

Nett Warrior Receptacle Battery Connector

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity Nett Warrior Battery Receptacle Connector to determine its conformance to the requirements of Product Specification 108-32114-1, Rev. A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE Connectivity Nett Warrior Battery Connector. Testing was performed at the Harrisburg Electrical Components Test Laboratory between January 8, 2016 and February 25, 2016. The test file numbers of this testing were EA20150744T, EA20160078T, and EA20160118T.

1.3 Conclusion

All specimens met the requirements specified in Product Specification 108-32114-1, Rev. A.

1.4 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 Group	Test Set	Qty	Part #	Description
1	1	3	2828420-1, Rev 5	PCB Receptacle
2	2	3	2828420-1, Rev 5	PCB Receptacle
	7	2	2828340-1, Rev 4	Bulkhead Mount Receptacle
3	3	3	2828420-1, Rev 5	PCB Receptacle
4	4	3	2828420-1, Rev 5	PCB Receptacle
5	5	3	2828420-1, Rev 5	PCB Receptacle
	8	2	2828340-1, Rev 4	Bulkhead Mount Receptacle
6	6	2	2828420-1, Rev 5	PCB Receptacle
	9	2	2828340-1, Rev 4	Bulkhead Mount Receptacle

Note: PCB receptacle connectors in Test Groups 1, 2, and 6 were mounted to printed circuit test board part number 60-1824775-1, Rev. A. All receptacle connectors in Test Groups 1, 2, 3, and 6 were mated to plug connector part number 2226910-1.

1.5 Qualification Test Sequence

Table 2 – Test Sequence

Test or Examination	Test Group (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Examination of Product	1	1	1	1	1	1
Low Level Contact Resistance	2,7	2,5				
Shell to Shell Conductivity	3,6					
Unmating Force	4					
Durability	5					
Vibration		3				
Mechanical Shock		4				
Insulation Resistance			2,5,8			
Dielectric Withstanding Voltage			3,6,9			
Thermal Shock			4			
Humidity/Temperature Cycling			7			
Salt Atmosphere				2		
Water Immersion					2	
Dust					3	
Temperature Rise						2
Examination of Product	8	6	10	3	4	3

Note: (a) See paragraph 1.4
 (b) Numbers indicate sequence which tests were performed.

1.6 Environmental Conditions

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

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

2. SUMMARY OF TESTING

2.1 Examination of Product

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

2.2 Low Level Contact Resistance

All low level resistance measurements had a maximum change in resistance (ΔR) of less than 10 milliohms after testing.

2.3 Shell to Shell Conductivity

All shell to shell conductivity measurements were less than 50 milliohms.

2.4 Unmating Force

All unmating force measurements had a force of 13 ± 3 pounds.

2.5 Durability

There was no apparent physical damage that would adversely affect the mechanical or electrical performance of the connectors.

2.6 Vibration

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

2.7 Mechanical Shock

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

2.8 Insulation Resistance

All insulation Resistance measurements were greater than 100 Megohms.

2.9 Dielectric Withstanding Voltage

There was no evidence of dielectric breakdown or flashover.

2.10 Thermal Shock

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

2.11 Humidity Temperature Cycling

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

2.12 Salt Atmosphere

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

2.13 Water Immersion

No signs of water ingress and no signs of physical damage were observed as a result of water immersion.

2.14 Dust

No signs of dust ingress and no signs of physical damage were observed as a result of dust.

2.15 Temperature Rise

All specimens had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 5 ampere DC and circuits 1, 2 and 3 simultaneously energized.

2.16 Final Examination

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

Specimens were subjected to an initial visual examination in accordance with EIA364-18B. Specimens were visually examined with the unaided eye.

3.2 Low Level Contact Resistance

Low level contact resistance measurements at low level current were made in accordance with EIA364-23C using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Measurement points were at the solder tails of the board mounted receptacle and at the wire ends of the plug. The measurement points for the bulkhead mount receptacle/plug assembly was at the wire ends. The wire length of all plugs was approximately 10.5 inches. The wire length for the bulkhead receptacles was approximately 2.25 inches.

3.3 Shell to Shell Conductivity

Shell to shell conductivity measurements were made in accordance with EIA364-83, with the exception that the test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. The resistance measurements at low level current were made using a four terminal measuring technique. Measurement points were on the flange of the receptacle connector and the flange of the plug connector.

3.4 Unmating Force

Unmating forces were measured in accordance with EIA364-13E. The PCB mounted receptacle connector was secured to a fixture and attached to a floating x/y table at the base of the tensile/compression tester. The cabled plug connector was mounted to a goal post fixture and attached to the load cell in the crosshead of the tensile/compression tester. The connectors were mated at a crosshead travel rate of 0.5 inches per minute until the connectors appeared to bottom out. The connectors were then unmated at the same travel rate and the actual unmating forces were measured.

