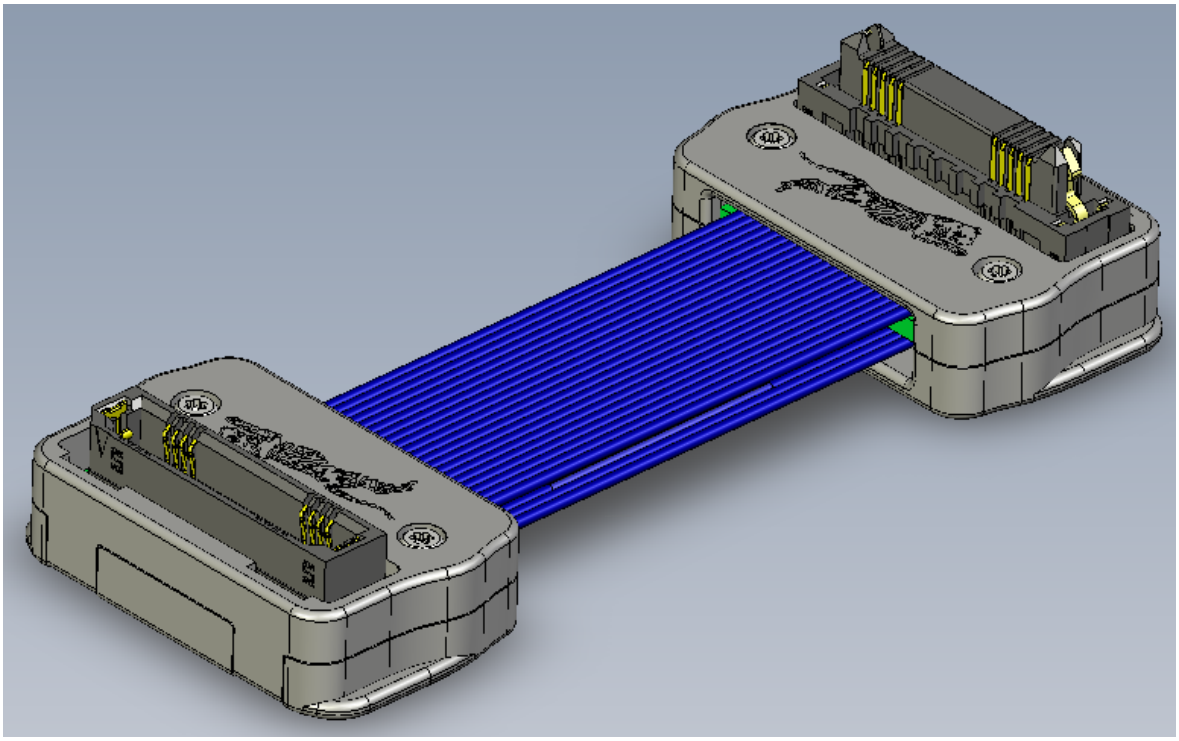
Project Number: 21253	Tracking Code: TC0910--2306_ReportRev1		
Requested by: Joe Smallwood	Date: 4/16/2009	Product Rev: 3	
Part #: ERCD-020-06.00-STL-TTR-1-D	Lot #: 2275753	Tech: Gary Lomax, Rodney Riley, & Tony Wagoner	Eng: Troy Cook
Part description: ERCD			Qty to test: 50
Test Start: 9/4/2008	Test Completed: 04/10/2009		



