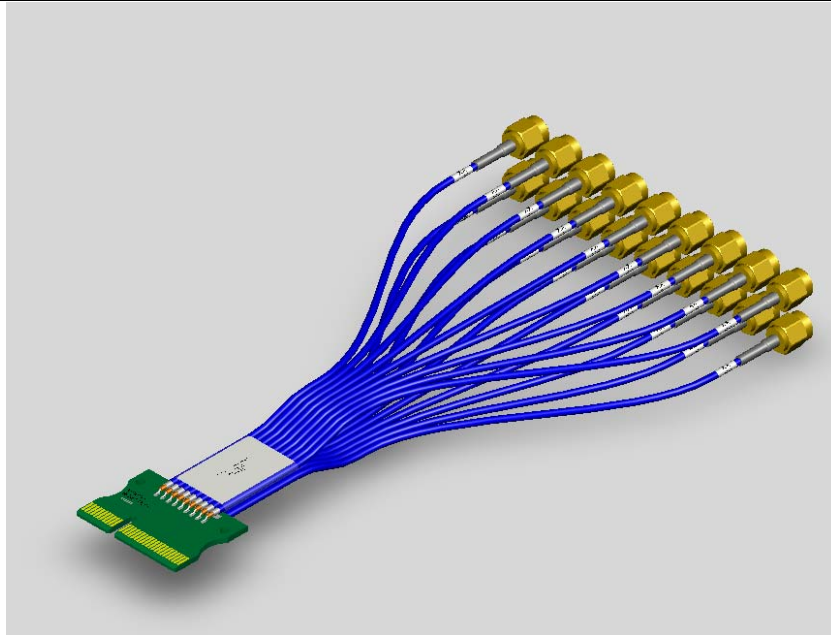




Project Number:		Tracking Code: TC0719--1348	
Requested by: John Riley		Date: 5/11/2007	Product Rev: 1
Part #: PCRF-064-0305-SMA-P-1		Lot #: 99999	Tech: Tony Wagoner/Tori Meek Eng: Troy Cook
Part description: PCRF			Qty to test: 50
Test Start: 06/07/2007	Test Completed: 7/17/2007		



