Circular Multi-Pin Connector

TENTATIVE

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the AMP* Circular Multi-Pin Connectors with removable crimp contacts and the printed circuit board headers with fixed contacts. The connectors are designed for use in electronic, electric power and control circuits.

1.2. Qualification

When tests are performed on the subject product line, the procedures specified in AMP 109 series specifications shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the 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. 109-1: General Requirements for Test Specifications
B. 109 Series: Test Specifications as indicated in Figure 1. (Comply with MIL-STD-202, MIL-STD-1344 and EIA RS-364)
C. Corporate Bulletin 401-76: Cross-reference between AMP Test Specifications and Military or Commercial Documents
D. 114-1010: Contact, Pin & Socket, Mate-N-Lok, Universal, Application of
E. 501- : Test Report

3. REQUIREMENTS

3.1. Design and Construction

Connectors and headers shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

A. Contact: Pins-Brass or Phos Brz., Sockets-Phos. Brz., all Pre-Plated Gold over Nickel on the mating surface, Tin over Nickel in the wire barrel and on the solder tail.

B. Housing: Polyester, 94V-0

3.3. Ratings

A. Voltage/Current: 600 vac.

B. Operating Temperature: -55° to 105°C

3.4. Performance and Test Description

Connector and header assemblies shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of Product	Meets requirements of product drawing and AMP Spec 114-1010.	Visual, dimensional and functional per applicable inspection plan.
	ELECTRICAL	
Termination Resistance, Specified Current	Wire size AWG / Test Current ampere / Resistance milliohms maximum initial 24 / 1.5 / 3.5 22 / 3.5 / 3.5 20 / 4.5 / 3.0 18 / 6.0 / 3.0 16 / 8.0 / 2.75 14 / 10.0 / 2.75 12 / 12.0 / 2.50 10 / 14.0 / 2.50	Measure potential drop of mated contacts assembled in housing, see Figure 4 or 5; AMP Spec 109-25, calculate
Termination Resistance, Dry Circuit	3.5 milliohms maximum initial.	Subject mated contacts assembled in housing to 50 mv open circuit at 100 ma maximum, see Figure 4 or 5; AMP Spec 109-6-1.
Dielectric Withstanding Voltage	5.0 kvac (connector) or 2.9 kvac (header) dielectric withstanding voltage, one minute hold.	Test between adjacent contacts or mated connector and header assemblies; AMP Spec 109-29-1.

Figure 1 (cont)

Test Description	Requirement	Procedure
Insulation Resistance	1000 megohms minimum initial.	Test between adjacent contacts or mated connector and header assemblies; AMP Spec 109-28-4.
Temperature Rise vs Current (a)	Temperature rise, see Figure 2; termination resistance, specified current.	T-rise at rated current; AMP Spec 109-45-1.
	MECHANICAL	
Vibration (b)	No discontinuities greater than 10 microseconds. 5.0 milliohms maximum termination resistance, dry circuit.	Subject mated connector and header assemblies all to 10-55-10 Hz traversed in 1 minute at .06 inches total excursion; 2 hours in each of 3 mutually perpendicular planes; AMP Spec 109-21-1.
Physical Shock (b)	No discontinuities greater than 10 microseconds. 6.0 milliohms maximum termination resistance, dry circuit.	Subject mated connector and header assemblies to 50 G's sawtooth in 11 milliseconds; 3 shocks in each direction applied along the 3 mutually perpendicular planes total 18 shocks; AMP Spec 109-26-7.
Mating Force	1.5 pounds maximum initial, per contact.	Measure force necessary to mate connector and header assemblies with locking latches removed. Mount connector in fixtures and perform test at .5 inch per minute. Align connector halves where mating begins, incorporating free floating fixtures and mate additional .075 inch, measure force; AMP Spec 109-42, cond A. Calculate force per contact.

