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1.0 **OBJECTIVE**

This specification defines the performance, test, quality and reliability requirements of the METRAL 3000 Series Differential Connector.

2.0 **SCOPE**

This specification is applicable to the termination characteristics of separable METRAL 3000 Series two-piece backplane connector modules. One side of the mating connector pair contains exposed pin contacts; the other contains protected receptacle contacts.

3.0 **GENERAL**

This document is composed of the following sections:


Paragraph	Title
1.0	OBJECTIVE
2.0	SCOPE
3.0	GENERAL
4.0	APPLICABLE DOCUMENTS
5.0	REQUIREMENTS
5.1	Qualification
5.2	Material
5.3	Finish
5.4	Design and Construction
6.0	ELECTRICAL CHARACTERISTICS
7.0	MECHANICAL CHARACTERISTICS
8.0	ENVIRONMENTAL CONDITIONS
9.0	QUALITY ASSURANCE PROVISIONS
9.1	Equipment Calibration
9.2	Inspection Conditions
9.3	Sample Quantity and Description
9.4	Acceptance
9.5	Qualification Testing
9.6	Re-qualification Testing
TABLE 1	QUALIFICATION TESTING MATRIX

3.1 Banned/Restricted Substances

All products where the part number ends in 'LF' meet the European Union directives and other country regulations as described in GS-22-008. The part numbers that do not end in 'LF' meet all regulations except for Pb in SnPb plating.

3.2 Manufacturing Processability

All headers covered by this specification will with stand exposure to 260°C and receptacles covered by this specification will withstand exposure to 240°C for 60 seconds in a convection, infra-red or vapor phase reflow oven.

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4.0 **APPLICABLE DOCUMENTS**

4.1 Specifications

4.1.1 Engineering Drawings 10114433, 10071947, 74750, 74760, 63371, 63372, 58347, 84962

4.1.2 Process Drawings

4.2 Military Standards

4.2.1 MIL-STD-1344A: Test Method for Electrical Connectors

4.2.2 MIL-G-45204: Gold Plating (Electrodeposited)

4.2.3 MIL-STD-2166: Connectors, Electrical, Compliant Pin

4.2.4 MIL-STD-202F: Test Method for Electrical and Electronic Component Parts

4.2.5 MIL-P-81728: SnPb Plating

4.2.6 MIL-P-45209: Palladium Alloy Plating

4.3 Federal Specifications

4.3.1 QQ-N-290 - Nickel Plating

QQ-C-533 - Beryllium Copper Alloy Strip

4.4 Other Standards and Specifications

4.4.1 UL94-VO: Flammability

4.4.2 EIA 364: Test Procedure 65

4.4.3 EIA-364-21: Insulation Resistance Test Procedure

4.4.4 EIA-364-04: Normal Force Test Procedure

4.4.5 BellCore: GR-1217-CORE

4.5 FCI Specifications

4.5.1 BUS-29-xxx: METRAL 3000 Series Qualification Summary

4.5.2 BUS-03-404: Normal Force measurement


4.5.3 BUS-03-601: Current Rating / 30°C Temperature Rise

4.5.4 BUS-03-405: Insertion / Withdrawal Force Measurement

4.5.5 GS-46-001 Sn (lead free) Plating

4.6 FCI Lab Reports - Supporting Data

4.6.1 EL 2001-05-037

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5.0 REQUIREMENTS

5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

5.2 Material

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

Receptacle Signal Contacts - Beryllium Copper

Receptacle Ground Contacts - Olin Alloy 663

Receptacle and Header Housings - Glass Filled LCP

Receptacle Nosepiece - Glass Filled LCP

Receptacle Protective Cover - Glass Filled Stanyl 46 Nylon or Copper Alloy (see drawing)

Header Signal and Ground pin contacts - Phosphor Bronze / Olin Alloy 663

Header Ground Shields - Olin Alloy 663 / Phosphor Bronze / Brass C260

Receptacle Metal Cover – Copper Alloy

Receptacle Vertical Shield – Copper Alloy

5.3 Finish

5.3.1 Receptacle Signal Telecordia Central Office Qualified
(Contact FCI representative for further details)

5.3.2 Receptacle Ground Telecordia Central Office Qualified
(Contact FCI representative for further details)


5.3.3 Header Pins Telecordia Central Office Qualified
(Contact FCI representative for further details)

5.3.4 Header Pins Telecordia Central Office Qualified
(Contact FCI representative for further details)

5.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawings.

