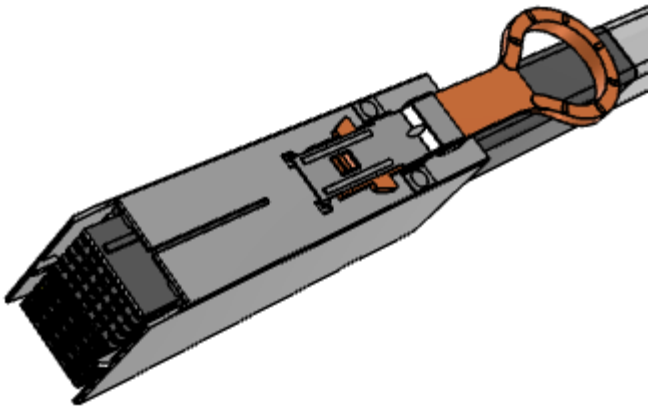
| | |
|---|---|
| Project: Design Qualification Test Report | Tracking Code: CR-1097101_Report_Rev_1 |
| Requested by: Jacob Harris | Date: 8/21/2025 |
| Part #: NVACE-DP-5-8-1.0-A-1-1/NVACP-DP-1-8-12.0 | |
| Part description: NVACE/NVACP | Tech: Brian Stemle |
| Test Start: 7/15/2024 | Test Completed: 9/4/2024 |



**DESIGN QUALIFICATION TEST REPORT**

**NVACE/NVACP**
**NVACE-DP-5-8-1.0-A-1-1/NVACP-DP-1-8-12.0**

## REVISION HISTORY

| DATA | REV.NUM. | DESCRIPTION | ENG |
|---|---|---|---|
| **8/21/2025** | **1** | **Initial test** | **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 the 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 DWV/IR testing were cleaned according to CO-SC-WI-3029.
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 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

# FLOWCHARTS

## Mating/Unmating

Group 1
NVACE-DP-5-8-1.0-A-1-1
NVACP-DP-1-8-12.0
8 Assemblies

| Step | Description |
| --- | --- |
| 1. | Contact Gaps |
| 2. | Mating/Unmating Force(1) |
| 3. | Cycles<br>Quantity = 25 Cycles |
| 4. | Mating/Unmating Force(1) |
| 5. | Cycles<br>Quantity = 25 Cycles |
| 6. | Mating/Unmating Force(1) |
| 7. | Cycles<br>Quantity = 25 Cycles |
| 8. | Mating/Unmating Force(1) |
| 9. | Cycles<br>Quantity = 25 Cycles |
| 10. | Mating/Unmating Force(1) |

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

## Current Carrying Capacity

Group 1
NVACE-DP-5-8-X.X-A-1-1
NVACP-DP-1-8-XX.X-A-1-1
64 Pins Powered
Signal

| Step | Description |
| --- | --- |
| 1. | CCC(1)<br>Rows = 8<br>Number of Positions = 8<br>*Note: Only running power through signal pins* |

(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-5-8-X.X-A-1-1
NVACP-DP-1-8-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-5-8-1.0-A-1-1
NVACP-DP-1-8-12.0
60 Points

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

(1) Nanosecond Event Detection (Mechanical Shock) = Other
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 (30 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 | Group 2 | Group 3 |
|---|---|---|
| NVACE-DP-5-8-1.0-A-1-1 | NVACE-DP-5-8-1.0-A-1-1 | NVACE-DP-5-8-1.0-A-1-1 |
| NVACP-DP-1-8-12.0 | NVACP-DP-1-8-12.0 | NVACP-DP-1-8-12.0 |
| 5 Assemblies | 5 Assemblies | 5 Assemblies |
| 0 Degrees - NVACE | 90 Degrees Vertical - NVACE | 90 Degrees Lateral - NVACE |
| **Step** **Description** | **Step** **Description** | **Step** **Description** |
| 1. Cable Pull (1) | 1. Cable Pull (1) | 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

