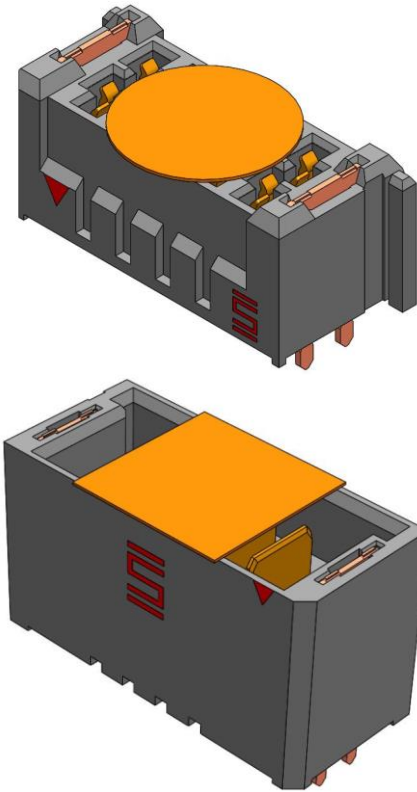




Project Number: Severe Environment Test Report	Tracking Code: 2208698_Report_Rev_1
Requested by: Stephen Brutscher	Date: 5/13/2020
Part #: UMPS-05-05.5-G-VT-SM-WT-K / UMPT-05-06.5-G-VT-SM-WT-K	
Part description: UMPS / UMPT	Tech: Troy Cook
Test Start: 2/3/2020	Test Completed: 3/13/2020



## **SEVERE ENVIRONMENT TEST REPORT**

**UMPS / UMPT**

**UMPS-05-05.5-G-VT-SM-WT-K / UMPT-05-06.5-G-VT-SM-WT-K**

**REVISION HISTORY**

<b>DATA</b>	<b>REV.NUM.</b>	<b>DESCRIPTION</b>	<b>ENG</b>
5/13/2020	1	Initial Issue	KH

## 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: EIA Publication 364; 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-110510-TST.

**FLOWCHARTS****Mating/Unmating/Durability**

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

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

Group 1

UMPS-05-05.5-G-VT-SM-WT-K  
UMPT-05-06.5-G-VT-SM-WT-K  
8 Assemblies  
5 Positions

Group 2

UMPS-02-05.5-G-VT-SM-WT-K  
UMPT-02-06.5-G-VT-SM-WT-K  
8 Assemblies  
2 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)

**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

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

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:</i> 1) 5 Hz to 100 Hz, PSD increasing at 3dB/octave 2) 100 Hz to 1000 Hz 0.10 g <sup>2</sup> /Hz 3) 1000 Hz to 2000 Hz PSD decreasing at 3dB/octave
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**Mechanical Shock/Random Vibration/Event Detection**Group 1

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

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 <sup>2</sup> /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

**FLOWCHARTS Continued****Temperature Cycling**Group 1

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

8 Assemblies

500 Thermal Cycles

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

Step	Description
1.	Continuity (Initial)
2.	Temperature Cycles <sup>(1)</sup> - 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

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

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

8 Assemblies

Non-Operate Class Temperature

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

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

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

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

3 Assemblies

Custom Group

**Step Description**

1. DWV at Test Voltage<sub>(1)</sub> - Non Standard  
*Note: Test Voltage to be 300 VAC*

**Pin to Weld Tab**Group 2

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

3 Assemblies

Custom Group

**Step Description**

1. DWV at Test Voltage<sub>(2)</sub> - 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

**Electrostatic Discharge (ESD)**Group 1

UMPS-05-05.5-G-VT-SM-WT-K

UMPT-05-06.5-G-VT-SM-WT-K

8 Assemblies

EN61000-4-2

**Step Description**

1. Exposure To 5kV, 10kV, 15kV,  
Repeat 10 Times  
*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.*

## 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) Reference document: other, *Vibration Test Procedure for Electrical Connectors*
- 2) Test Condition: V3 vita 47.1
- 3) Power Spectral Density: 0.1 G<sup>2</sup> / Hz
- 4) G 'RMS': 12
- 5) Frequency: 5 to 2000 Hz
- 6) Duration: 1 Hours per axis (3 axis total)



### ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

#### 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

#### 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 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: other, *Withstanding Voltage Test Procedure for Electrical Connectors*.
  - b. Test Conditions IV=70000 ft
  - c. Test voltage applied for 60 seconds.

