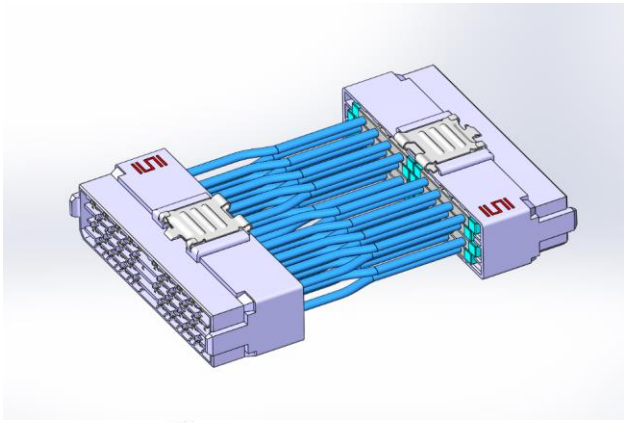
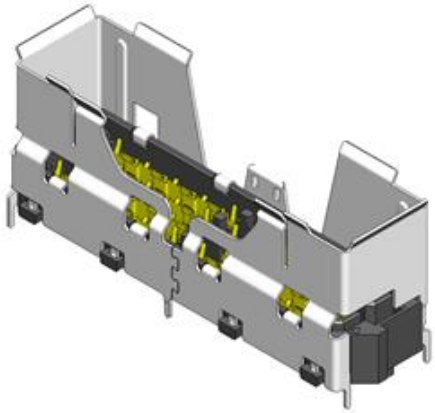
Project Number: Design Qualification Test Report	Tracking Code: 2662667_Report_Rev_3
Requested by: Neal Patterson	Date: 4/7/2024
Part #: NVAC-DP-3-04-2-12.0-01-1-L/ NVAM-DP-04-2-02.0-S-2-C	Tech: Aaron McKim
Part description: NVAC/NVAM	Qty to test: 80
Test Start: 07/10/2020	Test Completed: 09/21/2022





DESIGN QUALIFICATION TEST REPORT

NVAC/NVAM
NVAC-DP-3-04-2-12.0-01-1-L/ NVAM-DP-04-2-02.0-S-2-C

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/22/2021	**1**	**Initial Issue**	**PC**
9/22/2022	**2**	**Updated the durability and normal force group**	**PC**
4/7/2024	**3**	**Updated the Durability, S&V and Latch retention test 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.

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-110683-TST, PCB-110685-TST.

FLOWCHARTS

Gas Tight

Note: 100% LLCR

Group 1
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
3 Assemblies

Step	Description
1.	LLCR (2)
2.	Gas Tight (1)
3.	LLCR (2) 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

Normal Force

Group 1
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Signal Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.018 " Expected Force at Max Deflection = 125 g

Group 2
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC MFBL Ground Beam Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.021 " Expected Force at Max Deflection = 81 g

Group 3
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Flanking Ground Beam Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.0078 " Expected Force at Max Deflection = 27 g

Group 4
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Center Ground Beam Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.0137 " Expected Force at Max Deflection = 128 g

Group 5
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Signal With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.018 " Expected Force at Max Deflection = 125 g

Group 6
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC MFBL Ground Beam With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.021 " Expected Force at Max Deflection = 81 g

Group 7
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Flanking Ground Beam With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.0078 " Expected Force at Max Deflection = 27 g

Group 8
NVAC-DP-3-04-2-06.0-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Contacts Minimum
NVAC Center Ground Beam With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.0137 " Expected Force at Max Deflection = 128 g

(1) Normal Force = EIA-364-04

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

FLOWCHARTS

Mating/Unmating/Durability

Note: 100% LLCR

Group 1
NVAC-DP-3-04-2-XX.X-XX-X-L
NVAM-DP-04-2-02.0-S-2-C
3 Assemblies

Note: Update callout to MUD to test single ended with twinax terminated to PCB. CHG from 8 assemblies to 3 assemblies all groups.

Step	Description
1.	Contact Gaps
2.	LLCR (2)
3.	Mating/Unmating Force (3)
4.	Cycles Quantity = 25 Cycles
5.	Mating/Unmating Force (3)
6.	Contact Gaps
7.	LLCR (2) Max Delta = 15 mOhm
8.	Thermal Shock (4)
9.	LLCR (2) Max Delta = 15 mOhm
10.	Humidity (1)
11.	LLCR (2) Max Delta = 15 mOhm
12.	Mating/Unmating Force (3)

Group 2
NVAC-DP-3-03-2-12.0-01-1-L
NVAM-DP-03-2-02.0-S-2-C
3 Assemblies

Note: PCB-110685-TST-XX (M/U)

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force (3)
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force (3)

Group 3
NVAM-DP-02-2-02.0-S-2-CT
NVAC-DP-3-02-2-0.60-01-1-L
8 Assemblies
Taller Shield

Step	Description
1.	Contact Gaps
2.	LLCR (2)
3.	Mating/Unmating Force (3)
4.	Cycles Quantity = 25 Cycles
5.	Mating/Unmating Force (3)
6.	Contact Gaps
7.	LLCR (2) Max Delta = 15 mOhm
8.	Thermal Shock (4) - Non Standard
9.	LLCR (2) Max Delta = 15 mOhm
10.	Humidity (1)
11.	LLCR (2) Max Delta = 15 mOhm
12.	Mating/Unmating Force (3)

Group 4
NVAC-DP-3-02-1-12.0-01-1-L
NVAM-DP-02-1-02.0-S-2-CT
4 Assemblies
MUB

Note: PCB-110685-TST-XX (M/U)

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force (1)
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force (1)

(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 = EIA-364-32
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

Thermal Aging

Note: 100% LLCR

Group 1
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
3 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force (2)
3.	LLCR (1)
4.	Thermal Age (3)
5.	LLCR (1) 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)

IR/DWV

Pin-to-Pin

Group 1
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 2
NVAC-DP-3-04-2-12.0-01-1-L
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 3
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 4
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	IR (4)
2.	DWV at Test Voltage (1)
3.	Thermal Shock (5)
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
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 6
NVAC-DP-3-04-2-12.0-01-1-L
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 7
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 8
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
2 Assemblies

Step	Description
1.	IR (4)
2.	DWV at Test Voltage (1)
3.	Thermal Shock (5)
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 NVAC-DP-3-04-2-12.0-01-1-L NVAM-DP-04-2-02.0-S-2-C 2 Assemblies		Group 10 NVAC-DP-3-04-2-12.0-01-1-L 2 Assemblies		Group 11 NVAM-DP-04-2-02.0-S-2-C 2 Assemblies		Group 12 NVAC-DP-3-04-2-12.0-01-1-L NVAM-DP-04-2-02.0-S-2-C 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)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

Pin-to-Closest Metallic Hardware

Group 13 NVAC-DP-3-04-2-12.0-01-1-L NVAM-DP-04-2-02.0-S-2-C 2 Assemblies		Group 14 NVAC-DP-3-04-2-121.0-01-1-L 2 Assemblies		Group 15 NVAM-DP-04-2-02.0-S-2-C 2 Assemblies		Group 16 NVAC-DP-3-04-2-12.0-01-1-L NVAM-DP-04-2-02.0-S-2-C 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)
						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 = EIA-364-32
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

Current Carrying Capacity

Group 1
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
1 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 1 Number of Positions = 1 *Note: single signal pin within single wafer*

Group 2
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
2 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 1 Number of Positions = 2 *Note: two adjacent signal pins (DP pair) within single wafer*

Group 3
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
4 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 1 Number of Positions = 4 *Note: Three adjacent signal pins within single wafer*

Group 4
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 1 Number of Positions = 8 *Note: 1 wafer, all signal powered*

Group 5
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
32 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 4 Number of Positions = 8 *Note: 4 wafers, all signals powered*

Group 6
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
8 Pins Powered
Ground

Step	Description
1.	CCC (2) Rows = 1 Number of Positions = 8 *Note: 1 wafer/shield powered (no signals)*

Group 7
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
16 Pins Powered
Ground

Step	Description
1.	CCC (2) Rows = 2 Number of Positions = 8 *Note: 2 wafer/shields powered (no signals)*

Group 8
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
32 Pins Powered
Ground

Step	Description
1.	CCC (2) Rows = 4 Number of Positions = 8 *Note: 4 wafers/shield powered (no signals)*

Group 9
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
64 Pins Powered
Ground

Step	Description
1.	CCC (2) Rows = 4 Number of Positions = 16 *Note: 2 Banks x 4 wafers/shield powered (no signals)*

Group 10
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-C
64 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 16 *Note: 2 Banks x 4 wafers, all signals powered*

Group 11
NVAC-DP-3-04-2-XX.X-XX-1-L
NVAM-DP-04-2-02.0-S-2-C
All Power

Step	Description
1.	CCC-All Power

(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
NVAC-DP-3-04-2-06.0-01-1-L
NVAM-DP-04-2-02.0-S-2-CT
8 Assemblies

Note: PCB-110683-TST-01 for 100% LLCR
PCB-112663-TST-XX is Bus-board to terminate processed cable ends

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2)
3.	Random Vibration (3)
4.	LLCR (1) 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
NVAC-DP-3-04-2-12.0-01-1-L
NVAM-DP-04-2-02.0-S-2-CT
60 Points

Note: PCB -110695-TST-XX

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

Note: PCB-110683-TST-XX (LLCR)

Group 1	
NVAC-DP-3-04-2-12.0-01-1-L	
NVAM-DP-04-2-02.0-S-2-C	
5 Assemblies	
0 Degrees	
Step	**Description**
1.	Cable Pull (1)

Group 2	
NVAC-DP-3-04-2-12.0-01-1-L	
NVAM-DP-04-2-02.0-S-2-C	
5 Assemblies	
90 Degrees	
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

Cable Flex

Note: PCB-110685-TST-XX (IR/DWV)

Group 1	
NVAC-DP-3-04-2-12.0-01-1-L	
NVAM-DP-04-2-02.0-S-2-C	
8 Assemblies	
Flat Cable	
Step	**Description**
1.	IR (3)
2.	DWV at Test Voltage(2) Test Voltage = 548 V
3.	Cable Flex (1)
4.	Visual Inspection
5.	IR (3)
6.	DWV at Test Voltage(2) Test Voltage = 548 V

(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 Retention

Group 1

NVAC-DP-3-04-2-12.0-01-1-L

NVAM-DP-04-2-02.0-S-2-CT

4 Assemblies

Note: PCB-110685-TST-XX

Step	Description
1.	Latch Push *Note: Measure the force required to break latch in fully engage state.*

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: -55°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 :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.

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.

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.

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

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

INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

1) PROCEDURE:
    a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts 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 another similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:
    a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Rate of Application 500 V/Sec
        iii. Test Voltage (VAC) until breakdown occurs.
2) MEASUREMENTS/CALCULATIONS
    a. The breakdown voltage shall be measured and recorded.
    b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
    c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

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:
    c. Ambient
    d. 85^{o} C
    e. 95^{o} C
    f. 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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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:
    g. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
    h. 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.

CABLE PULL:

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

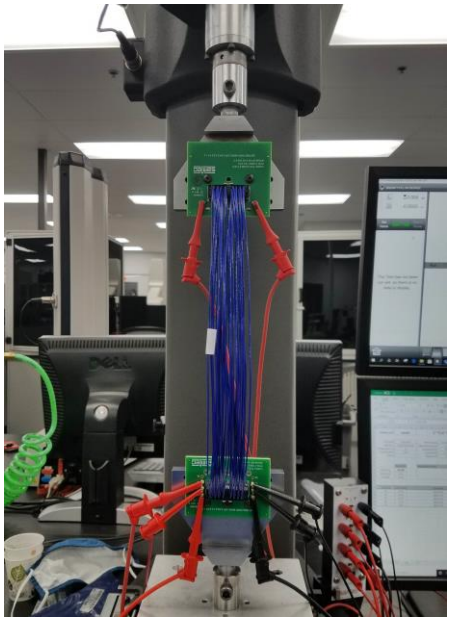


Fig. 1
90° Connector pull, notice the electrical continuity hook-up wires.

CABLE FLEX:

1) Oscillate and monitor electrical continuity for open circuit indication.
    a. ± 70° Flex Mode, bend up to 500 cycles. 16 oz load on cable end.