TC0637--1163 PCRF DVT Report

**PCRF-064-0305-SMA-P-1 mated with
PCIE-64-02-F-D-TH-R-HZ & SMA-J-P-H-ST-TH1**

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

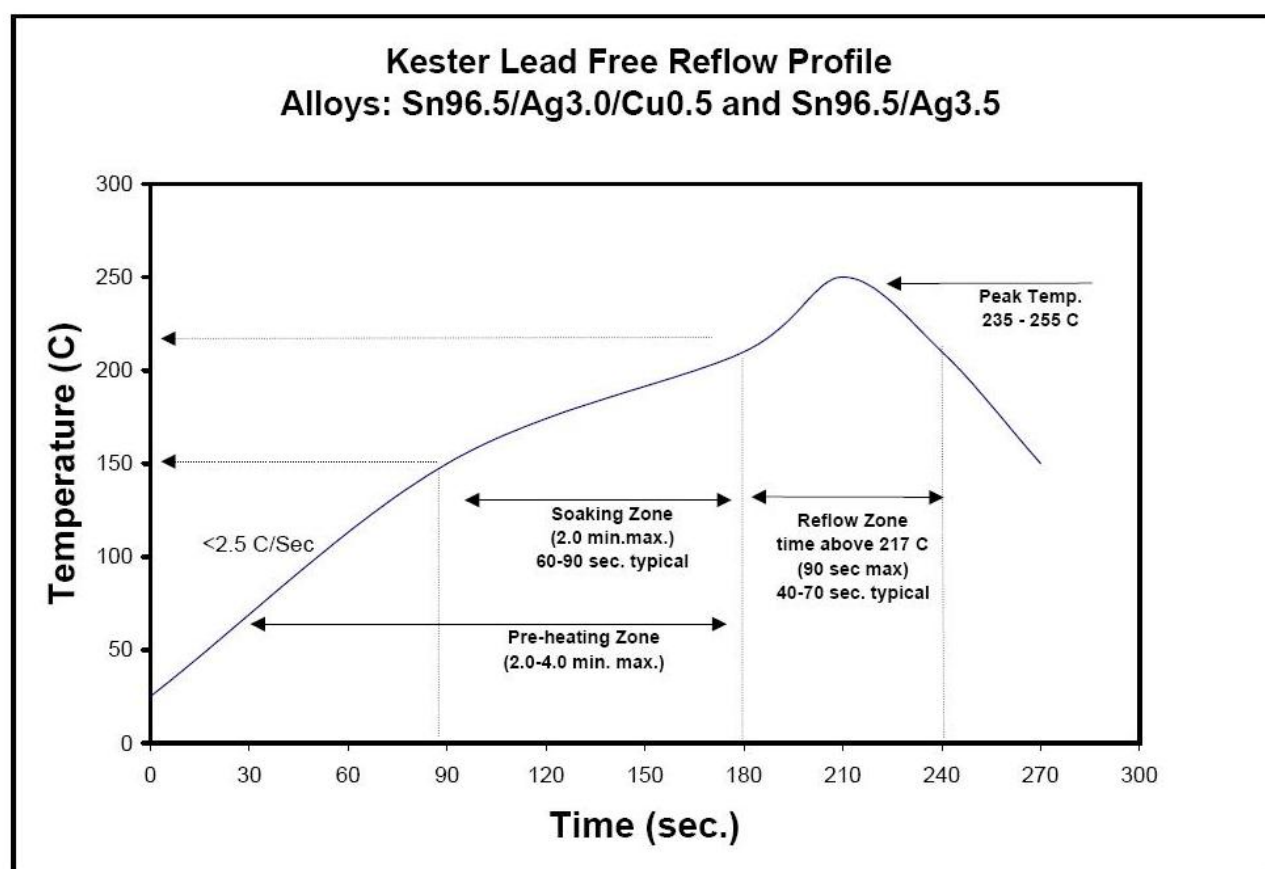
To perform the following tests: match testing for PCIEC TC0637--1163

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) Internal Test PCBs used: PCB-100776-TST-XX

OVEN PROFILE (Soldering Parts to Test Boards)

FLOWCHARTS

Current Carrying Capacity

TEST STEP	GROUP 1 All Cables Powered Measured at Connector	GROUP 2 All Cables Powered Measured at Cable
01	CCC	CCC

Tabulate calculated current at RT, 60° C, 75° C and 80° C

after derating 20% and based on 80° C

CCC, Temp rise = EIA-364-70

IR

TEST STEP	GROUP 1A Signal-Signal	GROUP 1B Signal - Ground
01	IR	IR
02	Data Review	Data Review
03	Thermal Aging	Thermal Aging
04	IR	IR
05	Data Review	Data Review
06	Humidity	Humidity
07	IR	IR

Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;

Time Condition 'B' (250 hours)

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

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

delete steps 7a and 7b

FLOWCHARTS Continued

DWV

TEST	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6
STEP	Signal - Signal	Signal - Ground	Signal - Signal	Signal - Ground	Signal - Signal	Signal - Ground
	Ambient	Ambient	Thermal	Thermal	Humidity	Humidity
01	DWV/Working Voltage	DWV/Working Voltage	Thermal Aging	Thermal Aging	Humidity	Humidity
02			DWV/Working Voltage	DWV/Working Voltage	DWV/Working Voltage	DWV/Working Voltage

Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;

Time Condition 'B' (250 hours)

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

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

delete steps 7a and 7b

Connector Pull

TEST STEP	GROUP 1	GROUP 2
	DV SIG 0°	DV SIG 90°
01	Pull test, Continuity	Pull test, Continuity

Secure both cables in the center

Monitor continuity and pull

record forces when continuity fails.

FLOWCHARTS Continued**Resistance, SIG Continuity**

TEST	GROUP 1	GROUP 1A
STEP	90°	35°
	SIG	SIG
01	Resistance	Resistance
02	1000 Cycles	1000 Cycles
03	Resistance	Resistance
04	Data Review	Data Review
05	2000 Cycles	2000 Cycles
06	Resistance	Resistance
07	Data Review	Data Review
08	3000 Cycles	3000 Cycles
09	Resistance	Resistance
10	Data Review	Data Review
11	4000 Cycles	4000 Cycles
12	Resistance	Resistance
13	Data Review	Data Review
14	5000 Cycles	5000 Cycles
15	Resistance	Resistance

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

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) Connectors are sometimes mated and all samples are pre-conditioned at ambient.

