AMP*

QUALIFICATION TEST REPORT

AMPMODU* Mod II Interconnection System,
Short Point-of-Contact Receptacle

501-77 Rev. A

Product Specification:	108-25027, Rev. 0
CTL No.:	CTL5182-005
Date:	8/1/88
Classification:	Unrestricted
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Revised:	Per ECN B-5885

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Qualification Test Report
AMPMODU Mod II Interconnection System,
Short Point-of-Contact Receptacle

1. Introduction

1.1 Purpose

Testing was conducted to measure product performance of the AMPMODU Mod II Interconnection System, Short Point-of-Contact Receptacle, when tested to the requirements of AMP Product Specification 108-25027, Rev. 0.

1.2 Scope

This report covers the electrical and mechanical performance of AMPMODU Mod II Interconnection System, Short Point-of-Contact Receptacle made by the Packaging Components Division of the Packaging Systems Products Group. They were submitted to the Corporate Test Laboratory on April 1, 1987, and testing was performed between November 9, 1987 and June 22, 1988.

1.3 Conclusion

AMPMODU Mod II Interconnection System, Short Point-of-Contact Receptacle met the performance requirements of AMP Product Specification 108-25027, Rev. 0.

1.4 Product Description

The AMPMODU Mod II Interconnection System, Short Point-of-Contact Receptacles are housed in board mounted flame retardant housings. The mating male header assemblies utilize .025 inch square or .025 inch diameter posts in flame retardant insulating headers. The header assemblies may be shrouded or unshrouded. The receptacles and posts mate on .100 or .150 inch centerlines and both mount to solderable printed circuit boards.

1.5 Test Samples

Test samples were selected randomly from current production. The following part numbers were used:

(All Test Samples are Receptacles)

Test Group	Part Number	Description	Plating
1	4- 87729-7	38 Position	30 Au
	4-102083-6	40 Position	15 Au
	4-103221-6	40 Position	15 Au
	4-102084-8	36 Position	100-200 SnPb
2	533013-1	46 Position	30 Au
	4-103220-1	50 Position	30 Au
	4-102083-6	40 Position	15 Au
	103228-6	22 Position	15 Au
	4-102084-8	36 Position	100-200 SnPb
3	1-103175-3	36 Position	30 Au
	4- 87729-7	38 Position	30 Au
	4-102083-6	40 Position	15 Au
4	1-103175-3	36 Position	30 Au
	103107-1	84 Position	30 Au
	4- 87729-7	38 Position	30 Au
	1-103225-8	52 Position	30 Au
5	4- 87729-7	38 Position	30 Au
	1-103175-3	36 Position	30 Au
	4-102084-8	36 Position	100-200 SnPb
6	4- 87729-7	38 Position	30 Au
	4-103221-6	40 Position	15 Au
	4-102084-8	36 Position	100-200 SnPb

1.6 Qualification Test Sequence

Test or Examination	Test Group					
	1	2	3	4	5	6
	Test Sequence (a)					
Examination of Product	1,12	1,6	1,6	1,8	1,3	1,3
Termination Resistance Dry Circuit	5,10	2,5	2,5			
Dielectric Withstanding Voltage				3,7		
Insulation Resistance				2,6		
Temperature Rise vs Current						2
Vibration	8					
Physical Shock	9					
Mating Force	4					
Unmating Force	11					
Durability	6	3	3			
Solderability					2	
Thermal Shock				4		
Humidity-Temperature Cycling		4		5		
Corrosion, IMFG (Au)			4			
Contact Engaging Force	2					
Contact Separating Force	3,7					

(a) Number indicates sequence in which tests were performed.

2. Summary of Testing

2.1 Examination of Product - Groups 1 to 6

All connectors submitted for testing were selected from production lots that were subjected to inspection and found to be acceptable by the Product Assurance Department of the Packaging Components Division.

2.2 Contact Engaging Force - Group 1

All samples of Group 1 met the engaging force requirement of 6.0 ounces maximum per contact.

2.2 Contact Engaging Force - Group 1 (Cont'd.)

Values are recorded in ounces.

