



Project Number: Design Qualification Test Report	Tracking Code: 325946_Report_Rev_1
Requested by: Travis Newton	Date: 8/11/2014
Part #: MCP-8-02-L-00.25-T-BC/HR30-8J-12SC-71	
Part description: MCP/HR30	Tech: Tony Wagoner
Test Start: 05/10/2014	Test Completed: 06/15/2014



## **DESIGN QUALIFICATION TEST REPORT**

**MCP/HR30**  
**MCP-8-02-L-00.25-T-BC/HR30-8J-12SC-71**

Tracking Code: 325946_Report_Rev_1	Part #: MCP-8-02-L-00.25-T-BC/HR30-8J-12SC-71
Part description: MCP/HR30	

**REVISION HISTORY**

<b>DATA</b>	<b>REV.NUM.</b>	<b>DESCRIPTION</b>	<b>ENG</b>
8/7/2014	1	Initial Issue	PC

## CERTIFICATION

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

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### SCOPE

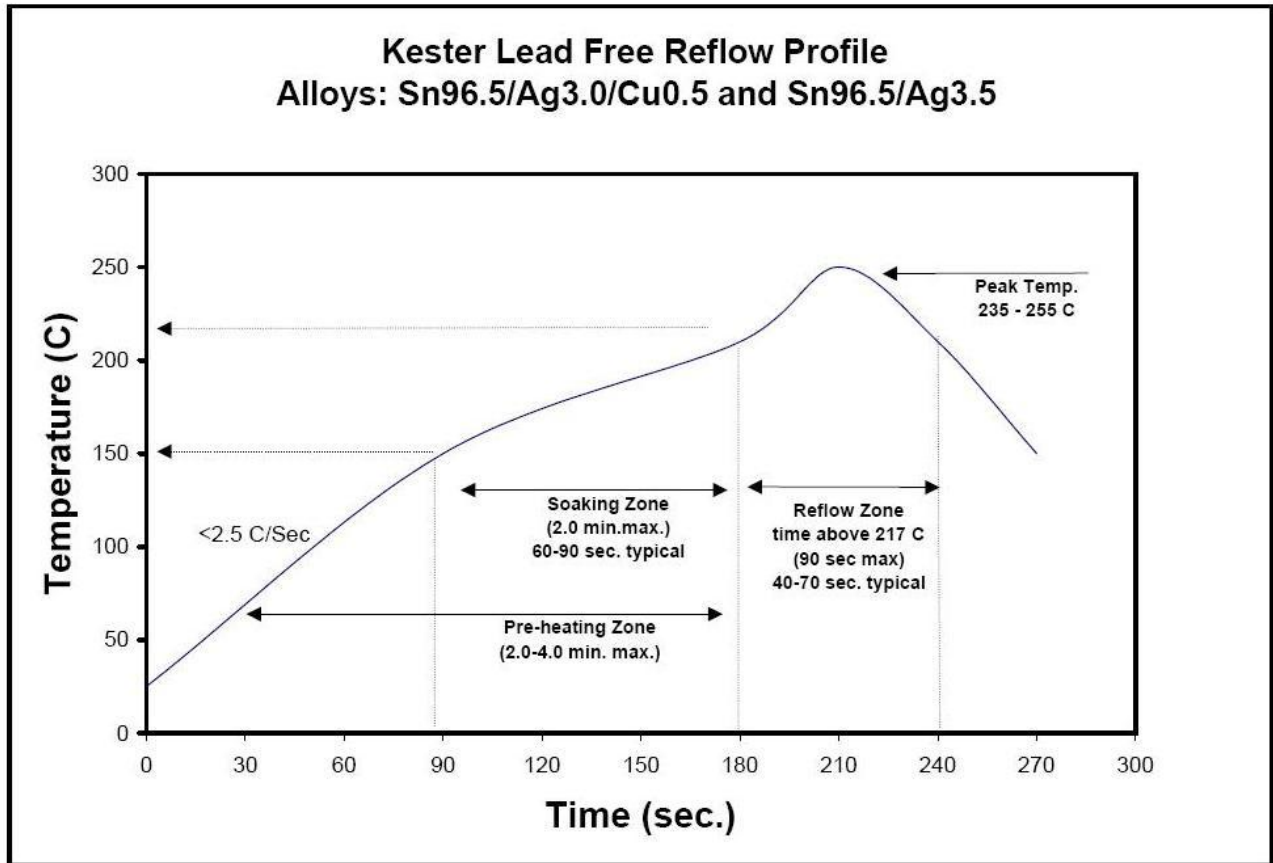
To perform the following tests: Design Qualification test. Please see test plan.

