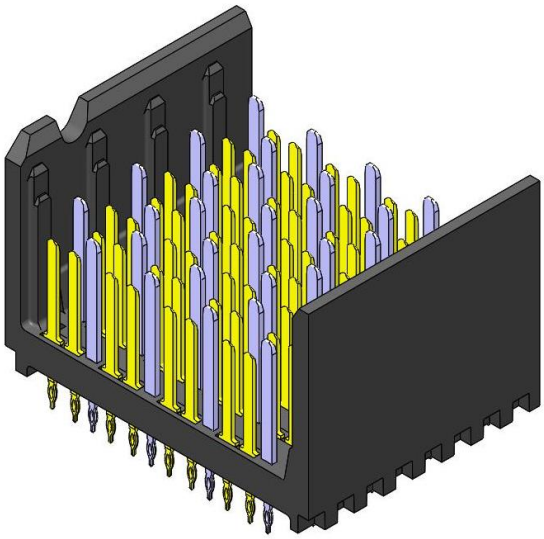
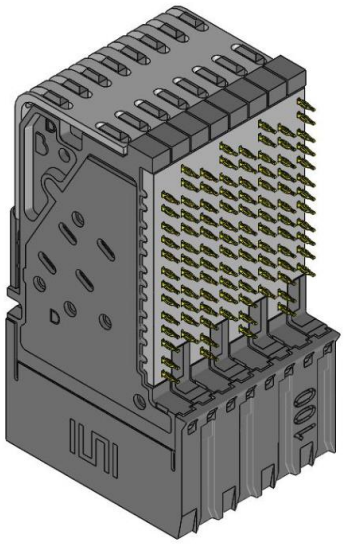
Project Number: Mixed Flowing Gas test report	Tracking Code: 2321507_Report_Rev_1
Requested by: Corey Rose	Date: 4/24/2020
Part #: HDTF-4-08-S-RA-HS-100/HDTM-4-08-1-S-VT-0-1	
Part description: HDTF-HDTM	Tech: Keney Chen
Test Start: 3/17/2020	Test Completed: 4/20/2020





(Actual part not depicted)

MIXED FLOWING GAS TEST REPORT

HDTF/HDTM
HDTF-4-08-S-RA-HS-100/HDTM-4-08-1-S-VT-0-1

REVISION HISTORY

DATE	REV.NUM.	DESCRIPTION	ENG
4/23/2020	**1**	**Initial Issue**	**KC**

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: Mixed Flowing Gas per EIA-364-65 test. Please see test plan.

APPLICABLE DOCUMENTS

Standards: EIA Publication 364.

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) Parts not intended for testing LLCR are visually inspected and cleaned if necessary.
4) Any additional preparation will be noted in the individual test sequences.
5) Test PCBs used: PCB446 Amphenol test boards

FLOWCHARTS

Group 1

HDTF-4-08-S-RA-HS-100

HDTM-4-08-1-S-VT-0-1

200 Points

Samtec -RA Mated To Samtec -VT

Step	Description
1.	Visual Inspection
2.	LLCR(1) Max Delta = 10 mOhm
3.	Cycles Quantity = 100 Cycles
4.	Mating/Unmating Force (2) - Non Standard
5.	LLCR(1) Max Delta = 10 mOhm
6.	Mixed Flowing Gas Unmated (4) Duration = 5 Days
7.	LLCR(1) Max Delta = 10 mOhm
8.	Mixed Flowing Gas Unmated (4) Duration = 5 Days
9.	LLCR(1) Max Delta = 10 mOhm
10.	Mixed Flowing Gas Mated (3) Duration = 5 Days
11.	LLCR(1) Max Delta = 10 mOhm
12.	Mixed Flowing Gas Mated (3) Duration = 5 Days
13.	LLCR(1) Max Delta = 10 mOhm
14.	Disturbance *Note: Telcordia GR 1217 CORE i02 section 9.1.3.3 item 4 option 2. Linear motion of aprox. 0.10 mm reset to fully mated condition.*
15.	LLCR(1) Max Delta = 10 mOhm
16.	Cycles Quantity = 100 Cycles
17.	LLCR(1) Max Delta = 10 mOhm

(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mating/Unmating Force = Other
EIA-364-13 rate of 0.5" per minute.

(3) Mixed Flowing Gas Mated = EIA-364-65
Environmental Conditions = Class IIA

(4) Mixed Flowing Gas Unmated = EIA-364-65
Environmental Conditions = Class IIA

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

Mixed Flowing Gas:

1) EIA-364-65B, *Mixed Flowing Test Procedure For Electrical Connectors Contacts And Sockets*.
2) To adequately evaluate the risk of corrosion, the Mixed Flowing Gas test shall be done with the gas mixtures in below table.

