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Validation Testing of MTC Ground Blocks and Shell Kits - Manufacturing Relocation to Hermosillo, Mexico

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) MTC Ground Block assemblies and MTC Shell assemblies in order to validate transfer of manufacturing from TE Connectivity's Tijuana, Mexico, facility to its Hermosillo, Mexico, facility.

1.2 Scope

Testing was performed in accordance with TE / Raychem Specifications C-6114, Rev. B, and C-6115, Rev. F, at the TE Harrisburg Electrical Components Test Laboratory between March 17, 2014, and April 1, 2014.

1.3 Conclusion

All specimens, as identified in Paragraph 1.4, met the requirements for the tests performed as stated in TE / Raychem Specifications C-6114, Rev. B, and C-6115, Rev. F, when tested per the test sequence as defined in Paragraph 1.5.

1.4 Test Specimens

Specimens identified with the following part numbers were used for test:

Table 1 – Test Specimens

Test Set	Qty	Part Number	Description	Test Group
1	2	MTC100Q-SH1-P22 MTC100Q-SH1-R22 CHA-0305, CHA-0307 MTCP-122-20PQ MTCP-122-20S	1 inch Plug Shell 1 inch Receptacle Shell 1 inch Grounding Blocks Signal Inserts Signal Inserts	1
2	2	MTC100Q-SH1-P22 MTC100Q-SH1-R22 CHA-0305, CHA-0307 MTCP-122-20PQ MTCP-122-20S	1 inch Plug Shell 1 inch Receptacle Shell 1 inch Grounding Blocks Signal Inserts Signal Inserts	2
3	2	MTC100Q-SH2-P22 MTC100Q-SH2-R22 CHA-0306, CHA-0308 MTCP-122-20PQ1 MTCP-122-20PQ2 MTCP-122-20S1 MTCP-122-20S2	2 inch Plug Shell 2 inch Receptacle Shell 2 inch Grounding Blocks Signal Inserts Signal Inserts Signal Inserts Signal Inserts	1
4	2	MTC100Q-SH2-P22 MTC100Q-SH2-R22 CHA-0306, CHA-0308 MTCP-122-20PQ1 MTCP-122-20PQ2 MTCP-122-20S1 MTCP-122-20S2	2 inch Plug Shell 2 inch Receptacle Shell 2 inch Grounding Blocks Signal Inserts Signal Inserts Signal Inserts Signal Inserts	2
All	64	22759/11-22	22 AWG Ground Wire, crimped to size 22 ground contact	All
2 & 4	240	592503-000	20 AWG Signal Wire, crimped to size 20-22 signal contact	2

1.5 Test Sequence

Table 2 – Test Sequence

Test or Examination	Test Group	
	1	2
Initial Examination	1	1
Coupling Torque		2
Maintenance Aging		3
Contact Resistance at Room Temperature		4
Shell to Shell Conductivity	2	
Ground Pin Insertion Force	3	
Ground Pin Probe Test	4	
Engaging Force with Contacts		5
Insert Retention		6
Final Examination	5	7

1.6 Environmental Conditions

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

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

2. SUMMARY OF TESTING

2.1 Initial Visual Examination

All connectors were uniform in quality, and were free from burrs, cracks, voids, chips, blisters, sharp cutting edges, or other defects that would affect life or serviceability as specified in TE / Raychem Specification C-6114, Rev. B.

2.2 Coupling Torque

Coupling torque measurements were less than the maximum requirement of 20 in-lb as specified in TE / Raychem Specification C-6114, Rev. B.

2.3 Maintenance Aging

The ground blocks showed no evidence of damage detrimental to performance or handling as specified in TE / Raychem Specification C-6114, Rev. B.

2.4 Contact Resistance at Room Temperature

Contact resistance at room temperature measurements were less than the maximum millivolt drop requirement of 55 mV as specified in TE / Raychem Specification C-6114, Rev. B. Refer to Table 3 for a statistical summary of the test results.

Table 3 – Contact Resistance at Room Temperature (millivolts)

	MTC100Q-SH1-P22 & R22, CHA-305 & 307 (1 Inch)		MTC100Q-SH2-P22 & R22, CHA-306 & 308 (2 Inch)	
	201	**202**	**401**	**402**
Min	35.98	37.24	36.64	35.99
Max	37.61	38.02	38.26	38.42
Avg	36.88	37.59	37.59	36.96
Std Dev	0.81	0.33	0.59	0.82

2.5 Shell to Shell Conductivity

Receptacle shell to panel conductivity measurements were less than the maximum millivolt drop requirement of 1 mV, receptacle shell to plug shell conductivity measurements were less than the maximum millivolt drop requirement of 10 mV, and shield ground to shield ground conductivity measurements were less than the maximum millivolt drop requirement of 20 mV, all as specified in TE / Raychem Specification C-6114, Rev. B.

