AMPLIMITE* HDP-20 Subminiature D Connector With F Crimp Contacts

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMPLIMITE* HDP-20 Subminiature D Connectors With F Crimp Contacts to determine their conformance to the requirements of Product Specification 108-40005 Revision B.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the AMPLIMITE HDP-20 Subminiature D Connectors With F Crimp Contacts. Testing was performed at the Engineering Assurance Product Test Laboratory between 28Aug89 and 06Oct89. The test file number for this testing is CTL 5091-152-012. This documentation is on file at and available from the Engineering Assurance Product Test Laboratory.

1.3. Conclusion

The AMPLIMITE HDP-20 Subminiature D Connectors With F Crimp Contacts listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-40005 Revision B.

1.4. Product Description

AMPLIMITE HDP-20 Subminiature D Connectors With F Crimp Contacts are designed for discrete wire termination and are available in 9, 15, 25, 37 and 50 position. The shells are available in both zinc and tin plating with the tin plated shell also available with grounding indents. The HDP-20 metal shell connectors accept size 20 DF (precision formed) contacts.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1	45	66507-3	30 µin gold pin with 24 AWG wire
	45	66505-3	30 µin gold socket with 24 AWG wire
	10	205817-1	Female screwlocks
1,3	15 each	205204-1	9 position zinc plug housing
	15 each	205203-1	9 position zinc receptacle housing
	40 each	206478-1	Cable clamp
1,3,5	815 each	66507-4	Gold flash pin with 24 AWG wire
	815 each	66505-4	Gold flash socket with 24 AWG wire
2	36	747960-1	50 position tin plug housing with shield

Figure 1 (continued)

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| Indicates change

Test Group	Quantity	Part Number	Description
2	36	747959-1	50 position tin receptacle housing with shield
	600	205310-4	Gold flash pin with 28 AWG wire
	600	205310-4	Gold flash pin with 24 AWG wire
	600	205311-4	Gold flash socket with 28 AWG wire
	600	205311-4	Gold flash socket with 24 AWG wire
	30	206478-5	Cable clamp
2,4	630 each	745229-5	Gold flash pin with 18 AWG wire
	630 each	745230-5	Gold flash socket with 18 AWG wire
4	30	66507-4	Gold flash pin with 28 AWG wire
	30	66507-4	Gold flash pin with 26 AWG wire
	30	66507-4	Gold flash pin with 24 AWG wire
	30	66505-4	Gold flash socket with 28 AWG wire
	30	66505-4	Gold flash socket with 26 AWG wire
	30	66505-4	Gold flash socket with 24 AWG wire
	30	745229-5	Gold flash pin with 20 AWG wire
	30	745229-5	Gold flash pin with 22 AWG wire
	30	745230-5	Gold flash socket with 20 AWG wire
	30	745230-5	Gold flash socket with 22 AWG wire
5	5	205204-4	9 position tin plug housing with indent
	5	205203-3	9 position tin receptacle housing
	5	205206-3	15 position tin plug housing with indent
	5	205205-2	15 position tin receptacle housing
	5	207464-2	25 position tin plug housing with indent
	5	207463-1	25 position tin receptacle housing
	5	205210-3	37 position tin plug housing with indent
	5	205209-2	37 position tin receptacle housing
	5	205212-3	50 position tin plug housing with indent
	5	205211-2	50 position tin receptacle housing

Figure 1 (end)

1.6. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial examination of product	1	1	1	1	1
Low level contact resistance	3,7	2,8			
Contact resistance, specified current	8				
Insulation resistance			3,7		
Withstanding voltage			4,8		
Temperature rise vs current		3,9			
Vibration, random	5	7(c)			
Mechanical shock					
Durability	4	4			4
Mating force	2				2,5
Unmating force	9				3,6
Contact insertion force			2		
Contact retention force			9		
Contact engaging force				2	
Contact separating force				3	
Crimp tensile				4	
Thermal shock			5		
Humidity-temperature cycling			6		
Temperature life		6			
Mixed flowing gas		5			
Final examination of product	10	10	10	5	1,7

NOTE
(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Discontinuities shall not be measured. Energize at 18˚C level for 100% loadings per Specification 102-950.