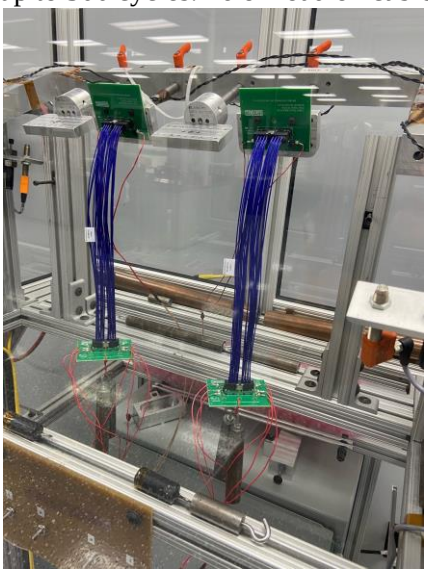


Fig. 2
(Setup picture)

RESULTS

Temperature Rise, CCC at a 20% de-rating

Signal Pin

- **CCC for a 30°C Temperature Rise----------2.00 A per contact with 1 contact (1x1) powered.**
- **CCC for a 30°C Temperature Rise----------1.48 A per contact with 2 contacts (1x2) powered.**
- **CCC for a 30°C Temperature Rise----------1.23 A per contact with 4 contacts (1x4) powered.**
- **CCC for a 30°C Temperature Rise----------0.97 A per contact with 8 contacts (1x8) powered.**
- **CCC for a 30°C Temperature Rise----------0.67 A per contact with 32 contacts (4x8) powered.**
- **CCC for a 30°C Temperature Rise----------0.52 A per contact with 64 contacts (4x16) powered.**

Ground Pin

- **CCC for a 30°C Temperature Rise----------9.9 A per contact with 8 contacts (1x8) powered.**
- **CCC for a 30°C Temperature Rise----------8.1 A per contact with 16 contacts (1x16) powered.**
- **CCC for a 30°C Temperature Rise----------6.6 A per contact with 32 contacts (4x8) powered.**
- **CCC for a 30°C Temperature Rise----------4.6 A per contact with 64 contacts (4x16) powered.**

All Powered

- **CCC for a 30°C Temperature Rise----------4.2 A per contact with All powered**

Mating – Unmating Forces

Thermal aging Group

- **Initial**
  - **Mating**
    - **Min ---------- 6.58 lbs**
    - **Max---------- 7.77 lbs**
  - **Unmating**
    - **Min ---------- 5.09 lbs**
    - **Max---------- 5.71 lbs**
- **After Thermal**
  - **Mating**
    - **Min ---------- 4.77 lbs**
    - **Max---------- 5.56 lbs**
  - **Unmating**
    - **Min ---------- 3.65 lbs**
    - **Max---------- 4.26 lbs**

RESULTS Continued

Mating/Unmating Durability Group

Group 1 (NVAC-DP-3-04-2-XX.X-XX-X-L/ NVAM-DP-04-2-02.0-S-2-C)

- **Initial**
  - **Mating**
    - **Min ---------- 7.05 lbs**
    - **Max---------- 7.86 lbs**
  - **Unmating**
    - **Min ---------- 4.96 lbs**
    - **Max---------- 5.53 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 7.97 lbs**
    - **Max---------- 9.57 lbs**
  - **Unmating**
    - **Min ---------- 5.28 lbs**
    - **Max---------- 5.85 lbs**
- **After humidity**
  - **Mating**
    - **Min ---------- 5.47 lbs**
    - **Max---------- 7.05 lbs**
  - **Unmating**
    - **Min ---------- 3.88 lbs**
    - **Max---------- 4.89 lbs**

Group 2 (NVAC-DP-3-03-2-12.0-01-1-L/ NVAM-DP-03-2-02.0-S-2-C)

- **Initial**
  - **Mating**
    - **Min ---------- 4.04 lbs**
    - **Max---------- 5.70 lbs**
  - **Unmating**
    - **Min ---------- 4.99 lbs**
    - **Max---------- 6.82 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 5.19 lbs**
    - **Max---------- 6.81 lbs**
  - **Unmating**
    - **Min ---------- 6.28 lbs**
    - **Max---------- 8.36 lbs**

RESULTS Continued

Group 3 (NVAC-DP-3-02-2-06.0-01-1-L/ NVAM-DP-02-2-02.0-S-2-CT)

- **Initial**
  - **Mating**
    - **Min ---------- 3.07 lbs**
    - **Max---------- 3.75 lbs**
  - **Unmating**
    - **Min ---------- 2.35 lbs**
    - **Max---------- 2.81 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 3.80 lbs**
    - **Max---------- 5.42 lbs**
  - **Unmating**
    - **Min ---------- 2.53 lbs**
    - **Max---------- 3.05 lbs**
- **After humidity**
  - **Mating**
    - **Min ---------- 2.88 lbs**
    - **Max---------- 3.21 lbs**
  - **Unmating**
    - **Min ---------- 2.08 lbs**
    - **Max---------- 2.49 lbs**

Group 4 (NVAC-DP-3-02-1-12.0-01-1-L/ NVAM-DP-02-1-02.0-S-2-CT)

- **Initial**
  - **Mating**
    - **Min ---------- 1.83 lbs**
    - **Max---------- 2.02 lbs**
  - **Unmating**
    - **Min ---------- 1.27 lbs**
    - **Max---------- 1.44 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 1.94 lbs**
    - **Max---------- 2.38 lbs**
  - **Unmating**
    - **Min ---------- 1.36 lbs**
    - **Max---------- 1.56 lbs**

RESULTS Continued

Normal force:

NVAC Signal pin deflected @ 0.011”

- **Initial**
  - **Min----------57.50 gf Set ----- 0.0000 Inch**
  - **Max ----------61.20 gf Set ----- 0.0001 Inch**
- **After Thermal**
  - **Min----------37.40 gf Set ----- 0.0024 Inch**
  - **Max ----------43.00 gf Set ----- 0.0033 Inch**

NVAC MFBL pin deflected @ 0.0098”

- **Initial**
  - **Min----------47.80 gf Set ----- 0.0000 Inch**
  - **Max ----------52.00 gf Set ----- 0.0000 Inch**
- **After Thermal**
  - **Min----------25.40 gf Set ----- 0.0038 Inch**
  - **Max ----------31.30 gf Set ----- 0.0049 Inch**

NVAC Flanking pin deflected @0.0078”

- **Initial**
  - **Min----------19.10 gf Set ----- 0.0000 Inch**
  - **Max ----------20.60 gf Set ----- 0.0000 Inch**
- **After Thermal**
  - **Min----------17.60 gf Set ----- 0.0000 Inch**
  - **Max ----------20.10 gf Set ----- 0.0003 Inch**

NVAC Center pin deflected @0.009”

- **Initial**
  - **Min----------58.90 gf Set ----- 0.0000 Inch**
  - **Max ----------69.10 gf Set ----- 0.0001 Inch**
- **After Thermal**
  - **Min----------34.40 gf Set ----- 0.0015 Inch**
  - **Max ----------49.60 gf Set ----- 0.0033 Inch**

Cable Pull force

- **90° Pull Lateral**
  - **Min----------13.30 lbs**
  - **Max ----------15.79 lbs**
- **90° Pull Vertical**
  - **Min---------- 6.00 lbs**
  - **Max ---------- 6.56 lbs**

Latch Retention

- **Min----------16.06 lbs**
- **Max ----------17.42 lbs**

RESULTS Continued

Cable Flex:

Insulation Resistance minimums, IR

Pin to Pin

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
- **After 500 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**

Pin to Ground

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**

Pin-to-Closest Metallic Hardware

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Test Voltage ---------- 550 VAC**

Pin to Pin

- **Initial DWV ---------- Passed**
- **After 500 Flex cycles DWV ---------- Passed**

Row to Row

- **Initial DWV ---------- Passed**
- **After 500 Flex cycles DWV ---------- Passed**

Pin to Ground

- **Initial DWV ---------- Passed**
- **After 500 Flex cycles DWV ---------- Passed**

Pin-to-Closest Metallic Hardware

- **Initial DWV ---------- Passed**
- **After 500 Flex cycles DWV ---------- 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 ---------- 45000 Meg 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**

Pin-to-Closest Metallic Hardware

- **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**

RESULTS Continued

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage----------730 VAC**
  - **Test Voltage ----------550 VAC**
  - **Working Voltage ----------180 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**

Pin-to-Closest Metallic Hardware

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

RESULTS Continued

LLCR Gas Tight Group (216 LLCR test points)

Signal Pin

- **Initial ---------- 341.91 mOhms Max**

Ground Pin

- **Initial ---------- 50.83 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 203 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 13 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 (216 LLCR test points)

Signal Pin

- **Initial ---------- 398.46 mOhms Max**

Ground Pin

- **Initial ---------- 69.15 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 193 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 23 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 (216 LLCR test points)

Signal Pin

- **Initial ---------- 168.22 mOhms Max**

Ground Pin

- **Initial ---------- 21.26 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 214 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 2 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 ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 24 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 ---------- 191 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 24 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 1 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 (512 signal and 64 ground LLCR test points)

Signal Pin

- **Initial ---------- 236.75 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 388 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 109 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 15 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**

Ground Pin

- **Initial ---------- 19.98 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 64 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**

Mechanical Shock & Random Vibration:

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

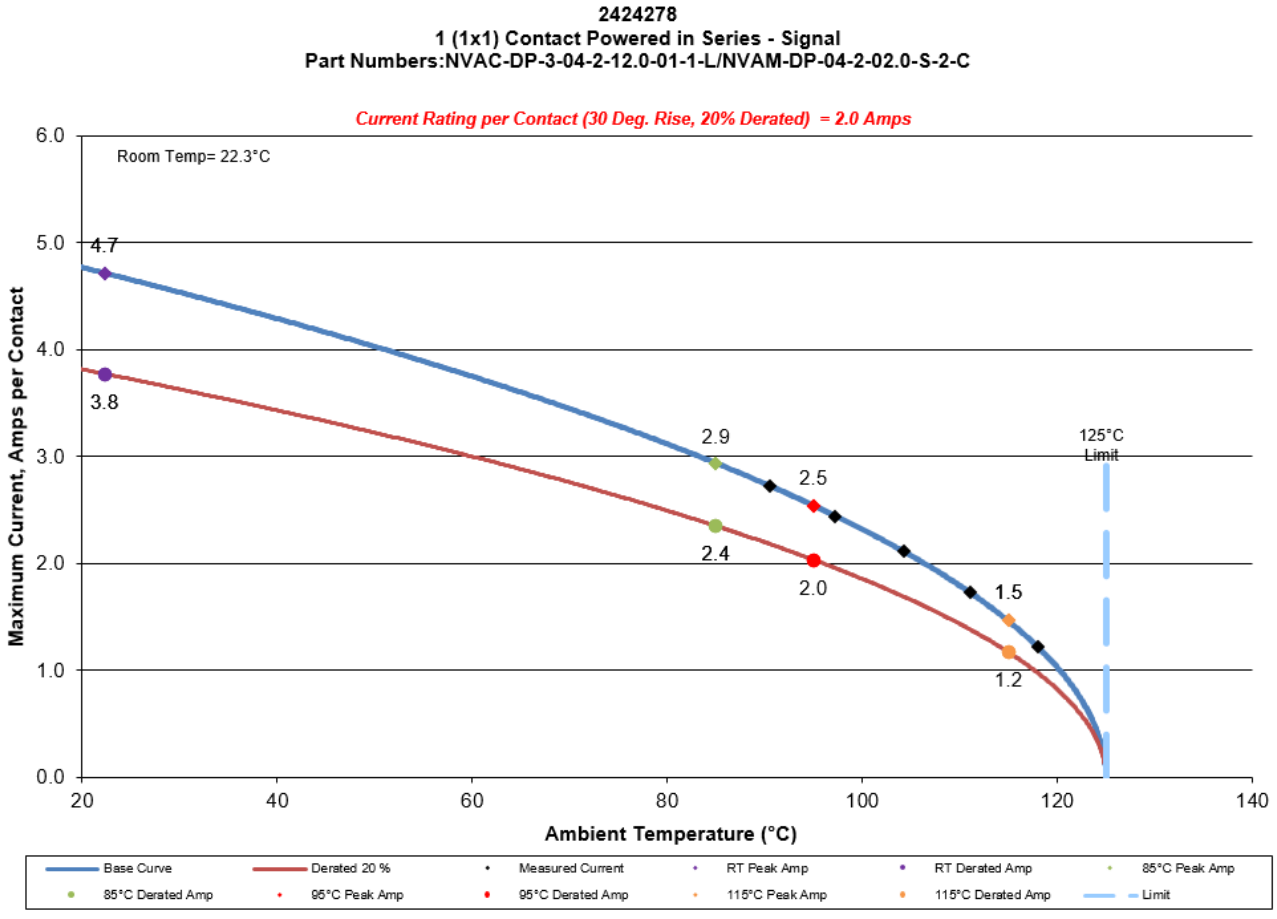
DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

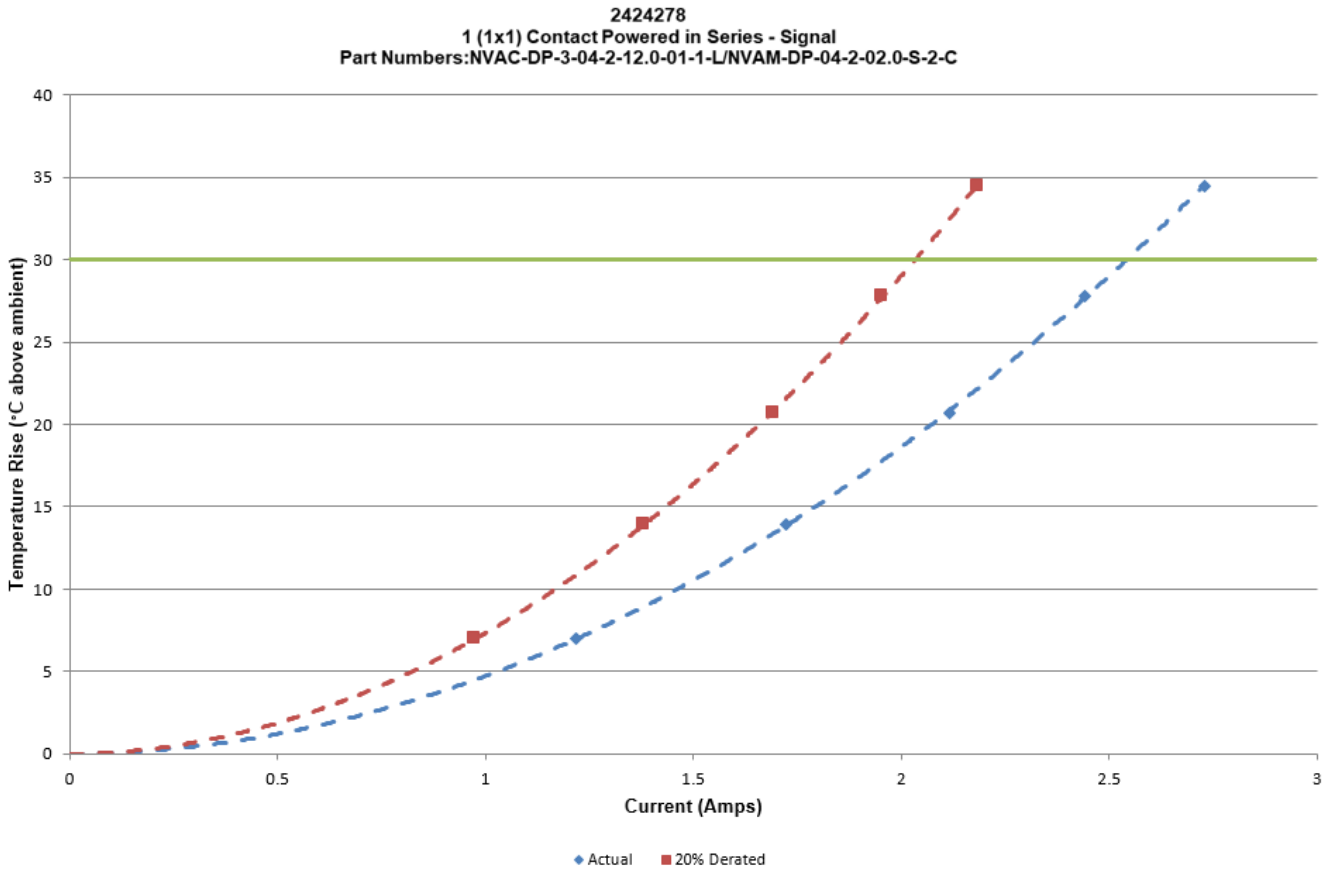
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

Signal Pin

a. Linear configuration with 1 adjacent conductors/contacts powered.

