


NUMBER <b>GS-12-093</b>	TYPE <b>PRODUCT SPECIFICATION</b>		
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## 1.0 OBJECTIVE

THIS SPECIFICATION DEFINES THE PERFORMANCE, TEST, QUALITY AND RELIABILITY REQUIREMENTS OF THE USB (UNIVERSAL SERIAL BUS) INCLUDING. THE FOLLOWING:  
 SERIES "B" RIGHT ANGLE RECEPTACLE  
 SERIES "B" PLUG


## 2.0 SCOPE

THIS SPECIFICATION IS APPLICABLE TO THE TERMINATION CHARACTERISTICS OF THE USB FAMILY OF PRODUCTS WHICH PROVIDES INTERCONNECTION OF COMPUTER PERIPHERALS.

## 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	PRODUCT EXAMINATION
5.3	MATERIAL
5.4	FINISH
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

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9.6	RE-QUALIFICATION TESTING
FIGURE 1	CONTACT RESISTANCE MEASUREMENT POINTS TYPICAL
FIGURE 2	VIBRATION AND PHYSICAL SHOCK MOUNTING FIXTURE
TABLE 1	QUALIFICATION TESTING AND SEQUENCE MATRIX

## 4.0 APPLICABLE DOCUMENTS

### 4.1 SPECIFICATIONS

#### 4.1.1 ENGINEERING DRAWINGS

SERIES "B" RECEPTACLE  
61729

DOUBLE RAW RECEPTACLES:  
THROUGH HOLE

SERIES "B" PLUG KIT  
61730  
61768

DOUBLE RAW:  
STRAIGHT TYPE  
RIGHT ANGLE TYPE

### 4.2 MILITARY STANDARDS

4.2.1 MIL-STD-202F: TEST METHODS FOR ELECTRICAL COMPONENT PARTS.

4.2.2 MIL-STD-1344A: TEST METHODS FOR ELECTRICAL CONNECTORS.

4.2.3 MIL-C-45662: EQUIPMENT CALIBRATION

### 4.3 FEDERAL SPECIFICATIONS

4.3.1 QQ-N-290: NICKEL PLATING(ELECTRODEPOSITED)

4.3.2 QQ-B-750: PHOSPHOR BRONZE ALLOY STRIP


4.3.3 QQ-S-571: SOLDER

### 4.4 OTHER STANDARDS AND SPECIFICATIONS

4.4.1 UL91-V0: FLAMMABILITY.

4.4.2 ASTM B-103: PHOSPHOR BRONZE

4.4.3 ISO 9000:

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- 4.4.4 EIA 364: ELECTRICAL CONNECTOR/SOCKET TEST PROCEDURES INCLUDING ENVIRONMENTAL CLASSIFICATIONS
- 4.4.5 ASTM-D-4565: PHYSICAL AND ENVIRONMENTAL PERFORMANCE PROPERTIES OF INSULATION AND JACKET FOR TELCOMMUNICATIONS
- 4.4.6 ASTM-D-4566: ELECTRICAL PERFORMANCE PROPERTIES OF ISULATION AND JECKET FOR TELECOMMUNICATION WIRE AND CABLE,TEST STANDARD METHOD
- 4.4.7 USB UNIVERSAL SERIAL BUS SPECIFICATION

#### 4.5 FCI SPECIFICATIONS

- 4.5.1 BUS-03-114: CAPACITANCE MEASUREMENT.
- 4.5.2 BUS-03-404: NORMAL FORCE MEASUREMENT.
- 4.5.3 BUS-03-405: INSERTION/WITHDRAWAL FORCE MEASUREMENT.
- 4.5.4 BUS-03-601: CURRENT RATING/30 TEMPERATURE RISE
- 4.5.5 BUS-16-016: PHOSPHOR BRONZE STRIP
- 4.5.6 BUS-16-074: PCT.30% GLASS
- 4.5.7 BUS-19-002: SOLDERABILITY
- 4.5.8 BUS-19-020: POROSITY
- 4.5.9 BUS-19-040: PLATING ADHESION
- 4.6.0 BUS-19-002: SURFACE MOUNT SOLDER JOINT RELIABILITY
- 4.6.1 BUS-19-122: SOLDER JOINT RELIABILITY TEST PROCEDURE FOR SURFACE MOUNT CONNECTORS.


