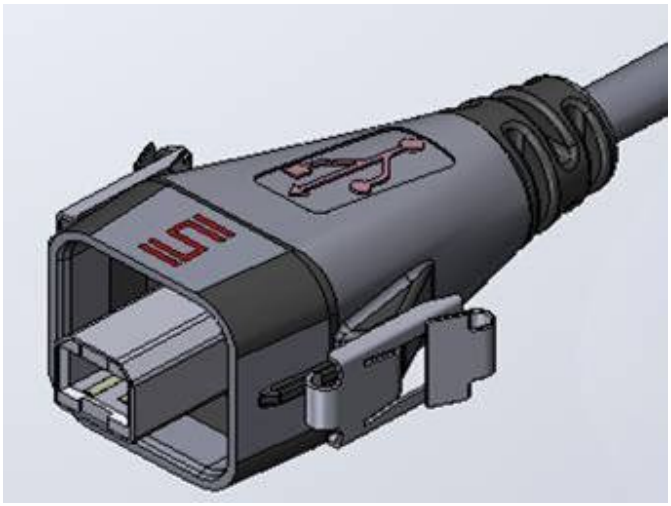
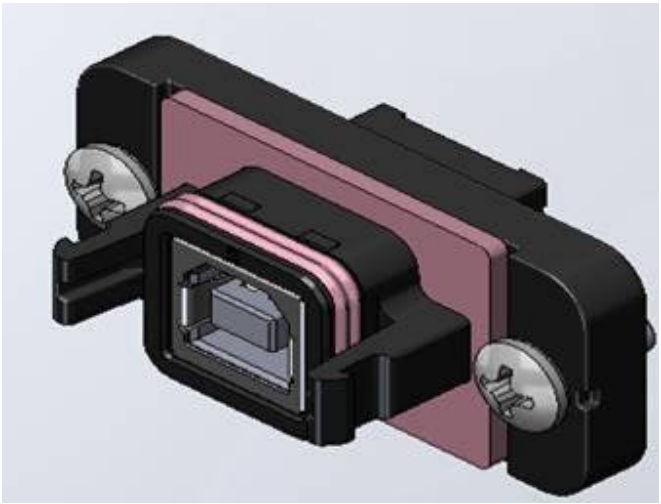
Project Number: Design Qualification Test Report	Tracking Code: 123474_Report_Rev_1		
Requested by: Travis Newton	Date: 11/21/2011	Product Rev: N/A	
Part #: RCU-G-02.00-BMS-BC/RPBU-01-S-B-VT-LC	Lot #: N/A	Tech: Nick Greco	Eng: Eric Mings
Part description: RCU/RPBU			Qty to test: 30
Test Start: 04/6/2011	Test Completed: 04/27/2011		





DESIGN QUALIFICATION TEST REPORT

RCU/RPUB
RCU-G-02.00-AMS-BC/ RPBU-01-S-A-VT-LC

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.

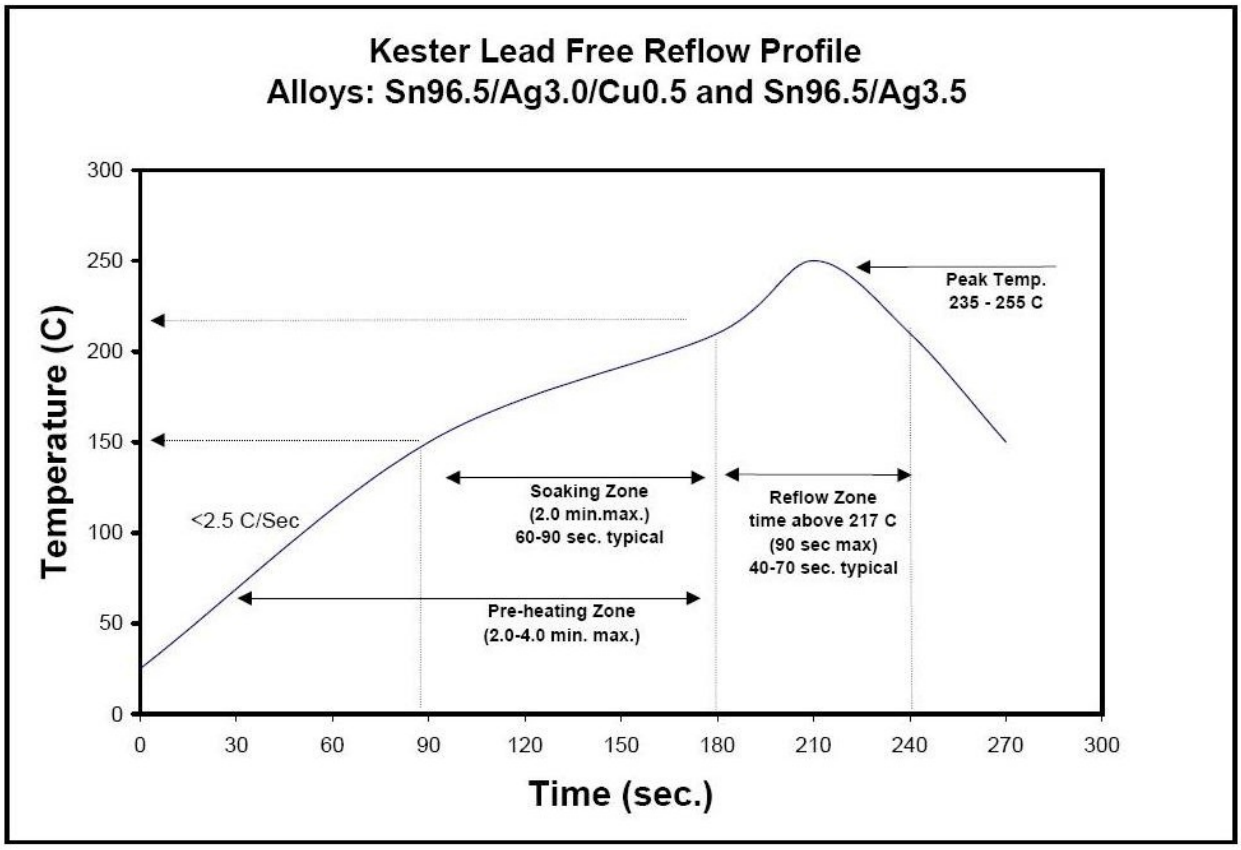
APPLICABLE DOCUMENTS

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 and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead Free
9) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-102606-TST-XX\ PCB-102607-TST-XX