STANDARD HDR DVT DVT REPORT

PART DESCRIPTION

ERCD-020-06.00-STL-TTR-1-D

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

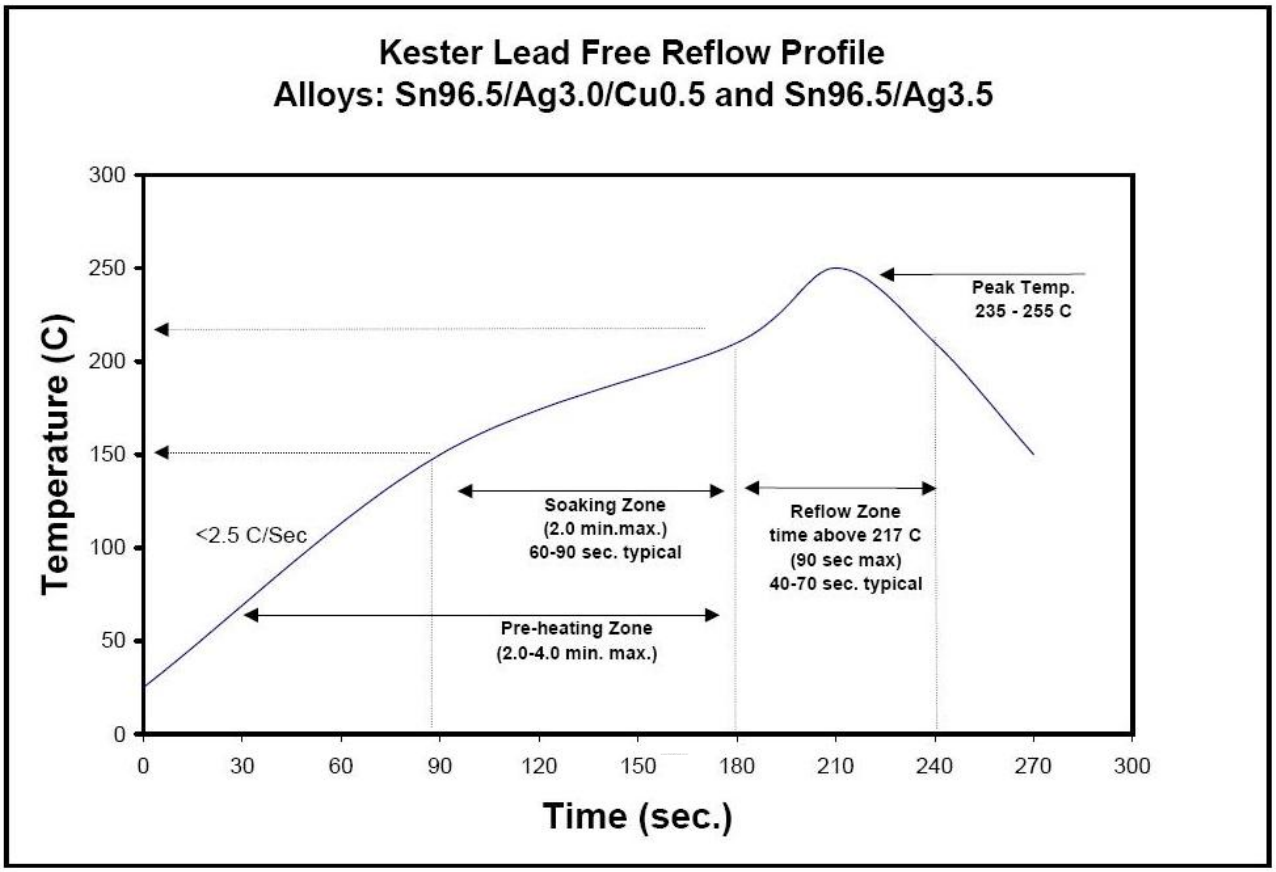
APPLICABLE DOCUMENTS

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-101424-TST-XX, PCB-101425-TST-XX

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Current Carrying Capacity

3 Mated Assemblies Each

TEST STEP	GROUP A 3 Mated Assembies 2 CONTACT POWERED	GROUP B 3 Mated Assembies 4 CONTACTS POWERED	GROUP C 3 Mated Assembies 6 CONTACTS POWERED	GROUP D 3 Mated Assembies 8 CONTACTS POWERED	GROUP E 3 Mated Assembies ALL CONTACTS POWERED
01	CCC	CCC	CCC	CCC	CCC

(TIN PLATING) - Tabulate calculated current at RT, 65° C, 75° C and 95° C
after derating 20% and based on 105° C
(GOLD PLATING) - Tabulate calculated current at RT, 85° C, 95° C and 115° C
after derating 20% and based on 125° C
CCC, Temp rise = EIA-364-70

IR / DWV

TEST STEP	GROUP A 2 Boards Ambient	GROUP B1 2 Boards Ambient	GROUP B2 2 Boards Thermal	GROUP B3 2 Boards Humidity
01	IR	DWV/Working Voltage	Thermal Aging	Humidity
02	Data Review		DWV/Working Voltage	DWV/Working Voltage
03	Thermal Aging			
04	IR			
05	Data Review			
06	Humidity			
07	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)
ambient pre-condition and delete steps 7a and 7b
IR = EIA-364-21
DWV = EIA-364-20

FLOWCHARTS Continued

Connector Pull

	5 Pieces	5 Pieces
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.

Resistance, SIG Contiinuity

	10 Pieces	10 Pieces
TEST	GROUP 1	GROUP 1A
STEP	DV End 90°	DV End 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) All test samples are pre-conditioned at ambient.
5) 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.

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.

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 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 or 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

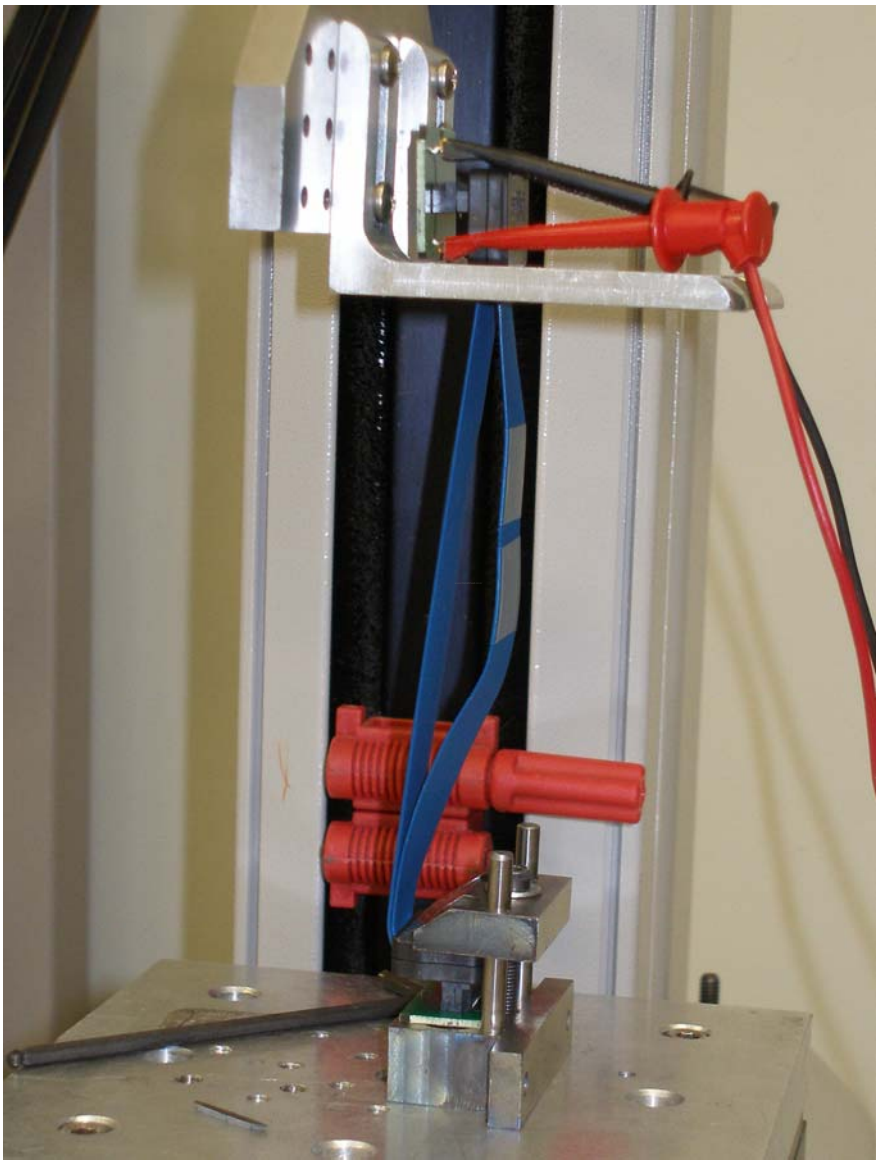


Fig. 1
(Typical set-up, actual part depicted.)
0° Connector pull, notice the electrical continuity hook-up wires.

