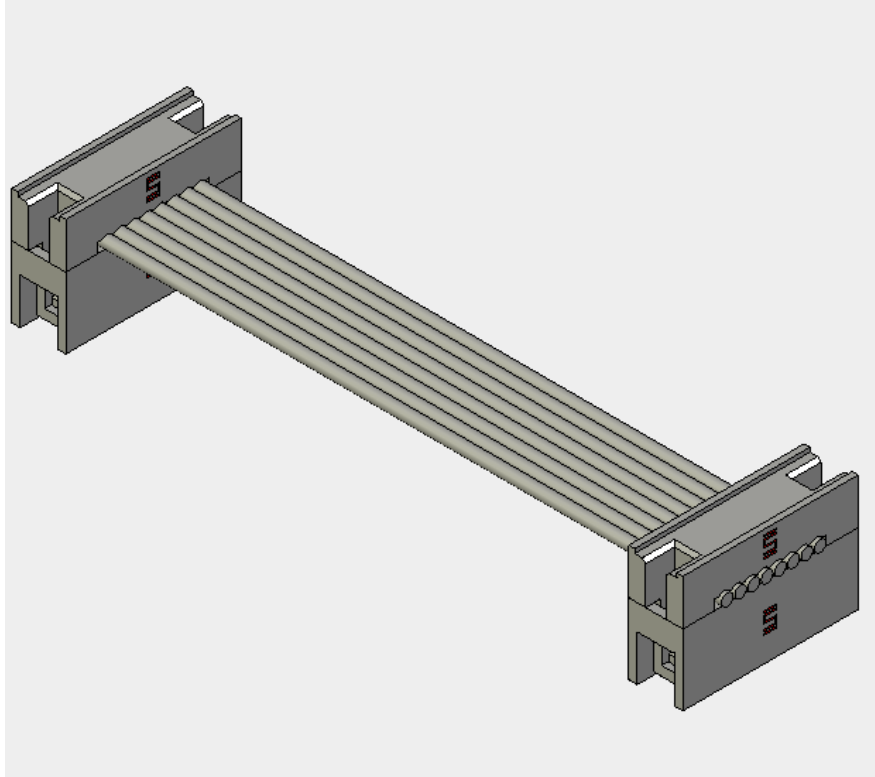




Project Number:		Tracking Code: TC0735--1433		
Requested by: Brandon Harpenau		Date: 8/28/2007	Product Rev: 1	
Part #: TMM-125-06-L-D-SM/ PCB-100876-TST-01		Lot #: 1	Tech: Tony Wagoner/Tori Meek	Eng: Troy Cook
Part description: NR-TLSD-25-D-5.00-01-L-N				Qty to test: 60
Test Start: 09/21/2007		Test Completed: 11/27/2007		



**PART DESCRIPTION**

**TLSD DESIGN VERIFICATION REPORT  
TLSD-25-D-5.00-01-L-N / TMM-125-06-L-D-SM**

## 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

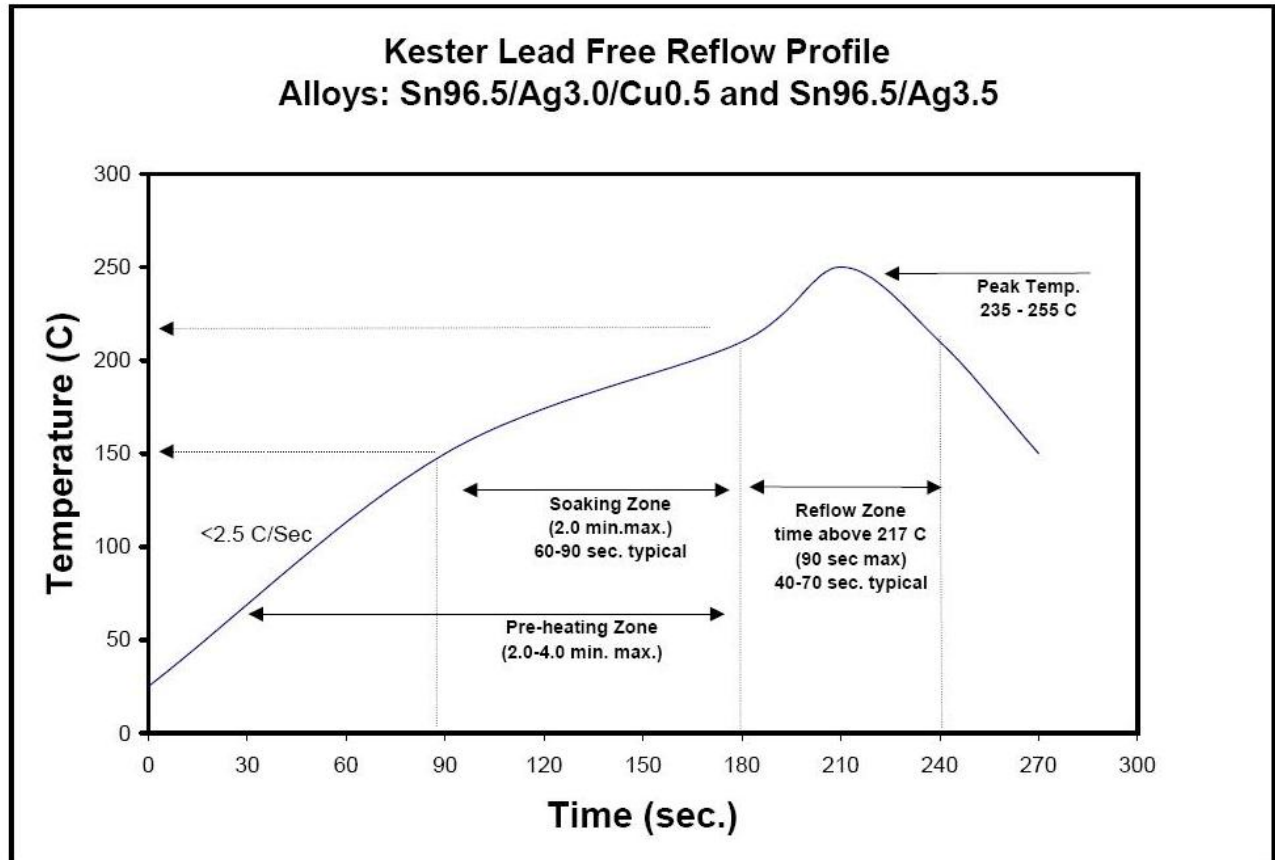
To perform the following tests: See attached flowchart. I will have assemblies on 9/6. Kyle can process the boards, just let me know when you need him to do so.

### 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-100876-TST-01

**TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)**

## FLOWCHARTS

### Current Carrying Capacity

TEST STEP	GROUP A 1 board min  1 contact alone, 6 Contacts in series, clustered if possible
01	CCC

Tabulate calculated current at RT, 65° C, 75° C and 95° C  
after derating 20% and based on 105° C

CCC, Temp rise = EIA-364-70

### Mating/Unmating/Normal Force

TEST STEP	GROUP A 10 Boards 50 Cycles	GROUP B1 Individual Contacts (30) min	GROUP B2 Individual Contacts (30) min
01	Contact Meas.	<b>Setup Approve</b>	<b>Setup Approve</b>
02	Mating / Unmating	Normal Force	Thermal Aging (Mated)
03	Data Review	Data Review	Normal Force
04	50 Cycles		
05	Mating / Unmating		
06	Contact Meas.		
07	Data Review		
08	Thermal Aging (Mated)		
09	Mating / Unmating		
10	Contact Meas.		
11	Data Review		
12	Humidity (Mated)		
13	Mating / Unmating		
14	Contact Meas.		

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

Mating/Un-Mating Forces = EIA-364-13

Normal Force = EIA-364-04

Contact Gaps/Height - No standard method. Usually measured optically

**FLOWCHARTS Continued****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

**Durability/Thermal Age/Cyclic Humidity**

TEST STEP	GROUP A 200 Points 50 Cycles
01	LLCR-1
02	Data Review
03	100 Cycles
04	LLCR-2
05	Data Review
06	Thermal Age
07	LLCR-3
08	Data Review
09	Cyclic Humidity
10	LLCR-4

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/98% RH)

ambient pre-condition and delete steps 7a and 7b

LLCR = EIA-364-23, LLCR

use Keithley 580 in the dry circuit mode, 10 mA Max

**FLOWCHARTS Continued****Gas Tight**

<b>TEST STEP</b>	<b>GROUP A 200 Points (min)</b>
<b>01</b>	LLCR-1
<b>02</b>	Gas Tight
<b>03</b>	LLCR-2

Gas Tight = EIA-364-36

LLCR = EIA-364-23, LLCR

use Keithley 580 in the dry circuit mode, 10 mA Max

**SUPPLEMENTAL TESTING FOR STRAIN RELIEF:****Connector Pull**

<b>TEST STEP</b>	<b>GROUP 1  DV SIG 0°</b>	<b>GROUP 2  DV SIG 90°</b>
<b>01</b>	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**

<b>TEST STEP</b>	<b>GROUP 1 DV End 90° SIG</b>	<b>GROUP 1A DV End 35° SIG</b>
<b>01</b>	Resistance	Resistance
<b>02</b>	1000 Cycles	1000 Cycles
<b>03</b>	Resistance	Resistance
<b>04</b>	Data Review	Data Review
<b>05</b>	2000 Cycles	2000 Cycles
<b>06</b>	Resistance	Resistance
<b>07</b>	Data Review	Data Review
<b>08</b>	3000 Cycles	3000 Cycles
<b>09</b>	Resistance	Resistance
<b>10</b>	Data Review	Data Review
<b>11</b>	4000 Cycles	4000 Cycles
<b>12</b>	Resistance	Resistance
<b>13</b>	Data Review	Data Review
<b>14</b>	5000 Cycles	5000 Cycles
<b>15</b>	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. 85° C
  - c. 95° C
  - d. 115° 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.