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Gas Tight

TEST STEP	GROUP A1 64 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

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)

TEST STEP	GROUP A1 2 Mated Sets Break Down Pin-to-Ground	GROUP A2 2 Unmated of Part # Being Tested Break Down Pin-to-Ground	GROUP A3 2 Unmated of Mating Part # Break Down Pin-to-Ground	GROUP B1 2 Mated Sets Pin-to-Ground
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:

-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

TEST STEP	GROUP B1 8 Boards (largest position submitted)
01	Contact Gaps
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
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 +80°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

Current Carrying Capacity - Single Row

TEST STEP	GROUP A1 3 Mated Assemblies 1 Contact Powered	GROUP A2 3 Mated Assemblies 2 Contacts Powered	GROUP A3 3 Mated Assemblies 3 Contacts Powered
01	CCC	CCC	CCC

TEST STEP	GROUP A4 3 Mated Assemblies 4 Contacts Powered	GROUP A5 3 Mated Assemblies All Contacts Powered
01	CCC	CCC

IP67 Dust & Water

TEST STEP	GROUP A1 6 Mated Connectors	GROUP B1 6 Connectors (Cable Dust Cover)	GROUP C1 6 Connectors (Mating Part Dust Cover)
01	Dust Test	Dust Test	Dust Test
02	Check for Dust	Check for Dust	Check for Dust

Dust/Water Testing = Per CEI/IEC 60529 Code IP67

FLOWCHARTS Continued

IP68 Dust & Water

TEST STEP	GROUP G1 3 Mated Connectors For Each Depth Tested (27 Total Mated Connectors)
01	2M for 30 Minutes
02	Check for Water
03	3M for 30 Minutes
04	Check for Water
05	4M for 30 Minutes
06	Check for Water
07	5M for 30 Minutes
08	Check for Water
09	6M for 30 Minutes
10	Check for Water
11	7M for 30 Minutes
12	Check for Water
13	8M for 30 Minutes
14	Check for Water
15	9M for 30 Minutes
16	Check for Water
17	10M for 30 Minutes
18	Check for Water

Dust/Water Testing = Per CEI/IEC 60529 Code IP68

For this test you have to use the pressure chamber

New parts should be used for each depth tested

Stop testing once parts fail

*** It is not necessary to perform the dust portion of this test if IP67 testing has been performed**

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.

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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. <= +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^{o} C
        ix. The final LLCR shall be conducted within 1 hour after drying.

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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).

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
    a. Self heating (resistive)
    b. Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at three temperature points are reported:
    a. Ambient
    b. 80^{o} C
    c. 95^{o} C
    d. 115^{o} C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

WATER TESTING:

1) Reference document: CEI/IEC 60529 Code IP67
2) SCRES torque specification for SPN-17-01 is 12 IN-LB
3) SCPE torque specification for SCN-17-01 is 12 IN-LB

DUST TESTING:

1) Reference document: CEI/IEC 60529 Code IP67
2) SCRES torque specification for SPN-17-01 is 12 IN-LB
3) SCPE torque specification for SCN-17-01 is 12 IN-LB

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise----------4.5 A per contact with 1 Contacts in Series 20 AWG Wire Powered**
- **CCC for a 30°C Temperature Rise----------3.6 A per contact with 2 Contacts in Series 20 AWG Wires Powered**
- **CCC for a 30°C Temperature Rise----------4.2 A per contact with 1 Contacts in Series 25 AWG Wire Powered**
- **CCC for a 30°C Temperature Rise----------3.5 A per contact with 1 Contacts in Series 25 AWG Wire Powered**
- **CCC for a 30°C Temperature Rise----------2.7 A per contact with all contacts in series 20 AWG Wire Powered**
- **CCC for a 30°C Temperature Rise----------3.0 A per contact with all contacts in series 25 AWG Wire Powered**
- **CCC for a 30°C Temperature Rise----------3.6 A per contact with all contacts in series cable bundle Powered**

RESULTS Continued

Mating – Unmating Forces

- **Initial**
  - **Mating**
    - **Min ---------- 11.79 Lbs**
    - **Max ---------- 17.35 Lbs**
  - **Unmating**
    - **Min ----------3.56 Lbs**
    - **Max----------6.01 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 11.32 Lbs**
    - **Max ---------- 15.63 Lbs**
  - **Unmating**
    - **Min ----------3.64 Lbs**
    - **Max----------6.26 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 11.26 Lbs**
    - **Max ---------- 15.58 Lbs**
  - **Unmating**
    - **Min ----------3.69 Lbs**
    - **Max----------6.94 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 11.42 Lbs**
    - **Max ---------- 15.71 Lbs**
  - **Unmating**
    - **Min ----------3.64 Lbs**
    - **Max----------7.35 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 11.80 Lbs**
    - **Max ---------- 15.89 Lbs**
  - **Unmating**
    - **Min ----------3.65 Lbs**
    - **Max----------7.39 Lbs**
- **After Humidity**
  - **Mating**
    - **Min ---------- 12.57 Lbs**
    - **Max ---------- 17.93 Lbs**
  - **Unmating**
    - **Min ----------5.48 Lbs**
    - **Max----------7.95 Lbs**

