

MILITARY SPECIFICATION

CONNECTOR, TRIAXIAL, RADIOFREQUENCY,  
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 the general requirements and tests for radiofrequency (RF), triaxial, connectors (see 6.1)

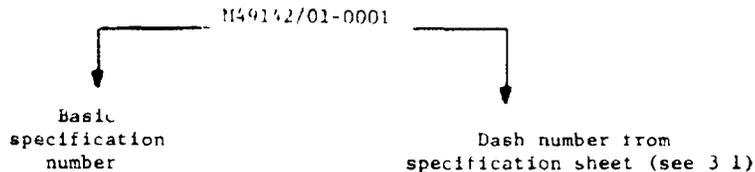
1.2 Classification Connectors shall be of the following classes and part numbers, as specified (see 3.1)

1.2.1 Class The class of connectors shall consist of the following

- a Class 1 - A class 1 connector is a connector which is intended to provide superior RF performance at specified frequencies, and for which all RF characteristics are completely defined
- b Class 2 - A class 2 connector is intended to provide mechanical connection within an RF circuit providing specified RF performance.

1.2.2 Part number The part number shall consist of the letter "M" followed by the basic specification sheet number, and a sequentially assigned dash number which is used to designate the material of the connector body (shell), i.e. The four-digit dash number (-0001, -0002, etc) designates the material as brass. An insertion of "1" as the first digit of the four-digit number (-1001, -1002, etc) designates phosphor bronze. A "2" is inserted to designate aluminum (-2001, -2002, etc). A "3" shall designate corrosion resistant steel (-3001, -3002, etc), and a "4" shall designate copper beryllium (-4001, -4002, etc). (See 3.1 and 6.2)

Example



2 APPLICABLE DOCUMENTS

2.1 Issues of documents 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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U S Army Electronics Command, ATTN DRSEL-RD-TS-9, Fort Monmouth, NJ 07703 by using the self-addressed Standardization Document Improvement Proposal (DI) Form 1426 appearing at the end of this document or by letter

## SPECIFICATIONS

## FEDERAL

- L-P-389 - Plastic Molding Material, FEP Fluorocarbon, Molding and Extrusion
- L-P-403 - Plastic Molding Material, Polytetrafluoroethylene (TFE-Fluorocarbon)
- O-F-499 - Flux, Brazing, (Silver Alloy, Low-Melting Point)
- QQ-A-225/6 - Aluminum Alloy Bar, Rod, and Wire, Rolled, Drawn or Cold Finished, 2024
- QQ-B-613 - Brass, Leaded and Nonleaded Flat Products (Plate, Bar, Sheet, and Strip)
- QQ-B-626 - Brass, Leaded and Nonleaded Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip)
- QQ-B-750 - Bronze, Phosphor, Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections
- QQ-C-530 - Copper-Beryllium Alloy Bar, Rod, and Wire (Copper Alloy Numbers 172 and 173)
- QQ-C-533 - Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172)
- QQ-C-576 - Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip).
- QQ-S-571 - Solder, Tin Alloy, Tin-Lead Alloy, and Lead Alloy
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting
- WW-T-799 - Tube, Copper, Seamless, (For Use With Solder-Flared- or Compression-Type Fittings)
- ZZ-R-765 - Rubber, Silicone

## MILITARY

- MIL-F-14072(EL) - Finishes for Ground Electronic Equipment
- MIL-I-17214 - Indicator, Permeability, Low-Mu (Go-No Go)
- MIL-G-45204 - Gold Plating, Electrodeposited
- MIL-C-45662 - Calibration System Requirements
- MIL-C-55330 - Connectors, Preparation for Delivery of

(See Supplement 1 for list of associated specification sheets.)

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-202 - Test Methods for Electronic and Electrical Components Parts
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.
- MIL-STD-1344 - Test Methods for Electrical Connectors

(Copies of specifications, standards, drawings, and publications required by contractors 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 documents form 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.

AMERICAN NATIONAL STANDARDS INSTITUTE INC.

ANSI B46.1-1962 - Surface Texture.

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM 582 - Free Machining Stainless and Heat-Resisting Steel Bars, Hot Rolled or Cold Finished.

(Applications for copies should be addressed to the American Society for Testing and Materials 1916 Race St. Philadelphia, PA. 19103.)

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

3. REQUIREMENTS

3.1 Specification sheets for individual connectors and associated fittings. The individual part requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between the requirements of the basic specification and those of the associated specification sheets, the latter shall govern.

3.2 Qualification. Connectors furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.4 and 6.3.)

3.3 Material. Material shall be as specified herein (see table I). If materials other than those specified are used, the contractor shall certify to the qualifying activity that the substitute material enables the connectors to meet the requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the product. When a definite material is not specified, a material shall be used which will enable the connector to meet the requirements of this specification.

TABLE I Materials

Component material	Applicable specification
Brass - - - - -	QQ-B-613 or QQ-B-626
Copper beryllium - - - - -	QQ-C-530 or QQ-C-533
Phosphor bronze - - - - -	QQ-B-750
Soft copper - - - - -	QQ-C-576
Aluminum - - - - -	QQ-A-225/6
Steel-corrosion resisting - - - - -	QQ-S-763 or ASTM 582
Flux - - - - -	Q-F-499
TFE fluorocarbon - - - - -	L-P-403
FEP fluorocarbon - - - - -	L-P-389
Silicon rubber - - - - -	ZZ-R-765
Soft solder - - - - -	QQ-S-571

3.3.1 Finish Unless otherwise specified (see 6.2), center contacts shall be gold-plated to a minimum thickness of 0.0001-inch in accordance with MIL-C-45204, type II, class 2. Silver shall not be used as an underplate. All other metal parts shall be finished so as to provide a connector that meets the corrosion requirements of this specification.

