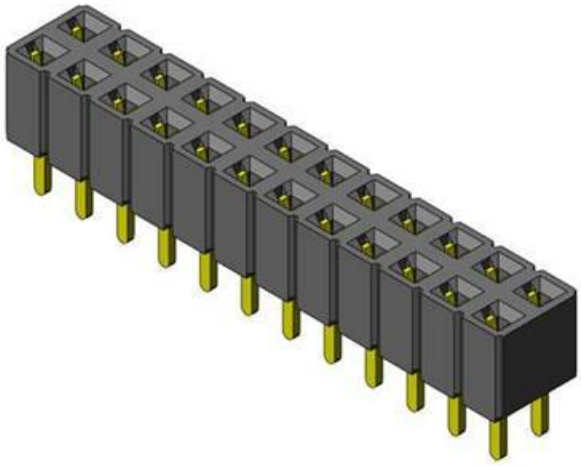
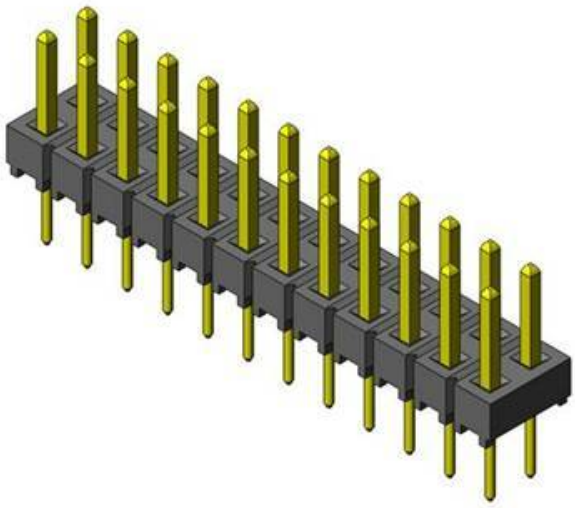
Project Number: Design Qualification Test Report	Tracking Code: 196413_Report_Rev_2			
Requested by: Eric Mings	Date: 4/15/2019	Product Rev: W		
Part #: SLW-150-01-L-D \ TSW-150-07-L-D	Lot #: N/A	Tech: Kason He	Eng: Vico Zhao	
Part description: SLW\ TSW			Qty to test: 60	
Test Start: 07/24/2012	Test Completed: 08/14/2012			





DESIGN QUALIFICATION TEST REPORT

SLW \ TSW
SLW-150-01-L-D \ TSW-150-07-L-D

REVISION HISTORY

DATE	REV.NUM.	DESCRIPTION	ENG
10/19/2012	**1**	**Initial Issue**	**KH**
11/29/2012	**2**	**Remove CCC section**	**CE**

CERTIFICATION

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

SCOPE

To perform the following tests: 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 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-103849-TST/PCB-103851-TST/PCB-103848-TST

FLOWCHARTS

Gas Tight

TEST STEP	GROUP A1 192 Points
01	LLCR-1
02	Gas Tight
03	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

Normal Force

TEST STEP	GROUP A1 Individual Contacts (8-10 min)	GROUP A2 Individual Contacts (8-10 min)
01	Contact Gaps	Contact Gaps
02	Setup Approved	Thermal Aging (Mated and Undisturbed)
03	Normal Force	Contact Gaps
04		Setup Approved
05		Normal Force

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

Time Condition 'B' (250 Hours)

Normal Force = EIA-364-04

(Perpendicular) Displacement Force = 12.7 mm/min ± 6 mm/min

Spec is 50 N @ 1 mm displacement

Contact Gaps / Height - No standard method. Usually measured optically

Gaps to be taken on a minimum of 20% of each part tested

FLOWCHARTS Continued

Thermal Aging

TEST STEP	GROUP A1 8 Boards Thermal Aging (Mated)
01	Contact Gaps
02	Forces - Mating / Unmating
03	LLCR-1
04	Thermal Aging (Mated and Undisturbed)
05	LLCR-2
06	Forces - Mating / Unmating
07	Contact Gaps

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

Time Condition 'B' (250 Hours)

Mating / Unmating Forces = EIA-364-13

Contact Gaps / Height - No standard method. Usually measured optically.

