QUALIFICATION TEST REPORT

FIVE POSITION BATTERY
INTERCONNECT SYSTEM

501-305 Rev. O

Product Specification:	108-1501
CTL No.:	CTL1878-038-001
CGL No.:	CGL 1878-31
Date:	June 12, 1995
Classification:	Unrestricted
Prepared By:	W.L. Scharff

Corporate Test Laboratory Harrisburg, Pennsylvania

Table of Contents

(R1878WS)

AMP

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CORPORATE TEST LABORATORY

Qualification Test Report

1. Introduction

1.1 Purpose

Testing was performed on AMP* 5 position battery interconnect system to determine its conformance to the requirements of AMP Product Specification 108-1501 Rev. O.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the 5 position battery interconnect system manufactured by the Business Development Division of the Capital Goods Business Unit. The testing was performed between February 8, 1995 and May 26, 1995.

1.3 Conclusion

The 5 position battery interconnect system meets the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1501 Rev. O.

* Trademark

1.4 Product Description

The AMP 5 position battery interconnect system consists of a battery housing assembly and a printed circuit board mounted header assembly. The battery housing and header assembly are loaded with contacts for resistive welding and thru-hole soldering respectively.

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	MATING ORIENTATION See Fig. 1	QUANTITY	PART NUMBER	DESCRIPTION
1	1	30	787242-1	BATTERY ASSEMBLY
"	1	6	787145-1	HEADER
"	2	30	787242-1	BATTERY ASSEMBLY
"	2	6	787145-1	HEADER
2	1	6	787242-1	BATTERY ASSEMBLY
"	1	6	787145-1	HEADER
3	1	6	787242-1	BATTERY ASSEMBLY
"	1	6	787145-1	HEADER
4	1	6	787242-1	BATTERY ASSEMBLY
"	1	6	787145-1	HEADER
5	1	6	787242-1	BATTERY ASSEMBLY
"	1	6	787145-1	HEADER

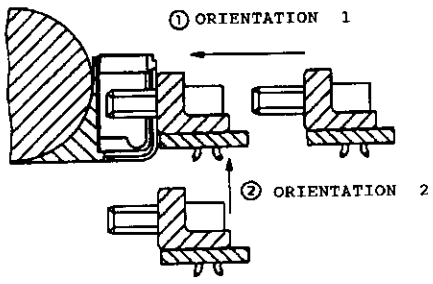

Figure 1
Mating Orientations

1.6 Qualification Test Sequence

Test or Examination	Test Groups				
	1(a)	2	3	4	5
	Test Sequence (a)				
Examination of Product	1,9	1,9	1,8	1,3	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(c)			
Physical Shock	6				
Mating Force	2				
Unmating Force	8				
Contact Retention				2	
Durability	4				
Solderability					2
Thermal Shock			4		
Humidity-Temperature Cycling		4(b)	5		
Temperature Life		5			

(a) The numbers indicate the sequence in which tests were performed.

(b) Precondition header assemblies with 5000 cycles durability. Each battery housing assembly was cycled with a header assembly for 1000 cycles only. The battery housings were replaced every 1000 cycles until 5000 cycles had been performed on the header assemblies.

(c) Energized at the 18 degrees C level.

2. Summary of Testing

2.1 Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Capital Goods Business Unit.

2.2 Termination Resistance, Dry Circuit - Groups - 1 & 2

All termination resistance measurements, taken at 100 milliamperes DC and 50 millivolts open circuit voltage were less than 5.5 milliohms.

TEST GROUP	MATING ORIENTATION See Fig. 1	NUMBER OF DATA POINTS	CONDITION	MINIMUM Milliohms	MAXIMUM Milliohms	AVERAGE Milliohms
1	1	30	INITIAL	1.62	2.57	1.904
1	1	30	AFTER MECHANICAL	1.54	4.03	2.295
1	2	30	INITIAL	1.63	2.10	1.798
1	2	30	AFTER MECHANICAL	1.73	3.54	2.373
2	1	30	INITIAL	1.45	2.17	1.625
2	1	30	AFTER TEMP LIFE	1.72	3.23	2.188

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 1000 megohms.

2.5 Temperature Rise vs Current - Group - 2

All samples had a temperature rise of less than 30°C above ambient when a specified current of 8.74 amperes DC was applied.

2.6 Vibration - Group - 1

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

2.8 Mating Force - Group - 1

All mating force measurements were less than 40 newtons.

2.9 Unmating Force - Group - 1

All unmating force measurements were greater than 5 newtons.

2.10 Contact Retention - Group - 4

The contacts were not displaced from the specified interface dimensions as a result of applying a 22 newton force to each contact for 10 seconds in each direction.

2.11 Durability - Group - 1

No physical damage occurred to the header samples as a result of mating and unmating the connectors 5000 times each. Additionally, no physical damage occurred to any of the battery housing assemblies as a result of mating and unmating 1000 times.