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.

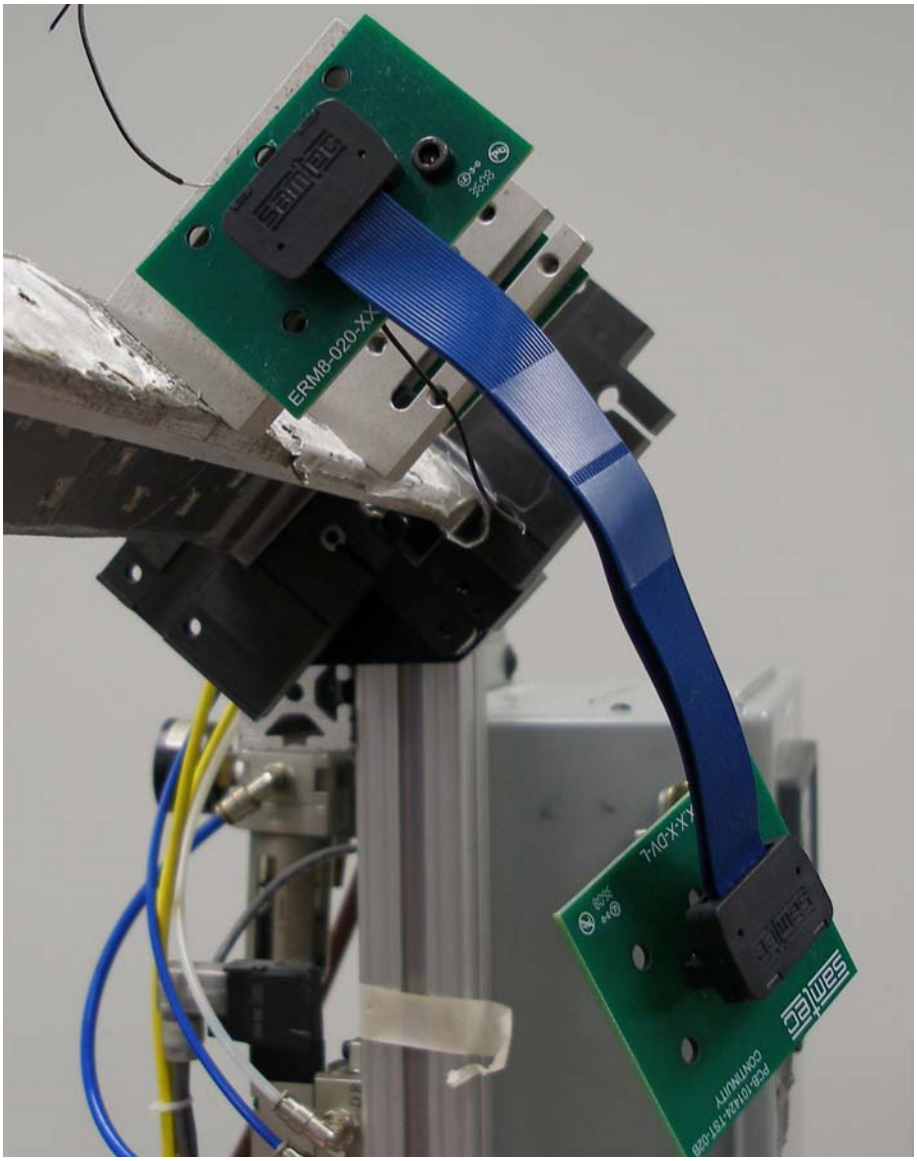


Fig. 2
(Typical set-up, actual part depicted.)

b. ± 90° Flex Mode, bend up to 5,000 cycles with 8 oz. load on cable end.

