AMP

QUALIFICATION TEST REPORT

AMPMODU* Connectors
and
AMP* Box Contact Connectors
Per MIL-C-55302D

501-21 Rev. 0

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CORPORATE TEST LABORATORY

Qualification Retention Test of AMPMODU Connectors and AMP Box Contact Connectors per MIL-C-55302D

1. Introduction

1.1 Purpose

Testing was conducted to determine that AMPMODU Connectors and AMP Box Contact Connectors continue to comply with the Group C Inspection requirements of MIL-C-55302D, paragraph 4.5.4.

1.2 Scope

This report covers electrical and mechanical performance of these connectors, made by the Packaging and Components Division of the General Products Group. Connectors, representative of current production, were subjected to inspection and accepted by the Product Assurance Department of the division. They were submitted to the laboratory on Feb. 20, 1984. Testing was performed between March 27, 1984 and June 5, 1984.

1.3 Conclusions

All samples met the the Group C periodic inspection requirements specified in MIL-C-55302D.

1.4 Product Description

The AMP Box Contact Connector Series is a two-piece board to board connector system, which is especially suitable for use in systems containing 100 or more contacts per connector. Tongues and grooves on headers and receptacles provide polarization and positive contact alignment, eliminating the need for card guides.

AMPMODU connectors consist of rectangular shaped housings with either one or two rows of contacts. These connectors are soldered directly to a printed circuit board and through the use of a pin assembly can mate another printed circuit board at a 90° angle.

1.5 Test Samples

The following items were subjected to the Group C Inspection Test sequence of MIL-C-55302D:

Quantity	Part Number	Description
2	531133-8	240 Position Pin Header, 0.100 inch Grid
2	1-530753-8	110 Position Pin Header, 0.100 inch Grid
2	530785-4	180 Position Pin Header, 0.075 inch Grid
2	1-583697-1	110 Position Pin Header, 0.075 inch Grid
2	1-530743-1	128 Position Pin Header, 0.050 inch Grid
2	531803-4	50 Position Pin Header, 0.050 inch Grid
2	530725-3	80 Position Pin Header, 0.050 inch Grid
2	583706-6	110 Position Pin Header, 0.100 inch Grid
2	531721-9	110 Position Pin Header, 0.100 inch Grid
2	531134-8	240 Position Receptacle, 0.100 inch Grid
2	583707-6	110 Position Receptacle, 0.100 inch Grid
2	531145-4	180 Position Receptacle, 0.075 inch Grid
2	1-583698-1	110 Position Receptacle, 0.075 inch Grid
2	1-530745-1	128 Position Receptacle, 0.050 inch Grid
2	530745-4	50 Position Receptacle, 0.050 inch Grid
2	530726-3	80 Position Receptacle, 0.050 inch Grid
4	530758-9	110 Position Receptacle, 0.100 inch Grid
2	6-87961-4	130 Position Receptacle, 0.100 inch Grid
2	5-87968-8	59 Position Receptacle, 0.100 inch Grid

Sample Identification:

Sample Number	AMP Part Numbers
1	531133-8 mated with 531134-8
2	1-530753-8 mated with 583707-6
3	530785-4 mated with 531145-4
4	1-583697-1 mated with 1-583698-1
5	1-530743-1 mated with 1-530745-1
6	531803-4 mated with 530745-4
7 (AMPMODU)	0.025 inch Sq. Post mated with 6-87961-4
8	530725-3 mated with 530726-3
9 (AMPMODU)	0.025 inch Sq. Post mated with 5-87968-8
10	583706-6 mated with 530758-9
11	531721-9 mated with 530758-9

1.6 Test Sequence Specified in MIL-C-55302D

Samples were subjected to the test sequence listed below:

Sub Group 1:

