# Connector, Mini-Box Contact With Compliant Printed Wiring Board Termination

## 1. INTRODUCTION

### 1.1. Purpose

Testing was performed on AMP* Mini-Box Connector with compliant pin contacts to determine its conformance to the requirements of AMP Product Specification 108-1663 Rev. O.

### 1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Mini-Box Connector with compliant pin contacts manufactured by Aerospace & Government Systems Sector. The testing was performed between April 9, 1997 and June 13, 1997.

### 1.3. Conclusion

The Mini-Box Connector with compliant pin contacts, listed in paragraph 1.5., meet the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1663 Rev O.

### 1.4. Product Description

The AMP Mini-box connector assembly provides a connection method for .050 inch centerline and a solderless compliant pin termination to a printed wiring board. The pins are brass with 50$\mu$in gold in the contact area, 100$\mu$in tin on the tail over nickel on the entire contact. The receptacles are beryllium copper with 50$\mu$in gold in the contact area, 100$\mu$in tin on the tail over nickel on the entire contact. The housing material is liquid crystal polymer.

### 1.5. Test Samples

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

| Test Group | Quantity | Part Nbr | Description |
|---|---|---|---|
| 1,2,3,4,6 | 3 ea | 2-530743-2 | 128 Pos. Pin Header |
| 1,2,3,4,6 | 3 ea. | 1-443362-1 | 128 Pos. Receptacle |
| 5 | 5 ea. | 443066-2 | Receptacle Contact with Compliant Pin |

1.6. Qualification Test Sequence

| Test or Examination | Test Groups | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Examination of Product | 1,9 | 1,5 | 1,5 | 1,8 | 1,5 | 1,5 |
| Termination Resistance, Dry Circuit | 3,7 | 2,4 | 2,4 | | | 2,4 |
| Dielectric Withstanding Voltage | | | | 2,7 | | |
| Insulation Resistance | | | | 3,6 | | |
| Vibration | 5 | | | | | |
| Physical Shock | 6 | | | | | |
| Durability | 4 | | | | | |
| Contact Engaging Force | | | | | 3 | |
| Contact Separating Force | | | | | 4 | |
| Insertion Force, compliant pin | | | | | 2 | |
| Mating Force | 2 | | | | | |
| Unmating Force | 8 | | | | | |
| Temperature Life | | 3 | | | | |
| Thermal Shock | | | | 4 | | |
| Humidity-temperature Cycling | | | 3 | 5 | | |
| Salt Spray Corrosion | | | | | | 3 |

**NOTE** *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 randomly selected from current production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, samples were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Termination Resistance, Dry Circuit - Groups 1, 2, 3 and 6

All termination resistance measurements, taken at 100 milliamperes maximum and 50 millivolts open circuit voltage were less than 25 milliohms initially and 30 milliohms finally.

| Test Group | Nbr of Data points | Condition | Termination Resistance Min | Max | Mean |
|---|---|---|---|---|---|
| 1 | 383 (a) | Initial | 9.05 | 16.25 | 12.654 |
| | 256 (b) | After Mechanical | 9.23 | 18.24 | 12.929 |
| 2 | 384 | Initial | 9.16 | 16.12 | 12.481 |
| | 383 (a) | After Temp Life | 9.56 | 18.81 | 13.412 |
| 3 | 78 | Initial | 10.17 | 16.45 | 13.290 |
| | 78 | After Humidity | 10.74 | 10.10 | 13.060 |
| 6 | 384 | Initial | 9.13 | 16.35 | 12.687 |
| | 384 | After Salt Spray | 9.29 | 19.20 | 13.411 |

All values in milliohms

**NOTE**

*(a) Sample 102 and 201 had one data point mis-read.*
*(b) Sample 101 was physically damaged (non-testing) and removed from testing.*

2.3. Dielectric Withstanding Voltage - Group 4

No dielectric breakdown or flashover occurred.

2.4. Insulation Resistance - Group 4

All insulation resistance measurements were greater than 1000 megohms.

2.5. Vibration - Group 1

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

2.6. Physical Shock - Group 1

No discontinuities were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.7. Durability - Group 1

No physical damage occurred to the samples as a result of mating and unmating the connector 500 times.

2.8. Contact Engaging Force - Group 5

All contact engaging forces were less than 6.0 ounces per contact.

2.9. Contact Separating Force - Group 5

All contact separating forces were greater than 0.1 ounces per contact.

2.10. Insertion Force, compliant pin - Group 5

The force required to fully insert a compliant pin into an PC board plated thru hole was less than 6.0 pounds.

2.11. Mating Force - Group 1

All mating force measurements were less than 0.30 pound per contact.

2.12. Unmating Force - Group 1

All unmating force measurements were greater than 0.03 pound per contact.