Figure 1 (cont)

Test Description	Requirement	Procedure
Unmating Force	.5 pounds minimum final.	Measure force necessary to unmate connector and header assemblies with locking latches removed/ at a rate of 0.5 inch/ minute; AMP Spec 109-42, cond A, calculate force per contact.
Contact Insertion Force	3 pounds maximum per contact.	Measure force to insert crimped contact into contact holder; AMP Spec 109-41.
Contact Retention	35 pounds minimum.	Apply axial load of 35 pounds to crimped contacts; AMP Spec 109-30, except grip wire.
Crimp Tensile	Wire Size AWG / Crimp Tensile pounds minimum 24 — 8 22 — 14 20 — 14 18 — 30 16 — 45 14 — 50 12 — 60 10 — 70	Determine crimp tensile at a rate of 1 inch/ minute; AMP Spec 109-16.
Durability	Mating-unmating; 3.6 milliohms maximum termination resistance, dry circuit.	Mate and unmate connector and header assemblies for 50 cycles; AMP Spec 109-27.
Housing Panel Retention	75 pounds minimum.	Measure panel retention force for connector and header receptacles using nominal panel cutout dimensions as specified in AMP Customer Drawing; AMP Spec 109-49.
Housing Lock Strength	35 pounds minimum in any direction.	Connector and header assemblies must withstand a 35 pound weight hung on a 3 foot cable for 1 minute when supported from either end or panel; axially and in all four directions radially.

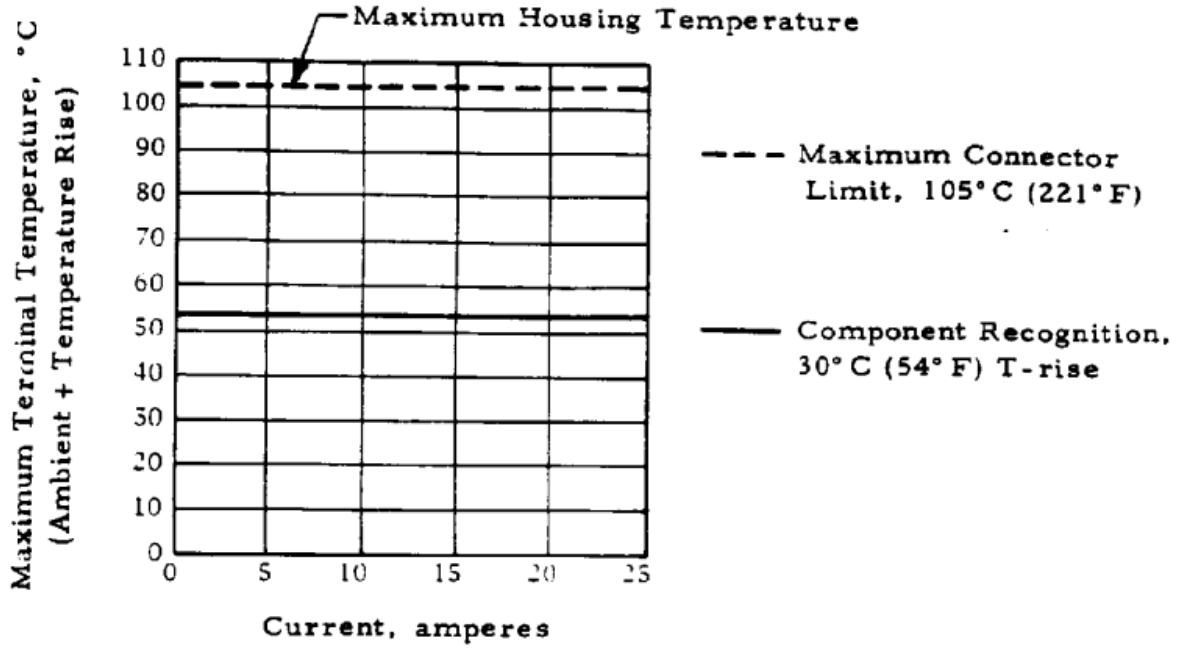
Figure 1 (cont)

