NUMBER 108-12020

# PRODUCT SPECIFICATION

# AMP* BNC SERIES COAXIAL CONNECTORS

# DUAL CRIMP TYPE

## TABLE OF CONTENTS



## 1.0 SCOPE

1.1 This specification contains performance requirements and qualification test procedures and production testing for AMP BNC Dual Crimp Coaxial connectors. This specification meets the performance and qualification test requirements of MIL-C-39012/16 through 19.

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NAME PRODUCT SPECIFICATION BNC SERIES COAXIAL CONNECTORS DUAL CRIMP TYPE

## 2.0 APPLICABLE DOCUMENTS

2.1 The following documents constitute a part of this specification to the extent specified herein. In the event of conflict between requirements of this specification and the referenced documents, this specification shall take precedence.

2.1.1 Military Documents.

| | |
|---|---|
| MIL-STD-202 | Test Methods for Electrical and Electronic Component Parts |
| MIL-I-17214 | Indicator, Permeability, Low-Mu |
| MIL-C-39012 | Connectors, Coaxial, Radio Frequency, General Specification for |
| MIL-C-45662 | Calibration of Standards |

## 3.0 REQUIREMENTS

3.1 Definitions. For the purpose of this specification, the following definitions shall apply.

3.1.1 Connector Assembly. A connector assembly consists of a mated plug and jack terminated to their respective cable.

3.1.2 Connector. A connector may be either a plug or a jack, as described below.

3.1.2.1 Plug. The plug contains the male inner contact and a rotating outer collar for locking purposes.

3.1.2.2 Jack. The jack contains the female inner contact and may be either cable or panel mount type.

3.2 Design and Construction. Connector shall be of the noncaptive contact design. Construction and physical dimensions shall be as specified on the AMP Product Drawing.

3.3 Materials and Finish. The materials used in the construction of this product and the finish and plating shall be as specified on the AMP Product Drawing.

3.4 Functional Characteristics.

| | |
|---|---|
| Nominal Impedance | 50 ohms |
| Frequency Range | 0 to 4 GHz |
| Operating Voltage @ Sea Level | 500 volts rms |
| Operating Temperature | -65°C to +165°C * |
| | -55°C to +85°C ** |

* When assembled to cable having Polytetrafluorethylene dielectric.

** When assembled to cable having Polyethylene dielectric.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General Provisions. The quality provisions specified herein shall be employed in the manufacturing and testing of this product to insure that normal production units continue to meet the performance requirements of this specification.

4.2 Classification of Test.

(A) Qualification Inspection (See 5.0)
(B) Quality Conformance Inspection (See 6.0)

4.3 Test Conditions.

4.3.1 Measurements. Measurements shall be made with instruments that have been calibrated and are certified in accordance with Specification MIL-C-45662.

4.3.2 Laboratory Conditions. Unless otherwise specified herein, normal laboratory temperature, humidity, and atmospheric pressure shall be considered acceptable for test purposes.

4.3.3 Coaxial Cable. Coaxial cable used for testing shall be RG-58 C/U, in accordance with MIL-C-17.

## 5.0 QUALIFICATION INSPECTION

5.1 Sample Selection. Test connectors selected for qualification inspection shall be representative of current production and shall have met the requirements for Quality Conformance Inspection, Paragraph 6.0.

5.2 Test Procedure. Qualification Inspection shall be conducted in accordance with Table I with each test group consisting of three connector pairs. Each test group shall be tested in the sequence specified.

5.3 Sample Preparation. After Quality Conformance Inspection, preparation of test samples shall be conducted in accordance with AMP Instruction Sheets governing assembly and crimping technique.

5.4 Acceptance. All samples shall meet the requirements specified in the Performance Section of this specification, Paragraph 5.5.

5.5 Performance Requirements and Test Methods. Connectors shall be designed to meet the performance requirements specified herein. To verify compliance to this specification, production items shall be tested and shall meet the requirements of this specification. Tests shall be conducted in the order specified in Table I.

