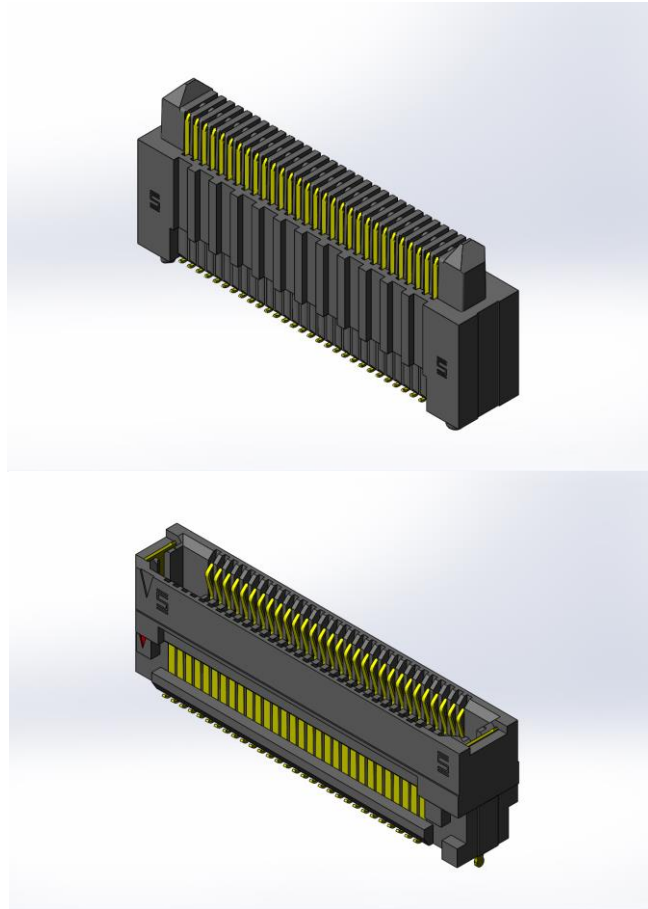




Project Number: Severe Environment Test Report	Tracking Code: 2032023_Report_Rev_1
Requested by: Stephen Brutscher	Date: 2/27/2020
Part #: ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR	Tech: John Crawford
Part description: ERF8/ERM8	Qty to test: 50
Test Start: 08/30/2019	Test Completed: 09/24/2019



SEVERE ENVIRONMENT TEST REPORT

ERF8/ERM8

ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
2/27/2020	1	Initial Issue	PC

CERTIFICATION

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

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SCOPE

To perform the following tests: Severe Environment Test. Please see test plan.

APPLICABLE DOCUMENTS

Standards: VITA 47.1

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) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
- 4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 5) The automated procedure is used with aqueous compatible soldering materials.
- 6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
- 7) Any additional preparation will be noted in the individual test sequences.
- 8) Solder Information: Lead free
- 9) Samtec Test PCBs used: PCB-110050-TST.

FLOWCHARTS

Mating/Unmating/Durability

Note: From MIL-STD-810G: For chamber control purposes, 100% RH implies as close to 100% RH as possible, but not less than 95%.

Note: With Humidity (Up to 100% RH, 240 hours, 25°C to 65°C)

Group 1

ERF8-075-09.0-S-DV-K-TR
ERM8-075-09.0-S-DV-K-TR
8 Assemblies
150 Positions

Step	Description
1.	LLCR (2)
2.	Mating/Unmating Force (3)
3.	Cycles Quantity = 250 Cycles
4.	LLCR (2) Max Delta = 15 mOhm
5.	Thermal Shock (4)
6.	LLCR (2) Max Delta = 15 mOhm
7.	Humidity (1) - Non Standard
8.	LLCR (2) Max Delta = 15 mOhm
9.	Mating/Unmating Force (3)

Group 2

ERF8-050-09.0-S-DV-K-TR
ERM8-050-09.0-S-DV-K-TR
8 Assemblies
100 Positions

Step	Description
1.	Mating/Unmating Force (3)
2.	Cycles Quantity = 250 Cycles
3.	Mating/Unmating Force (3)

