AMPHENOL TCS

TB-2352

GENERAL PRODUCT SPECIFICATION FOR ELITE PRODUCT FAMILY INTERCONNECT SYSTEMS

REVISION “A”

Specification Revision Status

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A	S7949	New Release	DMS	10-30-2019

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1 SCOPE

1.1 Content

1.1.1 This specification covers the performance, test and quality requirements for Elite product family interconnect systems.

1.1.2 The Elite product family encompasses Elite product lines, and their corresponding product derivatives including; daughtercard, backplane, orthogonal, and cable backplane interconnect systems.

1.1.3 Unless stated otherwise, "Elite" refers to any product or derivative within the Elite product family.

1.2 Function

1.2.1 The function of the Elite connector is to provide a separable electro-mechanical interface between two subsystems of an electronic system without an unacceptable effect on the performance of the system. The customers' electronic performance requirements, application, and electro-mechanical constraints are translated into functional requirements, and used to determine the appropriate Elite connector or connector configuration that effectively satisfies all needs of the customer.

1.2.2 The Elite connector is a two-part device, consisting of receptacle and pin header pieces. Terminations from the receptacle and pin header pieces are available in the following forms:

- Through hole, eye-of-the-needle, compliant contacts.
- Cable connectors, mating to either receptacle or pin connector, via cable harness.

1.3 Testing

1.3.1 When tests are performed on subject product line, procedures specified in EIA-364-B shall be used per the test sequences outlined in Amphenol TCS Technical Bulletin TB-2023. All inspections shall be performed using applicable inspection plan and product drawings.

2 REFERENCE DOCUMENTS

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

2.1 Amphenol TCS Documents

2.1.1 TB-2023 Amphenol TCS Commercial Connector Qualification Plan

2.1.2 TB-2347 Elite Routing Guidelines

2.1.3 TB-2348 Elite Backplane Vertical Header Connector Installation Process

2.1.4 TB-2349 Elite Right-Angle Connector Installation Process

2.1.5 TB-2347 Elite Right-Angle Connector Removal and Replacement Process

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, IEC-60352-6 international standards, solderless connections, press fit connections, general requirements, test method and practical guidance.

3 MATERIAL FINISHES

3.1 Contacts

3.1.1 Receptacle, Direct Orthogonal, Backplane, and Cable signal beams are 0.180 mm thick high performance copper alloy. Contacts are plated per EGS205.

3.1.2 Direct Orthogonal, Backplane, and Cable shield blades are 0.150 mm thick high performance copper alloy. Contacts are plated per EGS205.

3.1.3 Direct Orthogonal, Backplane, and Cable signals, shield blades, and shield plates are lubricated per EGS305.

Note - All contacts meet lead free requirements, refer to EGS205.

3.2 Sub Components

Component	Material	Specification
Insulator, Direct Orthogonal / Backplane / Cable	Glass reinforced polyester (LCP)	UL 94V-0 Rating
Insulator, Receptacle / Direct Orgtogonal wafers	Glass reinforced polyester(LCP)/ Nylon	UL 94V-0 Rating
Compliant Pin Organizer	Glass reinforced polyester (LCP)	UL 94V-0 Rating
Stiffener	Stainless steel, Type 301	N/A
Enhanced Compliant Pin Organizer	High performance copper alloy	N/A
Receptacle Guides and Direct Orthogonal Housing Retainers	Zinc Alloy	N/A

4 MATED BULK RESISTANCE

4.1 Elite 12 Pair Connector mated to 8 Pair EX-DO 270* configuration

12 pr RAF Contact	8 pr EX-DO Contact	TOTAL CONDUCTOR LENGTH	Bulk Resistance
A1	R12	80.98	53
A2	P12	75.92	50
A3	M12	70.86	46
A4	K12	65.94	43
A5	H12	52.86	34
A6	F12	47.8	31
A7	D12	42.84	28
B2	N12	74.83	49
B3	L12	69.83	46
B4	J12	64.75	42
B5	G12	51.75	34
B6	E12	46.72	30
B7	C12	41.68	27
B8	A12	36.59	24
C1	Q11	85.03	55
C2	N11	79.99	52
C3	L11	74.99	49
C4	J11	69.91	46
C5	G11	56.91	37
C6	E11	51.88	34
C7	C11	46.84	31
C8	A11	41.75	27
D1	R11	86.65	57
D2	P11	81.69	53
D3	M11	76.53	50
D4	K11	71.61	47
D5	H11	58.53	38
D6	F11	53.47	35
D7	D11	48.51	32
D8	B11	43.45	28
E1	R10	90.83	59
E2	P10	85.77	56
E3	M10	80.71	53
E4	K10	75.79	49
E5	H10	62.71	41

