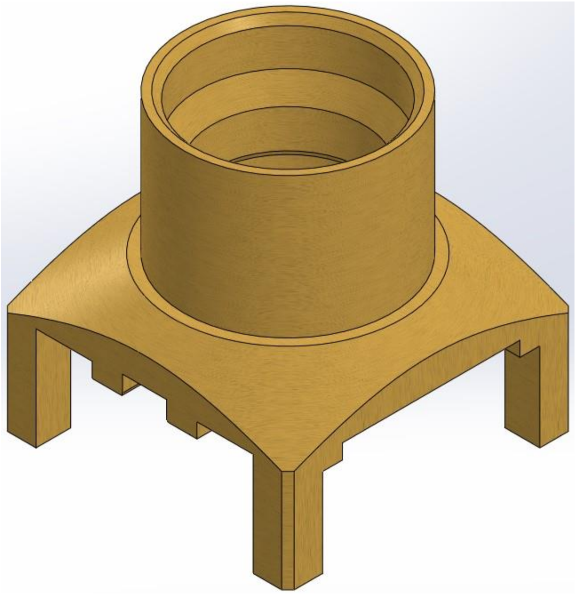
Project Number: Design Qualification Test Report	Tracking Code: CR-936202_Report_Rev_1
Requested by: Joe Huang	Date: 9/1/2023
Part #: SMP-PL-P-HG-ST-MT1 / SMP-PL-P-HG-ST-MT2	Tech: Peter Chen
Part description: SMP Mixed Technology Connector	Qty to test: 20
Test Start: 6/13/2023	Test Completed: 8/2/2023



DESIGN QUALIFICATION TEST REPORT

SMP Mixed Technology Connector
SMP-PL-P-HG-ST-MT1 / SMP-PL-P-HG-ST-MT2

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
8/9/2023	**1**	**Initial Issue**	**PC**