Group 3

ERF8-005-09.0-S-DV-K-TR
ERM8-005-09.0-S-DV-K-TR
8 Assemblies
10 Positions

Step	Description
1.	Mating/Unmating Force (3)
2.	Cycles Quantity = 250 Cycles
3.	Mating/Unmating Force (3)

(1) Humidity = Other
240 Hours
+25°C to +65°C @ 95% RH up to 100% RH

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

(3) Mating/Unmating Force = EIA-364-13

(4) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued**Mechanical Shock/Random Vibration/LLCR**Group 1

ERF8-075-09.0-S-DV-K-TR
ERM8-075-09.0-S-DV-K-TR
8 Assemblies
VITA 47.1 (V To V)

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2) - Non Standard
3.	Random Vibration (3) - Non Standard <i>Note: Conditions: 1) 5 Hz to 100 Hz, PSD increasing at 3dB/octave 2) 100 Hz to 1000 Hz 0.10 g²/Hz 3) 1000 Hz to 2000 Hz PSD decreasing at 3dB/octave</i>
4.	LLCR (1) Max Delta = 15 mOhm

Group 2

ERF8-075-01-S-D-RA-TR
ERM8-075-01-S-D-RA-TR
8 Assemblies
VITA 47.1 (RA To RA)

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2) - Non Standard
3.	Random Vibration (3) - Non Standard <i>Note: Conditions: 1) 5 Hz to 100 Hz, PSD increasing at 3dB/octave 2) 100 Hz to 1000 Hz 0.10 g²/Hz 3) 1000 Hz to 2000 Hz PSD decreasing at 3dB/octave</i>
4.	LLCR (1) Max Delta = 15 mOhm

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Mechanical Shock = Other

40G, 11 milliseconds, Half Sine

Number of Shocks = 3 Per Direction, Per Axis, 18 Total

Operating Shock Class OS2

(3) Random Vibration = Other

12 G 'RMS', 5Hz to 2000Hz, 1 Hours/Axis

Vibration Class V3 VITA 47.1

FLOWCHARTS Continued**Mechanical Shock/Random Vibration/Event Detection**Group 1

ERF8-075-09.0-S-DV-K-TR
ERM8-075-09.0-S-DV-K-TR
8 Assemblies
VITA 47.1 (V To V)

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) (1) - Non Standard
2.	Nanosecond Event Detection (Random Vibration) (2) - Non Standard <i>Note: Conditions:</i> 1) 5 Hz to 100 Hz, PSD increasing at 3dB/octave 2) 100 Hz to 1000 Hz 0.10 g ² /Hz 3) 1000 Hz to 2000 Hz PSD decreasing at 3dB/octave

Group 2

ERF8-075-01-S-D-RA-TR
ERM8-075-01-S-D-RA-TR
8 Assemblies
VITA 47.1 (RA To RA)

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) (1) - Non Standard
2.	Nanosecond Event Detection (Random Vibration) (2) - Non Standard <i>Note: Conditions:</i> 1) 5 Hz to 100 Hz, PSD increasing at 3dB/octave 2) 100 Hz to 1000 Hz 0.10 g ² /Hz 3) 1000 Hz to 2000 Hz PSD decreasing at 3dB/octave

(1) Nanosecond Event Detection (Mechanical Shock) = Other
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
40G, 11 milliseconds, Half Sine

(2) Nanosecond Event Detection (Random Vibration) = Other
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Random Vibration: 12 G 'RMS', 5Hz to 2000Hz, 1 Hours/Axis, Vibration Class V3 VITA 47.1

