



|   |                            |                       |                                     |
|---|----------------------------|-----------------------|-------------------------------------|
| Project Number: Design Qualification Test Report              |                            | Tracking Code: 197421 |                                     |
| Requested by: James Borgelt                                   |                            | Date: 5/7/2012        | Product Rev: N/A                    |
| Part #: ACP-16-04-H-00.35-T-S-P-3\ ACR-16-04-H-00.35-S-S1-P-3 |                            | Lot #: N/A            | Tech: Craig Ryan<br>Eng: Eric Mings |
| Part description: ACP\ACR                                     |                            |                       | Qty to test: 30                     |
| Test Start: 05/11/2012  | Test Completed: 09/28/2012 |                       |                                     |



**DESIGN QUALIFICATION TEST REPORT**

**ACP-16-04-H-00.35-T-S-P-3  
ACR-16-04-H-00.35-S-S1-P-3**

## 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: Design Qualification 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) 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) Samtec Test PCBs used: PCB-103219-TST-XX

**FLOWCHARTS****Gas Tight**

| <b>TEST<br/>STEP</b> | <b>GROUP A1<br/>8 Assemblies</b> |
|----------------------|----------------------------------|
| <b>01</b>            | LLCR-1                           |
| <b>02</b>            | Gas Tight                        |
| <b>03</b>            | LLCR-2                           |

Gas Tight = EIA-364-36A

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

**Thermal Aging**

| <b>TEST<br/>STEP</b> | <b>GROUP A1<br/>8 Boards<br/>Thermal Aging (Mated)</b> |
|----------------------|--|
| <b>01</b>            | Forces - Mating / Unmating                             |
| <b>02</b>            | LLCR-1   |
| <b>03</b>            | Thermal Aging<br>(Mated and Undisturbed)               |
| <b>04</b>            | LLCR-2   |
| <b>05</b>            | Forces - Mating / Unmating                             |

Thermal Aging = EA-364-17, Test Condition 4 (105°C)

Time Condition 'B' (250 Hours)

Mating / Unmating Forces = EA-364-13

LLCR = EA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

**FLOWCHARTS Continued****IR & DWV**

| <b>TEST STEP</b> | <b>GROUP A1<br/>2 Mated Sets<br/>24 AWG to 24 AWG</b>                                  | <b>GROUP B1<br/>2 Mated Sets<br/>RF-to-Ground</b>                                      | <b>GROUP C1<br/>2 Mated Sets<br/>24 AWG-to-Ground</b>                                  |
|------------------|--|--|--|
| <b>01</b>        | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 375V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) |
| <b>02</b>        | Thermal Shock<br>(Mated and Undisturbed)   | Thermal Shock<br>(Mated and Undisturbed)   | Thermal Shock<br>(Mated and Undisturbed)   |
| <b>03</b>        | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 375V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) |
| <b>04</b>        | Cyclic Humidity<br>(Mated and Undisturbed)   | Cyclic Humidity<br>(Mated and Undisturbed)   | Cyclic Humidity<br>(Mated and Undisturbed)   |
| <b>05</b>        | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 375V test voltage<br>(on both mated sets and on<br>each connector unmated) | IR & DWV at 900V test voltage<br>(on both mated sets and on<br>each connector unmated) |

**DWV on Group B1 to be performed at Test Voltage**

DWV test voltage is equal to 75% of the lowest break down voltage from Groups A1, A2 or A3

Thermal Shock = EIA-364-32, Table II, Test Condition I:

-55°C to +85°C 1/2 hour dwell, 100 cycles

Humidity = EIA-364-31, Test Condition B (240 Hours)

and Method III (+25°C to +65°C @ 90% RH to 98% RH)