### 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 is visually inspected and cleaned if necessary.
- 7) Any additional preparation will be noted in the individual test sequences.
- 8) Solder Information: Lead Free
- 9) Re-Flow Time/Temp: See accompanying profile.
- 10) Samtec Test PCBs used: PCB-103219-TSX.

**TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)**

**FLOWCHARTS****Mating/Unmating/Durability****Group 1**

MCP-8-02-L-00.25-T-BC

HR30-8J-12SC-71

8 Assemblies

Step	Description
1.	LLCR $\mu_1$ Max Delta = 15 mOhm
2.	Mating/Unmating Force $\mu_1$
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force $\mu_1$
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force $\mu_1$
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force $\mu_1$
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force $\mu_1$
11.	LLCR $\mu_1$ Max Delta = 15 mOhm
12.	Thermal Shock $\mu_1$ - Non Standard
13.	LLCR $\mu_1$ Max Delta = 15 mOhm
14.	Humidity $\mu_1$
15.	LLCR $\mu_1$ Max Delta = 15 mOhm
16.	Mating/Unmating Force $\mu_1$

(1) Humidity = EIA-364-31

Test Condition = B (240 Hours)

Test Method = III (+2.5°C to +65°C @ 90% RH to 98% RH)

Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(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 = Other

Exposure Time at Temperature Extremes = 1/2 Hour

Method A, Test Condition = -20°C to +80°C

Test Duration = A-3 (100 Cycles)

EIA-364-32

**FLOWCHARTS Continued****Dust/Water****IPx7 Water Submersion**Group 1

MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
6 Assemblies

Step	Description
1.	Water Submersion - IPX7 (2) Depth = 1 meters
2.	Visual Inspection

Group 2

DC-MCR-8  
HR30-8J-12SC-71  
6 Assemblies

Step	Description
1.	Water Submersion - IPX7 (2) Depth = 1 meters
2.	Visual Inspection

**IPx8 Deep Water Submersion**Group 3

MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 2 meters Duration = 30 min
2.	Visual Inspection

Group 4

DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 2 meters Duration = 30 min
2.	Visual Inspection

Group 5

MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 3 meters Duration = 30 min
2.	Visual Inspection

Group 6

DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 3 meters Duration = 30 min
2.	Visual Inspection

Group 7

MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 4 meters Duration = 30 min
2.	Visual Inspection

Group 8

DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 4 meters Duration = 30 min
2.	Visual Inspection

Group 9

MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 5 meters Duration = 30 min
2.	Visual Inspection

Group 10

DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 5 meters Duration = 30 min
2.	Visual Inspection

## Part description: MCP/HR30

**FLOWCHARTS Continued**

Group 11  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 6 meters Duration = 30 min
2.	Visual Inspection

Group 12  
DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 6 meters Duration = 30 min
2.	Visual Inspection

Group 13  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 7 meters Duration = 30 min
2.	Visual Inspection

Group 14  
DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 7 meters Duration = 30 min
2.	Visual Inspection

Group 15  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 8 meters Duration = 30 min
2.	Visual Inspection

Group 16  
DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 8 meters Duration = 30 min
2.	Visual Inspection

Group 17  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 9 meters Duration = 30 min
2.	Visual Inspection

Group 18  
DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 9 meters Duration = 30 min
2.	Visual Inspection

Group 19  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 10 meters Duration = 30 min
2.	Visual Inspection

Group 20  
DC-MCR-8  
HR30-8J-12SC-71  
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 10 meters Duration = 30 min
2.	Visual Inspection

