AMPMODU* System 50 Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMPMODU system 50 connectors to determine conformance of 100-position connector samples with the requirements of product specification 108-1093, rev O and 50-position connector samples with the requirements of 108-1093, rev B.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of AMPMODU system 50 connectors. The initial testing was performed between September 6, 1994 and January 6, 1995. Additional testing was performed on headers stamped from brass (C274) with 30-µin. Au plating mated with 30-µin. Au receptacles at TE Harrisburg Electrical Components Test Laboratory between July 6, 2014 and October 1, 2014. Testing data is on file at HECTL and can be found under test number EA20140040T and CTL5503-044-006.

1.3. Conclusion

AMPMODU system 50 connectors meet the electrical, mechanical, and environmental performance requirements of 108-1093, rev O for the 100-position connector samples and 108-1093, rev B for the 50-position connector samples.

1.4. Product Description

AMPMODU system 50 connectors are a miniature board-to-board system consisting of receptacles and headers having 0.015-in. square posts on 0.050 by 0.100 in. centerline interface spacing (0.050 in. between circuits within a row and 0.100 in. between rows).

1.5. Test Specimens

The test specimens were representative of normal production lots, and specimens identified with the following part numbers were used for testing:

Test Group	Qty	Part Number	Description
1,2,3,4	13	103911-8	100-Position Receptacle, Phosphor Bronze
1,2,3	13	1-104118-7	100-Position Header, Phosphor Bronze
1	5	1-104186-9	50-Position Header, Brass (C274)
1	5	5-104196-9	50-Position Receptacle, Phosphor Bronze
2	8	1-104186-9	50-Position Header, Brass (C274)
3	8	5-104196-9	50-Position Receptacle, Phosphor Bronze
1,2	13	60-1824445-1	Right-Angle Receptacle, Printed Circuit Board
1,2	13	60-1824445-2	Right-Angle Header, Printed Circuit Board

Figure 1

1.6. Environmental Conditions

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

Temperature: 15° to 35°C

Relative humidity: 20 to 80%

1.7. Qualification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)			
	1	2	3	4
	TEST SEQUENCE (b)			
Initial Examination of Product	1	1	1	1
Termination Resistance	3,7	2,7		
Insulation Resistance			2,6	
Dielectric Withstanding Voltage			3,7	
Temperature Rise vs Current		3,8		
Vibration	5	6(c)		
Mechanical Shock	6			
Durability	4			
Mating Force	2			
Un-Mating Force	8			
Contact Retention				2
Thermal Shock			4	
Humidity-Temperature Cycling			5	
Temperature Life		5		
Mixed Flowing Gas		4(d)		
Final Examination of Product	9	9	8	3

(a) See paragraph 1.5.

(b) Numbers indicate sequence that tests were performed.

(c) Discontinuities not measured, specimens were energized at 18°C level for 100% loading.

(d) Pre-condition with 10 cycles of durability.

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product —All Groups

All samples submitted for testing were representative of normal current production lots. A certificate of conformance (C of C) was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Termination Resistance—Groups 1 and 2

All termination resistance measurements taken at 100 milliamperes (maximum) and 20 millivolts (maximum) open circuit voltage were initially less than 15 milliohms and had a change in resistance (ΔR) of less than 4.0 milliohms after testing. See Figure 3.

2.3. Insulation Resistance—Group 3

All insulation resistance measurements were initially greater than 5,000 megohms and 1,000 megohms after humidity exposure.

2.4. Dielectric Withstanding Voltage—Group 3

No dielectric breakdown or flashover occurred.

Test Group	Number of Data Points	Condition	Termination Resistance (milliohms)		
			Min	Max	Mean
1	30	Initial	11.35	13.14	12.029
		After Mechanical (ΔR)	-0.16	1.38	0.364
2	30	Initial	11.42	13.63	12.031
		After Current Verification (ΔR)	0.13	2.62	0.801
1 (See Note)	47	Initial	7.91	11.59	8.63
		After Mechanical (ΔR)	-1.84	2.44	0.31
2 (See Note)	47	Initial	7.44	10.10	8.28
		After Current Verification (ΔR)	-0.80	3.76	0.47

