Connector, Series "M"

1. SCOPE

1.1. Content

This specification covers the performance requirements, test methods and quality assurance provisions requirements for a family of rectangular, rack and panel, electrical connectors with crimp type removable contacts and preloaded contacts for automatic wiring.

1.2. Temperature

The upper temperature is the maximum internal hot-spot temperature resulting from any combination of electrical load and ambient conditions. These connectors are rated for operation within the temperature range as follows:

A. Noryl: -55 to 100°C
B. Phenolic: -55 to 150°C
C. Diallyl phthalate: -65 to 125°C
D. Polyester: -55 to 130°C

1.3. Current Rating

The maximum current that can be carried in any one given connector is limited by the maximum working temperature of the housing material and influenced by the wire size, connector size (number of cavities operating) and the ambient temperature in which the connector is operating. Figures 1 and 2 show how these variables effect connector current carrying capacity and serve as a guide to realistically select a connector for a particular application where these variables are known.

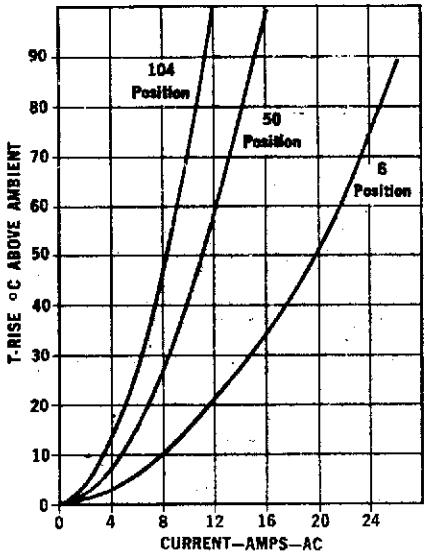

Figure 1
"M" Series Connectors
Type III + Size 16 Contacts
All contacts energized 14 AWG wire

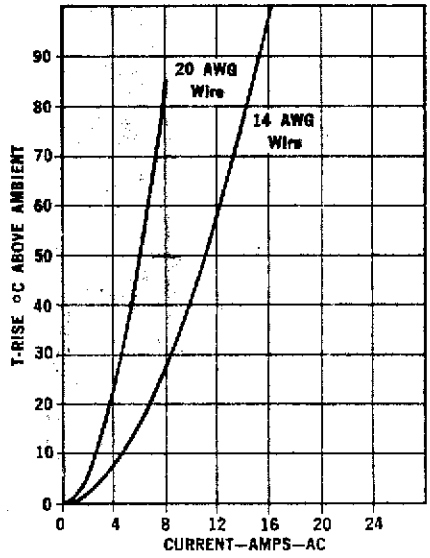

Figure 2
"M" Series Connectors
50 Position
Type III + Size 16 Contacts
All contacts energized

* Trademark
| Indicates change

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, latest edition of the document applies. In the event of conflict between requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. AMP Specifications

A. 108-10028: Contacts, Electrical, General Specification For
B. 109 Series: Test Specifications as indicated in Figure 3

2.2. Military Standard

MIL-STD-105: Sampling Procedures and Tables for Inspection by Attributes

2.3. Military Specification

MIL-W-16878/4: Wire, Electrical, Insulated, High Temperature

3. REQUIREMENTS

3.1. Test Equipment and Condition

A. Conditions

Unless otherwise specified, the tests shall be conducted under the following laboratory conditions:

(1) Temperature: 15 to 35°C
(2) Atmospheric pressure: 650 to 800 millimeters of mercury
(3) Relative humidity: 30 to 80%

B. Equipment

Facilities used to provide the required environments shall be controlled and monitored. Instruments and equipment shall be regularly maintained and calibrated to standards which are traceable to the National Bureau of Standards.

C. Report

Laboratory test reports shall be maintained during the test program and contain test details, test measurements and equipment used to conduct the tests.

3.2. Qualification Inspection

Qualification inspection determines if the construction, materials and processes comply with the requirements of this specification. Connectors and accessories furnished under this specification shall be products that meet all requirements specified herein.

A. Contacts

Contacts used in testing these connectors shall meet all the performance requirements of AMP Specification 108-10028.

B. Connectors

The connectors used for qualification inspection shall be produced with equipment and procedures representative of production.

(1) Standard "M" Series

A minimum of 4 connectors, assembled with a full complement of contacts, shall be subjected to the test sequence shown in Figure 4, Test Group 1.

(2) Special "M" Series

A minimum of 2 connectors, assembled with a full complement of contacts, shall be subjected to the test sequence shown in Figure 4, Test Group 2.

C. Preparation of Samples

(1) Contacts

Contacts shall be crimped to the specified wire gage in accordance with the applicable instruction sheet.