Gaps to be taken on a minimum of 20% of each part tested

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

FLOWCHARTS Continued

Durability/Mating/Unmating/Gaps

TEST STEP	GROUP B1 8 Boards (largest position submitted)	GROUP B2 8 Boards (middle position submitted)	GROUP B3 8 Boards (smallest position submitted)
01	Contact Gaps	Contact Gaps	Contact Gaps
02	LLCR-1	Forces - Mating / Unmating	Forces - Mating / Unmating
03	Forces - Mating / Unmating	25 Cycles	25 Cycles
04	25 Cycles	Forces - Mating / Unmating	Forces - Mating / Unmating
05	Forces - Mating / Unmating	25 Cycles (50 Total)	25 Cycles (50 Total)
06	25 Cycles (50 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
07	Forces - Mating / Unmating	25 Cycles (75 Total)	25 Cycles (75 Total)
08	25 Cycles (75 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
09	Forces - Mating / Unmating	25 Cycles (100 Total)	25 Cycles (100 Total)
10	25 Cycles (100 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
11	Forces - Mating / Unmating		
12	Clean w/Compressed Air		
13	Contact Gaps		
14	LLCR-2		
15	Thermal Shock (Mated and Undisturbed)		
16	LLCR-3		
17	Cyclic Humidity (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

Contact Gaps / Height - No standard method. Usually measured optically.

Gaps to be taken on a minimum of 20% of each part tested

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

FLOWCHARTS Continued

IR & DWV

TEST STEP	GROUP A1 2 Mated Sets Break Down Pin-to-Pin	GROUP A2 2 Unmated of Part # Being Tested Break Down Pin-to-Pin	GROUP A3 2 Unmated of Mating Part # Break Down Pin-to-Pin	GROUP B1 2 Mated Sets Pin-to-Pin
01	DWV/Break Down Voltage	DWV/Break Down Voltage	DWV/Break Down Voltage	IR & DWV at test voltage (on both mated sets and on each connector unmated)
02				Thermal Shock (Mated and Undisturbed)
03				IR & DWV at test voltage (on both mated sets and on each connector unmated)
04				Cyclic Humidity (Mated and Undisturbed)
05				IR & DWV at test voltage (on both mated sets and on 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:

-55ºC to +85ºC 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

TEST STEP	GROUP C1 2 Mated Sets Break Down Row-to-Row	GROUP C2 2 Unmated of Part # Being Tested Break Down Row-to-Row	GROUP C3 2 Unmated of Mating Part # Break Down Row-to-Row	GROUP D1 2 Mated Sets Row-to-Row
01	DWV/Break Down Voltage	DWV/Break Down Voltage	DWV/Break Down Voltage	IR & DWV at test voltage (on both mated sets and on each connector unmated)
02				Thermal Shock (Mated and Undisturbed)
03				IR & DWV at test voltage (on both mated sets and on each connector unmated)
04				Cyclic Humidity (Mated and Undisturbed)
05				IR & DWV at test voltage (on both mated sets and on each connector unmated)

FLOWCHARTS Continued

Mechanical Shock / Vibration / LLCR

TEST STEP	GROUP A1 192 Points
01	LLCR-1
02	Shock
03	Vibration
04	LLCR-2

Mechanical Shock = EIA 364-27 Half Sine,

100 g's, 6 milliSeconds (Condition "C") each axis

Vibration = EIA 364-28, Random Vibration

7.56 g RMS, Condition VB --- 2 hours/axis

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

Shock / Vibration / nanoSecond Event Detection

TEST STEP	GROUP A1 60 Points
01	Event Detection, Shock
02	Event Detection, Vibration

Mechanical Shock = EIA 364-27 Half Sine,

100 g's, 6 milliSeconds (Condition "C") each axis

Vibration = EIA 364-28, Random Vibration

7.56 g RMS, Condition VB --- 2 hours/axis

Event detection requirement during Shock / Vibration is 50 nanoseconds minimum

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.

