<table>
<thead>
<tr>
<th>Project Number: Severe Environment Test Report</th>
<th>Tracking Code: 2039923_Report_Rev_1</th>
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<tbody>
<tr>
<td>Requested by: Stephen Brutscher</td>
<td>Date: 11/21/2019</td>
</tr>
<tr>
<td>Part #: TSM-140-01-S-DV/SSM-140-S-DV</td>
<td></td>
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<tr>
<td>Part description: TSM/SSM</td>
<td>Tech: Scott Rollefstad</td>
</tr>
<tr>
<td>Test Start: 9/4/2019</td>
<td>Test Completed: 10/5/2019</td>
</tr>
</tbody>
</table>

SEVERE ENVIRONMENT TEST REPORT

TSM/SSM
TSM-140-01-S-DV/SSM-140-S-DV
## REVISION HISTORY

<table>
<thead>
<tr>
<th>DATA</th>
<th>REV.NUM.</th>
<th>DESCRIPTION</th>
<th>ENG</th>
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<tbody>
<tr>
<td>11/21/2019</td>
<td>1</td>
<td>Initial Issue</td>
<td>KH</td>
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</tbody>
</table>
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 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 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-110069-TST
# 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%.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Step</th>
<th>Description</th>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>LLCR (2)</td>
<td>1.</td>
<td>Mating/Unmating Force (1)</td>
<td>1.</td>
<td>Mating/Unmating Force (1)</td>
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<tr>
<td>5.</td>
<td>Thermal Shock (4)</td>
<td>5.</td>
<td>Humidity (1) - Non Standard</td>
<td>5.</td>
<td>Humidity (1) - Non Standard</td>
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<tr>
<td>6.</td>
<td>LLCR (2)</td>
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<tr>
<td>7.</td>
<td>Max Delta = 15 mOhm</td>
<td>7.</td>
<td>Max Delta = 15 mOhm</td>
<td>7.</td>
<td>Max Delta = 15 mOhm</td>
</tr>
</tbody>
</table>

(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 = 1 (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)
FLOWCHARTS Continued

Mechanical Shock/Random Vibration/LLCR

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSM-140-01-S-DV</td>
<td>TSM-140-01-S-DH</td>
</tr>
<tr>
<td>SSM-140-S-DV</td>
<td>SSM-140-S-DV</td>
</tr>
<tr>
<td>8 Assemblies</td>
<td>8 Assemblies</td>
</tr>
<tr>
<td>VITA 47.1 (V To V)</td>
<td>VITA 47.1 (DH To V)</td>
</tr>
</tbody>
</table>

Step | Description |
---|---|
1. | LLCR (a) |
2. | Mechanical Shock (2) - Non Standard |
3. | Random Vibration (3) - Non Standard |
   | Note: Conditions: |
   | 1) 5 Hz to 100 Hz, PSD increasing at 36B/octave |
   | 2) 100 Hz to 1000 Hz 0.10 g²/Hz |
   | 3) 1000 Hz to 2000 Hz PSD decreasing at 36B/octave |
4. | LLCR (a) |
   | Max Delta = 15 mΩ/m |

---

(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 02

(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

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSM-140-01-S-DV</td>
<td>TSM-140-01-S-DH</td>
</tr>
<tr>
<td>SSM-140-S-DV</td>
<td>SSM-140-S-DV</td>
</tr>
<tr>
<td>8 Assemblies</td>
<td>8 Assemblies</td>
</tr>
<tr>
<td>VITA 47.1 (V To V)</td>
<td>VITA 47.1 (DH To V)</td>
</tr>
</tbody>
</table>

Step | Description |
---|---|
1. | Nanosecond Event Detection (Mechanical Shock) (1) - Non Standard |
2. | Nanosecond Event Detection (Random Vibration) (2) - Non Standard |
   | Note: Conditions: |
   | 1) 5 Hz to 100 Hz, PSD increasing at 36B/octave |
   | 2) 100 Hz to 1000 Hz 0.10 g²/Hz |
   | 3) 1000 Hz to 2000 Hz PSD decreasing at 36B/octave |

---

(1) Nanosecond Event Detection (Mechanical Shock) = Other
Use EIA-364-4 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 100mV)
40G, 11 milliseconds, Half Sine