(2) Connectors

Fifty percent of the connectors shall be assembled with contacts crimped to their specified maximum wire gage. The other fifty percent shall contain contacts crimped to the specified minimum wire gage. All wire shall be approximately 2 feet long and conform to MIL-W-16878/4.

D. Failures

There shall be no failures during any examination or tests of the samples submitted for test. After notification of any failure, the Reliability Engineer responsible for testing shall receive details of corrective action from the Product Engineer before initiating any further tests deemed necessary to ensure compliance with the requirements of this specification.

3.3. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Visual Inspection	The connectors and accessories shall show no evidence of physical defects or being otherwise unfit for testing. The markings on all connectors and accessories shall be legible after all tests.	The connectors and accessories shall be thoroughly examined to ensure that they have been properly assembled in accordance with the applicable instruction sheets. Visual inspection of the connectors and accessories shall be performed throughout the test program to note any changes in material color, marking, etc.
Insulation Resistance	The insulation resistance shall not be less than the values shown. Resistance (megohms) Material / Initial / Final Noryl / 2000 / 50 Phenolic / 5000 / 100 Diallyl phthalate / 50000 / 5000	The connector assemblies shall be tested in accordance with AMP Spec 109-28. The following details shall apply. 1. Test sample: unmated 2. Test voltage: 500 vdc 3. Duration of application of test voltage: 1 minute 4. Points of application of test voltage: between all contacts alternately connected, See Figure 5

Figure 3 (cont)

Test Description	Requirement	Procedure
Thermal Shock	There shall be no evidence of damage detrimental to the ability of the connectors to meet all subsequent test requirements.	The connector assemblies shall be tested in accordance with AMP Spec 109-22. The following details shall apply: 1. Test sample: unmated 2. Number of cycles: 5 3. Temperature extremes: as follows (a) Noryl: -55 to 100°C (b) Phenolic: -55 to 150°C (c) Diallyl phthalate: -65 to 125°C (d) Polyester: -55 to 130°C
Dielectric Withstanding Voltage	There shall be no disruptive discharge or breakdown.	The connector assemblies shall be tested in accordance with AMP Spec 109-29. The following details shall apply: 1. Test sample: unmated, except 17 position mated 2. Magnitude of test voltage: as shown below 3. Nature of potential: ac-rms 4. Points of application of test voltage: between all contacts alternately connected, See Figure 5 5. Barometric pressure: as shown below Test Condition Contacts / Sea Level / 25000 Ft / 50000 Ft Std "M" Series Type II: 1500 / 1000 / 500 Type III: 900 / 600 / 300 Spl "M" Series Autowire, .150¢: 900 / 600 / 300 Autowire, .200¢: 1500 / 1000 / 500 High voltage 17 position: 10000 (cont to gnd) 15000 (cont to cont) High voltage 28 position: 3000 (cont to cont or gnd)
Durability	There shall be no evidence of damage detrimental to the ability of the connectors to meet al subsequent test requirements.	The connector assemblies shall be subjected to 500 cycles of mating and unmating at a rate not to exceed 500 cycles per hour. Jackscrews shall be removed for this test, guide pins and sockets shall be installed and the connector shall be mated and unmated by machine. The following exceptions shall apply: 1. Connector assemblies with tin plated contacts: 250 cycles 2. Connector assemblies with Type I contacts: 100 cycles 3. 160 position center fastener connector: 25 cycles

Figure 3 (cont)

Test Description	Requirement	Procedure
Humidity	The insulation resistance shall not be less than the Final values specified. Corrosion shall not be sufficient to prevent the connector assemblies from meeting all subsequent test requirements.	The connector assemblies shall be tested in accordance with AMP Spec 109-23, Condition B. The following details shall apply: 1. Test sample: unmated 2. Step 7b is not required 3. Initial measurements after conditioning: not required 4. Polarization and load voltage: not required 5. Final measurements: immediately following the 24 hour conditioning period insulation resistance shall be measured in accordance with AMP Spec 109-28.
Vibration	During the 6 hour period of vibration at a maximum amplitude of 10 G's and a frequency range of 5 to 55 Hz, the connector assemblies shall not become unmated and there shall be no breaking or loosening of parts. There shall be no recurrent loss of electrical continuity for a period of 1 microsecond or greater. A single nonrecurrent discontinuity shall be ignored.	Wired and mated connector assemblies shall be tested in accordance with AMP Spec 109-21. The following details shall apply: 1. Test condition letter: A 2. Electrical load conditions: all contacts shall be connected in series to a suitable testing circuit with .1 ampere flowing through the contacts 3. Measurements during test: contacts shall be monitored for loss of electrical continuity of 1 microsecond duration
Mechanical Shock	When subjected to 18 drops of 50 G's input shock pulse with a time duration of 11 milliseconds each pulse, the connector assemblies shall not become unmated and there shall be no breaking or loosening of parts. There shall be no recurrent loss of electrical continuity for a period of 1 microsecond or greater. A single nonrecurrent discontinuity shall be ignored.	Wired and mated connector assemblies shall be tested in accordance with AMP Spec 109-26. The following details shall apply: 1. Test condition letter: A 2. Electrical load conditions: all contacts shall be connected in series to a suitable testing circuit with .1 ampere flowing through the contacts 3. Measurements during test: contacts shall be monitored for loss of electrical continuity of 1 microsecond duration
Contact Retention	The contacts shall withstand the specified axial load without dislodging or damaging the contact or connector. Contact — Load (Lbs) Type II & III — 10 (minimum initial) 4.5 (after 5 cycles) 10 (minimum average) Type I — 15 Type XII — 25	A minimum of 6 randomly selected contacts in each connector half shall be inserted, removed, and reinserted 10 times (5 times for Type II & III contacts) using the applicable extraction tool. After the 11th insertion (6th insertion for Type II & III contacts), each connector half shall be mounted to an appropriate fixture and the specified axial load applied to the engaging end of the cycled contacts at a rate of 1 pound per second. Full load shall be maintained for 5 to 10 seconds.

