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Representative XCede® Product (4-Pair version shown)




Representative Custom Daughtercard Receptacle Monoblock Assembly



Individual Daughtercard Receptacle Module



Backplane Header Modules

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1.0 OBJECTIVE

This specification defines the performance, test, quality and reliability requirements of the XCode® Connector System. The test sequences defined in this specification meet the intent of the Telcordia GR-1217-CORE document.

2.0 SCOPE

This specification is applicable to the mating and PCB termination characteristics of the XCode® high-speed differential backplane connector with press-fit compliant-pin board termination.

3.0 APPLICABLE DOCUMENTS

3.1 FCI Specifications

- Applicable FCI product customer drawings
- FCI Application Specification GS-20-121 (XCode® Connector System)

3.2 Other Standards and Specifications

- UL94V-O: Test for Flammability of Plastic Materials in Devices and Appliances
- EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- GR-1217-CORE: Telcordia Specification "Generic Requirements for Separable Electrical Connectors"

3.3 FCI Product Qualification Test reports

- EL 2011-02-013: XCode® Connectors Qualification Testing

4.0 REQUIREMENTS


4.1 Materials

The material for each component shall be as specified herein or equivalent.

- **Contacts:** High Performance Copper Alloy
- **Plating:**
 - Contact Mating Area: Performance-based plating, qualified to meet the requirements of this specification, including the Telcordia GR-1217-CORE (Issue 2) Central Office test sequence.
 - Compliant Tail Termination Areas: Tin or tin-lead over nickel.
- **Housings:** High temperature thermoplastic; UL 94V-0 compliant

4.2 Visual Examination of Product

Visual examinations shall be performed using 10x magnification. Parts should be free from blistering, cracks, discoloration, etc.

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5.0 ELECTRICAL CHARACTERISTICS

5.1 Contact Resistance

Low Level (LLCR) Measurements shall be performed using a four-wire method per EIA 364-23. The maximum initial signal contact resistance is to be 55 mΩ. The increase in resistance for any position shall not exceed 10 mΩ.

The following details apply:

- a. Test voltage: 20 mV maximum open circuit
- b. Test current: 100 mA maximum
- c. Number of readings: 500 minimum

5.2 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 1000 MΩ after environmental exposure when measured in accordance with EIA 364-21

The following details shall apply:


- a. Test voltage: 500 VDC
- b. Electrification time: 60 seconds
- c. Points of measurement: between closest adjacent contacts
- d. Number of readings: 30 (10 readings per loose-piece connector set)

5.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (> 0.5 mA) when the mated connectors are tested in accordance with EIA 364-20.

The following details shall apply:

- a. Test voltage: 500 VAC, 60Hz
- b. Test duration: 60 seconds
- c. Voltage application rate: 500 V per second
- d. Points of Measurement: between closest adjacent contacts
- e. Number of readings: 30 (10 readings per loose-piece connector set)

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6.0 MECHANICAL CHARACTERISTICS

6.1 Mating / Un-mating Force

Perform in accordance with EIA 364-13. The force to mate a receptacle connector and compatible header shall not exceed 0.65N per contact. The un-mating force shall not be less than 0.15 N per contact. The following details shall apply:

- a. Cross head speed: 1 inch per minute
- b. Lubrication: Backplane header module contacts only
- c. Utilize free-floating fixtures
- d. Number of mate/un-mate cycles: 3
- e. Number of mated connector pairs to be tested: per test matrix tables

7.0 ENVIRONMENTAL CONDITIONS

After exposure to the following environmental conditions in accordance with “Table 1 – Qualification Test Matrix”, the product shall show no physical damage and shall meet the electrical and mechanical requirements in sections 6 and 7. Unless specified otherwise the products shall be mated during exposure.

7.1 **Thermal Shock:**

Perform in accordance with EIA 364-32. The following details shall apply:

- a. Number of cycles: 5
- b. Temperature range: -55 to +85°C
- c. Time at each temperature (mass-dependent):
 - 30 minutes minimum per cycle, group 3a
 - 60 minutes minimum per cycle, group 3b
- d. Transfer time: 30 seconds maximum

7.2 **Cyclical Humidity and Temperature:**

Samples are to be exposed to cyclical humidity and temperature in accordance with EIA 364-31. Samples are to be subjected to 50 cycles of 10-hour duration for a total of 500 hours.


