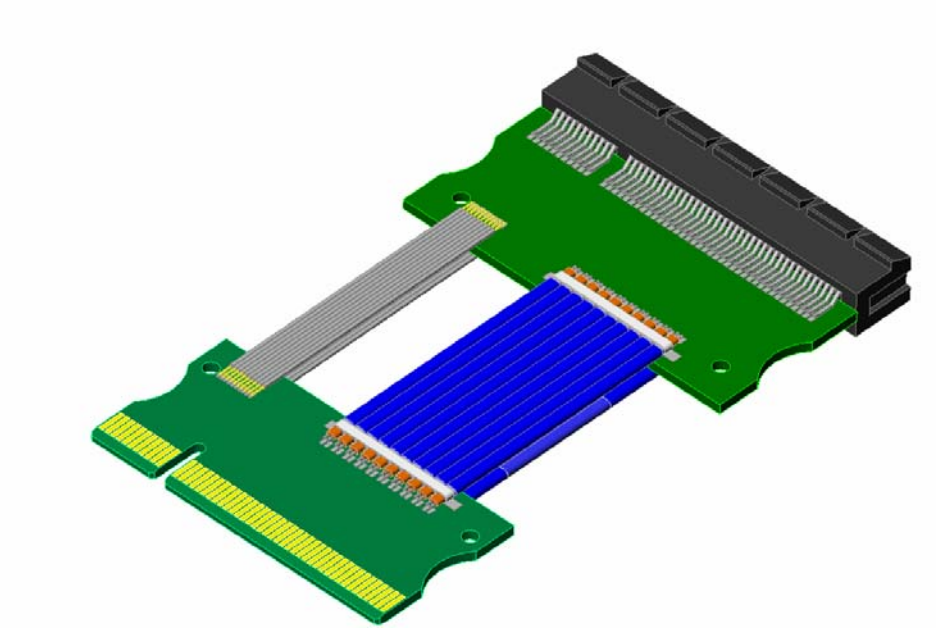
Project Number:	Tracking Code: TC0637--1163		
Requested by: Gary Lewis	Date: 9/14/2006	Product Rev: N/A	
Part #: PCIEC-064-0152-EC-EM-P	Lot #: N/A	Tech: Tony Wagoner/Tori Meek	Eng: Troy Cook
Part description: PCIEC			Qty to test: 50
Test Start: 02/26/2007	Test Completed: 4/1/2007		



PCIEC DVT Report

PCIEC-064-0152-EC-EM-P

Mated with PCIE-064-64-02-F-D-TH

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: Standard HDR DVT should have assemblies early November.

