


NUMBER <b>GS-12-453</b>	TYPE <b>PRODUCT SPECIFICATION</b>		
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		AUTHORIZED BY Heaven Cen	DATE 03/03/09
CLASSIFICATION <b>UNRESTRICTED</b>			

## 1.0 OBJECTIVE

This specification defines the performance, test, quality and reliability requirements of the modular metric Metral B receptacle Connector.

## 2.0 SCOPE

This specification is applicable to the termination characteristics of the Metral B receptacle family of products which provides a separable interconnect for printed circuit boards, and includes press-fit & solder to board receptacles connector.


## 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	Definitions
5.3	Material
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5.5	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

## 4.0 APPLICABLE DOCUMENTS

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

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4.1 – Scope: This product line performance is defined in several external industry standards as identified in this section. Only performance standards exceeding or not defined in these external standards will be covered in this document.

#### 4.2 Industry Product Performance Standards

IEC 512: Electromechanical components for electronic equipment, basic testing procedures and measuring methods.

IEC 707: Method of test for the determination of the flammability of solid electronic insulating materials exposed to an igniting source.

EIA-IS64: 2 mm two-part connector for printed wiring boards and backplanes.

EIA-364-04: Normal Force test procedure for Electrical Connectors.

Bell core GR-1217-CORE: Generic Requirements for Separable Electrical Connectors Used in Telecommunications Hardware.

#### 4.3 FCI Specifications :

- (a) General requirements from test specifications
- (b) Engineering Drawings
- (c) Process drawings
- (d) GS-20-001 Heat Stake Application Specification
- (e) BUS-03-108 Crosstalk
- (f) BUS-03-110 Characteristic Impedance
- (g) BUS-03-111 Propagation Delay
- (h) BUS-03-113 Inductance
- (i) BUS-03-114 Capacitance


#### 4.4 Military Specifications

#### 4.5 Military Standards

- (a) MIL-STD-202 : Test methods for electrical and electronic components
- (b) MIL-G-45204 : Gold plating (electro-deposited)
- (c) MIL-P-81728 : SnPb plating

#### 4.6 U.S. Federal Specifications

- (a) QQ-N-290 : Nickel Plating (electro-deposited)
- (b) UL-STD-498 : Standard for attachment plugs and receptacles
- (c) UL-STD-94 : Test for flammability of plastic materials

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## 5.0 REQUIREMENTS

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

5.2 Definitions :

5.2.1 Receptacle Signal Contact Solder to Board.

A dual beam female right angle contacts with a solder tail for termination to the printed circuit board.

5.2.2 Receptacle Power contact Solder to Board.

A dual beam female right angle contact with three solder tails for termination to the printed circuit board.

5.2.3 Receptacle Insulator Housing.

The plastic modules in which the female contacts are retained.

5.3 Material: the material for each part shall as be specified herein.

5.3.1 Metallic Parts

Receptacle Contact Body: The receptacle shall be phosphor bronze alloy CuSn6 or CuSn5.

5.3.2 Insulator Housing ; All receptacle housing material shall be Liquid Crystal Polymer 30% glass standard IEC 707, category FV-1.

5.4 Finish :

### CONTACT PLATING


2.0 micron gold/1.3 micron min. Nickel

1.3 micron gold/1.3 micron min. Nickel

0.8 micron gold/1.3 micron min. Nickel

0.8 micron GXT/1.3 micron min. Nickel

5.5 Design and Construction: The receptacle connector shall be a multi-piece assembly having 4 (or 5) rows of contacts with solder tail terminations for installation in 1.48 mm to 2.57 mm thick printed circuit boards. The receptacle contacts shall interface with a 0.5 mm male pin on a 4 or 5 row 2 mm grid.

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5.5.1 Mating: The receptacle connector shall be capable of mating with any appropriately constituted male connector of the same population without any degradation in performance.

5.5.2 Workmanship: Connectors shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, blisters, pin holes, sharp edges, and other defects that will adversely effects life or serviceability.

## 6.0 ELECTRICAL CHARACTERISTICS

6.1 Signal Pin Current Carrying Capacity : The current carrying capacity of a mated signal pair is rated at 1 ampere with current applied to all contacts (24 (4 rows) or 30 (5 rows) contacts) when measured in accordance with EIA-364-70.

6.2 Power Pin Current Carrying Capacity : The current carrying capacity of a mated power pair is rated at 3 amperes with current applied to all contacts (24 contacts) when measured in accordance with EIA-364-70.


6.3 Low Level Contact Resistance: The low level contact resistance (bulk plus interfacial) shall not exceed the values shown in Table I when measured in accordance with EIA-364-23. The following details apply :

a) Method or connection – See EIA-IS-64 for contact resistance measurement points.


