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IMPACT Power Qualification

1. INTRODUCTION

1.1 Purpose

Testing was performed on the Tyco Electronics IMPACT Power Connectors to determine their conformance to the requirements of 108-2473 Rev O2.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the IMPACT Power Connectors. Testing was performed at the Harrisburg Electrical Components Test Laboratory between March 22, 2012 and July13, 2012, 2012.

1.3 Conclusion

All test specimens met the requirements established in 108-2473 Rev O2.

1.4 Test Specimens

See Tables 1 through 2 for test specimen allocation and attributes.

Table 1- Test specimen allocation and attributes

Test Specimen Description				
Test Set	**Test Group**	**Quantity**	**Part Number**	**Attributes**
1	5	5	2169869-2	5 PAIR R/A Header Assembly
1	5	5	2169859-1	5 PAIR Vertical Receptacle Assembly
2	5	5	2169797-2	3 PAIR R/A Header Assembly
2	5	5	2169806-1	3 PAIR Vertical Receptacle Assembly
3	5	5	2169802-2	4 PAIR R/A Header Assembly
3	5	5	2169809-1	4 PAIR Vertical Receptacle Assembly
4	2	5	2169869-2	5 PAIR R/A Header Assembly
4	2	5	2169859-1	5 PAIR Vertical Receptacle Assembly
5	2	5	2169797-2	3 PAIR R/A Header Assembly
5	2	5	2169806-1	3 PAIR Vertical Receptacle Assembly
6	2	5	2169802-2	4 PAIR R/A Header Assembly
6	2	5	2169809-1	4 PAIR Vertical Receptacle Assembly

Table 2- Test specimen allocation and attributes continued

Test Specimen Description Cont.				
Test Set	**Test Group**	**Quantity**	**Part Number**	**Attributes**
7	3	5	2169797-2	3 PAIR R/A Header Assembly
7	3	5	2169806-1	3 PAIR Vertical Receptacle Assembly
8	3	5	2169869-2	5 PAIR R/A Header Assembly
8	3	5	2169859-1	5 PAIR Vertical Receptacle Assembly
9	1	5	2169869-2	5 PAIR R/A Header Assembly
9	1	5	2169859-1	5 PAIR Vertical Receptacle Assembly
10	4A	5	2169869-2	5 PAIR R/A Header Assembly
10	4A	5	2169859-1	5 PAIR Vertical Receptacle Assembly
11	4B	5	2169869-2	5 PAIR R/A Header Assembly
11	4B	5	2169859-1	5 PAIR Vertical Receptacle Assembly
12	6	5	2169869-2	5 PAIR R/A Header Assembly
12	6	5	2169859-1	5 PAIR Vertical Receptacle Assembly
13	7	5	2169869-2	5 PAIR R/A Header Assembly
13	7	5	2169859-1	5 PAIR Vertical Receptacle Assembly
14	8	5	2169869-2	5 PAIR R/A Header Assembly
14	8	5	2169859-1	5 PAIR Vertical Receptacle Assembly
15	9	5	2169869-2	5 PAIR R/A Header Assembly
15	9	5	2169859-1	5 PAIR Vertical Receptacle Assembly

1.5 Test Sequence

The test specimens identified in paragraph 1.4 were subjected to the tests outlined in Table 4.

Table 3- Test Sequence

Test Sequence										
	Test Group									
Test or Examination	**1**	**2**	**3**	**4A**	**4B**	**5**	**6**	**7**	**8**	**9**
Initial Visual Examination	1	1	1	1	1	1	1		1	1
Low Level Contact Resistance	3,5						2,4, 6,8	2,5, 7,9	2,5, 8	2,4,6 8,10,12
Insulation Resistance		2								
Withstand Voltage		3								
Temperature Rise vs. Current						2				
Sinusoidal Vibration									6	
Mechanical Shock									7	
Durability, preconditioning							3	3	3	3
Durability	4									
Mating/Unmating Force	2,6									
Compliant Pin Mounting Force to PCB				2						
Compliant Pin Push-out Force				3						
Terminal Retention Force, in Housing			2							
Compliant Pin Performance					2					
Reseating							7	8		11
Thermal Shock								4		
Humidity/Temperature Cycling								6		
Temperature Life, preconditioning									4	5
Temperature Life							5			
Mixed Flowing Gas										7
Thermal Disturbance										9
Final Visual Examination	7	4	3	3	3	3	9	10	9	13

Note: The numbers indicate sequence in which tests were performed.