### CONTACT GAP:

- 1) Contact gaps were measured before and after stressing the contacts (e.g. thermal aging, mechanical cycling, etc.).
- 2) Typically, all contacts on the connector are measured.

**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.

**NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):**

- 1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
- 2) The contacts shall be tested in the connector housing.
- 3) If necessary, a "window" shall be made in the connector body to allow a probe to engage and deflect the contact at the same attitude and distance (plus 0.05 mm [0.002"]) as would occur in actual use.
- 4) The connector housing shall be placed in a holding fixture that does not interfere with or otherwise influence the contact force or deflection.
- 5) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC<sup>2</sup>, computer controlled test stand with a deflection measurement system accuracy of 5.0  $\mu$ m (0.0002").
- 6) The nominal deflection rate shall be 5 mm (0.2")/minute.
- 7) Unless otherwise noted a minimum of five contacts shall be tested.
- 8) The force/deflection characteristic to load and unload each contact shall be repeated five times.
- 9) The system shall utilize the TC<sup>2</sup> software in order to acquire and record the test data.
- 10) The permanent set of each contact shall be measured within the TC<sup>2</sup> software.
- 11) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

**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).

### 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.  $\leq +5.0$  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

### 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.  $\leq +5.0$  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  $50^{\circ}$  C
    - ix. The final LLCR shall be conducted within 1 hour after drying.

## SUPPLEMENTAL TESTS

### CONNECTOR PULL:

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

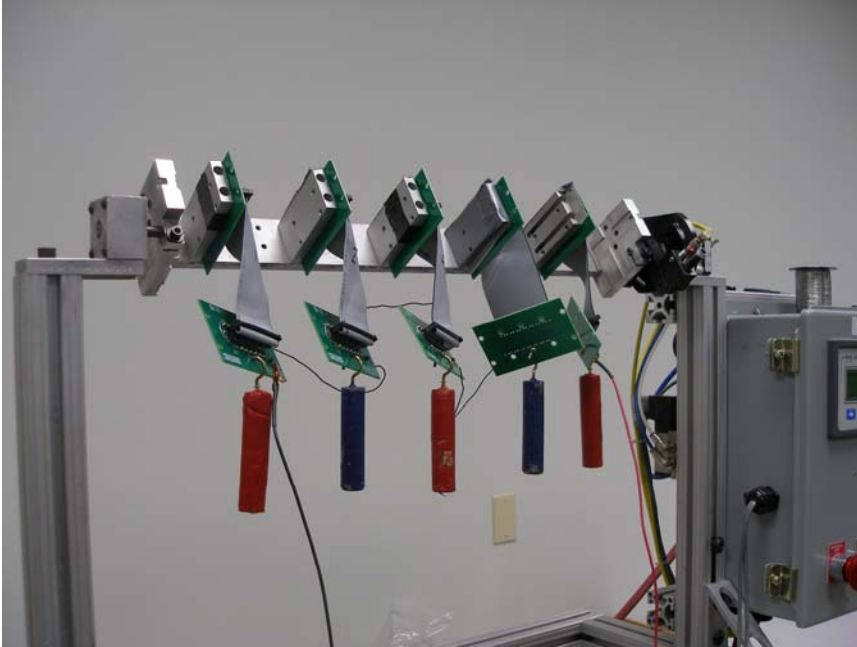


- b. At 0°, in-line with cable



**CABLE DURABILITY:**

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



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



## RESULTS

### Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----1.8 A per contact with 6 adjacent contacts powered

### Contact Gap – 50 CYCLE GROUP

- Initial
  - Min-----.278 mm
  - Max-----.394 mm
- After 100 Cycles
  - Min-----.283 mm
  - Max-----.416 mm
- Thermal
  - Min-----.350 mm
  - Max-----.440 mm
- Humidity
  - Min-----.354 mm
  - Max-----.412 mm

### Mating – Unmating Forces – 50 CYCLE GROUP

- Initial
  - Mating
    - Min-----6.4 Lbs.
    - Max-----7.1 Lbs.
  - Unmating
    - Min-----4.2 Lbs.
    - Max-----5.0 Lbs.
- After 50 Cycles
  - Mating
    - Min-----5.4 Lbs.
    - Max-----6.6 Lbs.
  - Unmating
    - Min-----4.2 Lbs.
    - Max-----5.6 Lbs.
- Thermal
  - Mating
    - Min-----4.3 Lbs.
    - Max-----5.8 Lbs.
  - Unmating
    - Min-----3.6 Lbs.
    - Max-----4.9 Lbs.
- Humidity
  - Mating
    - Min-----4.4 Lbs.
    - Max-----5.5 Lbs.
  - Unmating
    - Min-----3.8 Lbs.
    - Max-----4.5 Lbs.

**Normal Force at .007" deflection**

- **Initial**
  - **Min**-----209.1 Grams    **Set** -----.0008"
  - **Max**-----221.9 Grams    **Set** -----.0016"
- **Thermal**
  - **Min**-----187.9 Grams
  - **Max**-----199.6 Grams

**Insulation Resistance minimums, IR**

- **Initial**
  - **Mated**-----100,000 Meg  $\Omega$  ----- Pass
- **Thermal**
  - **Mated**-----50,000 Meg  $\Omega$
- **Humidity**
  - **Mated**-----50,000 Meg  $\Omega$

**Dielectric Withstanding Voltage minimums, DWV**

- **Initial**
  - **Breakdown**
    - **Mated**-----1,300 VAC
  - **DWV**
    - **Mated**-----975 VAC
  - **Working voltage**
    - **Mated**-----325 VAC
- **Thermal**
  - **Breakdown**
    - **Mated**-----1,400 VAC
  - **DWV**
    - **Mated**-----1,050 VAC
  - **Working voltage**
    - **Mated**-----350 VAC
- **Humidity**
  - **Breakdown**
    - **Mated**-----1,300 VAC
  - **DWV**
    - **Mated**-----975 VAC
  - **Working voltage**
    - **Mated**-----325 VAC

**LLCR Durability (200 LLCR test points) – 50 CYCLE GROUP**

- **Initial** ----- 27.4 mOhms Max
- **Durability, 50 Cycles**
  - <= +5.0 mOhms ----- 199 Points ----- Stable
  - +5.1 to +10.0 mOhms ----- 1 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 ----- 197 Points ----- Stable
  - +5.1 to +10.0 mOhms ----- 3 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 ----- 184 Points ----- Stable
  - +5.1 to +10.0 mOhms ----- 13 Points ----- Minor
  - +10.1 to +15.0 mOhms ----- 3 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

**LLCR Gas Tight (200 LLCR test points)**

- **Initial** ----- 30.3 mOhms Max
- **Gas-Tight**
  - <= +5.0 mOhms ----- 195 Points ----- Stable
  - +5.1 to +10.0 mOhms ----- 5 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

**SUPPLEMENTAL TESTING – STRAIN RELIEF FEATURE**

**Supplemental – Connector/Cable Pull**

- |             | <u>Strain Relief Failure</u> | <u>Continuity Failure</u> |
|-------------|------------------------------|---------------------------|
| • 0° -----  | 14.3 Lbs. Min.               | 28.4 Lbs. Min.            |
| • 90° ----- | 9.7 Lbs. Min.                | 99.8 Lbs. Min.            |