Test Description	Requirement	Procedure
	ENVIRONMENTAL	
Thermal Shock (b)	Dielectric withstanding voltage; 3.75 milliohms maximum termination resistance, dry circuit.	Subject mated connector and header assemblies to 25 cycles between -55° and 85°C; AMP Spec 109-22.
Humidity-Temperature Cycling	100 megohms minimum insulation resistance; 6.0 milliohms maximum termination resistance, dry circuit.	Subject mated connector and header assemblies to 10 humidity-temperature cycles between 25° and 65°C at 95% RH; AMP Spec 109-23, method III, cond B, with low frequency vibration and cold shock at -10°C.
Corrosion, Salt Spray	7.0 milliohms maximum termination resistance, dry circuit.	Subject mated connector and header assemblies to 5% salt concentration for 48 hours; AMP Spec 109-24, cond B.
Industrial Mixed Flowing Gas	Termination resistance, dry circuit and specified current; 7 milliohms maximum.	Subject mated connector and header assemblies to environmental class III for 20 days; AMP Spec 109-85-3.

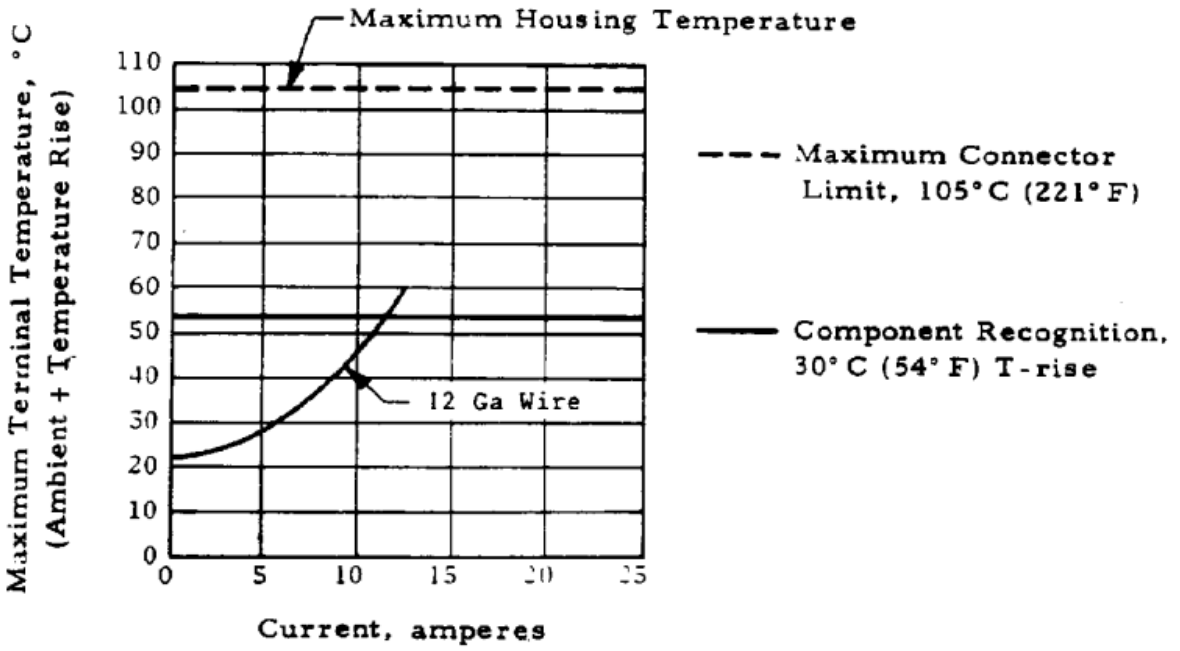
(a) Maximum rated current that can be carried by the contacts in this product is limited by maximum operating temperature of housings, which is 105°C, and temperature rise of contacts, which is 30°C. Variables which shall be considered for each application are: wire size, connector size, contact material, ambient temperature, connector population, and contact location in the connector.

(b) Shall remain mated and show no evidence of damage, cracking or chipping.