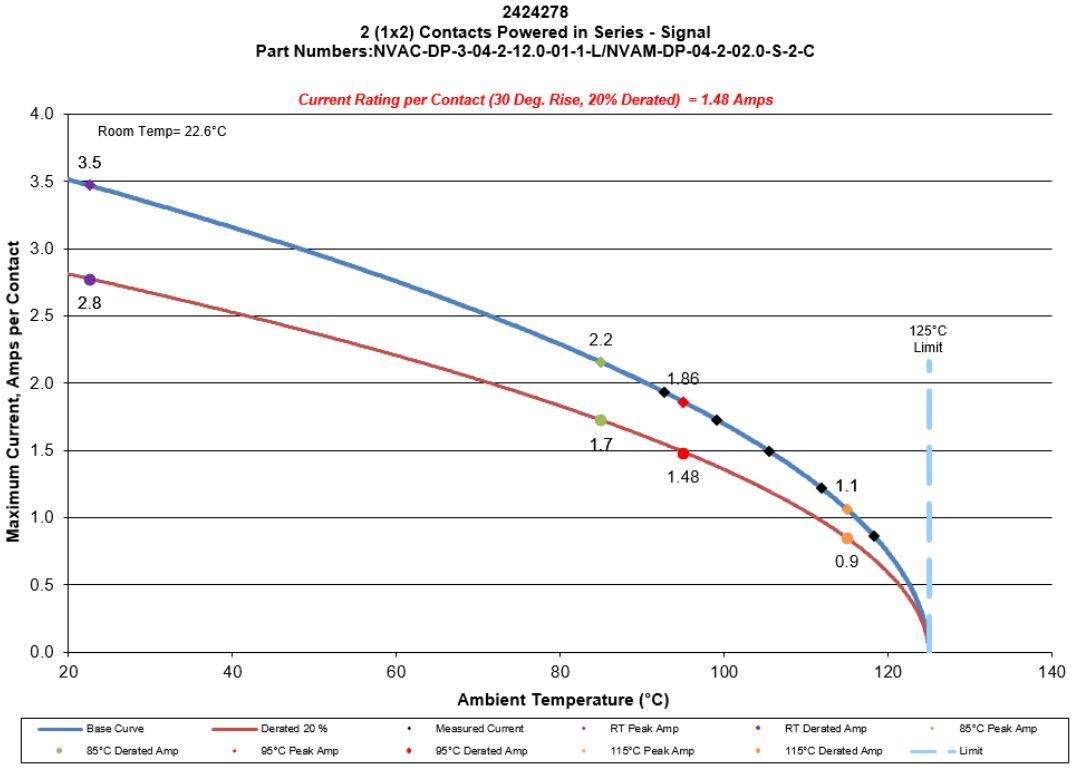


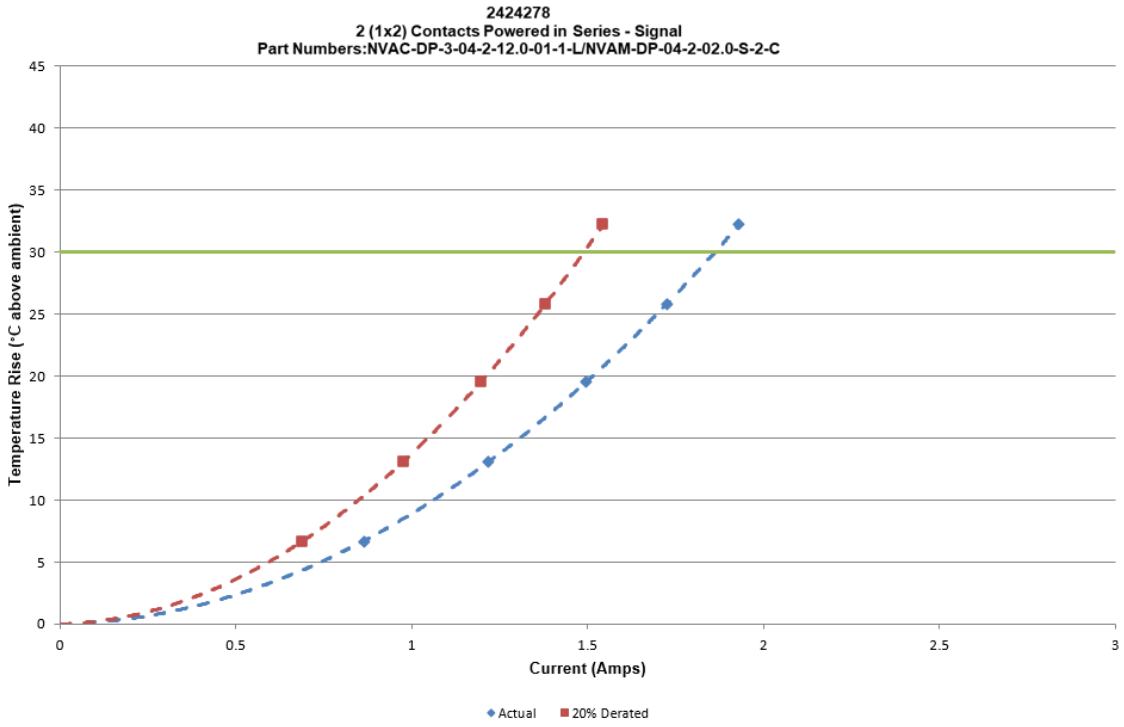
DATA SUMMARIES Continued



DATA SUMMARIES Continued

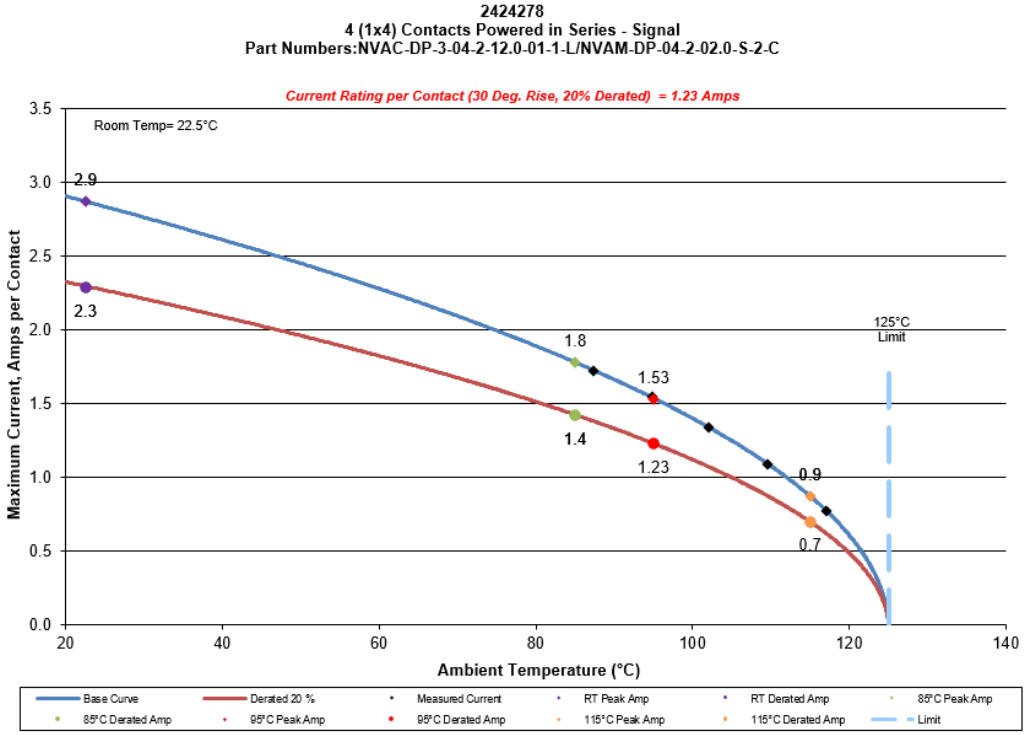
b. Linear configuration with 2 adjacent conductors/contacts powered.

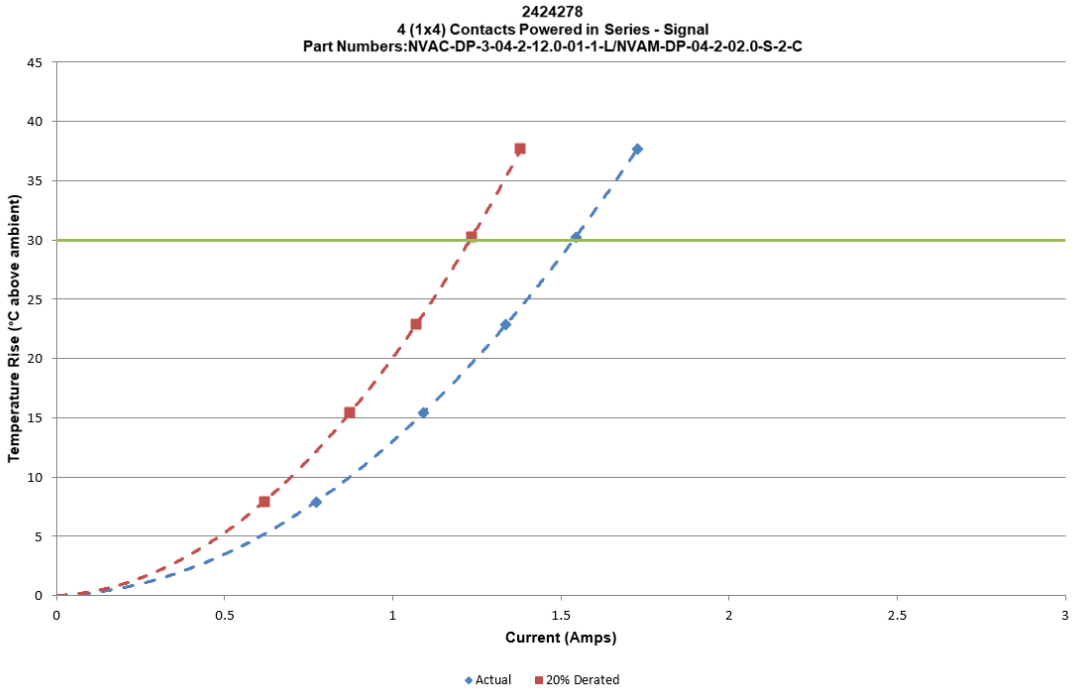




DATA SUMMARIES Continued

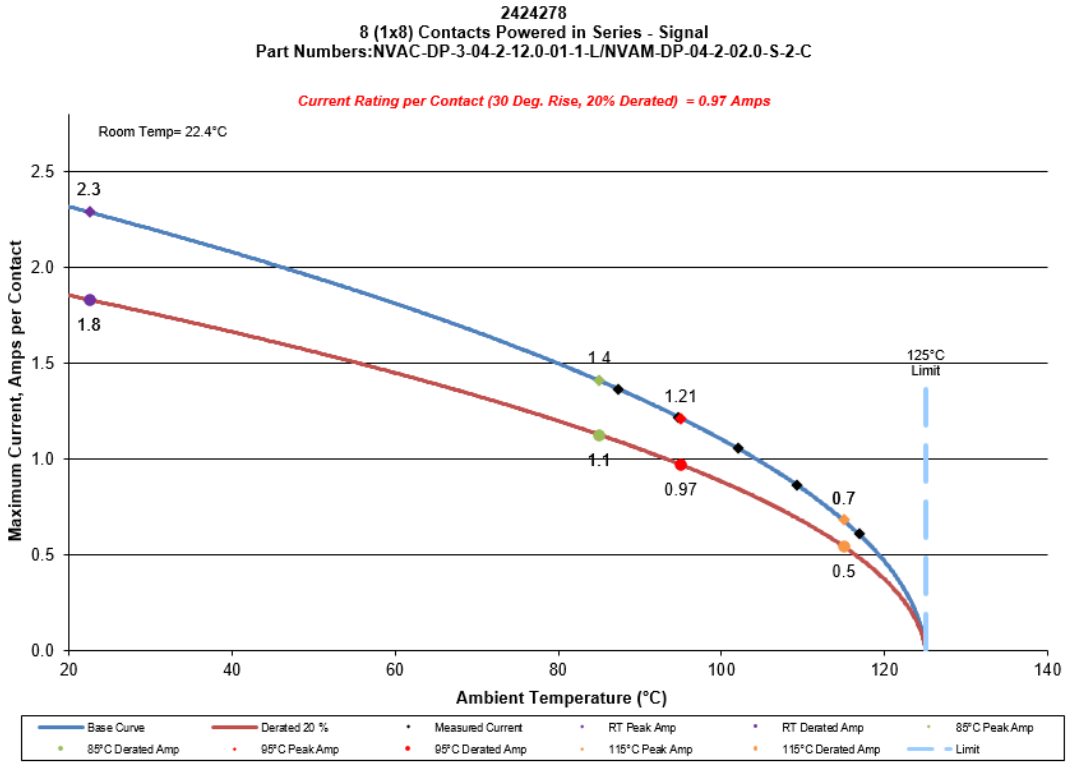
c. Linear configuration with 4 adjacent conductors/contacts powered.

