Header, MATE-N-LOK*, Universal

1. SCOPE

1.1. Content

This specification covers performance requirements for the universal MATE-N-LOK* printed circuit board headers. These connectors provide a highly reliable and economical means of interfacing with printed circuit boards in today's home entertainment centers, appliances, vending machines, computers, and other sophisticated commercial equipment.

1.2. Qualification

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

2. APPLICABLE DOCUMENTS

The following TE Connectivity (TE) 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 product drawing, product drawing shall take precedence. In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

2.1. TE Connectivity (TE) documents

- 114-1010: Universal MATE-N-LOK* Connectors (Application Specification)
- 501-134030: Universal MATE-N-LOK* Headers (Qualification Test Report)

2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC-60512-1: Connectors for Electronic Equipment-Tests and Measurements-Part 1. General

3. REQUIREMENTS

3.1. Design and Construction

Headers shall be of design, construction and physical dimensions specified on applicable product drawing.

3.2. Materials

- Housing: Nylon, 94V-0 or 94V-2
- Pin: Phosphor bronze, pre-tin
- Socket: Phosphor bronze, pre-tin

3.3. Ratings

- Current/Voltage: 600 volts AC at 12 amperes maximum on #14 AWG stranded wire
- Operating temperature: -40 to 105°C

| Indicates Change

3.4. Performance and Test Description

Headers shall be designed to meet electrical, mechanical and environmental performance requirements specified in Figure 1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirements	Procedures
Examination of Product	Meets requirements of product drawings and 114-1010	Visual, dimensional and functional per applicable inspection plan
Termination Resistance (Original Sequence)	Wire Size AWG / Test Current (amps) / Resistance Milliohms MAX Final 24 / 1.5 / 5 22 / 3.0 / 5 20 / 4.5 / 5 18 / 6.0 / 5 16 / 8.0 / 5 14 / 10.0 / 5	EIA 364-6B & IEC 60512-2-2 Measure potential drop of mated contacts assembled on test board. Calculate resistance; see figure 4 or figure 5
Termination Resistance (Improved Sequence)	Wire Size AWG / Test Current (amps) / Resistance Milliohms MAX Final 24 / 1.5 / 15 22 / 3.0 / 15 20 / 4.5 / 15 18 / 6.0 / 15 16 / 8.0 / 15 14 / 10.0 / 15	EIA 364-6B & IEC 60512-2-2 Measure potential drop of mated contacts assembled on test board. Calculate resistance; see figure 4 or figure 5
Insulation Resistance	1,000 mega-ohms MIN initial 100 mega-ohms MIN final	EIA 364-21C & IEC 60512-3-1 Test between adjacent circuits of free hanging connector mated with header
Dielectric Withstanding Voltage	2.9 KVAC dielectric withstanding voltage	EIA 364-20B & IEC 60512-4-1
Temperature Rise versus Current See Note (a) & Note (c)	Temperature Rise See Figures 3 & 4	EIA 364-70A & IEC 60512-5-1
Mating Force	3.0 pounds MAX initial	EIA 364-13B & IEC 60512-13-1 Measure force necessary to mate connector assembly with locking latches removed. Calculate force per contact.
Durability	Mating / Un-Mating. 2.6 milliohms maximum for straight header and 4.6 milliohms maximum for right angle header termination resistance, dry circuit.	EIA 364-9C & IEC 60512-9-1 Mate and un-mate connector with header mounted on a printed circuit board for 50 cycles.
Vibration	*Frequency Range*: 20-500 Hz *Type*: Random *Amplitude*: 0.05 g²/Hz (4.90 grams) *Duration Each Axis*: 15 minutes	EIA 364-28, Condition VII, Level E

Figure 1 (cont)