MECHANICAL SHOCK (Specified Pulse):

1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
2) Test Condition C
3) Peak Value: 100 G
4) Duration: 6 Milliseconds
5) Wave Form: Half Sine
6) Velocity: 12.3 ft/s
7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
2) Test Condition V, Letter B
3) Power Spectral Density: 0.04 G^2 / Hz
4) G 'RMS': 7.56
5) Frequency: 50 to 2000 Hz
6) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

MATING/UNMATING:

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

LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +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

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC^2, computer controlled test stand with a deflection measurement system accuracy of 5 µm (0.0002").
9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of ± 0.2%.
10) The nominal deflection rate shall be 5 mm (0.2")/minute.
11) Unless otherwise noted a minimum of five contacts shall be tested.
12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
13) The system shall utilize the TC^2 software in order to acquire and record the test data.
14) The permanent set of each contact shall be measured within the TC^2 software.
15) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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:
3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

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).

RESULTS

Mating – Unmating Forces

Thermal Aging Group (SLW-150-01-L-D \ TSW-150-07-L-D)

- **Initial**
  - **Mating**
    - **Min ----------24.51 Lbs**
    - **Max----------31.38 Lbs**
  - **Unmating**
    - **Min ----------19.41 Lbs**
    - **Max----------26.77 Lbs**
- **After Thermal**
  - **Mating**
    - **Min ----------19.74 Lbs**
    - **Max----------26.91 Lbs**
  - **Unmating**
    - **Min ----------17.61 Lbs**
    - **Max----------22.59 Lbs**

RESULTS Continued

Mating – Unmating Forces

Mating/Unmating Durability Group (SLW-150-01-L-D \ TSW-150-07-L-D)

- **Initial**
  - **Mating**
    - **Min ----------27.42 Lbs**
    - **Max----------30.41 Lbs**
  - **Unmating**
    - **Min ----------21.23 Lbs**
    - **Max----------26.33 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------27.70 Lbs**
    - **Max----------35.03 Lbs**
  - **Unmating**
    - **Min ----------23.40 Lbs**
    - **Max----------33.52 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ----------29.35 Lbs**
    - **Max----------39.52 Lbs**
  - **Unmating**
    - **Min ----------26.17 Lbs**
    - **Max----------38.44 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ----------32.05 Lbs**
    - **Max----------44.51 Lbs**
  - **Unmating**
    - **Min ----------29.61 Lbs**
    - **Max----------41.97 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ----------36.46 Lbs**
    - **Max----------46.71 Lbs**
  - **Unmating**
    - **Min ----------34.29 Lbs**
    - **Max----------45.52 Lbs**
- **After Humidity**
  - **Mating**
    - **Min ----------24.64 Lbs**
    - **Max----------29.29 Lbs**
  - **Unmating**
    - **Min ----------22.05 Lbs**
    - **Max----------25.94 Lbs**

RESULTS Continued

Mating – Unmating Forces

Mating/Unmating Basic Group (SLW-125-01-L-D \ TSW-125-07-L-D)