### 5.0 REQUIREMENTS

#### 5.1 QUALIFICATION

CONNECTORS FURNISHED UNDER THIS SPECIFICATION SHALL BE CAPABLE OF MEETING THE QUALIFICATION TEST REQUIREMENTS SPECIFIED HEREIN.

#### 5.2 PRODUCT EXAMINATION

PRODUCT WILL BE EXAMINED PER EIA-364-18 VERIFYING VISUALLY

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PARAGRAPHS 3, 5.4 AND 5.5 DIMENSIONAL EXAMINATION IS NOT REQUIRED.

### 5.3 MATERIAL

THE MATERIAL FOR EACH COMPONENT SHALL BE AS SPECIFIED HEREIN OR EQUIVALENT. SUBSTITUTE MATERIAL SHALL MEET THE PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION

5.3.1 RECEPTACLE TERMINAL: THE BASE MATERIAL SHALL BE PHOSPHOR BRONZE STRIP.

5.3.2 RECEPTACLE INSULATOR HOUSINGS:  
CONNECTORS SHALL BE MOLDED OF PLASTIC THAT IS RATED UL94-V-0 OR BETTER IN ACCORDANCE WITH UL-94.

5.3.3 RECEPTACLE SHELL: THE BASE MATERIAL SHALL BE PHOSPHOR BRONZE STRIP


### 5.4 FINISH

5.4.1 RECEPTACLE TERMINAL SHALL BE PLATED IN THE CONTACT AREA WITH 0.76um (30u"INCHES) PALLDIUM NICKED WITH GOLD FLASH MINIMUM OVER 1.27um (50u"INCHES) MINIMUM NICKEL. THE RECEPTACLE TERMINAL SOLDER TAIL SECTIONS SHALL BE PLATED WITH 2.54um (100u"INCHES) 90/10 TIN-LEAD MINIMUM OVER 1.27um (50u"INCHES) MINIMUM NICKEL. THE THERMINAL AREAS OUTSIDE OF THE 1.27um (50u"INCHES) NICKEL MINIMUM.

5.4.2 OUTSIDE SHELL OF THE RECEPTACLE AND PLUG KIT SHALL BE PLATED WITH 2.54um (100u"INCHES) 90/10 TIN-LEAD MINIMUM OVER 1.27um (50u"INCHES) MINIMUM NICKEL UNDERPLATE.

### 5.5 DESIGN AND CONSTRUCTION

5.5.1 SINGLE DECK: THE RECEPTACLE CONNECTOR SHALL BE A MULTIPLE PIECE ASSEMBLY HAVING DOUBLE ROWS OF

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CONTACTS. (THE TWO CONTACTS ARE SPACED 2.5mm) IN THE INTERFACE AREA. EACH TERMINAL TRANSITION WILL BE A 90 DEGREE BEND TO ALLOW FOR TERMINATION TO THE PC BOARD BY MEANS OF A THROUGH HOLE LEG. THE SHELL HAS RESILIENT CONTACT ARMS (ON THE TWO SIDE INTERNAL) THAT ACT AS ESD GROUNDING AS WELL AS CABLE PLUG RETENTION FEATURES. AND SHELL ASSURE THAT THERE IS CONSTANT CONTACT BETWEEN THE RECEPTACLE SHELL AND THE SHELL OF THE MATING CABLE ASSEMBLY PLUG WHILE THE CONNECTORS ARE MATED. THE ENTIRE RECEPTACLE ASSEMBLY IS ATTACHED TO THE PRINTED CIRCUIT BOARD VIA RETENTION CLAWS ON THE OUTSIDE SHALL. THE RECOMMENDED P.C.BOARD THICKNESS IS 1.57mm (0.62"INCHED )

5.5.2 MATING: THE CONNECTORS SHALL BE CAPABLE OF MATING AND UNMATING MANUALLY WITHOUT THE USE OF SPECIAL TOOLS.

5.5.3 WORKMANSHIP: CONNECTORS SHALL BE UNIFORM IN QUALITY AND SHALL BE FREE FROM BURRS, SCRATCHES, CRACKS, VOIDS, CHIPS, BLISTERS, PIN HOLES, SHARP EDGES, OTHER DEFECTS, DEBRIS AND ANY INGRESS OF FOREIGN MATERIAL THAT WILL ADVERSELY AFFECT LIFE OF SERVICEABILITY.