(2) Nanosecond Event Detection (Random Vibration) = Other
Use EIA-364-4 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 100mV)
Random Vibration: 12 G RMS; 5Hz to 2000Hz, 1 Hours/Axis, Vibration Class V3 VITA 47.1
Temperature Cycling

Group 1
TSM-140-01-S-DV
SSM-140-S-DV
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

Non-Operating Class Temperature

VITA 47.1

Group 1
TSM-140-01-S-DV
SSM-140-S-DV
8 Assemblies
Non-Operating Class Temperature

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

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

**DWV @ Altitude**

*Pin to Pin*

**Group 1**
- TSM-140-01-S-DV
- SSM-140-S-DV
- 3 Assemblies
- Custom Group

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

---

**Row to Row**

**Group 2**
- TSM-140-01-S-DV
- SSM-140-S-DV
- 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: 110K
   - 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: 110K
   - DWV test voltage is equal to 75% of the lowest breakdown voltage
   - Test voltage applied for 60 seconds

**Electrostatic Discharge (ESD)**

**Group 1**
- TSM-140-01-S-DV
- SSM-140-S-DV
- 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: Other, Humidity Test Procedure for Electrical Connectors.
2) Test Condition, 240 Hours.
3) Method, +25°C to + 65°C, 95% to 100% Relative Humidity excluding sub-cycles 7a.
4) All samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

MATING/UNMATING:
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.

MECHANICAL SHOCK (Specified Pulse):
1) Reference document: Other, Mechanical Shock Test Procedure for Electrical Connectors
2) Test Condition: OS2
3) Peak Value: 40 G
4) Duration: 11 Milliseconds
5) Wave Form: Half Sine
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: 0.04 G² / 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.

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 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:
   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 (TSM-140-01-S-DV/SSM-140-S-DV)

- **Initial**
  - Mating
    - Min: 14.61 lbs
    - Max: 18.65 lbs
  - Unmating
    - Min: 12.52 lbs
    - Max: 14.05 lbs
- **After 250 Cycles**
  - Mating
    - Min: 19.73 lbs
    - Max: 25.18 lbs
  - Unmating
    - Min: 17.87 lbs
    - Max: 22.56 lbs
- **After Humidity**
  - Mating
    - Min: 14.00 lbs
    - Max: 18.21 lbs
  - Unmating
    - Min: 12.77 lbs
    - Max: 15.41 lbs

#### Mating Unmating Basic Group (TSM-125-01-S-DV/SSM-125-S-DV)

- **Initial**
  - Mating
    - Min: 8.74 lbs
    - Max: 10.39 lbs
  - Unmating
    - Min: 6.78 lbs
    - Max: 8.28 lbs
- **After 250 Cycles**
  - Mating
    - Min: 13.79 lbs
    - Max: 17.75 lbs
  - Unmating
    - Min: 12.26 lbs
    - Max: 15.86 lbs

#### Mating Unmating Basic Group (TSM-105-01-S-DV/SSM-105-S-DV)

- **Initial**
  - Mating
    - Min: 1.81 lbs
    - Max: 4.10 lbs
  - Unmating
    - Min: 1.34 lbs
    - Max: 1.53 lbs
- **After 250 Cycles**
  - Mating
    - Min: 2.60 lbs
    - Max: 3.18 lbs
  - Unmating
    - Min: 2.30 lbs
    - Max: 2.83 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

   Row to Row
   • DWV --------------------------------------Passed

   Un Mated
   Pin to Pin
   • DWV --------------------------------------Passed

   Row to Row
   • DWV --------------------------------------Passed

Electrostatic Discharge

   5kV
   • No Damage --------------------------------------Passed

   10kV
   • No Damage --------------------------------------Passed

   15kV
   • No Damage --------------------------------------Passed
RESULTS Continued

LLCR Mating Unmating Durability Group (192 LLCR test points)

- Initial

  5.52 mOhms Max

- Durability, 250 Cycles

  - Initial

  - <= +5.0 mOhms
  - +5.1 to +10 mOhms
  - +10.1 to +15.0 mOhms
  - +15.1 to +50.0 mOhms
  - +50.1 to +1000 mOhms
  - >+1000 mOhms