***NVACE***

| Group 1 | Group 2 |
|---|---|
| NVACE-DP-5-8-12.0-X-X-X | NVACE-DP-5-8-12.0-X-X-X |
| NVACP-DP-1-8-12.0-X-X-X | NVACP-DP-1-8-12.0-X-X-X |
| 8 Assemblies | 8 Assemblies |
| Circular Cable | Circular Cable |
| *Note: No continuity tested.* | *Note: Test for continuity.* |
| **Step** **Description** | **Step** **Description** |
| 1. IR (3) | 1. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 1.5" mandrel radius.* |
| 2. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | 2. Visual Inspection |
| 3. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 1.5" mandrel radius.* | 3. Rotate Cable 90° |
| 4. Visual Inspection | 4. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 1.5" mandrel radius.* |
| 5. IR (3) | 5. Visual Inspection |
| 6. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | |
| 7. Rotate Cable 90° | |
| 8. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 1.5" mandrel radius.* | |
| 9. Visual Inspection | |
| 10. IR (3) | |
| 11. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | |

***NVACP***

| Group 3 | Group 4 |
|---|---|
| NVACP-DP-1-8-12.0-X-X-X | NVACP-DP-1-8-12.0-X-X-X |
| NVACE-DP-5-8-12.0-X-X-X | NVACE-DP-5-8-12.0-X-X-X |
| 8 Assemblies | 8 Assemblies |
| Circular Cable | Circular Cable |
| *Note: No continuity tested.* | *Note: Test for continuity.* |
| **Step** **Description** | **Step** **Description** |
| 1. IR (3) | 1. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 0.75" mandrel radius.* |
| 2. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | 2. Visual Inspection |
| 3. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 0.75" mandrel radius.* | 3. Rotate Cable 90° |
| 4. Visual Inspection | 4. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 0.75" mandrel radius.* |
| 5. IR (3) | 5. Visual Inspection |
| 6. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | |
| 7. Rotate Cable 90° | |
| 8. Cable Flex (1) *Note: 100 cycles. 1 lb weight. 0.75" mandrel radius.* | |
| 9. Visual Inspection | |
| 10. IR (3) | |
| 11. DWV at Test Voltage (2) *Note: Use test voltage from DWV Breakdown sequence.* | |

(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-5-8-1.0-A-1-1

5 Assemblies

| Step | Description |
| --- | --- |
| 1. | Photos (3)<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 orange pull strap for each cycle. Do not mate the connectors during each cycle.* |
| 4. | Mating/Unmating Force (2) |
| 5. | Photos (3)<br>*Note: Take a picture of the latch being engaged.* |
| 6. | Cable Pull (1) - Non Standard<br>*Note: With the latch still engaged, pull at 0° to failure.* |

(1) Cable Pull = Other
Measure and Record Force Required to Failure
Failure = Force Required to Pull NVACE Cable out of NVC Cage

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

(3) Photos
Attach 2-3 photos of contact area

## Pull Strap Durability

Group 1
NVACE-DP-5-8-1.0-A-1-1

| Step | Description |
| --- | --- |
| 1. | Cable Pull (1) - Non Standard<br>*Note: Pull SNG-IM-SK-15902 at 90 degrees relative to the top face of SK-15901-08.* |
| 2. | Photos (2) - Non Standard |

(1) Cable Pull = Other
Measure and Record Force Required to Failure
Failure = Deformation of Latch Mechanism

(2) Photos = Other
Attach 2-3 photos of latch area after pull

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### MECHANICAL SHOCK (Specified Pulse):

1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
2) Test Condition C
3) Peak Value: 30 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 testing, the samples were characterized to ensure 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

### MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

## ATTRIBUTE DEFINITIONS 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 three temperature points are reported:
    a. Ambient
    b. $80^o$ C
    c. $95^o$ C
    d. $115^o$ C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

### 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

## 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°, in-line with cable
    b. At 90°, in-line with cable

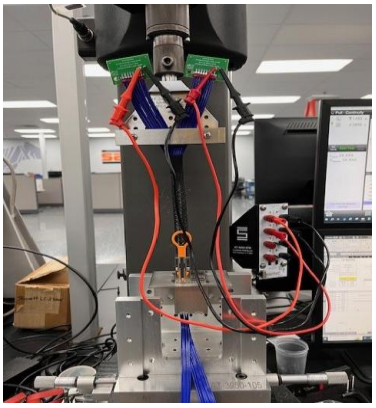


Fig. 1
0° Connector pull.