1.6 Environmental Conditions

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

Temperature:	15°C to 35°C
Relative Humidity	20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Visual Examination

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

All Low Level Contact Resistance measurements in Test Sets 9, 12, 13, 14, 15 met the requirement of less than one milliohm of resistance as per 108-2473 Rev O2. See Tables 4 through 13 for data summaries.

Table 4-Test Set 9 LLCR Summary

Test Set 9 LLCR Five Pair (Long Contacts)		
	After Mating Force	After Durability
Min	0.32	0.32
Max	0.41	0.57
Mean	0.37	0.38
Std Dev	0.03	0.08
N	10	10

All Units in milliohms

Table 5- Test Set 9 LLCR Summary

Test Set 9 LLCR Five Pair (Short Contacts)		
	After Mating Force	After Durability
Min	0.12	0.11
Max	0.15	0.14
Mean	0.13	0.13
Std Dev	0.01	0.01
N	10	10

All Units in milliohms

Table 6- Test Set 12 LLCR Summary

Test Set 12 LLCR Five Pair (Long Contacts)				
	Initial	After Durability	After Temp Life	After Reseating
Min	0.32	0.31	0.37	0.39
Max	0.44	0.35	0.72	0.61
Mean	0.36	0.34	0.53	0.50
Std Dev	0.04	0.01	0.10	0.07
N	10	10	10	10

All Units in milliohms

Table 7- Test Set 12 LLCR Summary

Test Set 12 LLCR Five Pair (Short Contacts)				
	Initial	After Durability	After Temp Life	After Reseating
Min	0.12	0.12	0.14	0.13
Max	0.14	0.14	0.20	0.22
Mean	0.13	0.13	0.17	0.16
Std Dev	0.01	0.01	0.02	0.03
N	10	10	10	10

All Units in milliohms

Table 8- Test Set 13 LLCR Summary

Test Set 13 LLCR Five Pair (Long Contacts)				
	Initial	After Thermal Shock	After Temp Humidity	After Reseating
Min	0.34	0.32	0.31	0.32
Max	0.40	0.41	0.38	0.41
Mean	0.37	0.34	0.34	0.35
Std Dev	0.02	0.03	0.02	0.03
N	10	10	10	10

All Units in milliohms

Table 9- Test Set 13 LLCR Summary

Test Set 13 LLCR Five Pair (Short Contacts)				
	Initial	After Thermal Shock	After Temp Humidity	After Reseating
Min	0.12	0.12	0.11	0.12
Max	0.14	0.14	0.14	0.14
Mean	0.13	0.13	0.13	0.13
Std Dev	0.01	0.01	0.01	0.01
N	10	10	10	10

All Units in milliohms

Table 10- Test Set 14 LLCR Summary

Tests Set 14 LLCR Five Pair (Long Contacts)			
	Initial	After Temp Life	After Vibration
Min	0.35	0.35	0.41
Max	0.39	0.47	0.57
Mean	0.38	0.40	0.48
Std Dev	0.01	0.04	0.05
N	10	10	10

All Units in milliohms

Table 11- Test Set 14 LLCR Summary

Tests Set 14 LLCR Five Pair (Short Contacts)			
	Initial	After Temp Life	After Vibration
Min	0.12	0.12	0.12
Max	0.13	0.18	0.20
Mean	0.12	0.14	0.14
Std Dev	0.01	0.02	0.02
N	10	10	10

All Units in milliohms

Table 12- Test Set 15 LLCR Summary

Test Set 15 LLCR Five Pair (Long Contacts)							
	Initial	After 200 Cycles of Durability	After Temp Life	After 9 Days Unmated in MFG	After 5 Days Mated in MFG	After Thermal Disturbance	After Reseating
Min	0.29	0.29	0.43	0.34	0.40	0.42	0.40
Max	0.37	0.38	0.63	0.68	0.67	0.71	0.60
Mean	0.33	0.32	0.51	0.52	0.47	0.52	0.49
Std Dev	0.02	0.02	0.06	0.13	0.09	0.10	0.09
N	10	10	10	10	10	10	10

