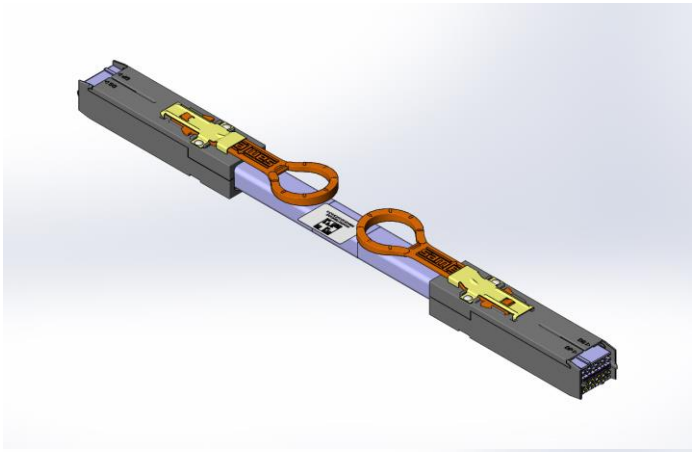
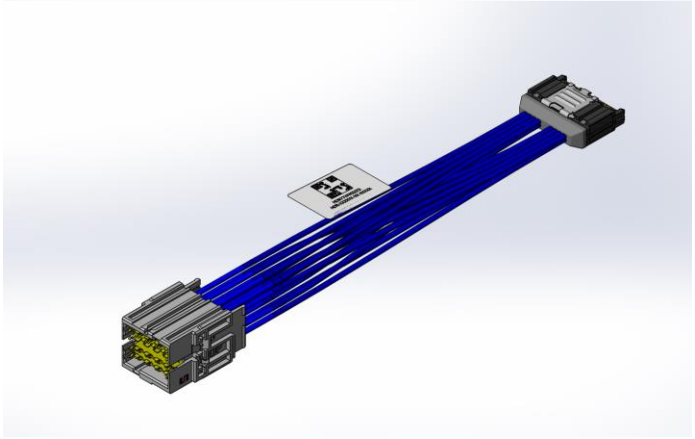
| | |
|---|---|
| Project Number: Design Qualification Test Report | Tracking Code: CR-646601_Report_Rev_1 |
| Requested by: Chad Humphres | Date: 9/29/2022 |
| Part #: NVACE-DP-5-4-X.X-A-1-1/NVACP-DP-1-4-XX.X-A-1-1 | Tech: Aaron McKim |
| Part description: NVACE/NVACP | Qty to test: 80 |
| Test Start: 09/5/2021 | Test Completed: 10/25/2021 |





# DESIGN QUALIFICATION TEST REPORT

## NVACE/NVACP
## NVACE-DP-5-4-X.X-A-1-1/NVACP-DP-1-4-XX.X-A-1-1

## REVISION HISTORY

| DATA | REV.NUM. | DESCRIPTION | ENG |
|---|---|---|---|
| **7/12/2022** | **1** | **Initial Issue** | **PC** |

## 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 Qualification test. Please see test plan.

### 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) Samtec Test PCBs used: PCB-111042-TST, PCB-111043-TST, PCB-111044-TST.

# FLOWCHARTS

## Gas Tight

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Assemblies

| Step | Description |
| --- | --- |
| 1. | LLCR (2) |
| 2. | Gas Tight (1) |
| 3. | LLCR (2)<br>Max Delta = 15 mOhm |

(1) Gas Tight = EIA-364-36

(2) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

## Thermal Aging

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Assemblies

| Step | Description |
| --- | --- |
| 1. | Contact Gaps |
| 2. | Mating/Unmating Force (2) |
| 3. | LLCR (1) |
| 4. | Thermal Age (3) |
| 5. | LLCR (1)<br>Max Delta = 15 mOhm |
| 6. | Mating/Unmating Force (2) |
| 7. | Contact Gaps |

(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mating/Unmating Force = EIA-364-13

(3) Thermal Age = EIA-364-17
Test Condition = 4 (105°C)
Time Condition = B (250 Hours)

# FLOWCHARTS Continued

## Normal Force

### Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACP Signal Without Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Normal Force (1)<br>Expected Force at Max Deflection = 165 g<br>Deflection = 0.0138 " |

### Group 2
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACP MFBL Without Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Normal Force (1)<br>Deflection = 0.0066 "<br>Expected Force at Max Deflection = 108 g |

### Group 3
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACP Signal With Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Thermal Age (2) |
| 3. | Contact Gaps |
| 4. | Normal Force (1)<br>Deflection = 0.0138 "<br>Expected Force at Max Deflection = 165 g |

### Group 4
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACP MFBL With Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Thermal Age (2) |
| 3. | Contact Gaps |
| 4. | Normal Force (1)<br>Deflection = 0.0066 "<br>Expected Force at Max Deflection = 108 g |

### Group 5
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE Signal Without Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Normal Force (1)<br>Deflection = 0.0138 "<br>Expected Force at Max Deflection = 165 g |

### Group 6
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE Ground Without Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Normal Force (1)<br>Deflection = 0.0098 "<br>Expected Force at Max Deflection = 170 g |

### Group 7
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE MFBL Without Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Normal Force (1)<br>Deflection = 0.0098 "<br>Expected Force at Max Deflection = 108 g |

### Group 8
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE Signal With Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Thermal Age (2) |
| 3. | Contact Gaps |
| 4. | Normal Force (1)<br>Deflection = 0.0138 "<br>Expected Force at Max Deflection = 165 g |

### Group 9
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE Ground With Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Thermal Age (2) |
| 3. | Contact Gaps |
| 4. | Normal Force (1)<br>Deflection = 0.0098 "<br>Expected Force at Max Deflection = 170 g |

### Group 10
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Contacts Minimum
NVACE MFBL With Thermals

| Step | Description |
|---|---|
| 1. | Contact Gaps |
| 2. | Thermal Age (2) |
| 3. | Contact Gaps |
| 4. | Normal Force (1)<br>Deflection = 0.0098 "<br>Expected Force at Max Deflection = 108 g |

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(1) Normal Force = EIA-364-04

(2) Thermal Age = EIA-364-17
Test Condition = 4 (105°C)
Time Condition = B (250 Hours)

## FLOWCHARTS Continued

## Mating/Unmating/Durability

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Assemblies
Standard
*Note: Note: 100% LLCR*

| Step | Description |
| --- | --- |
| 1. | Contact Gaps<br>*Note: Measure gaps on the NVACP and the NVACE connectors.* |
| 2. | LLCR (2) |
| 3. | Mating/Unmating Force (3) |
| 4. | Cycles<br>Quantity = 25 Cycles |
| 5. | Mating/Unmating Force (3) |
| 6. | Cycles<br>Quantity = 25 Cycles |
| 7. | Mating/Unmating Force (3) |
| 8. | Cycles<br>Quantity = 25 Cycles |
| 9. | Mating/Unmating Force (3) |
| 10. | Cycles<br>Quantity = 25 Cycles |
| 11. | Mating/Unmating Force (3) |
| 12. | Contact Gaps<br>*Note: Measure gaps on the NVACP and the NVACE connectors.* |
| 13. | LLCR (2)<br>Max Delta = 15 mOhm |
| 14. | Thermal Shock (4) - Non Standard |
| 15. | LLCR (2)<br>Max Delta = 15 mOhm |
| 16. | Humidity (1) |
| 17. | LLCR (2)<br>Max Delta = 15 mOhm |
| 18. | Mating/Unmating Force (3) |

(1) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(2) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(3) Mating/Unmating Force = EIA-364-13

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-40°C to +85°C)
Test Duration = A-3 (100 Cycles)
Twinax cable (TX-34100CU-T01-S) is only rated down to -40°C

# FLOWCHARTS Continued

## IR/DWV

***Pin-to-Pin***

| Group 1<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 2<br>NVACE-DP-5-4-X.X-A-1-1<br>2 Assemblies | | Group 3<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 4<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | |
|---|---|---|---|---|---|---|---|
| **Step** | **Description** | **Step** | **Description** | **Step** | **Description** | **Step** | **Description** |
| 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | IR (4) |
| | | | | | | 2. | DWV at Test Voltage (1) |
| | | | | | | 3. | Thermal Shock (5) - Non Standard |
| | | | | | | 4. | IR (4) |
| | | | | | | 5. | DWV at Test Voltage (1) |
| | | | | | | 6. | Humidity (3) |
| | | | | | | 7. | IR (4) |
| | | | | | | 8. | DWV at Test Voltage (1) |

***Row-to-Row***

| Group 5<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 6<br>NVACE-DP-5-4-X.X-A-1-1<br>2 Assemblies | | Group 7<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 8<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | |
|---|---|---|---|---|---|---|---|
| **Step** | **Description** | **Step** | **Description** | **Step** | **Description** | **Step** | **Description** |
| 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | IR (4) |
| | | | | | | 2. | DWV at Test Voltage (1) |
| | | | | | | 3. | Thermal Shock (5) - Non Standard |
| | | | | | | 4. | IR (4) |
| | | | | | | 5. | DWV at Test Voltage (1) |
| | | | | | | 6. | Humidity (3) |
| | | | | | | 7. | IR (4) |
| | | | | | | 8. | DWV at Test Voltage (1) |

# FLOWCHARTS Continued

***Pin-to-Ground***

| Group 9<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 10<br>NVACE-DP-5-4-X.X-A-1-1<br>2 Assemblies | | Group 11<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | | Group 12<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>2 Assemblies | |
|---|---|---|---|---|---|---|---|
| **Step** | **Description** | **Step** | **Description** | **Step** | **Description** | **Step** | **Description** |
| 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | DWV Breakdown (2) | 1. | IR (4) |
| | | | | | | 2. | DWV at Test Voltage (1) |
| | | | | | | 3. | Thermal Shock (5) - Non Standard |
| | | | | | | 4. | IR (4) |
| | | | | | | 5. | DWV at Test Voltage (1) |
| | | | | | | 6. | Humidity (3) |
| | | | | | | 7. | IR (4) |
| | | | | | | 8. | DWV at Test Voltage (1) |

(1) DWV at Test Voltage = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(3) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(4) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

(5) Thermal Shock = Other
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-40°C to +85°C)
Test Duration = A-3 (100 Cycles)

## Current Carrying Capacity

| Group 1<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>8 Pins Powered<br>Signal | | Group 2<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>16 Pins Powered<br>Signal | | Group 3<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>24 Pins Powered<br>Signal | | Group 4<br>NVACE-DP-5-4-X.X-A-1-1<br>NVACP-DP-1-4-XX.X-A-1-1<br>32 Pins Powered<br>Signal | |
|---|---|---|---|---|---|---|---|
| **Step** | **Description** | **Step** | **Description** | **Step** | **Description** | **Step** | **Description** |
| 1. | CCC (1)<br>Rows = 1<br>Number of Positions = 8 | 1. | CCC (1)<br>Rows = 2<br>Number of Positions = 8 | 1. | CCC (1)<br>Rows = 3<br>Number of Positions = 8 | 1. | CCC (1)<br>Rows = 4<br>Number of Positions = 8 |

(1) CCC = EIA-364-70
Method 2, Temperature Rise Versus Current Curve
(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

## FLOWCHARTS Continued

# Mechanical Shock/Random Vibration/LLCR

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
8 Assemblies

| Step | Description |
|---|---|
| 1. | LLCR (1) |
| 2. | Mechanical Shock (2) |
| 3. | Random Vibration (3) |
| 4. | LLCR (1)<br>Max Delta = 15 mOhm |

(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27
Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28
Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

# Mechanical Shock/Random Vibration/Event Detection

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
60 Points

| Step | Description |
|---|---|
| 1. | Nanosecond Event Detection (Mechanical Shock) (1) |
| 2. | Nanosecond Event Detection (Random Vibration) (2) |

(1) Nanosecond Event Detection (Mechanical Shock)
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Use EIA-364-27 for Mechanical Shock:
Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Use EIA-364-28 for Random Vibration:
Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

