

TB-2123

GENERAL PRODUCT SPECIFICATION FOR THE APTERA™  
INTERCONNECT SYSTEM

Revision “B”

**Specification Revision Status**

<u>Revision</u>	<u>SCR No.</u>	<u>Description</u>	<u>Initial</u>	<u>Date</u>
"01"	N/A	Initial Release	T. Do	12-8-03
"02"	N/A	Updated name and preliminary specs Revised test plan sections 13 and 14 Added bulk resistance values for sig/shield section 4 Updated multiple notes	D.Milbrand	8-23-04
"03"	N/A	Revised sections 5, 6, and 7	T. Do	9-28-04
"04"	N/A	Update to add stacker	D. Cannon	9-30-07
-	S0317	Release to EPR	D.Manning	8/16/06
"A"	S0640	Update to add stacker	D.CANNON	9-4-07
"B"	S0802	Updated Copyright Information	C.Palmer	02-25-08

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## **SCOPE**

### 1.1 Content

1.1.1 This specification covers performance, test, and quality requirements for the Aptera™ interconnect system. These connectors are two-piece devices that connect two printed circuit boards. Terminal connectors are surface mounted connectors and the Receptacle connectors are through hole devices with eye of the needle compliant pin. This product specification covers:

- Aptera™ LS
- Aptera™ Power
- Aptera™ Stacker

### 1.2 Qualification

1.2.1 When tests are performed on subject product line, procedures specified in EIA-364-B shall be used per the test sequences outlined in Amphenol Technical Bulletin TB2023. All inspections shall be performed using applicable inspection plan and product drawings.

## **2.0 REFERENCE DOCUMENTS**

2.1 The following documents form a part of this specification to the extent specified herein.

### 2.1.1 Amphenol Documents

TB2023 Amphenol Commercial Connector Qualification Plan

TBD Aptera™ Interconnection System Electrical Characterization Report

TB2134 Aptera™ PWB Routing Guidelines

TB2135 Aptera™ DFM and SMT Guidelines

### 2.2 Commercial Standards

2.2.1 EIA-364-B Electrical Connector Test Procedure Including Environmental Classifications

2.2.2 GR-1217-CORE – Generic Requirements for Separable Electrical Connectors used in Telecommunications Hardware

2.2.3 IEC-512 – Electromechanical components for electronic equipment – Basic testing procedures and measuring methods

### 3.0 MATERIAL FINISHES

#### 3.1 Contacts

- 3.1.1 Signal terminal blades shall be 0.20 mm thick copper alloy.  
Finish shall be in accordance with Amphenol Specification EGS 205. Plating type and thicknesses are as specified by their part number call out.
- 3.1.2 Signal contacts shall be 0.25 mm thick copper alloy.  
Finish shall be in accordance with Amphenol Specification EGS 205. Plating type and thicknesses are as specified by their part number call out.
- 3.1.3 Power terminal blades shall be 0.20 mm thick copper alloy.  
Finish shall be in accordance with Amphenol Specification EGS 205. Plating type and thicknesses are as specified by their part number call out.
- 3.1.4 Power contacts shall be 0.30 mm thick copper alloy.  
Finish shall be in accordance with Amphenol Specification EGS 205. Plating type and thicknesses are as specified by their part number call out.

#### 3.2 Sub Components

Component	Material	Specification
Insulators	Glass reinforced polyester (LCP)	UL 94V-0 Rating, Color Grey
Alignment pin	Stainless steel	---
Stacker alignment contact	Stainless steel	---

### 4.0 BULK RESISTANCE RATINGS

Contact	Electrical Lengths <sup>(2)</sup>	Bulk Resistance <sup>(1)</sup> , mΩ
Signal	18.15 mm	5.7
Power	18.15 mm	3.8

### 5.0 ELECTRICAL RATINGS

Description	Value
Mating Interface Contact Resistance Change	10 mΩ maximum
Compliant Pin to Plated Through Hole Resistance Change	1 mΩ maximum
Insulation Resistance	1000 MegaΩ
Dielectric Withstanding Voltage	1000 Volts AC Peak

## 6.0 CURRENT AND TEMPERATURE RATINGS

Description	Value <sup>(3,4)</sup>
Signal Contact	1 Amp per contact
Power Contact	3 Amps per blade
Maximum operating temperature	105°C

### NOTES:

1. The resistance values are typical measured values.
2. Electrical lengths are measured from DC board surface to BP compliant.
3. Current has been de-rated per EIA-364-TP70.
4. Product was tested in worst-case conditions where the PCB did not have any ground planes. For other test conditions please contact TCS Application Engineering.