#### ELECTROSTATIC DISCHARGE:

- 1) Reference Document: EN61000-4-2, VITA 47
- 2) Connector shall not be susceptible to damage by electrostatic discharge (ESD) events from 0 to 15kV as discharged from a 150-pf capacitor through a 330-ohm resistor
- 3) Any damage shall be noted

## RESULTS

### Mating – Unmating Forces

#### Mating-Unmating Durability Group (UMPS-05-05.5-G-VT-SM-WT-K / UMPT-05-06.5-G-VT-SM-WT-K)

- **Initial**
  - **Mating**
    - **Min** ----- 6.03 Lbs
    - **Max** ----- 7.05 Lbs
  - **Unmating**
    - **Min** ----- 3.53 Lbs
    - **Max** ----- 4.47 Lbs
- **After 250 Cycles**
  - **Mating**
    - **Min** ----- 7.04 Lbs
    - **Max** ----- 8.53 Lbs
  - **Unmating**
    - **Min** ----- 5.10 Lbs
    - **Max** ----- 7.04 Lbs
- **Humidity**
  - **Mating**
    - **Min** ----- 3.00 Lbs
    - **Max** ----- 3.57 Lbs
  - **Unmating**
    - **Min** ----- 2.37 Lbs
    - **Max** ----- 2.82 Lbs

#### Mating-Unmating Basic (UMPS-02-05.5-G-VT-SM-WT-K / UMPT-02-06.5-G-VT-SM-WT-K)

- **Initial**
  - **Mating**
    - **Min** ----- 1.74 Lbs
    - **Max** ----- 2.39 Lbs
  - **Unmating**
    - **Min** ----- 0.85 Lbs
    - **Max** ----- 1.18 Lbs
- **After 250 Cycles**
  - **Mating**
    - **Min** ----- 2.09 Lbs
    - **Max** ----- 3.18 Lbs
  - **Unmating**
    - **Min** ----- 1.69 Lbs
    - **Max** ----- 2.13 Lbs

**RESULTS Continued**

**Temperature Cycling**

- Continuity Initial**
  - No Interruptions -----Passed
- Continuity Following 500 Cycles**
  - No Interruptions -----Passed

**DWV @ Altitude**

- **Minimums**
  - Test Voltage -----300 VAC
  - Altitude Tested -----70000 ft

**Mated**

- Pin to Pin**
- DWV-----Passed

- Pin to Weld Tab**
- DWV-----Passed

**Unmated**

- Pin to Pin**
- DWV-----Passed

- Pin to Weld Tab**
- DWV-----Passed

**Electrostatic Discharge**

- 5kV**
  - No Damage -----Passed
- 10kV**
  - No Damage -----Passed
- 15kV**
  - No Damage -----Passed

**RESULTS Continued****LLCR Mating/Unmating Durability Group (40 LLCR test points)**

- **Initial** -----1.60 mOhms Max
- **Durability, 250 Cycles**
  - **<= +5.0 mOhms**----- 40 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**----- 40 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**----- 40 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

**LLCR Non-Operating Class Temperature Group (40 LLCR test points)**

- **Initial** -----1.81 mOhms Max
- **Temperature Cycle1 (-55°C to +105°C)**
  - **<= +5.0 mOhms**----- 40 Points ----- Stable
  - **+5.1 to +10 mOhms** -----0 Points ----- Minor
  - **+10 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
- **Temperature Cycle2 (-65°C to +125°C)**
  - **<= +5.0 mOhms**----- 40 Points ----- Stable
  - **+5.1 to +10 mOhms** -----0 Points ----- Minor
  - **+10 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 (40 LLCR test points)**

- **Initial -----1.71 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms----- 40 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:**

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

**DATA SUMMARIES****MATING-UNMATING FORCE:****Mating-Unmating Durability Group (UMPS-05-05.5-G-VT-SM-WT-K / UMPT-05-06.5-G-VT-SM-WT-K)**

	Initial				After 250 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	26.82	6.03	15.70	3.53	31.31	7.04	22.68	5.10
Maximum	31.36	7.05	19.88	4.47	37.94	8.53	31.31	7.04
<b>Average</b>	28.77	<b>6.47</b>	18.07	<b>4.06</b>	34.67	<b>7.79</b>	26.08	<b>5.86</b>
St Dev	1.78	0.40	1.67	0.37	1.95	0.44	2.65	0.60
Count	8	8	8	8	8	8	8	8