One cycle consists of the following steps.

- a. 2 hour ramp from 25°C at 80%-98% RH to 65°C at 90%-98% RH
- b. 4 hour dwell at 65°C at 90%-98% RH
- c. 2 hour ramp down to 25°C at 80%-98% RH
- d. 2 hour dwell at 25°C at 80%-98% RH

7.3 **Temperature Life:**

Perform in accordance with EIA 364-17. Headers and receptacles shall remain mated without any electrical load. The following details shall apply:

- a. Temperature: 85°C
- b. Duration: 500 hours

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7.4 Industrial Mixed Flowing Gas (Class IIA, 4-gas):

Expose samples to gas mixture per Telcordia GR-1217-CORE, Issue 2, Section 9.1.3 as follows:

- a. Temperature: 30°C
- b. Relative humidity: 70%
- c. Mandatory readings after the 10th and 20th days
- d. Gas compositions, per **Central Office** requirements:

<u>Gas Type</u>	<u>Gas Concentration</u>
NO ₂	200 ppb
Cl ₂	10 ppb
H ₂ S	10 ppb
SO ₂	100 ppb

Un-mated backplane connectors are to be exposed to gas mixture for 10 days, then mated and exposed for an additional 10 days.

7.5 Vibration

Perform in accordance with Telcordia GR-1217-CORE, Issue 2, Sections 6.3.5 and 9.1.2.1. The following details shall apply:

- a. Vibration amplitude: 1.5 mm (0.06 inch) double amplitude or 10G acceleration
- b. Frequency range: 10 to 500 to 10 Hz
- c. Sweep time: 15 minutes per cycle
- d. Duration: 2 hours along each of three orthogonal axes (6 hours total)
- e. Mounting: rigidly mounted assemblies
- f. No discontinuities greater than 1 micro-second (requirement of signal connectors only)

7.6 Mechanical Shock

Perform in accordance with Telcordia GR-1217-CORE, Issue 2, Sections 6.3.5 and 9.1.2.1. The following details shall apply:

- a. Amplitude: half sine 30G
- b. Duration: 11 milliseconds
- c. Number of shocks: 3 shocks along each of three orthogonal axis (18 total)
- d. Mounting: rigidly mounted assemblies
- e. No discontinuities greater than 1 micro-second (required of signal connectors only)


7.7 Durability

Perform in accordance with EIA 364-09C. Use standard laboratory procedure as applicable to the specific product. The following details shall apply:

- a. Number of cycles: See Table 1 (250 total mating cycles)
- b. Cycling rate: 12.5 cm (5 inches) per minute

7.8 Dust Contamination

Perform in accordance with Telcordia GR-1217-CORE, Issue 2, Section 9.1.1.1 & Table 9-1. Samples shall be subjected to a one-hour dust exposure using a benign dust composition as specified in Table 9-1 of Telcordia GR-1217-CORE, Issue 2. Un-mated backplane connectors alone shall be subjected to dust exposure.

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7.9 Contact Disturbance

Perform in accordance with Telcordia GR-1217-CORE, Issue 2, Section 9.1.3.3 paragraph 5. The mated connectors shall be subjected to an interface disturbance that consists of slightly unmating the sample approximately 0.10 mm (0.004 inch). The sample is then resealed and resistance measurements are made.

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ISO 9000.

8.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a. Temperature: 25 ± 5°C
- b. Relative humidity: 20% to 80%
- c. Barometric pressure: Local ambient

8.3 Sample Quantity and Description

The sample descriptions and quantities are shown in Tables 3 and 4. The number of readings is specified in the description for each test.

8.4 Acceptance

Electrical and mechanical requirements placed on test samples as indicated in the sections of this specification shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with the product specification shall meet the stated requirements.

Failures attributed to equipment, test set-up or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

8.5 Qualification Testing

Qualification testing shall be performed on sample units with equipment and procedures normally used in production. The test sequences are shown in Tables 1 and 2.