  192 Points Stable
  0 Points Minor
  0 Points Marginal
  0 Points Unstable
  0 Points Open Failure

- Thermal Shock

  - <= +5.0 mOhms
  - +5.1 to +10 mOhms
  - +10.1 to +15.0 mOhms
  - +15.1 to +50.0 mOhms
  - +50.1 to +1000 mOhms
  - >+1000 mOhms

  192 Points Stable
  0 Points Minor
  0 Points Marginal
  0 Points Unstable
  0 Points Open Failure

- Humidity

  - <= +5.0 mOhms
  - +5.1 to +10 mOhms
  - +10.1 to +15.0 mOhms
  - +15.1 to +50.0 mOhms
  - +50.1 to +1000 mOhms
  - >+1000 mOhms

  192 Points Stable
  0 Points Minor
  0 Points Marginal
  0 Points Unstable
  0 Points Open Failure
RESULTS Continued

LLCR Vibration and Mechanical Shock Group (192 LLCR test points)
Group 1 TSM-140-01-S-DV/SSM-140-S-DV (V to V)
- Initial ---------------------------------5.70 mOhms Max
- Shock and Vibe
  - <= +5.0 mOhms------------------------192 Points Stable
  - +5.1 to +10 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

Group 2 TSM-140-01-S-DH/SSM-140-S-DV (DH to V)
- Initial ---------------------------------7.06 mOhms Max
- Shock and Vibe
  - <= +5.0 mOhms------------------------192 Points Stable
  - +5.1 to +10 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
RESULTS Continued

LLCR Non-Operating Class Temperature Group (192 LLCR test points)

- Initial --------------------------------------------------------------6.24 mOhms Max
- Temperature Cycle1 (-55°C to +105°C)
  - <= +5.0 mOhms--------------------------------- 192 Points ----------------- Stable
  - +5.1 to +10 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

- Temperature Cycle2 (-65°C to +125°C)
  - <= +5.0 mOhms--------------------------------- 192 Points ----------------- Stable
  - +5.1 to +10 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
### DATA SUMMARIES

#### Mating/Unmating: Mating Unmating Durability Group

**TSM-140-01-S-DV/SSM-140-S-DV**

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>250 Cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mating</td>
<td>Unmating</td>
</tr>
<tr>
<td></td>
<td>Newtons Force (Lbs)</td>
<td>Newtons Force (Lbs)</td>
</tr>
<tr>
<td>Minimum</td>
<td>64.97 14.61</td>
<td>55.68 12.52</td>
</tr>
<tr>
<td>Maximum</td>
<td>82.97 18.65</td>
<td>62.48 14.05</td>
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<tr>
<td>Average</td>
<td>74.08 16.65</td>
<td>58.28 13.10</td>
</tr>
<tr>
<td>St Dev</td>
<td>6.48 1.46</td>
<td>2.60 0.58</td>
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<td>Count</td>
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**After Humidity**

<table>
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<tr>
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<th>Unmating</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Newtons Force (Lbs)</td>
<td>Newtons Force (Lbs)</td>
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<tr>
<td>Minimum</td>
<td>62.28 14.00</td>
<td>56.80 12.77</td>
</tr>
<tr>
<td>Maximum</td>
<td>81.02 18.21</td>
<td>68.53 15.41</td>
</tr>
<tr>
<td>Average</td>
<td>73.41 16.51</td>
<td>64.17 14.43</td>
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<tr>
<td>St Dev</td>
<td>6.93 1.56</td>
<td>3.71 0.83</td>
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<td>Count</td>
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</table>

#### Mating Unmating Basic Group

**TSM-125-01-S-DV/SSM-125-S-DV**

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>250 Cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mating</td>
<td>Unmating</td>
</tr>
<tr>
<td></td>
<td>Newtons Force (Lbs)</td>
<td>Newtons Force (Lbs)</td>
</tr>
<tr>
<td>Minimum</td>
<td>38.87 8.74</td>
<td>30.17 6.78</td>
</tr>
<tr>
<td>Maximum</td>
<td>46.22 10.39</td>
<td>36.82 8.28</td>
</tr>
<tr>
<td>Average</td>
<td>42.86 9.64</td>
<td>33.26 7.48</td>
</tr>
<tr>
<td>St Dev</td>
<td>2.57 0.58</td>
<td>2.49 0.56</td>
</tr>
<tr>
<td>Count</td>
<td>8 8 8 8 8 8 8 8</td>
<td></td>
</tr>
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</table>