Table I – Contact Resistance

Signal	Initial Resistance milliohms Maximum
Row A	25
Row B	35
Row C	40
Row D	45
Row E	45
Power	
All Rows	8
Shorting contact	30 After all mechanical and environmental tests

6.4 Insulation Resistance: The insulation resistance of unmated connectors shall be no less than 5000 megohms initially, (1000 megohms after environmental exposure) when measured in accordance with EIA-364-21, at applied test voltage of 500 VDC.

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- 6.5 Proof Voltage/Dielectric Withstanding Voltage: There shall be no evidence of arc-over or insulation breakdown when measured in accordance with EIA-364-20, at an applied test voltage of 1000 VDC.
- 6.6 Capacitance: The capacitive coupling between adjacent rows of contacts shall not exceed 3pF. The capacitive coupling between adjacent contacts within a row shall not exceed 2pF. The following details apply per BUS-03-114 :
- a) Connectors shall be mated and mounted onto test boards.
  - b) Test condition: 1 MHz at 1 nsec rise time.
  - c) Measurement equipment: Impedance analyzer or other suitable equipment capable of measuring capacitance at 1 MHz.
- 6.7 Inductance: The inductance between adjacent contacts shall be no greater than 25 nH, and between one contact and all other surrounding contacts grounded shall be no greater than 15 nH. The following details apply per BUS-03-113.
- a) Connectors shall be mated.
  - b) Measurements shall be made from tail tip to tail tip.
  - c) Test conditions 1 ns rise time pulse (0.0 V to 1.0 V), with a 50 Ohm termination.
  - d) Measurements equipment : Sampler/TDR/Scope equipment with a 50 Ohm reference impedance.
- 6.8 Propagation Delay: The maximum propagation delay shall not exceed 225 psec, and the maximum row-to-row delay shall not exceed 40 psec. The following details apply per BUS-03-111
- a) Connector shall be mated.
  - b) Measurements shall be made from tail tip to tail tip.
  - c) Test Condition: 250 psec rise time pulse (0.0 V and 2 V) with a 50 Ohm termination.
  - d) Measurements equipment: Sampler/pulse generator/scope equipment with a 50 Ohm reference impedance and 250 psec rise time.
- 6.9 Cross Talk: Adjacent active/quiet near end cross talk shall not exceed 5% in any row or column combination. The far end cross talk shall nt exceed 2.5%. The following details apply per BUS-03-108:
- a) Connectors shall be mated.
  - b) Measurements shall be made from tail tip to tail tip.
  - c) Test Condition: 1 ns rise time pulse (0.0 V to 2.0 V) with a 50 Ohm termination.

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d) Measurements equipment: Sampler/Pulse Generator/Scope equipment with 50 Ohm reference impedance.

6.10 Characteristics Impedance: The mated connector characteristic impedance shall be within the range of 50-60 Ohms. The following conditions apply per BUS-03-110 :

- a) Sample documentation;
- b) Sample test conditions.

## 7.0 MECHANICAL CHARACTERISTICS

7.1 Contact Retention: There shall be no loosening of the contact or damage to the contact or damage to the connector when a force (listed table II) is applied to a contact in either direction along the axis of retention, when measured in accordance with EIA-364-29.

Table II

Contact Type	Minimum Axial Force
Receptacle	5 Newton

7.2 Total Mating Force: The total force to mate a female connector with an appropriately populated male header shall not exceed the values in Table III times the number of contacts, when measured in accordance with EIA-364.13.


Table III

Contact Type	Maximum Insertion Force/Contact
Signal	0.45 Newton
Power	1.5 Newton

7.3 Individual Contact Insertion Force: Using a maximum gage (configuration as shown in EIA-IS-64), the individual insertion force shall not exceed those values given in Table III, when measured in accordance with EIA-364-37.

7.4 Individual Contact Withdrawal Force: After 5 insertions of a maximum gage, the force required to withdraw a minimum gage (configuration as shown in EIA-IS-64) shall be no less than those values given in Table IV, when measured in accordance with EIA-364-37.

Table IV

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	Minimum
Contact Type	Withdrawal Force/Contact
Signal	0.15 Newton
Power	0.30 Newton

#### 7.5 Signal Compliant Contact Insertion/ Retention Force:

The force required to insert an individual signal compliant contact into a plated through hole in a printed circuit board at a rate of 5.1 mm/minute shall not exceed 32N. The retention force in an axial direction opposite that of insertion shall not be less than 7N.

#### 7.6 Normal Force: The normal force for female contacts only shall be no less than shown in Table V, when measured in accordance with EIA-364-04.