- **Initial**
  - **Mating**
    - **Min ----------16.20 Lbs**
    - **Max----------17.45 Lbs**
  - **Unmating**
    - **Min ----------11.40 Lbs**
    - **Max----------14.14 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------17.50 Lbs**
    - **Max----------22.06 Lbs**
  - **Unmating**
    - **Min ----------12.95 Lbs**
    - **Max----------20.91 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ----------18.49 Lbs**
    - **Max----------29.03 Lbs**
  - **Unmating**
    - **Min ----------17.44 Lbs**
    - **Max----------26.66 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ----------22.68 Lbs**
    - **Max----------32.39 Lbs**
  - **Unmating**
    - **Min ----------21.28 Lbs**
    - **Max----------28.90 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ----------26.49 Lbs**
    - **Max----------34.74 Lbs**
  - **Unmating**
    - **Min ----------24.87 Lbs**
    - **Max----------31.16 Lbs**

RESULTS Continued

Mating – Unmating Forces

Mating/Unmating Basic Group (SLW-105-01-L-D \ TSW-105-07-L-D)

- **Initial**
  - **Mating**
    - **Min ---------- 3.17 Lbs**
    - **Max---------- 3.82 Lbs**
  - **Unmating**
    - **Min ---------- 2.54 Lbs**
    - **Max---------- 2.86 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 3.00 Lbs**
    - **Max---------- 3.65 Lbs**
  - **Unmating**
    - **Min ---------- 2.78 Lbs**
    - **Max---------- 3.39 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 3.58 Lbs**
    - **Max---------- 4.59 Lbs**
  - **Unmating**
    - **Min ---------- 3.25 Lbs**
    - **Max---------- 4.47 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 3.88 Lbs**
    - **Max---------- 5.79 Lbs**
  - **Unmating**
    - **Min ---------- 3.53 Lbs**
    - **Max---------- 5.36 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 4.68 Lbs**
    - **Max---------- 6.64 Lbs**
  - **Unmating**
    - **Min ---------- 4.44 Lbs**
    - **Max---------- 6.15 Lbs**

Normal Force at 0.0020 in deflection (Tested outside the housing)

- **Initial**
  - **Min---------- 216.10 gf Set ----- 0.0000 in**
  - **Max ---------- 303.50 gf Set ----- 0.0004 in**
- **Thermal**
  - **Min---------- 115.80 gf Set----- 0.0004 in**
  - **Max ---------- 249.80 gf Set----- 0.0013 in**

RESULTS Continued

Insulation Resistance minimums, IR

Pin to Pin

- **Initial**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**

Row to Row

- **Initial**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 10000Meg Ω ---------- Passed**
  - **Unmated ---------- 10000Meg Ω ---------- Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 1625 VAC**
  - **Test Voltage ---------- 1219 VAC**
  - **Working Voltage ---------- 406 VAC**

Pin to Pin

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

Row to Row

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

RESULTS Continued

LLCR Thermal Aging Group (192 LLCR test points)

- **Initial ---------- 5.75mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

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

- **Initial ---------- 5.66mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

LLCR Gas Tight Group (192 LLCR test points)

- **Initial ---------- 4.70mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

RESULTS Continued

LLCR Shock & Vibration Group (192 LLCR test points)

- **Initial ----------6.11mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 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:

Thermal Aging Group (SLW-150-01-L-D \ TSW-150-07-L-D)

	Initial				After Thermals			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	109.02	24.51	86.34	19.41	87.80	19.74	78.33	17.61
Maximum	139.58	31.38	119.07	26.77	119.70	26.91	100.48	22.59
Average	115.88	**26.05**	96.62	**21.72**	99.52	**22.38**	87.20	**19.60**
St Dev	10.03	2.25	10.58	2.38	12.57	2.83	8.31	1.87
Count	8	8	8	8	8	8	8	8

Mating/Unmating Durability Group (SLW-150-01-L-D \ TSW-150-07-L-D)

