## 1. INTRODUCTION

### 1.1 Purpose

Testing was performed on the TE Connectivity (TE) IMPACT Power Interconnect Systems to determine their conformance to the requirements of Product Specification 108-2473, Revision A.

### 1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE IMPACT Power Interconnect System. Testing was performed at the Harrisburg Electrical Components Test Laboratory between March 22, 2012 and July13, 2012, 2012. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory under test file number EA20120202T.

### 1.3 Conclusion

All part numbers listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements established in Product Specification 108-2473 Revision A.

### 1.4 Product Description

The TE Connectivity (TE) IMPACT Power Interconnect Systems which consists of modular groupings of broad-edge coupled signals with optional integrated guidance. These connectors are two-piece devices, which connect two Printed Circuit Boards (PCBs). The right angle receptacle connectors (daughter card) and header pin connectors (backplane) are through-hole devices with Eye-of-the-Needle (EON) compliant pin terminals.

### 1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test:

**Table 1 – Test Specimens**

| Test Set | Test Group | Qty | Part Number | Description |
|---|---|---|---|---|
| 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 1 – Test Specimens Cont'**

| Test Set | Test Group | Qty | Part Number | Description |
|---|---|---|---|---|
| 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 |

### 1.6 Qualification Test Sequence

**Table 2 - Test Sequence**

| Test or Examination | Test Group (a) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4A | 4B | 5 | 6 | 7 | 8 | 9 |
| | Test Sequence (b) | | | | | | | | | |
| Initial examination of product | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LLCR | 3,5 | | | | | | 2,4,6,8 | 2,5,7,9 | 2,5,8 | 2,4,6,8,10,12,14 |
| Insulation resistance | | 2 | | | | | | | | |
| Withstanding voltage | | 3 | | | | | | | | |
| Temperature rise vs. current | | | | | | 2 | | | | |
| Random vibration | | | | | | | | | 6 | |
| Mechanical shock | | | | | | | | | 7 | |
| Durability, preconditioning | | | | | | | 3 | 3 | 3 | 3 |
| Durability | 4 | | | | | | | | | |
| Mating/Unmating force | 2,6 | | | | | | | | | |
| Compliant pin mounting force onto PCB | | | | 2 | | | | | | |
| Compliant pin push-out force | | | | 3 | | | | | | |
| Terminal retention force, in housing | | | 2 | | | | | | | |
| Compliant pin performance | | | | | 2 | | | | | |
| Reseating | | | | | | | 7 | 8 | | 13 |
| Thermal shock | | | | | | | | 4 | | |
| Humidity/temperature cycling | | | | | | | | 6 | | |
| Temperature life, preconditioning | | | | | | | | | 4 | 5 |
| Temperature life | | | | | | | 5 | | | |
| Mixed flowing gas | | | | | | | | | | 7,9 |
| Thermal disturbance | | | | | | | | | | 11 |
| Final examination of product | 6 | 4 | 3 | 4 | 3 | 3 | 9 | 10 | 9 | 15 |

Note: (a) See paragraph 1.5
(b) Numbers indicate sequence which tests were performed.

### 1.7 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 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 1,6,7,8, and 9

All Low Level Contact Resistance measurements in Test Sets 9, 12, 13, 14, 15 met the requirement of less than one milliohm of resistance. See Tables 3 through 7 for data summaries.

**Table 3-Test Set 9 LLCR Summary**

| Test Set 9 Five Pair LLCR | | |
|---|---|---|
| | After Mating Force | After Durability |
| Min | 0.12 | 0.11 |
| Max | 0.41 | 0.57 |
| Mean | 0.25 | 0.25 |
| Std Dev | 0.12 | 0.12 |
| N | 20 | 20 |

**All Units in milliohms**

**Table 4- Test Set 12 LLCR Summary**

| Test Set 12 LLCR Five Pair | | | | |
|---|---|---|---|---|
| | Initial | After Durability | After Temp Life | After Reseating |
| Min | 0.12 | 0.12 | 0.14 | 0.13 |
| Max | 0.44 | 0.35 | 0.72 | 0.61 |
| Mean | 0.25 | 0.23 | 0.35 | 0.33 |
| Std Dev | 0.12 | 0.11 | 0.20 | 0.18 |
| N | 20 | 20 | 20 | 20 |

**All Units in milliohms**

**Table 5- Test Set 13 LLCR Summary**

| Test Set 13 LLCR Five Pair | | | | |
|---|---|---|---|---|
| | Initial | After Thermal Shock | After Temp Humidity | After Reseating |
| Min | 0.12 | 0.12 | 0.11 | 0.12 |
| Max | 0.40 | 0.41 | 0.38 | 0.41 |
| Mean | 0.25 | 0.23 | 0.23 | 0.24 |
| Std Dev | 0.12 | 0.11 | 0.11 | 0.12 |
| N | 20 | 20 | 20 | 20 |

