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|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 1 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

1.0 OBJECTIVE

This specification defines the performance, test, quality, and reliability of the Minitek™ 2 millimeter insulation displacement connector (IDC).

2.0 SCOPE

This specification applies to the termination and mated connection characteristics of Minitek™ IDC connectors. The connectors are designed for insulation displacement termination to flat ribbon cable, and mating connection to Minitek™ 2.0 millimeter centerline headers.

3.0 GENERAL

This document is composed of the following sections:

| <u>Paragraph</u> | <u>Title</u> |
|------------------|------------------------------|
| 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 | Qualification Testing |


| | |
|---------|------------------------------|
| Table 1 | Test Sample Description |
| Table 2 | Qualification Testing Matrix |

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.

4.1 Federal Specifications

- 4.1.1 QQ-N-290 - Nickel Plating
- 4.1.2 QQ-B-750 - Bronze, phosphor, bar, plate, rod, sheet strip, flatwire, and structural and special shaped sections.

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 2 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

4.2 Industry Standards and Specifications

- 4.2.1 UL94 tests for flammability of plastic materials
- 4.2.2 EIA-364
- 4.2.3 ISO 9000

4.3 FCI Specifications

- 4.3.1 BUS-02-055 - Plastic Resin Selection
- 4.3.2 BUS-02-056 - Metal Selection
- 4.3.3 DPS-12-011 - Minitek II Connectors Product Specification
- 4.3.4 BUS-03-302 - Sulfide Vapor Test
- 4.3.5 BUS-12-116 - Round Conductor Flat Cable - 1mm Cable

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 specified herein for equivalent.

Receptacle Terminal: Phosphor Bronze
 Receptacle Housing: Glass Filled PBT, UL 94V-0
 Receptacle Cover: Glass Filled PBT, UL 94V-0
 Strain relief (optional) : Unfilled PBT

5.3 Finish

The finish for the receptacle contact shall be as specified herein or equivalent.

Minimum of 1.27 micro meters of nickel underplate all over. Contact area to have precious metal plating per specific product requirements stated on the product print. Those options are as follows:
 0.2um min. Au, 0.38um min. Au, 0.76um Au, 0.38um GXT™, 0.76um GXT™.

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 3 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

5.4 Design and Construction

5.4.1 Description

The receptacle connector shall be of design, construction, and physical dimensions specified on the applicable product drawings. The receptacle connector shall be of multiple-piece construction having self stripping/exposing contact terminations for flat, flexible, round conductor cable on 1 millimeter centers. The contact shall have one single-ended cantilever member for interfacing with a header contact. The header contact is defined as a square wire pin with a smoothly beveled or tapered tip, and a 0.50mm (0.505 to 0.516 typ) millimeter square or round cross sectional shape. The pin length is 3.50mm minimum to 4.50 maximum (4.00mm nominally). The header shall meet the header requirements stated in DPS-12-011.

5.4.2 Installation

The assembled connector shall simultaneously terminate up to 50 wires size AWG #28 (stranded) on 1.0 millimeter centers without pre-stripping the PVC (poly vinyl chloride) insulation. The cable shall conform to the requirements of specification BUS-12-116.

5.4.3 Keying

An optional molded-in keying feature shall be available to insure correct orientation of the receptacle connector and a mating header.

5.4.4 Friction Latch

An optional molded in friction latch shall be available in conjunction with the keying feature to help secure the receptacle connector to appropriate Minitek™ shrouded headers.

5.4.5 Polarization


An optional plug shall be available for installation in individual receptacle positions to permit selective identification, polarization, or programming.

5.4.6 Mating

The connector shall be capable of mating and unmating by hand without the use of special tools within the specified temperature range.

5.4.7 Strain relief

An optional strain relief shall be available to protect the receptacle terminations against pull and flexing forces.

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 4 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

5.4.8 Workmanship

The connector shall be uniform in quality and shall be free from burrs, scratching, cracks, voids, chips, blisters, pin holes, sharp edges and other defects that would adversely affect life or serviceability.

5.4.9 Operating Temperature Range

The connector is designed to operate properly in a temperature range of -40°C to 105°C including the temperature rise caused by application of current.