TABLE I

| QUALIFICATION INSPECTION | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test or Examination | Paragraph | Test Group and Sequence I | II | III | IV | V | VI |
| Examination of Product | 5.5.1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Force to Engage/Disengage | 5.5.2 | 2-7 | 2-8 | 2-22 | 2 | 2 | 2 |
| Mating Characteristics | 5.5.3 | 3 | 3-9 | 3 | 3 | 3 | 3 |
| Permeability | 5.5.4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Insulation Resistance | 5.5.5 | 5 | 5 | 5-16 | 5 | 5 | 5 |
| Contact Resistance | 5.5.6 | | | 6*-9*-11*-14* | | | 6 |
| Dielectric Withstanding Voltage | 5.5.7 | | | 7-13-17 | | | |
| Voltage Standing Wave Ratio | 5.5.8 | | 6 | | | | |
| R. F. High Potential | 5.5.9 | | | 19 | | | |
| Coupling Mechanism Retention | 5.5.10 | | | 21 | | | |
| Cable Retention | 5.5.11 | | | 20 | | | |
| Corona Level | 5.5.12 | | | 18 | | | |
| Temperature Cycling | 5.5.13 | | | 12 | | | |
| Moisture Resistance | 5.5.14 | | | 15 | | | |
| Connector Durability | 5.5.15 | | 7 | | | | |
| Salt Spray Corrosion | 5.5.16 | 6 | | | | | |
| Vibration | 5.5.17 | | | 8 | | | |
| Physical Shock | 5.5.18 | | | 10 | | | |
| R. F. Leakage | 5.5.19 | | | | 6 | | |
| R. F. Insertion Loss | 5.5.20 | | | | | 6 | |

* Center contact only

5.5.1 Examination of Product. When test specimens are examined as specified, there shall be no evidence of physical damage or any other defect that could render the specimen unsuitable for test.

5.5.1.1 Test Method. Each connector shall be thoroughly examined prior to test to assure proper design, construction, physical dimensions and workmanship.

5.5.2 Force to Engage/Disengage. When tested as specified, the longitudinal force required to initiate the engaging of the coupling nut shall not exceed 3 pounds and the maximum torque required to completely couple or uncouple each connector from its mating connector shall not exceed 2.5 inch pounds.

5.5.2.1 Test Method. Connectors, (plugs and jacks) shall be mated and unmated with their mating standard parts, during which time the torque values required to fully couple and uncouple the connectors shall be measured. The bayonet coupled connectors are fully engaged when the bayonet lugs of the jack have passed the detents in the coupling mechanism of the plug. The longitudinal force required to initiate the engaging of the coupling nut shall also be measured.

5.5.3 Mating Characteristics. When tested as specified, the following performance shall be met:

A. Outer Contacts - Plug only. When inserted into a .319" maximum I.D. test ring to a minimum depth of .093", the insertion force shall not exceed 5 pounds. When inserted into a .324" minimum I.D. test ring, all slotted spring members shall contact the ring within .031" of their tip ends.

B. Inner Contact - Jack Only. After one insertion of a polished steel test pin having a minimum diameter of .057" to a depth of .125" minimum, the insertion and withdrawal forces shall be as follows:

Insertion Force -- 2 pounds maximum with a .054" minimum diameter steel test pin.

Withdrawal Force -- 2 ounces minimum with a .052" maximum diameter steel test pin.

5.5.3.1 Test Method.

A. Outer Contacts. The connector plug, without the coupling nut, shall be held rigidly in a suitable fixture. A test ring having an I.D. of .319 inch attached to a force indicating device shall be aligned to within .004 inch T.I.R. of any plane passing through the axis of the contact under test. While engaging the test ring and contact, the total force required shall be measured.

B. Center Contact. The connector jack containing the female center contact shall be rigidly held in a fixture, assuring proper alignment with the test pin. Three test pins shall be utilized for this test. An oversize pin, having a diameter of .057 inch shall be inserted into the center contact one time as a preconditioning step. The maximum test pin (.054 inch dia.) shall then be inserted into the contact while recording the insertion force. Finally, the minimum test pin (.052 inch dia.) shall be inserted into the contact and the force required to withdraw the pin shall be recorded. Insertion depth of all pins shall be .125 inch, excluding the lead-in length.

5.5.4 Permeability. When tested as specified, the magnetic properties of the connector shall be less than 2 mu.

5.5.4.1 Test Method. Each connector shall be measured with a permeability indicator conforming to MIL-I-17214.

5.5.5 Insulation Resistance. When tested as specified at 500 VDC, the insulation resistance between the inner contact and the body of the connector shall be 5000 megohms or greater.

5.5.5.1 Test Method. Cabled connectors shall be tested in accordance with MIL-STD-202, Method 302, Test Condition B. The measurement shall be taken between the inner contact and the outer shell of the assembly.

5.5.6 Contact Resistance. When tested as specified, the contact resistance of mated contacts shall not exceed the following values:

| Contact Resistance -- Milliohms | | |
|---|---|---|
| Contact | Initial | After Environment |
| Center contact | 1.5 | 2.0 |
| Outer contact | .2 | N/A |
| Braid to body | .1 | N/A |

5.5.6.1 Test Method. Contact Resistance measurements shall be conducted in accordance with MIL-STD-202, Method 307, using a test current of 1 ampere D.C. Measurements shall be taken on the center contact, outer contact and braid to body crimp as required in MIL-C-39012.

