



TEST REPORT: EL-2000-12-021B CR
TESTED BY: B. Meck, K. Rahn, G. Stupp

REQUESTED BY: Bill Spink
DATES TESTED: 2001 Jan. 3 – 2001 Mar. 1
DATE: 2001 April 22

REPORTED BY: R. Nissly _____
(Product Test Engineer)

SUBJECT: MEG-ARRAY[®] Telcordia product qualification.

PURPOSE: This report summarizes testing to the specification Telcordia GR-1217-CORE (rev. 1995) New Technology Section 7 for MEG-ARRAY product.

CONCLUSIONS: The MEG-ARRAY connectors met the level III Central Office requirements of Telcordia GR-1217-CORE with 200 durability cycles (with the exception that the Mixed Flowing Gas testing was performed on mated connectors only). Two samples were dropped out of Mechanical Shock testing due to test board failures.

SAMPLE GROUP DESCRIPTION

- 0mm, 400 position MEG-ARRAY plug assemblies, 50µin Au.

- 4mm, 400 position MEG-ARRAY receptacle assemblies, 50µin Au.

All samples were examined upon receipt and were found to be suitable for the requested testing.

Samples that received contact resistance measurements were soldered to contact resistance test boards SK-39042 (plugs) and SK-38711 (receptacles). Those needing event detection monitoring were soldered to continuity boards SK-39872 Rev. 4 (plugs) and SK-39875 Rev. 4 (receptacles). The boards were fitted with press-fit BERGSTIK[®] pin headers for attachment of monitoring equipment.

PROCEDURE/RESULTS

TEMPERATURE LIFE

Sample Group:

– 4 pairs.

Specification Limit:

- Initial LLCR < 20mΩ per individual contact interface.

- ΔLLCR – Refer to Table 1.

Minimum No. Contacts to be Tested	Quality Level	>5mΩ	>10mΩ	>50mΩ
180	II	3%	1%	0%
500	II	-	-	0.1%
180	III	1%	0%	0%
500	III	3%	1%	0%

Test Sequence:

1. Visual inspection of product.
2. Initial LLCR.
3. Environmental Exposure to 85°C for 500 hrs (~21 days), mated condition.
4. Final LLCR.

Low Level Contact Resistance (LLCR)

Resistances were measured in accordance with EIA 364-23 with the exception that thermal EMF compensation was handled internally to the Keithley 580 operation. The results are shown in Table 2.

	Initial	Deltas
No. Data Points	800	800
Maximum	10.223	1.763
Minimum	5.946	-0.961
Overall Mean	8.433	0.398
Overall St. Dev.	0.950	0.416
No. > 20	0	
% > 5		0

THERMAL SHOCK/MOISTURE RESISTANCE

Sample Groups:

- 4 pairs for resistance measurements and 1 pair for discontinuity monitoring.
- 1 set unmated for IR and DWV measurements.

Specification Limits:

- Initial LLCR < 20m Ω per individual contact interface.
- Δ LLCR – Refer to Table 1.
- IR – 1000M Ω minimum (final).
- DWV (initial and final) - no breakdown, flashover, and/or leakage current >1.0mA at a test voltage equal to 200V RMS with a 60 second voltage hold dwell.
- 1 μ s event detection.

Test Sequence:

1. Visual inspection.
2. Initial IR and DWV.
3. Initial LLCR.
4. Thermal Shock exposure at :
 - -55°C to +85°C, 5 cycles
 - 30 minute dwell time at each temperature extreme.
 - Transfer rate < 1 minute.
 - 1 μ s event detection.
 - Mated condition - LLCR samples.
 - Unmated condition - IR/DWV samples.
5. LLCR.
6. Applied 100 durability cycles.
7. Applied dust as follows:
 - 9g/ft cubed of test chamber space.
 - Dust dried for one hour at 50°C.
 - Dust exposure for one hour at flow rate=360cfm.
 - Let samples set for one hour in chamber after exposure.
8. LLCR.
9. Moisture Resistance environment exposure:
 - +25°C to +65°C at 90-95% Relative Humidity.
 - 100 cycles (500 hours), 1 cycle equals 1hr transition from +25°C to +65°C with a 3hr dwell at +65°C and a 1hr transition from +65°C to +25°C.
 - Mated condition - LLCR samples.
 - Unmated condition - IR/DWV samples.
10. Final LLCR.
11. Final IR/DW.

Low Level Contact Resistance (LLCR)

Resistances were measured in accordance with EIA 364-23 with the exception that thermal EMF compensation was handled internally to the Keithley 580 operation. The results are shown in Table 3.