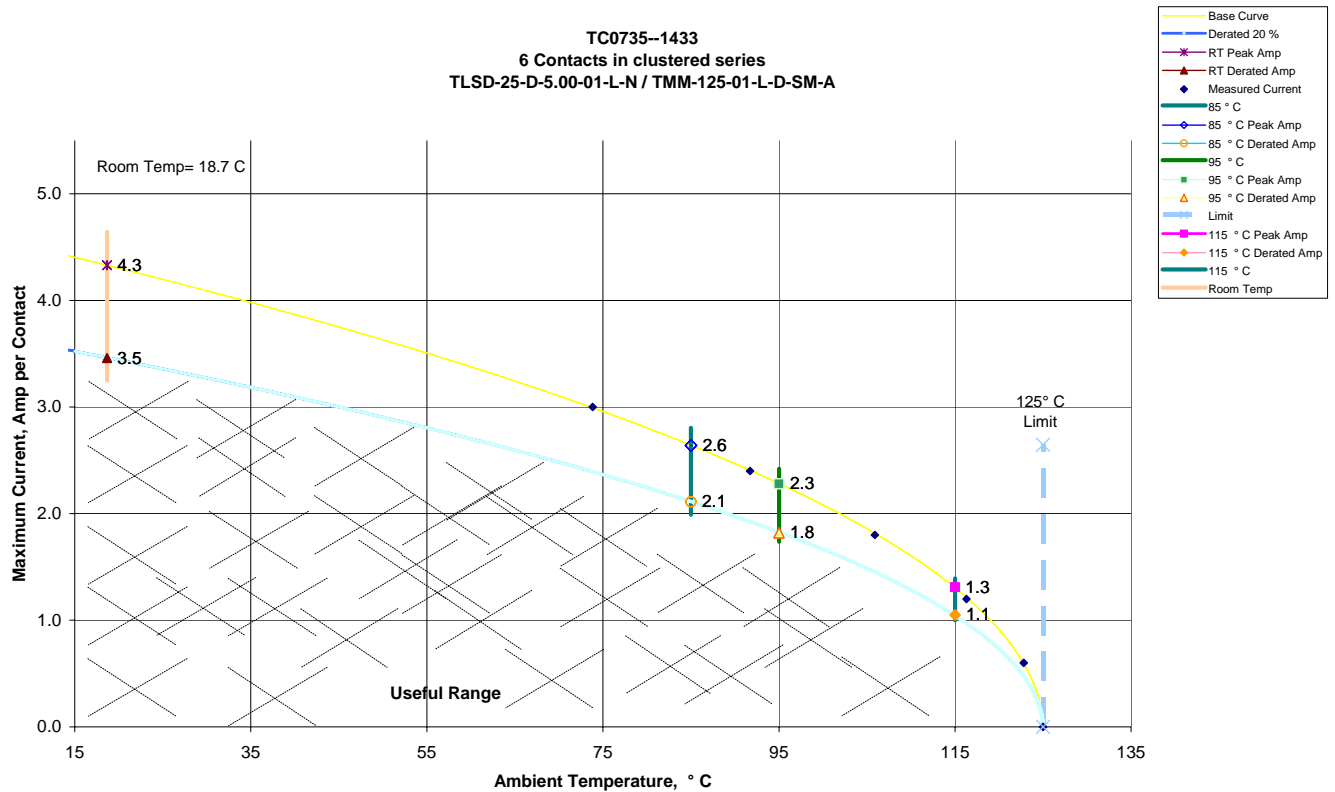
**Supplemental – Cable Bend 5,000 Cycles**

- ±35° Pendulum Mode ----- No Electrical Failures
- ±90° Flex Mode ----- Earliest failure at 2,702 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, 6 contacts in clustered series.

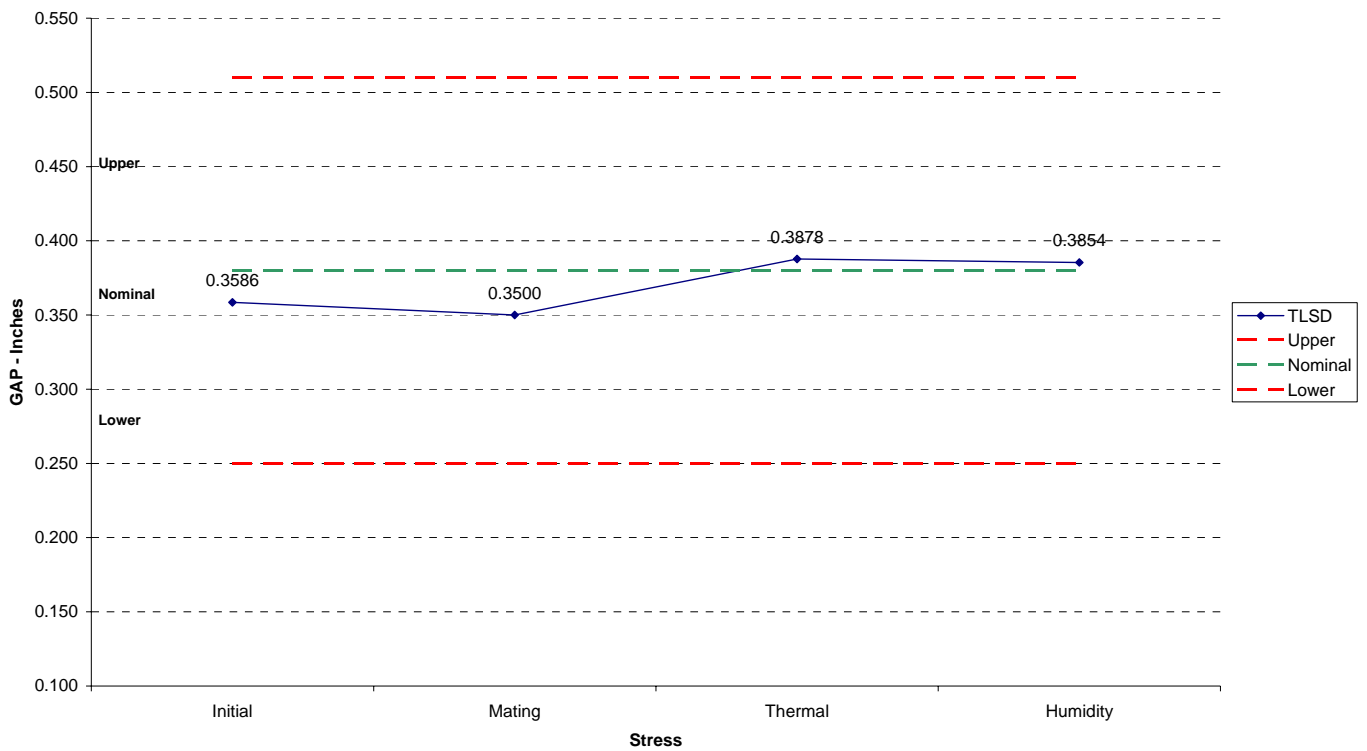


**DATA SUMMARIES Continued**

**CONTACT GAPS – 50 CYCLE GROUP:**

Initial		50 CYCLES		THERMAL		HUMIDITY	
Measurements in millimeters		Measurements in millimeters		Measurements in millimeters		Measurements in millimeters	
<i>Minimum</i>	0.2780	<i>Minimum</i>	0.2830	<i>Minimum</i>	0.3500	<i>Minimum</i>	0.3540
<i>Maximum</i>	0.4400	<i>Maximum</i>	0.4160	<i>Maximum</i>	0.4400	<i>Maximum</i>	0.4120
<i>Average</i>	0.3586	<i>Average</i>	0.3500	<i>Average</i>	0.3878	<i>Average</i>	0.3854
<i>St. Dev.</i>	0.0221	<i>St. Dev.</i>	0.0352	<i>St. Dev.</i>	0.0192	<i>St. Dev.</i>	0.0109
<i>Count</i>	200	<i>Count</i>	100	<i>Count</i>	100	<i>Count</i>	100