2.6 Ground Pin Insertion Force

Ground pin contacts were capable of being inserted without the use of an insertion tool as specified in TE / Raychem Specification C-6114, Rev. B.

2.7 Ground Pin Probe Test

There was no evidence of physical damage that would adversely affect the mechanical or electrical performance of the ground blocks.

2.8 Engaging Force with Contacts

Engaging force measurements were less than the maximum requirement of 40 pounds when engaged with the mating faces parallel, and less than the maximum requirement of 25 pounds when engaged with a single helix already engaged, both as specified in TE / Raychem Specification C-6114, Rev. B.

2.9 Insert Retention

The inserts were not damaged or dislocated from their fully seated position as specified in TE / Raychem Specification C-6114, Rev. B.

2.10 Final Visual Examination

There was no evidence of cracking, loosening of parts, excessive wear or missing parts.

3. TEST METHODS

3.1 Initial Visual Examination

Specimens were examined with the unaided eye.

3.2 Coupling Torque

The torque required to completely engage the helix at each end was measured using a digital torque wrench with a flat bladed screwdriver bit held in the chuck. Each specimen was mated to a point just before where the helix was engaged. While holding the specimen in one hand, the helix was fully engaged at one end and then the other end using the torque wrench. Refer to Figure 1 for an illustration of the test method. Testing was performed according to Raychem specification C-6114, Rev. B, Paragraph 4.5.13.

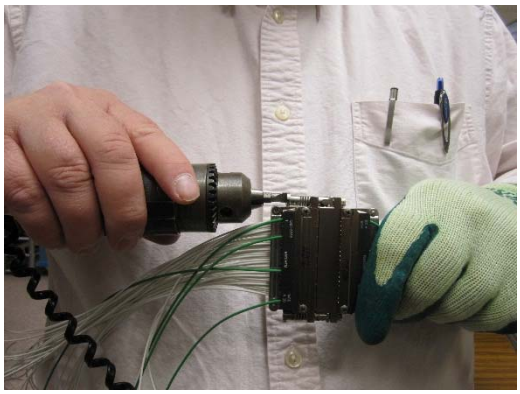

Figure 1 - Test Method

3.3 Maintenance Aging

A maintenance aging test was performed on the grounding blocks, ground contacts, and the removable inserts in accordance with TE / Raychem Specifications C-6114, Rev. B, Paragraph 4.5.15, and C-6115, Rev. F, Paragraph 4.5.15. Terminated specimens were fully mated and unmated three times. The ground blocks were removed and reinstalled three times in a manner simulating actual service. Four ground contacts on each specimen were removed and reinstalled three times. Ground contacts were inserted by hand and removed with tool # M81969/1-04. The removable inserts were removed and reinstalled ten times using tool # CTA-0161. Isopropyl alcohol was used on the removable insert extraction tool to aid in the extraction of the inserts.

3.4 Contact Resistance at Room Temperature

Contact resistance was measured in accordance with TE / Raychem Specification C-6114, Rev. B, Paragraph 4.5.5.1. The voltage drop was measured across the connector while energizing each circuit at 7.5 amps. The readings were allowed to stabilize before the measurement was recorded. Twenty two inches of wire bulk (139.896 mV) were subtracted from the measurement. Refer to Figure 2.

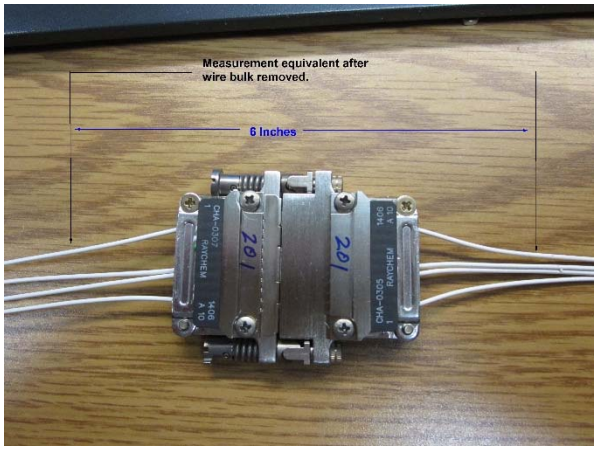

Figure 2 - Test Set-up

3.5 Shell to Shell Conductivity

Shell to shell conductivity was measured in accordance with TE / Raychem Specification C-6114, Rev. B, Paragraph 4.5.6. The shell to shell conductivity was measured between receptacle shell and the panel, between receptacle shell and plug shell and across the two grounding blocks. The millivolt drop was measured at 1 amp. Figures 3 thru 5 illustrate the measurement points.

