CCJ (Crown Clip Junior) Power Cable Assembly

1. INTRODUCTION

1.1. Purpose

Testing was performed on the CCJ (Crown Clip Junior) Power Cable Assembly with 2 end cable connectors to determine its conformance to the requirements of Product Specification.

1.2. Scope

This report covers the electrical, mechanical and environmental test, which test in TE Shanghai test lab/TE Dongguan test center during 2017Apr.~2017Jun., 2017Sep., Test file number is TP-17-00817-1, TP-17-00817-2, TP-17-00817-3, TP-17-02479, TR-152032-1, TR-152032-2, TR-152032-3 and TR-152032-4.

1.3. Conclusion

All test specimens met the requirements of the CCJ Power Cable Assembly product specification 108-152037.

1.4. Test Specimens

CCJ Power Cable Assembly with 2 MBXLE 2ACP cable connector and AWG8 cable

1.5. Test Sequence

The test specimens identified in paragraph 1.4 were subjected to the tests outlined in Table 1.

Table 1 – Test Sequence

Test or Examination	Test Group							
	1	2	3	4	5	6	7	8
	Test sequence(a)							
Initial examination of product	1	1	1	1	1	1	1	1
Low level contact resistance	3,7	2,7,9		2,4,6			2,4	
Contact resistance at rated current		5,11						
Temperature rise vs. Current		4,10						
Crimp tensile					2			
Mating force	2							
Un-mating force	8							
Durability(Precondition)		3		3				
Durability	4							
Contact retention, straight pull						2		
Contact retention, angled pull						3		
Housing lock strength, straight pull						4		
Housing lock strength, angled pull						5		
Vibration, random	5	8						
Mechanical shock	6							
Salt Spray Test				5				
Insulation resistance			2,6					2,6
Withstanding voltage			3,7					3,7
Thermal shock			4					
Temperature life		6						
Humidity-temperature cycling			5					
Stress thermal shock								4
Stress temperature life							3	
Stress humidity-temperature cycling								5
Final examination of product	9	12	8	7			5	8
Sample Size per Test Group	5	5	5	5	5	5	5	5

| Indicates Change

Note: (a) Number indicate sequence in which tests are performed.

1.6. Environmental Conditions

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

- Temperature: 25±10°C
- Relative Humidity: 50±25% RH

2. SUMMARY OF TESTING

2.1. Initial Examination of Product – All Test Groups

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

2.2. Low Level Contact Resistance – Test Group 1,2,4 and 7

All low-level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage, were less than the 0.3 milliohms maximum requirement for initial measurements and 0.5 milliohms maximum for final measurements for CCJ side only (refer to Figure 2) and 2.5milliohms maximum from initial to final including cables and MBXLEs (refer to Figure 3).

Test Group	Number of Data Points	Condition	LLCR(milliohms)		
			Minimum	Maximum	Average
1	2	Initial(actual)	0.05	0.05	0.05
	2	Mechanical Shock	0.05	0.06	0.056
2	2	Initial(actual)	0.04	0.08	0.05
	2	Temperature Life	0.11	0.22	0.136
	2	Vibration, Random	0.06	0.08	0.07
4	2	Initial(actual)	0.05	0.07	0.06
	2	Durability(Precondition)	0.06	0.09	0.07
	2	Salt Spray Test	0.02	0.09	0.06

Figure 2

Test Group	Number of Data Points	Condition	LLCR(milliohms)		
			Minimum	Maximum	Average
7	2	actual	1.31	1.42	1.35

Figure 3

2.3. Contact Resistance at Rated Current– Test Group 2

All contact resistance at rated current measurements, taken at rated load, were less than the specified 0.3 milliohms maximum requirement for initial and final measurements.

Test Group	Number of Data Points	Condition	CR(milliohms)		
			Minimum	Maximum	Average
1	3	Temperature Rise(Initial)	0.05	0.07	0.06
	3	Temperature Rise(Final)	0.11	0.27	0.17

Figure 4

2.4. Insulation Resistance – Test Group 3 and 8

All insulation resistance measurements were greater than 1000 megaohms between adjacent Contacts

2.5. Withstanding Voltage – Test Group 3 and 8

No dielectric breakdown or flashover occurred

2.6. Temperature Rise vs. Current – Test Group 2

110A with 2*AWG#8 cable are under 30°C temperature rise.

2.7. Vibration, random – Test Group 1 and 2

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

2.8. Mechanical Shock – Test Group 1

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

2.9. Durability (Precondition) – Test Group2 and 4

No physical damage occurred as a result of mating and unmating the specimens 5 cycles.