E6	F10	57.65	38
E7	D10	52.69	34
E8	B10	47.63	31
F1	Q10	89.79	59
F2	N10	84.75	55
F3	L10	79.75	52
F4	J10	74.67	49
F5	G10	61.67	40
F6	E10	56.64	37
F7	C10	51.6	34
F8	A10	46.51	30
G1	Q9	99.73	65
G2	N9	94.69	62
G3	L9	89.69	59
G4	J9	84.61	55
G5	G9	71.61	47
G6	E9	66.58	43
G7	C9	61.54	40
G8	A9	56.45	37
H1	R9	96.62	63
H2	P9	91.56	60
H3	M9	86.5	56
H4	K9	81.58	53
H5	H9	68.5	45
H6	F9	63.44	41
H7	D9	58.48	38
H8	B9	53.42	35
J1	R8	100.83	66
J2	P8	95.77	62
J3	M8	90.71	59
J4	K8	85.79	56
J5	H8	72.71	47
J6	F8	67.65	44
J7	D8	62.69	41
J8	B8	57.63	38
K1	Q8	99.79	65
K2	N8	94.75	62
K3	L8	89.75	59
K4	J8	84.67	55
K5	G8	71.67	47
K6	E8	66.64	43
K7	C8	61.6	40

K8	A8	56.51	37
L1	Q7	104.97	68
L2	N7	99.93	65
L3	L7	94.93	62
L4	J7	89.85	59
L5	G7	76.85	50
L6	E7	71.82	47
L7	C7	66.78	44
L8	A7	61.69	40
M1	R7	105.69	69
M2	P7	100.63	66
M3	M7	95.57	62
M4	K7	90.65	59
M5	H7	77.57	51
M6	F7	72.51	47
M7	D7	67.55	44
M8	B7	62.49	41
N1	R6	110.84	72
N2	P6	105.78	69
N3	M6	100.72	66
N4	K6	95.8	63
N5	H6	82.72	54
N6	F6	77.66	51
N7	D6	72.7	47
N8	B6	67.64	44
P1	Q6	110.96	72
P2	N6	105.92	69
P3	L6	100.92	66
P4	J6	95.84	63
P5	G6	82.84	54
P6	E6	77.81	51
P7	C6	72.77	47
P8	A6	67.68	44
Q1	Q5	115.13	75
Q2	N5	110.09	72
Q3	L5	105.09	69
Q4	J5	100.01	65
Q5	G5	87.01	57
Q6	E5	81.98	53
Q7	C5	76.94	50
Q8	A5	71.85	47
R1	R5	116.93	76

R2	P5	111.87	73
R3	M5	106.81	70
R4	K5	101.89	66
R5	H5	88.81	58
R6	F5	83.75	55
R7	D5	78.79	51
R8	B5	73.73	48
S1	R4	121.12	79
S2	P4	116.06	76
S3	M4	111	72
S4	K4	106.08	69
S5	H4	93	61
S6	F4	87.94	57
S7	D4	82.98	54
S8	B4	77.92	51
T1	Q4	121.27	79
T2	N4	116.23	76
T3	L4	111.23	73
T4	J4	106.15	69
T5	G4	93.15	61
T6	E4	88.12	57
T7	C4	83.08	54
T8	A4	77.99	51
U1	Q3	125.49	82
U2	N3	120.45	79
U3	L3	115.45	75
U4	J3	110.37	72
U5	G3	97.37	64
U6	E3	92.34	60
U7	C3	87.3	57
U8	A3	82.21	54
V1	R3	127.39	83
V2	P3	122.33	80
V3	M3	117.27	77
V4	K3	112.35	73
V5	H3	99.27	65
V6	F3	94.21	61
V7	D3	89.25	58
V8	B3	84.19	55
W1	R2	131.61	86
W2	P2	126.55	83
W3	M2	121.49	79

W4	K2	116.57	76
W5	H2	103.49	68
W6	F2	98.43	64
W7	D2	93.47	61
W8	B2	88.41	58
X1	Q2	131.83	86
X2	N2	126.79	83
X3	L2	121.79	79
X4	J2	116.71	76
X5	G2	103.71	68
X6	E2	98.68	64
X7	C2	93.64	61
X8	A2	88.55	58
Y1	Q1	135.97	89
Y2	N1	130.93	85
Y3	L1	125.93	82
Y4	j1	120.85	79
Y5	G1	107.85	70
Y6	E1	102.82	67
Y7	C1	97.78	64
Y8	A1	92.69	60
Z1	R1	137.93	90
Z3	M1	127.81	83

Notes:
-Mated bulk resistance values are typical values.
-Mated mechanical lengths are taken from the DC board surface to the DO board surface.

