QUALIFICATION TEST SUMMARY REPORT
ESR-9383
Qualification Type Testing of
Amphenol Corporation's 2M804 Series Connector

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REV. C
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FIGURES AND TABLES

1. PURPOSE OF TEST:

The purpose of this test summary is to define the test samples, test sequences and test methods required to verify that Amphenol 2M804 Series of connectors meet the applicable internal Amphenol requirements.

2. CONCLUSION:

All following test groups of Amphenol 2M804 series connectors satisfactorily completed the qualification tests outlined in L-40991-161 Rev C.

3. TEST AGENCY:

All tests and inspections were performed at and by the Amphenol Corporation, 40-60 Delaware Avenue, Sidney, NY 13838.

4. STANDARD TEST CONDITIONS:

Ambient Temperature: 20 ± 5°C

Ambient Humidity: 50 ± 30%

5. TEST SAMPLES:

The following connector samples, wire, sealing plugs, and contacts were provided for qualification testing.

Amphenol Part Number	Description	Size	Coded Number	Total	Group					Spares
					1	2	3	4	5	
F9-678901-07P	Plug	6	2M804-001-06NF6-7PA	15	3	3	3		4	2
F9-678961-07S	Receptacle	6	2M804-003-01NF6-7SA	13	3	3	3		2	2
*804-001-06NF6-7PA	Plug	6	N/A	4	1	1	1			1
*804-003-01NF6-7SA	Receptacle	6	N/A	4	1	1	1			1
FH-696130-006	Plug Shell	6	N/A	4				2		2
+FH-696152-006	Recept Shell Kit	6	N/A	4				2		2
10-597346-735	Pin	23	2M809-001	105						
10-597345-735	Socket	23	2M809-002	112						
F2-678904-19P	Plug	9	2M804-001-06ZNU9-19P	11	3	3	3			2
F2-678944-19S	Receptacle	9	2M804-003-00ZNU9-19S	11	3	3	3			2
*804-001-06ZNU9-19P	Plug	9	N/A	4	1	1	1			1
*804-003-00ZNU9-19S	Receptacle	9	N/A	4	1	1	1			1
FH-696130-009	Plug Shell	9	N/A	4				2		2
+FH-696152-009	Recept Shell Kit	9	N/A	4				2		2
10-597346-735	Pin	23	2M809-001	209						
10-597345-735	Socket	23	2M809-002	209						
F7-678906-37P	Plug	12	2M804-001-06MT12-37P	11	3	3	3			2
F7-678966-37S	Receptacle	12	2M804-003-01MT12-37S	11	3	3	3			2
*804-001-06MT12-37P	Plug	12	N/A	4	1	1	1			1
*804-003-01MT12-37S	Receptacle	12	N/A	4	1	1	1			1
FH-696130-012	Plug Shell	12	N/A	4				2		2
+FH-696152-012	Recept Shell Kit	12	N/A	4				2		2
10-597346-735	Pin	23	2M809-001	407						
10-597345-735	Socket	23	2M809-002	407						
AS22759/11-24	Wire	24	N/A	AN						
AS22759/22-24	Wire (High Strength)	24	N/A	AN						

AN= As Needed

*Competitor Part Numbers

+Populated with Canted Coil Spring and O-ring

6. TEST SEQUENCES:
The samples shall be subjected to tests in order specified.

Qualification Test Sequences

Test Group 1		
TEST	MIL-DTL-38999 Requirement Paragraph	MIL-DTL-38999L Test Paragraph
Visual and mechanical examination **6X optical inspection**	3.1, 3.3, 3.4, 3.5, 3.52 and 3.53	4.5.1
Insert Retention **25 lbs for size 6, 30 lbs for size 9 and 12 (Max)**	L-40991-161 Para. 8.15.1	
Preparation of samples	L-40991-161 Para 7.1	
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See table 3**	L-40991-161 Para 8.7	
Insulation resistance at ambient temperature **500 Gohms @ 500 VDC**	L-40991-161 Para 8.1	
Dielectric withstanding voltage at sea level **Less than 2 milli-amperes @ 500 VAC**	L-40991-161 Para 8.2	
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	
Durability **500 Cycles**	3.12	4.5.8
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See table 3**	L-40991-161 Para 8.9	
Salt spray (Static test) **48 hr exposure, unmated**	3.17	4.5.13.1
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See Table 3**	L-40991-161 Para 8.7	
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	