Sample Number	Engagement Force Min.	Max.	Sample Number	Engagement Force Min.	Max.
51A1R	2.2	5.1	51D1R	3.5	4.9
51A2R	2.2	5.5	51D2R	4.0	4.7
51A3R	2.3	4.2	51D3R	3.7	4.3
51B1R	3.0	6.0			
51B2R	2.8	4.0			
51B3R	2.7	3.9			

2.3 Contact Separating Force - Group 1

All samples of Group 1 met the requirement of 0.75 ounce minimum separating force.

Values are recorded in ounces.

Sample Number	Separation Force Min.	Max.	Sample Number	Separation Force Min.	Max.
51A1R	1.2	1.9	51D1R	1.3	2.5
51A2R	1.2	1.9	51D2R	1.6	2.6
51A3R	1.3	1.8	51D3R	1.6	2.9
51B1R	1.8	3.4			
51B2R	1.7	2.8			
51B3R	2.4	3.9			

2.4 Mating Force - Group 1

All samples of Group 1 met the requirement of 8.0 ounces maximum per contact. Individual contact forces were calculated from the total connector mating force.

Sample Number	No. of Contacts	Total Mating Force (lbs.)	Force per Contact (ounces)
51A1	38	7.7	3.24
51A2	38	10.2	4.29
51A3	38	8.1	3.41
51B1	40	11.7	4.68
51B2	40	11.8	4.72
51B3	40	11.9	4.76

2.4 Mating Force - Group 1 (Cont'd.)

Sample Number	No. of Contacts	Total Mating Force (lbs.)	Force per Contact (ounces)
51C1	40	10.7	4.28
51C2	40	11.4	4.56
51C3	40	10.2	4.08
51D1	36	15.9	7.07
51D2	36	16.2	7.20
51D3	36	16.5	7.33

2.5 Termination Resistance, Dry Circuit - Groups 1, 2, & 3

All test samples from Groups 1, 2, and 3 met the resistance requirement of 12.0 milliohms or less initially and after test. All test results are in milliohms.

Test Group 1

Sample No.	Part Number	Initial Max.	Initial Avg.	Final Max.	Final Avg.
51A1	4- 87729-7	6.47	5.26	6.57	5.71
51A2	4- 87729-7	3.88	3.57	3.93	3.64
51A3	4- 87729-7	6.17	5.27	6.64	5.48
51B1	4-102083-6	5.04	4.47	5.40	4.26
51B2	4-102083-6	6.69	6.00	6.65	5.97
51B3	4-102083-6	5.28	4.70	5.31	4.85
51C1	4-103221-6	6.58	6.26	7.02	6.54
51C2	4-103221-6	4.85	4.31	5.65	4.63
51C3	4-103221-6	7.12	6.49	6.99	6.15
51D1	4-102084-8	4.38	4.03	4.85	4.21
51D2	4-102084-8	8.21	6.49	7.21	6.31
51D3	4-102084-8	4.56	3.88	4.72	4.07

Test Group 2

Sample No.	Part Number	Initial Max.	Initial Avg.	Final Max.	Final Avg.
52A1	533013-1	6.15	5.21	6.08	5.02
52A2	533013-1	4.50	3.62	4.18	3.38
52A3	533013-1	5.20	4.89	5.18	4.84
52B1	4-103220-1	6.27	5.94	7.21	6.21
52B2	4-103220-1	3.75	3.48	4.36	3.69
52B3	4-103220-1	6.96	6.36	9.23	6.87

Test Group 2 (Cont'd.)

Sample No.	Part Number	Initial Max.	Initial Avg.	Final Max.	Final Avg.
52C1	4-102083-6	7.26	6.56	7.28	6.54
52C2	4-102083-6	7.28	6.34	7.32	6.89
52C3	4-102083-6	5.40	4.82	6.08	5.19
52D1	103228-6	6.72	6.24	7.81	7.15
52D2	103228-6	5.62	4.84	5.69	4.95
52D3	103228-6	6.62	6.18	6.93	6.44
52E1	4-102084-8	4.77	3.94	7.62	5.27
52E2	4-102084-8	6.46	6.08	6.29	5.51
52E3	4-102084-8	6.11	5.56	6.87	5.40

