Project Number: Design Verification Test Report		Tracking Code: TC1023--3437_Report_Rev_3		
Requested by: Steven Xu		Date: 09/13/2010	Product Rev: 0	
Part #: PHT-150-01-L-D/PHF-150-01-L-D		Lot #:1	Tech: Kason He	Eng: Vico Zhao
Part description: PHT/PHF			Qty to test: 60	
Test Start: 07/21/2010	Test Completed: 12/21/2010			
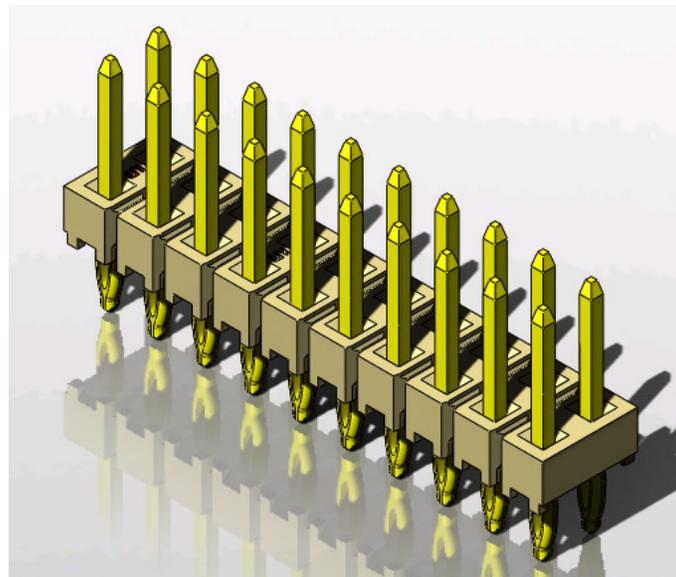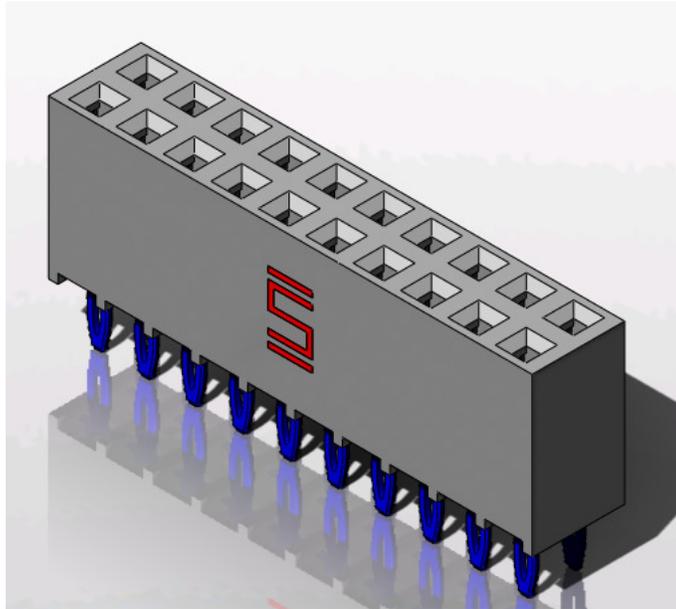
Design Verification Test Report

PHT/PHF

PHT-150-01-L-D/PHF-150-01-L-D

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
10/14/2014	3	Add the S&V data	KH

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.

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SCOPE
To perform the following tests: Design Verification Test

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-102270-TST/

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)

Kester Lead Free Reflow Profile
Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5
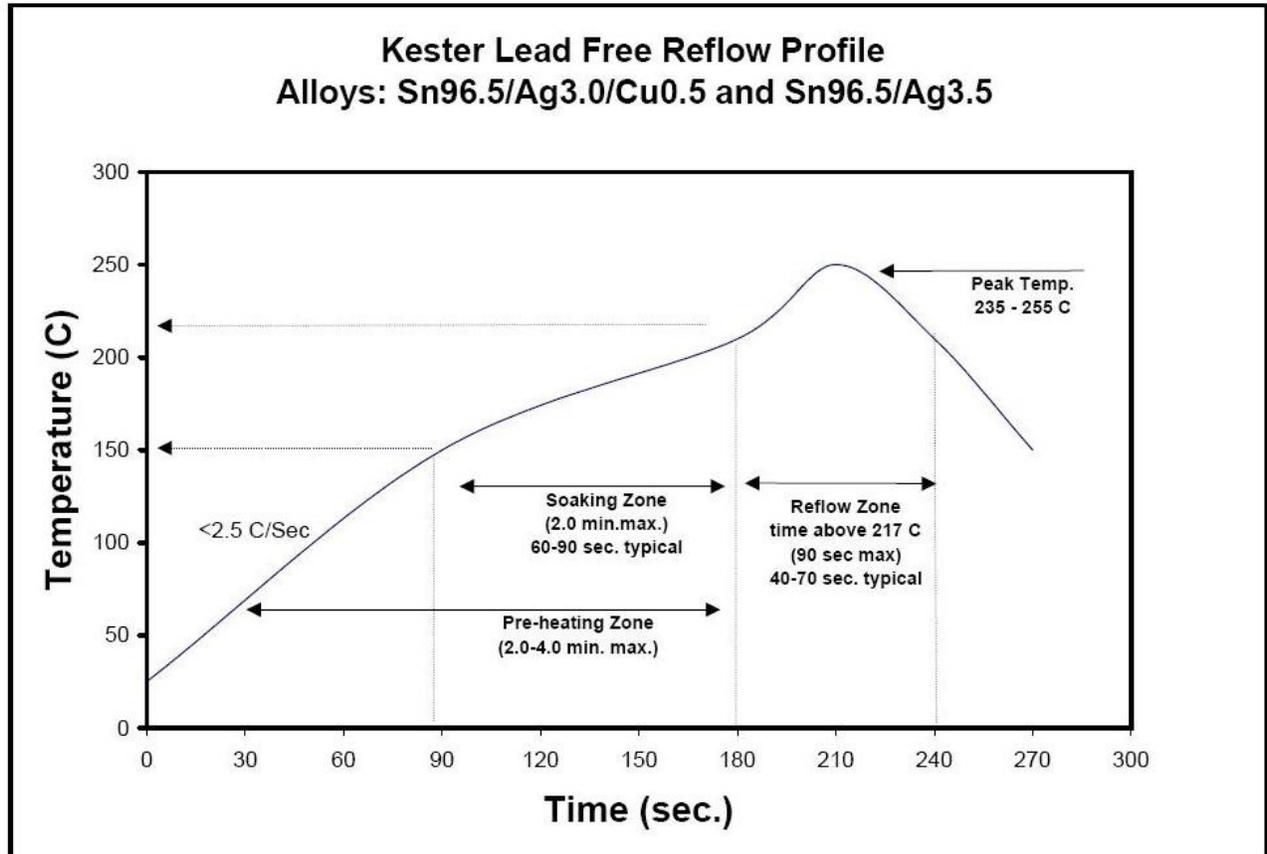
FLOWCHARTS

Gas Tight

TEST STEP	GROUP A 192 Points	GROUP B 30 Points Compliant only
01	LLCR-1	LLCR-1
02	Gas Tight	Gas Tight
03	LLCR-2	LLCR-2

Gas Tight = EIA-364-36A

LLCR = EIA-364-23, LLCR

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

Mating/Unmating/Gaps/Normal Force/Deflection Force

TEST STEP	GROUP A 10 Boards	GROUP B1 Individual Contacts (30) min	GROUP B2 Individual Contacts (30) min
01	Contact Gaps	**Setup Approve**	**Setup Approve**
02	Mating / Unmating	Normal Force	Thermal Aging (Mated)
03	Data Review	Data Review	Normal Force
04	100 Cycles		
05	Mating / Unmating		
06	Contact Gaps		
07	Data Review		
08	Thermal Aging (Mated)		
09	Mating / Unmating		
10	Contact Gaps		
11	Data Review		
12	Humidity (Mated)		
13	Contact Gaps		
14	Mating / Unmating		

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

  (Perpendicular) displacement Force = 12.7 mm/min +/- 6 mm/min

  Spec is 50 N @ 1 mm displacement

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

FLOWCHARTS Continued

IR & DWV

TEST STEP	GROUP A1 2 Mated Sets Break Down - Pin to Pin	GROUP A2 2 Unmated of Part # Being Tested Break Down - Pin to Pin	GROUP A3 2 Unmated of Mating Part # Break Down - Pin to Pin	GROUP B 2 Mated Sets Pin to Pin
01	DWV/Break Down Voltage	DWV/Break Down Voltage	DWV/Break Down Voltage	IR & DWV at test voltage (on both mated sets and on each connector unmated)
02				Thermal Aging (both sets unmated)
03				IR & DWV at test voltage (on both mated sets and on each connector unmated)
04				Cyclic Humidity (both sets unmated)
05				IR & DWV at test voltage (on both mated sets and on each connector unmated)

* - DWV on group B to be performed at Test Voltage

DWV test voltage is equal to 75% of the lowest break down voltage from group A1, A2 or A3

Thermal Aging = EIA-364-17, Test Condition 4 (105 °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, Test Condition 1

FLOWCHARTS Continued

Durability/Thermal Age/Cyclic Humidity

TEST STEP	GROUP A 192 Points 100 Cycles	GROUP B 48 Points compliant only
01	LLCR-1	LLCR-1
02	100 Cycles	3 Cycles
03	Clean Mating Interface	Clean Mating Interface
04	LLCR-2	LLCR-2
05	Thermal Age (Mated and undisturbed)	Thermal Age (Mated and undisturbed)
06	LLCR-3	LLCR-3
07	Cyclic Humidity (Mated and undisturbed)	Cyclic Humidity (Mated and undisturbed)
08	LLCR-4	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 to 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

Current Carrying Capacity

Current Carrying Capacity   3 Mated Assemblies Each   **DOUBLE ROW**

TEST STEP	GROUP A 3 Mated Assemblies 2 CONTACT POWERED	GROUP B 3 Mated Assemblies 4 CONTACTS POWERED	GROUP C 3 Mated Assemblies 6 CONTACTS POWERED	GROUP D 3 Mated Assemblies 8 CONTACTS POWERED	GROUP E 3 Mated Assemblies 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

FLOWCHARTS Continued

Insertion/Retention force

TEST	GROUP A	GROUP B
STEP	90 Points (30 per cycle, individual pins)	90 Points (30 per cycle, individual pins)
	Insertion/Retention force Min PTH (.039 dia)	Insertion/Retention force Max PTH (.043 dia)
01	measure and record the compiant pin (width only)	measure and record the compiant pin (width only)
02	Measure/record PTH hole diameter to determine it is smallest diameter permissible.	Measure/record PTH hole diameter to determine it is largest diameter permissible.
	1st Cycle	1 Cycle
03	Fixture and press pin into PTH, Record data	Fixture and press pin into PTH, Record data
04	Fixture and remove pin from PTH, Record data	Fixture and remove pin from PTH, Record data
	2nd Cycle (Use new compliant pin, same hole)	2nd Cycle (Use new compliant pin, same hole)
05	measure and record the compiant pin (width only)	Measure Compliant pin size
06	Fixture and press pin into PTH, Record data	Fixture and press pin into PTH, Record data
07	Fixture and remove pin from PTH, Record data	Fixture and remove pin from PTH, Record data
	3rd Cycle (Use new compliant pin, same hole)	3rd Cycle (Use new compliant pin, same hole)
08	measure and record the compiant pin (width only)	Measure Compliant pin size
09	Fixture and press pin into PTH, Record data	Fixture and press pin into PTH, Record data
10	Fixture and remove pin from PTH, Record data	Fixture and remove pin from PTH, Record data
11	photo inspection of vias (check for cracked barrel)	photo inspection of vias (check for cracked barrel)

Insertion/Retention Forces = EIA-364-13

Mechanical Shock / Vibration / LLCR

TEST STEP	GROUP A1 192 Points
01	LLCR-1
02	Shock
03	Vibration
04	LLCR-2

Mechanical Shock = EIA 364-27 Half Sine,

        100 g's, 6 milliSeconds (Condition "C") each axis

Vibration = EIA 364-28, Random Vibration

        7.56 g RMS, Condition VB --- 2 hours/axis

LLCR = EIA-364-23, LLCR

        20 mV Max, 100 mA Max

        Use Keithley 580 or 3706 in 4 wire dry circuit mode

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.

MECHANICAL SHOCK (Specified Pulse):
1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
2) Test Condition C
3) Peak Value: 100 G
4) Duration: 6 Milliseconds
5) Wave Form: Half Sine
6) Velocity: 12.3 ft/s
7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:
1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
2) Test Condition V, Letter B
3) Power Spectral Density: 0.04 G² / Hz
4) G 'RMS': 7.56
5) Frequency: 50 to 2000 Hz
6) Duration: 2.0 Hours per axis (3 axis total)

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.

ATTRIBUTE DEFINITIONS
The following is a brief, simplified description of attributes.

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):
1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors.*
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC^2, computer controlled test stand with a deflection measurement system accuracy of 5 µm (0.0002").
9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of ± 0.2%.
10) The nominal deflection rate shall be 5 mm (0.2")/minute.
11) Unless otherwise noted a minimum of five contacts shall be tested.
12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
13) The system shall utilize the TC^2 software in order to acquire and record the test data.
14) The permanent set of each contact shall be measured within the TC^2 software.
15) 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

ATTRIBUTE DEFINITIONS
The following is a brief, simplified description of attributes.

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.

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.

ATTRIBUTE DEFINITIONS
The following is a brief, simplified description of attributes

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. Barometric Test Condition 1
      iii. Rate of Application 500 V/Sec
      iv. 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. <= +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

ATTRIBUTE DEFINITIONS
The following is a brief, simplified description of attributes.

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. <= +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° C
      ix. The final LLCR shall be conducted within 1 hour after drying.

Insertion/Retention force

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.

