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## 1.0 GENERAL.

Scope - This specification covers the insulation piercing Quickie™ Connector designed for printed wiring board-to-flat cable (round conductor) interconnection in low power applications. In all applications the mated system (male to female) plating should be gold to gold or GXT to GXT. The specification is composed of the following sections.

Para.	Title	Page
1.0	General	1
2.0	Applicable Documents	1
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3.1	Qualification	2
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4.3	Qualification Inspection	14


## 2.0 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.

### SPECIFICATIONS

#### MILITARY

MIL-M-24519	Molding Plastics, Polyester, Thermoplastic
MIL-G-45204	Gold Plating, Electrodeposited
MIL-G-45662	Calibration System Requirement
MIL-P-55110	Printed Wiring Boards

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FEDERAL

- QQ-N-290 Nickel Plating (Electrodeposited)
- QQ-W-343 Wire, Electrical and Nonelectrical, Copper (Uninsulated)
- QQ-B-750 Bronze, Phosphor; Bar, Plate, Rod, Sheet Strip, Flat Wire, and Structural and Special Shaped Sections.
- Q-S-763 Steel Bars, Shapes, and Forgings, Corrosion-Resisting.

STANDARDS

MILITARY

- MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-202 Test Methods for Electronic and Electrical Component Parts
- MIL-STD-275 Printed Wiring Board for Electronic Equipment
- MIL-STD-1344 Test Methods for Electrical Connectors

INDUSTRY SPECIFICATIONS/STANDARDS


- UL-94 Tests for Flammability of Plastic Materials

FCI TEST SPECIFICATIONS


- BUS-12-001 Round Conductor Flat Flexible Cable

**3.0 REQUIREMENTS.**

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

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- 3.2 Material - The material for each part shall be as specified herein, or equivalent. Substitute material shall meet the performance requirements of this specification.
- 3.2.1 Contact - Both the header and receptacle contact shall be phosphor bronze in accordance with QQ-B-750, Composition A.
- 3.2.2 Latch - The standard Quickie shall have a plastic molded-in latch.
- 3.2.3 Plastic Parts - Except as subsequently specified, all molded plastic parts of the receptacle connector and the mating header shall be filled polyester in accordance with MIL-M-24519, Type GPT-30F. Except as noted, all plastic material shall be rated flame retardant 94V-0 in accordance with UL-94.
- 3.2.3.1 Header Locking Latches (Optional) - The latches shall be polyester in accordance with MIL-M-24519, Type PT-F.
- 3.2.3.2 Strain Relief (Optional) - The strain relief shall be unfilled thermoplastic material, which includes latching strain relief (opt).
- 3.2.3.3 Keys (Optional) - The keys shall be unfilled Type 6-6 Nylon; the material shall be rated flame retardant 94V-2 in accordance with UL-94.
- 3.3 Finish - This specification is applicable to parts with 30 microinches gold or 30 microinches GXT plating in the contact area. Details of plating location are specified on product drawings.
- 3.3.1 Both the header and receptacle contacts shall be plated with either gold per MIL-45204B or GXT. Nickel shall be plated per QQ-N-290, Class 2.


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3.4 Design and Construction - The connector system shall be of two-piece design, consisting of: a molded, straight or right-angle, shielded header having .64/0.025 diameter or .64/0.025 square header contacts arranged for printed wiring board termination on a 2.54/0.100 square grid; and a multi-piece receptacle connector having self-stripping contact terminations for flat, flexible, round conductor cable on a 1.27/0.050 inch center and one single-ended member for interfacing with the male contact.

NOTE: While the receptacle connector will mate with any .64/0.025 diameter or .64/0.025 square header contacts on an appropriate grid, performance of such a combination must be determined by actual test. Minimum pin length is 4.32/.170", maximum pin length is 6.35/.250". Recommended pin length is 5.84/.230".