Height Measurements

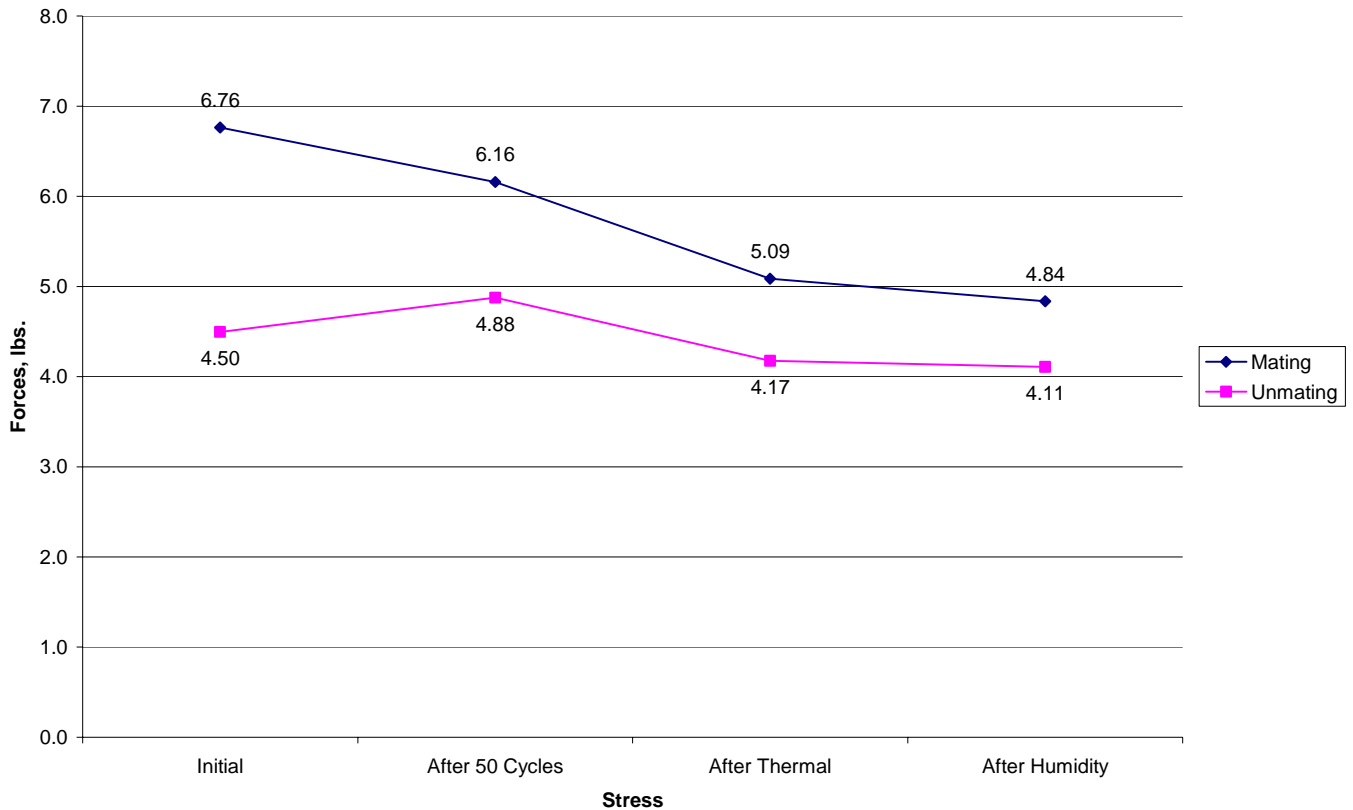


**DATA SUMMARIES Continued**

**MATING/UNMATING – 50 CYCLE GROUP:**

	Initial				After 50 Cycles			
	Mating		Unmating		Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	101.8	6.36	66.4	4.15	86.2	5.39	66.7	4.17
Maximum	113.6	7.1	80.0	5.0	105.1	6.6	89.3	5.6
<b>Average</b>	<b>108.2</b>	<b>6.8</b>	<b>71.9</b>	<b>4.5</b>	<b>98.5</b>	<b>6.2</b>	<b>78.0</b>	<b>4.9</b>
	After Thermal				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	69.1	4.3	58.2	3.6	69.6	4.4	60.8	3.8
Maximum	92.2	5.8	78.6	4.9	87.4	5.5	72.6	4.5
<b>Average</b>	<b>81.4</b>	<b>5.1</b>	<b>66.8</b>	<b>4.2</b>	<b>77.4</b>	<b>4.8</b>	<b>65.7</b>	<b>4.1</b>

**Mating/Unmating Compare**



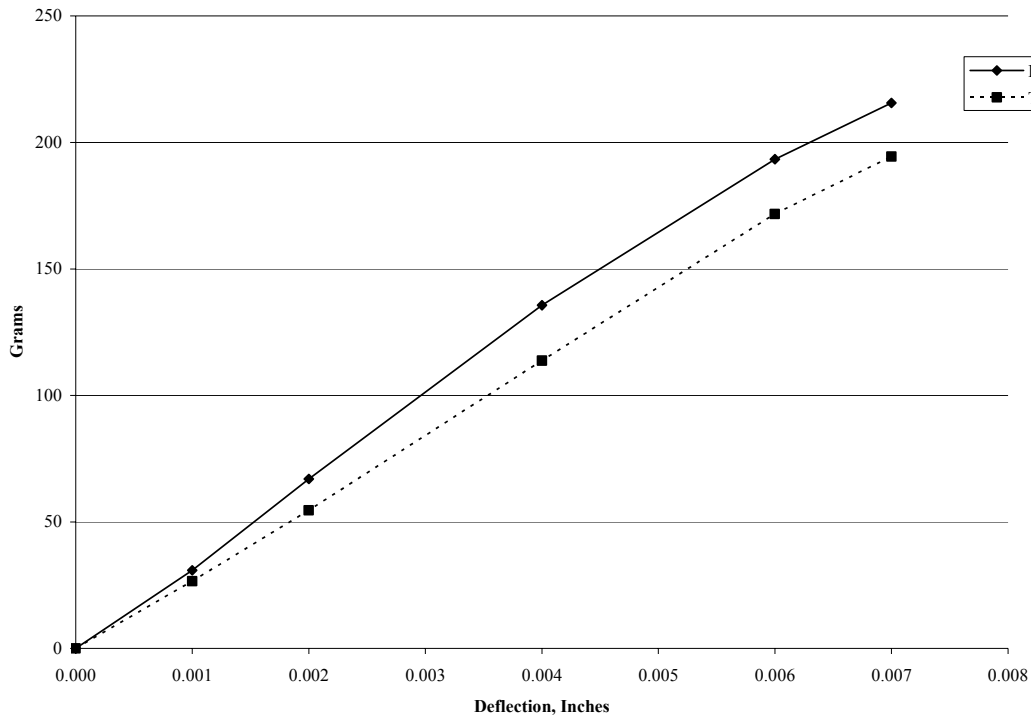
**DATA SUMMARIES Continued****NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):**

- 1) Calibrated force gauges are used along with computer controlled positioning equipment.
- 2) For Normal force 8-10 measurements are taken and the averages reported.

Initial	Deflections in inches Forces in Grams					
	<u>0.001</u>	<u>0.002</u>	<u>0.004</u>	<u>0.006</u>	<u>0.007</u>	<u>SET</u>
Averages	30.88	66.99	135.68	193.38	215.64	0.0012
Min	25.50	57.30	121.00	182.30	209.10	0.0008
Max	37.30	77.30	148.70	201.40	221.90	0.0016
St. Dev	3.54	5.52	7.14	5.39	4.75	0.0002
Count	13	13	13	13	13	13

Thermal	Deflections in inches Forces in Grams					
	<u>0.001</u>	<u>0.002</u>	<u>0.004</u>	<u>0.006</u>	<u>0.007</u>	<u>SET</u>
Averages	30.88	66.99	135.68	193.38	215.64	0.0012
Min	23.00	45.40	103.80	162.90	187.90	0.0005
Max	31.10	66.70	131.70	181.30	199.60	0.0015
St. Dev	2.50	5.80	8.08	7.22	4.67	0.0003
Count	11	11	11	11	11	11

Normal Force Compare



**DATA SUMMARIES Continued****INSULATION RESISTANCE (IR):**

	<b>Initial</b>	<b>Thermal</b>	<b>Humidity</b>
	<b>Signal-Signal</b>	<b>Signal-Signal</b>	<b>Signal-Signal</b>
	<b>Mated</b>	<b>Mated</b>	<b>Mated</b>
	<b><u>Insulation Resistance</u></b>	<b><u>Insulation Resistance</u></b>	<b><u>Insulation Resistance</u></b>
<b>Average</b>	100000	75000	87500
<b>Min</b>	100000	50000	50000
<b>Max</b>	100000	100000	100000

**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

<b>Signal to Signal</b>			
<b>Initial</b>			
	<b><u>Breakdown Voltage</u></b>	<b><u>DWV</u></b>	<b><u>Working Voltage</u></b>
<b>Average</b>	1500	1125	375
<b>Min</b>	1300	975	325
<b>Max</b>	1600	1200	400
<b>Signal to Signal</b>			
<b>Thermal</b>			
	<b><u>Breakdown Voltage</u></b>	<b><u>DWV</u></b>	<b><u>Working Voltage</u></b>
<b>Average</b>	1500	1125	375
<b>Min</b>	1300	975	325
<b>Max</b>	1600	1200	400
<b>Signal to Signal</b>			
<b>Humidity</b>			
	<b><u>Breakdown Voltage</u></b>	<b><u>DWV</u></b>	<b><u>Working Voltage</u></b>
<b>Average</b>	1500	1125	375
<b>Min</b>	1300	975	325
<b>Max</b>	1600	1200	400

**DATA SUMMARIES Continued**

**LLCR – 50 CYCLE GROUP:**

- 1) A total of 200 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.  $\leq +5.0$  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

Date	Sep. 24 2007	Oct. 10 2007	Oct. 23 2007	Nov. 07 2007
Room Temp C	23	22	23	23
RH	52%	41%	55%	22%
Name	Tony Wagoner	Tony Wagoner	Tori Meek	Jerry Smallwood
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta 100 Cycles</b>	<b>Delta Thermal</b>	<b>Delta Humidity</b>
Average	24.2	0.0	1.3	2.4
St. Dev.	0.8	0.8	1.2	2.0
Min	22.7	-2.6	-1.1	0.0
Max	27.4	5.5	7.2	14.1
Count	200	200	200	200

**DATA SUMMARIES Continued**

**GAS TIGHT:**

- 1) A total of 200 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.  $\leq +5.0$  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