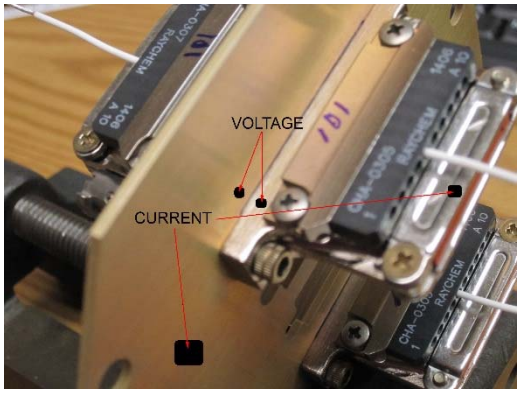

Figure 3 - Shell to Panel

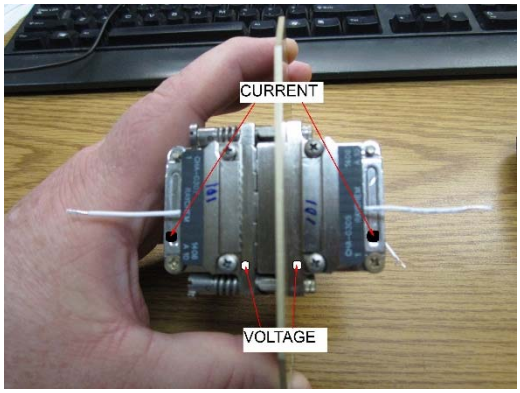

Figure 4 - Shell to Shell

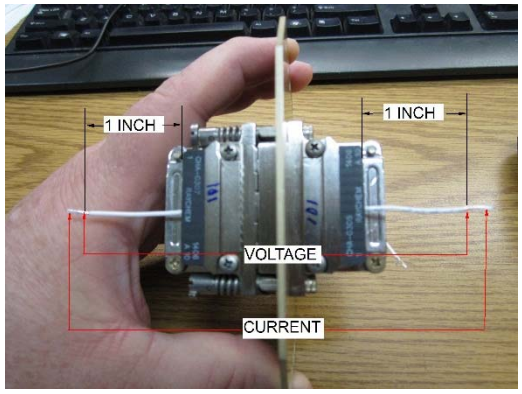

Figure 5 - Wire to Wire

3.6 Ground Pin Insertion Force

Ground pin insertion force was measured in accordance with TE / Raychem Specification C-6114, Rev. B, Paragraph 4.5.30. Four ground pins were inserted into the ground block of each connector without the use of an insertion tool.

3.7 Ground Pin Probe Test

Ground pin probe testing was performed in accordance with TE / Raychem Specification C-6114, Rev B., Paragraph 4.5.31. The receptacle connectors were fixed in a rotating device and a .030" diameter test pin with a 0.125 in.-lbf moment was inserted into the socket bore. The device was manually rotated at a slow and uniform rate through 360°. The test pin was inserted 0.55 inches +/- 0.010 inches. Figure 6 illustrates the test setup.

3.7 Ground Pin Probe Test (cont.)

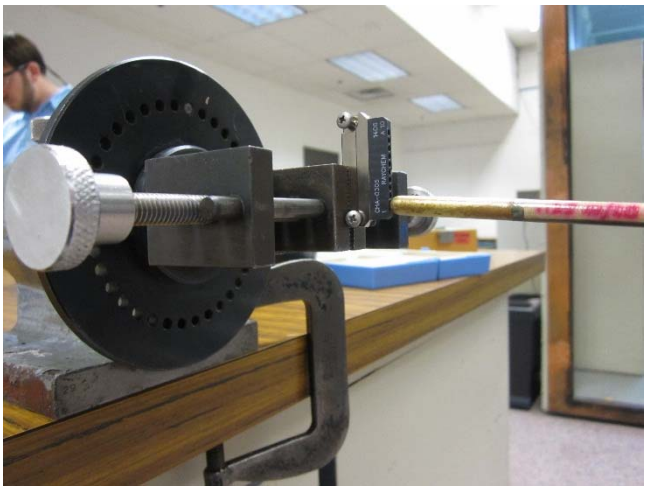

Figure 6 - Resistance to Test Probe Damage

3.8 Engaging Force with Contacts

Engaging force with contacts measurements were performed in accordance with TE / Raychem Specification C-6114, Rev. B, Paragraph 4.5.29. Testing was performed by mating the connector in two methods. The first method mated the receptacle and plug half together while keeping the mating face of each connector parallel to each other. The connector halves were mated until the quick disconnect screws could be engaged. The force was recorded at that point. The second measurement mated the connectors and engaged the quick disconnect screw on one side only. An axial force was then applied to the disengaged screw until it was in a position to be engaged. This force was then recorded. All measurements were made with the receptacle connector mounted in a panel. The crosshead speed was 0.5 inches per minute. Figures 7 and 8 illustrate the test setup.