Test Description	Requirements	Procedures
Mechanical Shock	*Pulse Type*: Half-Sine *Pulse Amplitude*: 50 grams *Pulse Duration*: 11 milliseconds	EIA 364-27, Condition A & IEC 60512-6-3
Un-Mating Force	0.5 pounds MIN final	EIA 364-13B & IEC 60512-13-1 Measure force necessary to un-mate connector assembly with locking latches removed. Calculate force per contact.
Thermal Shock	Dielectric withstanding voltage. 12 milliohms MAX (straight header) 16 milliohms MAX (right-angle header) Termination resistance, dry circuit. Shall remain mated and shall show no evidence of cracking or chipping.	EIA 364-32C & IEC 60512-11-4 Subject connector mated with header on printed circuit board to 25 cycles between -55 and 85°C.
Resistance to Soldering Heat	See Note (d)	EIA-364-56, Procedure 3, Condition Letter G for 5 second and 10 second exposure durations.
Humidity-Temperature Cycling	See Note (b)	EIA 364-31B Method IV, IEC 60512-11-3 & IEC 60512-11-12 Subject connector mated with header on printed circuit board to ten 24-hour cycles between 25 and 65°C at 95% RH with a -10°C cold shock between cycles.
Temperature Life	See Note (b)	EIA 364-17B & IEC 60512-11-9 Subject connector mated with header on printed circuit board to temperature life at 120°C for 500 hours.
Mixed Flowing Gas	Duration – 20 days	EIA 364-65 Class IIIA & IEC 60512-11-7 Method 3

Figure 1 (end)

NOTES

(a) Maximum rated current that can be carried by this product is limited by NOTE 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, and printed circuit board design.

(b) Shall meet visual requirements, show no physical damage, and meet requirements of additional test as specified in the Separable Interface Testing in test sequence 2.

(c) The temperature rise test currents are based on the test current from the termination resistance test. The temperature should be measured at 6 relatively even spaced currents. Table 2 suggests current levels for each wire size.

(d) Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 3.

Spaced Test Currents for Temperature Rise Testing							
%	#24	#22	#20	#18	#16	#14	Notes
25	0.4	0.8	1.1	1.5	2.0	2.5	
50	0.8	1.5	2.3	3.0	4.0	5.0	
75	1.1	2.3	3.4	4.5	6.0	7.5	
100	1.5	3.0	4.5	6.0	8.0	10.0	
125	1.9	3.8	5.6	7.5	10.0	12.5	expect +40°C T-rise
150	2.3	4.5	6.8	9.0	12.0	15.0	expect +40°C T-rise

Figure 2

3.6. Connector Tests and Sequences

Test or Examination	Test Group (a)						
	Original Sequence				Improved Sequence		
	1	2	3	4	5	6	7
	Test Sequence (b)						
Initial Examination of Product	1	1	1	1	1	1	1
Termination Resistance (Original)		3	3,5,9				
Termination Resistance (Improved)					3,7	2,5(c),7(c),9	
Insulation Resistance			10				2,6
Dielectric Withstanding Voltage			8				3,7
Temperature Rise versus Current		2				3,10	
Mating Force			2		2		
Durability			4		4		
Vibration					5	8	
Mechanical Shock					6		
Un-Mating Force			6		8		
Resistance to Soldering Heat				2			
Thermal Shock			7				4
Humidity-Temperature Cycling						4(d)	5
Temperature Life						6	
Mixed Flowing Gas						4(d)	
Final Examination of Product		4	11	3	9	11	8

Figure 3

NOTES

(a) See Paragraph 4.1.A.

(b) Numbers indicate the sequence tests were performed.

(c) Optical measurements used for verification.

(d) Each Sample must be mated/un-mated 10 times prior to test.

Non-Noble Plating: Humidity-Temperature Cycling, but not Mixed Flowing Gas

Noble Plating: Mixed Flowing Gas, but not Humidity-Temperature Cycling

(e) Discontinuities shall not be measured. Energize at 18˚C level for 100% loading per Quality specification 102-950

