Header, MATE-N-LOK*, Mini-Universal

1. INTRODUCTION

1.1. Purpose

Testing was performed on Mini-Universal MATE-N-LOK* Headers to determine their conformance to
I the requirements of Product Specification 108-1543 Rev. A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of Mini-Universal MATE-N-LOK Headers. Testing was performed at the Global Automotive Division, Americas North
I Laboratory between 11May95 and 16Jul96. The test file number for this testing is ACL1311-073, 074.
I Additional testing was performed to validate the decrease in minimum temperature rating to -55°C.
I The test number for this additional testing is 19990352ACL.

1.3. Conclusion

Mini-Universal MATE-N-LOK Headers, listed in paragraph 1.5., met the electrical, mechanical, and
I environmental performance requirements of Product Specification 108-1543 Rev A.

1.4. Product Description

I The Mini-Universal MATE-N-LOK Headers with right angle PC board pins are used in wire to printed circuit board applications. These headers are designed to mate with Mini-Universal MATE-N-LOK plug connectors and are available it 2 through 24 positions. The pin is tin plated brass, the housing material
I is Nylon, UL94V-O rated.

1.5. Test Samples

The test samples were randomly selected from normal current production lots, the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1	16	770605-1	2 circuit right angle header (tin)
	16	172165-1	2 circuit plug
	32	770904-1	Brass, pre-tin socket terminated with 18 AWG
	I 8	172167-1	4 position plug
	I 8	770968-1	4 position header
	I 32	171639-1	Contact sockets
2	4	770617-1	24 circuit right angle header (tin)
	4	770587-1	24 circuit plug
	96	770904-1	brass, pre-tin socket terminated with 18 AWG
	I 4	770579-1	8 position plug
	I 4	770970-1	8 position header
	I 32	171639-1	Contact sockets

* Trademark
I Indicates change

Test Group	Quantity	Part Number	Description
3	6	770587-1	24 circuit plug
	6	770617-1	24 circuit right angle header (tin)
	144	770904-1	Brass, pre-tin socket terminated with 18 AWG
	30	172165-1	2 circuit plug (unloaded)
	30	770605-1	2 circuit right angle header (tin)
4	3	770617-1	24 circuit right angle header (tin)

1.6. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15 to 35°C
Relative Humidity: 20 to 80%

1.7. Qualification Test Sequence

Test or Examination	Test Groups			
	1	2	3	4
	Test Sequence (a)			
Examination of Product	1,9	1,9	1,9	1,3
Termination Resistance, Dry Circuit	3,7	2,7		
Dielectric Withstanding Voltage			3,7	
Insulation Resistance			2,6	
Temperature Rise vs Current		3,8		
Vibration	5	6		
Physical Shock	6			
Mating Force	2			
Unmating Force	8			
Durability	4			
Housing Lock Strength			8	
Thermal Shock			4	
Humidity-Temperature Cycling		4(b)	5	
Temperature Life		5		
Solderability				2

NOTE *(a) The numbers indicate sequence in which tests were performed.*
(b) Precondition with 5 cycles of Durability.

2. SUMMARY OF TESTING

2.1. Examination of Product - All Groups

All samples submitted for testing were randomly selected from current production lots. A Certificate of Conformance was issued by the Product Assurance Department of the Commercial Products Division. Where specified, samples were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Termination Resistance, Dry Circuit - Groups 1 and 2

All termination resistance measurements, taken at 100 milliamperes maximum and 20 millivolts open circuit voltage were less than 10 milliohms initially and 20 milliohms finally.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
1	32	Initial	2.48	5.14	3.57
		After mechanical	2.99	6.72	4.23
2	96	Initial	2.58	5.13	3.34
		After environments	2.86	17.75	5.59

NOTE *All values in milliohms.*

2.3. Dielectric Withstanding Voltage - Group 3

No dielectric breakdown or flashover occurred.

2.4. Insulation Resistance - Group 3

All insulation resistance measurements were greater than 1,000 megohms.

2.5. Temperature Rise vs Current - Group 2

All samples had a temperature rise after environments of less than 30°C above ambient when tested using a baseline rated current of 7.133 amperes and the correct derating factor value based on the samples wiring configuration.

2.6. Vibration - Groups 1 and 2

No discontinuities were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.7. Physical Shock - Group 1

No discontinuities were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.8. Mating Force - Group 1

All mating force measurements were less than 1.5 pounds per circuit.

2.9. Unmating Force - Group 1

All unmating force measurements were greater than .15 pound per circuit.

2.10. Durability - Group 1

No physical damage occurred to the samples as a result of mating and unmating the connector 20 times.

2.11. Housing Lock Strength - Group 3

Locking latches of the mated headers and plugs remained engaged after an axial force of 6 pounds was exerted.

2.12. Thermal Shock - Group 3

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.13. Humidity-Temperature Cycling - Groups 2 and 3

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.14. Temperature Life - Group 2

No evidence of physical damage was visible as a result of exposure to temperature life.

2.15. Solderability - Group 4

All contact leads had a minimum of 95% solder coverage.