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	121.96	27.42	94.43	21.23	123.21	27.70	104.08	23.40
Maximum	135.26	30.41	117.12	26.33	155.81	35.03	149.10	33.52
Average	127.91	**28.76**	106.59	**23.96**	139.36	**31.33**	128.00	**28.78**
St Dev	4.44	1.00	7.85	1.76	11.50	2.59	15.97	3.59
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	130.55	29.35	116.40	26.17	142.56	32.05	131.71	29.61
Maximum	175.78	39.52	170.98	38.44	197.98	44.51	186.68	41.97
Average	157.01	**35.30**	149.20	**33.54**	176.84	**39.76**	168.43	**37.87**
St Dev	18.18	4.09	20.05	4.51	20.57	4.62	20.05	4.51
Count	8	8	8	8	8	8	8	8
	After 100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	162.17	36.46	152.52	34.29	109.60	24.64	98.08	22.05
Maximum	207.77	46.71	202.47	45.52	130.28	29.29	115.38	25.94
Average	187.61	**42.18**	179.58	**40.37**	119.06	**26.77**	105.83	**23.79**
St Dev	17.08	3.84	16.56	3.72	7.31	1.64	7.43	1.67
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating Force:

Mating/Unmating Basic Group (SLW-125-01-L-D \ TSW-125-07-L-D)

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	72.06	16.20	50.71	11.40	77.84	17.50	57.60	12.95
Maximum	77.62	17.45	62.89	14.14	98.12	22.06	93.01	20.91
Average	75.31	**16.93**	57.58	**12.95**	84.91	**19.09**	75.68	**17.01**
St Dev	1.75	0.39	3.80	0.85	6.99	1.57	11.27	2.53
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	82.24	18.49	77.57	17.44	100.88	22.68	94.65	21.28
Maximum	129.13	29.03	118.58	26.66	144.07	32.39	128.55	28.90
Average	104.16	**23.42**	97.98	**22.03**	121.56	**27.33**	111.86	**25.15**
St Dev	15.39	3.46	13.99	3.15	14.92	3.35	12.09	2.72
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	117.83	26.49	110.62	24.87
Maximum	154.52	34.74	138.60	31.16
Average	137.51	**30.92**	125.08	**28.12**
St Dev	12.45	2.80	9.76	2.20
Count	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating Force:

Mating/Unmating Basic Group (SLW-105-01-L-D \ TSW-105-07-L-D)