Test Group 3

Sample No.	Part Number	Initial Max.	Initial Avg.	Final Max.	Final Avg.
53A1	1-103175-3	6.45	5.73	6.45	6.02
53A2	1-103175-3	4.36	3.76	4.36	3.89
53A3	1-103175-3	7.25	5.55	6.65	5.77
53A4	1-103175-3	4.83	4.28	4.30	3.91
53A5	1-103175-3	5.66	5.14	5.53	5.17
53A6	1-103175-3	4.14	3.90	4.05	3.80
53B1	4- 87729-7	6.25	5.74	6.13	5.26
53B2	4- 87729-7	3.72	3.53	3.98	3.60
53B3	4- 87729-7	5.60	4.66	5.87	5.12
53B4	4- 87729-7	3.80	3.56	3.91	3.57
53B5	4- 87729-7	4.23	3.54	4.12	3.61
53B6	4- 87729-7	5.61	5.07	6.42	5.87
53C1	4-102083-6	6.99	6.44	6.28	6.28
53C2	4-102083-6	7.53	6.76	7.58	6.98
53C3	4-102083-6	6.99	6.29	7.48	7.00
53C4	4-102083-6	5.62	4.78	5.19	4.80
53C5	4-102083-6	6.61	5.87	6.72	6.16
53C6	4-102083-6	6.62	6.04	6.77	6.40

2.6 Durability - Groups 1, 2, & 3

There was no excessive visible wear or damage to the contacts or connector housings, after the required number of mating and unmating cycles for each plating type and thickness. Following durability testing, samples met the minimum separation force (0.75 ounce per contact) and maximum termination resistance (12 milliohms) requirements. See individual tests for actual measurements.

2.7 Vibration - Group 1

During vibration testing, there were no discontinuities of the contacts greater than one microsecond. 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 one microsecond. Following physical shock, there were no cracks, breaks or loose parts of the connector assemblies.

2.9 Unmating Force - Group 1

All samples met the requirement of 1.0 ounce minimum unmating force per contact when unmated at a rate of 0.5 inch per minute. Force per contact was calculated for each connector.

Sample Number	Unmating Force (pounds)	Force/Contact (ounces)	Number of Contacts
51A1	5.8	2.44	38
51A2	6.17	2.60	38
51A3	6.32	2.66	38
51B1	7.72	3.09	40
51B2	8.96	3.58	40
51B3	10.16	4.06	40
51C1	9.17	3.67	40
51C2	7.53	3.01	40
51C3	7.60	3.04	40
51D1	9.77	4.34	36
51D2	5.66	2.52	36
51D3	7.02	3.12	36

Force per contact was calculated by dividing the total unmating force of each connector by the number of contacts in it.

2.10 Humidity-Temperature Cycling - Groups 2 & 4

After ten days of humidity-temperature cycling, there was no physical damage to the connectors. Connectors of Group 2 met the 12 milliohms maximum termination resistance requirement. Connectors of Group 4 met the 1 X 10^3 megohms final insulation resistance requirement and final dielectric withstanding voltage testing.

2.11 Industrial Mixed Flowing Gas (IMFG) - Group 4

Connectors were exposed to a Class II environment for 20 days. There was no physical damage to the connectors.

2.12 Insulation Resistance - Group 4

All insulation resistances were greater than the 5.0 X 10^3 megohms minimum for initial measurements and 1.0 X 10^3 megohms minimum after humidity-temperature cycling. The minimum initial measurement was 1.0 X 10^6 megohms, and the minimum final measurement after humidity-temperature cycling was 2.0 X 10^3 megohms.

2.13 Dielectric Withstanding Voltage - Group 4

There was no dielectric breakdown, flashover or arcing when the specified test voltage was applied between all adjacent contacts of each connector type.

2.14 Thermal Shock - Group 4

Connectors were exposed to five cycles of thermal shock at the appropriate temperature extremes listed. The connectors were then examined, and there was no evidence of damage, cracking or chipping.

2.15 Solderability - Group 5

All samples tested met the solderability requirement of 95% minimum coverage on functional areas (soldertails).

2.16 Temperature Rise vs Specified Current (T-Rise) - Group 6

All samples met the temperature rise requirement of 30°C maximum above ambient at the specified current. The ambient temperature varied between 26.0°C and 28.0°C during testing. An ambient temperature of 26.0°C was used for calculating T-Rise.

