BUCHANAN WireMate* Two-Piece Connector System

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity BUCHANAN WireMate Two-Piece Connector System to determine its conformance to the requirements of Product Specification 108-133105 Rev A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the BUCHANAN WireMate Two-Piece Connector System. Testing was performed at the Harrisburg Electrical Components Test Laboratory between October 17, 2018 and November 21, 2018. Documentation is on file and maintained at the Harrisburg Electrical Components Test Laboratory under EA20180360T.

1.3 Conclusion

The BUCHANAN Wiremate specimens listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-133105 Rev A.

1.4 Product Description

TE Connectivity's (TE) BUCHANAN WireMate two-piece poke-in series of products provide designers a three directional solution for wall mounting a device and improve the overall installation experience for the novice installer. Wires are routed through an opening in the wall to TE's BUCHANAN WireMate connector mounted on a wall plate. The wires are stripped of insulation and easily poked into the terminal block device providing a reliable termination without the need for tooling. Wire extracting is also made easy, with simple levers to release individual wires. The mating header is surface mount attached to the PCB in the device to be mounted on the wall. The two-piece combination allows wall mounting of a device in three different directions; into the wall, along the wall and in a twist or rotating motion.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test (See table 1).

Table 1 – Test Specimens

Test Group	Test Set	Quantity	Part Number	Description
A	1	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	2	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	3	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB

Table 1 – Test Specimens (Continued)

Test Group	Test Set	Quantity	Part Number	Description
A	4	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	5	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	6	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	7	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	8	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
AA	9	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	10	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	11	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	12	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	13	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB

Table 1 – Test Specimens (Continued)

Test Group	Test Set	Quantity	Part Number	Description
AA	14	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	15	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	16	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
B	17	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	18	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	19	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	20	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	21	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	22	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB

Table 1 – Test Specimens (Continued)

Test Group	Test Set	Quantity	Part Number	Description
B	23	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	24	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
C	25	4	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		4	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		4	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	26	4	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		4	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
D	27	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	28	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(20 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	29	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	30	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	31	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	32	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(20 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB

Table 1 – Test Specimens (Continued)

Test Group	Test Set	Quantity	Part Number	Description
D	33	1	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	34	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	35	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(20 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	36	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	37	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	38	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(22 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	39	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(20 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	40	1	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		1	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		1	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB

Table 1 – Test Specimens (Continued)

Test Group	Test Set	Quantity	Part Number	Description
E	41	2	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(22 AWG Stranded Wire)**
		2	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		2	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	42	2	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Stranded Wire)**
		2	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		2	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	43	2	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(24 AWG Solid Wire)**
		2	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		2	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
	44	2	2319461-8 Rev A	WIREMATE Wall Plate **5mm** Connector, 8 Circuit **(18 AWG Solid Wire)**
		2	2318770-8 Rev A	WIREMATE Wall Plate **5mm** SMT Header, 8 Position
		2	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
F	45	5	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit
		5	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
		5	2323665-1 Rev 1	WIREMATE Wall Plate Test PCB
G	46	5	2318136-8 Rev A	WIREMATE Wall Plate **8mm** SMT Header, 8 Position
H	47	5	2318582-8 Rev A	WIREMATE Wall Plate **8mm** Connector, 8 Circuit

1.6 Qualification Test Sequence

The specimens listed in paragraph 1.5 were subjected to the test sequences outlined below in Table 2.

Table 2 – Qualification Test Sequence

Test or Examination	Test Sets								
	1 - 8	9 - 16	17 - 24	25, 26	27 - 40	41 - 44	45	46	47
	Test Group								
	A	AA	B	C	D	E	F	G	H
	Test Sequence (a)								
Initial Examination of Product	1	1	1	1	1	1	1	1	1
LLCR	2,6	2,6	2,5,7,9	2,7		2,5			
Insulation Resistance				3,8					
Withstanding Voltage				4,9					
Temperature Rise vs. Current			3,10			3,6			
Random Vibration	4	4	8						
Mechanical Shock	5	5							
Wire Insertion Force					3				
Wire Extraction Force					4				
Current Cycling						4			
Header Retention Force, Push Off							3		
Header Retention Force, Pull Off								2	
Connector Retention Force									2
Mating Force, Vertical					2				
Mating Force, Horizontal							2		
Durability, 10 Cycles	3								
Durability, 30 Cycles		3							
Thermal Shock				5					
Humidity/Temperature Cycling			4	6					
Temperature Life			6						
Final Examination of Product	7	7	11	10	5	7	4	3	3

Note: (a) 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 Examination of Product – All 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 (LLCR) – Groups A, AA, B, C, E

Refer to Table 3 through 7 for LLCR data in milliohms. All low level contact resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage had a change in resistance (ΔR) of less than 25.0 milliohms after testing.