5.5.7 Dielectric Withstanding Voltage. When tested as specified at 1500 volts rms, there shall be no evidence of dielectric breakdown or flashover.

5.5.7.1 Test Method. Cabled connectors shall be tested in accordance with MIL-STD-202, Method 301. A test potential of 1500 volts rms, 60 Hz shall be instantaneously applied between the center contact and outer shell and held for a period of one minute.

5.5.8 Voltage Standing Wave Ratio. When tested as specified, the VSWR of a connector shall not exceed 1.30 at frequencies to 4 GHz.

5.5.8.1 Test Method. Measurement of connector VSWR shall be conducted in accordance with the method stated in Specification MIL-C-39012, as applicable. Tests shall be conducted through a frequency range of .5 to 4.0 GHz.

5.5.9 R. F. High Potential. When tested as specified at 1000 volts rms, 5 MHz, connector assemblies shall show no evidence of dielectric breakdown or flashover.

5.5.9.1 Test Method. Testing shall be conducted with the connectors mated and attached to approximately 2 inches of cable. An R.F. potential of 1000 volts rms, 5 MHz shall be instantaneously applied between the center contact and the body of the connectors and held for a duration of one minute. The R.F. voltage source shall be frequency stabilized and have an approximate pure sine wave output with minimum harmonic content. Test equipment shall contain provisions for detection of disruptive discharge.

5.5.10 Coupling Mechanism Retention. When tested as specified at 100 pounds minimum, the coupling nut shall not be damaged or dislodged from the connector body.

5.5.10.1 Test Method. The body and coupling mechanism of the plug shall be secured to the lower and upper jaws, respectively, of a tensile testing machine. An axial force, applied at a rate of 100 pounds per minute, shall be held for one minute at 100 pounds. During the minute in which the 100-pound force is being held, the coupling mechanism shall be rotated, with respect to the connector body, two full revolutions in each direction.

5.5.11 Cable Retention. When tested as specified using an axial force of 60 pounds, there shall be no evidence of mechanical failure, breaking or loosening of parts, or electrical discontinuity.

5.5.11.1 Test Method. The connector shall be rigidly held in the jaws of a tensile machine with a suitable fixture. An axial force of 60 pounds shall be applied to the cable in a direction away from the connector in such a manner that the cable remains unbent and untwisted. The force shall be held for 30 seconds minimum, then removed, and the connector examined for mechanical failure, loosening or breaking of parts, and tested for electrical continuity using a simple low voltage lamp circuit. With the connector still in the fixed position, the cable shall be held at a point ten times the cable diameter from the connector and bent to an angle of 90° from the axis of the connector then reversed 180°. This procedure shall be repeated four times and the connector re-examined and tested for continuity as described above.

5.5.12 Corona Level. When tested as specified at a simulated altitude of 70,000 feet, mated connectors shall show no evidence of sustained corona discharge in excess of 5 picocoulombs with 375 volts rms, 60 Hz applied.

5.5.12.1 Test Method. Connector assemblies shall be subjected to simulated altitude in accordance with MIL-STD-202, Method 105, Test Condition C. The test circuit used shall be corona free to the extent that a discharge of 5 picocoulombs or less can be measured at the simulated altitude. Connector assemblies shall be tested as follows:

Samples shall be placed in a vacuum chamber and subjected to a simulated altitude of 70,000 feet for 10 minutes. (NOTE: Exposed cable ends shall be immersed in oil.) At the end of this period, and while still at 70,000 feet (simulated), a 60 Hz test voltage shall be increased until the detector, having a sensitivity of 5 picocoulombs, indicates a sustained corona discharge. The test voltage shall

then be immediately reduced until the discharge stabilizes at 5 picocoulombs or less. This final voltage is the corona extinguishing level of the connector.

5.5.13 Temperature Cycling. Upon completion of testing as specified at +85°C and -65°C, connectors shall show no evidence of physical damage.

5.5.13.1 Test Method. Unmated cabled connectors shall be subjected to temperature cycling in accordance with MIL-STD-202, Method 102, Test Condition C, except high temperature shall be +85°C.

5.5.14 Moisture Resistance. After the Moisture Resistance test as specified, connectors shall show no evidence of physical damage. Within 5 minutes after removal from humidity, samples shall be subjected to the Insulation Resistance test as specified in Paragraph 5.5.5.1 and shall display a resistance of 200 megohms or greater.