**TSM-105-01-S-DV/SSM-105-S-DV**

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>250 Cycles</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mating</td>
<td>Unmating</td>
</tr>
<tr>
<td></td>
<td>Newtons Force (Lbs)</td>
<td>Newtons Force (Lbs)</td>
</tr>
<tr>
<td>Minimum</td>
<td>8.05 1.81</td>
<td>5.95 1.34</td>
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<tr>
<td>Maximum</td>
<td>18.23 4.10</td>
<td>6.81 1.53</td>
</tr>
<tr>
<td>Average</td>
<td>10.60 2.38</td>
<td>6.41 1.44</td>
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<tr>
<td>St Dev</td>
<td>3.17 0.71</td>
<td>0.29 0.07</td>
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<tr>
<td>Count</td>
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</table>
DATA SUMMARIES Continued

Temperature Cycling

Temperature Cycling Event Detection Summary

<table>
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<tr>
<th>Contacts tested</th>
<th>640</th>
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<tbody>
<tr>
<td>Test Conditions</td>
<td>Continuity (Monitor for 1 MicroSecond Interruptions Throughout)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Min Temp = -65°C / Max Temp = 125°C</td>
</tr>
<tr>
<td>Dwell Time</td>
<td>30 Minutes at each Extreme</td>
</tr>
<tr>
<td>Ramp Rate</td>
<td>10°C/min</td>
</tr>
<tr>
<td>Total Events</td>
<td>0</td>
</tr>
</tbody>
</table>

DWV @ Altitude

Altitude Tested = 70,000 feet

Test Voltage= 300

<table>
<thead>
<tr>
<th>Pin to Pin</th>
<th>Row to Row</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mated</td>
<td>Mated</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
</tbody>
</table>

Altitude Tested at = 70,000 feet

Test Voltage= 300

<table>
<thead>
<tr>
<th>Pin to Pin</th>
<th>Row to Row</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un Mated</td>
<td>Un Mated</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
<tr>
<td>Passed</td>
<td>Passed</td>
</tr>
</tbody>
</table>

Electrostatic Discharge

Electrostatic Discharge (ESD) Summary

<table>
<thead>
<tr>
<th>Assemblies tested</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Conditions</td>
<td>Exposure to 5kV, 10kV, and 15kV (Repeated 10 Times)</td>
</tr>
<tr>
<td>5kV</td>
<td>No Damage</td>
</tr>
<tr>
<td>10kV</td>
<td>No Damage</td>
</tr>
<tr>
<td>15kV</td>
<td>No Damage</td>
</tr>
<tr>
<td>Pass/Fail</td>
<td>Pass</td>
</tr>
</tbody>
</table>
**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 $+10$ 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

<table>
<thead>
<tr>
<th>Date</th>
<th>9/4/2019</th>
<th>9/5/2019</th>
<th>9/16/2019</th>
<th>10/2/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Temp (Deg C)</td>
<td>22</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Rel Humidity (%)</td>
<td>53</td>
<td>47</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>Technician</td>
<td>Scott Rollefstad</td>
<td>Scott Rollefstad</td>
<td>Tony Wagoner</td>
<td>Scott Rollefstad</td>
</tr>
<tr>
<td>mOhm values</td>
<td>Actual Initial</td>
<td>Delta 250 Cycles</td>
<td>Delta Therm Shck</td>
<td>Delta Humidity</td>
</tr>
<tr>
<td>Pin Type 1: Signal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>4.90</td>
<td>0.14</td>
<td>0.27</td>
<td>0.31</td>
</tr>
<tr>
<td>St. Dev.</td>
<td>0.24</td>
<td>0.10</td>
<td>0.16</td>
<td>0.21</td>
</tr>
<tr>
<td>Min</td>
<td>4.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Max</td>
<td>5.52</td>
<td>0.59</td>
<td>0.85</td>
<td>1.44</td>
</tr>
<tr>
<td>Summary Count</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>192</td>
</tr>
<tr>
<td>Total Count</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>192</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>mOhms</th>
<th>Stable &lt;=5</th>
<th>Minor &gt;5 &amp; &lt;=10</th>
<th>Acceptable &gt;10 &amp; &lt;=15</th>
<th>Marginal &gt;15 &amp; &lt;=50</th>
<th>Unstable &gt;50 &amp; &lt;=1000</th>
<th>Open &gt;1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 Cycles</td>
<td>192</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Therm Shck</td>
<td>192</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Humidity</td>
<td>192</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
DATA SUMMARIES Continued