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance - Test Groups 1 and 2

All low level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 15 milliohms.

Test Group	Number of Data Points	Wire Size (AWG)	Condition	Contact Resistance		
				Min	Max	Mean
1	90	24	Initial	3.20	4.27	3.91
			Final	3.57	4.63	4.10
2	500	28	Initial	4.10	9.13	6.87
			Final	4.54	13.85	8.29
	500	24	Initial	3.35	4.45	4.00
			Final	4.19	9.98	5.38
	500	18	Initial	2.46	3.53	2.94
			Final	2.85	9.99	4.89

NOTE *All values in milliohms.*

Figure 3

2.3. Contact Resistance, Specified Current - Test Group 1

All contact resistance measurements, taken at specified current of 1.6 amperes, were less than 15 milliohms.

Quantity	Test Current (amperes)	Contact Resistance		
		Min	Max	Mean
45	1.6	3.97	5.53	4.32
		3.88	4.73	4.24

Figure 4

2.4. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 5000 megohms initially and 500 megohms after testing.

2.5. Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

2.6 Temperature Rise vs Current - Test Group 2

All specimens had a temperature rise of less than 30˚C above ambient when tested using a specified current with all contacts in a 50 position housing energized.

Contact Plating	Wire Size (AWG)	Specified Current (amperes)	Contact Quantity	Temperature Rise (˚C)	
				Initial	Final
Gold flash	28	1.2	500	25.4	26.5
	24	1.6	500	21.0	19.0
	18	3.1	500	18.1	23.4

NOTE *Values calculated from test data.*

Figure 5

2.7. Vibration - Test Groups 1 and 2

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical Shock - Test Group 1

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability - Test Groups 1, 2 and 5

No physical damage occurred as a result of mating and unmating gold flash specimens 100 times and 30 µin gold plated specimens 500 times.

2.10. Mating Force - Test Groups 1 and 5

All mating force measurements were less than the specified requirements.

Size	Positions	N [lbf] Maximum	
		With Ground Indents	Without Ground Indents
1	9	12.5 [2.8]	133.4 [30]
2	15	20.9 [4.7]	146.8 [33]
3	25	34.7 [7.8]	164.6 [37]
4	37	51.6 [11.6]	177.9 [40]
5	50	69.4 [15.6]	195.7 [44]

Figure 6

2.11. Unmating Force - Test Group 1

All unmating force measurements were less than the requirements specified in Figure 6.

2.12. Contact Insertion Force - Test Group 3

The force required to insert each contact into its housing was less than 13.3 N [3 lbf].

2.13. Contact Retention Force - Test Group 3

No contacts were dislodged from the housing when subject to a load of 44.5 N [10 lbf].

2.14. Contact Engaging Force - Test Group 4

All contact engaging force measurements were less than 2.2 N [8 ozf] maximum per contact.

2.15. Contact Separating Force - Test Group 4

| All contact separating force measurements were greater than 0.208 N [.75 ozf] minimum per contact.

2.16. Crimp Tensile - Test Group 4

All crimp tensile measurements were greater than the specified requirements.

2.17. Thermal Shock - Test Group 3

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.18. Humidity-temperature Cycling - Test Group 3

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.19. Temperature Life - Test Group 2

No evidence of physical damage was visible as a result of exposure to temperature life.