Temperature CyclingGroup 1

ERF8-075-09.0-S-DV-K-TR
ERM8-075-09.0-S-DV-K-TR
8 Assemblies
500 Thermal Cycles

Note: Reference MIL-STD-202G, Method 107, Thermal Shock

Step	Description
1.	Continuity (Initial)
2.	Temperature Cycles (1) - Non Standard Cycles = 500 Cycles Continuity = Monitor for 1 MicroSecond Interruptions Throughout
3.	Continuity (Following Last Cycle)

(1) Temperature Cycles = Other
Max Temperature = 125° C
Min Temperature = -65° C
Dwell Time = 30 minutes at each extreme
Ramp Rate = 10° C/min
VITA 47.1

FLOWCHARTS Continued**Non-Operating Class Temperature****VITA 47.1**Group 1

ERF8-075-09.0-S-DV-K-TR

ERM8-075-09.0-S-DV-K-TR

8 Assemblies

Non-Operating Class Temperature

Step	Description
1.	LLCR (1) Max Delta = 15 mOhm
2.	Temperature Cycle Temperature Cycle = -55°C to 105°C Cycles = 100
3.	LLCR (1) Max Delta = 15 mOhm
4.	Temperature Cycle Cycles = 100 Temperature Cycles = -65°C to 125°C
5.	LLCR (1) Max Delta = 15 mOhm

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

Electrostatic Discharge (ESD)Group 1

ERF8-075-09.0-S-DV-K-TR

ERM8-075-09.0-S-DV-K-TR

8 Assemblies

EN61000-4-2

Step	Description
1.	Exposure To 5kV, 10kV, 15kV, Repeat 10 Times <i>Note: The connector shall not be susceptible to damage by ESD events from 0 to 15kV as discharged from a 150 pf capacitor through a 330 ohm resistor.</i>

FLOWCHARTS Continued**DWV @ Altitude****Pin to Pin**Group 1

ERF8-075-09.0-S-DV-K-TR

ERM8-075-09.0-S-DV-K-TR

3 Assemblies

Custom Group

Step Description

1. DWV at Test Voltage (1) - Non
Standard
Note: Test Voltage to be 300 VAC

Row to RowGroup 2

ERF8-075-09.0-S-DV-K-TR

ERM8-075-09.0-S-DV-K-TR

3 Assemblies

Custom Group

Step Description

1. DWV at Test Voltage (2) - Non
Standard
Note: Test Voltage to be 300 VAC

-
- (1) DWV at Test Voltage = Other
Test Condition IV= 70,000 ft
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds
- (2) DWV at Test Voltage = Other
Test Condition IV= 70,000 ft
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

TEMPERATURE CYCLES:

- 1) OTHER, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
- 2) Test Condition: -65°C to +125°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Test Duration: 500 Cycles
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

TEMPERATURE CYCLES:

- 7) OTHER, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
- 8) Test Condition: -55°C to +105°C and -65°C to +125°C
- 9) Test Time: ½ hour dwell at each temperature extreme
- 10) Test Duration: 100 Cycles
- 11) All test samples are pre-conditioned at ambient.
- 12) All test samples are exposed to environmental stressing in the mated condition.

THERMAL SHOCK:

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
- 2) Test Condition I: -55°C to +85°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Test Duration: A-3 100 Cycles
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

- 1) Reference document: MIL-STD-810G, *Humidity Test Procedure for Electrical Connectors.*
- 2) Test Condition B, 240 Hours.
- 3) Method III, +25° C to + 65° C, 95% to 100% Relative Humidity.
- 4) All samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

MECHANICAL SHOCK (Specified Pulse):

- 1) Other method, *Mechanical Shock Test Procedure for Electrical Connectors*
- 2) Peak Value: 40 G
- 3) Duration: 11 Milliseconds
- 4) Wave Form: Half Sine
- 5) Velocity: Operating Shock Class OS2
- 6) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

- 1) Other method, *Vibration Test Procedure for Electrical Connectors*
- 2) G 'RMS': 12
- 3) Frequency: 5 to 2000 Hz
- 4) Vibration Class V3 VITA 47.1
- 5) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

- 1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
- 2) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
- 3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

ATTRIBUTE DEFINITIONS Continued

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.