5.5.4 TEMPERATURE RATING: THE RECEPTACLE CONNECTOR SHALL BE CAPABLE OF WITHSTANDING STORAGE TEMPERATURE AND OPERATING TEMPERATURE RANGE OF -55 DEGREES C TO 85 DEGREES C.


## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 LOW LEVEL CONTACT RESISTANCE (LLCR):

6.1.1 TEST STANDARD: EIA 364-23

6.1.2 ACCEPTANCE CRITERIA: 30m MAX.

6.1.3 CONNECTION METHOD: ATTACH CURRENT VOLTAGE LEADS AS SHOWN IN FIGURE 1

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## 6.2 INSULATION RESISTANCE:

- 6.2.1 TEST STANDARD: EIA364-21
- 6.2.2 ACCEPTANCE CRITERIA: >1000 MEGOHMS, MATED AND UNMATED
- 6.2.3 TEST VOLTAGE: 500 VOLTS DC
- 6.2.4 ELECTRIFICATION TIME: 2 MINUTES
- 6.2.5 MEASUREMENT POINTS: BETWEEN ADJACENT CONTACT AND BETWEEN CONTACTS SHELL

## 6.3 DIELECTRIC WITHSTANDING VOLTAGE

- 6.3.1 TEST STANDARD: EIA 364-20, METHOD A
- 6.3.2 ACCEPTANCE CRITERIA: NO EVIDENCE OF ARC-OVER, INSULATION BREAKDOWN, OR EXCESSIVE CURRENT LEAKAGE (>1MA) MATED AND UNMATED CONNECTORS
- 6.3.3 TEST VOLTAGE: 750 VOLTS AC, 60 HZ
- 6.3.4 TEST BAROMETRIC PRESSURE: 60mm Hg, SEA LEVEL


## 6.4 CURRENT RATING

- 6.4.1 TEST STANDARD: BUS-03-601
- 6.4.2 ACCEPTANCE CRITERIA: 30 DEGREES C MAX. DEL T ANY POINT.
- 6.4.3 TEST METHODS: 1 CONTACT AT 1.50A, ALL CONTACTS IN SERIES AT 1.00A
- 6.4.4 AMBIENT CONDITIONS: STILL AIR AT 25 DEGREES C.

## 6.5 CAPACITANCE:

- 6.5.1 TEST STANDARD: EIA364-30
- 6.5.2 ACCEPTANCE CRITERIA: 2Pf MAX.
- 6.5.3 AMBIENT CONDITIONS: STILL AIR AT 25 DEGREES C.
- 6.5.4 FREQUENCY: 1 KHZ (DEFAULT 1 MHZ)
- 6.5.5 POINTS OF MEASUREMENT: BETWEEN ADJACENT CONTACTS IN AN UNMATED CONNECTOR.

## 7.0 MECHANICAL CHARACTERISTICS

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## 7.1 MATING / UNMATING FORCE

- 7.1.1 TEST STANDARD: EIA 364-13
- 7.1.2 ACCEPTANCE CRITERIA:
  - 7.1.2.1 MATING: <35.N (7.87Lb) PER PLUG
  - 7.1.2.2 UNMATING: >10.0N(2.25Lb) PER PLUG
- 7.1.3 CROSS HEAD SPEED: 1 INCH PER MINUTE
- 7.1.4 MOUNTING: FREE FLOATING FIXTURES

## 7.2 CONTACT RETENTION:

- 7.2.1 TEST STANDARD: EIA 364-29
- 7.2.2 ACCEPTANCE CRITERIA: AXIAL LOAD > 0.5 POUNDS WITHOUT DISLOADING
- 7.2.3 APPLICATION RATE: 0.2 INCHES/MINUTE

## 8.0 ENVIRONMENTAL CONDITIONS


ACCEPTANCE CRITERIA: 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 PER PARAGRAPHS 6.0 AND 7.0 AS SPECIFIED IN THE TABLE 1. UNLESS SPECIFIED OTHERWISE, ASSEMBLIES SHALL BE MATED DURING EXPOSURE.