All Units in milliohms

Table 13- Test Set 15 LLCR Summary

Test Set 15 LLCR Five Pair (Short Contacts)							
	Initial	After 200 Cycles of Durability	After Temp Life	After 9 Days Unmated in MFG	After 5 Days Mated in MFG	After Thermal Disturbance	After Reseating
Min	0.29	0.29	0.43	0.34	0.40	0.42	0.40
Max	0.37	0.38	0.63	0.68	0.67	0.71	0.60
Mean	0.33	0.32	0.51	0.52	0.47	0.52	0.49
Std Dev	0.02	0.02	0.06	0.13	0.09	0.10	0.09
N	10	10	10	10	10	10	10

All Units in milliohms

2.3 Insulation Resistance

All test specimens in Test Sets 4, 5, and 6 met the requirement of 20,000 MΩ (2x10^10Ω) minimum Insulation Resistance as per 108-2473 Rev O2

2.4 Withstand Voltage

All test specimens in Test Sets 4, 5, and 6 met the requirement of 108-2473 Rev O2 when subjected to 1500 volts DC for one minute with no breakdown, flashover or leakage exceeding five milliamperes.

2.5 Temperature Rise vs. Current

All test specimens in Test Sets 1, 2, and 3 met the requirement of less than a 30°C temperature rise when subjected to the currents listed in Table 14 as per 108-2473 Rev O2.

Table 14- Temperature Rise vs. Current Summary

Test Sets 1, 2, and 3 Temperature Rise vs. Current			
	3 Pair	4 Pair	5 Pair
Current	14.97	19.95	24.93
Min	16.10	14.20	19.20
Max	16.70	15.20	21.30
Mean	16.36	14.72	20.32
Std Dev	0.24	0.43	0.76
Ambient Temp	25.30	25.60	25.80

All Units in Degrees C
Current in Amperes

2.6 Random Vibration

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing as per 108-2473 Rev O2.

2.7 Mechanical Shock

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing as per 108-2473 Rev O2.

2.8 Durability, Preconditioning

No apparent physical damage was observed as a result of 20 cycles of Durability preconditioning as per 108-2473 Rev O2.

2.9 Durability

No apparent physical damage was observed as a result of 200 cycles of Durability as per 108-2473 Rev O2.

2.10 Mating/Unmating Force

Mating Force:
All test specimens in Test Set 9 were below the maximum allowable mating force of 2.5 kgf as per 108-2473 Rev O2. See Table 15 for Mating Force data summary.

Table 15- Test Set 9 Mating Force Summary

Test Set 9 Mating Force Five Pair	
Min	1.97
Max	2.09
Mean	2.02
Std Dev	0.05

Units in kgf

Unmating Force:
All test specimens in Test Set 9 were above the minimum allowable unmating force of 0.05 kgf as per 108-2473 Rev O2. See Table 16 for Unmating Force data summary.

Table 16- Test Set 9 Unmating Force Summary

Test Set 9 Un-mating Force Five Pair	
Min	0.99
Max	1.09
Mean	1.05
Std Dev	0.04

Units in kgf

2.11 Compliant Pin mounting force onto PCB

All test specimens in Test Set 10 met the requirement of less than 6.0 kgf insertion per pin as per 108-2473 Rev O2. Test specimens have thirty-two pins resulting in a maximum allowable insertion force of 192.0 kgf. See Tables17 and 18 for data summaries.

Table 17- Test Set 10 Compliant Pin Mounting Force Summary

Compliant Pin Mounting Force onto PCB (Blades) Five Pair	
	Insertion
Min	94.13
Max	101.79
Mean	97.67
Std Dev	3.48

Units in kgf

Table 18- Test Set 10 Compliant Pin Mounting Force Summary

Compliant Pin Mounting Force onto PCB (Sockets) Five Pair	
	Insertion
Min	103.61
Max	107.45
Mean	105.64
Std Dev	1.41

Units in kgf

2.12 Compliant Pin push-out force

All test specimens in Test Set 10 met the requirement of more than 0.50 kgf withdraw per pin as per 108-2473 Rev O2. Test specimens have thirty-two pin resulting in a minimum allowable withdraw force of 16 kgf. See Tables 19 and 20 for data summaries.