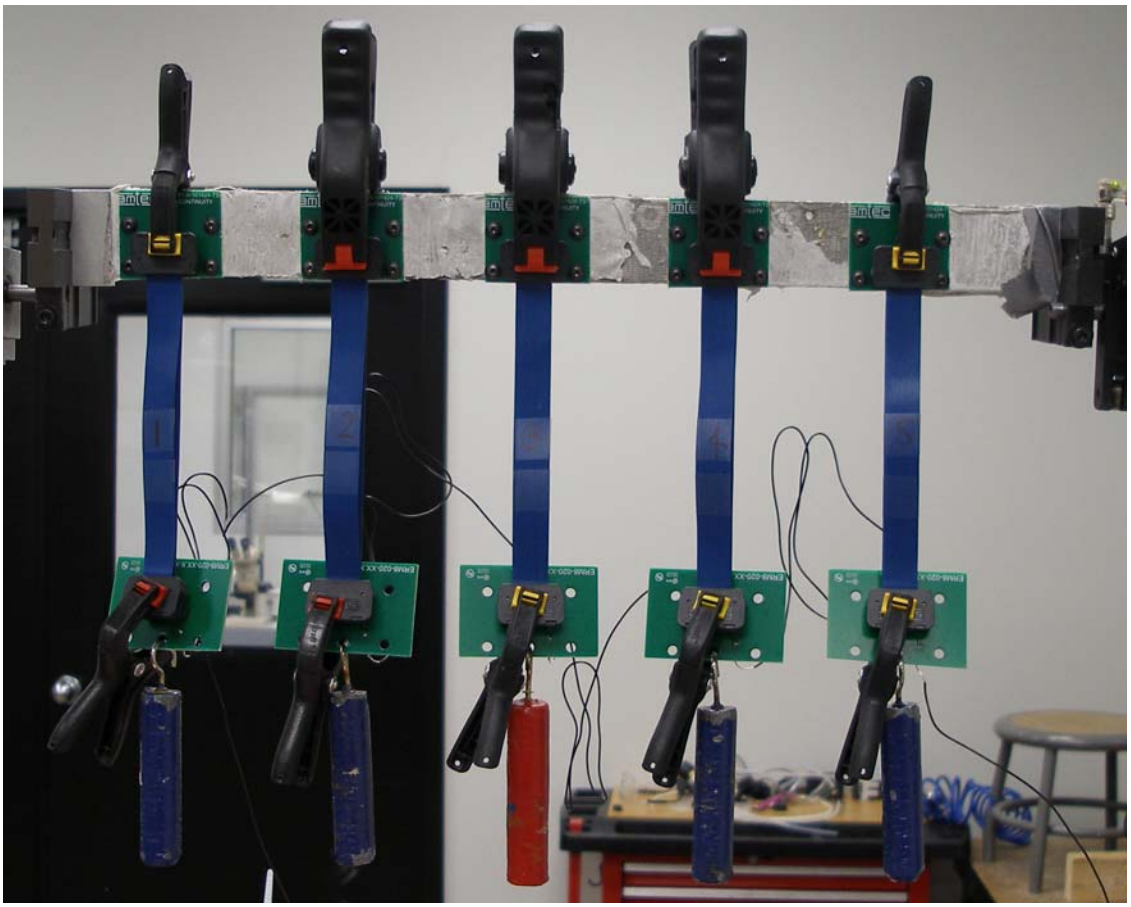


Fig. 3
(Typical set-up, actual part depicted.)

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise----------1.3A per contact with 2 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------1.2A per contact with 4 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------.9A per contact with 6 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------.85A per contact with 8 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------.5A per contact with all adjacent contacts powered**

Insulation Resistance minimums, IR

- **Initial**
  - **Mated----------100,000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------100,000 Meg Ω**
- **Humidity**
  - **Mated----------7,000 Meg Ω**

Dielectric Withstanding Voltage minimums, DWV

- **Initial**
  - **Breakdown**
    - **Mated ----------640 VAC**
  - **DWV**
    - **Mated ----------480 VAC**
  - **Working voltage**
    - **Mated ----------213 VAC**
- **Thermal**
  - **Breakdown**
    - **Mated ----------820 VAC**
  - **DWV**
    - **Mated ----------615 VAC**
  - **Working voltage**
    - **Mated ----------273 VAC**
- **Humidity**
  - **Breakdown**
    - **Mated ----------880 VAC**
  - **DWV**
    - **Mated ----------660 VAC**
  - **Working voltage**
    - **Mated ----------293 VAC**

SUPPLEMENTAL TESTING

Supplemental – Connector/Cable Pull

- **0° ---------- 151.43 lbs min**
- **90° ---------- 39.06 lbs min**

Cable Bend 5,000 Cycles

- **±35° Pendulum Mode ---------- No Electrical Failures**

Cable Bend 1,000 Cycles

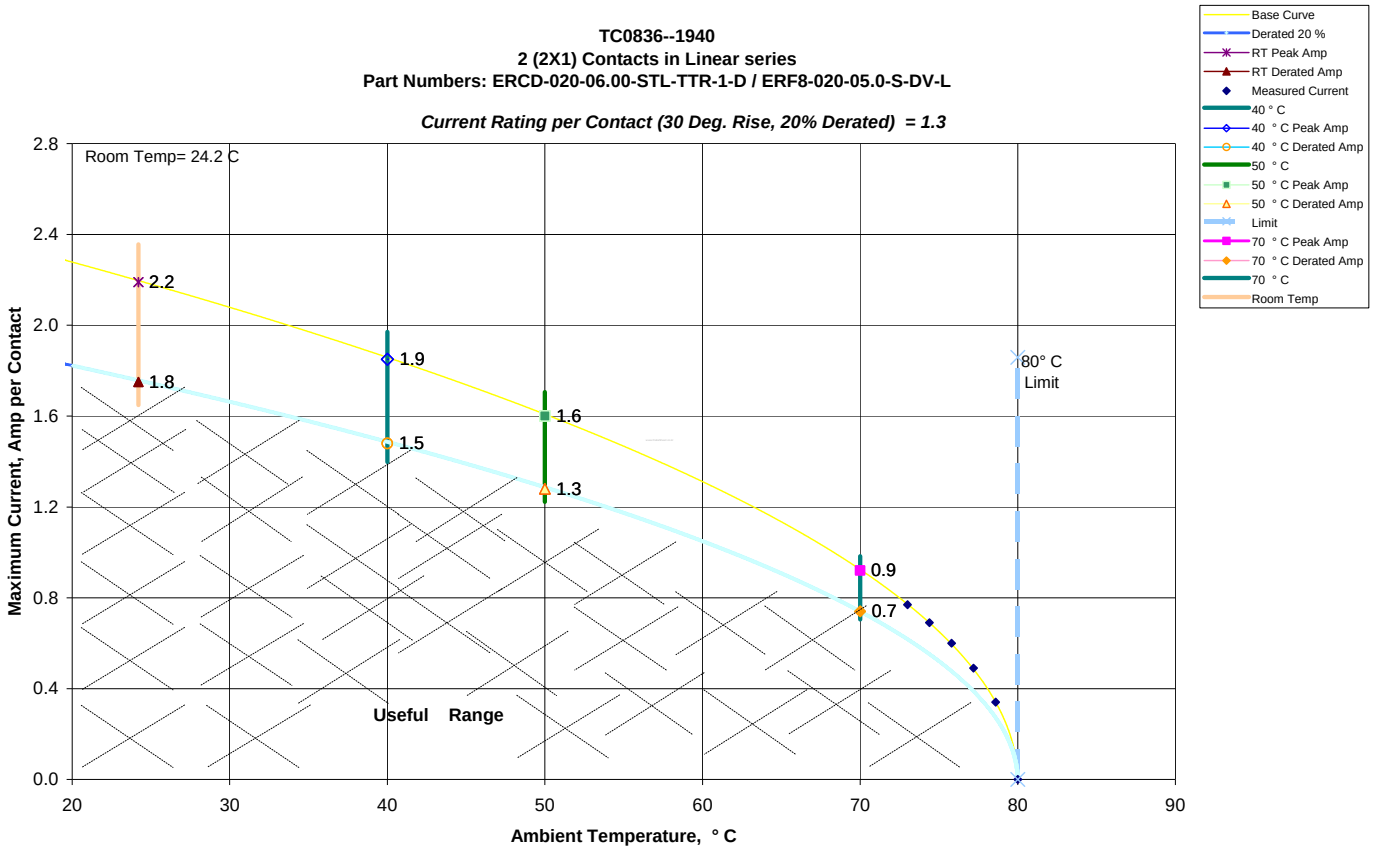
- **±90° Flex Mode ---------- No Electrical Failures**