### 8.1 THERMAL SHOCK:

- 8.1.1 TEST STANDARD: EIA 364-32, TEST CONDITION 1
- 8.1.2 NUMBER OF CYCLES: 5
- 8.1.3 TIME AT EACH TEMPERATURE: 30 MINUTES
- 8.1.4 TRANSFER TIME: 5 MINUTES MAXIMUM

### 8.2 HUMIDITY, STEADY STATE:

- 8.2.1 TEST STANDARD: EIA 364-31, METHOD II CONDITION A

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### 8.3 HIGH TEMPERATURE LIFE:

8.3.1 TEST STANDARD: EIA 364-17, TEST CONDITION 3,  
METHOD A

8.3.2 TEST TEMPERATURE: 85 DEGREES C

8.3.3 TEST DURATION: 250 HOURS

### 8.4 INDUSTRIAL MIXED FLOWING GAS (IMFG):

8.4.1 TEST STANDARD: EIA 364-65, CLASS:III

8.4.2 DURATION: 20 DAYS

8.4.3 CONDITION: MATED CONNECTORS

### 8.5 VIBRATION RANDOM:

8.5.1 TEST STANDARD: EIA 364-28, TEST CONDITION: V, TEST  
LETTER A

8.5.2 ACCEPTANCE CRITERIA: NO DISCONTINUITIES GREATER THAN 1  
MICROSECOND

8.5.3 DURATION: 15 MINUTES ALONG EACH OF THREE  
ORTHOGONAL AXES

8.5.4 MOUNTING: SEE FIGURE 2

### 8.6 MECHANICAL SHOCK

8.6.1 TESTSTANDARD: EIA 364-27,CONDITION:H

8.6.2 ACCEPTANCE CRITERIA: NO DISCONTINUITIES GREATER THAN 1  
MICROSECONDS


8.6.3 MOUNTING: SEE FIGURE 2

### 8.7 DURABILITY:

8.7.1 TEST STANDARD: STANDARD LABORATORY PROCEDURE  
AS APPLICABLE TO THE SPECIFIC  
PRODUCT

8.7.2 NUMBER OF CYCLES: 1500CYCLES

8.7.3 CYCLING RATE: 200 CYCLES/HOUR MAXIMUM

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## 8.8 SOLDERABILITY :

8.8.1 TEST STANDARD: ANSI-J-002, TEST CONDITION A  
8.8.2 ACCEPTANCE CRITERIA: MEETS ANSI-J-002 REQUIREMENTS  
8.8.3 STEAM AGING: 4 HOURS

## 8.9 RESISTANCE TO SOLDER HEAT:

### 8.9.1 TEST STANDARD:

8.9.1.1 THRU HOLE EIA 364-56, PROCEDURE 3, CONDITION  
E  
8.9.1.2 SURFACE MOUNT EIA 364-56, PROCEDURE 5, LEVEL 3

8.9.2 ACCEPTANCE CRITERIA: THERE SHALL BE NO EVIDENCE OF PHYSICAL OR MECHANICAL DAMAGE

## 8.10 RESISTANCE TO SOLVENTS:


8.10.1 TEST STANDARD: EIA 364-11, CLASS IV  
8.10.2 ACCEPTANCE CRITERIA: NO EVIDENCE OF PHYSICAL OR MECHANICAL DAMAGE  
8.10.3 SOLVENT TEMPERATURE: 25 DEGREES C  
8.10.4 IMMERSION TIME: 3 MINUTES

## 8.11 SURFACE MOUNT CONNECTIR SOLDER JOINT RELIABILITY:

8.11.1 TEST STANDARD: FCI BUS-19-122  
8.11.2 TEST CONDITION: 900 THERMAL CYCLES, CONTIUNITY MONITOR ONLY.

## 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 ISO9000.

## 9.2 INSPECTION CONDITIONS.

UNLESS OTHERWISE SPECIFIED HEREIN, ALL INSPECTIONS SHALL BE PERFORMED UNDER THE FOLLOWING AMBIENT CONDITIONS:

- 9.2.1 TEMPERATURE : 25 +/- 5°C.
- 9.2.2 RELATIVE HUMIDITY: 30% TO 60%.
- 9.2.3 BAROMETRIC PRESSURE: LOCAL AMBIENT.