5 ELECTRICAL RATINGS

Description	Value
Mating Interface Contact Resistance Change	10mΩ Maximum
Compliant Pin to Plated Through Hole Resistance	1 mΩ Maximum
Insulation Resistance	1000 MegaΩ
Dielectric Withstanding Voltage	500 VAC RMS

6 TEMPERATURE RATINGS

Description	Value
Maximum non-operating temperature rating (unmated)	125°C for 24 hours (1)
Maximum operating temperature rating	105°C
Maximum operating temperature rating - Cable	Connector 105°C, Harness varies, see cable manufacturer specifications
Minimum operating temperature rating	-40° C

1. Per EIA-364-1000 the testing for 85o C (10 years) Field Temperature and Field Life at 105o C for 1600 hours. Testing for maximum non-operating temperature rating (unmated) at 125o C for 24 hours is pending.

7 MECHANICAL RATINGS

	Value, per contact	
Description	**Grams**	**Newtons**
Signal Contact Normal Force (End of Life)	40	0.39
Cross Shield Contact Normal Force (End of Life)	40	0.39
Chevron Shield Contact Normal Force (End of Life)	30	0.29
Signal Contact Engagement Force[5]	87 max	0.85 max (1.7N / Diff Pair)
Cross Shield Contact Engagement Force[5]	75 max	0.74 max
Chevron Shield Contact Engagement Force[5]	75 max	0.74 max
Signal Contact Separation Force[5]	15 min	0.15 min
Cross Shield Contact Separation Force[5]	9 min	0.09 min
Chevron Shield Contact Separation Force[5]	8 min	0.08 min
Signal, Shield, and Power Contact Durability	Rated for 250 Mating Cycles	
Mechanical Wipe Minimum Values	2.0 mm Signal 2.6 mm Cross Shield 1.6 mm Chevron Shield	
Front stiffener retention	8.5 lbs per assembly of 8 wafers and 2 guides	
Wafer to stiffener retention	10.0 lbs per assembly of 8 wafers and 2 guides	
DC guide to stiffener retention	3.0 lbs minimum	
DC Long Ground compliant, board insertion/retention	Insertion 5.0 lbs Max retention 0.4 lbs Min	
DC Short signal compliant, board insertion/retention	Insertion 5.0 lbs Max retention 0.4 lbs Min	
12 wafer connector assy peel no screws or guides	40 lbs	
12 wafer connector assy peel with screws and guides	Greater than 120 lbs	
Ortho Front Housing Retention Force	5.0 lbs min (as an assembly)	22.0 min (as an assembly)

8 COMPLIANT PIN INTERFACE

8.1.1 Radial hole deformation not to exceed 70µm (0.0015") measured from drilled hole

8.1.2 Axial hole deformation not to exceed 50µm (0.00197") per IEC 60352-5 measured in the vertical plane

8.1.3 Three insertions on Plated Through Holes (PTH)

Description	Value per Pin, lbs
0.0157" Drill (Femto DC/BMA Pin)	
Signal and Shield Compliant Pin Insertion	5[2,4,5] Maximum
Signal and Shield Compliant Pin Retention	0.4 Minimum [5]

**This is for all finishes*

Notes:

2. Ensure press can reach maximum force required to press connector with a safety factor of 1.2 [Maximum force= (Max value per pin)*(1.2)*(Number of pins on connector)].
3. Refer to technical bulletin TB-2347, Elite Routing Guidelines, for drilled and finished hole requirements.
4. These values are maximum and minimum expected forces, averaged over the number of mating points (contacts) in a connector. This data is to be used for purposes of system mechanical sizing.
5. All engagement/separation force values assume the connector is pressed on a sufficiently rigid PCB without excessive flexing during mating.