**All Units in milliohms**

**Table 6- Test Set 14 LLCR Summary**

| Tests Set 14 LLCR Five Pair | | | |
|---|---|---|---|
| | Initial | After Temp Life | After Vibration |
| Min | 0.12 | 0.12 | 0.12 |
| Max | 0.39 | 0.47 | 0.57 |
| Mean | 0.25 | 0.27 | 0.31 |
| Std Dev | 0.13 | 0.14 | 0.18 |
| N | 20 | 20 | 20 |

**All Units in milliohms**

**Table 7- Test Set 15 LLCR Summary**

| Test Set 15 LLCR Five Pair | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 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 | 0.35 |
| Max | 0.54 | 0.38 | 0.75 | 0.89 | 0.83 | 0.87 | 0.77 |
| Mean | 0.38 | 0.35 | 0.58 | 0.57 | 0.52 | 0.59 | 0.55 |
| Std Dev | 0.06 | 0.03 | 0.10 | 0.16 | 0.13 | 0.15 | 0.11 |
| N | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

**All Units in milliohms**

### 2.3 Insulation Resistance – Test Group 2

All test specimens in Test Sets 4, 5, and 6 met the requirement of 20,000 MΩ (2x10^10Ω) minimum Insulation resistance.

### 2.4 Withstand Voltage – Test Group 2

All test specimens in Test Sets 4, 5, and 6 met the requirement of 1500 volts DC for one minute with no breakdown, flashover or leakage exceeding five milliamperes.

### 2.5 Temperature Rise vs. Current – Test Group 5

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 8 as per Product Specification 108-2473 Revision A.

**Table 8- 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 |

**Temperature Rise in Degrees C**
**Current in DC Amperes**

### 2.6 Random Vibration – Test Group 8

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing.

### 2.7 Mechanical Shock – Test Group 8

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing.

### 2.8 Durability, Preconditioning Test Groups 6,7,8, and 9

No apparent physical damage was observed as a result of 20 cycles of Durability preconditioning.

### 2.9 Durability – Test Group 1

No apparent physical damage was observed as a result of 200 cycles of Durability.

## 2.10 Mating/Unmating Force – Test Group 1

**Mating Force:**
All test specimens in Test Set 9 were below the maximum allowable mating force of 2.5 kgf. See Table 9 for Mating Force data summary.

**Table 9- 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 0.20 kgf. See Table 10 for Unmating Force data summary.

**Table 10- 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 – Test Group 4A

All test specimens in Test Set 10 met the requirement of less than 6.0 kgf insertion per pin. The total force was divided by 32 to obtain the maximum average force per pin. . See Tables11 and 12 for data summaries.

**Table 11- Test Set 10 Compliant Pin Mounting Force Summary**

| Compliant Pin Mounting Force onto PCB (Blades) Five Pair | |
|---|---|
| | **Insertion** |
| **Min** | 2.94 |
| **Max** | 3.13 |
| **Mean** | 3.05 |
| **Std Dev** | 0.107 |

**Units in kgf**

**Table 12- Test Set 10 Compliant Pin Mounting Force Summary**

| Compliant Pin Mounting Force onto PCB (Sockets) Five Pair | |
|---|---|
| | **Insertion** |
| **Min** | 3.24 |
| **Max** | 3.36 |
| **Mean** | 3.32 |
| **Std Dev** | 0.045 |

**Units in kgf**

### 2.12 Compliant Pin push-out force – Test Group 4A

All test specimens in Test Set 10 met the requirement of more than 0.50 kgf withdraw per pin. The total force was divided by 32 to obtain the maximum average force per pin. See Tables 13 and 14 for data summaries.

**Table 13- Test Set 10 Compliant Pin Push-out Force Summary**

| Compliant Pin Push-out Force (Blades) | |
|---|---|
| | **Withdraw** |
| **Min** | 1.52 |
| **Max** | 1.64 |
| **Mean** | 1.60 |
| **Std Dev** | 0.05 |

**Units in kgf**

**Table 14- Test Set 10 Compliant Pin Push-out Force Summary**

| Compliant Pin Push-out Force (Sockets) | |
|---|---|
| | **Withdraw** |
| **Min** | 1.24 |
| **Max** | 1.37 |
| **Mean** | 1.31 |
| **Std Dev** | 0.05 |

**Units in kgf**

### 2.13 Terminal Retention force, in housing – Test Group 3

All test specimens in Test Sets 7 and 8 met the requirement of more than 1.30 kgf withdraw per pin. See Tables 15 through 19 for data summaries.