LLCR Vibration and Mechanical Shock 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 mOhms: -------------------Minor
   c. +7.6 to +10.0 mOhms: -------------------Acceptable
   d. +10.1 to +50.0 mOhms: -------------------Marginal
   e. +50.1 to +1000 mOhms: -------------------Unstable
   f. >+1000 mOhms: -------------------Open Failure

Group 1 TSM-140-01-S-DV/SSM-140-S-DV (V to V)

<table>
<thead>
<tr>
<th>Date</th>
<th>Room Temp (Deg C)</th>
<th>Rel Humidity (%)</th>
<th>Technician</th>
<th>mOhm values</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/11/2019</td>
<td>23</td>
<td>51</td>
<td>Scott Rollefstad</td>
<td>Actual</td>
</tr>
<tr>
<td>9/26/2019</td>
<td>23</td>
<td>47</td>
<td>Scott Rollefstad</td>
<td>Initial</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin Type 1: Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>St. Dev.</td>
</tr>
<tr>
<td>Min</td>
</tr>
<tr>
<td>Max</td>
</tr>
</tbody>
</table>

| Summary Count | 192 | 192 |
| Total Count | 192 | 192 |

LLCR Delta Count by Category

<table>
<thead>
<tr>
<th>mOhms</th>
<th>Stable</th>
<th>Minor</th>
<th>Acceptable</th>
<th>Marginal</th>
<th>Unstable</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock-Vib</td>
<td>192</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Nanosecond Event Detection:

<table>
<thead>
<tr>
<th>Shock and Vibration Event Detection Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacts tested</td>
</tr>
<tr>
<td>Test Condition</td>
</tr>
<tr>
<td>Shock Events</td>
</tr>
<tr>
<td>Test Condition</td>
</tr>
<tr>
<td>Vibration Events</td>
</tr>
<tr>
<td>Total Events</td>
</tr>
</tbody>
</table>
### DATA SUMMARIES Continued

**Group 2 TSM-140-01-S-DH/SSM-140-S-DV (DH to V)**

<table>
<thead>
<tr>
<th>Date</th>
<th>10/1/2019</th>
<th>10/3/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Temp (Deg C)</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Rel Humidity (%)</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>Technician</td>
<td>Scott Rollefstad</td>
<td>Scott Rollefstad</td>
</tr>
</tbody>
</table>

**mOhm values**

<table>
<thead>
<tr>
<th>Pin Type 1: Signal</th>
<th>Actual</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Shock-Vib</td>
</tr>
<tr>
<td>Average</td>
<td>5.58</td>
<td>0.23</td>
</tr>
<tr>
<td>St. Dev.</td>
<td>0.68</td>
<td>0.32</td>
</tr>
<tr>
<td>Min</td>
<td>4.48</td>
<td>0</td>
</tr>
<tr>
<td>Max</td>
<td>7.06</td>
<td>3.29</td>
</tr>
<tr>
<td>Summary Count</td>
<td>192</td>
<td>192</td>
</tr>
<tr>
<td>Total Count</td>
<td>192</td>
<td>192</td>
</tr>
</tbody>
</table>

**LLCR Delta Count by Category**

<table>
<thead>
<tr>
<th>mOhms</th>
<th>Stable</th>
<th>Minor</th>
<th>Acceptable</th>
<th>Marginal</th>
<th>Unstable</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock-Vib</td>
<td>&lt;=5</td>
<td>&gt;5 &amp; &lt;=10</td>
<td>&gt;10 &amp; &lt;=15</td>
<td>&gt;15 &amp; &lt;=50</td>
<td>&gt;50 &amp; &lt;=1000</td>
<td>&gt;1000</td>
</tr>
<tr>
<td></td>
<td>192</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Nanosecond Event Detection:**