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) Connectors are sometimes mated and all samples are pre-conditioned at ambient.

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. 50° C
 - c. 60° C
 - d. 75° 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.

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 and 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 5000 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 and Signal-to-Ground
 - ii. Rate of Application 500 V/Sec
 - iii. 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).

SUPPLEMENTAL TESTS

CONNECTOR PULL:

- 1) Secure cable near center and pull on connector
 - a. At 90°, right angle to cable
 - b. At 0°, in-line with cable

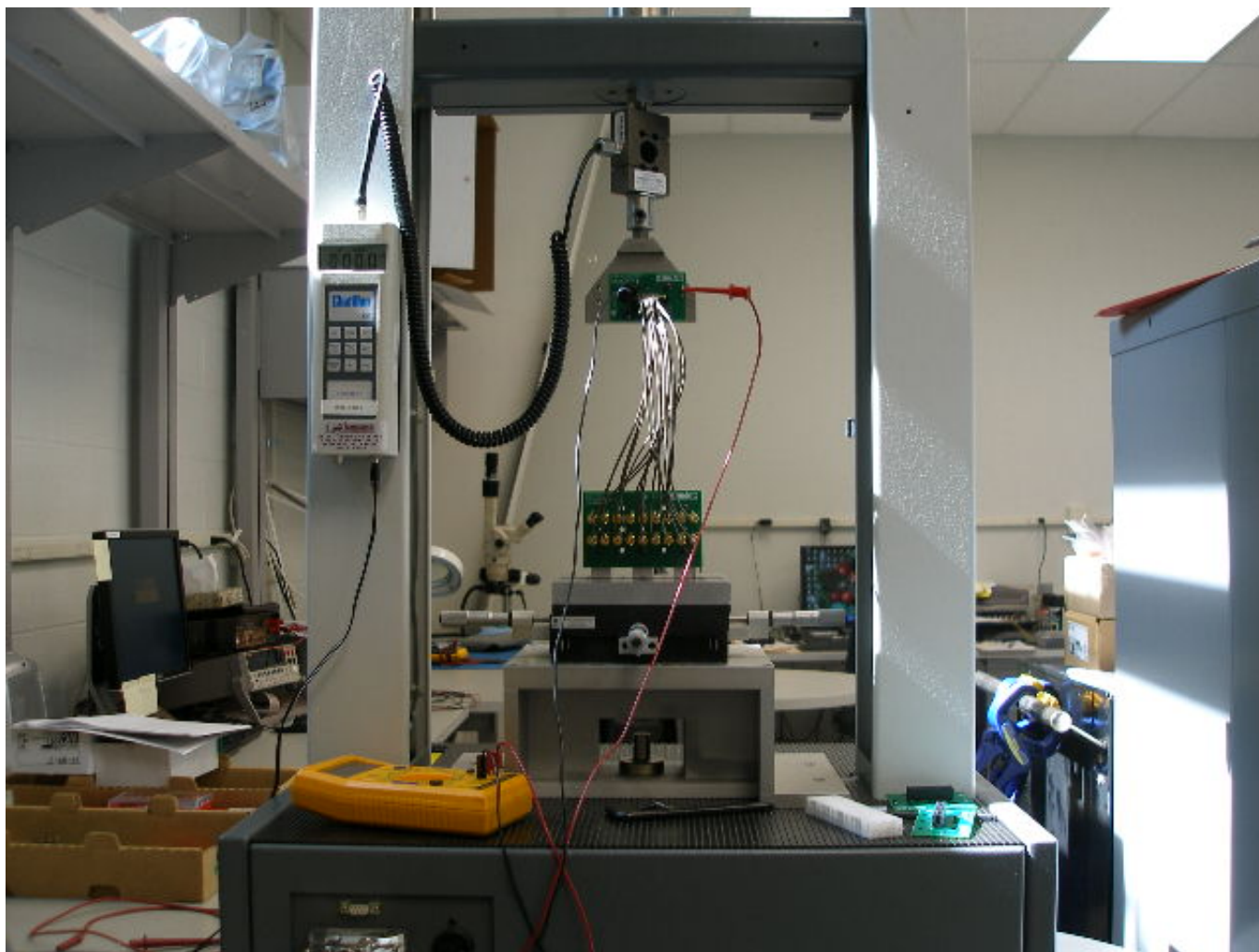


Fig. 1
90° Connector pull, notice the electrical continuity hook-up wires.

CABLE DURABILITY:

- 1) Oscillate and monitor electrical continuity for open circuit indication.
 - a. $\pm 35^\circ$ Pendulum Mode, bend up 5,000 cycles with 8 oz. load on cable end.

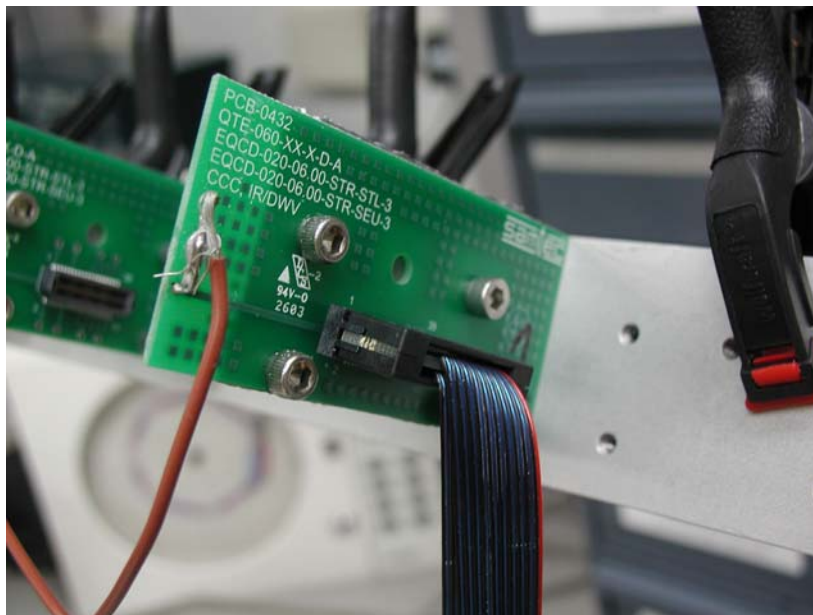


Fig. 2
(Typical set-up, actual part not depicted.)

- b. $\pm 90^\circ$ Flex Mode, bend up to 5,000 cycles with 8 oz. load on cable end.

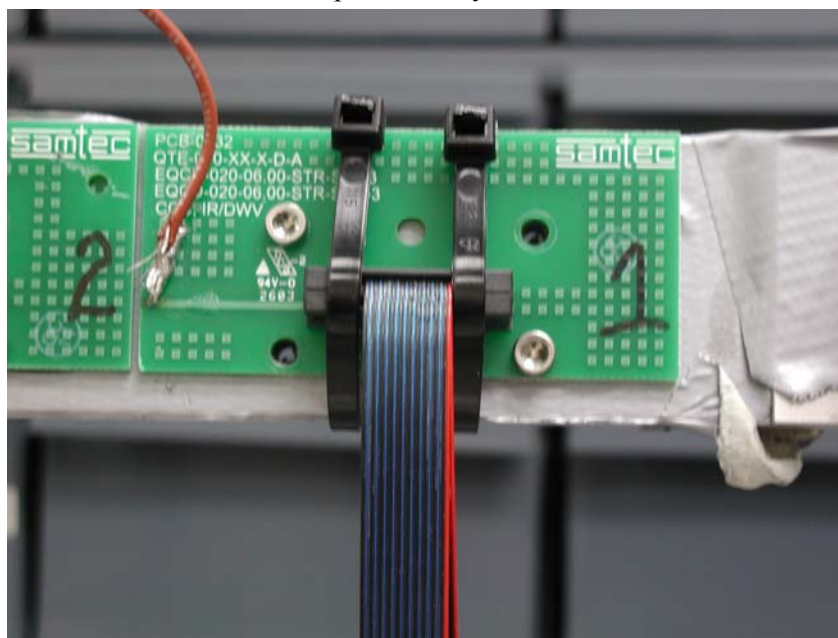


Fig. 3
(Typical set-up, actual part not depicted.)

RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise (Connector)-----1.3 A per contact with 6 adjacent contacts powered
- CCC for a 30°C Temperature Rise (Cable)-----2.0 A per contact with 12 adjacent contacts powered

Insulation Resistance minimums, IR

- Initial
 - Signal-Signal -----100,000 Meg Ω ----- Pass
 - Signal-Ground -----100,000 Meg Ω
- Thermal
 - Signal-Signal -----100,000 Meg Ω
 - Signal-Ground -----100,000 Meg Ω
- Humidity
 - Signal-Signal ----- 10,000 Meg Ω
 - Signal-Ground -----8,000 Meg Ω

Dielectric Withstanding Voltage minimums, DWV

- Initial
 - Breakdown
 - Signal-Signal -----820 VAC
 - Signal-Ground -----640 VAC
 - DWV
 - Signal-Signal -----615 VAC
 - Signal-Ground -----480 VAC
 - Working voltage
 - Signal-Signal -----205 VAC
 - Signal-Ground -----160 VAC
- Thermal
 - Breakdown
 - Signal-Signal -----700 VAC
 - Signal-Ground -----540 VAC
 - DWV
 - Signal-Signal -----525 VAC
 - Signal-Ground -----405 VAC
 - Working voltage
 - Signal-Signal -----175 VAC
 - Signal-Ground -----135 VAC
- Humidity
 - Breakdown
 - Signal-Signal -----840 VAC
 - Signal-Ground -----580 VAC
 - DWV
 - Signal-Signal -----630 VAC
 - Signal-Ground -----435 VAC
 - Working voltage
 - Signal-Signal -----210 VAC
 - Signal-Ground -----135 VAC

Tracking Code: TC0719--1348	Part #: PCRF-064-0305-SMA-P-1
Part description: PCRF	

SUPPLEMENTAL TESTING

Supplemental – Connector/Cable Pull

- 0° ----- 202.50 lbs min
- 90° ----- 31.00 lbs min

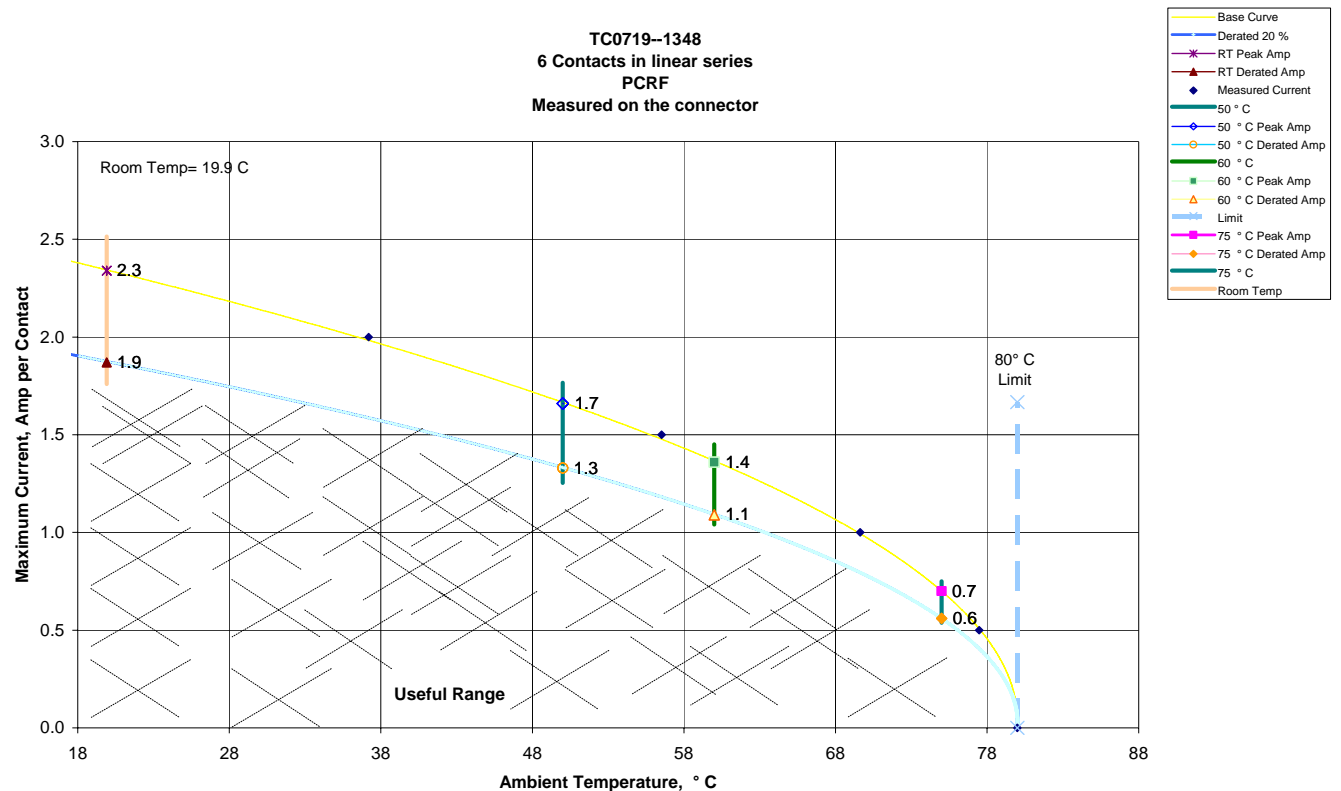
Supplemental – Cable Bend up to 5,000 Cycles