Table 19- Test Set 10 Compliant Pin Push-out Force Summary

Compliant Pin Push-out Force (Blades)	
	Withdraw
Min	48.50
Max	52.50
Mean	51.06
Std Dev	1.75

Units in kgf

Table 20- Test Set 10 Compliant Pin Push-out Force Summary

Compliant Pin Push-out Force (Sockets)	
	Withdraw
Min	39.81
Max	43.90
Mean	41.99
Std Dev	1.49

Units in kgf

2.13 Terminal Retention force, in housing

All test specimens in Test Sets 7 and 8 met the requirement of more than 1.30 kgf withdraw per pin as per 108-2473 Rev O2. See Tables 21 through 24 for data summaries.

Table 21- Test Set 7 Termination Retention Force Summary

Test Set 7 Terminal Retention Force in Housing Three Pair (Blades)		
	Long Contacts	Short Contacts
Min	3.41	3.89
Max	3.93	4.78
Mean	3.57	4.34
Std Dev	0.15	0.31

All Units in kgf

Table 22- Test Set 7 Termination Retention Force Summary

Test Set 7 Terminal Retention Force in Housing Three Pair (Sockets)		
	Long Contacts	Short Contacts
Min	1.71	2.75
Max	4.01	3.79
Mean	3.12	3.38
Std Dev	0.67	0.31

All Units in kgf

Table 23- Test Set 7 Termination Retention Force Summary

Test Set 8 Terminal Retention Force in Housing Five Pair (Blades)		
	Long Contacts	Short Contacts
Min	2.73	4.24
Max	5.14	4.93
Mean	3.77	4.58
Std Dev	0.79	0.24

All Units in kgf

Table 24- Test Set 7 Termination Retention Force Summary

Test Set 8 Terminal Retention Force in Housing Five Pair (Sockets)		
	Long Contacts	Short Contacts
Min	2.42	2.71
Max	4.90	5.09
Mean	4.07	3.89
Std Dev	0.78	0.73

All Units in kgf

2.14 Compliant Pin performance

No apparent physical damage was observed to the plated thru-hole as a result Compliant Pin Performance testing as per 108-2473 Rev O2.

2.15 Reseating

No apparent physical damage was observed as a result of Reseating as per 108-2473 Rev O2.

2.16 Thermal Shock

No apparent physical damage was observed as a result of five cycles of Thermal Shock between -55 and 85°C with a dwell time of 30 minutes at each extreme and a one minute transition time as per 108-2473 Rev O2.

2.17 Humidity/Temperature Cycling

No apparent physical damage was observed as a result of twenty-four cycles of Humidity/Temperature Cycling as per 108-2473 Rev O2.

2.18 Temperature Life, preconditioning

No apparent physical damage was observed as a result of Temperature Life preconditioning at 105°C for 120 hours as per 108-2473 Rev O2.

2.19 Temperature Life

No apparent physical damage was observed as a result of Temperature Life at 105°C for 240 hours as per 108-2473 Rev O2.

2.20 Mixed Flowing Gas

No apparent physical damage was observed as a result of Mixed Flowing Gas as per 108-2473 Rev O2. Copper corrosion rate (Average) at 16.7 $\mu g/cm^2$/day (Required: 12-18).

2.21 Thermal Disturbance

No apparent physical damage was observed as a result of ten cycles of Thermal Disturbance between 15 and 85°C as per 108-2473 Rev O2.

2.22 Final Visual Examination

Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1 Initial Visual Examination

A Certification 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 made using the same core manufacturing processes and technologies as production parts. Where specified, specimens were visually examined for evidence of physical damage detrimental to product performance. Visual examinations were performed in accordance with Test Specification EIA 364-18.

3.2 Low Level Contact Resistance

Low Level Contact Resistance measurements at low level current were made using a four terminal measuring technique as per EIA 364-23. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Test Sets 9, 12, 13, and 14 Low Level Contact Resistance was measured using the thru-hole via for all positions. Test Set 15 Low Level Contact Resistance was measured by probing the PCB board pad at each EON termination. See Figure 1 for test setup.