3.4.1 Installation.


- 3.4.1.1 Header - The header shall mount on single-or double-sided or multi-layered printed wiring boards having .89/0.035 ± .083/.003 diameter holes (Round Pin) or 1.02/.040 ± .08/.003 diameter holes (square pin) on a 2.54/0.100 square grid. The termination layout shall be in accordance with the printed wiring requirements of MIL-STD-275 and MIL-P-551.
- 3.4.1.2 Receptacle - The receptacle shall simultaneously terminate up to 64 wires size AWG #28 (stranded) or AWG #30 (solid) on 1.27/0.050 inch centers without pre-stripping the PVC (polyvinylchloride) cable insulation. The cable shall conform to the requirements of specifications BUS-12-001.

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- 3.4.2 Latching Mechanism - An optional latching mechanism shall be available for locking the plug into the receptacle to withstand service conditions without disconnecting.
- 3.4.3 Strain Relief - An optional strain relief shall be available to protect the receptacle terminations against pull and flexing forces.
- 3.4.4 Latching Strain Relief - Optional, protects terminations while locking receptacles and headers with end windows.
- 3.4.5 Key - An optional molded-in polarizing feature shall be available to insure correct orientation of the receptacle connector and its mating header. Additionally, a central key is available to increase the available polarization of the receptacle to the header.
- 3.4.6 Polarizing - An optional plug shall be available for installation in individual positions in the receptacle to permit selective identification or programming.
- 3.4.7 Mating - The connector shall be capable of mating and unmating by hand without the use of special tools within the specified temperature range.
- 3.4.8 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 affect life or serviceability.

3.5 Electrical Characteristics.

- 3.5.1 Current Rating - The maximum current rating of the connector shall be 1.0 ampere DC.


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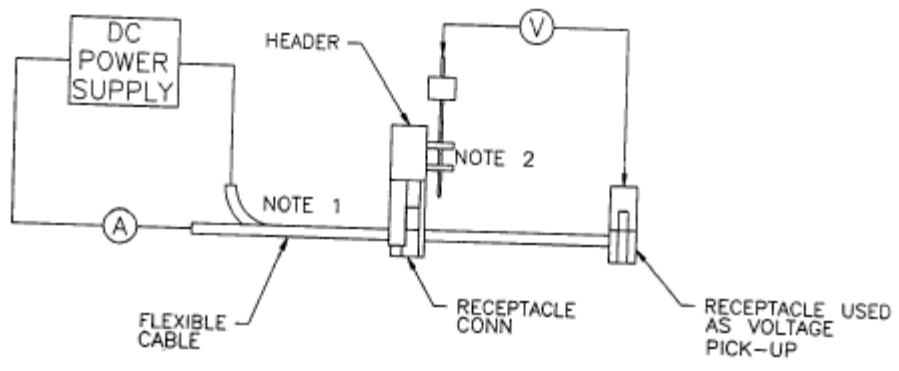
3.5.2 Contact Resistance - The contact resistance shall not exceed 12 milliohms initially or 15 milliohms after exposure to environments when measured in accordance with MIL-STD-202 Method 307. The following details shall apply:

- (a) Method of Connection - attach current and voltage leads as shown in Figure 1.
- (b) Test Current - 1.0 ampere DC.

3.5.3 Low Level Circuit Resistance - The low level circuit resistance shall not exceed 12 milliohms initially or 15 milliohms after exposure to environments when measured in accordance with MIL-STD-1344, Method 3002. The following details shall apply.

- (a) Method of Connection - see Figure 1
- (b) Test Current - 1 milliampere DC
- (c) Maximum Open Circuit Voltage-20 millivolts DC


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**NOTES:**

1. Current connected to first and last conductor; adjacent intermediate leads shorted.
2. BergStik used to short alternate terminals in complimentary pattern to cable conductors.
3. Voltmeter lead piercing cable insulation.

