Modular, High Density, RF Connection System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) modular, high density, blind-mate RF coaxial backplane connection system combining a high performance, broad bandwidth multi-position RF coaxial interconnect in a customer configurable platforms like as specified in the VITA 67.0, 67.1 and 67.2 documents.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

Successful qualification testing on the subject product line was completed on 25aPR11. The Qualification Test Report number for this testing is 501-748. This documentation is on file at and available from Engineering Practices and Standards (EPS).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity Documents

- 408-10373: (Instruction Sheet) SMPM Floating Panel Mount, Cable Jacks (Direct Solder Attachment) 1996390-1, 1996771-1
- 501-748: (Qualification Test Report) Modular, High Density, RF Connection System

2.2. Industry Documents

- ASTM G85: Standard Practice for Modified Salt Spray (Fog) Testing
- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- VITA 67.0: Coaxial Interconnect on VPX
- VITA 67.1: Coaxial Interconnect , 3U, 4 Position SMPM Configuration
- VITA 67.2: Coaxial Interconnect, 6U, 8 position SMPM Configuration)

2.3. Government Document

MIL-STD-810: Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

2.4. Reference Documents

- 109-197: Test Specification (TE Test Specifications vs EIA and IEC Test Methods)
- MIL-STD-202: Test Method Standard, Electronic and Electrical Component Parts
- VITA 47: Environmental, Design and Construction, Safety, and Quality for Plug-In Units

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings (per VITA requirements)

- Operating Voltage: 200 volts AC
- Current: RF power (C.W. Ave.): VHF/UHF/SHF (30 MHz to 30 GHz): >20 dBm HF (3 to 30 MHz): >30 dBm
- Temperature Range: -55 to 105°C
- Characteristic Impedance: 50 ohms
- Frequency Range: DC to 26.5 GHz

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

Test Description	Requirements	Procedures
Initial examination of product	Meets requirements of product drawing	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product	Meets visual requirements	EIA-364-18. Visual inspection.
ELECTRICAL		
Low Level Contact Resistance (LLCR).	8 milliohms maximum initial for center contact. 2 milliohms maximum initial for outer contact. ΔR 5 milliohms maximum.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Voltage Standing Wave Ratio (VSWR).	1.5:1 maximum to 26.5 GHz for semi-rigid cable. 1.5:1 maximum to 20 GHz for flexible cable.	EIA-364-108. Measure VSWR from 1.0 to 26.5 GHz.
Insulation resistance.	10,000 megohms minimum initial. 5,000 megohms minimum final.	EIA-364-21. 500 volts DC, 2 minute hold. Test between each single contact to all other contacts and between the shell and all the contacts.
Withstanding voltage.	One minute hold with no breakdown or flashover. Five milliamperes maximum leakage current.	EIA-364-20, Method D, Condition I. 325 volts rms at sea level. Test between adjacent contacts.

Figure 1 (cont)

