QUALIFICATION TEST REPORT

AMP* HDR Connector Assemblies
and Type XI Contacts

501-109 Rev. B

Product Specification:	108-10015, Rev. D
CTL No.:	CTL5041-002-003
Date:	July 16, 1993
Classification:	Unrestricted
Prepared By:	Terrance M. Shingara
Per EC:	0990-0062-94

*Trademark

Corporate Test Laboratory Harrisburg, Pennsylvania

Table of Contents

(R5041TS1)

AMP

AMP INCORPORATED

HARRISBURG, PENNSYLVANIA 17105 PHONE: 717-564-0100 TWX: 510-657-4110

CORPORATE TEST LABORATORY

Qualification Test Report
HDR Connector Assemblies and Type XI Contacts

1. Introduction

1.1 Purpose

Testing was performed on AMP HDR Connector Assemblies and Type XI Contacts to determine if they met the requirements of AMP Product Specification 108-10015, Rev. D.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance requirements of the HDR Connector Assemblies and Type XI Contacts, which are manufactured by the Federal Systems Unit of the Aerospace and Government Systems Sector. The testing was performed between April 4, 1989, and December 22, 1989.

1.3 Conclusion

The HDR Connector Assemblies and Type XI Contacts met the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-10015 Rev. D.

1.4 Product Description

This connector has been designed for high density pin and socket circuitry applications requiring easy maintenance, ready circuit identification, ease of circuit change, and repeated connect/disconnect capabilities. The basic configuration is rectangular, of 0.100 inch center square grid and Diallyl Phthalate (DAP) or Phenolic housing material.

1.5 Test Samples

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

Test Group	Quantity	Part Number	Description
1,2,3,4,5	12	3-204282-4	24 Pos *DAP Recpt
1,2,3,4,5	12	204729-2	24 Pos *DAP Plug
1,2,3	6	204729-1	24 Pos Phenolic Plug
1,2,3	6	204742-1	24 Pos Phenolic Recpt
1,2,3,4,5	10	204749-2	106 Pos *DAP Plug
1,2,3,4,5	10	204738-2	106 Pos *DAP Recpt
1,2,3	6	204737-1	106 Pos Phenolic Plug
1,2,3	6	204750-1	106 Pos Phenolic Recpt
1,2,3	390	203802-3	30 Gold Socket
1,2,3	390	203816-3	30 Gold Pin
1,2,3	390	203802-4	30 Gold Select Socket
1,2,3	390	203816-4	30 Gold Select Pin
1,2,3	390	203875-3	30 Gold Socket
1,2,3	390	203874-3	30 Gold Pin
1,2	284	203875-4	30 Gold Select Socket
1,2	284	203874-4	30 Gold Select Pin
1,2	284	1-204330-2	30 Gold Socket (**WW)
1,2	284	1-204332-2	30 Gold Pin (**WW)
3,4,5	390	203802-6	Tin Socket
3,4,5	390	203816-6	Tin Pin

*DAP - Diallyl Phthalate
**WW - Wire Wrap

1.6 Qualification Test Sequence

	Test Groups				
Test or Examination	1	2	3	4	5
Examination of Product	1,10	1,10	1,12	1,10	1,10
Termination Resistance, Spec. Current	3			3	
Termination Resistance, Dry Circuit	2,8	3,8		2,8	3,8
Dielectric Withstanding Voltage			6,10		
Insulation Resistance			5,9		
T-Rise vs Current	4,9			4,9	
Vibration, Discontinuity		4			4
Vibration, Energized	5			5	
Physical Shock		5			5
Mating Force		2			2
Unmating Force		9			9
Contact Retention			4		
Contact Engaging Force			2		
Contact Separating Force			3		
Crimp Tensile			11		
Durability		6			6
Thermal Shock			7		
Humidity/Temperature Cycling			8	6	7
Mixed Flowing Gas	6	7			
Temperature Life	7			7	

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. They were inspected and accepted by the Reliability Engineering Department of Federal Systems.

2.2 Termination Resistance, Specified Current - Groups 1,4

All termination resistance measurements taken at the specified currents were less than the specification requirement.

Test Group	No of Samples	Condition	(Amperes) Test Current	Wire Size	Plating	Max	Spec Max
1	40	Initial	7.5	AWG 20	Gold	7.67	8.00
	40		3.0	AWG 24	Gold	14.45	14.50
	40		2.0	AWG 26	Gold	21.22	21.50
	20		1.5	AWG 28	Gold	34.85	36.00
	40		1.0	AWG 30	Gold	46.80	48.00
4	20	Initial	7.5	AWG 20	Tin	8.70	9.20
	20		3.0	AWG 24	Tin	14.72	15.50

All values in milliohms

2.3 Termination Resistance, Dry Circuit - Groups 1,2,4,5

All termination resistance measurements taken at 100 milliamperes DC and 50 millivolts open circuit voltage were less than the specification requirement.