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. $\leq +5.0$ 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

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

- 1) PROCEDURE:
 - a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
 - b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. Barometric Test Condition 1
 - iii. Rate of Application 500 V/Sec
 - iv. Test Voltage (VAC) until breakdown occurs
- 2) MEASUREMENTS/CALCULATIONS
 - a. The breakdown voltage shall be measured and recorded.
 - b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
 - c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

ESD:

- 1) Other method, *Electrostatic Discharge Test Procedure for Electrical Connectors and Sockets*.
- 2) Exposure To 5kV, 10kV, 15kV.
- 3) Repeat 10 Times.

RESULTS

Mating – Unmating Forces

Mating-Unmating Durability Group (ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR)

- **Initial**
 - **Mating**
 - **Min** -----11.06 Lbs
 - **Max**-----12.80 Lbs
 - **Unmating**
 - **Min** ----- 5.34 Lbs
 - **Max**----- 6.38 Lbs
- **After 250 Cycles**
 - **Mating**
 - **Min** -----10.78 Lbs
 - **Max**-----14.04 Lbs
 - **Unmating**
 - **Min** ----- 6.65 Lbs
 - **Max**-----10.57 Lbs
- **Humidity**
 - **Mating**
 - **Min** ----- 8.14 Lbs
 - **Max**----- 9.67 Lbs
 - **Unmating**
 - **Min** ----- 4.23 Lbs
 - **Max**----- 5.02 Lbs

Mating-Unmating Basic (ERF8-050-09.0-S-DV-K-TR /ERM8-050-09.0-S-DV-K-TR)

- **Initial**
 - **Mating**
 - **Min** ----- 7.91 Lbs
 - **Max**----- 9.07 Lbs
 - **Unmating**
 - **Min** ----- 3.14 Lbs
 - **Max**----- 3.87 Lbs
- **After 250 Cycles**
 - **Mating**
 - **Min** ----- 7.54 Lbs
 - **Max**----- 9.29 Lbs
 - **Unmating**
 - **Min** ----- 3.66 Lbs
 - **Max**----- 6.44 Lbs

Mating-Unmating Basic (ERF8-005-09.0-S-DV-K-TR /ERM8-005-09.0-S-DV-K-TR)

- **Initial**
 - **Mating**
 - **Min** ----- 0.70 Lbs
 - **Max**----- 0.82 Lbs
 - **Unmating**
 - **Min** ----- 0.24 Lbs
 - **Max**----- 0.39 Lbs
- **After 250 Cycles**
 - **Mating**
 - **Min** ----- 0.68 Lbs
 - **Max**----- 0.99 Lbs
 - **Unmating**
 - **Min** ----- 0.42 Lbs
 - **Max**----- 0.67 Lbs

RESULTS Continued**Dielectric Withstanding Voltage minimums, DWV**

- **Minimums**
 - Test Voltage -----300 VAC

Pin to Pin

- **Initial DWV -----Passed**

Row to Row

- **Initial DWV -----Passed**

Electrostatic Discharge, ESD

- **Post 5KV Discharge -----Passed**
- **Post 10KV Discharge-----Passed**
- **Post 15KV Discharge-----Passed**

LLCR Mating/Unmating Durability Group (192 LLCR test points)

- **Initial ----- 30.32 mOhms Max**
- **Durability, 250 Cycles**
 - **<= +5.0 mOhms ----- 192 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**
- **Thermal Shock**
 - **<= +5.0 mOhms ----- 192 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**
- **Humidity**
 - **<= +5.0 mOhms ----- 190 Points ----- Stable**
 - **+5.1 to +10.0 mOhms -----2 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**

RESULTS Continued**LLCR Shock & Vibration Group (192 LLCR test points)**

ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR

- **Initial** ----- 30.84 mOhms Max
- **Shock &Vibration**
 - **<= +5.0 mOhms** ----- 192 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