Sample Number	Current (amps)	Pin No.	Temp Rise (Max.)	Measured Temp.
5-6A	2.0	1	21°C	47°C
		2	27°C	53°C
		3	28°C	54°C
5-6B	2.0	1	14°C	40°C
		2	28°C	54°C
		3	27°C	53°C
5-6C	2.0	1	8°C	36°C
		2	18°C	46°C
		3	18°C	46°C

3. Test Methods

3.1 Examination of Product - Groups 1 to 6

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

3.2 Engaging Force - Group 1

Connectors were measured for engaging force, in accordance with AMP Specification 109-35. Connectors were mounted in an appropriate test fixture, and a 0.0260 inch gage pin was inserted into each socket contact. Engagement depth was 0.206 inch minimum from top entry. Engagement forces were then measured and recorded.

3.3 Separating Force - Group 1

Connectors were measured for separating force, in accordance with AMP Specification 109-35. Connectors were mounted in an appropriate test fixture, and each contact was sized twice with a 0.0260 inch gage. On the third insertion, a 0.0240 inch gage pin was used, and the separation force was measured. Engagement depth was 0.206 inch minimum for top entry.

3.4 Mating Force - Group 1

Connectors were measured for mating force, in accordance with AMP Specification 109-42, Condition A. Connector halves were mounted in a free floating fixture and mated at a rate of 0.5 inch/minute. The force required to mate them after one unmonitored cycle was measured. Force per contact was then calculated by dividing the total mating force by the number of contacts in the connector.

3.5 Termination Resistance, Dry Circuit - Groups 1, 2, 3

Termination resistance was measured on all contacts in each test group, in accordance with AMP Specification 109-6-1. A four-terminal resistance measuring circuit was used. (See Figure 1.) Current during the test was maintained at 100 milliamperes with 50 millivolts maximum open circuit voltage.

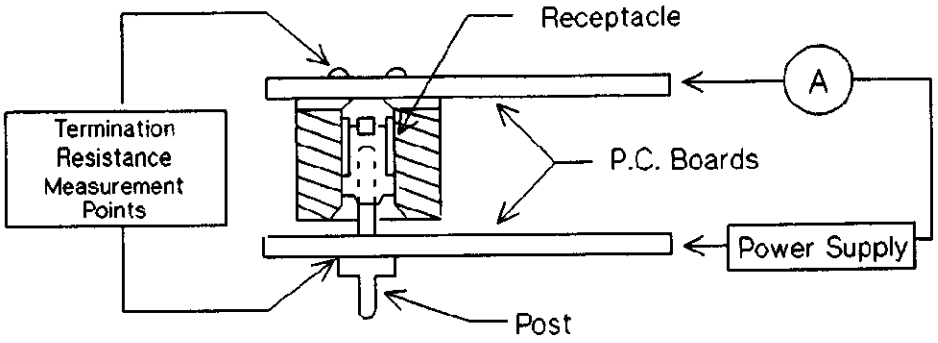

Fig. 1. Termination Resistance Measurement Method

3.6 Durability - Groups 1, 2, 3

Connectors were mated and unmated at a rate of 600 cycles per hour, maximum, for a specified number of cycles based on plating type and thickness. Testing was performed in accordance with AMP Specification 109-27.

Plating Type	Thickness in Microinches	Number of Cycles
Au	30	200
Au	15	100
SnPb	100	75

3.7 Vibration - Group 1

Mated connectors were subjected to vibration having sinusoidal motion. The amplitude was either 0.06 inch, double amplitude or 20 gravity units peak, whichever was less. The vibration frequency was varied between the limits of 10 and 2000 Hz and returned to 10 Hz in 20 minutes. This cycle was performed 12 times in each of three mutually perpendicular planes. Contacts were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit. Testing was in accordance with AMP Specification 109-21-4.

3.8 Physical Shock - Group 1

Mated connectors were physically shocked. The parameters were a sawtooth waveform of 100 gravity units for a duration of six milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes for a total of 18 shocks. The contacts were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit. Connectors were tested in accordance with AMP Specification 109-26-9.

3.9 Unmating Force - Group 1

The force needed to unmate the connectors assemblies after the first 2 unmonitored cycles was measured on the third cycle. A free floating mating force fixture was used. The rate of unmating was 0.5 inch per minute. Connectors were tested in accordance with AMP Specification 109-42, Condition A. Force per contact was then calculated.

