.040/2.8 mm Unsealed Hybrid Multilock Connector System

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics .040/2.8 mm Unsealed Hybrid Multilock Connector System to determine its conformance to the requirements of Product Specification 108-2217 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the .040/2.8 mm Unsealed Hybrid Multilock Connector System . Testing was performed at the Global Automotive Division Product Reliability Center. The test file numbers for this testing are 20060047ACL, 20060047ACLa, 20060049ACL, 20060049ACLa, 20060050ACL and 20060051ACL. This documentation is on file at and available from the Global Automotive Division Product Reliability Center.

1.3. Conclusion

The .040/2.8 mm Unsealed Hybrid Multilock Connector System listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2217 Revision A.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Part Number	Description
175265-1	.040 Series S Receptacle Contact
638207-6	.040 Multilock 10 Position Plug Assembly
1326030-4	2.8 mm Receptacle, Unsealed, 10-12 AWG
9-1438743-6	54 Way Hybrid .040, 2.8 Pins Down Cap Assembly
1438759-1	22 Way Hybrid .040/2.8 Plug Assembly Key B
1438761-6	22 Way Hybrid .040/2.8 Plug Assembly Key A
9-1438772-6	54 Way Hybrid .040/2.8 Pins Up Cap Assembly With Boardlocks
9-1438789-2	38 Way Hybrid .040/2.8 Hybrid Cap Assembly With Boardlocks
175966-2	.040 Multilock 16 Position Plug Assembly

Figure 1

1.5. Environmental Conditions

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

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

* Trademark
| Indicates change

1.6. Qualification Test Sequence

Test Group ID	1	2	3	4	5	6	7	8	9	10	11
Specimen Quantity	10	10	10	8	15	12	3	5	3(a)	20	10(b)
Test or Examination	Test Sequence (Numbers indicate sequence in which tests are performed)										
Visual inspection	1,4	1,3	1,4	1,3	1,5	1,3	1,3	1,3	1,7	1,3	1,3
Terminal-to-connector insertion force	2										
Terminal-to-connector extraction force, primary	3										
Terminal-to-connector extraction force, secondary		2									
Connector-to-connector mating force					2						
Connector-to-connector unmating force					3						
Primary connector lock disengage force					4						
Polarization feature effectiveness						2					
Miscellaneous component engage force (TPA)			2								
Miscellaneous component disengage force (TPA)			3								
Connector-to-connector audible click				2							
Connector drop test							2				
Cavity damage susceptibility								2			
Header pin retention										2	
Header pin solderability											2
Connector cycling									2		
Circuit continuity monitoring									4(c)		
Dry circuit resistance									3,5		
Voltage drop									6		
Vibration/mechanical shock									4		

NOTE

(a) Three complete assemblies consisting of 54 position header, 22 position plugs key A and B, 10 position plug. Connector assemblies to be soldered to printed circuit board with support representative of typical Radio application.

(b) Ten pin contacts pulled randomly from 3 header assemblies, tested both before and after soldering heat exposure.

(c) Test run concurrently with vibration/mechanical shock.

Figure 2

2. SUMMARY OF TESTING

2.1. Visual Inspection

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Terminal-To-Connector Insertion Force

All terminal-to-connector insertion force measurements were less than 30 N.

2.3. Terminal-To-Connector Extraction Force With Primary Latching

All terminal-to-connector extraction force measurements with primary latching were greater than 30 N for .040 contacts, and greater than 60 N for 2.8 contacts.

2.4. Terminal-To-Connector Extraction Force With Secondary Latching

All terminal-to-connector extraction force measurements with secondary latching were greater than 75 N for .040 contacts, and greater than 90 N for 2.8 contacts.

2.5. Connector-To-Connector Mating Force

All connector-to-connector mating force measurements for a fully loaded 22 position plug were less than 95 N.

2.6. Connector-To-Connector Unmating Force

All connector-to-connector unmating force measurements for a fully loaded 22 position plug were greater than 110 N with the primary lock engaged, and less than 95 N with the primary lock disengaged.

2.7. Primary Connector Lock Disengage Force

All primary connector lock disengage force measurements were greater than 10 N and less than 70 N.

2.8. Polarization Feature Effectiveness

Mis-matched (rotated 180 degrees from normal orientation) specimens would not mate when subjected to a force of 220 N for 2 minutes.

2.9. Miscellaneous Component Engage Force (TPA)

All miscellaneous component engaging force measurements were greater than 15 N without terminals and less than 75 N with terminals.