Figure 1 (end)



Terminal Temperature vs Current/Circuit, 10 Circuit Housing



Terminal Temperature vs Current/Circuit, 13 Circuit Housing

Figure 2

3.6. Connector Qualification and Requalification Tests and Sequences

Test or Examination	Test Group (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Examination of Product	1	1	1	1	1	1
Termination Resistance, Specified Current		2				
Termination Resistance, Dry Circuit	4,6,9,11	4,6	2,4,6,8			
Dielectric Withstanding Voltage	2,8,13					
Insulation Resistance	3,12					
Temperature Rise vs Current		3				
Current Cycling		5				
Vibration			3			
Physical Shock			5			
Mating Force		7				
Unmating Force		8				
Contact Insertion Force					2	
Contact Retention					3	
Crimp Tensile				2		
Durability	5					
Housing Panel Retention		9				
Housing Lock Strength	14					
Thermal Shock	7					
Humidity-Temperature Cycling	10					
Corrosion, Salt Spray			7			
Industrial Mixed Flowing Gas						2

(a) See Para 4.1.A.
(b) Numbers indicate sequence in which tests are performed.

Figure 3

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector and header assemblies and contacts shall be prepared in accordance with applicable instruction sheets. Components shall be selected at random from current production. Test groups 1, 2, 3 and 6 shall consist of 3 mated connector assemblies and 3 mated header assemblies per group. The assemblies and wire sizes shall be chosen randomly to cover the range of the product line. Group 4 samples shall consist of 15 pin and socket contacts per wire size. Group 5 samples shall consist of 15 pins and 15 socket contacts crimped on 13 AWG wire.

Crimped contacts shall be attached to tin plated test conductors PN 103501 and PN 103502 in accordance with AMP Specification 114-1010.

B. Test Sequence

Qualification shall be established by testing samples as specified in Figure 3.

C. Acceptance

(1) Test results from development on pre-qualification samples will be used to determine upper and lower one-sided statistical tolerance limits for 99% reliability at 95% confidence, as follows. Let Xbar and s denote the sample average and standard deviation, respectively, of the test data. Let k denote the normal distribution one-sided tolerance factor for 95% confidence and 99% reliability. The value of k varies with sample size. Values of k are given in various tables, for example, NBS Handbook 91, Factors for One-Sided Tolerance Limits for Normal Distribution. Suitability of the normal distribution for representing the data shall be verified with normal probability plots, goodness of fit tests, etc.

Then the upper one-sided tolerance limit for 99% reliability at 95% confidence is given by Xbar + ks. The interpretation of this tolerance limit is as follows: based on the test data, and assuming a normal distribution for the test data, we can be 95% confident that 99% of the population of values represented by the sample data will not exceed Xbar + ks. For any test parameter for which there is specified an upper requirement which is not to be exceeded, satisfactory performance of the product is achieved when the value of Xbar + ks does not exceed the requirement value.

The lower one-sided tolerance limit for 95% confidence and 99% reliability is given by Xbar - ks. This has a similar interpretation and corresponding application to lower requirement values.

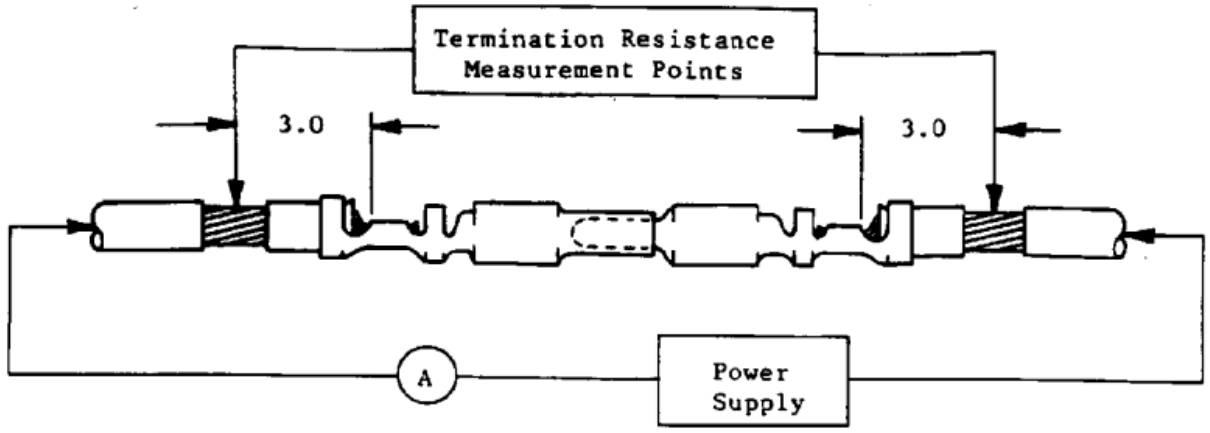
(2) Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

