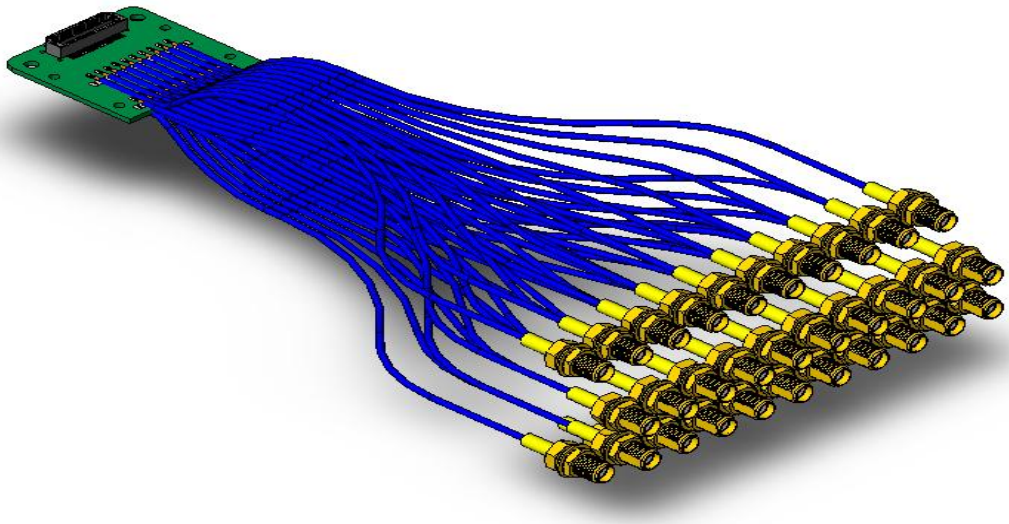
Project Number:	Tracking Code: TC0612--0977		
Requested by: Gary Lewis	Date: 3/24/2006	Product Rev: N/A	
Part #: N-EQRF-020-06.0-T-L-SMA-J-1	Lot #: N/A	Tech: Troy Cook/Tony Wagoner	Eng: Dave Scopelliti
Part description: EQRF			Qty to test: 40
Test Start: 05/12/2006	Test Completed: 8/1/2006		



DVT REPORT
for
EQRF-020-06.0-T-L-SMA-J-1
Mated with 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 IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: TESTPLAN ALLREADY SETUP….IR/DWV, CCC, PULL, FLEX