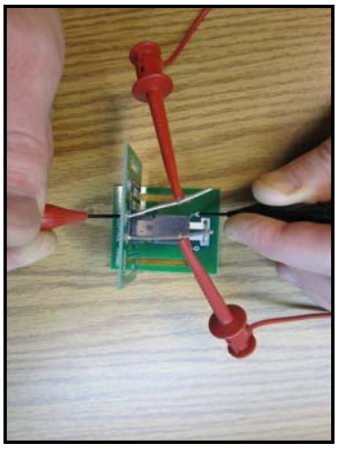

Figure 1- Low Level Contact Resistance test setup

3.3 Insulation Resistance

Test specimens were subjected to Insulation Resistance as per EIA 364-21. Parameters included 500 volt DC potential, 500 Volts per second ramp time for a duration of 2 minutes. Test specimens were tested in two orientations, Front to Back and Left to Right, see Figures 2 and 3 for details.

Figure 2- Front to Back IR test setup

Figure 3- Left to Right IR Test setup

3.4 Withstand Voltage

All test specimens were subjected to Withstand Voltage as per EIA 364-20, Condition I, for one minute with a DC potential of 1500 V and a slew rate of 500V/S. Test specimens were tested in two orientations, Front to Back and Left to Right. See Figures 4 and 5 for test setup.

Figure 4- Front to Back Withstand Voltage test setup

Figure 5- Left to Right Withstand Voltage Test setup

3.5 Temperature Rise vs. Current

Test specimens were supplied mounted on test boards. The end cap was removed and cut away to gain access to the contact and then reinstalled. Thirty AWG T Type thermocouple wires were then attached to the contact with thermally conductive epoxy and allowed to cure for twenty-four hours. Twelve inch jumper wires were made with 12, 14, and 16 AWG wire for the 5, 4, and 3 Pair connectors respectively and terminated to a ring terminal. The jumper wires were then bolted to the test boards in a series circuit. The specimens were then subjected to Temperature Rise vs. Current Testing. Specimens were subjected to the 25, 20, 15 amperes for the 5, 4, and 3 Pair connectors respectively for two hours. These contacts were then monitored for thermal stability. Thermal stability is defined as when the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C. Once thermal stability was obtained, the temperature measurements were recorded. See Figure 6 for test setup.

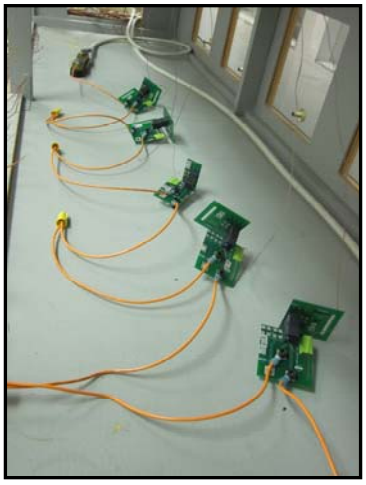

Figure 6- Temperature Rise vs. Current test setup

3.6 Random Vibration

The test specimens were subjected to a random vibration test as stated in TE Connectivity Design Objective 108-2473, Rev"02", in accordance with specification EIA-364-28F, test condition "VII", test condition letter "D". See Figure 7 below for vibration setup photograph.

The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hertz (Hz). The spectrum remains flat at 0.02 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS.

The test specimens were subjected to this test for 15 minutes in each of the three mutually perpendicular axes, for a total test time of 45 minutes per test specimen.

The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

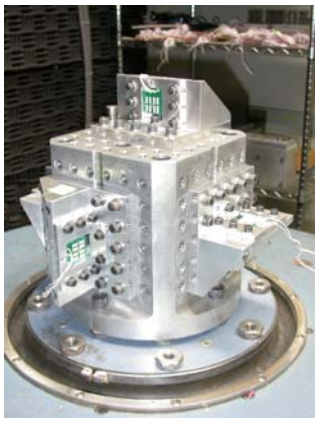

Figure 7- Vibration/Shock Setup

3.7 Mechanical Shock

The test specimens were subjected to a mechanical shock test as stated in TE Connectivity Design Objective 108-2473, Rev"02", in accordance with specification EIA-364-27C, test condition "H",. See Figure 7 above for shock setup photograph.

The parameters of this test condition are a half-sine waveform with an acceleration amplitude of 30 gravity units (g's peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks.

The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.8 Durability, preconditioning

Test specimens were unmated and mated 20 times by hand at a rate of no more than 500 cycles per hour as per EIA 364-9.

