

**Validation Testing of Quadrax Rectangular Connector
- Assembly Location Change to Hermosillo, Mexico**

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) Quadrax Rectangular connector in order to validate a change in assembly location from the TE manufacturing facility in Mt. Joy, Pennsylvania, to the TE manufacturing facility in Hermosillo, Mexico. Baseline testing of the TE Quadrax Rectangular connector assembled at the TE manufacturing facility in Mt. Joy, Pennsylvania, was completed and is documented under Engineering Test Report 502-134112, Rev. A.

1.2 Scope

Testing was performed in accordance with Boeing Part Specification BPS-C-193, Rev. A, at the TE Harrisburg Electrical Components Test Laboratory (HECTL) between November 24, 2014, and December 8, 2014. Detailed test data is on file and maintained at HECTL under test number EA20140707T.

1.3 Conclusion

All specimens, as identified in Paragraph 1.4, met the requirements for the tests performed as stated in Boeing Part Specification BPS-C-193, Rev. A, when tested per the test sequence as defined in Paragraph 1.5.

1.4 Test Specimens

Specimens identified with the following part numbers were used for test:

Table 1 – Test Specimens

Test Set	Qty	Part Number	Description
1	2	1604799-8	Quadrax Receptacle, 12 Position. Assembled in Hermosillo, Mexico.
	2	1-1604800-4	Quadrax Plug, 12 Position. Assembled in Hermosillo, Mexico.

1.5 Test Sequence

Table 2 – Test Sequence

Test or Examination	Test Sequence
Dielectric Withstanding Voltage	1, 5
Insulation Resistance	2, 4
Altitude Immersion	3
Contact Retention	6

1.6 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C
Relative Humidity: 20% to 80%

2. SUMMARY OF TESTING

2.1 Dielectric Withstanding Voltage, Initial

All unmated plug and receptacle connectors exhibited no evidence of dielectric breakdown or flashover, and all leakage current measurements were less than the maximum requirement of 1 milliampere, as specified in Boeing Part Specification BPS-C-193, Rev. A. Leakage current results are contained in Table 3. Individual test records are contained in Appendix A.

Table 3 – Initial Dielectric Withstanding Voltage Leakage Current

Sample ID	Connector Position	Leakage Current (milliamperes) (Note: R, B, G, and Y indicate signal contact wire insulation color.)			
		Y – R/B/G	R – Y/B/G	B – R/Y/G	All – Outer Body
101 Plug	1	0.019	0.018	0.019	0.031
	2	0.019	0.019	0.018	0.032
	3	0.018	0.019	0.018	0.032
	4	0.019	0.019	0.019	0.034
	5	0.019	0.019	0.019	0.033
	6	0.019	0.019	0.018	0.033
	7	0.019	0.018	0.020	0.032
	8	0.018	0.019	0.019	0.034
	9	0.019	0.018	0.018	0.032
	10	0.019	0.019	0.019	0.033
	11	0.018	0.019	0.018	0.033
	12	0.018	0.019	0.019	0.033
101 Receptacle	1	0.021	0.020	0.020	0.035
	2	0.020	0.020	0.020	0.036
	3	0.020	0.020	0.020	0.035
	4	0.020	0.020	0.021	0.035
	5	0.020	0.020	0.020	0.035
	6	0.020	0.019	0.021	0.036
	7	0.019	0.019	0.020	0.036
	8	0.019	0.019	0.020	0.036
	9	0.019	0.020	0.019	0.038
	10	0.019	0.020	0.019	0.038
	11	0.019	0.019	0.019	0.037
	12	0.020	0.020	0.020	0.039
102 Plug	1	0.025	0.019	0.019	0.035
	2	0.019	0.020	0.019	0.033
	3	0.018	0.018	0.018	0.035
	4	0.018	0.018	0.018	0.033
	5	0.019	0.019	0.019	0.034
	6	0.020	0.020	0.019	0.035
	7	0.019	0.019	0.018	0.035
	8	0.019	0.019	0.018	0.034
	9	0.019	0.018	0.019	0.029
	10	0.018	0.019	0.018	0.035
	11	0.019	0.018	0.019	0.032
	12	0.019	0.018	0.019	0.035
102 Receptacle	1	0.020	0.019	0.020	0.033
	2	0.020	0.020	0.020	0.032
	3	0.019	0.019	0.020	0.033
	4	0.021	0.019	0.019	0.032
	5	0.019	0.019	0.019	0.032
	6	0.019	0.019	0.019	0.032
	7	0.019	0.019	0.019	0.032
	8	0.019	0.019	0.019	0.033
	9	0.019	0.020	0.019	0.033
	10	0.019	0.019	0.019	0.033
	11	0.019	0.020	0.020	0.033
	12	0.019	0.019	0.019	0.032

2.2 Insulation Resistance, Initial

Insulation resistance measurements of all unmated plug and receptacle connectors were greater than the minimum requirement of 5.0×10^3 MegOhms, as specified in Boeing Part Specification BPS-C-193, Rev. A. Insulation resistance results are contained in Table 4. Individual test records are contained in Appendix A.

Table 4 – Initial Insulation Resistance

Sample ID	Connector Position	Insulation Resistance (MegOhms) (Note: R, B, G, and Y indicate signal contact wire insulation color.)			
		Y – R/B/G	R – Y/B/G	B – R/Y/G	All – Outer Body
101 Plug	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
101 Receptacle	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
102 Plug	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
102 Receptacle	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵

2.3 Altitude Immersion

Following altitude immersion cycling, and while still immersed in the salt water solution, mated plug and receptacle connectors were subjected to insulation resistance measurements and dielectric withstanding voltage testing. Individual test records are contained in Appendix A.

