STRADA Whisper 100 Ohm PiR

1. INTRODUCTION

1.1 Purpose

Testing was performed on TE Connectivity* (TE) STRADA Whisper 100 Ohm PiR 4x6 connectors to determine their conformance to the requirements of Product Specification 108-32021 Rev E.

1.2 Scope

This report covers the electrical, mechanical and environmental performance of the TE STRADA Whisper 100 Ohm PiR 4x6 connectors. Testing was performed at the TE Harrisburg Electrical Components Test Laboratory from 17-May-2016 to 8-August-2016 and 29-December-2016 and 02-February-2017. Detailed results are stored under EA20160206T and EA20160511T.

1.3 Conclusion

The STRADA Whisper 100 Ohm PiR 4x6 connectors listed in paragraph 1.5 met all of the requirements in Product Specification 108-32021 Rev E.

1.4 Product Description

The STRADA Whisper 100 Ohm PiR Connector System is a backplane connector designed for high-performing, high-bandwidth systems. It is capable of transferring data at speeds of 25 Gbps and offers unparalleled scalability up to 56 Gbps – allowing future system upgrades without costly backplane or midplane redesigns. It operates with extremely low noise, low insertion loss and little to no skew – all of which provide system architects with design flexibility and high design margin. The connector footprint keeps crosstalk down and uses latest eye of needle (EON) technology.

1.5 Test Specimens

The specimens as identified in Table 1 were submitted for testing.

Table 1 – Test Specimens

Test Group	Qty	Part number	Description
1, 2a, 4a, 5, 6	3 each	2187509-1	STRADA Whisper 4x6 100 Ohm PiR Receptacle
	3 each	2187510-1	STRADA Whisper 4x6 100 Ohm PiR Header
	3 each	60-1824239-1	LLCR Receptacle PCB
	3 each	60-1824458-1	LLCR Header PCB
2b, 4b	3 each	2187509-1	STRADA Whisper 4x6 100 Ohm PiR Receptacle
	3 each	2187510-1	STRADA Whisper 4x6 100 Ohm PiR Header
	3 each	60-1824462-1	LLCPR Receptacle PCB
	3 each	60-1824459-1	LLCPR Header PCB
3	3	2187509-1	STRADA Whisper 4x6 100 Ohm PiR Receptacle
	3	2187510-1	STRADA Whisper 4x6 100 Ohm PiR Header

* Trademark

1.6 Qualification Test Sequence

The test specimens referred to in paragraph 1.4 and Table 1 were tested according to the test sequence listed in Table 2.

Table 2 – Test Sequence

Test or Examination	Test Group							
	1	2a	2b	3	4a	4b	5	6
	Test Sequence (a)							
Initial Visual Examination	1	1	1	1	1	1	1	1
Low Level Contact Resistance	3,6,8,10,12	2,4,6,8,10			3(b), 5		2,4,6,8,10,12,14,16	
Low Level Compliant Pin Resistance			2,5			3, 5		
Insulation Resistance				6				
Withstanding Voltage				7				
Random Vibration	9							
Mechanical Shock	11							
Durability	5	3		2			3(c),15(c)	
Mating Force	2,14							
Unmating Force	4,13							
Compliant Pin Insertion Force					2			
Compliant Pin Retention Force					6			
Minute Disturbance							13	
Thermal Shock		7	3	4				
Humidity / Temperature Cycling		9	4	5				
Temperature Life					4	4		
Mixed Flowing Gas (Mated)							9(d),11(d)	
Mixed Flowing Gas (Unmated)							5(d),7(d)	
Dust Contamination	7	5		3				
Temperature Rise Vs. Current								2
Final Visual Examination	15	11	6	8	7	7	17	3

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

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

The specimens were visually examined and no evidence of physical damage detrimental to the operation of the parts were observed.

A certification of conformance was issued stating that the specimens in the test package were produced, inspected, and accepted as conforming to product drawing requirements and made using the same core manufacturing processes and technologies as production parts.

2.2 Low Level Contact Resistance – Test Groups 1, 2a, 4a, and 5

All specimens met the performance requirements listed of Product Specification 108-32021 Rev E. The signal contacts met the Δ10 milliohm maximum requirement. The ground contacts met the Δ20 milliohm maximum requirement. See Tables 3 to 6 for a summary of the test results.