3.9 Durability

Test specimens were clamped tight with a customer provided fixture and subjected to 200 cycles of Durability at a rate of less than 500 cycles per hour as per EIA 364-9. See Figure 8 for test setup.

Figure 8- Durability Test Setup

3.10 Mating/Unmating Force

Mating Force:
Test specimens were subjected to Mating Force as per EIA 364-13 at rate of ½ inch per minute. Test specimens were placed on a XY table to ensure axial alignment and "flat rocked" into the fully mated position. After the specimens were fully mated the maximum force was recorded. See Figure 9 for test setup.

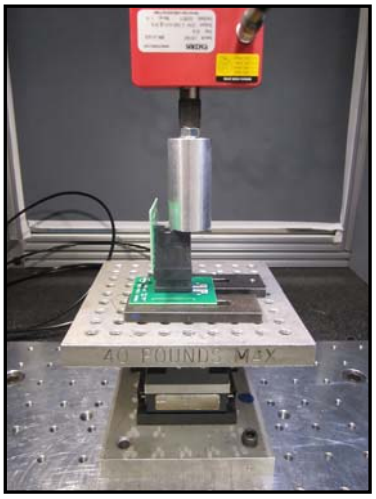

Figure 9- Mating Force Test Setup

Unmating Force:
Test specimens were subjected to Unmating Force as per EIA 364-13 at a rate of ½ inch per minute. The test specimens were mounted to a XY table to ensure axial alignment and clamped tight using a slotted fixture. The tensile machines crosshead was then lowered and the mating half of the connector was clamped tight to a 90° fixture. The test specimens were then unmated and the maximum force was recorded. See Figure 10 for test setup.

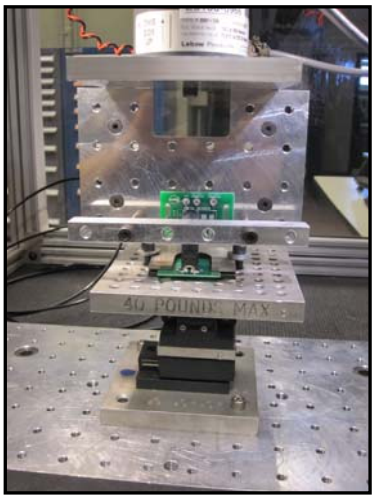

Figure 10- Unmating Force Test Setup

3.11 Compliant Pin mounting force onto PCB

All test specimens were pressed onto the PCB with a tensile testing machine. The PCBs were supported in a manner that allowed the compliant pins to move freely and prevent the PCB form flexing excessively. The connector was pressed into the PCB with a flat bottom plunger attached to the crosshead of the tensile testing machine with a 1000lb load cell. The crosshead was lowered at a rate of 1 inch per minute until the connector was fully seated on the PCB. The greatest force required to seat the connector was recorded. Refer to Figure 11 for a detailed image of the test set up.

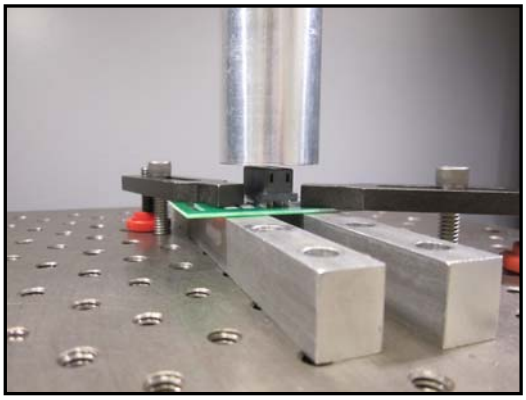

Figure 11- Typical Compliant Pin mounting force onto PCB test setup.

3.12 Compliant Pin push-out force

All test specimens were removed from the PCBs by pressing on the compliant pins with a tensile testing machine. The PCBs were supported in a manner that allowed the connector to move freely and prevent the PCB form flexing excessively. The compliant pins were pressed out with a flat bottom plunger attached to the crosshead of the tensile testing machine with a 1000lb load cell. The crosshead was lowered at a rate of 1 inch minute until the connector was removed from the PCB or until the compliant pins were no longer able to be pressed against (compliant pins became flush with the surface of the PCB). The greatest force required to remove the connector from the PCB was recorded. Refer to Figure 12 for a detailed image of the test set up.