2.3.1 Insulation Resistance, Post Altitude Immersion

Following altitude Immersion cycling, insulation resistance measurements of all mated plug and receptacle connectors were greater than the minimum requirement of 5.0×10^3 MegOhms, as specified in Boeing Part Specification BPS-C-193, Rev. A. Post altitude immersion insulation resistance results are contained in Table 5. Individual test records are contained in Appendix A.

Table 5 – Post Altitude Immersion Insulation Resistance

Sample ID	Connector Position	Insulation Resistance (MegOhms) (Note: R, B, G, and Y indicate signal contact wire insulation color.)			
		Y – R/B/G	R – Y/B/G	G – R/Y/B	All – Outer Body
101 Plug & Receptacle	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
102 Plug & Receptacle	1	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	2	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	3	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	4	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	5	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	6	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	7	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	8	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	9	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	10	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	11	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵
	12	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵	> 1.0 x 10 ⁵

2.3.2 Dielectric Withstanding Voltage, Post Altitude Immersion

Following altitude Immersion cycling, all mated plug and receptacle connectors exhibited no evidence of dielectric breakdown or flashover, and all leakage current measurements were less than the maximum requirement of 1 milliampere, as specified in Boeing Part Specification BPS-C-193, Rev. A. Leakage current results are contained in Table 6. Individual test records are contained in Appendix A.

2.3.2 Dielectric Withstanding Voltage, Post Altitude Immersion (cont.)

Table 6 – Post Altitude Immersion Dielectric Withstanding Voltage Leakage Current

Sample ID	Connector Position	Leakage Current (milliamperes) (Note: R, B, G, and Y indicate signal contact wire insulation color.)			
		Y – R/B/G	R – Y/B/G	B – R/Y/G	All – Outer Body
101 Plug & Receptacle	1	0.034	0.033	0.034	0.064
	2	0.034	0.033	0.034	0.065
	3	0.033	0.030	0.030	0.063
	4	0.032	0.034	0.033	0.066
	5	0.033	0.033	0.034	0.065
	6	0.033	0.033	0.031	0.064
	7	0.031	0.031	0.029	0.064
	8	0.033	0.034	0.034	0.066
	9	0.031	0.032	0.034	0.065
	10	0.032	0.032	0.032	0.064
	11	0.033	0.033	0.033	0.066
	12	0.034	0.031	0.034	0.065
102 Plug & Receptacle	1	0.035	0.035	0.034	0.131
	2	0.034	0.034	0.034	0.134
	3	0.035	0.035	0.035	0.129
	4	0.035	0.034	0.034	0.128
	5	0.035	0.034	0.034	0.130
	6	0.035	0.035	0.035	0.129
	7	0.035	0.035	0.035	0.131
	8	0.036	0.036	0.036	0.129
	9	0.036	0.036	0.036	0.130
	10	0.035	0.035	0.034	0.131
	11	0.035	0.035	0.035	0.130
	12	0.035	0.035	0.036	0.130

2.4 Contact Retention

Contact displacement measurements of all unmated plug and receptacle connectors were less than the maximum requirement of 0.015 inches, as specified in Boeing Part Specification BPS-C-193, Rev. A. There was no dislodging or damage to the contacts. Contact displacement results are contained in Table 7. Individual test records are contained in Appendix A.

Table 6 – Contact Retention Contact Displacement

Connector Position	Contact Displacement (inches)			
	101 Plug	101 Receptacle	102 Plug	102 Receptacle
1	0.0124	0.0107	0.0065	0.0079
2	0.0061	0.0081	0.0060	0.0083
3	0.0057	0.0083	0.0058	0.0078
4	0.0080	0.0086	0.0078	0.0073
5	0.0062	0.0081	0.0048	0.0073
6	0.0053	0.0084	0.0048	0.0083
7	0.0052	0.0077	0.0060	0.0078
8	0.0052	0.0069	0.0054	0.0086
9	0.0060	0.0078	0.0048	0.0076
10	0.0049	0.0081	0.0051	0.0088
11	0.0055	0.0079	0.0055	0.0076
12	0.0124	0.0077	0.0050	0.0071

3. TEST METHODS

3.1 Dielectric Withstanding Voltage

The unmated plug and receptacle connectors were subjected to a dielectric withstanding voltage at sea level test in accordance with paragraphs 3.4.6 and 4.6.6.1 of Boeing BPS- C-193, Rev. A, and EIA 364-20, Rev. D (superseding Method 3001 of MIL-STD-1344). A test voltage of 1,000 volts RMS (60 Hz) was applied between all adjacent center contacts, and a test voltage of 500 volts RMS (60 Hz) was applied between all center contacts and the outer body of each Quadrax contact. The maximum specified leakage current was 1 milliamperere. The test voltage was applied at a rate of 500 volts per second, and maintained for a period of 60 seconds. Photographs of the initial test setup are contained in Figure 1 and Figure 2. Photographs of the post Altitude Immersion test setup are contained in Figure 3 and Figure 4.

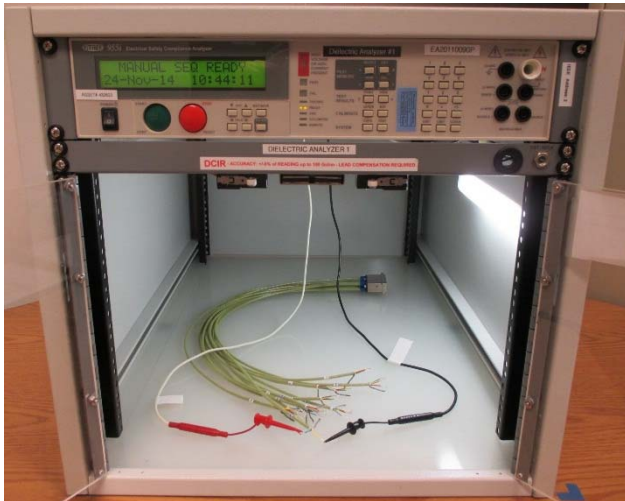


Figure 1 – Initial Dielectric Withstanding Voltage / Insulation Resistance Test Setup