Table 3 – LLCR Summary Data in milliohms, Test Group 1

Reading	Initial	After Durability	After Dust	After Vibration	Final
	Actual	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)
Signals					
Minimum	31.94	-1.75	-2.19	-2.60	-1.96
Maximum	54.16	1.81	0.78	1.18	3.96
Average	43.37	-0.37	-0.47	-0.56	-0.54
Std Dev	7.49	0.48	0.47	0.59	0.65
N	144	144	144	144	144
Grounds					
Minimum	11.03	-1.07	-2.43	-1.23	-0.55
Maximum	18.99	4.53	5.69	4.99	5.83
Average	15.67	0.74	1.01	0.95	1.61
Std Dev	2.16	1.57	1.81	1.60	1.67
N	54	54	54	54	54

Table 4 – LLCR Summary Data in milliohms, Test Group 2

Reading	Initial	After Durability	After Dust	After Thermal Shock	Final
	Actual	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)
Signals					
Minimum	32.53	-1.68	-2.30	-2.46	-2.13
Maximum	55.09	1.11	1.12	1.14	6.81
Average	43.53	-0.17	-0.43	-0.50	0.10
Std Dev	7.56	0.45	0.47	0.55	1.06
N	144	144	144	144	144
Grounds					
Minimum	14.61	-0.54	-0.59	-0.77	-1.69
Maximum	19.21	1.37	2.20	2.34	6.00
Average	16.13	0.42	0.56	0.48	2.42
Std Dev	1.15	0.38	0.60	0.65	1.31
N	54	54	54	54	54

Table 5 – LLCR Summary Data in milliohms, Test Group 4

Reading	Initial	Final
	Actual	Delta (ΔR)
Signals		
Minimum	31.72	-0.64
Maximum	54.78	7.24
Average	43.30	1.49
Std Dev	7.50	1.42
N	144	144
Grounds		
Minimum	14.28	0.12
Maximum	19.45	11.44
Average	15.42	2.67
Std Dev	1.11	2.36
N	54	54

Table 6 – LLCR Summary Data in milliohms, Test Group 5

Reading	Initial	After Durability	After 5 Days MFG	After 10 Days MFG	After 10 Days MFG (Retest)*	After 15 Days MFG	After 20 Days MFG	After Minute Disturbance	Final
	Actual	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)	Delta (ΔR)
Signals									
Minimum	32.47	-1.93	-1.46	-1.93	-2.58	-2.11	-1.96	-1.63	-1.88
Maximum	54.35	1.20	7.77	5.17	6.85	6.60	7.10	5.73	3.36
Average	43.52	-0.17	0.19	0.53	0.45	0.62	0.48	0.25	0.24
Std Dev	7.46	0.51	1.10	1.31	1.34	1.53	1.41	1.04	0.85
N	144	144	144	144	144	144	144	144	144
Grounds									
Minimum	14.65	-1.35	-0.65	-1.07	0.37	0.07	-0.08	-0.15	-0.12
Maximum	18.78	1.20	2.42	3.29	2.49	4.83	5.69	3.07	3.03
Average	16.01	0.03	0.64	0.82	1.47	1.44	1.37	1.14	1.14
Std Dev	1.09	0.57	0.68	0.87	0.42	0.87	1.13	0.60	0.54
N	54	54	54	54	54	54	54	54	54

*After 11 days of testing it was found that the MFG corrosion rate was incorrect. The 10 day low level contact resistance measurements were retaken after 6.4 days to receive measurements at the correct corrosion rate. More details can be found in Paragraph 3.18.

2.3 Low Level Compliant Pin Resistance – Test Groups 2b and 4b

All specimens met the performance requirements of 1 mohm max initial and 1 mohm max delta after environments as listed of Product Specification 108-32021 Rev E. See Tables 7 and 8 for a summary of the test results.

Table 7 – LLCPR Summary Data in microohms, Test Group 2

Reading	Initial	Final	Initial	Final
	Actual	Delta (ΔR)	Actual	Delta (ΔR)
	Header		Receptacle	
Signals				
Minimum	145.95	-179.70	79.00	-37.10
Maximum	411.30	86.50	358.50	335.80
Average	293.21	-13.03	164.68	145.09
Std Dev	51.07	61.58	63.67	94.35
N	48	48	72	72
Grounds				
Minimum	196.50	23.45	13.45	-14.70
Maximum	496.51	648.91	97.10	109.00
Average	381.65	189.09	39.39	49.39
Std Dev	75.96	178.18	15.70	29.10
N	24	24	36	36

Table 8 – LLCPR Summary Data in microohms, Test Group 4

Reading	Initial	Final	Initial	Final
	Actual	Delta (ΔR)	Actual	Delta (ΔR)
	Header		Receptacle	
Signals				
Minimum	196.50	-145.50	90.50	-144.50
Maximum	361.00	90.95	358.50	271.60
Average	270.55	-23.60	174.31	120.32
Std Dev	41.60	56.90	82.36	98.81
N	48	48	72	72
Grounds				
Minimum	245.50	-37.45	131.50	1.00
Maximum	465.00	397.00	289.50	978.11
Average	364.68	187.70	191.00	147.62
Std Dev	73.41	104.64	42.54	226.75
N	24	24	36	36

2.4 Insulation Resistance – Test Group 3

The specimens met the performance requirement of 1,000 Megohm as listed in Product Specification 108-32021 Rev E for insulation resistance.