ambient pre-condition and delete steps 7a and 7b

IR = EIA-364-21

DWV = EIA-364-20, Test Condition 1

**FLOWCHARTS Continued****Durability/Mating/Unmating/Gaps**

| <b>TEST<br/>STEP</b> | <b>GROUP A1<br/>6 Assemblies</b>           |
|----------------------|--|
| 02                   | LLCR-1                                     |
| 03                   | Forces - Mating / Unmating                 |
| 04                   | 25 Cycles                                  |
| 05                   | Forces - Mating / Unmating                 |
| 06                   | 25 Cycles (50 Total)                       |
| 07                   | Forces - Mating / Unmating                 |
| 08                   | 25 Cycles (75 Total)                       |
| 09                   | Forces - Mating / Unmating                 |
| 10                   | 25 Cycles (100 Total)                      |
| 11                   | Forces - Mating / Unmating                 |
| 12                   | Clean w/Compressed Air                     |
| 14                   | LLCR-2                                     |
| 15                   | Thermal Shock<br>(Mated and Undisturbed)   |
| 16                   | LLCR-3                                     |
| 17                   | Cyclic Humidity<br>(Mated and Undisturbed) |
| 18                   | LLCR-4                                     |
| 19                   | Forces - Mating / Unmating                 |

**Thermal Shock = EIA-364-32, Table II, Test Condition I:**

**-55°C to +85°C 1/2 hour dwell, 100 cycles**

**Humidity = EIA-364-31, Test Condition B (240 Hours)**

**and Method III (+25°C to +65°C @ 90% RH to 98% RH)**

**ambient pre-condition and delete steps 7a and 7b**

**Mating / Unmating Forces = EIA-364-13**

**LLCR = EIA-364-23, LLCR**

**20 mV Max, 100 mA Max**

**Use Keithley 580 or 3706 in 4 wire dry circuit mode**

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### THERMAL SHOCK:

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

### THERMAL:

- 1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors*.
- 2) Test Condition 4 at 105° C.
- 3) Test Time Condition B for 250 hours.
- 4) All test samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

### HUMIDITY:

- 1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors*.
- 2) Test Condition B, 240 Hours.
- 3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
- 4) All samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

### 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. <= +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 +2000 mOhms:----- Unstable
  - f. >+2000 mOhms:----- Open Failure

### INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

- 1) PROCEDURE:
  - a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
  - b. Test Conditions:
    - i. Between Adjacent Contacts or Signal-to-Ground
    - ii. Electrification Time 2.0 minutes
    - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
- 2) MEASUREMENTS:
  - a. When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

## ATTRIBUTE DEFINITIONS Continued

### 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).

### GAS TIGHT:

To provide method for evaluating the ability of the contacting surfaces in preventing penetration of harsh vapors which might lead to oxide formation that may degrade the electrical performance of the contact system.

- 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  $+2000$  mOhms:----- Unstable
  - f.  $>+2000$  mOhms:----- Open Failure
- 4) Procedure:
  - a. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
  - b. Test Conditions:
    - i. Class II--- Mated pairs of contacts assembled to their plastic housings.
    - ii. Reagent grade Nitric Acid shall be used of sufficient volume to saturate the test chamber
    - iii. The ratio of the volume of the test chamber to the surface area of the acid shall be 10:1.
    - iv. The chamber shall be saturated with the vapor for at least 15 minutes before samples are added.
    - v. Exposure time, 55 to 65 minutes.
    - vi. The samples shall be no closer to the chamber walls than 1 inches and no closer to the surface of the acid than 3 inches.
    - vii. The samples shall be dried after exposure for a minimum of 1 hour.
    - viii. Drying temperature  $50^{\circ}$  C
    - ix. The final LLCR shall be conducted within 1 hour after drying.

## RESULTS

### Mating – Unmating Forces

#### Thermal Aging group

- **Initial**
  - **Mating**
    - **Min** -----2.96 Lbs
    - **Max** -----4.45 Lbs
  - **Unmating**
    - **Min** -----2.20 Lbs
    - **Max** -----2.82 Lbs
- **After Thermal Aging**
  - **Mating**
    - **Min** -----3.33 Lbs
    - **Max** -----5.11 Lbs
  - **Unmating**
    - **Min** -----1.30 Lbs
    - **Max** -----3.44 Lbs