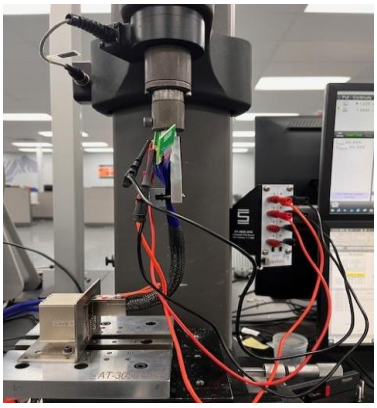


Fig. 2
90° Lateral Connector pull.

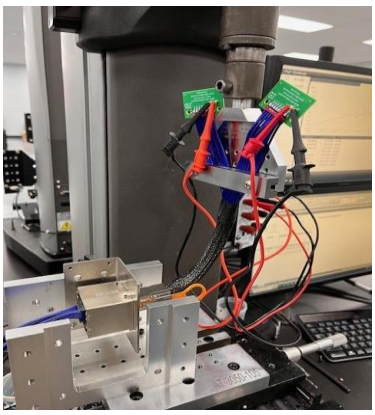


Fig. 3
90° Vertical Connector pull.

### CABLE DURABILITY:

1) Oscillate and monitor electrical continuity for open circuit indication.
    a. ± 90°Flex Mode, bend up to 200 cycles. load on cable end.

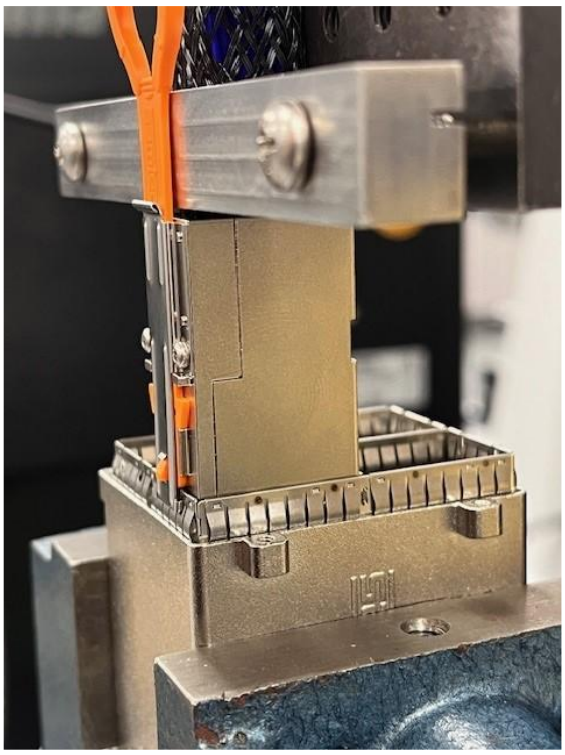
Fig. 4
(Setup picture)

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### Latch Durability:

Manually pull back the orange pull strap for each cycle. Do not mate the connectors during each cycle.