Table V

Contact Type	Normal Force After Life
Signal	0.4 Newton, minimum
Power	0.8 Newton, minimum

#### 7.7 Heat Stake Durability: Refer to Heat Stake Specification GS-20-001.


#### 7.8 PCB Hole Deformation Radius:

Cross-section should be parallel to board surface. Photograph and measure the holes deformation radius at a point 0.25mm from the surface and at the center of the compliant pin section. The average holes deformation radius of 10 holes shall be no greater than 37.5µm when measured from the finished hole. The absolute maximum deformation radius shall not exceed 50µm. Reference Telcordia GR-1217-CORE, section 5.1.7.

### 8.0 ENVIRONMENTAL CONDITIONS

Environmental conditions, sequence of testing and applicable requirements shall be as specified in TABLES P, AP, BP, CP, DP, EP and FP of EIA-IS-64. An "X" in the "Requirements" column of those tables indicates that the test or conditioning shall be applied.

Unless otherwise specified, mated sets of connectors shall be tested and care shall be taken to ensure that the mated sets remain together during the complete test sequence. ie., when un-mating is necessary for a certain test, the same connector pairs shall be mated for the subsequent tests. All mated sets of connectors (also referred to as a specimen) will be subjected to initial testing in accordance with table P of EIA-IS-64. The test specimens will then be divided according to test group as shown in the sample quantity matrix in paragraph 10.1 of this specification.

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8.1 In addition to the testing conducted in accordance with EIA-IS-64 the product shall be exposed to a typical 10 year central office dust environment per Bellcore GR-1217-CORE. There shall be no electrical discontinuities during subsequent electrical tests, and the low level contact resistance shall not exceed a 10mΩ rise, maximum, above the values measured in Table I.

8.2 The climatic categories of the three connector classes shall be as shown in TABLE VI. These classes correspond to the EIA-IS-64 performance levels PL1, PL2 and PL3 respectively.

TABLE VI – CLIMATIC CONDITIONS

DAMP HEAT

CLASS	CATEGORY	TEMPERATURE RANGE	STEADY STATE
CLASS I	55/125/56	-55 C TO +125 C	56 DAYS
CLASS II	55/125/56	-55 C TO +125 C	56 DAYS
CLASS III	55/125/56	-55 C TO +125 C	N/A

8.3 Vibration conditions by connector class shall be as shown in TABLE VII.

TABLE VII – VIBRATION CONDITIONS

CLASS	CONDITIONS
CLASS I	10 TO 2000 Hz AND 1,5 mm or 20g
CLASS II	10 TO 500 Hz AND 0,35 mm or 5g
CLASS III	N/A

8.4 Mechanical endurance (number of mate/unmate cycles) by connector class shall be as shown in TABLE VIII.


TABLE VIII – MECHANICAL ENDURANCE

CLASS	CONDITIONS
CLASS I	250 CYCLES MINIMUM
CLASS II	100 CYCLES MINIMUM
CLASS III	30 CYCLES MINIMUM

## 9.0 QUALITY ASSURANCE PROVISIONS

### 9.1 Equipment Calibration



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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 : 25 ± 5 deg C
- b) Relative Humidity : 30% to 60%
- c) Barometric Pressure : Local ambient

## 9.3 Sample Quantity And Description

The required sample quantities are listed in TABLE IX. The numbers listed for Test Group P under each Class (44, 40 and 32) represent the total required for completing all test groups. Upon completing the Test Group P sequence, these samples are divided as indicated among the remaining six test groups. The dust test will require additional samples as indicated in paragraph 8.1

TABLE IX – SAMPLE QUANTITY

TEST GROUP	CLASS 1	CLASS II	CLASS III
P	44	40	32
AP	8	8	8
BP	8	8	8
CP	8	8	N/A
DP	8	8	8
EP	4	N/A	N/A
FP	8	8	8


DUST TEST – QUANTITY/SPEC REFERENCED IN PARAGRAPH 8.1

## 9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test set up, ore 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

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Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequence shall be as specified in EIA-IS-64.

#### 9.6 Re-qualification Testing

If either of the following conditions occur, the responsible product engineer shall initiate re-qualification testing consisting of all applicable parts of the Test Schedule Tables in EIA-IS-64.

- a) A significant design change is made to the existing product. A significant change shall include, but is not limited to, changes in the over plate composition, plating thickness, contact force, contact surface geometry, under plate material composition, insulator design, contact base material, or contact lubrication requirements.
- 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.

#### 10.0 RECORD RETENTION

##### REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	All	New release according to GS-12-002 updated	DG07-0105	07/04/02
B	All	Update form format	DG09-0065	03/03/09

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