## 7.0 MECHANICAL RATINGS

Description	Value, per contact
	Grams
Signal Contact Normal Force	40 End Of Life (EOL)
Signal Contact Engagement Force	35 to 65
Signal Contact Separation Force	25 to 40
Power Contact Normal Force	90 End Of Life (EOL)
Power Contact Engagement Force	70 to 100
Power Contact Separation Force	47 to 67
Signal, and Power Contact Durability	250 Mating Cycles
Contact Mechanical Wipe Minimum Values	Signal 1.0

## 8.0 COMPLIANT PIN INTERFACE<sup>(4)</sup>

Description	Value per Pin, lbs
Signal and Compliant Pin Insertion	8 <sup>(1)</sup>
Signal and Compliant Pin Retention	1.5 Minimum/1.1 Minimum for Bare Copper Finish <sup>(2)</sup>
Power Compliant Pin Insertion	15 <sup>(1)</sup>
Power Compliant Pin Retention	3.5 Minimum <sup>(2)</sup>

8.1 Radial hole deformation not to exceed 0.0015" (0.038mm) measured from drilled hole.

8.2 Axial hole deformation not to exceed 0.0010" (0.025mm) measured in the vertical plane.

## 9.0 QUALIFICATION TESTING

9.1 Sample Selection: Refer to Section 14.2 for minimum recommended sample connector size.

9.2 Test Sequence: Qualification testing shall be performed per the sequences listed in Section 14 of this document.

## 10.0 REQUALIFICATION TESTING

10.1 If changes affecting form, fit or function are made to the product or to the manufacturing process, Product Engineering and Mechanical Integrity Engineering shall coordinate re-qualification testing, consisting of all or part of the original testing sequence as required.

### NOTES:

1. Compliant pin insertion force values are used for press sizing only.
2. Data reflects values for single pin insertion and retention forces for compliant pins tested in Tin/Lead Reflowed & HASL, Immersion Tin, Immersion Silver, and Bare Copper plated through holes.
3. Refer to technical bulletin TBD, Aptera Routing Guidelines, for drilled and finished hole requirements.

## 11.0 ACCEPTANCE

11.1 Acceptance is based on verification that the product meets the requirements of Section 14. Failures attributed to equipment, test set-up, or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Verification of corrective action is required before re-submittal.

## 12.0 QUALITY CONFORMANCE INSPECTION

12.1 The applicable RSIR (Raw Stock Inspection Report) and Plating Quality Inspection Plan shall specify the acceptable stamping and molding quality levels to be applied. Dimensional and functional requirements shall be in accordance with the applicable product drawings and this product specification.

## 13.0 SPECIFICATION SUMMARY

13.1 Material

Parameters	Specification	Aptera™ Value	Reference Document
Plating Integrity	Acceptable Porosity Exposed to nitric vapors	3 Pores per cm <sup>2</sup>	EIA-364-TP53
Contact Metallization	30µin Gold min 50µin Nickel min	30µin Gold min 50µin Nickel min	GR-1217-CORE Per paragraph 9.3.1
Durability	200 Cycles	250 Cycles	GR-1217-CORE Per paragraph 9.1.1.2 EIA-364-TP09
Base Metallization	Surface finish = 16 RMS or otherwise specified	16 RMS on mating surfaces	GR-1217-CORE
Lubrication	Must be present on all backplane blades	Must be present on all backplane blades	GR-1217-CORE Per paragraph 5.3.1
Flammability Rating	94V-0	Must Pass Requirement	UL94

### 13.2 Mechanical

Parameters	Specification	Aptera™ Value	Reference Document
Contact Normal Force	40 Grams End of Life (EOL)	40 Grams End of Life (EOL)	GR-1217-CORE Per paragraph 5.1.2 EIA-364-TP04
Mate/Unmate Force	N/A	SEE SECTION 7.0	GR-1217-CORE Per paragraph 5.1.5 EIA-364-TP37A
Contact Strength	Apply 0.25 lbs Axial Force per contact	Apply 0.25 lbs Axial Force per contact	GR-1217-CORE Per paragraph 6.1.7 Per paragraph 6.1.7
Contact Wipe Distance	0.51 mm (0.020") min	1.0 mm (0.039") min	GR-1217-CORE Per paragraph 5.1.3
Polarization Force	100 N (22.5 lbs)	Mate Samples 180° out of phase	GR-1217-CORE Per paragraph 5.1.9
Compilant Pin Retention Force	N/A	SEE SECTION 8.0	GR-1217-CORE Per paragraph 5.1.6 EIA-364-TP29
Contact Geometry	Minimum one curved surface in mating area	Minimum one curved surface in mating area	GR-1217-CORE Per paragraph 5.1.4
Hertzian Stress	N/A	Greater than 150 Kpsi	N/A