9 TESTING

9.1 Qualification Testing

9.1.2 Test Sequence: Qualification testing shall be performed per the sequences listed in Section 15 of this document.

9.1.3 The qualification for the Elite product line was performed with the 12 Pair x 8 Wafer Right Angle Receptacle mated to 8 Pair x 12 Wafer Right Angle Direct Orthogonal interconnect and by mating interface similarity all other derivatives of the product line are considered qualified.

9.2 REQUALIFICATION TESTING

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 of all or part of the original testing sequence as required.

10 ACCEPTANCE

Acceptance is based on verification that the product meets the requirements of Section 12. 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.

11 SPECIFICATION SUMMARY

11.1 Material

Parameters	Specification	Elite Value	Reference Document
Plating Integrity	Acceptable Porosity	3 Pores per cm^2	EIA-364-TP53 Exposed to nitric vapors
Contact Metallization	30µin Gold min over 50-150µin Ni or 10µin Gold min over 20-40µin NiW alloy	30µin Gold min over 50-150µin Ni or 10µin Gold min over 20-40µin NiW alloy	GR-1217-CORE Per paragraph 9.1.1.2 EIA-364-TP09
Durability	200 Cycles	Cycles	GR-1217-CORE Per paragraph 9.1.1.2 EIA-364-TP09
Base	Surface finish is 16 RMS or otherwise specified	RMS on mating surfaces	GR-1217-CORE
Lubrication	Must be present on all backplane blades/shields	Must be present on all backplane blades/shields	GR-1217-CORE R5-67
Flammability Rating	94V-0	Must Pass Requirement	UL94

11.2 Mechanical

Parameters	Specification	Elite Value	Reference Document
Contact Normal Force	40 Grams End of Life (EOL)	40 Grams End of Life (EOL)	GR-1217-CORE EIA-364-TP04
Engagement Force	NA	SEE SECTION 7.0	EIA-364-TP37A
Contact Strength	Apply 0.25 lbs. Axial Force per contact	Apply 0.25 lbs. Axial Force per contact	GB-1217-CORE Per paragraph 6.1.7
Contact Wipe Distance	0.51 mm (0.020") min.	2.0 mm (0.039") min	GR-1217-CORE R5-28
Polarization Force	100 N (22.5 lbs)	Mate Samples 180° out of Phase	GR-1217-CORE Per paragraph 5.1.9
Compliant Pin Retention	N/A	SEE SECTION 8.0	GR-1217-CORE EIA-364-TP29
Contact Geometry	Minimum one curved surface in mating area	Minimum one curved surface in mating area	N/A
Hertzian Stress	N/A	Greater than 150 Kpsi	N/A
Angle Mate	+/-2˚	+/-2˚	See Figure 1 below