Figure 3 (end)

3.4. Connector Tests and Sequences

Test or Examination	Test Group (a)	
	1	2
	Test Sequence (b)	
Visual Inspection	1	1
Insulation Resistance	2	
Thermal Shock	3	
Dielectric Withstanding Voltage	4	2
Durability	5	
Humidity	6	
Vibration	7	
Mechanical Shock	8	
Contact Retention	9	3

NOTE

(a) See Para 3.2.B.
(b) Numbers indicate sequence in which tests are performed.

Figure 4

4. QUALITY ASSURANCE PROVISIONS

4.1. Responsibility for Inspection

AMP Incorporated is responsible for the performance of all inspection requirements specified herein, and for controlling the quality of the delivered product.

4.2. Classification of Inspections

The inspections specified herein are classified as follows:

A. Qualification Inspection per Para 3.2.

B. Quality Conformance Inspection per Para 4.3.

4.3. Quality Conformance Inspection

A. Lot Inspection

Piece parts, sub-assemblies and finished assemblies shall be subjected to inspection and tests to ensure product conformance to the applicable product drawing. Dimensional and visual inspections shall be performed using appropriate process controls. The sampling plan, plan level and the acceptable quality level shall meet the requirements of MIL-STD-105.

B. Requalification Test

Requalification testing shall occur after any material, process or tooling change that can effect the product performance.

C. Periodic Inspection

Four connector assemblies shall be selected from production 24 months after the date of qualification and after each subsequent 24 month period and subjected to the inspections and tests of Figure 4 in the order shown.

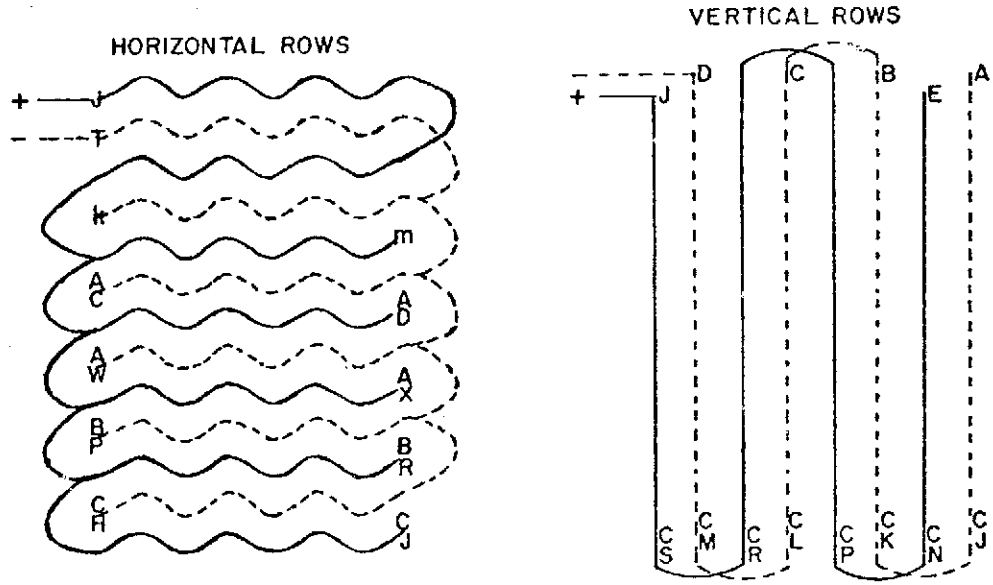

Figure 5
Wiring Diagram, Typical Suggested Method For Insulation Resistance, Dielectric Withstanding Voltage & Moisture Resistance Tests