### 13.3 Electrical

Parameters	Specification	Aptera™ Value	Reference Document
Contact Resistance Stability (LLCR)	Less than 10mΩ change from initial reading	Less than 10mΩ change from initial reading	GR-1217-CORE Per paragraph 5.4.1 EIA-364-TP23
Compliant Pin to PTH Resistance	1mΩ maximum  Test current 100mA and 20mV open circuit	1mΩ maximum	GR-1217-CORE Per paragraph 5.6.1 EIA-364-TP23
Mated Bulk Resistance	N/A	SEE SECTION 4.0	N/A
Signal Continuity	Less than 10 nanosecond interrupt	Less than 10 nanosecond interrupt	GR-1217-CORE
Current Rating	Less than 30° C Temperature Rise	SEE SECTION 6.0	GR-1217-CORE EIA-364-TP70
Insulation Resistance	1,000 MegaΩ	1,000 MegaΩ	GR-1217-CORE Per paragraph 5.4.6 EIA-364-TP21
Dielectric Withstanding Voltage	1,000 VAC Peak	1000 VAC Peak De-rated value	GR-1217-CORE Per paragraph 5.4.7 EIA-364-TP20

13.4 Environmental

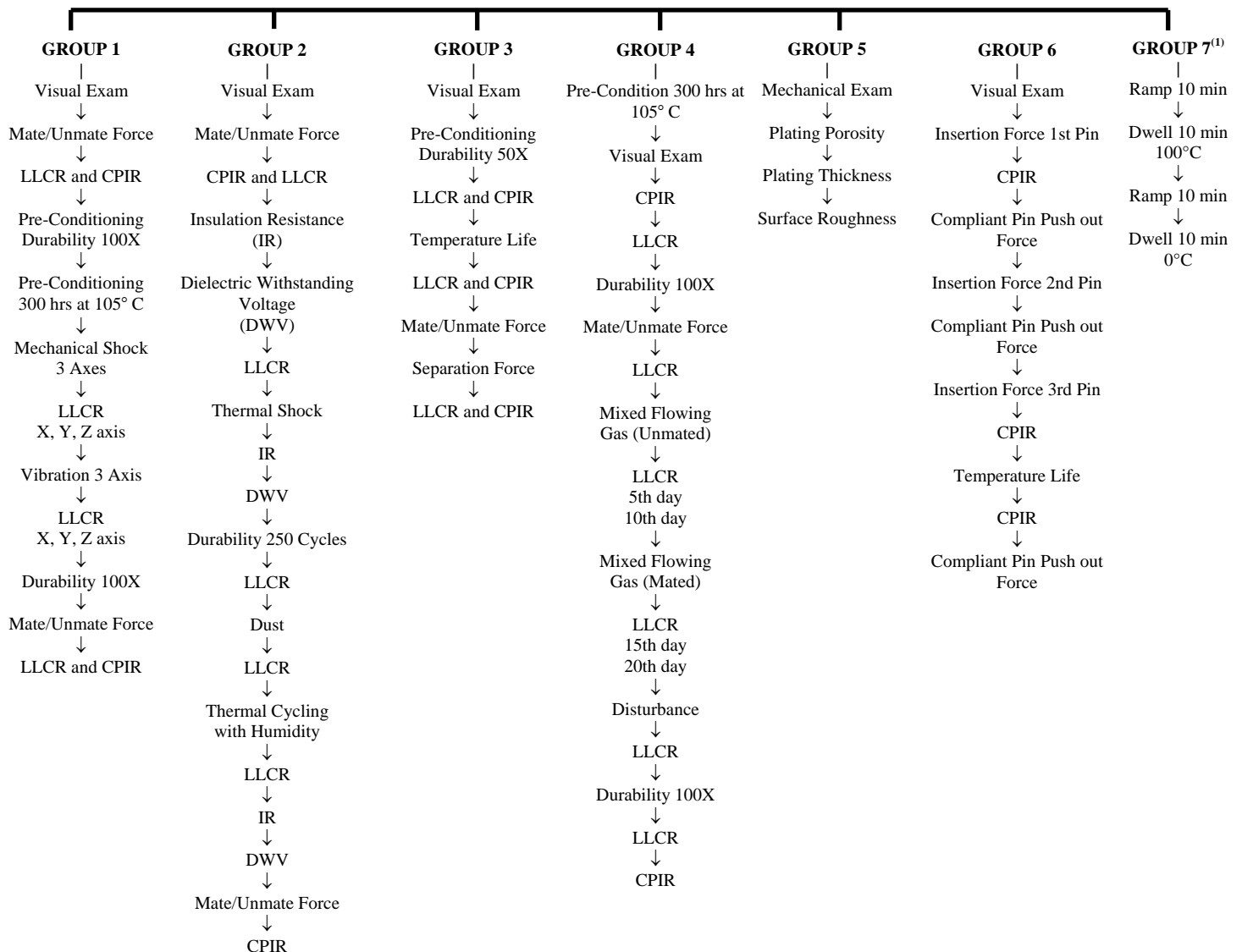
Parameters	Specification	Aptera™ Value	Reference Document
Temperature Life	No Change in LLCR greater than 10mΩ  105°C for 1000 hrs	10mΩ Maximum change	GR-1217-CORE Per paragraph 6.3.2 EIA-364-TP17 Test condition 4
Thermal Shock	No Change in LLCR greater than 10mΩ  10 cycles for -55C to 85C	Same as above	GR-1217-CORE Per paragraph 6.3.3 EIA-364-TP32
Humidity Cycling	No Change in LLCR greater than 10mΩ  Relative Humidity 90 to 95% For 500 hrs	Same as above	GR-1217-CORE Per paragraph 6.3.4 EIA-364-TP31 Procedure II
Dust	No Change in LLCR greater than 10mΩ	Same as above	GR-1217-CORE Per paragraph 9.1.1.1 EIA-364-TP91
Vibration	No Change in LLCR greater than 10mΩ  3.1 G RMS Minimum	Same as above	GR-1217-CORE Per paragraph 6.3.5 EIA-364-TP28 Test Condition VII Letter "D"
Mechanical Shock	No Change in LLCR greater than 10mΩ  30 G's for 11 milliseconds Half Sine 3 axis	Same as above	GR-1217-CORE Per paragraph 6.3.5 EIA-364-TP27
Mixed Flowing Gas	No Change in LLCR greater than 10mΩ  300 hrs at 105C thermal conditioning also included 20 Days total exposure to CL <sub>2</sub> ,NO <sub>2</sub> , H <sub>2</sub> S,SO <sub>2</sub>	Same as above	GR-1217-CORE Per paragraph 9.1.3 EIA-364-TP65