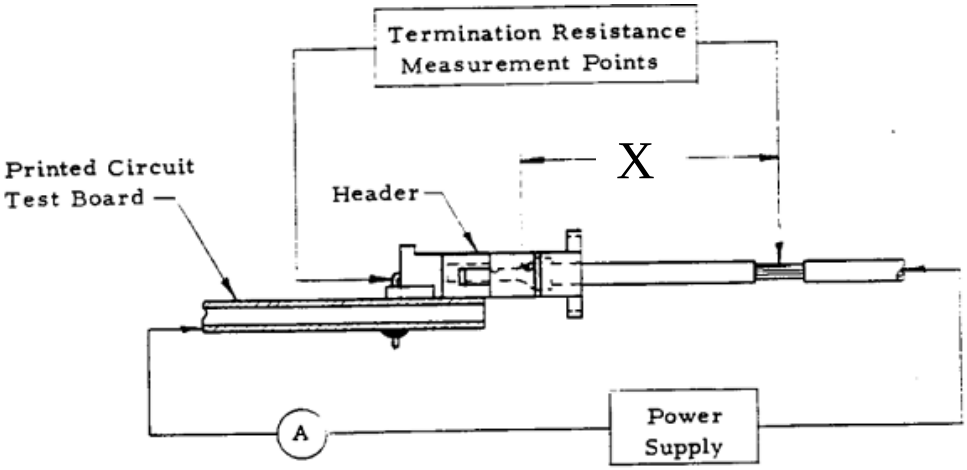

Figure 4
(Right Angle Header Termination Resistance Measurement Points)

NOTES
(1) A 1-foot minimum length of continuous lead for heat dissipation.

(2) Termination resistance equals milli-volts divided by test current less resistance of "X" inches of wire.

(3) Printed circuit test board is tin plated 2 ounce copper with plated through holes and traces on both sides.

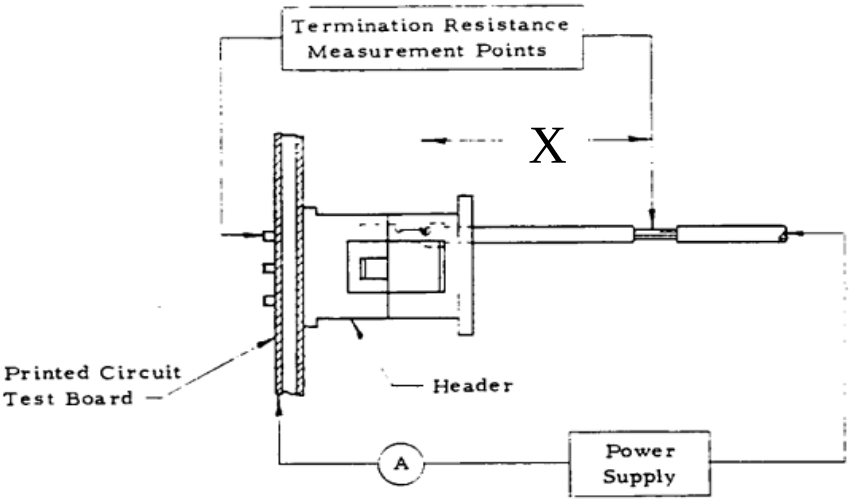

Figure 5
(Straight Header Termination Resistance Measurement Points)

NOTE
(1) A 1-foot minimum length of continuous lead for heat dissipation.

(2) Termination resistance equals milli-volts divided by test current less resistance of "X" inches of wire.

(3) Printed circuit test board is tin plated 2 ounce copper with plated through holes and traces on both sides