Table 3 – LLCR Summary Data in Milliohms (Group A)

Milliohms	Initial	Final	Initial	Final
	Actual R	Delta R (ΔR)	Actual R	Delta R (ΔR)
	Test Set 1 – 22 AWG Stranded / 5 mm		Test Set 5 – 22 AWG Stranded / 8 mm	
Minimum	37.36	0.18	36.87	0.14
Maximum	37.87	0.82	37.22	0.60
Average	37.72	0.47	37.03	0.38
	Test Set 2 – 18 AWG Stranded / 5 mm		Test Set 6 – 18 AWG Stranded / 8 mm	
Minimum	19.70	-0.15	19.17	-0.17
Maximum	19.95	0.60	19.71	0.28
Average	19.81	0.27	19.40	0.05
	Test Set 3 – 24 AWG Solid / 5 mm		Test Set 7 – 24 AWG Solid / 8 mm	
Minimum	52.67	0.12	52.23	0.01
Maximum	53.16	0.95	52.38	0.44
Average	52.84	0.36	52.31	0.17
	Test Set 4 – 18 AWG Solid / 5 mm		Test Set 8 – 18 AWG Solid / 8 mm	
Minimum	17.91	0.07	17.18	-0.10
Maximum	18.15	0.47	17.54	0.36
Average	18.01	0.23	17.38	0.19

Table 4 – LLCR Summary Data in Milliohms (Group AA)

Milliohms	Initial	Final	Initial	Final
	Actual R	Delta R (ΔR)	Actual R	Delta R (ΔR)
	Test Set 9 – 22 AWG Stranded / 5 mm		Test Set 13 – 22 AWG Stranded / 8 mm	
Minimum	37.16	-0.01	36.67	0.12
Maximum	37.45	0.62	36.91	0.51
Average	37.33	0.33	36.80	0.29
	Test Set 10 – 18 AWG Stranded / 5 mm		Test Set 14 – 18 AWG Stranded / 8 mm	
Minimum	19.77	0.18	18.94	-0.02
Maximum	20.10	0.49	19.38	0.92
Average	19.97	0.35	19.20	0.32
	Test Set 11 – 24 AWG Solid / 5 mm		Test Set 15 – 24 AWG Solid / 8 mm	
Minimum	52.71	0.10	52.24	0.18
Maximum	52.87	1.15	52.64	3.07
Average	52.78	0.51	52.38	1.54
	Test Set 12 – 18 AWG Solid / 5 mm		Test Set 16 – 18 AWG Solid / 8 mm	
Minimum	17.25	0.44	16.72	0.01
Maximum	17.79	0.69	17.18	0.67
Average	17.49	0.54	17.01	0.34

Table 5 – LLCR Summary Data in Milliohms (Group B)

Milliohms	Initial	After Humidity/ Temp. Cycling	After Temperature Life	After Random Vibration
	Actual R	Delta R (ΔR)	Delta R (ΔR)	Delta R (ΔR)
Test Set 17 – 22 AWG Stranded / 5 mm				
Minimum	37.63	-0.13	0.51	0.35
Maximum	38.17	0.50	4.04	1.69
Average	37.91	0.27	1.59	1.22
Test Set 18 – 18 AWG Stranded / 5 mm				
Minimum	18.92	0.12	0.58	0.80
Maximum	19.25	0.43	0.99	2.15
Average	19.10	0.24	0.74	1.33
Test Set 19 – 24 AWG Solid / 5 mm				
Minimum	48.18	0.22	1.46	0.98
Maximum	48.94	1.34	6.18	6.82
Average	48.58	0.66	4.08	3.07
Test Set 20 – 18 AWG Solid / 5 mm				
Minimum	19.33	-0.03	0.60	0.31
Maximum	19.70	0.64	3.44	1.44
Average	19.47	0.25	1.32	0.87
Test Set 21 – 22 AWG Stranded / 8 mm				
Minimum	37.26	-0.19	0.69	0.54
Maximum	37.47	0.65	3.29	1.84
Average	37.33	0.29	1.75	1.11
Test Set 22 – 18 AWG Stranded / 8 mm				
Minimum	18.24	0.18	0.54	0.66
Maximum	18.51	0.72	1.38	1.58
Average	18.40	0.41	0.90	1.20
Test Set 23 – 24 AWG Solid / 8 mm				
Minimum	47.67	-0.07	1.30	2.74
Maximum	47.99	0.93	8.42	7.44
Average	47.82	0.34	3.24	4.44
Test Set 24 – 18 AWG Solid / 8 mm				
Minimum	18.48	-0.07	0.28	0.42
Maximum	19.06	2.21	3.82	1.39
Average	18.81	0.98	2.07	0.86

Table 6 – LLCR Summary Data in Milliohms (Group C)

Milliohms	Initial	Final
	Actual R	Delta R (ΔR)
Test Set 25 – 24 AWG Solid / 5 mm		
Minimum	35.02	0.07
Maximum	35.70	1.11
Average	35.34	0.52
Test Set 26 – 18 AWG Solid / 5 mm		
Minimum	14.64	-0.32
Maximum	15.65	0.78
Average	15.19	0.26

Table 7 – LLCR Summary Data in Milliohms (Group E)

Milliohms	Initial	After Current Cycling
	Actual R	Delta R (ΔR)
Test Set 41 – 22 AWG Stranded / 5 mm		
Minimum	25.83	0.18
Maximum	26.35	1.72
Average	26.01	0.73
Test Set 42 – 18 AWG Stranded / 5 mm		
Minimum	13.78	-0.02
Maximum	14.83	0.61
Average	14.31	0.25
Test Set 43 – 24 AWG Solid / 5 mm		
Minimum	34.92	-0.09
Maximum	35.28	0.83
Average	35.09	0.28
Test Set 44 – 18 AWG Solid / 5 mm		
Minimum	14.52	-0.42
Maximum	15.36	0.80
Average	14.94	0.25

2.3 Insulation Resistance – Group C

All insulation resistance measurements were greater than 100 megohms initially and 10 megohms after testing.