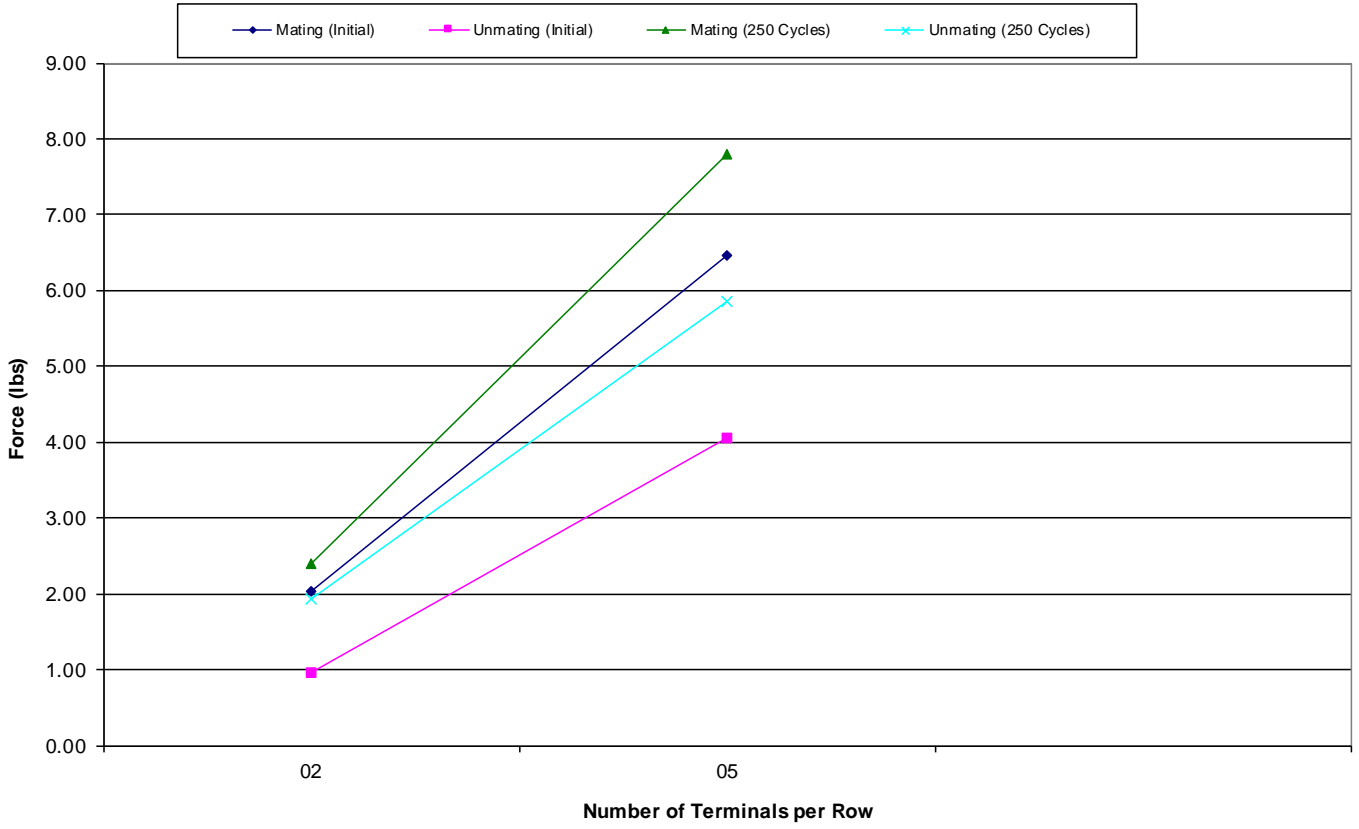
	After Humidity			
	Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	13.34	3.00	10.54	2.37
Maximum	15.88	3.57	12.54	2.82
<b>Average</b>	14.49	<b>3.26</b>	11.41	<b>2.57</b>
St Dev	1.05	0.24	0.63	0.14
Count	8	8	8	8

**Mating-Unmating Basic (UMPS-02-05.5-G-VT-SM-WT-K / UMPT-02-06.5-G-VT-SM-WT-K)**

	Initial				After 250 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	7.74	1.74	3.78	0.85	9.30	2.09	7.52	1.69
Maximum	10.63	2.39	5.25	1.18	14.14	3.18	9.47	2.13
<b>Average</b>	9.05	<b>2.04</b>	4.31	<b>0.97</b>	10.66	<b>2.40</b>	8.58	<b>1.93</b>
St Dev	0.98	0.22	0.52	0.12	1.68	0.38	0.75	0.17
Count	8	8	8	8	8	8	8	8

### DATA SUMMARIES Continued

#### Mating/Unmating Data for 02 and 05 Position UMPS/UMPT



**DATA SUMMARIES Continued****Temperature Cycling**

<b>Temperature Cycling Event Detection Summary</b>	
Contacts tested	40
Test Conditions	Continuity (Monitor for 1 Microsecond Interruptions Throughout)
Temperature	Min Temp = -65°C / Max Temp = 125°C
Dwell Time	30 Minutes at each Extreme
Ramp Rate	10°C/min
Total Events	No IPC Events Observed On The 8 Samples

