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			J.R. Volstorf		20-Sep-05		
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1.0 OBJECTIVE

This specification defines the performance, test, quality, and reliability of the "T" series solder to board signal receptacle, which is part of the Metral connector system.

2.0 SCOPE

This specification is applicable to the termination characteristics of both the vertical and right angle "T" series solder to board signal receptacle.

3.0 GENERAL

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TABLE 1 Product Qualification Plan

3.2 Band 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.

3.3 Manufacturing Processability

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

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4.0 **APPLICABLE DOCUMENTS**

The following documents, of the issue in effect on the date of the latest revision to this specification, shall form a part of this specification to the extent specified herein.

4.1 **FCI Specification**

4.1.1 Engineering Drawings

- 4.1.1.1 SE96846 – Standard 4 Row Right Angle Receptacle Product
- 4.1.1.2 SE96860 – Standard 4 Row Vertical Receptacle Product
- 4.1.1.3 SE96847 – Standard 5 Row Right Angle Receptacle Product
- 4.1.1.4 SE96872 – Standard 5 Row Vertical Receptacle Product

4.2 **Industry Product Specifications**

- 4.2.1 IEC 61076-4-104 Printed Board Connectors With Assessed Quality – Detail Specification for Two-Part Modular Connectors, Basic Grid of 2mm, With Terminations on a Multiple Grid of 0.5mm
- 4.2.2 EIA 616 2 Millimeter, Two-Part Connectors for Use with Printed Boards and Backplanes

4.3 **Industry Performance Standards and Procedures**

- 4.3.1 Telcordia GR-1217-CORE Generic Requirements for Separable Electrical Connectors Used In Telecommunications Hardware
- 4.3.2 IEC 60512 Electromechanical components for electronic equipment; Basic Testing Procedures and Measuring Methods
- 4.3.3 EIA-364 Electrical Connector / Socket Test Procedures Including Environmental Classifications

4.4 **Military Standards**


- 4.4.1 MIL-C-45662 Calibration System Requirement

4.5 **Other Standards and Specifications**

- 4.5.1 UL 94 Test for Flammability of Plastic Materials
- 4.5.2 ISO 9000 Quality System Requirements

4.6 **Test Reports**

EL-2000-10-016

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5.0 REQUIREMENTS

5.1 Qualification

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

5.2 Materials

5.2.1 Terminal
Phosphor Bronze Alloy

5.2.2 Insulator
Glass Filled Thermoplastic capable of meeting UL 94-V0 flammability rating.

5.2.3 Keeper
Glass Filled Thermoplastic capable of meeting UL 94-V-0 flammability rating.

5.3 Contact Finish

0.75 microns minimum Au plating in contact mating area with 0.51 microns minimum Sn (lead free) if part number ends in 'LF' or SnPb if part number does not end in 'LF' on contact tails. All over 1.91 microns minimum Ni plating.

Or


0.64 microns minimum 80/20 Palladium Nickel plating with 0.05 - 0.18 microns Au flash in contact mating area with 0.51 microns minimum Sn (lead free) if part number ends in 'LF' or SnPb if part number does not end in 'LF' on contact tails. All over 1.91 microns minimum Ni plating.

5.4 Design and Construction

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

5.4.1 Mating
The connector shall be capable of mating with any appropriately constituted male connector meeting IEC 61076-4-104 or EIA-616 specifications.

5.4.2 Workmanship
Connectors shall be uniform in quality and shall be free of defects that will effect the product's life or serviceability.

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6.0 ELECTRICAL CHARACTERISTICS

6.1 **Current Carrying Capacity**

The current carrying capacity shall be 1.5 amperes per contact when current is applied to all contacts. Test methodology shall be in accordance with IEC 60512, test 5b.

6.2 **Temperature Rise at Rating**

The maximum temperature rise at rated current for all contacts shall not be greater than 30° C. Test methodology shall be in accordance with IEC 60512, test 5a.

6.3 **Low Level Contact Resistance**

The low level contact resistance (bulk plus interfacial) shall not exceed the values given below:

- Row A – 25 mΩ
- Row B – 35 mΩ
- Row C – 40 mΩ
- Row D – 45 mΩ
- Row E – 50 mΩ

Test methodology shall be in accordance with IEC 60512, test 2a.

6.4 **Insulation Resistance**

The insulation resistance between two adjacent contacts of an unmated connector shall not be less than 5,000 MΩ initially, and shall not be less than 1,000 MΩ after environmental exposure. Test methodology shall be in accordance with IEC 60512, test 3a.

6.5 **Dielectric Withstanding Voltage**

There shall be no evidence of arc-over or insulation breakdown when a test voltage 1,000 volts rms is applied. Test methodology shall be in accordance with IEC 60512, test 4a.

7.0 MECHANICAL CHARACTERISTICS

7.1 **Contact Retention**


Contacts shall not exceed a maximum axial displacement of 0.1mm when a 5 Newton force is applied along the direction of the contact's retention feature. Test methodology shall be in accordance with IEC 60512, test 15a.

7.2 **Connector Mating / Unmating Forces**

The maximum force to mate a female connector with an appropriately populated male connector shall not exceed a maximum of 0.45 Newtons per contact. The minimum force to unmate a female connector with an appropriately populated male connector shall not be less than 0.15 Newtons per contact. The test methodology shall be in accordance with IEC 60512, test 13b.