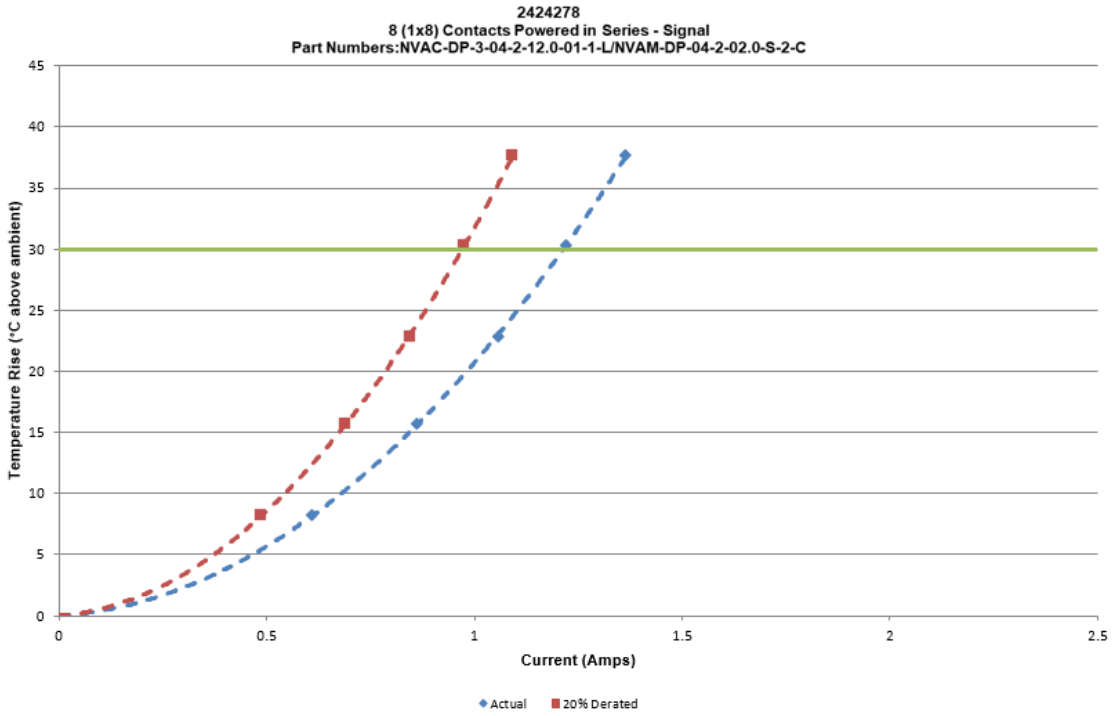




DATA SUMMARIES Continued

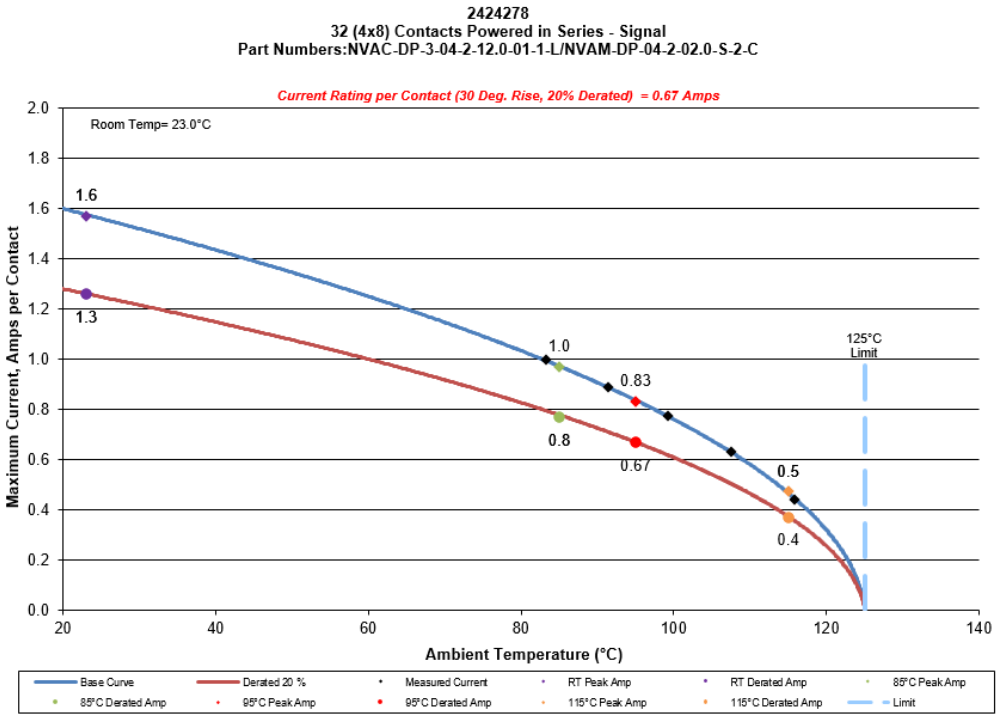
d. Linear configuration with 8 adjacent conductors/contacts powered.

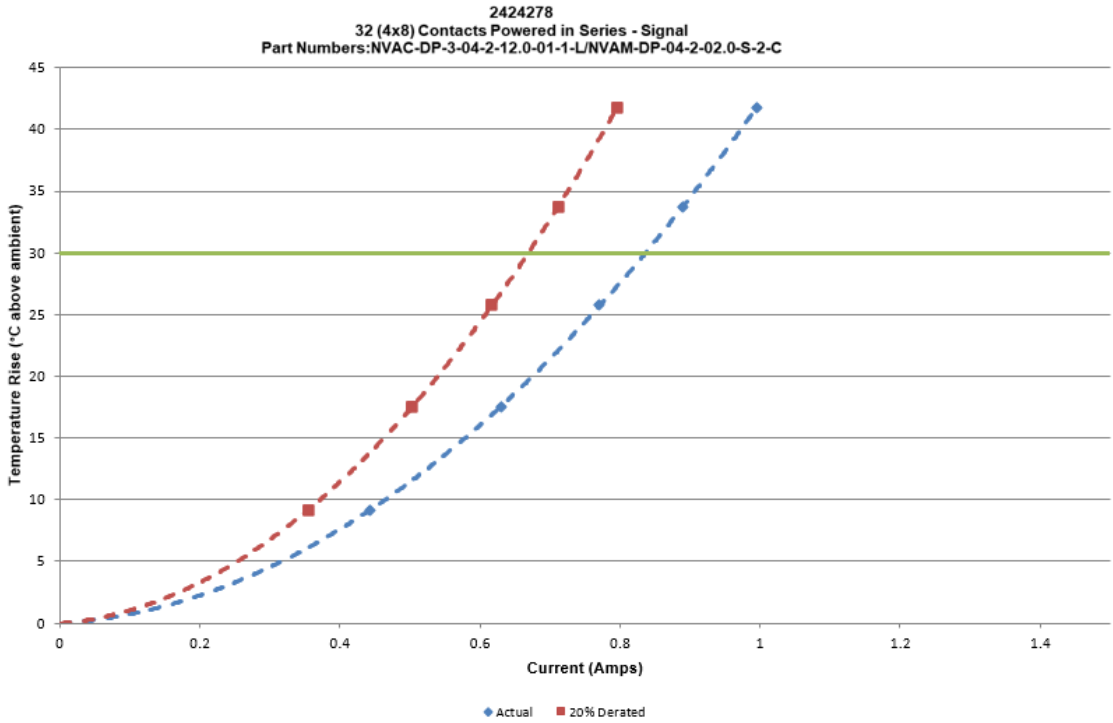




DATA SUMMARIES Continued

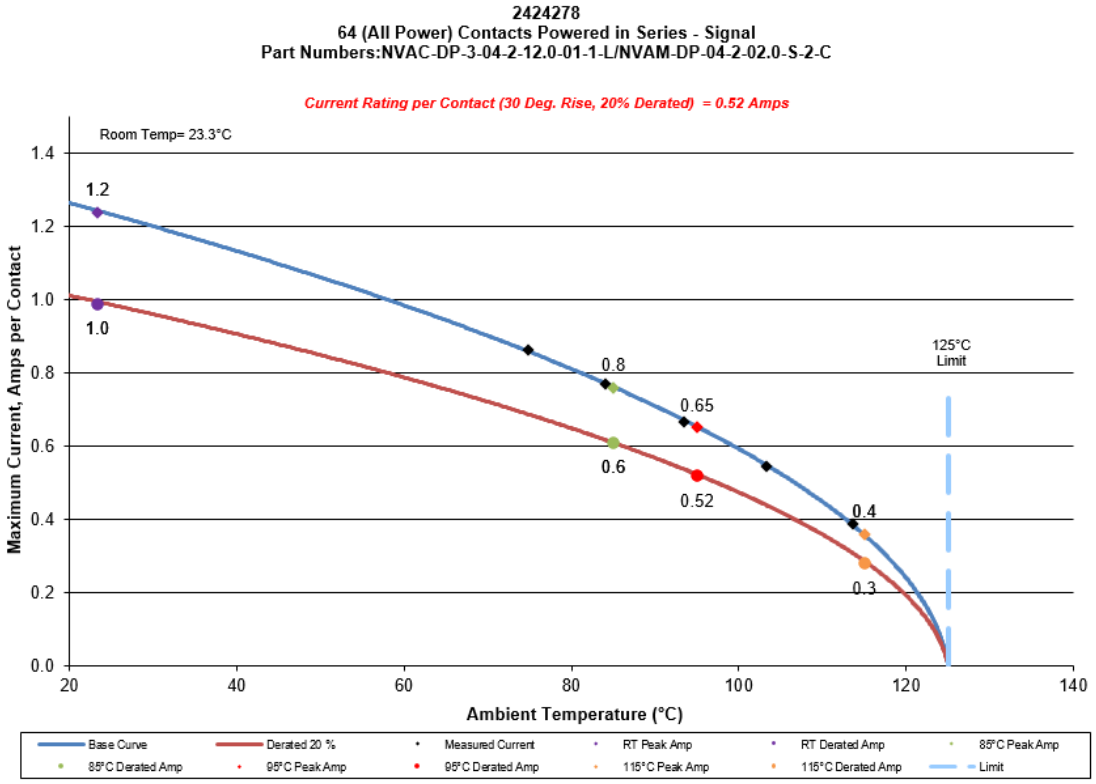
e. Linear configuration with 32 adjacent conductors/contacts powered.

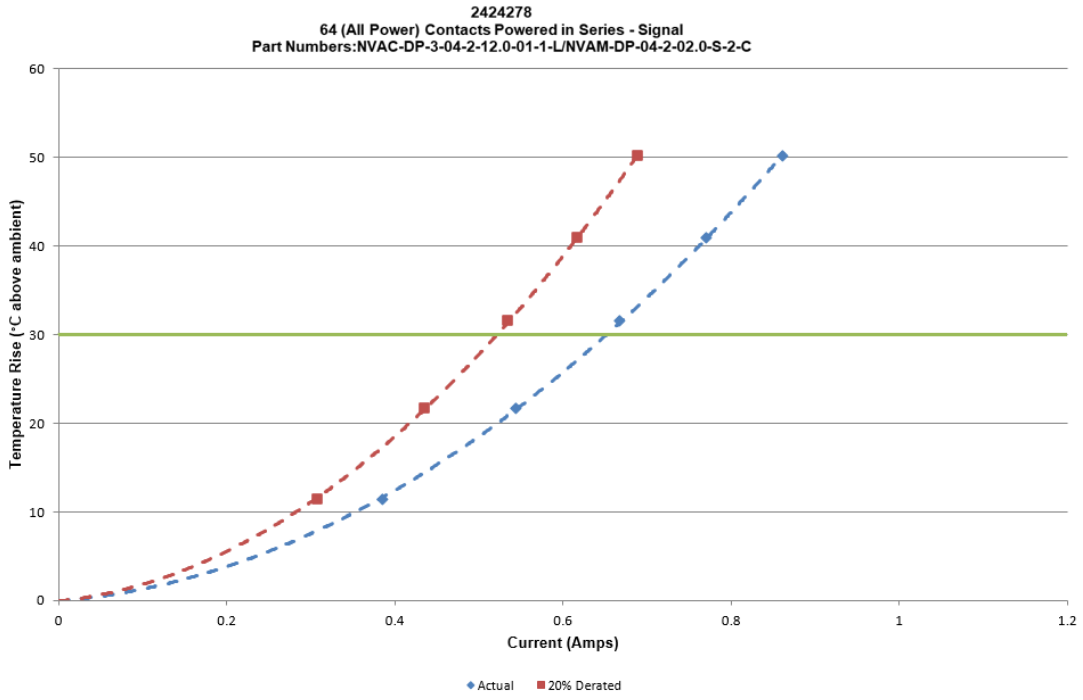




DATA SUMMARIES Continued

f. Linear configuration with 64 adjacent conductors/contacts powered.