Test	Requirement Paragraph	Method Paragraph
Oversize pin exclusion	3.6	4.7.2
Contact engagement and separation forces	3.7	4.7.3
Contact retention	3.11	4.7.6
Dielectric withstanding voltage (high altitude)	3.13	4.7.7.2
Contact life	3.15	4.7.9
Contact resistance	3.10	4.7.5
Mating and unmating	3.8	4.7.4
Vibration	3.16	4.7.10
Shock (specified pulse)	3.20	4.7.14
Contact resistance	3.10	4.7.5
Mating and unmating	3.8	4.7.4
Salt spray	3.17	4.7.11
Low level circuit	3.18	4.7.12
Contact resistance	3.10	4.7.5
Visual and mechanical	3.4.6, 3.27 and 3.28.1	4.7.1
Interchangeability	3.5	4.7.1.1

Sub Group 2

Dielectric withstanding voltage (sea level)	3.13	4.7.7.1
Temperature cycling	3.19	4.7.13
Contact resistance	3.10	4.7.5
Humidity	3.21	4.7.15
Insulation resistance	3.14	4.7.8
Mating and unmating	3.8	4.7.4
Visual and mechanical	3.4.6, 3.27 and 3.28.1	4.7.1
Interchangeability	3.5	4.7.1.1

Each sub group consisted of one connector assembly of each of the eleven sample numbers listed in paragraph 1.5.

2. Summary of Test Results

Sub Group 1

2.1 Oversized Pin Exclusion

None of the sockets permitted entrance of the test pin, and there was no evidence of damage to any socket after testing.

Test Method:

A steel test pin was applied to seven socket contacts in each receptacle connector for 10 seconds.

Pin Size	Force	Sample Nos.
0.050 inch	80.0 oz	7 & 9
0.0465 inch	80.0 oz	1, 2, 3, 4, 10, 11
0.0330 inch	32.0 oz	5, 6, 8

2.2 Contact Engaging and Separating Forces

A maximum size pin was inserted into seven randomly selected contacts in each sample connector and the insertion forces were recorded. Then a minimum size pin was inserted into and withdrawn from the same contacts and the withdrawal forces were recorded.

Sample Number	Insertion Force (max)	Specification Limit (max)	Withdrawal Force (min)	Specification Limit (min)
1	3.4 oz	6.0 oz	0.8 oz	0.1 oz
2	3.2 oz	6.0 oz	0.8 oz	0.1 oz
3	1.3 oz	6.0 oz	1.0 oz	0.1 oz
4	1.1 oz	6.0 oz	0.6 oz	0.1 oz
5	5.4 oz	6.0 oz	2.7 oz	0.1 oz
6	4.5 oz	6.0 oz	1.3 oz	0.1 oz
7	4.8 oz	6.0 oz	3.2 oz	0.75 oz
8	4.8 oz	6.0 oz	1.6 oz	0.1 oz
9	5.6 oz	6.0 oz	1.9 oz	0.75 oz
10	1.9 oz	6.0 oz	0.6 oz	0.1 oz
11	1.9 oz	6.0 oz	0.6 oz	0.1 oz

Test Method:

Receptacles were mounted in a fixture suitable for applying a gradually increasing load for the engagement and separation of the test pins from the socket contacts. For samples 7 and 9, a 0.025 inch square, gold plated test pin was inserted to a depth of 0.315 inch. The remaining samples were tested with suitable test pins in accordance with MS3197 which were inserted to a depth of 0.140 inch, measured from the front of the socket contact.

2.3 Contact Retention

After the contact retention test there was no sign of any contact displacement greater than 0.015".

Test Method:

Connector halves were supported in a suitable test fixture. The specified axial load was applied to seven contacts in each sample and was held for five seconds.

2.4 Dielectric Withstanding Voltage (70,000 feet)

There was no sign of flashover or breakdown during this test.

Test Method:

Mated connectors were wired as specified. They were subjected to a simulated altitude of 70,000 feet. While at this altitude, samples 5, 6, and 8 had a test voltage of 150 v ac applied for one minute. Samples 7 and 9 were tested at 275v ac, and the remaining samples were tested at 200 v ac.