2.5 Withstanding Voltage – Test Group 3

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E for withstanding voltage.

Specimens displayed no breakdown or flashover when the specimens were subjected to 250 VAC for one minute.

2.6 Random Vibration – Test Group 1

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E, having no apparent physical damage or discontinuities of one microsecond or greater occurring during testing.

2.7 Mechanical Shock – Test Group 1

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E having no apparent physical damage or discontinuities of one microsecond or greater occurring during testing.

2.8 Durability – Test Group 1, 2a, 3, and 5

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.9 Mating Force – Test Group 1

The specimens met the 2.1 N initial maximum average mating force and the 2.5 N final maximum average mating force per differential pair as listed in Product Specification 108-32021 Rev E. See Table 9 for detailed test results. The total force was divided by 24 to obtain the maximum average per differential pair including ground.

Table 9 – Mating Force Results in Newtons

Specimen ID	Initial		Final	
	Total Force	Avg. Force per Differential Pair	Total Force	Avg. Force per Differential Pair
1	39.66	1.65	38.83	1.62
2	38.87	1.62	36.62	1.53
3	37.37	1.56	37.94	1.58

2.10 Unmating Force – Test Group 1

The specimens met the 0.31 Newton minimum average requirement for unmating force per differential pair as listed in Product Specification 108-32021 Rev E for both initial and final unmating. See Table 10 for detailed test results. The total force was divided by 24 to obtain the average per differential pair including ground.

Table 10 – Unmating Force Results in Newtons

Specimen ID	Initial		Final	
	Total Force	Avg. Force per Differential Pair	Total Force	Avg. Force per Differential Pair
1	30.17	1.26	27.51	1.15
2	29.31	1.22	27.25	1.14
3	28.32	1.18	26.12	1.09

2.11 Compliant Pin Insertion Force – Test Group 4

The specimens met the 17.8 Newton maximum average requirement for compliant pin insertion force per pin as listed in Product Specification 108-32021 Rev E. See Table 11 for detailed test results. The connector force was divided by 156 to obtain the maximum average force per pin.

Table 11 – Compliant Pin Insertion Force Results in Newtons

Specimen ID	Header		Receptacle	
	Insertion Force	Avg. Force per Pin	Insertion Force	Avg. Force per Pin
1	1022.71	6.56	965.98	6.19
2	1037.76	6.65	973.22	6.24
3	1035.46	6.63	1077.00	6.90

2.12 Compliant Pin Retention Force – Test Group 4

The specimens met the 1.8 Newton minimum average requirement for compliant pin retention force per pin as listed in Product Specification 108-32021 Rev E. See Table 12 for detailed test results. The connector force was divided by 156 to obtain the average force per pin.

Table 12 – Header Compliant Pin Retention Force Results in Newton

Specimen ID	Header		Receptacle	
	Retention Force	Avg. Force per Pin	Retention Force	Avg. Force per Pin
1	391.40	2.51	389.26	2.50
2	350.62	2.25	443.85	2.85
3	380.85	2.44	291.44	1.87

2.13 Minute Disturbance – Test Group 5

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage visible as a result of unmating and re-mating the specimens a distance of 0.1 mm.

2.14 Thermal Shock – Test Groups 2a, 2b, and 3

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.15 Humidity / Temperature Cycling – Test Groups 2a, 2b, and 3

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.16 Temperature Life – Test Groups 4a and 4b

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.17 Mixed Flowing Gas (Mated) – Test Group 5

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

Copper corrosion rate (Average) = 14.8 **μg/cm^2/day**

2.18 Mixed Flowing Gas (Unmated) – Test Group 5

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.19 Dust Contamination – Test Groups 1, 2a, and 4a

The specimens met the performance requirements listed in Product Specification 108-32021 Rev E with no evidence of physical damage detrimental to the operation of the part observed.

2.20 Temperature Rise vs. Current – Test Group 6

Specimens met the 30°C temperature rise above ambient when energized with 0.5 Amps DC requirement listed in Product Specification 108-32021 Rev E. See Table 13 for temperature rise vs. current results.