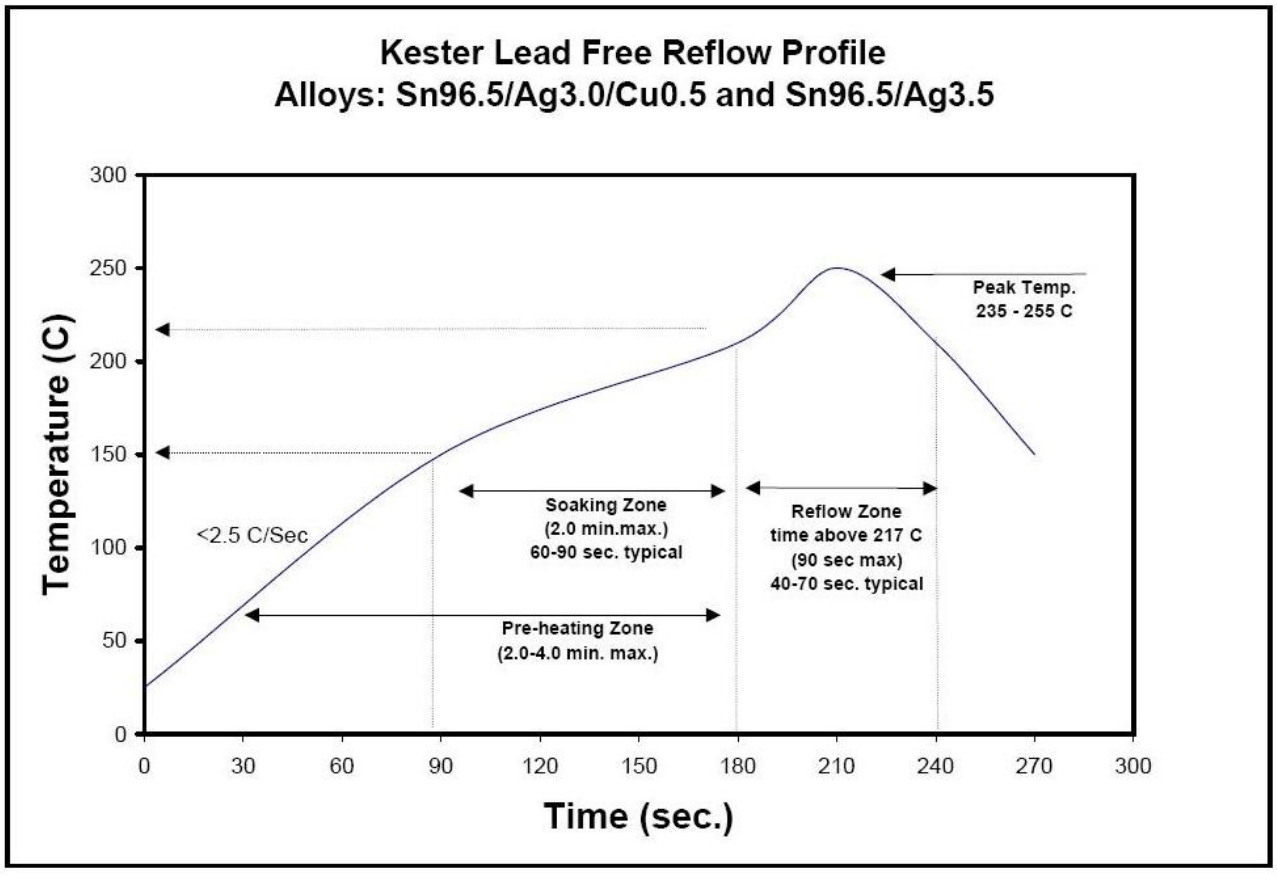
APPLICABLE DOCUMENTS

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-100646-TST-XX

OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Current Carrying Capacity

TEST STEP	GROUP 1 Both Cables Powered - BLUE HDR 6 Adjacent Contacts in both cables	GROUP 2 Gray Cable 6 Adjacent Contacts in both cables - Signal	GROUP 2 Gray Cable 6 Adjacent Contacts in both cables - 12.0 Volts	GROUP 2 Gray Cable 6 Adjacent Contacts in both cables - 3.3 Volts
01	CCC	CCC	CCC	CCC

Tabulate calculated current at RT, 50° C, 65° C and 75° C
after derating 20% and based on 80° C
CCC, Temp rise = EIA-364-70

IR

TEST STEP	GROUP 1A Front Cable, Conductor - to - Conductor	GROUP 1B Back Cable, Conductor - to - Conductor
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 STEP	GROUP 1 Front Cable, Conductor - to - Conductor Ambient	GROUP 2 Back Cable, Conductor - to - Conductor Ambient	GROUP 3 Front Cable, Conductor - to - Conductor Thermal	GROUP 4 Back Cable, Conductor - to - Conductor Thermal	GROUP 5 Front Cable, Conductor - to - Conductor Humidity	GROUP 6 Back Cable, Conductor - to - Conductor 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 DV SIG 0°	GROUP 2 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 Contiinuity

TEST STEP	GROUP 1 DV End 90° SIG	GROUP 1A DV End 35° 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^{o} C
    c. 65^{o} C
    d. 75^{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.

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
        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
        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).