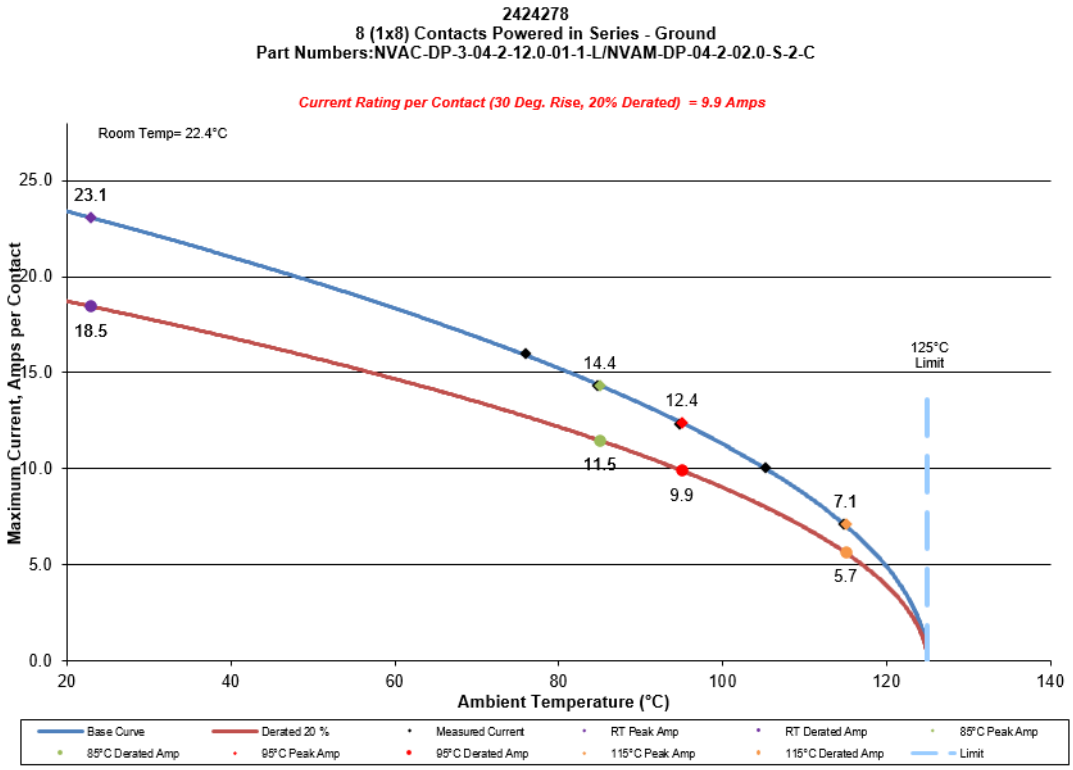


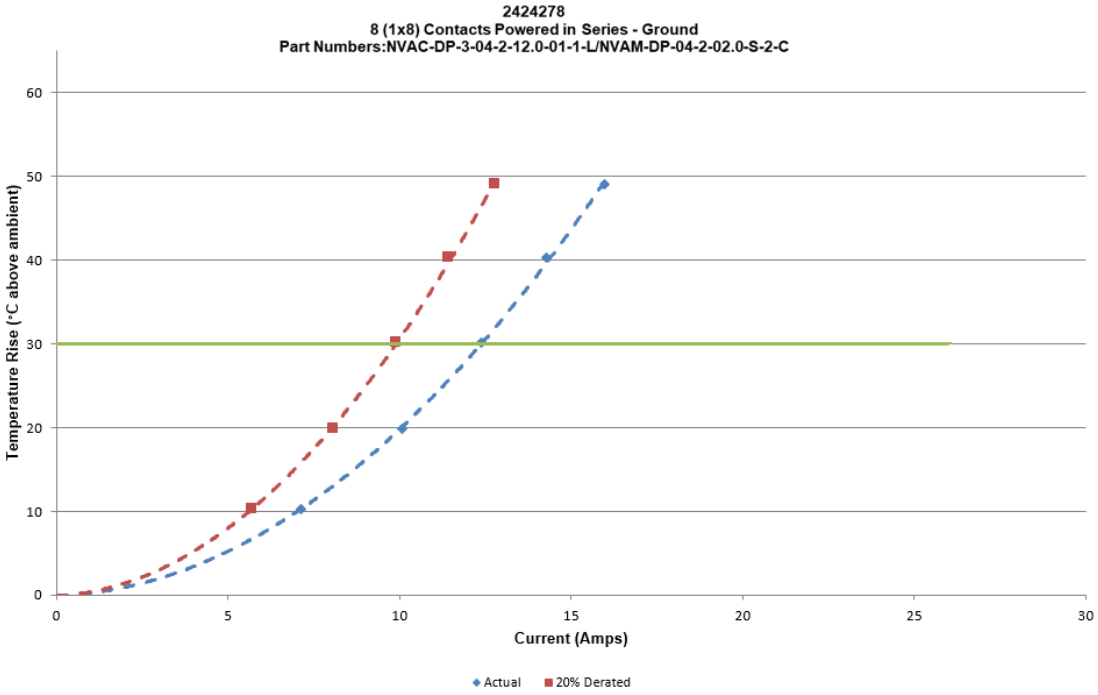


DATA SUMMARIES Continued

Ground Pin

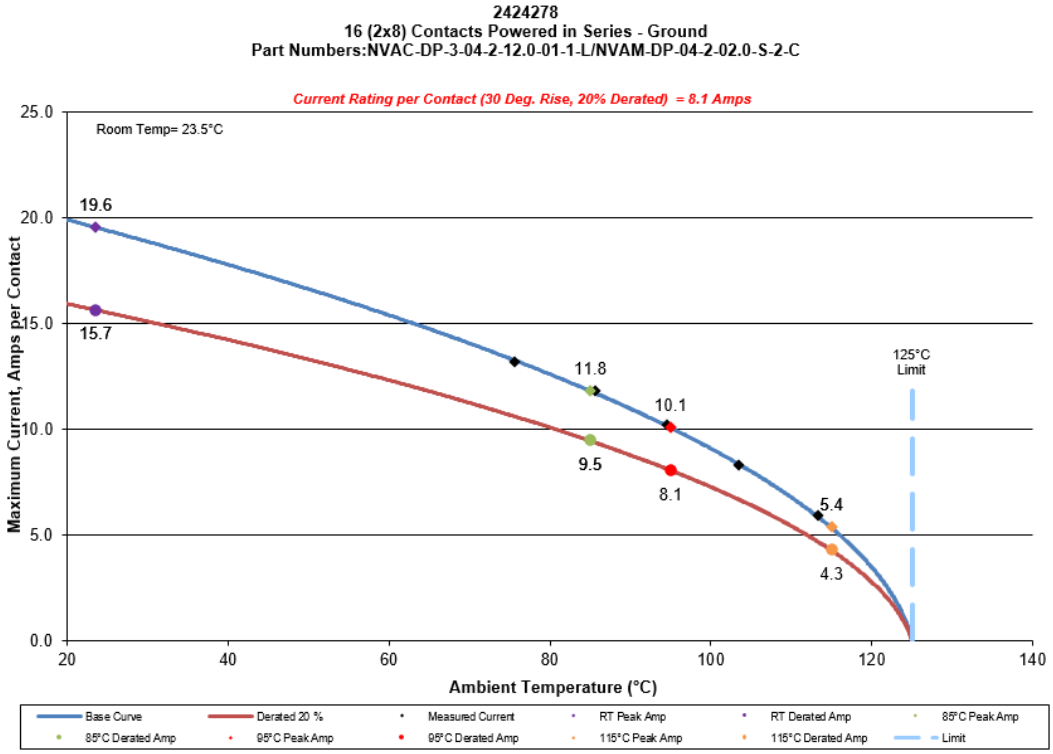
a. Linear configuration with 8 adjacent conductors/contacts powered.

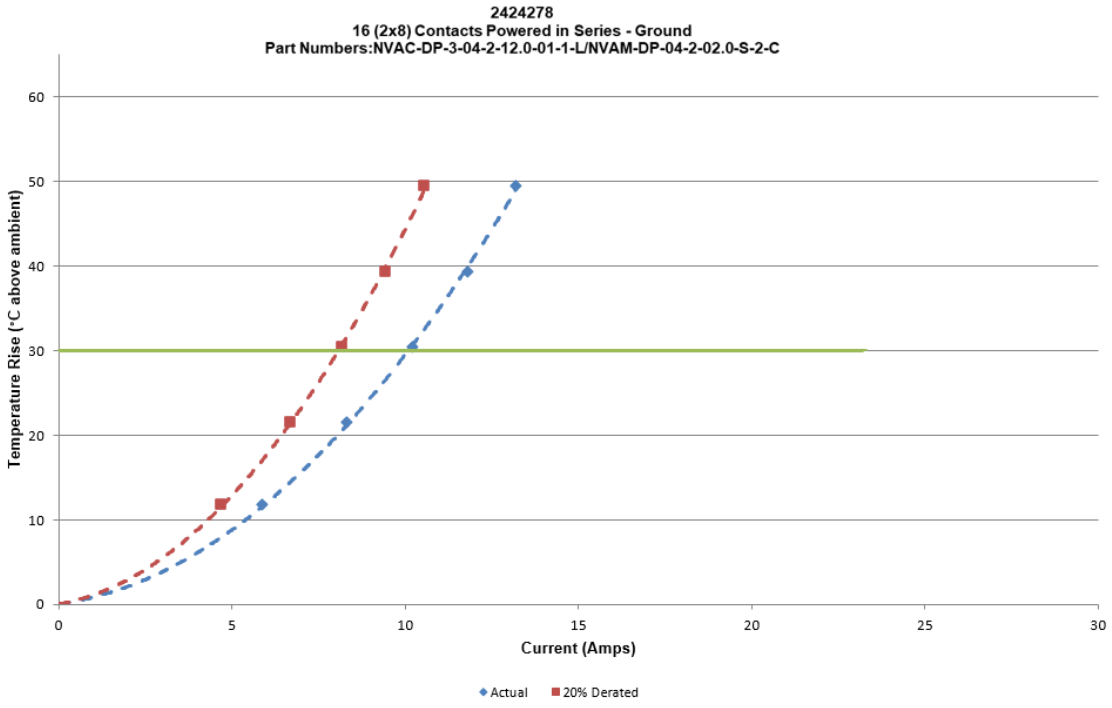




DATA SUMMARIES Continued

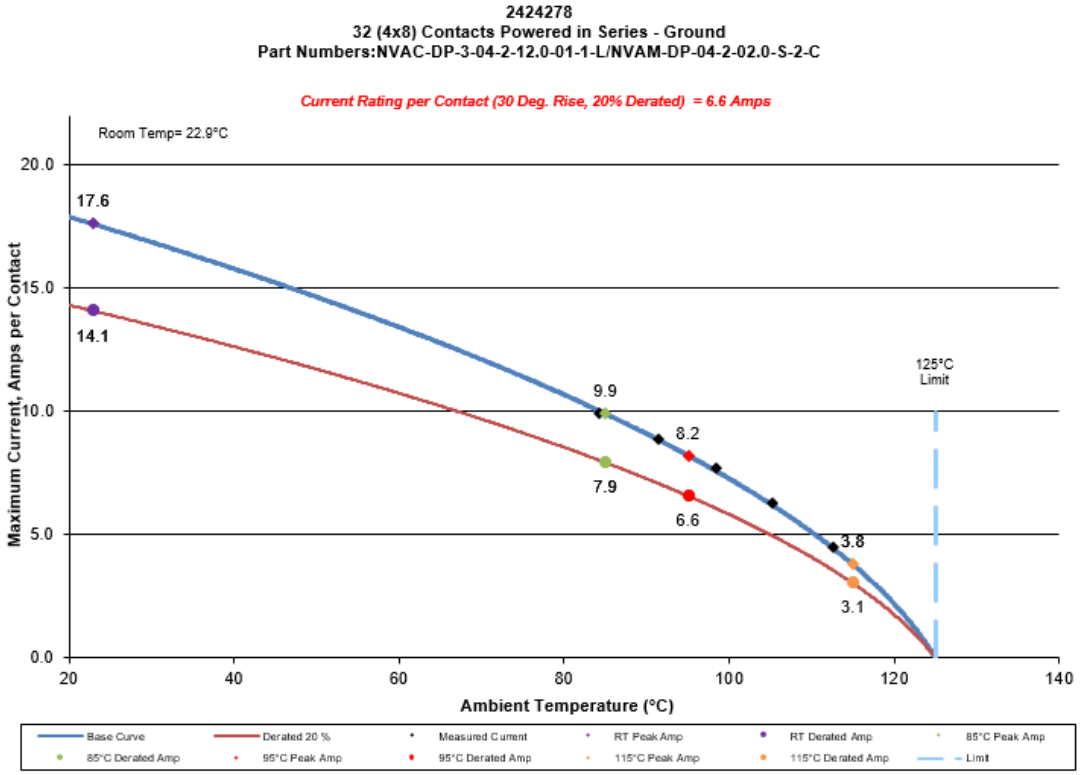
b. Linear configuration with 16 adjacent conductors/contacts powered.