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

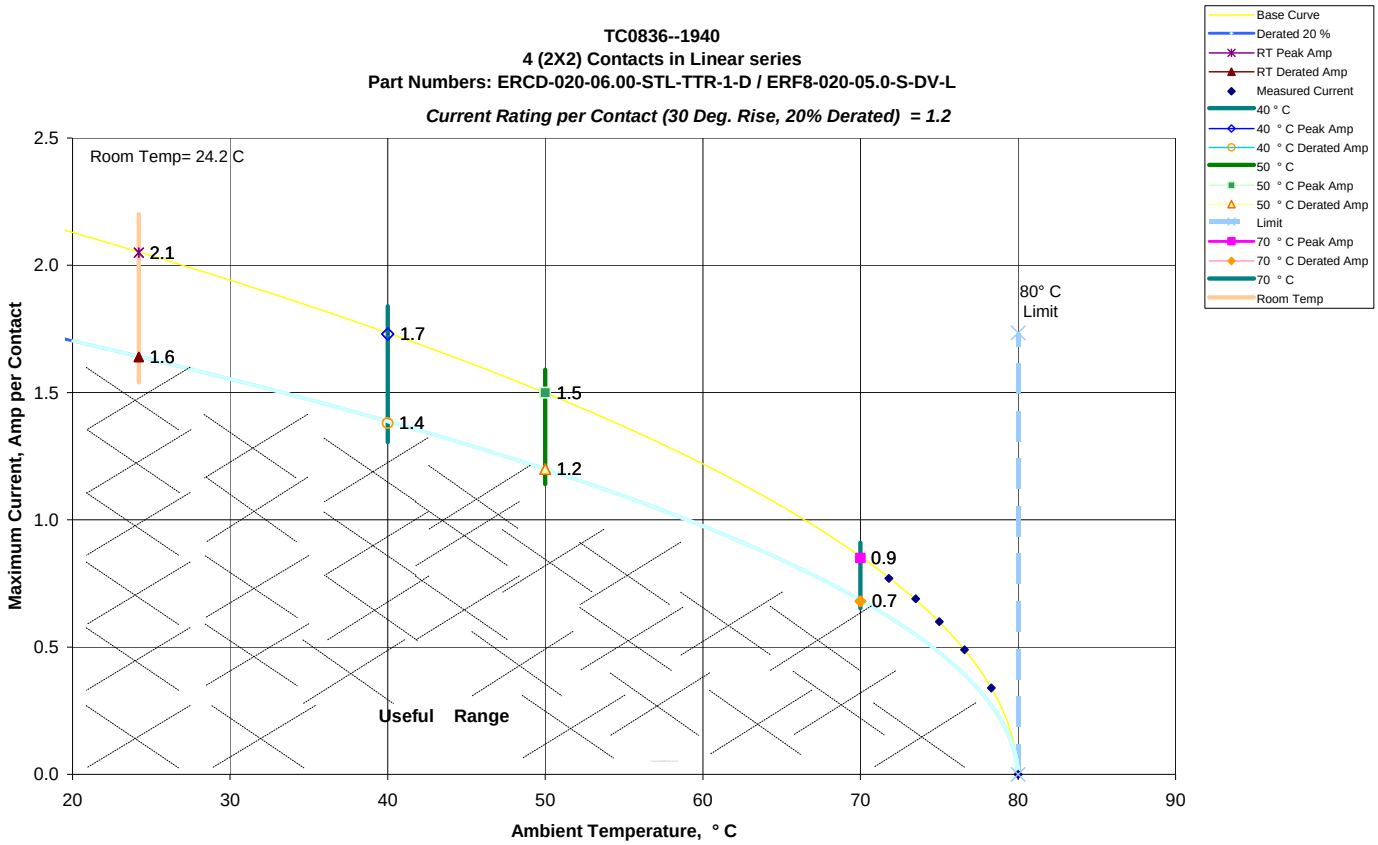
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