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

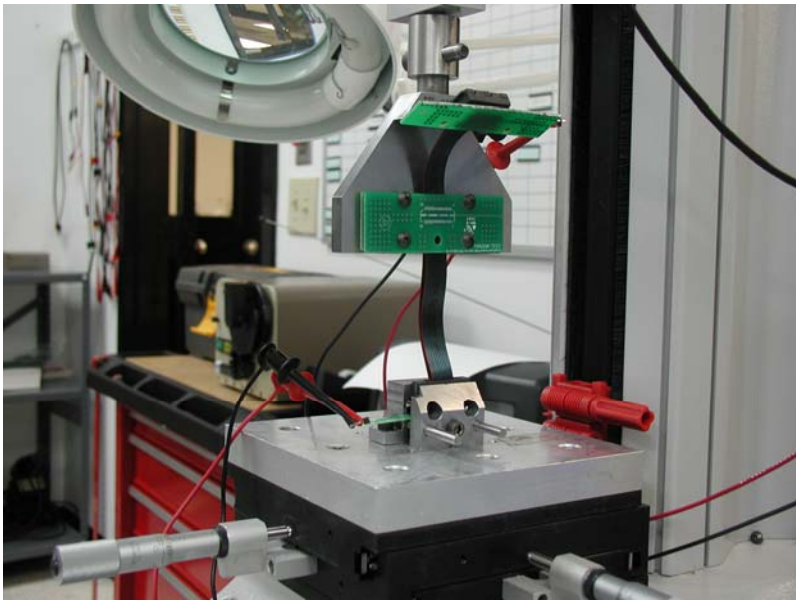


Fig. 1
(Typical set-up, actual part not depicted.)
0° Connector pull, notice the electrical continuity hook-up wires.

CABLE DURABILITY:

1) Oscillate and monitor electrical continuity for open circuit indication.
   a. ± 35° Pendulum Mode, bend up to 5,000 cycles with 4 oz. load on cable end.

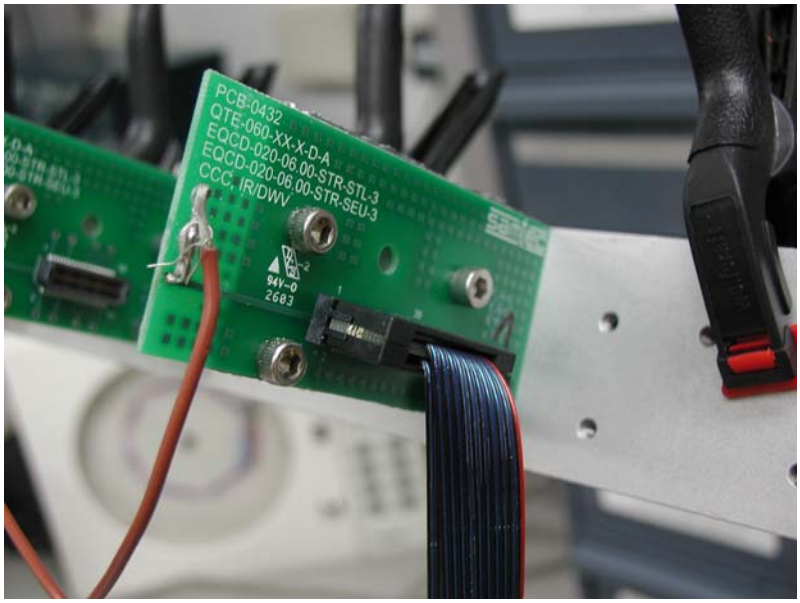


Fig. 2
(Typical set-up, actual part not depicted.

   b. ± 90° Flex Mode, bend up to 5,000 cycles with 4 oz. load on cable end.

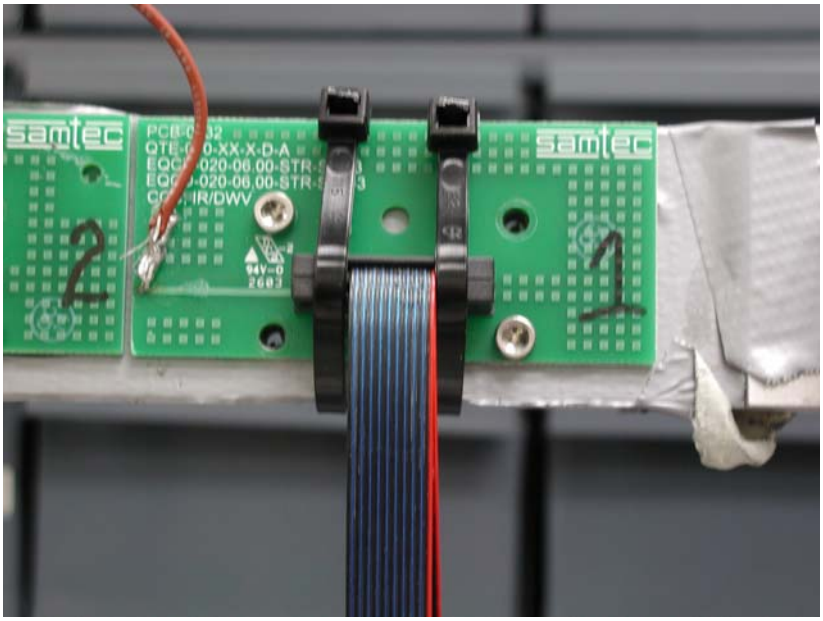


Fig. 3
(Typical set-up, actual part not depicted.)