MIL-C-49142

3.3.1.1 Spring members. Unless otherwise specified (see 3.1) conductor spring members shall be made of copper beryllium.

3.3.2 Dissimilar metals Dissimilar metals between which an electromotive couple may exist shall not be placed in contact with each other. Reference is made to MIL-F-14072(SigC) for definition of dissimilar metals.

3.3.3 Nonmagnetic materials All parts (except hermetic sealed connectors) shall be made from materials which are classed as nonmagnetic (see 3.8)

3.3.4 Assembly instructions Complete assembly instructions shall be furnished by the vendor with each connector procured under this specification (see 6.2)

3.4 Design and construction Connectors shall be of the design, construction, and physical dimensions specified (see 3.1)

3.4.1 Engineering parameters The parameters of nominal impedance, voltage rating, frequency range, and temperature range shall be as specified (see 3.1)

3.4.2 Mating (visual indication) When applicable (see 3.1), a visual means shall be provided to indicate when two mating connectors are properly mated

3.5 Force to engage/disengage

3.5.1 Bayonet and threaded types When tested as specified in 4.6.2.1, the torque necessary to completely couple or uncouple the connectors shall not exceed that specified (see 3.1). Also the longitudinal force necessary to initiate the engaging or disengaging cycle shall not exceed that specified (see 3.1)

3.5.2 "Push on" connector types When tested as specified in 4.6.2.2, the forces necessary to fully engage or disengage the connectors shall not exceed that specified (see 3.1)

3.6 Coupling proof torque (threaded types only). When connectors are tested as specified in 4.6.3, the coupling mechanism shall not be dislodged and the connector shall meet the requirements of 3.5.1. The interface dimensions of the connectors shall remain as specified (see 3.1).

3.7 Mating characteristics. When connectors are tested as specified in 4.6.4, the mating dimensions shall be gaged as specified (see 3.1) and the dimensions shall remain within the specified tolerances (see 3.1).

3.8 Permeability of nonmagnetic materials. When connectors (except hermetic sealed) are tested as specified in 4.6.5, the permeability ( $\mu$ ) shall be less than 2.0.

3.9 Hermetic seal (pressurized connectors) When connectors are tested as specified in 4.6.6, the leakage rate shall not exceed that specified (see 3.1).

3.10 Leakage (pressurized connectors) When connectors are tested as specified in 4.6.7, there shall be no leakage as detected by escaping air bubbles.

3.11 Insulation resistance When connectors are tested as specified in 4.6.8, the insulation shall not be less than 5,000 megohms (M $\Omega$ ) minimum. Following the environmental tests, insulation resistance shall not change from the initial requirement.

3.12 Conductor retention. When all class 1 and class 2 connectors are tested (when applicable see 3.1) as specified in 4.6.9, the center conductor must not be displaced from the specified interface dimensions in the uncabled connector by the application of the specified axial force (see 3.1) in either direction

3.13 Salt spray, (corrosion). Unless otherwise specified (see 3.1), connectors shall be tested as specified in 4.6.10. There shall be no exposure of the base metal on the interface or mating surface, and they shall meet the requirements of 3.5.1 or 3.5.2, as applicable. Following the test, connectors shall meet the requirements of 3.11.

3.14 Dielectric withstanding voltage. When connectors are tested as specified in 4.6.11, there shall be no evidence of breakdown.

3.15 Vibration, high frequency. When the cabled (or wired, as applicable) connector is tested as specified in 4.6.12, there shall be no electrical interruptions exceeding 1 microsecond ( $\mu$ s), unless otherwise specified (see 3.1). There shall be no evidence of visual mechanical damage after the test.

3.16 Shock (specified pulse). When the cabled (or wired, as applicable) connector is tested as specified in 4.6.13, there shall be no electrical interruptions exceeding 1  $\mu$ s, unless otherwise specified (see 3.1). There shall be no evidence of visual or mechanical damage after the test.

3.17 Thermal shock. When connectors are tested as specified in 4.6.14, there shall be no evidence of visual mechanical damage to the connector and it shall meet the dielectric withstanding voltage requirements (see 3.14).

3.18 Moisture resistance. Unless otherwise specified (see 3.1), connectors shall be tested as specified in 4.6.15 and there shall be no evidence of damage. Insulation resistance shall be as specified in 3.11.

3.19 Conductor resistance. When connectors are tested as specified in 4.6.16, the conductor resistance of the center conductor, intermediate conductor, and outer conductor to body shall be as specified (see 3.1).

3.20 Corona level. When connectors are tested as specified in 4.6.17, at the altitude and voltage specified (see 3.1), there shall be no evidence of sustained corona discharge.

3.21 RF high potential withstanding voltage. When connectors are tested as specified in 4.6.18, there shall be no breakdown, or the leakage current specified shall not be exceeded (see 3.1).

3.22 Cable retention force. When applicable (see 3.1) connectors shall be tested as specified in 4.6.19 and there shall be no evidence of mechanical failure, loosening, rupture, or discontinuity.

3.23 Coupling mechanism retention force. When tested as specified in 4.6.20 the coupling mechanism shall not be dislodged from the connector and shall be capable of meeting the requirements of 3.5.1 immediately after the test.

3.24 RF leakage. When connectors are tested as specified in 4.6.21, the total leakage cable to cable shall not exceed that specified (see 3.1).

3.25 Risetime degradation When connectors are tested as specified in 4.6.12, the risetime degradation shall be less than 400 picoseconds (ps).

3.26 Connector durability When connectors are tested as specified in 4.6.23 they shall show no evidence of severe mechanical damage and the coupling device shall remain functional. Connectors shall meet the applicable requirements of 3.5 and 3.7.