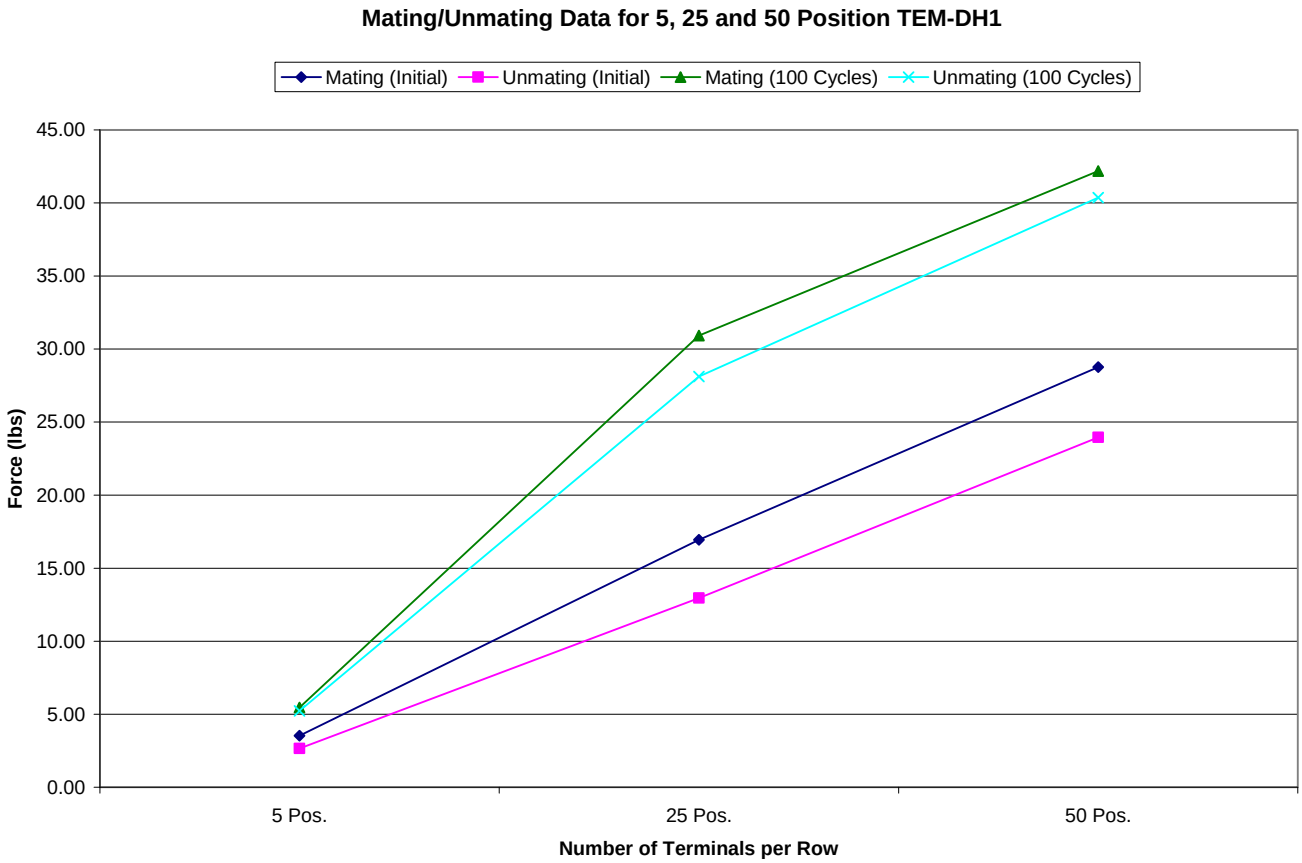
	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	14.10	3.17	11.30	2.54	13.34	3.00	12.37	2.78
Maximum	16.99	3.82	12.72	2.86	16.24	3.65	15.08	3.39
Average	15.70	**3.53**	11.84	**2.66**	15.20	**3.42**	13.69	**3.08**
St Dev	1.11	0.25	0.54	0.12	1.02	0.23	0.99	0.22
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	15.92	3.58	14.46	3.25	17.26	3.88	15.70	3.53
Maximum	20.42	4.59	19.88	4.47	25.75	5.79	23.84	5.36
Average	17.39	**3.91**	16.59	**3.73**	20.50	**4.61**	19.76	**4.44**
St Dev	1.61	0.36	2.07	0.47	2.96	0.67	2.75	0.62
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	20.82	4.68	19.75	4.44
Maximum	29.53	6.64	27.36	6.15
Average	24.26	**5.45**	23.23	**5.22**
St Dev	3.04	0.68	2.67	0.60
Count	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating Force Comparison



DATA SUMMARIES Continued

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

Initial	Deflections in inches Forces in Grams										
	0.0002	**0.0004**	**0.0006**	**0.0008**	**0.0010**	**0.0012**	**0.0015**	**0.0016**	**0.0018**	**0.0020**	***SET***
Averages	35.64	59.26	79.80	105.46	127.89	152.10	192.61	203.37	230.75	252.96	0.0000
Min	18.20	42.10	63.30	85.10	101.50	120.30	164.90	171.50	195.30	216.10	0.0000
Max	94.00	122.40	131.00	161.70	176.20	206.40	233.10	249.30	272.60	303.50	0.0004
St. Dev	19.472	20.872	18.620	21.868	20.958	26.021	25.289	25.677	27.524	28.955	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0002	**0.0004**	**0.0006**	**0.0008**	**0.0010**	**0.0012**	**0.0015**	**0.0016**	**0.0018**	**0.0020**	***SET***
Averages	5.18	16.39	28.37	46.61	68.03	89.79	124.58	133.63	159.60	183.88	0.0008
Min	-0.20	-0.20	-0.20	0.00	0.00	11.10	53.10	64.90	87.00	115.80	0.0004
Max	39.60	64.20	85.10	111.40	126.20	152.60	192.50	199.70	222.20	249.80	0.0013
St. Dev	12.408	21.452	29.012	35.264	34.229	37.417	38.647	39.301	42.718	44.046	0.0003
Count	12	12	12	12	12	12	12	12	12	12	12