**IP6x Dust**

Group 21  
MCP-8-02-L-00.25-T-BC  
HR30-8J-12SC-71  
6 Assemblies

Step	Description
1.	Dust - IP6X (1)
2.	Visual Inspection

Group 22  
DC-MCR-8  
HR30-8J-12SC-71  
6 Assemblies

Step	Description
1.	Dust - IP6X (1)
2.	Visual Inspection

(1) Dust - IP6X = CEI/IEC 60529

(2) Water Submersion - IPX7 = CEI/IEC 60529

(3) Water Submersion - IPX8 = CEI/IEC 60529

**FLOWCHARTS Continued****Hood Breaking Torque***Note: Requirement 0.6 Nm or more; See page 51 of HR30 Test Data for test procedure*Group 1

MCP-8-02-L-00.25-T-BC

8 Assemblies

**Step Description****1. Torque Test***Note: Requirement 0.9 Nm or more; See page 51 of HR30 Test Data for test procedure***Nut Breaking Torque***Note: Requirement 0.9 Nm or more; See page 52 of HR30 Test Data for test procedure*Group 1

MCR-8-02-L-00.25-S-BC

8 Assemblies

**Step Description****1. Torque Test***Note: Requirement 0.9 Nm or more; See page 52 of HR30 Test Data for test procedure***Contact Retention Force***Note: Requirement 20 N or more; See page 54 of HR30 Test Data for test procedure*Group 1

MCP-8-02-L-00.25-S-BC

8 Assemblies

**Step Description****1. Contact Retention Force***Note: Requirement 20 N or more; See page 54 of HR30 Test Data for test procedure. This test will be required to be done on both the terminal and socket.*Group 2

MCP-8-02-L-00.25-T-BC

8 Assemblies

**Step Description****1. Contact Retention Force***Note: Requirement 20 N or more; See page 54 of HR30 Test Data for test procedure. This test will be required to be done on both the terminal and socket.*

## 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: -20°C to +80°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.

### 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.  $\leq +5.0$  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

### WATER TESTING:

- 1) Reference document: CEI/IEC 60529 Code IPX7 and IPX8
- 2) MCP torque specification for PN-30-8 onto CH-P-30-8-12 is 4.4 IN-LB

### DUST TESTING:

- 1) Reference document: CEI/IEC 60529 Code IP6X
- 2) MCP torque specification for PN-30-8 onto CH-P-30-8-12 is 4.4 IN-LB

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### TORQUE

- 1) Hood breaking torque force requirement 0.6 Nm or more, see fig1;
- 2) Nut breaking torque force requirement 0.9 Nm or more, see fig2.



Fig. 1



Fig. 2

**RESULTS****Mating – Unmating Forces****Mating\Unmating Durability Group**

- **Initial**
  - **Mating**
    - **Min** ----- 3.20 Lbs
    - **Max** ----- 6.00 Lbs
  - **Unmating**
    - **Min** ----- 5.52 Lbs
    - **Max** ----- 8.84 Lbs
- **After 25 Cycles**
  - **Mating**
    - **Min** ----- 3.76 Lbs
    - **Max** ----- 6.25 Lbs
  - **Unmating**
    - **Min** ----- 4.10 Lbs
    - **Max** ----- 7.62 Lbs
- **After 50 Cycles**
  - **Mating**
    - **Min** ----- 4.11 Lbs
    - **Max** ----- 6.72 Lbs
  - **Unmating**
    - **Min** ----- 4.24 Lbs
    - **Max** ----- 7.83 Lbs
- **After 75 Cycles**
  - **Mating**
    - **Min** ----- 4.14 Lbs
    - **Max** ----- 6.29 Lbs
  - **Unmating**
    - **Min** ----- 4.17 Lbs
    - **Max** ----- 8.22 Lbs
- **After 100 Cycles**
  - **Mating**
    - **Min** ----- 3.67 Lbs
    - **Max** ----- 6.43 Lbs
  - **Unmating**
    - **Min** ----- 4.18 Lbs
    - **Max** ----- 8.24 Lbs
- **After Humidity**
  - **Mating**
    - **Min** ----- 4.31 Lbs
    - **Max** ----- 6.02 Lbs
  - **Unmating**
    - **Min** ----- 3.67 Lbs
    - **Max** ----- 5.86 Lbs