2.4 Withstanding Voltage – Group C

No dielectric breakdown or flashover occurred.

2.5 Temperature Rise vs. Current – Groups B, E

All specimens had a temperature rise of less than 33°C above ambient when tested using a baseline rated current of 5.0 amperes (18 AWG) and 3.0 amperes (20,22,24 AWG). Refer to Table 8 through 10 for temperature rise vs. current data in degrees Celsius.

Table 8 – Temperature Rise vs. Current Data in Degrees Celsius, Group B (5 mm Connector)

5 mm Connector		Initial	Final	Initial	Final	Initial	Final	Initial	Final
		Test Set 17 22 AWG Stranded		Test Set 18 18 AWG Stranded		Test Set 19 24 AWG Solid		Test Set 20 18 AWG Solid	
Specimen ID	Current, Amps DC	3.0		5.0		3.0		5.0	
	Position ID	Temperature Rise, °C							
1	Pos. 4	12.6	14.0	27.9	30.1	14.9	19.7	28.4	32.6
	Pos. 8	10.7	11.8	22.2	23.3	12.5	15.0	23.5	25.3

Table 9 – Temperature Rise vs. Current Data in Degrees Celsius, Group B (8 mm Connector)

8 mm Connector		Initial	Final	Initial	Final	Initial	Final	Initial	Final
		Test Set 21 22 AWG Stranded		Test Set 22 18 AWG Stranded		Test Set 23 24 AWG Solid		Test Set 24 18 AWG Solid	
Specimen ID	Current, Amps DC	3.0		5.0		3.0		5.0	
	Position ID	Temperature Rise, °C							
1	Pos. 4	10.0	11.6	22.9	24.2	12.2	15.7	22.8	25.8
	Pos. 8	7.2	8.9	16.8	18.2	8.2	12.2	17.0	19.3

Table 10 – Temperature Rise vs. Current Data in Degrees Celsius, Group E (5 mm Connector)

5 mm Connector		Initial	Final	Initial	Final	Initial	Final	Initial	Final
		Test Set 41 22 AWG Stranded		Test Set 42 18 AWG Stranded		Test Set 43 24 AWG Solid		Test Set 44 18 AWG Solid	
Specimen ID	Current, Amps DC	3.0		5.0		3.0		5.0	
	Position ID	Temperature Rise, °C							
1	Pos. 4	11.5	12.1	22.4	22.7	13.0	13.2	25.1	25.8
	Pos. 8	8.7	9.1	18.1	17.9	9.6	10.1	19.5	19.6
2	Pos. 4	11.9	12.3	23.6	23.9	13.2	13.7	25.9	26.1
	Pos. 8	9.0	9.4	18.9	19.4	9.3	10.2	20.1	20.0

2.6 Random Vibration – Groups A, AA, B

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

2.7 Mechanical Shock – Group A, AA

No discontinuities were detected during mechanical shock. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible. The pulse velocity change was 79.1 inches per second.

2.8 Wire Insertion – Group D

Refer to Table 11 and Table 12 for wire insertion force summary data in Newtons. All recorded forces were below the maximum requirement of 9.0 Newtons for wire insertion force.

Table 11 – Wire Insertion Force Summary Data in Newtons, 5 mm Connector

Newtons	TS27	TS28	TS29	TS30	TS31	TS32	TS33
	22 AWG Stranded	20 AWG Stranded	18 AWG Stranded	24 AWG Solid	22 AWG Solid	20 AWG Solid	18 AWG Solid
Minimum	2.62	2.72	4.72	2.51	2.83	3.13	3.55
Maximum	6.00	6.46	7.57	5.91	5.12	6.87	4.98
Average	4.15	3.84	5.95	4.32	3.71	3.93	4.19

Table 12 – Wire Insertion Force Summary Data in Newtons, 8 mm Connector

Newtons	TS34	TS35	TS36	TS37	TS38	TS39	TS40
	22 AWG Stranded	20 AWG Stranded	18 AWG Stranded	24 AWG Solid	22 AWG Solid	20 AWG Solid	18 AWG Solid
Minimum	2.60	3.11	3.91	2.46	2.57	2.94	3.25
Maximum	7.41	6.51	8.49	5.29	3.70	5.68	5.63
Average	4.58	4.31	5.60	3.44	3.21	3.46	4.06

2.9 Wire Retention – Group D

Refer to Table 13 and Table 14 for wire retention force summary data in Newtons. All recorded forces were above the minimum required forces, listed below. The specimens in Test Set 40 were limited to 120 Newtons to avoid damage to the connector during testing.

Table 13 – Wire Retention Force Summary Data in Newtons, 5 mm Connector

Newtons	TS27	TS28	TS29	TS30	TS31	TS32	TS33
	22 AWG Stranded	20 AWG Stranded	18 AWG Stranded	24 AWG Solid	22 AWG Solid	20 AWG Solid	18 AWG Solid
Minimum	27.61	49.09	54.61	47.58	69.97	114.64	162.52
Maximum	38.88	62.80	78.65	48.54	73.74	119.47	178.16
Average	34.79	56.81	65.07	48.10	72.49	117.06	169.44
Requirement	20.0 N Min.	30.0 N Min.	30.0 N Min.	13.4 N Min.	20.0 N Min.	30.0 N Min.	30.0 N Min.