**RESULTS Continued****Mating\Unmating Durability Group**

- **Initial**
  - **Mating**
    - **Min** -----3.29 Lbs
    - **Max** -----4.42 Lbs
  - **Unmating**
    - **Min** -----2.24 Lbs
    - **Max** -----2.91 Lbs
- **After 25 Cycles**
  - **Mating**
    - **Min** -----4.44 Lbs
    - **Max** -----6.30 Lbs
  - **Unmating**
    - **Min** -----2.67 Lbs
    - **Max** -----4.07 Lbs
- **After 50 Cycles**
  - **Mating**
    - **Min** -----5.00 Lbs
    - **Max** -----6.88 Lbs
  - **Unmating**
    - **Min** -----3.01 Lbs
    - **Max** -----4.59 Lbs
- **After 75 Cycles**
  - **Mating**
    - **Min** -----5.32 Lbs
    - **Max** -----7.15 Lbs
  - **Unmating**
    - **Min** -----3.23 Lbs
    - **Max** -----4.75 Lbs
- **After 100 Cycles**
  - **Mating**
    - **Min** -----5.50 Lbs
    - **Max** -----6.88 Lbs
  - **Unmating**
    - **Min** -----3.47 Lbs
    - **Max** -----4.83 Lbs
- **After Humidity**
  - **Mating**
    - **Min** -----3.56 Lbs
    - **Max** -----4.34 Lbs
  - **Unmating**
    - **Min** -----2.70 Lbs
    - **Max** -----3.23 Lbs

**RESULTS Continued**

**Insulation Resistance minimums, IR**

**24 AWG Signal to 24 AWG Signal:**

- **Initial**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Thermal**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Humidity**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass

**24 AWG Signal to Ground:**

- **Initial**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Thermal**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Humidity**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass

**RF to Ground:**

- **Initial**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Thermal**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Humidity**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass

**Ground to Ground:**

- **Initial**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Thermal**
  - Mated ----- 100000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass
- **Humidity**
  - Mated ----- 15000 Meg Ohms ----- Pass
  - Unmated----- 100000 Meg Ohms ----- Pass

**RESULTS Continued**

**Dielectric Withstanding Voltage minimums, DWV**

- **Minimums**
  - **Test Voltage 24AWG to 24AWG ----- 900 VAC**
  - **Working Voltage ----- 300 VAC**
  
  - **Test Voltage 24AWG to Ground ----- 900VAC**
  - **Working Voltage ----- 300VAC**
  
  - **Test Voltage RF Signal to Ground ----- 375VAC**
  - **Working Voltage ----- 125VAC**
  
  - **Test Voltage Ground to Ground----- 900VAC**
  - **Working Voltage ----- 300VAC**

**24 AWG Signal to 24 AWG Signal:**

- **Initial DWV ----- Passed**
- **Thermal DWV ----- Passed**
- **Humidity DWV ----- Passed**

**24 AWG Signal to Ground:**

- **Initial DWV ----- Passed**
- **Thermal DWV ----- Passed**
- **Humidity DWV ----- Passed**

**RF to Ground:**

- **Initial DWV ----- Passed**
- **Thermal DWV ----- Passed**
- **Humidity DWV ----- Passed**

**Ground to Ground:**

- **Initial DWV ----- Passed**
- **Thermal DWV ----- Passed**
- **Humidity DWV ----- Passed**

**LLCR:**

**LLCR Gas Tight – 24 AWG (16 pin LLCR test points)**

- **Initial ----- 51.96 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable**
  - **>+2000 mOhms ----- 0 Points -----Open Failure**

**LLCR Gas Tight – RF Signal (16 pin LLCR test points)**

- **Initial** ----- 165.58 mOhms Max
- **Gas-Tight**
  - **<= +5.0 mOhms**----- 16 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 +2000 mOhms**----- 0 Points -----Unstable
  - **>+2000 mOhms** ----- 0 Points -----Open Failure

**RESULTS Continued**

**LLCR Gas Tight – RF Ground (16 pin LLCR test points)**

- **Initial** ----- 18.71 mOhms Max
- **Gas-Tight**
  - **<= +5.0 mOhms**----- 16 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 +2000 mOhms**----- 0 Points -----Unstable
  - **>+2000 mOhms** ----- 0 Points -----Open Failure

**LLCR Thermal Aging – 24AWG (16 pin LLCR test points)**

- **Initial** ----- 52.16 mOhms Max
- **Thermal Aging**
  - **<= +5.0 mOhms**----- 16 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 +2000 mOhms**----- 0 Points -----Unstable
  - **>+2000 mOhms** ----- 0 Points -----Open Failure