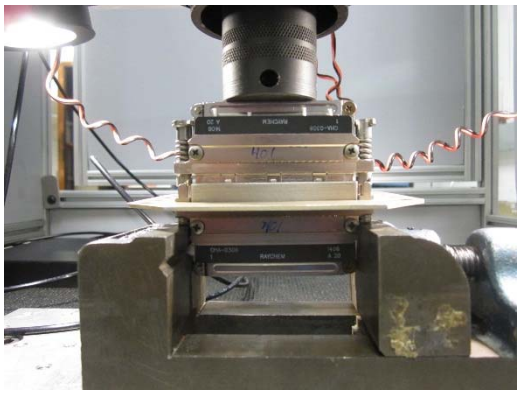

Figure 7 - Mate with Mating Face Parallel

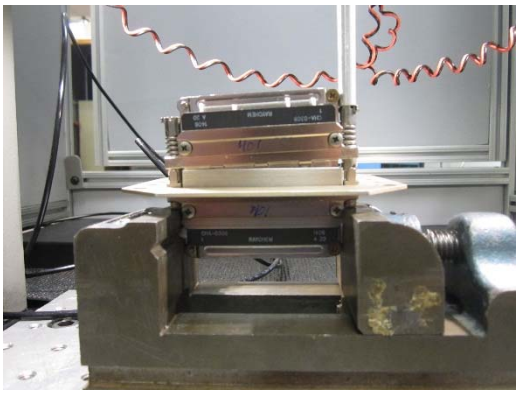

Figure 8 - Mate with One Latch Engaged

3.9 Insert Retention

Insert Retention testing was performed in accordance with TE / Raychem Specification C-6114, Rev. B, Paragraph 4.5.11. Testing was performed by applying an axial load to the inserts of 200 psi (41 lbs for 1 inch and 82 lbs for 2 inch), and maintaining that load for 5 seconds. A crosshead speed of 0.02 inches per minute was used during the test. Figures 9 and 10 illustrate the test setup.

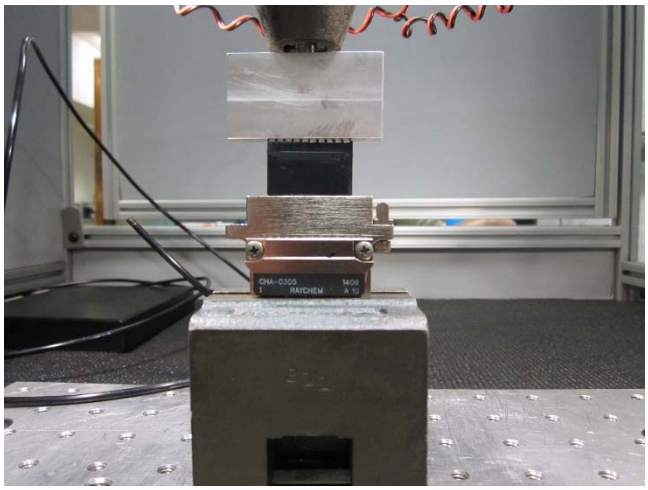

Figure 9 - Insert Retention, 1 Inch

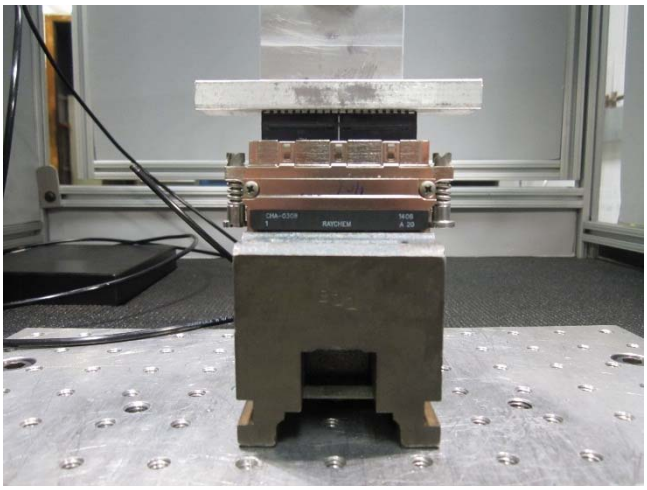

Figure 10 - Insert Retention, 2 Inch

3.10 Final Visual Examination

Specimens were examined with the unaided eye.

4. EQUIPMENT

4.1 Calibration Statement

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

4.2 Equipment List

Equipment Name	Calibration Number
Thermo Recorder	E9100-1703
Digital Torque Wrench	E4997-0564
Load Frame	E9100-1729
Load Cell	E9100-1730
Multimeter	E9100-1146
DC Power Supply	E9100-1147
Digital Calipers	95-756018-002-19
Digital Micrometers	95-54-905-251-128