Figure 2 – Initial Dielectric Withstanding Voltage / Insulation Resistance Test Setup

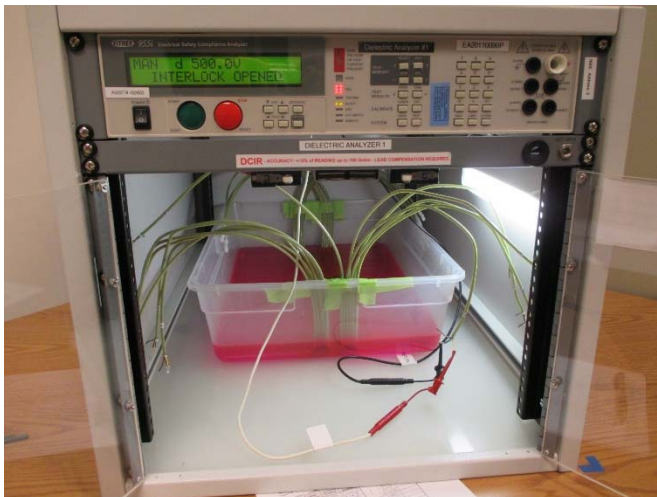


Figure 3 – Post Altitude Immersion Dielectric Withstanding Voltage / Insulation Resistance Test Setup

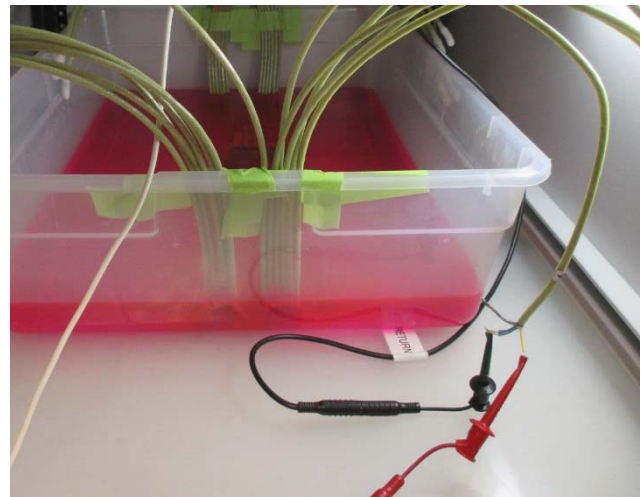


Figure 4 – Post Altitude Immersion Dielectric Withstanding Voltage / Insulation Resistance Test Setup

3.2 Insulation Resistance

The unmated plug and receptacle connectors were subjected to an insulation resistance at ambient temperature test in accordance with paragraphs 3.4.5.1 and 4.6.5.1 of Boeing BPS- C-193, Rev. A, and EIA 364-21, Rev. E (superseding Method 3003 of MIL-STD-1344). A test voltage of 500 volts DC was applied between all adjacent signal contacts, and between all signal contacts and the outer body of each contact. The test voltage was applied for a maximum of 2 minutes, or when a stable reading greater than the minimum specified requirement of 5.0×10^3 MegOhms was measured. Photographs of the initial test setup are contained in Figure 1 and Figure 2. Photographs of the post Altitude Immersion test setup are contained in Figure 3 and Figure 4.

3.3 Altitude Immersion

The mated plug and receptacle connectors were subjected to an altitude immersion test in accordance with paragraphs 3.4.16 and 4.6.16 of Boeing Specification BPS-C-193, Rev. A, and EIA 364-03, Rev. C (superseding Method 1004.1 of MIL-STD-1344). The specimens were placed in a container of 5% salt water and dye solution so that the uppermost point of the specimens was at least 1 inch below the surface of the solution. All wired ends were sealed in dielectric wax, located inside the chamber and exposed to the atmosphere, but not submerged in the solution. Photographs of the test setup are contained in Figure 5 and Figure 6.

The specimens were then subjected to 3 cycles of the following:

- Step 1 – 5 Minutes transfer from ambient pressure to 50,000 feet above sea level
- Step 2 – 30 minute dwell at 50,000 feet above sea level
- Step 3 – 1 minute transfer from 50,000 feet above sea level to ambient pressure
- Step 4 – 30 minute dwell at ambient pressure

Following the third cycle, the specimens were tested for dielectric withstanding voltage and insulation resistance measurements while still submerged in the salt solution.

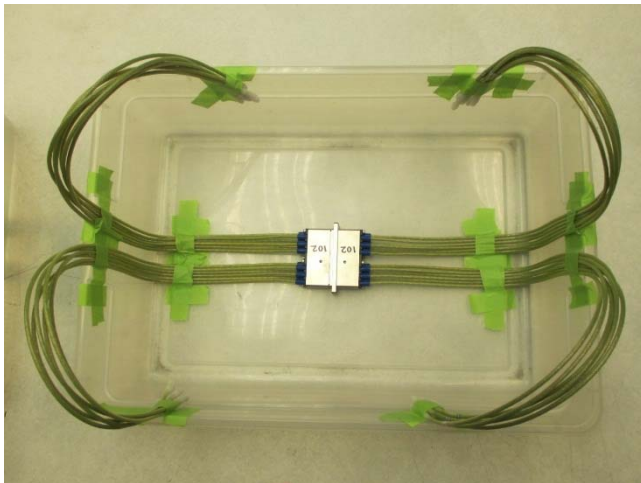


Figure 5 – Altitude Immersion Test Setup



Figure 6 – Altitude Immersion Test Setup

3.4 Contact Retention

The unmated plug and receptacle connectors were subjected to contact retention testing in accordance with paragraphs 3.4.10 and 4.6.10 of Boeing Specification BPS-C-193, Rev. A, and EIA 364-29, Rev. C. Unwired contacts were inserted into each cavity in place of the wired contacts to facilitate testing. The specimen under test was then mounted into a vise secured to an adjustable x-y table on the base of the tensile/compression machine. A steel gage pin was secured in a chuck attached to the load cell on the moveable crosshead of the tensile/compression machine. The contact under test was then pre-loaded to approximately 3 pounds in a direction tending to displace the contact to the rear. A minimum axial load of 35 pounds was then applied to the contact position under test at a crosshead rate of 0.3 inches per minute, and maintained for a minimum period of 6 seconds. Both during and following the application of the load, the contact displacement was measured using a deflectometer. Photographs of the test setup are contained in Figure 7 and Figure 8.