- ±35° Pendulum Mode ----- Failed at 1,958 cycles
- ±90° Flex Mode ----- Failed at 232 cycles

DATA SUMMARIES

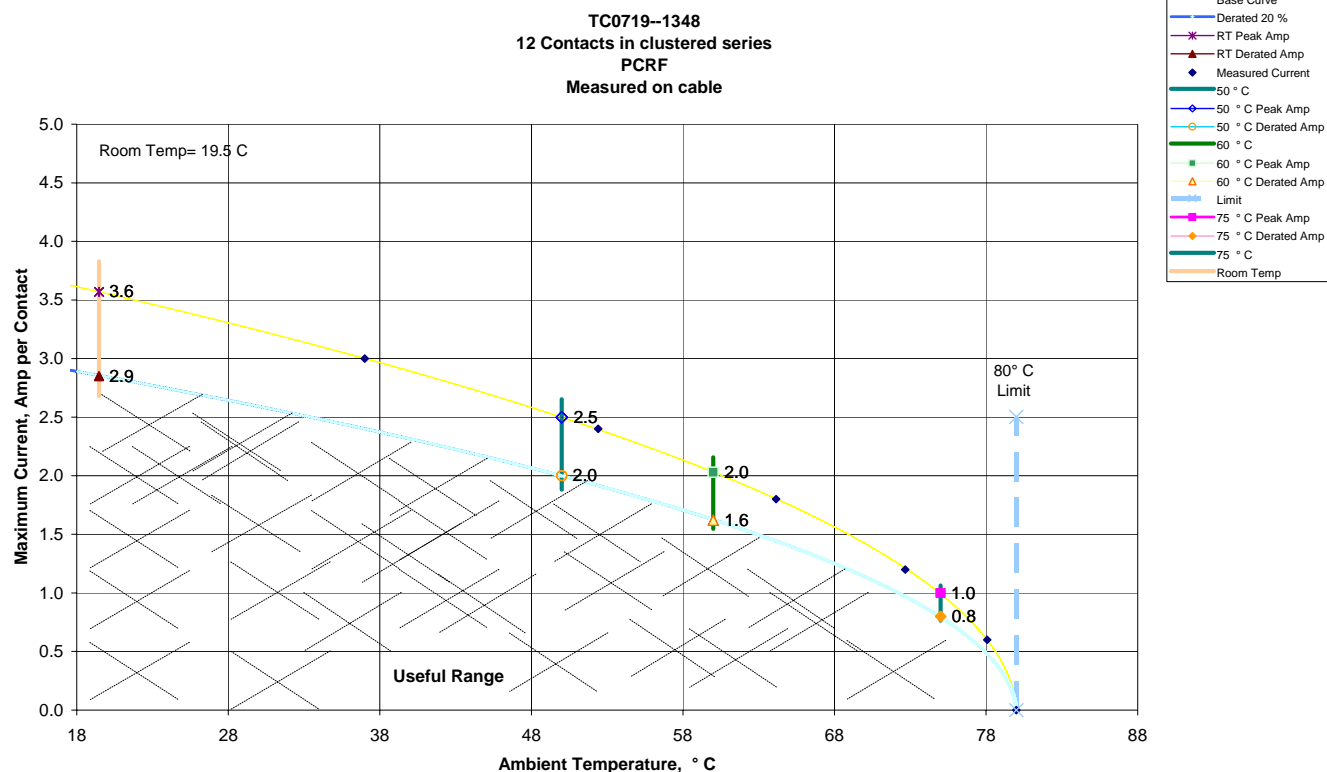
TEMPERATURE RISE (Current Carrying Capacity, CCC):