2.5 Contact Life

After 500 matings and unmatings, samples were examined and found to have no signs of visible physical damage.

Test Method:

Test samples were mated and unmated mechanically for 500 cycles at a rate of approximately 500 cycles per hour. After visual examination, contact resistance and mating and unmating forces were measured.

2.6 Contact Resistance

All samples met the contact resistance requirements of the specification. Values listed below are in ohms.

Sample Number	Maximum Res.	Average Res.	Max. Res. Requirement	Max. Average Res. Requirement
1	0.018	0.013	0.020	none
2	0.011	0.010	0.020	none
3	0.018	0.013	0.020	0.015
4	0.015	0.012	0.020	0.015
5	0.022	0.019	0.030	0.025
6	0.016	0.014	0.020	0.015
7	0.007	0.005	0.012	none
8	0.009	0.008	0.030	0.025
9	0.005	0.003	0.012	none
10	0.014	0.012	0.020	0.015
11	0.013	0.010	0.020	none

2.6 Contact Resistance (continued)

Test Method

After the contact life test, contact resistance was measured, as specified, on seven mated pairs of contacts in each sample.

2.7 Mating and Unmating Forces

All samples met the mating and unmating force requirements of the specification. Values listed below are in pounds.

Sample Number	Mating Force	Max. Mating Force Requirement	Unmating Force	Min. Unmating Force Requirement
1	20.0	60.0	15.5	6.00
2	10.4	27.5	9.7	2.75
3	17.0	45.0	15.6	4.50
4	7.5	27.5	6.0	2.75
5	19.7	38.4	10.0	3.84
6	9.2	15.0	6.0	1.50
7	19.4	56.8	9.4	6.09
8	18.0	24.0	12.5	2.40
9	14.5	25.8	13.0	2.76
10	9.2	27.5	4.0	2.75
11	9.0	27.5	5.4	2.75

Test Method:

After three unmonitored matings and unmatings, the force required to fully insert and withdraw a plug from a receptacle was measured.

2.8 Vibration

After the vibration test, samples were examined and found to have no visible physical damage. No discontinuities were detected during testing.

Test Method:

Mated connectors were subjected to vibration having sinusoidal motion with an amplitude of either 0.06 inch double amplitude or 15 gravity units peak, whichever was less. The vibration frequency was varied between the limits of 10 and 2000 hertz and returned to 10 hertz in a time period of 20 minutes. This cycle was performed 12 times in each of three mutually perpendicular directions. The connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

2.9 Physical Shock

After the physical shock test, samples were examined and found to have no signs of visible physical damage. No discontinuities were detected during testing.

Test Method:

Mated connectors were subjected to physical shock. The parameters were a sawtooth waveform of 100 gravity units for a duration of six milliseconds. One shock in each direction was applied along the three mutually perpendicular directions for a total of six shocks. The connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit. After visual examination, contact resistance and mating and unmating forces were measured again.

2.10 Contact Resistance

All samples met the contact resistance requirements of the specification. Values listed below are in ohms.

Sample Number	Maximum Res.	Average Res.	Max. Res. Requirement	Max. Average Res. Requirement
1	0.018	0.013	0.020	none
2	0.012	0.011	0.020	none
3	0.016	0.014	0.020	0.015
4	0.014	0.012	0.020	0.015
5	0.020	0.019	0.030	0.025
6	0.016	0.014	0.020	0.015
7	0.008	0.006	0.012	none
8	0.011	0.009	0.030	0.025
9	0.007	0.005	0.012	none
10	0.016	0.014	0.020	0.015
11	0.014	0.011	0.020	none

Test Method:

After the physical shock test, contact resistance was measured, as specified, on seven mated pairs of contacts in each sample.