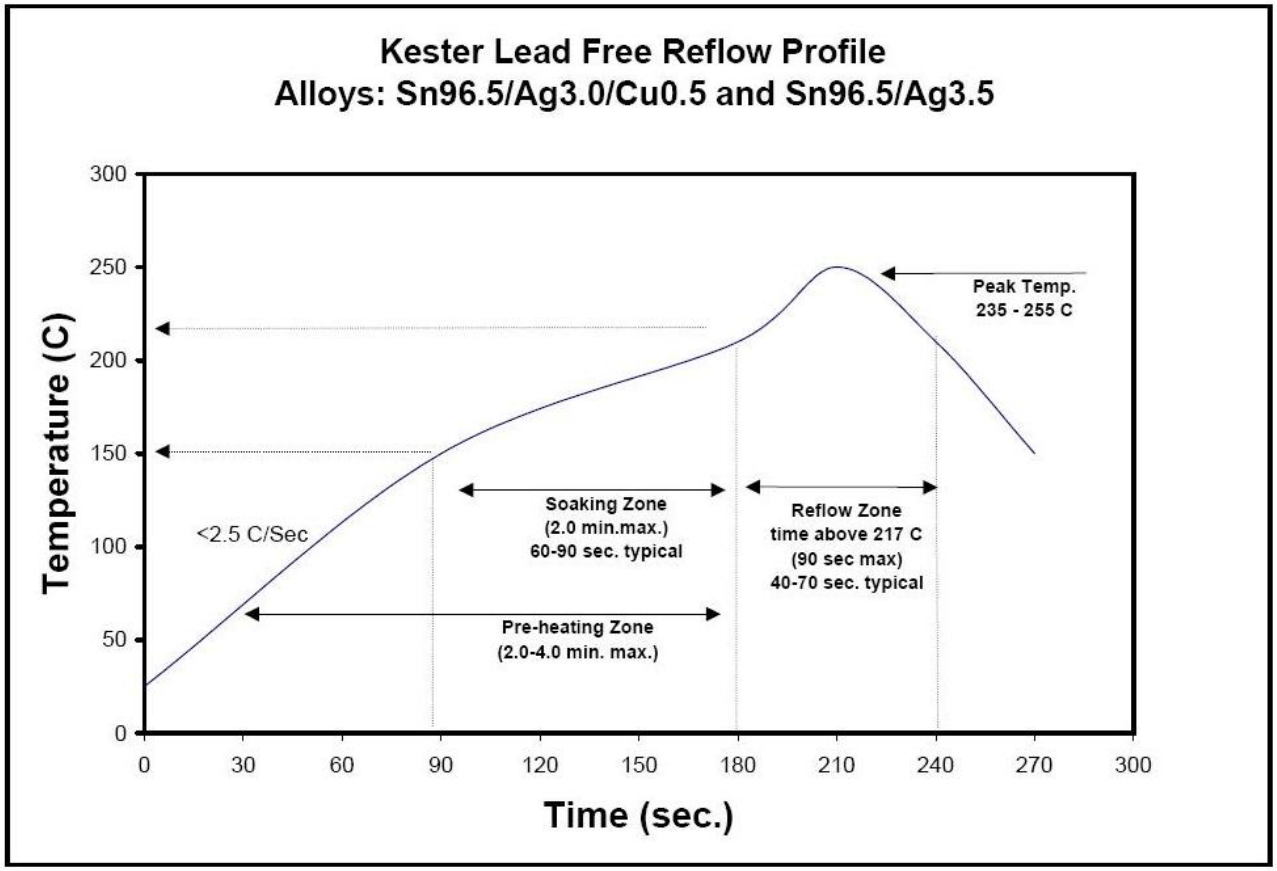
APPLICABLE DOCUMENTS

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-100492-TST-XX

OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Current Carrying Capacity

TEST STEP	GROUP 1 Cable Center 6 Adjacent Signal Lines
01	CCC

Tabulate calculated current at RT, 55° C, 65° C and 70° C
after derating 20% and based on 80° C
CCC, Temp rise = EIA-364-70

IR

TEST STEP	GROUP 1A DV Pin-Pin	GROUP 1A DV Row-Row
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

DWV

TEST STEP	GROUP 1a Pin-Pin Ambient	GROUP 2a Row-Row Ambient	GROUP 1b Pin-Pin Thermals	GROUP 2b Row-Row Thermals	GROUP 1c Pin-Pin Humidity	GROUP 2c Row-Row 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

FLOWCHARTS Continued

Connector Pull

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

Secure both cables in the center
Monitor continuity and pull
record forces when continuity fails.

Resistance, Snaked for 2-Wire Resistance

	Flex Mode	Pendulum Mode
TEST	GROUP 1	GROUP 2
STEP	DV	DV
	SIG, ±90° Bend Shroud	SIG, ±35° Bend Shroud
01	Resistance	Resistance
02	5000 Cycles	5000 Cycles
03	Data Review	Data Review
04	Resistance	Resistance
05	10000 Cycles	10000 Cycles
06	Data Review	Data Review
07	Resistance	Resistance
08	15000 Cycles	15000 Cycles
09	Data Review	Data Review
10	Resistance	Resistance
11	20000 Cycles	20000 Cycles
12	Data Review	Data Review
13	Resistance	Resistance
14	25000 Cycles	25000 Cycles
15	Resistance	Resistance

Cycling with No Load on cable loading at 1500 to 3000 /Hour
25 to 50 per minute

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. 55^{o} C
    c. 65^{o} C
    d. 70^{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 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
        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