RESULTS Continued

Insulation Resistance minimums, IR

Pin to Pin

- **Initial**
  - **Mated ---------- 7000Meg Ω ----------Pass**
  - **Unmated ---------- 7000Meg Ω ----------Pass**
- **Thermal**
  - **Mated ----------50000Meg Ω ----------Pass**
  - **Unmated ---------- 100000Meg Ω ----------Pass**
- **Humidity**
  - **Mated ----------15000Meg Ω ----------Pass**
  - **Unmated ----------10000Meg Ω ----------Pass**

Pin to Ground

- **Initial**
  - **Mated ---------- 5000Meg Ω ----------Pass**
  - **Unmated ---------- 5000Meg Ω ----------Pass**
- **Thermal**
  - **Mated ---------- 100000Meg Ω ----------Pass**
  - **Unmated ---------- 100000Meg Ω ----------Pass**
- **Humidity**
  - **Mated ---------- 100000Meg Ω ----------Pass**
  - **Unmated ---------- 100000Meg Ω ----------Pass**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage---------- 1200 VAC**
  - **Test Voltage---------- 900 VAC**
  - **Working Voltage---------- 300 VAC**

Pin to Pin

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

Pin to Ground

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

RESULTS Continued

LLCR:

Mating\Unmating Durability Group (48 points signal LLCR test points)

Signal pin:

- **Initial---------- 51.4 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms---------- 48 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---------- 48 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---------- 48 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**

Gas Tight Group (48 points signal LLCR test points)

Signal Pin

- **Initial---------- 29.6 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms---------- 47 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

IP67 Testing (Dust)

Group A1

	Initial (Before Exposure)	After Exposure
Dust	**No Dust Present**	**No Dust Present**

Group B1

	Initial (Before Exposure)	After Exposure
Dust	**No Dust Present**	**No Dust Present**

Group C1

	Initial (Before Exposure)	After Exposure
Dust	**No Dust Present**	**No Dust Present**

IPX8 Testing (Water)

Group A1 (10 m)

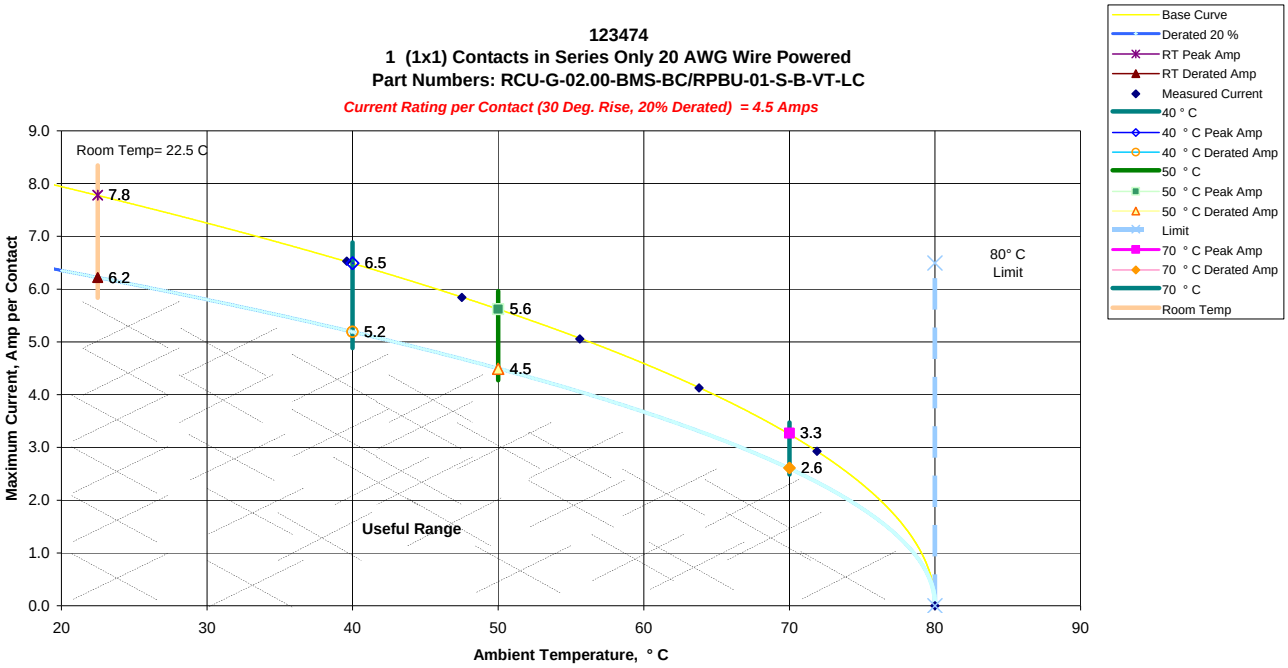
	Initial (Before Exposure)	After Exposure
Water	**No Water Present**	**No Water Present**