ERF8-075-01-S-D-RA-TR / ERM8-075-01-S-D-RA-TR

- **Initial** ----- 29.94 mOhms Max
- **Shock &Vibration**
 - **<= +5.0 mOhms** ----- 192 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

Mechanical Shock & Random Vibration:

ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR

- **Shock**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass
- **Vibration**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass

ERF8-075-01-S-D-RA-TR / ERM8-075-01-S-D-RA-TR

- **Shock**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass
- **Vibration**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass

DATA SUMMARIES**MATING-UNMATING FORCE:****Mating-Unmating Durability Group (ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR)**

	Initial				250 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	49.19	11.06	23.73	5.34	47.96	10.78	29.57	6.65
Maximum	56.93	12.80	28.36	6.38	62.46	14.04	47.02	10.57
Average	53.24	11.97	26.79	6.02	56.84	12.78	36.46	8.20
St Dev	2.91	0.65	1.69	0.38	5.13	1.15	5.69	1.28
Count	8	8	8	8	8	8	8	8
	After Humidity							
	Mating		Unmating					
	Newton	Force (Lbs)	Newton	Force (Lbs)				
Minimum	36.22	8.14	18.83	4.23				
Maximum	43.00	9.67	22.32	5.02				
Average	39.35	8.85	20.69	4.65				
St Dev	2.32	0.52	1.10	0.25				
Count	8	8	8	8				

Mating-Unmating Basic (ERF8-050-09.0-S-DV-K-TR /ERM8-050-09.0-S-DV-K-TR)

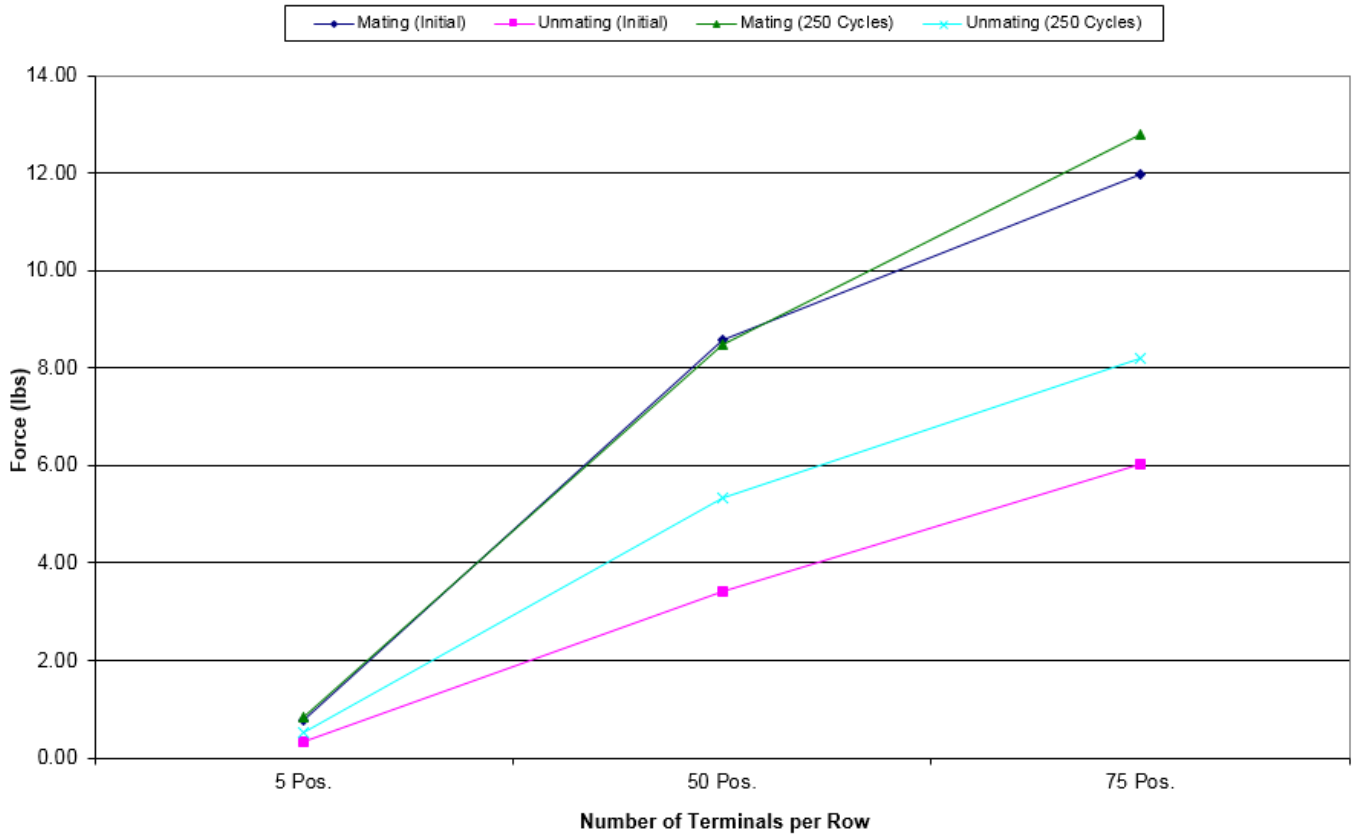
	Initial				After 250 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	35.18	7.91	13.97	3.14	33.55	7.54	16.28	3.66
Maximum	40.34	9.07	17.20	3.87	41.32	9.29	28.62	6.44
Average	38.11	8.57	15.21	3.42	37.77	8.49	23.68	5.32
St Dev	1.59	0.36	1.12	0.25	2.82	0.63	4.22	0.95
Count	8	8	8	8	8	8	8	8