RESULTS

Temperature Rise, CCC at a 20% de-rating
- **CCC for a 30°C Temperature Rise ----------------------4.8A per contact with 2 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------------------3.6A per contact with 4 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------------------3.0A per contact with 6 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------------------2.9A per contact with 8 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------------------1.8A per contact with all adjacent contacts powered**

Contact Gaps

- **Initial**
  - o **Min-- 0.0192 in**
  - o **Max --- 0.0239 in**
- **After 100 Cycles**
  - o **Min-- 0.0191 in**
  - o **Max --- 0.0243 in**
- **After Thermal**
  - o **Min-- 0.0196 in**
  - o **Max --- 0.0244 in**

RESULTS Continued

Mating – Unmating Forces

- **Initial**
  - o **Mating**
    - **Min** ---------------------------------- **6.61 Lbs**
    - **Max**----------------------------------**10.41 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.53 Lbs**
    - **Max** ---------------------------------- **5.77 Lbs**
- **After 25 Cycles**
  - o **Mating**
    - **Min** ---------------------------------- **6.44 Lbs**
    - **Max**----------------------------------**10.25 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.89 Lbs**
    - **Max**---------------------------------- **6.30 Lbs**
- **After 50 Cycles**
  - o **Mating**
    - **Min** ---------------------------------- **6.32 Lbs**
    - **Max**----------------------------------**10.03 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.56 Lbs**
    - **Max** ---------------------------------- **6.79 Lbs**
- **After 75 Cycles**
  - o **Mating**
    - **Min** ---------------------------------- **6.55 Lbs**
    - **Max** ---------------------------------- **9.94 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.39 Lbs**
    - **Max** ---------------------------------- **5.83 Lbs**
- **After 100 Cycles**
  - o **Mating**
    - **Min** ---------------------------------- **5.87 Lbs**
    - **Max** ---------------------------------- **9.81 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.08 Lbs**
    - **Max** ---------------------------------- **5.49 Lbs**
- **Thermal**
  - o **Mating**
    - **Min** ---------------------------------- **5.25 Lbs**
    - **Max** ---------------------------------- **8.92 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.28 Lbs**
    - **Max** ---------------------------------- **5.47 Lbs**
- **Humidity**
  - o **Mating**
    - **Min** ---------------------------------- **6.07 Lbs**
    - **Max** ---------------------------------- **8.59 Lbs**
  - o **Unmating**
    - **Min** ---------------------------------- **4.58 Lbs**
    - **Max** ---------------------------------- **5.54 Lbs**

RESULTS Continued

Normal Force at 0.084 mm deflection
- **Initial**
    - **Min**---**80.80 gf**   **Set ----- 0.0020 mm**
    - **Max** --**97.00 gf**   **Set ----- 0.0120 mm**
- **Thermal**
    - **Min**---**86.10 gf**   **Set ----- 0.0000 mm**
    - **Max** --- **113.50 gf**   **Set ----- 0.0140 mm**

Insulation Resistance minimums, IR
- **Initial**
    - **Mated**---**10000Meg Ω** -----------------------**Pass**
    - **Unmated** --**10000Meg Ω** ----------------------**Pass**
- **Thermal**
    - **Mated**-- **10000Meg Ω** ----------------------**Pass**
    - **Unmated** ---------------------------------------**10000Meg Ω** ----------------------**Pass**
- **Humidity**
    - **Mated**---**10000Meg Ω** ----------------------**Pass**
    - **Unmated** --**10000Meg Ω** ----------------------**Pass**

Dielectric Withstanding Voltage minimums, DWV

Breakdown ----------------------------------- **1350VAC**
DWV--- **1013VAC**
Working voltage--------------------------------**338VAC**

Initial   -----------------------------------**Passed**
Thermal   -----------------------------------**Passed**
Humidity -----------------------------------**Passed**

RESULTS Continued

LLCR Durability (192 LLCR test points)
Group A
- **Initial -- 10.3 mOhms Max**
- **Durability, 100 Cycles**
  - o **<= +5.0 mOhms ---------------------------------- 192 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------0 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**
- **Thermal**
  - o **<= +5.0 mOhms ---------------------------------- 192 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------0 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**
  - o
- **Humidity**
  - o **<= +5.0 mOhms ---------------------------------- 191 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------1 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**

LLCR Durability (48 LLCR test points)
Group B
- **Initial ---1.5 mOhms Max**
- **Durability, 3 Cycles**
  - o **<= +5.0 mOhms ----------------------------------48 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------0 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**
- **Thermal**
  - o **<= +5.0 mOhms ----------------------------------48 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------0 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**
  - o
- **Humidity**
  - o **<= +5.0 mOhms ----------------------------------48 Points ----------------------- Stable**
  - o **+5.1 to +10.0 mOhms ----------------------------------0 Points ----------------------- Minor**
  - o **+10.1 to +15.0 mOhms ----------------------------------0 Points ----------------------- Acceptable**
  - o **+15.1 to +50.0 mOhms ----------------------------------0 Points ----------------------- Marginal**
  - o **+50.1 to +2000 mOhms----------------------------------0 Points ----------------------- Unstable**
  - o **>+2000 mOhms ----------------------------------0 Points ----------------------- Open Failure**

RESULTS Continued

LLCR Gas Tight (192 LLCR test points)
Group A
- **Initial** --- 10.3 mOhms Max
- **Gas-Tight**
  - **<= +5.0 mOhms** ---------------------------------- 192 Points ----------------------- Stable
  - **+5.1 to +10.0 mOhms** ---------------------------------0 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

LLCR Gas Tight (48 LLCR test points)
Group B
- **Initial** ---1.5 mOhms Max
- **Gas-Tight**
  - **<= +5.0 mOhms** ------------------------------------48 Points ----------------------- Stable
  - **+5.1 to +10.0 mOhms** ---------------------------------0 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

LLCR Shock & Vibration Group (192 LLCR test points)
- **Initial** --- 11.5 mOhms Max
- **Shock &Vibration**
  - **<= +5.0 mOhms** ---------------------------------- 188 Points ----------------------- Stable
  - **+5.1 to +10.0 mOhms** ---------------------------------4 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

Insertion/Retention force
Group A PCB aperture 0.039 in
- **1 Cycles**
  - **Mating**
    - **Min** ------------------------------------- 4.05 Lbs
    - **Max**------------------------------------- 5.45 Lbs
  - **Unmating**
    - **Min** ------------------------------------- 3.06 Lbs
    - **Max**------------------------------------- 4.26 Lbs
- **2 Cycles**
  - **Mating**
    - **Min** ------------------------------------- 3.65 Lbs
    - **Max**------------------------------------- 4.79 Lbs
  - **Unmating**
    - **Min** ------------------------------------- 2.66 Lbs
    - **Max**------------------------------------- 4.30 Lbs
- **3 Cycles**
  - **Mating**
    - **Min** ------------------------------------- 3.37 Lbs
    - **Max**------------------------------------- 4.65 Lbs
  - **Unmating**
    - **Min** ------------------------------------- 2.13 Lbs
    - **Max**------------------------------------- 4.10 Lbs

RESULTS Continued

Group B PCB aperture 0.043 in

- **1 Cycles**
  - **Mating**
    - **Min -------------------------------------- 2.77 Lbs**
    - **Max-------------------------------------- 3.43 Lbs**
  - **Unmating**
    - **Min -------------------------------------- 2.13 Lbs**
    - **Max-------------------------------------- 2.72 Lbs**
- **2 Cycles**
  - **Mating**
    - **Min -------------------------------------- 1.59 Lbs**
    - **Max-------------------------------------- 3.40 Lbs**
  - **Unmating**
    - **Min -------------------------------------- 1.97 Lbs**
    - **Max-------------------------------------- 3.22 Lbs**
- **3 Cycles**
  - **Mating**
    - **Min -------------------------------------- 1.41 Lbs**
    - **Max-------------------------------------- 3.21 Lbs**
  - **Unmating**
    - **Min -------------------------------------- 1.53 Lbs**
    - **Max-------------------------------------- 3.10 Lbs**

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 all ground conductors/contacts powered

TC1023-3437
2(2x1) Contacts in Linear series
Part number:NR-PHF-150-01-L-D/NR-PHT-150-01-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 4.8 Amps
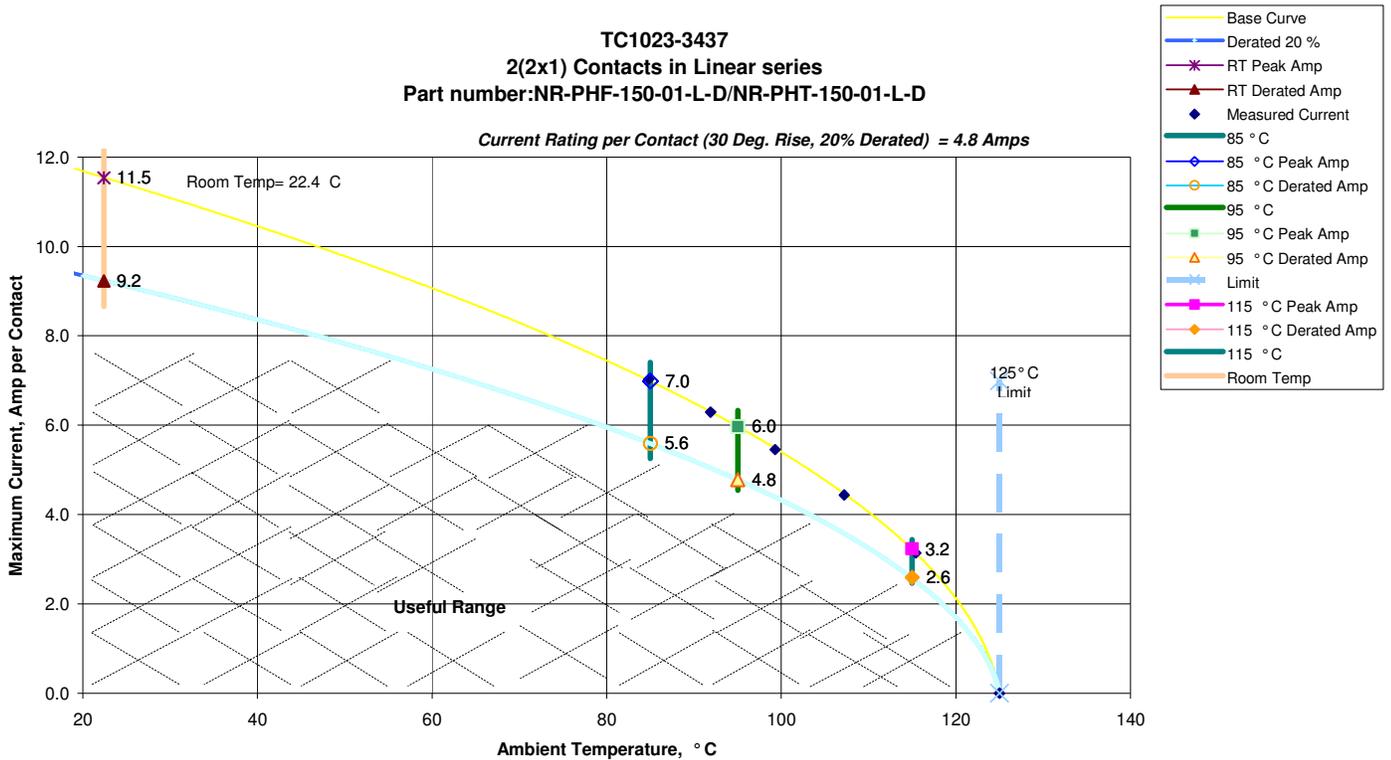
DATA SUMMARIES Continued

b.   Linear configuration with all signals conductors/contacts powered

TC1023-3437
4(2x2) Contacts in Linear series
Part number:NR-PHF-150-01-L-D/NR-PHT-150-01-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 3.6 Amps
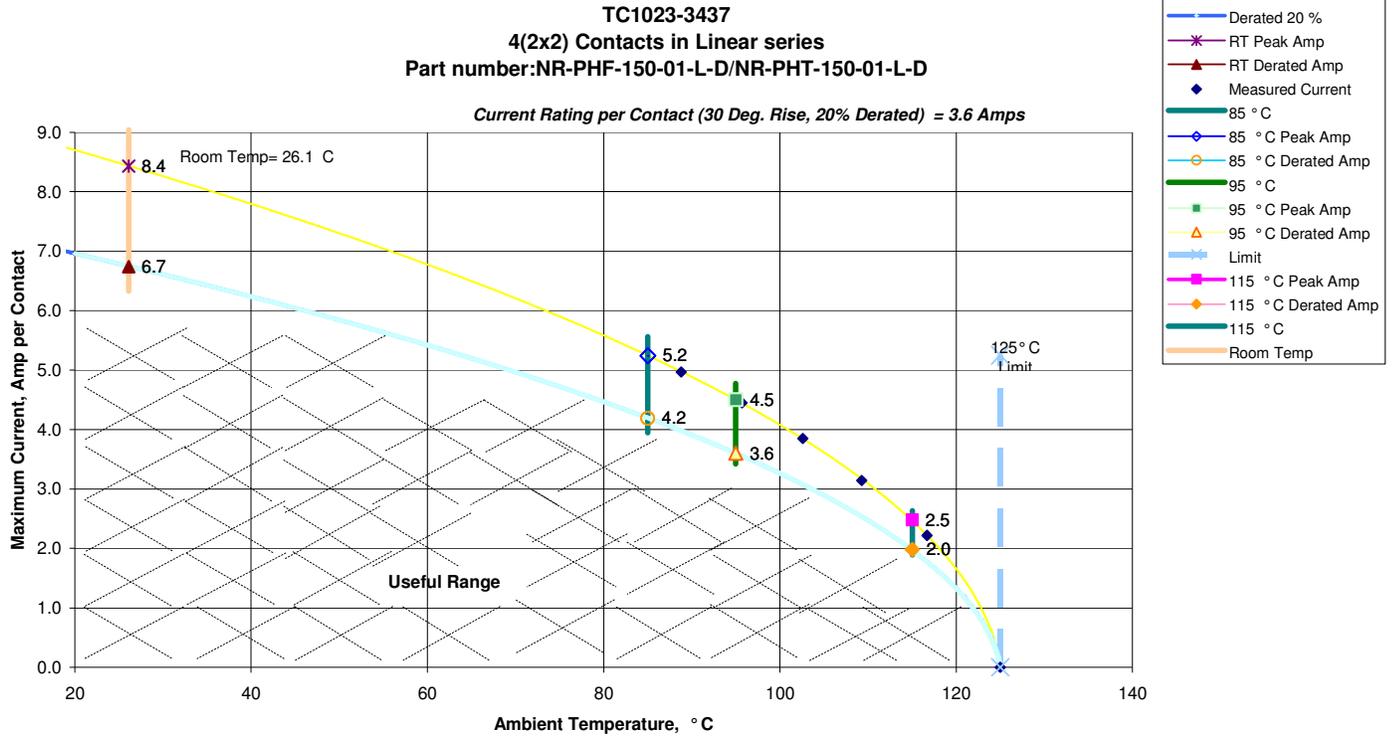
DATA SUMMARIES Continued

c. Linear configuration with 6 adjacent conductors/contacts powered

TC1023-3437
6(2x3) Contacts in Linear series
Part number:NR-PHF-150-01-L-D/NR-PHT-150-01-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 3.0 Amps

Legend:
- Base Curve
- Derated 20 %
- RT Peak Amp
- RT Derated Amp
- Measured Current
- 85 °C
- 85 °C Peak Amp
- 85 °C Derated Amp
- 95 °C
- 95 °C Peak Amp
- 95 °C Derated Amp
- Limit
- 115 °C Peak Amp
- 115 °C Derated Amp
- 115 °C
- Room Temp