**FIGURE 1 - CONTACT RESISTANCE**

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3.5.4 Insulation Resistance - The insulation resistance of mated connectors shall be not less than 50,000 megohms initially and 20,000 megohms after exposure to humidity when measured in accordance with MIL-STD-202, Method 302. The following details shall apply:

- (a) Test Condition - B (500 Volts DC)
- (b) Special Preparation - the header and receptacle shall not be terminated.
- (c) Points of Measurement - between adjacent contact positions.

3.5.5 Dielectric Withstanding Voltage - There shall be no evidence of arc-over or insulation breakdown when the mated connectors are tested in accordance with MIL-STD-202, Method 301. The following details shall apply:

- (a) Test Potential - 1000 volts RMS, 60 Hz at sea-level pressure; 450 volts RMS, 60 Hz at 50,000 ft. simulated altitude.
- (b) Test Duration - 60 seconds
- (c) Special Preparation - the header and receptacle shall not be terminated.
- (d) Points of Measurement - between adjacent contact positions.

### 3.6 Mechanical Characteristics.

3.6.1 Cable Flex Resistance \*\* - With strain relief installed, the receptacle shall withstand 100 cycles of cable flexing. The following details shall apply:

- (a) Tension on Cable - 2 pounds per-inch-of-cable-width (0.029 newtons per-millimeter-of-cable-width).
- (b) Flex Angle - 140° as shown in Figure 2.

\*\* Stranded wire only; solid conductors will not withstand flexing, whether or not a connector is installed.





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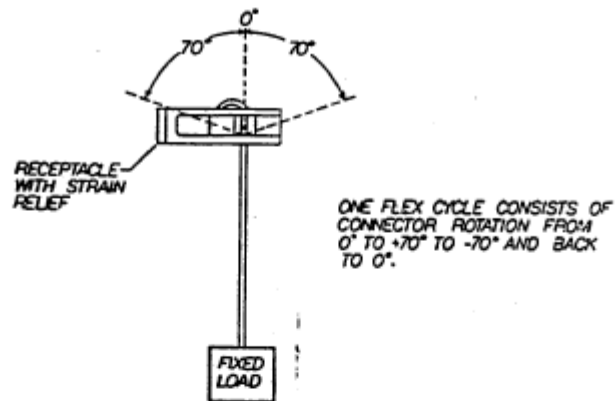
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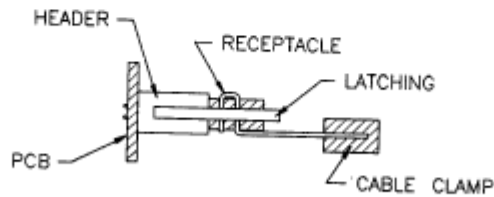
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**FIGURE 2**




**FIGURE 3**

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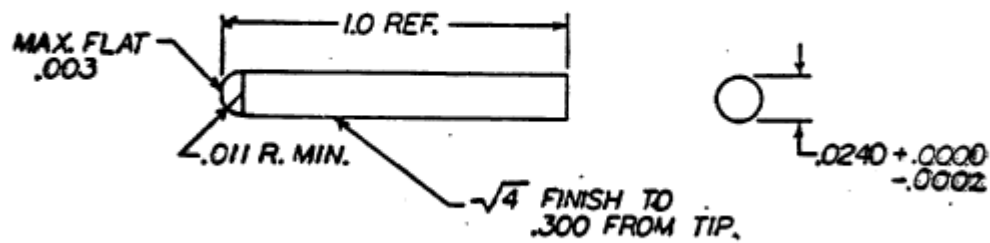
- 3.6.2 Cable Retention - The strain relief on the receptacle shall withstand an evenly distributed force of 10 pounds per inch of cable width (.146 newtons per millimeter of cable width) applied to the cable in a direction parallel to the contact axis as shown in Figure 3.
- 3.6.3 Total Mating Force - The total force to mate the header and receptacle shall not exceed the values shown in Table I. Contacts are lubricated prior to testing.