# FLOWCHARTS Continued

## Cable Pull

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACE 0 Degrees

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

Group 2
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACE 90 Degrees Vertical

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

Group 3
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACP 0 Degrees

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

Group 4
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACP 90 Degrees Vertical

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

Group 5
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACP 90 Degrees Lateral

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

Group 6
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACE 90 Degrees Lateral

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) |

(1) Cable Pull = EIA-364-38
Measure and Record Force Required to Failure
Failure = Discontinuity >1 microsecond at 10 ohms

# FLOWCHARTS Continued

## Cable Flex

Group 1
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
5 Assemblies
Circular Cable

| Step | Description |
|---|---|
| 1. | IR (3) |
| 2. | DWV at Test Voltage (2) |
| 3. | Cable Flex (1) |
| 4. | Visual Inspection |
| 5. | IR (3) |
| 6. | DWV at Test Voltage (2) |
| 7. | Rotate Cable 90° |
| 8. | Cable Flex (1) |
| 9. | Visual Inspection |
| 10. | IR (3) |
| 11. | DWV at Test Voltage (2) |

Group 2
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
5 Assemblies
Circular Cable

| Step | Description |
|---|---|
| 1. | Cable Flex (1) |
| 2. | Visual Inspection |
| 3. | Rotate Cable 90° |
| 4. | Cable Flex (1) |
| 5. | Visual Inspection |

Group 2
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACP Circular Cable
*Note: Use test voltage from IR/DWV.*

| Step | Description |
|---|---|
| 1. | IR (3) |
| 2. | DWV at Test Voltage (2) |
| 3. | Cable Flex (1) |
| 4. | Visual Inspection |
| 5. | IR (3) |
| 6. | DWV at Test Voltage (2) |
| 7. | Rotate Cable 90° |
| 8. | Cable Flex (1) |
| 9. | Visual Inspection |
| 10. | IR (3) |
| 11. | DWV at Test Voltage (2) |

Group 3
NVACE-DP-5-4-X.X-A-1-1
NVACP-DP-1-4-XX.X-A-1-1
3 Assemblies
NVACE Circular Cable
*Note: Use test voltage from IR/DWV.*

| Step | Description |
|---|---|
| 1. | Cable Flex (1) |
| 2. | Visual Inspection |
| 3. | Rotate Cable 90° |
| 4. | Cable Flex (1) |
| 5. | Visual Inspection |

(1) Cable Flex = EIA-364-41
Circular Jacket Cable - to be tested 90° each direction (180° total)
Flat Cable - to be tested 70° each direction (140° total)
Monitor continuity during flex testing
Failure = Discontinuity >1 microsecond at 10 ohms

(2) DWV at Test Voltage = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(3) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

## FLOWCHARTS Continued

### Latch Durability

Group 1

NVACE-DP-5-4-X.X-A-1-1

8 Assemblies

| Step | Description |
| --- | --- |
| 1. | Photo<br>*Note: Mate the connectors. Take a photo of the latch being engaged. Manually pull on the connectors to make sure the latch is engaged. Then unmate and proceed to cycling.* |
| 2. | Mating/Unmating Force (2) |
| 3. | Cycles<br>Quantity = 100 Cycles<br>*Note: Manually pull back the LTC-55 orange pull strap for each cycle. Do not mate the connectors during each cycle.* |
| 4. | Mating/Unmating Force (2) |
| 5. | Photo<br>*Note: Take a picture of the latch being engaged.* |
| 6. | Cable Pull (1)<br>*Note: With the latch still engaged, pull at 0° to failure.* |

(1) Cable Pull = EIA-364-38
Measure and Record Force Required to Failure
Failure = Discontinuity >1 microsecond at 10 ohms

(2) Mating/Unmating Force = EIA-364-13

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### THERMAL SHOCK:

1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition 1: -40°C to +85°C
3) Test Time: ½ hour dwell at each temperature extreme
4) Number of Cycles: 100
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stressing in the mated condition.

### 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 $G^2$ / Hz
4) G 'RMS': 7.56
5) Frequency: 50 to 2000 Hz
6) Duration: 2.0 Hours per axis (3 axis total)

### NANOSECOND-EVENT DETECTION:

1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
2) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### 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.

### 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 +1000 mOhms: ----------Unstable
    f. >+1000 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. <= +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 +1000 mOhms: ----------Unstable
    f. >+1000 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 inch 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 $50^{o}$ C
        ix. The final LLCR shall be conducted within 1 hour after drying.

## ATTRIBUTE DEFINITIONS Continued

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 four temperature points are reported:
    a. Ambient
    b. $85^o$ C
    c. $95^o$ C
    d. $115^o$ C
8) Typically, neighboring contacts (in close proximity to maximize heat buildup) 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.

### 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 Continued

The following is a brief, simplified description of attributes

### 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 1000 megohms.

### DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:
    a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts 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).

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### CABLE PULL:

1) Secure cable near center and pull on connector
    a. At 0 Degrees
    b. At 90 Degrees

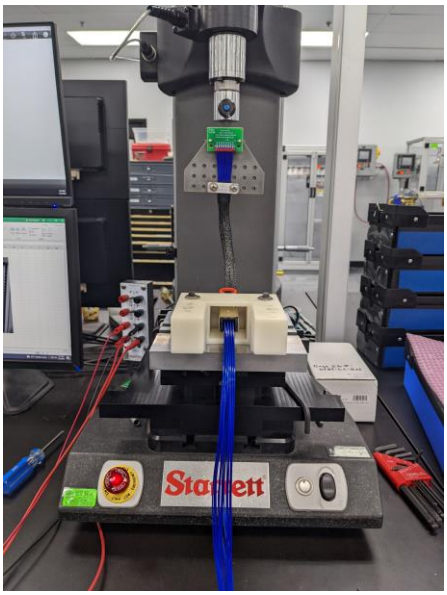



Fig. 1
90° Connector pull, notice the electrical continuity hook-up wires.

### CABLE FLEX:

1) Oscillate and monitor electrical continuity for open circuit indication.
    a. ± 70° Flex Mode, bend up to 500 cycles. 32 oz load on NVACE cable end and 20 oz load on NVACP cable end.

Fig. 2
(Typical set-up)

# RESULTS

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

- **CCC for a 30°C Temperature Rise----------1.17 A per contact with 8 contacts (8x1) powered**
- **CCC for a 30°C Temperature Rise----------0.92 A per contact with 16 contacts (8x2) powered**
- **CCC for a 30°C Temperature Rise----------0.83 A per contact with 24 contacts (8x3) powered**
- **CCC for a 30°C Temperature Rise----------0.74 A per contact with 32 contacts (8x4) powered**

## Mating – Unmating Forces

### Thermal Aging Group

- **Initial**
  - **Mating**
    - **Min ---------- 3.98 Lbs**
    - **Max---------- 5.75 Lbs**
  - **Unmating**
    - **Min ---------- 1.17 Lbs**
    - **Max---------- 1.81 Lbs**
- **After Thermal**
  - **Mating**
    - **Min ---------- 2.11 Lbs**
    - **Max---------- 2.91 Lbs**
  - **Unmating**
    - **Min ---------- 1.11 Lbs**
    - **Max---------- 1.57 Lbs**

### Latch Durability Force

- **Initial**
  - **Mating**
    - **Min ---------- 4.21 Lbs**
    - **Max---------- 6.03 Lbs**
  - **Unmating**
    - **Min ---------- 1.19 Lbs**
    - **Max---------- 1.69 Lbs**
- **After 100 Mating Cycles**
    - **Min ---------- 4.13 Lbs**
    - **Max---------- 6.03 Lbs**
  - **Unmating**
    - **Min ---------- 1.23 Lbs**
    - **Max---------- 1.69 Lbs**

## RESULTS Continued

### Mating – Unmating Forces

**Mating-Unmating Durability Group**

- **Initial**
  - **Mating**
    - **Min ---------- 3.84 Lbs**
    - **Max---------- 5.75 Lbs**
  - **Unmating**
    - **Min ---------- 1.13 Lbs**
    - **Max---------- 1.84 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 3.95 Lbs**
    - **Max---------- 5.87 Lbs**
  - **Unmating**
    - **Min ---------- 1.18 Lbs**
    - **Max---------- 1.89 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 3.94 Lbs**
    - **Max---------- 5.67 Lbs**
  - **Unmating**
    - **Min ---------- 1.26 Lbs**
    - **Max---------- 2.44 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 3.96 Lbs**
    - **Max---------- 6.22 Lbs**
  - **Unmating**
    - **Min ---------- 1.27 Lbs**
    - **Max---------- 2.83 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 3.97 Lbs**
    - **Max---------- 6.67 Lbs**
  - **Unmating**
    - **Min ---------- 1.29 Lbs**
    - **Max---------- 2.98 Lbs**
- **Humidity**
  - **Mating**
    - **Min ---------- 3.05 Lbs**
    - **Max---------- 3.55 Lbs**
  - **Unmating**
    - **Min ---------- 1.11 Lbs**
    - **Max---------- 1.44 Lbs**

## RESULTS Continued

### Cable Pull force

**NVACP**

- **0° Pull**
  - **Min----------29.32 lbs**
  - **Max ----------33.01 lbs**
- **90° Lateral Pull**
  - **Min----------31.33 lbs**
  - **Max ----------33.64 lbs**
- **90° Vertical Pull**
  - **Min----------28.12 lbs**
  - **Max ----------32.99 lbs**

**NVACE**

- **0° Pull**
  - **Min----------19.18 lbs**
  - **Max ----------21.72 lbs**
- **90° Lateral Pull**
  - **Min----------22.51 lbs**
  - **Max ----------64.58 lbs**
- **90° Vertical Pull**
  - **Min----------35.18 lbs**
  - **Max ----------57.94 lbs**

### Normal Force deflection

**NVACP Signal-0.0138 Inch**

- **Initial**
  - **Min---------- 106.60 gf Set ----- 0.0008 in**
  - **Max ---------- 114.20 gf Set ----- 0.0011 in**
- **Thermal**
  - **Min----------84.10 gf Set----- 0.0012 in**
  - **Max ----------99.90 gf Set----- 0.0023 in**

**NVACP MFBL-0.0066 Inch**

- **Initial**
  - **Min----------92.30 gf Set ----- 0.0001 in**
  - **Max ---------- 111.80 gf Set ----- 0.0002 in**
- **Thermal**
  - **Min----------60.60 gf Set----- 0.0004in**
  - **Max ---------- 114.40 gf Set----- 0.0016 in**

**NVACE Signal-0.0138 Inch**

- **Initial**
  - **Min----------80.50 gf Set ----- 0.0006 in**
  - **Max ----------86.60 gf Set ----- 0.0010 in**
- **Thermal**
  - **Min----------61.00 gf Set----- 0.0026 in**
  - **Max ----------69.80 gf Set----- 0.0043 in**

**NVACE Ground-0.0098 Inch**

- **Initial**
  - **Min----------85.00 gf Set ----- 0.0002 in**
  - **Max ----------92.10 gf Set ----- 0.0005 in**
- **Thermal**
  - **Min----------62.80 gf Set----- 0.0012 in**
  - **Max ----------78.80 gf Set----- 0.0029 in**

## RESULTS Continued

**NVACE MFBL-0.0098 Inch**

- **Initial**
  - **Min----------66.70 gf Set ----- 0.0000 in**
  - **Max ----------69.40 gf Set ----- 0.0002 in**
- **Thermal**
  - **Min----------41.00 gf Set----- 0.0008 in**
  - **Max ----------61.50 gf Set----- 0.0037 in**

## Cable Flex:

### Insulation Resistance minimums, IR

**Pin to Pin**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After Rotate 90-degree Flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Row to Row**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After Rotate 90-degree Flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Pin to Ground**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After Rotate 90-degree Flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**