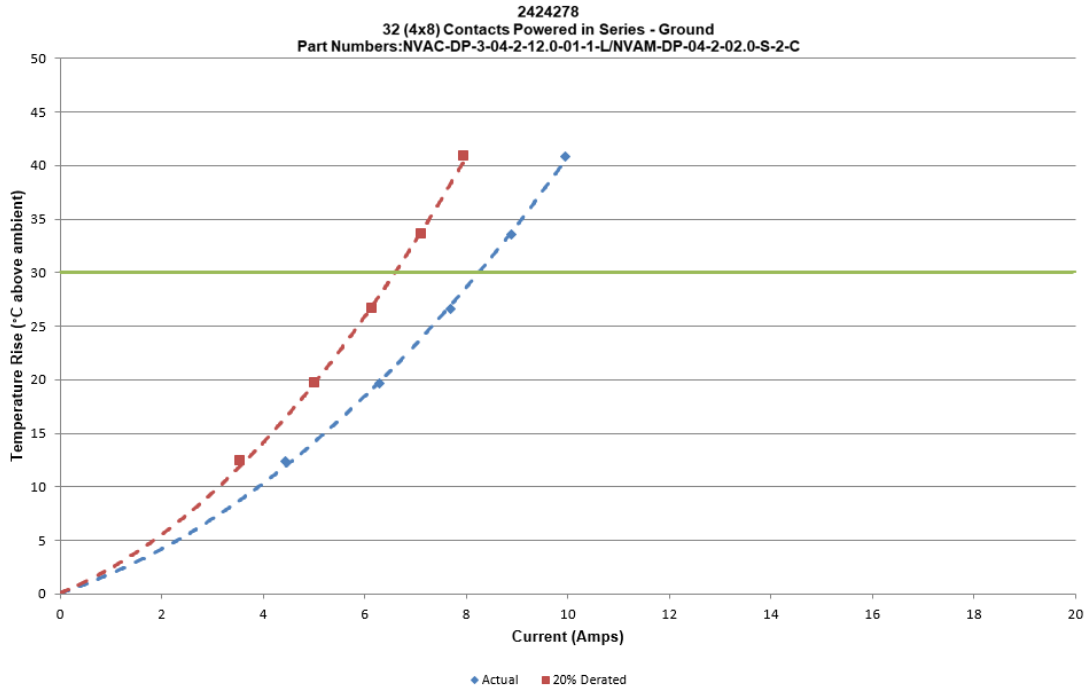




DATA SUMMARIES Continued

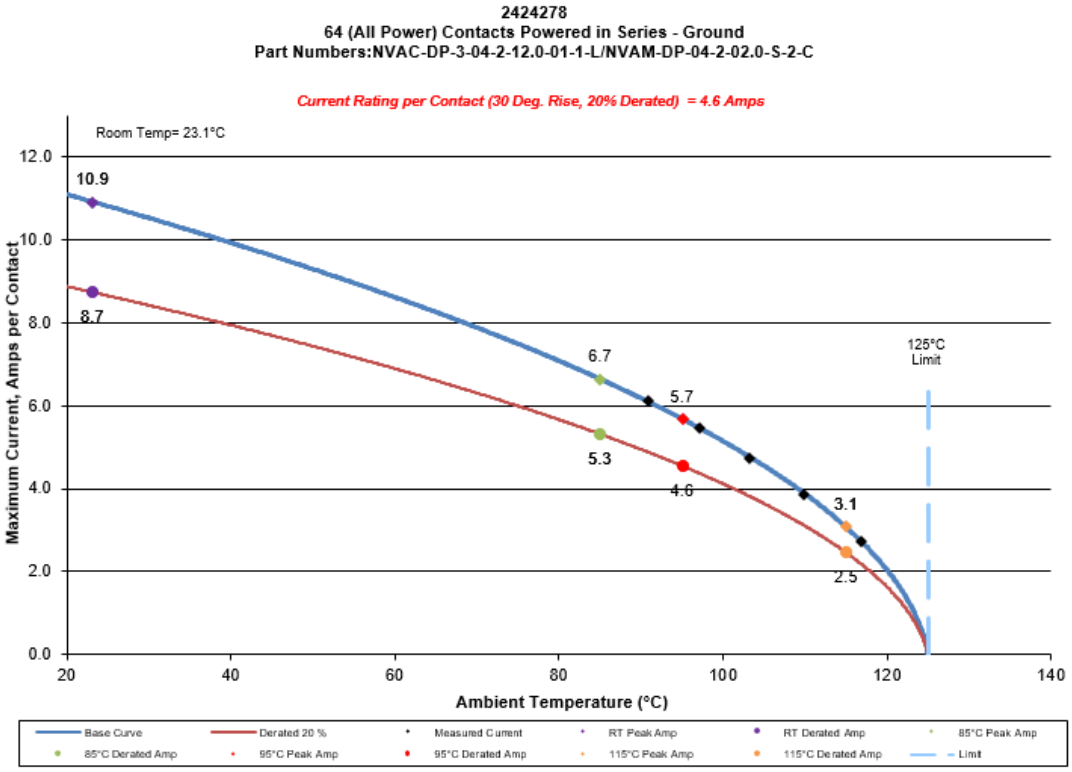
c. Linear configuration with 32 adjacent conductors/contacts powered.

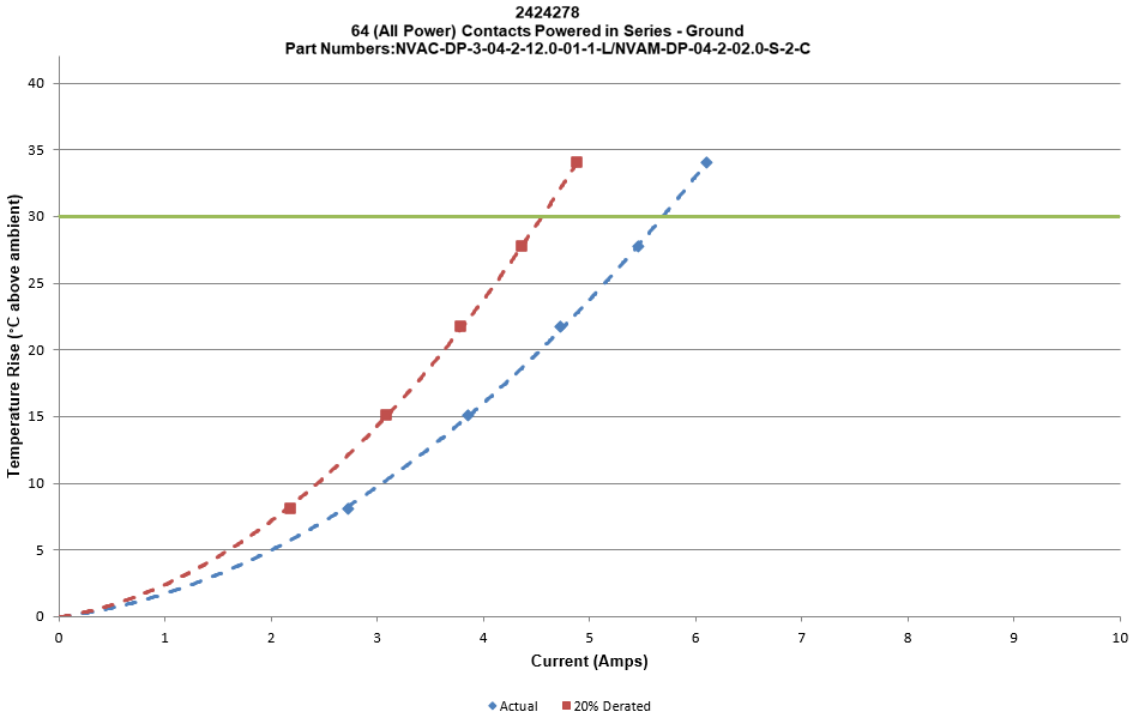




DATA SUMMARIES Continued

d. Linear configuration with 64 adjacent conductors/contacts powered.

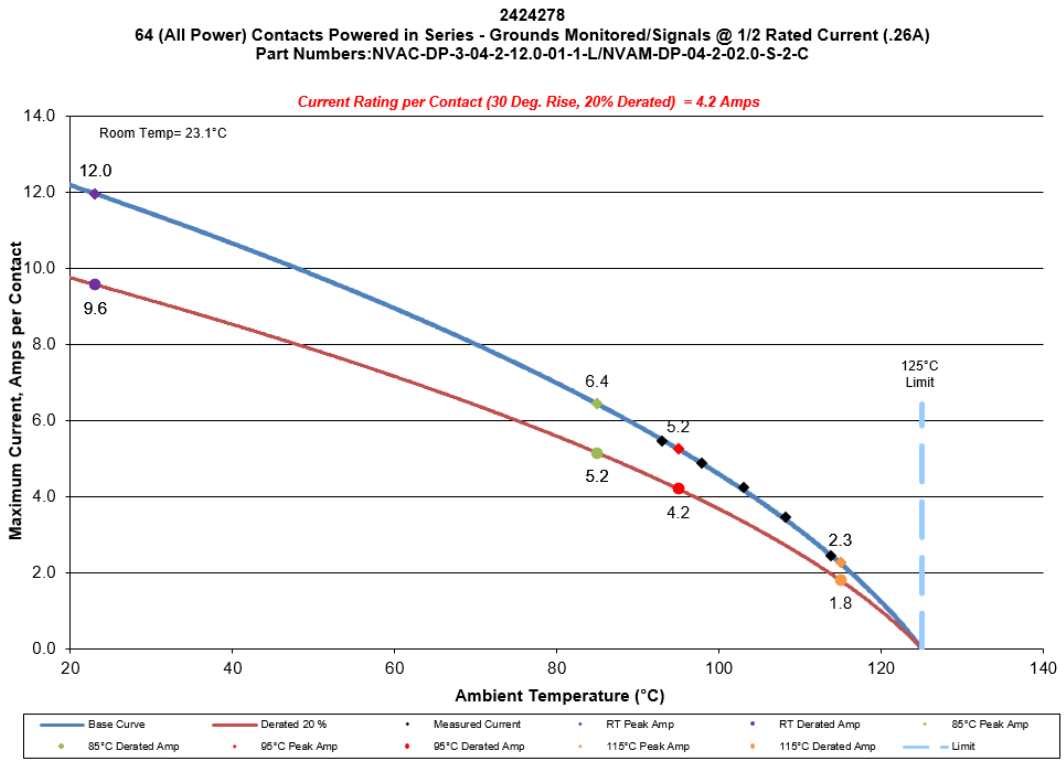


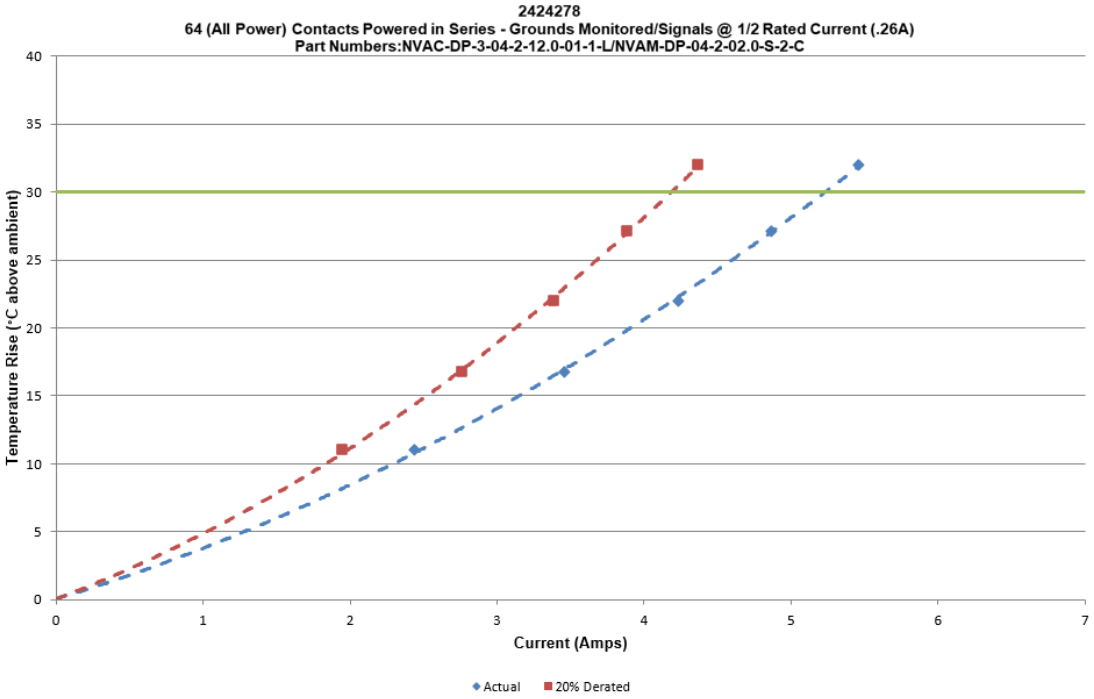


DATA SUMMARIES Continued

All POWER

e. Linear configuration with All adjacent conductors/contacts powered.





DATA SUMMARIES Continued

MATING/UNMATING:

Thermal Aging Group

	Initial				After Thermals			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	29.27	6.58	22.64	5.09	21.23	4.77	16.24	3.65
Maximum	34.56	7.77	25.40	5.71	24.73	5.56	18.96	4.26
Average	32.06	**7.21**	23.73	**5.34**	23.55	**5.30**	17.48	**3.93**
St Dev	1.78	0.40	1.10	0.25	1.31	0.30	1.11	0.25
Count	8	8	8	8	8	8	8	8

Mating unmating durability Group

Group 1 (NVAC-DP-3-04-2-XX.X-XX-X-L/ NVAM-DP-04-2-02.0-S-2-C)

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	31.36	7.05	22.06	4.96	35.45	7.97	23.49	5.28
Maximum	34.96	7.86	24.60	5.53	42.57	9.57	26.02	5.85
Average	33.60	**7.55**	23.63	**5.31**	40.09	**9.01**	24.89	**5.60**
St Dev	1.95	0.44	1.37	0.31	4.02	0.90	1.29	0.29
Count	3	3	3	3	3	3	3	3

	Humidity			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	24.33	5.47	17.26	3.88
Maximum	31.36	7.05	21.75	4.89
Average	27.90	**6.27**	19.32	**4.34**
St Dev	3.52	0.79	2.27	0.51
Count	3	3	3	3

Group 2 (NVAC-DP-3-03-2-12.0-01-1-L/ NVAM-DP-03-2-02.0-S-2-C)

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	17.97	4.04	22.20	4.99	23.09	5.19	27.93	6.28
Maximum	25.35	5.70	30.34	6.82	30.29	6.81	37.19	8.36
Average	21.62	**4.86**	25.90	**5.82**	27.24	**6.13**	32.53	**7.31**
St Dev	2.58	0.58	2.70	0.61	2.64	0.59	3.24	0.73
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Group 3 (NVAC-DP-3-02-2-06.0-01-1-L/ NVAM-DP-02-2-02.0-S-2-CT)

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	13.66	3.07	10.45	2.35	16.90	3.80	11.25	2.53
Maximum	16.68	3.75	12.50	2.81	24.11	5.42	13.57	3.05
Average	15.31	**3.44**	11.55	**2.60**	18.79	**4.22**	12.53	**2.82**
St Dev	1.05	0.24	0.65	0.15	2.21	0.50	0.67	0.15
Count	8	8	8	8	8	8	8	8