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise (Twin-Ax) ---------- 1.1 amps (6 contacts powered-both cables)**
- **CCC for a 30°C Temperature Rise (IDC cable – 3.3 V) …… 7.0 amps**
- **CCC for a 30°C Temperature Rise (IDC cable – 12.0 V)…….6.4 amps**

Insulation Resistance minimums, IR (Twin-Ax Cables)

- **Initial**
  - **Front Cable----------100,000 Meg Ω ---------- Pass**
  - **Back Cable ----------100,000 Meg Ω**
- **Thermal**
  - **Front Cable----------100,000 Meg Ω**
  - **Back Cable ----------100,000 Meg Ω**
- **Humidity**
  - **Front Cable----------2,500 Meg Ω**
  - **Back Cable ----------8,000 Meg Ω**

Dielectric Withstanding Voltage minimums, DWV (Twin-Ax Cables)

- **Initial**
  - **Breakdown**
    - **Front Cable----------920 VAC**
    - **Back Cable----------840 VAC**
  - **DWV**
    - **Front Cable----------690 VAC**
    - **Back Cable----------630 VAC**
  - **Working voltage**
    - **Front Cable----------230 VAC**
    - **Back Cable----------210 VAC**
- **Thermal**
  - **Breakdown**
    - **Front Cable----------820 VAC**
    - **Back Cable----------840 VAC**
  - **DWV**
    - **Front Cable----------615 VAC**
    - **Back Cable----------630 VAC**
  - **Working voltage**
    - **Front Cable----------205 VAC**
    - **Back Cable----------210 VAC**
- **Humidity**
  - **Breakdown**
    - **Front Cable----------740 VAC**
    - **Back Cable----------840 VAC**
  - **DWV**
    - **Front Cable----------555 VAC**
    - **Back Cable----------630 VAC**
  - **Working voltage**
    - **Front Cable----------185 VAC**
    - **Back Cable----------210 VAC**