### Dielectric Withstanding Voltage minimums, DWV

- **Test Voltage ----------632 VAC**

**Pin to Pin**

- **Initial DWV ----------Passed**
- **After 500 Flex cycles DWV ----------Passed**
- **After Rotate 90-degree Flex cycles ----------Passed**

**Row to Row**

- **Initial DWV ----------Passed**
- **After 500 Flex cycles DWV ----------Passed**
- **After Rotate 90-degree Flex cycles ----------Passed**

**Pin to Ground**

- **Initial DWV ----------Passed**
- **After 500 Flex cycles DWV ----------Passed**
- **After Rotate 90-degree Flex cycles ----------Passed**

## RESULTS Continued

### Insulation Resistance minimums, IR

**Pin to Pin**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

**Row to Row**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

**Pin to Ground**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

### Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 842VAC**
  - **Test Voltage ---------- 632VAC**
  - **Working Voltage ---------- 211 VAC**

**Pin to Pin**

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

**Row to Row**

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

**Pin to Ground**

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

## RESULTS Continued

**LLCR Gas Tight Group (264 LLCR test points)**

**Signal**

- **Initial ---------- 209.54 mOhms Max**

**Ground**

- **Initial ---------- 2.94 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 264 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

**LLCR Thermal Aging Group (264 LLCR test points)**

**Signal**

- **Initial ---------- 208.16 mOhms Max**

**Ground**

- **Initial ---------- 3.14 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 254 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 10 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

**LLCR Mating/Unmating Durability Group (264 LLCR test points)**

**Signal**

- **Initial ---------- 206.86 mOhms Max**

**Ground**

- **Initial ---------- 3.2 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 264 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 264 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 234 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 30 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

## RESULTS Continued

**LLCR Shock & Vibration Group (264 LLCR test points)**

**Signal**

- **Initial ---------- 208.61 mOhms Max**

**Ground**

- **Initial ---------- 2.93 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 259 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

**Mechanical Shock & Random Vibration:**

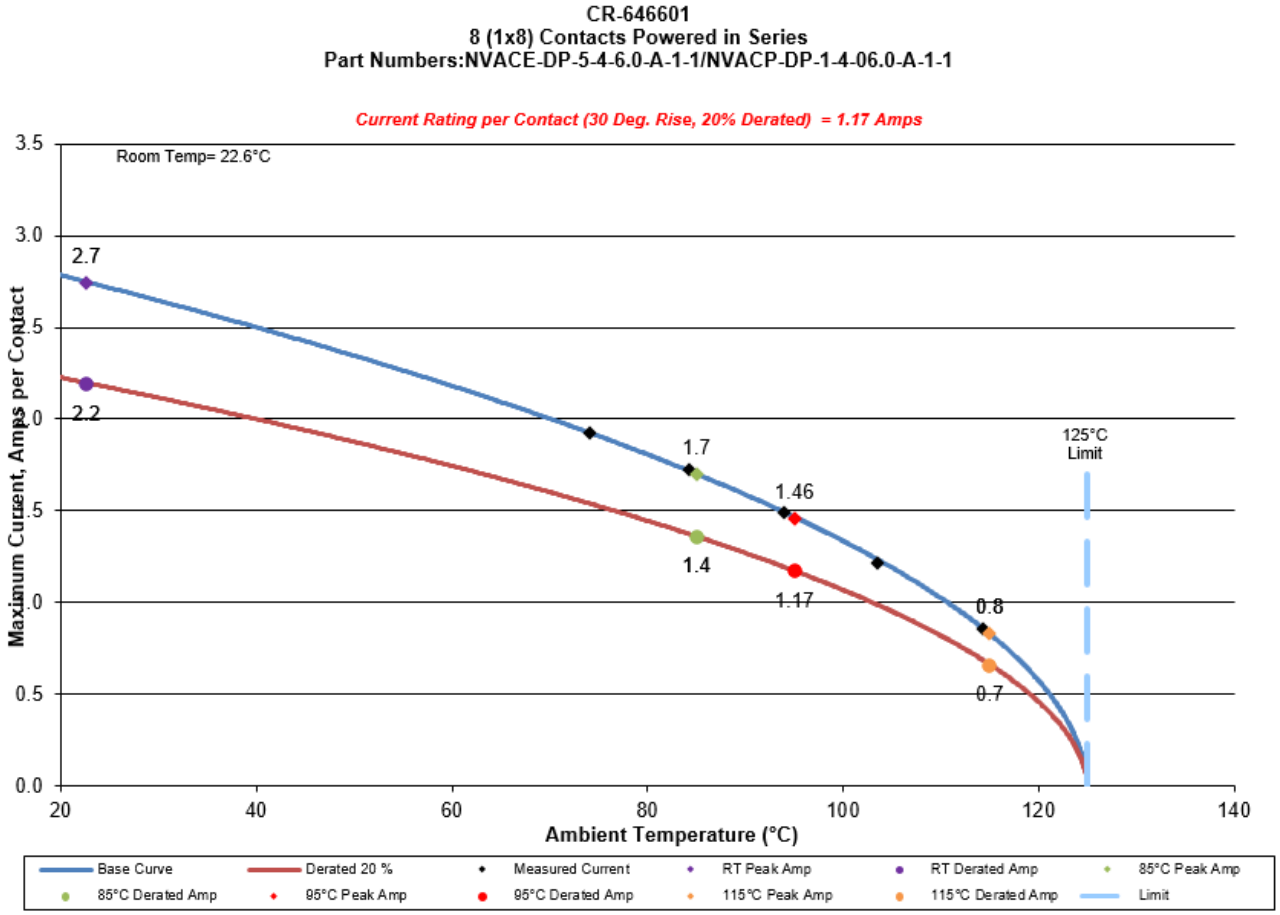
- **Shock**
  - **No Damage ---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**
- **Vibration**
  - **No Damage ---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**

## DATA SUMMARIES

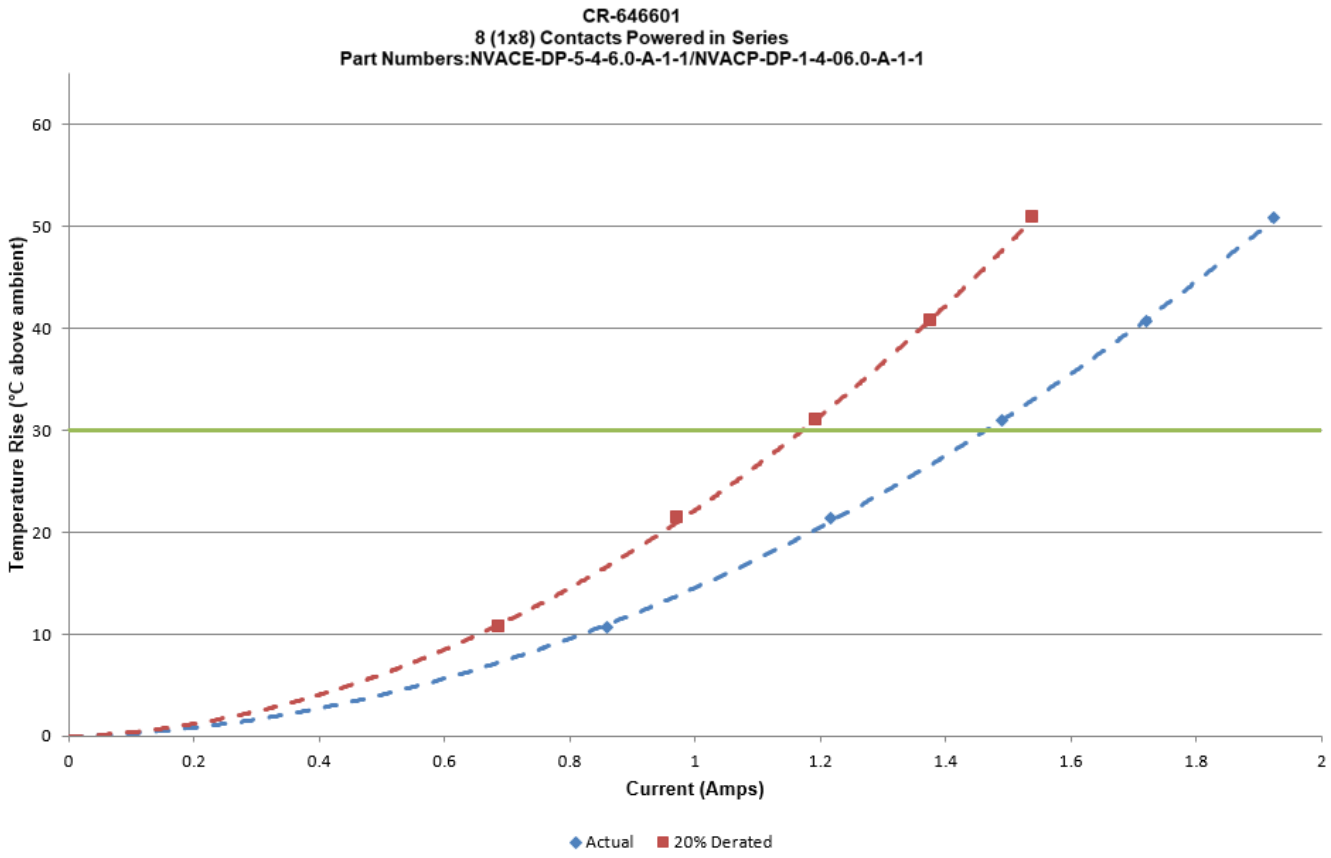
**TEMPERATURE RISE (Current Carrying Capacity, CCC):**

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 8 adjacent conductors/contacts powered