4.2. Requalification Testing

Requalification shall be established by the cognizant divisional engineering function and may consist of all or any part of the overall qualification program provided that it is conducted within the required time period.

4.3. Quality Conformance Inspection

The applicable AMP inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

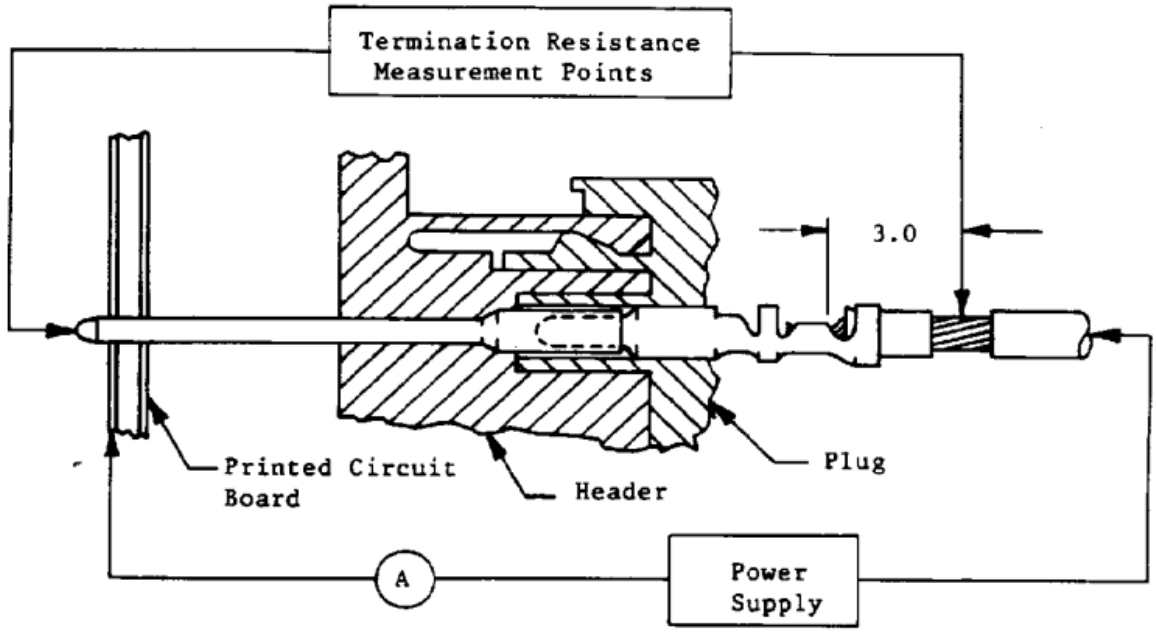


Notes:

1. A 1 foot minimum length of continuous lead for heat dissipation.
2. Termination resistance equals millivolts divided by test current less resistance of 6 inches of wire.

Figure 4

Termination Resistance Measurement Points



Notes:

1. A 1 foot minimum length of continuous lead for heat dissipation.
2. Termination resistance equals millivolts divided by test current less resistance of 3 inches of wire.
3. Printed circuit test board is tin plated 2 ounce copper with plated thru holes and traces on both sides.

Figure 5

Termination Resistance Measurement Points