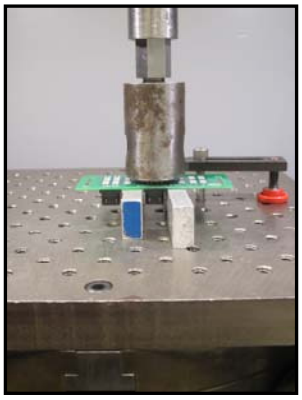

Figure 12- Typical Compliant Pin push-out force test setup.

3.13 Terminal Retention force, in housing

Blades:
All test specimens were subjected to the Terminal Retention Force test. Specimens were held tight with a slotted fixture. A flat probe was attached to the tensile machines crosshead and was lowered at a rate of ½ inch per minute pressing the contacts out of the housing. The top rows of contacts were pressed out first followed by the lower row. See Figure 13 for test setup.

Sockets:
All test specimens were subjected to the Terminal Retention Force test. Specimens were held tight with a slotted fixture. Twenty-eight AWG bus wire was threaded through the eye of the needle and looped. A hook was attached to the tensile machines crosshead and was raised at a rate of ½ inch per minute pulling the contacts out of the housing. See Figure 14 for test setup.

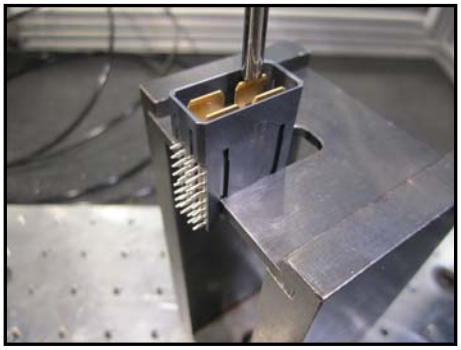

Figure 13- Terminal Retention Force, Blades

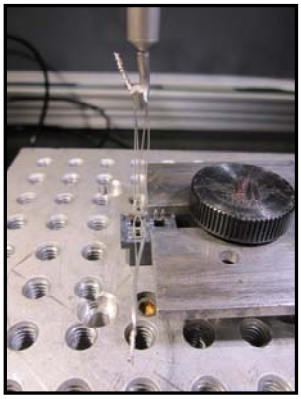

Figure 14- Terminal Retention Force, Sockets

3.14 Compliant Pin performance

The specimens were prepared for cross sectioning by placing them into individual plastic forms, and adding a two-part (resin and hardener) liquid epoxy potting compound. The forms were then placed in a vacuum chamber for a minimum of 5 minutes to draw out all air from the potted specimens, then removed from the chamber and allowed to cure for a minimum of 24 hours. Upon completion of the curing phase, the specimens were ground to the point of interest using progressively finer grit sanding wheels. Once the point of interest was reached, the sections were polished using progressively finer diamond suspension solutions. Following polishing, the sections were photographed using a microscope with associated digital camera at an appropriate level of magnification. Where applicable, measurements were recorded using digital photo software incorporating calibration files derived from a calibrated etched glass measurement standard. Measurement accuracy is a function of the magnification level, as detailed in Table 25 below.

Table 25 – Measurement Accuracy

Optical Magnification	Microscope System	English vs. Metric Measurement Units			
		English		Metric	
		Measurement Units	Accuracy	Measurement Units	Accuracy
6.3X	Leica Wild M420 Microscope	inches	± 0.0008	mm	± 0.019
7X		inches	± 0.0007	mm	± 0.017
8X		inches	± 0.0006	mm	± 0.015
10X		inches	± 0.0005	mm	± 0.012
12.5X		inches	± 0.0004	mm	± 0.010
16X		inches	± 0.0003	mm	± 0.008
20X		inches	± 0.0003	mm	± 0.006
25X		inches	± 0.0002	mm	± 0.005
32X		inches	± 0.0002	mm	± 0.004
50X	Nikon Epiphot Inverted Microscope	inches	± 0.0003	mm	± 0.006
100X		inches	± 0.0001	mm	± 0.002
200X		inches	± 0.00003	mm	± 0.0007
400X		inches	± 0.00002	mm	± 0.0004
400X		µinches	± 14	microns (µm)	± 0.35
1000X		µinches	± 6	microns (µm)	± 0.14

3.15 Reseating

Test specimens were subjected to three reseating cycles by hand as per 108-2473 Rev O2.