Mating-Unmating Basic (ERF8-050-09.0-S-DV-K-TR /ERM8-050-09.0-S-DV-K-TR)

	Initial				After 250 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	3.10	0.70	1.08	0.24	3.00	0.68	1.87	0.42
Maximum	3.66	0.82	1.73	0.39	4.39	0.99	2.99	0.67
Average	3.40	0.76	1.43	0.32	3.66	0.82	2.34	0.53
St Dev	0.19	0.04	0.24	0.05	0.52	0.12	0.36	0.08
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating Data for 5, 50 and 75 Position ERF8/ERM8



DATA SUMMARIES Continued**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

Voltage Rating Summary	
Minimum	ERF8/ERM8
Test Voltage	300
Pin to Pin	
Initial Test Voltage	Passed
Row to Row	
Initial Test Voltage	Passed

ESD

Post 5kV Discharges	Pass
Post 10kV Discharges	Pass
Post 15kV Discharges	Pass

DATA SUMMARIES Continued**LLCR Temperature Cycles 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. $\leq +5.0$ 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	8/30/2019	9/30/2019	10/5/2019
Room Temp (Deg C)	23	22	22
Rel Humidity (%)	48	50	40
Technician	Tony Wagoner	Tony Wagoner	Tony Wagoner
mOhm values	Actual Initial	Delta Temp Cycle1	Delta Temp Cycle 2
Pin Type 1: Signal			
Average	28.74	0.36	0.38
St. Dev.	0.52	0.29	0.37
Min	27.15	0.00	0.00
Max	30.32	1.83	2.89
Summary Count	192	192	192
Total Count	192	192	192

LLCR Delta Count by Category - Signal						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Temp Cycle 1	192	0	0	0	0	0
Temp Cycle 2	192	0	0	0	0	0

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability 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. $\leq +5.0$ 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	9/4/2019	9/10/2019	9/16/2019	9/30/2019
Room Temp (Deg C)		23	23	23	22
Rel Humidity (%)		53	49	51	52
Technician		John Crawford	John Crawford	Tony Wagoner	John Crawford
mOhm values		Actual	Delta	Delta	Delta
		Initial	250 Cycles	Therm Shck	Humidity
Pin Type 1: Signal					
Average		29.05	0.45	0.47	0.91
St. Dev.		0.85	0.42	0.46	0.95
Min		27.50	0.00	0.00	0.01
Max		32.92	2.68	3.30	7.32
Summary Count		192	192	192	192
Total Count		192	192	192	192