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

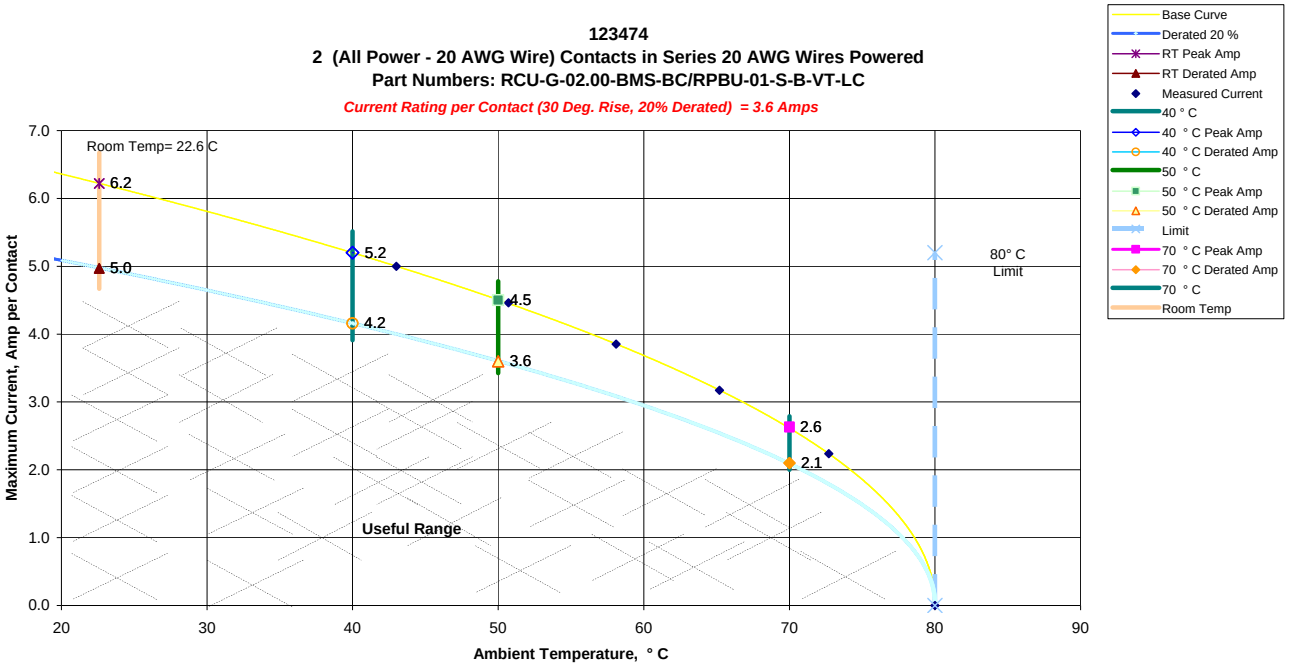
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
4) Adjacent contacts were powered:

    a. Linear configuration with 1 contact in Series 20 AWG Wire Powered

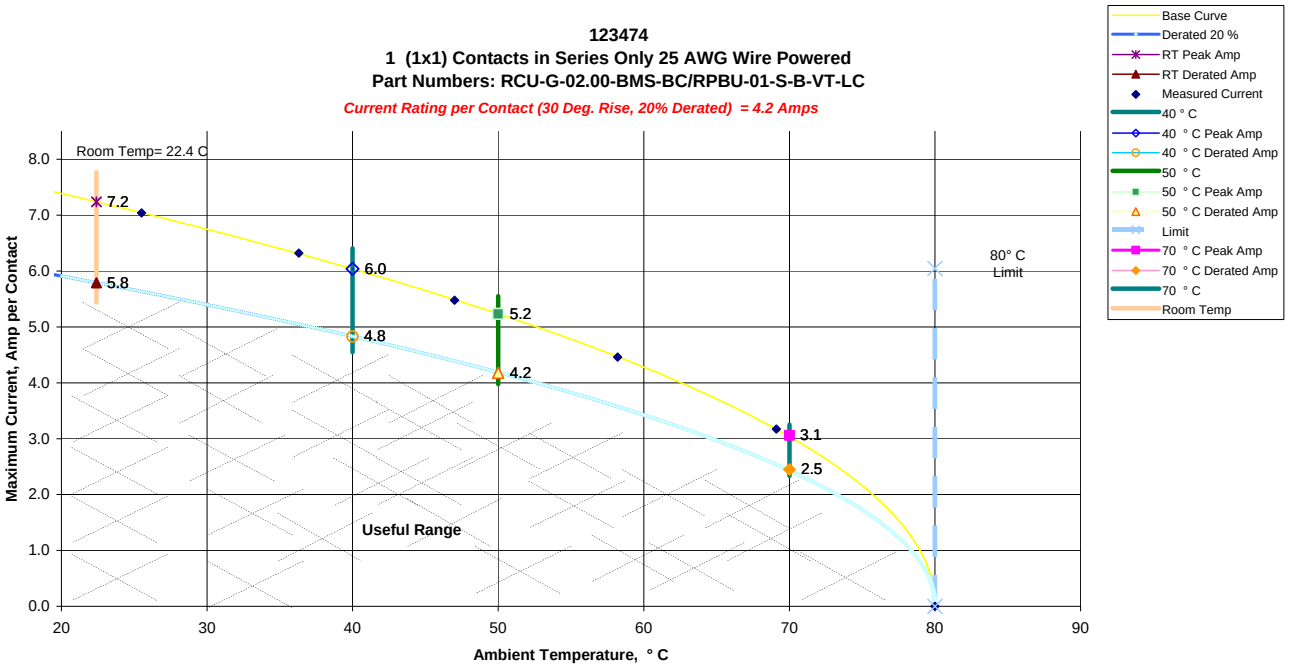


DATA SUMMARIES

b. Linear configuration with 2 contacts in Series 20 AWG Wire Powered

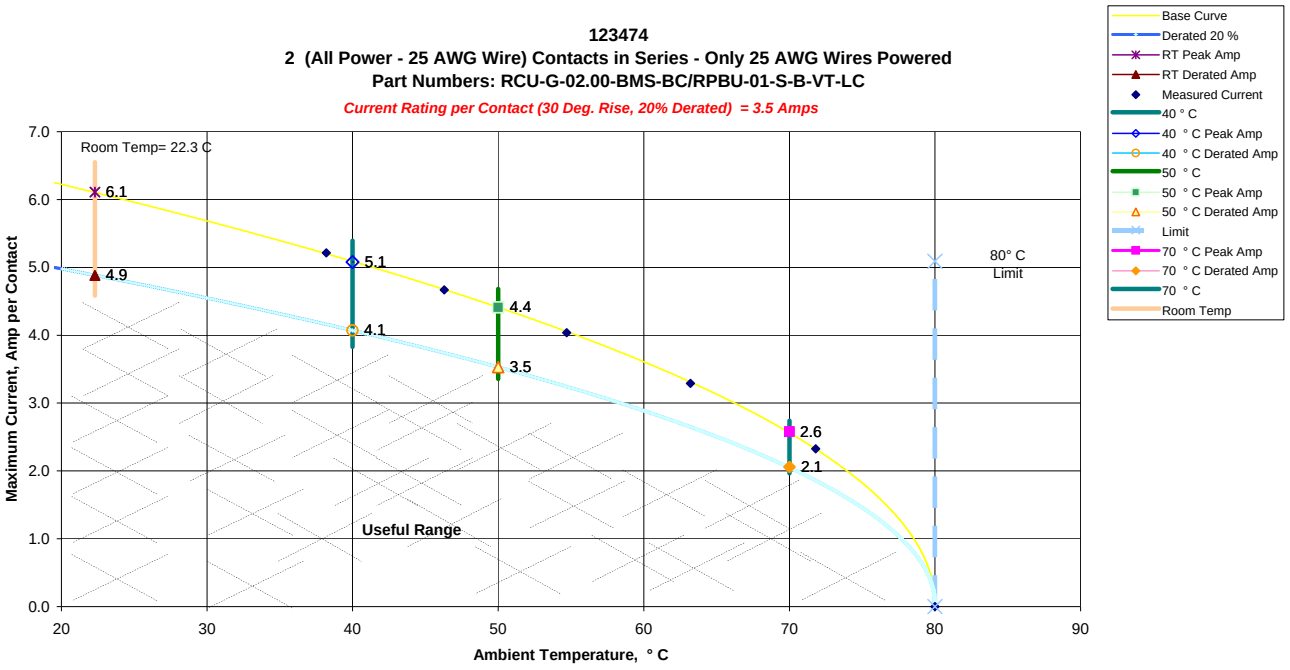


c. Linear configuration with 1 contacts in Series 25 AWG Wire Powered

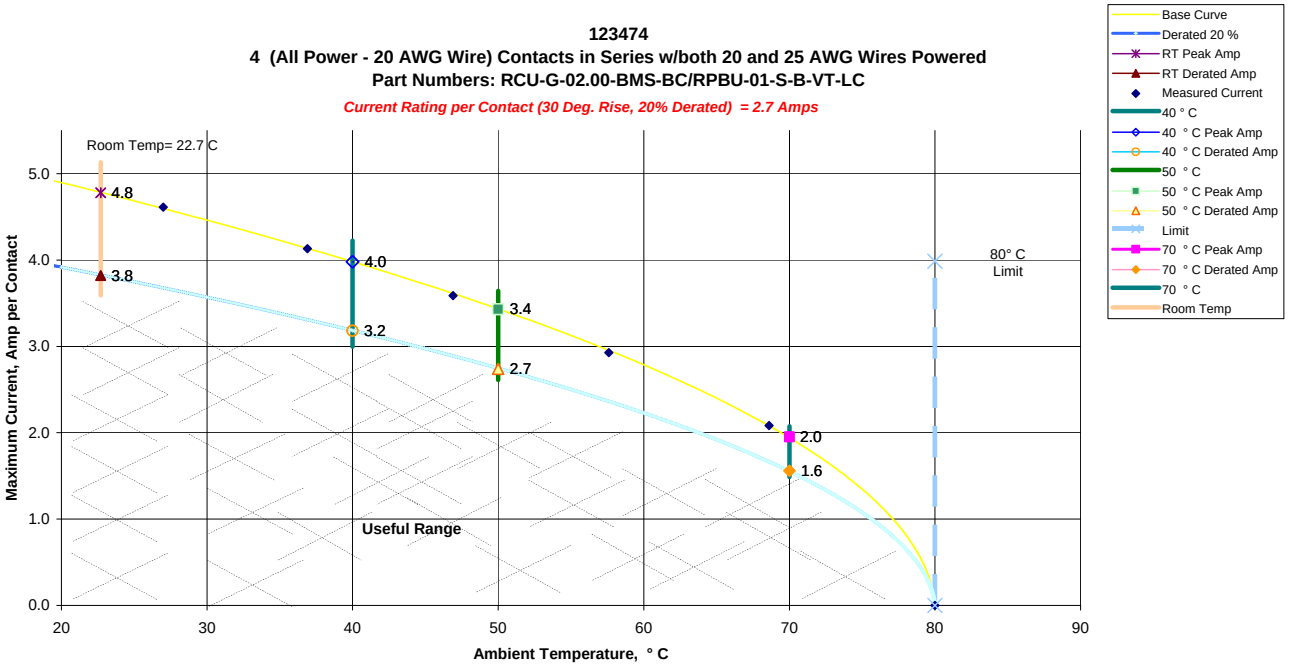


DATA SUMMARIES

d. Linear configuration with 2 contacts in Series 25 AWG Wire Powered

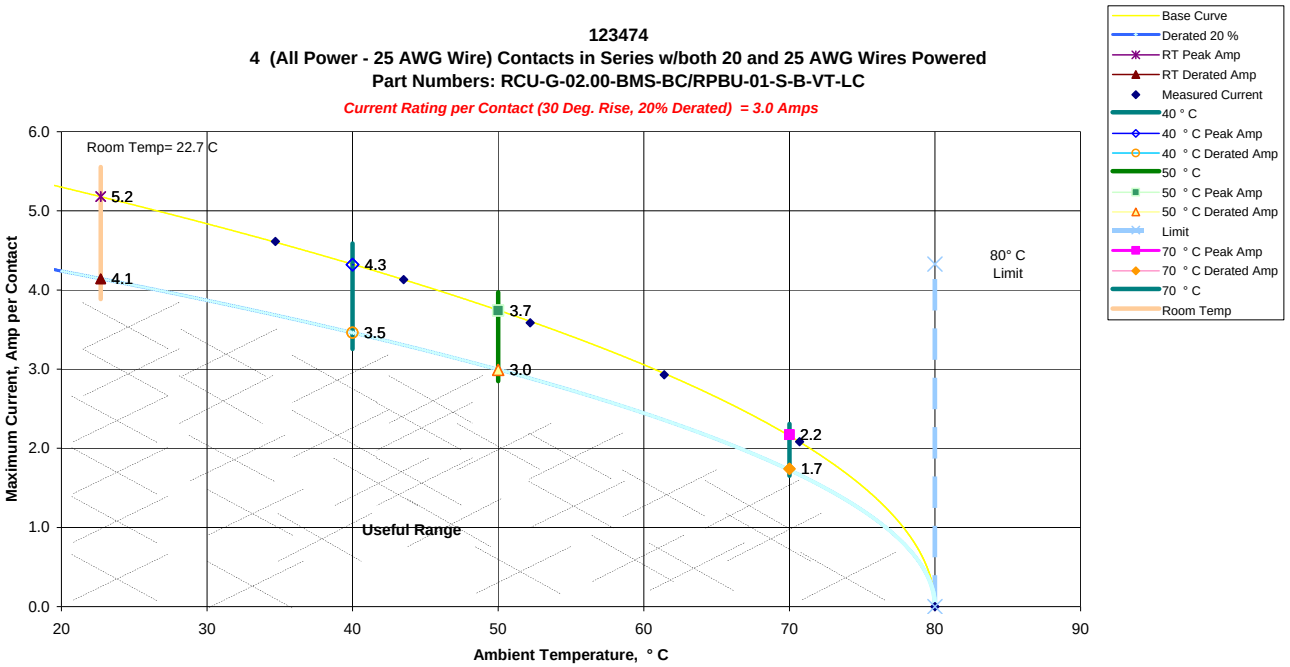


e. Linear configuration with ALL contacts in Series 20 AWG Wire Powered