Room Temp= 22.7 C

Useful Range

125° C Limit
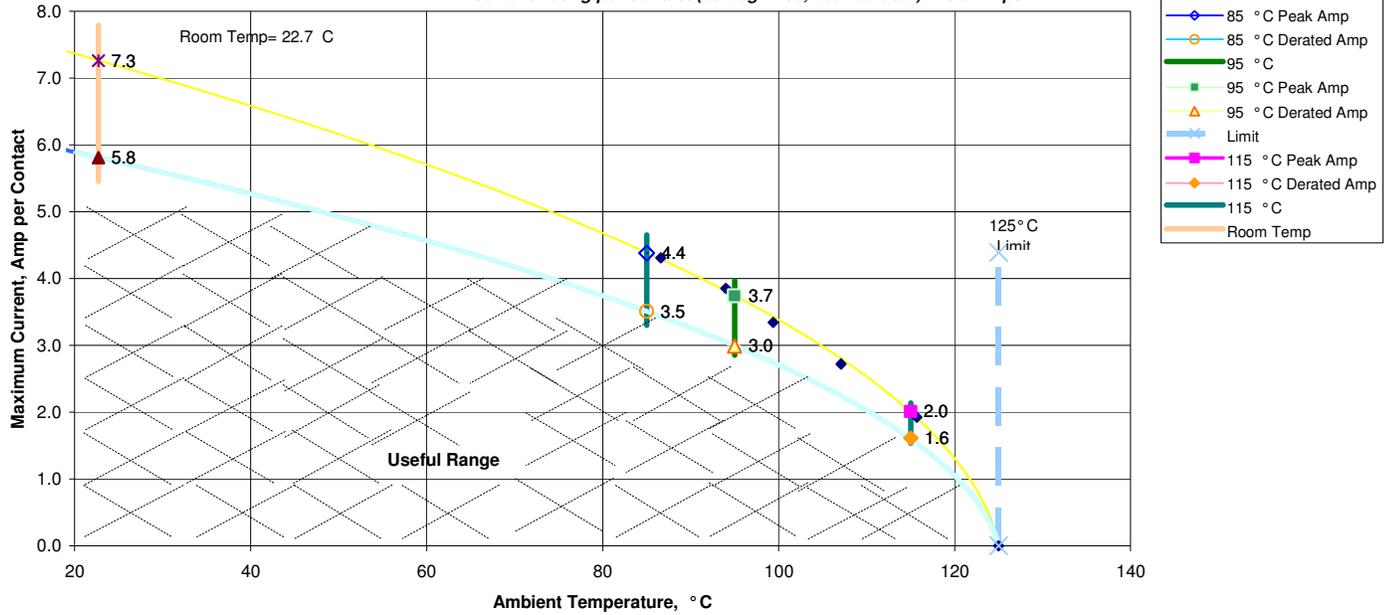
DATA SUMMARIES Continued

d.   Linear configuration with 8 adjacent conductors/contacts powered

TC1023-3437
8(2x4) Contacts in Linear series
Part number:NR-PHF-150-01-L-D/NR-PHT-150-01-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.9 Amps
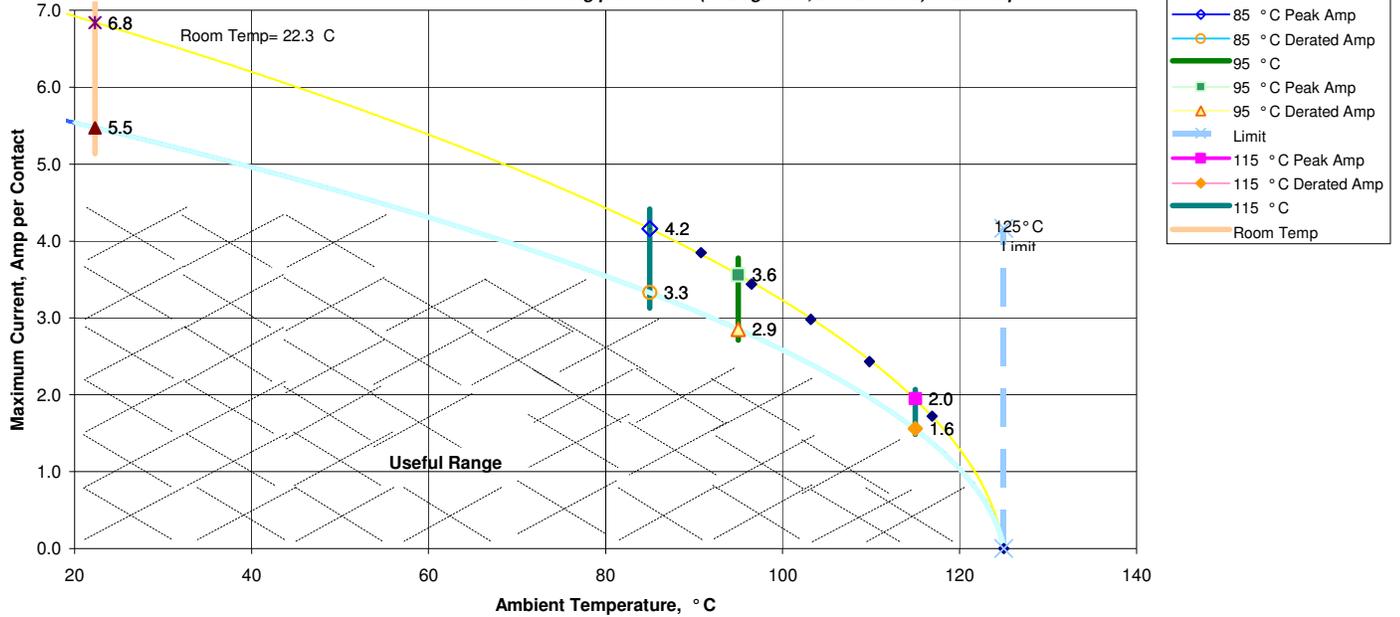
DATA SUMMARIES Continued

e.   Linear configuration with all adjacent conductors/contacts powered

TC1023-3437
100 (All) Contacts in Linear series
Part number:NR-PHF-150-01-L-D/NR-PHT-150-01-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.8 Amps

Legend:
- Base Curve
- Derated 20 %
- RT Peak Amp
- RT Derated Amp
- Measured Current
- 85 °C
- 85 °C Peak Amp
- 85 °C Derated Amp
- 95 °C
- 95 °C Peak Amp
- 95 °C Derated Amp
- Limit
- 115 °C Peak Amp
- 115 °C Derated Amp
- 115 °C
- Room Temp

Room Temp= 24.9 C

Useful Range

125°C Limit

X-axis: **Ambient Temperature, °C**
Y-axis: **Maximum Current, Amp per Contact**

DATA SUMMARIES Continued

CONTACT GAPS:

Initial		After 100 Cycles		After Thermal	
Units:	inches	Units:	inches	Units:	inches
Minimum	0.0192	Minimum	0.0191	Minimum	0.0196
Maximum	0.0239	Maximum	0.0243	Maximum	0.0244
Average	0.0215	Average	0.0220	Average	0.0224
St. Dev.	0.0006	St. Dev.	0.0008	St. Dev.	0.0008
Count	1000	Count	1000	Count	1000

	Dimensional		
	Nominal	Minimum	Maximum
Product Spec:	0.0200	0.0175	0.0225

MATING/UNMATING

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	29.40	6.61	20.15	4.53	28.65	6.44	21.75	4.89
Maximum	46.30	10.41	25.66	5.77	45.59	10.25	28.02	6.30
Average	34.71	7.80	22.27	5.01	33.05	7.43	23.83	5.36
St Dev	5.25	1.18	2.01	0.45	5.19	1.17	2.16	0.48
Count	10	10	10	10	10	10	10	10
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	28.11	6.32	20.28	4.56	29.13	6.55	19.53	4.39
Maximum	44.61	10.03	30.20	6.79	44.21	9.94	25.93	5.83
Average	33.44	7.52	23.76	5.34	32.67	7.34	22.90	5.15
St Dev	4.91	1.10	2.57	0.58	4.58	1.03	1.97	0.44
Count	10	10	10	10	10	10	10	10
	After 100 Cycles				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	26.11	5.87	18.15	4.08	23.35	5.25	19.04	4.28
Maximum	43.63	9.81	24.42	5.49	39.68	8.92	24.33	5.47
Average	33.17	7.46	22.07	4.96	28.20	6.34	21.13	4.75
St Dev	5.33	1.20	2.28	0.51	5.44	1.22	1.76	0.39
Count	10	10	10	10	10	10	10	10
	After Humidity							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	27.00	6.07	20.37	4.58				
Maximum	38.21	8.59	24.64	5.54				
Average	31.40	7.06	22.60	5.08				
St Dev	4.68	1.05	1.67	0.38				
Count	10	10	10	10				

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 mm Forces in Grams			
	0.042	**0.064**	**0.084**	**SET**
Averages	48.73	73.03	91.05	0.0042
Min	44.90	67.60	80.80	0.0020
Max	53.00	77.00	97.00	0.0120
St. Dev	2.38	2.66	4.13	0.0028
Count	12	12	12	12

Thermal	Deflections in mm, Forces in Grams			
	0.042	**0.064**	**0.084**	*SET*
Averages	49.70	75.95	96.41	0.0045
Min	42.00	69.50	86.10	0.0000
Max	54.70	85.70	113.50	0.0140
St. Dev	3.33	4.07	7.15	0.0045
Count	13	13	13	13

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**PHT/PHF**	**PHT**	**PHF**
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**PHT/PHF**
Break Down Voltage	1350
Test Voltage	1013
Working Voltage	338

Pin to Pin	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued

LLCR:
1) A total of 192 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. <= +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

Group A

Date	Jun. 30 2010	Jul. 01 2010	Jul. 12 2010	Jul. 23 2010
Room Temp C	23	24	25	23
RH	56%	58%	55%	52%
Name	Kason He	Kason He	Kason He	Peter Chen
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Thermal**	**Delta Humidity**
Average	7.3	0.0	0.3	0.0
St. Dev.	1.0	0.6	0.9	1.1
Min	4.7	-3.2	-2.6	-2.9
Max	10.3	2.9	5.0	5.1
Count	192	192	192	192

How many samples are being tested?	**8**
How many contacts are on each board?	**24**

	Stable	Minor	Acceptable	Marginal	Unstable	Open
100 Cycles	192	0	0	0	0	0
Thermal	192	0	0	0	0	0
Humidity	191	1	0	0	0	0

DATA SUMMARIES Continued

Group B

Date	Jun. 30 2010	Jul. 01 2010	Jul. 12 2010	2010-8-9
Room Temp C	23	24	25	25
RH	56%	58%	55%	56%
Name	Kason He	Kason He	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta 3 Cycles**	**Delta Thermal**	**Delta Humidity**
Average	1.3	0.0	0.1	0.1
St. Dev.	0.1	0.2	0.2	0.2
Min	1.1	-0.3	-0.2	-0.3
Max	1.5	0.4	0.5	0.5
Count	48	48	48	48

How many samples are being tested?	**2**
How many contacts are on each board?	**24**

	Stable	Minor	Acceptable	Marginal	Unstable	Open
3 Cycles	48	0	0	0	0	0
Thermal	48	0	0	0	0	0
Humidity	48	0	0	0	0	0

DATA SUMMARIES Continued

GAS TIGHT:

1) A total of 192 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. <= +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

Group A

Date	Jul. 02 2010	Jul. 08 2010
Room Temp C	22	24
RH	55%	49%
Name	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta Gas Tight**
Average	7.0	0.0
St. Dev.	0.8	0.6
Min	4.9	-2.3
Max	10.3	2.6
Count	192	192

How many samples are being tested?	<u>8</u>
How many contacts are on each board?	<u>24</u>

	Stable	Minor	Acceptable	Marginal	Unstable	Open
Gas Tight	192	0	0	0	0	0

DATA SUMMARIES Continued

Group B

Date	Jul. 02 2010	Jul. 08 2010
Room Temp C	22	24
RH	55%	49%
Name	Kason He	Kason He
mOhm values	**Actual Initial**	**Delta Gas Tight**
Average	1.2	0.1
St. Dev.	0.1	0.1
Min	1.0	-0.1
Max	1.5	0.4
Count	48	48

How many samples are being tested?	<u>2</u>
How many contacts are on each board?	<u>24</u>

	Stable	Minor	Acceptable	Marginal	Unstable	Open
Gas Tight	48	0	0	0	0	0

DATA SUMMARIES Continued

LLCR Shock & Vibration Group

1) A total of 192 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. <= +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	2010/12/17	2010/12/21
Room Temp C	23	23
RH	27%	27%
Name	LIEBER	Tony Wagoner
mOhm values	**Actual**	**Delta**
	Initial	**Shock & Vibe**
Average	9.9	0.5
St. Dev.	0.6	1.5
Min	6.2	-1.6
Max	11.5	6.8
Count	192	192

How many samples are being tested?	8
How many contacts are on each board?	24

	Stable	Minor	Acceptable	Marginal	Unstable	Open
Shock & Vibe	188	4	0	0	0	0

DATA SUMMARIES Continued

Insertion/Retention force
Group A PCB aperture 0.039 in

	1 Cycle				2 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	18.01	4.05	13.61	3.06	16.24	3.65	11.83	2.66
Maximum	24.24	5.45	18.95	4.26	21.31	4.79	19.13	4.30
Average	22.51	**5.06**	16.11	**3.62**	19.14	**4.30**	15.69	**3.53**
St Dev	1.32	0.30	1.18	0.27	0.99	0.22	1.74	0.39
Count	30	30	30	30	30	30	30	30

	3 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	14.99	3.37	9.47	2.13
Maximum	20.68	4.65	18.24	4.10
Average	18.09	**4.07**	14.74	**3.31**
St Dev	1.24	0.28	2.25	0.51
Count	30	30	30	30

Group B PCB aperture 0.043 in

	1 Cycle				2 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	12.32	2.77	9.47	2.13	7.07	1.59	8.76	1.97
Maximum	15.26	3.43	12.10	2.72	15.12	3.40	14.32	3.22
Average	13.44	**3.02**	10.87	**2.44**	12.43	**2.79**	11.86	**2.67**
St Dev	0.84	0.19	0.56	0.12	2.22	0.50	1.03	0.23
Count	30	30	30	30	30	30	30	30

	3 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	6.27	1.41	6.81	1.53
Maximum	14.28	3.21	13.79	3.10
Average	10.60	**2.38**	11.35	**2.55**
St Dev	2.90	0.65	1.56	0.35
Count	30	30	30	30

DATA

INSULATION RESISTANCE (IR):

Initial Insulation Resistance
Measured In Meg Ohms

	Pin to Pin		
	Mated	Unmated	
	x	x	x
Sample#	PHT/PHF	PHT	PHF
1	10000	10000	10000
2	10000	10000	10000

Thermal Insulation Resistance
Measured In Meg Ohms

	Pin to Pin		
	Mated	Unmated	
	x	x	x
Sample#	PHT/PHF	PHT	PHF
1	10000	10000	10000
2	10000	10000	10000

Humidity Insulation Resistance
Measured In Meg Ohms

	Pin to Pin		
	Mated	Unmated	
	X	X	X
Sample#	PHT/PHF	PHT	PHF
1	10000	10000	10000
2	10000	10000	10000

DATA Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Initial Breakdown Voltage
Test Voltage *Until Breakdown Occurs*

	Pin to Pin		
	Mated	**Unmated**	
	x		
Sample#	**PHT/PHF**	**PHT**	**PHF**
1	1350	1750	1750
2	1500	2000	1750