3.27 Marking Connectors and associated fittings shall be permanently and legibly marked in accordance with the general marking requirements of MIL-STD-1285 with the military part number and the manufacturer's federal supply code. The marking location is optional, when practicable, a location should be picked that will least likely be covered in cable assembly or installation.

3.28 Workmanship Connectors and associated fittings shall be processed in such a manner as to be uniform in quality and shall be free from sharp edges, burrs and other defects that will affect life, serviceability or appearance.

#### 4 QUALITY ASSURANCE PROVISIONS

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

4.1.1 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 contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-C-45662.

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

- a Qualification inspection (see 4.4)
- b Quality conformance inspection (see 4.5)
- c Qualification verification inspection (see 4.5.1.2.1)

4.3 Inspection conditions Unless otherwise specified herein, all inspections shall be performed in accordance with the test condition specified in the "GENERAL REQUIREMENTS" of MIL-STD-1344. For each test of threaded coupling connectors where the test is performed on mated pairs, the pair shall be torqued to the specified value (see 3.1).

4.4 Qualification inspection Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.2) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample size Twenty-five class 1 connectors of the same part number with its mating connector or fifteen class 2 connectors of the same part number with its mating connector (see 1.2.1) shall be subjected to qualification inspection.

4.4.2 Inspection routine The sample shall be subjected to the inspections specified in table II. All sample units shall be subjected to the inspection of group I. The sample shall then be divided into 5 groups consisting of five each of class 1 connectors or three each of class 2 connectors (see 1.2.1). The sample units shall then be subjected to the inspection for their particular group.

TABLE 11 Qualification inspection.

Examination or test	Requirement paragraph	Method paragraph
Group I		
Visual and mechanical examination - - - - -	3.1	4.6.1
Material - - - - -	3.3	4.6.1
Finish - - - - -	3.3.1	4.6.1
Dissimilar metals - - - - -	3.3.2	4.6.1
Design and construction (dimensions) - - - - -	3.4	4.6.1.1
Marking - - - - -	3.27	4.6.1
Workmanship - - - - -	3.28	4.6.1
Mating (visual indication) - - - - -	3.4.2	4.6.1
Force to engage/disengage - - - - -	3.5	4.6.2
Bayonet and threaded types - - - - -	3.5.1	4.6.2.1
Push-on connector types - - - - -	3.5.2	4.6.2.2
Coupling proof torque <u>1</u> / - - - - -	3.6	4.6.3
Mating characteristics - - - - -	3.7	4.6.4
Permeability of nonmagnetic materials - - - - -	3.8	4.6.5
Hermetic seal <u>2</u> / - - - - -	3.9	4.6.6
Leakage <u>2</u> / - - - - -	3.10	4.6.7
Insulation resistance - - - - -	3.11	4.6.8
Group II		
Conductor retention <u>3</u> / - - - - -	3.12	4.6.9
Salt spray (corrosion) - - - - -	3.13	4.6.10
Group III		
Dielectric withstanding voltage - - - - -	3.14	4.6.11
Vibration, high frequency - - - - -	3.15	4.6.12
Shock (specified pulse) - - - - -	3.16	4.6.13
Thermal shock - - - - -	3.17	4.6.14
Moisture resistance - - - - -	3.18	4.6.15
Conductor resistance - - - - -	3.19	4.6.16
Group IV		
Corona level - - - - -	3.20	4.6.17
RF high potential withstanding voltage - - - - -	3.21	4.6.18
Cable retention force - - - - -	3.22	4.6.19
Coupling mechanism retention force - - - - -	3.23	4.6.20
Group V		
RF leakage - - - - -	3.24	4.6.21
Risetime degradation - - - - -	3.25	4.6.22
Connector durability - - - - -	3.26	4.6.23
Group VI		
Conductor resistance - - - - -	3.19	4.6.16

1/ Threaded connectors only.

2/ Pressurized connectors only.

3/ Captivated center conductor only.

4.4.3 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.4.4 Retention of qualification. To retain qualification, the contractor shall forward a report at 12-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of

- a. An annual summary of the results of the tests performed for inspection of product for delivery, groups A and B, indicating as a minimum the number of lots that have passed and the number that have failed. The results of tests of all reworked lots shall be identified and accounted for
- b. The results of tests performed for periodic inspection, group C, shall include the number and mode of failures. The test report shall include results of all periodic inspection tests performed and completed during the 12-month period. If the test results indicate nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list.

Failure to submit the report within 60 days after the end of each 12-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity at any time during the 12-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If no group C (periodic) inspection report is received during 2 consecutive reporting periods or there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit a representative product from each group, as defined by 4.4.2 to testing in accordance with the qualification inspection requirements.

#### 4.5 Quality conformance inspection

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

4.5.1.1 Inspection lot. An inspection lot shall consist of all the connectors and associated fittings comprised of identical piece parts produced under essentially the same conditions and offered for inspection at one time.

4.5.1.1.1 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table III, and shall be made on the same set of sample units, in the order shown.