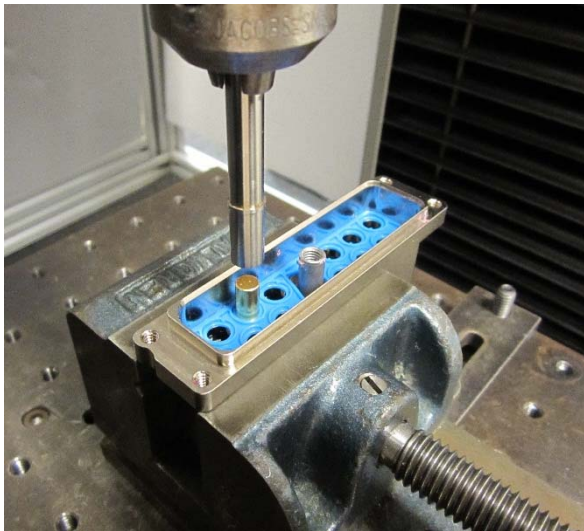


Figure 7 – Contact Retention Test Setup

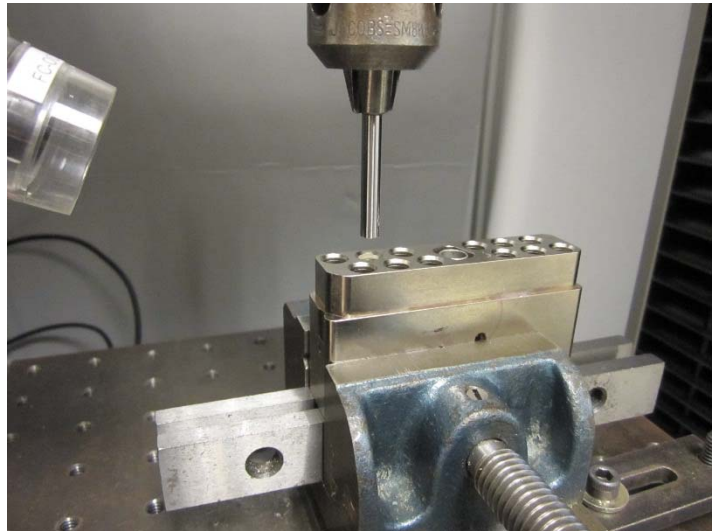


Figure 8 – Contact Retention Test Setup

4. EQUIPMENT

4.1 Calibration Statement

All equipment containing a calibration number is calibrated and traceable through TE Connectivity (TE) to the National Institute of Standards and Technology (NIST).

4.2 Equipment List

<u>Equipment Name</u>	<u>Calibration Number</u>
Dielectric Analyzer / High Resistance Meter	E9100-1754
Dielectric Analyzer / High Resistance Meter	E9100-1744
Altitude Chamber	E9100-1118
Tensile/Compression Tester	E9100-1722
Load Cell	E9100-1749
Deflectometer	E9100-1725
Temperature/Humidity/Pressure Recorder	E9100-1703

Appendix A

Individual Test Records



Test Number: EA20140707 T
Type of Test: DWV at sea level

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 1	Run: 1 - Initial
Product Description: Rectangular Quadrax Connector	Temperature: 22-23 C	Tester: J. Price	
Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Humidity: 36-46 % RH	Start Date: 11/24/14	
Control Document: Boeing BPS-C-193 Rev A	BP: 29.2-29.6 inHg	Compl. Date: 11/25/14	
Test Group: 1			

Results:

There was no evidence of dielectric breakdown or flashover, and leakage current measurements did not exceed 1 milliamperes. See Tables 1 through 4 for individual results.

Table 1 – Initial Dielectric Withstanding Voltage at Sea Level – 101 Pin Contacts (micro-amps)

Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage	Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage
1	Y-R/B/G	18.54	1,000 VAC	7	Y-R/B/G	19.45	1,000 VAC
	R-Y/B/G	18.22			R-Y/B/G	17.95	
	B-R/Y/G	18.83			B-R/Y/G	19.58	
	All to shield	31.38	500 VAC		All to shield	32.01	500 VAC
2	Y-R/B/G	18.52	1,000 VAC	8	Y-R/B/G	18.12	1,000 VAC
	R-Y/B/G	18.69			R-Y/B/G	18.97	
	B-R/Y/G	18.44			B-R/Y/G	18.62	
	All to shield	31.82	500 VAC		All to shield	34.11	500 VAC
3	Y-R/B/G	18.19	1,000 VAC	9	Y-R/B/G	18.72	1,000 VAC
	R-Y/B/G	18.55			R-Y/B/G	18.15	
	B-R/Y/G	18.46			B-R/Y/G	18.45	
	All to shield	32.09	500 VAC		All to shield	31.58	500 VAC
4	Y-R/B/G	19.06	1,000 VAC	10	Y-R/B/G	18.63	1,000 VAC
	R-Y/B/G	19.36			R-Y/B/G	18.57	
	B-R/Y/G	19.08			B-R/Y/G	18.64	
	All to shield	33.82	500 VAC		All to shield	32.89	500 VAC
5	Y-R/B/G	19.06	1,000 VAC	11	Y-R/B/G	17.85	1,000 VAC
	R-Y/B/G	19.48			R-Y/B/G	18.97	
	B-R/Y/G	19.06			B-R/Y/G	18.37	
	All to shield	32.91	500 VAC		All to shield	32.75	500 VAC
6	Y-R/B/G	18.54	1,000 VAC	12	Y-R/B/G	18.22	1,000 VAC
	R-Y/B/G	19.08			R-Y/B/G	19.38	
	B-R/Y/G	18.20			B-R/Y/G	18.61	
	All to shield	32.51	500 VAC		All to shield	33.17	500 VAC