**TABLE I - MAXIMUM TOTAL INSERTION FORCE**  
(Values based on 50 pos. testing)

<u>Contact Population</u>	<u>Force</u>	
	<u>Pounds</u>	<u>Nts.</u>
2 X 3	2.4	10.7
2 X 4	3.2	14.2
2 X 5	4.0	17.8
2 X 7	5.6	24.9
2 X 8	6.4	28.5
2 X 10	8.0	35.6
2 X 12	9.6	42.7
2 X 13	10.4	46.3
2 X 15	12.0	53.4
2 X 17	13.6	60.5
2 x 20	16.0	71.2
2 X 22	17.6	78.3
2 x 25	20.0	89.0
2 X 30	24.0	106.8
2 X 32	25.6	113.9


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3.6.4 Individual Contact Separation Force - When measured using a gage configured as shown in Figure 4, the individual contact separation force shall be not less than 15.0 grams.




**FIGURE 4 - SEPARATION FORCE GAGE**

3.6.5 Durability - After 100 mating cycles of the header and receptacle, the individual contact separation force shall be not less than specified above (see paragraph 3.6.4) and the contact resistance shall not exceed 15 milliohms (see paragraph 3.5.2).

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### 3.7 Environmental Conditions

- 3.7.1 Humidity - Within 1 hour after exposure of the mated connector to a high humidity environment, the insulation resistance of an unterminated connector shall be not less than 20,000 megohms (see paragraph 3.5.4); the contact resistance of a terminated connector shall not exceed 15 milliohms (see paragraph 3.5.2). The test shall be in accordance with MIL-STD-202, Method 103; the following details shall apply:
- (a) Test Duration - 96 hours
  - (b) Relative Humidity - 90% minimum
  - (c) Temperature - 40°C
- 3.7.2 Thermal Shock - After exposure of the mated connector to alternate periods of extreme high and low temperature, there shall be no evidence of cracking or crazing of the insulator or other physical damage to the connector; the dielectric withstanding voltage of the unterminated connector shall be not less than 1,000 volts RMS, 60 Hz (see paragraph 3.5.5). The test shall be in accordance with MIL-STD-202, Method 107. The following details shall apply:
- (a) Test Condition - B (1 hour cycles)
  - (b) Temperature Range - -65 to +105°C
- 3.7.3 High Temperature Life - After exposure of the mated connector to a high temperature operating environment, the insulation resistance of an unterminated connector shall not be less than 50,000 megohms (see paragraph 3.5.4); the contact resistance of a terminated connector shall not exceed 15 milliohms (see paragraph 3.5.2). The test shall be in accordance with MIL-STD-202, Method 108; the following details shall apply:
- (a) Test Chamber Temperature - 85°C
  - (b) Test Condition (Duration) - B (250 hours)
  - (c) Operating Conditions - 1.0 ampere DC current (rated) through all contacts of terminated connector; duty cycle: 45 minutes ON and 15 minutes OFF.

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3.7.4 Hydrogen Sulfide (H<sub>2</sub>S) Exposure - After exposure of the mated connectors to an H<sub>2</sub>S atmosphere, the low level circuit resistance shall not exceed 15 milliohms. The following details shall apply:

- (a) Test Medium - solution of 120 grams of Na<sub>2</sub>S·9H<sub>2</sub>O in 500 ml. of distilled water, with 14 grams of K<sub>2</sub>HPO<sub>4</sub> added immediately prior to test.
- (b) Test Temperature: 40° C
- (c) Test Duration: 48 hours in a sealed 9,000 cc. glass container.


3.7.5 Salt Spray - After exposure of the mated connectors to a salt fog atmosphere, the low level circuit resistance and contact resistance shall not exceed 15 milliohms. The test shall be in accordance with MIL-STD-202, Method 101; the following details shall apply:

- (a) Salt Solution - 5 percent by weight
- (b) Test Condition - B (48 hours)

#### 4.0 QUALITY ASSURANCE PROVISIONS.

- 4.1 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.
- 4.2 Inspection Conditions - Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions.