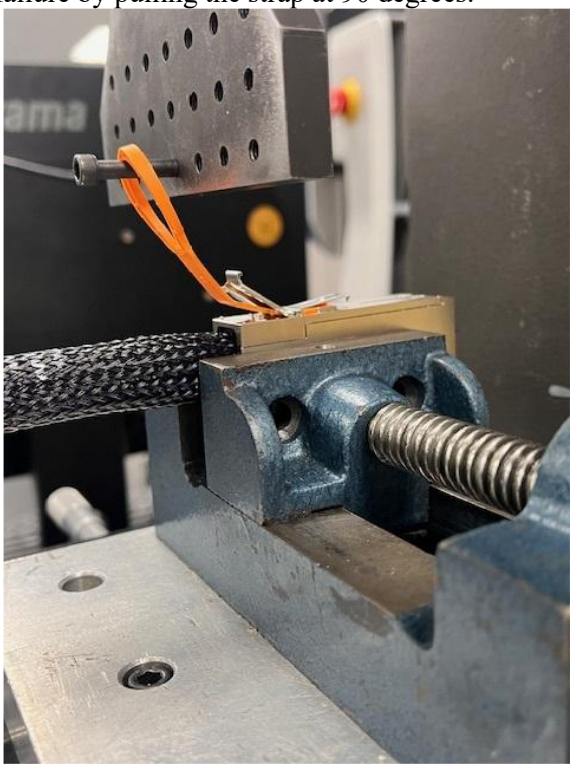


## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### Pull Strap Durability:

Measure the force required to failure by pulling the strap at 90 degrees.



# RESULTS

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

- **CCC for a 30°C Temperature Rise----------0.6 A per contact with 64 contacts (8 x 8) powered.**

## Mating – Unmating Forces

**Mating/Unmating Group (NVACE-DP-5-8-1.0-A-1-1\NVACP-DP-1-8-12.0)**

- **Initial**
  - **Mating**
    - **Min ---------- 6.03 lbs**
    - **Max---------- 7.45 lbs**
  - **Unmating**
    - **Min ---------- 3.05 lbs**
    - **Max---------- 4.01 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 6.48 lbs**
    - **Max---------- 7.70 lbs**
  - **Unmating**
    - **Min ---------- 3.17 lbs**
    - **Max---------- 4.67 lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 6.46 lbs**
    - **Max---------- 7.77 lbs**
  - **Unmating**
    - **Min ---------- 3.27 lbs**
    - **Max---------- 4.92 lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 6.49 lbs**
    - **Max---------- 7.78 lbs**
  - **Unmating**
    - **Min ---------- 3.30 lbs**
    - **Max---------- 5.10 lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 6.47 lbs**
    - **Max---------- 8.00 lbs**
  - **Unmating**
    - **Min ---------- 3.37 lbs**
    - **Max---------- 5.67 lbs**

## Cable Pull force:

- **0° Pull**
  - **Min----------11.42 lbs**
  - **Max ----------27.52 lbs**
- **90° Pull-Vertical**
  - **Min----------29.96 lbs**
  - **Max ----------83.76 lbs**
- **90° Pull-Lateral**
  - **Min---------- 9.42 lbs**
  - **Max ----------73.48 lbs**

## RESULTS Continued

### Latch Durability

#### Mating Force

**Group 1 (NVACE-DP-5-8-1.0-A-1-1)**

- **Initial**
  - **Mating**
    - **Min ---------- 1.53 lbs**
    - **Max---------- 2.00 lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 1.25 lbs**
    - **Max---------- 1.92 lbs**

#### Cable Pull Force

**Group 1 (NVACE-5-8-1.0-A-1-1)**

- **0° Pull**
  - **Min----------10.39 lbs**
  - **Max ----------18.23 lbs**

### Pull Strap Durability

**Group 1 (NVACE-DP-5-8-1.0-A-1-1)**

- **90° Pull**
  - **Min----------48.04 lbs**
  - **Max ----------58.24 lbs**

## RESULTS Continued

### Cable Flex:

#### Insulation Resistance minimums, IR

**NVACE Group 1**

**Pin to Pin**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Row to Row**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Pin to Ground**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

**NVACP Group 3**

**Pin to Pin**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Row to Row**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

**Pin to Ground**

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 100 flex cycles Rotate Cable 90°**
  - **Mated----------45000 Meg Ω ---------- Passed**

## RESULTS Continued

**Dielectric Withstanding Voltage minimums, DWV**

- **Test Voltage ----------630 VAC**

**NVACE Group 1**

**Pin to Pin**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

**Row to Row**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

**Pin to Ground**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

**NVACP Group 3**

**Pin to Pin**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

**Row to Row**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

**Pin to Ground**

- **Initial DWV ----------Passed**
- **After 100 Flex cycles DWV ----------Passed**
- **After 100 Flex cycles DWV Rotate Cable 90° ---------Passed**

