Connector, 50 Ohm Coaxial SMB Series

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMP* 50 Ohm, Coaxial, SMB Series connector to determine its conformance to the requirements of AMP Product Specification 108-1401 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the 50 Ohm, Coaxial, SMB Series connector. Testing was performed at the Americas Regional Laboratory between 01Jul97 and
I 07Nov97, 03Aug98 and 04Sep98, and 01Feb99 and 08Feb99. The test file numbers for this testing are CTL
I B007645-001 (Class 2), CTL 3386-000-008, and CTL 3386-014. This documentation is on file at and available from the Americas Regional Laboratory.

1.3. Conclusion

The 50 Ohm, Coaxial, SMB Series connectors, listed in paragraph 1.5., met the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1401 Revision A.

1.4. Product Description

The AMP SMB Series connectors feature unique spring mating with snap-fit couplings for quick connect/disconnect applications. These coaxial connectors are designed to be intermateable with MIL-C-39012 connectors.

1.5. Test Samples

The test samples were representative of normal production lots. The following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1,2,3,4,5	5 each	414948-1	Straight Cable Jack on RG-174/U cable
1,2,3,4,5	5 each	414363-3	Right Angle Cable Plug on RG-174/U cable
5	5 each	414946-1	Straight Cable Plug on RG-174/U cable
5,6	5 each	414337-1	Right Angle PCB Jack on 50 ohm PCB
5	15 each	413985-3	Straight Cable Plug on RG-316/U cable
5	15 each	414170-1	Straight Cable Jack on RG-316/U cable

Figure 1

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 Group (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Examination of product	1,9	1,5	1,5	1,8	1,5	1,3
Termination resistance	3,7	2,4	2,4			
Insulation resistance				2,7		
Dielectric withstanding voltage				3,6		
Shielding effectiveness					4	
RF insertion loss					2	
Voltage standing wave ratio					3	
Solderability						2
Vibration	5					
Mechanical shock	6					
Durability	4					
Mating force	2					
Unmating force	8					
Thermal shock				4		
Humidity-temperature cycling				5		
Temperature life		3(c)				
Mixed flowing gas			3(c)			

NOTE

(a) See Para 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Precondition samples with 10 cycles durability.

Figure 2

2. SUMMARY OF TESTING

2.1. Examination of Product - All Test Groups

All samples submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by the Product Assurance Department of the Communication Business Unit. Where specified, samples were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Termination Resistance - Test Groups 1, 2 and 3

All termination resistance measurements, taken at 100 milliamperes maximum and 20 millivolts open circuit voltage had a change in resistance (ΔR) of less than 7 milliohms for the center contacts and a change in resistance of less than 1.0 milliohm for the outer contact.

Test Group	Number of Data Points	Condition	Termination Resistance (ΔR)		
			Min	Max	Mean
Center Contact					
1	5	After Mechanical	-1.07	+0.08	-0.465
2	5	After Temperature Life	+1.06	+3.99	+2.479
3	5	After Mixed Flowing Gas	-2.51	+1.54	-0.554
Outer Contact					
1	5	After Mechanical	-0.16	-0.09	-0.129
2	5	After Temperature Life	+0.14	+0.65	+0.277
3	5	After Mixed Flowing Gas	-0.28	+0.98	+0.220

NOTE *All values in milliohms.*

Figure 3

2.3. Insulation Resistance - Test Group 4

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

2.4. Dielectric Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.5. Shielding Effectiveness - Test Group 5

When tested through the frequency range of 50 to 400 MHz, radiation was reduced a minimum of 35dB, and a minimum of 30dB up to 1,000 MHz for samples prepared on RG-174/U cable. When tested through the frequency range of 50 to 3000 MHz, radiation was reduced a minimum of 30dB for samples prepared on RG-316/U cable.

2.6. Insertion Loss - Test Group 5

All insertion loss results were less than.30 dB at 1,000MHz for samples prepared on RG-174/U cable. All insertion loss results were less than .30 dB at 3,000MHz for samples prepared on RG-316/U cable.

2.7. Voltage Standing Wave Ratio - Test Group 5

All voltage standing wave ratio measurements were less than the specification requirement of 1.4 from 50 to 1,000 MHz for samples prepared on RG-174/U cable. All voltage standing wave ratio measurements were less than the specification requirement of 1.4 from 50 to 3,000 MHz for samples prepared on RG-316/U cable.

2.8. Solderability - Test Group 6

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

2.9. Vibration - Test Group 1

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

2.10. Mechanical Shock - Test Group 1

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

2.11. Durability - Test Group 1

No physical damage occurred to the samples as a result of mating and unmating the connector 500 times.