CERTIFICATION

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

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SCOPE

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

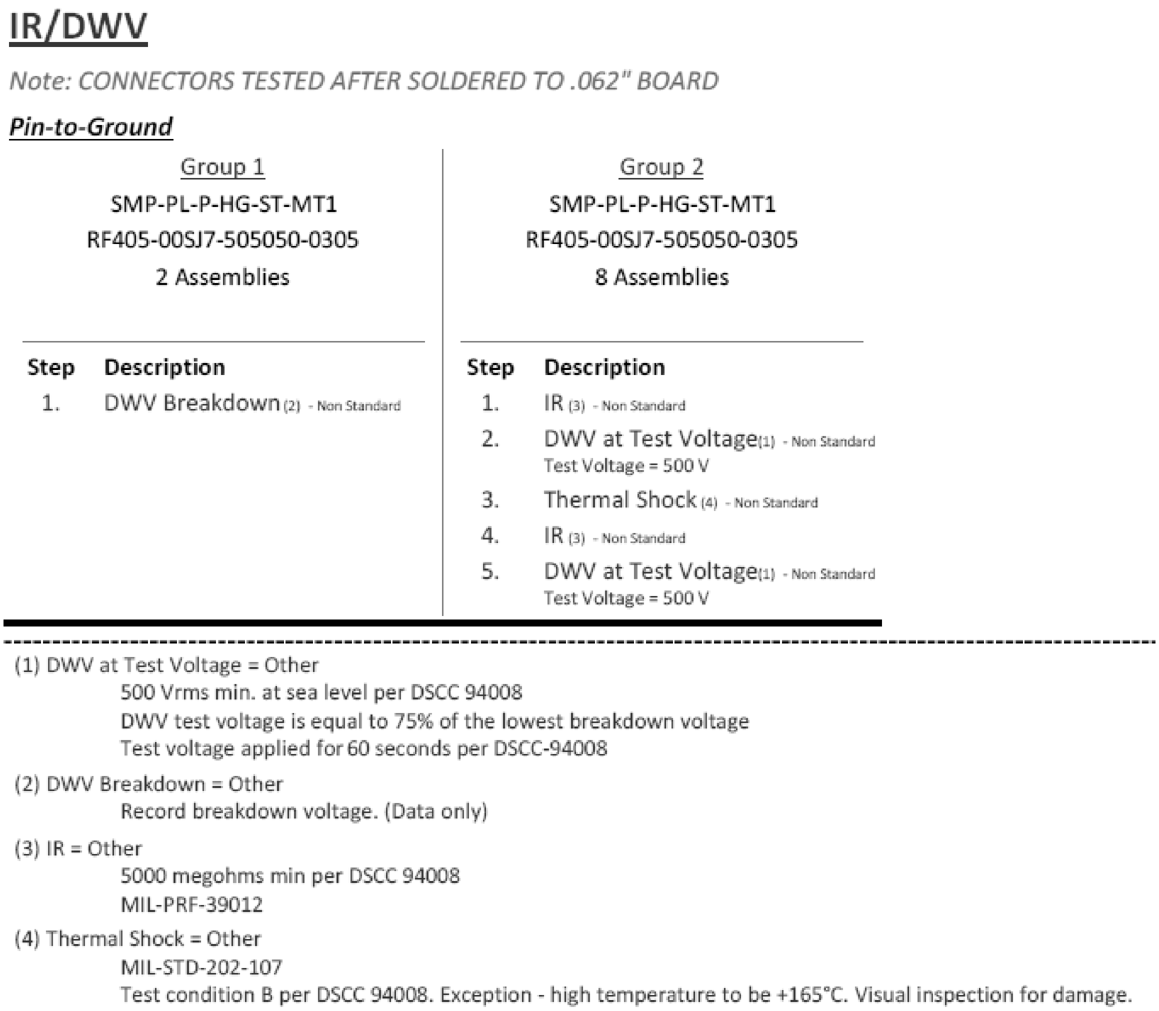
APPLICABLE DOCUMENTS

Standards: MIL-PRF-39012 and EIA-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 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



IR/DWV

Note: CONNECTORS TESTED AFTER SOLDERED TO .062" BOARD

Pin-to-Ground

Group 1
SMP-PL-P-HG-ST-MT1
RF405-00SJ7-505050-0305
2 Assemblies

Step	Description
1.	DWV Breakdown (2) - Non Standard

Group 2
SMP-PL-P-HG-ST-MT1
RF405-00SJ7-505050-0305
8 Assemblies

Step	Description
1.	IR (3) - Non Standard
2.	DWV at Test Voltage(1) - Non Standard Test Voltage = 500 V
3.	Thermal Shock (4) - Non Standard
4.	IR (3) - Non Standard
5.	DWV at Test Voltage(1) - Non Standard Test Voltage = 500 V