- 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 six adjacent contacts powered, measured at PCIE connector



DATA SUMMARIES Continued

b. Linear configuration with 12 adjacent contacts powered, measured on cable

**INSULATION RESISTANCE (IR):**

	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	Signal	Sig-Gnd	Signal	Sig-Gnd	Signal	Sig-Gnd
	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>
Average	100000	100000	100000	100000	12500	9000
Min	100000	100000	100000	100000	10000	8000
Max	100000	100000	100000	100000	15000	10000

DATA SUMMARIES Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Initial, VAC Signal			Initial, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
Average	840	630	210	700	525	175
Min	820	615	205	640	480	160
Max	860	645	215	760	570	190

	Thermal, VAC Signal			Thermal, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
Average	760	570	190	590	443	148
Min	700	525	175	540	405	135
Max	820	615	205	640	480	160

	Humidity, VAC Signal			Humidity, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
Average	840	630	210	610	458	153
Min	840	630	210	580	435	145
Max	840	630	210	640	480	160

SUPPLEMENTAL TESTS

CONNECTOR/CABLE PULL:

		<i>0 Deg. Pull</i>		<i>90 Deg. Pull</i>	
		<u>Force (Lbs)</u>		<u>Force (Lbs)</u>	
Minimum		202.50		31.00	
Maximum		335.00		36.00	
Average		275.80		33.70	

DATA SUMMARIES Continued**CABLE BEND UP TO 5,000 CYCLES:**

35 Deg. Continuity - Resistance, Ohms						
	Initial	After 1000	After 2000	After 3000	After 4000	After 5000
Avg	1.3964	1.3860	1.3745	1.3590	1.4030	1.4300
Min	1.3070	1.3120	1.3000	1.3070	1.4030	1.4300
Max	1.4950	1.4740	1.4780	1.4110	1.4030	1.4300
St. Dev.	0.0745	0.0700	0.0858	0.0735	N/A	N/A
Count	5	5	4	2	1	1

90 Deg. Flex - Resistance, Ohms						
	Initial	After 1000	After 2000	After 3000	After 4000	After 5000
Avg	1.4092	N/A	N/A	N/A	N/A	N/A
Min	1.3150	N/A	N/A	N/A	N/A	N/A
Max	1.4580	N/A	N/A	N/A	N/A	N/A
St. Dev.	0.0553	N/A	N/A	N/A	N/A	N/A
Count	5	0	0	0	0	0

DATA**INSULATION RESISTANCE (IR):**

<u>Sample #</u>	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	Signal	Sig-Gnd	Signal	Sig-Gnd	Signal	Sig-Gnd
	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>	<u>Insulation Resistance</u>
1	100000	100000	100000	100000	10000	8000
2	100000	100000	100000	100000	15000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

<u>Sample #</u>	Initial, VAC Signal			Initial, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
1	820	615	205	760	570	190
2	860	645	215	640	480	160