Table 3. LLCR Summary for Thermal Shock/Moisture Resistance.				
(Values in mΩ)				
	Initial	Post Thermal Shock Deltas	Post Dust Deltas	Post Moisture Environment Deltas
No. Data Points	800	800	800	800
Maximum	10.175	1.726	2.610	2.550
Minimum	6.046	-3.266	-3.336	-3.445
Overall Mean	8.534	0.309	-0.205	-0.290
Overall St. Dev.	0.930	0.621	0.549	0.544
No. > 20	0			
% > 5		0	0	0

Insulation Resistance/Dielectric Withstanding Voltage (IR/DWV)

The testing was performed in accordance with industry standard EIA-364-20. 200VDC were applied for 60 seconds between 5 contacts within the same row (adjacent) and 5 contacts between rows (opposite) at room temperature and 22% humidity. All measurements passed the specified requirements of no breakdown, flashover, and/or leakage current >1.0mA at a test voltage equal to 200V RMS with a 60 second voltage hold dwell, and a 1000MΩ minimum insulation resistance – both after thermal shock and after environmental exposure.

Discontinuity Monitoring

One sample pair was attached to continuity boards and then fitted with BERGSTIK pin headers for attachment to monitoring equipment. The sample was monitored during thermal shock with 1μs detection. During transport from heat to cold and vice versa, detections occurred and were reset. These were triggered by the Thermal Shock equipment solenoids. No detections occurred while the sample was resting in either environment, so the sample was rated as passed.

MIXED FLOWING GAS (MFG) – CENTRAL OFFICE

The in-chamber portion of this test was performed and reported on by Contech Research as Test Report #201017.

Sample Groups:

- 4 mated pairs.

Specification Limits:

- Initial LLCR < 20mΩ per individual contact interface.
- ΔLLCR – Refer to Table 1.
- Gas corrosion rates of 15 +/-3 μg/cm²-day.

Test Sequence:

1. Visual Inspection.
2. Initial LLCR.
3. Applied 100 durability cycles.
4. LLCR.
5. MFG exposure:
 - 10 day mated.
 - NO₂=200ppb (±50ppb), H₂S=10ppb (±5ppb), CL₂=10ppb (±3ppb), SO₂=100ppb (±20ppb).
 - RH=70% (±2%), Temperature=30C (±1C).
 - LLCR.
6. Interface disturbance of ~.004in.
7. LLCR.
8. Applied 100 durability cycles.
9. Final LLCR.

The average corrosion rate for the 10 days of exposure was 13.6 μg/cm²-day.

Low Level Contact Resistance (LLCR)

Resistances were measured in accordance with EIA 364-23 with the exception that thermal EMF compensation was handled internally to the Keithley 580 operation. The results are shown in Table 4.

Table 4. LLCR Summary for Mixed Flowing Gas.					
(Values in mΩ)					
	Initial	Post 100 Cycle Deltas	Post Gas Exposure	Post Disturbed Deltas	Post Final 100 Cycle Deltas
No. Data Points	800	800	800	800	800
Maximum	9.909	3.310	5.370	8.480	3.866
Minimum	6.028	-1.209	-1.009	-0.799	-0.670
Overall Mean	7.863	0.005	0.337	1.142	0.689
Overall St. Dev.	0.745	0.448	0.702	0.955	0.529
No. > 20	0				
% > 5		0	.125	.625	0
% > 10		0	0	0	0

VIBRATION AND MECHANICAL SHOCK

Sample groups:

- 4 pairs for resistance measurements and 1 pair for discontinuity monitoring.

Specification Limits:

- Initial LLCR < 20m Ω per individual contact interface.
- Δ LLCR – Refer to Table 1.
- 1 μ s event detection.

Test Sequence:

1. Visual inspection.
2. Initial LLCR.
3. Applied 100 durability cycles.
4. Applied dust as follows:
 - 9g/ft cubed of test chamber space.
 - Dust dried for one hour at 50°C.
 - Dust exposure for one hour at flow rate=360cfm.
 - Let samples set for one hour in chamber after exposure.
5. LLCR.
6. Vibration Environmental Exposure – Axis 1.
 - Sinusoidal, 10 to 500Hz at 10g, 8 hrs per axis (Log sweep rate = 0.1 octave per minute).
 - 1 μ s event detection.
7. LLCR.
8. Vibration Environmental Exposure – Axis 2.
 - Sinusoidal, 10 to 500Hz at 10g, 8 hrs per axis (Log sweep rate = 0.1 octave per minute).
 - 1 μ s event detection.
9. LLCR.
10. Vibration Environmental Exposure – Axis 3.
 - Sinusoidal, 10 to 500Hz at 10g, 8 hrs per axis (Log sweep rate = 0.1 octave per minute).
 - 1 μ s event detection.
11. LLCR.
12. Mechanical Shock Environment – Axis 1.
 - 50g 11ms Pulse Duration, ½ sine, 3 shocks each axis, 3 mutually perpendicular planes (18 total shocks).
13. LLCR.
14. Mechanical Shock Environment – Axis 2.
 - 50g 11ms Pulse Duration, ½ sine, 3 shocks each axis, 3 mutually perpendicular planes (18 total shocks).
15. LLCR.
16. Mechanical Shock Environment – Axis 3.
 - 50g 11ms Pulse Duration, ½ sine, 3 shocks each axis, 3 mutually perpendicular planes (18 total shocks).
17. LLCR.
18. Applied 100 durability cycles.
19. Final LLCR.