**LLCR Thermal Aging – RF Signal (15 pin LLCR test points)**

- **Initial** ----- 194.23 mOhms Max
- **Thermal Aging**
  - **<= +5.0 mOhms**----- 14 Points -----Stable
  - **+5.1 to +10.0 mOhms** ----- 0 Points -----Minor
  - **+10.1 to +15.0 mOhms**----- 1 Points -----Acceptable
  - **+15.1 to +50.0 mOhms**----- 0 Points -----Marginal
  - **+50.1 to +2000 mOhms**----- 0 Points -----Unstable
  - **>+2000 mOhms** ----- 0 Points -----Open Failure

**LLCR Thermal Aging – RF Ground (16 pin LLCR test points)**

- **Initial** ----- 18.67 mOhms Max
- **Thermal Aging**
  - **<= +5.0 mOhms**----- 16 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 +2000 mOhms**----- 0 Points -----Unstable
  - **>+2000 mOhms** ----- 0 Points -----Open Failure

**RESULTS Continued**

**Mating\Unmating Durability Group – 24 AWG (16 LLCR test points)**

- **Initial** ----- 52.00 mOhms Max
- **Durability, 100 Cycles**
  - <= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure
- **Thermal Shock**
  - <= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure
- **Humidity**
  - <= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure

**Mating\Unmating Durability Group – RF Signal (15 LLCR test points)**

- **Initial** ----- 164.64 mOhms Max
- **Durability, 100 Cycles**
  - <= +5.0 mOhms----- 15 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 +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure
- **Thermal Shock**
  - <= +5.0 mOhms----- 15 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 +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure
- **Humidity**
  - <= +5.0 mOhms----- 14 Points -----Stable
  - +5.1 to +10.0 mOhms ----- 0 Points -----Minor
  - +10.1 to +15.0 mOhms----- 1 Points -----Acceptable
  - +15.1 to +50.0 mOhms----- 0 Points -----Marginal
  - +50.1 to +2000 mOhms----- 0 Points -----Unstable
  - >+2000 mOhms ----- 0 Points -----Open Failure

**RESULTS Continued**

**Mating\Unmating Durability Group – RF Ground (16 LLCR test points)**

- **Initial ----- 18.83 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable**
  - **>+2000 mOhms ----- 0 Points -----Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable**
  - **>+2000 mOhms ----- 0 Points -----Open Failure**
- **Humidity**
  - **<= +5.0 mOhms----- 16 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 +2000 mOhms----- 0 Points -----Unstable**
  - **>+2000 mOhms ----- 0 Points -----Open Failure**

**DATA SUMMARIES****MATING/UNMATING FORCE:****Thermal Aging Group**

|                | Initial |             |          |             | After Thermals |             |          |             |
|----------------|---------|-------------|----------|-------------|----------------|-------------|----------|-------------|
|                | Mating  |             | Unmating |             | Mating         |             | Unmating |             |
|                | Newton  | Force (Lbs) | Newton   | Force (Lbs) | Newton         | Force (Lbs) | Newton   | Force (Lbs) |
| Minimum        | 13.17   | 2.96        | 9.79     | 2.20        | 14.81          | 3.33        | 5.78     | 1.30        |
| Maximum        | 19.79   | 4.45        | 12.54    | 2.82        | 22.73          | 5.11        | 15.30    | 3.44        |
| <b>Average</b> | 16.01   | <b>3.60</b> | 11.02    | <b>2.48</b> | 19.43          | <b>4.37</b> | 12.78    | <b>2.87</b> |
| St Dev         | 1.97    | 0.44        | 0.78     | 0.18        | 2.93           | 0.66        | 3.05     | 0.68        |
| Count          | 8       | 8           | 8        | 8           | 8              | 8           | 8        | 8           |