3.10 Humidity-Temperature Cycling - Groups 2 & 4

Mated connectors were exposed to 10 cycles of humidity-temperature cycling. Each cycle took 24 hours, and consisted of cycling the temperature between 25°C and 65°C twice. The relative humidity was held at 95%. During five of the first nine cycles, connectors were exposed to a cold shock at -10°C for 3 hours. Testing was in accordance with AMP Specification 109-23, Method III, Condition B, (5 cold shocks) less Step 7b (vibration).

3.11 Industrial Mixed Flowing Gas (IMFG) - Group 4

Mated connectors were exposed for 20 days in an 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 10 ppb, NO_2 at 200 ppb and H_2S at 10 ppb. Testing was in accordance with AMP Specification 109-85-2.

3.12 Insulation Resistance - Group 4

Insulation resistance was measured between adjacent contacts of mated connector assemblies. A voltage of 500 volts dc was applied for two minutes, and the insulation resistance was measured. Testing was in accordance with AMP Specification 109-28-4.

3.13 Dielectric Withstanding Voltage - Group 4

An appropriate test voltage was applied between all adjacent contacts of each mated connector type. The voltage was applied at a rate of 500 volts per second, and was held for one minute when reached. Testing was in accordance with AMP Specification 109-29-1.

The voltages applied were as follows:

Samples 54A1, 2, 3, & 54C1, 2, 3 (P/N 1-103175-3, 4-87729-7):	V (RMS)	Altitude
	750	Sea Level
	330	50,000 ft.
	275	70,000 ft.

Samples 54B1, 2, 3 & 54D1, 2, 3 (P/N 103107-1, 1-103225-8):	V (RMS)	Altitude
	1,000	Sea Level
	400	50,000 ft.
	275	70,000 ft.

3.14 Thermal Shock - Group 4

Connectors were exposed to five cycles of thermal shock at the appropriate temperature extremes listed below. Each cycle consisted of 30 minutes at each temperature extreme. Transition between temperatures was less than five minutes. Testing was in accordance with AMP Specification 109-22.

Sample Numbers	Temperature Extremes
54A1, 2, 3 & 54B1, 2, 3 (P/N 1-103175-3, 103107-1):	-55°C to +125°C
54C1, 2, 3 & 54D1, 2, 3 (P/N 4-87729-7), 1-103225-8):)	-65°C to +105°C

3.15 Solderability - Group 5

Connectors were subjected to solderability testing, in accordance with AMP Specification 109-11-1. Connectors were tested using the solder dip method. Immersion of area under test (soldertails) was held in the 245°C molten solder bath for 3-5 seconds. Rate of immersion and withdrawal was 1.0 inch/second.

3.16 Temperature Rise vs Specified Current (T-Rise) - Group 6

Connectors were subjected to temperature rise testing, in accordance with AMP Specification 109-45-1. Thermocouples were attached at 3 specified points along each connector, by drilling holes through the connector housings to the 3 contacts and inserting the thermocouples. A thermocouple was placed at the end of a row, in the middle of that same row, and a third thermocouple was placed in between the first two. (See Figure 2.) The contact temperatures at the specified steady state current of 2.0 amps were measured, and the rise above ambient was calculated. Measurements were made when 3 consecutive readings showed no more than 1.0°C change between them.

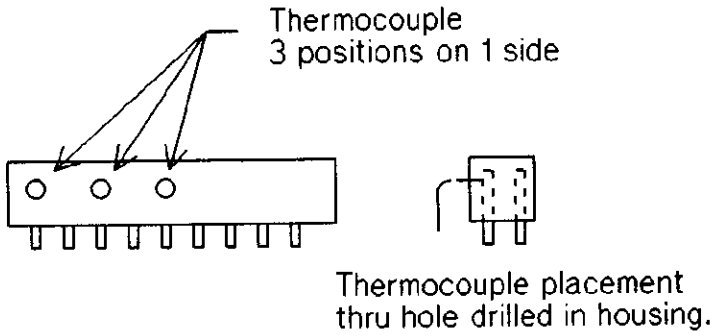

Fig. 2 Thermocouple Placement

4. Validation

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