2.10. Miscellaneous Component Disengage Force (TPA)

All misc component disengaging force measurements were greater than 15 N without terminals (removal of TPA from housing) and less than 60 N with terminals (Lock to Preset position).

2.11. Connector-To-Connector Audible Click

All connector-to-connector audible click measurements were greater than 7 dB at ambient without moisture conditioning and greater than 5 dB at ambient after moisture conditioning.

2.12. Connector Drop Test

No physical damage occurred as a result of dropping unmated specimens 3 times (once on each primary axis) onto a concrete surface from a height of 1 meter.

2.13. Cavity Damage Susceptibility

No physical damage occurred as a result of applying a minimum force of 80 N to the TPA, while a receptacle terminal was partially installed. Extraction force of the receptacle terminals following this test was confirmed and met the values required in paragraph 2.4.

2.14. Header Pin Retention

All header pin retention measurements were greater than 24 N for .040 contacts, and greater than 50 N for 2.8 contacts following reflow solder heat exposure per Condition B of Test Specification 109-201 (Peak Reflow - 260˚C).

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2.15. Header Pin Solderability

All header pins had a minimum of 95% solder coverage.

2.16. Connector Cycling

No physical damage occurred as a result of manually mating and unmating the specimens 10 times.

2.17. Circuit Continuity Monitoring

No discontinuities greater than 1 microsecond were detected.

2.18. Dry Circuit Resistance

All dry circuit resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 20 milliohms for .040 contacts, and less than 5 milliohms for 2.8 contacts.

2.19. Voltage Drop

All voltage drop measurements were less than 20 milliohms for .040 contacts, and less than 5 milliohms for 2.8 contacts.

2.20. Vibration/Mechanical Shock

No discontinuities were detected during vibration and mechanical shock testing. Following vibration and mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

3. TEST METHODS

3.1. Visual Examination

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Terminal-To-Connector Insertion Force

The force required to insert terminals into individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 50 mm per minute.

3.3. Terminal-To-Connector Extraction Force With Primary Latching

The force required to remove the terminals from individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 50 mm per minute. The secondary latch was inoperable during testing.

3.4. Terminal-To-Connector Extraction Force With Secondary Latching

The force required to remove the terminals from individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 50 mm per minute. The secondary latch was operable during testing.

3.5. Connector-To-Connector Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 50 mm per minute.

3.6. Connector-To-Connector Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 50 mm per minute. Testing was performed with latches both engaged and disengaged.

3.7. Primary Connector Lock Disengage Force

The force necessary to disengage the primary lock to a point where unmating could occur was measured by using a pin held in a tensile/compression device with a free floating fixture to depress the primary lock at a maximum rate of 25 mm per minute until the specimens could be unmated.

3.8. Polarization Feature Effectiveness

Mis-matched (rotated 180 degrees from normal orientation) specimens were mounted in a tensile/compression device with a free floating fixture and subjected to a force of 220 N for 2 minutes. The force was applied at a maximum rate of 5 mm per minute.

3.9. Miscellaneous Component Engage Force (TPA)

The force necessary to push the TPA was measured using a tensile/compression device with a free floating fixture at a maximum rate of 50 mm per minute in a sequence of preset to fully installed, fully installed to preset, and preset to fully off.

3.10. Miscellaneous Component Disengage Force (TPA)

The force necessary to pull the TPA was measured using a tensile/compression device with a free floating fixture at a maximum rate of 50 mm per minute in a sequence of preset to fully installed, fully installed to preset, and preset to fully off.

3.11. Connector-To-Connector Audible Click

Specimens were manually mated 600 mm from a sound probe located in a dark room 20 feet long by 12 feet wide by 8 feet high with carpeted floor and a drop ceiling. A second set of specimens was preconditioned at 40˚C and 95 to 98% RH for 6 hours prior to testing. Both sets of specimens were tested at ambient conditions.

3.12. Connector Drop Test

Unmated specimens were dropped 3 times (once on each primary axis) onto a concrete surface from a height of 1 m.

3.13. Cavity Damage Susceptibility

Terminals were inserted into the housings to a point just before full insertion. The TPAs were pushed using a tensile/compression device with a free floating fixture at a maximum rate of 50 mm to see if they would insert into the plugs. The TPAs were then removed, the wires were installed, the TPAs fully seated and the wires extracted.

3.14. Header Pin Retention

Header pin retention was measured using a pin held in a tensile/compression device with a free floating fixture to push against the header pin at a maximum rate of 50 mm per minute in a direction to unseat the header pin. One header from each cavity was tested at ambient conditions after being subjected to the lead free solder heat profile of Condition B of Test Specification 109-201 (Peak Reflow - 260˚C).