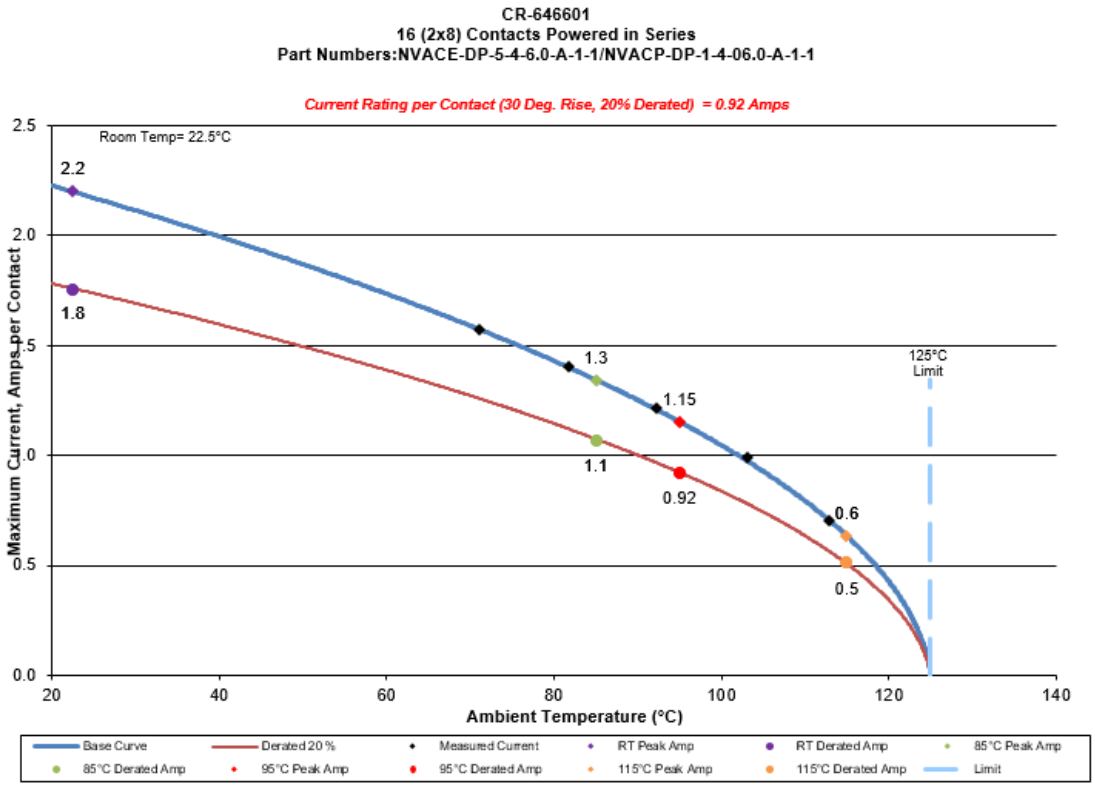


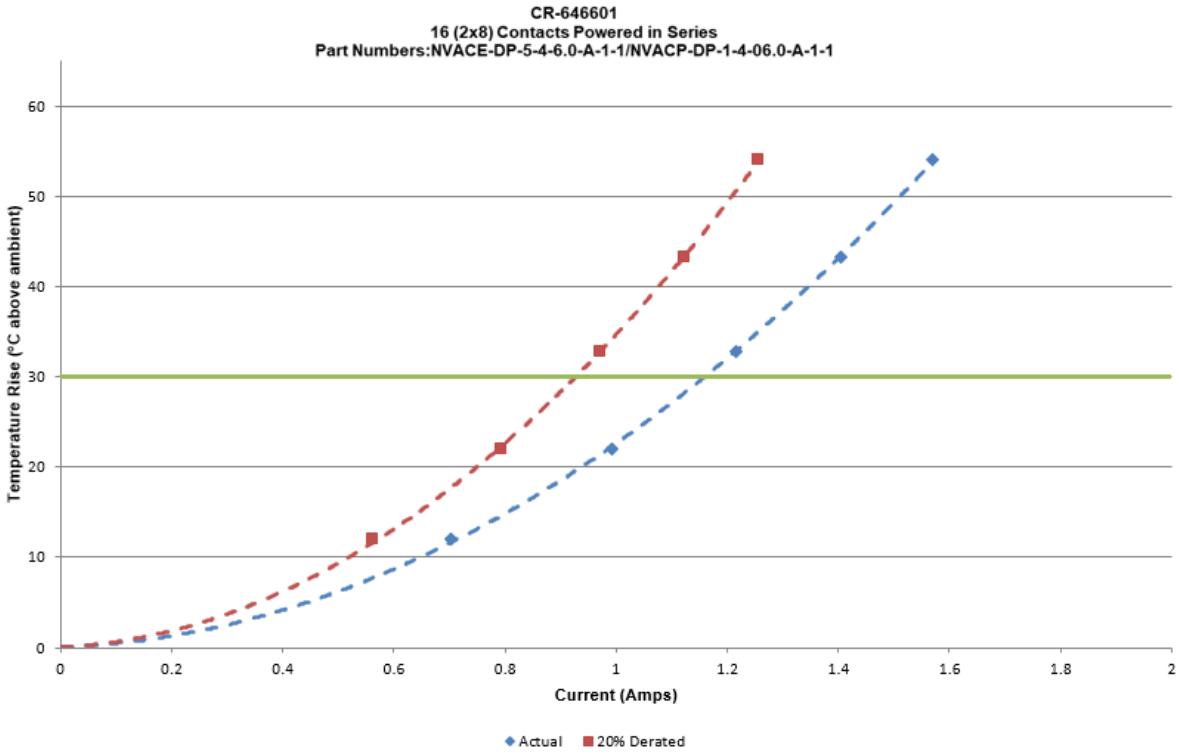
## DATA SUMMARIES Continued



## DATA SUMMARIES Continued

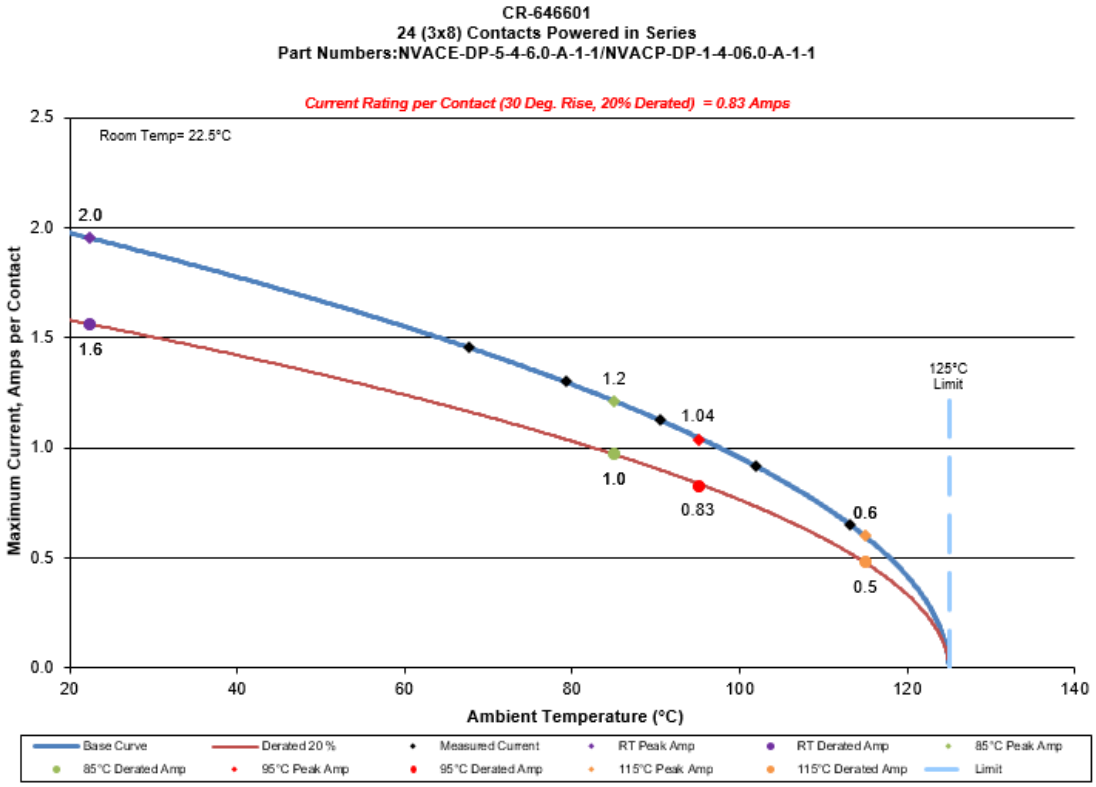
b. Linear configuration with 16 adjacent conductors/contacts powered

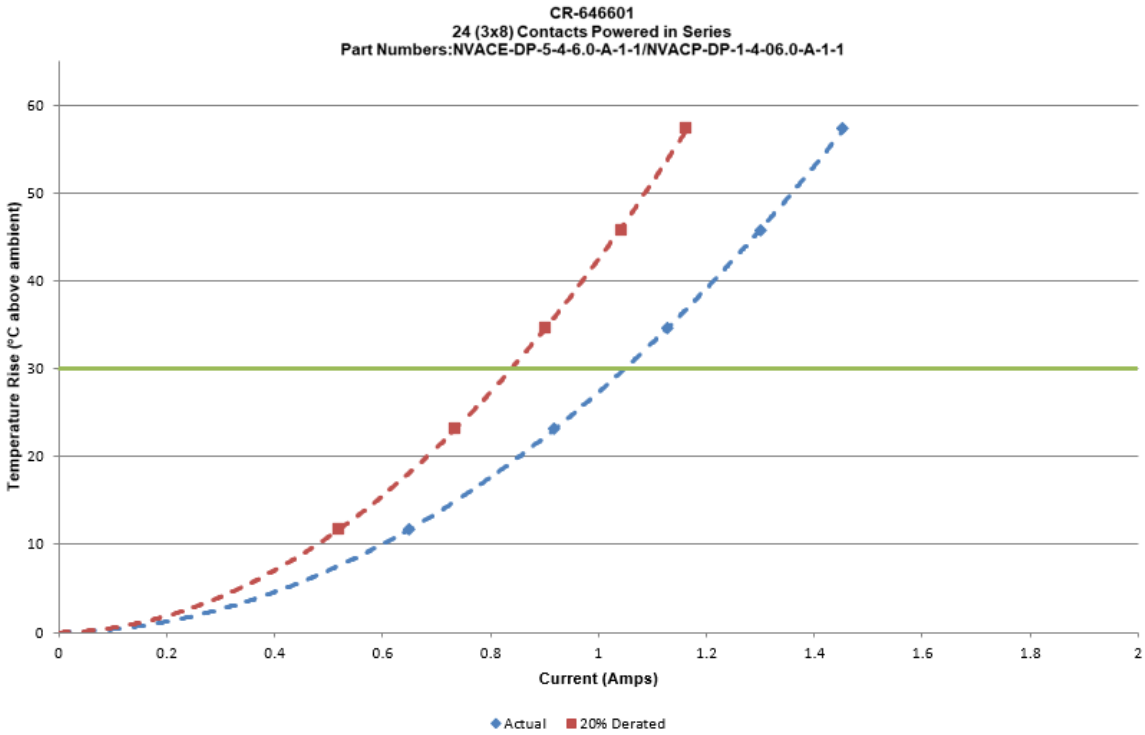


## DATA SUMMARIES Continued

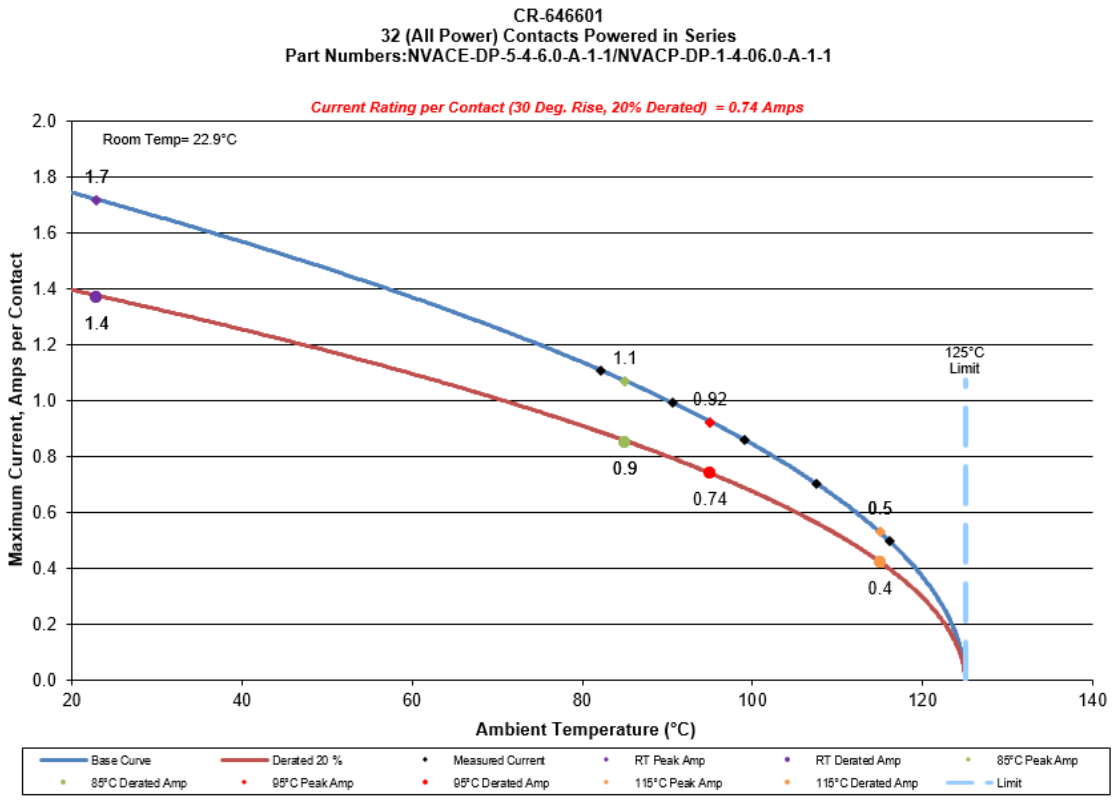
c. Linear configuration with 24 adjacent conductors/contacts powered