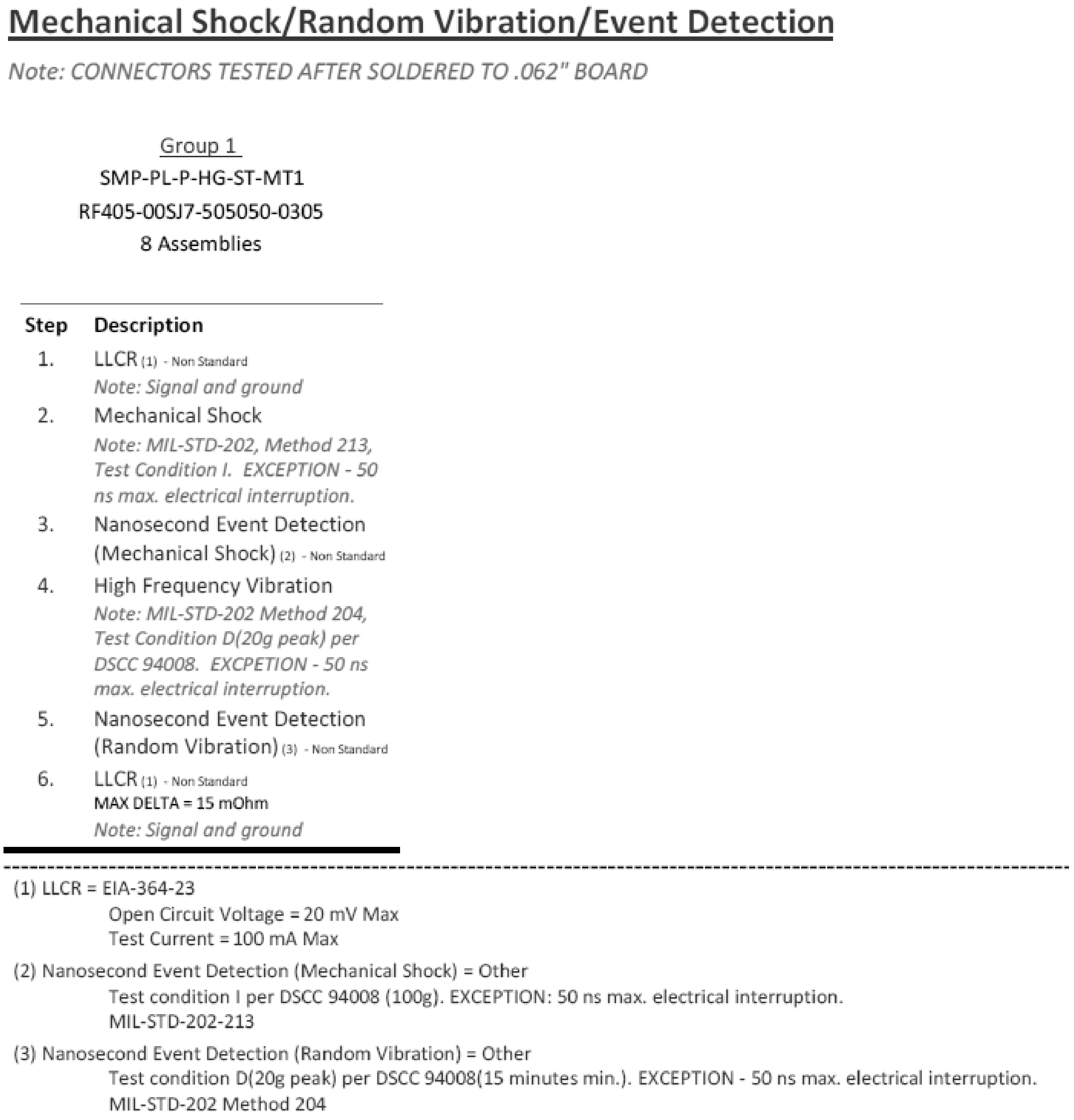
(1) DWV at Test Voltage = Other
500 Vrms min. at sea level per DSCC 94008
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds per DSCC-94008

(2) DWV Breakdown = Other
Record breakdown voltage. (Data only)

(3) IR = Other
5000 megohms min per DSCC 94008
MIL-PRF-39012

(4) Thermal Shock = Other
MIL-STD-202-107
Test condition B per DSCC 94008. Exception - high temperature to be +165°C. Visual inspection for damage.

FLOWCHARTS Continued



Mechanical Shock/Random Vibration/Event Detection

Note: CONNECTORS TESTED AFTER SOLDERED TO .062" BOARD

Group 1
SMP-PL-P-HG-ST-MT1
RF405-00SJ7-505050-0305
8 Assemblies

Step	Description
1.	LLCR (1) - Non Standard *Note: Signal and ground*
2.	Mechanical Shock *Note: MIL-STD-202, Method 213, Test Condition I. EXCEPTION - 50 ns max. electrical interruption.*
3.	Nanosecond Event Detection (Mechanical Shock) (2) - Non Standard
4.	High Frequency Vibration *Note: MIL-STD-202 Method 204, Test Condition D(20g peak) per DSCC 94008. EXCPETION - 50 ns max. electrical interruption.*
5.	Nanosecond Event Detection (Random Vibration) (3) - Non Standard
6.	LLCR (1) - Non Standard MAX DELTA = 15 mOhm *Note: Signal and ground*