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

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

TABLE III. Group A inspection

Inspection	Requirement paragraph	Test method paragraph	AQL (percent defective)	
			Major	Minor
Visual and mechanical examination				
Material - - - - -	3 3	} 4.6 1	} 65	} 2 5
Finish <u>1/</u> - - - - -	3 3.1			
Dissimilar metals - - - - -	3 3 2			
Design and construction - - - - -	3 4			
Marking - - - - -	3.27			
Workmanship - - - - -	3.28			
Mating (visual indication - - - - -	3 4.2			
Hermetic seal <u>2/</u> - - - - -	3 9	4.6.6		
Leakage <u>2/</u> - - - - -	3 10	4 6 7		
Dielectric withstanding voltage - -	3.14	4 6.11		

1/ Verification of finish may be accomplished using the manufacturer's process controls providing these controls are clearly equal to or more stringent than the requirements of this specification

2/ Pressurized connectors

4 5 1 1 2 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table IV in the order shown, and shall be made on sample units which have been subjected to and passed the group A inspection. Connectors having identical piece parts may be combined for lot purposes and shall be in proportion to the quantity of each part-numbered connector produced

4 5 1 1 2 1 Sampling plan. The sampling plan shall be in accordance with MIL-STD-105 for special inspection level S-4. The sample size shall be based on the inspection lot size from which the sample was selected for group A inspection. The AQL shall be 2.5 percent defective.

TABLE IV Group B inspection

Inspection	Requirement paragraph	Method paragraph
Force to engage/disengage - - - - -	3 5	4 6 2
Bayonet and threaded type - - - - -	3 5 1	4 6 2 1
Push-on connector type - - - - -	3 5 2	4 6 2 2
Coupling proof torque <u>1/</u> - - - - -	3 6	4 6 3
Mating characteristics - - - - -	3 7	4.6 4
Permeability of nonmagnetic material - -	3 8	4.6 5
Insulation resistance - - - - -	3 11	4 6 8

1/ Threaded connectors only

4 5 1 1 2 2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4 5 1 1 2 3 Disposition of sample units. Sample units which have passed all the group B inspection may be delivered on the contract, if the lot is accepted. Any connector or connector part deformed or otherwise damaged during testing shall not be delivered on the contract.

4.5.1.2 Periodic inspection. The periodic inspection shall consist of group C inspection, initially at 12 months, and each 36 months thereafter. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.5.1.2.1.4). Delivery of products which have passed groups A and B shall not be delayed pending the results of these periodic inspections.

4.5.1.2.1 Group C inspection. Group C inspection shall consist of the inspections specified in table V, in the order shown. Group C inspection shall be made on sample units selected from inspection lots which have passed the groups A and B inspection.

4 5 1 2 1 1 Sampling plan Fifteen sample units of each part-numbered connector with its mating connector shall be selected from the first lot produced. Fifteen sample units of each part-numbered connector with its mating connector shall also be selected after 200,000 connectors of each part number have been produced or at least once each year, whichever comes first. The sample units shall be divided equally among the five subgroups.

4 5 1 2 1 2 Failures If one or more sample units fails to pass group C inspection, the sample shall be considered to have failed.

4 5 1 2 1 3 Disposition of sample units Sample units which have been subjected to group C inspection shall not be delivered on the contract.

TABLE V. Group C inspection.

Examination or test	Requirement paragraph	Method paragraph
Subgroup 1		
Conductor retention <sup>1/</sup> - - - - -	3.12	4.6.9
Salt spray (corrosion) - - - - -	3.13	4.6.10
Subgroup 2		
Dielectric withstanding voltage - - - - -	3.14	4.6.11
Vibration high frequency - - - - -	3.15	4.6.12
Shock (specified pulse) - - - - -	3.16	4.6.13
Thermal shock - - - - -	3.17	4.6.14
Moisture resistance - - - - -	3.18	4.6.15
Conductor resistance - - - - -	3.19	4.6.16
Subgroup 3		
Corona level - - - - -	3.20	4.6.17
RF high potential withstanding voltage - - - - -	3.21	4.6.18
Cable retention force - - - - -	3.22	4.6.19
Coupling mechanism retention force - - - - -	3.23	4.6.20
Subgroup 4		
RF leakage - - - - -	3.24	4.6.21
Risetime degradation - - - - -	3.25	4.6.22
Connector durability - - - - -	3.26	4.6.23
Subgroup 5		
Conductor resistance - - - - -	3.19	4.6.16

<sup>1/</sup> Captivated center conductor only.

4.5.1.2.1.4 Noncompliance If a sample fails to pass group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, group C inspection shall be repeated on additional sample units (all inspection, or the inspection which the original sample failed, at the option of the qualifying activity). Groups A and B inspection may be reinstated, however, final acceptance and shipment shall be withheld until the group C inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.5.2 Inspection of packaging The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of MIL-C-55330.

#### 4.6 Methods of inspection

4.6.1 Visual and mechanical examination Connectors and associated fittings shall be examined to verify that the design, construction, physical dimensions, marking and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.4, 3.27, and 3.28).

4.6.1.1 Dimensional examination Mating dimensions shall be examined by mating the connector with its applicable mating gages or other suitable means acceptable to the Government.

#### 4.6.2 Force to engage/disengage (see 3.5)

4.6.2.1 Bayonet and threaded types (see 3.5.1) The connector shall be engaged with its mating standard part (see 3.1). During the entire coupling/uncoupling cycle (until the connector is fully engaged/disengaged) the forces and/or torques necessary shall not exceed those specified (see 3.1). A thread coupled connector is fully engaged with its mating standard part when their reference planes (see 3.1) coincide. A bayonet coupled connector is fully engaged with its mating standard part when the bayonet studs have passed the detent and their reference planes coincide. No additional tightening torque shall be applied. The mating standard part is a steel jig containing the critical interface dimensions finished to the tolerances specified (see 3.1). Its spring members when applicable shall be heat treated beryllium copper. The surface finish on mating surfaces shall be 16 microinches rms maximum, per ANSI B46.1-1962.

4.6.2.2 "Push-on" connector types (see 3.5.2) The connector under test shall be engaged with its standard mating part (gage). During this engaging cycle the force necessary to fully engage the connectors shall not exceed that specified (see 3.1). Upon completion of engagement, an opposite force necessary for disengagement shall be applied. This force shall be within the limits specified, and shall include any unlatching forces required.