Table 14 – Wire Retention Force Summary Data in Newtons, 8 mm Connector

Newtons	TS34	TS35	TS36	TS37	TS38	TS39	TS40
	22 AWG Stranded	20 AWG Stranded	18 AWG Stranded	24 AWG Solid	22 AWG Solid	20 AWG Solid	18 AWG Solid
Minimum	30.40	47.06	41.57	47.56	69.03	116.59	118.83
Maximum	41.94	60.59	86.15	49.57	75.08	123.29	119.00
Average	36.17	55.82	67.60	48.87	72.04	119.04	118.93
Requirement	20.0 N Min.	30.0 N Min.	30.0 N Min.	13.4 N Min.	20.0 N Min.	30.0 N Min.	30.0 N Min.

2.10 Current Cycling – Group E

No evidence of physical damage was visible as a result of current cycling. Refer to Table 15 for current cycling data in degrees Celsius. The temperature rise difference between cycle 1 and cycle 84 was below Δ5°C for all specimens.

Table 15 – Current Cycling Data in Degrees Celsius

Cycle ID →		1	84	ΔT, °C	1	84	ΔT, °C
Specimen ID	Current, Amps DC	4.5			4.5		
	Position ID	Temperature Rise, °C			Temperature Rise, °C		
		Test Set 41 22 AWG Stranded			Test Set 43 24 AWG Solid		
1	Pos. 4	24.11	25.07	**0.96**	27.82	28.38	**0.56**
	Pos. 8	18.55	19.04	**0.49**	21.01	20.98	**-0.03**
2	Pos. 4	25.57	26.16	**0.59**	27.47	28.52	**1.05**
	Pos. 8	19.38	19.77	**0.39**	20.36	21.15	**0.79**
		Test Set 42 18 AWG Stranded			Test Set 44 18 AWG Solid		
Specimen ID	Current, Amps DC	7.5			7.5		
	Position ID	Temperature Rise, °C			Temperature Rise, °C		
1	Pos. 4	48.54	48.28	**-0.26**	54.05	54.76	**0.72**
	Pos. 8	38.40	38.70	**0.30**	42.03	42.94	**0.92**
2	Pos. 4	51.17	51.33	**0.16**	55.32	55.69	**0.38**
	Pos. 8	40.92	41.37	**0.45**	42.81	42.85	**0.05**

2.11 Header Retention Force, Push Off – Group F

Refer to Table 16 for header push off retention force summary data in Newtons. All recorded forces were above the minimum force of 100.0 Newtons for header push off retention. The typical failure mode was the solder joint fractured.

Table 16 – Header Contact Push Off Retention Force Summary Data

Newtons	Header Contact Retention Force (Push Off)
Minimum	353.75
Maximum	420.03
Average	391.15

2.12 Header Retention Force, Pull Off – Group G

Refer to Table 17 for header contact retention (pull off) data in Newtons. All forces were above the minimum requirement of 80.0 Newtons for header contact retention (pull off). The typical failure mode was the trace being removed from the PCB.

Table 17 – Header Contact Pull Off Retention Force Summary Data

Newtons	Header Contact Retention Force (Pull Off)
Minimum	143.12
Maximum	243.18
Average	191.86

2.13 Connector Retention Force – Group H

Refer to Table 18 for connector retention force data in Newtons. All forces were above the minimum requirement of 70.0 Newtons per contact for connector retention. The connector force was divided by 8 to obtain the average per contact force.

Table 18 – Connector Retention Force Summary Data

Specimen ID	Connector Force	Average per Contact Force
	Newtons	Newtons
47-1	1130.12	141.27
47-2	1039.90	129.99
47-3	953.80	119.23
47-4	856.80	107.10
47-5	740.07	92.51

2.14 Mating Force, Vertical – Group D

Refer to Table 19 for vertical mating force data in Newtons. All recorded forces were below the maximum of 43.0 Newtons average per contact for vertical mating force. The connector force was divided by 8 to obtain the average per contact.

Table 19 – Vertical Mating Force Summary Data

Test Set ID	Connector Force	Average Per Contact Force	Test Set ID	Connector Force	Average Per Contact Force
	Newtons	Newtons		Newtons	Newtons
5 mm Connector / Header			8 mm Connector / Header		
27	38.38	4.80	**34**	35.06	4.38
28	34.37	4.30	**35**	34.77	4.35
29	35.19	4.40	**36**	32.41	4.05
30	34.05	4.26	**37**	33.59	4.20
31	35.00	4.38	**38**	31.91	3.99
32	36.62	4.58	**39**	32.78	4.10
33	33.84	4.23	**40**	33.30	4.16
Minimum	33.84	4.23	**Minimum**	31.91	3.99
Maximum	38.38	4.80	**Maximum**	35.06	4.38
Average	35.35	4.42	**Average**	33.40	4.18

2.15 Mating Force, Horizontal – Group F

Refer to Table 20 for horizontal mating force data in Newtons. All recorded forces were below the maximum force of 43.0 Newtons average per contact for mating force. The connector force was divided by 8 to obtain the average per contact force.