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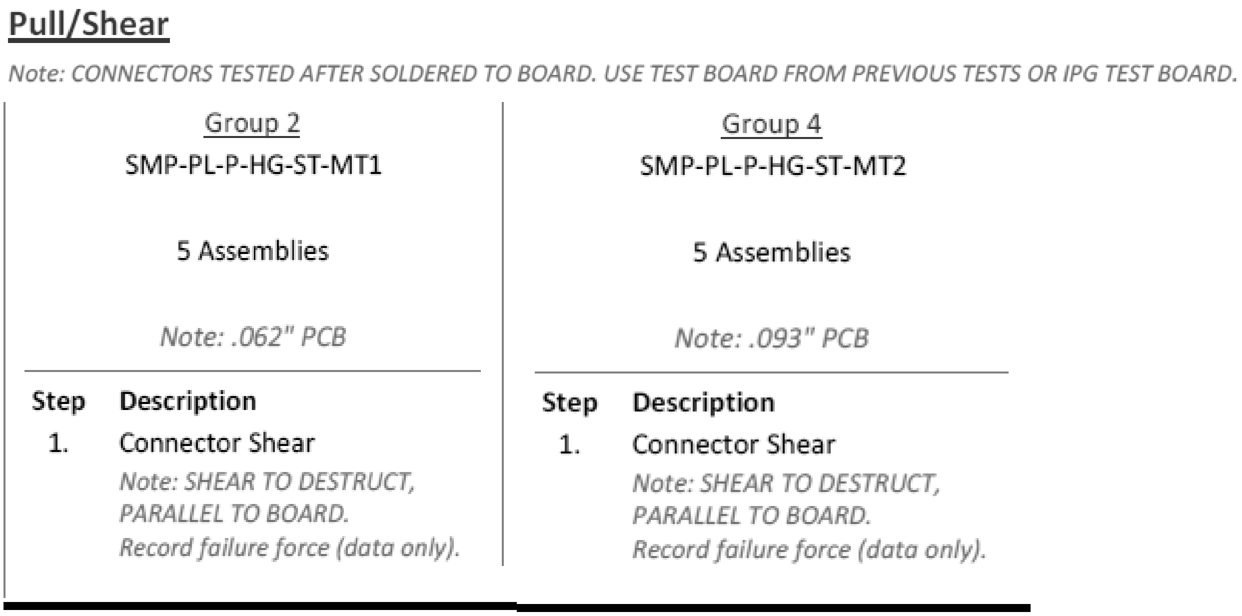
(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Nanosecond Event Detection (Mechanical Shock) = Other
Test condition I per DSCC 94008 (100g). EXCEPTION: 50 ns max. electrical interruption.
MIL-STD-202-213

(3) Nanosecond Event Detection (Random Vibration) = Other
Test condition D(20g peak) per DSCC 94008(15 minutes min.). EXCEPTION - 50 ns max. electrical interruption.
MIL-STD-202 Method 204

FLOWCHARTS Continued



Pull/Shear

Note: CONNECTORS TESTED AFTER SOLDERED TO BOARD. USE TEST BOARD FROM PREVIOUS TESTS OR IPG TEST BOARD.

Group 2

SMP-PL-P-HG-ST-MT1

5 Assemblies

Note: .062" PCB

Step	Description
1.	Connector Shear *Note: SHEAR TO DESTRUCT, PARALLEL TO BOARD.* *Record failure force (data only).*

Group 4

SMP-PL-P-HG-ST-MT2

5 Assemblies

Note: .093" PCB

Step	Description
1.	Connector Shear *Note: SHEAR TO DESTRUCT, PARALLEL TO BOARD.* *Record failure force (data only).*

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°C to +165°C)
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 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

MECHANICAL SHOCK (Specified Pulse):

1) Reference document: MIL-STD-202, Method 213 Cond. I.
2) Test Condition G
3) Peak Value: 100 G
4) Duration: 6 Milliseconds
5) Wave Form: Sawtooth
6) Velocity: 12.3 ft/s
7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

1) Reference document: MIL-STD-202-204, Condition D.
2) Test Condition V, Letter B
3) Power Spectral Density: 0.10 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: MIL-STD-202, *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

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, *Insulation Resistance Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Electrification Time 2.0 minutes
        iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
2) MEASUREMENTS:
3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