**Mating\Unmating Durability Group**

|                | Initial    |             |          |             | 25 Cycles      |             |          |             |
|----------------|------------|-------------|----------|-------------|----------------|-------------|----------|-------------|
|                | Mating     |             | Unmating |             | Mating         |             | Unmating |             |
|                | Newton     | Force (Lbs) | Newton   | Force (Lbs) | Newton         | Force (Lbs) | Newton   | Force (Lbs) |
| Minimum        | 14.63      | 3.29        | 9.96     | 2.24        | 19.75          | 4.44        | 11.88    | 2.67        |
| Maximum        | 19.66      | 4.42        | 12.94    | 2.91        | 28.02          | 6.30        | 18.10    | 4.07        |
| <b>Average</b> | 16.19      | <b>3.64</b> | 11.13    | <b>2.50</b> | 22.22          | <b>5.00</b> | 15.99    | <b>3.60</b> |
| St Dev         | 1.73       | 0.39        | 0.91     | 0.20        | 2.65           | 0.60        | 1.92     | 0.43        |
| Count          | 8          | 8           | 8        | 8           | 8              | 8           | 8        | 8           |
|                | 50 Cycles  |             |          |             | 75 Cycles      |             |          |             |
|                | Mating     |             | Unmating |             | Mating         |             | Unmating |             |
|                | Newton     | Force (Lbs) | Newton   | Force (Lbs) | Newton         | Force (Lbs) | Newton   | Force (Lbs) |
| Minimum        | 22.24      | 5.00        | 13.39    | 3.01        | 23.66          | 5.32        | 14.37    | 3.23        |
| Maximum        | 30.60      | 6.88        | 20.42    | 4.59        | 31.80          | 7.15        | 21.13    | 4.75        |
| <b>Average</b> | 24.81      | <b>5.58</b> | 18.42    | <b>4.14</b> | 25.83          | <b>5.81</b> | 19.22    | <b>4.32</b> |
| St Dev         | 2.51       | 0.56        | 2.33     | 0.52        | 2.55           | 0.57        | 2.20     | 0.49        |
| Count          | 8          | 8           | 8        | 8           | 8              | 8           | 8        | 8           |
|                | 100 Cycles |             |          |             | After Humidity |             |          |             |
|                | Mating     |             | Unmating |             | Mating         |             | Unmating |             |
|                | Newton     | Force (Lbs) | Newton   | Force (Lbs) | Newton         | Force (Lbs) | Newton   | Force (Lbs) |
| Minimum        | 24.46      | 5.50        | 15.43    | 3.47        | 15.83          | 3.56        | 12.01    | 2.70        |
| Maximum        | 30.60      | 6.88        | 21.48    | 4.83        | 19.30          | 4.34        | 14.37    | 3.23        |
| <b>Average</b> | 26.54      | <b>5.97</b> | 19.98    | <b>4.49</b> | 17.67          | <b>3.97</b> | 13.22    | <b>2.97</b> |
| St Dev         | 1.87       | 0.42        | 2.10     | 0.47        | 1.62           | 0.36        | 0.97     | 0.22        |
| Count          | 8          | 8           | 8        | 8           | 7              | 7           | 7        | 7           |

**DATA SUMMARIES Continued****INSULATION RESISTANCE (IR):**

|                 | <b>24 AWG to 24 AWG</b> |            |            |
|-----------------|-------------------------|------------|------------|
|                 | Mated                   | Unmated    | Unmated    |
| Minimum         | <b>ACP/ACR</b>          | <b>ACP</b> | <b>ACR</b> |
| <b>Initial</b>  | 100000                  | 100000     | 100000     |
| <b>Thermal</b>  | 100000                  | 100000     | 100000     |
| <b>Humidity</b> | 100000                  | 100000     | 100000     |

|                 | <b>24 AWG to Ground</b> |            |            |
|-----------------|-------------------------|------------|------------|
|                 | Mated                   | Unmated    | Unmated    |
| Minimum         | <b>ACP/ACR</b>          | <b>ACP</b> | <b>ACR</b> |
| <b>Initial</b>  | 100000                  | 100000     | 100000     |
| <b>Thermal</b>  | 100000                  | 100000     | 100000     |
| <b>Humidity</b> | 50000                   | 100000     | 100000     |

|                 | <b>RF to Ground</b> |            |            |
|-----------------|---------------------|------------|------------|
|                 | Mated               | Unmated    | Unmated    |
| Minimum         | <b>ACP/ACR</b>      | <b>ACP</b> | <b>ACR</b> |
| <b>Initial</b>  | 100000              | 100000     | 100000     |
| <b>Thermal</b>  | 100000              | 100000     | 100000     |
| <b>Humidity</b> | 100000              | 100000     | 100000     |

|                 | <b>Ground to Ground</b> |            |            |
|-----------------|-------------------------|------------|------------|
|                 | Mated                   | Unmated    | Unmated    |
| Minimum         | <b>ACP/ACR</b>          | <b>ACP</b> | <b>ACR</b> |
| <b>Initial</b>  | 100000                  | 100000     | 100000     |
| <b>Thermal</b>  | 100000                  | 100000     | 100000     |
| <b>Humidity</b> | 15000                   | 15000      | 100000     |