4.6.3 Coupling proof torque (threaded types only) (see 3.6) The connector under test shall be engaged with its mating standard part (gage), and their reference planes (see 3.1) shall coincide. The coupling nut shall be tightened to the torque value specified (see 3.1). After 1 minute the connector under and its mating standard part shall be disengaged.

4.6.4 Mating characteristics (see 3.7). After insertion of the specified oversize pin the specified number of times (see 3.1), the contact to be tested shall be held rigid by means of a suitable jig or fixture. A gage containing the test pin or test ring and a suitable force indicating dial shall be aligned to within 0.004 total indicator reading (TIR) of any plane passing through the axis of the contact under test. Engagement or withdrawal of the test pin or test ring shall be made smoothly and at such a rate that the dial does not bounce or otherwise give a false reading. The test pin or test ring may be chamfered to facilitate entry, but the specified engagement length shall not include the chamfer length and the finish shall be as specified and in accordance with ANSI B46.1-1962.

4.6.5 Permeability of nonmagnetic materials (see 3.8). The permeability of the connector shall be measured with an indicator conforming to MIL-I-17214.

4.6.6 Hermetic seal (pressurized connectors only) (see 3.9). Connectors shall be tested in accordance with method 112, MIL-STD-202. The following details shall apply:

- a. Test condition letter - C.
- b. Procedure number - III.
- c. Leakage rate sensitivity  $-10^{-8}$  cubic centimeters (cm<sup>3</sup>) per second.

4.6.7 Leakage (pressurized connectors only) (see 3.10). Connectors shall be subjected to air pressure specified (see 3.1) applied to one end, and the whole assembly immersed in water at a temperature of 15° to 25°C. The connector shall remain immersed for at least 2 minutes.

4.6.8 Insulation resistance (see 3.11). When applicable, (see 3.1), connector shall be tested in accordance with method 3003.1 of MIL-STD-1344. The following details shall apply:

- a. Points of Measurement
  1. Between center conductor and intermediate conductor.
  2. Between intermediate conductor and outer conductor and/or body.

4.6.9 Conductor retention (captivated center conductor only) (see 3.12). An axial force (see 3.1) shall be applied, first in one direction and then the other, to the center contact of an assembled and uncabled connector utilizing a method and force measuring device suitable to the Government. The intermediate conductor shall be inspected after the force has been applied in one direction and again after the force has been applied in the opposite direction to determine if the conductor has been displaced from the specified interface dimensions.

4.6.10 Salt spray (corrosion) (see 3.13). Unless otherwise specified (see 3.1), unmated and uncabled connectors shall be tested in accordance with method 101 of MIL-STD-202. The following details shall apply:

- a. Test condition letter - B
- b. Measurements after exposure. Connectors shall be washed, shaken, and lightly brushed, then permitted to dry for 24 hours at 40°C. Connectors shall then be examined for evidence of corrosion, pitting, and shall be tested as specified in 4.6.2.1 or 4.6.2.2, as applicable.

4.6.11 Dielectric withstanding voltage (see 3.14). Connectors shall be tested in accordance with method 301 of MIL-STD-202. The following details shall apply:

- a. Special preparations or conditions.
  1. The maximum relative humidity shall be 50 percent. When facilities are not available at this test condition, connectors shall be tested at room ambient relative humidity. In case of dispute, if the test has been made at room ambient relative humidity, retest shall be made at 50 percent maximum relative humidity.

2. The center contact of plug connectors and receptacle connectors shall be positioned in such a manner as to simulate actual assembly conditions.
  3. Precaution shall be taken to prevent air-gap voltage breakdowns.
  4. The voltage shall be metered on the high side of the transformer.
- b. Magnitude of test voltage (see 3.1). The voltage shall be instantaneously applied.
- c. Nature of potential - Alternating current.
- d. Points of application of test voltage
1. Between the center conductor and intermediate conductor.
  2. Between intermediate conductor and outer conductor.

4.6.12 Vibration, high frequency (see 3.15). A complete assembly shall be tested in accordance with method 2005.1 of MIL-STD-1344, test condition III. The measurements shall be by visual examination and shall be made as specified in 4.6.1.

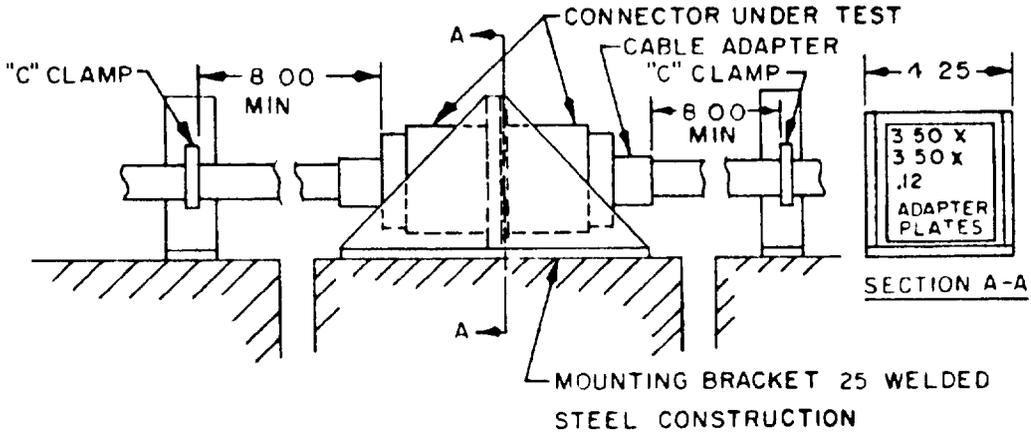


FIGURE 1 Typical vibration testing setup

4.6.13 Shock (specified pulse) (see 3.16). The connector shall be mated with its mating connector (see 3.1) and subjected to method 2004.1 of MIL-STD-1344. The following details shall apply

- a. Mounting - Receptacles and panel or bulkhead mounted connectors and adapters shall be mounted by normal means. Other connectors and adapters shall be rigidly clamped to the shock test table.
- b. Test condition letter - E

4.6.14 Thermal shock (see 3.17). Unmated connectors shall be subjected to method 107 of MIL-STD-202. The following details and exception shall apply:

- a. Test condition letter - B, except test high temperature shall be +85°C.
- b. Final measurements - Dielectric withstanding voltage shall be measured as specified in 4.6.11 after the test an examination for mechanical damage shall be made.