2.11 Mating and Unmating Forces

All samples met the mating and unmating force requirements of the specification. Values listed below are in pounds.

Sample Number	Mating Force	Max. Mating Force Requirement	Unmating Force	Min. Unmating Force Requirement
1	13.5	60.0	13.0	6.00
2	9.0	27.5	3.0	2.75
3	25.0	45.0	10.0	4.50
4	13.0	27.5	7.5	2.75
5	28.0	38.4	15.0	3.84
6	7.4	15.0	6.0	1.50
7	20.4	56.8	13.0	6.09
8	14.0	24.0	5.5	2.40
9	10.5	25.8	7.0	2.76
10	8.0	27.5	3.5	2.75
11	13.5	27.5	4.3	2.75

Test Method:

After three unmonitored matings and unmatings, the force required to fully insert and withdraw a plug from a receptacle was measured.

2.12 Salt Spray

After salt spray testing, there was no evidence of corrosion damage.

Test Method:

Mated samples were exposed to a 5% salt fog environment at 95°F for 48 hours. After removal from the chamber they were cleaned, dried and visually examined.

2.13 Low Level Circuit Resistance

After salt spray testing, all samples met the low level circuit resistance requirements of the specification. Values listed below are in ohms.

Sample Number	Maximum Res.	Average Res.	Max. Res. Requirement	Max. Average Res. Requirement
1	0.016	0.013	0.020	none
2	0.013	0.011	0.020	none
3	0.012	0.009	0.020	0.015
4	0.018	0.013	0.020	0.015
5	0.024	0.015	0.030	0.025
6	0.015	0.009	0.020	0.015
7	0.006	0.004	0.012	none
8	0.012	0.009	0.030	0.025
9	0.006	0.003	0.012	none
10	0.013	0.009	0.020	0.015
11	0.019	0.013	0.020	none

2.13 Low Level Circuit Resistance (continued)

Test Method:

After salt spray testing, low level contact resistance was measured on seven mated pairs of contacts in each sample. A test current of one milliampere was used.

2.14 Contact Resistance

All samples met the contact resistance of the specification. Values listed below are in ohms.

Sample Number	Maximum Res.	Average Res.	Max. Res. Requirement	Max. Average Res. Requirement
1	0.017	0.012	0.020	none
2	0.011	0.010	0.020	none
3	0.012	0.012	0.020	0.015
4	0.012	0.012	0.020	0.015
5	0.027	0.022	0.030	0.025
6	0.017	0.010	0.020	0.015
7	0.005	0.005	0.012	none
8	0.008	0.008	0.030	0.025
9	0.007	0.004	0.012	none
10	0.010	0.008	0.020	0.015
11	0.016	0.008	0.020	none

Test Method:

After salt spray and low level circuit testing, contact resistance was measured on seven mated pairs of contacts in each sample.

2.15 Visual and Mechanical

After testing, the samples met the visual and mechanical requirements of the specification.

Test Method:

Samples were examined visually. There were no signs of any defects which would affect life, serviceability, or appearance of the connectors. All required marking was present and legible.

2.16 Interchangeability

All samples were found to meet the interchangeability requirements of the specification.

Test Method:

Receptacles of a given type were examined and were found to be capable of being mated with associated plugs meeting the requirements of MIL-C-55302D. The mated connectors and individual plugs and receptacles, having related part numbers, are directly and completely interchangeable.

3. Summary of Test Results

Sub Group 2

3.1 Dielectric Withstanding Voltage (sea level)

There was no sign of flashover or breakdown during this test.

Test Method:

Mated connectors were wired as specified. While at sea level, samples 5 and 6 had a test voltage of 600 v ac applied for one minute. Samples 7 and 9 were tested at 750 v ac, sample 8 was tested at 450 v ac and the remaining samples were tested at 900 v ac.

3.2 Temperature Cycling

After the temperature cycling test, samples were examined and found to have no signs of visible physical damage. They could be mated and unmated during the last cycle at each temperature extreme.