## 14.0 QUALIFICATION TEST GROUP SUMMARY

### 14.1 Test Groups

- Group 1: Vibration and mechanical shock with durability and thermal pre-conditioning
- Group 2: Thermal shock and humidity with dust and durability
- Group 3: Temperature life, 1000 hrs @ 105°C
- Group 4: Mixed flowing gas, 4 gases with durability and thermal pre-conditioning
- Group 5: Porosity and plating thickness
- Group 6: Compliant pin resistance with temperature life 1000 hrs @ 105°C
- Group 7: Solder Joint Thermal Cycling 3000 Cycles

### TELCORDIA GR-1217-CORE, ISSUE 1 NOVEMBER 1995 QUALIFICATION PLAN

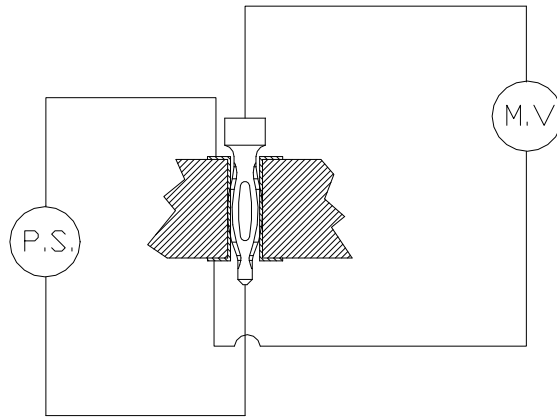


NOTES:

1. Record events exceeding 200ns and record LLCR.

- 14.2 Each test group will have at a minimum of 4 connectors and 250 LLCR-CPIR measurements.
- 14.3 Definitions
  - 14.3.1 LLCR- Low Level Contact Resistance
  - 14.3.2 CPIR- Compliant Pin Interface Resistance
  - 14.3.3 DWV- Dielectric Withstanding Voltage
  - 14.3.4 IR- Insulation Resistance

## 15.0 RESISTANCE MEASUREMENT SET-UP



**FIGURE 2, Typical contact resistance set-up. Kelvin 4 wire traces from connector hole to monitoring hole.**