Eurocard Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMP* Eurocard connector to determine its conformance to the requirements of DIN 41612, Part 5, Performance Levels 1 and 2, dated October 1987.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Eurocard connector. Testing was performed at the Americas Regional Laboratory between April 1994 and April 1999. The test file numbers for this testing are CTL5607-075-008, CTL5607-111-016, and CTL6303-003. This documentation is on file at and available from the Americas Regional Laboratory.

1.3. Conclusion

The Eurocard connectors listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of DIN 41 612, Part 5, Performance Levels 1 and 2 with the noted exceptions.

NOTE *The Group AP connectors were not subjected to test sequence AP-8, test 6a; Acceleration. (Level 1 requirement).*
The Group EP connectors were not subjected to test sequence EP-3, test 11e; Growth of Mold. (Level 1 requirement).
The Group EP connectors were not subjected to test sequence EP-5, test 20a; Combustibility. (Level 1 requirement).

1.4. Product Description

The product tested was the Eurocard Type R connector, which is a 2 piece, 0.100 inch centerline, 3 row, 96 position, inverse style connector for board to board applications. The TTR receptacle connectors (PN 650461-5) and pin connectors (PN 650470-5) were plated with 3 to 5 microinches of gold over 30 microinches of palladium-nickel in the contact area. All contacts had 50 to 90 microinches of nickel underplating. Testing was also performed on outer row contacts of the enhanced 5 row Eurocard receptacle connector (PN 1-148445-1). Contact platings for the 5 row receptacle connectors were the same as for the 3 row. A total of 26 connectors of both types were tested.

1.5. Test Samples

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

Test Group	Quantity	Part Number	Description
AP	6	650461-5	TTR receptacle assembly
AP	6	650470-5	Pin assembly
AP	6	1-148445-1	Enhanced 5 row VME 64X receptacle assembly
AP	6	02 01 160 2101	Harting pin assembly
BP	8	650461-5	TTR receptacle assembly
BP	8	650470-5	Pin assembly

Figure 1 (cont)

* Trademark
I Indicates change

Test Group	Quantity	Part Number	Description
BP	8	1-148445-1	Enhanced 5 row VME 64X receptacle assembly
BP	8	02 01 160 2101	Harting pin assembly
CP,DP,EP	12	650461-5	TTR receptacle assembly
CP,DP,EP	12	650470-5	Pin assembly
CP,DP,EP	12	1-148445-1	Enhanced 5 row VME 64X receptacle assembly
CP,DP,EP	12	02 01 160 2101	Harting pin assembly

Figure 1 (end)

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 Groups (a)				
	AP	BP	CP	DP	EP
	Test Sequence (b)				
Examination of product	1,15,25	1,17	1,10	1,11	1,8
Connector polarization	2	2	2	2	2
Termination resistance, dry circuit	3,22	3,8,10,12	3,7	3,8	3
Insulation resistance	4,13,21	4,13	4,8	4	4
Dielectric withstanding voltage	5,9,14,23	5,14	5,9	5,9	5
Contact separating force	6	6,15			
Total insertion & withdrawal forces	7,24				
Solderability	8				
Vibration	10				
Physical shock	11				
Thermal shock	12				
Durability		7,11		6	
Terminal strength					6
Contact retention					7
Humidity-temperature cycling	17,20				
Humidity, steady state			6		
Industrial atmosphere		9			
Insulation resistance during dry heat	16				
Discharge voltage				10	
Dielectric withstanding voltage at partial vacuum	19				
Electrical load at high temperature				7	
Cold shock	18				
Static axial force		16			

NOTE

(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.

Figure 2

2. SUMMARY OF TESTING

2.1. Examination of Product - All Test Groups

All samples submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by the Product Assurance Department of the Capital Goods Business Group. Where specified, samples were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Connector Polarization - All Test Groups

All samples met the polarization check.

2.3. Termination Resistance, Dry Circuit - All Test Groups

All termination resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 20 milliohms at all specified measurement intervals.