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

| <b>Voltage Rating Summary</b> |                   |
|-------------------------------|-------------------|
| <b>Minimum</b>                | <b>ACP/ACR-RF</b> |
| <b>Break Down Voltage</b>     | Not Tested        |
| <b>Test Voltage</b>           | 375               |
| <b>Working Voltage</b>        | 125               |

| <b>Voltage Rating Summary</b> |                      |
|-------------------------------|----------------------|
| <b>Minimum</b>                | <b>ACP/ACR-24AWG</b> |
| <b>Break Down Voltage</b>     | Not Tested           |
| <b>Test Voltage</b>           | 900                  |
| <b>Working Voltage</b>        | 300                  |

| <b>24 AWG to 24 AWG=900V</b>       |        |
|------------------------------------|--------|
| <b>Initial Test Voltage</b>        | Passed |
| <b>After Thermal Test Voltage</b>  | Passed |
| <b>After Humidity Test Voltage</b> | Passed |

| <b>24AWG to Ground=900V</b>        |        |
|------------------------------------|--------|
| <b>Initial Test Voltage</b>        | Passed |
| <b>After Thermal Test Voltage</b>  | Passed |
| <b>After Humidity Test Voltage</b> | Passed |

| <b>Ground to Ground=900V</b>       |        |
|------------------------------------|--------|
| <b>Initial Test Voltage</b>        | Passed |
| <b>After Thermal Test Voltage</b>  | Passed |
| <b>After Humidity Test Voltage</b> | Passed |

| <b>RF to Ground=375V</b>           |        |
|------------------------------------|--------|
| <b>Initial Test Voltage</b>        | Passed |
| <b>After Thermal Test Voltage</b>  | Passed |
| <b>After Humidity Test Voltage</b> | Passed |

### DATA SUMMARIES Continued

**LLCR:**

**Gas Tight**

- 1) A total of 48 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
- 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  $+2000$  mOhms ----- Unstable
  - f.  $>+2000$  mOhms: ----- Open Failure

| LLCR Measurement Summaries by Pin Type |                |                   |              |              |
|--|----------------|-------------------|--------------|--------------|
| Date                                   | 5/17/2012      | 5/17/2012         |              |              |
| Room Temp (Deg C)                      | 22             | 22                |              |              |
| Rel Humidity (%)                       | 32             | 32                |              |              |
| Technician                             | Craig Ryan     | Craig Ryan        |              |              |
| <b>mOhm values</b>                     | <b>Actual</b>  | <b>Delta</b>      | <b>Delta</b> | <b>Delta</b> |
|  | <b>Initial</b> | <b>Acid Vapor</b> |              |              |
| Pin Type 1: 24AWG Signal               |                |                   |              |              |
| Average                                | 50.88          | 0.38              |              |              |
| St. Dev.                               | 2.15           | 0.37              |              |              |
| Min                                    | 42.65          | 0.10              |              |              |
| Max                                    | 51.96          | 1.53              |              |              |
| Summary Count                          | 16             | 16                |              |              |
| Total Count                            | 16             | 16                |              |              |
| Pin Type 2: RF Signal                  |                |                   |              |              |
| Average                                | 162.64         | 0.67              |              |              |
| St. Dev.                               | 1.10           | 0.29              |              |              |
| Min                                    | 160.85         | 0.29              |              |              |
| Max                                    | 165.58         | 1.42              |              |              |
| Summary Count                          | 16             | 16                |              |              |
| Total Count                            | 16             | 16                |              |              |
| Pin Type 3: RF Ground                  |                |                   |              |              |
| Average                                | 18.54          | 0.07              |              |              |
| St. Dev.                               | 0.10           | 0.04              |              |              |
| Min                                    | 18.41          | 0.01              |              |              |
| Max                                    | 18.71          | 0.15              |              |              |
| Summary Count                          | 16             | 16                |              |              |
| Total Count                            | 16             | 16                |              |              |

| LLCR Delta Count by Category |          |                     |                      |                      |                        |         |
|------------------------------|----------|---------------------|----------------------|----------------------|------------------------|---------|
|                              | Stable   | Minor               | Acceptable           | Marginal             | Unstable               | Open    |
| mOhms                        | $\leq 5$ | $>5 \ \& \ \leq 10$ | $>10 \ \& \ \leq 15$ | $>15 \ \& \ \leq 50$ | $>50 \ \& \ \leq 1000$ | $>1000$ |
| Acid Vapor                   | 48       | 0                   | 0                    | 0                    | 0                      | 0       |