8.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate re-qualification testing consisting of all applicable parts of the qualification test program as shown in Tables 1 and 2.

- a. A significant design change is made to the existing product, which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating, material composition or thickness, contact force, pin/contact surface geometry, insulator or housing design, pin/contact base material or pin/contact lubrication.
- b. A significant change is made to the manufacturing process, which impacts the product form, fit or function.
- c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.


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Table 1: Qualification Test Matrix

TEST GROUP ID ►		P	1	2	3a	3b	4 ⁽¹⁾	5
TEST DESCRIPTION	SECTION	Design verification for product extension	Mixed Flowing Gas	Temp Life	Thermal Shock & Humidity	Thermal Shock & Humidity	Vibration & Mech. Shock	Durability
VISUAL EXAMINATION OF PRODUCT	4.2	1,5	1,13	1,5	1,10	1,11	1,11	1,5
ELECTRICAL:								
CONTACT RESISTANCE, LOW LEVEL (LLCR)	5.1	2,4	2,4,6,8,10,12	2,4		2,4,6,8,10	2,4,6,8,10	2,4
INSULATION RESISTANCE	5.2				2,5,8			
DIELECTRIC WITHSTANDING VOLTAGE	5.3				3,6,9			
MECHANICAL:								
MATING / UN-MATING FORCE ⁽²⁾	6.1	See note 2	See note 2			See note 2	See note 2	See note 2
ENVIRONMENTAL:								
THERMAL SHOCK	7.1				4	3		
CYCLICAL HUMIDITY & TEMPERATURE	7.2				7	9		
TEMPERATURE LIFE	7.3			3				
MFG, UNMATED, 10-DAYS	7.4		5					
MFG, MATED, 10-DAYS	7.4		7					
VIBRATION	7.5						7 ⁽¹⁾	
MECHANICAL SHOCK	7.6						9 ⁽¹⁾	
DURABILITY, 100 CYCLES ⁽²⁾	7.7	3 ⁽²⁾	3,11 ⁽²⁾			5 ⁽²⁾	3 ⁽²⁾	
DURABILITY, 250 CYCLES ⁽²⁾	7.7							3 ⁽²⁾
DUST CONTAMINATION	7.8					7	5	
CONTACT DISTURBANCE	7.9		9					

TEST SEQUENCE NOTES:

1. Discontinuity monitored on 3 samples, 15 lines each.
2. Mating and un-mating forces recorded on the first three cycles of each durability group.



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Table 2: Qualification Sample Requirements

TEST GROUP ID ►	P	1	2	3a	3b	4	5
SAMPLE DESCRIPTION ⁽¹⁾	Design verification for product extension ^(1,3)	Mixed Flowing Gas	Temp Life	Thermal Shock & Humidity	Thermal Shock & Humidity	Vibration & Mech. Shock	Durability
Product and test samples required:							
LLCR BACKPLANE SAMPLES ⁽²⁾	See note 3	7	7	n/a	7	3	7
LLCR DAUGHTERCARD SAMPLES ⁽²⁾	See note 3	7	7	n/a	7	3	7
BACKPLANE VERTICAL HEADER SAMPLES (Loose)	n/a	n/a	n/a	3	n/a	n/a	n/a
DAUGHTERCARD R/A RECEPT SAMPLES (Loose)	n/a	n/a	n/a	3	n/a	n/a	n/a

SAMPLE REQUIREMENT NOTES:

- The baseline 4-pair version is exposed to the entire qualification program (test groups 1-7). Product extensions having the same design, but different number or rows or columns, are to be exposed to test group P only for design verification.
- One LLCR test sample consists of a daughtercard or backplane with three (3) mounted connector modules and associated guide hardware for the baseline 4-pair 6-column product qualification. On the daughtercard, three connector assemblies and two end guide-modules are joined together onto a metal organizer and termed a "receptacle monoblock assembly". On the backplane side, the three vertical header modules are applied as separate adjacent modules, with a two standalone metal guide-pins mounted to the board, one at each end of the three connectors.
- Sampling methods for subsequent design verification of new product variations will be chosen based on the product version being tested (ie. number of modules on a test card may be fewer or more than the baseline configuration).

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