Date	Sep. 24 2007	Oct. 30 2007
Room Temp C	23	22
RH	52%	32%
Name	Tony Wagoner	Tori Meek
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta Gas Tight</b>
Average	23.9	1.2
St. Dev.	0.9	1.4
Min	22.4	-4.9
Max	30.3	8.3
Count	200	200

**SUPPLEMENTAL TESTING – STRAIN RELIEF FEATURE**

**Supplemental – Connector/Cable Pull:**

<b>0 Deg. Pull Test</b>		
	Strain Rel.	Continuity
	Force (lbs)	Force (lbs)
Minimum	14.30	28.35
Maximum	17.95	37.50
Average	16.28	32.93

<b>90 Deg. Pull Test</b>		
	Strain Rel.	Continuity
	Force (lbs)	Force (lbs)
Minimum	9.70	99.75
Maximum	14.25	
Average	12.27	

**DATA SUMMARIES Continued****Supplemental – Connector/Cable Pull:****35 Deg. Pendulum:**

	<b>Resistance, Ohms</b>					
	<b>Initial</b>	<b>After 1000</b>	<b>After 2000</b>	<b>After 3000</b>	<b>After 4000</b>	<b>After 5000</b>
<b>Avg</b>	2.1680	2.4870	2.1670	2.1290	2.0790	2.1280
<b>Min</b>	2.0000	1.9900	1.9300	1.9900	1.9900	2.0200
<b>Max</b>	2.3800	5.6000	2.7700	2.7900	2.2800	2.3000
<b>St. Dev.</b>	0.1327	1.1014	0.2495	0.2393	0.0911	0.0974
<b>Count</b>	10	10	10	10	10	10

**90 Deg. Flex:**

	<b>Resistance, Ohms</b>					
	<b>Initial</b>	<b>After 1000</b>	<b>After 2000</b>	<b>After 3000</b>	<b>After 4000</b>	<b>After 5000</b>
<b>Avg</b>	2.4540	2.2480	2.7350	2.7114	2.5000	#DIV/0!
<b>Min</b>	2.1000	2.0300	2.0400	2.1500	2.5000	0.0000
<b>Max</b>	2.8100	2.4400	3.8900	3.7500	2.5000	0.0000
<b>St. Dev.</b>	0.3094	0.1542	0.7150	0.5525	#DIV/0!	#DIV/0!
<b>Count</b>	10	10	10	7	1	0

## DATA

## CONTACT GAP – 50 CYCLE GROUP:

## Measurements in mm.

Sample#	INITIAL MEASUREMENTS				100 CYCLES	THERMAL		HUMIDITY		
	B1	B2	B3	B4	B1	B2	B1	B2	B1	B2
1	0.3120	0.3100	0.4380	0.3780	0.3490	0.3195	0.4380	0.3780	0.4040	0.4000
2	0.3020	0.3300	0.4140	0.3800	0.3215	0.3250	0.4140	0.3800	0.3920	0.3920
3	0.2900	0.3320	0.4020	0.3880	0.3215	0.3455	0.4020	0.3880	0.3860	0.4020
4	0.2860	0.3260	0.4080	0.3900	0.3390	0.3015	0.4080	0.3900	0.3900	0.3980
5	0.2800	0.3240	0.4200	0.3740	0.3310	0.3255	0.4200	0.3740	0.3740	0.3980
6	0.2860	0.3460	0.4040	0.3740	0.3480	0.2935	0.4040	0.3740	0.3820	0.3960
7	0.2780	0.3160	0.4100	0.3820	0.3415	0.3120	0.4100	0.3820	0.3780	0.3940
8	0.2840	0.3180	0.4040	0.3780	0.3365	0.2900	0.4040	0.3780	0.3700	0.3920
9	0.2800	0.3200	0.4160	0.3620	0.3265	0.2920	0.4160	0.3620	0.3760	0.3920
10	0.2780	0.3360	0.4040	0.3720	0.3080	0.3080	0.4040	0.3720	0.3780	0.3900
11	0.2920	0.3260	0.4080	0.3600	0.3175	0.2935	0.4080	0.3600	0.3940	0.3660
12	0.2780	0.3300	0.4040	0.3580	0.3205	0.3170	0.4040	0.3580	0.3740	0.3820
13	0.3040	0.3260	0.4100	0.3600	0.3205	0.3065	0.4100	0.3600	0.3920	0.3920
14	0.2820	0.3240	0.4020	0.3700	0.3340	0.2955	0.4020	0.3700	0.3800	0.3800
15	0.2860	0.3340	0.4140	0.3760	0.3280	0.3020	0.4140	0.3760	0.3920	0.3880
16	0.3060	0.3340	0.4080	0.3700	0.3280	0.3265	0.4080	0.3700	0.3980	0.3780
17	0.3020	0.3240	0.4080	0.3660	0.3360	0.3085	0.4080	0.3660	0.4000	0.3840
18	0.2860	0.3380	0.4180	0.3580	0.3365	0.3325	0.4180	0.3580	0.4080	0.3860
19	0.2940	0.3380	0.4200	0.3700	0.3380	0.3010	0.4200	0.3700	0.3900	0.3940
20	0.2840	0.3440	0.4160	0.3680	0.3150	0.3060	0.4160	0.3680	0.3980	0.3800
21	0.2780	0.3420	0.4220	0.3820	0.3040	0.3080	0.4220	0.3820	0.3880	0.3720
22	0.2860	0.3360	0.4240	0.3760	0.3200	0.3155	0.4240	0.3760	0.4100	0.3800
23	0.2900	0.3200	0.4400	0.3700	0.3045	0.3030	0.4400	0.3700	0.3960	0.3860
24	0.2800	0.3320	0.4360	0.3820	0.3275	0.2830	0.4360	0.3820	0.4120	0.4000
25	0.2860	0.3300	0.4300	0.3820	0.3385	0.3025	0.4300	0.3820	0.3940	0.3960
26	0.3780	0.3400	0.3760	0.3940	0.3725	0.3910	0.3680	0.4000	0.3860	0.4080
27	0.3640	0.3460	0.3720	0.4000	0.3515	0.4065	0.3500	0.4100	0.3940	0.3980
28	0.3640	0.3360	0.3620	0.3940	0.3770	0.3960	0.3520	0.3920	0.3720	0.3860
29	0.3620	0.3440	0.3740	0.3780	0.3635	0.3840	0.3520	0.3900	0.3900	0.3800
30	0.3520	0.3300	0.3780	0.3900	0.3640	0.3985	0.3540	0.3960	0.3940	0.3880
31	0.3740	0.3400	0.3780	0.3980	0.3710	0.4105	0.3700	0.3840	0.3820	0.4020
32	0.3680	0.3320	0.3680	0.4040	0.3680	0.3930	0.3740	0.3920	0.3780	0.3840
33	0.3780	0.3340	0.3740	0.3940	0.3530	0.4030	0.3640	0.3860	0.3760	0.3880
34	0.3860	0.3420	0.3800	0.3920	0.3615	0.3720	0.3740	0.3900	0.3740	0.3940
35	0.3720	0.3340	0.3780	0.4040	0.3565	0.3935	0.3580	0.3820	0.3840	0.3920
36	0.3540	0.3280	0.3960	0.3880	0.3760	0.3695	0.3620	0.3740	0.3820	0.3740
37	0.3580	0.3200	0.3760	0.3860	0.3635	0.3725	0.3820	0.3940	0.3840	0.3740
38	0.3640	0.3280	0.3860	0.4020	0.3740	0.4000	0.3860	0.4020	0.3860	0.3760
39	0.3580	0.3220	0.3820	0.3940	0.3795	0.3790	0.3760	0.3860	0.3840	0.3900
40	0.3620	0.3400	0.3620	0.3740	0.3630	0.3810	0.3960	0.3880	0.3840	0.3740
41	0.3720	0.3240	0.3580	0.3820	0.3850	0.3920	0.3780	0.4040	0.3860	0.3880
42	0.3640	0.3400	0.3740	0.3900	0.3905	0.3915	0.3800	0.3920	0.3760	0.3780
43	0.3600	0.3220	0.3640	0.3860	0.3890	0.3730	0.3740	0.3940	0.3880	0.3860
44	0.3520	0.3240	0.3740	0.3920	0.3690	0.3745	0.3680	0.4040	0.3760	0.3740
45	0.3940	0.3400	0.3700	0.3840	0.3730	0.4005	0.3780	0.3980	0.3740	0.3820
46	0.3660	0.3100	0.3540	0.3960	0.3790	0.4070	0.3780	0.3900	0.3540	0.3740

47	0.3760	0.3240	0.3520	0.3900	0.4080	0.3820	0.3740	0.3780	0.3700	0.3760
48	0.3660	0.3340	0.3520	0.3920	0.3600	0.4160	0.3620	0.3940	0.3620	0.3760
49	0.3640	0.3360	0.3500	0.4100	0.3740	0.4010	0.3720	0.4000	0.3720	0.3780
50	0.3740	0.3360	0.3680	0.4000	0.4075	0.3755	0.3760	0.3940	0.3740	0.3660

