AMP*

QUALIFICATION TEST REPORT

Breakaway Connector

501-87 Rev. 0

Product Specification: 108-10003
CTL No.: 5012-005
Date: 2-21-89
Classification: Unrestricted
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AMP

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CORPORATE TEST LABORATORY

Qualification Test Report
Breakaway Connector

1. Introduction

1.1 Purpose

Testing was performed on AMP's Breakaway Connector to determine if it meets the requirements of AMP Product Specification 108-10003.

1.2 Scope

This report covers the electrical, mechanical and environmental performance of the Breakaway Connector made by the Interconnection Components Division. The testing was performed between September 19, 1988 and Februrary 10, 1989.

1.3 Conclusion

The Breakaway Connector meets the electrical, mechanical and environmental performance requirements of AMP Product Specification 108-10003.

1.4 Product Description

Breakaway Connectors are single contact, splice type, pin and socket connectors designed for circuits in military, commercial, aircraft and missile application. They are fully pre-insulated, whether sealed or unsealed.

All styles use AMP Type I contacts, which are gold over nickel plated before assembly. These contacts feature cantilevered beam retention springs and bell mouth socket entry for easy pin alignment. All styles have nylon insulator sleeves and sealed versions have neoprene grommets and "O" rings.

1.5 Qualification Test Sequence

	Test Groups							
Test or Examination	1	2	3	4	5	6	7	8
Examination of Product	1,9	1,6	1,6	1,10	1,6	1,8	1,5	1,5
Termination Resistance, Specified Current				2,8				
Termination Resistance, Dry Circuit	3,7	2,5	2,5		2,4		2,4	
Dielectric Withstanding Voltage						2,6		2,4
Insulation Resistance						3,7		
T-Rise vs. Current				3,9				
Vibration	5			7				
Physical Shock	6							
Mating Force	2							
Unmating Force	8							
Contact Retention					5			
Durability	4	3	3	4				
Thermal Shock						4		
Humidity-Temperature Cycling			4	5		5		
Industrial Mixed Flowing Gas					3			
Temperature Life		4		6				
Fluid Immersion							3	3

The numbers indicate sequence in which tests were performed.

1.6 Test Samples

The samples were taken randomly from current production, and the following samples were used for test:

Test Group	Quantity	Wire Size	Part Number	Description
1-6 8	72	26	**207424-1**	**KIT - Medical Splice**
			43392-1	Sleeve
			43341-1	Pin
			207425-1	Grommet
			207426-1	Sealing Plug
1-6 8	72	20	**327734-1**	**KIT - Medical Splice**
			43516	Sleeve
			43340-1	Socket
			1-21950-7	O Ring
			327079-2	Grommet
1-6	60	20/26	**327736-2**	**KIT - 1/5 Splice**
			43341-1	Pin
			43392-1	Sleeve
1-6	60	20/26	**327734-2**	**KIT - 1/5 Splice**
			43340-1	Socket
			43516	Sleeve
			1-21950-7	O Ring
1-6	60	20	**200878-1**	**KIT - 5/15 Splice**
			200809-2	Sleeve
			43341-1	Pin
			327079-1	Grommet
1-6	60	20	**200877-1**	**KIT - 5/15 Splice**
			200876-1	Sleeve
			43340-1	Socket
			327079-2	Grommet
			1-21950-7	O Ring
1-6	60	10/12	**207027-1**	**KIT - 25/35 Splice**
			207147-1	Sleeve
			202422-1	Pin
1-6	60	10/12	**207028-1**	**KIT - 25/35 Splice**
			207151-1	Sleeve
			202417-1	Socket

2. Summary of Testing

2.1 Examination of Product - All Groups

All samples submitted for testing were selected from normal production lots. They were inspected and accepted by the Product Assurance Department of the Interconnection Components Division.

2.2 Termination Resistance, Specified Current - Group 4

All termination resistance measurements taken at the specified current were less then the specification requirement. Voltage probe points were 7.25 inches apart.

Group	Condition	Splice Type	Wire Size	Test Current	Min	Max	Mean	Spec. Max
4	Initial	Med.	26/20	2.0	12.24	**13.01**	12.65	25.0
		1/5	20/20	7.5	5.84	**6.80**	6.38	25.0
		1/5	26/26	2.0	20.49	**21.94**	21.04	25.0
		5/15	20/20	7.5	5.51	**6.51**	6.11	25.0
		25/35	12/12	23.0	1.26	**1.54**	1.38	15.0
		25/35	14/14	17.0	2.32	**2.68**	2.48	15.0
4	Final	Med.	26/20	2.0	12.46	**13.13**	12.85	25.0
		1/5	20/20	7.5	6.29	**8.53**	7.19	25.0
		1/5	26/26	2.0	20.56	**21.65**	21.15	25.0
		5/15	20/20	7.5	6.60	**7.87**	7.01	25.0
		25/35	12/12	23.0	1.43	**1.74**	1.58	15.0
		25/35	14/14	17.0	3.62	**4.19**	4.01	15.0

All values in milliohms

2.3 Termination Resistance, Dry Circuit - Group 1,2,3,5,7

All termination resistance measurements taken at 100 milliamperes dc and 50 millivolts open circuit voltage were less than the specification requirements. Voltage probe points were 7.25 inches apart.

