SEC II Power Card Edge Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Standard Edge II (SEC II) Power Connector Assembly to determine its conformance to the requirements of Product Specification 108-2202, Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Tyco Electronics SEC II Power Connector Assembly. Testing was performed at the Engineering Assurance Product Testing Laboratory between 24Feb05 and 28Apr05. The test file number for this testing is CTLH089-014. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The Tyco Electronics SEC II Power Connector Assembly listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2202, Revision A.

1.4. Product Description

The Tyco Electronics SEC II Power Connector Assembly with high current contacts is to simultaneously carry high and low current.

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
1,3	5 each	1658780-1	Connector assembly, SEC II power card edge
2	3	1658780-1	Connector assembly, SEC II power card edge
1,2	8 each	60-474647-1	Printed circuit test board, Revision O
1,2	8 each	60-474647-2	Daughter card, Revision O

Figure 1

1.6. Environmental Conditions

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

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

* Trademark
| Indicates change

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)		
	1	2	3
	Test Sequence (b)		
Initial examination of product	1	1	1
Low level contact resistance	3,7	2,10	
Insulation resistance			2,6
Withstanding voltage			3,7
Temperature rise vs current		3,9	
Temperature life with current cycling		6	
Vibration, random	5	7(c)	
Mechanical shock	6	8(c)	
Durability	4		
Mating force	2		
Unmating force	8		
Thermal shock			4
Humidity, steady state			5
Temperature life		4(d)	
Mixed flowing gas		5(d)	
Final examination of product	9	11	8

NOTE
(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Discontinuities not measured, specimens energized at 18˚C level for 100% loading.
(d) Precondition specimens with 10 durability cycles.

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. Where specified, 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 4 milliohms for signal contacts, and less than 1.5 milliohms for power contacts.

Test Group	Number of Data Points	Condition	Termination Resistance			
			Min	Max	Mean	Contact Type
1	110	Initial	1.25	2.24	1.48	Signal
		After mechanical	1.35	3.56	1.62	
	40	Initial	0.40	0.61	0.50	Power
		After mechanical	0.40	0.69	0.51	
2	66	Initial	1.30	1.65	1.42	Signal
		After temperature rise	1.49	2.78	1.81	
	24	Initial	0.40	0.54	0.46	Power
		After temperature rise	0.44	0.96	0.61	

NOTE *All values in milliohms.*

Figure 3

2.3. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 5000 megohms.

2.4. Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

2.5. Temperature Rise vs Current - Test Group 2

Specimens had temperature rise specified in Figure 4.

Specimen Number	Amperes			
	4.0	6.0	15.0	22.0
	Signal Contacts		Power Contacts	
	100% Loading	Single Circuit	100% Loading	Single Circuit
Initial Reading				
1	19.0	7.6	18.8	15.6
2	16.7	6.2	17.6	14.0
3	17.0	6.5	18.3	15.9
Final Reading				
1	19.2	8.2	18.9	17.1
2	17.3	6.8	18.0	16.7
3	20.7	7.9	21.4	17.0

NOTE *All values in ˚C.*

Figure 4

2.6. Temperature Life with Current Cycling - Test Group 2

No evidence of physical damage was visible as a result of 50 cycles of current cycling. Test current was 15 amperes DC with a chamber temperature of 45˚C.

2.7. Vibration, Random - Test Groups 1 and 2

No discontinuities were detected during vibration testing for test group 1. Test group 2 specimens maintained the required 15 amperes current flow. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical Shock - Test Groups 1 and 2

No discontinuities were detected during mechanical shock testing for test group 1. Test group 2 specimens maintained the required 15 amperes current flow. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability - Test Group 1

No physical damage occurred as a result of mating and unmating the specimens 250 times.

2.10. Mating Force - Test Group 1

All mating force measurements were less than 19 ounces maximum per contact pair.

2.11. Unmating Force - Test Group 1

All unmating force measurements were greater than 1.25 ounces minimum per contact pair.

2.12. Thermal Shock - Test Group 3

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

2.13. Humidity, Steady State - Test Group 3

No evidence of physical damage was visible as a result of exposure to steady state humidity.

2.14. Temperature Life - Test Group 2

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

2.15. 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.