	After Humidity			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	12.81	2.88	9.25	2.08
Maximum	14.28	3.21	11.08	2.49
Average	13.39	**3.01**	9.73	**2.19**
St Dev	0.47	0.11	0.59	0.13
Count	8	8	8	8

Group 4 (NVAC-DP-3-02-1-12.0-01-1-L/ NVAM-DP-02-1-02.0-S-2-CT)

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	8.14	1.83	5.65	1.27	8.63	1.94	6.05	1.36
Maximum	8.98	2.02	6.41	1.44	10.59	2.38	6.94	1.56
Average	8.47	**1.91**	6.05	**1.36**	9.90	**2.23**	6.58	**1.48**
St Dev	0.36	0.08	0.35	0.08	0.87	0.20	0.39	0.09
Count	4	4	4	4	4	4	4	4

DATA SUMMARIES Continued

Cable Pull:

0° Pull

	Force (lbs)
Minimum	13.30
Maximum	15.79
Average	14.58

90° Pull

	Force (lbs)
Minimum	6.00
Maximum	6.56
Average	6.34

Latch Retention

	Force (lbs)
Minimum	16.06
Maximum	17.42
Average	16.80

DATA SUMMARIES Continued

Cable Flex:

Insulation Resistance minimums, IR

Pin to Pin	
Mated	
Minimum	
Initial	45000
After 500 Flex Cycles	45000

Pin to Ground	
Mated	
Minimum	
Initial	45000
After 500 Flex Cycles	45000

Row to Row	
Mated	
Minimum	
Initial	45000
After 500 Flex Cycles	45000

Dielectric Withstanding Voltage minimums, DWV

Voltage Rating Summary	
Minimum	
Break Down Voltage	730
Test Voltage	550
Working Voltage	180

Pin to Pin	
Initial Test Voltage	Passed
After 500 Flex Cycles Test Voltage	Passed

Row to Row	
Initial Test Voltage	Passed
After 500 Flex Cycles Test Voltage	Passed

Pin to Ground	
Initial Test Voltage	Passed
After 500 Flex Cycles Test Voltage	Passed

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**NVAC/NVAM**	**NVAC**	**NVAM**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**NVAC/NVAM**	**NVAC**	**NVAM**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	**NVAC/NVAM**	**NVAC**	**NVAM**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Pin to Closest Metallic Hardware		
	Mated	Unmated	Unmated
Minimum	**NVAC/NVAM**	**NVAC**	**NVAM**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

DATA SUMMARIES Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**NVAC/NVAM**
Break Down Voltage	730
Test Voltage	550
Working Voltage	180

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

Pin to Closest Metallic Hardware	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued

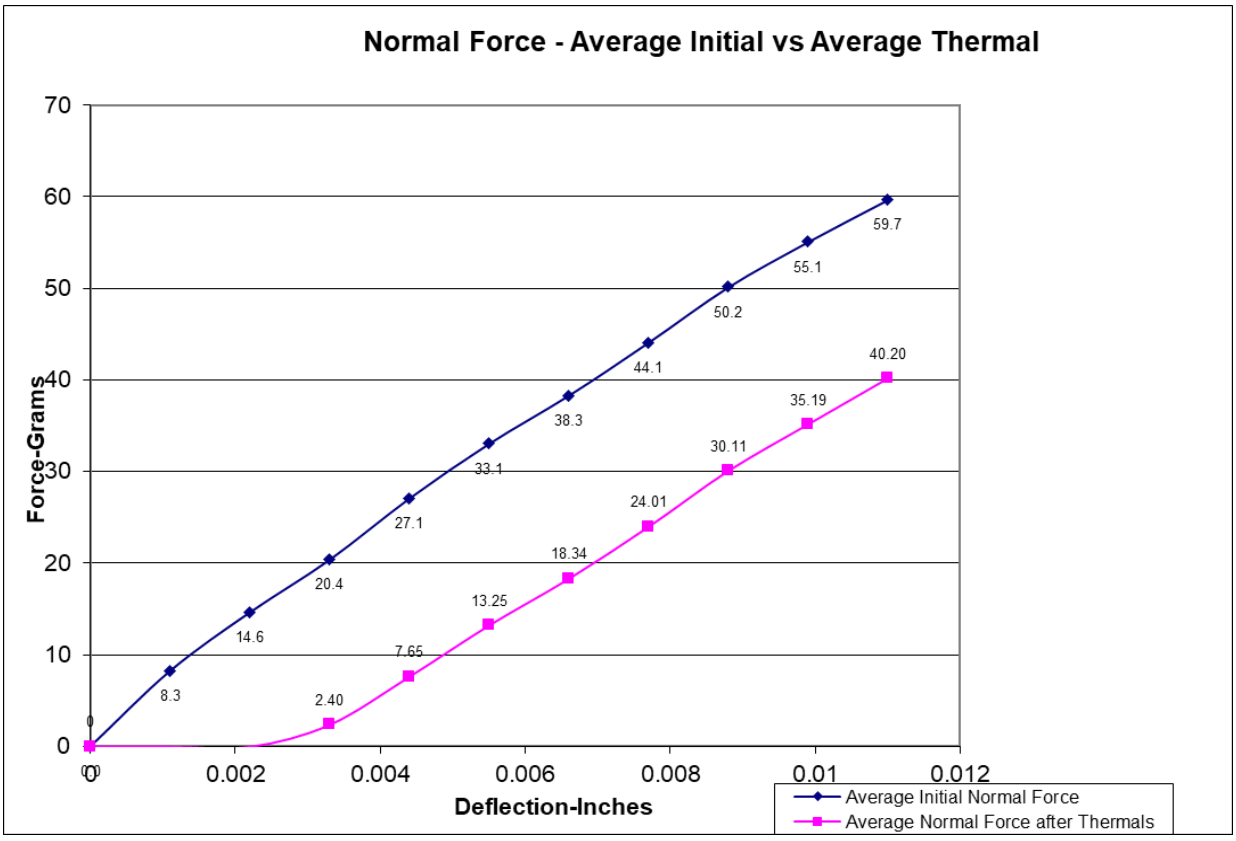
NORMAL FORCE (FOR CONTACTS TESTED OUT THE HOUSING):

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.

Signal Beam

Initial	Deflections in inches Forces in Grams										
	0.0011	**0.0022**	**0.0033**	**0.0044**	**0.0055**	**0.0066**	**0.0077**	**0.0088**	**0.0099**	**0.0110**	***SET***
Averages	8.25	14.64	20.38	27.08	33.05	38.31	44.10	50.15	55.09	59.68	0.0000
Min	7.80	14.10	19.90	26.10	31.80	36.80	42.50	48.50	53.20	57.50	-0.0002
Max	9.00	15.50	21.40	28.10	34.10	39.40	45.10	51.40	56.60	61.20	0.0001
St. Dev	0.457	0.493	0.580	0.698	0.767	0.864	0.915	1.036	1.089	1.161	0.0001
Count	8	8	8	8	8	8	8	8	8	8	8

After Thermals	Deflections in inches Forces in Grams										
	0.0011	**0.0022**	**0.0033**	**0.0044**	**0.0055**	**0.0066**	**0.0077**	**0.0088**	**0.0099**	**0.0110**	***SET***
Averages	-0.01	-0.01	2.40	7.65	13.25	18.34	24.01	30.11	35.19	40.20	0.0028
Min	-0.10	-0.10	1.00	6.00	11.50	16.20	21.50	27.50	32.40	37.40	0.0024
Max	0.10	0.00	4.50	9.90	15.50	20.70	26.50	32.80	38.00	43.00	0.0033
St. Dev	0.064	0.035	1.243	1.485	1.477	1.570	1.723	1.787	1.898	1.991	0.0003
Count	8	8	8	8	8	8	8	8	8	8	8

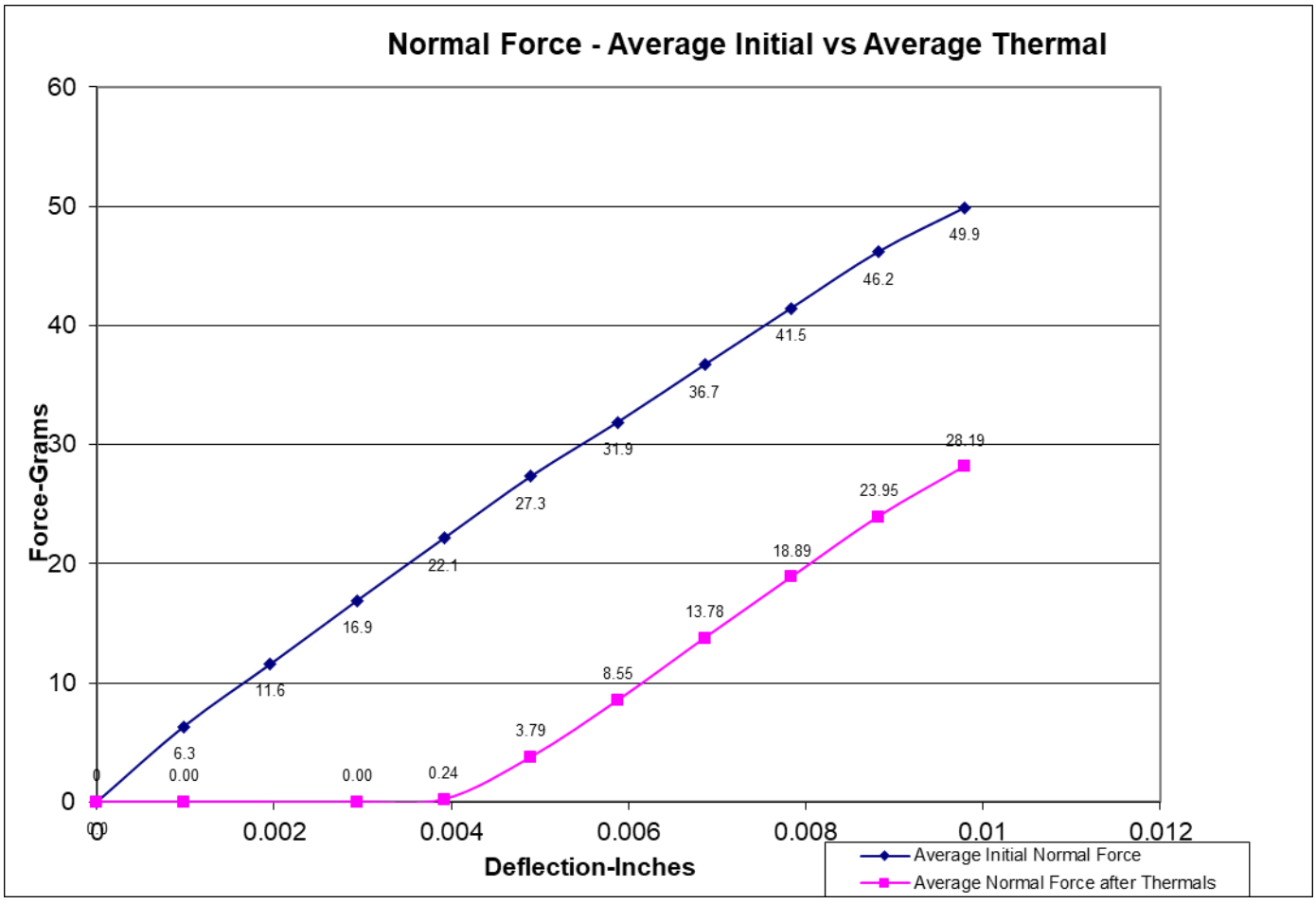


DATA SUMMARIES Continued

NVAC 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	6.33	11.58	16.91	22.14	27.33	31.88	36.69	41.45	46.16	49.88	0
Min	6.00	11.10	16.10	21.20	26.20	30.40	35.00	39.80	44.20	47.80	0
Max	6.70	12.30	17.70	23.00	28.40	33.40	38.70	43.50	48.40	52.00	0
St. Dev	0.219	0.440	0.569	0.699	0.900	1.159	1.268	1.396	1.486	1.573	0.0000
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	0.00	-0.01	0.00	0.24	3.79	8.55	13.78	18.89	23.95	28.19	0.0042
Min	-0.10	-0.10	0.00	0.00	0.10	4.80	10.40	15.80	20.90	25.40	0.0038
Max	0.10	0.00	0.00	1.10	5.90	10.50	15.60	21.20	26.70	31.30	0.0049
St. Dev	0.053	0.035	0.000	0.370	2.105	2.161	2.086	2.150	2.345	2.396	0.0004
Count	8	8	8	8	8	8	8	8	8	8	8