    a. Linear configuration with 2 adjacent conductors/contacts powered



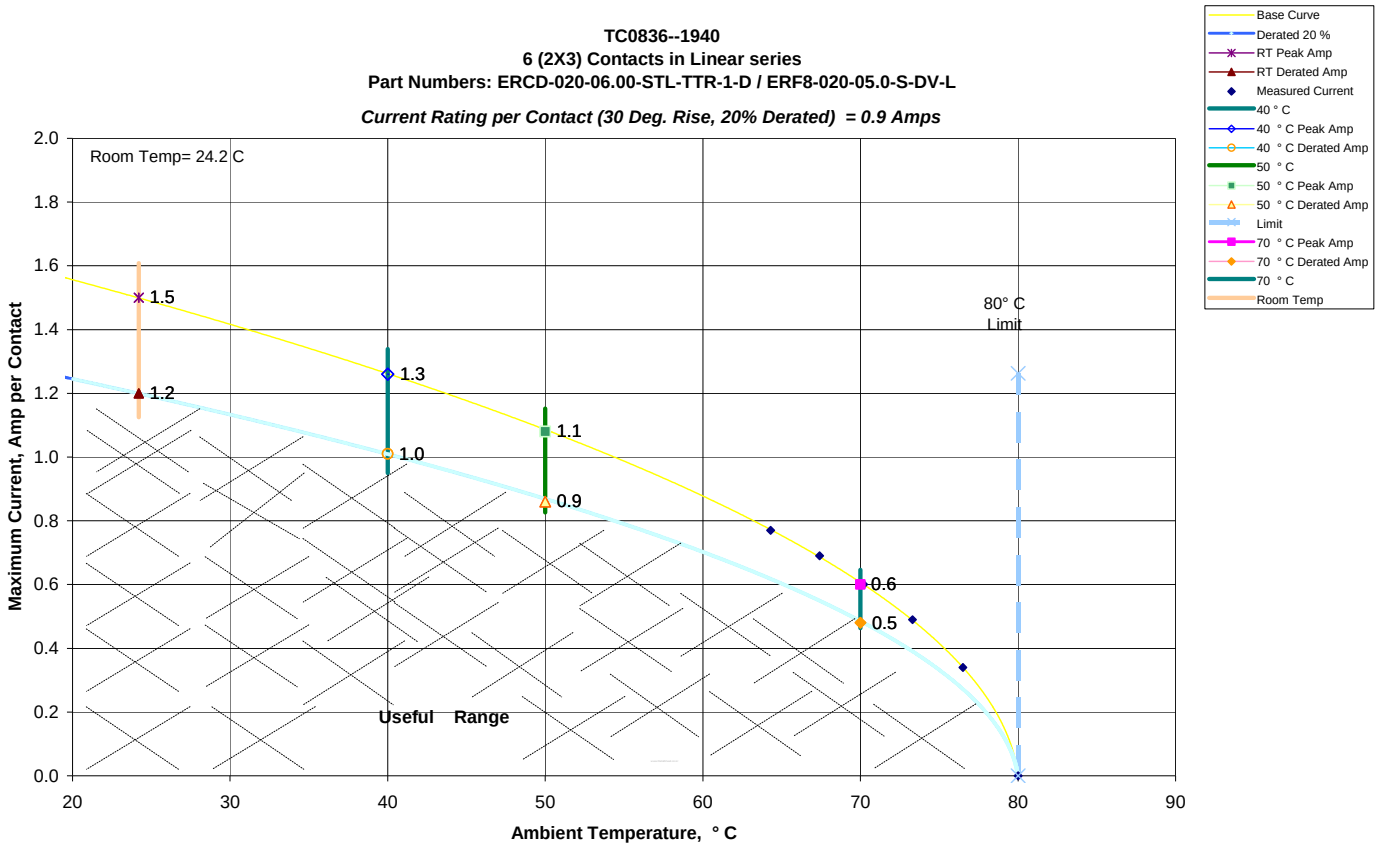
DATA SUMMARIES Continued

b. Linear configuration with 4 adjacent conductors/contacts powered



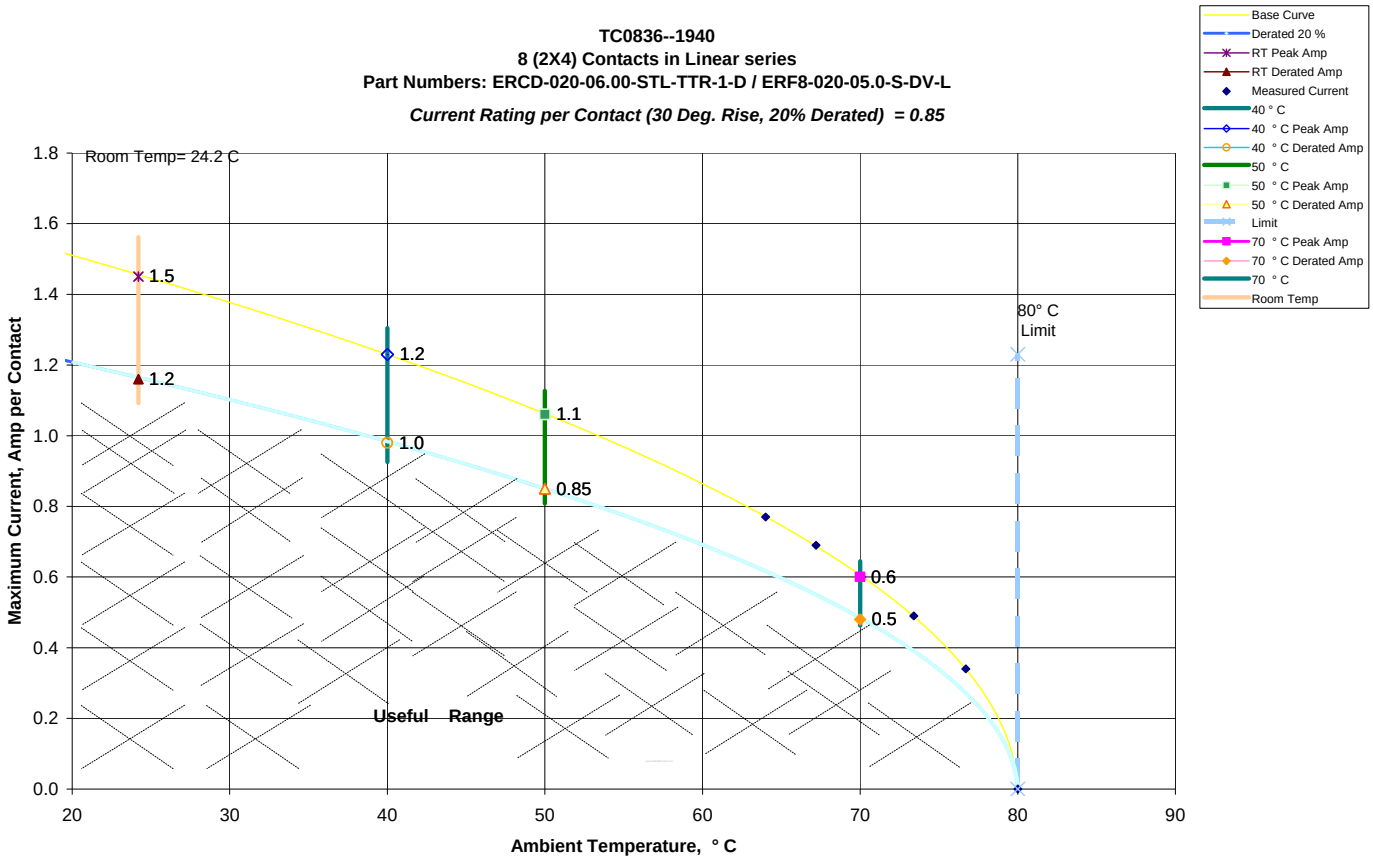
DATA SUMMARIES Continued

c. Linear configuration with 6 adjacent conductors/contacts powered