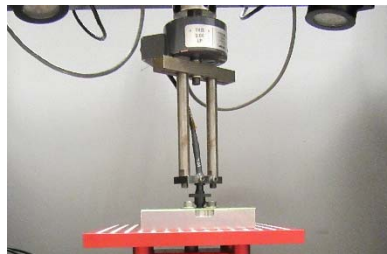


Figure 1 - Unmating Force

3.5 Durability

The specimens were subjected to a durability test of 2000 cycles, in accordance with EIA364-9C. The PCB mounted Receptacle Connector was secured to a fixture and attached to a floating x/y table at the base of the durability machine. The cabled Plug Connector was mounted to a goal post fixture and attached to the top of the durability machine. The durability cycle rate for this test was 250 cycles per hour.



Figure 2 - Durability

3.6 Vibration

Vibration was performed in accordance with MIL-STD-810G, Method 514.7, Procedure 1. The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 2000 Hertz (Hz). The spectrum is flat at 0.04 G²/Hz from 100 Hz to 1000 Hz. The spectrum slopes down at 6 dB per octave to a PSD of 0.01 G²/Hz at the upper bound frequency of 2000 Hz. The root-mean square amplitude of the excitation was 7.7 GRMS. The test specimens were subjected to this test for 1 hour in each of the three mutually perpendicular axes, for a total test time of 3 hours per test specimen. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

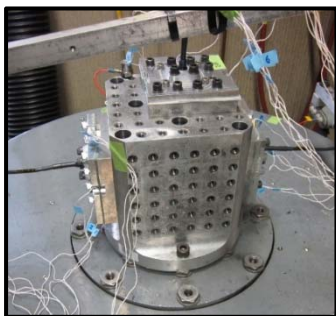


Figure 3 - PCB Mounted Receptacle

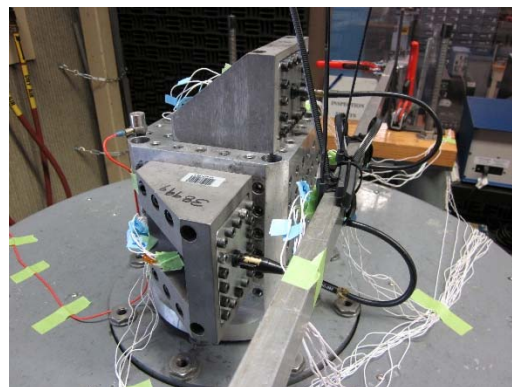


Figure 4 - Bulkhead Mounted Receptacle

3.7 Mechanical Shock

Mechanical shock was performed in accordance with MIL-STD-810G, Method 516.7, Procedure 1. The parameters of this test condition are a saw tooth waveform with an acceleration amplitude of 40 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. The Pulse Velocity Change: 86.2 Inches/Second.

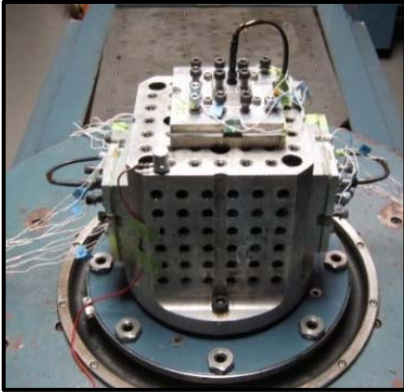


Figure 5 - PCB Mounted Receptacle

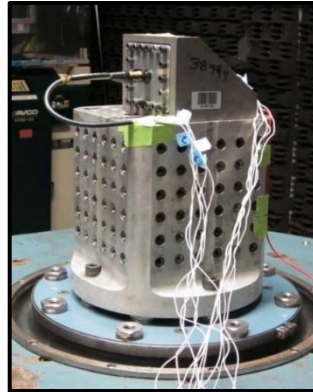


Figure 6 - Bulkhead Mounted Receptacle

3.8 Insulation Resistance

Insulation resistance was measured in accordance with EIA364-21E. Insulation Resistance of mated connectors was measured between adjacent signal contacts and between signal contacts and shield. The test voltage of 500 VDC was applied for 2 minutes.

3.9 Dielectric Withstanding Voltage

Dielectric withstanding voltage test was performed in accordance with EIA364-20E. DWV of mated connectors was measured between adjacent signal contacts and between signal contacts and shield. The test voltage of 500 VDC was applied for 1 minute.