Table 20 – Horizontal Mating Force Summary Data

Specimen ID	Connector Force	Average Per Contact Force
	Newtons	Newtons
8 mm Connector / Header		
45-1	60.67	7.58
45-2	44.37	5.55
45-3	54.56	6.82
45-4	44.14	5.52
45-5	42.29	5.29
Minimum	42.29	5.29
Maximum	60.67	7.58
Average	49.21	6.15

2.16 Durability, 10 Cycles – Group A

No physical damage occurred to the specimens as a result of mating and unmating the specimens 10 times.

2.17 Durability, 30 Cycles – Group AA

No physical damage occurred to the specimens as a result of mating and unmating the specimens 30 times.

2.18 Thermal Shock – Group C

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

2.19 Humidity/Temperature Cycling – Groups B, C

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.20 Temperature Life – Group B

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

2.21 Final Examination of Product – All Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1 Initial Examination of Product

A 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 with the unaided eye. Testing was performed in accordance with EIA-364-18B.

3.2 Low Level Contact Resistance (LLCR)

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. Testing was performed in accordance with EIA-364-23C.

3.3 Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for two minutes before the resistance was measured. Testing was performed in accordance with EIA-364-21E.

3.4 Withstanding Voltage

A test potential of 1500 volts AC was applied between the adjacent contacts of mated specimens. This potential was applied for one minute and then returned to zero. Testing was performed in accordance with EIA-364-20E.

3.5 Temperature Rise vs. Current

Thermocouples were beaded and epoxied to the blades of the header specimen. The specimens were placed in a draft free enclosure to eliminate the effects of airflow. The contacts were connected in series and energized using a baseline rated current of 5.0 amperes (18 AWG) and 3.0 amperes (20,22,24 AWG). The temperature was measured on every specimen at contact 4 and contact 8. The ambient temperature was then subtracted from the measured temperature to find the temperature rise. Testing was performed in accordance with EIA-364-70C.

3.6 Random Vibration

The test specimens were subjected to a random vibration test in accordance with specification EIA-364-28F, test condition VII, test condition letter E. The test specimens were subjected to this test for 90 minutes in each of the three mutually perpendicular axes, for a total test time of 4.5 hours per test specimen. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes. Refer to Figure 1 for images of the typical setup.

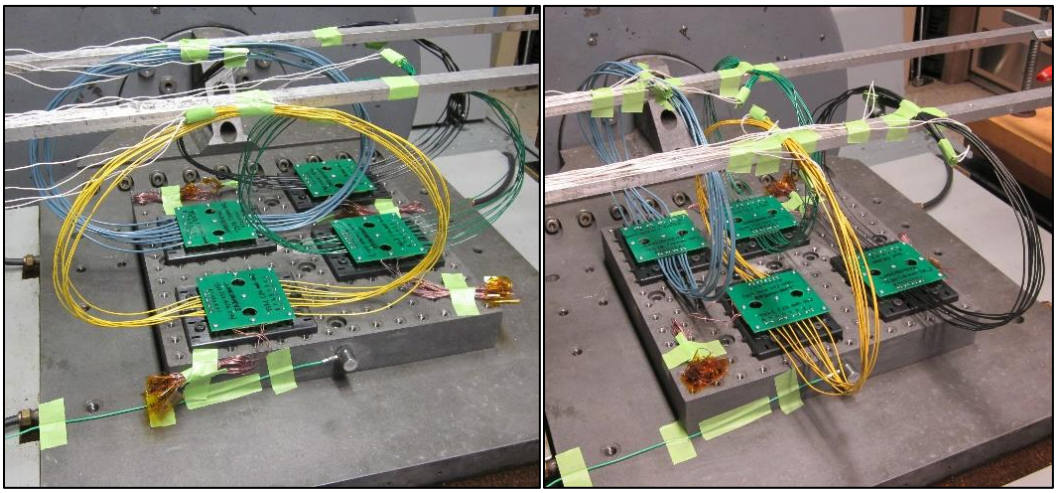

Figure 1 – Typical Random Vibration Test Setup

3.7 Mechanical Shock

The test specimens were subjected to a mechanical shock in accordance with specification EIA-364-27C, test condition H. 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. Refer to Figure 2 for images of the typical test setup.