3. TEST METHODS

3.1. Examination of Product

Where specified, samples were visually examined for evidence of physical damage detrimental to product performance.

3.2. Termination Resistance, Low Level Dry Circuit

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes maximum with a 20 millivolt open circuit voltage.

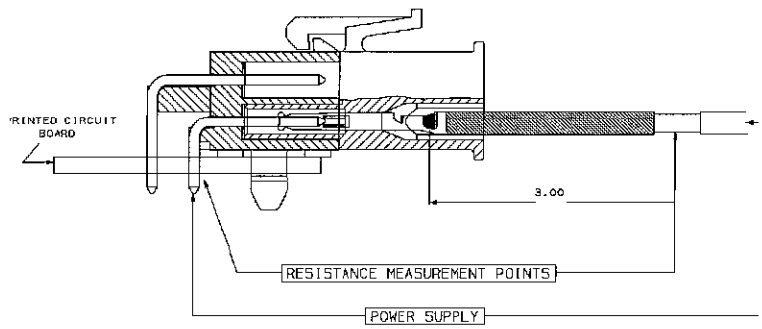

Figure 1
Typical Termination Resistance Measurement Points

3.3. Dielectric Withstanding Voltage

A test potential of 1,500 volts AC was applied between the adjacent circuits. This potential was applied for 1 minute and then returned to zero.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent circuits, using a test voltage of 500 volts DC. This voltage was applied for 2 minutes before the resistance was measured.

3.5. Temperature Rise vs Specified Current

Temperature rise curves were produced by measuring individual contact temperatures terminated to their maximum wire size at a minimum of 5 different current levels. These measurements were plotted to produce a temperature rise vs current curve. Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded.

3.6. Vibration, Sine

Mated header and plugs were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 0.06 inch, double amplitude. The vibration frequency was varied uniformly between the limits of 10 and 55 Hz and returned to 10 Hz in 1 minute. This cycle was performed 120 times in each of 3 mutually perpendicular planes for a total vibration time of 6 hours. Headers and plugs were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes.

3.7. Physical Shock

Mated headers and plugs were subjected to a physical shock test having a sawtooth waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Headers and plugs were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.8. Mating Force

The force required to mate individual headers and plugs without locking latch was measured using a tensile/compression device with the rate of travel at 0.5 inch/minute and a free floating fixture.

3.9. Unmating Force

The force required to unmate individual headers and plugs without locking latch was measured using a tensile/compression device with the rate of travel at 0.5 inch/minute and a free floating fixture.

3.10. Durability

Headers and plugs were mated and unmated 20 times at a rate not to exceed 500 cycles per hour.

3.11. Housing Lock Strength

Mated headers and plug assemblies without contacts and latches engaged were secured in a tensile tester. An axial force was exerted at a constant rate of 0.5 inch per minute until connector locking latches disengaged.

3.12. Thermal Shock

Mated headers and plugs were subjected to 25 cycles of thermal shock with each cycle consisting of 1 hour dwells at -55 and 105°C. The transition between temperatures was less than 1 minute.

3.13. Humidity-Temperature Cycling

Mated headers and plugs were preconditioned at 50°C for 24 hours then exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity. A -10°C sub-cycle was performed during the first 5 humidity-temperature cycles between the 18th and 21st hours of the 24 hour cycle. (Figure 2)

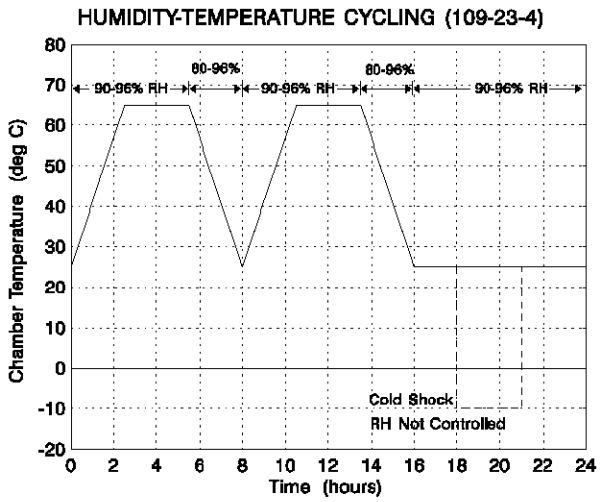

Figure 2
Typical Humidity-Temperature Cycling Profile

3.14. Temperature Life

Mated headers and plugs were exposed to a temperature of 105°C for 580 hours.

3.15. Solderability

Header solder tails were subjected to a solderability test. The soldertails were immersed in a mildly activated rosin flux for 5 to 10 seconds, allowed to drain for 5 to 20 seconds, then held over molten solder without contact for 2 seconds. The solder tails were then immersed in the molten solder at a rate of approximately one inch per second, held for 4.5 to 5 seconds, then withdrawn at a constant rate of 1 inch per second. After cleaning in isopropyl alcohol, the samples were visually examined for solder coverage. The solder used for testing was 60/40 tin lead composition and was maintained at a temperature of 245 ± 5°C.