Test Group	Number of Samples	Test Condition	Row	Values in Milliohms		
				Min	Max	Mean
AP	180	Initial reading	A	4.52	5.58	4.89
	180		B	5.66	6.73	5.94
	180		C	6.88	7.92	7.32
	18		D	6.86	8.22	7.58
	18		Z	6.57	8.33	7.10
	180	Final reading	A	4.86	6.57	5.25
	180		B	5.66	7.59	6.30
	180		C	6.79	8.97	7.56
	18		D	7.42	12.82	9.53
	18		Z	6.77	16.99	9.84
BP	240	Initial reading	A	4.63	5.65	4.94
	240		B	5.68	6.46	9.98
	240		C	6.84	7.94	7.32
	24		D	6.89	8.67	7.66
	24		Z	6.38	6.49	7.26
	240	After Durability See Note (a)	A	4.61	7.73	5.17
	240		B	5.72	6.72	6.11
	240		C	6.47	8.02	7.45
	24		D	6.73	9.83	7.77
	24		Z	6.49	8.53	7.27
	240	After Industrial Atmosphere	A	4.88	16.43	5.63
	240		B	5.79	12.52	6.66
	240		C	7.11	12.06	7.93
	24		D	7.01	10.52	7.86
	24		Z	6.57	8.88	7.40

Figure 3 (cont)

Test Group	Number of Samples	Test Condition	Row	Values in Milliohms		
				Min	Max	Mean
BP	240	After Durability See Note (a)	A	4.73	8.04	5.27
	240		B	5.87	10.84	6.66
	240		C	6.97	9.93	7.77
	24		D	7.22	13.72	9.42
	24		Z	6.75	11.11	7.71
CP	120	Initial reading	A	4.62	5.56	4.97
	120		B	5.71	6.69	6.02
	120		C	6.89	8.08	7.31
	12		D	7.16	7.84	7.44
	12		Z	6.69	7.90	7.11
	120	After Steady State Humidity	A	4.70	5.60	4.97
	120		B	5.62	6.60	6.01
	120		C	6.99	8.00	7.40
	12		D	7.25	11.11	8.35
	12		Z	6.58	18.92	8.56
DP	120	Initial reading	A	4.66	5.53	4.96
	120		B	5.76	6.62	6.04
	120		C	6.97	7.83	7.35
	12		D	6.72	8.25	7.34
	12		Z	6.28	7.60	6.87
	120	After Durability See Note (a)	A	4.62	5.67	5.10
	120		B	5.70	6.80	6.13
	120		C	6.93	8.03	7.42
	120	After Electrical Load At High Temperature	A	4.80	6.61	5.21
	120		B	5.88	7.54	6.24
	120		C	6.94	8.17	7.46
	12		D	6.72	10.41	8.12
	12		Z	6.29	7.71	6.96
EP	8	Initial reading	A	4.62	4.85	4.74
	8		B	6.04	6.51	6.20
	8		C	7.50	7.80	7.66
	12		D	6.62	8.23	7.34
	12		Z	6.14	7.81	7.07

NOTE

(a) DIN specification did not require a measurement at these intervals.
(b) A different resistance range for each row reflects the added bulk of longer solder tails in each row.

Figure 3 (end)

2.4. Insulation Resistance - All Test Groups

All insulation resistance measurements were greater than 1×10^{12} ohms initially and at all other measurement intervals subject to this requirement.

2.5. Dielectric Withstanding Voltage - All Test Groups

No dielectric breakdown or flashover occurred when a potential of 1,000 volts AC was applied between adjacent contacts.

2.6. Contact Separating Force - Test Groups AP and BP

All contact separating forces were greater than 0.15 Newton [0.54 ounce] per contact.

2.7. Total Insertion & Withdrawal Forces - Test Group AP

The total connector insertion and withdrawal forces were less than 90.7 Newtons [20.4 pounds].

2.8. Solderability - Test Group AP

The contact leads had a minimum of 95% solder coverage.

2.9. Vibration - Test Group AP

Contact resistance, of the monitored contacts, did not exceed 40 milliohms during the vibration exposure. Following vibration testing, there was no visual evidence of cracks, breaks, or other physical damage to any of the connector assemblies.

2.10. Physical Shock - Test Group AP

Contact resistance, of the monitored contacts, did not exceed 40 milliohms during the shock exposure. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.11. Thermal Shock - Test Group AP

No evidence of physical damage to either the contacts or the connectors was visible as a result of thermal shock.

2.12. Durability - Test Groups BP and DP

No physical damage occurred to the samples as a result of mating and unmating the Test Group BP connectors 500 times and the Test Group DP connectors 250 times.

2.13. Terminal Strength - Test Group EP

Six contacts per connector sustained a 20 Newtons [4.5 pounds] tensile and thrust force for a period of 10 seconds with no evidence of damage.