Note: Headers with brass (C274) only

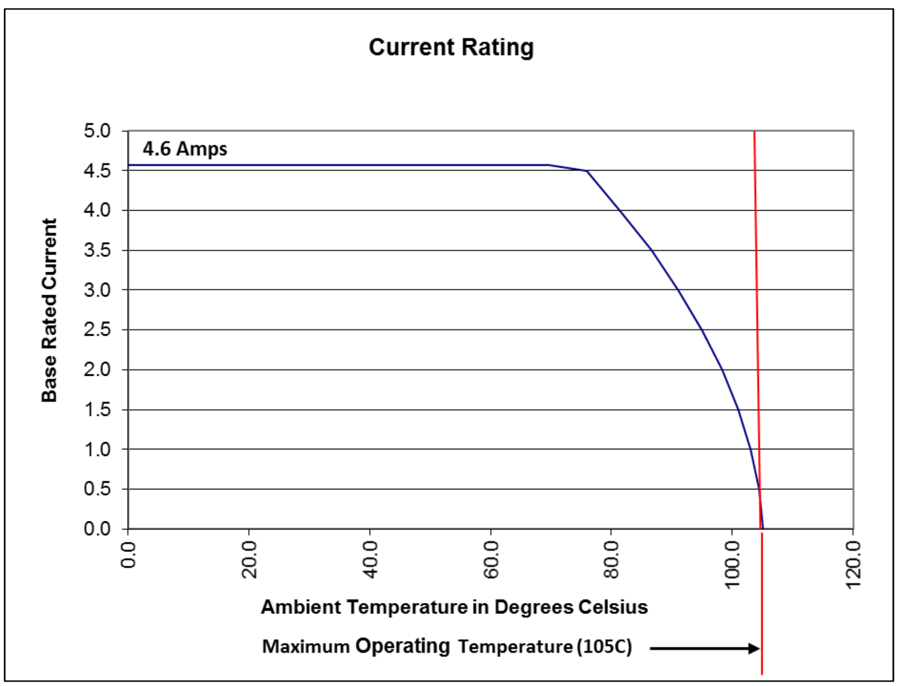
Figure 3

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 was applied.

All header specimens with brass had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 4.6 amperes and the correct de-rating factor value based on the specimen wiring configuration. See Figure 4.

Current Rating Base Curve (Header Specimens with Brass)



SINGLE	F FACTOR CONNECTOR LOADED	
	50%	100%
1	0.510	0.392

Figure 4

2.6. Vibration—Groups 1 and 2

No discontinuities were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the specimens were visible. Discontinuities were not measured for test group 2; these samples were energized at an 18°C temperature rise and 100% loaded.

2.7. Mechanical Shock—Group 1

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

2.8. Durability—Group 1

No physical damage occurred to the specimens as a result of mating and un-mating 200 times.

2.9. Mating Force—Group 1

All mating force measurements were less than 5 ounces per contact.

2.10. Un-Mating Force—Group 1

All un-mating force measurements were greater than 0.8 ounces per contact.

2.11. Contact Retention—Group 4

No physical damage occurred to neither the contacts nor the housing, and no contacts dislodged from the housings as a result of applying an axial load of 2 lbs to the contacts.

2.12. Thermal Shock—Group 3

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

2.13. Humidity-Temperature Cycling—Group 3

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

2.14. Temperature Life—Group 2

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

2.15. Mixed Flowing Gas—Group 2

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

2.16. Final Examination of Product—All 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 C of C 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. Termination Resistance

Termination resistance measurements at low level current were made using a 4-terminal measuring technique. See Figure 5. The test current was maintained at 100 milliamperes (maximum) with a 20 millivolt (maximum) open circuit voltage.

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts of un-mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.4. Dielectric Withstanding Voltage

A test potential of 500 volts AC was applied between the adjacent contacts. This potential was applied for 1 minute and then returned to zero.