Table 13 – Temperature Rise vs. Current Results in Degrees Celsius

Current	0.20	0.31	0.40	0.50	0.60	0.71
Specimen ID	Temperature Rise					
1	2.30	5.43	9.47	14.69	20.75	27.64
2	2.17	5.06	8.77	13.50	19.06	25.33
3	2.41	5.42	9.30	14.26	20.02	26.62

2.21 Final Visual Examination – 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 Visual Examination

The specimens were visually examined in accordance with test procedure EIA-364-18B and Product Specification 108-32021 Rev E for evidence of physical damage that would be detrimental to the operation of the parts.

3.2 Low Level Contact Resistance

The specimens were subjected to a low level contact resistance (LLCR) test in accordance with test procedure EIA-364-23C and Product Specification 108-32021 Rev E. See Figure 1 for a representative image of the test setup.

LLCR 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. Positive and negative current were applied to the series signal circuit created with the printed circuit boards. Positive and negative voltage probes were applied via the discrete headers of the printed circuit board. Negative voltage and current probes were applied to the ground discrete headers of the header printed circuit board. Positive voltage and current were applied to the ground discrete headers of the header printed circuit board.

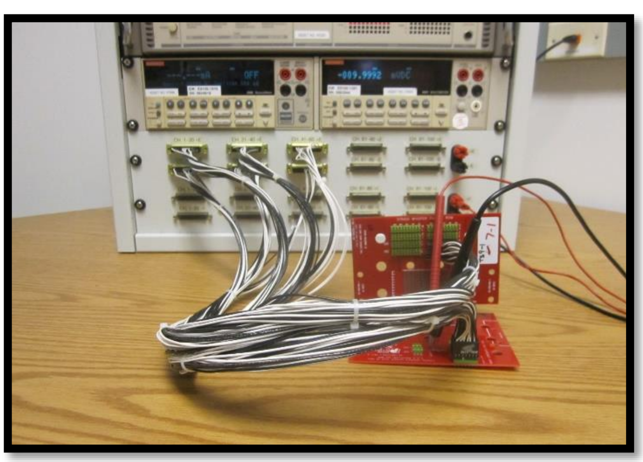

Figure 1 – Low Level Contact Resistance Test Setup

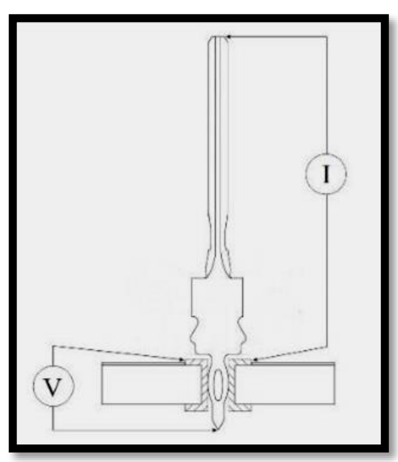

Figure 2 – LLCPR Test Setup

3.3 Low Level Compliant Pin Resistance

The specimens were subjected to a low level compliant pin resistance (LLCPR) test in accordance with test procedure EIA-364-23C and Product Specification 108-32021 Rev E. See Figure 2 for an illustration of the test setup.

LLCPR measurements at low level current were made using a four terminal measuring technique at the microohm level. Current was applied at the interface end of each contact and the pad surrounding the thru-hole. One voltage probe was attached to the tail of the contact protruding from the bottom of the thru-hole and the remaining one was attached to the access trace connected to the pad surrounding the thru-hole. Both signal and ground contacts were measured.

3.4 Insulation Resistance

Insulation resistance was conducted as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-21E. See Figure 3 for a representative image of the test setup.

A test potential of 100 VDC was applied to adjacent contacts on mated specimens for two minutes with insulation resistance measurements recorded immediately after.

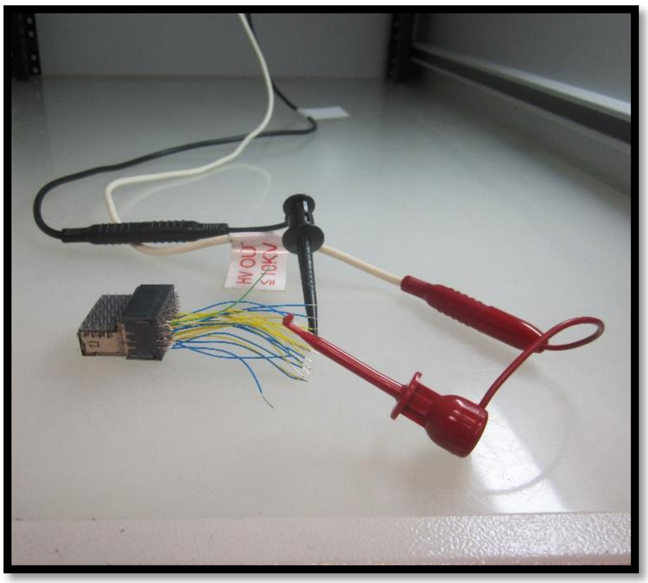

Figure 3 – Insulation Resistance and Withstanding Voltage Test Setup

3.5 Withstanding Voltage

Dielectric withstanding voltage was conducted as stated in Product Specification 108-32021 Rev E and in accordance with EIA 364-20D. See Figure 3 for a representative image of the test setup.