Test Group	Nbr of Samples	Condition	Wire Size	Plating	Max	Spec Max
1	40	Initial	AWG 20	Gold	7.22	8.0
	40		AWG 24	Gold	13.88	14.5
	40		AWG 26	Gold	20.77	22.0
	20		AWG 28	Gold	33.92	36.0
	40		AWG 30	Gold	45.27	48.0
2	40	Initial	AWG 20	Gold	7.31	8.0
	40		AWG 24	Gold	13.95	14.5
	40		AWG 26	Gold	20.96	22.0
	5		AWG 28	Gold	32.39	36.0
	40		AWG 30	Gold	46.56	48.0
4	20	Initial	AWG 20	Tin	7.79	16.5
	20		AWG 24	Tin	14.17	27.0
5	20	Initial	AWG 20	Tin	7.31	16.5
	20		AWG 24	Tin	13.92	27.0

All values in milliohms

Test Group	Nbr of Samples	Condition	Wire Size	Plating	Max	Spec Max
1	40	Final	AWG 20	Gold	7.47	8.0
	40		AWG 24	Gold	13.86	14.5
	40		AWG 26	Gold	21.74	22.0
	20		AWG 28	Gold	34.84	36.0
	39		AWG 30	Gold	45.88	48.0
2	40	Final	AWG 20	Gold	7.51	8.0
	40		AWG 24	Gold	14.08	14.5
	40		AWG 26	Gold	21.06	22.0
	20		AWG 28	Gold	34.44	36.0
	39		AWG 30	Gold	47.23	48.0
4	20	Final	AWG 20	Tin	8.21	16.5
	20		AWG 24	Tin	13.72	27.0
5	20	Final	AWG 20	Tin	13.70	16.5
	20		AWG 24	Tin	23.60	27.0

All values in milliohms

2.4 Dielectric Withstanding Voltage - Group 3

There was no dielectric breakdown or flashover between adjacent contacts, when a test voltage was applied for one minute. The test voltages were: 1000 Vac/sea level, 300 Vac/50,000 ft, and 200 Vac/70,000 ft.

2.5 Insulation Resistance - Group 3

All insulation resistance measurements were greater than the specification minimum requirements of 50,000 megohms for DAP housings and 5000 megohms for Phenolic housings initially, and 5000 megohms for DAP housings and 100 megohms for Phenolic housings final.

2.6 Temperature Rise vs Current - Groups 1,4

No samples had a temperature rise greater than 30°C above ambient when the applicable specified current was applied.

Condition	Wire Size	Test Current	Temperature Rise Above Ambient (Max)
Initial	AWG 20	3.00	12.3
	AWG 24	2.25	*16.8
	AWG 26	1.75	*17.2
	AWG 28	1.25	24.4
	AWG 30	1.00	14.6
Final	AWG 20	3.00	*21.7
	AWG 24	2.25	*30.0
	AWG 26	1.75	*26.6
	AWG 28	1.25	27.2
	AWG 30	1.00	23.4

All temperatures in degrees celsius
*Values Not Measured But Calculated From Data

2.7 Vibration, Discontinuity - Groups 2,5

There were no discontinuities of the contacts greater than one microsecond during vibration. Following vibration, there were no cracks, breaks, or loose parts on the connector assemblies.

2.8 Vibration, Energizes - Groups 1,4

Following vibration, there were no cracks, breaks, or loose parts on the connector assemblies.

2.9 Physical Shock - Groups 2,5

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

2.10 Mating Force - Groups 2,5

All mating force measurements were less than the specification requirement of 25 oz. for Gold contacts and 50 oz. for Tin contacts.

2.11 Unmating Force - Groups 2,5

All unmating force measurements were greater than the specification minimum requirement of 1.5 oz. for Gold contacts and 1.8 oz. for Tin contacts.

2.12 Contact Retention - Group 3

There was no physical damage to either the contacts or the housing, and no contacts dislodged from the housings as a result of applying 5.0 pounds axial load to the contacts in DAP housings and 7.5 pounds of contacts in Phenolic housings.

2.13 Contact Engaging Force - Group 3

All contact engaging forces were less than the specification maximum requirement of 25 ounces per contact for gold and 50 ounces per contact for tin.

2.14 Contact Separating Force - Group 3

All contact separating forces were greater than the specification minimum requirements of 0.75 ounce per contact for gold and 6 ounces per contact for tin.

2.15 Crimp Tensile - Group 3

All tensile values were greater than the specification minimum requirements.

Wire Gage	No. of Samples	Spec Min	Measured Min
AWG 20	90	20.0	20.70
AWG 24	120	7.5	7.67
AWG 26	60	5.0	6.59
AWG 30	45	1.3	1.54

All values in pounds

2.16 Durability - Group 2,5

There was no physical damage occurred to the samples as a result of mating and unmating the connectors 500 times for Gold or 250 times for Tin.