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Test Number: EA20140707 T
 Type of Test: DWV at sea level

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 1 Run: 1 - Initial

Table 2 – Dielectric Withstanding Voltage at Sea Level – 101 Socket Contacts (micro-amps)

Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage	Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage
1	Y-R/B/G	21.01	1,000 VAC	7	Y-R/B/G	19.07	1,000 VAC
	R-Y/B/G	19.83			R-Y/B/G	19.32	
	B-R/Y/G	20.39			B-R/Y/G	19.63	
	All to shield	35.25	500 VAC		All to shield	36.19	500 VAC
2	Y-R/B/G	20.49	1,000 VAC	8	Y-R/B/G	19.13	1,000 VAC
	R-Y/B/G	20.16			R-Y/B/G	19.30	
	B-R/Y/G	19.72			B-R/Y/G	19.56	
	All to shield	35.93	500 VAC		All to shield	35.73	500 VAC
3	Y-R/B/G	19.85	1,000 VAC	9	Y-R/B/G	19.27	1,000 VAC
	R-Y/B/G	19.93			R-Y/B/G	19.51	
	B-R/Y/G	19.97			B-R/Y/G	19.29	
	All to shield	35.02	500 VAC		All to shield	37.78	500 VAC
4	Y-R/B/G	19.98	1,000 VAC	10	Y-R/B/G	19.21	1,000 VAC
	R-Y/B/G	20.49			R-Y/B/G	19.52	
	B-R/Y/G	20.57			B-R/Y/G	19.21	
	All to shield	35.30	500 VAC		All to shield	38.30	500 VAC
5	Y-R/B/G	19.53	1,000 VAC	11	Y-R/B/G	19.25	1,000 VAC
	R-Y/B/G	19.53			R-Y/B/G	18.81	
	B-R/Y/G	19.92			B-R/Y/G	19.26	
	All to shield	35.46	500 VAC		All to shield	37.38	500 VAC
6	Y-R/B/G	19.72	1,000 VAC	12	Y-R/B/G	19.71	1,000 VAC
	R-Y/B/G	19.37			R-Y/B/G	20.00	
	B-R/Y/G	21.14			B-R/Y/G	19.54	
	All to shield	35.76	500 VAC		All to shield	38.63	500 VAC

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Test Number: EA20140707 T
Type of Test: DWV at sea level

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 1 Run: 1 - Initial

Table 3 – Dielectric Withstanding Voltage at Sea Level – 102 Pin Contacts (micro-amps)

Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage	Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage
1	Y-R/B/G	24.70	1,000 VAC	7	Y-R/B/G	18.85	1,000 VAC
	R-Y/B/G	18.73			R-Y/B/G	18.83	
	B-R/Y/G	18.98			B-R/Y/G	18.39	
	All to shield	34.96	500 VAC		All to shield	34.54	500 VAC
2	Y-R/B/G	19.21	1,000 VAC	8	Y-R/B/G	18.51	1,000 VAC
	R-Y/B/G	19.69			R-Y/B/G	18.76	
	B-R/Y/G	19.48			B-R/Y/G	18.37	
	All to shield	33.19	500 VAC		All to shield	34.30	500 VAC
3	Y-R/B/G	18.01	1,000 VAC	9	Y-R/B/G	18.98	1,000 VAC
	R-Y/B/G	18.09			R-Y/B/G	18.20	
	B-R/Y/G	17.97			B-R/Y/G	19.06	
	All to shield	34.53	500 VAC		All to shield	28.52	500 VAC
4	Y-R/B/G	17.70	1,000 VAC	10	Y-R/B/G	18.14	1,000 VAC
	R-Y/B/G	18.16			R-Y/B/G	18.93	
	B-R/Y/G	18.22			B-R/Y/G	18.05	
	All to shield	32.94	500 VAC		All to shield	35.07	500 VAC
5	Y-R/B/G	18.80	1,000 VAC	11	Y-R/B/G	18.71	1,000 VAC
	R-Y/B/G	18.85			R-Y/B/G	18.42	
	B-R/Y/G	18.85			B-R/Y/G	18.83	
	All to shield	34.24	500 VAC		All to shield	31.91	500 VAC
6	Y-R/B/G	19.53	1,000 VAC	12	Y-R/B/G	19.36	1,000 VAC
	R-Y/B/G	19.64			R-Y/B/G	18.11	
	B-R/Y/G	19.18			B-R/Y/G	19.24	
	All to shield	34.63	500 VAC		All to shield	35.49	500 VAC

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Test Number: EA20140707 T
 Type of Test: DWV at sea level

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 1 Run: 1 - Initial

Table 4 – Dielectric Withstanding Voltage at Sea Level – 102 Socket Contacts (micro-amps)

Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage	Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage
1	Y-R/B/G	19.62	1,000 VAC	7	Y-R/B/G	18.87	1,000 VAC
	R-Y/B/G	19.30			R-Y/B/G	19.15	
	B-R/Y/G	19.55			B-R/Y/G	18.83	
	All to shield	33.00	500 VAC		All to shield	32.47	500 VAC
2	Y-R/B/G	19.62	1,000 VAC	8	Y-R/B/G	18.80	1,000 VAC
	R-Y/B/G	19.55			R-Y/B/G	19.42	
	B-R/Y/G	19.52			B-R/Y/G	19.18	
	All to shield	31.55	500 VAC		All to shield	32.66	500 VAC
3	Y-R/B/G	19.44	1,000 VAC	9	Y-R/B/G	18.84	1,000 VAC
	R-Y/B/G	19.34			R-Y/B/G	19.51	
	B-R/Y/G	20.13			B-R/Y/G	19.02	
	All to shield	32.50	500 VAC		All to shield	33.09	500 VAC
4	Y-R/B/G	20.72	1,000 VAC	10	Y-R/B/G	18.82	1,000 VAC
	R-Y/B/G	19.14			R-Y/B/G	19.05	
	B-R/Y/G	18.93			B-R/Y/G	19.07	
	All to shield	32.31	500 VAC		All to shield	33.10	500 VAC
5	Y-R/B/G	18.62	1,000 VAC	11	Y-R/B/G	19.29	1,000 VAC
	R-Y/B/G	18.68			R-Y/B/G	19.66	
	B-R/Y/G	19.41			B-R/Y/G	19.58	
	All to shield	32.21	500 VAC		All to shield	32.71	500 VAC
6	Y-R/B/G	18.93	1,000 VAC	12	Y-R/B/G	18.79	1,000 VAC
	R-Y/B/G	18.64			R-Y/B/G	18.55	
	B-R/Y/G	18.68			B-R/Y/G	18.64	
	All to shield	32.29	500 VAC		All to shield	31.68	500 VAC

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Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 2	Run: 1 – Initial
Product Description: Rectangular Quadrad Connector Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Temperature: 22-23 C Humidity: 36 %RH	Tester: J. Price Start Date: 11/25/14	
Control Document: Boeing BPS-C-193 Rev A Test Group: 1	BP: 29.6-29.7 InHg	Compl. Date: 12/01/14	

Results:

All insulation resistance measurements were greater than the minimum specified requirement of 5.0X10⁹ megohms. See Table 1 and Table 2 for individual results.

Table 1 – Insulation Resistance at Ambient Temperature – 101 Pin Contacts (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	>1 x 10 ⁹	7	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹
2	Y-R/B/G	>1 x 10 ⁹	8	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹
3	Y-R/B/G	>1 x 10 ⁹	9	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹
4	Y-R/B/G	>1 x 10 ⁹	10	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹
5	Y-R/B/G	>1 x 10 ⁹	11	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹
6	Y-R/B/G	>1 x 10 ⁹	12	Y-R/B/G	>1 x 10 ⁹
	R-Y/B/G	>1 x 10 ⁹		R-Y/B/G	>1 x 10 ⁹
	B-R/Y/G	>1 x 10 ⁹		B-R/Y/G	>1 x 10 ⁹
	All to shield	>1 x 10 ⁹		All to shield	>1 x 10 ⁹

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Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 2 Run: 1 - Initial

Table 2 – Insulation Resistance at Ambient Temperature – 101 Socket Contacts (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	>1 x 10 ⁶	7	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
2	Y-R/B/G	>1 x 10 ⁶	8	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
3	Y-R/B/G	>1 x 10 ⁶	9	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
4	Y-R/B/G	>1 x 10 ⁶	10	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
5	Y-R/B/G	>1 x 10 ⁶	11	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
6	Y-R/B/G	>1 x 10 ⁶	12	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶

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Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 2 Run: 1 - Initial

Table 3 – Insulation Resistance at Ambient Temperature – 102 Pin Contacts (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	>1 x 10 ⁶	7	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
2	Y-R/B/G	>1 x 10 ⁶	8	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
3	Y-R/B/G	>1 x 10 ⁶	9	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
4	Y-R/B/G	>1 x 10 ⁶	10	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
5	Y-R/B/G	>1 x 10 ⁶	11	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
6	Y-R/B/G	>1 x 10 ⁶	12	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶

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Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 2 Run: 1 - Initial

Table 4 – Insulation Resistance at Ambient Temperature – 102 Socket Contacts (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	>1 x 10 ⁶	7	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
2	Y-R/B/G	>1 x 10 ⁶	8	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
3	Y-R/B/G	>1 x 10 ⁶	9	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
4	Y-R/B/G	>1 x 10 ⁶	10	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
5	Y-R/B/G	>1 x 10 ⁶	11	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶
6	Y-R/B/G	>1 x 10 ⁶	12	Y-R/B/G	>1 x 10 ⁶
	R-Y/B/G	>1 x 10 ⁶		R-Y/B/G	>1 x 10 ⁶
	B-R/Y/G	>1 x 10 ⁶		B-R/Y/G	>1 x 10 ⁶
	All to shield	>1 x 10 ⁶		All to shield	>1 x 10 ⁶

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Test Number: EA20140707 T
 Type of Test: Altitude Immersion

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 3	Run: 1
Product Description: Rectangular Quadrax Connector	Temperature: N/A	Tester: J. Price	
Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Humidity: N/A	Start Date: 12/03/14	
Control Document: Boeing BPS-C-193 Rev A	BP: N/A	Compl. Date: 12/04/14	
Test Group: 1			

Results:

Following the Altitude Immersion test, fluid was observed on the outside of the interface area, and there was no evidence of moisture or foreign deposits on the interface or contacts, or deterioration, of the seals.

Procedure:

The fully populated mated connectors were subjected to an altitude immersion test in accordance with paragraphs 3.4.16 and 4.6.16 of Boeing Specification BPS-C-193 Rev A and EIA-364-03C which superseded Method 3001 of MIL-STD-1344. An exception to these specifications was that all wired ends were dipped in dielectric wax, located inside the chamber and exposed to the atmosphere, but not submerged in the solution.