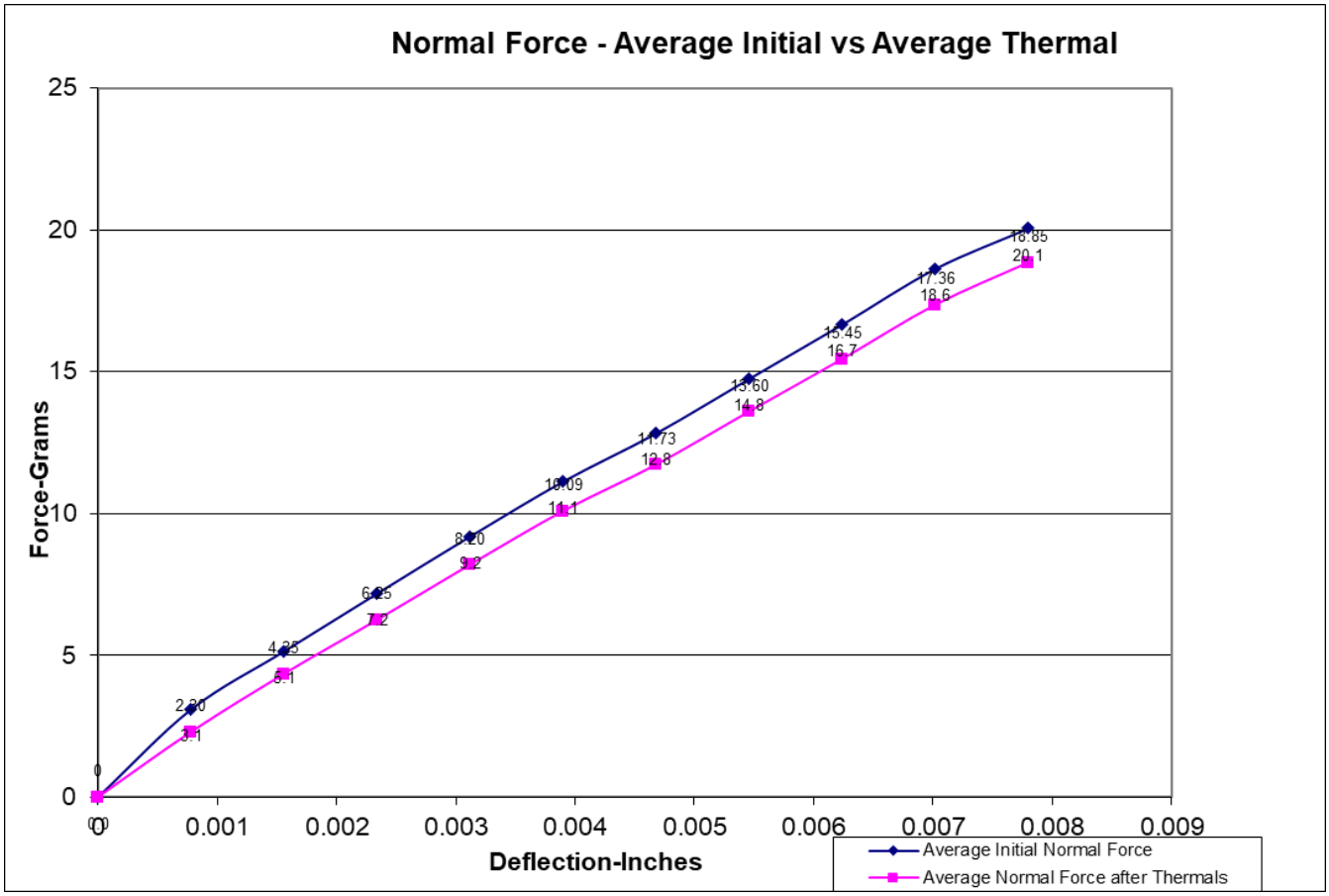


DATA SUMMARIES Continued

Flanking Ground Pin

Initial	Deflections in inches Forces in Grams										
	0.0008	**0.0016**	**0.0023**	**0.0031**	**0.0039**	**0.0047**	**0.0055**	**0.0062**	**0.0070**	**0.0078**	***SET***
Averages	3.09	5.14	7.18	9.19	11.13	12.83	14.75	16.66	18.63	20.05	0
Min	2.90	4.80	6.80	8.80	10.50	12.30	14.10	15.90	17.80	19.10	0
Max	3.30	5.40	7.60	9.70	11.50	13.10	15.10	17.20	19.20	20.60	0
St. Dev	0.136	0.220	0.287	0.309	0.377	0.333	0.385	0.493	0.506	0.558	0.0001
Count	8	8	8	8	8	8	8	8	8	8	8

After Thermals	Deflections in inches Forces in Grams										
	0.0008	**0.0016**	**0.0023**	**0.0031**	**0.0039**	**0.0047**	**0.0055**	**0.0062**	**0.0070**	**0.0078**	***SET***
Averages	2.30	4.35	6.25	8.20	10.09	11.73	13.60	15.45	17.36	18.85	0
Min	1.00	3.00	5.00	7.00	8.70	10.50	12.40	14.20	16.10	17.60	0
Max	3.30	5.50	7.30	9.30	11.20	12.80	14.80	16.70	18.70	20.10	0.0003
St. Dev	0.769	0.802	0.741	0.741	0.774	0.755	0.767	0.805	0.828	0.843	0.0002
Count	8	8	8	8	8	8	8	8	8	8	8

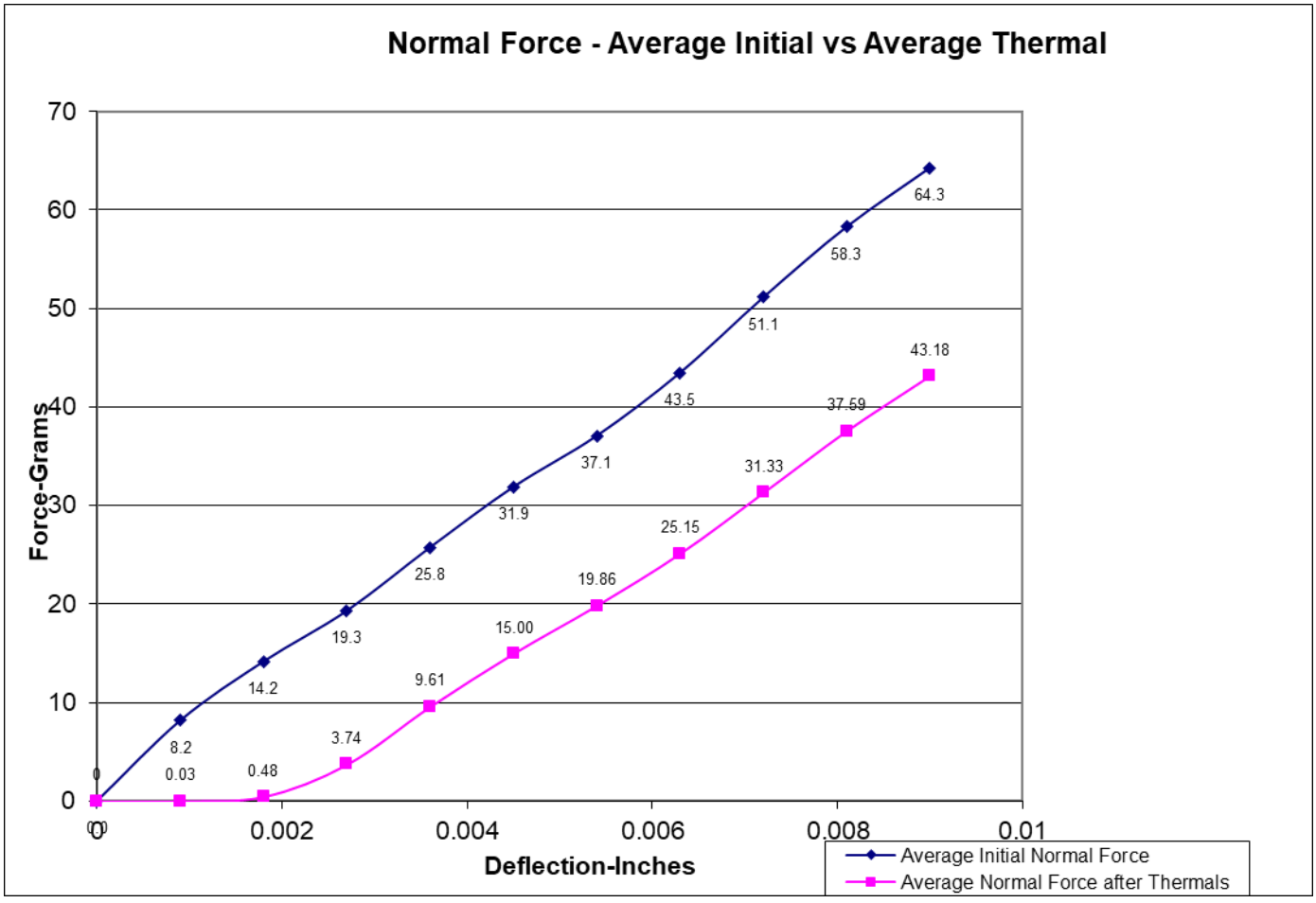


DATA SUMMARIES Continued

Center Ground pin

Initial	Deflections in inches Forces in Grams										
	0.0009	**0.0018**	**0.0027**	**0.0036**	**0.0045**	**0.0054**	**0.0063**	**0.0072**	**0.0081**	**0.0090**	***SET***
Averages	8.18	14.16	19.31	25.75	31.89	37.08	43.48	51.14	58.29	64.28	0.0000
Min	7.20	12.30	16.70	22.60	29.50	34.60	39.80	46.90	53.40	58.90	0
Max	8.50	15.00	20.60	27.40	35.20	41.50	48.80	56.30	63.30	69.10	0.0001
St. Dev	0.477	0.932	1.374	1.666	1.778	2.124	2.716	3.145	3.553	3.702	0.0001
Count	8	8	8	8	8	8	8	8	8	8	8

After Thermals	Deflections in inches Forces in Grams										
	0.0009	**0.0018**	**0.0027**	**0.0036**	**0.0045**	**0.0054**	**0.0063**	**0.0072**	**0.0081**	**0.0090**	***SET***
Averages	0.03	0.48	3.74	9.61	15.00	19.86	25.15	31.33	37.59	43.18	0.0022
Min	-0.10	-0.10	0.00	3.50	9.30	14.30	19.00	24.80	30.20	34.40	0.0015
Max	0.10	3.40	8.40	14.00	19.30	24.20	29.60	35.40	42.90	49.60	0.0033
St. Dev	0.071	1.196	2.630	3.173	3.083	3.166	3.496	3.348	4.033	4.869	0.0005
Count	8	8	8	8	8	8	8	8	8	8	8



DATA SUMMARIES Continued

LLCR GAS TIGHT:

1) A total of 192 signal and 24 ground 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	7/23/2020	7/27/2020		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	55	52		
Technician	Aaron McKim	Aaron McKim		
mOhm values	Actual	**Delta**		
	Initial	**Acid Vapor**		
Pin Type: Signal 1				
Average	329.15	1.70		
St. Dev.	4.60	1.86		
Min	319.43	0.00		
Max	341.91	9.92		
Summary Count	192	192		
Total Count	192	192		
Pin Type: GND 1				
Average	43.33	2.06		
St. Dev.	4.15	1.68		
Min	35.61	0.01		
Max	50.83	8.44		
Summary Count	24	24		
Total Count	24	24		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Acid Vapor	**203**	**13**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Thermal aging

1) A total of 192 signal and 24 ground 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	7/17/2020	7/28/2020		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	51	52		
Technician	Aaron McKim	Aaron McKim		
mOhm values	Actual **Initial**	**Delta Thermal**		
Pin Type: Signal 1				
Average	329.75	2.20		
St. Dev.	5.79	1.84		
Min	319.14	0.01		
Max	398.46	9.6		
Summary Count	192	192		
Total Count	192	192		
Pin Type: GND 1				
Average	44.75	3.05		
St. Dev.	5.67	1.78		
Min	37.06	0.1		
Max	69.15	9.49		
Summary Count	24	24		
Total Count	24	24		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Thermal	**193**	**23**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Mating/Unmating Durability Group

1). A total of 192 signal and 24 ground 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	8/22/2022	8/25/2022	9/3/2022	9/17/2022
Room Temp (Deg C)	23	23	22	22
Rel Humidity (%)	54	52	53	54
Technician	John Crawford	Aaron McKim	John Crawford	John Crawford
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	161.64	1.33	2.80	2.93
St. Dev.	1.68	1.17	1.88	1.93
Min	156.87	0.01	0.05	0.08
Max	168.22	6.77	9.05	10.82
Summary Count	192	192	192	192
Total Count	192	192	192	192
	Pin Type: GND 1			
Average	18.16	0.54	0.85	2.92
St. Dev.	2.29	0.42	0.35	1.13
Min	15.58	0.03	0.08	1.05
Max	21.26	1.52	1.51	5.62
Summary Count	24	24	24	24
Total Count	24	24	24	24

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Cycles	**214**	**2**	**0**	**0**	**0**	**0**
Therm Shck	**192**	**24**	**0**	**0**	**0**	**0**
Humidity	**191**	**24**	**1**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Shock & Vibration

1) A total of 512 signal and 64 ground 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	2023/7/10	2023/7/11		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	54	56		
Technician	Daniel Haydon	Daniel Haydon		
mOhm values	Actual	**Delta**		
	Initial	**Shock-Vib**		
	Pin Type: Signal 1			
Average	175.24	3.67		
St. Dev.	8.13	2.56		
Min	94.75	0.01		
Max	236.75	13.79		
Summary Count	512	512		
Total Count	512	512		
	Pin Type: GND 1			
Average	18.48	1.58		
St. Dev.	0.63	0.79		
Min	17.04	0.13		
Max	19.98	3.03		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Shock-Vib	**452**	**109**	**15**	**0**	**0**	**0**

DATA SUMMARIES Continued

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 05/24/2022, Next Cal: 08/24/2023

Equipment #: TCT-06
Description: Test Resources test stand
Manufacturer: Test Resources
Model: 100R250-12
Serial #: 0710016-01
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 05/03/2022, Next Cal: 05/03/2023

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/30/2022, Next Cal: 04/30/2023

Equipment #: OV-05
Description: Forced Air Oven, 5 Cu. Ft., 120 V (Chamber Room)
Manufacturer: Sheldon Mfg.
Model: CE5F
Serial #: 02008008
Accuracy: +/- 5 deg. C
… Last Cal: 02/18/2022, Next Cal: 02/18/2023

Equipment #: THC-01
Description: Temperature/Humidity Chamber (Chamber Room)
Manufacturer: Thermotron
Model: SM-8-7800
Serial #: 30676
Accuracy: See Manual
… Last Cal: 10/24/2022, Next Cal: 10/24/2023

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

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 #: PS-02
Description: Power Supply
Manufacturer: Hewlett Packard
Model: 6033A
Serial #: 2847A-04167
Accuracy: Last Cal: 6/12/2022, Next Cal: 6/12/2023