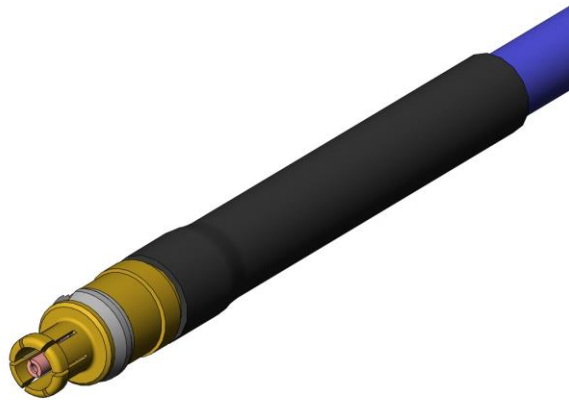




Project Number: Design Qualification Test Report	Tracking Code: CR-918204_Report_Rev_2
Requested by: Joe Huang	Date: 3/6/2024
Part #: RF086-GC86-303030-0305	
Part description: GC86 GANGED CABLE ASSEMBLY	Tech: Peter Chen
Test Start: 5/1/2023	Test Completed: 5/10/2023



## DESIGN QUALIFICATION TEST REPORT

GC86 GANGED CABLE ASSEMBLY  
RF086-GC86-303030-0305

Tracking Code: CR-918204\_Report\_Rev\_2

Part #: RF086-GC86-303030-0305

Part description: GC86 GANGED CABLE ASSEMBLY

### REVISION HISTORY

<b>DATA</b>	<b>REV.NUM.</b>	<b>DESCRIPTION</b>	<b>ENG</b>
5/28/2023	1	Initial Issue	PC
8/15/2023	2	Update the cable pull force	PC

## CERTIFICATION

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

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### SCOPE

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

### APPLICABLE DOCUMENTS

Standards: EIA-364 and MIL-STD-202-301

### 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 IR\_DWV 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 IR\_DWV 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/Durability**Group 1

RF086-GC86-303030-0305

RF086-MOSP-303030-0305

5 Assemblies

Step	Description
1.	Interface Gaging
2.	LLCR (2) - Non Standard <i>Note: Signal and ground.</i>
3.	Cycles Quantity = 100 Cycles <i>Note: By hand. Torque each time to 8 in-lbs. Rotate plug coupling nut only. Do not rotate entire assembly. MIL-PRF-39012, Paragraph. 4.6.12</i>
4.	LLCR (2) - Non Standard Max Delta = 15 mOhm <i>Note: Signal and ground.</i>
5.	Interface Gaging
6.	DWV at Test Voltage <sup>(1)</sup> - Non Standard DWV = 500 VAC

(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) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max  
Test Current = 100 mA Max

**FLOWCHARTS Continued****IR/DWV**Group 1

RF086-GC86-303030-0305

RF086-MOSP-303030-0305

5 Assemblies

**Step Description**

1. IR (2) - Non Standard
2. Thermal Shock (3) - Non Standard
3. IR (2) - Non Standard
4. DWV at Test Voltage(1) - Non Standard  
Test Voltage = 500 VAC

**(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) Thermal Shock = Other**

EIA-364-32: TEST COND. III. A-4

**Cable Pull**Group 1

RF086-GC86-303030-0305

5 Assemblies

0 Degrees

**Step Description**

1. Cable Retention (2) - Non Standard  
*Note: Pull-to-destruct. Record destruction force.*

Group 2

RF086-GC86-303030-0305

RF086-MOSP-303030-0305

5 Assemblies

0 Degrees

**Step Description**

1. Interface Gaging
2. LLCR (3) - Non Standard  
*Note: Signal and ground.*
3. Cable Retention (1) - Non Standard
4. LLCR (3) - Non Standard  
*Note: Signal and ground.*
5. Interface Gaging

**(1) Cable Retention = Other**

Apply 10 pounds (4.6 kg) for Cable Retention test.  
MIL-PRF-39012, Paragraph 4.6.21

**(2) Cable Retention = Other**

Pull-to-destruct.  
MIL-PRF-30192, Paragraph 4.6.21

**(3) LLCR = EIA-364-23**

Open Circuit Voltage = 20 mV Max  
Test Current = 100 mA Max

## 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 I: -65°C to +125°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Number of Cycles: 10
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

### 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

### 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-STD-202-302, *Insulation Resistance Test Procedure for Electrical Connectors*.
  - b. Test Conditions:
    - i. Between Adjacent Contacts or Signal-to-Ground
    - ii. Electrification Time 2.0 minutes
    - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
- 2) MEASUREMENTS:
- 3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 5000 megohms.