SUPPLEMENTAL TESTING

Supplemental – Connector/Cable Pull

- **0° ---------- 140.8 lbs min**
- **90° ---------- 111.2 lbs min**

Supplemental – Cable Bend 5,000 Cycles

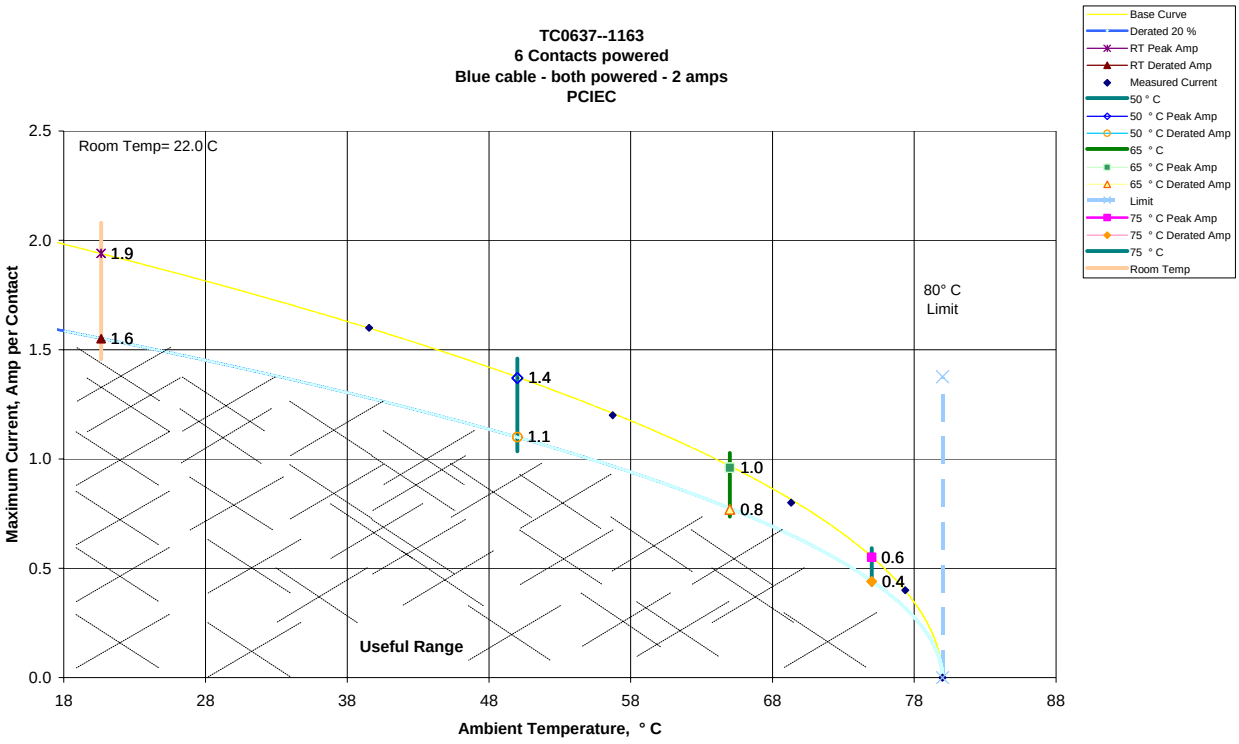
- **±35° Pendulum Mode ---------- Initial Failure at 352 Cycles**
- **±90° Flex Mode ---------- Initial Failure at 579 Cycles**

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

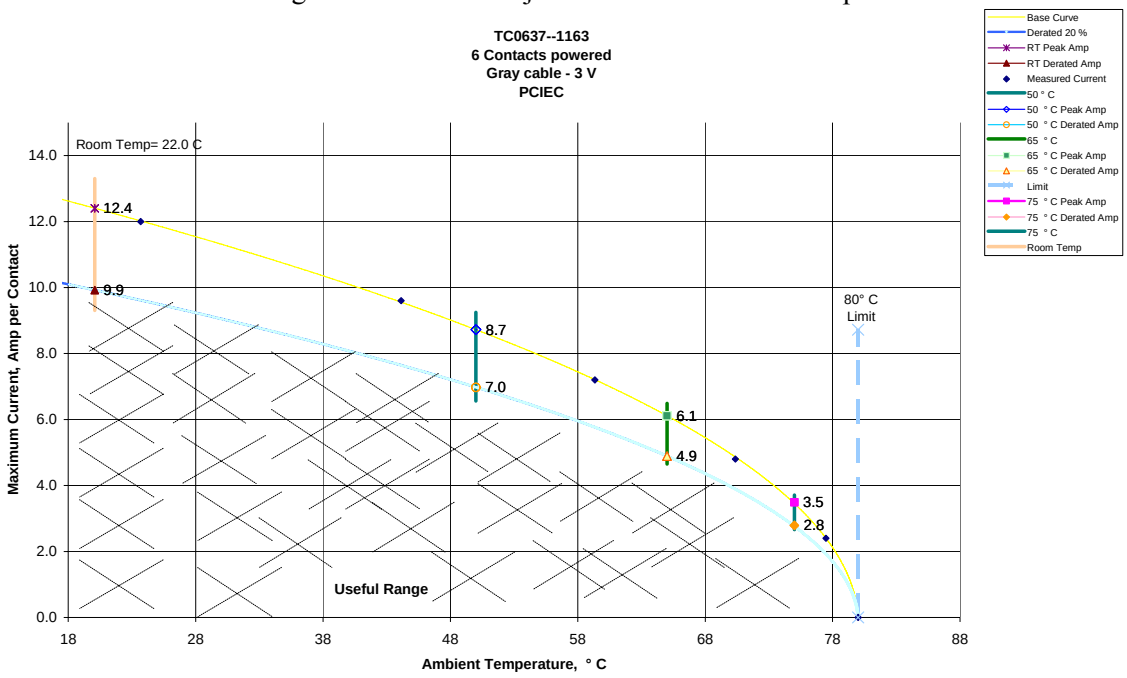
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

    a. Linear configuration with six adjacent conductors/contacts powered – Twin-Ax with both powered