Test leads were connected to adjacent contacts on mated specimens with the test voltage increased from zero to 250 VAC at a rate of 250 volts per second. The 250 VAC was held for one minute and the maximum leakage current recorded.

3.6 Random Vibration

Random vibration was performed as stated in Product Specification 108-32021 Rev E, in accordance with specification EIA-364-28F, test condition "VII", test condition letter "D". See Figure 4 and Figure 5 for representative images of the test setup.

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.

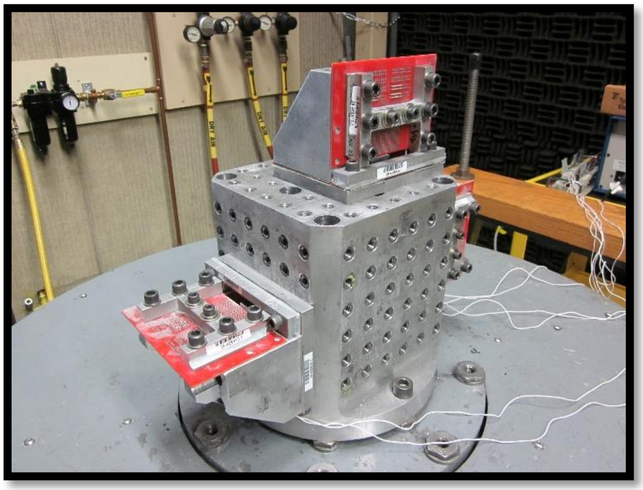

Figure 4 – Random Vibration Test Setup

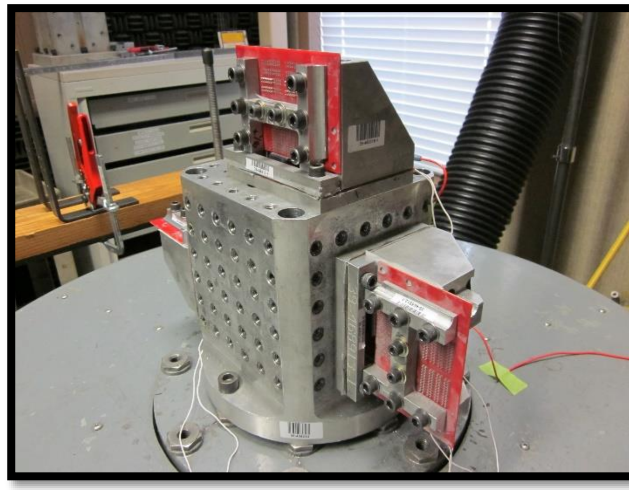

Figure 5 – Random Vibration Test Setup

3.7 Mechanical Shock

Mechanical shock was performed as stated in Product Specification 108-32021 Rev E, in accordance with specification EIA-364-27C, test condition “A”. See Figure 6 for a representative image of the test setup.

The parameters of this test condition are a half-sine waveform with an acceleration amplitude of 50 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.

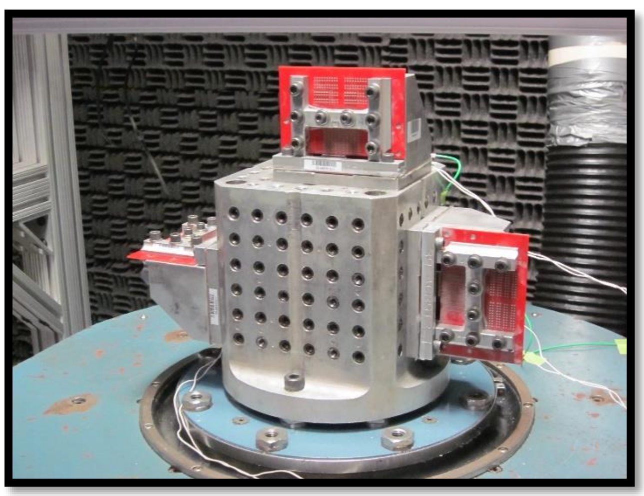

Figure 6 – Mechanical Shock Test Setup

3.8 Durability

Specimens were subjected to durability as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-9C.