Typical Low Level Contact Resistance Measurement Points

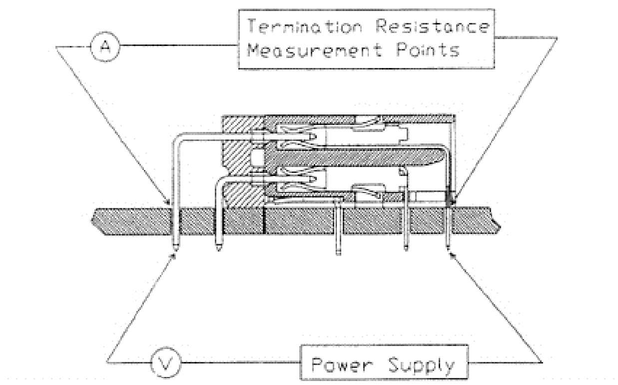


Figure 5

3.5. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at 5 different current levels. These measurements were plotted to produce a temperature rise versus current curve. Thermo-couples were attached to individual contacts to measure their temperatures on the phosphor bronze specimens. Thermography was used to measure temperature on the brass header specimens. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings were taken at 5-minute intervals and did not differ by more than 1°C, the temperature measurement was recorded.

3.6. Vibration

Mated connectors were subjected to sinusoidal vibration having a simple harmonic motion with an amplitude of 0.06 in., double amplitude, or 15 g (whichever was less). The vibration frequency was varied logarithmically between the limits of 10 and 2,000 Hz and returned to 10 Hz in 20 minutes. This cycle was performed 12 times in each of 3 mutually perpendicular planes for a total vibration time of 12 hours. Connectors were monitored for discontinuities greater than 1 microsecond using a current of 100 milliamperes in the monitoring circuit (test group 1 only). Test group 2 samples were energized with a current producing a temperature rise of about 18°C.

3.7. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6 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.

3.8. Durability

Specimens were mated and un-mated 200 times at a maximum rate of 150 cycles per hour.

3.9. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device and a free floating fixture. The cross-head rate of travel was 0.5 in./minute. The average force per contact was calculated.

3.10. Un-Mating Force

The force required to un-mate individual specimens was measured using a tensile/compression device and a free floating fixture. The crosshead rate of travel was 0.5 in./minute. The average force per contact was calculated.

3.11. Contact Retention

An axial load of 2 lbs was applied to each contact and held for 60 seconds. The force was applied in a direction to cause removal of the contacts from the housing.

3.12. Thermal Shock

Un-mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30-minute dwells. The transition between temperatures was less than 1 minute.

3.13. 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. See Figure 6.

Typical Humidity-Temperature Cycling Profile

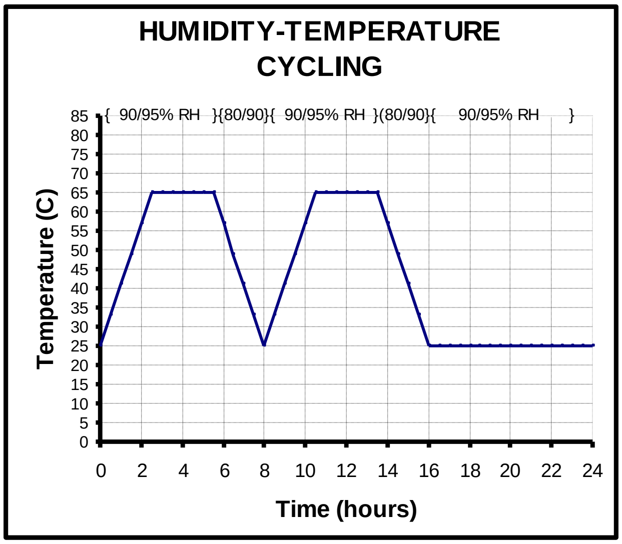


Figure 6

3.14. Temperature Life

Mated samples were exposed to a temperature of 118°C for 792 hours.

3.15. Mixed Flowing Gas

Specimens of the original testing from 1995 were exposed to MFG class III, and the specimens with the brass headers were exposed to MFG class IIIA.

A. Class III

Mated specimens were exposed for 10 days to a mixed flowing gas class III exposure.

NOTE
Class III exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb.

B. Class IIIA

Mated connectors with 30 micro-in. gold plating were exposed for 20 days to a mixed flowing gas class III exposure.

NOTE
Class IIIA exposure is defined as a temperature of 30°C and a relative humidity of 70% 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. Specimens were pre-conditioned with 10 cycles of durability.

3.16. Final Examination of Product

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