Table 1 - Environmental classes

Class	Relative humidity, %	Temperature, °C	Concentration, ppb			
			Cl_2	NO_2	H_2S	SO_2
I	Discontinued as a test procedure.					
II	Superseded by class IIA					
IIA	70 ± 2	30 ± 1	10 ± 3	200 ± 50	10 ± 5	100 ± 20
III	Superseded by class IIIA					
IIIA	70 ± 2	30 ± 1	20 ± 5	200 ± 50	100 ± 20	200 ± 50
IV	75 ± 2	40 ± 2	30 ± 5	200 ± 50	200 ± 20	N/A

3) The mated and unmated exposure is done in parallel for qualification at Class IIA conditions.
4) Exposure time for mated and unmated is 20 days

LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms:---------- Acceptable
   d. +15.1 to +50.0 mOhms:---------- Marginal
   e. +50.1 to +1000 mOhms:---------- Unstable
   f. >+1000 mOhms: ---------- Open Failure

RESULTS

LLCR Mixed Flowing Gas Group (440 LLCR test points)

- **Initial ---------- 24.72 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 440 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **5 Days Mixed Flowing Gas (with 2 Samples Unmated Exposure)**
  - **<= +5.0 mOhms ---------- 440 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **10 Days Mixed Flowing Gas (with 2 Samples Unmated Exposure)**
  - **<= +5.0 mOhms ---------- 439 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **15 Days Total Mixed Flowing Gas (with 2 Samples Mated Exposure)**
  - **<= +5.0 mOhms ---------- 437 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------3 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **20 Days Total Mixed Flowing Gas (with 2 Samples Mated Exposure)**
  - **<= +5.0 mOhms ---------- 433 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------7 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **Disturbance**
  - **<= +5.0 mOhms ---------- 437 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------3 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**
- **100 Cycle**
  - **<= +5.0 mOhms ---------- 437 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------3 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**

DATA SUMMARIES

LLCR Mixed Flowing Gas Group

1). A total of 192 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:----------Stable
   b. +5.1 to +10.0 mOhms: ----------Minor
   c. +10.1 to +15.0 mOhms: ----------Acceptable
   d. +15.1 to +50.0 mOhms: ----------Marginal
   e. +50.1 to +1000 mOhms ----------Unstable
   f. > +1000 mOhms: ----------Open Failure

LLCR Measurement Summaries by Pin Type

Date	3/17/2020	3/18/2020	3/24/2020	3/31/2020	4/7/2020	4/16/2020	4/17/2020	4/20/2020
Room Temp (Deg C)	23	23	23	23	23	23	23	23
Rel Humidity (%)	50	50	50	50	50	50	50	50
Technician	Keney Chen	Keney Chen	Keney Chen	Keney Chen	Keney Chen	Keney Chen	Keney Chen	Keney Chen
mOhm values	**Actual Initial**	**Actual 100 Cycles**	**Actual 5 days MFG**	**Actual 10 days MFG**	**Actual 15 days MFG**	**Actual 20 days MFG**	**Actual Disturbance**	**Actual 100 cycle**
	Pin Type 1:Signal							
Average	19.50	-0.75	-0.59	-0.37	-0.57	0.01	-0.33	-0.26
St. Dev.	2.90	0.45	0.58	0.70	0.68	1.05	0.72	0.95
Min	13.29	-2.09	-2.28	-2.28	-2.19	-1.89	-2.30	-2.44
Max	24.72	1.09	1.68	2.89	2.75	7.13	5.79	6.43
Summary Count	282	282	282	282	282	282	282	282
Total Count	282	282	282	282	282	282	282	282
	Pin Type 2: Ground							
Average	16.50	-0.43	-0.22	0.06	0.34	1.14	0.09	0.11
St. Dev.	1.65	0.29	0.37	0.82	1.36	1.58	1.03	1.05
Min	12.85	-1.13	-1.21	-1.11	-0.81	-1.05	-3.59	-0.90
Max	20.18	0.23	1.38	5.81	7.28	7.06	7.57	8.37
Summary Count	158	158	158	158	158	158	158	158
Total Count	158	158	158	158	158	158	158	158

LLCR Delta Count by Category

	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
100 Cycles	**440**	**0**	**0**	**0**	**0**	**0**
5 days MFG	**440**	**0**	**0**	**0**	**0**	**0**
10 days MFG	**439**	**1**	**0**	**0**	**0**	**0**
15 days MFG	**437**	**3**	**0**	**0**	**0**	**0**
20 days MFG	**433**	**7**	**0**	**0**	**0**	**0**
Disturbance	**437**	**3**	**0**	**0**	**0**	**0**
100 cycle	**437**	**3**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 3/7/2020, Next Cal: 3/6/2021

Equipment #: HZ-MO-05
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 3706
Serial #: 1285188
Accuracy: Last Cal: 9/25/2020, Next Cal: 9/24/2021

Equipment #: DG-MFG-01
Description: Mixed Flow Gas Chamber
Manufacturer: Yamasaki
Model: GH-180
Serial #: 715
Accuracy: Last Cal: 12/5/2019, Next Cal: 12/4/2020