Interconnection System, AMP* Memory Card Receptacle/Header Assemblies

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP* Interconnection System, Memory Card Receptacle/Header Assembly to
| determine its conformance to the requirements of AMP Product Specification 108-1469 Rev. A.

1.2. Scope

| This report covers the electrical, mechanical, and environmental performance of the AMP Interconnection
| System, Memory Card Receptacle/Header Assembly manufactured by the Portable Solutions Unit Division of
| the Personal Computer Business Group. The testing was performed between May 16, 1994 and February 24,
| 1995. Additional testing was performed between May 13, 1996 and October 24, 1996.

1.3. Conclusion

| The AMP Interconnection System, Memory Card Receptacle/Header Assembly, listed in paragraph 1.5. meets
the electrical, mechanical, and environmental performance requirements of AMP Product Specification
| 108-1469 Rev. A.

1.4. Product Description

| The AMP Memory Card Connectors consist of SMT (Surface Mount Technology) and through hole PC Card
| and PC CardBus headers and receptacles. The contacts are copper alloy, plated gold over nickel on the
mating ends. The housings are high temperature thermoplastic.

1.5. Test Samples

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

Test Group	Quantity	Part Nbr	Description
1,2,3,4,5,6,7	2 ea.	535632-1	Receptacle
1,2,3,4,5,6,7	2 ea.	535653-1	Header
1,2	5 ea.	146321-1	Shielded header
1,2	10 ea.	146325-1	Shielded receptacle
1,2	5 ea.	146739-1	Shielded header

* Trademark
| Indicates change

1.6. Qualification Test Sequence

Test or Examination	Test Groups						
	1	2	3	4	5	6	7
Examination of Product	1,9	1,13	1,8	1,5	1,6	1,4	1,7
Termination Resistance, Dry Circuit	4,6	2,5,8,12		2,4	2,5		2,6
Dielectric Withstanding Voltage			2,6				
Insulation Resistance			3,7				
Vibration					3		
Physical Shock					4		
Mating Force	2,7						
Unmating Force	3,8						
Contact Retention						3	
Durability	5	3,6,9					3
Solderability						2	
Thermal Shock			4				
Humidity-Temperature Cycling (10 day)			5				
Humidity-Temperature Cycling (4 day)		4,7,10					
Mixed Flowing Gas, unmated (2 day)							4
Mixed Flowing Gas, mated (8 day)							5
Temperature Life				3			
Hydrogen Sulfide Exposure		11					

NOTE *The numbers indicate sequence in which tests were performed.*

2. SUMMARY OF TESTING

2.1. Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. A Certificate of Conformance was issued by the Product Assurance Department of the Personal Computer Business Group. 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, 2, 4, 5, 7

All termination resistance measurements, taken at 100 milliamperes DC and 50 millivolts open circuit voltage were less than 40 milliohms initially, and a maximum increase in resistance (ΔR) of less than 20 milliohms.

Test Group	Nbr of Data points	Condition	Min	Max	Mean
1	136	Initial	18.95	26.59	22.885
(Shielded)	332	Initial	8.10	29.15	11.116
	40	Initial GP contacts	4.63	5.91	5.130
	136	After Durability (ΔR)	-0.49	17.56	1.673
(Shielded	332	After Durability (ΔR)	-1.93	14.08	0.390
	40	GP after Durability (ΔR)	-0.63	0.60	0.103
2	136	Initial	19.74	39.12	27.685
(Shielded)	340	Initial	8.97	12.46	10.530
	40	Initial GP contacts	4.59	5.72	5.054
	136	After Humidity (ΔR)	-16.83	2.59	-4.005
(Shielded)	340	After Humidity (ΔR)	-1.92	0.97	-0.013
	136	After H_2S Exposure (ΔR)	-16.78	4.11	-3.837
(Shielded)	340	After H_2S Exposure (ΔR)	-2.25	1.20	0.053
	40	GP after H_2S Exposure (ΔR)	0.15	5.66	2.545
4	136	Initial	18.95	26.59	22.885
		After Temp. Life (ΔR)	-0.49	17.56	1.673
5	136	Initial	19.98	30.08	24.284
		After Mechanical (ΔR)	-4.09	1.05	-0.757
7	136	Initial	19.35	29.37	23.456
		After Flowing Gas (ΔR)	-2.97	11.77	0.428

All values in milliohms

2.3. Dielectric Withstanding Voltage - Group 3

No dielectric breakdown or flashover occurred when a test voltage was applied between adjacent contacts.

2.4. Insulation Resistance - Group 3

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

2.5. Vibration - Group 5

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

2.6. Physical Shock - Group 5

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

2.7. Mating Force - Group 1

All mating force measurements were less than 8.8 pounds.

2.8. Unmating Force - Group 1

All unmating force measurements were greater than 1.5 pounds.

2.9. Contact Retention - Group 6

No physical damage occurred to either the pin contacts or the housing, and no contacts dislodged from the housings as a result of applying an axial load of 2.2 pounds to the pin contacts. No physical damage occurred to either the receptacle contacts or the housing, and no contacts dislodged from the housings as a result of applying an axial load of 1.1 pounds to the receptacle contacts.

2.10. Durability - Groups 1, 2, 7

No physical damage occurred to the samples as a result of mating and unmating the connector 10,000 times (Group 1), 5,000 times (Group 2), and 1,000 times (Group 7).

2.11. Solderability - Group 6

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

2.12. Thermal Shock - Group 3

No evidence of physical damage to either the contacts or the connector was visible as a result of thermal shock.

2.13. Humidity-Temperature Cycling (10 day) - Group 3

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to humidity-temperature cycling.

2.14. Humidity-Temperature Cycling (4 day) - Group 2

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to humidity-temperature cycling.