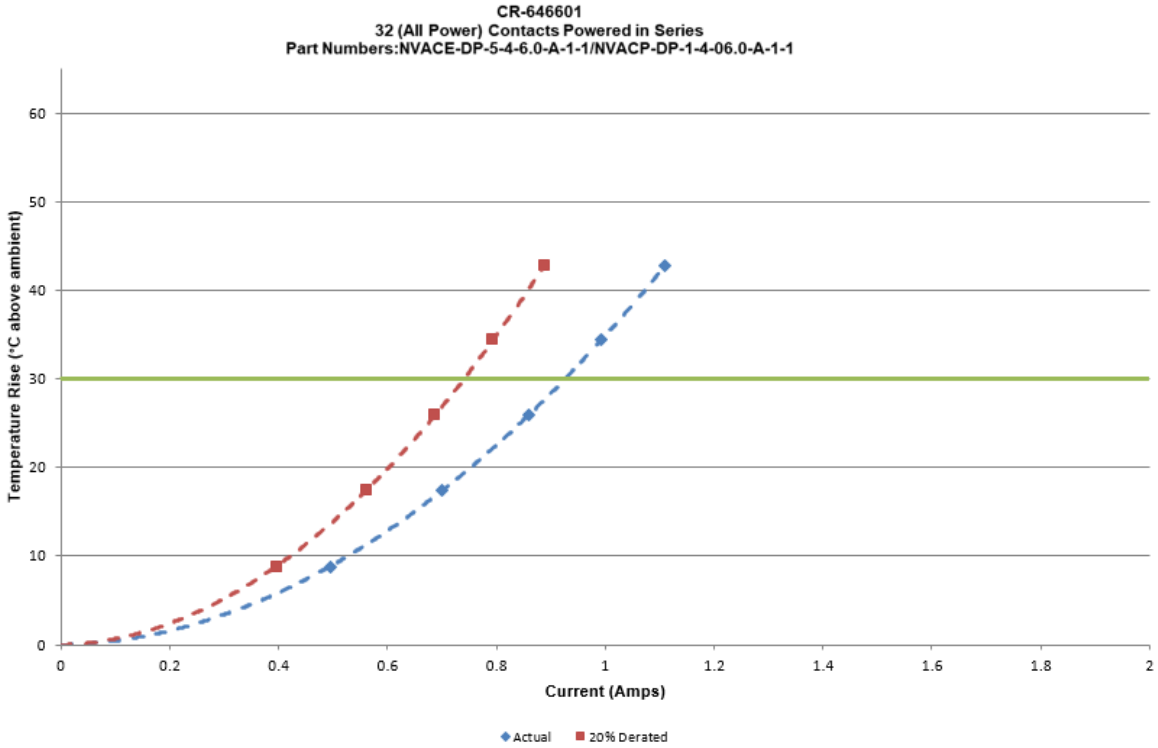


## DATA SUMMARIES Continued

d. Linear configuration with all adjacent conductors/contacts powered



# DATA SUMMARIES Continued

## MATING-UNMATING FORCE:

**Thermal Aging Group**

| | Initial | | | | After Thermals | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 17.70 | 3.98 | 5.20 | 1.17 | 9.39 | 2.11 | 4.94 | 1.11 |
| Maximum | 25.58 | 5.75 | 8.05 | 1.81 | 12.94 | 2.91 | 6.98 | 1.57 |
| **Average** | 22.30 | **5.01** | 6.35 | **1.43** | 11.14 | **2.50** | 5.95 | **1.34** |
| St Dev | 2.70 | 0.61 | 0.93 | 0.21 | 1.32 | 0.30 | 0.58 | 0.13 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

## Latch Durability Force

| | Initial | | | | After 100 Latch Cycles | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 18.73 | 4.21 | 5.29 | 1.19 | 18.37 | 4.13 | 5.47 | 1.23 |
| Maximum | 26.82 | 6.03 | 7.52 | 1.69 | 26.82 | 6.03 | 7.52 | 1.69 |
| **Average** | 21.93 | **4.93** | 6.49 | **1.46** | 22.57 | **5.08** | 6.61 | **1.49** |
| St Dev | 3.14 | 0.71 | 0.96 | 0.22 | 2.55 | 0.57 | 0.76 | 0.17 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

# DATA SUMMARIES Continued

**Mating-Unmating Durability Group**

| | Initial | | | | 25 Cycles | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 17.08 | 3.84 | 5.03 | 1.13 | 17.57 | 3.95 | 5.25 | 1.18 |
| Maximum | 25.58 | 5.75 | 8.18 | 1.84 | 26.11 | 5.87 | 8.41 | 1.89 |
| **Average** | 21.40 | **4.81** | 6.32 | **1.42** | 22.62 | **5.09** | 6.70 | **1.51** |
| St Dev | 2.88 | 0.65 | 1.15 | 0.26 | 2.56 | 0.57 | 1.28 | 0.29 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| | 50 Cycles | | | | 75 Cycles | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 17.53 | 3.94 | 5.60 | 1.26 | 17.61 | 3.96 | 5.65 | 1.27 |
| Maximum | 25.22 | 5.67 | 10.85 | 2.44 | 27.67 | 6.22 | 12.59 | 2.83 |
| **Average** | 22.46 | **5.05** | 8.06 | **1.81** | 23.02 | **5.18** | 8.55 | **1.92** |
| St Dev | 2.70 | 0.61 | 1.54 | 0.35 | 3.43 | 0.77 | 2.00 | 0.45 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| | 100 Cycles | | | | After Humidity | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 17.66 | 3.97 | 5.74 | 1.29 | 13.57 | 3.05 | 4.94 | 1.11 |
| Maximum | 29.67 | 6.67 | 13.26 | 2.98 | 15.79 | 3.55 | 6.41 | 1.44 |
| **Average** | 24.00 | **5.40** | 8.97 | **2.02** | 14.62 | **3.29** | 5.59 | **1.26** |
| St Dev | 4.02 | 0.90 | 2.14 | 0.48 | 0.80 | 0.18 | 0.52 | 0.12 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

## DATA SUMMARIES Continued

### Cable Pull:

**NVACP**

**0° Pull**

| | Force (lbs) |
|---|---|
| Minimum | 29.32 |
| Maximum | 33.01 |
| Average | 31.25 |

**90° Lateral Pull**

| | Force (lbs) |
|---|---|
| Minimum | 31.11 |
| Maximum | 33.64 |
| Average | 32.03 |

**90° Vertical Pull**

| | Force (lbs) |
|---|---|
| Minimum | 28.12 |
| Maximum | 32.99 |
| Average | 30.43 |

**NVACE**

**0° Pull**

| | Force (lbs) |
|---|---|
| Minimum | 19.18 |
| Maximum | 21.72 |
| Average | 20.21 |

**90° Lateral Pull**

| | Force (lbs) |
|---|---|
| Minimum | 22.51 |
| Maximum | 64.58 |
| Average | 51.49 |

**90° Vertical Pull**

| | Force (lbs) |
|---|---|
| Minimum | 35.18 |
| Maximum | 57.94 |
| Average | 46.61 |

## DATA SUMMARIES Continued

### Cable Flex:

**Insulation Resistance minimums, IR**

| Pin to Pin | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |
| **After 90 degree rotate Flex Cycles** | 45000 |

| Row to Row | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |
| **After 90 degree rotate Flex Cycles** | 45000 |

| Pin to Ground | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |
| **After 90 degree rotate Flex Cycles** | 45000 |

**Dielectric Withstanding Voltage minimums, DWV**

| Voltage Rating Summary | |
|---|---|
| **Minimum** | |
| **Break Down Voltage** | 842 |
| **Test Voltage** | 632 |
| **Working Voltage** | 211 |

| Pin to Pin | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |
| **After 90 degree rotate Flex Cycles** | Passed |

| Row to Row | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |
| **After 90 degree rotate Flex Cycles** | Passed |

| Pin to Ground | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |
| **After 90 degree rotate Flex Cycles** | Passed |

## DATA SUMMARIES Continued

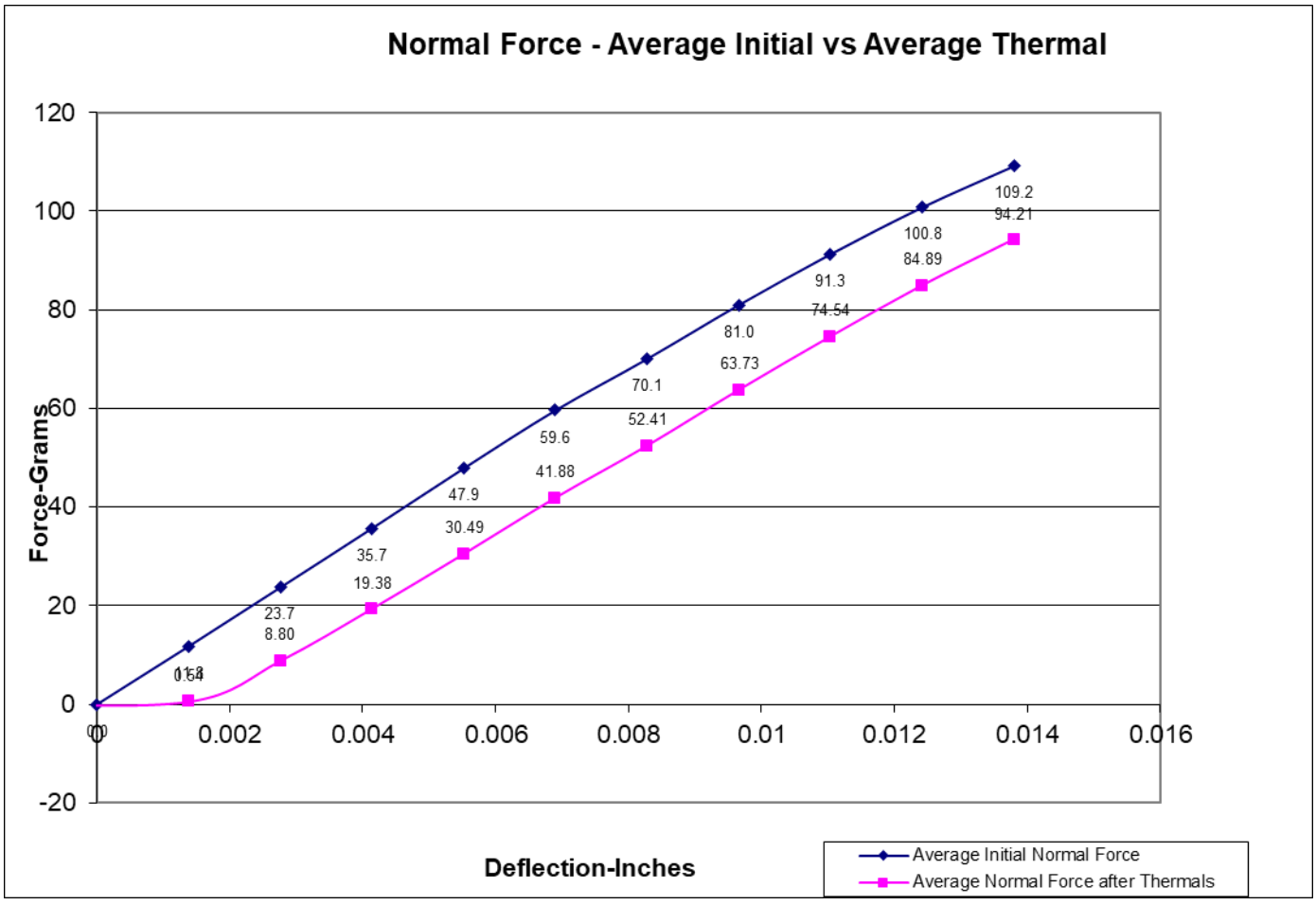
### NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

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.