2.10. Durability – Test Group1

No physical damage occurred as a result of mating and unmating the specimens 50 cycles.

2.11. Mating Force – Test Group 1

All mating force measurements were not greater than 120 N per connector.

2.12. Un-mating Force – Test Group 1

All un-mating force measurements were not less than 15 N per connector.

2.13. Thermal Shock – Test Group 3

No evidence of physical damage was visible as result of thermal shock testing

2.14. Humidity-temperature cycling – Test Group 3

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

2.15. Temperature life – Test Group 2

No evidence of physical damage was visible as result of temperature life testing.

2.16. Salt Spray Test – Test Group 4

No evidence of physical damage was visible as result of exposure to the pollutants of salt spray test.

2.17. Crimp Tensile – Test Group 5

All CCJ contacts can withstand 90lbs retention for 60second without dislodging, all MBXLE power contact can withstand 80lbs retention for 60second without dislodging.

2.18. Contact Retention, Straight Pull – Test Group 6

All CCJ/MBXLE power contacts can withstand axial 33.75lbs retention for 6+/-1second without dislodging.

2.19. Contact Retention, Angled Pull – Test Group 6

All CCJ/MBXLE power contacts can withstand 45Deg angled 33.75lbs retention for 6+/-1second without dislodging.

2.20. Housing Lock Strength, Straight Pull – Test Group 6

All specimens can withstand axial 16.8lbs retention for 6+/-1second without dislodging when mounting to panel with specified M3 screw and stainless steel washer.

2.21. Housing Lock Strength, Angled Pull – Test Group 6

All specimens can withstand 45Deg 16.8lbs retention for 6+/-1second without dislodging when mounting to panel with specified M3 screw and stainless steel washer.

2.22. Stress Temperature life – Test Group 7

No cable insulator crack or other evidence of physical damage was visible as a result of exposure to stress temperature life.

2.23. Stress Thermal Shock – Test Group 8

No cable insulator crack or other evidence of physical damage was visible as a result of exposure to stress thermal shock.

2.24. Stress Humidity-temperature Cycling – Test Group 8

No cable insulator crack or other evidence of physical damage was visible as a result of exposure to stress humidity-temperature cycling.

2.25. Final Examination of Product – All Test Groups

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

3. TEST METHOD

3.1. Initial Examination of Product.

Specimens were visually examined per EIA 364-18 for damage detrimental to product performance.

3.2. Low Level Contact Resistance.

Each specimen was wired for a continuous path through the specimen. 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, in accordance with EIA–364-23.

3.3. Contact Resistance at Rated Current.

Each specimen was wired for a continuous path through the specimen. Energize the circuit and increase the current until the specified test current was achieved, CCJ has reached thermal equilibrium and use a four-terminal measuring technique, in accordance with EIA–364-6.

3.4. Insulation resistance

Insulation resistance was measured between adjacent power contacts of mated specimens. A test voltage of 500 volts DC was applied for 1 minutes before the resistance was measured, in accordance with EIA–364-21.

3.5. Withstanding Voltage

A test potential of 1000 volts AC was applied between the adjacent power contacts of mated specimens. This potential was applied for 1 minute and then returned to zero. In accordance with EIA–364-20 Condition I.

3.6. Temperature Rise vs. Current

Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C. Test with single energized contact and with all adjacent power contacts energized. Test Condition: EIA-364-70, Method II.

3.7. Vibration, random

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum with excitation frequency bounds of 5 and 500 Hz. The spectrum remained flat at 0.05 G2/Hz from 20Hz to upper bound frequency of 500Hz. The root-mean square amplitude of excitation was 4.90 GRMS. The specimens were subjected to this test time of 45 minutes per specimen. Specimens were monitored for discontinuities of microsecond or greater using an energizing current of 100 milliamperes. In accordance with EIA–364-28 Condition Ⅶ.

3.8. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half – sine waveform of 50 gravity units (g peak) and duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of one microsecond or greater using a current of 100 milliamperes DC. In accordance with EIA–364-27B Method A.

3.9. Durability (Precondition)

Specimens were mated and unmated 5 cycles at a maximum rate of 200 cycles per hour. In accordance with EIA–364-09.

3.10. Durability

Specimens were mated and unmated 50 cycles at a maximum rate of 200 cycles per hour. In accordance with EIA–364-09.

3.11. Mating force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a maximum rate of travel of 12.7 mm per minute. The maximum force per connector was 120 N. In accordance with EIA–364-13.

3.12. Un-mating force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a maximum rate of travel of 12.7 mm per minute. The minimum force per connector was 15N. In accordance with EIA–364-13.