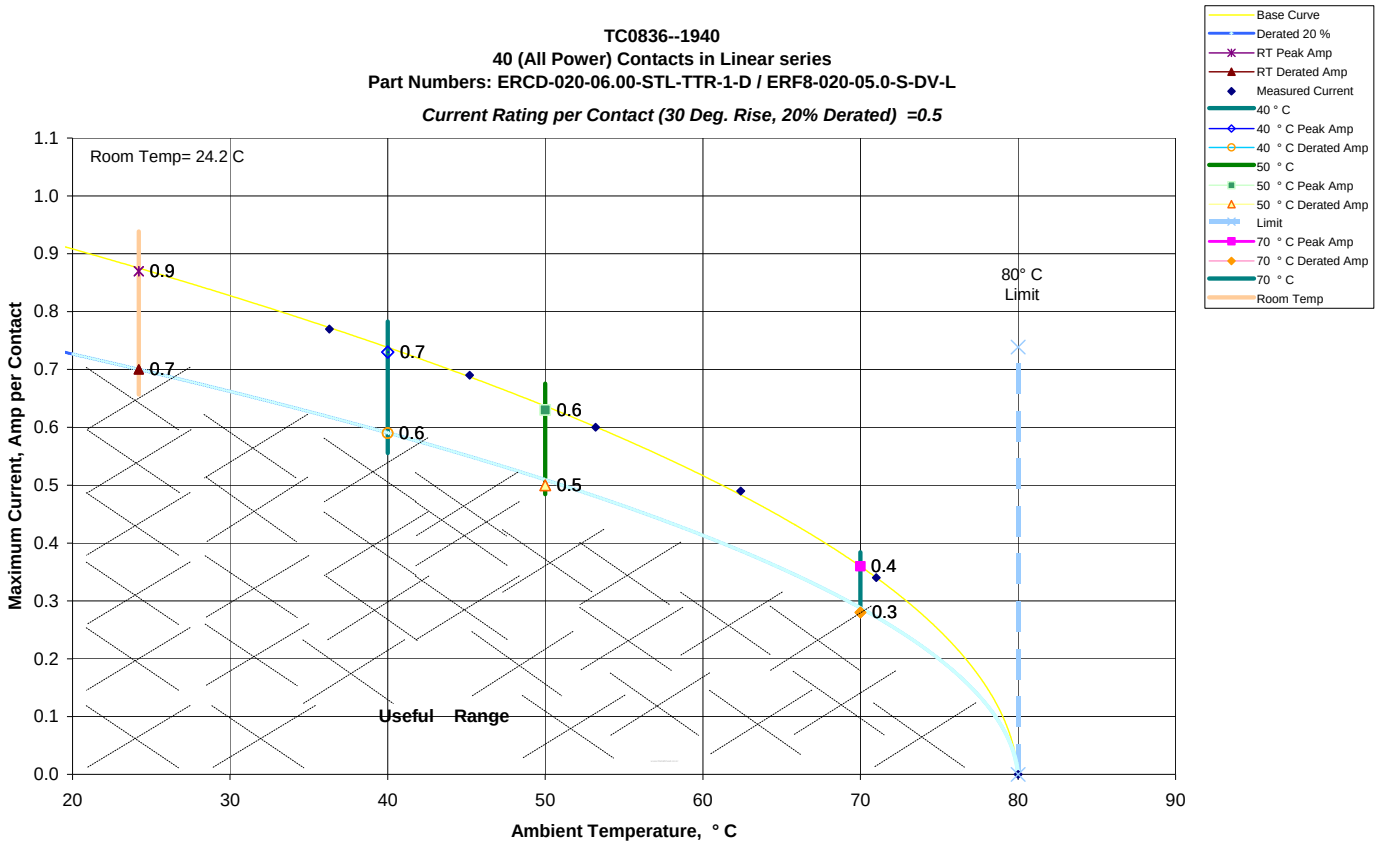
DATA SUMMARIES Continued

d. Linear configuration with 8 adjacent conductors/contacts powered



DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin Pin
	Mated
Minimum	ERCD/ERX8
Initial	100,000
Thermal	100,000
Humidity	7,000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