5.4.1 See Drawing numbers 10114433, 74750, 74760, 63371, 63372, 58347, and 84962 for test connector configurations.

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6.0 ELECTRICAL CHARACTERISTICS

- 6.1 Low Level Contact Resistance, Specified Current – Total contact circuit resistance at a specified current shall not exceed 50 m-Ω initially or after mating cycles and environmental exposure when measured in accordance with EIA reference 364-23. For test sample size ≤ 500 , change in resistance measurements shall not exceed 10 milliohms on any signal contact, and 25 milliohms on any ground contact. For test samples size > 500 , 1% of samples are allowed to have a change in resistance > 10 milliohms < 50 milliohms for signal contacts, and > 25 milliohms < 50 milliohms for ground contacts. The following details shall apply:
- a. Test Voltage - 20 millivolts DC maximum open circuit.
 - b. Test Current - Not to exceed 100 milliamperes
- 6.2 Insulation Resistance - The insulation resistance of mated connectors shall not be less than 1000 Megohms (after environmental exposure) when measured in accordance with EIA-364-21. The following details shall apply:
- a. Test Voltage - 500 volts DC
 - b. Electrification Time - 60 seconds
 - c. Points of Measurement - Between adjacent contacts and between contacts and metal shields
- 6.3 Dielectric Withstanding Voltage - There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (>0.5 milliampere) when the mated connectors are tested in accordance with EIA-364-20A. The following details shall apply:
- a. Test Voltage - 500 Vdc or 500 Vac peak volts RMS or AC, 60Hz
 - b. Test Duration - 60 seconds
 - c. Voltage: Applied at a rate of 500 volts per second
 - d. Points of Measurement - Between adjacent contacts and between contacts and metal shields
- 6.4 Current Rating - The temperature rise above ambient shall not exceed 30 degrees C at any point in the system when all contacts are powered at 0.5 amperes or one contact is powered to 1 amperes. The following details shall apply:
- a. Ambient conditions - Still air at 25 degree C
 - b. Reference - BUS-03-601

7.0 MECHANICAL CHARACTERISTICS

- 7.1 Mating / Unmating Force - The force to mate and unmate receptacle and compatible header connector modules shall meet the following criteria:

Maximum Insertion

Minimum Retention

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Rev E

GS-01-001


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8x5 Module:	83.2 Newtons [18.7 lbf]	19.2 Newtons [4.32 lbf]
8x6 Module:	155.7 Newtons [22.2 lbf]	35.0 Newtons [5.12 lbf]
6x5 Module:	62.4 Newtons [14.0 lbf]	14.4 Newtons [3.23 lbf]

The following details shall apply during testing:

- a. Cross Head Speed - 1 inch per minute.
- b. Lubrication - None
- c. Utilize free-floating fixtures
- d. Reference EIA 364-13