**NVACP Signal:**

| Initial | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0014** | **0.0028** | **0.0041** | **0.0055** | **0.0069** | **0.0083** | **0.0097** | **0.0110** | **0.0124** | **0.0138** | ***SET*** |
| **Averages** | 11.78 | 23.73 | 35.71 | 47.89 | 59.64 | 70.08 | 81.01 | 91.33 | 100.84 | 109.19 | 0.0009 |
| **Min** | 11.40 | 23.10 | 34.50 | 46.40 | 58.00 | 67.60 | 78.50 | 88.80 | 98.20 | 106.60 | 0.0008 |
| **Max** | 12.20 | 24.30 | 36.70 | 49.20 | 61.10 | 72.00 | 83.60 | 94.70 | 104.50 | 114.20 | 0.0011 |
| **St. Dev** | 0.266 | 0.403 | 0.755 | 1.006 | 1.018 | 1.401 | 1.723 | 2.130 | 2.463 | 2.989 | 0.0001 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| After Thermals | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0014** | **0.0028** | **0.0041** | **0.0055** | **0.0069** | **0.0083** | **0.0097** | **0.0110** | **0.0124** | **0.0138** | ***SET*** |
| **Averages** | 0.54 | 8.80 | 19.38 | 30.49 | 41.88 | 52.41 | 63.73 | 74.54 | 84.89 | 94.21 | 0.0018 |
| **Min** | -1.00 | 4.60 | 14.60 | 24.70 | 35.20 | 44.80 | 55.30 | 65.60 | 75.70 | 84.10 | 0.0012 |
| **Max** | 2.90 | 13.50 | 25.20 | 36.50 | 47.70 | 57.60 | 68.60 | 78.90 | 89.60 | 99.90 | 0.0023 |
| **St. Dev** | 1.620 | 3.682 | 4.212 | 4.574 | 4.659 | 4.710 | 4.843 | 5.045 | 5.207 | 5.801 | 0.0004 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

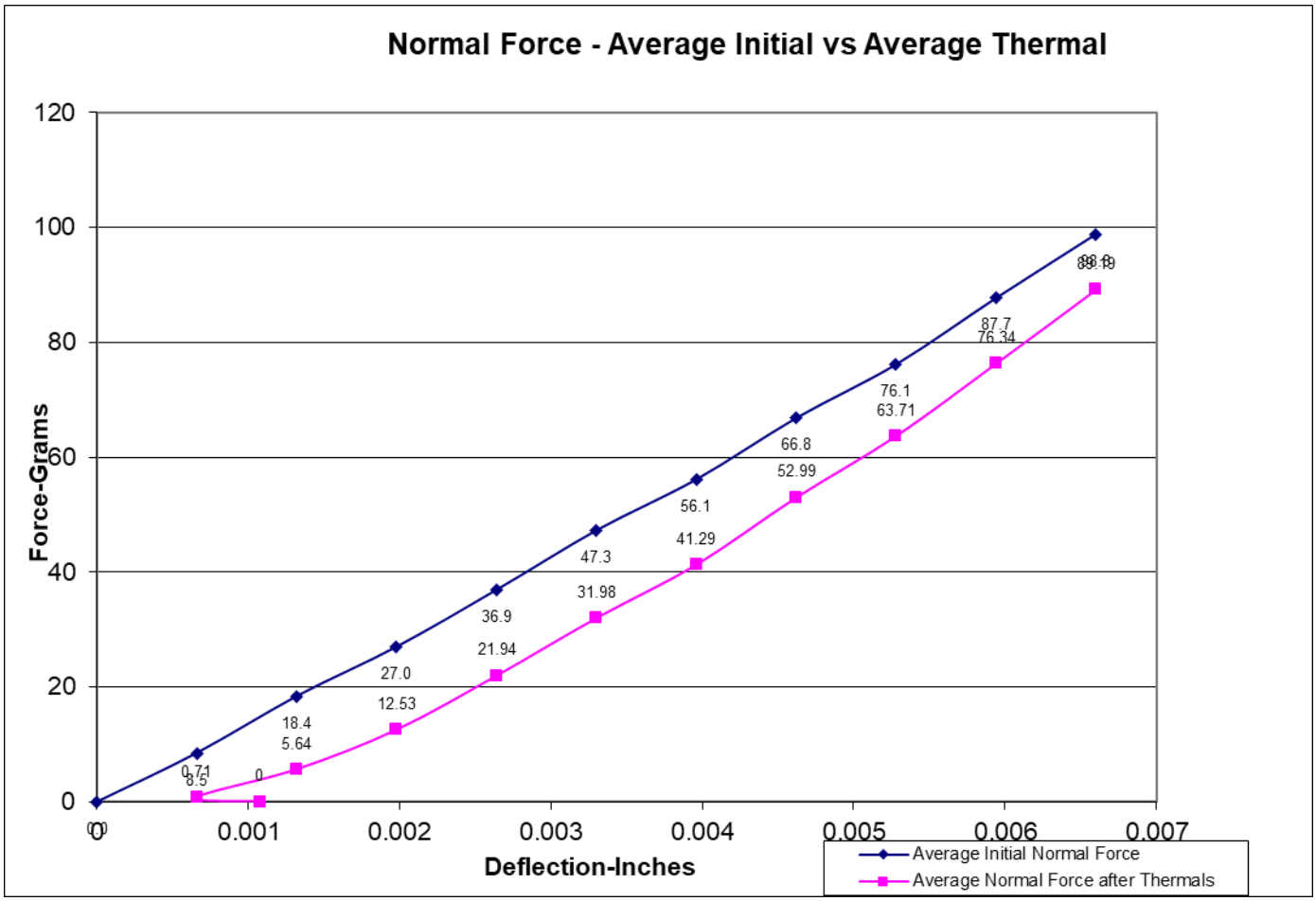


## DATA SUMMARIES Continued

**NVACP MFBL:**

| Initial | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0007** | **0.0013** | **0.0020** | **0.0026** | **0.0033** | **0.0040** | **0.0046** | **0.0053** | **0.0059** | **0.0066** | ***SET*** |
| **Averages** | 8.51 | 18.40 | 27.00 | 36.90 | 47.25 | 56.11 | 66.80 | 76.14 | 87.69 | 98.79 | 0.0001 |
| **Min** | 7.80 | 16.90 | 24.30 | 33.20 | 44.30 | 54.20 | 65.20 | 73.30 | 83.00 | 92.30 | 0.0001 |
| **Max** | 9.00 | 19.00 | 28.20 | 38.10 | 48.40 | 59.10 | 72.50 | 84.60 | 98.80 | 111.80 | 0.0002 |
| **St. Dev** | 0.364 | 0.713 | 1.231 | 1.612 | 1.286 | 1.443 | 2.389 | 3.913 | 5.435 | 6.818 | 0.0001 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| After Thermals | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0007** | **0.0013** | **0.0020** | **0.0026** | **0.0033** | **0.0040** | **0.0046** | **0.0053** | **0.0059** | **0.0066** | ***SET*** |
| **Averages** | 0.71 | 5.64 | 12.53 | 21.94 | 31.98 | 41.29 | 52.99 | 63.71 | 76.34 | 89.19 | 0.0010 |
| **Min** | -1.20 | -1.20 | 3.20 | 12.80 | 22.30 | 29.80 | 36.80 | 43.70 | 51.90 | 60.60 | 0.0004 |
| **Max** | 5.10 | 15.00 | 23.40 | 34.10 | 47.80 | 59.90 | 73.90 | 85.60 | 101.10 | 114.40 | 0.0016 |
| **St. Dev** | 2.768 | 6.530 | 7.521 | 7.933 | 9.997 | 12.071 | 14.369 | 15.976 | 17.884 | 19.207 | 0.0005 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

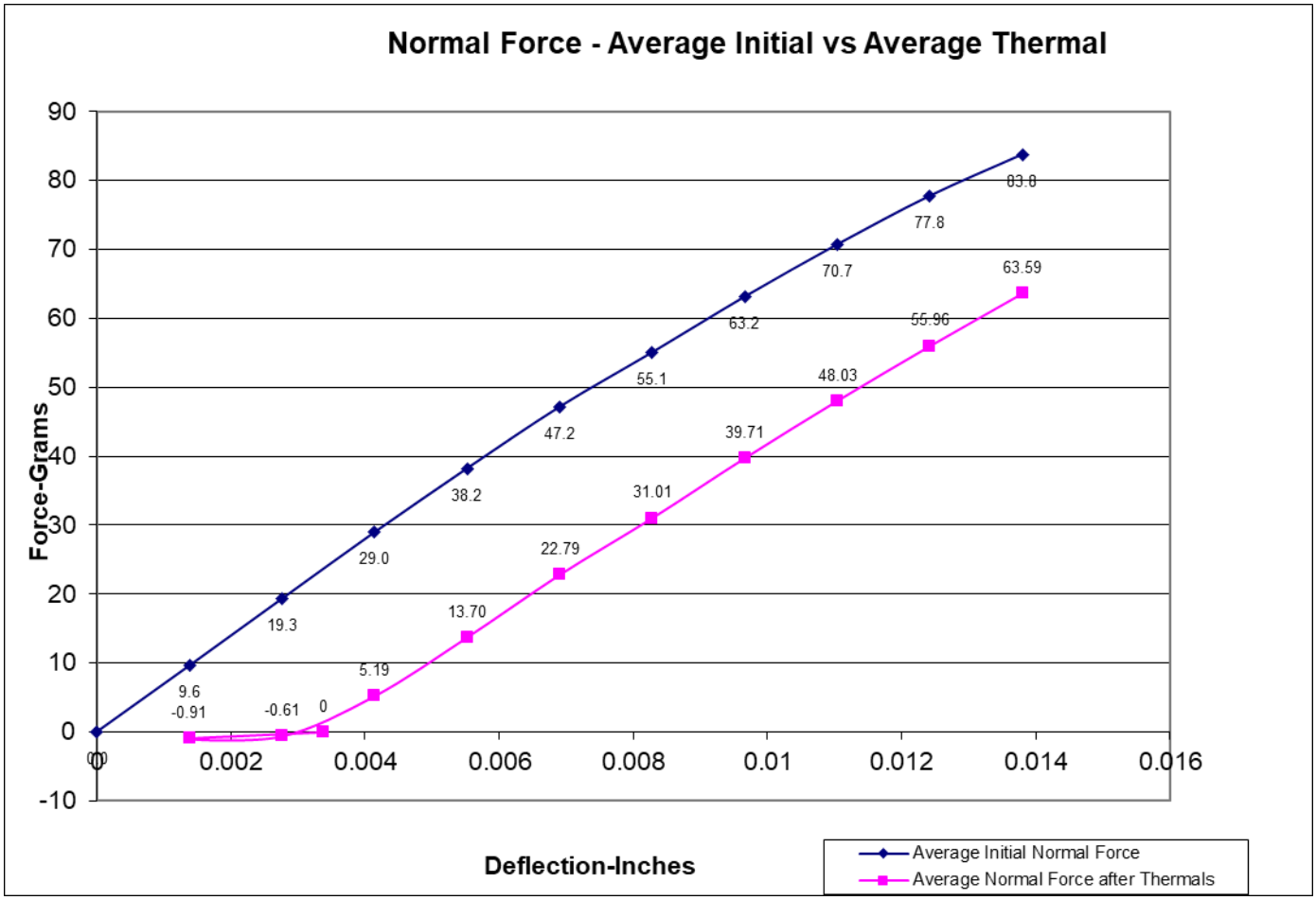


## DATA SUMMARIES Continued

**NVACE Signal:**

| Initial | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0014** | **0.0028** | **0.0041** | **0.0055** | **0.0069** | **0.0083** | **0.0097** | **0.0110** | **0.0124** | **0.0138** | ***SET*** |
| **Averages** | 9.61 | 19.31 | 28.96 | 38.23 | 47.16 | 55.06 | 63.15 | 70.74 | 77.79 | 83.80 | 0.0008 |
| **Min** | 9.40 | 18.50 | 28.20 | 37.10 | 45.70 | 53.20 | 61.00 | 68.20 | 75.00 | 80.50 | 0.0006 |
| **Max** | 10.30 | 21.00 | 31.00 | 40.90 | 50.10 | 58.00 | 66.00 | 73.30 | 80.20 | 86.60 | 0.0010 |
| **St. Dev** | 0.309 | 0.747 | 0.881 | 1.200 | 1.391 | 1.477 | 1.611 | 1.702 | 1.770 | 2.038 | 0.0001 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| After Thermals | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0014** | **0.0028** | **0.0041** | **0.0055** | **0.0069** | **0.0083** | **0.0097** | **0.0110** | **0.0124** | **0.0138** | ***SET*** |
| **Averages** | -0.91 | -0.61 | 5.19 | 13.70 | 22.79 | 31.01 | 39.71 | 48.03 | 55.96 | 63.59 | 0.0035 |
| **Min** | -1.00 | -1.00 | 0.20 | 7.80 | 16.90 | 25.60 | 35.30 | 44.90 | 53.10 | 61.00 | 0.0026 |
| **Max** | -0.90 | 1.50 | 8.90 | 17.30 | 26.00 | 33.30 | 43.30 | 52.50 | 61.40 | 69.80 | 0.0043 |
| **St. Dev** | 0.035 | 0.854 | 2.635 | 3.030 | 2.886 | 2.561 | 2.357 | 2.290 | 2.615 | 2.809 | 0.0005 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