Specimens were mated and unmated for 200 cycles using a durability machine at a rate of no more than 600 cycles per hour. Please note that Test Group 5 was cycled 100 times before, and cycled 100 times after mixed flowing gas testing.

3.9 Mating Force

Specimens were subjected to mating force as stated in in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-13E. See Figure 8 for a representative image of the test setup.

The header was placed on the base of the tensile/compression machine. The receptacle was manually aligned with the header. A block attached to the load cell of the tensile/compression crosshead and was aligned with the top of the receptacle. The crosshead was lowered at a rate of 12.70 mm/min until the specimen was fully mated and the peak force was recorded. PCBs were placed behind the test PCB to allow clearance for the access header tails.

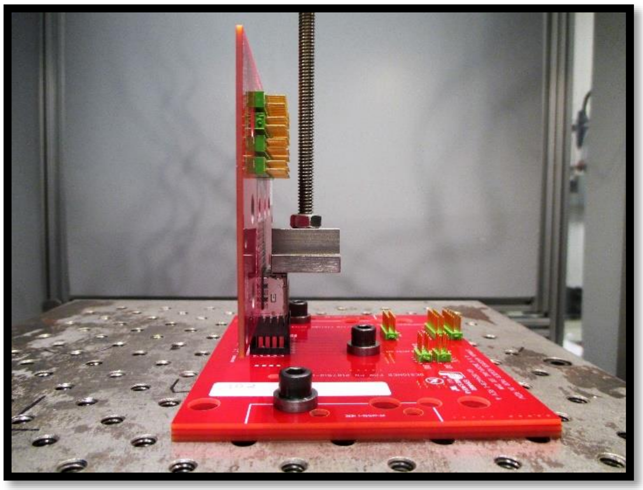

Figure 8 – Mating Force Test Setup

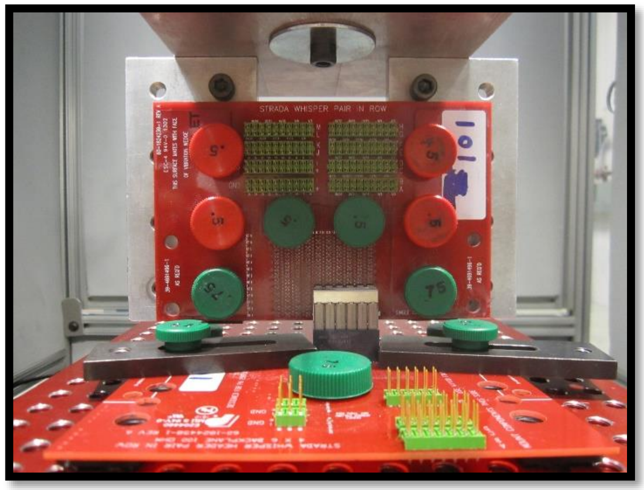

Figure 9 – Unmating Force Test Setup

3.10 Unmating Force

Specimens were subjected to unmating force as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-13E. See Figure 9 for a representative image of the test setup.

The header PC board was secured to a XYR alignment table rigidly attached to the base of the tensile/compression machine. The receptacle PC board was clamped to a 90° fixture attached to the load cell of the tensile/compression crosshead. The crosshead was raised at a rate of 12.70 mm/min until the specimen was fully unmated and the peak force was recorded.

3.11 Compliant Pin Insertion Force

Specimens were subjected to compliant pin insertion force as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-05B. See Figures 10 and 11 for representative images of the test setup.

The specimens were manually aligned with the PCB and placed on a plate that was attached to the base of the tensile/compression machine. A customer supplied fixture (P/N: 2215264 Rev A & 2215265 Rev A) was placed into the header to facilitate insertion and a block was placed on top of the receptacle specimens. A probe was attached to the moveable crosshead of the tensile/compression machine and aligned with the center of the specimen. Force was then applied in a downward direction at a rate of 12.70 mm/min until the specimens were fully inserted. For the receptacle specimens and all of the LLCPR specimens, backer PCBs were used to allow for the tails of the compliant pins to protrude.