## RESULTS Continued

### LLCR Shock & Vibration (512 signal and 16 ground LLCR test points)

**Signal Pin**

- **Initial ---------- 398.22 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 508 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 4 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

**Ground Pin**

- **Initial ---------- 9.35 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 16 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:

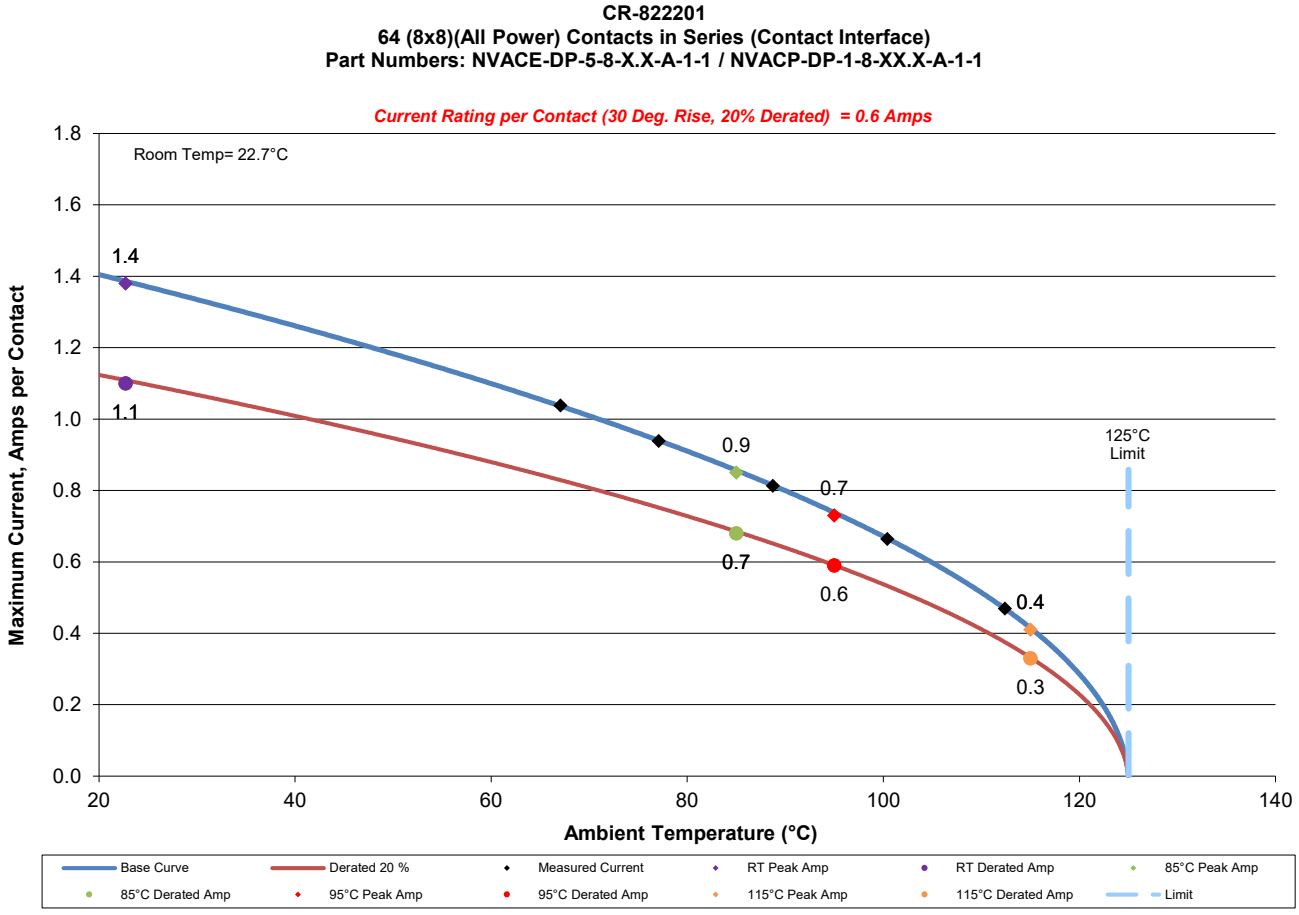
- **Shock**
  - **No Damage ---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**
- **Vibration**
  - **No Damage ---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**

