Z-PACK TinMan* Connector System

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Z-PACK TinMan* Connector System to determine its conformance to the requirements of Product Specification 108-2303 Revision B.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Z-PACK TinMan Connector System. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 11Jan08 and 16Apr08, additional testing was performed between 08Feb11 and 29Mar11. The test file numbers for this testing are CTLB086100-007 and EA20100985T Rev A respectively. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory.

1.3. Conclusion

The Z-PACK TinMan Connector System listed in Paragraph 1.5, conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2303 Revision B.

1.4. Product Description

The Z-PACK TinMan Connector System uses a modular concept to interconnects two printed circuit boards. Both receptacle and pin connectors are connected to the printed circuit board with plated thru-hole compliant press-fit leads.

1.5. Test Specimens

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

A. Test Report CTLB086100-007

Test Group	Quantity	Part Number	Description
1, 2a,4	6 each	1934218-1	Right angle receptacle with 30 µin Au plating
2b,5	3 each	1934218-1	Right angle receptacle with 30 µin Au plating
3	9	1934218-1	Right angle receptacle with 30 µin Au plating
1,2a,2b,4,5	3 each	1934269-1	Vertical header with 30 µin Au plating
3	6	1934269-1	Vertical header with 30 µin Au plating
1,2a,3,4	3 each	1934269-1	Vertical header with 15 µin PdNi plating
1,2a,4	6 each	60-104198-1	Header PCB
3	9	60-104198-1	Header PCB
5	3	60-104198-1	Header PCB
1,2a,4	6 each	60-1042199-1	Receptacle PCB
3	9	60-1042199-1	Receptacle PCB
5	3	60-1042199-1	Receptacle PCB

Figure 1 (continued)

| Indicates Change

B. Test Report EA20100985T

Test Group	Quantity	Part Number	Description
4	3	1934222-1	4 X 8 receptacle assembly, 3 µin Au over 27 µin PdNi over 50 µin Ni
	3	1934305-1	4 X 8 header assembly, 3 µin Au over 27 µin PdNi over 50 µin Ni
	3	60-1042862-1	Header PCB
	3	60-1042863-1	Receptacle PCB

Figure 1 (end)

1.6. Environmental Conditions

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

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

1.7. Qualification Test Sequence

A. Test Report CTLB086100-007

Test or Examination	Test Group (a)					
	1	2a	2b	3	4	5
	Test Sequence (b)					
Initial examination of product	1	1	1	1	1	1
Low level contact resistance	3,6,8,10,12	3,5,7,9,11		4(c),6	2,4,6,8,10,12,14,16	
Low level compliant pin resistance		2,12		3,7		
Insulation resistance			6			
Withstanding voltage			7			
Temperature rise vs current						2
Random vibration	9					
Mechanical shock	11					
Durability	5	4	2		3(d),15(d)	
Mating force	2,14					
Unmating force	4,13					
Compliant pin insertion force				2		
Compliant pin retention force				8		
Minute disturbance					13	
Thermal shock		8	4			
Humidity/temperature cycling		10	5			
Temperature life				5		
Mixed flowing gas (mated)					9(e),11(e)	
Mixed flowing gas (unmated)					5(e),7(e)	
Dust contamination	7	6	3			
Final examination of product	15	13	8	9	17	3

NOTE

(a) See Paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Perform 10 durability cycles prior to initial measurement.
(d) Perform 100 durability cycles before, and 100 durability cycles after mixed flowing gas testing.
(e) Exposure interval of 5 days.

Figure 2 (continued)

B. Test Report EA20100985T

Test or Examination	Test Group (a)
	4
	Test Sequence (b)
Initial examination of product	1
Low level contact resistance	2,4,6,8,10,12,14,16
Durability	3(c),15(c)
Minute disturbance	13
Mixed flowing gas (mated)	9(d),11(d)
Mixed flowing gas (unmated)	5(d),7(d)
Final examination of product	17

NOTE

(a) See Paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Perform 100 durability cycles before, and 100 durability cycles after mixed flowing gas testing.
(d) Exposure interval of 5 days.

Figure 2 (end)

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups (Test Reports CTLB086100-007 and EA20100985T)

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance (C of C) was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance

A. Test Report CTLB086100-007 - Test Groups 1, 2a, 3 and 4

All low level contact resistence measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 100 milliohms initially and had a change in resistance (ΔR) of less than 10 milliohms after testing.

B. Test Report EA20100985T - Test Group 4

All low level contact resistence measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 100 milliohms initially and had a change in resistance (ΔR) of less than 10 milliohms after testing.

Test Condition	Initial	After 100 Durability Cycles	After 5 Days Unmated Mixed Flowing Gas	After 10 Days Unmated Mixed Flowing Gas	After 5 Days Mated Mixed Flowing Gas	After 10 Days Mated Mixed Flowing Gas	After Minute Disturbance	After 100 Durability Cycles
Minimum	20.01	-2.12	-1.89	-2.23	-1.82	-2.19	-1.97	-2.35
Maximum	46.03	0.33	0.61	1.61	5.36	2.76	1.68	1.26
Average	33.72	-0.92	-0.58	-0.24	-0.42	-0.57	-0.32	-0.43
Standard Deviation	7.99	0.44	0.47	0.65	0.64	0.58	0.52	0.53
Nv[Nr]	192[192]	192[192]	192[192]	192[192]	192[192]	192[192]	192[192]	192[192]

Figure 3

2.3. Low Level Compliant Pin Resistance - Test Groups 2a and 3 (Test Report CTLB086100-007)

All compliant pin resistence measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 1 milliohm initially and had a change in resistance (ΔR) of less than 1 milliohm after testing.