2.12 Solderability - Group - 5

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

2.13 Thermal Shock - Group - 3

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

2.14 Humidity-Temperature Cycling - Groups - 2 & 3

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

2.15 Temperature Life - Group - 2

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

3. Test Methods

3.1 Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2 Termination Resistance, Low Level

Termination resistance measurements at low level current were made using a four terminal measuring technique (Figure 2). The test current was maintained at 100 milliamperes DC with an open circuit voltage of 50 millivolts DC.

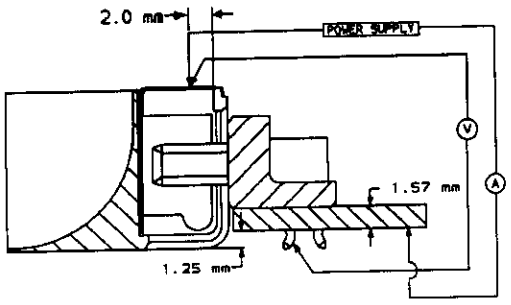

Figure 2
Typical Termination Resistance Measurement Points

3.3 Dielectric Withstanding Voltage

A test potential of 150 vac was applied and maintained for a period of one minute between the mated adjacent contacts. Next a potential of 50 vac was applied and maintained for a period of one minute between the mated adjacent contacts while the samples were soaked in an altitude chamber at a pressure equal to 50,000 feet above sea level.

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 Temperature Rise vs Specified Current

Contact temperature was measured, while energized at the specified current of 8.74 amperes AC. Thermal imaging, (thermography) was used to determine the hot spots, and rated current.

3.6 Vibration, Random

Mated connectors were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 5 and 500 hertz. The power spectral density at 5 hz is 0.000312 G^2/Hz. The spectrum slopes up at 6 dB per octave to a PSD of 0.02 G^2/Hz at 14 Hz. The spectrum is flat at 0.02 G^2/Hz from 14 to 500 Hz. The root-mean square amplitude of the excitation was 3.13 GRMS. The samples were subjected to this test for 20 minutes in each of three mutually perpendicular axes for a total of 1 hour. The connectors in Group - 1 were monitored for discontinuities greater than one microsecond using a current of 100 milliamperes in the monitoring circuit. During the vibration of Group - 2 the connectors were energized at 18 degrees C level for 100% loading.

3.7 Physical Shock

Mated connectors were subjected to a physical shock test, having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6.0 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.

3.8 Mating Force

The force required to mate individual connectors was measured using a tensile/compression device and a free floating fixture. The crosshead speed was 1.5 mm per second.

3.9 Unmating Force

The force required to unmate individual connectors was measured using a tensile/compression device and a free floating fixture. The crosshead speed was 1.5 mm per second.

3.10 Contact Retention

A force of 22 newtons was applied to the header contacts for 10 seconds in each direction.

3.11 Durability

Headers were mated and unmated 5000 times at a rate not exceeding 600 per hour. The battery housings were mated and unmated 1000 times at a rate not exceeding 600 per hour.

3.12 Solderability

Connector assembly contact solder tails were subjected to a solderability test by immersing them in a mildly activated 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.

3.13 Thermal Shock

Unmated connectors were subjected to 25 cycles of temperature extremes with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -30°C and +105°C. The transition between temperatures was less than one minute.

3.14 Humidity-Temperature Cycling

Unmated 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%. (During five of the first nine cycles, the connectors were exposed to a cold shock at -10°C for 3 hours.)

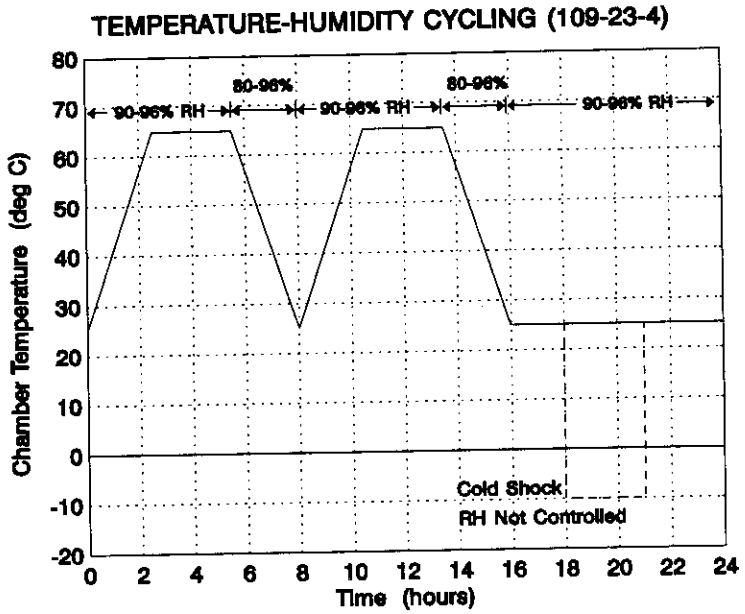

Figure 3

3.15 Temperature Life

Mated samples were exposed to a temperature of 105°C for 480 hours.

4. Validation

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