2.16. 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 have been produced, inspected, and accepted as conforming to product drawing requirements, and manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Low Level Contact Resistance

Resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 5). Test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

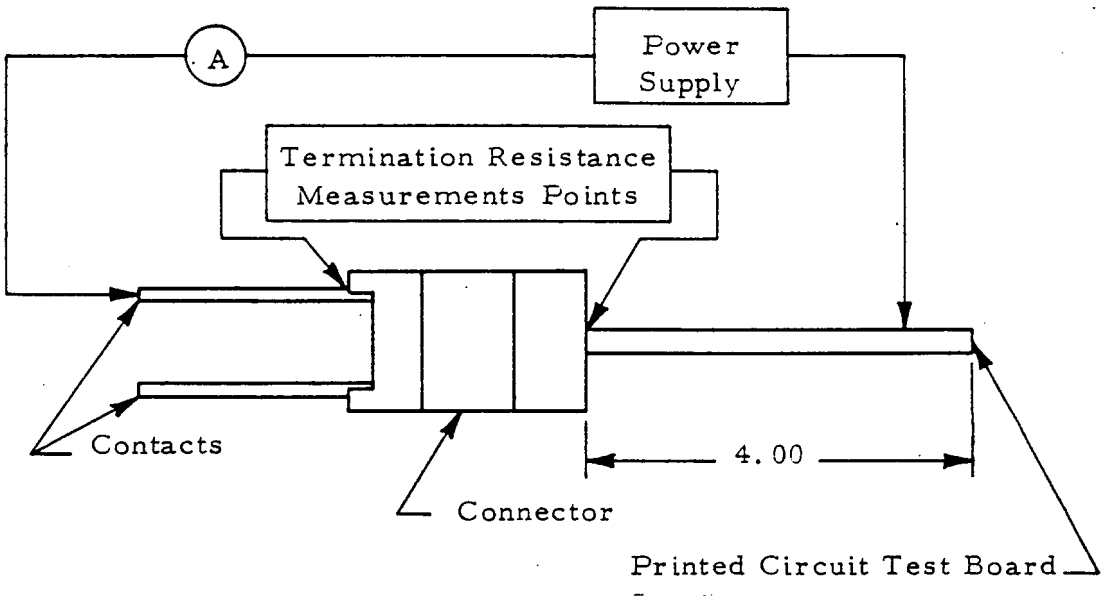

Figure 5
Low Level Contact Resistance Measurement Points

3.3. Insulation Resistance

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

3.4. Withstanding Voltage

A test potential of 1500 volts AC was applied between the adjacent contacts of unmated specimens for 1 minute and then returned to zero.

3.5. Temperature Rise vs Current

An infrared camera was used with standard optics to image the specimens. Sight holes were milled in the side of the plastic housing at various locations to image the interface. ThermaCAM™ Researcher 2001 thermal imaging processing system was used for data analysis. The area tool software feature was used to determine maximum temperature of the measurement area. The area tool software feature allows a shape, which can be sized, and placed on an area of interest. The pixels inside the shape are analyzed giving minimum, average, and maximum temperature. The test boards were placed in the temperature rise enclosure to ensure a free stable air environment for temperature measurement. Temperature measurements were taken at approximately 30 minutes, after current was applied, to ensure temperature stabilization.

3.6. Temperature Life with Current Cycling

Testing consisted of 50 cycles of current cycling, with each cycle having current ON for 30 minutes and current OFF for 15 minutes. Test current was 15 amperes DC. The chamber was maintained at 45˚C.

3.7. Vibration, Random

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 20 and 500 Hz. The spectrum was flat at 0.02 G^2/Hz from 20 to 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. This was performed for 10 minutes in each of 3 mutually perpendicular planes for a total vibration time of 30 minutes. Specimens in test group 1 were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC. Test group 2 specimens maintained the required 15 amperes current flow.

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 in test group 1 were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC. Test group 2 specimens maintained the required 15 amperes current flow.

3.9. Durability

Specimens were mated and unmated 250 times at a maximum rate of 500 cycles per hour.

3.10. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with the rate of travel at .5 inch per minute and a free floating fixture. The average force per contact pair was calculated.

3.11. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with the rate of travel at .5 inch per minute and a free floating fixture. The average force per contact pair was calculated.

3.12. Thermal Shock

Unmated 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.

3.13. Humidity, Steady State

Unmated specimens were subjected to a relative humidity of 90 to 95% and a temperature of 40˚C for a period of 96 hours.

3.14. Temperature Life

Mated specimens were exposed to a temperature of 105˚C for 500 hours. Specimens were preconditioned with 10 cycles of durability.

3.15. Mixed Flowing Gas, Class IIA

Mated specimens were exposed for 14 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30˚C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb, and SO_2 at 100 ppb. Specimens were preconditioned 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.