Initial DWV
Test Voltage= 1013

	Pin to Pin		
	Mated	**Unmated**	
Sample#	**PHT/PHF**	**PHT**	**PHF**
1	1013	1013	1013
2	1013	1013	1013

Thermal Test Voltage
Test Voltage= 1013

	Pin to Pin		
	Mated	**Unmated**	
Sample#	**PHT/PHF**	**PHT**	**PHF**
1	1013	1013	1013
2	1013	1013	1013

Humidity Test Voltage
Test Voltage= 1013

	Pin to Pin		
	Mated	**Unmated**	
Sample#	**PHT/PHF**	**PHT**	**PHF**
1	1013	1013	1013
2	1013	1013	1013

DATA Continued

CONTACT GAPS:

	Initial									
	Units: inches									
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0207	0.0212	0.0214	0.0208	0.0201	0.0210	0.0213	0.0210	0.0212	0.0211
2	0.0208	0.0214	0.0205	0.0215	0.0214	0.0210	0.0216	0.0210	0.0214	0.0207
3	0.0208	0.0205	0.0216	0.0215	0.0203	0.0211	0.0216	0.0204	0.0215	0.0214
4	0.0208	0.0214	0.0217	0.0204	0.0203	0.0211	0.0210	0.0213	0.0215	0.0213
5	0.0209	0.0215	0.0205	0.0215	0.0216	0.0205	0.0217	0.0213	0.0215	0.0205
6	0.0210	0.0204	0.0205	0.0216	0.0214	0.0210	0.0217	0.0204	0.0217	0.0215
7	0.0211	0.0214	0.0218	0.0216	0.0203	0.0213	0.0213	0.0201	0.0217	0.0212
8	0.0210	0.0210	0.0219	0.0215	0.0216	0.0211	0.0217	0.0209	0.0215	0.0199
9	0.0209	0.0218	0.0219	0.0215	0.0217	0.0211	0.0217	0.0216	0.0216	0.0217
10	0.0212	0.0218	0.0220	0.0219	0.0205	0.0211	0.0218	0.0215	0.0220	0.0215
11	0.0212	0.0217	0.0220	0.0217	0.0218	0.0211	0.0216	0.0218	0.0218	0.0201
12	0.0211	0.0220	0.0205	0.0210	0.0216	0.0213	0.0220	0.0215	0.0216	0.0217
13	0.0212	0.0195	0.0212	0.0218	0.0192	0.0214	0.0206	0.0203	0.0221	0.0216
14	0.0214	0.0217	0.0208	0.0217	0.0219	0.0213	0.0221	0.0215	0.0219	0.0206
15	0.0213	0.0221	0.0220	0.0212	0.0218	0.0205	0.0220	0.0221	0.0219	0.0216
16	0.0212	0.0219	0.0205	0.0216	0.0205	0.0207	0.0218	0.0218	0.0219	0.0216
17	0.0213	0.0218	0.0218	0.0217	0.0221	0.0213	0.0224	0.0205	0.0219	0.0210
18	0.0217	0.0221	0.0221	0.0204	0.0206	0.0213	0.0205	0.0218	0.0208	0.0219
19	0.0215	0.0222	0.0214	0.0209	0.0214	0.0214	0.0219	0.0220	0.0218	0.0216
20	0.0216	0.0216	0.0202	0.0217	0.0221	0.0216	0.0218	0.0214	0.0219	0.0217
21	0.0218	0.0220	0.0221	0.0216	0.0214	0.0215	0.0218	0.0217	0.0219	0.0204
22	0.0217	0.0221	0.0214	0.0214	0.0220	0.0213	0.0228	0.0221	0.0217	0.0223
23	0.0219	0.0217	0.0211	0.0209	0.0219	0.0203	0.0238	0.0206	0.0219	0.0213
24	0.0218	0.0220	0.0222	0.0219	0.0207	0.0218	0.0220	0.0220	0.0221	0.0209
25	0.0220	0.0208	0.0214	0.0214	0.0222	0.0211	0.0221	0.0205	0.0217	0.0206
26	0.0219	0.0222	0.0205	0.0213	0.0218	0.0204	0.0220	0.0207	0.0221	0.0213
27	0.0211	0.0221	0.0220	0.0219	0.0206	0.0218	0.0219	0.0222	0.0220	0.0206
28	0.0221	0.0211	0.0217	0.0219	0.0220	0.0219	0.0219	0.0197	0.0222	0.0200
29	0.0212	0.0224	0.0208	0.0206	0.0222	0.0210	0.0222	0.0216	0.0207	0.0223
30	0.0220	0.0223	0.0218	0.0217	0.0217	0.0215	0.0223	0.0222	0.0222	0.0215
31	0.0220	0.0220	0.0222	0.0219	0.0204	0.0217	0.0219	0.0212	0.0221	0.0220
32	0.0221	0.0223	0.0221	0.0216	0.0219	0.0221	0.0220	0.0223	0.0222	0.0219
33	0.0223	0.0222	0.0223	0.0220	0.0209	0.0208	0.0221	0.0223	0.0221	0.0214
34	0.0223	0.0221	0.0220	0.0217	0.0206	0.0220	0.0239	0.0206	0.0219	0.0203
35	0.0223	0.0224	0.0214	0.0210	0.0220	0.0220	0.0221	0.0222	0.0221	0.0216
36	0.0224	0.0225	0.0219	0.0215	0.0223	0.0217	0.0221	0.0224	0.0222	0.0217
37	0.0224	0.0206	0.0218	0.0218	0.0218	0.0220	0.0221	0.0207	0.0223	0.0206
38	0.0224	0.0219	0.0222	0.0206	0.0207	0.0222	0.0222	0.0220	0.0221	0.0205
39	0.0222	0.0223	0.0209	0.0217	0.0224	0.0214	0.0221	0.0225	0.0220	0.0222
40	0.0221	0.0208	0.0217	0.0218	0.0222	0.0219	0.0215	0.0204	0.0222	0.0221
41	0.0227	0.0221	0.0214	0.0219	0.0206	0.0221	0.0222	0.0222	0.0222	0.0217
42	0.0217	0.0224	0.0219	0.0213	0.0225	0.0221	0.0222	0.0223	0.0219	0.0220

43	0.0227	0.0221	0.0207	0.0217	0.0220	0.0216	0.0223	0.0218	0.0220	0.0206
44	0.0226	0.0226	0.0222	0.0220	0.0223	0.0222	0.0224	0.0225	0.0217	0.0217
45	0.0226	0.0219	0.0221	0.0217	0.0222	0.0222	0.0223	0.0223	0.0222	0.0215
46	0.0222	0.0219	0.0204	0.0205	0.0223	0.0217	0.0236	0.0219	0.0220	0.0221
47	0.0226	0.0209	0.0207	0.0216	0.0221	0.0221	0.0222	0.0210	0.0221	0.0219
48	0.0212	0.0211	0.0220	0.0204	0.0222	0.0203	0.0221	0.0237	0.0217	0.0209
49	0.0225	0.0221	0.0218	0.0210	0.0218	0.0215	0.0218	0.0224	0.0213	0.0220
50	0.0224	0.0220	0.0205	0.0215	0.0219	0.0221	0.0211	0.0214	0.0211	0.0220
51	0.0206	0.0211	0.0204	0.0214	0.0203	0.0210	0.0206	0.0211	0.0211	0.0200
52	0.0208	0.0211	0.0204	0.0212	0.0215	0.0208	0.0214	0.0202	0.0210	0.0202
53	0.0210	0.0213	0.0205	0.0212	0.0213	0.0209	0.0214	0.0214	0.0213	0.0211
54	0.0209	0.0209	0.0202	0.0214	0.0203	0.0208	0.0214	0.0211	0.0214	0.0211
55	0.0210	0.0214	0.0217	0.0215	0.0215	0.0209	0.0215	0.0212	0.0214	0.0215
56	0.0216	0.0213	0.0217	0.0212	0.0217	0.0211	0.0214	0.0214	0.0214	0.0215
57	0.0211	0.0213	0.0202	0.0214	0.0212	0.0210	0.0205	0.0212	0.0216	0.0213
58	0.0211	0.0203	0.0215	0.0212	0.0203	0.0211	0.0216	0.0203	0.0214	0.0204
59	0.0210	0.0216	0.0213	0.0204	0.0214	0.0211	0.0217	0.0214	0.0211	0.0214
60	0.0212	0.0216	0.0203	0.0217	0.0215	0.0213	0.0217	0.0215	0.0217	0.0215
61	0.0211	0.0205	0.0217	0.0214	0.0216	0.0212	0.0218	0.0202	0.0216	0.0203
62	0.0211	0.0219	0.0215	0.0227	0.0216	0.0203	0.0218	0.0216	0.0205	0.0214
63	0.0213	0.0214	0.0203	0.0209	0.0217	0.0203	0.0217	0.0204	0.0205	0.0217
64	0.0213	0.0203	0.0216	0.0214	0.0205	0.0216	0.0216	0.0205	0.0217	0.0204
65	0.0215	0.0214	0.0220	0.0211	0.0201	0.0217	0.0218	0.0213	0.0208	0.0210
66	0.0214	0.0217	0.0217	0.0214	0.0218	0.0210	0.0214	0.0218	0.0216	0.0218
67	0.0209	0.0218	0.0218	0.0216	0.0219	0.0215	0.0216	0.0213	0.0217	0.0205
68	0.0216	0.0214	0.0220	0.0203	0.0204	0.0216	0.0218	0.0213	0.0205	0.0216
69	0.0215	0.0218	0.0204	0.0204	0.0218	0.0215	0.0206	0.0205	0.0216	0.0206
70	0.0204	0.0215	0.0206	0.0203	0.0219	0.0205	0.0217	0.0206	0.0205	0.0219
71	0.0217	0.0215	0.0220	0.0215	0.0203	0.0204	0.0216	0.0218	0.0217	0.0217
72	0.0218	0.0204	0.0221	0.0204	0.0220	0.0214	0.0219	0.0205	0.0221	0.0213
73	0.0212	0.0221	0.0206	0.0217	0.0206	0.0205	0.0214	0.0220	0.0217	0.0216
74	0.0216	0.0210	0.0220	0.0217	0.0208	0.0214	0.0219	0.0205	0.0219	0.0213
75	0.0216	0.0218	0.0221	0.0211	0.0210	0.0216	0.0220	0.0207	0.0215	0.0209
76	0.0217	0.0223	0.0221	0.0213	0.0209	0.0214	0.0217	0.0215	0.0221	0.0212
77	0.0219	0.0220	0.0219	0.0216	0.0203	0.0217	0.0218	0.0218	0.0219	0.0219
78	0.0220	0.0216	0.0220	0.0212	0.0205	0.0218	0.0219	0.0206	0.0219	0.0213
79	0.0220	0.0223	0.0208	0.0203	0.0220	0.0205	0.0220	0.0222	0.0204	0.0216
80	0.0219	0.0213	0.0204	0.0216	0.0205	0.0218	0.0207	0.0214	0.0219	0.0217
81	0.0219	0.0225	0.0220	0.0215	0.0212	0.0219	0.0219	0.0231	0.0220	0.0217
82	0.0220	0.0220	0.0218	0.0204	0.0215	0.0220	0.0221	0.0216	0.0220	0.0215
83	0.0221	0.0213	0.0211	0.0216	0.0222	0.0216	0.0220	0.0216	0.0219	0.0218
84	0.0220	0.0219	0.0218	0.0217	0.0221	0.0220	0.0219	0.0193	0.0220	0.0220
85	0.0220	0.0219	0.0219	0.0203	0.0199	0.0216	0.0218	0.0222	0.0206	0.0204
86	0.0221	0.0224	0.0206	0.0215	0.0224	0.0219	0.0219	0.0222	0.0221	0.0210
87	0.0221	0.0203	0.0212	0.0218	0.0222	0.0221	0.0220	0.0211	0.0220	0.0218
88	0.0221	0.0221	0.0220	0.0204	0.0204	0.0219	0.0221	0.0218	0.0207	0.0219
89	0.0222	0.0214	0.0204	0.0216	0.0224	0.0219	0.0219	0.0223	0.0219	0.0203
90	0.0221	0.0204	0.0206	0.0215	0.0222	0.0211	0.0218	0.0206	0.0220	0.0219
91	0.0219	0.0217	0.0220	0.0204	0.0218	0.0216	0.0220	0.0194	0.0220	0.0219

92	0.0221	0.0218	0.0221	0.0214	0.0207	0.0205	0.0219	0.0202	0.0220	0.0203
93	0.0221	0.0223	0.0211	0.0217	0.0219	0.0222	0.0220	0.0222	0.0221	0.0219
94	0.0222	0.0212	0.0219	0.0217	0.0224	0.0217	0.0204	0.0211	0.0220	0.0219
95	0.0212	0.0222	0.0221	0.0216	0.0223	0.0222	0.0220	0.0221	0.0220	0.0211
96	0.0222	0.0223	0.0219	0.0209	0.0219	0.0222	0.0218	0.0223	0.0219	0.0217
97	0.0223	0.0210	0.0220	0.0215	0.0210	0.0216	0.0218	0.0204	0.0219	0.0219
98	0.0219	0.0202	0.0219	0.0215	0.0204	0.0211	0.0210	0.0204	0.0218	0.0211
99	0.0223	0.0221	0.0217	0.0213	0.0204	0.0221	0.0218	0.0215	0.0205	0.0219
100	0.0221	0.0209	0.0214	0.0214	0.0219	0.0217	0.0205	0.0205	0.0218	0.0219