2.14. Contact Retention - Test Group EP

No contacts dislodged from the housing and no physical damage occurred to either the housings or contacts as a result of applying an axial load of 10 Newtons [2.25 pounds] to the contacts.

2.15. Humidity-Temperature Cycling - Test Group AP

No evidence of physical damage to either the contacts or the connectors was visible as a result of exposure to humidity-temperature cycling.

2.16. Humidity, Steady State - Test Group CP

There was no visible evidence of physical damage to either the contacts or the connectors as a result of exposure to a steady state humidity environment.

2.17. Industrial Atmosphere - Test Group BP

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to 21 days of a sulfur dioxide environment.

2.18. Insulation Resistance During Dry Heat - Test Group AP

There was no evidence of physical damage to either the contacts or the connectors as a result of exposure to an elevated temperature of 125°C. All insulation resistance measurements were greater than the required $1x10^{11}$ ohms.

2.19. Discharge Voltage - Test Group DP

There was no corona discharge greater than 5 picocoulombs at or below a potential of 1,000 volts AC. No evidence of physical damage to either the contacts or the connectors was visible as a result of performing the discharge voltage test.

2.20. Dielectric Withstanding Voltage At Partial Vacuum - Test Group AP

There were no dielectric breakdown failures to any adjacent contacts after applying 300 volts AC for 1 minute while at a partial vacuum of 300 millibars (simulated 30,000 foot altitude).

2.21. Electrical Load At High Temperature - Test Group DP

No evidence of physical damage to either the contacts or the connectors was visible as a result of maintaining a test current of 1 ampere through the contacts for 1,000 hours while at a 70°C testing temperature.

2.22. Cold Shock - Test Group AP

There was no evidence of physical damage to the contacts or connectors after exposure to a -55°C cold shock.

2.23. Static Axial Force - Test Group BP

No visible evidence of defects or cracks was noted in the housings after applying a static axial force of 90 Newtons [20.25 pounds].

3. TEST METHODS

3.1. Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2. Connector Polarization

All samples were checked for a polarization feature which would prevent the connector halves from being physically mated when improperly oriented.

3.3. Termination Resistance, Dry Circuit

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 4). The test current was maintained at 100 milliamperes DC with an open circuit voltage of 20 millivolts DC.

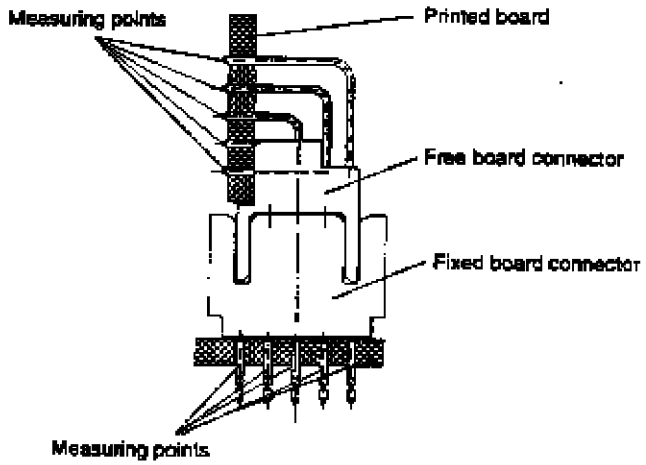

Figure 4
Typical Termination Resistance Measurement Points

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts, using a test voltage of 100 volts DC. This voltage was applied for 1 minute before the resistance was measured.

3.5. Dielectric Withstanding Voltage

A test potential of 1,000 volts AC was applied between the adjacent contacts. This potential was applied for 1 minute and then returned to zero.

3.6. Contact Separating Force

Row A, B, and C receptacle contacts were preconditioned 3 times using a maximum size gage pin of 0.024 by 0.039 inch. A minimum size gage pin of 0.022 by 0.039 inch was then inserted and withdrawn from the Row A, B, and C contacts while measuring the separating force. Row D and Z contacts were preconditioned 3 times using a maximum size gage pin of 0.048 inch. A minimum size gage pin of 0.0385 inch was then inserted and withdrawn from Row D and Z contacts while measuring the separating forces.

3.7. Total Insertion and Withdrawal Forces

A test sample consisted of a plug and receptacle with all contacts installed. Samples were mounted in test fixtures in a manner similar to normal service. The samples were aligned and brought to a position where mechanical mating began. Force measurements were taken while samples were mated and unmated at a rate of 1 inch per minute.