6.0 ELECTRICAL CHARACTERISTICS

6.1 Current Rating

The maximum current rating of the receptacle shall be 1.0 ampere AC or DC.

6.2 Voltage Rating

The maximum voltage rating of the receptacle shall be 200 volts AC or DC.

6.3 Contact Resistance


The contact resistance shall not exceed 12 milliohms initially or 15 milliohms after environment exposure when measured in accordance with EIA-364-06. The following details shall apply:

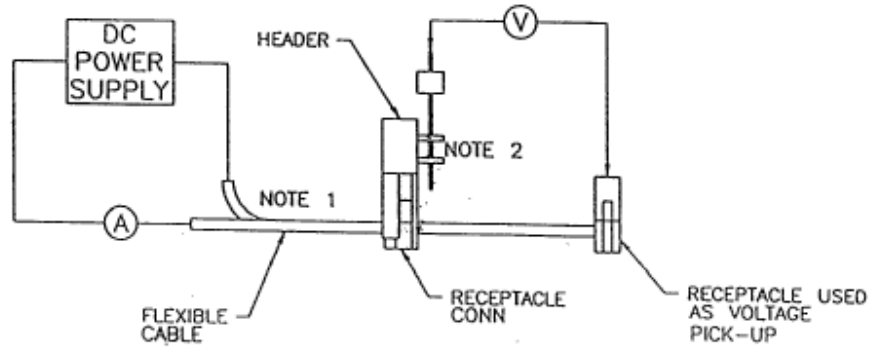
- a) Method of Connection: Attach current and voltage leads as shown in Figure 1.
- b) Test Current: 1.0 ampere DC

6.4 Low Level Contact Resistance

The low level contact resistance shall not exceed 12 milliohms initially or 15 milliohms after environment exposure when measured in accordance with EIA-364-23. The following details apply:

- a) Method of Connection: see Figure 1.
- b) Test Current: Not to exceed 100 milliamperes
- c) Maximum open circuit voltage: 20 millivolts DC


| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 5 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |



NOTES:

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

FIGURE 1 - CONTACT RESISTANCE

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 6 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

6.5 Insulation Resistance

The insulation resistance of mated connectors shall be not less than 1,000 megohms after exposure to humidity when measured in accordance with EIA-364-21. The following details shall apply:

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

6.6 Dielectric Withstanding Voltage

There shall be no evidence of arc-over or insulation breakdown when the unmated connectors are tested in accordance with EIA-364-20. The following details shall apply:

- a) Test Potential: 650 volts RMS, 60 Hz
- b) Test Duration: 60 seconds
- c) Special Preparation: the header and receptacle shall not be mated.
- d) Points of Measurement: between adjacent contact positions.

7.0 MECHANICAL CHARACTERISTICS

7.1 Total Mating/Unmating Force

7.1.1 The total force required to mate the receptacle to a Minitek™ header shall not exceed 200 grams maximum per position.


7.1.2 The total force required to separate or unmate the receptacle from a Minitek™ header shall not be less than 20 grams minimum per position.

7.2 Contact Retention Force

Each individual receptacle contact shall withstand a load of 0.7 kilograms applied along the axis of retention at a rate of 25mm/minute without dislodging from the housing cavity. Reference EIA-364-29.

7.3 Strain relief retention (optional)

The strain relief on the receptacle shall withstand 1.2N/contact when an axial pull out force is applied to the cable.

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 7 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

8.0 ENVIRONMENTAL CONDITIONS

All environment tests apply to 0.76um gold and 0.76um GXT™ plated product only.

8.1 Humidity

Within 1 hour after exposure of the mated connector to a high humidity environment, the insulation resistance of an unmated connector shall be not less than 100 megohms; the low level contact resistance of a mated connector shall not exceed 15 milliohms (see paragraph 6.4). The test shall be in accordance with EIA-364-31; the following details shall apply:

- a) Test Duration: 96 hours
- b) Relative Humidity: 90% minimum
- c) Temperature: 40°C

8.2 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 unmated connector shall be not less than 650 volts RMS, 60 Hz (see paragraph 6.6). The test shall be in accordance with EIA-364-32. The following details shall apply:

- a) Test Condition: B (1 hour cycles)
- b) Temperature Range: -55°C to 85°C (30 minutes at each temperature including transition)
- c) Cycles: 5

8.3 High Temperature Life

After exposure of the mated connector to a high temperature operating environment, the insulation resistance of an unmated connector shall not be less than 100 megohms; the low level contact resistance of a mated connector shall not exceed 15 milliohms. The test shall be in accordance with EIA-364-17; 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 mated connector; duty cycle: 45 minutes ON and 15 minutes OFF.