		Pin-Pin
		Mated
Minimum		ERCD/ERX8
Breakdown Voltage	Initial	640
	Thermal	820
	Humidity	880
DWV	Initial	480
	Thermal	615
	Humidity	660
Working Voltage	Initial	213
	Thermal	273
	Humidity	293

DATA SUMMARIES Continued

SUPPLEMENTAL TEST

PULL:

	0 Deg.	***90 Deg.***
Pull DV	Force (Lbs)	Force (Lbs)
Minimum	151.43	39.06
Maximum	*185.17*	*58.50*
Average	***168.4***	***46.8***

35 DEGREE FLEX:

	Resistance, Ohms					
	Initial	**After 1000**	**After 2000**	**After 3000**	**After 4000**	**After 5000**
Avg	7.2800	7.2800	7.2800	7.2000	7.1600	7.2200
Min	7.2000	7.2000	7.2000	7.2000	7.1000	7.2000
Max	7.3000	7.4000	7.3000	7.2000	7.2000	7.3000
St. Dev.	0.0447	0.0837	0.0447	0.0000	0.0548	0.0447
Count	5	5	5	5	5	5

90 DEGREE FLEX:

Resistance, Ohms			
	Initial	**After 1000**	**After 2000**
Avg	7.2800	7.2800	7.2333
Min	7.2000	7.2000	7.2000
Max	7.3000	7.4000	7.3000
St. Dev.	0.0447	0.0837	0.0577
Count	5	5	3

DATA

INSULATION RESISTANCE (IR):

	Mated INITIAL	
Sample#	ERCD/ERX8	
1A	100,000	Top Cable
1B	100,000	Bottom Cable
2A	100,000	Top Cable
2B	100,000	Bottom Cable

	Mated THERMALS	
Sample#	ERCD/ERX8	
1A	100,000	Top Cable
1B	100,000	Bottom Cable
2A	100,000	Top Cable
2B	100,000	Bottom Cable

	Mated HUMIDITY	
Sample#	ERCD/ERX8	
1A	10,000	Top Cable
1B	15,000	Bottom Cable
2A	9,000	Top Cable
2B	7,000	Bottom Cable

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

	Mated x	
Sample#	ERCD/ERX8	
1A	640	Top Cable
1B	680	Bottom Cable
2A	860	Top Cable
2B	870	Bottom Cable

	Mated x	
Sample#	ERCD/ERX8	
1A	920	Top Cable
1B	940	Bottom Cable
2A	820	Top Cable
2B	920	Bottom Cable

	Mated x	
Sample#	ERCD/ERX8	
1A	970	Top Cable
1B	880	Bottom Cable
2A	960	Top Cable
2B	920	Bottom Cable

DATA Continued

SUPPLEMENTAL TEST

PULL:

Pull DV	*0 Deg.*	*90 Deg.*
Sample#	Maximum Force (Lbs)	Maximum Force (Lbs)
1	185.17	47.96
2	153.26	46.25
3	151.43	39.06
4	171.46	58.50
5	180.91	42.42

35 DEGREE FLEX:

Resistance, Ohms						
Cable	**Initial**	**After 1000 Cycles**	**After 2000 Cycles**	**After 3000 Cycles**	**After 4000 Cycles**	**After 5000 Cycles**
1	7.2	7.4	7.2	7.2	7.1	7.2
2	7.3	7.3	7.3	7.2	7.2	7.2
3	7.3	7.3	7.3	7.2	7.1	7.3
4	7.3	7.2	7.3	7.2	7.2	7.2
5	7.3	7.2	7.3	7.2	7.2	7.2

90 DEGREE FLEX:

Resistance, mOhms				
Cable	**Initial**	**After 1000 Cycles**	**After 2000 Cycles**	**After 3000 Cycles**
1	7.2	7.4	7.2	**Failed @ 2665**
2	7.3	7.3	7.2	**Failed @ 2068**
3	7.3	7.3	**Failed @ 1354**	N/A
4	7.3	7.2	**Failed @ 1775**	N/A
5	7.3	7.2	7.3	**Failed @ 2934**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 02/10/2009, Next Cal: 02/10/2010

Equipment #: PS-07
Description: 20 V, 120 A DC Power Supply - AutoRanging SO/HPIB
Manufacturer: Hewlett Packard / Agilent
Model: AT-6031A
Serial #: 2721A00648
Accuracy: See Manual Current Carrying Capacity (CCC) Chamber
… Last Cal: 10/25/2008, Next Cal: 10/25/2009

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 06/22/08, Next Cal: 06/22/09

Equipment #: STG-01
Description: Hipot Megomter Safety Test Cage
Manufacturer: Hipotronics
Model: TC-25
Serial #: M9910141
Accuracy: N/A
… Last Cal: No Calibration Required, Next Cal:

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

Equipment #: CM-01
Description: Continuity Monitor
Manufacturer: Samtec
Model:
Serial #: NA
Accuracy: 1 mS to 10 mS window
… Last Cal: No Calibration Required, Next Cal:

Equipment #: TCT-01
Description: Test Stand
Manufacturer: Chatillon
Model: TCD-1000
Serial #: 05 23 00 02
Accuracy: Speed Accuracy: +/-5% of max speed; Speed Accuracy: +/-5% of max speed;
… Last Cal: 5/24/08, Next Cal: 5/31/09

Equipment #: TC111307-(001 - 017)
Description: CCC Chamber Thermocouples
Manufacturer: Samtec
Model:
Serial #: TC111307-(001 - 017)
Accuracy: +/- 1 Deg.
… Last Cal: 11/30/2008, Next Cal: 11/30/2009

Equipment #: LC-100
Description: 100 Lb. Load Cell
Manufacturer: Chatillon
Model: CISB
Serial #: 60596
Accuracy: +/-.01 Lb
… Last Cal: 5/24/2008, Next Cal: 5/31/2009

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: 06/17/08, Next Cal: 06/17/09

Equipment #: THC-04
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SM-8-3800
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/07/2009, Next Cal: 04/07/2010