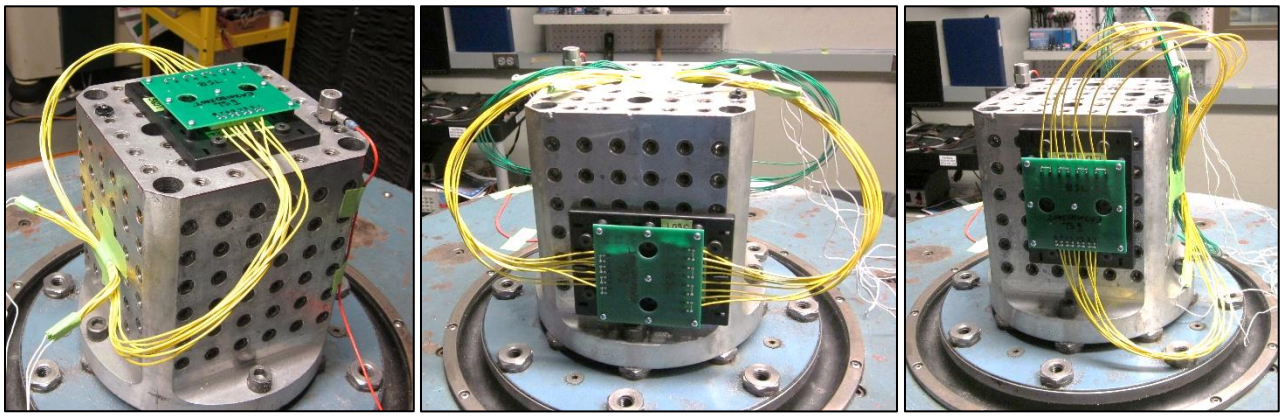

Figure 2 – Typical Mechanical Shock Test Setup

3.8 Wire Insertion

The connector was attached to a right-angle plate on a mill table at the base of the tensile/compression machine. The wire was held in a drill chuck attached to the moveable crosshead of the tensile/compression machine. The wire was manually aligned with the poke-in opening of the connector and force was applied in a downward direction at a rate of 0.5 in/min until the wire bottomed in the connector. Refer to Figure 3 for images of the typical test setup. Testing was performed in accordance with EIA-364-13E.

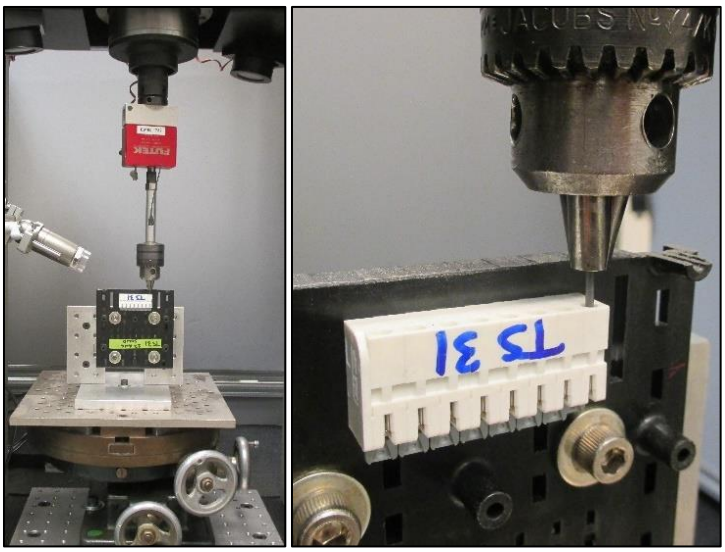

Figure 3 – Typical Wire Insertion Setup

3.9 Wire Retention

The connector was attached to a right-angle plate on a free-floating x/y and rotational table at the base of the tensile/compression machine. The wire was clamped in an air jaw attached to the moveable crosshead of the tensile/compression machine and force was applied in an upward direction at a rate of 0.5 in/min until the wire was removed from the connector. The force for Test Set 40 was limited to 120 Newtons to avoid damage to the connector during testing. Refer to Figure 4 for images of the typical test setup. Testing was performed in accordance with EIA-364-08C.

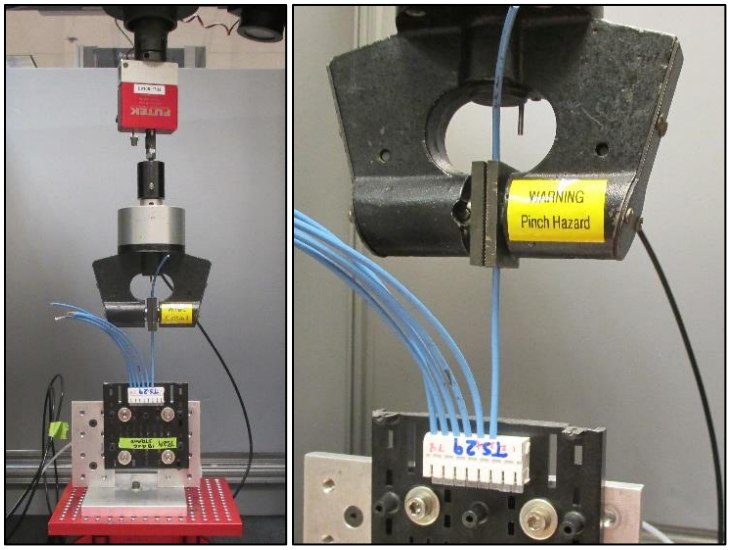

Figure 4 – Typical Wire Retention Setup

3.10 Current Cycling

Thermocouples were beaded and epoxied to the blades of the header specimen. The temperature was measured on every specimen at contact 4 and contact 8. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. The specimens were subjected to 84 cycles of current cycling, with each cycle having current on for 30 minutes and current off for 30 minutes. The test current was 150% of the rated current, 4.5 amperes DC (20,22,24 AWG) and 7.5 amperes DC (18 AWG). The temperature measurement was recorded at the end of the 30 minute “ON” segment. Testing was performed in accordance with EIA-364-55A.

3.11 Header Retention Force, Push Off

The PCB was clamped to a right-angle plate attached to mill table at the base of the tensile/compression machine. A pin was held in a drill chuck attached to the moveable crosshead of the tensile/compression machine. The pin was aligned with the header contact and force was applied in a downward direction at a rate of 1.0 in/min until the contact was removed from the PCB. Refer to Figure 5 for images of the typical contact retention (push off) test setup. Testing was performed in accordance with EIA-364-29C.