2.17 Thermal Shock - Group 3

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

2.18 Humidity-Temperature Cycling - Groups 3,4,5

There was no evidence of physical damage to either the contacts or the connector as a result of exposure to humidity/temperature cycling.

2.19 Mixed Flowing Gas - Groups 1,2

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

2.20 Temperature Life - Groups 1,4

There was no evidence of physical damage to either the contacts or the connector as a result of exposure to a temperature of 125°C for DAP housings and 150°C for Phenolic housings for 300 hours.

3. Test Methods

3.1 Examination of Product

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

3.2 Termination Resistance, Specified Current

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

3.3 Termination Resistance, Dry Circuit

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.

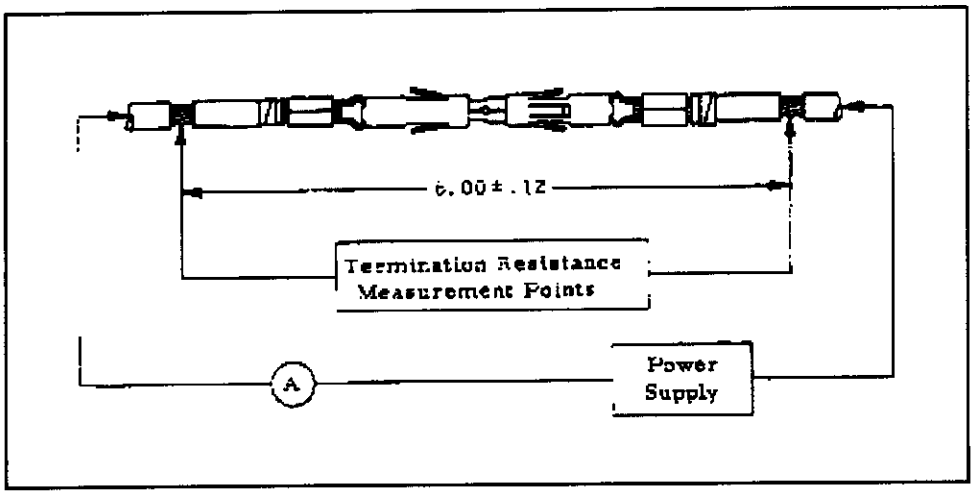

Figure 1
Typical Termination Resistance Measurement Points

3.4 Dielectric Withstanding Voltage

A test potential was applied between the adjacent contacts and held for one minute. The test was performed at sea level, 50,000 ft, and 70,000 ft.

3.5 Insulation Resistance

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

3.6 Temperature Rise vs Specified Current

The contact temperature was measured, while energized at the specified current. A thermocouple probe was attached to the back of each contact 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 {Discontinuity} [Energized], 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 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.} [Connectors were energized with a current which produced about a 20° temperature rise above ambient and total circuit voltage drop was monitored.]

3.8 Physical Shock

Mated connectors were subjected to a physical shock test, having a sawtooth waveform of 75 gravity units (g peak) and a duration of 6 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 connector pairs (jackscrews removed) 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 connector pairs (jackscrews removed) 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 5 pounds for DAP Housings and 7.5 pounds for Phenolic housings 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 Contact Engaging Force

After sizing two times with the 0.041 steel gage pin, the engaging forces were measured on the third cycle by inserting the gage 0.19 inch into the socket.

3.13 Contact Separating Force

After sizing three times with the 0.041 steel gage pin,the separating forces were acquired by withdrawing a 0.039 steel gage pin from the socket.

3.14 Crimp Tensile

An axial load was applied to each sample at a crosshead rate of 1.0 inch per minute.

3.15 Durability

Connectors were mated and unmated 500 times for Gold plated contacts and 250 times for Tin plated contacts at a rate not exceeding 300 cycles per hour.

3.16 Thermal Shock

Mated connectors were subjected to five cycles of temperature extremes with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -65°C and 125°C. The transition between temperatures was less than one minute.

3.17 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%.

3.18 Mixed Flowing Gas, Class II

Mated connectors were exposed for 20 days to the mixed flowing gas chamber. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70%. Pollutants of $C1_2$ at 10 ppb, NO_2 at 200 ppb, and H_2S at 10 ppb.

3.19 Temperature Life

Mated samples were subjected to 300 hours at an elevated temperature of 150°C.

4. Validation

Prepared by:

7/19/93

Terrance M. Shingara
Test Engineer
Design Assurance Testing
Corporate Test Laboratory

Reviewed by:

7/19/93

Richard A. Groft
Supervisor
Design Assurance Testing
Corporate Test Laboratory

Approved by:

7/23/93

Jack Kalasky
Total Quality Management Manager
Aerospace & Government Systems