2.4. Insulation Resistance - Test Group 2b (Test Report CTLB086100-007)

All insulation resistance measurements were greater than 1000 megohms.

2.5. Withstanding Voltage - Test Group 2b (Test Report CTLB086100-007)

No dielectric breakdown or flashover occurred.

2.6. Temperature Rise vs Current - Test Group 5 (Test Report CTLB086100-007)

All specimens had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of .5 ampere per signal contact, fully energized.

2.7. Random Vibration - Test Group 1 (Test Report CTLB086100-007)

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

2.8. Mechanical Shock - Test Group 1 (Test Report CTLB086100-007)

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

2.9. Durability

A. Test Report CTLB086100-007 - Test Groups 1, 2a, 3 and 4

No physical damage occurred as a result of mating and unmating the specimens 200 times.

B. Test Report EA20100985T - Test Group 4

No physical damage occurred as a result of mating and unmating the specimens 200 times.

2.10. Mating Force - Test Group 1 (Test Report CTLB086100-007)

All mating force measurements were less than 0.44 N [.1 lbf] average per contact.

2.11. Unmating Force - Test Group 1 (Test Report CTLB086100-007)

All unmating force measurements were greater than 0.1 N [.022 lbf] average per contact.

2.12. Compliant Pin Insertion Force - Test Group 3 (Test Report CTLB086100-007)

All compliant pin insertion force measurements were less than 44.5 N [10 lbf] average per contact.

2.13. Compliant Pin Retention Force - Test Group 3 (Test Report CTLB086100-007)

All compliant pin retention force measurements were greater than 4.4 N [1 lbf] average per contact.

2.14. Minute Disturbance - Test Group 4 (Test Reports CTLB086100-007 and EA20100985T)

No evidence of physical damage was visible as a result of minute disturbance.

2.15. Thermal Shock - Test Groups 2a and 2b (Test Report CTLB086100-007)

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

2.16. Humidity/temperature Cycling - Test Groups 2a and 2b (Test Report CTLB086100-007)

No evidence of physical damage was visible as a result of humidity/temperature cycling.

2.17. Temperature Life - Test Group 3 (Test Report CTLB086100-007)

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

2.18. Mixed Flowing Gas - Test Group 4 (Test Reports CTLB086100-007 and EA20100985T)

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

2.19. Dust Contamination - Test Groups 1, 2a and 2b (Test Report CTLB086100-007)

No evidence of physical damage was visible as a result of exposure to a dust laden atmosphere.

2.20. Final Examination of Product - All Test Groups (Test Reports CTLB086100-007 and EA20100985T)

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. Low Level Contact Resistance

Low level contact resistance measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

3.3. Low Level Compliant Pin Resistance

Low level compliant pin resistance measurements were made using a 4 terminal measuring technique. The test current was applied at the interface of each contact and the pad surrounding the thru-hole. The voltage drop was measured by probing the end of the contact protruding from the bottom of the thru-hole and on the pad surrounding the thru-hole.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 100 volts DC was applied for 2 minutes before the resistance was measured.

3.5. Withstanding Voltage

A test potential of 560 volts AC was applied between adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Temperature was measured with all signal contacts energized at .5 ampere. A thermocouple was placed between the 2 center chicklets to measure the temperature of the specimen while energized in the stable air environment of a temperature rise enclosure.

3.7. Random Vibration

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 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.8. Mechanical Shock

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 were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Durability

Specimens were mated and unmated 200 times at a maximum rate of 600 cycles per hour. Specimens exposed to mixed flowing gas were mated and unmated 100 times before and 100 times after exposure.

3.10. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute. The maximum average force per contact was calculated.

3.11. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute. The minimum average force per contact was calculated.

3.12. Compliant Pin Insertion Force

Specimens were pressed onto printed circuit boards using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.13. Compliant Pin Retention Force

Specimens were removed from the printed circuit boards using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.14. Minute Disturbance

Specimens were unmated and mated a distance of approximately 0.1 mm [.004 in].

3.15. Thermal Shock

Unmated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -65 and 90°C and 1 minute transition between temperatures.

3.16. Humidity/temperature Cycling

Mated specimens were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity.

3.17. Temperature Life

Mated specimens were exposed to a temperature of 90°C for 500 hours.

3.18. Mixed Flowing Gas, Class IIA

Mated specimens were exposed for 20 days (10 days unmated followed by 10 days mated) to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30°C and a relative humidity of 75% 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 subjected to 100 cycles of durability before and after exposure.

3.19. Dust Contamination

Unmated specimens were exposed to benign dust for 1 hour at a flow rate of 360 cfm.

3.20. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.