4.6.15 Moisture resistance (see 3.18). Unless otherwise specified (see 3.1), connectors shall be mated and cabled with its mating connector and subjected to method 1002 of MIL-STD-1344. The following details and exception shall apply

- a. Initial measurements - none.
- b. Loading voltage - No load.
- c. Procedure - Type II
- d. Final measurements:
  1. At high humidity - None.
  2. After the drying period - Insulation resistance shall be measured as specified in 4.6.8.

4.6.16 Conductor resistance (see 3.19) All conductor resistance tests shall be conducted with the apparatus shown in figure 2. Circuit adjustments and the measurement procedures for all conductor resistance tests shall be in accordance with 4.6.12 1. The conductor resistance to be measured as follows

- a. Conductor resistance of the mated center conductor contact from terminal end to terminal end.
- b. Conductor resistance of the mated intermediate conductor contact from terminal end to terminal end.
- c. Conductor resistance of mated outer conductor contact between points on the cable braid, or outer conductor, close to the terminal ends of the outer conductor contacts. The coupling nut must be removed for this test or from appropriate wires for uncabled connectors.

4.6.16.1 General procedure. The apparatus shall be assembled as shown in figure 2. The contacts,  $C_1 - C_2$ , shown in the figure represent the mating contacts upon which millivolt (mV) drop tests are to be conducted.

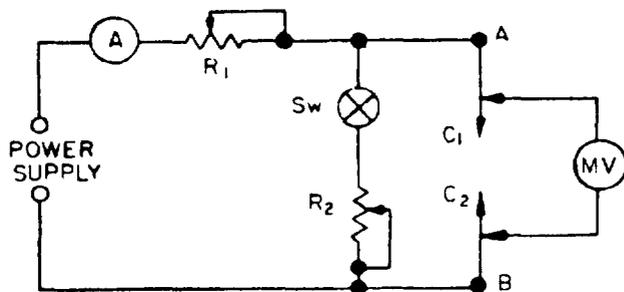
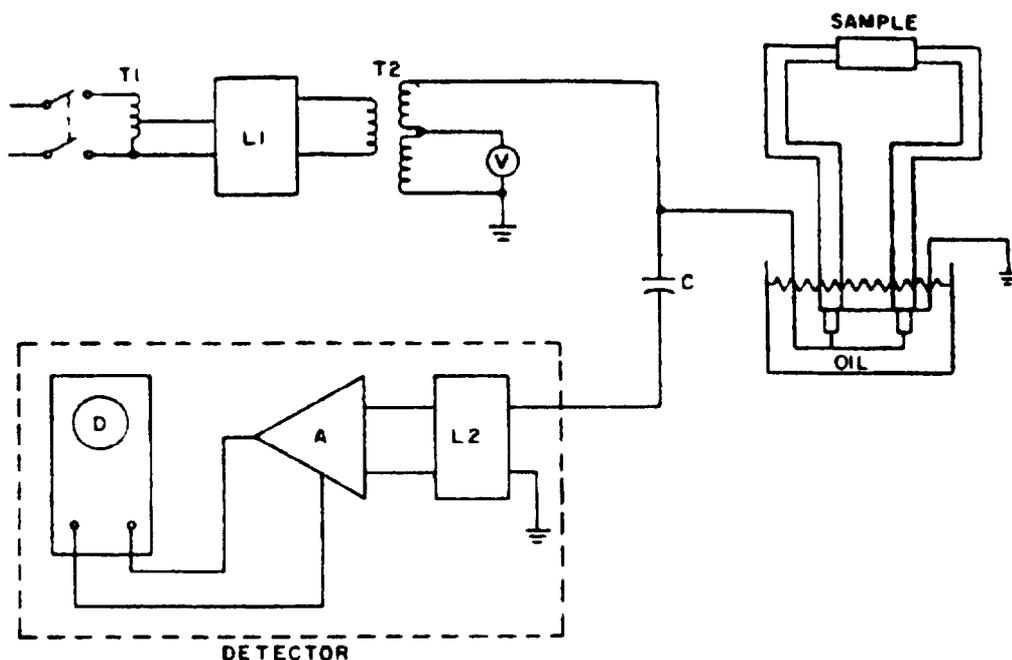


FIGURE 2 Typical diagram for contact resistance

- a. Remove contacts  $C_1 - C_2$  from the measuring circuit.
- b. Close switch SW.
- c. Adjust  $R_2$  for a millivoltmeter (mVm) reading of 50 mV.
- d. Connect contacts  $C_1 - C_2$  to the measuring circuit and mate.
- e. Check to see that the mVm reading drops significantly prior to opening switch in f.
- f. Open switch SW.
- g. Adjust  $R_1$  for a circuit current (I) of 1 ampere (A).
- h. Measure the mV drop across contacts  $C_1 - C_2$  and call this "e".
- i. Compute contact resistance. Contact resistance (milliohms) ( $m\Omega$ ) = mV - I A.

