AMP*

QUALIFICATION TEST REPORT

AMPLIMITE* HDE-20
Insulation Displacement Connector

501-115 Rev. 0

Product Specification:	108-40011, Rev. 0
CTL No.:	CTL4975-068-007
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AMP

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CORPORATE TEST LABORATORY

Qualification Test Report
AMPLIMITE HDE-20
Insulation Displacement Connector

1. Introduction

1.1 Purpose

Testing was performed on AMP's AMPLIMITE HDE-20 Connector to determine if it meets the requirements of AMP Product Specification 108-40011, Rev. 0.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the AMPLIMITE HDE-20 Connector, manufactured by the Interconnection Components & Assemblies Products Division of the Capital Goods Business Sector. The testing was performed between February 2, 1990 and May 3, 1990.

1.3 Conclusion

The AMPLIMITE HDE-20 Connector meets the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-40011, Rev. 0.

1.4 Product Description

The AMPLIMITE HDE-20 is an all plastic connector, made from black Thermoplastic with an 94V-0 rating. The housings are available with or without metal shells. The contacts are insulation displacing. Contacts are available with 30 microinch or flash gold plating, with Phosphor Bronze base metal. Connectors are available in 9, 15, 25 and 37 position, with a full range of cable clamps and hardware.

1.5 Test Samples

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

Test Group	Total Quantity	Part Number	Description
1,2,3,4	4	745215-4	37 Pos. Plug AWG 30
1,2,3,4	4	745213-4	37 Pos. Recp AWG 30
1,2,3,4	5	745215-5	37 Pos. Plug AWG 26,24
1,2,3,4	5	745213-5	37 Pos. Recp AWG 26,24
1,2,3,4,6	6	745215-6	37 Pos. Plug AWG 22,20
1,2,3,4,6	6	745213-6	37 Pos. Recp AWG 22,20
5	1	745211-4	25 Pos. Plug AWG 30,26
5	1	745209-4	25 Pos. Recp AWG 30,26
5	1	745211-5	25 Pos. Plug AWG 26,22
5	1	745209-5	25 Pos. Recp AWG 26,22
5	1	745211-6	25 Pos. Plug AWG 22
5	1	745209-6	25 Pos. Recp AWG 22
7	9	745201-1	9 Pos. Recp AWG 30,28,26
7	9	745203-1	9 Pos. Plug AWG 30,28,26
7	9	745201-2	9 Pos. Recp AWG 26,24,22
7	9	745203-2	9 Pos. Plug AWG 26,24,22
7	6	745201-3	9 Pos. Recp AWG 22,20
7	6	745203-3	9 Pos. Plug AWG 22,20
7	18	745266-7	Gold Flash Pin AWG 22-26, F Crimp
7	18	745269-7	Gold Flash Socket AWG 22-26, F Crimp

1.6 Qualification Test Sequence

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

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 production lots. They were inspected and accepted by the Product Assurance Department of the Capital Goods Business Sector.

2.2 Termination Resistance, Dry Circuit - Groups 1, 2, 3, 4, 5

All termination resistance measurements, taken at 100 milliamperes dc. and 50 millivolts open circuit voltage, were less than the specification requirement of 30 milliohms.

Test Group	No. of Samples	Condition	Min.	Max.	Mean
1	111	Initial	3.49	7.27	5.95
		After Mechanical	4.09	14.91	6.84
2	111	Initial	3.60	8.30	6.29
		After Temperature Life	5.88	28.41	9.83
3	111	Initial	1.66	7.11	5.53
		After Humidity	1.74	15.05	6.67
4	185	Initial	-0.75	14.72	4.70
		After Temperature Rise	1.46	18.31	5.28
5	125	Initial	2.55	7.02	5.96
		After Industrial Gas	3.29	18.47	6.89

All values in milliohms

2.3 Dielectric Withstanding Voltage - Group 6

There was no dielectric breakdown or flashover between adjacent contacts, when a test voltage of 1000 VAC was applied for one minute.

2.4 Insulation Resistance - Group 6

All insulation resistance measurements were greater than the specification requirement of 5000 megohms for the initial measurement and 500 megohms for measurement taken after test.

2.5 Temperature Rise vs. Current - Group 4

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

P/N	Wire Size AWG	Test Current	Temperature Rise Above Ambient (Max)
745215-4 745213-4	30	1.00	19.6
745215-5 745213-5	26	1.50	17.0
745215-5 745213-5	24	2.00	18.3
745215-6 745213-6	22	2.40	21.5
745215-6 745213-6	20	3.00	22.0

All Temperatures in Degrees Celsius

2.6 Vibration, Discontinuity - Group 1

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.

2.7 Physical Shock - Group 1

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.

2.8 Mating Force - Groups 1, 8

All mating force measurements were less than the specification requirements.

Size	No. of Positions	Shell Material	Spec Max.	Measured Max.
1	9	Metal	30.0	15.0
	9	Plastic	2.8	2.7
2	15	Metal	33.0	13.2
	15	Plastic	4.7	2.7
3	25	Metal	37.0	18.4
	25	Plastic	7.8	5.0
4	37	Metal	40.0	22.0
	37	Plastic	11.6	11.0

All force values in pounds.