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 8 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

8.4 Hydrogen Sulfide (H₂S) Exposure

After exposure of the mated connectors to an H₂S atmosphere, the low level circuit resistance shall not exceed 15 milliohms. The following details shall apply (reference BUS-02-302):

- a) Test Medium - solution of 120 grams of Na₂S.9H₂O in 500 ml. of distilled water, with 14 grams of K₂HP0₄ added immediately prior to test.
- b) Test Temperature: 40°C
- c) Test Duration: 48 hours in a sealed 9,000 cc. glass container.

8.5 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 EIA-364-26; the following details shall apply:

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

8.6 Durability

After 100 mating/unmating cycles, the total unmating force shall not be less than 20 grams per contact. The low level contact resistance shall not exceed 15 milliohms for contacts plated with the 0.76um Au or 0.76um GXT™ options. (Reference paragraphs 6.4 and 7.1.2.)

| | | | |
|---------------------------------------|--------------------------------------|--------------------------------|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION | FCI | |
| TITLE Minitek™ IDC | | PAGE 9 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

8.7 Cable Flex Resistance

The receptacle shall withstand 50 cycles of cable flexing when tested with stranded wire. The following details apply:

- a) Flex angle - +/- 45° (See Figure 2)
- b) Fixed load - 50 grams per conductor

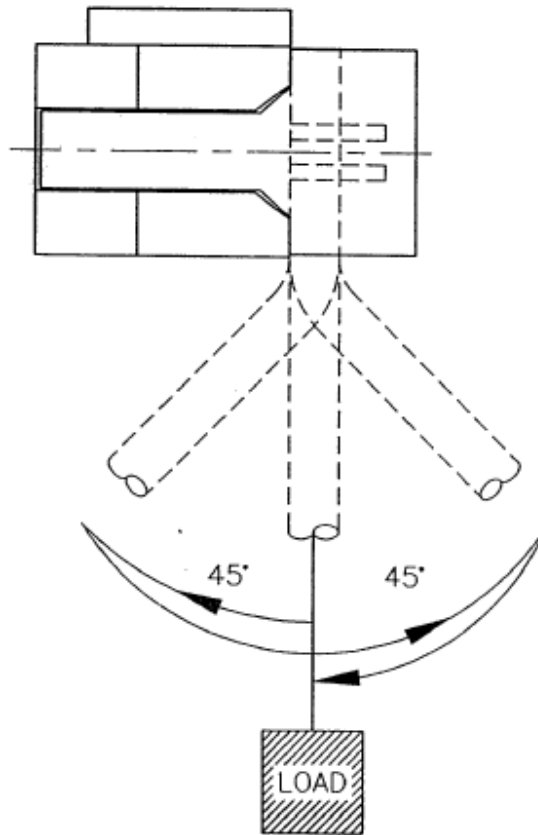



FIGURE 2

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 10 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

8.8 Vibration

There shall be no evidence of physical or mechanical damage when the mated connectors are subjected to transient accelerations. During and after each shock, the contacts shall evidence no discontinuity greater than 1 microsecond. The low level contact resistance shall not exceed 15 milliohms after the test. The test shall be in accordance with EIA-364-28. The following details shall apply:

- a) Frequency range: 10 to 2000 Hz.
- b) Condition: B (+/-15G and .06" da @ below 70 Hz. crossover point)
- c) Sweep & Duration: 20 minutes per sweep, 4 hours along each of 3 orthogonal axis (12 hours total)
- d) Continuity: All contacts monitored for discontinuity depending on product specification (1micro-second down to 10 nano-seconds)
- e) Mounting: Rigid

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 herein, all inspections shall be performed under the following ambient conditions:

- a) Temperature: 25⁰C +/- 5⁰C
- b) Relative Humidity: 30% to 80%
- c) Barometric Pressure - Local Ambient

9.3 Qualification Testing


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

9.3.1 Sample

Ten (10) of the 50 positions (2x25) connectors shall be subjected to the qualification inspection.