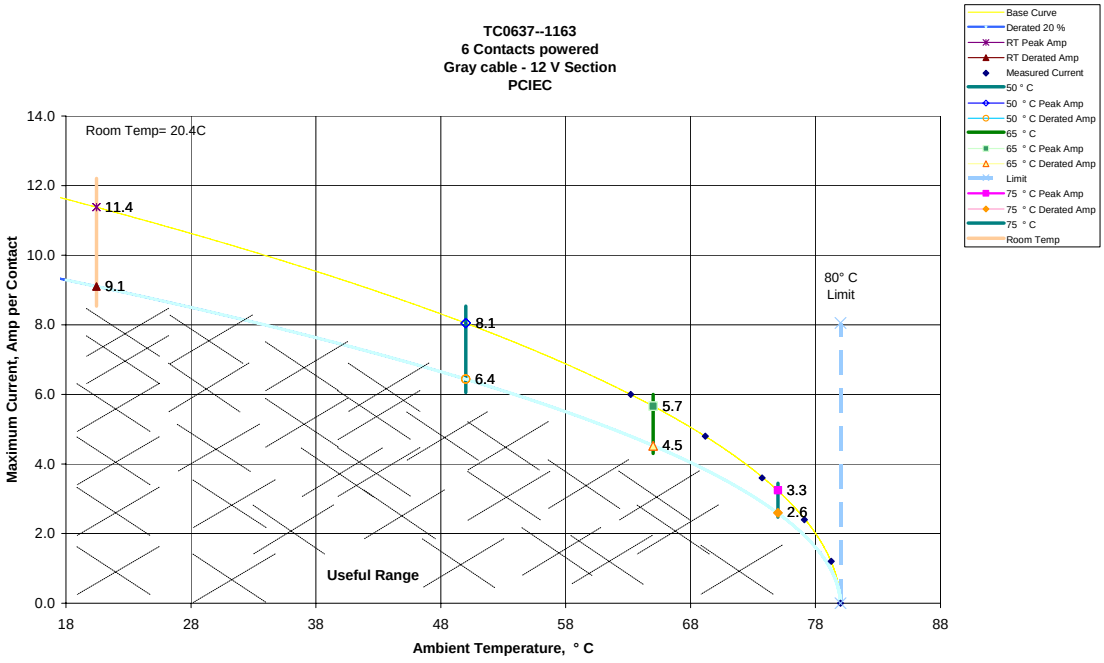


DATA SUMMARIES Continued

b. Linear configuration with six adjacent conductors/contacts powered –IDC Cable – 3.3 Volts



c. Linear configuration with six adjacent conductors/contacts powered –IDC Cable – 12.0 Volts



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	Front	Back	Front	Back	Front	Back
	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance
Average	100000	100000	100000	100000	8750	10250
Min	100000	100000	100000	100000	2500	8000
Max	100000	100000	100000	100000	15000	12500

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Initial, VAC Front			Initial, VAC Back		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	940	705	235	900	675	225
Min	920	690	230	840	630	210
Max	960	720	240	960	720	240

	Thermal, VAC Front			Thermal, VAC Back		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	940	705	235	880	660	220
Min	820	615	205	840	630	210
Max	1060	795	265	920	690	230

	Humidity, VAC Front			Humidity, VAC Back		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	760	570	190	840	630	210
Min	740	555	185	840	630	210
Max	780	585	195	840	630	210

DATA SUMMARIES Continued

SUPPLEMENTAL TESTS

CONNECTOR/CABLE PULL:

	0 Deg. Pull	***90 Deg. Pull***
	Force (Lbs)	Force (Lbs)
Minimum	140.80	111.22
Maximum	*271.77*	*122.95*
Average	***212.1***	***117.0***

DATA SUMMARIES Continued

CABLE BEND TESTING:

A. 35° Pendulum Mode:

	Resistance, Ohms					
	Initial	**After 1000**	**After 2000**	**After 3000**	**After 4000**	**After 5000**
Avg	4.0756	3.9790	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Min	3.7230	3.9790	0.0000	0.0000	0.0000	0.0000
Max	5.1780	3.9790	0.0000	0.0000	0.0000	0.0000
St. Dev.	0.6191	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Count	5	1	0	0	0	0

