

OCP IT Gear Power Cable Assembly

1. INTRODUCTION

1.1. Purpose

Testing was performed on the OCP IT Gear Power Cable Assembly 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 2017Jul.~2017Aug. Test file number is TP-17-01010-1, TP-17-01010-2, TP-17-01010-3, TP-17-01010-4, TR-152045-1 and TR-152045-2.

1.3. Conclusion

All test specimens met the requirements of the OCP IT Gear Power Cable Assembly product specification 108-152030.

1.4. Test Specimens

OCP IT Gear Power Cable Assembly.

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
	Test sequence(a)					
Initial examination of product	1	1	1	1	1	1
Low level contact resistance	3,7	2,7,9		2,4,6		
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			
Withstanding voltage			3,7			
Thermal shock			4			
Temperature life		6				
Humidity-temperature cycling			5			
Final examination of product	9	12	8	7		
Sample Size per Test Group	5	5	5	5	5	10

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, and 4

All low-level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage, were less than 10 milliohms maximum requirement for initial measurements and 20 milliohms maximum for final measurements for IT Gear connector only (refer to Figure 2) .

Test Group	Number of Data Points	Condition	LLCR(milliohms)		
			Minimum	Maximum	Average
1	10	Initial(actual)	0.43	0.67	0.51
	10	Final	0.26	0.65	0.43
2	10	Initial(actual)	0.364	0.526	0.43
	10	After Temperature Life	0.78	0.96	0.86
	10	Final	1.05	1.68	1.26
4	10	Initial(actual)	0.35	0.53	0.44
	10	After Durability(Precondition)	0.40	0.50	0.45
	10	Final	0.34	0.48	0.41

Figure 2

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 0.5 milliohms maximum requirement for initial and final measurements.

Test Group	Number of Data Points	Condition	CR(milliohms)		
			Minimum	Maximum	Average
2	10	Initial	0.29	0.39	0.34
	10	Final	0.36	0.48	0.42

Figure 3

2.4. Insulation Resistance – Test Group 3

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

2.5. Withstanding Voltage – Test Group 3

No dielectric breakdown or flashover occurred

2.6. Temperature Rise vs. Current – Test Group 2

75A with AWG#6 wire 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 Group 2 and 4
No physical damage occurred as a result of mating and unmating the specimens 5 cycles.
- 2.10. Durability – Test Group 1
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 130 N per connector.
- 2.12. Un-mating Force – Test Group 1
All un-mating force measurements were not less than 12 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 IT Gear contacts crimping with 6AWG wire can withstand 100lbs retention for 60second without dislodging.
- 2.18. Contact Retention, Straight Pull – Test Group 6
All IT Gear contacts can withstand axial 30lbs retention for 6+/-1second without dislodging inside of housing.
- 2.19. Contact Retention, Angled Pull – Test Group 6
All IT Gear contacts can withstand 45Deg angled 30lbs retention for 6+/-1second without dislodging inside of housing.
- 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. 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, IT Gear Power Cable Assembly 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^oC. 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 500 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 cable assembly was 130 N. In accordance with EIA-364-13.
- 3.12. Un-mating force
The force required to un-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 minimum force per connector was 12N. 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 minutes. 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 25 and 65°C at 80 to 98 %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 48 hours to a 5% solution salt spray, at 35 +/-2°C, in accordance with EIA-364-26.
- 3.17. Crimp Tensile.
Total 100-pound weight was placed on a calibrated scale and verified. The test IT Gear contact specimen was placed on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 100-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 30-pound weight was placed on a calibrated scale and verified. The test IT Gear specimen was placed on a clamp fixture that acted as a slotted plate and the wire was straightly attached to the 30-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 30-pound weight was placed on a calibrated scale and verified. The test IT Gear specimen was placed on a clamp fixture that acted as a slotted plate and the wire was attached to the 30-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 IT Gear 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 IT Gear 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. 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.

<u>Equipment Name</u>	<u>Equipment No.</u>
LLCR Scanner System(Agilent/34980A)	E-00340
Connector durability Tester(GP-RA-600)	E-00199
Vibration-Temperature Combined Test System	E-00524
Connector Discontinuity Detector (MERTRONICS DM600-10)	E-00001
Milliohm Meter (Agilent 34420A)	E-00112
Acceleration Sensor	E-00530/531
Fixture	TFV-J-008-01
Normal force & LLCR Tester (MAX-1KN-H-2 500N)	E-00017
Fixture	TFM-J-007
Fixture	TFM-J-042
Connector Durability Tester(GP-RA-600)	E-00199
Memory Hilogger (LR8400-21)	E-00042
Multi-Range DC power supply (GWINSTEK PSW 30-108)	E-00646
Cyclic Corrosion Tester (Q-FOG CRH-600-HSC)	E-00385
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