5.5.14.1 Test Method. Mated connector assemblies shall be subjected to 240 hours of Moisture Resistance in accordance with MIL-STD-202, Method 106, excluding the Vibration Sub-cycle. Within five minutes after removal from the chamber, the connectors shall be tested for Insulation Resistance.

5.5.15 Contact Durability. After 500 cycles of mating and unmating as specified, connectors shall meet the requirements for all subsequent testing.

5.5.15.1 Test Method. Cabled connectors shall be completely mated and unmated a total of 500 times at a maximum rate of 12 cycles per minute.

5.5.16 Salt Spray. After being subjected to a 5% salt spray environment for 48 hours as specified, there shall be no base metal exposed on the interface or mating surface of the connectors.

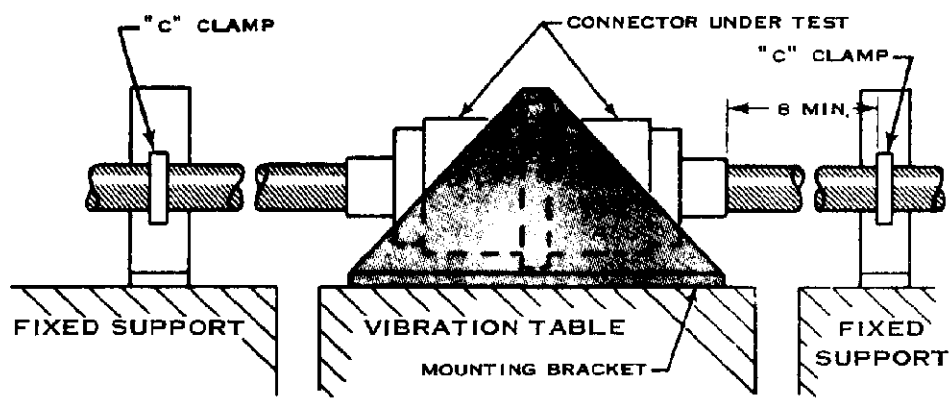
5.5.16.1 Test Method. Unmated, uncabled connectors shall be subjected to salt spray corrosion test in accordance with MIL-STD-202, Method 101, Test Condition B, using a 5% salt solution concentration. After 48 hours exposure to the salt fog environment, connectors shall be taken from the test chamber, washed in distilled water, brushed lightly, and then air dried for a period of 24 hours at 40°C.

5.5.17 Vibration. During the Vibration test as specified at 10-2000 Hz for 12 hours, there shall be no electrical discontinuities exceeding 1 microsecond duration. Upon completion of testing, there shall be no evidence of physical damage.

5.5.17.1 Test Method. Mated connectors assembled to appropriate cables and mounted as illustrated in Figure I shall be subjected to vibration in accordance with MIL-STD-202, Method 204, Test Condition B. During the test, center and outer contacts shall be wired in series and a D.C. current of 0.1 ampere shall be applied. Instrumentation shall be incorporated to detect electrical discontinuities as short as 1 microsecond.

FIGURE I

VIBRATION AND SHOCK



5.5.18 Physical Shock. During the Shock test as specified (18 shock pulses at 50 G's), there shall be no electrical discontinuities exceeding 1 microsecond duration. Upon completion of testing, there shall be no evidence of physical damage.

5.5.18.1 Test Method. Mated connectors shall be mounted as illustrated in Figure I and subjected to physical shock in accordance with MIL-STD-202, Method 213, Test Condition G. They shall withstand a total of 18 shock pulses at 50 G's.

5.5.19 R. F. Leakage. When tested at a frequency between 2 and 3 GHz as specified, the total leakage, cable to cable, shall not exceed -55 db minimum.

5.5.19.1 Test Method. Mated connector pairs shall be tested for R. F. Leakage in accordance with Specification MIL-C-39012 at a frequency between 2 and 3 GHz.

5.5.20 R. F. Insertion Loss. When tested at 3 GHz as specified, the insertion loss of a connector shall not exceed .2 db.

5.5.20.1 Test Method. Mated connector pairs shall be tested for R. F. Insertion Loss in accordance with Specification MIL-C-39012 at a frequency of 3 GHz.

## 6.0 QUALITY CONFORMANCE INSPECTION

6.1 Sample Selection. Unless otherwise specified, sampling procedures shall be in accordance with MIL-STD-105. Sampling and Acceptable Quality Levels shall be as specified in the applicable AMP Quality Specification. Dimensional requirements shall be in accordance with the applicable AMP Product Drawing.