After 100 Cycles

Units: inches

Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0208	0.0215	0.0220	0.0197	0.0206	0.0224	0.0214	0.0205	0.0222	0.0213
2	0.0208	0.0216	0.0208	0.0214	0.0207	0.0222	0.0216	0.0216	0.0215	0.0204
3	0.0209	0.0206	0.0221	0.0213	0.0220	0.0224	0.0209	0.0216	0.0216	0.0221
4	0.0210	0.0216	0.0223	0.0204	0.0208	0.0223	0.0218	0.0212	0.0217	0.0203
5	0.0210	0.0218	0.0208	0.0213	0.0223	0.0208	0.0218	0.0218	0.0216	0.0207
6	0.0204	0.0206	0.0210	0.0214	0.0223	0.0209	0.0208	0.0218	0.0219	0.0221
7	0.0212	0.0216	0.0225	0.0205	0.0207	0.0224	0.0216	0.0219	0.0219	0.0214
8	0.0212	0.0213	0.0224	0.0215	0.0221	0.0222	0.0206	0.0218	0.0217	0.0200
9	0.0213	0.0220	0.0225	0.0215	0.0223	0.0206	0.0217	0.0219	0.0220	0.0222
10	0.0214	0.0222	0.0226	0.0219	0.0208	0.0221	0.0219	0.0210	0.0222	0.0219
11	0.0214	0.0221	0.0227	0.0217	0.0223	0.0221	0.0222	0.0217	0.0221	0.0208
12	0.0215	0.0223	0.0208	0.0206	0.0209	0.0224	0.0212	0.0222	0.0209	0.0223
13	0.0216	0.0211	0.0209	0.0219	0.0208	0.0224	0.0214	0.0214	0.0224	0.0221
14	0.0217	0.0216	0.0209	0.0218	0.0224	0.0224	0.0205	0.0218	0.0222	0.0212
15	0.0217	0.0226	0.0225	0.0206	0.0224	0.0208	0.0225	0.0224	0.0223	0.0223
16	0.0204	0.0223	0.0219	0.0218	0.0208	0.0214	0.0223	0.0221	0.0222	0.0222
17	0.0218	0.0222	0.0223	0.0220	0.0227	0.0210	0.0207	0.0221	0.0223	0.0209
18	0.0220	0.0227	0.0227	0.0206	0.0209	0.0209	0.0222	0.0210	0.0210	0.0225
19	0.0219	0.0226	0.0217	0.0220	0.0214	0.0221	0.0226	0.0222	0.0222	0.0214
20	0.0222	0.0221	0.0205	0.0220	0.0226	0.0217	0.0218	0.0228	0.0223	0.0209
21	0.0222	0.0224	0.0229	0.0237	0.0220	0.0210	0.0213	0.0222	0.0225	0.0207
22	0.0223	0.0226	0.0218	0.0213	0.0226	0.0210	0.0226	0.0223	0.0213	0.0228
23	0.0223	0.0217	0.0208	0.0225	0.0225	0.0208	0.0210	0.0219	0.0225	0.0220
24	0.0223	0.0225	0.0228	0.0223	0.0219	0.0228	0.0225	0.0224	0.0226	0.0204
25	0.0225	0.0217	0.0218	0.0227	0.0227	0.0196	0.0206	0.0226	0.0223	0.0211
26	0.0223	0.0230	0.0218	0.0207	0.0226	0.0208	0.0213	0.0225	0.0220	0.0212
27	0.0226	0.0227	0.0226	0.0224	0.0209	0.0226	0.0227	0.0224	0.0227	0.0214
28	0.0226	0.0208	0.0216	0.0226	0.0226	0.0227	0.0203	0.0225	0.0228	0.0207
29	0.0227	0.0230	0.0206	0.0219	0.0228	0.0222	0.0221	0.0228	0.0215	0.0230
30	0.0227	0.0229	0.0222	0.0225	0.0207	0.0220	0.0228	0.0228	0.0228	0.0215
31	0.0228	0.0227	0.0230	0.0228	0.0222	0.0212	0.0204	0.0238	0.0226	0.0226
32	0.0229	0.0230	0.0227	0.0211	0.0226	0.0228	0.0230	0.0223	0.0228	0.0227
33	0.0231	0.0230	0.0229	0.0227	0.0212	0.0208	0.0230	0.0222	0.0228	0.0209
34	0.0229	0.0216	0.0224	0.0226	0.0223	0.0228	0.0209	0.0202	0.0227	0.0210
35	0.0230	0.0231	0.0208	0.0209	0.0214	0.0226	0.0228	0.0229	0.0219	0.0222
36	0.0232	0.0232	0.0220	0.0209	0.0230	0.0209	0.0232	0.0229	0.0229	0.0225
37	0.0231	0.0213	0.0210	0.0221	0.0219	0.0226	0.0213	0.0229	0.0230	0.0213

38	0.0232	0.0215	0.0228	0.0210	0.0213	0.0221	0.0204	0.0229	0.0219	0.0207
39	0.0232	0.0231	0.0213	0.0225	0.0230	0.0217	0.0230	0.0224	0.0228	0.0229
40	0.0222	0.0212	0.0211	0.0229	0.0229	0.0219	0.0210	0.0228	0.0230	0.0221
41	0.0238	0.0226	0.0221	0.0224	0.0215	0.0226	0.0221	0.0227	0.0224	0.0224
42	0.0227	0.0232	0.0211	0.0220	0.0232	0.0225	0.0228	0.0231	0.0228	0.0227
43	0.0236	0.0214	0.0215	0.0219	0.0225	0.0218	0.0218	0.0234	0.0225	0.0222
44	0.0236	0.0234	0.0228	0.0224	0.0229	0.0226	0.0230	0.0230	0.0211	0.0223
45	0.0236	0.0224	0.0227	0.0227	0.0228	0.0226	0.0227	0.0233	0.0231	0.0216
46	0.0233	0.0219	0.0208	0.0209	0.0229	0.0210	0.0229	0.0232	0.0221	0.0223
47	0.0238	0.0217	0.0211	0.0220	0.0228	0.0224	0.0219	0.0233	0.0230	0.0227
48	0.0213	0.0216	0.0226	0.0210	0.0231	0.0208	0.0217	0.0227	0.0211	0.0214
49	0.0236	0.0225	0.0223	0.0208	0.0221	0.0218	0.0231	0.0223	0.0211	0.0223
50	0.0234	0.0223	0.0206	0.0221	0.0220	0.0223	0.0226	0.0227	0.0228	0.0231
51	0.0207	0.0214	0.0208	0.0212	0.0206	0.0222	0.0216	0.0204	0.0219	0.0212
52	0.0209	0.0210	0.0222	0.0212	0.0219	0.0206	0.0204	0.0224	0.0216	0.0197
53	0.0213	0.0217	0.0211	0.0212	0.0219	0.0220	0.0218	0.0229	0.0214	0.0204
54	0.0210	0.0215	0.0205	0.0214	0.0205	0.0221	0.0231	0.0223	0.0217	0.0216
55	0.0203	0.0217	0.0223	0.0213	0.0221	0.0217	0.0217	0.0233	0.0233	0.0221
56	0.0212	0.0226	0.0224	0.0195	0.0223	0.0207	0.0220	0.0217	0.0217	0.0221
57	0.0213	0.0217	0.0216	0.0217	0.0214	0.0211	0.0218	0.0214	0.0218	0.0205
58	0.0213	0.0205	0.0222	0.0214	0.0208	0.0223	0.0203	0.0219	0.0218	0.0196
59	0.0213	0.0220	0.0218	0.0204	0.0219	0.0205	0.0242	0.0238	0.0213	0.0217
60	0.0215	0.0220	0.0206	0.0218	0.0207	0.0224	0.0221	0.0220	0.0220	0.0203
61	0.0214	0.0205	0.0223	0.0216	0.0223	0.0222	0.0209	0.0221	0.0220	0.0209
62	0.0215	0.0221	0.0207	0.0207	0.0222	0.0211	0.0221	0.0221	0.0239	0.0222
63	0.0220	0.0230	0.0214	0.0210	0.0223	0.0210	0.0206	0.0218	0.0206	0.0223
64	0.0206	0.0216	0.0218	0.0216	0.0227	0.0230	0.0212	0.0218	0.0221	0.0216
65	0.0217	0.0219	0.0227	0.0211	0.0206	0.0229	0.0214	0.0209	0.0218	0.0217
66	0.0218	0.0222	0.0224	0.0216	0.0223	0.0216	0.0224	0.0219	0.0221	0.0226
67	0.0227	0.0223	0.0218	0.0220	0.0224	0.0225	0.0217	0.0220	0.0222	0.0215
68	0.0220	0.0219	0.0226	0.0213	0.0216	0.0226	0.0214	0.0221	0.0208	0.0214
69	0.0220	0.0222	0.0218	0.0205	0.0207	0.0225	0.0219	0.0223	0.0221	0.0211
70	0.0207	0.0220	0.0208	0.0205	0.0227	0.0216	0.0207	0.0221	0.0213	0.0226
71	0.0223	0.0222	0.0226	0.0213	0.0217	0.0207	0.0228	0.0219	0.0221	0.0224
72	0.0223	0.0208	0.0217	0.0206	0.0226	0.0221	0.0213	0.0237	0.0227	0.0221
73	0.0210	0.0227	0.0224	0.0220	0.0219	0.0221	0.0226	0.0224	0.0223	0.0216
74	0.0222	0.0202	0.0228	0.0223	0.0217	0.0223	0.0211	0.0222	0.0225	0.0221
75	0.0224	0.0228	0.0227	0.0211	0.0205	0.0224	0.0212	0.0227	0.0225	0.0220
76	0.0224	0.0228	0.0228	0.0212	0.0233	0.0221	0.0226	0.0226	0.0226	0.0191
77	0.0227	0.0225	0.0226	0.0222	0.0218	0.0225	0.0213	0.0222	0.0226	0.0226
78	0.0227	0.0220	0.0227	0.0205	0.0221	0.0225	0.0211	0.0227	0.0227	0.0230
79	0.0227	0.0230	0.0226	0.0207	0.0226	0.0218	0.0229	0.0227	0.0217	0.0219
80	0.0226	0.0228	0.0208	0.0225	0.0221	0.0224	0.0218	0.0223	0.0227	0.0224
81	0.0226	0.0207	0.0225	0.0222	0.0208	0.0227	0.0212	0.0227	0.0228	0.0204
82	0.0228	0.0225	0.0225	0.0220	0.0223	0.0227	0.0218	0.0228	0.0227	0.0220
83	0.0229	0.0227	0.0219	0.0223	0.0228	0.0222	0.0207	0.0230	0.0228	0.0226
84	0.0230	0.0224	0.0224	0.0224	0.0227	0.0227	0.0243	0.0228	0.0229	0.0228
85	0.0230	0.0223	0.0226	0.0225	0.0213	0.0223	0.0228	0.0223	0.0223	0.0212
86	0.0230	0.0232	0.0209	0.0226	0.0231	0.0226	0.0229	0.0228	0.0229	0.0219

87	0.0229	0.0214	0.0210	0.0228	0.0229	0.0226	0.0214	0.0229	0.0228	0.0228
88	0.0229	0.0230	0.0215	0.0206	0.0220	0.0225	0.0217	0.0230	0.0228	0.0228
89	0.0232	0.0227	0.0207	0.0227	0.0230	0.0222	0.0229	0.0216	0.0229	0.0209
90	0.0231	0.0207	0.0222	0.0226	0.0228	0.0214	0.0208	0.0227	0.0227	0.0228
91	0.0231	0.0216	0.0227	0.0207	0.0222	0.0221	0.0203	0.0221	0.0229	0.0228
92	0.0230	0.0220	0.0227	0.0223	0.0208	0.0211	0.0214	0.0229	0.0230	0.0207
93	0.0232	0.0233	0.0206	0.0228	0.0226	0.0227	0.0228	0.0231	0.0231	0.0227
94	0.0233	0.0207	0.0226	0.0228	0.0230	0.0219	0.0201	0.0221	0.0230	0.0228
95	0.0228	0.0233	0.0227	0.0228	0.0230	0.0226	0.0227	0.0226	0.0231	0.0214
96	0.0233	0.0232	0.0225	0.0210	0.0226	0.0225	0.0230	0.0227	0.0229	0.0225
97	0.0236	0.0212	0.0226	0.0227	0.0222	0.0219	0.0217	0.0229	0.0229	0.0228
98	0.0228	0.0220	0.0226	0.0225	0.0220	0.0209	0.0209	0.0233	0.0228	0.0215
99	0.0236	0.0231	0.0224	0.0220	0.0209	0.0225	0.0239	0.0229	0.0223	0.0232
100	0.0234	0.0218	0.0220	0.0229	0.0236	0.0220	0.0232	0.0225	0.0231	0.0231

After Thermal

Units: inches

Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0207	0.0209	0.0210	0.0213	0.0230	0.0215	0.0221	0.0222	0.0231	0.0222
2	0.0210	0.0217	0.0212	0.0223	0.0217	0.0222	0.0224	0.0222	0.0217	0.0230
3	0.0215	0.0209	0.0211	0.0215	0.0219	0.0225	0.0217	0.0214	0.0226	0.0225
4	0.0212	0.0216	0.0213	0.0219	0.0223	0.0216	0.0208	0.0223	0.0227	0.0222
5	0.0213	0.0218	0.0218	0.0221	0.0224	0.0213	0.0215	0.0221	0.0225	0.0219
6	0.0214	0.0212	0.0205	0.0212	0.0221	0.0222	0.0220	0.0215	0.0224	0.0226
7	0.0223	0.0207	0.0219	0.0209	0.0217	0.0226	0.0223	0.0222	0.0224	0.0223
8	0.0219	0.0218	0.0212	0.0212	0.0211	0.0225	0.0238	0.0212	0.0224	0.0224
9	0.0214	0.0214	0.0211	0.0220	0.0222	0.0223	0.0220	0.0225	0.0229	0.0227
10	0.0222	0.0216	0.0219	0.0222	0.0231	0.0225	0.0230	0.0216	0.0229	0.0216
11	0.0206	0.0218	0.0217	0.0220	0.0216	0.0224	0.0225	0.0216	0.0229	0.0210
12	0.0217	0.0227	0.0208	0.0211	0.0221	0.0226	0.0226	0.0223	0.0229	0.0226
13	0.0215	0.0206	0.0214	0.0223	0.0214	0.0229	0.0226	0.0215	0.0231	0.0226
14	0.0217	0.0226	0.0202	0.0225	0.0226	0.0228	0.0236	0.0223	0.0231	0.0221
15	0.0221	0.0228	0.0209	0.0219	0.0224	0.0205	0.0229	0.0228	0.0229	0.0212
16	0.0229	0.0224	0.0223	0.0224	0.0213	0.0220	0.0228	0.0227	0.0228	0.0217
17	0.0219	0.0227	0.0211	0.0210	0.0226	0.0229	0.0227	0.0213	0.0230	0.0221
18	0.0219	0.0227	0.0224	0.0214	0.0214	0.0227	0.0213	0.0227	0.0231	0.0228
19	0.0222	0.0227	0.0213	0.0218	0.0211	0.0222	0.0225	0.0230	0.0227	0.0220
20	0.0224	0.0211	0.0212	0.0213	0.0221	0.0228	0.0221	0.0225	0.0229	0.0228
21	0.0223	0.0214	0.0222	0.0226	0.0224	0.0223	0.0222	0.0216	0.0222	0.0207
22	0.0225	0.0229	0.0220	0.0219	0.0225	0.0222	0.0231	0.0231	0.0216	0.0231
23	0.0226	0.0228	0.0209	0.0213	0.0225	0.0222	0.0214	0.0224	0.0232	0.0227
24	0.0218	0.0215	0.0218	0.0217	0.0224	0.0228	0.0242	0.0230	0.0225	0.0221
25	0.0228	0.0217	0.0238	0.0224	0.0222	0.0208	0.0229	0.0223	0.0215	0.0218
26	0.0225	0.0218	0.0217	0.0224	0.0230	0.0217	0.0229	0.0224	0.0226	0.0230
27	0.0219	0.0228	0.0220	0.0222	0.0198	0.0218	0.0228	0.0228	0.0228	0.0219
28	0.0213	0.0240	0.0228	0.0224	0.0216	0.0220	0.0221	0.0219	0.0222	0.0224
29	0.0228	0.0231	0.0215	0.0222	0.0228	0.0227	0.0229	0.0226	0.0231	0.0230
30	0.0219	0.0229	0.0232	0.0227	0.0226	0.0227	0.0229	0.0228	0.0220	0.0213
31	0.0228	0.0228	0.0227	0.0227	0.0218	0.0216	0.0226	0.0213	0.0230	0.0229
32	0.0230	0.0223	0.0231	0.0225	0.0228	0.0228	0.0226	0.0232	0.0230	0.0229