**MATING/UNMATING – 50 CYCLE GROUP:**

Sample#	Initial				After 50 Cycles			
	Mating		Unmating		Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	110.4	6.90	77.6	4.85	99.4	6.21	78.9	4.93
2	107.5	6.72	67.2	4.20	90.9	5.68	72.8	4.55
3	113.6	7.10	72.0	4.50	99.2	6.20	73.1	4.57
4	108.6	6.79	75.7	4.73	101.8	6.36	80.8	5.05
5	110.2	6.89	69.8	4.36	100.5	6.28	71.8	4.49
6	105.4	6.59	66.4	4.15	86.2	5.39	66.7	4.17
7	101.8	6.36	66.6	4.16	100.6	6.29	81.0	5.06
8	107.0	6.69	70.6	4.41	96.6	6.04	80.6	5.04
9	106.4	6.65	73.6	4.60	105.1	6.57	85.0	5.31
10	110.9	6.93	80.0	5.00	105.1	6.57	89.3	5.58
Sample#	After Thermal				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	92.2	5.76	78.6	4.91	73.3	4.58	65.4	4.09
2	88.6	5.54	71.0	4.44	81.4	5.09	65.4	4.09
3	78.4	4.90	68.0	4.25	81.1	5.07	71.0	4.44
4	79.2	4.95	66.1	4.13	73.1	4.57	63.0	3.94
5	77.8	4.86	59.5	3.72	77.1	4.82	66.9	4.18
6	69.1	4.32	60.0	3.75	80.3	5.02	67.0	4.19
7	88.8	5.55	69.3	4.33	87.4	5.46	72.6	4.54
8	78.6	4.91	63.4	3.96	73.6	4.60	61.6	3.85
9	85.3	5.33	73.8	4.61	76.8	4.80	63.4	3.96
10	75.8	4.74	58.2	3.64	69.6	4.35	60.8	3.80

**DATA Continued****NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):**

<b>Initial Sample #</b>	<b>Deflections in inches Forces in Grams</b>					<b>SET</b>
	<b>0.001</b>	<b>0.002</b>	<b>0.004</b>	<b>0.006</b>	<b>0.007</b>	
1	26.00	61.40	128.70	187.90	210.50	0.00100
2	34.60	71.40	141.90	200.50	221.90	0.00110
3	33.70	72.80	143.70	199.60	217.30	0.00160
4	37.30	77.30	148.70	201.40	219.60	0.00150
5	33.20	71.90	141.40	193.20	213.70	0.00100
6	32.80	68.20	136.40	193.20	213.70	0.00120
7	32.30	67.30	132.30	188.70	210.00	0.00120
8	30.50	68.70	134.10	191.00	210.00	0.00150
9	29.10	65.00	133.70	191.90	216.40	0.00120
10	25.50	57.30	121.00	182.30	209.10	0.00080
11	28.20	62.30	136.40	196.00	221.90	0.00110
12	31.00	65.00	134.60	195.50	220.50	0.00100
13	27.30	62.30	131.00	192.80	218.70	0.00090

<b>Thermal Sample #</b>	<b>Deflections in inches Forces in Grams</b>					<b>SET</b>
	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	
1	31.10	66.70	131.70	181.30	196.00	0.00150
2	26.00	45.40	107.10	165.90	190.80	0.00050
3	25.20	50.90	112.30	175.80	199.60	0.00070
4	26.00	53.50	112.30	172.50	195.20	0.00070
5	27.80	58.30	121.10	180.20	199.60	0.00080
6	27.40	56.50	116.30	173.20	197.80	0.00090
7	30.00	58.70	119.60	181.30	199.60	0.00070
8	23.00	48.40	105.60	163.30	189.00	0.00060
9	24.50	52.40	109.30	167.70	194.90	0.00060
10	27.40	57.20	112.30	164.80	188.30	0.00070
11	23.80	52.00	103.80	162.90	187.90	0.00060

**INSULATION RESISTANCE (IR):**

<b>Sample #</b>	<b>Initial</b>	<b>Thermal</b>	<b>Humidity</b>
	<b>Signal-Signal</b>	<b>Signal-Signal</b>	<b>Signal-Signal</b>
	<b>Mated</b>	<b>Mated</b>	<b>Mated</b>
	<b>Insulation Resistance</b>	<b>Insulation Resistance</b>	<b>Insulation Resistance</b>
1	100000	100000	100000
2	100000	50000	50000
3	100000	100000	100000
4	100000	50000	100000

**DATA Continued****DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

<b>Signal to Signal</b>			
<b>Initial</b>			
<b>Sample #</b>	<b>Breakdown Voltage</b>	<b>DWV</b>	<b>Working Voltage</b>
1	1500	1125	375
2	1600	1200	400
3	1300	975	325
4	1600	1200	400
<b>Signal to Signal</b>			
<b>Thermal</b>			
<b>Sample #</b>	<b>Breakdown Voltage</b>	<b>DWV</b>	<b>Working Voltage</b>
1	1500	1125	375
2	1600	1200	400
3	1300	975	325
4	1600	1200	400
<b>Signal to Signal</b>			
<b>Humidity</b>			
<b>Sample #</b>	<b>Breakdown Voltage</b>	<b>DWV</b>	<b>Working Voltage</b>
1	1500	1125	375
2	1600	1200	400
3	1300	975	325
4	1600	1200	400

**LLCR – 50 CYCLE GROUP:**

	<b>mOhm values</b>	<b>Actual</b>	<b>Delta</b>	<b>Delta</b>	<b>Delta</b>
<b>Board</b>	<b>Position</b>	<b>Initial</b>	<b>100 Cycles</b>	<b>Thermal</b>	<b>Humidity</b>
1	P1	23.8	0.4	2.5	2.6
1	P2	23.2	0.5	2.2	2.7
1	P3	24.2	-0.2	1.7	3.1
1	P4	24.9	0.9	7.2	3.8
1	P5	24.3	1.1	4.5	6.2
1	P6	24.2	-0.7	1.2	2.2
1	P7	24.6	-0.1	2.4	2.9
1	P8	23.9	0.5	4.7	4.7
1	P9	23.6	0.9	6.0	8.0
1	P10	24.1	0.4	5.2	3.4
1	P11	24.2	0.3	2.2	2.8
1	P12	23.8	0.4	2.1	2.0

1	P13	23.9	0.1	1.9	2.2
1	P14	23.8	0.1	1.6	2.1
1	P15	25.0	-0.3	1.5	2.4
1	P16	23.4	0.2	1.3	2.1
1	P17	23.5	0.5	1.8	2.7
1	P18	24.1	1.4	4.7	4.8
1	P19	24.4	0.5	1.6	1.1
1	P20	24.0	0.2	3.4	8.2
1	P21	23.9	0.9	2.5	3.4
1	P22	24.8	1.2	0.2	0.9
1	P23	24.5	1.2	3.3	5.7
1	P24	25.8	1.0	2.6	4.1
1	P25	23.3	0.1	2.2	2.6
2	P1	24.8	4.0	3.0	4.5
2	P2	24.9	1.3	3.3	11.9
2	P3	25.0	5.5	2.5	7.2
2	P4	24.3	2.0	1.9	4.9
2	P5	23.7	1.6	1.9	3.9
2	P6	22.7	1.9	3.0	4.0
2	P7	23.6	0.3	2.2	2.4
2	P8	22.8	0.1	0.7	1.0
2	P9	23.6	-0.2	1.2	3.1
2	P10	23.6	0.2	-0.1	0.4
2	P11	23.9	-0.1	1.9	2.8
2	P12	23.9	0.4	1.4	1.5
2	P13	23.3	-0.1	2.0	1.1
2	P14	23.8	-0.4	0.8	1.1
2	P15	24.6	-0.3	1.8	3.7
2	P16	23.7	0.2	0.9	1.6
2	P17	24.9	0.2	1.9	3.2
2	P18	23.8	-0.2	0.7	1.3
2	P19	23.5	0.0	0.5	1.7
2	P20	25.1	1.4	1.0	6.8
2	P21	23.7	-0.5	1.2	0.8
2	P22	24.4	-0.4	0.8	1.7
2	P23	25.3	-0.5	2.1	3.8
2	P24	23.8	-0.5	1.0	0.9
2	P25	24.3	-0.3	0.0	3.1
3	P1	23.6	-0.4	1.8	5.0
3	P2	23.5	0.5	2.6	3.1
3	P3	23.2	-0.2	2.2	3.6
3	P4	22.8	-0.2	0.7	1.2
3	P5	23.1	-0.3	3.0	1.4
3	P6	23.5	-0.3	1.3	1.8
3	P7	23.5	-0.3	1.6	1.2
3	P8	24.3	-1.0	4.5	6.9
3	P9	23.2	-0.1	0.8	1.0
3	P10	24.7	-0.6	3.0	3.5
3	P11	23.8	-0.2	3.0	5.2