Low Level Contact Resistance (LLCR)

Resistances were measured in accordance with EIA 364-23 with the exception that thermal EMF compensation was handled internally to the Keithley 580 operation. The results are shown in Tables 5 and 6.

Table 5. LLCR Summary for Vibration. (Values in mΩ)					
	Initial	Post Dust Deltas	Post 1st Vibration Axis Deltas	Post 2nd Vibration Axis Deltas	Post 3rd Vibration Axis Deltas
No. Data Points	800	800	799	800	799
Maximum	10.168	0.647	0.701	0.883	0.496
Minimum	6.005	-1.292	-1.515	-1.524	-1.666
Overall Mean	8.446	-0.252	-0.416	-0.389	-0.483
Overall St. Dev.	0.943	0.297	0.358	0.377	0.344
No. > 20	0				
% > 5		0	0	0	0

Table 6. LLCR Summary for Mechanical Shock. (Values in mΩ)				
	Post 1st Shock Axis Deltas	Post 2nd Shock Axis Deltas	Post 3rd Shock Axis Deltas	Post 100 Cycle Deltas
No. Data Points	799	799	799	400*
Maximum	0.851	0.815	0.448	1.460
Minimum	-1.664	-1.676	-1.694	-1.786
Overall Mean	-0.500	-0.470	-0.472	-0.336
Overall St. Dev.	0.347	0.357	0.350	0.409
No. > 20				
% > 5	0	0	0	0

* Samples 1 and 2 failed to read across the entire sample following the final 100 durability cycles. The cause was determined to be a pcb problem in which the solder pads were separating from the laminate material during vibration and/or durability cycling. This was verified by performing a dye test in which a red dye was injected around the solder ball area. A vacuum was drawn and the part was placed in an oven at ~50°C to dry it. The connector was then removed from the board. Dye was found beneath some of the pads, most notably at the corner positions.

Discontinuity Monitoring

One sample pair was attached to continuity boards and then fitted with BERGSTIK pin headers for attachment to monitoring equipment. The sample was monitored during vibration with 1μs detection. No detections occurred. The sample was rated as passed.

EQUIPMENT

Table 7. Equipment list.			
ITEM NAME	MANUFACTURER	V.G. NUMBER	CALIBRATION DUE DATE
7002 Switch System	Keithley	7145	N/A
706 Scanner	Keithley	6833	N/A
706 Scanner	Keithley	7100	N/A
Dry Heat Oven	Blue M	6858	04/01
580 Multimeter	Keithley	7024	12/13/01
580 Multimeter	Keithley	7025	12/13/01
580 Multimeter	Keithley	6106	01/01
580 Multimeter	Keithley	6851	07/11/01
Thermal Shock Machine	Thermotron	6931	05/01
Chart Recorder Model 2702	Molytek	6983	05/01
Relative Humidity Chamber	Blue M	7468	04/01
Dielectric Analyzer	Vitretek 944i	7535	01/01
Environmental Monitor	Davis	7172	07/01
Vibration Table	Umholtz-Dickie	SN 499	N/A
Vibration Controller	Umholtz-Dickie	6929	03/01
Signal Conditioner	Umholtz-Dickie	6927	03/01
Sine Control	Umholtz-Dickie	6928	03/01
Accelerometer	Umholtz-Dickie	6957	03/02
Event Detector Model 32 EHD	AnaTech	6989	06/01
Shock Machine (SM110 MP)	Avex	SN ED0107	N/A
Digital Oscilloscope (IQ400)	Hi-Techniques	6924	07/01
Low Pass Filter (3200R)	Krohn-Hite	6925	07/01
Charge Amplifier (2740B)	Endevco	6926	07/01
Accelerometer (5011)	Columbia	6961	07/01
Event Detector Model 32 EHD	AnaTech	7495	06/01
Microscope	Bausch & Lomb	6818	03/01
Olympus SZH Stereoscope	Olympus	7399	03/01
DMC-Ie Digital Camera	Polaroid	7555	N/A