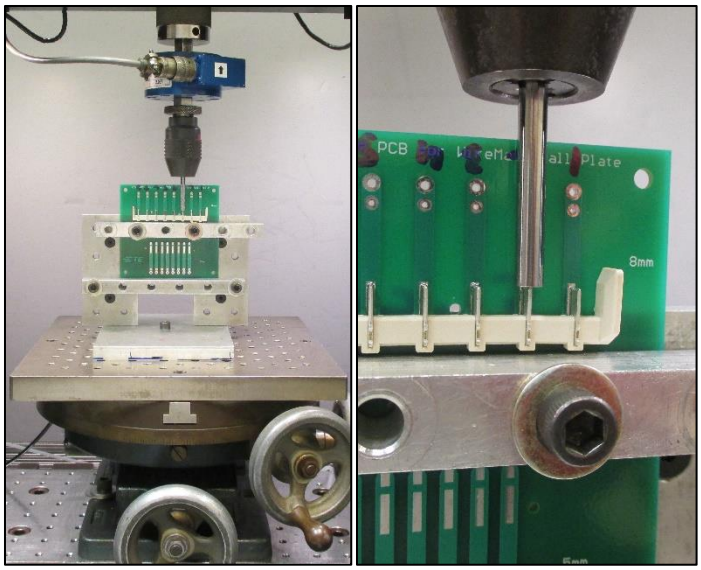

Figure 5 – Typical Contact Retention Push Off Force

3.12 Header Retention Force, Pull Off

Prior to testing, a slot was cut in the connector housing between each contact. The PCB was clamped to a free-floating x/y and rotational table at the base of the tensile/compression machine. The contact was clamped in a vise attached to the moveable crosshead of the tensile/compression machine. Force was applied in an upward direction at a rate of 1.0 in/min until the contact was removed from the PCB. Refer to Figure 6 for images of the typical test setup. Testing was performed in accordance with EIA-364-29C.

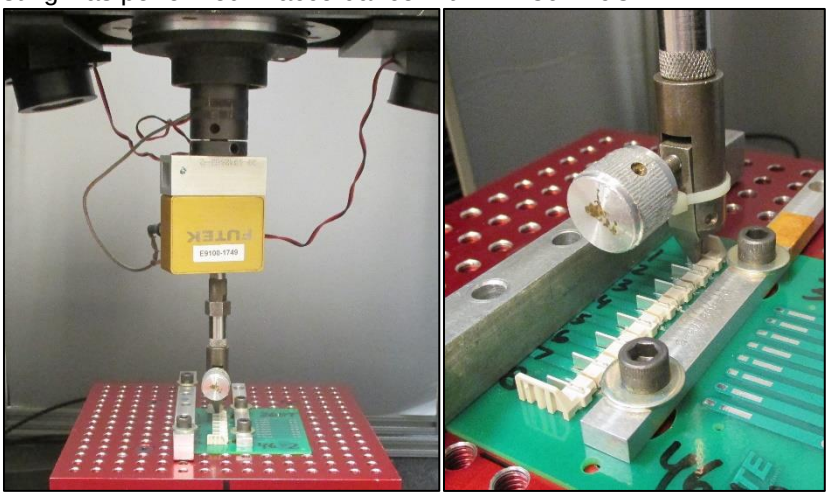

Figure 6 – Typical Header Retention Pull Off Force Test Setup

3.13 Connector Retention Force

The connector mounting plate was attached to a right-angle fixture on a mill table at the base of the tensile/compression machine. A block was attached to the moveable crosshead of the tensile/compression machine and aligned with the connector. Force was applied in a downward direction at a rate of 1.0 in/min until failure. Refer to Figure 7 for images of the typical test setup. Testing was performed in accordance with EIA-364-29C.