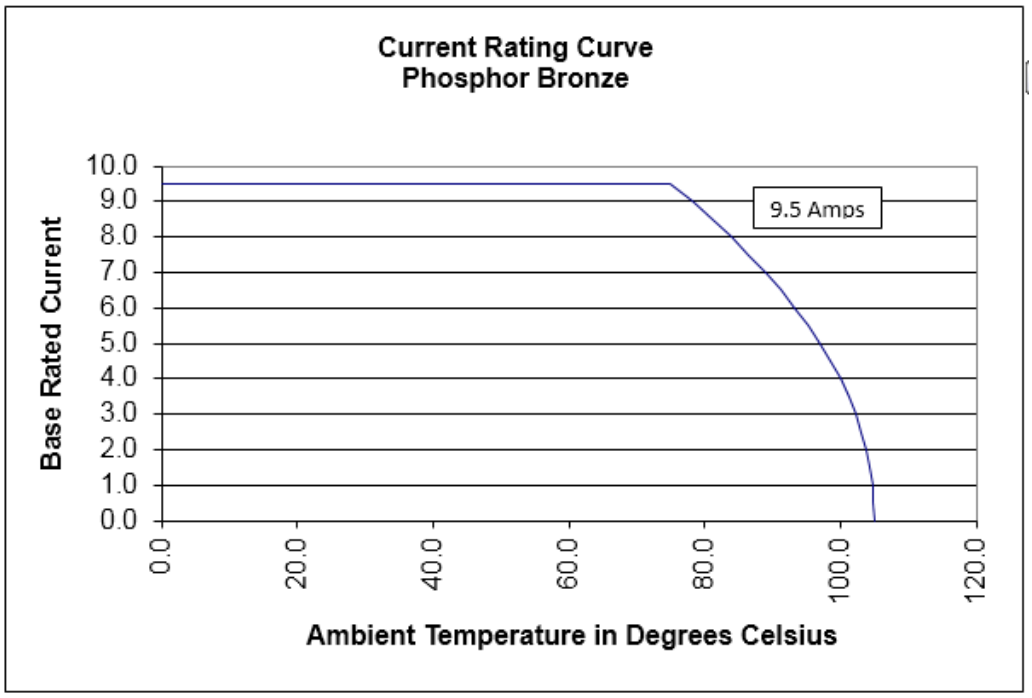

Figure 6
(Current Rating Curve for Phosphor Bronze)

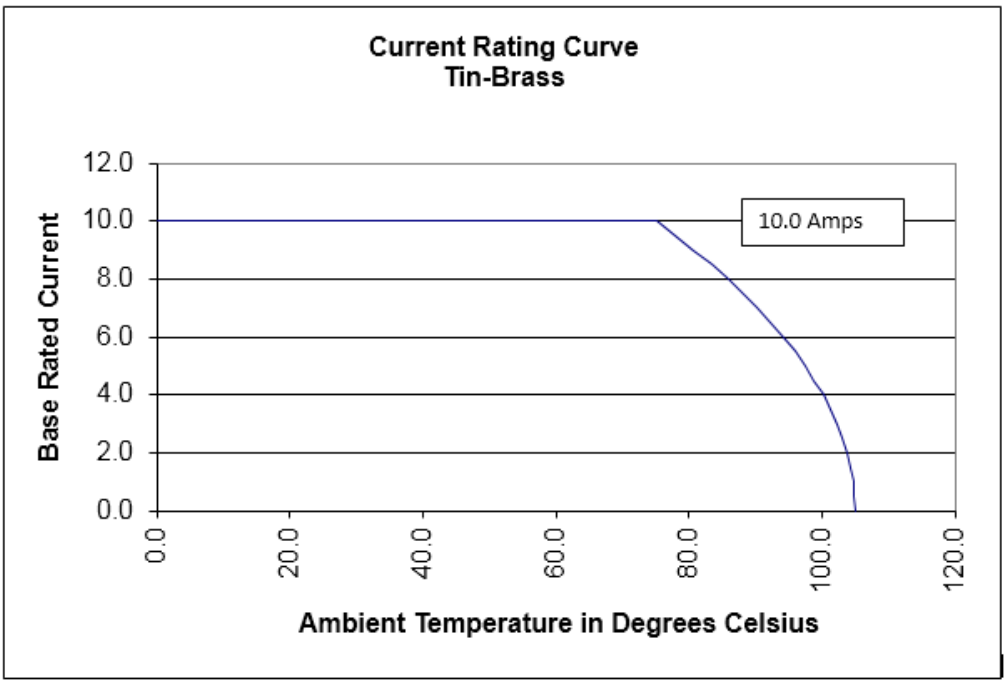

Figure 7
(Current Rating Curve for Tin-Brass)

Percent Connector Loading	12 Position	
	Wire Size AWG	
	24	14
Single Contact	.521	1
50	.400	.768
100	.323	.619

Figure 8
(**Current Rating Factor (F) for Phosphor Bronze**)

Percent Connector Loading	12 Position	
	Wire Size AWG	
	24	14
Single Contact	.486	1
50	.374	.770
100	.302	.623

Figure 9
(Current Rating Factor (F) for Tin-Brass)

NOTE
To determine acceptable current rating for percentage connector loading and wire gage indicated, use the Multiplication Factor (F) from the above chart and multiply it times the Base Rated Current for a single circuit at the desired ambient operating temperature.

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector assemblies shall be selected at random from current production. Test group 1 shall consist of 1 assembly of each size. Test group 2 shall consist of 2 connectors for each requirement of Figures 6 and 7. Test group 3 and 4 shall consist of 5 random connector assemblies. All contacts shall be crimped to tin plated conductors in accordance with Application Specification 114-1010.

B. Test Sequence

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

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that product meets requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

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