2.15. Mixed Flowing Gas, unmated (2 day) - Group 7

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to the pollutants of mixed flowing gas.

2.16. Mixed Flowing Gas, mated (8 day) - Group 7

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to the pollutants of mixed flowing gas.

2.17. Temperature Life - Group 4

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to an elevated temperature.

2.18. Hydrogen Sulfide Exposure - Group 2

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to Hydrogen Sulfide.

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

Termination resistance measurements at low level current were made using a four terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes DC with a 50 millivolt open circuit voltage.

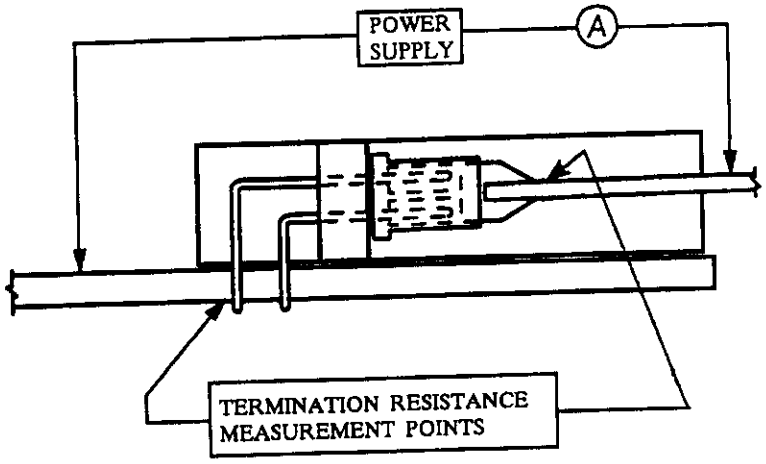

Figure 1
Typical Termination Resistance Measurement Points

3.3. Dielectric Withstanding Voltage

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

3.4. Insulation Resistance

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

3.5. Vibration, Sine

Mated connectors 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 2,000 Hz and returned to 10 Hz in 10 minutes. This cycle was performed 24 times in each of three mutually perpendicular planes, for a total vibration time of 12 hours. Connectors were monitored for discontinuities of one microsecond or greater, using a current of 100 milliamperes DC.

3.6. Physical Shock

Mated connectors were subjected to a physical shock test, having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes, for a total of 18 shocks. Connectors were monitored for discontinuities of one microsecond or greater, using a current of 100 milliamperes DC.

3.7. Mating Force

The force required to mate individual connectors was measured using a tensile compression device with the rate of travel at 0.5 inch/minute and a free floating fixture.

3.8. Unmating Force

The force required to unmate individual connectors was measured using a tensile compression device with the rate of travel was 0.5 inch/minute and a free floating fixture.

3.9. Contact Retention

The force was applied in a direction to cause removal of the contacts from the housing.

3.10. Durability

Connectors were mated and unmated at a rate not exceeding 500 cycles per hour.

3.11. Solderability

Connector assembly contact solder tails were subjected to a solderability test by immersing them in a Nonactivated Rosin flux for 5 to 10 seconds, allowed to drain for 10 to 60 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 3 to 5 seconds, then withdrawn. 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°C.

3.12. Thermal Shock

Mated connectors were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 85°C. The transition between temperatures was less than one minute.

3.13. Humidity-Temperature Cycling (10 day)

Mated connectors were 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 the relative humidity was held above 80%. During five of the first nine cycles, the connectors were exposed to a cold shock at -10°C for 3 hours. (Figure 2)

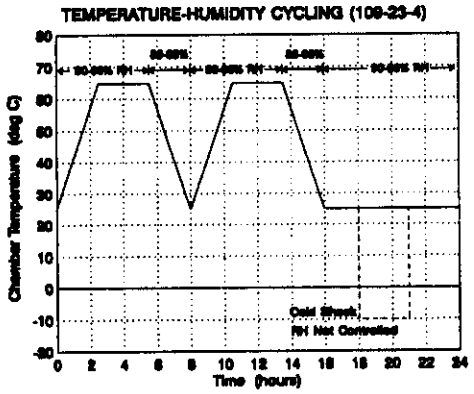

Figure 2
Typical Humidity-Temperature Cycling Profile

3.14. Humidity-Temperature Cycling (4 days)

Unmated connectors were exposed to 4 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while the relative humidity was held above 80%. (Figure 3)

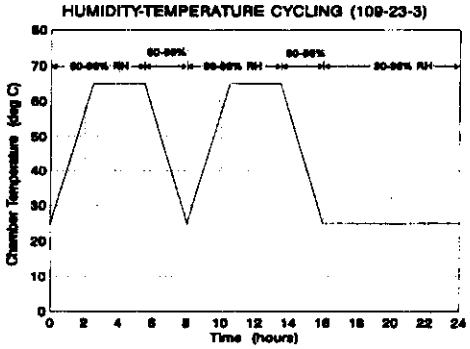

Figure 3
Typical Humidity-Temperature Cycling Profile

3.15. Mixed Flowing Gas, Class II (2 days)

Unmated connectors were exposed for 2 days to a mixed flowing gas Class II exposure. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, and H_2S at 10 ppb.

3.16. Mixed Flowing Gas, Class II (8 day)

Mated connectors were exposed for 8 days to a mixed flowing gas Class II exposure. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, and H_2S at 10 ppb.

3.17. Temperature Life

Mated samples were exposed to a temperature of 85°C for 250 hours.

3.18. Hydrogen Sulfide Exposure

Mated connectors were exposed for 4 days to a hydrogen sulfides atmosphere. The temperature was maintained at 40°C and relative humidity at 80% with the H_2S at 3 ppb.

4. VALIDATION

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