.2 Level B. Attenuators, packed as specified in 5.2.2, shall be unitized as specified in 5.2.4.1 except that the fiberboard caps shall be class domestic.

5.2.4.3 Level C. Attenuators, packed as specified in 5.2.3, shall be unitized with pallets and caps of the type, size and kind commonly used for the purpose and shall conform to the applicable carrier rules and regulations.

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5.3 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 shall be marked in accordance with MIL-STD-129.

#### 5.4 General.

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

#### 5.4.2 Army procurements.

5.4.2.1 Levels A and B packing. For level A packing when quantities per destination are less than a unitized load, the fiberboard containers shall not be banded but shall be placed in a close fitting box conforming to PPP-B-601, overseas type; PPP-B-621, class 2, style 4 or PPP-B-585, class 3, style 2 or 3. Closure and strapping shall be in accordance with applicable container specification except that metal strapping shall conform to QQ-S-781, type I, finish B. When the gross weight exceeds 200 pounds or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids (laid flat) shall be applied in accordance with the requirements of the container specification. If not described in the container specification, the skids shall be applied in a manner which will adequately support the item and facilitate the use of material handling equipment. For level B packing, fiberboard boxes shall be weather resistant as specified in level A and the containers shall be banded (see 5.2.1 and 5.2.2).

5.4.2.2 Levels A and B unitization. For levels A and B unitization, the fiberboard caps shall be weather resistant and softwood pallets conforming to NN-P-71, type IV, size 2 shall be used (see 5.2.4.1 and 5.2.4.2).

### 6. NOTES

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 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Title, number, and date of the applicable specification sheet, the class and complete part number (see 3.1).
- (c) Levels of preservation-packaging and packing required (see 5.1 and 5.2).
- (d) Special marking, if required (see 5.3).

Custodians:  
 Army - EL  
 Navy - EC  
 Air Force - 80

Preparing activity:  
 Navy - EC

Review activities:  
 Army - SL  
 Navy - AS, OS  
 Air Force - 11, 17  
 DSA - ES

Agent:  
 DSA - ES

(Project 5985-0742)

User activities:  
 Army - AV  
 Navy - MC, CG, SH  
 Air Force - 19

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL***(See Instructions – Reverse Side)*

<b>1. DOCUMENT NUMBER</b>		<b>2. DOCUMENT TITLE</b>	
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>		<b>4. TYPE OF ORGANIZATION (Mark one)</b>	
<b>b. ADDRESS (Street, City, State, ZIP Code)</b>		<input type="checkbox"/> <b>VENDOR</b>	
		<input type="checkbox"/> <b>USER</b>	
		<input type="checkbox"/> <b>MANUFACTURER</b>	
		<input type="checkbox"/> <b>OTHER (Specify):</b> _____	
<b>5. PROBLEM AREAS</b>			
<b>a. Paragraph Number and Wording:</b>			
<b>b. Recommended Wording:</b>			
<b>c. Reason/Rationale for Recommendation:</b>			
<b>6. REMARKS</b>			
<b>7a. NAME OF SUBMITTER (Last, First, MI) – Optional</b>		<b>b. WORK TELEPHONE NUMBER (Include Area Code) – Optional</b>	
<b>c. MAILING ADDRESS (Street, City, State, ZIP Code) – Optional</b>		<b>8. DATE OF SUBMISSION (YYMMDD)</b>	

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)