**RESULTS Continued****Hood breaking torque force**

- Min ----- 0.85 Nm
- Max----- 1.77 Nm

**Nut breaking torque force**

- Min ----- 1.11 Nm
- Max----- 1.89 Nm

**Contact Retention Force**

- MCP-8-02-L-00.25-S-BC (The contact pulled out of the body)
  - Min -----26.08 N
  - Max-----29.70 N
- HR30-8P-12PC
  - Min -----24.90 N
  - Max-----28.40 N
- MCP-8-02-L-00.25-T-BC(The contact pulled out of the body)
  - Min -----20.11 N
  - Max-----21.92 N
- HR30-8R-12SC
  - Min -----29.40 N
  - Max-----31.40 N

**LLCR Durability (96 LLCR test points)**

- Initial ----- 76.79 mOhms Max
- Durability, 100 Cycles
  - <= +5.0 mOhms -----96 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
  - <= +5.0 mOhms -----92 Points ----- Stable
  - +5.1 to +10.0 mOhms -----4 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 -----87 Points ----- Stable
  - +5.1 to +10.0 mOhms -----9 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****IP6X Testing (Dust)**

MCP-8-02-L-00.25-S-BC/HR30-8J-12SC-71

	<u>Initial (Before Exposure)</u>	<u>After Exposure</u>
Dust	No Dust Present	No Dust Present

HR30-8P-12PC-71/DC-MCR-8

	<u>Initial (Before Exposure)</u>	<u>After Exposure</u>
Dust	No Dust Present	No Dust Present

**IPX8 Testing (Water)**

MCP-8-02-L-00.25-S-BC/HR30-8P-12PC-71(10 m)

	<u>Initial (Before Exposure)</u>	<u>After Exposure</u>
Water	No Water Present	No Water Present

HR30-8P-12PC-71/DC-MCR-8(10 m)

	<u>Initial (Before Exposure)</u>	<u>After Exposure</u>
Water	No Water Present	No Water Present

**DATA SUMMARIES****MATING/UNMATING FORCE:****Mating/Unmating Durability Group**

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	14.23	3.20	24.55	5.52	16.72	3.76	18.24	4.10
Maximum	26.69	6.00	39.32	8.84	27.80	6.25	33.89	7.62
<b>Average</b>	18.64	<b>4.19</b>	29.11	<b>6.55</b>	20.62	<b>4.64</b>	24.13	<b>5.43</b>
St Dev	4.20	0.94	5.04	1.13	3.51	0.79	4.94	1.11
Count	8	8	8	8	8	8	8	8
	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	18.28	4.11	18.86	4.24	18.41	4.14	18.55	4.17
Maximum	29.89	6.72	34.83	7.83	27.98	6.29	36.56	8.22
<b>Average</b>	21.75	<b>4.89</b>	23.86	<b>5.37</b>	21.38	<b>4.81</b>	23.92	<b>5.38</b>
St Dev	3.55	0.80	5.14	1.15	2.92	0.66	6.29	1.41
Count	8	8	8	8	8	8	8	8
	100 Cycles				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	16.32	3.67	18.59	4.18	19.17	4.31	16.32	3.67
Maximum	28.60	6.43	36.65	8.24	26.78	6.02	26.07	5.86
<b>Average</b>	20.96	<b>4.71</b>	23.66	<b>5.32</b>	23.76	<b>5.34</b>	20.23	<b>4.55</b>
St Dev	3.73	0.84	6.31	1.42	2.75	0.62	2.94	0.66
Count	8	8	8	8	8	8	8	8

**DATA SUMMARIES Continued****Hood breaking torque force**

	Force (Nm)
Minimum	<b>0.85</b>
Maximum	1.77
Average	1.34

**Nut breaking torque force**

	Force (Nm)
Minimum	<b>1.11</b>
Maximum	1.89
Average	1.52

**Contact Retention Force**

MCP-8-02-L-00.25-S-BC (The contact pulled out of the body)

