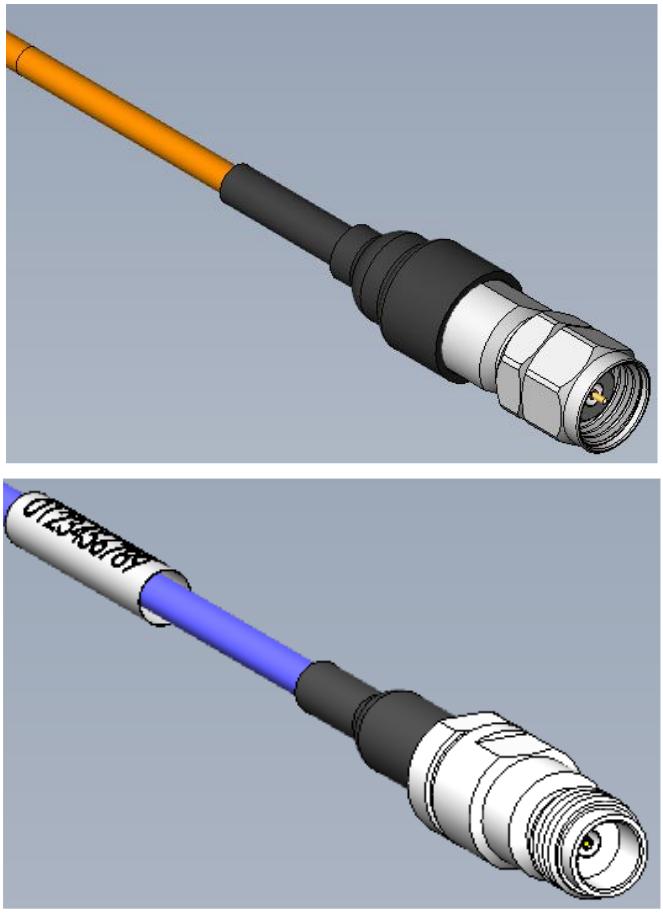
| | |
|---|---|
| Project: Design Qualification Test Report | Tracking Code: CR-1263201_Report_Rev_1 |
| Requested by: Tom Yahav | Date: 8/26/2025 |
| Part #: LL071-18BJ-505050-0152/RF086-18SP-505050-0152 | |
| Part description: LL071/RF086 | Tech: Tony Wagoner |
| Test Start: 6/10/2025 | Test Completed: 6/25/2025 |



# DESIGN QUALIFICATION TEST REPORT

## LL071/RF086
## LL071-18BJ-505050-0152/RF086-18SP-505050-0152

## REVISION HISTORY

| DATA | REV.NUM. | DESCRIPTION | ENG |
|---|---|---|---|
| **7/4/2025** | **1** | **Initial Issue** | **PC** |

## CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.



## SCOPE

To perform the following tests: Design Qualification test. Please see test plan.

## APPLICABLE DOCUMENTS

Standards: MIL-PRF-39012.

## 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) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
4) Any additional preparation will be noted in the individual test sequences.

# FLOWCHARTS

## IR/DWV

***Pin-to-Ground***

Group 1
LL071-18BJ-505050-0152
RF086-18SP-505050-0152
5 Assemblies

*Note: For STEP 6, please put the following additional cable assemblies in the thermal shock chamber (ride along parts).*
*Plug & jack versions are mated with dust caps (yellow) on open ends.*
*Jack version: LL07-18SB-505050-0152 (5 PCS)*
*Plug version: RF086-18SP-505050-0152 (5 PCS)*

| Step | Description |
| --- | --- |
| 1. | Length & Mass |
| 2. | Interface Gaging |
| 3. | IR (2) - Non Standard |
| 4. | DWV at Test Voltage (1) - Non Standard<br>Test Voltage = 500 VAC |
| 5. | LLCR (3) - Non Standard<br>*Note: Signal and ground.* |
| 6. | Thermal Shock (4) - Non Standard |
| 7. | IR (2) - Non Standard |
| 8. | DWV at Test Voltage (1) - Non Standard<br>Test Voltage = 500 VAC |
| 9. | LLCR (3) - Non Standard<br>Max Delta = 15 mOhm<br>*Note: Signal and ground.* |
| 10. | Interface Gaging |

(1) DWV at Test Voltage = Other
Test Condition = 1 (Sea Level) Test voltage applied for 60 seconds
MIL-PRF-39012, Paragraph. 4.6.14 per MIL-STD-202-301

(2) IR = Other
Test Condition = 500V DC, 2 Minutes Max
MIL-PRF-39012, Paragraph 4.6.8 per MIL-STD-202-302

(3) LLCR = Other
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
MIL-PRF-39012, Paragraph 4.6.13 except current to be 100mA nominal and voltage to be 20 mV maximum.