3.13. Thermal Shock

Mated specimens were subjected to 10 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55° and 85°C. The transition between temperatures was less than 5 minute. In accordance with EIA–364-32.

3.14. 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 20 and 65°C at 80 to 100 %RH. With no cold shock. In accordance with EIA–364-31 Method Ⅲ.

3.15. Temperature Life

Mated specimens were exposed to a temperature of 125°C for 504 hours (21 days). In accordance with EIA–364-17 Method A.

3.16. Salt Spray Test

Mated specimens were exposed for 72 hours to a 5% solution salt spray, at 35 +1/-2˚C, in accordance with EIA–364-26.

3.17. Crimp Tensile.

Total 90-pound/80-pound weight was placed on a calibrated scale and verified. The test CCJ contact specimen was placed on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 90-pound weight. The test MBXLE contact specimen was place on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 80-pound weight. The weight was applied for a period of 60 second min., and each 5pcs specimens were tested, in accordance with EIA–364-29.

3.18. Contact Retention, Straight Pull.

Total 33.75-pound weight was placed on a calibrated scale and verified. The test CCJ/MBXLE specimen was placed on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 33.75-pound weight. The weight was applied for a period of 6+/-1 second, and total 5pcs specimens were tested, in accordance with EIA–364-29.

3.19. Contact Retention, Angled Pull.

Total 33.75-pound weight was placed on a calibrated scale and verified. The test CCJ/MBXLE specimen was placed on a clamp fixture that acted as a slotted plate and the wire was attached to the 33.75-pound weight at a 45Deg angle in 4 directions from normal exit plane of cable. The weight was applied for a period of 6+/-1 second, and total 5pcs specimens were tested, in accordance with EIA–364-29.

3.20. Housing Lock Strength, Straight Pull.

Total 16.8-pound weight was placed on a calibrated scale and verified. The test CCJ specimen was placed on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 16.8-pound weight. The weight was applied for a period of 6+/-1 second, and total 5pcs specimens were tested, in accordance with EIA–364-29.

3.21. Housing Lock Strength, Angled Pull.

Total 16.8-pound weight was placed on a calibrated scale and verified. The test CCJ specimen was placed on a clamp fixture that acted as a slotted plate and the wire was attached to the 16.8-pound weight at a 45Deg angle in 4 directions from normal exit plane of cable. The weight was applied for a period of 6+/-1 second, and total 5pcs specimens were tested, in accordance with EIA–364-29.

3.22. Stress Temperature Life.

Un-mated specimens were wound onto a mandrel with diameter 5 time of cable diameter and exposed to a temperature of 125°C for 504hrs, in accordance with EIA–364-17, Method A.

3.23. Stress Thermal Shock.

Un-mated specimens were wound onto a mandrel with diameter 5 time of cable diameter and subjected to 10 cycles of thermal shock with each cycle consisting of 30minute dwell times at -55°C ~85°C. The transition between temperatures was less than 5 minutes. In accordance with EIA–364-32.

3.24. Stress Humidity-temperature Cycling.

Un-mated specimens were wound onto a mandrel with diameter 5 time of cable diameter and exposed to 10 cycles of humidity-temperature cycling. Each cycle last 24 hours and consisted of cycling the temperature between 20°C and 65°C at 80~100% RH while maintaining high humidity with no cold shock. In accordance with EIA–364-31 Method III.

3.25. Final Examination of Product.

Specimens were visually examined per EIA 364-18 for damage detrimental to product performance.

4. TEST EQUIPMENT

4.1. Equipment List.

Equipment Name	Equipment No.
LLCR Scanner System(Agilent/34980A)	E-00340
Connector durability Tester(GP-RA-600)	E-00199
DC power supply (SM 15-400)	E-00407
Memory Hilogger (LR8400-21)	E-00658
Milliohm Meter (KEITHLEY 2000)	E-00107
High Temperature Chamber (Espec PHH-201)	E-00060
Insulation Resistance Tester (Agilent 4339B)	E-00111
Dielectric Strength Tester (Sefelec RMG12AC-DC)	E-00085
Thermal Shock Chamber(TSA-72ES-W)	E-00013
Environmental Stress Chamber(EGNX12-4CWL)	E-00014
Static Tensile Tester	FA043
Bend Tester	FA044
Milli-OHM Meter	FA-010
Temperature & Humidity chamber	SETH-Z-042L
Voltage withstanding & resistance meter	FA091-4
Thermal shock chamber	SN08110366
Humidity-temperature cycling chamber	SN08113565