# DATA SUMMARIES

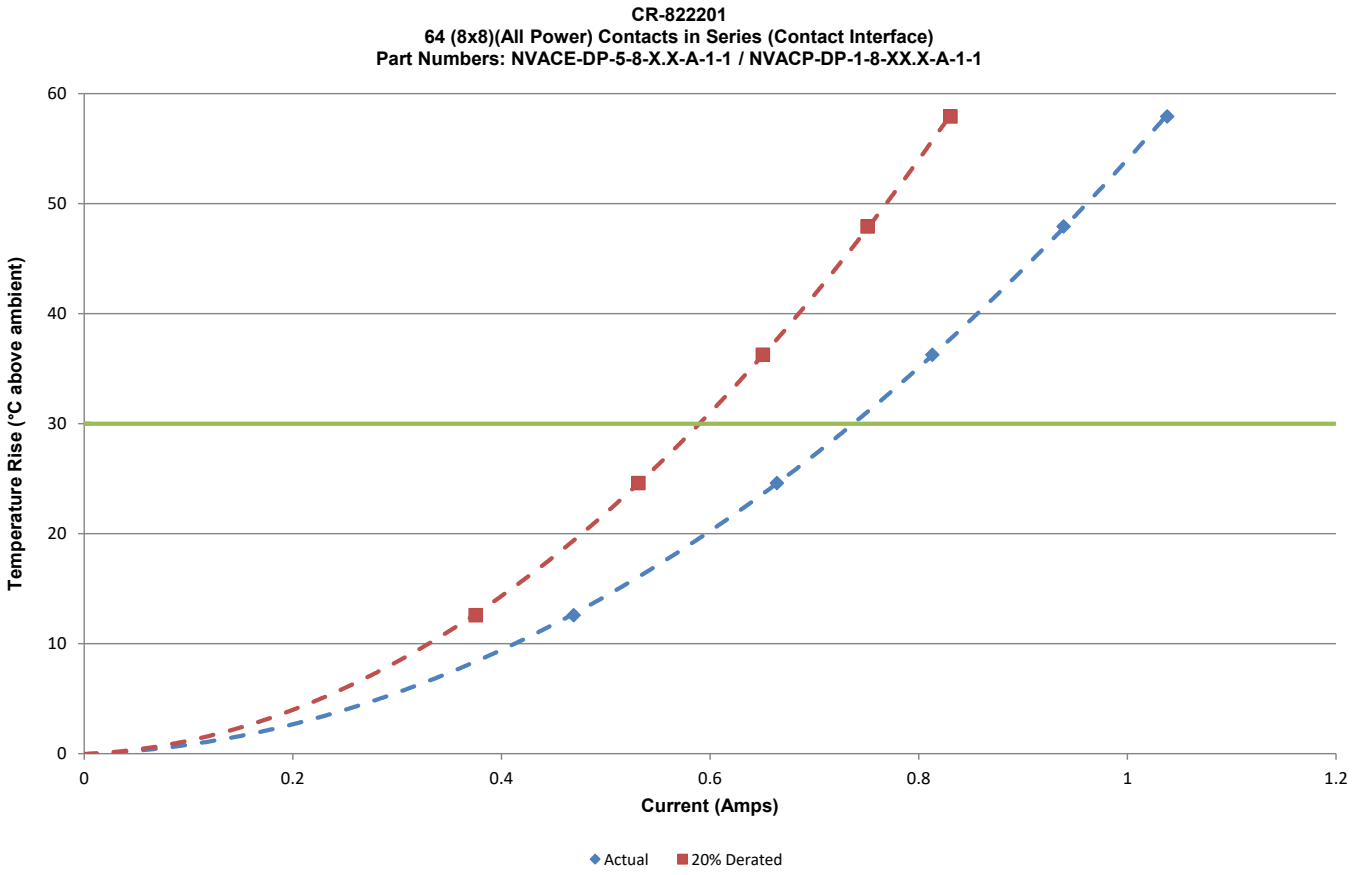
## TEMPERATURE RISE (Current Carrying Capacity, CCC):