3.8. Solderability

Connector assembly contact solder tails were subjected to a solderability test by immersing them in a Type R flux for 5 to 10 seconds, allowed to drain for 10 to 60 seconds, then held over molten solder without contact for 2 seconds. The solder tails were then immersed in the molten solder at a rate of approximately 1 inch per second, held for 3 to 5 seconds, then withdrawn. After cleaning in isopropyl alcohol, the samples were visually examined for solder coverage. The solder used for testing was 60/40 tin lead composition and was maintained at a temperature of 245°C.

3.9. Vibration, Sine

Mated connectors were subjected to sinusoidal vibration having a simple harmonic motion with an amplitude of 0.06 inch, double amplitude or 20 g's peak, whichever is less. The vibration frequency was varied (logarithmically/uniformly) between the limits of 10 and 2000 Hz and returned to 10 Hz in 20 minutes. This cycle was performed 6 times in each of 3 mutually perpendicular planes, for a total vibration time of 6 hours. Six contact pairs on each connector were monitored for any increase in contact resistance which exceeded 40 milliohms.

3.10. 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 3 mutually perpendicular planes, for a total of 18 shocks. Six contact pairs on each connector were monitored for any increase in contact resistance which exceeded 40 milliohms.

3.11. Thermal Shock

Mated connectors were subjected to 5 cycles of temperature extremes with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -55 and 125°C, with transition between extremes of less than 1 minute.

3.12. Durability

Connectors were mated and unmated the specified number of times at a rate not exceeding 120 cycles per hour.

3.13. Terminal Strength

A thrust and tensile force of 20 Newtons [4.5 pounds] was applied in the axial direction to 6 contacts per connector for a period of 10 seconds.

3.14. Contact Retention

A load of 10 Newtons [2.25 pounds] was applied axially to 6 contacts per sample and held for 10 seconds. This load was applied in a direction which would have caused removal of the contacts from the housing.

3.15. Humidity-Temperature Cycling

Mated connectors were exposed to a total of 6 cycles of humidity-temperature cycling. Each 24 hour cycle consisted of cycling the temperature between 55°C (9 hours) and 25°C (9 hours) with a 3 hour transition time between each extreme. The relative humidity was held at 90%.

3.16. Humidity, Steady State

Mated connectors were subjected to a relative humidity of 93% and a temperature of 40°C for a period of 56 days.

3.17. Industrial Atmosphere

Four mated and 4 unmated connectors were exposed for 21 days to a 25 part per million concentration of sulfur dioxide at 25°C and a relative humidity of 75%.

3.18. Insulation Resistance During Dry Heat

Six mated connectors were subjected to a temperature of 125°C for 16 hours. Insulation resistance was measured on 3 adjacent contact pairs of each connector. These measurements were made while at ambient, initially and immediately after removal from the oven.

3.19. Discharge Voltage

The samples were connected to a partial discharge network with the detector set at 5 picocoulombs. The test voltage was gradually incremented above the required proof voltage of 1,000 volts AC until partial discharge (inception voltage) was observed on the oscilloscope. The voltage was then decreased until discharge extinction occurred. The extinction voltage was above the proof voltage of 1,000 volts AC.

3.20. Dielectric Withstanding Voltage At Partial Vacuum

Samples were placed in an altitude chamber with 3 adjacent contact pairs on each sample wired to test dielectric withstanding voltage. A test voltage of 300 volts AC was applied for 1 minute to each adjacent pair at a time while the chamber was maintained at a simulated altitude of 30,000 feet.

3.21. Electrical Load At High Temperature

Four mated samples were exposed to a temperature of 70°C for 1,000 hours. During the exposure period, a 1 ampere DC current was applied to all contacts of the series wired connector assemblies.

3.22. Cold Shock

Samples were placed in a test chamber environment of -55°C for a period of 2 hours. After removal, the samples were inspected for any evidence of physical damage.

3.23. Static Axial Load

An axial force of 90 Newtons [20.25 pounds] was applied to the top-center of the test connector (pin half) at a rate of 10 Newtons per second. A 15 mm diameter rod was used to apply the 90 Newton force which was maintained for 5 seconds. The connectors were supported by their end flanges only. Upon completion of the test, the samples were visually inspected for cracks, breaks or other physical damage to the housings.