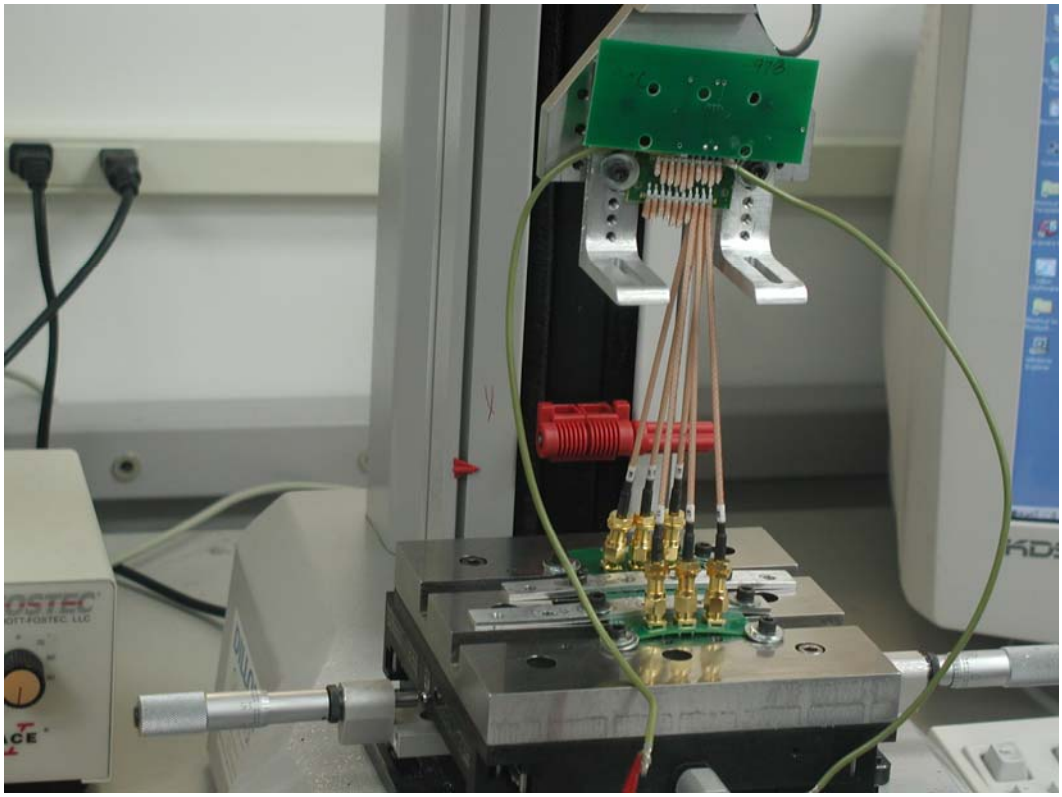


Fig. 1
(Typical set-up.)
0° Connector pull, notice the electrical continuity hook-up wires.

CABLE DURABILITY:

1) Oscillate and monitor electrical continuity for open circuit indication.

   a. ± 35° Pendulum Mode, bend up to 15,000 cycles with no weight or load on the cable end.

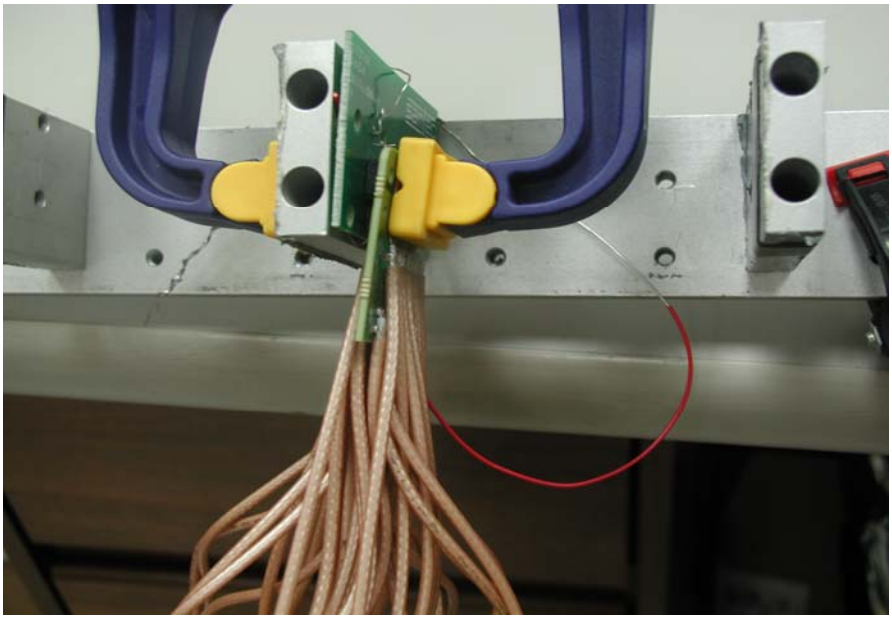


Fig. 2
(Typical set-up, actual part depicted.)

b. ± 90° Flex Mode, bend up to 5,000 cycles with no weight or load on cable end.