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 2 adjacent conductors/contacts powered



# DATA SUMMARIES Continued



## DATA SUMMARIES Continued

## MATING/UNMATING:

**Mating/Unmating Group (NVACE-DP-5-8-1.0-A-1-1\NVACP-DP-1-8-12.0)**

| | Initial | | | | 25 Cycles | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 26.82 | 6.03 | 13.57 | 3.05 | 28.82 | 6.48 | 14.10 | 3.17 |
| Maximum | 33.14 | 7.45 | 17.84 | 4.01 | 34.25 | 7.70 | 20.77 | 4.67 |
| **Average** | 29.01 | **6.52** | 15.53 | **3.49** | 31.73 | **7.13** | 16.62 | **3.74** |
| St Dev | 1.93 | 0.43 | 1.55 | 0.35 | 2.18 | 0.49 | 2.05 | 0.46 |
| 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 | 28.73 | 6.46 | 14.54 | 3.27 | 28.87 | 6.49 | 14.68 | 3.30 |
| Maximum | 34.56 | 7.77 | 21.88 | 4.92 | 34.61 | 7.78 | 22.68 | 5.10 |
| **Average** | 31.65 | **7.12** | 17.22 | **3.87** | 31.56 | **7.10** | 17.57 | **3.95** |
| St Dev | 2.14 | 0.48 | 2.31 | 0.52 | 2.10 | 0.47 | 2.52 | 0.57 |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| | 100 Cycles | | | |
|---|---|---|---|---|
| | **Mating** | | **Unmating** | |
| | Newtons | Force (Lbs) | Newtons | Force (Lbs) |
| Minimum | 28.80 | 6.47 | 14.99 | 3.37 |
| Maximum | 35.58 | 8.00 | 25.22 | 5.67 |
| **Average** | 31.87 | **7.16** | 18.24 | **4.10** |
| St Dev | 2.40 | 0.54 | 3.14 | 0.71 |
| Count | 8 | 8 | 8 | 8 |

## DATA SUMMARIES Continued

**Cable Pull Force:**

**0° Pull**

| | Force (lbs) |
| --- | --- |
| Minimum | 11.42 |
| Maximum | 27.52 |
| Average | 19.88 |

**90° Pull-Vertical**

| | Force (lbs) |
| --- | --- |
| Minimum | 29.96 |
| Maximum | 83.76 |
| Average | 53.53 |

**90° Pull-Lateral**

| | Force (lbs) |
| --- | --- |
| Minimum | 9.42 |
| Maximum | 73.48 |
| Average | 34.09 |

## DATA SUMMARIES Continued

### Latch Durability:

#### Mating Force

**Group 1 (NVACE-DP-5-8-1.0-A-1-1)**

| | Initial | 100 Cycles |
| --- | --- | --- |
| | Force (lbs) | Force (lbs) |
| Minimum | **1.53** | **1.25** |
| Maximum | 2.00 | 1.92 |
| Average | 1.83 | 1.66 |

#### Cable Pull Force

**Group 1 (NVACE-DP-5-8-1.0-A-1-1)**

| | Force (lbs) |
| --- | --- |
| Minimum | **10.39** |
| Maximum | 18.23 |
| Average | 14.11 |

### Pull Strap Durability

**Group 1 (NVACE-DP-5-8-1.0-A-1-1)**

| | Force (lbs) |
| --- | --- |
| Minimum | **48.04** |
| Maximum | 58.24 |
| Average | 53.49 |

## DATA SUMMARIES Continued

### Cable Flex:

#### Insulation Resistance minimums, IR

**NVACE Group 1**

| Pin to Pin | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

| Row to Row | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

| Pin to Ground | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

**NVACP Group 3**

| Pin to Pin | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

| Row to Row | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

| Pin to Ground | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 100 Flex Cycles** | 45000 |
| **After 100 Flex Cycles Rotate Cable 90°** | 45000 |