3	P12	22.9	0.4	1.8	1.8
3	P13	24.0	-0.4	1.2	2.1
3	P14	23.2	0.1	1.6	3.6
3	P15	23.4	0.2	1.9	2.6
3	P16	23.9	-0.6	1.0	2.5
3	P17	23.2	-0.3	1.7	2.7
3	P18	23.2	-0.4	1.3	2.1
3	P19	24.6	-1.4	0.0	0.6
3	P20	24.9	0.7	1.7	3.6
3	P21	26.8	-2.2	0.5	2.9
3	P22	24.2	-0.2	0.7	0.6
3	P23	23.6	0.3	1.4	1.9
3	P24	24.3	-0.5	0.9	0.8
3	P25	24.1	-0.9	0.9	2.0
4	P1	23.7	-0.1	0.2	1.4
4	P2	23.2	0.4	1.8	0.9
4	P3	24.2	-0.3	1.1	3.7
4	P4	23.5	-0.3	1.2	0.9
4	P5	24.1	-0.2	0.2	0.5
4	P6	24.4	1.7	0.4	2.6
4	P7	23.6	0.0	0.9	2.1
4	P8	24.1	-0.1	1.0	4.1
4	P9	24.5	-0.2	0.4	2.1
4	P10	24.1	1.6	0.5	2.2
4	P11	23.3	-0.1	1.6	1.9
4	P12	23.6	-0.1	1.4	1.1
4	P13	23.4	-0.1	1.6	1.9
4	P14	24.1	0.2	1.3	0.7
4	P15	24.1	-0.3	0.8	1.5
4	P16	24.6	0.6	0.1	1.0
4	P17	24.0	-0.2	1.1	1.1
4	P18	24.5	-0.2	0.7	1.1
4	P19	24.6	-0.4	-0.2	0.5
4	P20	24.2	0.6	2.6	1.3
4	P21	24.0	-0.4	0.3	0.6
4	P22	23.8	-0.2	0.3	2.0
4	P23	25.3	0.5	-0.2	0.7
4	P24	23.9	-0.4	0.3	14.1
4	P25	23.6	0.1	1.1	1.5
5	P1	24.7	-0.6	1.1	4.6
5	P2	24.2	0.0	1.0	1.0
5	P3	26.5	-0.8	0.8	3.3
5	P4	24.7	-0.4	0.8	1.1
5	P5	25.3	-0.3	0.5	0.7
5	P6	26.4	-1.4	-1.1	1.0
5	P7	27.4	-2.6	1.4	4.9
5	P8	24.5	-0.6	-0.2	1.3
5	P9	24.2	-0.5	0.6	0.8
5	P10	26.2	-1.4	0.2	1.2

5	P11	25.0	-0.8	1.2	2.8
5	P12	25.3	-0.8	0.2	2.2
5	P13	23.8	-0.4	0.1	1.3
5	P14	24.9	-0.3	0.1	1.6
5	P15	23.7	-0.4	0.4	1.1
5	P16	23.7	-0.2	0.7	1.0
5	P17	24.0	0.2	0.9	1.9
5	P18	23.7	0.0	0.7	0.8
5	P19	23.8	0.1	0.9	2.1
5	P20	24.9	-0.6	0.7	3.7
5	P21	24.8	-0.4	0.7	0.2
5	P22	24.4	0.1	1.9	2.5
5	P23	25.0	0.1	1.1	1.8
5	P24	25.4	0.0	0.8	1.7
5	P25	24.2	0.0	1.7	2.2
6	P1	23.8	0.2	1.8	6.6
6	P2	23.2	1.3	3.7	8.0
6	P3	23.8	0.3	1.7	2.8
6	P4	24.5	1.1	0.5	1.4
6	P5	24.1	0.9	2.0	2.5
6	P6	25.1	0.2	1.3	2.4
6	P7	25.3	-0.7	0.4	1.9
6	P8	24.1	0.1	2.3	2.3
6	P9	23.2	0.1	0.4	0.4
6	P10	24.4	-0.7	0.1	0.2
6	P11	24.3	-0.5	-0.2	0.0
6	P12	24.1	0.1	0.4	0.7
6	P13	24.1	0.1	2.9	2.5
6	P14	24.1	0.2	0.4	1.9
6	P15	23.9	0.1	1.8	1.3
6	P16	23.8	-0.1	1.4	1.5
6	P17	23.2	-0.3	1.1	1.4
6	P18	23.5	-0.3	3.9	2.4
6	P19	23.4	0.1	1.4	2.0
6	P20	23.3	0.2	2.2	5.3
6	P21	23.4	2.0	3.1	1.9
6	P22	23.5	0.0	1.1	1.6
6	P23	23.6	0.3	1.1	1.7
6	P24	23.6	-0.1	1.4	2.0
6	P25	23.5	0.4	1.5	2.7
7	P1	24.2	-0.6	1.3	2.7
7	P2	23.6	-0.2	0.6	1.8
7	P3	23.8	-0.3	0.4	1.2
7	P4	23.2	0.0	1.0	1.6
7	P5	26.0	-0.4	0.5	4.8
7	P6	25.8	-0.8	-0.1	4.6
7	P7	26.4	0.2	-0.9	4.3
7	P8	24.8	0.5	0.3	1.9
7	P9	26.1	-0.8	2.2	7.9

7	P10	24.7	-1.1	-0.2	0.8
7	P11	24.1	-0.6	0.4	2.1
7	P12	23.8	0.0	0.8	1.3
7	P13	24.6	-0.2	0.4	1.2
7	P14	24.4	0.0	0.5	0.7
7	P15	24.9	-0.6	0.6	0.8
7	P16	24.3	-0.1	1.4	1.5
7	P17	23.8	-0.3	0.7	1.1
7	P18	23.8	0.1	1.0	1.8
7	P19	25.2	-0.9	0.0	0.0
7	P20	23.4	0.6	1.3	2.0
7	P21	23.9	0.3	2.9	2.8
7	P22	23.3	0.3	1.5	1.7
7	P23	24.0	0.1	1.3	1.7
7	P24	24.0	-0.3	0.2	1.3
7	P25	23.7	-0.3	1.2	1.8
8	P1	24.0	-0.3	3.7	10.2
8	P2	23.7	0.0	1.1	1.5
8	P3	23.5	0.0	1.3	3.1
8	P4	23.7	-0.4	0.1	0.2
8	P5	23.8	-0.2	1.4	2.7
8	P6	23.9	0.1	1.4	3.7
8	P7	24.8	-0.5	1.5	5.1
8	P8	23.1	-0.1	0.5	0.7
8	P9	23.6	-0.2	0.8	1.1
8	P10	24.1	0.0	0.8	0.9
8	P11	25.0	-0.4	0.4	0.3
8	P12	24.1	-0.7	1.0	1.0
8	P13	24.1	-0.5	1.4	2.0
8	P14	24.1	-0.8	0.3	0.9
8	P15	24.6	-0.5	1.1	1.3
8	P16	23.8	-0.6	1.3	2.3
8	P17	24.6	-0.8	-0.2	0.1
8	P18	24.5	-0.5	0.4	0.9
8	P19	25.9	-1.6	0.7	2.0
8	P20	24.2	-0.9	0.3	1.4
8	P21	23.6	-0.2	0.6	0.6
8	P22	23.6	-0.2	0.2	0.3
8	P23	24.0	-0.2	0.5	0.9
8	P24	24.6	-0.1	2.6	4.9
8	P25	23.9	0.3	1.8	3.5

**GAS TIGHT:**

	mOhm values	Actual	Delta
Board	Position	Initial	Gas Tight
1	P1	23.5	1.7

1	P2	27.7	-1.2
1	P3	23.8	0.9
1	P4	23.0	0.9
1	P5	24.1	0.8
1	P6	23.2	0.1
1	P7	23.0	0.1
1	P8	24.9	2.7
1	P9	25.3	1.5
1	P10	24.4	1.6
1	P11	24.3	2.2
1	P12	22.5	0.2
1	P13	23.4	1.4
1	P14	23.1	2.3
1	P15	23.1	1.0
1	P16	23.2	0.3
1	P17	24.3	2.4
1	P18	23.0	0.4
1	P19	22.9	0.3
1	P20	23.3	0.0
1	P21	24.4	4.3
1	P22	23.4	3.7
1	P23	30.3	-4.9
1	P24	25.2	5.2
1	P25	24.3	0.9
2	P1	22.8	0.3
2	P2	24.7	0.2
2	P3	24.9	1.3
2	P4	24.7	0.4
2	P5	26.4	-0.5
2	P6	24.0	2.2
2	P7	24.2	0.6
2	P8	24.6	0.8
2	P9	24.1	0.8
2	P10	23.3	1.4
2	P11	24.2	1.2
2	P12	25.2	0.3
2	P13	24.9	2.1
2	P14	25.3	3.5
2	P15	23.9	4.2
2	P16	24.3	1.5
2	P17	23.8	0.6
2	P18	24.2	1.2
2	P19	24.2	1.5
2	P20	24.4	0.2
2	P21	23.4	0.1
2	P22	23.4	0.4
2	P23	24.2	0.4
2	P24	24.1	0.0
2	P25	23.2	1.0