Test Method:

Mated connectors were exposed to temperature cycling at extremes of -65°C and +125°C. Five cycles, consisting of 30 minutes at each temperature with a transition of less than five minutes, were performed. After this exposure, contact resistance was measured.

3.3 Contact Resistance

All samples met the contact resistance requirements of the specification. Values listed below are in ohms.

Sample Number	Maximum Res.	Average Res.	Max. Res. Requirement	Max. Average Res. Requirement
1	0.012	0.010	0.020	none
2	0.009	0.009	0.020	none
3	0.013	0.012	0.020	0.015
4	0.013	0.012	0.020	0.015
5	0.019	0.018	0.030	0.025
6	0.010	0.008	0.020	0.015
7	0.008	0.007	0.012	none
8	0.008	0.007	0.030	0.025
9	0.009	0.007	0.012	none
10	0.014	0.011	0.020	0.015
11	0.010	0.009	0.020	none

Test Method:

After temperature cycling, contact resistance was measured on seven mated pairs of contacts in each sample.

3.4 Humidity

After humidity-temperature cycling, samples were examined and found to have no sign of visible physical damage.

Test Method:

Test samples were exposed to ten cycles of humidity-temperature cycling as specified. A loading voltage of 100 v dc was applied between adjacent contacts during the test. Following completion of this exposure, insulation resistance was measured and the mating and unmating test was carried out.

3.5 Insulation Resistance

All samples met the minimum insulation resistance requirement of 1.0×10^3 megohms. Values listed below are in megohms.

Sample Number	Insulation Resistance
1	2.6×10^6
2	2.6×10^5
3	3.4×10^6
4	1.0×10^5
5	1.4×10^5
6	5.0×10^6
7	3.0×10^4
8	1.3×10^4
9	6.0×10^3
10	2.2×10^6
11	3.0×10^6

Test Method:

After humidity-temperature cycling, insulation resistance measurements were taken between adjacent contact pairs, between contacts and hardware, and between contacts and shell, if any.

3.6 Mating and Unmating Forces

All samples met the mating and unmating force requirements of the specification. Values listed below are in pounds.

Sample Number	Mating Force	Max. Force Requirement	Unmating Force	Min. Force Requirement
1	21.0	60.0	19.5	6.00
2	11.3	27.5	9.5	2.75
3	14.2	45.0	11.7	4.5
4	7.8	27.5	6.5	2.75
5	19.3	38.4	15.5	3.84
6	7.0	56.8	6.7	6.06
7	19.2	56.8	10.5	6.09
8	23.3	24.0	22.0	2.40
9	14.0	25.8	13.7	2.76
10	9.6	27.5	8.0	2.75
11	10.7	27.5	6.8	2.75

Test Method:

After three unmonitored matings and unmatings, the force required to fully insert and withdraw a plug from a receptacle was measured.

3.7 Visual and Mechanical

After testing, the samples met the visual and mechanical requirements of the specification.

Test Method:

Samples were examined visually. There were no signs of any defects which would affect life, serviceability, or appearance of the connectors. All required marking was present and legible.

3.8 Interchangeability

All samples were found to meet the interchangeability requirements of the specification.

Test Method:

Receptacles of a given type were examined and were found to be capable of being mated with associated plugs meeting the requirements of MIL-C-55302D. The mated connectors and individual plugs and receptacles, having related part numbers, are directly and completely interchangeable.

4. Test Equipment Calibration

4.1 Calibrated Equipment

Calibrated test equipment used for this program is on a periodic calibration schedule which complies with MIL-STD-45662. Calibration of test equipment is performed by AMP Corporate Metrology, with standards that are traceable to the National Bureau of Standards.

4.2 Uncalibrated Equipment

All uncalibrated equipment (ovens, chambers, power supplies and the like) used for this program were monitored with calibrated equipment.

5. Validation

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