Group	Condition	Splice Type	Wire Size	Min	Max	Mean	Spec. Max
1	Initial	Med.	26/20	12.73	**13.25**	12.98	25.0
		1/5	20/20	5.76	**6.27**	6.01	25.0
		1/5	26/26	21.10	**22.13**	21.46	25.0
		5/15	20/20	6.45	**6.77**	6.59	25.0
		25/35	12/12	1.41	**1.73**	1.51	15.0
		25/35	14/14	2.34	**3.27**	2.90	15.0
1	After Mechanical	Med.	26/20	12.72	**13.60**	13.07	25.0
		1/5	20/20	5.80	**6.37**	6.06	25.0
		1/5	26/26	21.28	**22.34**	21.57	25.0
		5/15	20/20	6.49	**6.88**	6.67	25.0
		25/35	12/12	1.46	**1.87**	1.59	15.0
		25/35	14/14	2.26	**3.36**	2.74	15.0

Group	Condition	Splice Type	Wire Size	Min	Max	Mean	Spec. Max
2	Initial	Med.	26/20	12.76	**13.22**	12.96	25.0
		1/5	20/20	5.67	**6.05**	5.88	25.0
		1/5	26/26	21.26	**22.15**	21.45	25.0
		5/15	20/20	6.27	**6.59**	6.48	25.0
		25/35	12/12	1.39	**1.50**	1.45	15.0
		25/35	14/14	2.08	**2.98**	2.57	15.0
2	After Temp. Life	Med.	26/20	12.78	**13.29**	13.02	25.0
		1/5	20/20	5.90	**7.27**	6.31	25.0
		1/5	26/26	21.34	**22.02**	21.52	25.0
		5/15	20/20	6.31	**8.35**	6.87	25.0
		25/35	12/12	1.51	**1.89**	1.64	15.0
		25/35	14/14	2.01	**8.60**	5.80	15.0
3	Initial	Med.	26/20	12.56	**12.96**	12.78	25.0
		1/5	20/20	5.71	**9.31**	6.17	25.0
		1/5	26/26	21.07	**22.73**	21.49	25.0
		5/15	20/20	5.72	**6.18**	5.82	25.0
		25/35	12/12	1.33	**1.47**	1.37	15.0
		25/35	14/14	2.24	**2.58**	2.39	15.0
3	After Hum/Temp Cyc	Med.	26/20	12.62	**13.19**	12.82	25.0
		1/5	20/20	6.65	**9.37**	6.29	25.0
		1/5	26/26	21.01	**22.53**	21.51	25.0
		5/15	20/20	5.65	**6.01**	5.82	25.0
		25/35	12/12	1.40	**2.05**	1.63	15.0
		25/35	14/14	2.45	**5.29**	3.49	15.0
5	Initial	Med.	26/20	12.56	**15.45**	13.57	25.0
		1/5	20/20	6.22	**6.55**	6.42	25.0
		1/5	26/26	19.07	**19.86**	19.32	25.0
		5/15	20/20	5.81	**6.75**	6.40	25.0
		25/35	12/12	1.27	**1.79**	1.40	15.0
		25/35	14/14	2.27	**3.06**	2.52	15.0
5	After IMFG	Med.	26/20	12.65	**15.35**	13.75	25.0
		1/5	20/20	6.28	**6.61**	6.47	25.0
		1/5	26/26	19.05	**19.94**	19.35	25.0
		5/15	20/20	6.20	**6.83**	6.52	25.0
		25/35	12/12	1.40	**1.77**	1.48	15.0
		25/35	14/14	2.52	**4.41**	2.93	15.0
7	Initial	Med.	26/20	13.79	**14.81**	14.14	25.0
7	After Fluid Immersion	Med.	26/20	13.86	**14.68**	14.19	25.0

All values in milliohms

2.4 Dielectric Withstanding Voltage - Group 6,8

There was no dielectric breakdown or flashover when a test voltage of 1500 Vac was applied between contacts of mated connector assemblies and the exterior of the pin sleeve.

2.5 Insulation Resistance - Group 6

All insulation resistance measurements were greater than the specification requirement of 5,000 megohms minimum for the initial measurement and 1,000 megohms minimum for measurement taken after Humidity/Temperature cycling.

2.6 Temperature Rise vs. Current - Group 4

All samples had a temperature rise of less then 30°C above ambient when the specified current was applied.

Condition	Splice	Wire Size	Test Current	Temperature Rise Above Ambient (Max)
Initial	Med.	26/20	2.0	2.8°C
	1/5	26	2.0	3.0°C
	1/5	20	7.5	8.2°C
	5/15	20	7.5	7.0°C
	25/35	12	23.0	13.1°C
	25/35	14	17.0	11.9°C
Final	Med.	26/20	2.0	2.0°C
	1/5	26	2.0	3.0°C
	1/5	20	7.5	9.0°C
	5/15	20	7.5	8.0°C
	25/35	12	23.0	12.0°C
	25/35	14	17.0	18.0°C

2.7 Vibration - Group 1,4

During vibration testing, there were no discontinuities of the contacts greater than ten microseconds. Following vibration, there were no cracks, breaks or loose parts on the connector assemblies.