2.20. Mixed Flowing Gas - Test Group 2

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

2.21. Final Examination of Product - All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Low Level Contact Resistance

Low level contact resistance measurements were made using a 4 terminal measuring technique (Figure 7). The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

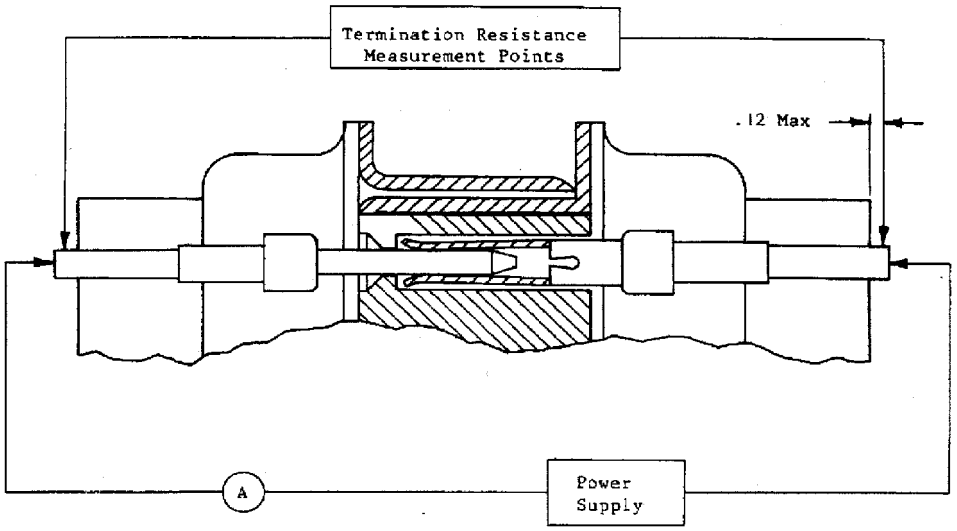

Figure 7
Low Level Contact Resistance Measurement Points

3.3. Contact Resistance, Specified Current

Contact resistance measurements taken at specified current were made using a 4 terminal measuring technique (Figure 7).

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated/unmated specimens. A test voltage of 500 volts DC was applied for 1 minute before the resistance was measured.

3.5. Withstanding Voltage

A test potential of 1000 volts AC was applied between adjacent contacts. This potential was applied for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at specified current levels. Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1˚C, the temperature measurement was recorded.

3.7. Vibration, Random

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 Hz. The power spectral density at 50 Hz was 0.075 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.04 G^2/Hz at 100 Hz. The spectrum was flat at 0.04 G^2/Hz from 100 to 1000 Hz. The spectrum sloped down at 6 dB per octave to the upper bound frequency of 2000 Hz at which the PSD was 0075 G^2/Hz. The root-mean square amplitude of the excitation was 20.71 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes in the monitoring circuit.

3.8. Mechanical Shock, Half-sine

Mated specimens were subjected to a mechanical 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 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Durability

Gold flash specimens were mated and unmated 100 times, while 30 µin gold plated specimens were mated and unmated 500 times, at a maximum rate of 200 cycles per hour.

3.10. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 25.4 mm [1 in] per minute.

3.11. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 25.4 mm [1 in] per minute.

3.12. Contact Insertion Force

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

3.13. Contact Retention Force

An axial load of 44.5 N [10 lbf] was applied to each contact in a direction to cause removal from the housing and held for 6 seconds.

3.14. Contact Engaging Force

Contact engaging forces were measured by inserting a 1.04 mm [.041 in] steel gage into the socket to a depth of 5.6 mm [.220 in].

3.15. Contact Separating Force

Contact separating forces were measured by withdrawing a 0.99 mm [.039 in] steel gage from a depth of 5.6 mm [.220 in].

3.16. Crimp Tensile

An axial load was applied at a rate of 25.4 mm [1 in] per minute.

3.17. Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 105˚C. The transition between temperatures was less than 1 minute.

3.18. Humidity-temperature Cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65˚C twice while maintaining high humidity.

3.19. Temperature Life

Mated specimens were exposed to a temperature of 105˚C for 500 hours.

3.20. Mixed Flowing Gas, Class IIIA

Mated specimens were exposed for 20 days to a mixed flowing gas Class IIIA exposure. Class IIIA exposure is defined as a temperature of 30˚C and a relative humidity of 75% with the pollutants of Cl_2 at 20 ppb, NO_2 at 200 ppb, H_2S at 100 ppb and SO_2 at 200 ppb.

3.21. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.