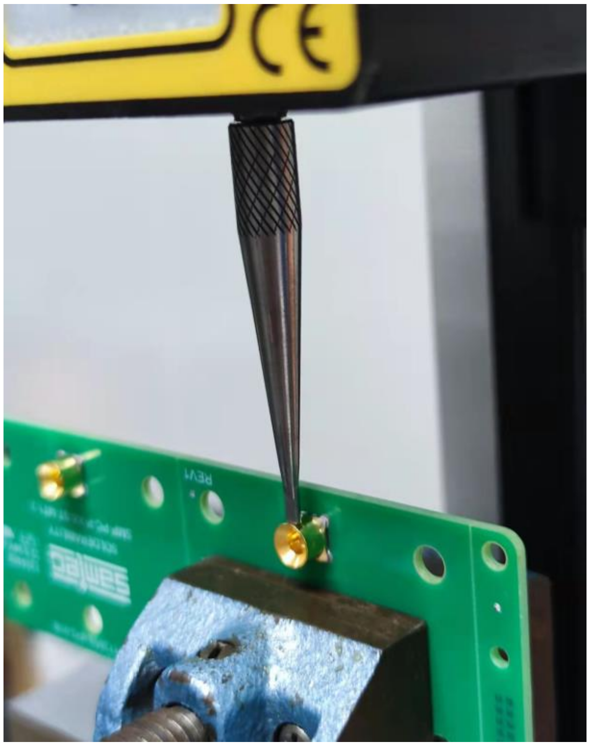
1) PROCEDURE:
    a. Reference document: MIL-PRF-39012, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1
        iii. Rate of Application 500 V/Sec
        iv. Test Voltage (VAC) until breakdown occurs
2) MEASUREMENTS/CALCULATIONS
    a. The breakdown voltage shall be measured and recorded.
    b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
    c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

Pull/Shear

Pull to destruct, Parallel to board, record failure force.



Parallel to board

RESULTS

Pull/Shear

0.062" PCB

- **Parallel**
    - **Min-- 164.66 Lbs**
    - **Max --- 187.75 Lbs**

0.093" PCB

- **Parallel**
    - **Min-- 160.09 Lbs**
    - **Max --- 195.50 Lbs**

Insulation Resistance minimums, IR

Pin to Ground

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

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
    - **Breakdown Voltage-------------------------------- 1295 VAC**
    - **Test Voltage ---975 VAC**
    - **Working Voltage -------------------------------------320 VAC**

Pin to Ground

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

RESULTS Continued

LLCR Shock & Vibration (16 LLCR test points)

Signal pin

- **Initial -- 56.13 mOhms Max**

Ground Pin

- **Initial --8.56 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------------------------------------ ---------------------------------- Pass**
  - **50 Nanoseconds ------------------------------- ---------------------------------- Pass**
- **Vibration**
  - **No Damage------------------------------------ ---------------------------------- Pass**
  - **50 Nanoseconds ------------------------------- ---------------------------------- Pass**

DATA SUMMARIES

Pull/Shear:

0.062" PCB

	Force (lbs)
Minimum	164.66
Maximum	187.75
Average	175.67

0.093" PCB

	Force (lbs)
Minimum	160.09
Maximum	195.50
Average	179.13

INSULATION RESISTANCE (IR):

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**SMP/RF405**	**SMP**	**RF405**
Initial	45000	45000	45000
Thermal	45000	45000	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**SMP/RF405**
Break Down Voltage	1295
Test Voltage	975
Working Voltage	320

Pin to Ground	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed

DATA SUMMARIES Continued

LLCR Shock &Vibration:

1). A total of 16 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	7/10/2023	8/3/2023		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	53	50		
Technician	Richard Ison	Richard Ison		
mOhm values	Actual **Initial**	**Delta** **Shock-Vib**		
	Pin Type: Signal 1			
Average	55.6	0.19		
St. Dev.	0.28	0.18		
Min	55.14	0.06		
Max	56.13	0.6		
Summary Count	8	8		
Total Count	8	8		
	Pin Type: GND 1			
Average	8.45	0.56		
St. Dev.	0.08	0.15		
Min	8.38	0.35		
Max	8.56	0.74		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Shock-Vib	**16**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	16
Test Condition	I, 100g's, 6ms, Sawtooth
Shock Events	0
Test Condition	D, 20g peak
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-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: 05/29/2023, Next Cal: 05/29/2024

Equipment #: HZ-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: 06/30/2023, Next Cal: 06/30/2024

Equipment #: HZ-HPT-01
Description: Hipot Safety Tester
Manufacturer: Vitrek
Model: V73
Serial #: 019808
Accuracy:
… Last Cal: 05/15/2023, Next Cal: 05/15/2024

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 11/31/2022, Next Cal: 11/31/2023

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/09/2023, Next Cal: 07/09/2024

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 06/04/2023, Next Cal: 06/04/2024