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes = 1/2 Hour
Test Condition = I (-65°C to +125°C)
Test Duration = test condition B except 10 cycles instead of 5.
MIL-PRF-39012, Paragraph. 4.6.17 per MIL-STD-202-107

## FLOWCHARTS Continued

### Cable Pull

**Group 1**
LL071-18BJ-505050-0152

5 Assemblies
0 Degrees

| Step | Description |
|---|---|
| 1. | Cable Retention (2) - Non Standard<br>*Note: Pull-to-destruct.* |

**Group 2**
LL071-18BJ-505050-0152

5 Assemblies
90 Degrees

| Step | Description |
|---|---|
| 1. | Cable Retention (2) - Non Standard<br>*Note: Pull-to-destruct.* |

**Group 3**
LL071-18BJ-505050-0152
RF086-18SP-505050-0152

5 Assemblies
0 Degrees

| Step | Description |
|---|---|
| 1. | Length & Mass |
| 2. | Interface Gaging |
| 3. | LLCR (3) - Non Standard<br>*Note: Signal and ground.* |
| 4. | Cable Retention (1) - Non Standard<br>*Note: Apply 8 pounds (3.6 kg) for Cable Retention test.* |
| 5. | LLCR (3) - Non Standard<br>*Note: Signal and ground.* |
| 6. | Interface Gaging |

(1) Cable Retention = Other
Apply 8 pounds (3.6 kg) for Cable Retention test.
MIL-PRF-30192, Paragraph 4.6.21

(2) Cable Retention = Other
Pull-to-destruct.
MIL-PRF-30192, Paragraph 4.6.21

(3) LLCR = Other
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
MIL-PRF-39012, Paragraph 4.6.13 except current to be 100mA nominal and voltage to be 20 mV maximum.

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### THERMAL SHOCK:

1) MIL-PRF-39012, paragraph. 4.6.17 per MIL-STD-202-107.
2) Test Condition I: -65℃ to +125℃
3) Test Time: ½ hour dwell at each temperature extreme
4) Test Duration: test condition B except 10 cycles instead of 5.
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stress in mated conditions.

### LLCR:

1) MIL-PRF-39012, Paragraph 4.6.13 except current to be 100 mA nominal and voltage to be 20 mV maximum.
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 of stress
    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

### CABLE RETENTION:

1) Pull to destruct.
2) MIL-PRF-30192, paragraph. 4.6.21.

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

### INSULATION RESISTANCE (IR):

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

1) PROCEDURE:
    a. Reference document: MIL-PRF-39012, paragraph. 4.6.8 per MIL-STD-202-302.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Electrification Time 2.0 minutes
        iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
2) MEASUREMENTS:
3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

### DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

1) PROCEDURE:
    a. Reference document: MIL-PRF-39012, paragraph. 4.6.14 per MIL-STD-202-301.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1(Sea Level) Test voltage applied for 60 seconds.
        iii. Rate of Application 500 V/Sec
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).

## RESULTS

### Cable Pull force

**0**

- **Min ---------- 22.34 lbs**
- **Max ---------- 23.40 lbs**

**90**

- **Min ---------- 22.91 lbs**
- **Max ---------- 26.68 lbs**

### Insulation Resistance minimums, IR

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

### Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Test Voltage ---------- 500 VAC**

**Mating-Unmating Durability Group**

- **Initial DWV ---------- Passed**

**IR\DWV Group**

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

### Interface Gaging

**IR\DWV Group**

**Initial**

- **Min ---------- 0.00095 in**
- **Max ---------- 0.00175 in**

**After Thermal Shock**

- **Min ---------- 0.00110 in**
- **Max ---------- 0.00195 in**

**Cable Pull Group**

**Initial**

- **Min ---------- 0.00110 in**
- **Max ---------- 0.00230 in**

**After 5 Ib Retention Force**

- **Min ---------- 0.00100 in**
- **Max ---------- 0.00230 in**

## RESULTS Continued

### LLCR IR/DWV (5 ground and 5 signal LLCR test points)

**Signal pin**

- **Initial ---------- 27.98 mOhms Max**

**Ground pin**

- **Initial ---------- 16.07 mOhms Max**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 10 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

### LLCR Cable Pull (5 ground and 5 signal LLCR test points)

**Signal pin**

- **Initial ---------- 28.23 mOhms Max**

**Ground pin**

- **Initial ---------- 15.96 mOhms Max**
- **After 5Ib Retention Force**
  - **<= +5.0 mOhms ---------- 10 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**

## DATA SUMMARIES

### Cable Pull Force:

**0° Pull**

| | Force (lbs) |
|---|---|
| Minimum | **22.34** |
| Maximum | 23.40 |
| Average | 22.86 |

**90° Pull**

| | Force (lbs) |
|---|---|
| Minimum | **22.91** |
| Maximum | 26.68 |
| Average | 24.91 |