- 7.2 Normal Force - The contact normal force (end-of-life), shall not be less than 40 grams per beam when tested in accordance with Berg Test Specification BUS-03-404.
- 7.3 Contact Retention - The dual insert molded lead assemblies (DIMLA) shall withstand an axial load of 2.2 N minimum applied at a rate of 0.2 inches per minute without dislodging from the housing cavity. Reference EIA 364-29.
- 7.4 Individual Compliant Pin Insertion / Retention Force - The force required to insert an individual compliant pin into a plated through hole in a printed circuit board at a rate of 0.2 inches/minute shall not exceed 50 N. The retention force in an axial direction opposite that of insertion shall not be less than 5 N.
- 7.5 PCB Hole Deformation Radius - Cross-section parallel to board surface. Photograph and measure the hole deformation (deformation of board material) radius at the center of the compliant pin section. Include 10 holes. The average hole deformation radius shall be no greater than 0.0381 mm (0.0015 in) when measured from the drilled hole. The absolute maximum deformation shall not exceed 0.0508 mm (0.002 in). Reference MIL-STD-2166.
- 7.6 PCB Hole Wall Damage - Cross-section perpendicular to the board surface, and through the compliant section wear track. Photograph and measure the copper thickness remaining between the compliant pin and the printed wiring board laminate. Include 10 holes. The minimum average copper thickness remaining between the compliant pin and the printed wiring board laminate shall not be less than 0.00762 mm (0.0003 in.). In addition there shall be no copper cracks, separations between conductive interfaces, or laminate-to-laminate copper separations. Reference MIL-STD-2166.

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8.0 ENVIRONMENTAL CONDITIONS

After exposure to the following environmental conditions in accordance with the specified test procedure and / or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements of paragraphs 6.0 and 7.0 as detailed in Table 1 test sequences. Unless otherwise specified, assemblies shall be mated during exposure.

8.1 Thermal Shock - EIA 364-32, Test Condition II

- a. Number of Cycles - 5
- b. Temperature Range - -55°C to 85°C
- c. Time at Each Temperature - 30 minutes minimum
- d. Transfer Time - 5 minutes, maximum

8.2 Humidity - Mated samples are to be exposed to cyclical humidity and temperature in accordance to EIA-364-31A, February 1983, Method III, Condition B, with the following exceptions. Samples are to be subjected to 50 cycles of 10 hours duration for a total of 500 hours after 24 hours in a conditioning oven at 50+/-2°C. A cycle consisted of the following steps:


- a. Ramp from 25+/-2°C at 84%+/-4% RH to 65+/-2°C at 94%+/-4% RH in 120 minutes.
- b. Dwell at 65+/-2°C at 94%+/-4% RH for 4 hours
- c. Ramp down to 25+/-2°C at 94%+/-4% RH in 120 minutes
- d. Dwell at 25+/-2°C at 94%+/-4% RH for 2 hours

8.3 High Temperature Life - EIA-364-17A, November 1987, Method A, Test Condition 4. Headers and receptacles shall be mated w/o any electrical load.

- a. Temperature 85 °C +/- 2°C
- b. Test duration - 500 hours.

8.4 Vibration Sinusoidal - In accordance with Bellcore GR-1217-CORE, November 1995.

- a. Vibration Amplitude - 0.06" DA or 10G acceleration
- b. Frequency Range - 10 to 500 Hertz
- c. Sweep Time and Duration - 8 hours along each of three orthogonal axes (24 hours total)
- d. Mounting - Rigidly mount assemblies
- e. No Discontinuities greater than 1 microsecond

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8.5 Mechanical Shock - In accordance with Bellcore GR-1217-CORE, November 1995 sections 6.3.5 and 9.1.2.1.

- a. Conditions - Half-sine 30G, 11 millisecond duration
- b. Shocks - 3 shocks along each of three orthogonal axes
- c. Mounting - rigidly mount assemblies
- d. Resistance measurements taken after shock in each axis.

8.6 Durability - Standard laboratory procedure as applicable to the specific product

- a. Number of Cycles - 200
- b. Cycling Rate - 5 inches per minute

8.7 Industrial Mixed Flowing Gas (4-Gas MFG) - Samples are to be exposed to industrial gas mixture in accordance with Bellcore GR-1217-CORE, November 1995, Section 9.1.3. The headers only are to be exposed for 10 days to the gas mixture detailed below, with interim resistance measurements made after the 5th and 10th days. The samples are then mated with the appropriate receptacle and exposed to an additional 10 days with resistance measurements taken after the 15th and 20th days of exposure. The test chamber is to be maintained at a temperature of 30°C +/-1°C with a relative humidity of 70%+/2%.