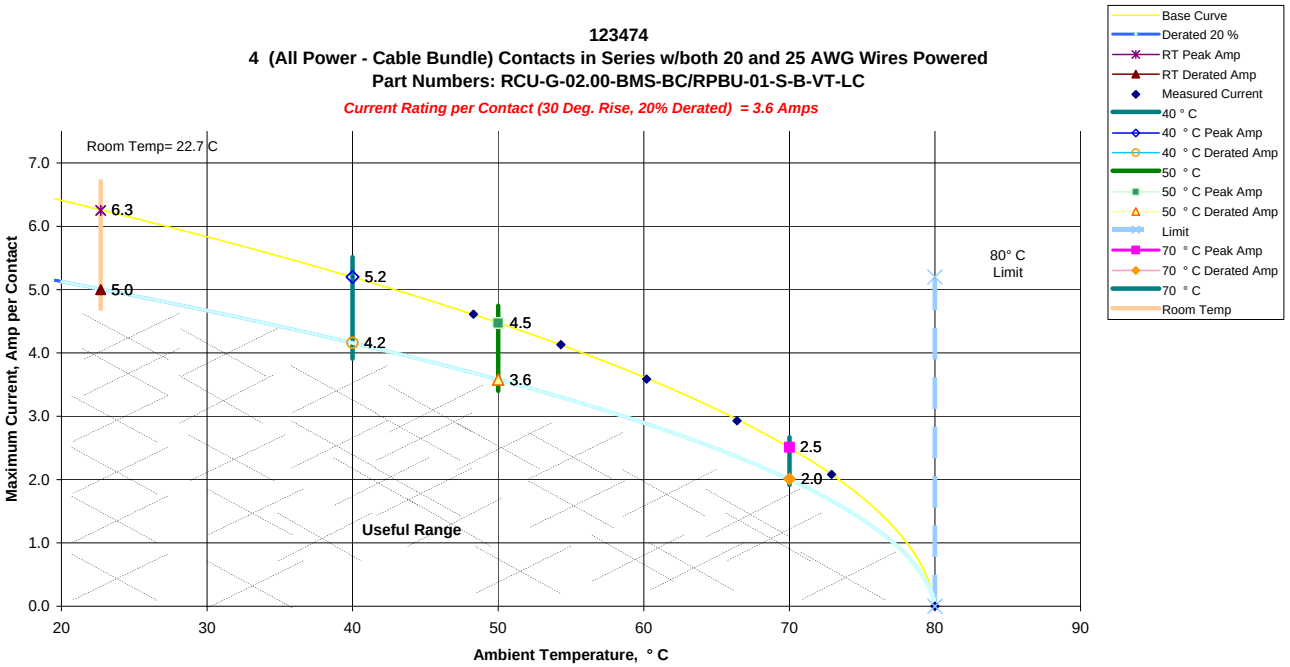


DATA SUMMARIES

f. Linear configuration with ALL contacts in Series 20 AWG Wire Powered



g. Linear configuration with ALL contacts in Series 20 and 25 AWG Wire Powered



DATA SUMMARIES Continued

MATING/UNMATING FORCE:

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	52.44	11.79	15.83	3.56	50.35	11.32	16.19	3.64
Maximum	77.17	17.35	26.73	6.01	69.52	15.63	27.84	6.26
Average	64.56	**14.51**	22.71	**5.11**	58.25	**13.10**	22.41	**5.04**
St Dev	8.02	1.80	4.34	0.98	6.20	1.39	4.20	0.94
Count	8	8	8	8	8	8	8	8