7.3 **Contact Normal Force**

The contact normal force shall not be less than 0.50 Newtons at 0.127mm deflection before and after environmental exposure. The test methodology shall be in accordance with EIA-364-04.

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8.0 ENIRONMENTAL CONDITIONS

After exposure to the following environmental conditions in accordance with the specified test procedure, the product shall show no physical damage and shall meet the electrical and mechanical requirements of sections 6.0 and 7.0.

8.1 **Temperature Life**

Mated connectors shall be tested at a temperature of $85^{\circ} \pm 2^{\circ}$ Celsius for 1,000 hours. The test methodology shall be in accordance with IEC 60512, test 11i.

8.2 **Thermal Shock**

Mated connectors shall be tested with cyclic variation from -55° C to $+85^{\circ}$ C for a minimum of 5 cycles (30 minutes at each temperature extreme). The test methodology shall be in conformance with IEC 60512, test 11d.

8.3 **Moisture Resistance (Steady State Damp Heat)**

Mated connectors shall be tested at a temperature humidity environment of $40^{\circ} \pm 5^{\circ}$ Celsius and $93\% \pm 2\%$ R.H. for a total exposure of 21 days. The test methodology shall be in accordance with IEC 60512, test 11C.

8.4 **Vibration**

Mated connectors shall be tested in accordance with IEC 60512, test 6d. Test duration shall be monitored continuously during the vibration by an event detector, which is capable of detecting interruptions of one 1 microsecond or less.

Frequency Range: 10 HZ – 2,000 HZ

Double Amplitude: 1.5 mm (.060) in.

Peak Sinusoidal Excitation: 10 g's

Crossover Frequency: 57.1 HZ


10 sweeping cycles per axis. Full duration per axis is 2 hours.

8.5 **Mechanical Shock**

Mated connectors shall be tested according to IEC 60512, test 6C. Connectors shall be exposed to 6 shocks in each of the 3 axis directions, for a total of 18 shocks. Continuity shall be monitored continuously during the shock by an event detector, which is capable of detecting interruptions of 1 microsecond or less.

Half-Sine Excitation: 30 g's

Duration: 11 ms

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8.6 Mixed Flowing Gas (MFG)

Mated connectors shall not experience a change in low level contact resistance (LLCR) greater than 10mΩ at any time during the sequence. Connectors shall be tested in accordance with section 9.1.3 of Telcordia GR-1217 CORE, central office (CO) conditions. Test sequence shall be a 10-day parallel mated and unmated exposure as per section 9.1.3.2 of the Telcordia GR-1217 CORE specification. Temperature shall be 30° ± 1° Celsius with relative humidity at 70% ± 2%. Gas compositions are as follows:

Gas	Four (4) Gas Mixture Central Office Environment
NO ₂	200 ± 50 ppb
CL ₂	10 ± 3 ppb
H ₂ S	10 ± 5 ppb
SO ₂	100 ± 20 ppb

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 MIL-C-45662 and ISO 9000.

9.2 Inspection conditions

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

- (a) Temperature: 25⁰ ± 5⁰ C
- (b) Relative Humidity: 30% to 60%
- (c) Barometric Pressure: Local Ambient

9.3 Sample Quantity and Description

Samples shall meet the requirements of section 5.4. Refer to Table 1 for sample quantity.


9.4 Acceptance

9.4.1 Product shall meet the stated electrical, mechanical and environmental requirements as specified in paragraphs 6.0, 7.0, and 8.0 from established test data using appropriate statistical techniques.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product.

9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production.

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9.6 Requalification Testing

If either of the following conditions occur, the responsible product engineer shall initiate a requalification test consisting of all test groups he or she deems applicable:

- (a) A significant design change is made to the existing product. A significant change shall include, but is not limited to, changes in the plating material composition or thickness, contact normal force, contact surface geometry, insulator design and material, contact base material, or contact lubrication requirements.
- (b) A significant design change is made to the manufacturing process that impacts the product's 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.


Table 1 - Product Qualification Plan

Test Description	Procedure	Test Groups and Sequences						
		1	2	3	4	5	6	7
Examination of Product	Section 5.4 ¹	1	1	1	1	1	1	1
Contact Normal Force	EIA-364-04	3	5			6		
Mating / Unmating Force	IEC 60512, test 13b		2,4					
Contact Retention Force	IEC 60512, test 15a	2				5		
Durability (50 cycles)	IEC 60512, test 9a							3
Durability (200 cycles)			3					
Low Level Contact Resistance	IEC 60512, test 2a				2,6,10	2,4		2,6
Insulation Resistance	IEC 60512, test 3a				3,7,11			
Dielectric Withstanding Voltage	IEC 60512, test 4a				4,8,12			
Current Carrying Capacity	IEC 60512, test 5b						2	
Temperature Rise at Rating	IEC 60512, test 5a						3	
Temperature Life	IEC 60512, test 11l					3		
Thermal Shock	IEC 60512, test 11d				5			
Steady State Damp Heat	IEC 60512, test 11c				9			
Vibration	IEC 60512, test 6d							4
Mechanical Shock	IEC 60512, test 11c							5
Mixed Flowing Gas	Telcordia GR-1217 CORE section 9.1.3.2			2				
Sample Size Per Test Group ²		4 REC	4 PAIR	8 PAIR	4 PAIR	4 PAIR	4 PAIR	4 PAIR

¹ Refers to GS-12-177

² REC refers to a Receptacle Assembly.

PAIR refers to 1 Receptacle Assembly plus 1 Header Assembly.

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