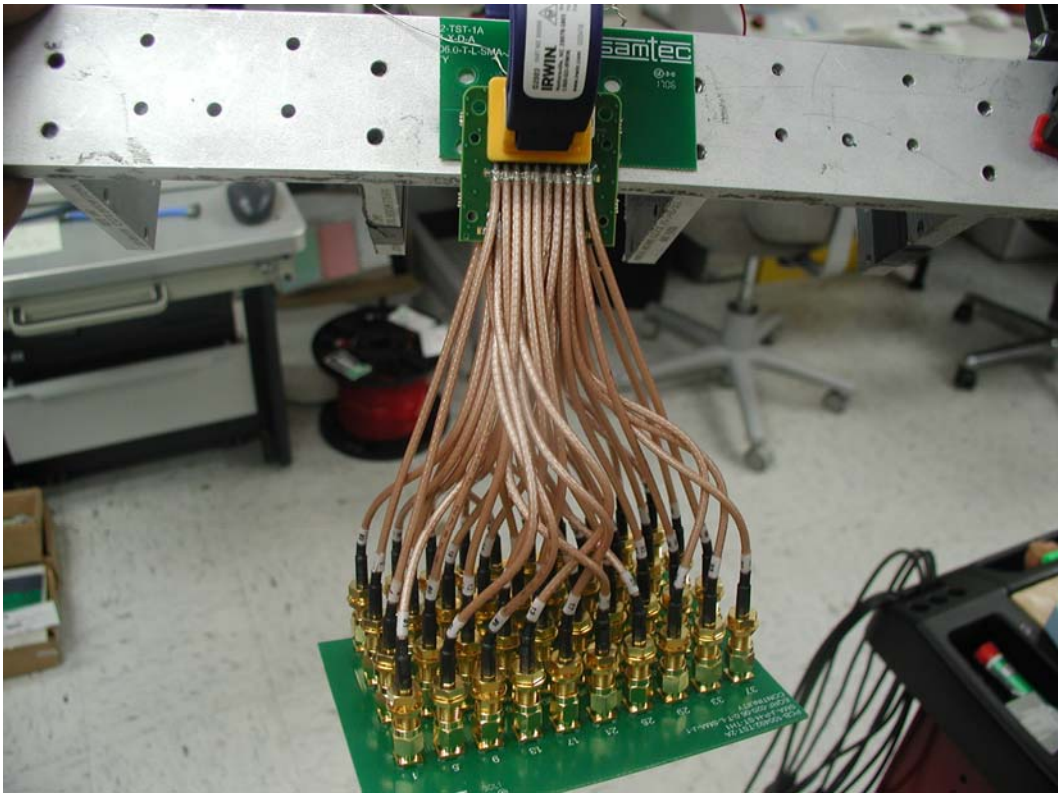


Fig. 3
(Typical set-up, actual part depicted.)

RESULTS

Temperature Rise, CCC at a 20% de-rating

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

Insulation Resistance minimums, IR

- **Initial**
  - **Row to Row---------- 10,000 Meg Ω ---------- Pass**
  - **Pin to Pin----------100,000 Meg Ω**
- **Thermal**
  - **Row to Row----------100,000 Meg Ω**
  - **Pin to Pin---------- 50,000 Meg Ω**
- **Humidity**
  - **Row to Row----------100,000 Meg Ω**
  - **Pin to Pin---------- 50,000 Meg Ω**

Dielectric Withstanding Voltage minimums, DWV

- **Initial**
  - **Breakdown**
    - **Row to Row----------1,800 VAC**
    - **Pin to Pin----------740 VAC**
  - **DWV**
    - **Row to Row----------1,350 VAC**
    - **Pin to Pin----------555 VAC**
  - **Working voltage**
    - **Row to Row----------450 VAC**
    - **Pin to Pin----------185 VAC**
- **Thermal**
  - **Breakdown**
    - **Row to Row----------1,000 VAC**
    - **Pin to Pin----------1,100 VAC**
  - **DWV**
    - **Row to Row----------750 VAC**
    - **Pin to Pin----------825 VAC**
  - **Working voltage**
    - **Row to Row----------250 VAC**
    - **Pin to Pin----------275 VAC**
- **Humidity**
  - **Breakdown**
    - **Row to Row----------1,400 VAC**
    - **Pin to Pin----------1,000 VAC**
  - **DWV**
    - **Row to Row----------1,050 VAC**
    - **Pin to Pin----------750 VAC**
  - **Working voltage**
    - **Row to Row----------350 VAC**
    - **Pin to Pin----------250 VAC**