Central Office		Uncontrolled Environment
Gas	Gas Concentration	
NO2	200 ppb	200 ppb
Cl2	10 ppb	20 ppb
H2S	10 ppb	100 ppb
SO2	100 ppb	200 ppb

8.7.1 Gas concentrations per Central Office


8.7.2 Gas concentrations per Uncontrolled Environment

8.7.3 Gas concentration for Commercial non-Telcordia product. (Ten days at 30°C / 70% RH)

Gas	Gas Concentration
Cl2	10 ppb
H2S	10 ppb
NO2	200 ppb

8.8 Dust Contamination

- a. Per sections 9.1.1.1 and Table 9-1 Telcordia GR-1217-CORE, November 1995

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9.0 QUALITY ASSURANCE PROVISIONS

9.1 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

9.2 Inspection conditions

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

- a. Temperature - 25 +/- 5 degree C
- b. Relative humidity - 30 to 60%
- c. Barometric Pressure - Local ambient

9.3 Sample Quality and Description

Sample quantity for each Test Group in Table 1 shall consists of a minimum of thirty (30) contacts. The 30 contacts shall be selected from a minimum of three (30) connectors.


9.4 Acceptance

9.4.1 Electrical and Mechanical requirements shall be as indicated in Paragraphs 6.0 and 7.0 using test data and appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

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

9.5 Qualification Testing


Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. Test sequences are as shown in Table 1.

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9.6 Re-qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate re-qualification testing consisting of the applicable parts of the test matrix, Table 1.


- a. A significant design change is made to the existing product that 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 or contact surface geometry, insulator design, contact base material or contact lubrication requirements.
- b. A Significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.
- c. A significant change is made to the manufacturing process that impacts the product form, fit or function.

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DEVELOPMENT & QUALIFICATION TEST SEQUENCE SELECTION MATRIX

TABLE 1.

Test	Paragraph	Test Groups						
		1	2	3	4	5	6	7
		MFG	High Temp Life	Thermal Shock Humidity	Vibration & Shock	Hole Deformation	Electrical Performance	Current Rating
Visual Examination		1	1	1	1	1	1	1
Mating Forces	7.1		2 8		2 18			
Unmating Forces	7.1		3 7		4 17			
Low Level Contact Resistance	6.1	2 4 6 8 10 12 14	4 6	2 6 10	3 6 8 10 12 14 16			
Insulation Resistance	6.2			3 7 11				
Dielectric Withstanding Voltage	6.3			4 8 12				
99 Durability Cycles	8.6	3 13			5 15			
High Temp Life	8.3		5					
Thermal Shock	8.1			5				
Moisture Resistance	8.2			9				
MFG - 5 Days Unmated	8.7	5 7						
MFG - 5 Days Mated	8.7	9 11						
Vibration - 1st Axis					7			
2nd Axis					9			
3rd Axis	8.4				11			
Mechanical Shock	8.5				13			
Normal Force	7.2		9					
Contact Retention	7.3							
Individual Pin Insertion Force	7.4					2 4 6		
Individual Pin Retention Force	7.4					3 5 7		
PCB Hole Deformation	7.5					8		
PCB Hole Wall Damage	7.6					9		
Current Rating	6.4							2
Characteristic Impedance	6.5						2	
Cross-talk	6.6						3	

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REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	All	Release rev. A	V20352	02/18/02
B	2-8	Correct P/n's and Typo that were present after PDF	V03-0118	01/24/03
C	All	Add lead free information	V05-0934	10/04/05
D	All	Change logo	V06-0405	04/26/06
E	ALL	Add 10114433, change guardian,	V10-0221	05/11/10
F	3&5	Update mating force amount	ELX V-004076	6/9/11



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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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