33	0.0231	0.0229	0.0230	0.0227	0.0219	0.0224	0.0230	0.0210	0.0220	0.0213
34	0.0228	0.0233	0.0226	0.0221	0.0231	0.0219	0.0230	0.0217	0.0228	0.0219
35	0.0229	0.0232	0.0198	0.0217	0.0222	0.0227	0.0225	0.0218	0.0232	0.0226
36	0.0229	0.0235	0.0224	0.0227	0.0227	0.0213	0.0228	0.0234	0.0218	0.0229
37	0.0226	0.0222	0.0224	0.0227	0.0232	0.0231	0.0227	0.0235	0.0231	0.0230
38	0.0233	0.0232	0.0230	0.0218	0.0221	0.0230	0.0232	0.0204	0.0221	0.0224
39	0.0238	0.0209	0.0221	0.0227	0.0231	0.0207	0.0225	0.0232	0.0215	0.0231
40	0.0230	0.0222	0.0227	0.0221	0.0233	0.0226	0.0224	0.0220	0.0230	0.0231
41	0.0236	0.0209	0.0230	0.0232	0.0212	0.0221	0.0230	0.0230	0.0232	0.0225
42	0.0229	0.0231	0.0232	0.0231	0.0230	0.0230	0.0225	0.0225	0.0225	0.0229
43	0.0232	0.0238	0.0226	0.0225	0.0229	0.0232	0.0232	0.0221	0.0233	0.0231
44	0.0223	0.0230	0.0215	0.0232	0.0233	0.0229	0.0232	0.0229	0.0227	0.0226
45	0.0228	0.0234	0.0215	0.0229	0.0231	0.0229	0.0231	0.0233	0.0225	0.0227
46	0.0234	0.0235	0.0221	0.0215	0.0212	0.0228	0.0228	0.0216	0.0229	0.0224
47	0.0234	0.0229	0.0208	0.0220	0.0234	0.0228	0.0230	0.0225	0.0227	0.0231
48	0.0218	0.0238	0.0232	0.0224	0.0221	0.0220	0.0228	0.0236	0.0227	0.0225
49	0.0221	0.0235	0.0229	0.0201	0.0232	0.0222	0.0227	0.0230	0.0218	0.0231
50	0.0233	0.0221	0.0222	0.0225	0.0228	0.0227	0.0221	0.0235	0.0221	0.0221
51	0.0212	0.0218	0.0218	0.0216	0.0224	0.0223	0.0214	0.0220	0.0226	0.0225
52	0.0212	0.0215	0.0210	0.0220	0.0221	0.0210	0.0223	0.0209	0.0230	0.0210
53	0.0213	0.0218	0.0216	0.0212	0.0220	0.0225	0.0224	0.0223	0.0227	0.0216
54	0.0213	0.0219	0.0212	0.0218	0.0225	0.0224	0.0226	0.0227	0.0229	0.0224
55	0.0220	0.0213	0.0217	0.0217	0.0218	0.0220	0.0229	0.0216	0.0225	0.0213
56	0.0219	0.0219	0.0219	0.0212	0.0222	0.0225	0.0230	0.0227	0.0224	0.0225
57	0.0216	0.0223	0.0228	0.0217	0.0232	0.0223	0.0205	0.0227	0.0225	0.0226
58	0.0215	0.0211	0.0216	0.0219	0.0220	0.0224	0.0228	0.0213	0.0225	0.0206
59	0.0215	0.0222	0.0217	0.0210	0.0229	0.0236	0.0230	0.0223	0.0213	0.0224
60	0.0217	0.0225	0.0207	0.0225	0.0233	0.0226	0.0230	0.0226	0.0231	0.0223
61	0.0215	0.0213	0.0223	0.0223	0.0223	0.0228	0.0228	0.0214	0.0231	0.0219
62	0.0217	0.0224	0.0218	0.0231	0.0221	0.0203	0.0242	0.0229	0.0222	0.0227
63	0.0219	0.0222	0.0203	0.0216	0.0223	0.0221	0.0222	0.0228	0.0226	0.0226
64	0.0221	0.0238	0.0222	0.0219	0.0224	0.0227	0.0228	0.0202	0.0220	0.0212
65	0.0217	0.0218	0.0219	0.0218	0.0204	0.0232	0.0232	0.0222	0.0216	0.0214
66	0.0220	0.0225	0.0228	0.0237	0.0224	0.0221	0.0228	0.0228	0.0226	0.0232
67	0.0221	0.0208	0.0223	0.0224	0.0227	0.0229	0.0239	0.0224	0.0231	0.0220
68	0.0221	0.0224	0.0228	0.0208	0.0214	0.0225	0.0226	0.0228	0.0205	0.0232
69	0.0222	0.0226	0.0206	0.0207	0.0228	0.0229	0.0229	0.0217	0.0227	0.0218
70	0.0222	0.0212	0.0215	0.0213	0.0226	0.0225	0.0223	0.0219	0.0227	0.0230
71	0.0224	0.0223	0.0225	0.0221	0.0215	0.0215	0.0215	0.0234	0.0219	0.0225
72	0.0224	0.0203	0.0232	0.0208	0.0228	0.0220	0.0232	0.0208	0.0230	0.0208
73	0.0213	0.0226	0.0224	0.0242	0.0217	0.0228	0.0242	0.0229	0.0225	0.0225
74	0.0216	0.0218	0.0231	0.0225	0.0218	0.0229	0.0219	0.0223	0.0230	0.0228
75	0.0229	0.0199	0.0228	0.0218	0.0222	0.0229	0.0231	0.0236	0.0227	0.0229
76	0.0225	0.0230	0.0229	0.0219	0.0227	0.0213	0.0228	0.0231	0.0214	0.0219
77	0.0225	0.0230	0.0230	0.0225	0.0203	0.0229	0.0230	0.0226	0.0228	0.0232
78	0.0226	0.0207	0.0229	0.0207	0.0229	0.0228	0.0231	0.0223	0.0227	0.0214
79	0.0232	0.0232	0.0227	0.0220	0.0231	0.0216	0.0231	0.0234	0.0212	0.0229
80	0.0226	0.0223	0.0222	0.0236	0.0216	0.0230	0.0217	0.0218	0.0228	0.0225
81	0.0230	0.0227	0.0226	0.0226	0.0223	0.0234	0.0228	0.0240	0.0228	0.0222

82	0.0227	0.0230	0.0232	0.0226	0.0227	0.0233	0.0232	0.0227	0.0215	0.0229
83	0.0228	0.0230	0.0225	0.0225	0.0234	0.0226	0.0214	0.0228	0.0229	0.0228
84	0.0232	0.0226	0.0230	0.0226	0.0230	0.0233	0.0229	0.0202	0.0232	0.0230
85	0.0229	0.0239	0.0225	0.0227	0.0210	0.0227	0.0229	0.0232	0.0226	0.0201
86	0.0229	0.0234	0.0226	0.0244	0.0233	0.0229	0.0244	0.0235	0.0229	0.0208
87	0.0230	0.0198	0.0236	0.0232	0.0234	0.0234	0.0231	0.0214	0.0231	0.0229
88	0.0225	0.0223	0.0231	0.0213	0.0218	0.0232	0.0230	0.0224	0.0217	0.0230
89	0.0234	0.0221	0.0226	0.0229	0.0236	0.0234	0.0230	0.0234	0.0231	0.0223
90	0.0223	0.0196	0.0230	0.0231	0.0236	0.0212	0.0224	0.0243	0.0222	0.0234
91	0.0230	0.0232	0.0231	0.0233	0.0227	0.0229	0.0214	0.0209	0.0225	0.0230
92	0.0234	0.0229	0.0234	0.0241	0.0227	0.0218	0.0229	0.0217	0.0227	0.0219
93	0.0229	0.0236	0.0226	0.0231	0.0227	0.0230	0.0220	0.0227	0.0227	0.0227
94	0.0231	0.0218	0.0231	0.0233	0.0237	0.0230	0.0228	0.0208	0.0223	0.0230
95	0.0230	0.0236	0.0231	0.0229	0.0235	0.0231	0.0231	0.0218	0.0227	0.0226
96	0.0236	0.0236	0.0231	0.0215	0.0227	0.0229	0.0228	0.0236	0.0221	0.0225
97	0.0233	0.0202	0.0233	0.0219	0.0228	0.0226	0.0220	0.0221	0.0228	0.0227
98	0.0228	0.0219	0.0231	0.0232	0.0234	0.0216	0.0225	0.0221	0.0221	0.0199
99	0.0233	0.0235	0.0228	0.0227	0.0221	0.0232	0.0229	0.0226	0.0219	0.0230
100	0.0234	0.0230	0.0230	0.0228	0.0238	0.0229	0.0216	0.0242	0.0226	0.0204

DATA Continued

Mating--Unmating

Sample#	Initial		After 25 Cycles		After 50 Cycles		After 75 Cycles	
	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	7.91	5.58	6.59	5.29	6.58	5.45	6.96	5.50
2	8.20	5.77	7.91	6.30	8.28	6.79	7.97	5.83
3	8.14	4.85	6.92	5.25	7.25	5.37	6.98	5.27
4	10.41	4.78	10.25	5.76	10.03	5.24	9.94	5.71
5	6.97	4.53	6.52	4.93	6.79	4.56	6.55	4.82
6	6.61	4.78	6.82	5.35	6.97	5.24	6.59	5.14
7	6.63	4.53	6.87	4.89	6.32	4.94	6.57	4.82
8	6.87	4.62	6.44	5.91	6.94	5.14	6.87	4.96
9	8.81	5.22	7.96	4.92	7.85	5.17	7.32	4.39
10	7.48	5.40	8.02	4.97	8.17	5.52	7.69	5.04

Sample#	After 100 Cycles		After Thermals		After Humidity	
	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	6.75	5.42	5.79	4.66	6.47	4.59
2	8.17	5.00	7.01	5.05	8.26	4.97
3	6.96	5.49	5.75	4.50	6.33	4.58
4	9.81	5.45	5.94	4.49	7.63	5.24
5	6.56	5.36	5.80	4.46	6.17	5.44
6	7.06	5.26	5.52	4.80	6.07	5.54
7	5.87	4.60	5.25	4.28	6.32	4.67
8	6.61	4.43	5.47	4.51	6.27	5.34
9	8.71	4.08	8.92	5.47	8.49	4.98
10	8.07	4.52	7.96	5.29	8.59	5.47

DATA Continued

NORMAL FORCE:
Initial

Initial	Deflections in mm Forces in Grams			
Sample #	**0.042**	**0.064**	**0.084**	*SET*
1	53.00	76.00	94.00	0.00300
2	49.00	72.00	92.00	0.00300
3	47.00	74.00	97.00	0.00300
4	51.00	77.00	94.00	0.00200
5	44.90	67.60	80.80	0.01200
6	46.90	71.80	93.00	0.00300
7	48.50	71.50	88.00	0.00300
8	47.20	70.20	89.70	0.00700
9	46.90	73.50	88.60	0.00400
10	49.20	73.50	90.10	0.00500
11	52.20	76.10	93.70	0.00300
12	48.90	73.20	91.70	0.00200

After thermal

Thermal	Deflections in mm Forces in Grams			
Sample #	**0.042**	**0.064**	**0.084**	*SET*
1	50.70	74.70	100.40	0.00400
2	54.70	85.70	113.50	0.00700
3	47.20	73.00	95.80	0.00200
4	52.00	78.30	100.70	0.00700
5	48.50	75.20	99.90	0.00000
6	48.10	72.60	87.60	0.00100
7	49.80	76.50	92.60	0.00500
8	42.00	69.50	86.10	0.01400
9	52.00	78.70	96.20	0.00200
10	49.80	73.90	91.40	0.00400
11	46.30	72.60	91.80	0.01200
12	52.50	77.90	95.50	0.00000
13	52.50	78.70	101.80	0.00000

DATA Continued

LLCR:
Group A

Board	mOhm values Position	Actual Initial	Delta 100 Cycles	Delta Thermal	Delta Humidity
1	P1	7.4	-0.2	0.3	-0.3
1	P2	7.1	-0.4	-0.5	0.6
1	P3	6.8	0.2	0.4	0.4
1	P4	6.3	-0.8	-0.1	-0.5
1	P5	6.4	0.9	0.1	0.8
1	P6	8.7	0.6	-0.6	-1.3
1	P7	9.6	0.8	-1.1	-1.3
1	P8	8.1	0.3	0.1	-2.0
1	P9	9.0	0.3	1.2	0.0
1	P10	8.3	-0.6	-0.8	-0.7
1	P11	6.2	0.3	1.7	0.1
1	P12	9.4	1.9	-1.7	0.3
1	P13	7.7	-0.6	-0.9	0.2
1	P14	7.4	-0.3	-0.2	-0.2
1	P15	7.1	1.1	0.3	3.4
1	P16	8.0	-0.2	-0.6	-1.2
1	P17	6.8	-0.2	0.1	0.4
1	P18	6.5	0.2	0.6	0.6
1	P19	6.6	0.0	1.3	0.0
1	P20	5.4	0.4	0.7	1.2
1	P21	7.2	-0.2	-0.2	-0.2
1	P22	7.3	0.6	0.6	1.3
1	P23	6.8	0.4	0.4	1.0
1	P24	6.6	-0.1	0.7	1.2
2	P1	7.5	-0.6	0.6	1.5
2	P2	6.4	0.3	0.2	0.0
2	P3	7.0	0.2	0.3	-0.5
2	P4	4.7	1.3	2.8	1.1
2	P5	4.8	2.9	5.0	2.9
2	P6	7.5	0.8	-0.1	-0.2
2	P7	7.7	-0.1	0.7	-0.6
2	P8	6.7	0.5	1.0	-0.1
2	P9	9.0	0.0	1.7	-1.1
2	P10	6.8	0.0	-0.2	-0.4
2	P11	6.8	0.0	0.7	-0.1
2	P12	6.5	0.5	0.6	0.7
2	P13	6.9	0.4	0.9	0.4
2	P14	7.0	0.2	0.5	0.3
2	P15	6.7	0.1	1.5	1.1
2	P16	6.6	0.7	1.1	0.8
2	P17	6.6	0.2	0.9	0.6