SUPPLEMENTAL TESTING

Supplemental – Connector/Cable Pull

- **0° ---------- 138.06 lbs min**
- **90° ---------- 79.72 lbs min**

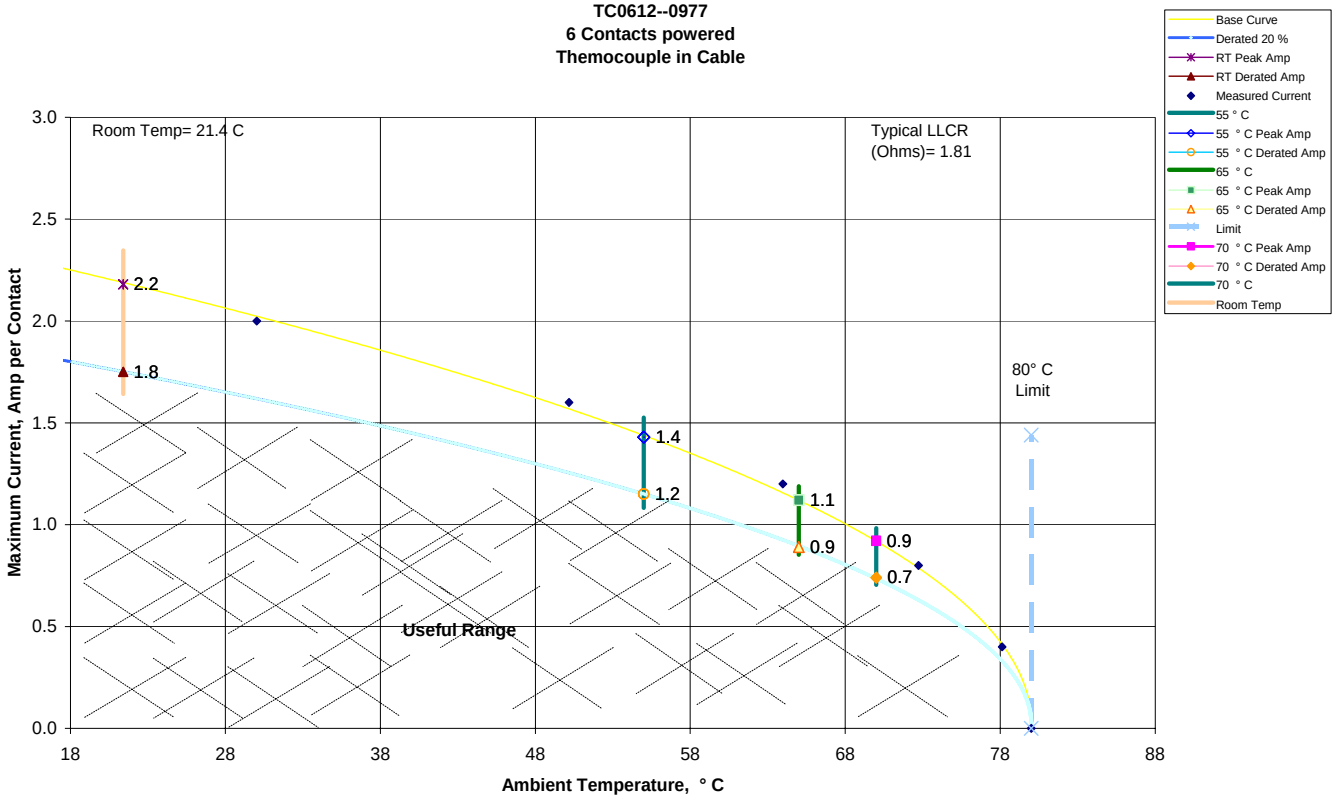
Supplemental – Cable Bend 25,000 Cycles

- **±35° Pendulum Mode ---------- Earliest failure at 24,317 Cycles**
- **±90° Flex Mode ---------- Earliest failure at 459 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
5) CCC was tested with the thermocouples in the following locations:
    a. Bundled in the cable, 6 adjacent lines powered



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	P-P	R-R	P-P	R-R	P-P	R-R
	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance
Average	100000	55000	75000	100000	75000	100000
Min	100000	10000	50000	100000	50000	100000
Max	100000	100000	100000	100000	100000	100000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Initial, VAC P-P			Initial, VAC R-R		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	1030	773	258	1517	1138	379
Min	740	555	185	1000	750	250
Max	1200	900	300	1900	1425	475