2.9 Unmating Force - Groups 1, 8

All unmating force measurements were less than the specification requirements.

Size	No. of Positions	Shell Material	Spec Max.	Measured Max.
1	9	Metal	30.0	16.5
	9	Plastic	2.8	2.7
2	15	Metal	33.0	12.9
	15	Plastic	4.7	2.6
3	25	Metal	37.0	18.0
	25	Plastic	7.8	3.4
4	37	Metal	40.0	20.0
	37	Plastic	11.6	8.0

All force values in pounds.

2.10 Contact Insertion Force - Group 7

All contact insertion force measurements were less than the specification requirement of 3.0 pounds per contact.

2.11 Contact Retention - Group 7

There was no physical damage to either the contacts or the housing, and no contacts dislodged from the housings as a result of applying 7.0 pounds axial load to each contacts.

2.12 Contact Engaging Force - Group 7

All contact engaging forces were less than the specification requirement of 8.0 ounces per contact.

2.13 Contact Separating Force - Group 7

All contact separating forces were greater than the specification requirement of 0.75 ounces per contact.

2.14 Crimp Tensile - Group 7

All tensile values were greater than the specification requirements.

Wire Size	No. of Contacts	Measured Minimum	Specification Minimum
*AWG 18	6	40.8	27.0
AWG 20	12	10.0	9.5
AWG 22	24	7.6	4.0
AWG 24	12	9.0	6.0
AWG 26	24	3.0	2.5
AWG 28	6	5.6	2.5
AWG 30	6	3.2	1.0

All values in pounds

*'F' Crimp

2.15 Durability - Groups 1, 2, 3

There was no physical damage to the samples, as a result of mating and unmating the connector 100 times.

2.16 Thermal Shock - Group 6

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

2.17 Humidity-Temperature Cycling - Groups 3, 6

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

2.18 Industrial Mixed Flowing Gas - Group 5

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

2.19 Temperature Life - Group 2

There was no evidence of physical damage to either the contacts or the connector, as a result of exposure to a temperature of 105°C for 500 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, 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.

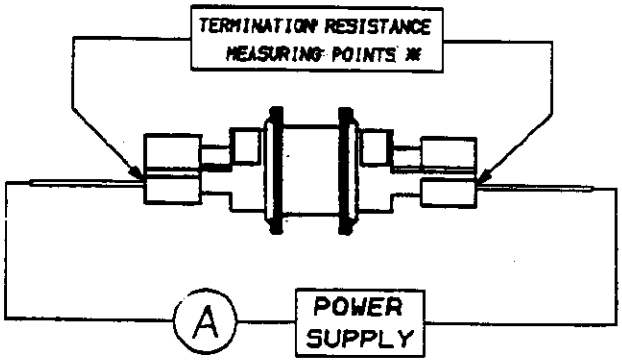

Figure 1
Typical Termination Resistance Measurement Points

3.3 Dielectric Withstanding Voltage

A test potential of 1000 vac was applied between the adjacent contacts. This potential was applied for one minute, and then returned to zero.

3.4 Insulation Resistance

Insulation resistance was measured between adjacent contacts, using a test voltage of 10 vdc. This voltage was applied for two minutes before the resistance was measured.

3.5 Temperature Rise vs Specified Current

The connector temperature was measured, while energized at the 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.

3.6 Vibration, Discontinuity, Random

Mated connectors were subjected to a random vibration test. The parameters of this test condition are specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 hertz. The power spectral density at 50 hz is 0.075 G^2/Hz. The spectrum slopes up at 6 dB per octave to a PSD of .3 G^2/Hz at 100 Hz. The spectrum is flat at .3 G^2/Hz from 100 to 1000 Hz. The spectrum slopes down at 6 dB per octave to the upper bound frequency of 2000 Hz, at which the PSD is 0.075 G^2/Hz. The root-mean square amplitude of the excitation was 20.71 GRMS. Connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.7 Physical Shock

Mated connectors were subjected to a physical 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 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 free floating fixture with the rate of travel at 1.0 inch/minute.

3.9 Unmating Force

The force required to unmate individual connectors was measured, using a free floating fixture with the rate of travel at 1.0 inch/minute.

3.10 Contact Insertion

The force required to seat each contact into the housing was measured.

3.11 Contact Retention

An axial load of 7 pounds was applied to each contact and held for 60 seconds. The force was applied in a direction causing removal of the contacts from the housing.

3.12 Contact Engaging Force

Engaging forces were acquired by inserting a .041 inch gage into the socket.

3.13 Contact Separating Force

Separating forces were acquired by withdrawing a .039 inch gage 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 100 times at a rate not exceeding 200 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 -55°C and 105°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%. During five of the first nine cycles, the connectors were exposed to a cold shock at -10°C for 3 hours.

3.18 Industrial Mixed Flowing Gas, Class III

Mated connectors were exposed for 20 days in the industrial mixed flowing gas chamber. Class III exposure is defined as a temperature of 30°C, and a relative humidity of 75%. Pollutants are Cl_2 at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb.

3.19 Temperature Life

Mated samples were subjected to 500 hours at an elevated temperature of 105°C.

4. Validation

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