**Table 15- 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 16- 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 17- 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 18- 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 – Test Group 4B

No apparent physical damage was observed to the plated thru-hole as a result Compliant Pin Performance.

### 2.15 Reseating – Test Groups 6,7 and 9

No apparent physical damage was observed as a result of Reseating.

### 2.16 Thermal Shock – Test Group 7

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.

### 2.17 Humidity/Temperature Cycling – Test Group 7

No apparent physical damage was observed as a result of twenty-four cycles of Humidity/Temperature Cycling.

### 2.18 Temperature Life, preconditioning – Test Groups 8 and 9

No apparent physical damage was observed as a result of Temperature Life preconditioning at 105°C for 120 hours.

### 2.19 Temperature Life – Test Group 6

No apparent physical damage was observed as a result of Temperature Life at 105°C for 240 hours.

### 2.20 Mixed Flowing Gas – Test Group 9

No apparent physical damage was observed as a result of Mixed Flowing Gas. The average copper corrosion rate was 16.7 $\mu g/cm^2$/day (Required: 12-18).

### 2.21 Thermal Disturbance – Test Group 9

No apparent physical damage was observed as a result of ten cycles of Thermal Disturbance between 15 and 85°C.

### 2.22 Final Visual Examination – All Test Groups

Where specified, 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 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 at low level current were made using a four terminal measuring technique. 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.

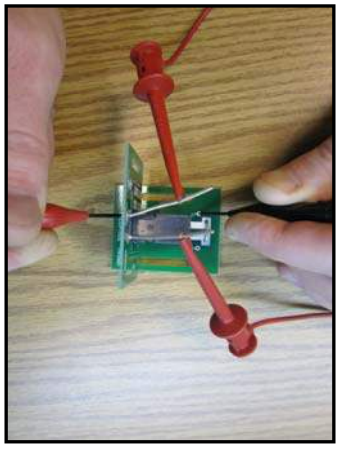

**Figure 1- Low Level Contact Resistance test setup**

### 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 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**

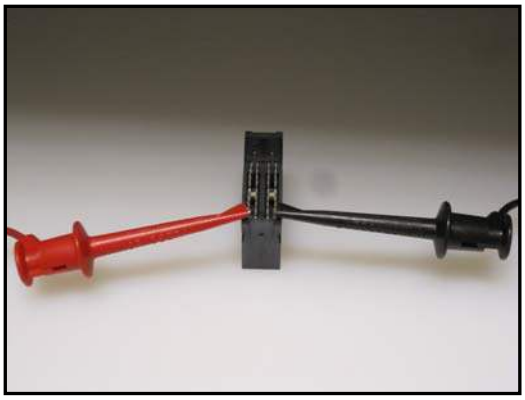

**Figure 3- Left to Right IR Test setup**

### 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**

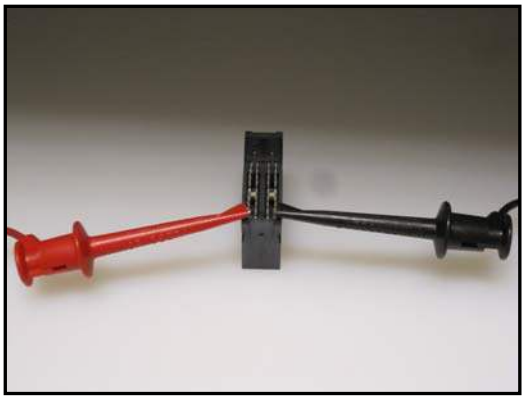

**Figure 5- Left to Right Withstand Voltage Test setup**

### 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. Type-T 30 AWG 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.

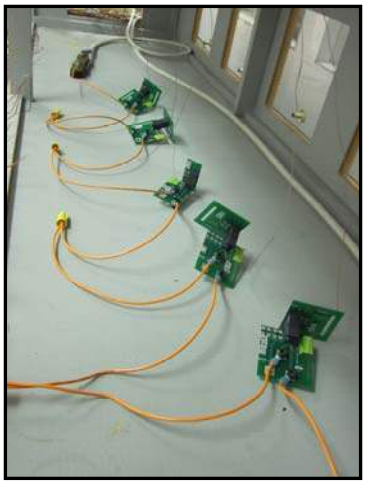

**Figure 6- Temperature Rise vs. Current test setup**

### 3.6 Random Vibration

The test specimens were subjected to a random vibration test as stated in 108-2473, Rev A, 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 G²/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.