Temperature - 25°C ± 5°C  
Relative Humidity - 30 to 80%  
Barometric Pressure - Local Ambient

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- 4.3 Qualification Inspection - Qualification inspection shall be performed on sample units produced with equipment and procedures normally used in production.
- 4.3.1 Sample - Ten (10) of the 50 position (2x25) connectors shall be subjected to the qualification inspection.
- 4.3.2 Preparation of Samples - The various test samples shall be configured and terminated as shown in Table II.
- 4.3.3 Test Sequence - The sample assemblies, shall be subjected to the inspections specified in Table III in the order shown.

**TABLE II - TEST SAMPLE DESCRIPTION**

<u>Qty</u>	<u>Sample No.</u>	<u>Positions</u>	<u>Strain Relief</u>	<u>Terminated Cable</u>	<u>Cable Length</u>
2	1	2 x 25	Yes	AWG 28 Stranded	10"
2	2	2 x 25	No	AWG 28 Stranded	10"
2	3	2 x 25	Yes	AWG 30 Solid	10"
2	4	2 x 25	-	Unterminated	-
2	5	2 x 25	Yes	AWG 28 Stranded	10"



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TABLE III - CONNECTOR QUALIFICATION INSPECTION

Test		<u>SAMPLE NO.</u>				
	<u>Para.</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Total Mating Force	3.6.3	-	-	x	-	-
Ind. Cont. Sep. Force	3.6.4	-	-	x	-	-
Low Level Circuit Resistance	3.5.3	x	x	x	-	x
Cable Retention	3.6.2	-	-	-	-	x
Low Level Circuit Resistance	3.5.3	-	-	-	-	x
Cable Flex Resistance	3.6.1	x	-	-	-	-
Low Level Circuit Resistance	3.5.3	x	-	-	-	-
Insulation Resistance	3.5.4	-	-	-	x	-
Dielectric With. Voltage	3.5.5	-	-	-	x	-
Thermal Shock	3.7.2	x	-	-	x	-
Dielectric With. Voltage	3.5.5	-	-	-	x	-
Low Level Circuit Resistance	3.5.3	x	-	-	-	-
Humidity	3.7.1	x	x	-	x	-
Insulation Resistance	3.5.4	-	-	-	x	-
Low Level Circuit Resistance	3.5.3	x	x	-	-	-
High Temperature Life	3.7.3	x	x	-	x	-
Insulation Resistance	3.5.4	-	-	-	x	-
Low Level Circuit Resistance	3.5.3	x	x	-	-	-
Durability (100 CY.)	3.6.5	-	-	x	-	-
Low Level Circuit Resistance	3.5.3	-	-	x	-	-
Ind. Cont. Sep. Force	3.6.4	-	-	x	-	-
Hydrogen Sulfide	3.7.4	-	-	x	-	-
Low Level Circuit Resistance	3.5.3	-	-	x	-	-
Salt Spray	3.7.5	-	-	x	-	-
Low Level Circuit Resistance	3.5.3	-	-	x	-	-

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**REVISION SHEET**

<u>REV.</u>	<u>PAGE</u>	<u>DESCRIPTION</u>	<u>ECR</u>	<u>DATE</u>
A	All	Change "17 milliohms" to "15 milliohms" on pages 6,11,12,13.	V00715	07/12/90
B	3-9	Changed wording of "male and female" to "header and receptacle", respectively in the following sections: 3.2.1, 3.2.2, 3.2.3.2, 3.3.1, 3.4, 3.4.1.1, 3.4.1.2, 3.4.4, 3.4.5, 3.6.1, 3.6.2, 3.6.3, 3.6.5, Figures 1 and 3.	V23437	12/07/92
C	All	Change to Rev. C per Clearfield's request, due to some figures being left out by mistake.	V23677	01/06/93
D	All	Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI.	V01904	08/01/00
E	All	New FCI Logo	V06-0709	07/31/06