B. 90° Flex Mode:

	Resistance, Ohms					
	Initial	**After 1000**	**After 2000**	**After 3000**	**After 4000**	**After 5000**
Avg	3.8362	3.8343	4.0320	#DIV/0!	#DIV/0!	#DIV/0!
Min	3.7610	3.6730	3.7780	0.0000	0.0000	0.0000
Max	3.8900	4.0540	4.2860	0.0000	0.0000	0.0000
St. Dev.	0.0615	0.1630	0.3592	#DIV/0!	#DIV/0!	#DIV/0!
Count	5	4	2	0	0	0

DATA

INSULATION RESISTANCE (IR):

	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	Front	Back	Front	Back	Front	Back
Sample #	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance
1	100000	100000	100000	100000	15000	8000
2	100000	100000	100000	100000	2500	12500

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Initial, VAC Front			Initial, VAC Back		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	920	690	230	840	630	210
2	960	720	240	960	720	240

	Thermal, VAC Front			Thermal, VAC Back		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	820	615	205	920	690	230
2	1060	795	265	840	630	210

	Humidity, VAC Front			Humidity, VAC Back		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	780	585	195	840	630	210
2	740	555	185	840	630	210

DATA Continued

SUPPLEMENTAL

CONNECTOR/CABLE PULL:

	0 Deg. Pull	***90 Deg. Pull***
Sample#	Maximum Force (Lbs)	Maximum Force (Lbs)
1	271.77	111.22
2	140.80	118.49
3	258.31	111.89
4	146.42	122.95
5	243.09	120.50

CABLE BEND TESTING:

A. 35° Pendulum Mode:

	Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
Cables	6	3.7	*Failed @ 643*	*N/A*	*N/A*	*N/A*	*N/A*
6 - 10	7	5.2	*Failed @ 448*	*N/A*	*N/A*	*N/A*	*N/A*
Used	8	3.8	*Failed @ 352*	*N/A*	*N/A*	*N/A*	*N/A*
4oz	9	3.8	*Failed @ 992*	*N/A*	*N/A*	*N/A*	*N/A*
weight	10	3.9	*4.0*	*Failed @ 1009*	*N/A*	*N/A*	*N/A*

B. 90° Flex Mode:

	Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
Cables	6	3.9	*3.848*	Fail @ 1752	N/A	*N/A*	*N/A*
6 - 10	7	3.9	4.1	*4.3*	Fail @ 2295	*N/A*	*N/A*
Used	8	3.9	Fail @ 579	*N/A*	N/A	*N/A*	*N/A*
4oz	9	3.8	3.7	3.8	Fail @ 2101	*N/A*	*N/A*
weight	10	3.8	3.8	Fail @ 1945	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: 06/16/06, Next Cal: 06/16/07

Equipment #: MO-02
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0780546
Accuracy: See Manual
… Last Cal: 05/12/06, Next Cal: 05/12/07

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 01/31/07, Next Cal: 01/31/08

Equipment #: PS-01
Description: System Power Supply
Manufacturer: Hewlett Packard
Model: HP 6033A
Serial #: (HP) 3329A-07330
Accuracy: See Manual
… Last Cal: 05/12/06, Next Cal: 05/12/07

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: 5/12/06, Next Cal: 05/12/07

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: 05/12/06, Next Cal: 05/12/07

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 #: TCT-03
Description: Dillon Quantrol TC2 Test Stand
Manufacturer: Dillon Quantrol
Model: TC2
Serial #: 02-1033-03
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 5/12/06, Next Cal: 5/12/07

Equipment #: LC-2500N(icell)
Description: 2500 N Load Cell for Dillon Quantrol
Manufacturer: Dillon Quantrol
Model: icell
Serial #: 01-0132-01
Accuracy: .10% of capacity
… Last Cal: 6/13/06, Next Cal: 6/13/07

Equipment #: HDR - 01
Description: HDR Flex Tester
Manufacturer: Samtec Inc.
Model: AT-1440-000
Serial #: 00120351
Accuracy: N/A
… Last Cal: No Calibration Required, Next Cal:

…