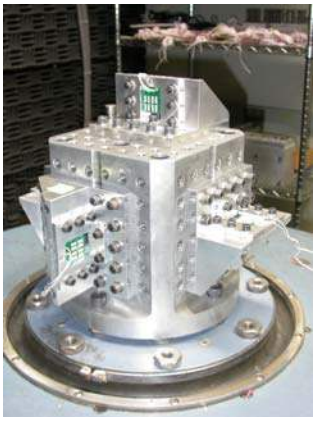

**Figure 7- Vibration/Shock Setup**

### 3.7 Mechanical Shock

The test specimens were subjected to a mechanical shock test as stated in 108-2473, Rev A, 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 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 X-Y 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.

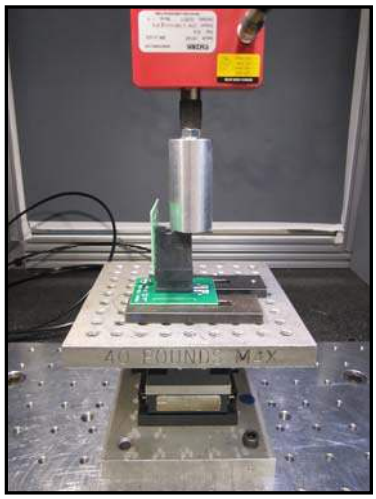


**Figure 9- Mating Force Test Setup**

**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 X-Y 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.

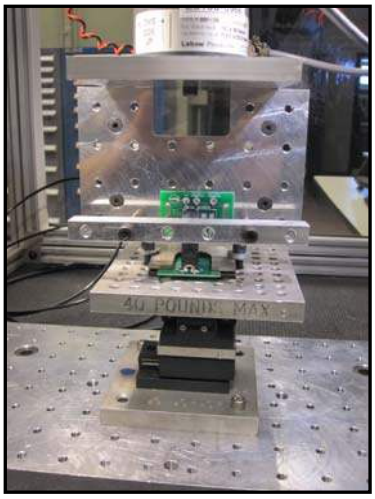


**Figure 10- Unmating Force Test Setup**

### 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.

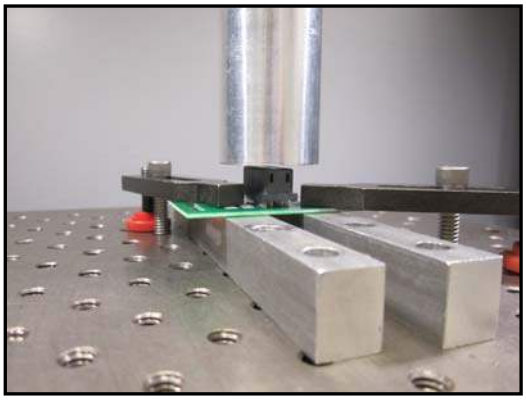

**Figure 11- Typical Compliant Pin mounting force onto PCB test setup.**

### 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.

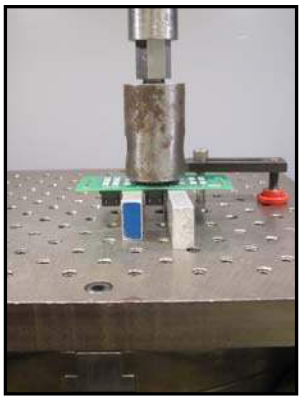

**Figure 12- Typical Compliant Pin push-out force test setup.**

### 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.

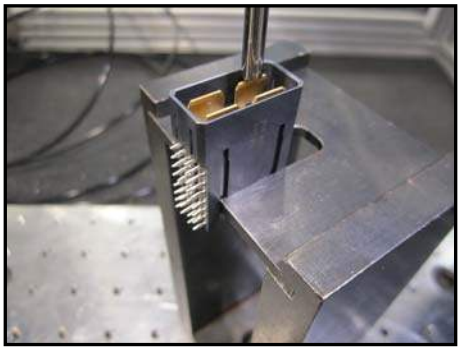

**Figure 13- Terminal Retention Force, Blades**

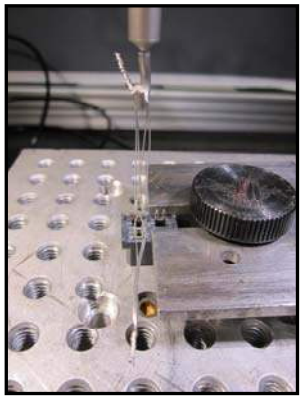

**Figure 14- Terminal Retention Force, Sockets**

### 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.

### 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.