3.15. Header Pin Solderability

A. Tyco Specification 109-11-5

Specimens were aged at 155˚C for 8 ± .25 hours and air dried at room ambient. Specimen were then immersed in ROL1 low activity level rosin flux for 5 to 20 seconds and allowed to drain for 10 to 60 seconds. Specimens were then immersed in the molten solder at a rate of 25 ± 6 mm per second, held for 3 to 5 seconds, and then withdrawn at a rate of 25 ± 6 mm per second. After solidifying at ambient conditions, the specimens 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.

B. Tyco Specification 109-11-6

Specimens were aged at 155˚C for 16 ± .25 hours and air dried at room ambient. Specimen were then immersed in Alpha 100-25 non-activated rosin flux for 5 to 20 seconds and allowed to drain for 60 ± 5 seconds. Specimens were then immersed in the molten solder at a rate of 25 ± 2.5 mm per second, held for 2 ± 0.5 seconds, and then withdrawn at a rate of 25 ± 2.5 mm per second. After solidifying at ambient conditions, the specimens were visually examined for solder coverage. The solder used for testing was 60/40 tin lead composition and was maintained at a temperature of 235 ± 5˚C.

3.16. Connector Cycling

Specimens were manually mated and unmated 10 times.

3.17. Circuit Continuity Monitoring

Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes in the monitoring circuit during vibration and mechanical shock testing.

3.18. Dry Circuit Resistance

Dry circuit resistance measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Overall measurements included 11 inches of either 18 or 14 AWG wire, the crimp, bulk material, interface, and right angle header post. The 11 inches of wire was subtracted from the overall measurements.

3.19. Voltage Drop

Voltage drop was measured across the 11 inches of the conductor used. Non-terminated wire ends (In and Out for each terminal size) were soldered together to form 1 continuous series circuit. Specimens were then attached to a non-conductive wood surface with a minimum of 50 mm between specimens. A test current of 4 amperes for 18 AWG specimens and 10 amperes for 14 AWG specimens was introduced and allowed to stabilize for 30 minutes. Millivolt measurements were obtained after this 30 minute period. Overall measurements included 11 inches of either 18 or 14 AWG wire, the crimp, bulk material, interface, and right angle header post. The 11 inches of wire was subtracted from the overall measurements.

3.20. Vibration/Mechanical Shock

A. Specimens were subjected to 10 half-sine waveform of 35 gravity units (g peak) and a duration of 10 milliseconds in each of 3 mutually perpendicular planes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

B. Specimens were subjected to the vibration profile shown in Figure 3 for 8 hours in each of 3 mutually perpendicular planes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

Frequency (Hz)	PSD (g^2/Hz)
5.0	0.00200
12.5	0.24800
77.5	0.00320
145.0	0.00200
200.0	0.01180
230.0	0.00032
1000.0	0.00002
Grms = 1.81	

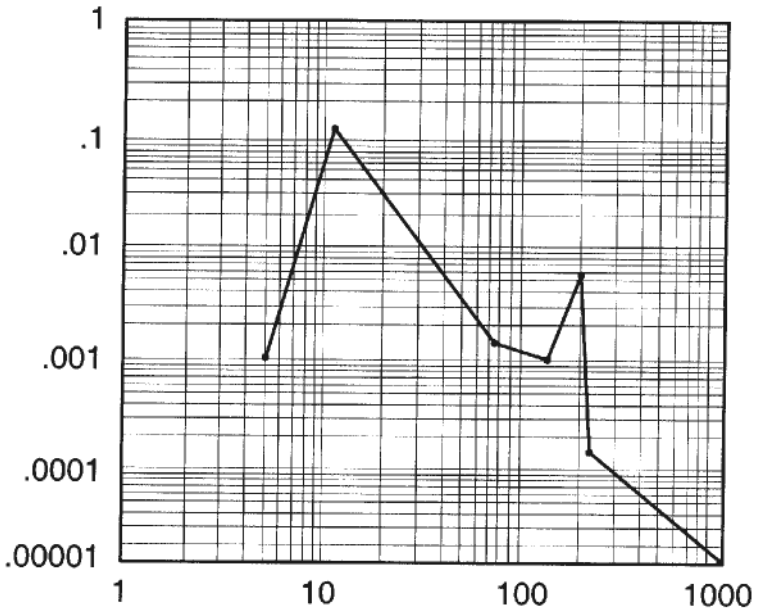

Figure 3