The specimens were mated by tightening the jack screw to 7.0 in-lbs in accordance with specification 114-13123. Specimens were placed in a container with a 5% salt and dye solution so the uppermost part of the specimens was at least 1 inch below the surface of the solution. The specimens were subjected to 3 cycles of the following:

- Step 1 – 5 Minutes transfer from ambient pressure to 50,000 feet above sea level
- Step 2 – 30 minute dwell at 50,000 feet above sea level
- Step 3 – 1 minute transfer from 50,000 feet above sea level to ambient pressure
- Step 4 – 30 minute dwell at ambient pressure

Following the third cycle, the specimens were tested for dielectric withstanding voltage and insulation resistance measurements while still submerged in the salt solution. See Figure 1 and Figure 2 for pictures of the test setup.

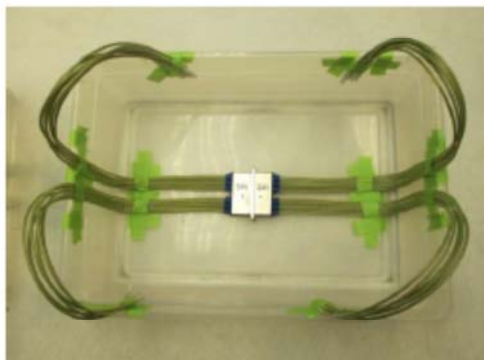


Figure 1 – Specimen before Adding Fluid



Figure 2 – Altitude Chamber Setup

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Test Number: EA20140707 T
Type of Test: Altitude Immersion

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 3 Run: 1

Equipment List:

All equipment containing a calibration number is calibrated and traceable through TE Connectivity (TE) to the National Institute of Standards and Technology (NIST).

<u>Equipment Name</u>	<u>Calibration Number</u>
Torque Meter	E4997-0564
Altitude Chamber	E9100-1118



Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 4	Run: 1 – After Altitude Immersion
Product Description: Rectangular Quadrad Connector Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Temperature: 22 C Humidity: 36 %RH	Tester: J. Price Start Date: 12/03/14	
Control Document: Boeing BPS-C-193 Rev A Test Group: 1	BP: 29.6-30.0 inHg	Compl. Date: 12/04/14	

Results:

All insulation resistance measurements were greater than the minimum specified requirement of 5.0X10⁵ megohms. See Table 1 and Table 2 for individual results.

Table 1 – Insulation Resistance After Altitude Immersion– 101 (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	> 1.0 x 10 ⁵	7	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵
2	Y-R/B/G	> 1.0 x 10 ⁵	8	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵
3	Y-R/B/G	> 1.0 x 10 ⁵	9	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵
4	Y-R/B/G	> 1.0 x 10 ⁵	10	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵
5	Y-R/B/G	> 1.0 x 10 ⁵	11	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵
6	Y-R/B/G	> 1.0 x 10 ⁵	12	Y-R/B/G	> 1.0 x 10 ⁵
	R-Y/B/G	> 1.0 x 10 ⁵		R-Y/B/G	> 1.0 x 10 ⁵
	B-R/Y/G	> 1.0 x 10 ⁵		B-R/Y/G	> 1.0 x 10 ⁵
	All to shield	> 1.0 x 10 ⁵		All to shield	> 1.0 x 10 ⁵

NOTE Contact Designation: Y - Yellow, R - Red, B - Blue, G - Green

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Test Number: EA20140707 T
 Type of Test: Insulation Resistance

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 4 Run: 1 - After Altitude Immersion

Table 2 – Insulation Resistance After Altitude Immersion- 102 (All Values in Megohms)

Shell Position	Contact to Contacts	Measured Insulation Resistance	Shell Position	Contact to Contacts	Measured Insulation Resistance
1	Y-R/B/G	> 1.0 × 10 ⁶	7	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶
2	Y-R/B/G	> 1.0 × 10 ⁶	8	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶
3	Y-R/B/G	> 1.0 × 10 ⁶	9	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶
4	Y-R/B/G	> 1.0 × 10 ⁶	10	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶
5	Y-R/B/G	> 1.0 × 10 ⁶	11	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶
6	Y-R/B/G	> 1.0 × 10 ⁶	12	Y-R/B/G	> 1.0 × 10 ⁶
	R-Y/B/G	> 1.0 × 10 ⁶		R-Y/B/G	> 1.0 × 10 ⁶
	B-R/Y/G	> 1.0 × 10 ⁶		B-R/Y/G	> 1.0 × 10 ⁶
	All to shield	> 1.0 × 10 ⁶		All to shield	> 1.0 × 10 ⁶

NOTE Contact Designation: Y - Yellow, R - Red, B - Blue, G - Green

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Test Number: EA20140707 T
 Type of Test: DWV at sea level

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 5	Run: 1 – After Altitude Immersion
Product Description: Rectangular Quadrad Connector	Temperature: 22 C	Tester: J. Price	
Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Humidity: 36 %RH	Start Date: 12/03/14	
Control Document: Boeing BPS-C-193 Rev A	BP: 29.6-30.0 inHg	Compl. Date: 12/04/14	
Test Group: 1			

Results:

There was no evidence of dielectric breakdown or flashover, and leakage current measurements did not exceed 1 milliamperes. See Table 1 and Table 2 for individual results.