3.10 Thermal Shock

Thermal shock test was performed in accordance with EIA364-32G. Mated specimens were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 85°C. The transition between temperatures was less than one minute.

3.11 Humidity Temperature Cycling

Thermal shock test was performed in accordance with EIA364-31D, Method IV. 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. Refer to Figure 7.

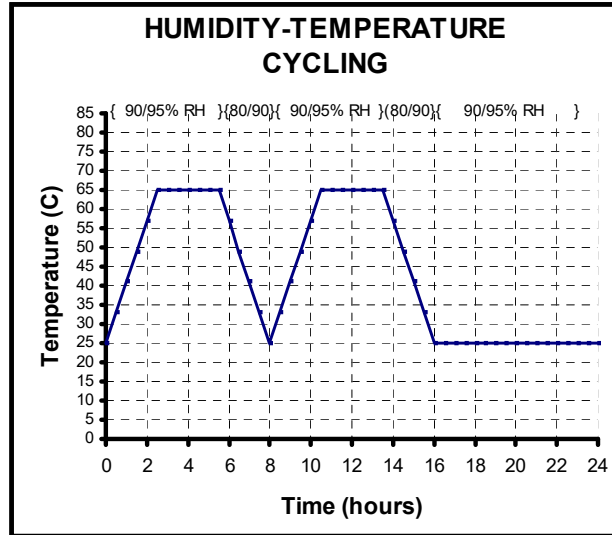


Figure 7 – Typical Humidity-Temperature Cycling Profile

3.12 Salt Atmosphere

Salt atmosphere test was performed in accordance with MIL-STD-810G, Method 509.6. Specimens were placed in the chamber on a screen basket for testing. The chamber was operated for a total of 48hrs, comprised of (2) 24-hr runs. After each run the screen basket with the specimens were removed from the chamber and allowed to dry at room ambient conditions for 24 hrs.

3.13 Water Immersion

Water immersion test was performed in accordance with paragraph 14.2.7 of IEC 60529 Edition 2.2, 2013-08. Specimens were mounted to a test enclosure (Figure 8 and Figure 9). Any exposed wire ends were sealed. Specimens were subjected to immersion testing in water containing a ultra-violet tracer at a depth of 1m for 30 minutes. The specimens and the inside of the enclosure were evaluated with a ultra-violet light (UV-A) for signs of water ingress.



Figure 8 - Water Immersion, Bulkhead Mount



Figure 9 - Water Immersion, PCB Mount

3.14 Dust

The dust test was performed in accordance with paragraph 13.4 of IEC60529 Edition 2.2, 2013-08. Specimens were mounted to a test enclosure (Figure 8 and Figure 9). Any exposed wire ends were sealed. A port in the enclosure was used to ensure the pressure inside the enclosure was maintained below the surrounding atmospheric pressure. Specimens were placed in the talcum dust chamber and the testing enclosure was attached to the vacuum line. Specimens were exposed to dust for duration of eight hours with a maximum vacuum of 2 kPa applied. Upon completion of testing, specimens and the inside of the enclosure were examined for signs of dust ingress.

3.15 Temperature Rise

The temperature rise test was performed in accordance with EIA364-70C. Infrared temperature measurement point, i.e. housing of specimen, was coated with Equate powder, used as an emissivity correction coating. The emissivity correction coating has a known value which is 0.95. Raising and knowing the emittance value allows for accurate temperature measurements. The infrared camera was used with the standard optics (50 mm lens) to image the test specimens.

ExamInIR thermal imaging processing system was used for data analysis. The area tool software feature was used to determine maximum temperature of the exposed contacts. The area tool software feature allows a shape, which can be sized, to be placed on an area of interest. The pixels inside the shape are analyzed giving minimum, maximum, average, and standard deviation measurements of the target temperature.

The mated test specimen was placed in the temperature rise enclosure and measurements were taken approximately 60 minutes after the specimen was energized. The same plug specimen was used to test all four receptacle specimens. Positions 1, 2 and 3 were simultaneously energized at 5 amps during the test. Refer to Figure 22 for an illustration of the energized contact positions.

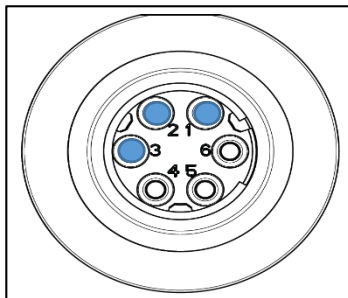


Figure 10 - Contact Positions

3.16 Final Examination

Specimens were subjected to a final visual examination in accordance with EIA364-18B. Specimens were visually examined with the unaided eye.