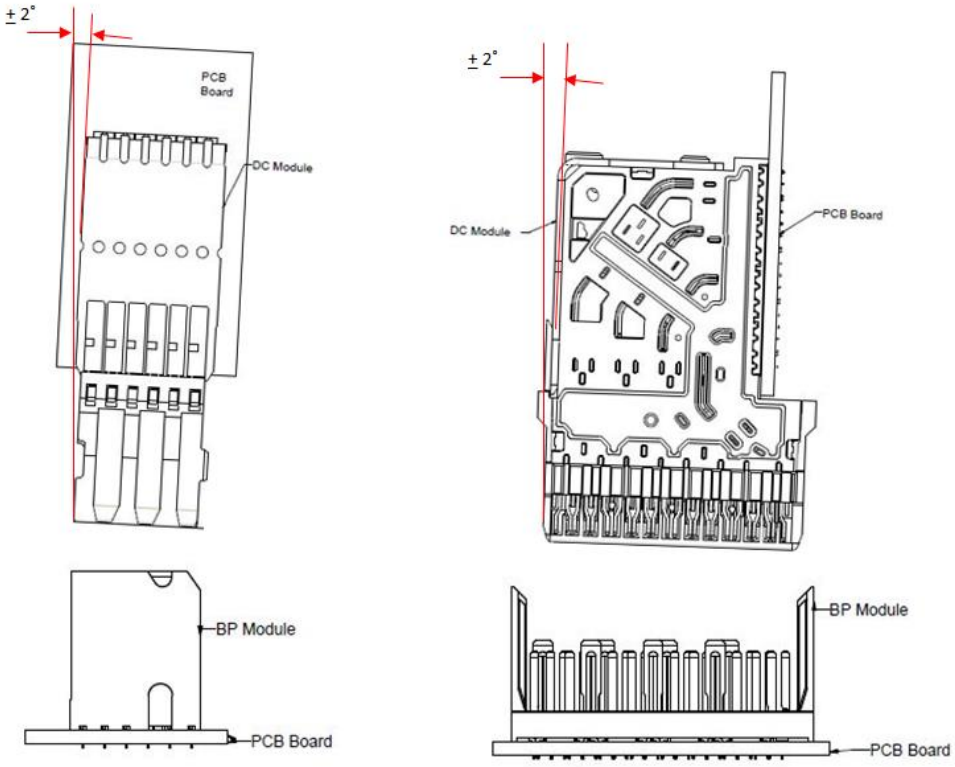


Figure 1. Connector Angle Reference

11.3 Electrical

Parameters	Specification	Elite Value	Reference Document
Contact Resistance Stability (LLCR)	Less than 10mΩ change from initial reading		GR-1217-CORE Per paragraph 6.2.1 EIA-364-TP23
Compliant Pin to PTH Resistance	1mΩ maximum Test current 100mA and 20mV open circuit		GR-1217-CORE EIA-364-TP23
Mated Bulk Resistance	N/A	SEE SECTION 4.0	N/A
Signal Continuity	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		GR-1217-CORE
Dielectric Withstanding Power	1,000 VAC (RMS)		GR-1217-CORE EIA-364-TP20
Dielectric Withstanding Signal	800 VAC (RMS)		GR-1217-CORE EIA-364-TP20