<u>Sample #</u>	Thermal, VAC Signal			Thermal, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
1	700	525	175	540	405	135
2	820	615	205	640	480	160

<u>Sample #</u>	Humidity, VAC Signal			Humidity, VAC Signal to Ground		
	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>	<u>Breakdown Voltage</u>	<u>DWV</u>	<u>Working Voltage</u>
1	840	630	210	580	435	145
2	840	630	210	640	480	160

DATA Continued**SUPPLEMENTAL****CONNECTOR/CABLE PULL:**

Sample#	0 Deg. Pull
	Force (Lbs)
1	307.0
2	335.0
3	202.5
4	305.0
5	229.5

Sample#	90 Deg. Pull
	Force (Lbs)
1	35.5
2	31.0
3	31.5
4	34.5
5	36.0

CABLE BEND UP TO 5,000 CYCLES:

35 Deg. Flex Continuity - Resistance, Ohms						
Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
1	1.422	1.420	1.412	1.411	1.403	1.430
2	1.495	1.474	1.478	Failed @ 2640	N/A	N/A
3	1.339	1.312	1.308	1.307	Failed @ 3756	N/A
4	1.307	1.317	1.300	Failed @ 2658	N/A	N/A
5	1.419	1.407	Failed @ 1958	N/A	N/A	N/A

90 Deg. Flex - Resistance, Ohms						
Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
1	1.433	Failed @ 388	N/A	N/A	N/A	N/A
2	1.458	Failed @ 283	N/A	N/A	N/A	N/A
3	1.411	Failed @ 295	N/A	N/A	N/A	N/A
4	1.315	Failed @ 232	N/A	N/A	N/A	N/A
5	1.429	Failed @ 264	N/A	N/A	N/A	N/A

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** THL-02**Description:** Temperature/Humidity Chart Recorder**Manufacturer:** Dickson**Model:** THDX**Serial #:** 00120351**Accuracy:** Temp: +/- 1C; Humidity: +/-2% RH (0 - 60%) +/- 3% RH (61 - 95%).

... Last Cal: 06/16/07, Next Cal: 06/16/08

Equipment #: PS-01**Description:** System Power Supply**Manufacturer:** Hewlett Packard**Model:** HP 6033A**Serial #:** (HP) 3329A-07330**Accuracy:** See Manual

... Last Cal: 06/22/07, Next Cal: 06/22/08

Equipment #: MO-02**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 0780546**Accuracy:** See Manual

... Last Cal: 06/22/07, Next Cal: 06/22/08

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

... Last Cal: 03/8/07, Next Cal: 03/8/08

Equipment #: TC090601-109/118**Description:** IC Thermocouple-109/118**Manufacturer:** Samtec**Model:****Serial #:** TC090601-109/118**Accuracy:** +/- 1 degree C

... Last Cal: , Next Cal:

Equipment #: HPM-01**Description:** Hipot Megommeter**Manufacturer:** Hipotronics**Model:** H306B-A**Serial #:** M9905004**Accuracy:** 2 % Full Scale Accuracy

... Last Cal: 06/22/07, Next Cal: 06/22/08

Equipment #: OV-03**Description:** Cascade Tek Forced Air Oven**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: 06/62/07, Next Cal: 06/22/08**Equipment #:** THC-01**Description:** Temperature/Humidity Chamber**Manufacturer:** Thermotron**Model:** SM-8-7800**Serial #:** 30676**Accuracy:** See Manual

... Last Cal: 8/18/2006, Next Cal: 8/18/2007

Equipment #: LC-250N (icell)**Description:** 250 Newton load cell for Dillon Quantrol test stand**Manufacturer:** Dillon Quantrol**Model:** icell**Serial #:** 04-0020-08**Accuracy:** .10 % of Capacity

... Last Cal: 5/24/2007, Next Cal: 5/24/2008

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: 05/18/2007, Next Cal: 05/18/2008

Equipment #: HDR-02**Description:** HDR Cycle Tester**Manufacturer:** Samtec Inc.**Model:** AT-1544-011**Serial #:** 00120351**Accuracy:** N/A

... Last Cal: No Calibration Required, Next Cal:

...