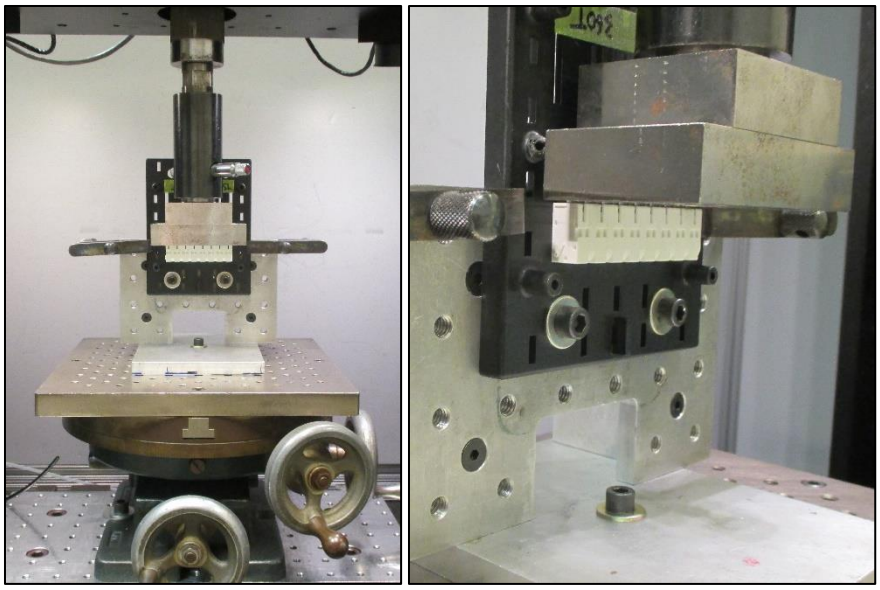

Figure 7 – Typical Connector Retention Test Setup

3.14 Mating Force, Vertical

The connector base plate was attached to a free-floating x/y and rotational table at the base of the tensile/compression machine. The header PCB was attached to a goal post fixture on the moveable crosshead of the tensile compression machine. The connector was manually aligned with the header and force was applied in a downward direction at a rate of 1.0 in/min until the PCB bottomed on the standoffs of the connector base plate. Refer to Figure 8 for images of the typical test setup. Testing was performed in accordance with EIA-364-13E.

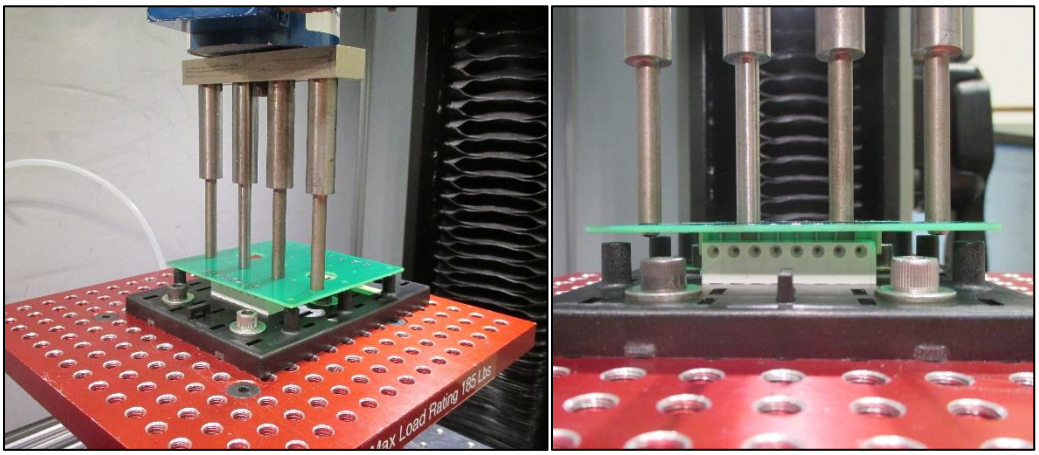

Figure 8 – Typical Vertical Mating Force Test Setup

3.15 Mating Force, Horizontal

The connector mounting plate was attached to right-angle plate on a mill table at the base of the tensile/compression machine. The header PCB was aligned with the connector. A bar was attached to the moveable crosshead of the tensile/compression machine and force was applied in a downward direction at a rate of 1.0 in/min until header was fully mated to the connector. Refer to Figure 9 for images of the typical test setup. Testing was performed in accordance with EIA-364-13E.

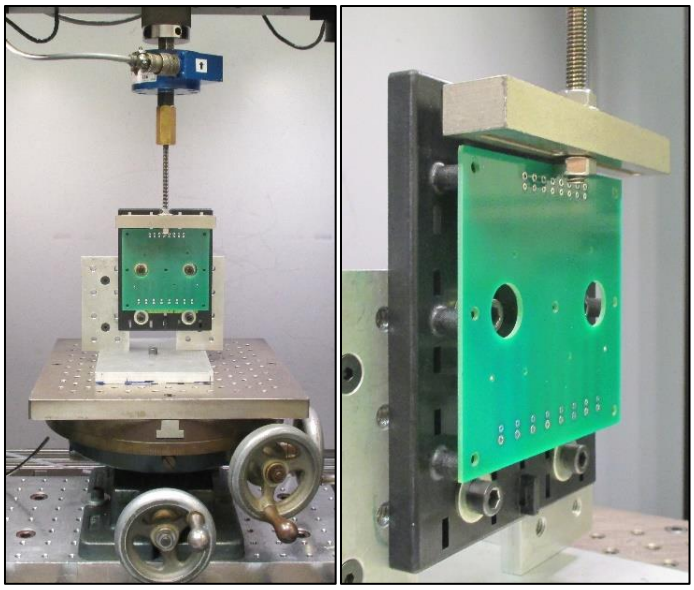

Figure 9 – Typical Horizontal Mating Force

3.16 Durability, 10 Cycles

Specimens were mated and unmated 10 times by hand in the vertical direction at a maximum rate of 300 cycles per hour. Testing was performed in accordance with EIA-364-09D.

3.17 Durability, 30 Cycles

Specimens were mated and unmated 30 times by hand in the vertical direction at a maximum rate of 300 cycles per hour. Testing was performed in accordance with EIA-364-09D.

3.18 Thermal Shock

Mated specimens were subjected to 150 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 90°C. The transition between temperatures was less than one minute. Testing was performed in accordance with EIA-364-32G.

3.19 Humidity/Temperature Cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice while maintaining high humidity. Testing was performed in accordance with EIA-364-31E.

3.20 Temperature Life

Mated specimens were exposed to a temperature of 110°C for 250 hours. Testing was performed in accordance with EIA-364-17C.

3.21 Final Examination of Product

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed. Testing was performed in accordance with EIA-364-18B.