### 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-STD-202-301, *Withstanding Voltage Test Procedure for Electrical Connectors*.
  - b. Test Conditions:
    - i. Between Adjacent Contacts or Signal-to-Ground
    - ii. Barometric Test Condition 1
    - iii. Rate of Application 500 V/Sec
    - iv. Test Voltage (VAC) until breakdown occurs

### ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes

#### 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).

#### CABLE PULL:

- 1) Secure cable near center and pull on connector
  - a. At 0°, in-line with cable

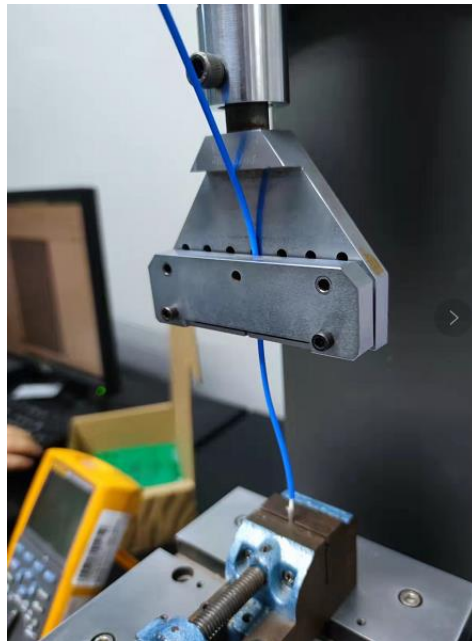


Fig. 1

0° Connector pull, notice the electrical continuity hook-up wires.

**RESULTS****Cable Pull force**

- 0° Pull
  - GC86
    - Min-----29.32 lbs
    - Max -----32.30 lbs

**IR\_DWV****Insulation Resistance minimums, IR****Pin to Ground**

- Initial
  - Mated-----45000 Meg  $\Omega$  ----- Passed
- Thermal Shock
  - Mated-----45000 Meg  $\Omega$  ----- Passed

**Dielectric Withstanding Voltage minimums, DWV**

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

**Pin to Ground**

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

**DWV Mating/Unmating Durability Group**

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

**Pin to Ground**

- Initial DWV -----Passed

### RESULTS Continued

#### Interface Gaging

##### Mating/Unmating Durability Group

###### GC86

###### Initial

- Min ----- 0.03 mm
- Max ----- 0.04 mm

###### After 100 cycles

- Min ----- 0.02 mm
- Max ----- 0.03 mm

###### M0SP

###### Initial

- Min ----- 0.02 mm
- Max ----- 0.04 mm

###### After 100 cycles

- Min ----- 0.03 mm
- Max ----- 0.04 mm

##### Cable Pull Group

###### GC86

###### Initial

- Min ----- 0.01 mm
- Max ----- 0.04 mm

###### After Pull

- Min ----- 0.01 mm
- Max ----- 0.03 mm

###### M0SP

###### Initial

- Min ----- 0.01 mm
- Max ----- 0.05 mm

###### After Pull

- Min ----- 0.01 mm
- Max ----- 0.03 mm

**RESULTS Continued****LLCR Cable Pull (5 signal and 5 ground LLCR test points)****Signal Pin**

- Initial ----- 44.65 mOhms Max

**Ground Pin**

- Initial ----- 18.21 mOhms Max

- 10 Ibs Retention

- <= +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 Durability (5 signal and 5 ground LLCR test points)****Signal Pin**

- Initial ----- 44.41 mOhms Max

**Ground Pin**

- Initial ----- 17.65 mOhms Max

- Durability, 100 Cycles

- <= +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**

GC86	Force (lbs)
Minimum	29.32
Maximum	32.30
Average	30.72

**IR\_DWV****INSULATION RESISTANCE (IR):**

Pin to Ground	
Mated	
Minimum	<b>GC86/M0SP</b>
<b>Initial</b>	45000
<b>Thermal Shock</b>	45000

**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

Pin to Ground (500 VAC)	
Initial Test Voltage	Pass
After Thermal Shock Test Voltage	Pass

**DWV Mating/Unmating Durability Group**

Pin to Ground (500 VAC)	
After cycles Test Voltage	Pass

**DATA SUMMARIES Continued****INTERFACE GAGING****Mating/Unmating Durability Group**

<b>Gaging (0.00 /0.05)(mm)</b>			
<b>GC86</b>	<b>Initial</b>	<b>Post 100 Cycles</b>	<b>Delta</b>
1	0.03	0.03	0.00
2	0.04	0.02	0.02
3	0.04	0.03	0.01
4	0.04	0.02	0.02
5	0.03	0.03	0.00
Max	0.04	0.03	0.02
Min	0.03	0.02	0.00
Average	0.04	0.03	0.01