2.12. Mating Force - Test Group 1

All mating force measurements were less than 14 pounds.

2.13. Unmating Force - Test Group 1

All unmating force measurements were greater than 4 pounds.

2.14. Thermal Shock - Test Group 4

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

2.15. Humidity-temperature Cycling - Test Group 4

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

2.16. Temperature Life - Test Group 2

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

2.17. Mixed Flowing Gas - Test Group 3

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

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

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

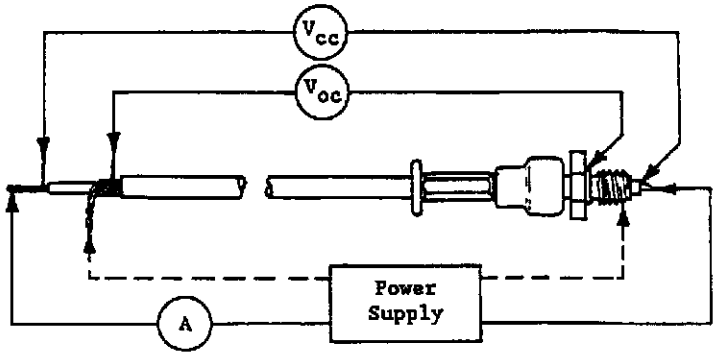

Figure 4
Typical Termination Resistance Measurement Points

3.3. Insulation Resistance

Insulation resistance was measured between the outer and center contacts, using a test voltage of 500 volts DC. This voltage was applied for 2 minutes before the resistance was measured.

3.4. Dielectric Withstanding Voltage

A test potential of 1,000 volts AC was applied between the outer and center contacts. This potential was applied for 1 minute and then returned to zero.

3.5. Shielding Effectiveness

The radiated response from unshielded cable while conductors were excited between 50 and 1,000 MHz for samples on RG-174/U cable and between 50 and 3,000 MHz for samples on RG-316/U cable was measured. The procedure was repeated, using jacks and plugs terminated to shielded cable. The difference in response is the shielding effectiveness in dB.

3.6. Insertion Loss

A full Two-Port Calibration was performed on a network analyzer and the insertion loss, S_{21}, of the sample was measured.

3.7. Voltage Standing Wave Ratio

VSWR was measured on mated samples using an HP8510B network analyzer. The sweep range was 50 to 1,000 MHz for samples on RG-174/U cable and 50 to 3,000 MHz for samples on RG-316/U cable.

3.8. Solderability

Connector assembly contact solder tails were subjected to a solderability test. The soldertails were immersed 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 1 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 ± 5°C.

3.9. Vibration, Sinusoidal

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 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. Connectors were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.10. Mechanical Shock, Half-sine

Mated connectors were subjected to a mechanical 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 3 mutually perpendicular planes for a total of 18 shocks. Connectors were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.11. Durability

Connectors were mated and unmated 500 times at a maximum rate of 600 cycles per hour.

3.12. 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 per minute and a free floating fixture.

3.13. Unmating Force

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

3.14. Thermal Shock

Mated connectors were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -65 and 85°C. The transition between temperatures was less than 1 minute.

3.15. Humidity-temperature Cycling

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 maintaining high humidity (Figure 5).

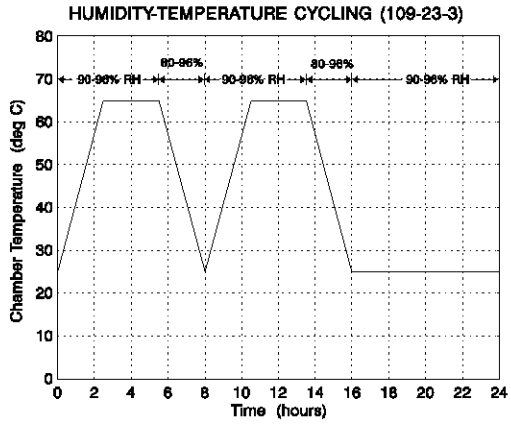

Figure 5
Typical Humidity-Temperature Cycling Profile

3.16. Temperature Life

Mated samples were exposed to a temperature of 85°C for 95 hours. Samples were preconditioned with 10 cycles of durability.

3.17. Mixed Flowing Gas, Class III

Mated connectors were exposed for 20 days to a mixed flowing gas Class III exposure. Class III exposure is defined as a temperature of 30°C and a relative humidity of 75% with the pollutants of Cl_2 at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb. Samples were preconditioned with 10 cycles of durability.