4.6.17 Corona level (see 3.20). The test sample shall be connected to a mating connector and arranged in a suitable test circuit such as indicated in figure 3. For this test tie both the intermediate and outer conductors (shields) to ground. Components of the test circuit shall be corona free to the extent that a discharge of 5 pico coulombs (pc) or less can be measured when the 60 hertz (Hz) test potential is increased to the value specified at the reduced pressure specified (see 3.1). The type and length of cable used shall be as specified (see 3.1). No grease or similar compounds shall be used in or on the test item. After the sample is purged of air, the 60 Hz voltage shall be slowly increased until the detector, operated at a sensitivity of 5 pc, indicates a sustained corona discharge. The voltage shall then be decreased until corona is at 5 pc level or less. The latter value is the corona level of the connector under test. The manufacturer may at his option, use a corona detector (which has been approved by the Government) for performing the test in lieu of the test set up of figure 3.



- C - Corona Free Coupling Capacitor (Note 1)
- D - Discharge Display
- L1 - Input Line Filter (Note 2)
- L2 - 10-50 kHz Detector Input Filter
- A - Detector Amplifier
- T1 - 0-130V Variable Transformer
- T2 - High Voltage Transformer (Corona Free - less than 5 picocoulombs)
- V - Voltmeter

## NOTES

- 1 Equal to or greater than total circuit capacitance.
- 2 100 dB 14 kHz to 10 GHz

FIGURE 3 Typical equipment and schematic for measuring corona level

4.6.18 RF high potential withstanding voltage (see 3.21). Connectors shall be mated with their mating connectors and cable appropriately attached. The assembly shall then be inserted into the high impedance circuit as shown in figure 4, or equivalent, and instantaneously subjected to the RF voltage and frequency specified, (see 3.1). The RF voltage shall be applied in turn between the center conductor and intermediate conductor and at a different level between the intermediate conductor and outer conductor. The duration of the test shall be 1 minute. The RF voltage source shall be frequency stabilized and have an approximate pure sine wave output with minimum harmonic content. Means shall be provided to indicate disruptive discharge and leakage current.

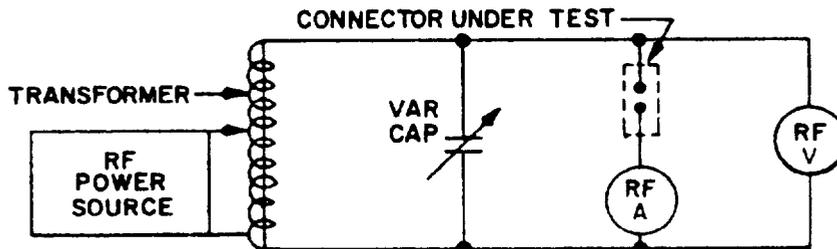


FIGURE 4. Typical circuit diagram for RF high potential withstanding voltage

4.6.19 Cable retention force (see 3.22). When applicable (see 3.1), the connector shall be assembled to its standard mating test cable. The connector shall be firmly fixed and a movable sleeve attached to the cable. The sleeve is then moved longitudinally away from the fixed connector gradually and in such a manner that the cable remains unbent and untwisted. A scale for measuring the retention force (see 3.1) shall be attached to the sleeve. The force shall be held for 30 seconds minimum. The assembly shall then be examined for mechanical failure, loosening, or rupture and tested with a suitable low voltage continuity circuit. With the connector still in the fixed position, the cable shall be held at a point 10 times the diameter of the cable from the connector and a torque shall be applied in both directions as specified (see 3.1). The cable shall then be bent at a radius of 10 times the diameter of the cable, starting at the connector at an angle of  $90^\circ \pm 5^\circ$  from the axis of the connector, then reversed  $180^\circ \pm 10^\circ$ . Repeat this procedure four times, then retest and reexamine as outlined above.

4.6.20 Coupling mechanism retention forces (see 3.23). The connector body and coupling mechanism shall be respectively secured to the lower and upper jaws of a tensile tester in an appropriate manner. A tensile load shall be applied at a rate of approximately 100 pounds per minute up to the force as specified and held at that value for 1 minute (see 3.1). During the 1 minute of steadily applied force, the coupling mechanism shall be rotated with respect to the connector body, two full revolutions in each direction.

4.6.21 RF leakage (see 3.24). The mating connector pair to be tested shall be assembled as shown in figure 5 and tested as shown in figure 6. The close fitting brass tubing shall be machined to thread into connector in lieu of compression nut. This test setup between 500 MHz and 11 GHz, shall have a dynamic range from 20 dBm to better than 100 dBm or a difference of 90 dB. Using a +20 dBm RF source with 10 dB isolation, an additional 30 dB range can be obtained by use of attenuator pads or a step attenuator producing a total range of 120 dB. The shorting plunger is adjusted to produce a maximum reading in the detector with the triaxial assembly inserted. The insertion loss caused by the insertion of the triaxial assembly adjusted as shown is a measure of the total leakage of the mated connector pair both at its interface as well as at the clamping points to both cables.