	Thermal, VAC P-P			Thermal, VAC R-R		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	1120	840	280	1150	863	288
Min	1100	825	275	1000	750	250
Max	1140	855	285	1300	975	325

	Humidity, VAC P-P			Humidity, VAC R-R		
	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
Average	1000	750	250	1550	1163	388
Min	1000	750	250	1400	1050	350
Max	1000	750	250	1700	1275	425

DATA SUMMARIES Continued

SUPPLEMENTAL – CONNECTOR/CABLE PULL

	0 Deg. Pull	90 Deg. Pull
	Force (Lbs)	Force (Lbs)
Minimum	138.06	79.72
Maximum	*155.00*	*93.71*
Average	***144.3***	***86.3***

SUPPLEMENTAL – CABLE BEND 15,000 CYCLES

a. 35 Deg. Pendulum

	Resistance, Ohms					
	Initial	**5000**	**10000**	**15000**	**20000**	**25000**
Avg	11.4250	11.3400	11.3150	11.3550	11.3450	11.3600
Min	11.3700	11.3200	11.3000	11.3500	11.3400	11.3600
Max	11.4800	11.3600	11.3300	11.3600	11.3500	11.3600
St. Dev.	0.0778	0.0283	0.0212	0.0071	0.0071	N/A
Count	2	2	2	2	2	1

b. 90 Deg. Flex

	Resistance, Ohms					
	Initial	**5000**	**10000**	**15000**	**20000**	**25000**
Avg	11.3950	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Min	11.3800	0.0000	0.0000	0.0000	0.0000	0.0000
Max	11.4100	0.0000	0.0000	0.0000	0.0000	0.0000
St. Dev.	0.0212	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Count	2	0	0	0	0	0

DATA

INSULATION RESISTANCE (IR):

	Initial, Meg Ohms		Thermal, Meg Ohms		Humidity, Meg Ohms	
	P-P	R-R	P-P	R-R	P-P	R-R
Sample #	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance	Insulation Resistance
1	100000	10000	50000	100000	50000	100000
2	100000	100000	100000	100000	100000	100000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Initial, VAC P-P			Initial, VAC R-R		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	740	555	185	1800	1350	450
2	1200	900	300	1900	1425	475

	Thermal, VAC P-P			Thermal, VAC R-R		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	1140	855	285	1300	975	325
2	1100	825	275	1000	750	250

	Humidity, VAC P-P			Humidity, VAC R-R		
Sample #	Breakdown Voltage	DWV	Working Voltage	Breakdown Voltage	DWV	Working Voltage
1	1000	750	250	1400	1050	350
2	1000	750	250	1700	1275	425

DATA (continued)

SUPPLEMENTAL – CONNECTOR/CABLE PULL

	0 Deg. Pull	90 Deg. Pull
Sample#	Maximum Force (Lbs)	Maximum Force (Lbs)
1	138.06	93.71
2	139.90	85.42
3	155.00	79.72

NOTE: Tested 6 wires bundled together for pull testing.

SUPPLEMENTAL – CABLE BEND 15,000 CYCLES

a. 35 Deg. Pendulum

	No Load Used					
Cable	Resistance, Ohms					
	Initial	5000	10000	15000	20000	25000
1	11.48	11.32	11.30	11.36	11.34	Failed at 24317 Cycles
2	11.37	11.36	11.33	11.35	11.35	11.3600

b. 90 Deg. Flex

	No Load Used					
Cable	Resistance, Ohms					
	Initial	5000	10000	15000	20000	25000
1	11.3800	Failed at 459 cycles	N/A	N/A	N/A	N/A
2	11.4100	Failed at 813 cycles	N/A	N/A	N/A	N/A

EQUIPMENT AND CALIBRATION SCHEDULES

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: 01/31/06, Next Cal: 01/31/07

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 #: TC090601-103/105
Description: IC Thermocouple-103/105
Manufacturer: Samtec
Model:
Serial #: TC090601-103/105
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
… 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 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 #: MO-01
Description: Micro-Ohmeter
Manufacturer: Keithley
Model: 580
Serial #: 0772740
Accuracy: See Manual
… Last Cal: 05/12/06, Next Cal: 05/12/07

Equipment #: HDR - 01
Description: HDR Flex Tester
Manufacturer: Samtec Inc.
Model: AT-1440-000
Serial #: 0780546
Accuracy: N/A
… Last Cal: No Calibration Required…