9.3.2 Preparation of Samples

The various test samples shall be configured and terminated as shown in Table I.

| | | | |
|-----------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 11 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| | | CLASSIFICATION UNRESTRICTED | |

9.3.3 Test Sequence

The sample assemblies shall be subjected to the inspections and tests specified in Table II in the order shown.

TABLE I - TEST SAMPLE DESCRIPTION

| <u>Quantity</u> | <u>Sample #</u> | <u>Positions</u> | <u>Terminated Cable</u> | <u>Cable Length</u> |
|-----------------|-----------------|------------------|-----------------------------|-------------------------|
| 2 | 1 | 2 x 25 | AWG 28 Stranded | 10" |
| 2 | 2 | 2 x 25 | AWG 28 Stranded | 10" |
| *6 | 3 | 2 x 25 | AWG 28 Stranded | 10" |
| 2 | 4 | 2 x 25 | Unterminated | - |
| 2 | 5 | 2 x 25 | AWG 28 Stranded | 10" |

*2 with 30u" Au
2 with 8u" Au
2 with 30u" GXT



| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 12 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

TABLE II - QUALIFICATION TESTING MATRIX

| TEST | TEST GROUP | | | | | | | | | | | |
|---------------------------------|------------|------------------------|-------------|-------------------|-------------|--------|---|---|---|---|----|----|
| | Para. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Examination of Product | 5.4 | 1 11 | 1 7 | 1 11 | 1 11 | 1 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| Contact Resistance Low Level | 6.4 | 2 4 6 8 10 | 2 4 6 | 3 5 8 10 | | | | | | | | |
| Insulation Resistance | 6.5 | | | | 2 7 9 | | | | | | | |
| Dielectric Withstand | 6.6 | | | | 3 5 | | | | | | | |
| Mating/Unmating Force | 7.1 | | | 2 6 | | | | | | | | |
| Contact Retention | 7.2 | | | | 10 | | | | | | | |
| Thermal Shock | 8.2 | 5 | | | 4 | | | | | | | |
| Humidity, Steady State | | 7 | 3 | | 6 | | | | | | | |
| High Temperature Life | | 9 | 5 | | 8 | | | | | | | |
| Vibration | 8.8 | | | | | 2 | | | | | | |
| Durability | 8.6 | | | 4 | | | | | | | | |
| Cable Flex Resistance | 8.7 | 3 | | | | | | | | | | |
| Hydrogen Sulfide | 8.4 | | | 7 | | | | | | | | |
| Salt Spray | 8.5 | | | 9 | | | | | | | | |

| | | | |
|---------------------------------------|--------------------------------------|---|-------------------|
| NUMBER BUS-12-115 | TYPE PRODUCT SPECIFICATION |  | |
| TITLE Minitek™ IDC | | PAGE 13 of 13 | REVISION E |
| | | AUTHORIZED BY Compagnon, JM | DATE 03 OCT 07 |
| CLASSIFICATION UNRESTRICTED | | | |

REVISION RECORD

| <u>REV</u> | <u>PAGE</u> | <u>DESCRIPTION</u> | <u>ECR#</u> | <u>DATE</u> |
|-------------------|--------------------|---|--------------------|--------------------|
| A | ALL | RELEASED | V70387 | 03/26/97 |
| B | ALL | Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI. | V01609 | 08/03/00 |
| C | ALL | NEW FCI LOGO | V06-1029 | 10/12/06 |
| D | ALL | Add Strain relief in § 5.2 Insert new § 5.4.7 Add new § 7.3 | F07-0178 | 04/16/07 |
| E | ALL | & 5.4.2, 50 wires was 68 wires & 9.3.1, 50 positions (2x25) was 68 positions (2x34) 2X25 was 2X34 in TABLE I. | F07-0261 | 10/03/07 |