Test Description	Requirements	Procedures
Insertion loss.	-0.12 sqrt f (GHz) dB maximum. 1.0 to 26.5 GHz for semi-rigid cable. 1.0 to 20.0 GHz for flexible cable.	EIA-364-101, Method A. Measure insertion loss from 1.0 to 26.5 GHz.
Frequency response.	± 1.0 dB maximum from 1.0 to 26.5 GHz for semi-rigid cable. ± 1.0 dB maximum from 1.0 to 20.0 GHz for flexible cable.	To be extracted from insertion loss data.
Isolation.	140 dB maximum from 3.0 to 30 MHz. 120 dB maximum from 30 MHz to 3.0 GHz. 100 dB maximum from 3.0 to 26.5 GHz.	EIA-364-90, Method B.
Power handling.	1.5 maximum VWSR at 3.0 to 30 MHz and 30 dBm. 1.5 maximum VSWR at 30 MHz to 26.5 GHz and 20 dBm.	EIA-364-108. Measure VSWR at maximum operation temperature (105°C) at each frequency band and power. Specimens must soak for 1 hour at maximum temperature prior to VSWR measurement.
MECHANICAL		
Vibration, Class V3.	One hour per axis. No discontinuities of 10 nanoseconds or greater using an energizing current of 100 milliamperes. See Note.	MIL-STD-810, Method 514, Procedure I. 5 to 100 Hz PSD increasing at 3 dB per octave. 100 to 1000 Hz PSD = 0.1 g^2/Hz 1000 to 2000 Hz PSD decreasing at 6 dB per octave. Three mutually perpendicular axes, 1 hour per axis. Cables shall be secured to the vibrating surface no more than 25.4 mm from the module end.
Mechanical shock, Class OS2.	No discontinuities of 10 nanoseconds or greater using an energizing current of 100 milliamperes. See Note.	MIL-STD-810, Method 516, Procedure I. Plug-in unit shall withstand 40 g, 11 millisecond, terminal sawtooth shock pulses in all 3 axes. Cables shall be secured to the vibrating surface no more than 25.4 mm from the module end.
Durability.	See Note.	EIA-364-9. Mate and unmate specimens for 500 cycles at a maximum rate of 600 cycles per hour.
Mating force.	75 N maximum for 4 position. 145 N maximum for 8 position.	EIA-364-13. Measure force necessary to mate specimens at a maximum rate of 12.7 mm per minute.

Figure 1 (cont)

Test Description	Requirements	Procedures
Unmating force.	13 N minimum for 4 position. 25 N minimum for 8 position.	EIA-364-13. Measure force necessary to unmate specimens at a maximum rate of 12.7 mm per minute.
ENVIRONMENTAL		
Thermal shock (non-operating).	See Note.	EIA-364-32. Subject mated specimens to 5 cycles between -55 and 125°C with 1 hour dwells at temperature extremes and 1 minute maximum transition between temperatures.
Operating temperature.	1.5.1 VSWR minimum to 20 GHz, at temperatures between -40 and 85°C. See Note.	EIA-364-108.
Corrosion resistance.	Contacts shall meet LLCR requirements and must mate and unmate after exposure.	ASTM G85, Annex A4, Cycle A4.4.4.1. with the exception that the specimens shall be oven dried after cleaning for 24 hours at 40°C. Subject specimens, mounted in optional enclosure with drain holes, to 48 hour salt fog with periodic SO_2 introduction.
Humidity.	See Note.	MIL-STD-810, Method 507, Procedure II, 10 cycles.

NOTE
Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence as shown in Figure 2.

Figure 1 (end)

Test or Examination	Test Group (a)							
	1	2	3 (b)	4	5	6	7	8
	Test Sequence (c)							
Initial examination of product	1	1	1	1	1	1	1	1
LLCR	2,8		2,4					
VSWR				2				
Insulation resistance		2,6						
Withstand voltage		3,7						
Insertion loss								2
Frequency response								3
Isolation								4
Power handling							2	
Vibration, Class V3						2		
Mechanical shock, Class OS2						3		
Durability	5							
Mating force	3,6							
Unmating force	4,7							
Thermal shock (non-operating)		4						
Operating temperature					2			
Corrosion resistance			3					
Humidity		5						
Final examination of product	9	8	5	3	3	4	3	5

NOTE

(a) See Paragraph 4.1.A.

(b) For 1-piece backplane module connector system only: Two sets of cables shall be used on the backplane for this test group. One set of cables shall be prepared and used for LLCR measurements. A separate environmental set shall be prepared and used for corrosion exposure only. Following corrosion exposure, the environmental cables shall be replaced with the original measurement cables in the same positions as originally installed, and shall be used for the final measurement.

(c) Numbers indicate sequence in which tests are performed.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheet and shall be selected at random from current production. Test All test groups 1, 2 and 3 shall consist of a minimum of 3 specimens each. Test groups 4 and 8 shall consist of 2 specimens each. Test groups 5 and 7 shall consist of 1 specimen each. Test group 6 shall consist of 6 specimens.Specimens can be either fully loaded modules or individual RF contacts, depending on the test being conducted. Test groups 1, 2, 3 and 6 are module level test groups; test groups 4, 5, 7 and 8 are contact level test groups.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

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