**Shock and Vibration Event Detection Summary**

| Contacts tested | 60 |
| Test Condition  | F, 40g's, 11ms, Half-Sine |
| Shock Events    | 0 |
| Test Condition  | V3 VITA 47.1, 12 G 'RMS', 5Hz to 2000Hz |
| Vibration Events| 0 |
| Total Events    | 0 |
DATA SUMMARIES Continued

LLCR Non-Operating Class Temperature 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 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

<table>
<thead>
<tr>
<th>Date</th>
<th>Room Temp (Deg C)</th>
<th>Rel Humidity (%)</th>
<th>Technician</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/10/2019</td>
<td>23</td>
<td>51</td>
<td>Scott Rollefstad</td>
</tr>
<tr>
<td>9/30/2019</td>
<td>23</td>
<td>50</td>
<td>Scott Rollefstad</td>
</tr>
<tr>
<td>10/5/2019</td>
<td>22</td>
<td>40</td>
<td>Tony Wagoner</td>
</tr>
</tbody>
</table>

| LLR Delta Count by Category - Signal |
|---|---|---|---|---|---|---|
| mOhms | Stable | Minor | Acceptable | Marginal | Unstable | Open |
| Temp Cycle 1 | <=5 | 192 | 0 | 0 | 0 | 0 |
| | >5 & <=10 | 0 | 0 | 0 | 0 | 0 |
| | >10 & <=15 | 0 | 0 | 0 | 0 | 0 |
| | >15 & <=50 | 0 | 0 | 0 | 0 | 0 |
| | >50 & <=1000 | 0 | 0 | 0 | 0 | 0 |
| | >1000 | 0 | 0 | 0 | 0 | 0 |

| Pin Type 1: Signal |
|---|---|---|---|
| Actual | Delta | Delta |
| Initial | Temp Cycle 1 | Temp Cycle 2 |
| Average | 4.99 | 0.51 | 0.55 |
| St. Dev. | 0.32 | 0.29 | 0.28 |
| Min | 4.01 | 0.03 | 0.02 |
| Max | 6.24 | 2.13 | 1.93 |
| Summary Count | 192 | 192 | 192 |
| Total Count | 192 | 192 | 192 |
## EQUIPMENT AND CALIBRATION SCHEDULES

<table>
<thead>
<tr>
<th>Equipment #</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Serial #</th>
<th>Accuracy</th>
<th>Last Cal</th>
<th>Next Cal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCT-04</td>
<td>Dillon Quantrol TC21 25-1000 mm/min series test stand</td>
<td>Dillon Quantrol</td>
<td>TC2 I series test stand</td>
<td>04-1041-04</td>
<td>Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;</td>
<td>05/29/2019</td>
<td>05/29/2020</td>
</tr>
<tr>
<td>MO-11</td>
<td>Switch/Multimeter</td>
<td>Keithley</td>
<td>3706</td>
<td>120169</td>
<td>See Manual</td>
<td>09/11/2019</td>
<td>09/11/2020</td>
</tr>
<tr>
<td>THC-05</td>
<td>Temperature/Humidity Chamber (Chamber Room)</td>
<td>Thermotron</td>
<td>SM-8-3800</td>
<td>05 23 00 02</td>
<td>See Manual</td>
<td>05/31/2019</td>
<td>11/30/2019</td>
</tr>
<tr>
<td>TSC-01</td>
<td>Vertical Thermal Shock Chamber</td>
<td>Cincinnati Sub Zero</td>
<td>VTS-3-6-6-SC/AC</td>
<td>10-VT14993</td>
<td>See Manual</td>
<td>06/30/2019</td>
<td>06/30/2020</td>
</tr>
<tr>
<td>HPT-01</td>
<td>Hipot Safety Tester</td>
<td>Vitrek</td>
<td>V73</td>
<td>019808</td>
<td>See Manual</td>
<td>05/15/2019</td>
<td>05/15/2020</td>
</tr>
<tr>
<td>OV-05</td>
<td>Forced Air Oven, 5 Cu. Ft., 120 V (Chamber Room)</td>
<td>Sheldon Mfg.</td>
<td>CE5F</td>
<td>02008008</td>
<td>+/- 5 deg. C</td>
<td>02/05/2019</td>
<td>02/05/2020</td>
</tr>
</tbody>
</table>
EQUIPMENT AND CALIBRATION SCHEDULES

**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 #:** 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: 10/31/2018, Next Cal: 10/31/2019