### INSULATION RESISTANCE (IR):

| | **Pin to Ground** |
|---|---|
| | Mated |
| Minimum | **LL071/RF086** |
| **Initial** | 45000 |
| **Thermal Shock** | 45000 |

### DIELECTRIC WITHSTANDING VOLTAGE (DWV):

| **Voltage Rating Summary** | |
|---|---|
| **Minimum** | **LL071/RF086** |
| **Test Voltage** | 500 |

**Mating-Unmating Durability Group**

| **Pin to Ground** | |
|---|---|
| **Initial Test Voltage** | Pass |

**IR\DWV Group**

| **Pin to Ground** | |
|---|---|
| **Initial Test Voltage** | Pass |
| **After Thermal Shock Test Voltage** | Pass |

## DATA SUMMARIES Continued

### INTERFACE GAGING

**IR/DWV Group**

| Interface Gaging (.003/.000) | | | |
|---|---|---|---|
| Sample # | Initial | Thermal Shock | Delta (Force) |
| 6 | 0.00175 | 0.00175 | 0.00000 |
| 7 | 0.00150 | 0.00195 | 0.00045 |
| 8 | 0.00095 | 0.00115 | 0.00020 |
| 9 | 0.00105 | 0.00110 | 0.00005 |
| 10 | 0.00105 | 0.00115 | 0.00010 |

**Cable Pull Group**

| Interface Gaging (.003/.000) | | | |
|---|---|---|---|
| Sample # | Initial | 8lb Ret. Force | Delta (Force) |
| 21 | 0.00110 | 0.00100 | 0.00010 |
| 22 | 0.00170 | 0.00160 | 0.00010 |
| 23 | 0.00230 | 0.00230 | 0.00000 |
| 24 | 0.00145 | 0.00145 | 0.00000 |
| 25 | 0.00120 | 0.00120 | 0.00000 |

## DATA SUMMARIES Continued

### LLCR IR/DWV:

1) A total of 5 signals and 5 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 | 6/20/2025 | 6/23/2025 | | |
| Room Temp (Deg C) | 22 | 22 | | |
| Rel Humidity (%) | 56 | 51 | | |
| Technician | Tony Wagoner | Tony Wagoner | | |
| **mOhm values** | Actual | **Delta** | | |
| | **Initial** | **Ther Shock** | | |
| | **Pin Type: Signal 1** | | | |
| Average | 27.82 | 0.21 | | |
| St. Dev. | 0.16 | 0.17 | | |
| Min | 27.62 | 0.05 | | |
| Max | 27.98 | 0.48 | | |
| Summary Count | 5 | 5 | | |
| Total Count | 5 | 5 | | |
| | **Pin Type: GND 1** | | | |
| Average | 15.08 | 1.7 | | |
| St. Dev. | 1.89 | 0.25 | | |
| Min | 11.7 | 1.38 | | |
| Max | 16.07 | 2 | | |
| Summary Count | 5 | 5 | | |
| Total Count | 5 | 5 | | |

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

## DATA SUMMARIES Continued

### LLCR Cable Pull:

1) A total of 5 signals and 5 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 | 6/20/2025 | 7/21/2025 |
| Room Temp (Deg C) | 22 | 22 |
| Rel Humidity (%) | 56 | 56 |
| Technician | Tony Wagoner | Tony Wagoner |
| **mOhm values** | Actual | **Delta** |
| | **Initial** | **Cable Retention** |
| **Pin Type: Signal 1** | | |
| Average | 28.01 | 0.17 |
| St. Dev. | 0.2 | 0.14 |
| Min | 27.74 | 0.05 |
| Max | 28.23 | 0.4 |
| Summary Count | 5 | 5 |
| Total Count | 5 | 5 |
| **Pin Type: GND 1** | | |
| Average | 14.26 | 1.06 |
| St. Dev. | 1.92 | 1.41 |
| Min | 12.04 | 0.11 |
| Max | 15.96 | 3.45 |
| Summary Count | 5 | 5 |
| Total Count | 5 | 5 |

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

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** MO-01
**Description:** Micro-Ohmeter
**Manufacturer:** Keithley
**Model:** 580
**Serial #:** 772740
**Accuracy:** See Manual
… Last Cal: 2/21/2025, Next Cal: 2/21/2026

**Equipment #:** HPT-01
**Description:** Hipot Safety Tester
**Manufacturer:** Vitrek
**Model:** V73
**Serial #:** 019808
**Accuracy:**
… Last Cal: 05/11/2025, Next Cal: 05/11/2026

**Equipment #:** TSC-01
**Description:** Vertical Thermal Shock Chamber
**Manufacturer:** Cincinnatti Sub Zero
**Model:** VTS-3-6-6-SC/AC
**Serial #:** 10-VT14993
**Accuracy:** See Manual
… Last Cal: 06/12/2025, Next Cal: 06/30/2026

**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: 05/03/2025, Next Cal: 05/03/2026