## DATA SUMMARIES Continued

### Dielectric Withstanding Voltage minimums, DWV

| Voltage Rating Summary | |
| --- | --- |
| **Minimum** | |
| **Test Voltage** | 630 |

### NVACE Group 1

| Pin to Pin | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

| Row to Row | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

| Pin to Ground | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

### NVACP Group 3

| Pin to Pin | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

| Row to Row | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

| Pin to Ground | |
| --- | --- |
| **Initial Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage** | Passed |
| **After 100 Flex Cycles Test Voltage Rotate Cable 90°** | Passed |

## DATA SUMMARIES Continued

### LLCR Shock & Vibration:

1). A total of 512 signals and 16 ground points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
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

| LLCR Measurement Summaries by Pin Type | | |
|---|---|---|
| Date | 2022/12/19 | 2022/12/21 |
| Room Temp (Deg C) | 22 | 22 |
| Rel Humidity (%) | 39 | 38 |
| Technician | Tony wagoner | Tony Wagoner |
| **mOhm values** | Actual **Initial** | **Delta Shock-Vib** |
| **Pin Type: Signal 1** | | |
| Average | 382.13 | 1.18 |
| St. Dev. | 8.67 | 1.06 |
| Min | 363.8 | 0 |
| Max | 398.22 | 9.94 |
| Summary Count | 512 | 512 |
| Total Count | 512 | 512 |
| **Pin Type: GND 1** | | |
| Average | 7.85 | 0.56 |
| St. Dev. | 0.65 | 0.28 |
| Min | 7.03 | 0.19 |
| Max | 9.35 | 1.1 |
| Summary Count | 16 | 16 |
| Total Count | 16 | 16 |

| LLCR Delta Count by Category | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Shock-Vib** | **524** | **4** | **0** | **0** | **0** | **0** |

### Nanosecond Event Detection:

| Shock and Vibration Event Detection Summary | |
|---|---|
| Contacts tested | 72 |
| Test Condition | 30g'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 #:** TCT-04
**Description:** Dillon Quantrol TC21 25-1000 mm/min series test stand
**Manufacturer:** Dillon Quantrol
**Model:** TC2 I series test stand
**Serial #:** 04-1041-04
**Accuracy:** Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;
… Last Cal: 05/29/2024, Next Cal: 05/29/2025

**Equipment #:** HPT-01
**Description:** Hipot Safety Tester
**Manufacturer:** Vitrek
**Model:** V73
**Serial #:** 019808
**Accuracy:**
… Last Cal: 05/15/2024, Next Cal: 05/15/2025

**Equipment #:** SVC-01
**Description:** Shock & Vibration Table
**Manufacturer:** Data Physics
**Model:** LE-DSA-10-20K
**Serial #:** 10037
**Accuracy:** See Manual
… Last Cal: 04/22/2024, Next Cal: 04/22/2025

**Equipment #:** ACLM-01
**Description:** Accelerometer
**Manufacturer:** PCB Piezotronics
**Model:** 352C03
**Serial #:** 115819
**Accuracy:** See Manual
… Last Cal: 07/18/2024, Next Cal: 07/18/2025

**Equipment #:** ED-03
**Description:** Event Detector
**Manufacturer:** Analysis Tech
**Model:** 32EHD
**Serial #:** 1100604
**Accuracy:** See Manual
… Last Cal: 10/31/2023, Next Cal: 10/31/2024

**Equipment #:** PS-02
**Description:** Power Supply
**Manufacturer:** Hewlett-Packer
**Model:** 6033A
**Serial #:** N/A
**Accuracy:** See Manual
… Last Cal: NOT CALIBRATED

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** MO-11
**Description:** Switch/Multimeter
**Manufacturer:** Keithley
**Model:** 3706
**Serial #:** 120169
**Accuracy:** See Manual
… Last Cal: 09/11/2023, Next Cal: 09/11/2024