	Force (Nm)
Minimum	<b>26.08</b>
Maximum	29.70
Average	28.34

**HR30-8P-12PC**

	Force (Nm)
Minimum	<b>24.90</b>
Maximum	28.40
Average	26.26

MCP-8-02-L-00.25-T-BC (The terminal pulled out of the body)

	Force (Nm)
Minimum	<b>20.11</b>
Maximum	21.92
Average	21.14

**HR30-8P-12PC**

	Force (Nm)
Minimum	<b>29.40</b>
Maximum	31.40
Average	30.27

**DATA SUMMARIES Continued****LLCR Durability:**

- 1) A total of 96 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
  - a.  $\leq +5.0$  mOhms:----- Stable
  - b.  $+5.1$  to  $+10.0$  mOhms:----- Minor
  - c.  $+10.1$  to  $+15.0$  mOhms:----- Acceptable
  - d.  $+15.1$  to  $+50.0$  mOhms:----- Marginal
  - e.  $+50.1$  to  $+2000$  mOhms----- Unstable
  - f.  $>+2000$  mOhms:----- Open Failure

<b>LLCR Measurement Summaries by Pin Type</b>				
Date	5/15/2014	5/19/2014	6/2/2014	6/13/2014
Room Temp (Deg C)	22	22	22	22
Rel Humidity (%)	34	31	46	40
Technician	Tony Wagoner	Tony Wagoner	Tony Wagoner	Tony Wagoner
mOhm values	<b>Actual</b>	<b>Delta</b>	<b>Delta</b>	<b>Delta</b>
	<b>Initial</b>	<b>100 Cycles</b>	<b>Therm Shck</b>	<b>Humidity</b>
<b>Pin Type 1: Signal</b>				
Average	73.39	0.25	1.10	1.38
St. Dev.	0.92	0.28	1.37	2.13
Min	71.45	0.00	0.04	0.00
Max	76.79	1.72	7.54	9.41
Summary Count	96	96	96	96
Total Count	96	96	96	96

<b>LLCR Delta Count by Category</b>						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	$\leq 5$	$>5$ & $\leq 10$	$>10$ & $\leq 15$	$>15$ & $\leq 50$	$>50$ & $\leq 1000$	$>1000$
<b>100 Cycles</b>	<b>96</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Therm Shck</b>	<b>92</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Humidity</b>	<b>87</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**EQUIPMENT AND CALIBRATION SCHEDULES**

Equipment #: THC-02  
Description: Temperature/Humidity Chamber  
Manufacturer: Thermotron  
Model: SE-1000-6-6  
Serial #: 31808  
Accuracy: See Manual  
... Last Cal: 02/16/2014, Next Cal: 02/16/2015

Equipment #: TSC-01  
Description: Vertical Thermal Shock Chamber  
Manufacturer: Cincinnatti Sub Zero  
Model: VTS-3-6-6-SC/AC  
Serial #: 10-VT14993  
Accuracy: See Manual  
... Last Cal: 05/18/2014, Next Cal: 05/18/2015

**Equipment #:** MO-11  
**Description:** Switch/Multimeter  
**Manufacturer:** Keithley  
**Model:** 3706  
**Serial #:** 120169  
**Accuracy:** See Manual  
... Last Cal: 08/29/2013, Next Cal: 08/29/2014

Equipment #: TCT-01  
Description: Test Stand  
Manufacturer: Chatillon  
Model: TCD-1000  
Serial #: 05 23 00 02  
Accuracy: Speed Accuracy: +/-5% of max speed; Displacement: +/- .5% or +/- .005, whichever is greater.  
... Last Cal: 08/24/2013, Next Cal: 08/24/2014

Equipment #: WATER-01  
Description: IP-67 1.0 Meter Water Column Chamber  
Manufacturer: Samtec Machine  
Model: N/A  
Serial #: N/A  
Accuracy: No Calibration Required

Equipment #: DUST-01  
Description: IP-X6 Dust Tester  
Manufacturer: Samtec Machine  
Model: N/A  
Serial #: N/A  
Accuracy: No Calibration Required