2	P18	6.6	0.3	2.0	0.5
2	P19	5.8	0.0	2.5	1.6
2	P20	6.2	0.2	1.0	0.4
2	P21	8.1	-0.5	0.5	-0.5
2	P22	7.4	0.4	1.3	0.0
2	P23	7.4	0.0	1.1	0.1
2	P24	9.0	-1.6	-1.7	-1.4
3	P1	7.6	-0.1	0.0	-0.4
3	P2	7.3	-0.6	-0.3	-1.3
3	P3	7.1	0.2	1.1	0.6
3	P4	5.8	-0.1	0.4	1.5
3	P5	8.2	-1.2	-1.2	1.1
3	P6	7.2	0.2	0.5	0.2
3	P7	7.6	-0.5	0.4	-0.1
3	P8	7.1	0.5	0.8	0.2
3	P9	7.6	-0.1	0.0	-0.5
3	P10	6.9	-0.3	0.9	-0.5
3	P11	9.6	-1.2	-1.4	-2.9
3	P12	9.1	-1.3	0.0	-2.1
3	P13	7.5	-0.3	0.5	-1.2
3	P14	7.1	-1.0	0.3	-0.5
3	P15	7.4	-0.7	0.5	-0.4
3	P16	8.6	-1.3	-0.2	-1.5
3	P17	7.3	0.2	1.5	0.3
3	P18	9.0	0.2	1.0	1.2
3	P19	5.9	-0.7	1.7	0.4
3	P20	6.7	-0.4	0.8	4.5
3	P21	7.4	-0.1	0.1	-0.4
3	P22	7.4	-0.5	-0.2	-0.7
3	P23	7.1	-0.7	0.0	-0.6
3	P24	7.2	-0.5	0.2	-0.6
4	P1	7.7	0.5	0.6	0.0
4	P2	7.2	0.4	0.2	1.2
4	P3	8.2	-0.4	0.3	0.2
4	P4	6.7	0.4	0.5	-1.1
4	P5	8.3	0.7	-0.4	-2.5
4	P6	8.3	-0.1	0.1	-0.6
4	P7	7.4	0.6	1.2	0.0
4	P8	7.9	0.1	0.7	-0.8
4	P9	7.0	-0.6	0.2	0.1
4	P10	7.3	0.1	0.0	0.5
4	P11	7.8	0.2	0.4	-0.3
4	P12	7.0	-0.4	1.0	-0.3
4	P13	6.4	0.0	0.6	0.1
4	P14	6.6	0.2	0.4	0.4
4	P15	7.4	-0.3	0.5	1.2
4	P16	7.3	-0.1	0.5	0.6
4	P17	6.6	0.0	0.4	0.6
4	P18	7.1	0.3	0.9	0.0

4	P19	6.8	0.3	1.4	-0.3
4	P20	6.5	0.1	2.3	0.1
4	P21	7.0	-0.3	0.3	0.3
4	P22	6.9	-0.3	1.1	1.0
4	P23	7.3	-0.3	0.4	-0.3
4	P24	7.0	0.1	1.8	1.1
5	P1	7.1	0.4	0.3	1.1
5	P2	7.3	0.3	0.4	0.1
5	P3	7.6	-0.5	-0.5	0.1
5	P4	5.3	0.2	-0.1	0.1
5	P5	5.2	-0.2	0.0	0.0
5	P6	6.7	0.0	0.6	1.3
5	P7	8.4	0.1	-1.2	0.0
5	P8	7.7	0.4	-0.5	0.0
5	P9	7.4	-0.2	-0.2	-0.7
5	P10	6.5	0.0	0.3	1.1
5	P11	6.8	0.7	-0.2	0.7
5	P12	6.3	0.5	0.6	0.7
5	P13	7.4	-0.4	-0.4	-0.3
5	P14	7.5	-0.4	0.1	-0.1
5	P15	8.2	-0.7	0.1	0.0
5	P16	7.1	-0.3	-0.6	-0.2
5	P17	7.0	0.5	0.6	0.0
5	P18	6.9	-0.2	-0.2	0.7
5	P19	8.2	-0.9	-1.8	-1.2
5	P20	8.0	0.1	-1.5	-1.9
5	P21	6.7	0.3	-0.2	-0.1
5	P22	6.5	0.6	0.0	0.8
5	P23	7.4	0.1	-0.1	0.2
5	P24	7.8	-0.6	-0.1	-0.3
6	P1	7.8	-0.5	0.0	-0.2
6	P2	9.0	-0.9	-1.9	-0.5
6	P3	7.2	0.4	-0.5	0.5
6	P4	7.2	-0.8	-1.1	-1.1
6	P5	9.6	-1.2	-1.7	-2.5
6	P6	8.8	0.0	-0.4	-2.1
6	P7	6.9	-0.6	-0.4	0.2
6	P8	8.6	-0.1	0.0	-0.8
6	P9	8.7	0.5	0.6	-0.3
6	P10	7.1	0.0	-0.2	-0.3
6	P11	6.5	0.0	1.0	0.3
6	P12	8.2	-0.6	-0.3	-0.9
6	P13	10.3	-3.2	-2.6	-2.5
6	P14	7.2	0.2	0.3	1.1
6	P15	7.5	-0.2	1.1	1.3
6	P16	7.3	-0.1	0.6	0.1
6	P17	6.8	-0.2	0.2	0.0
6	P18	7.2	0.2	-0.6	0.1
6	P19	7.6	-0.4	1.2	-0.3

6	P20	8.5	-0.1	-0.7	-0.3
6	P21	9.3	-1.2	-0.3	-1.7
6	P22	9.1	0.5	1.8	-0.7
6	P23	8.5	-1.0	0.3	-0.9
6	P24	9.1	-0.1	-0.3	-1.6
7	P1	7.2	-0.2	0.2	-0.2
7	P2	8.6	-0.4	0.0	-0.2
7	P3	6.4	0.1	0.2	-0.3
7	P4	6.0	0.3	-0.1	0.2
7	P5	8.6	0.1	-1.6	-0.9
7	P6	7.5	0.2	-0.8	-1.1
7	P7	7.7	-0.4	-0.3	-1.1
7	P8	8.8	-0.5	0.5	-0.2
7	P9	7.2	0.5	1.1	0.4
7	P10	7.3	-0.4	-0.5	-0.6
7	P11	6.8	-0.2	0.4	-0.4
7	P12	6.8	0.4	0.7	0.7
7	P13	6.7	0.0	1.0	0.5
7	P14	7.0	-0.2	-0.1	-0.4
7	P15	7.0	-0.1	1.5	1.5
7	P16	6.9	0.4	0.7	0.1
7	P17	7.2	0.7	0.2	0.0
7	P18	7.7	-0.2	0.6	0.1
7	P19	5.2	0.1	0.1	0.1
7	P20	5.8	0.4	0.3	-0.5
7	P21	6.7	-0.5	0.9	0.0
7	P22	7.9	-0.1	-0.3	1.0
7	P23	6.5	1.3	0.4	0.2
7	P24	8.2	0.1	0.8	0.8
8	P1	7.2	-0.4	-0.5	-0.1
8	P2	7.6	-0.1	-0.8	-1.0
8	P3	7.2	-0.1	-0.3	0.3
8	P4	4.9	0.8	0.1	1.5
8	P5	6.7	-0.5	0.6	2.5
8	P6	6.7	0.4	0.8	0.5
8	P7	6.1	1.0	0.4	5.1
8	P8	7.2	-0.2	1.9	1.6
8	P9	8.2	0.5	0.5	0.9
8	P10	7.4	-0.2	-0.1	-0.5
8	P11	8.9	1.3	0.1	-0.6
8	P12	6.5	-0.2	0.5	0.6
8	P13	7.1	0.2	0.5	0.5
8	P14	7.0	0.6	0.6	1.1
8	P15	7.1	-0.3	0.1	0.5
8	P16	8.0	-0.1	0.5	1.5
8	P17	7.2	0.5	0.3	0.1
8	P18	6.3	-0.1	0.0	0.2
8	P19	6.2	0.6	-0.1	0.9
8	P20	6.4	-0.1	-0.1	-0.8

8	P21	9.0	-0.3	-2.3	-2.4
8	P22	8.5	-0.4	0.3	-1.0
8	P23	7.5	0.3	0.1	0.1
8	P24	8.2	0.0	-0.5	-0.5

Group B

Board	mOhm values Position	Actual Initial	Delta 3 Cycles	Delta Thermal	Delta Humidity
1	P1	1.2	0.0	0.0	0.1
1	P2	1.3	0.0	0.0	0.0
1	P3	1.1	0.2	0.5	0.5
1	P4	1.4	0.2	0.2	0.2
1	P5	1.2	0.4	0.5	0.0
1	P6	1.5	-0.3	0.0	-0.2
1	P7	1.3	-0.2	-0.2	-0.1
1	P8	1.4	0.1	0.0	-0.2
1	P9	1.1	0.1	0.3	0.3
1	P10	1.3	0.1	-0.1	0.1
1	P11	1.4	-0.2	0.0	-0.1
1	P12	1.5	-0.2	-0.1	-0.1
1	P13	1.3	-0.1	-0.2	0.0
1	P14	1.1	0.0	0.0	0.1
1	P15	1.2	-0.1	0.1	0.1
1	P16	1.3	0.2	0.1	0.0
1	P17	1.4	-0.2	0.0	0.0
1	P18	1.3	-0.1	0.2	0.2
1	P19	1.4	-0.2	-0.1	0.0
1	P20	1.3	0.2	-0.1	0.1
1	P21	1.1	0.2	0.1	0.3
1	P22	1.1	0.0	0.0	0.2
1	P23	1.2	0.1	-0.1	0.2
1	P24	1.1	0.1	0.3	0.2
2	P1	1.5	-0.2	0.1	-0.3
2	P2	1.3	-0.3	-0.1	-0.1
2	P3	1.1	0.1	0.2	0.2
2	P4	1.1	0.2	0.5	0.5
2	P5	1.3	-0.2	0.0	0.2
2	P6	1.2	0.0	0.2	0.1
2	P7	1.4	-0.2	0.0	-0.2
2	P8	1.2	0.1	0.3	0.1
2	P9	1.1	0.1	0.2	0.3
2	P10	1.1	0.2	0.1	0.3
2	P11	1.1	0.0	0.3	0.1
2	P12	1.1	0.2	0.0	0.3
2	P13	1.1	0.1	0.3	0.2
2	P14	1.2	-0.1	0.2	0.1
2	P15	1.3	0.0	0.1	0.1

2	P16	1.1	0.0	0.3	0.2
2	P17	1.3	0.1	-0.1	0.0
2	P18	1.3	0.0	0.0	0.1
2	P19	1.3	-0.2	0.0	0.0
2	P20	1.1	-0.1	0.2	0.3
2	P21	1.3	0.0	-0.2	0.0
2	P22	1.3	0.0	0.0	0.2
2	P23	1.2	0.3	0.0	0.1
2	P24	1.2	0.2	0.1	0.1

DATA Continued

GAS TIGHT
Group A

Board	mOhm values Position	Actual Initial	Delta Gas Tight
1	P1	9.0	-0.5
1	P2	10.3	-2.2
1	P3	6.8	0.6
1	P4	6.2	0.6
1	P5	7.9	0.7
1	P6	6.6	2.6
1	P7	7.1	-0.2
1	P8	8.7	-2.3
1	P9	6.8	-0.2
1	P10	7.5	1.5
1	P11	7.0	1.6
1	P12	6.7	0.7
1	P13	8.9	-0.1
1	P14	7.5	-0.1
1	P15	7.8	-0.3
1	P16	6.6	-0.1
1	P17	7.6	0.0
1	P18	7.8	-0.2
1	P19	4.9	0.4
1	P20	5.7	-0.2
1	P21	7.4	-0.3
1	P22	7.2	-0.4
1	P23	6.0	0.0
1	P24	8.1	-0.6
2	P1	6.4	0.3
2	P2	7.9	-0.4
2	P3	6.6	-0.3
2	P4	6.6	1.2
2	P5	5.7	0.6
2	P6	7.7	0.1
2	P7	6.3	-0.1
2	P8	6.3	0.3
2	P9	6.2	0.7
2	P10	6.3	0.2
2	P11	6.7	0.0
2	P12	6.5	0.4
2	P13	6.8	0.2
2	P14	7.6	-0.2
2	P15	7.4	0.1
2	P16	6.3	0.0
2	P17	6.2	0.0
2	P18	6.5	0.1

2	P19	5.0	0.7
2	P20	5.7	0.3
2	P21	7.9	-1.0
2	P22	7.2	-0.1
2	P23	7.2	0.9
2	P24	8.1	-0.6
3	P1	7.2	-0.1
3	P2	8.4	-0.4
3	P3	6.1	0.3
3	P4	8.3	-1.5
3	P5	6.0	0.3
3	P6	7.1	-0.3
3	P7	6.5	0.0
3	P8	7.1	-0.1
3	P9	6.8	0.4
3	P10	7.4	-0.5
3	P11	6.9	-0.6
3	P12	7.5	0.3
3	P13	7.5	-0.3
3	P14	7.6	-0.8
3	P15	9.0	-1.1
3	P16	7.8	-0.6
3	P17	7.5	-0.9
3	P18	6.7	0.2
3	P19	6.2	-0.4
3	P20	6.1	-0.6
3	P21	6.8	-0.3
3	P22	6.9	0.3
3	P23	8.3	-0.9
3	P24	8.4	-0.8
4	P1	8.1	-0.2
4	P2	6.4	0.4
4	P3	8.2	0.7
4	P4	5.2	-0.2
4	P5	5.5	0.2
4	P6	6.1	0.7
4	P7	6.4	-0.2
4	P8	7.7	-0.5
4	P9	6.9	0.3
4	P10	6.6	-0.3
4	P11	8.2	-0.3
4	P12	7.0	-0.3
4	P13	7.6	-0.9
4	P14	7.0	-0.6
4	P15	8.3	-0.4
4	P16	6.9	0.3
4	P17	7.3	0.8
4	P18	7.4	-0.3
4	P19	7.5	-1.5

4	P20	10.2	-1.2
4	P21	6.7	0.1
4	P22	7.8	-1.4
4	P23	6.8	0.0
4	P24	7.1	-0.4
5	P1	7.4	-0.1
5	P2	7.8	-0.9
5	P3	6.6	-0.2
5	P4	7.1	0.0
5	P5	6.6	0.3
5	P6	7.1	-0.6
5	P7	7.1	0.0
5	P8	7.1	-0.3
5	P9	7.5	-0.8
5	P10	7.5	0.2
5	P11	7.7	-0.1
5	P12	7.8	0.2
5	P13	6.3	-0.3
5	P14	6.5	-0.1
5	P15	6.7	0.2
5	P16	6.3	0.8
5	P17	6.3	0.2
5	P18	6.5	-0.2
5	P19	6.3	0.4
5	P20	6.4	-0.3
5	P21	6.4	1.2
5	P22	7.1	0.9
5	P23	7.5	0.8
5	P24	7.7	-0.1
6	P1	6.7	0.4
6	P2	6.6	0.6
6	P3	6.1	0.3
6	P4	5.9	1.2
6	P5	7.0	0.8
6	P6	7.5	-0.2
6	P7	6.7	0.0
6	P8	6.4	0.5
6	P9	7.3	-0.8
6	P10	7.6	0.3
6	P11	6.4	-0.1
6	P12	6.2	0.6
6	P13	7.4	-0.4
6	P14	7.9	-0.9
6	P15	7.5	-0.5
6	P16	8.1	-0.7
6	P17	7.1	0.7
6	P18	8.0	-0.5
6	P19	5.4	0.4
6	P20	7.1	-0.6