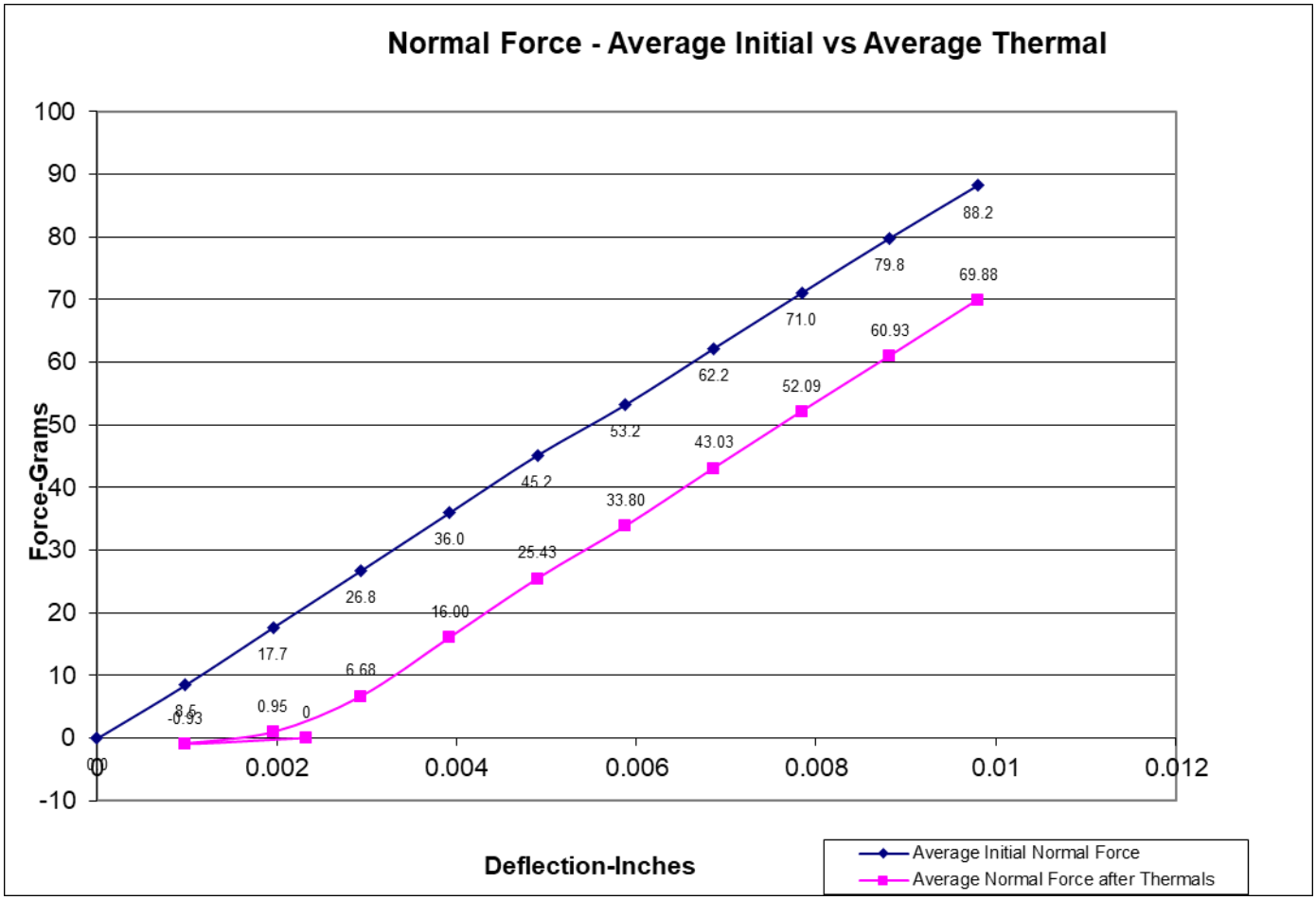


## DATA SUMMARIES Continued

**NVACE Ground:**

| Initial | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0010** | **0.0020** | **0.0029** | **0.0039** | **0.0049** | **0.0059** | **0.0069** | **0.0078** | **0.0088** | **0.0098** | ***SET*** |
| **Averages** | 8.49 | 17.69 | 26.78 | 35.96 | 45.15 | 53.21 | 62.16 | 71.03 | 79.78 | 88.18 | 0.0003 |
| **Min** | 7.90 | 16.90 | 25.70 | 34.60 | 43.10 | 51.30 | 60.00 | 68.30 | 76.90 | 85.00 | 0.0002 |
| **Max** | 8.90 | 18.60 | 28.10 | 37.40 | 47.10 | 55.50 | 64.90 | 73.90 | 83.00 | 92.10 | 0.0005 |
| **St. Dev** | 0.344 | 0.579 | 0.828 | 1.089 | 1.443 | 1.678 | 1.839 | 1.932 | 2.156 | 2.352 | 0.0001 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| After Thermals | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0010** | **0.0020** | **0.0029** | **0.0039** | **0.0049** | **0.0059** | **0.0069** | **0.0078** | **0.0088** | **0.0098** | ***SET*** |
| **Averages** | -0.93 | 0.95 | 6.68 | 16.00 | 25.43 | 33.80 | 43.03 | 52.09 | 60.93 | 69.88 | 0.0022 |
| **Min** | -1.00 | -1.00 | 0.30 | 9.40 | 18.60 | 27.10 | 36.20 | 45.10 | 53.80 | 62.80 | 0.0012 |
| **Max** | -0.90 | 7.30 | 16.90 | 26.50 | 35.70 | 43.70 | 52.80 | 61.50 | 70.70 | 78.80 | 0.0029 |
| **St. Dev** | 0.046 | 3.036 | 6.074 | 5.966 | 5.792 | 5.529 | 5.334 | 5.171 | 5.129 | 4.836 | 0.0006 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

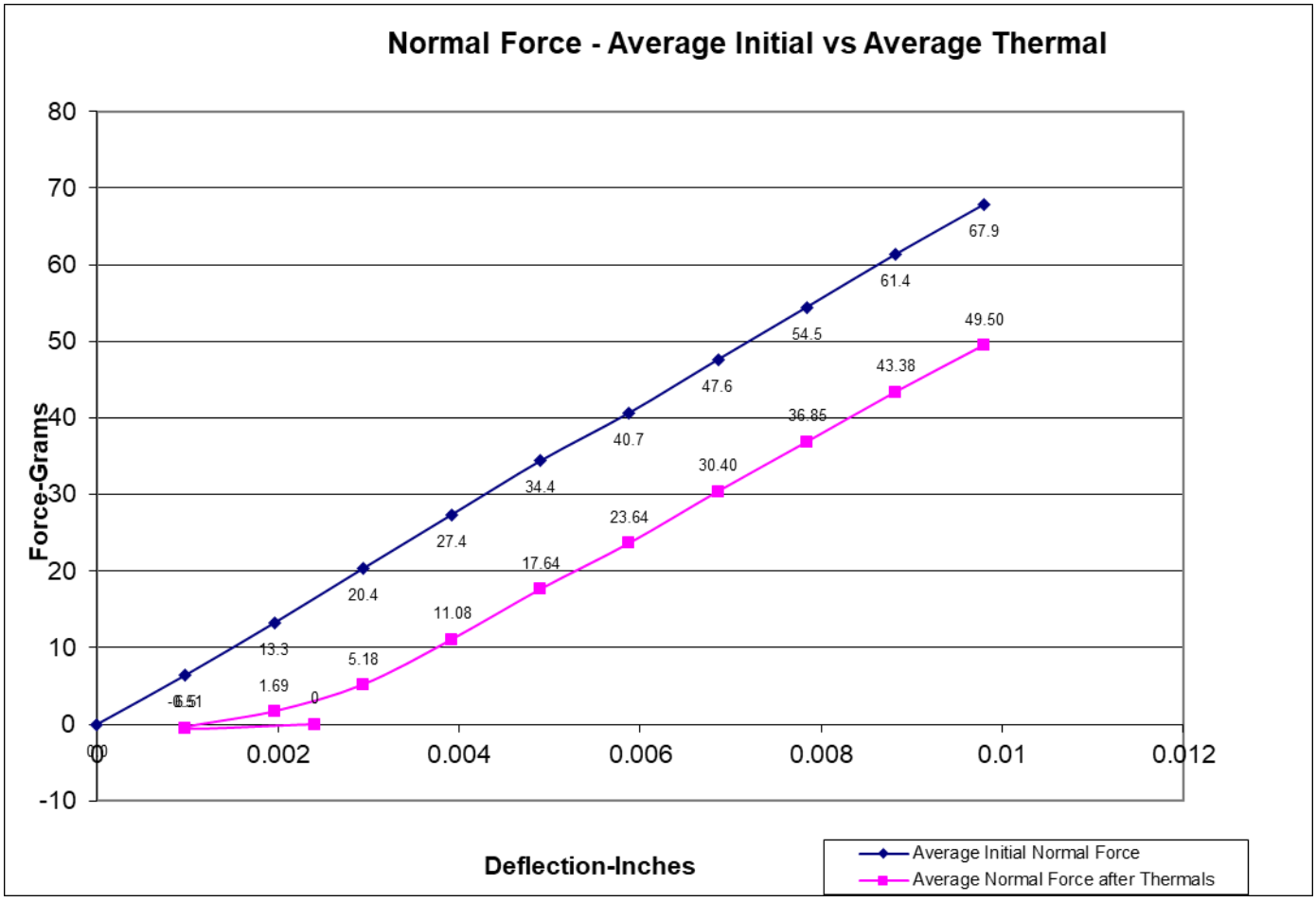


# DATA SUMMARIES Continued

**NVACE MFBL:**

| Initial | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0010** | **0.0020** | **0.0029** | **0.0039** | **0.0049** | **0.0059** | **0.0069** | **0.0078** | **0.0088** | **0.0098** | ***SET*** |
| **Averages** | 6.45 | 13.26 | 20.36 | 27.39 | 34.41 | 40.68 | 47.64 | 54.48 | 61.36 | 67.89 | 0.0001 |
| **Min** | 6.00 | 12.80 | 19.80 | 26.60 | 33.60 | 39.90 | 46.60 | 53.20 | 60.20 | 66.70 | 0.0000 |
| **Max** | 6.80 | 13.60 | 21.00 | 27.90 | 35.10 | 41.50 | 48.60 | 55.50 | 62.50 | 69.40 | 0.0002 |
| **St. Dev** | 0.256 | 0.288 | 0.444 | 0.491 | 0.608 | 0.678 | 0.754 | 0.897 | 0.896 | 0.919 | 0.0001 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| After Thermals | Deflections in inches Forces in Grams | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0.0010** | **0.0020** | **0.0029** | **0.0039** | **0.0049** | **0.0059** | **0.0069** | **0.0078** | **0.0088** | **0.0098** | ***SET*** |
| **Averages** | -0.51 | 1.69 | 5.18 | 11.08 | 17.64 | 23.64 | 30.40 | 36.85 | 43.38 | 49.50 | 0.0024 |
| **Min** | -0.90 | -0.90 | -0.90 | 1.20 | 7.90 | 14.40 | 20.90 | 28.00 | 34.60 | 41.00 | 0.0008 |
| **Max** | 0.70 | 7.80 | 14.60 | 21.90 | 28.90 | 34.90 | 41.90 | 48.50 | 54.90 | 61.50 | 0.0037 |
| **St. Dev** | 0.662 | 3.683 | 6.652 | 7.684 | 7.619 | 7.579 | 7.650 | 7.679 | 7.754 | 8.053 | 0.0011 |
| **Count** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |



## DATA SUMMARIES Continued

**INSULATION RESISTANCE (IR):**

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | Unmated |
| Minimum | **NVACE/NVACP** | **NVACE** | **NVACP** |
| **Initial** | 45000 | 45000 | 45000 |
| **Thermal** | 45000 | 45000 | 45000 |
| **Humidity** | 45000 | 45000 | 45000 |

| | Row to Row | | |
|---|---|---|---|
| | Mated | Unmated | Unmated |
| Minimum | **NVACE/NVACP** | **NVACE** | **NVACP** |
| **Initial** | 45000 | 45000 | 45000 |
| **Thermal** | 45000 | 45000 | 45000 |
| **Humidity** | 45000 | 45000 | 45000 |

| | Pin to Ground | | |
|---|---|---|---|
| | Mated | Unmated | Unmated |
| Minimum | **NVACE/NVACP** | **NVACE** | **NVACP** |
| **Initial** | 45000 | 45000 | 45000 |
| **Thermal** | 45000 | 45000 | 45000 |
| **Humidity** | 45000 | 45000 | 45000 |

**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

| Voltage Rating Summary | |
|---|---|
| **Minimum** | **NVACE/NVACP** |
| **Break Down Voltage** | 842 |
| **Test Voltage** | 635 |
| **Working Voltage** | 210 |

| Pin to Pin | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After Thermal Test Voltage** | Passed |
| **After Humidity Test Voltage** | Passed |

| Row to Row | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After Thermal Test Voltage** | Passed |
| **After Humidity Test Voltage** | Passed |

| Pin to Ground | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After Thermal Test Voltage** | Passed |
| **After Humidity Test Voltage** | Passed |

## DATA SUMMARIES Continued

### LLCR Thermal Aging Group

1) A total of 264 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 +1000 mOhms----------Unstable
   f. >+1000 mOhms: ----------Open Failure

| LLCR Measurement Summaries by Pin Type | | | | |
|---|---|---|---|---|
| Date | 9/29/2021 | 10/12/2021 | | |
| Room Temp (Deg C) | 22 | 22 | | |
| Rel Humidity (%) | 52 | 50 | | |
| Technician | Aaron McKim | Aaron McKim | | |
| **mOhm values** | Actual<br>**Initial** | **Delta**<br>**Thermal** | | |
| **Pin Type: Signal 1** | | | | |
| Average | 202.69 | 2.01 | | |
| St. Dev. | 1.5 | 1.57 | | |
| Min | 199.24 | 0.08 | | |
| Max | 208.16 | 8.27 | | |
| Summary Count | 256 | 256 | | |
| Total Count | 256 | 256 | | |
| **Pin Type: GND 1** | | | | |
| Average | 2.96 | 0.58 | | |
| St. Dev. | 0.11 | 0.17 | | |
| Min | 2.82 | 0.37 | | |
| Max | 3.14 | 0.85 | | |
| Summary Count | 8 | 8 | | |
| Total Count | 8 | 8 | | |

| LLCR Delta Count by Category | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Thermal** | **254** | **10** | **0** | **0** | **0** | **0** |

## DATA SUMMARIES Continued

### LLCR Mating/Unmating Durability Group

1). A total of 264 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 +1000 mOhms----------Unstable
   f. > +1000 mOhms:----------Open Failure

| | LLCR Measurement Summaries by Pin Type | | | |
|---|---|---|---|---|
| Date | 9/21/2021 | 9/30/2021 | 10/11/2021 | 10/22/2021 |
| Room Temp (Deg C) | 22 | 22 | 23 | 22 |
| Rel Humidity (%) | 51 | 50 | 51 | 43 |
| Technician | Aaron McKim | Aaron McKim | Aaron McKim | Aaron Mckim |
| **mOhm values** | Actual **Initial** | **Delta Cycles** | **Delta Therm Shck** | **Delta Humidity** |
| | **Pin Type: Signal 1** | | | |
| Average | 202.53 | 1.21 | 1.13 | 2.03 |
| St. Dev. | 1.3 | 0.96 | 0.95 | 1.98 |
| Min | 198.63 | 0.01 | 0.01 | 0.02 |
| Max | 206.86 | 4.84 | 4.81 | 9.43 |
| Summary Count | 256 | 256 | 256 | 256 |
| Total Count | 256 | 256 | 256 | 256 |
| | **Pin Type: GND 1** | | | |
| Average | 3.05 | 0.4 | 0.77 | 0.72 |
| St. Dev. | 0.15 | 0.32 | 0.36 | 0.39 |
| Min | 2.79 | 0.02 | 0.1 | 0.09 |
| Max | 3.2 | 0.87 | 1.05 | 1.23 |
| Summary Count | 8 | 8 | 8 | 8 |
| Total Count | 8 | 8 | 8 | 8 |

| LLCR Delta Count by Category | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Cycles** | **264** | **0** | **0** | **0** | **0** | **0** |
| **Therm Shck** | **262** | **0** | **0** | **0** | **0** | **0** |
| **Humidity** | **234** | **30** | **0** | **0** | **0** | **0** |

## DATA SUMMARIES Continued

### LLCR Gas Tight Group

1) A total of 264 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 +1000 mOhms:----------Unstable
   f. >+1000 mOhms:----------Open Failure

| | LLCR Measurement Summaries by Pin Type | | | |
|---|---|---|---|---|
| Date | 9/7/2021 | 9/9/2021 | | |
| Room Temp (Deg C) | 22 | 22 | | |
| Rel Humidity (%) | 47 | 45 | | |
| Technician | Aaron McKim | Aaron McKim | | |
| **mOhm values** | Actual | **Delta** | | |
| | **Initial** | **Acid Vapor** | | |
| | **Pin Type: Signal 1** | | | |
| Average | 199.94 | 0.77 | | |
| St. Dev. | 1.43 | 0.66 | | |
| Min | 197.56 | 0 | | |
| Max | 209.54 | 4.44 | | |
| Summary Count | 256 | 256 | | |
| Total Count | 256 | 256 | | |
| | **Pin Type: GND 1** | | | |
| Average | 2.59 | 0.34 | | |
| St. Dev. | 0.27 | 0.12 | | |
| Min | 2.18 | 0.11 | | |
| Max | 2.94 | 0.5 | | |
| Summary Count | 8 | 8 | | |
| Total Count | 8 | 8 | | |

| LLCR Delta Count by Category | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Acid Vapor** | **264** | **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 +1000 mOhms----------Unstable
   f. >+1000 mOhms: ----------Open Failure

| | LLCR Measurement Summaries by Pin Type | | | |
|---|---|---|---|---|
| Date | 9/17/2021 | 10/22/2021 | | |
| Room Temp (Deg C) | 23 | 23 | | |
| Rel Humidity (%) | 48 | 42 | | |
| Technician | Aaron Mckim | Aaron McKim | | |
| **mOhm values** | Actual | **Delta** | | |
| | **Initial** | **Shock-Vib** | | |
| | **Pin Type: Signal 1** | | | |
| Average | 200.56 | 1.33 | | |
| St. Dev. | 1.67 | 1.19 | | |
| Min | 198.03 | 0.01 | | |
| Max | 208.61 | 7.6 | | |
| Summary Count | 256 | 256 | | |
| Total Count | 256 | 256 | | |
| | **Pin Type: GND 1** | | | |
| Average | 2.54 | 0.16 | | |
| St. Dev. | 0.3 | 0.16 | | |
| Min | 2.1 | 0.01 | | |
| Max | 2.93 | 0.42 | | |
| Summary Count | 8 | 8 | | |
| Total Count | 8 | 8 | | |

| LLCR Delta Count by Category | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Shock-Vib** | **259** | **5** | **0** | **0** | **0** | **0** |

## DATA SUMMARIES Continued

**Nanosecond Event Detection:**

| Shock and Vibration Event Detection Summary | |
| --- | --- |
| Contacts tested | 192 |
| Test Condition | C, 100g's, 6ms, Half-Sine |
| Shock Events | 0 |
| Test Condition | V-B, 7.56g rms |
| Vibration Events | 0 |
| Total Events | 0 |

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** MO-01
**Description:** Micro-Ohmeter
**Manufacturer:** Keithley
**Model:** 580
**Serial #:** 772740
**Accuracy:** See Manual
… Last Cal: 2/5/2022, Next Cal: 2/29/2023

**Equipment #:** HPT-01
**Description:** Hipot Safety Tester
**Manufacturer:** Vitrek
**Model:** V73
**Serial #:** 019808
**Accuracy:**
… Last Cal: 05/11/2022, Next Cal: 05/11/2023

**Equipment #:** KIC Explorer
**Description:** Thermocouple Reader
**Manufacturer:** KIC
**Model:** OMEGA CL23
**Serial #:** KE4-07-B-002803
**Accuracy:** ±1.2°C
… Last Cal: 12/11/2021, Next Cal: 12/31/2022

**Equipment #:** TSC-01
**Description:** Vertical Thermal Shock Chamber
**Manufacturer:** Cincinnatti Sub Zero
**Model:** VTS-3-6-6-SC/AC
**Serial #:** 10-VT14993
**Accuracy:** See Manual
… Last Cal: 06/12/2022, Next Cal: 06/30/2023

**Equipment #:** THC-01
**Description:** Temperature/Humidity Chamber (Chamber Room)
**Manufacturer:** Thermotron
**Model:** SM-8-7800
**Serial #:** 30676
**Accuracy:** See Manual
… Last Cal: 10/24/2021, Next Cal: 10/24/2022

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** MO-02
**Description:** Multimeter /Data Acquisition System
**Manufacturer:** Keithley
**Model:** 2700
**Serial #:** 0780546
**Accuracy:** Last Cal: 6/16/2022, Next Cal: 6/16/2023

**Equipment #:** PS-01
**Description:** Power Supply
**Manufacturer:** Hewlett Packard
**Model:** 6033A
**Serial #:** 3329A-07330
**Accuracy:** Last Cal: 6/12/2022, Next Cal: 6/12/2023

**Equipment #:** SVC-01
**Description:** Shock & Vibration Table
**Manufacturer:** Data Physics
**Model:** LE-DSA-10-20K
**Serial #:** 10037
**Accuracy:** See Manual
… Last Cal: 11/31/2021, Next Cal: 11/31/2022

**Equipment #:** ACLM-01
**Description:** Accelerometer
**Manufacturer:** PCB Piezotronics
**Model:** 352C03
**Serial #:** 115819
**Accuracy:** See Manual
… Last Cal: 07/09/2022, Next Cal: 07/09/2023

**Equipment #:** ED-03
**Description:** Event Detector
**Manufacturer:** Analysis Tech
**Model:** 32EHD
**Serial #:** 1100604
**Accuracy:** See Manual
… Last Cal: 06/04/2022, Next Cal: 06/04/2023