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
250 Cycles	192	0	0	0	0	0
Therm Shck	192	0	0	0	0	0
Humidity	190	2	0	0	0	0

DATA SUMMARIES Continued**LLCR Shock & Vibration 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. $\leq +5.0$ 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

ERF8-075-09.0-S-DV-K-TR /ERM8-075-09.0-S-DV-K-TR

LLCR Measurement Summaries by Pin Type				
Date	9/26/2019	9/30/2019		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	43	51		
Technician	John Crawford	John Crawford		
mOhm values	Actual Initial	Delta Shock-Vib	Delta	Delta
Pin Type 1: Signal				
Average	28.77	0.42		
St. Dev.	0.61	0.31		
Min	27.32	0.00		
Max	30.84	2.43		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Shock-Vib	192	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	40G, 11ms, Half-Sine (Operating Class OS2)
Shock Events	0
Test Condition	12G 'RMS', 5Hz to 2000Hz (Vibration Class VITA 47.1)
Vibration Events	0
Total Events	0

DATA SUMMARIES Continued

ERF8-075-01-S-D-RA-TR / ERM8-075-01-S-D-RA-TR

LLCR Measurement Summaries by Pin Type				
Date	9/24/2019	9/26/2019		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	48	43		
Technician	John Crawford	John Crawford		
mOhm values	Actual Initial	Delta Shock-Vib	Delta	Delta
Pin Type 1: Signal				
Average	25.27	0.47		
St. Dev.	5.16	0.48		
Min	15.43	0.00		
Max	29.94	3.27		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
Shock-Vib	192	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	40G, 11ms, Half-Sine (Operating Class OS2)
Shock Events	0
Test Condition	12G 'RMS', 5Hz to 2000Hz (Vibration Class VITA 47.1)
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** TCT-04**Description:** Dillon Quantrol TC21 25-1000 mm/min series test stand**Manufacturer:** Dillon Quantrol**Model:** TC2 I series test stand**Serial #:** 04-1041-04**Accuracy:** Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;
... Last Cal: 05/29/2019, Next Cal: 05/29/2020**Equipment #:** MO-11**Description:** Switch/Multimeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 120169**Accuracy:** See Manual

... Last Cal: 09/11/2019, Next Cal: 09/11/2020

Equipment #: THC-05**Description:** Temperature/Humidity Chamber (Chamber Room)**Manufacturer:** Thermotron**Model:** SM-8-3800**Serial #:** 05 23 00 02**Accuracy:** See Manual

... Last Cal: 11/14/2019, Next Cal: 05/31/2020

Equipment #: TSC-01**Description:** Vertical Thermal Shock Chamber**Manufacturer:** Cincinnati Sub Zero**Model:** VTS-3-6-6-SC/AC**Serial #:** 10-VT14993**Accuracy:** See Manual

... Last Cal: 06/30/2019, Next Cal: 06/30/2020

Equipment #: HPT-01**Description:** Hipot Safety Tester**Manufacturer:** Vitrek**Model:** V73**Serial #:** 019808**Accuracy:**

... Last Cal: 05/15/2019, Next Cal: 05/15/2020

Equipment #: SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 04/22/2019, Next Cal: 04/22/2020

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** ACLM-01**Description:** Accelerometer**Manufacturer:** PCB Piezotronics**Model:** 352C03**Serial #:** 115819**Accuracy:** See Manual

... Last Cal: 07/18/2019, Next Cal: 07/18/2020

Equipment #: ED-03**Description:** Event Detector**Manufacturer:** Analysis Tech**Model:** 32EHD**Serial #:** 1100604**Accuracy:** See Manual

... Last Cal: 10/31/2019, Next Cal: 10/31/2020