6	P21	7.1	0.7
6	P22	6.7	-0.1
6	P23	7.3	-0.5
6	P24	6.7	0.4
7	P1	7.2	0.0
7	P2	6.7	0.1
7	P3	6.3	0.7
7	P4	6.0	-0.9
7	P5	6.5	-0.1
7	P6	6.2	0.5
7	P7	7.1	-0.4
7	P8	6.0	0.5
7	P9	6.9	-0.5
7	P10	7.8	0.2
7	P11	7.3	-0.1
7	P12	6.7	0.3
7	P13	6.6	0.1
7	P14	6.5	-0.1
7	P15	7.0	0.2
7	P16	6.5	-0.3
7	P17	7.8	-0.6
7	P18	7.7	-0.1
7	P19	5.9	0.1
7	P20	5.3	1.1
7	P21	7.3	-0.3
7	P22	6.5	0.5
7	P23	6.3	0.4
7	P24	7.1	0.2
8	P1	7.5	-0.1
8	P2	7.0	0.2
8	P3	5.9	0.2
8	P4	6.1	-0.4
8	P5	6.7	0.5
8	P6	7.0	1.0
8	P7	6.8	0.8
8	P8	7.1	0.1
8	P9	7.1	1.4
8	P10	6.7	0.5
8	P11	6.1	0.2
8	P12	7.1	0.1
8	P13	7.1	-0.3
8	P14	7.4	-0.5
8	P15	6.5	1.0
8	P16	6.8	0.6
8	P17	7.3	0.1
8	P18	8.1	-0.6
8	P19	5.5	-0.2
8	P20	5.6	0.4
8	P21	6.6	0.2

8	P22	7.7	0.4
8	P23	7.0	-0.4
8	P24	7.7	-0.5

Group B

Board	Position	mOhm values Actual Initial	Delta Gas Tight
1	P1	1.3	-0.1
1	P2	1.3	0.1
1	P3	1.5	-0.1
1	P4	1.3	0.0
1	P5	1.2	0.1
1	P6	1.4	-0.1
1	P7	1.3	0.0
1	P8	1.2	0.1
1	P9	1.1	0.0
1	P10	1.1	0.1
1	P11	1.1	0.3
1	P12	1.1	0.2
1	P13	1.1	0.0
1	P14	1.1	0.1
1	P15	1.1	0.3
1	P16	1.2	0.2
1	P17	1.4	-0.1
1	P18	1.2	0.2
1	P19	1.1	0.4
1	P20	1.3	0.0
1	P21	1.0	0.1
1	P22	1.1	0.0
1	P23	1.2	0.0
1	P24	1.1	0.2
2	P1	1.1	0.1
2	P2	1.5	-0.1
2	P3	1.2	0.0
2	P4	1.1	0.1
2	P5	1.2	0.0
2	P6	1.2	0.2
2	P7	1.2	0.0
2	P8	1.3	-0.1
2	P9	1.1	0.2
2	P10	1.3	0.0
2	P11	1.1	0.1
2	P12	1.1	0.2
2	P13	1.2	0.0
2	P14	1.3	-0.1
2	P15	1.1	0.3
2	P16	1.3	0.0
2	P17	1.3	0.0

2	P18	1.5	0.0
2	P19	1.2	0.0
2	P20	1.3	-0.1
2	P21	1.3	0.0
2	P22	1.2	0.2
2	P23	1.2	-0.1
2	P24	1.2	0.0

Shock & Vibe

Board	mOhm values Position	Actual Initial	Delta Shock & Vibe
1	P1	10.3	1.1
1	P2	10.5	0.4
1	P3	10.4	0.1
1	P4	8.0	0.0
1	P5	8.0	0.0
1	P6	10.3	-0.9
1	P7	10.3	-0.9
1	P8	10.7	-0.9
1	P9	10.0	-0.4
1	P10	9.8	-0.5
1	P11	9.8	-0.5
1	P12	10.7	-1.1
1	P13	9.8	-0.2
1	P14	10.2	-0.6
1	P15	10.0	4.4
1	P16	10.9	0.0
1	P17	10.4	3.2
1	P18	9.3	-0.2
1	P19	8.1	-0.1
1	P20	8.3	-0.2
1	P21	9.1	0.2
1	P22	9.6	0.8
1	P23	10.2	0.2
1	P24	10.4	1.6
2	P1	10.4	0.5
2	P2	10.4	-0.8
2	P3	10.3	0.1
2	P4	9.9	1.0
2	P5	9.9	-1.0
2	P6	9.9	0.2
2	P7	9.8	3.0
2	P8	10.1	-0.2
2	P9	9.6	0.2
2	P10	9.6	0.4
2	P11	10.2	-0.5
2	P12	10.1	-0.5
2	P13	10.6	-1.3

2	P14	10.2	-0.6
2	P15	9.7	1.4
2	P16	9.6	1.2
2	P17	9.8	1.1
2	P18	10.6	0.1
2	P19	8.8	0.9
2	P20	9.2	6.6
2	P21	9.8	6.8
2	P22	9.5	6.6
2	P23	9.6	5.5
2	P24	10.1	0.3
3	P1	10.2	0.3
3	P2	10.7	1.4
3	P3	9.9	0.1
3	P4	8.8	-0.3
3	P5	8.9	-0.1
3	P6	9.9	-0.5
3	P7	9.9	0.0
3	P8	10.3	0.0
3	P9	9.8	-0.3
3	P10	9.9	-0.2
3	P11	10.7	-0.6
3	P12	10.7	-0.6
3	P13	10.2	-0.8
3	P14	9.9	-0.7
3	P15	10.0	-0.5
3	P16	10.1	-0.4
3	P17	9.9	-0.2
3	P18	10.1	-0.5
3	P19	8.9	0.1
3	P20	8.9	-0.2
3	P21	9.7	2.1
3	P22	9.7	3.7
3	P23	10.0	1.9
3	P24	9.9	0.7
4	P1	10.1	1.0
4	P2	10.9	-0.1
4	P3	10.3	2.5
4	P4	9.3	1.4
4	P5	9.0	-0.3
4	P6	10.3	-0.9
4	P7	10.0	1.0
4	P8	10.1	0.0
4	P9	9.9	1.0
4	P10	10.0	0.5
4	P11	10.1	0.3
4	P12	10.3	-0.7
4	P13	10.0	-0.5
4	P14	9.8	-0.4

4	P15	10.1	-0.5
4	P16	10.3	-0.6
4	P17	10.0	-0.4
4	P18	10.4	-0.6
4	P19	9.1	-0.1
4	P20	9.3	-0.6
4	P21	9.7	0.2
4	P22	10.0	2.7
4	P23	9.8	4.7
4	P24	9.8	2.2
5	P1	10.8	0.5
5	P2	10.5	0.3
5	P3	10.6	0.6
5	P4	9.4	0.0
5	P5	9.1	0.1
5	P6	10.3	0.3
5	P7	10.2	-0.6
5	P8	10.0	0.3
5	P9	10.3	1.2
5	P10	10.0	0.4
5	P11	10.1	-0.1
5	P12	10.0	-0.5
5	P13	10.6	-1.2
5	P14	10.1	-0.2
5	P15	10.2	-0.3
5	P16	9.9	0.4
5	P17	10.4	0.0
5	P18	10.4	-0.5
5	P19	9.3	0.6
5	P20	9.0	-0.3
5	P21	9.8	0.8
5	P22	10.4	4.5
5	P23	9.9	1.6
5	P24	10.0	1.2
6	P1	10.2	1.5
6	P2	10.6	1.8
6	P3	10.4	1.7
6	P4	9.5	0.0
6	P5	9.2	0.0
6	P6	9.6	-0.2
6	P7	9.4	-0.5
6	P8	9.7	-0.3
6	P9	9.9	-0.2
6	P10	9.6	-0.3
6	P11	9.5	-0.4
6	P12	9.5	-0.5
6	P13	9.6	-0.5
6	P14	9.7	-0.5
6	P15	9.5	-0.4

6	P16	9.8	-0.7
6	P17	10.0	0.1
6	P18	9.8	0.0
6	P19	9.3	0.0
6	P20	8.8	0.0
6	P21	10.3	0.4
6	P22	9.7	2.6
6	P23	9.9	4.2
6	P24	9.9	0.6
7	P1	9.8	1.4
7	P2	10.3	1.8
7	P3	10.0	1.4
7	P4	8.8	0.1
7	P5	9.4	0.2
7	P6	10.3	-0.2
7	P7	9.4	0.3
7	P8	9.7	0.0
7	P9	10.3	-0.5
7	P10	9.7	-0.2
7	P11	10.1	-0.4
7	P12	10.3	-0.1
7	P13	9.8	0.6
7	P14	9.7	0.5
7	P15	9.5	0.4
7	P16	9.7	0.0
7	P17	10.8	-0.3
7	P18	9.7	0.1
7	P19	10.2	1.4
7	P20	8.9	1.2
7	P21	9.5	0.9
7	P22	9.4	4.6
7	P23	9.7	0.3
7	P24	9.4	3.7
8	P1	10.6	1.6
8	P2	10.5	2.4
8	P3	10.4	-0.8
8	P4	9.5	0.1
8	P5	9.6	-0.5
8	P6	10.3	-0.8
8	P7	10.6	-0.5
8	P8	10.4	0.6
8	P9	10.3	3.6
8	P10	10.4	-0.6
8	P11	10.6	-0.8
8	P12	10.8	-0.5
8	P13	11.5	-1.2
8	P14	11.0	-0.9
8	P15	10.6	-0.2
8	P16	10.5	1.3

8	P17	10.8	-0.2
8	P18	10.5	-0.4
8	P19	9.9	-0.5
8	P20	10.1	-0.7
8	P21	10.7	3.2
8	P22	10.4	3.7
8	P23	6.2	3.7
8	P24	7.9	-1.6

Insertion/Retention force
Group A PCB aperture 0.039 in

Sample#	1st Cycle		2nd Cycle		3rd Cycle	
	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	4.96	3.95	4.51	3.58	3.37	3.38
2	4.60	3.40	4.29	3.04	4.32	2.74
3	4.91	3.52	4.03	3.06	3.87	2.34
4	4.83	3.26	4.12	2.99	3.96	2.80
5	4.99	3.06	4.24	2.66	3.92	2.13
6	4.57	3.61	4.17	3.56	3.96	3.39
7	4.82	3.79	4.27	3.44	4.27	3.66
8	5.06	3.77	4.07	3.66	3.97	3.66
9	5.26	3.83	4.34	4.03	4.06	3.66
10	5.13	3.57	4.11	3.49	3.86	3.49
11	4.70	3.98	4.40	3.67	4.36	3.83
12	5.18	3.78	4.79	3.89	4.65	3.98
13	5.02	3.83	4.52	3.87	4.38	4.10
14	5.17	3.89	4.23	4.05	4.26	3.77
15	5.08	3.87	4.50	4.07	4.13	4.01
16	5.44	3.89	4.51	3.79	4.36	3.59
17	5.19	3.53	4.19	3.32	3.89	2.93
18	5.05	3.41	4.14	3.00	3.87	2.66
19	5.23	3.76	4.40	3.65	4.19	3.42
20	5.31	3.43	4.06	3.99	4.03	3.43
21	5.13	3.60	4.15	3.36	3.91	2.99
22	5.26	3.52	4.58	3.31	3.98	2.75
23	4.98	3.32	3.65	4.30	4.17	3.09
24	5.24	3.16	4.61	3.13	4.61	3.34
25	5.45	3.45	4.40	3.43	3.51	3.05
26	4.05	4.26	4.39	3.09	4.13	3.13
27	5.26	3.72	4.25	3.46	4.12	3.81
28	5.26	3.59	4.29	3.78	3.72	3.82
29	5.36	3.43	4.39	3.76	4.16	3.62
30	5.34	3.46	4.47	3.37	4.04	2.86

Group B PCB aperture 0.043 in

Sample#	1st Cycle		2nd Cycle		3rd Cycle	
	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	3.00	2.72	2.72	2.56	2.91	2.59
2	3.08	2.44	3.25	2.80	2.96	2.64
3	2.81	2.34	3.02	2.68	2.95	2.88
4	2.81	2.33	3.03	2.70	2.55	2.39
5	3.02	2.41	3.05	2.41	3.04	2.64
6	2.86	2.55	2.76	2.62	3.16	2.89
7	2.95	2.45	3.08	2.66	2.66	2.63
8	2.83	2.13	2.53	2.33	1.71	2.13
9	2.90	2.46	3.00	2.66	1.41	2.32
10	2.97	2.40	2.90	2.70	1.42	2.31
11	2.99	2.55	1.74	1.97	1.47	1.53
12	2.77	2.46	1.59	2.33	1.58	1.88
13	3.14	2.40	2.50	2.61	1.84	2.65
14	2.87	2.39	2.91	2.76	1.67	2.57
15	3.42	2.47	1.84	2.72	1.66	2.16
16	2.91	2.29	1.91	2.46	2.47	2.29
17	2.79	2.18	2.10	2.68	1.52	2.64
18	3.43	2.63	2.95	2.70	2.85	2.63
19	2.91	2.46	2.49	3.03	1.72	3.09
20	2.95	2.57	3.31	2.90	1.83	3.00
21	3.18	2.54	3.40	3.22	1.86	2.56
22	3.07	2.44	2.87	2.62	2.83	2.63
23	3.41	2.51	3.06	2.65	2.70	2.41
24	3.17	2.46	2.85	2.62	2.65	2.34
25	3.08	2.40	2.93	2.49	2.60	2.40
26	3.12	2.66	3.20	2.85	3.18	2.86
27	2.83	2.46	3.04	2.69	2.72	2.58
28	3.30	2.36	3.34	2.88	3.21	3.10
29	2.96	2.36	3.34	2.81	3.21	2.97
30	3.15	2.47	3.12	2.88	3.13	2.86

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-MO-03
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 580
Serial #: 297288
Accuracy: Last Cal: 2010-8-06, Next Cal: 2011-8-05

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 2010-4-28, Next Cal: 2011-4-27

Equipment #: HZ-OV-01
Description: Oven
Manufacturer: Huida
Model: CS101-1E
Serial #: CS101-1E-B
Accuracy: Last Cal: 2009-12-15, Next Cal: 2010-12-14

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: HMM30C
Serial #: D0240037
Accuracy: Last Cal: 2010-3-3, Next Cal: 2011-3-2

Equipment #: HZ-OGP-01
Description: Video measurement system
Manufacturer: OGP
Model: SMARTSCOPE FLASH 200
Serial #: SVW2003632
Accuracy: Last Cal: 2010-6-10, Next Cal: 2011-6-9

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 2010-4-28, Next Cal: 2011-4-27

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-PS-01
Description: Power Supply
Manufacturer: Agilent
Model: 6031A
Serial #: MY41000982
Accuracy: Last Cal: 2010-4-28, Next Cal: 2011-4-27

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 2010-11-31, Next Cal: 2011-11-31

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 2010-7-9, Next Cal: 2011-7-9