Table 1 – Dielectric Withstanding Voltage after Altitude Immersion – 101 (micro-amps)

Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage	Shell Position	Contact to Contacts	Measured Leakage Current	Applied Test Voltage
1	Y-R/B/G	33.7	1,000 VAC	7	Y-R/B/G	31.3	1,000 VAC
	R-Y/B/G	33.4			R-Y/B/G	30.92	
	B-R/Y/G	33.5			B-R/Y/G	29.2	
	All to shield	63.9	500 VAC		All to shield	64.4	500 VAC
2	Y-R/B/G	33.5	1,000 VAC	8	Y-R/B/G	33.0	1,000 VAC
	R-Y/B/G	33.0			R-Y/B/G	33.5	
	B-R/Y/G	33.5			B-R/Y/G	33.5	
	All to shield	65.1	500 VAC		All to shield	65.5	500 VAC
3	Y-R/B/G	32.7	1,000 VAC	9	Y-R/B/G	31.2	1,000 VAC
	R-Y/B/G	30.2			R-Y/B/G	31.5	
	B-R/Y/G	30.3			B-R/Y/G	33.7	
	All to shield	63.2	500 VAC		All to shield	64.6	500 VAC
4	Y-R/B/G	32.1	1,000 VAC	10	Y-R/B/G	31.9	1,000 VAC
	R-Y/B/G	33.9			R-Y/B/G	32.0	
	B-R/Y/G	33.3			B-R/Y/G	32.0	
	All to shield	65.8	500 VAC		All to shield	64.4	500 VAC
5	Y-R/B/G	33.4	1,000 VAC	11	Y-R/B/G	33.2	1,000 VAC
	R-Y/B/G	33.2			R-Y/B/G	33.1	
	B-R/Y/G	33.7			B-R/Y/G	33.1	
	All to shield	64.5	500 VAC		All to shield	64.5	500 VAC
6	Y-R/B/G	32.6	1,000 VAC	12	Y-R/B/G	33.9	1,000 VAC
	R-Y/B/G	32.7			R-Y/B/G	31.4	
	B-R/Y/G	30.7			B-R/Y/G	34.2	
	All to shield	64.4	500 VAC		All to shield	65.4	500 VAC

NOTE: Contact Designation: Y - Yellow, R - Red, B - Blue, G - Green

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Test Number: EA20140707T
 Type of Test: Contact Retention

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1	Section: 1	Step: 6	Run: 1
Product Description: Rectangular Quadrax Connector	Temperature: 21-22 C	Tester: J. Price	
Part Number: 1-1604800-4, 1604799-8, 1445692-4, 1445693-4, 1996544-1	Humidity: 33-35 % RH	Start Date: 12/05/14	
Control Document: Boeing BPS-C-193 Rev A	BP: N/A	Com pl. Date: 12/08/14	
Test Group: 1			

Results:

There was no dislodging or damage to the contacts, and the measured displacements were less than 0.015 inches when an axial load of 35 pounds was applied to the front of the Quadrax contacts. See Table 1 for individual results.

Table 1 – Contact Retention

Quadrax Connector	Quadrax Contact Position #	Contact Displacement (inch)	
		Pin	Sockets
101	1	0.0124	0.0107
	2	0.0061	0.0081
	3	0.0057	0.0083
	4	0.0080	0.0086
	5	0.0062	0.0081
	6	0.0053	0.0084
	7	0.0052	0.0077
	8	0.0052	0.0069
	9	0.0060	0.0078
	10	0.0049	0.0081
	11	0.0055	0.0079
	12	0.0124	0.0077
102	1	0.0065	0.0079
	2	0.0060	0.0083
	3	0.0058	0.0078
	4	0.0078	0.0073
	5	0.0048	0.0073
	6	0.0048	0.0083
	7	0.0060	0.0078
	8	0.0054	0.0086
	9	0.0048	0.0076
	10	0.0051	0.0088
	11	0.0055	0.0076
	12	0.0050	0.0071

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Test Number: EA20140707T
 Type of Test: Contact Retention

Harrisburg Electrical Components Test Laboratory

TEST DATA

Test Set: 1

Section: 1

Step: 6 Run: 1

Procedure

All of the contact positions in each unmated specimen were selected for testing in accordance with paragraphs 3.4.10 and 4.6.10 of Boeing Specification BPS-C-193A, and EIA364.29C which superseded Method 3001 of MIL-STD-1344. The specimen under test was held with a vise that was attached to a mill table mounted to the base of the tensile/compression machine. A steel gage pin was held in a chuck that was attached to the load cell on the crosshead. This pin was used to push on the mating surface of the Quadrax contact. The tested specimen was pre-loaded to approximately 3 pounds immediately prior to testing each position. An unwired dummy Quadrax contact was inserted into each cavity in place of the wired contact used for altitude immersion. These contacts were used for testing to assure an accurate displacement measurement. The crosshead was lowered at a rate of 0.3 inches per minute until a minimum axial load of 35 pounds was applied. Once the load was fully supported by the contact, it was held for a minimum of 6 seconds. Both during and following the application of the load, the contact displacement was measured using a deflectometer. See Figures 1 through 3 for pictures of the test setup.

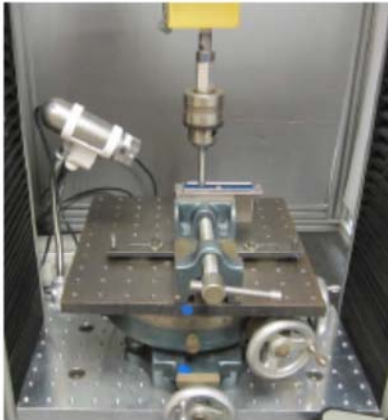


Figure 1 – Test Setup

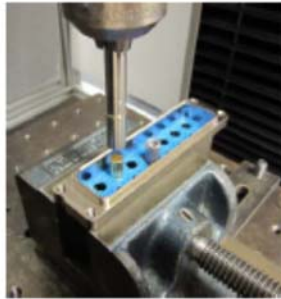


Figure 2 – Pins Setup



Figure 3 – Sockets Setup

Equipment List:

All equipment containing a calibration number is calibrated and traceable through TE Connectivity (TE) to the National Institute of Standards and Technology (NIST).

<u>Equipment Name</u>	<u>Calibration Number</u>
Tensile/Compression Tester	E9100-1722
Load Cell	E9100-1749
Deflectometer	E9100-1725
Temperature / Humidity Recorder	E9100-1703

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