3.16 Thermal Shock

Mated test specimens were subjected to five cycles of Thermal Shock between -55 and 85°C with thirty minute dwell times at each extreme with a one minute transition time as per EIA 364-32, Method A, Test Condition I. Test Duration A.

3.17 Humidity/Temperature Cycling

Mated test specimens were exposed to 24 cycles of humidity/temperature cycling between 25°C ±3°C at 80 ±3% RH to 65 ±3°C at 50 ±3% RH with a ramp time of thirty minutes and one hour dwell time. Dwell times started when temperature and humidity stabilized within the specified levels as per EIA 364-31, Method III.

3.18 Temperature Life, preconditioning

Mated test specimens were subjected to Temperature Life preconditioning at 105°C for 120 hours as per EIA 364-17, Method A, Test Condition 4.

3.19 Temperature Life

Mated test specimens were subjected to Temperature Life at 105°C for 240 hours as per EIA 364-17, Method A, Test Condition 4.

3.20 Mixed Flowing Gas

All specimens were subjected to a Mixed Flowing Gas test in accordance with EIA 364-65B, Class IIA. Test parameters listed in Table 26.

Table 26- Mixed Flowing Gas parameters

Environment	**Class IIA**
Temperature (^{0}C)	**30 ± 1**
Relative Humidity (%)	**70 ± 2**
Chlorine (Cl2) Concentration (ppb)	**10 ± 3**
Hydrogen Sulfide (H2S) Concentration (ppb)	**10 ± 5**
Nitrogen Dioxide (NO2) Concentration (ppb)	**200 ± 50**
Sulfur Dioxide (SO2) Concentration (ppb)	**100 ± 20**
Exposure Period	**14 Days**

The test specimens consisted of two groups of five connector assemblies. All connectors were unmated for the 1st 9 days (both connector halves exposed) and mated for the final 5 days. LLCR measurements were required after 9 and 14 days during the exposure period.

3.21 Thermal Disturbance

Mated test specimens were subjected to ten cycles of Thermal Disturbance between 15 and 85°C with approximately 10 degree per minute and allowed to dwell until acclimated as per EIA 364-110, condition A, Duration A.

3.22 Final Visual Examination

Specimens were visually examined for evidence of physical damage detrimental to product performance. Visual examinations were performed in accordance with Test Specification EIA 364-18B.

4. EQUIPMENT

4.1 Calibration Statement

All equipment containing a calibration number is calibrated and traceable through TE Connectivity (TE) to the National Institute of Standards and Technology (NIST).

4.2 Equipment List

Equipment Name	Calibration Number
Dielectric Analyzer	E9100-1754
Stop Watch	E9100-1616
Stop Watch	E9100-1495
IR Tester	E9100-0857
IR Tester	E9100-1510
Meter	E9100-1627
Power Supply	E9100-1322
Shunt	E9100-1435
Load Frame	E9100-1505
Load Cell	E9100-1528
Load Cell	E9100-1748
Load Cell	E9100-0966
Load Cell	E9100-1505
Load Frame	E9100-1722
Durability Machine	E9100-1612
Durability Machine	E9100-1611
Low Level Station	E9100-1535
Low Level Station	E9100-1144
Low Level Station	E9100-1668
Thermal Shock Chamber	E9100-1742
Thermal Shock Chamber	E9100-1310
Temperature Humidity Chamber	E9100-1174
Meter	E9100-1627
Shunt	E9100-1435
Shunt	E9100-1436
Oven	E9100-1180
Power Supply	E9100-1322
Weather Station	E9100-1703
Nikon Epiphot Inverted Microscope	N/A
Diagnostic Instruments, Inc., Spot Digital Camera	N/A
Diagnostic Instruments, Inc., Spot Digital Photo Software, Version 3.5.9	N/A
Geller Microanalytical Laboratory MRS-3	
Etched Glass Measurement Standard	E9100-1500
Control Accelerometer	E9100-1001
Charge Amplifier	E9100-1305
Vibration Controller	E9100-1625
Discontinuity Monitor	E9100-1745
Vibration Table & Amplifier	X0085-045
Cube	92-467383-1
Test Fixture	39-1824048
Test Fixture	39-1824049
Test Fixture	39-1824050
Test Fixture	39-1824051