<b>Gaging (0.00 /0.05)(mm)</b>			
<b>MOSP</b>	<b>Initial</b>	<b>Post 100 Cycles</b>	<b>Delta</b>
1	0.02	0.03	0.01
2	0.02	0.03	0.01
3	0.03	0.03	0.00
4	0.02	0.04	0.02
5	0.04	0.03	0.01
Max	0.04	0.04	0.02
Min	0.02	0.03	0.00
Average	0.03	0.03	0.01

**Cable Pull Group**

<b>Gaging (0.00 /0.05)(mm)</b>			
<b>GC86</b>	<b>Initial</b>	<b>Post 100 Cycles</b>	<b>Delta</b>
1	0.03	0.03	0.00
2	0.04	0.03	0.01
3	0.01	0.01	0.00
4	0.02	0.01	0.01
5	0.01	0.02	0.01
Max	0.04	0.03	0.01
Min	0.01	0.01	0.00
Average	0.04	0.03	0.01

<b>Gaging (0.00 /0.08)(mm)</b>			
<b>MOSP</b>	<b>Initial</b>	<b>Post 100 Cycles</b>	<b>Delta</b>
1	0.03	0.02	0.01
2	0.05	0.03	0.02
3	0.01	0.01	0.00
4	0.03	0.02	0.01
5	0.02	0.01	0.01
Max	0.05	0.03	0.02
Min	0.01	0.01	0.01
Average	0.03	0.03	0.01

**DATA SUMMARIES Continued****LLCR Durability:**

- 1) A total of 5 signal 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.  $\leq +5.0$  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	5/8/2023	5/8/2023	
Room Temp (Deg C)	22	23	
Rel Humidity (%)	50	50	
Technician	Peter Chen	Peter Chen	
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta 100 CYCLES</b>	
<b>Pin Type: Signal 1</b>			
Average	44.14	0.25	
St. Dev.	0.27	0.10	
Min	43.68	0.15	
Max	44.41	0.39	
Summary Count	5	5	
Total Count	5	5	
<b>Pin Type: GND 1</b>			
Average	16.95	0.47	
St. Dev.	0.41	0.50	
Min	16.63	0.03	
Max	17.65	1.33	
Summary Count	5	5	
Total Count	5	5	

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	$\leq 5$	$>5$ & $\leq 10$	$>10$ & $\leq 15$	$>15$ & $\leq 50$	$>50$ & $\leq 1000$	$>1000$
After 100 Cycles	10	0	0	0	0	0

**DATA SUMMARIES Continued****LLCR Cable Pull:**

- 1) A total of 5 signal 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.  $\leq +5.0$  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	8/7/2023	8/8/2023	
Room Temp (Deg C)	22	22	
Rel Humidity (%)	50	50	
Technician	Peter Chen	Peter Chen	
mOhm values	Actual	<b>Delta</b>	
	Initial	<b>Retention</b>	
<b>Pin Type: Signal 1</b>			
Average	43.87	2.13	
St. Dev.	1.35	2.78	
Min	42.32	0.15	
Max	44.65	5.31	
Summary Count	5	5	
Total Count	5	5	
<b>Pin Type: GND 1</b>			
Average	17.78	2.18	
St. Dev.	0.38	0.89	
Min	17.56	1.36	
Max	18.21	3.13	
Summary Count	5	5	
Total Count	5	5	

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	$\leq 5$	$>5$ & $\leq 10$	$>10$ & $\leq 15$	$>15$ & $\leq 50$	$>50$ & $\leq 1000$	$>1000$
Thermal Shock	10	0	0	0	0	0

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** HZ-TCT-01

**Description:** Normal force analyzer

**Manufacturer:** Mecmesin Multitester

**Model:** Mecmesin Multitester 2.5-i

**Serial #:** 08-1049-04

**Accuracy:** Last Cal: 4/26/2022, Next Cal: 4/25/2023

**Equipment #:** HZ-TSC-01

**Description:** Vertical Thermal Shock Chamber

**Manufacturer:** Cincinnatti Sub Zero

**Model:** VTS-3-6-6-SC/AC

**Serial #:** 10-VT14994

**Accuracy:** See Manual

... Last Cal: 06/28/2022, Next Cal: 06/27/2023

**Equipment #:** HZ-HPM-01

**Description:** NA9636H

**Manufacturer:** Ainuo

**Model:** 6031A

**Serial #:** 089601091

**Accuracy:** Last Cal: 3/7/2023, Next Cal: 3/6/2024