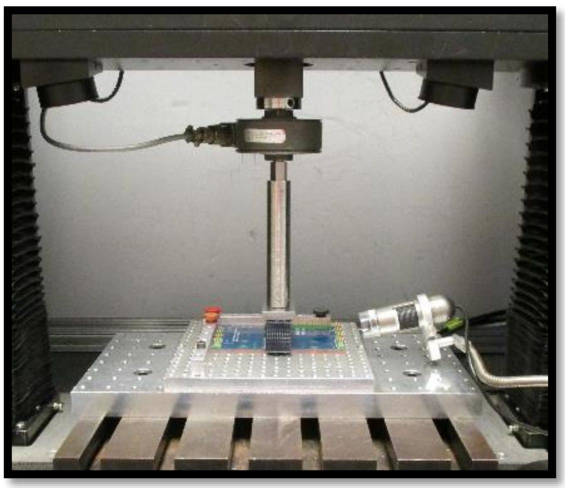

Figure 10 – Compliant Pin Insertion Force Test Setup – Receptacle PCB

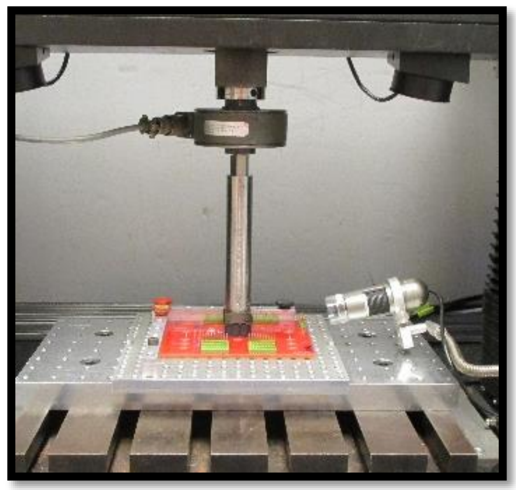

Figure 11 – Compliant Pin Insertion Force Test Setup – Header PCB

3.12 Compliant Pin Retention Force

Specimens were subjected to compliant pin retention force as stated in in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-05B. See Figures 12 and 13 for representative images of the test setup.

Header specimens were prepared for retention force by forcing FastSteel into the header contacts, placing a bolt in the center of the specimen, and molding more FastSteel to the specimen and around the bolt. The FastSteel was allowed to cure for a minimum of 24 hours. A nut was then placed on the bolt.

The specimen PC boards were clamped to a mill table attached to the base of the tensile/compression machine. The header specimens used a slotted plate and goal post fixture attached to the load cell of the tensile/compression crosshead aligned below the attached nut. The receptacle specimens were clamped using a vice attached to the load cell of the tensile/compression crosshead. The crosshead was raised at a rate of 12.70 mm/min until the specimen was fully removed from the PC board and the peak force was recorded.

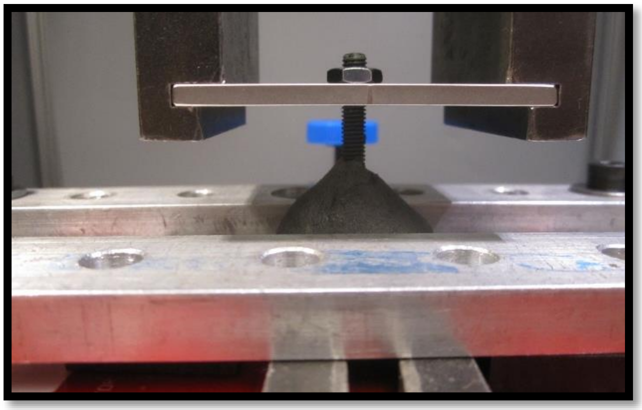

Figure 12 –Compliant Pin Retention Force Test Setup – Header PC Board Specimen

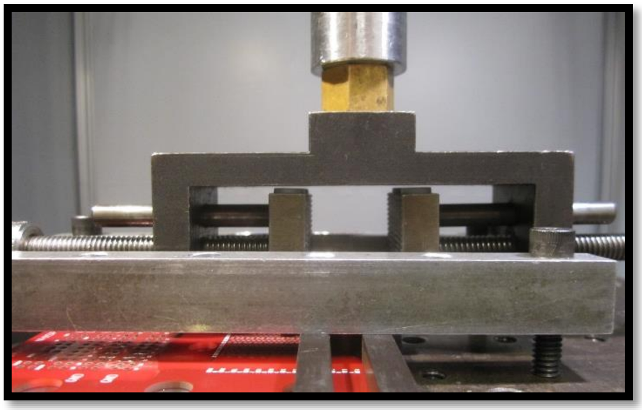

Figure 13 – Compliant Pin Retention Force Test Setup – Receptacle PC Board Specimen

3.13 Minute Disturbance

Specimens were subjected to compliant pin retention force as stated in Product Specification 108-32021 Rev E and were unmated and re-mated a distance of approximately 0.1 mm.

3.14 Thermal Shock

Unmated specimens were subjected to thermal shock as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-32G, Test Condition I.