### DATA SUMMARIES Continued

**Thermal Aging Group**

- 1) A total of 48 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
  - g.  $\leq +5.0$  mOhms: ----- Stable
  - h.  $+5.1$  to  $+10.0$  mOhms: ----- Minor
  - i.  $+10.1$  to  $+15.0$  mOhms: ----- Acceptable
  - j.  $+15.1$  to  $+50.0$  mOhms: ----- Marginal
  - k.  $+50.1$  to  $+2000$  mOhms ----- Unstable
  - l.  $>+2000$  mOhms: ----- Open Failure

| LLCR Measurement Summaries by Pin Type |                       |                      |              |              |
|--|-----------------------|----------------------|--------------|--------------|
| Date                                   | 5/24/2012             | 6/4/2012             |              |              |
| Room Temp (Deg C)                      | 23                    | 22                   |              |              |
| Rel Humidity (%)                       | 35                    | 41                   |              |              |
| Technician                             | Craig Ryan            | Craig Ryan           |              |              |
| <b>mOhm values</b>                     | <b>Actual Initial</b> | <b>Delta Thermal</b> | <b>Delta</b> | <b>Delta</b> |
| Pin Type 1: 24 AWG Signal              |                       |                      |              |              |
| Average                                | 51.22                 | 0.61                 |              |              |
| St. Dev.                               | 0.41                  | 0.23                 |              |              |
| Min                                    | 50.49                 | 0.40                 |              |              |
| Max                                    | 52.16                 | 1.30                 |              |              |
| Summary Count                          | 16                    | 16                   |              |              |
| Total Count                            | 16                    | 16                   |              |              |
| Pin Type 2: RF Signal                  |                       |                      |              |              |
| Average                                | 164.43                | 2.13                 |              |              |
| St. Dev.                               | 8.27                  | 2.69                 |              |              |
| Min                                    | 161.20                | 1.15                 |              |              |
| Max                                    | 194.23                | 12.18                |              |              |
| Summary Count                          | 15                    | 15                   |              |              |
| Total Count                            | 16                    | 16                   |              |              |
| Pin Type 3: RF Ground                  |                       |                      |              |              |
| Average                                | 18.50                 | 0.19                 |              |              |
| St. Dev.                               | 0.11                  | 0.15                 |              |              |
| Min                                    | 18.35                 | 0.01                 |              |              |
| Max                                    | 18.67                 | 0.55                 |              |              |
| Summary Count                          | 16                    | 16                   |              |              |
| Total Count                            | 16                    | 16                   |              |              |

| LLCR Delta Count by Category |          |                  |                   |                   |                     |         |
|------------------------------|----------|------------------|-------------------|-------------------|---------------------|---------|
|                              | Stable   | Minor            | Acceptable        | Marginal          | Unstable            | Open    |
| <b>mOhms</b>                 | $\leq 5$ | $>5$ & $\leq 10$ | $>10$ & $\leq 15$ | $>15$ & $\leq 50$ | $>50$ & $\leq 1000$ | $>1000$ |
| <b>Thermal</b>               | 46       | 0                | 1                 | 0                 | 0                   | 0       |

### DATA SUMMARIES Continued

**Mating\Unmating Durability Group**

- 1) A total of 48 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
  - m.  $\leq +5.0$  mOhms: ----- Stable
  - n.  $+5.1$  to  $+10.0$  mOhms: ----- Minor
  - o.  $+10.1$  to  $+15.0$  mOhms: ----- Acceptable
  - p.  $+15.1$  to  $+50.0$  mOhms: ----- Marginal
  - q.  $+50.1$  to  $+2000$  mOhms ----- Unstable
  - r.  $>+2000$  mOhms: ----- Open Failure