3	P1	24.0	-0.4
3	P2	24.9	-0.5
3	P3	25.2	-0.6
3	P4	24.6	0.0
3	P5	24.9	0.3
3	P6	25.3	-0.8
3	P7	26.3	1.4
3	P8	25.5	3.4
3	P9	23.6	0.7
3	P10	23.9	1.5
3	P11	24.9	2.1
3	P12	23.2	1.7
3	P13	23.2	1.0
3	P14	24.0	2.2
3	P15	25.8	5.2
3	P16	24.0	1.2
3	P17	23.1	-0.3
3	P18	24.3	0.3
3	P19	24.2	-0.1
3	P20	24.2	-0.3
3	P21	24.9	0.3
3	P22	24.6	-0.9
3	P23	25.4	-1.1
3	P24	24.9	-1.3
3	P25	25.4	-0.8
4	P1	23.4	2.1
4	P2	23.4	0.6
4	P3	23.3	1.1
4	P4	23.3	0.7
4	P5	24.5	0.5
4	P6	24.5	2.1
4	P7	24.3	1.5
4	P8	24.3	3.1
4	P9	23.4	0.8
4	P10	23.6	0.7
4	P11	23.8	0.7
4	P12	23.9	0.7
4	P13	24.8	1.5
4	P14	23.6	1.8
4	P15	23.5	0.5
4	P16	23.9	1.0
4	P17	23.7	1.1
4	P18	23.2	0.3
4	P19	23.6	1.3
4	P20	24.3	2.2
4	P21	23.2	0.2
4	P22	22.7	0.5
4	P23	23.9	0.6
4	P24	23.2	0.1

4	P25	22.8	0.7
5	P1	23.4	0.5
5	P2	23.4	0.5
5	P3	24.0	1.1
5	P4	23.3	8.3
5	P5	23.7	0.3
5	P6	23.5	0.4
5	P7	24.4	1.2
5	P8	23.7	0.3
5	P9	22.7	0.6
5	P10	24.3	1.7
5	P11	22.7	0.1
5	P12	22.4	0.6
5	P13	23.4	1.1
5	P14	23.0	0.8
5	P15	22.7	0.7
5	P16	23.1	0.5
5	P17	22.9	1.4
5	P18	22.9	0.9
5	P19	23.6	0.4
5	P20	24.1	0.3
5	P21	24.0	2.2
5	P22	24.7	3.3
5	P23	25.2	0.2
5	P24	26.5	1.7
5	P25	23.4	1.1
6	P1	23.3	1.5
6	P2	24.2	0.3
6	P3	24.1	3.7
6	P4	23.0	0.3
6	P5	23.0	0.1
6	P6	23.2	0.7
6	P7	23.3	1.3
6	P8	22.7	0.5
6	P9	23.0	0.8
6	P10	24.7	1.2
6	P11	23.3	0.9
6	P12	23.1	0.3
6	P13	23.7	1.1
6	P14	23.0	0.5
6	P15	23.6	1.1
6	P16	23.3	2.0
6	P17	23.5	1.2
6	P18	23.7	2.0
6	P19	23.2	1.8
6	P20	23.4	1.0
6	P21	23.2	1.5
6	P22	24.5	5.1
6	P23	23.8	3.0

6	P24	23.6	0.4
6	P25	23.6	-0.1
7	P1	23.3	0.7
7	P2	23.9	0.6
7	P3	23.0	0.9
7	P4	23.2	1.1
7	P5	23.3	0.5
7	P6	25.0	2.4
7	P7	24.1	1.7
7	P8	23.2	1.1
7	P9	23.5	2.8
7	P10	24.5	2.0
7	P11	23.1	0.7
7	P12	23.4	0.8
7	P13	23.2	0.7
7	P14	23.6	1.9
7	P15	23.6	1.0
7	P16	24.0	1.9
7	P17	23.8	0.3
7	P18	23.7	0.4
7	P19	23.7	0.3
7	P20	24.1	2.1
7	P21	23.2	0.5
7	P22	24.2	3.0
7	P23	24.4	0.2
7	P24	24.4	0.2
7	P25	23.5	1.3
8	P1	23.2	0.1
8	P2	23.7	2.1
8	P3	23.8	1.4
8	P4	23.3	0.8
8	P5	24.4	0.4
8	P6	24.5	6.1
8	P7	25.1	4.5
8	P8	23.1	0.3
8	P9	24.2	2.8
8	P10	23.6	0.9
8	P11	23.0	1.6
8	P12	23.1	0.4
8	P13	23.2	1.7
8	P14	23.6	2.3
8	P15	24.3	3.0
8	P16	23.1	0.5
8	P17	23.1	0.8
8	P18	25.4	3.7
8	P19	23.1	2.1
8	P20	24.1	0.5
8	P21	25.6	4.3
8	P22	23.7	2.5

8	P23	23.6	1.4
8	P24	25.3	1.8
8	P25	24.2	0.5

**SUPPLEMENTAL TESTING – STRAIN RELIEF FEATURE**

**CONNECTOR/CABLE PULL:**

<b>0 Deg. Pull Test</b>			
Sample #	Force (lbs)	Continuity	Comments
1	14.3	28.35	
2	16		connector-to-board glue failure at 19.40 lbs
3	16.85	37.5	
4	17.95		connector-to-board glue failure at 25.75 lbs

<b>90 Deg. Pull Test</b>			
Sample #	Force (lbs)	Continuity	Comments
1	9.7		cable-to-board glue failure at 53.95 lbs
2	13.5		cable-to-board glue failure at 59.75 lbs
3	12.8	99.75	wedged allen wrench for glue support (see picture)
4	11.1	100+	wedged allen wrench for glue support (see picture)
5	14.25		c-t-b glue failure at 48.80 lbs (also wedged block for support)

**CABLE BEND/FLEX :**

**35 Deg. Continuity:**

Resistance, mOhms						
Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
1	2.2	2.4	2.3	2.1	2.1	2.2
2	2.1	2.2	2.2	2.1	2.0	2.1
3	2.3	2.3	2.3	2.2	2.2	2.2
4	2.1	2.1	2.2	2.1	2.0	2.0
5	2.1	2.1	2.1	2.1	2.0	2.0
6	2.3	2.1	2.0	2.0	2.1	2.2
7	2.1	2.0	2.0	2.0	2.0	2.1
8	2.1	2.1	2.0	2.0	2.1	2.1
9	2.4	5.6	2.8	2.8	2.3	2.3
10	2.0	2.0	1.9	2.0	2.0	2.0

**DATA Continued****90 Deg. Flex:**

Resistance, mOhms						
Cable	Initial	After 1000 Cycles	After 2000 Cycles	After 3000 Cycles	After 4000 Cycles	After 5000 Cycles
1	2.8	2.4	3.4	3.8	<i>Failed at 3013 cycles</i>	N/A
2	2.8	2.4	3.9	3.1	<i>Failed at 3748 cycles</i>	N/A
3	2.7	2.3	3.4	2.6	<i>Failed at 3869 cycles</i>	N/A
4	2.7	2.3	3.0	2.6	2.5	<i>Failed at 4359 cycles</i>
5	2.7	2.4	3.2	2.7	<i>Failed at 3912 cycles</i>	N/A
6	2.3	2.3	2.2	2.2	<i>Failed at 3010 cycles</i>	N/A
7	2.2	2.2	2.1	Failed at 2946 Cycles	N/A	N/A
8	2.2	2.1	2.0	Failed at 2769 Cycles	N/A	N/A
9	2.1	2.0	2.1	Failed at 2702 Cycles	N/A	N/A
19	2.1	2.1	2.1	2.2	<i>Failed at 3200 cycles</i>	N/A

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

... Last Cal: , Next Cal:

**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: 5/18/07, Next Cal: 5/18/08

**Equipment #:** LC-5N(icell)**Description:** 5 N Load Cell for Dillon Quantrol**Manufacturer:** Dillon Quantrol**Model:** icell**Serial #:** 02-0159-03**Accuracy:** .10% of capacity

... Last Cal: 6/28/07, Next Cal: 6/28/08

**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: 6/28/07, Next Cal: 6/28/08

**Equipment #:** THC-01**Description:** Temperature/Humidity Chamber**Manufacturer:** Thermotron**Model:** SM-8-7800**Serial #:** 30676**Accuracy:** See Manual See Manual

... Last Cal: 9/21/2007, Next Cal: 9/21/2008

**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: 06/62/07, Next Cal: 06/22/08

**Equipment #:** OGP-01**Description:** 6"X 6" Video Measuring Machine**Manufacturer:** Optical Gauging Products**Model:** Smartscope 200 CFOV**Serial #:** SF2001956**Accuracy:** See Manual

... Last Cal: 03/13/07, Next Cal: 03/13/08

**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 #:** MO-01**Description:** Micro-Ohmmeter**Manufacturer:** Keithley**Model:** 580**Serial #:** (HP) 3329A-07330**Accuracy:** See Manual

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

**Equipment #:** MO-03**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 0791975**Accuracy:** See Manual

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