## 9.3 SAMPLE QUANTITY AND DESCRIPTION.

- 9.3.1 GROUPS 1,2,8: 8 SAMPLES IN EACH GROUP
- 9.3.2 GROUPS 3,5,6,7: 5 SAMPLES IN GROUP
- 9.3.3 GROUP 4: 9 SAMPLES IN GROUP


## 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 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. THE TEST SEQUENCE SHALL BE AS SHOWN IN TABLE 1.

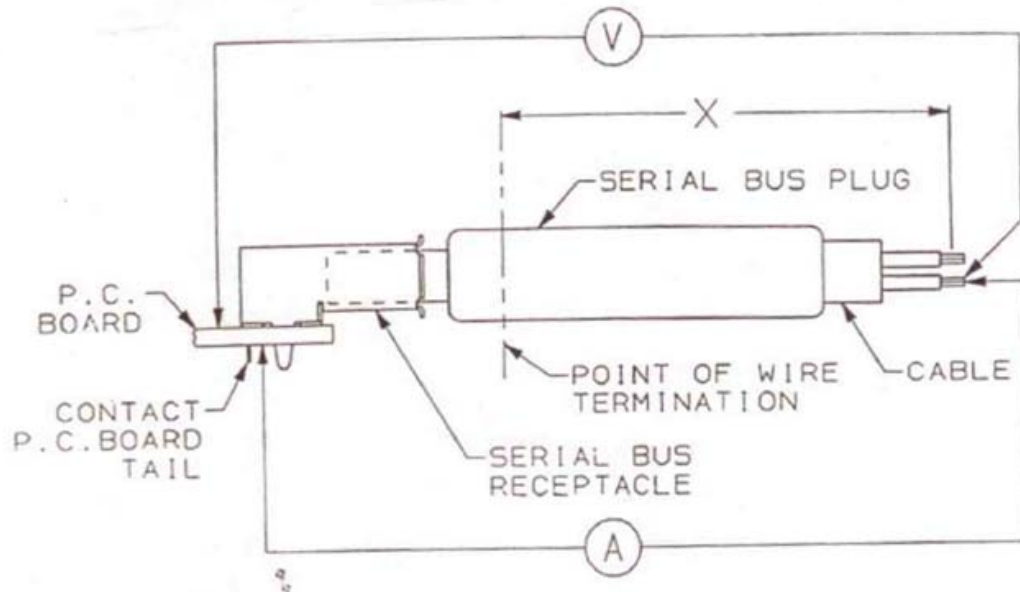
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## 9.6 REQUALIFICATION TESTING.

IF ANY OF THE FOLLOWING CONDITION OCCUR, THE RESPONSIBLE PRODUCT ENGINEER SHALL INITIATE RE-QUALIFICATION TESTING CONSISTING OF ALL APPLICABLE PARTS OF THE QUALIFICATION TEST MATRIX, TABLE 1.


- 9.6.1 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.
- 9.6.2 A SIGNIFICANT CHANGE IS MADE TO THE MANUFACTURING PROCESS WHICH IMPACTS THE PRODUCT FORM FIT OR FUNCTION.
- 9.6.3 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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1. RESISTANCE DUE TO X INCHES OF  
IS TO BE REMOVED FROM ALL READINGS.