| LLCR Measurement Summaries by Pin Type |                           |                             |                             |                           |
|--|---------------------------|-----------------------------|-----------------------------|---------------------------|
| Date                                   | 5/17/2012                 | 5/25/2012                   | 6/4/2012                    | 6/15/2012                 |
| Room Temp (Deg C)                      | 22                        | 22                          | 22                          | 22                        |
| Rel Humidity (%)                       | 32                        | 42                          | 41                          | 43                        |
| Technician                             | Craig Ryan                | Craig Ryan                  | Craig Ryan                  | Craig Ryan                |
| Pin Type 1: 24 AWG Signal              |                           |                             |                             |                           |
| mOhm values                            | <b>Actual<br/>Initial</b> | <b>Delta<br/>100 Cycles</b> | <b>Delta<br/>Therm Shck</b> | <b>Delta<br/>Humidity</b> |
| Average                                | 51.49                     | 0.19                        | 0.42                        | 0.37                      |
| St. Dev.                               | 0.34                      | 0.14                        | 0.17                        | 0.18                      |
| Min                                    | 50.94                     | 0.04                        | 0.12                        | 0.03                      |
| Max                                    | 52.00                     | 0.43                        | 0.68                        | 0.67                      |
| Summary Count                          | 16                        | 16                          | 16                          | 16                        |
| Total Count                            | 16                        | 16                          | 16                          | 16                        |
| Pin Type 2: RF Signal                  |                           |                             |                             |                           |
| Average                                | 162.59                    | 0.27                        | 0.76                        | 1.24                      |
| St. Dev.                               | 1.29                      | 0.37                        | 0.21                        | 3.50                      |
| Min                                    | 160.71                    | 0.01                        | 0.36                        | 0.06                      |
| Max                                    | 164.64                    | 1.55                        | 1.05                        | 13.85                     |
| Summary Count                          | 15                        | 15                          | 15                          | 15                        |
| Total Count                            | 16                        | 16                          | 16                          | 16                        |
| Pin Type 3: RF Ground                  |                           |                             |                             |                           |
| Average                                | 18.65                     | 0.07                        | 0.13                        | 0.14                      |
| St. Dev.                               | 0.12                      | 0.05                        | 0.05                        | 0.07                      |
| Min                                    | 18.46                     | 0.00                        | 0.07                        | 0.00                      |
| Max                                    | 18.83                     | 0.17                        | 0.25                        | 0.24                      |
| Summary Count                          | 16                        | 16                          | 16                          | 16                        |
| Total Count                            | 16                        | 16                          | 16                          | 16                        |

| 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>100 Cycles</b>            | 47       | 0                   | 0                    | 0                    | 0                      | 0       |
| <b>Therm Shck</b>            | 47       | 0                   | 0                    | 0                    | 0                      | 0       |
| <b>Humidity</b>              | 46       | 0                   | 1                    | 0                    | 0                      | 0       |

**EQUIPMENT AND CALIBRATION SCHEDULES****Equipment #:** MO-04**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 0798688**Accuracy:** See Manual

... Last Cal: 03/27/2012, Next Cal: 03/27/2013

**Equipment #:** RS-09**Description:** Current Shunt**Manufacturer:** Empro**Model:** HA10050**Serial #:** HA10050-1**Accuracy:** +/- 0.25% of RDG

... Last Cal: 05/30/2012, Next Cal: 05/30/2013

**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: 05/03/2011, Next Cal: 05/03/2013

**Equipment #:** THC-02**Description:** Temperature/Humidity Chamber (SJR Room – Unit #1)**Manufacturer:** Thermotron**Model:** SE-1000-6-6**Serial #:** 31808**Accuracy:** See Manual

... Last Cal: 11/04/2011, Next Cal: 11/04/2012

**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: 05/03/2012, Next Cal: 05/03/2013

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** OV-03

**Description:** Cascade Tek Forced Air Oven (Chamber Room)

**Manufacturer:** Cascade Tek

**Model:** TFO-5

**Serial #:** 0500100

**Accuracy:** Temp. Stability: +/- .1C/C change in ambient Temp. Stability: +/- .1C/C change in ambient  
... Last Cal: 05/03/2012, Next Cal: 05/03/2013

**Equipment #:** HPM-01

**Description:** Hipot Megommeter

**Manufacturer:** Hipotronics

**Model:** H306B-A

**Serial #:** M9905004

**Accuracy:** 2 % Full Scale Accuracy

... Last Cal: 05/24/2012, Next Cal: 08/24/2012