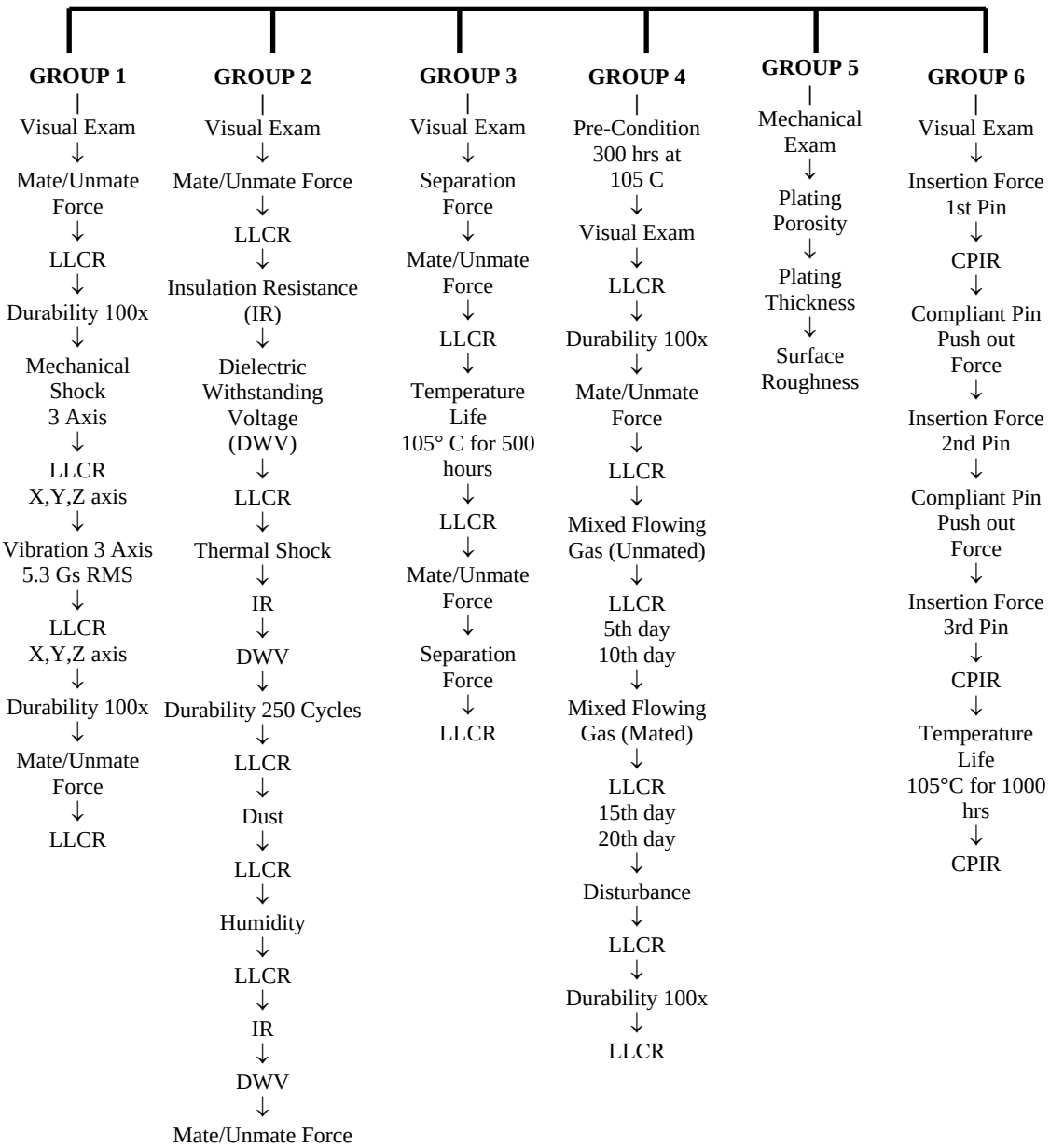
11.4 Environmental

Parameters	Specification	Elite Value	Reference Document
Temperature Life	No Change in LLCR greater than 10mΩ		GR-1217-CORE EIA-364-TP17 Test condition 4 Per paragraph 6.3.2
Thermal Shock	No Change in LLCR greater than 10mΩ 5 cycles for –55°C to 85°C	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 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 Random Vibration 5.3 RMS	Same as above	GR-1217-CORE EIA-364-TP28 Per paragraph 9.1.2.1
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 EIA-364-TP27
Mixed Flowing Gas	No Change in LLCR greater than 10mΩ 300 hrs at 105°C thermal conditioning also included	Same as above	GR-1217-CORE Per paragraph 9.1.3 EIA-364-TP65

12 TELCORDIA QUALIFICATION TEST GROUP SUMMARY

12.1 Test Groups

Group 1: Vibration and mechanical shock with dust and durability
Group 2: Thermal shock and humidity with dust and durability
Group 3: Temperature life, 500 hrs @ 105°C
Group 4: Mixed flowing gas, 4 gases with durability-thermal conditioning included prior to test
Group 5: Porosity and plating thickness
Group 6: Compliant pin resistance with temperature life



12.1.1 Each test group will have a minimum of 3 connectors and 200 LLCR-CPIR measurements.

12.1.2 Definitions

LLCR- Low Level Contact Resistance
CPIR- Compliant Pin Interface Resistance
DWV- Dielectric Withstanding Voltage
IR- Insulation Resistance

13 RESISTANCE MEASUREMENT SET-UP

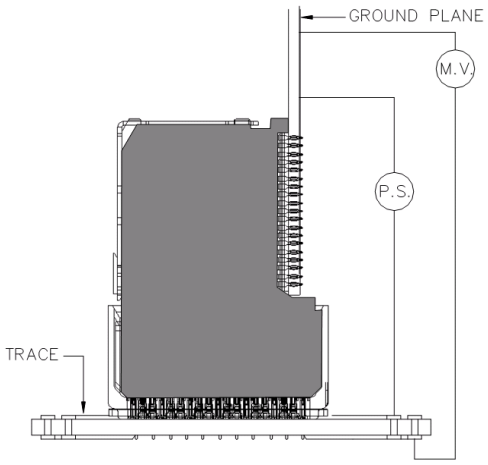


Figure 3. Shown above is an example of a typical contact resistance set-up. Kelvin 4 wire traces from connector hole to monitoring hole.

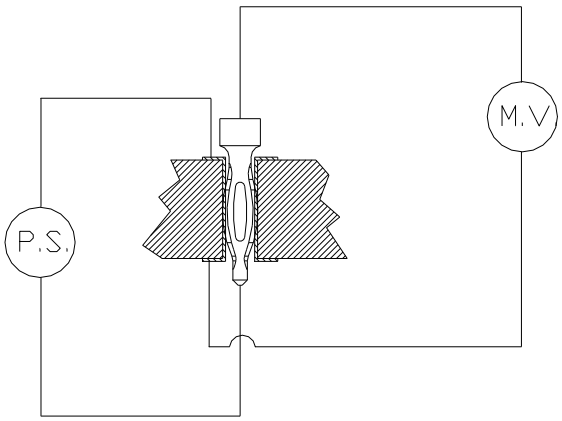


Figure 4. Typical compliant pin interface resistance (CPIR) set-up.