2.8 Physical Shock - Group 1

During physical shock testing, there were no discontinuities of the contacts greater than ten microseconds. Following physical shock testing, there were no cracks, breaks or loose parts on the connector assemblies.

2.9 Mating Force - Group 1

All mating force measurements were less than the specification requirements.

2.10 Unmating Force - Group 1

All unmating force measurements were greater than the specification requirements.

Splice	Size	Mating Force Measured	Mating Force Spec. Max	Unmating Force Measured	Unmating Force Spec. Min
Med.	26/20	2.3	10.0	2.4	0.5
1/5	20	7.3	10.0	10.0	0.5
1/5	26	7.8	10.0	7.3	0.5
5/15	26	14.2	15.0	12.3	1.0
25/35	12	13.8	35.0	13.8	5.0
25/35	14	11.7	35.0	12.4	5.0

All values in pounds

2.11 Contact Retention - Group 5

There was no physical damage to either the contacts or the housing, and no contact dislodged from its housing more than 0.015 inches after the test load was removed.

2.12 Durability - Group 1,2,3,4

There was no physical damage to the samples as a result of mating and unmating the connector 100 times. Test Groups 2 and 3 received 10 cycles of durability as a precondition for environmental testing.

2.13 Thermal Shock - Group 6

There was no evidence of physical damage to either the contacts or the connectors as a result of thermal shock.

2.14 Humidity-Temperature Cycling - Group 3,4,6

There was no evidence of physical damage to either the contacts or the connectors as a result of exposure to Humidity Temperature Cycling extremes.

2.15 Industrial Mixed Flowing Gas - Group 5

There was no evidence of physical damage to either the contacts or the connectors as a result of exposure to the pollutants of industrial mixed flowing gas.

2.16 Temperature Life - Group 2,4

There was no evidence of physical damage to either the contacts or the connectors as a result of exposure to a temperature of 105°C for 96 hours.

2.17 Fluid Immersion - Group 7,8

There was no evidence of physical damage to either the contacts or the connectors as a result of fluid immersion testing.

3. Test Methods

3.1 Examination of Product

The product drawings and inspection plans were used to examine the samples. They were examined visually, dimensionally and functionally.

3.2 Termination Resistance, Specified Current

Termination resistance measurements at specified current were made using a four terminal measuring technique (Figure 1).

3.3 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 an open circuit voltage of 50 millivolts dc.

Contact Resistance Measurement Points
Figure #1

3.4 Dielectric Withstanding Voltage

A test potential of 1500 Vac was applied between contacts of mated connector assemblies and the exterior of the pin sleeve. This potential was applied for one minute. The maximum leakage current was set for one milliampere.

3.5 Insulation Resistance

Insulation Resistance was measured between contacts of mated connectors and the exterior of the pin sleeve, using a test voltage of 500 volts dc. This voltage was applied for one minute before the the resistance was measured.

3.6 Temperature Rise vs Specified Current

The connector temperature was measured while energized at specified current. Thermocouples were attached to the connectors to measure their temperatures. This temperature was then subtracted from the ambient temperature to find the temperature rise. When three readings at five minute intervals were the same, the readings were recorded.

3.7 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 logarithmically between the limits of 10 and 55 Hz and returned to 10 Hz in one minute. This cycle was performed 120 times in each of three mutually perpendicular planes for a total vibration time of 6 hours. Connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.8 Physical Shock

Mated connectors 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 three mutually perpendicular planes for a total of 18 shocks. The connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.9 Mating Force

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

3.10 Unmating Force

The force required to unmate individual contacts was measured using a free floating fixture with the rate of travel at 0.5 inch/minute.

3.11 Contact Retention

An axial load of 8 pounds was applied to each contact and held for 60 seconds. The force was applied in a direction so as to cause removal of the contacts from the housing.

3.12 Durability

Connectors were mated and unmated 100 or 10 times at a rate not exceeding 500 per hour.

3.13 Thermal Shock

Mated connectors were subjected to ten cycles of temperature extremes. The temperature extremes were -40°C and 105°C. Each cycle consisted of 30 minutes at each temperature. The transition between temperatures was less than one minute.

3.14 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°C and 65°C twice, while the relative humidity was held at 95%.

3.15 Industrial Mixed Flowing Gas, Class II

Mated connectors were exposed for 7 days in the industrial mixed flowing gas chamber. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70%. Pollutants are Cl_2 at 30 ppb, NO_2 at 200 ppb and H_2S at 200 ppb.

3.16 Temperature Life

Mated samples were subjected to 96 hours at an elevated temperature of 105°C.

3.17.1 Fluid Immersion (Sealed Connectors Only)

Mated connectors were immersed in a 5% salt solution for 15 minutes. The test was performed at room ambient conditions.

3.17.2 Fluid Immersion (Medical Connectors Only)

Three groups of unmated connectors were immersed in the blood, urine or a 5% salt solution. The samples were air dried for 6 hours before final measurements.

4. Validation

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