Unmated specimens were subjected to 5 cycles between -55°C and 85°C with 30 minute dwells at temperature extremes and 1 minute transition between temperatures.

3.15 Humidity / Temperature Cycling

Mated specimens were subjected to temperature / humidity cycling as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-31D, Method III.

Unmated specimens were subjected to 50 cycles (800 hours) between 5°C and 85°C at 80 to 100% relative humidity.

3.16 Temperature Life

Mated specimens were subjected to temperature life as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-17C, Method A.

Mated specimens were subjected to 105°C for 1,000 hours.

3.17 Mixed Flowing Gas (Mated)

Mated specimens were subjected to a 4 gas environment as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-65B, Class 2a.

The specimens were exposed for 10 days. Specimens were removed for low level contact resistance measurements every five days. See Table 14 for the MFG test parameters and the following note for test deviations.

3.18 Mixed Flowing Gas (Unmated)

Unmated specimens were subjected to a 4 gas environment as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-65B, Class 2a.

The specimens were exposed for 10 days. Specimens were removed for low level contact resistance measurements every five days. See Table 14 for the MFG test parameters and the following note for test deviations.

Table 14 – MFG Test Parameters

Environment	**Class 2a**
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 (mated and unmated)	**20 Days ***

Test Deviations:
First three days of the test were done at 76% humidity.
*After 11 days of testing it was found that the copper coupons were corroding slowly at a rate of 4.65 g/cm^3/day. Because the rate should be 12-16 ug/cm^3/day we counted the 11 days (4.65/14)*11 = 3.6 days. The specimens were then tested with the right corrosion rate for the other 16.4 days. The 10 day low level contact resistance measurements were retaken after 6.4 days to receive measurements at the correct corrosion rate.

3.19 Dust Contamination

Unmated specimens were subjected to dust contamination as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-91A. See Figure 14 for a representative image of the test setup.

42 grams of #1 benign dust was prepared for dust contamination testing by placing the dust in a chamber to dry for one hour at 50°C. Immediately after removal from the temperature chamber, the benign dust was spread inside the chamber. The amount of 42 grams of benign dust used was calculated by using 9 grams of dust per cubic foot of chamber space with a chamber space estimated at 4.6 cubic feet.

The specimens were hung in the chamber and the blower system was turned on for an hour with a flow rate of 360 CFM. The blower system was then turned off and the specimens remained in the closed chamber for an additional hour. The specimens were then removed and tapped 5 times at a rate of 1.0 inch per minute to remove any excess accumulation of dust.

Figure 14 – Dust Contamination Test Setup

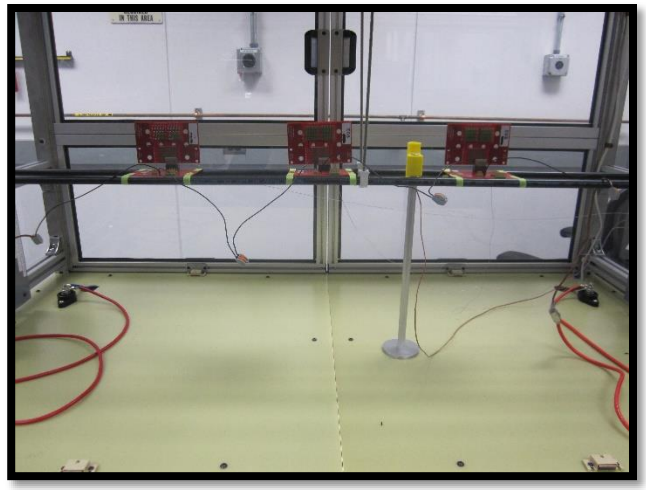

Figure 15 – Temperature Rise vs. Current Test Setup

3.20 Temperature Rise vs. Current

Specimens were subjected to temperature rise vs current testing as stated in Product Specification 108-32021 Rev E and in accordance with test procedure EIA 364-70C. See Figure 15 for a representative image of the test setup.

Specimens were prepared before testing by placing a 36 AWG thermocouple in the center of the connector between the header and receptacle before mating.

Temperature measurements were recorded when the specimens reached stability at each current level. The temperature is considered to be stable when the temperature rise of 3 consecutive readings taken at 5 minute intervals does not differ by more than 1°C. The ambient temperature was then subtracted from this measured temperature to obtain the temperature rise. As the PCB design allowed for connecting all of the signals in series, only the signals were energized.

3.21 Final Visual Examination

The specimens were visually examined in accordance with test procedure EIA-364-18B and Product Specification 108-32021 Rev E for evidence of physical damage that would be detrimental to the operation of the parts.