FIGURE 1  
CONTACT RESISTANCE MEASUREMENT POINTS TYPICAL

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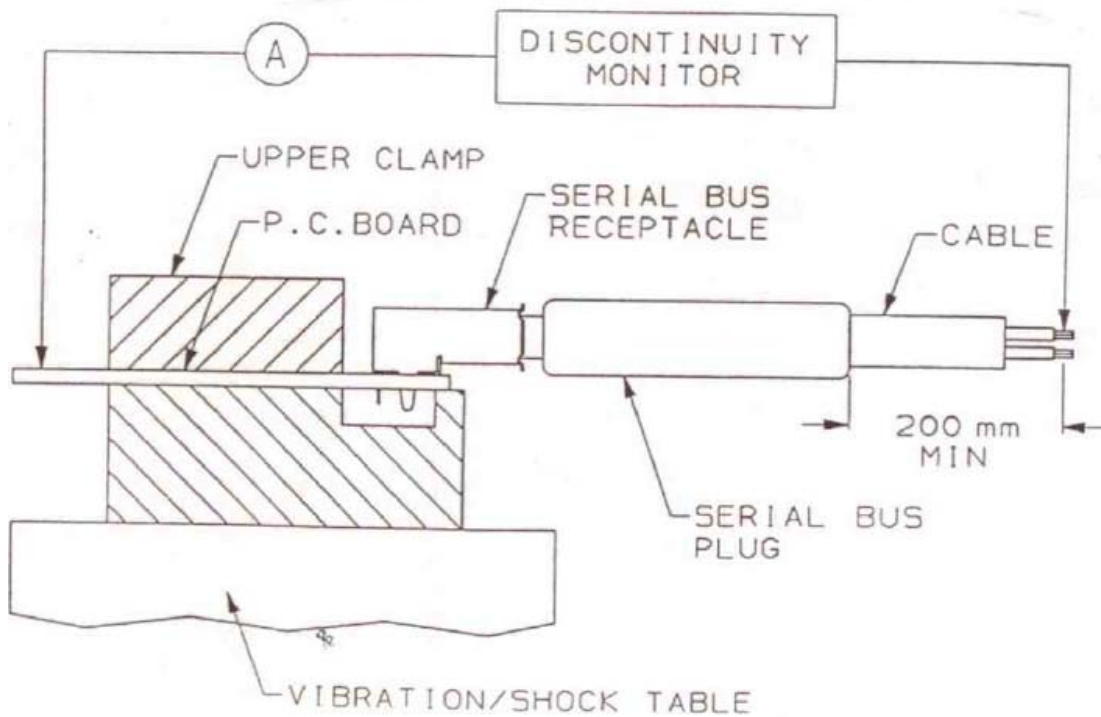




FIGURE 2  
VIBRATION AND PHYSICAL SHOCK MOUNTING FIXTURE

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Test Groups And Sequence									
Test Procedure	Para	1	2	3	4	5	6	7	8
Product Examination	5.2	1,11	1,6	1,5,14	1,3	1,3	1,4	1,3	1,5
Contact Resistance	6.1	3,5,8,1	2,4	6,8,10					2,3
Insulation Resistance	6.2			3,13 (C)					
Dielectric Withstanding Voltage	6.3			4,12 (C)					
Current Rating	6.4				2				
Capacitance	6.5			2,11 (C)					
Mating/Unmating Forces	7.1	2,9							
Contact Retention	7.2		7(B)						
Thermal Shock	8.1			7					
Humidity, Steady State	8.2			9					
High Temperature Life	8.3		5						
Ind. Mixed Flowing Gas	8.4								4
Vibration	8.5	6							
Mechanical Shock	8.6	7							
Durability	8.7	4	3(A)						
Solderability	8.8					2			
Resistance to Soldering Heat	8.9						2		
Resistance to Solvents	8.10						3		
Surface Mount Solder Joint Reliability	8.11							2	
(A)Condition samples with 10 cycles of durability									
(B)Testing to be done on loose piece (unterminated) connector that has been exposed to high temperature life testing.									
(C)A single loose piece may be used for this testing									

**TABLE 1 QUALIFICATION TESTING AND SEQUENCE MATRIX**

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<b>REVISED RECORD</b>				
<b>REV</b>	<b>PAGE</b>	<b>DESCRIPTION</b>	<b>ECR#</b>	<b>DATE</b>
A	ALL	RELEASED	T70149	4/18'97
B	5	CHANGE TO STORAGE TEMPERATURE AND OPERATING TEMPERATURE RANGE OF -40 DEGREES C TO 85 DEGREES C.		2/21'14

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