2.13. Temperature Life - Group 2

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

2.14. Thermal Shock - Group 4

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

2.15. Humidity-Temperature Cycling - Groups 3 and 4

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

2.16. Salt Spray Corrosion - Group 6

No evidence of physical damage was visible as a result of exposure to a salt spray.

## 3. TEST METHODS

3.1. Examination of Product

Where specified, samples were visually examined for evidence of physical damage detrimental to product performance.

3.2. Termination Resistance, Low Level

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes maximum with a 50 millivolt open circuit voltage.

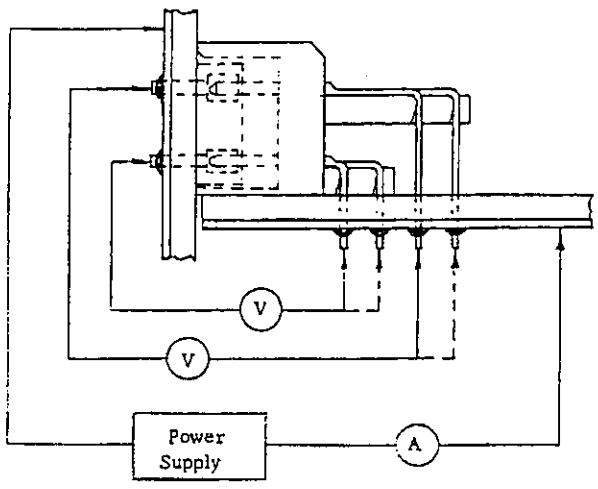



Figure 1
Typical Termination Resistance Measurement Points

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts, using a test voltage of 500 volts DC. This voltage was applied for 2 minutes before the resistance was measured.

3.4. Dielectric Withstanding Voltage

A test potential of 600 volts AC was applied between the adjacent contacts. This potential was applied for 1 minute and then returned to zero.

3.5. Vibration, 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 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 of 1 microsecond or greater using a current of 100 milliamperes DC.

3.6. Physical Shock

Mated connectors were subjected to a physical 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. Connectors were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.7. Durability

Connectors were mated and unmated 500 times at a rate of 600 cycles per hour.

3.8. Contact Engaging Force

After 3 sizing with a 0.019 inch post gage the engaging forces were measured by inserting a 0.019 post gage a depth of 0.147 inch into the sized receptacle contact.

3.9. Contact Separating Force

After 3 sizing with a 0.019 inch post gage the separating forces were measured by extracting an 0.017 post gage from a depth of 0.147 inch into the sized PCB hole.

3.10. Insertion Force, Compliant Pin

Compliant pin insertion force was measured by applying an increasing force to the pin until the pin was fully seated in the PCB hole.

3.11. Mating Force

The force required to mate fully loaded connectors was measured using a tensile/compression device with the rate of travel at 0.5 inch/minute and a free floating fixture. The force per contact was calculated.

3.12. Unmating Force

The force required to unmate fully loaded connectors was measured using a tensile/compression device with the rate of travel at 0.5 inch/minute and a free floating fixture. The force per contact was calculated.

3.13. Temperature Life

Mated samples were exposed to a temperature of 125°C for 1000 hours.

3.14. Thermal Shock

Mated connectors were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -65 and 125°C. The transition between temperatures was less than 1 minute.

3.15. 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 and 65°C twice while maintaining high humidity. (Figure 2)

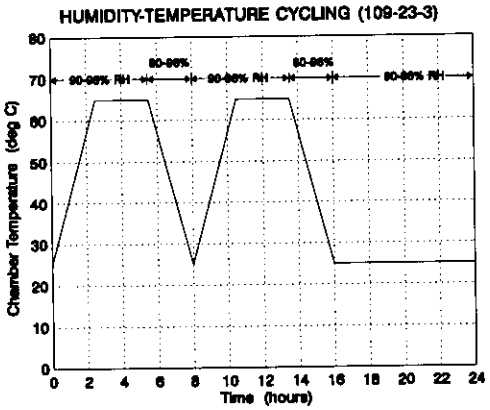


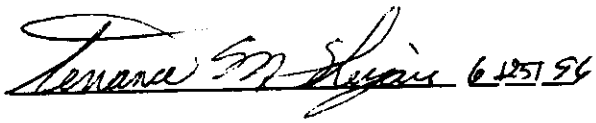

Figure 2
Typical Humidity-Temperature Cycling Profile

3.16. Corrosion, Salt Spray

Mated connectors were subjected to a 5% salt spray environment for 48 hours. The temperature of the box was maintained at 95 +2/-3°C, and the pH of the salt solution was between 6.5 and 7.2.

## 4. VALIDATION

Prepared by:



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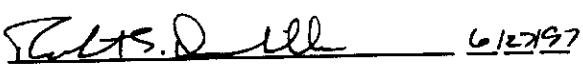

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