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	SLW/TSW	SLW	TSW
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	SLW/TSW	SLW	TSW
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	SLW/TSW
Break Down Voltage	1625
Test Voltage	1219
Working Voltage	406

Pin to Pin	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

Row to Row	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued

LLCR Thermal Aging Group

1) A total of 192 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	2012-7-26	2012-8-8
Room Temp (Deg C)	23	24
Rel Humidity (%)	58	55
Technician	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta Thermal**
	Pin Type 1: Signal	
Average	4.19	0.35
St. Dev.	0.31	0.31
Min	3.48	0.01
Max	5.75	2.05
Summary Count	192	192
Total Count	192	192

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

DATA SUMMARIES Continued

LLCR Mating/Unmating Durability Group

1). A total of 192 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +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	2012-7-25	2012-7-27	2012-8-1	2012-8-14
Room Temp (Deg C)	23	23	24	28
Rel Humidity (%)	56	59	55	62
Technician	Kason He	Kason He	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	4.14	0.15	0.14	0.16
St. Dev.	0.33	0.22	0.14	0.19
Min	3.00	0.00	0.00	0.00
Max	5.66	2.16	1.13	1.48
Summary Count	192	192	192	192
Total Count	192	192	192	192

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
100 Cycles	**192**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**192**	**0**	**0**	**0**	**0**	**0**
Humidity	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Gas Tight Group

1) A total of 192 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms:---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms: ---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	2012-7-24	2012-7-28
Room Temp (Deg C)	22	23
Rel Humidity (%)	57	60
Technician	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta Acid Vapor**
	Pin Type 1: Signal	
Average	4.17	0.16
St. Dev.	0.25	0.19
Min	3.25	0.00
Max	4.70	0.93
Summary Count	192	192
Total Count	192	192

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Acid Vapor	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Shock & Vibration Group

1) A total of 192 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +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	2012-8-6	2012-8-8
Room Temp (Deg C)	22	22
Rel Humidity (%)	40	38
Technician	Craig Ryan	Troy Cook
mOhm values	**Actual Initial**	**Delta Shock-Vib**
	Pin Type 1: Signal	
Average	4.42	0.08
St. Dev.	0.30	0.08
Min	3.82	0.00
Max	6.11	0.54
Summary Count	192	192
Total Count	192	192

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

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	58
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 4/27/2012, Next Cal: 4/26/2013

Equipment #: HZ-OV-01
Description: Oven
Manufacturer: Huida
Model: CS101-1E
Serial #: CS101-1E-B
Accuracy: Last Cal: 12/13/2011, Next Cal: 12/12/2012

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: HMM30C
Serial #: D0240037
Accuracy: Last Cal: 3/1/2012, Next Cal: 2/28/2013

Equipment #: HZ-HPM-01
Description: NA9636H
Manufacturer: Ainuo
Model: 6031A
Serial #: 089601091
Accuracy: Last Cal: 3/8/2012, Next Cal: 3/7/2013

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 4/27/2012, Next Cal: 4/26/2013

Equipment #: HZ-TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14994
Accuracy: See Manual
… Last Cal: 06/28/2012, Next Cal: 06/27/2013

EQUIPMENT AND CALIBRATION SCHEDULES Continued

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 11/31/2011, Next Cal: 11/31/2012

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/09/2012, Next Cal: 07/09/2013

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 09/19/2012, Next Cal: 09/19/2013