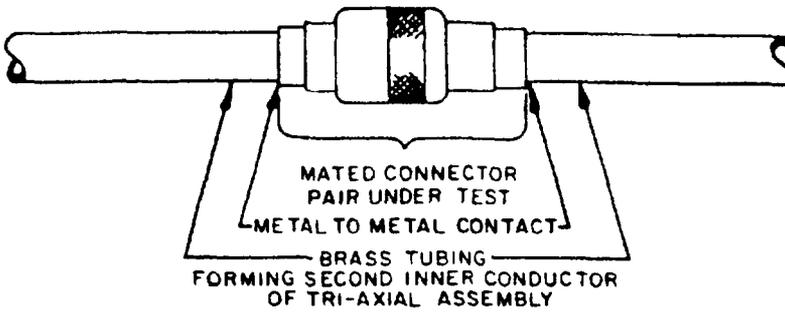


FIGURE 5 Connector assembly for RF leakage test

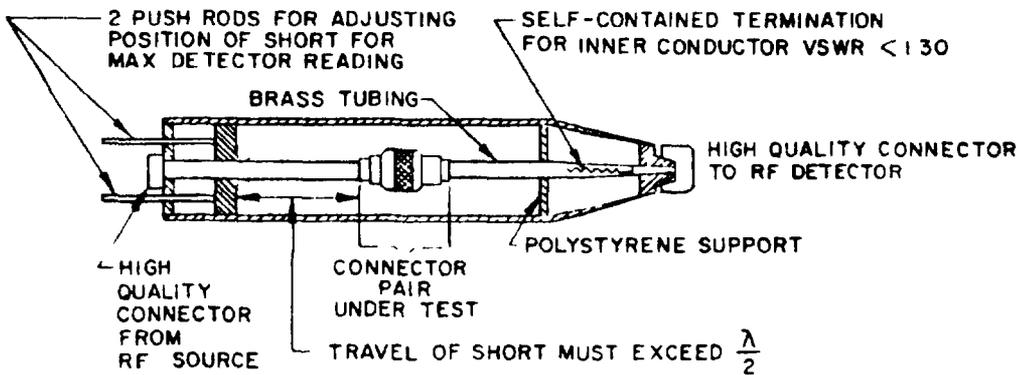
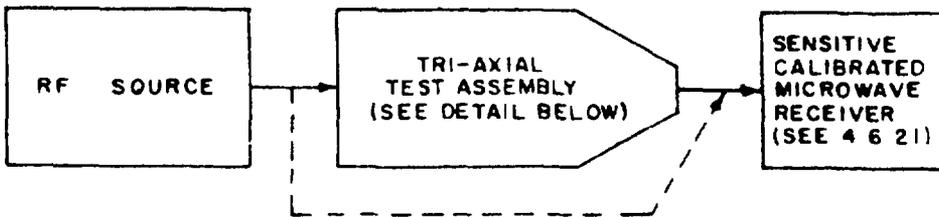


FIGURE 6 RF leakage test setup

4.6.22 Risetime degradation (see 3.25). When applicable (see 3.1), the connector shall be assembled to a minimum of 10 feet of its standard mating test cable and tested to determine the amount of wave form distortion.

4.6.22.1 Equipment.

- a. Pulse generator having a risetime of 200 ps.
- b. A receiver capable of measuring to the required limits specified.
- c. Termination corresponding to the characteristic of cable tested.

4.6.22.2 Method. The test signal is to be a square wave pulse having a pulse width of 2 nanoseconds (ns) and pulse repetition frequency of 1 MHz. The risetime shall be measured from the 20 percent to 80 percent levels of the pulse edge. The generator output pulse shall be measured and recorded as  $T_1$ . The specimen shall be inserted between the pulse source and the sampling lead, the output risetime shall be recorded as  $T_2$ . The risetime degradation,  $T_3$  shall be found from the following formula

$$T_3 = \sqrt{T_2^2 - T_1^2} \text{ reported in 10 foot length}$$

$T_3 = \text{ps/per 10 feet}$

4.6.23 Connector durability (see 3.26). Each cabled connector under test shall be mated with a typical production connector per this specification. The connector shall be subjected to the number of cycles of mating and unmating specified (see 3.1). The connector and its mating part shall be completely engaged and completely disengaged during this cycle. Lubrication of the threads or rotational parts shall not be employed for this test unless specified (see 3.1). It is permissible to shake or blow debris from the threads or interface surfaces at intervals of not less than 50 cycles. Solvents or tools shall not be used for cleaning.

5 PACKAGING

5.1 Packaging requirements Packaging shall be in accordance with MIL-C-55330

6 NOTES

6.1 Intended use Connectors and fittings covered by this specification are intended for use with triaxial cable and can be used for radio frequency application when more shielding is required. It can also be used for serial digital transfer.

6.2 Ordering data Procurement documents shall specify the following

- a. Title, number and date of this specification
- b. Title, number and date of the applicable detail specification
- c. The complete part number of the connector or fitting ordered (see 3.27)
- d. Specific finish when required (see 3.3.1)
- e. Assembly instructions (see 3.3.4)

**6.3 Qualification** With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification, in order that they may be eligible to be awarded contracts for the products covered by this specification. The activity responsible for the Qualified Products List is the Electronics Command, Department of the Army, Fort Monmouth, New Jersey 07703, however, information pertaining to qualification of products may be obtained from Defense Electronics Supply Center (DESC-E), 1507 Wilmington Pike, Dayton, Ohio 45444.

**6.4 Definitions.**

- a. Center conductor - innermost contacting surface.
- b. Intermediate conductor - middle contacting surface or shield.
- c. Outer conductor - outer contacting surface or shield.

**Custodians**

Army - EL  
Navy - EC  
Air Force - 85

**Review activities**

Army - AR, MI  
Navy - OS, SH  
Air Force - 17, 99  
DLA - ES

**User activities**

Army - AT  
Navy - AS, MC, SH  
Air Force - 19

**Preparing activity**

Army - EL

**Agent**

DLA - ES

(Project 5935-3018)

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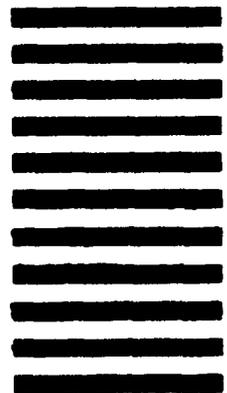


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OTHER (Specify) \_\_\_\_\_

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a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

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