	50 Cycles				75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	50.08	11.26	16.41	3.69	50.80	11.42	16.19	3.64
Maximum	69.30	15.58	30.87	6.94	69.88	15.71	32.69	7.35
Average	58.87	**13.24**	23.10	**5.19**	59.59	**13.40**	24.02	**5.40**
St Dev	7.06	1.59	4.74	1.07	6.95	1.56	5.16	1.16
Count	8	8	8	8	8	8	8	8

	100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	52.49	11.80	16.24	3.65	55.91	12.57	24.38	5.48
Maximum	70.68	15.89	32.87	7.39	79.75	17.93	35.36	7.95
Average	60.47	**13.60**	24.58	**5.53**	67.18	**15.10**	27.53	**6.19**
St Dev	6.80	1.53	5.17	1.16	7.13	1.60	3.59	0.81
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**RCU/RPBU**	**RCU**	**RPBU**
Initial	7000	10000	7000
Thermal	50000	100000	100000
Humidity	15000	10000	15000

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**RCU/RPBU**	**RCU**	**RPBU**
Initial	5000	7000	5000
Thermal	100000	100000	100000
Humidity	10000	100000	100000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**RCU/RPBU**
Break Down Voltage	1200
Test Voltage	900
Working Voltage	300

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

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

DATA SUMMARIES Continued

LLCR:

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) 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

SIGNALS ONLY

Date	7/13/2011	7/19/2011	8/3/2011	8/22/2011
Room Temp C	22	24	22	21
RH	61%	44%	50%	45%
Name	Troy Cook	Troy Cook	Troy Cook	Troy Cook
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Thermal**	**Delta Humidity**
Average	44.7	0.1	-0.1	0.2
St. Dev.	6.0	0.6	0.6	0.8
Min	37.1	-2.8	-1.1	-1.1
Max	51.4	1.3	2.6	3.3
Count	48	48	48	48

How many samples are being tested?	8
How many contacts are on each board?	6

	Stable	Minor	Acceptable	Marginal	Unstable	Open
100 Cycles	48	0	0	0	0	0
Thermal	48	0	0	0	0	0
Humidity	48	0	0	0	0	0

DATA SUMMARIES Continued

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) 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

	SIGNALS	
Date	3/22/2011	3/22/2011
Room Temp C	23	23
RH	45%	44%
Name	Lomax	Lomax
mOhm values	**Actual Initial**	**Delta Gas Tight**
Average	23.0	-0.2
St. Dev.	3.5	1.8
Min	18.8	-10.3
Max	29.6	2.0
Count	48	48

How many samples are being tested?	8
How many contacts are on each board?	6

	Stable	Minor	Acceptable	Marginal	Unstable	Open
Gas Tight	47	0	1	0	0	0

DATA

MATING/UNMATING:

Mating\Unmating Durability Group

Sample#	Initial		25 Cycles		50 Cycles		75 Cycles		100 Cycles		After Humidity	
	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	11.79	5.53	12.09	6.26	12.46	6.94	12.88	7.35	13.42	7.39	14.37	5.63
2	15.43	5.21	14.12	4.90	14.19	5.01	14.38	5.09	14.24	5.17	12.57	5.48
3	14.60	3.68	12.80	3.64	12.57	3.69	12.77	3.64	12.76	3.65	14.43	5.92
4	17.35	5.97	15.63	5.65	15.31	5.65	15.37	5.87	15.67	6.31	16.23	6.41
5	13.37	5.07	12.29	4.92	12.10	4.99	12.28	5.18	12.48	5.15	14.16	5.50
6	13.33	3.56	11.32	3.72	11.26	3.85	11.42	4.16	11.80	4.51	15.56	6.27
7	13.90	5.81	12.49	5.59	12.42	5.81	12.36	5.99	12.50	5.81	17.93	7.95
8	16.34	6.01	14.02	5.62	15.58	5.61	15.71	5.93	15.89	6.21	15.58	6.36

DATA Continued

INSULATION RESISTANCE (IR):

Initial Insulation Resistance
Measured In Meg Ohms

Pin to Pin		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
15000	50000	15000
7000	10000	7000

Pin to Ground		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
15000	25000	15000
5000	7000	5000

Thermal Insulation Resistance
Measured In Meg Ohms

Pin to Pin		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
100000	100000	100000
50000	100000	100000

Pin to Ground		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
100000	100000	100000
100000	100000	100000

DATA Continued

Humidity Insulation Resistance
Measured In Meg Ohms

Pin to Pin		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
100000	100000	100000
15000	10000	15000

Pin to Ground		
Mated	A Unmated	B
X	X	X
RCU/RPBU	RCU	RPBU
100000	100000	100000
10000	100000	100000

DATA Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Initial Breakdown Voltage
Test Voltage ***Until Breakdown Occurs***

Pin to Pin		
Mated	A	Unmated B
X		
RCU/RPBU	RCU	RPBU
1600	1800	1900
1750	1450	1700

Pin to Ground		
Mated	A	Unmated B
X		
RCU/RPBU	RCU	RPBU
1300	1300	2800
1300	1200	2700

Initial DWV
Test Voltage= 900

Pin to Pin		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

Pin to Ground		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

DATA Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Thermal Test Voltage
Test Voltage= 900

Pin to Pin		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

Pin to Ground		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

Humidity Test Voltage
Test Voltage= 900

Pin to Pin		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

Pin to Ground		
Mated	A	Unmated B
RCU/RPBU	RCU	RPBU
900	900	900
900	900	900

DATA Continued

LLCR:

Mating\Unmating Durability Group

	mOhm values	Actual	Delta	Delta	Delta
Board	Position	Initial	100 Cycles	Thermal	Humidity
1	P2	51.4	0.0	-0.6	-0.3
1	P3	50.6	0.1	-0.1	0.0
1	P4	38.8	0.2	0.1	0.2
1	P5	39.7	0.5	-0.2	0.1
1	P7	50.8	0.3	0.3	0.4
1	P8	39.5	0.0	0.7	1.2
2	P2	50.4	-0.2	-0.5	-0.1
2	P3	49.8	0.1	-0.1	0.2
2	P4	38.3	0.1	-0.1	0.1
2	P5	39.1	-0.1	-0.4	0.1
2	P7	51.3	-0.8	-1.1	-1.1
2	P8	38.9	-0.1	-0.4	-0.3
3	P2	50.3	0.6	-0.7	-0.1
3	P3	50.2	0.0	-0.6	-0.3
3	P4	39.3	0.4	-0.8	-0.6
3	P5	39.6	0.3	-0.9	-0.4
3	P7	50.8	0.4	-0.5	-0.1
3	P8	39.0	0.5	-0.5	0.1
4	P2	50.9	-0.3	-0.5	-0.3
4	P3	50.9	-0.5	-0.7	-0.6
4	P4	38.6	-0.3	-0.1	0.1
4	P5	38.7	-0.1	-0.2	0.0
4	P7	50.5	0.0	-0.4	-0.2
4	P8	38.5	0.1	-0.6	-0.1
5	P2	50.9	0.2	0.2	0.3
5	P3	50.8	-0.1	-0.2	-0.2
5	P4	39.0	0.0	-0.2	-0.1
5	P5	39.5	0.6	1.8	1.9
5	P7	50.8	0.0	-0.1	0.1
5	P8	38.8	0.1	0.1	0.4
6	P2	50.5	0.2	0.1	0.1
6	P3	50.2	0.2	0.4	0.2
6	P4	38.6	0.8	2.6	3.3
6	P5	38.8	0.1	0.0	-0.1
6	P7	50.6	0.3	-0.1	0.0
6	P8	39.1	-2.8	-0.2	0.0
7	P2	50.8	0.1	0.5	0.4
7	P3	50.2	0.2	0.3	0.2
7	P4	38.8	-0.2	0.2	0.3
7	P5	39.4	-0.1	0.0	-0.1
7	P7	49.8	0.1	0.0	0.1

7	P8	38.0	0.1	0.2	0.3
8	P2	50.7	0.0	-0.5	-0.3
8	P3	50.9	0.5	-0.7	-0.5
8	P4	37.1	1.3	-0.8	-1.1
8	P5	38.2	0.8	0.1	0.5
8	P7	50.2	-0.1	0.7	3.2
8	P8	38.4	0.2	0.2	0.3

DATA Continued

Gas Tight Group

	mOhm values	Actual	Delta
Board	Position	Initial	Gas Tight
1	P2	25.9	1.6
1	P3	27.3	-1.8
1	P4	20.3	-1.0
1	P5	20.0	0.0
1	P7	26.2	-0.6
1	P8	22.0	-3.0
2	P2	25.5	1.5
2	P3	26.8	-1.2
2	P4	19.1	-0.3
2	P5	19.2	0.1
2	P7	25.9	-0.7
2	P8	18.9	0.4
3	P2	28.0	-2.4
3	P3	25.6	0.2
3	P4	18.9	1.0
3	P5	19.6	0.1
3	P7	25.6	-0.3
3	P8	19.1	0.2
4	P2	25.7	0.1
4	P3	26.5	-0.5
4	P4	19.8	-0.8
4	P5	19.9	0.0
4	P7	26.3	-0.7
4	P8	19.9	-0.9
5	P2	26.5	-0.5
5	P3	25.5	1.2
5	P4	19.0	2.0
5	P5	19.5	0.3
5	P7	25.7	0.2
5	P8	19.2	0.8
6	P2	26.6	-0.9
6	P3	25.5	0.8
6	P4	18.8	0.4
6	P5	19.1	0.1
6	P7	25.2	0.9
6	P8	19.2	-0.2
7	P2	25.8	0.7
7	P3	27.3	-1.4
7	P4	29.6	-10.3
7	P5	19.3	0.2
7	P7	25.8	0.0
7	P8	19.8	-0.6
8	P2	25.6	0.3
8	P3	25.8	0.6

8	P4	18.9	0.9
8	P5	20.1	0.2
10	P7	26.2	0.1
11	P8	18.8	1.3

DATA Continued

IP67 Testing (Dust)

Group A1 (Dust mated)

Sample #	Visual Inspection
21	PASS
22	PASS
23	PASS
24	PASS
25	PASS
26	PASS

Group B1 (Cable dust cover)

Sample #	Visual Inspection
33	PASS
34	PASS
35	PASS
36	PASS
37	PASS
38	PASS

Group C2 (Mating part dust cover)

Sample #	Visual Inspection
45	PASS
46	PASS
47	PASS
48	PASS
49	PASS
50	PASS

Group D1 (Mating part dust cover)

Sample #	Visual Inspection
57	PASS
58	PASS
59	PASS
60	PASS
61	PASS
62	PASS

DATA Continued

IPX8 Testing (Water)

Sample #	Visual Inspection at 10 Meters
69	PASS
70	PASS
71	PASS
72	PASS
73	PASS
74	PASS

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/30/2011, Next Cal: 04/30/2012

Equipment #: PS-07
Description: Power Supply
Manufacturer: Agilent
Model: AT-6031A
Serial #: 2721A00648
Accuracy: See Manual See Manual
… Last Cal: 08/21/2011, Next Cal: 08/21/2012

Equipment #: TCT-04
Description: Dillon Quantrol TC2 Test Stand
Manufacturer: Dillon Quantrol
Model: TC2
Serial #: 04-1041-04
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 05/21/2011, Next Cal: 05/21/2012

Equipment #: THC-02
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 02/16/2011, Next Cal: 02/16/2012

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 11/30/2010, Next Cal: 11/30/2011

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: 05/18/2011, Next Cal: 05/18/2012

EQUIPMENT AND CALIBRATION SCHEDULES Continued

Equipment #: IPX8-01
Description: IP-X8 Water Pressure test 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