**DWV @ Altitude**

<b>Altitude Tested = 70,000 feet</b>	
<b>Test Voltage= 300</b>	
<b>Mated</b>	
<b>UMPS / UMPT</b>	
<b>Pin to Pin</b>	<b>Pin to Weld Tab</b>
Passed	Passed
Passed	Passed
Passed	Passed

<b>Altitude Tested = 70,000 feet</b>	
<b>Test Voltage= 300</b>	
<b>Unmated</b>	
<b>UMPS</b>	
<b>Pin to Pin</b>	<b>Pin to Weld Tab</b>
Passed	Passed
Passed	Passed
Passed	Passed

<b>Altitude Tested = 70,000 feet</b>	
<b>Test Voltage= 300</b>	
<b>Unmated</b>	
<b>UMPT</b>	
<b>Pin to Pin</b>	<b>Pin to Weld Tab</b>
Passed	Passed
Passed	Passed
Passed	Passed



**DATA SUMMARIES Continued****Electrostatic Discharge:**

<b>Electrostatic Discharge (ESD) Summary</b>	
Assemblies tested	8
Test Conditions	Exposure to 5kV, 10kV, and 15kV (Repeated 10 Times)
5kV	No Damage
10kV	No Damage
15kV	No Damage
Pass/Fail	Pass

**DATA SUMMARIES Continued****LLCR Non-Operating Class Temperature Group:**

- 1) A total of 40 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

<b>LLCR Measurement Summaries by Pin Type</b>			
Date	1/21/2020	3/9/2020	3/13/2020
Room Temp (Deg C)	23	23	23
Rel Humidity (%)	34	34	33
Technician	Troy Cook	Troy Cook	Troy Cook
<b>mOhm values</b>	Actual	<b>Delta</b>	<b>Delta</b>
	Initial	After Temp Cycle-1	After Temp Cycle-2
<b>Pin Type: Signal 1</b>			
Average	1.42	0.17	0.18
St. Dev.	0.21	0.16	0.14
Min	1.04	0	0.01
Max	1.81	0.4	0.51
Summary Count	40	10	40
Total Count	40	40	40

<b>LLCR Delta Count by Category - Signal</b>						
<b>mOhms</b>	<b>Stable</b>	<b>Minor</b>	<b>Acceptable</b>	<b>Marginal</b>	<b>Unstable</b>	<b>Open</b>
	$\leq 5$	$>5$ & $\leq 10$	$>10$ & $\leq 15$	$>15$ & $\leq 50$	$>50$ & $\leq 1000$	$>1000$
<b>After Temp Cycle-1</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>After Temp Cycle-2</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**DATA SUMMARIES Continued**

**LLCR Mating/Unmating Durability Group**

- 1). A total of 40 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

<b>LLCR Measurement Summaries by Pin Type</b>				
	1/21/2020	1/27/2020	2/10/2020	3/3/2020
Date	1/21/2020	1/27/2020	2/10/2020	3/3/2020
Room Temp (Deg C)	23	23	22	22
Rel Humidity (%)	37	35	38	43
Technician	Troy Cook	Troy Cook	Troy Cook	Aaron McKim
<b>Pin Type 1: Signal</b>				
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta 250 Cycles</b>	<b>Delta Therm Shck</b>	<b>Delta Humidity</b>
Average	1.40	0.13	0.07	0.06
St. Dev.	0.12	0.12	0.07	0.07
Min	1.07	0.01	0.00	0.00
Max	1.60	0.53	0.29	0.30
Summary Count	40	40	40	40
Total Count	40	40	40	40

<b>LLCR Delta Count by Category</b>						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	$\leq 5$	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	$>1000$
<b>250 Cycles</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Therm Shck</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Humidity</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

### DATA SUMMARIES Continued

#### LLCR Shock & Vibration Group

- 1) A total of 40 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	1/22/2020	1/27/2020		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	34	38		
Technician	Troy Cook	Troy Cook		
<b>mOhm values</b>	<b>Actual</b>	<b>Delta</b>	<b>Delta</b>	<b>Delta</b>
	<b>Initial</b>	<b>Shock-Vib</b>		
Pin Type 1: Signal				
Average	1.46	0.12		
St. Dev.	0.12	0.12		
Min	1.22	0.00		
Max	1.71	0.48		
Summary Count	40	40		
Total Count	40	40		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	$\leq 5$	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	$>1000$
<b>Shock-Vib</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

#### Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	32
Test Condition	C, 40g's, 11ms, Half-Sine
Shock Events	0
Test Condition	V-B, 12.0 rms g, 1 Hr./Axis
Vibration Events	0
<b>Total Events</b>	<b>0</b>

**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