Electrical Engagement **Measured engagement to .050" min**	3.19	4.5.14
Post test examination **6X optical inspection**	3.52 and 3.53	4.5.49

Test Group 2		
TEST	MIL-DTL-38999 Requirement Paragraph	MIL-DTL-38999L Test Paragraph
Visual and mechanical examination **6X optical inspection**	3.1, 3.3, 3.4, 3.5, 3.52 and 3.53	4.5.1
Preparation of samples	L-40991-161 Para 7.2	
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See table 3**	L-40991-161 Para 8.7	
Insulation resistance at ambient temperature **500 Gohms @ 500 VDC**	L-40991-161 Para 8.1	
Dielectric withstanding voltage at sea level **Less than 2 milli-amperes @ 500 VAC**	L-40991-161 Para 8.2	
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	
Temperature Cycling (Shock) **-65C to +175C, 5 cycles**	3.8	4.5.4
Insulation resistance at ambient temperature **500 Gohms @ 500 VDC**	3.14.1	4.5.10.1
Dielectric withstanding voltage at sea level **Less than 2 milli-amperes @ 500 VAC**	3.15	4.5.11.1
Durability **500 Cycles**	3.12	4.5.8
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See table 3**	L-40991-161 Para 8.7	
Vibration **20 min per 10-2000-10HZ sweep cycle, 12 sweep cycles per axis, no discontinuities greater than 1 micro-second**	L-40991-161 Para 8.5	
Shock **300 G half-sine, 3 millisecond duration, 3 pulses in each direction of 3 axes (18 pulses), no discontinuities greater than1 micro-second.**	L-40991-161 Para 8.6	

Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See table 3**	L-40991-161 Para 8.7	
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	
Humidity **10 days of 100% humidity cycles**	3.30	4.5.26
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	
Post test examination **6X optical inspection**	3.52 and 3.53	4.5.49

Test Group 3		
TEST	MIL-DTL-38999 Requirement Paragraph	MIL-DTL-38999L Test Paragraph
Visual and mechanical examination **6X optical inspection**	3.1, 3.3, 3.4, 3.5, 3.52 and 3.53	4.5.1
Preparation of samples	L-40991-161 Para 7.3	
Sand and Dust **MIL- STD-810F, Method 510.4**	L-40991-161 Para 8.11	
Immersion **1 meter water for 30 minutes**	L-40991-161 Para 8.10	
Post test examination **6X optical inspection**	3.52 and 3.53	4.5.49

Test Group 4		
TEST	MIL-DTL-38999 Requirement Paragraph	MIL-DTL-38999L Test Paragraph
Visual and mechanical examination **6X optical inspection**	3.1, 3.3, 3.4, 3.5, 3.52 and 3.53	4.5.1
Preparation of samples	L-40991-161 Para 7.4	
EMI Shielding-High Frequency **Met minimum dB attenuation requirements for all frequencies (See Table 1)**	L-40991-161 Para 8.8	
EMI Shielding-Low Frequency **Met minimum dB attenuation requirements for all frequencies (See Table 2)**	L-40991-161 Para 8.9	
Post test examination **6X optical inspection**	3.52 and 3.53	4.5.49

Test Group 5		
TEST	MIL-DTL-38999 Requirement Paragraph	MIL-DTL-38999L Test Paragraph
Visual and mechanical examination **6X optical inspection**	3.1, 3.3, 3.4, 3.5, 3.52 and 3.53	4.5.1
Preparation of samples	L-40991-161 Para 7.5	
Durability **2000 cycles**	L-40991-161 Para 8.14	
Shell-to-shell conductivity **Less than 2.5 millivolt drop at 1 amp**	3.29	4.5.25
Mating/Unmating Force **See Table 3**	L-40991-161 Para 8.7	
Low Level Contact Resistance **20 milli-ohms Max (20mV max and 100mA max)**	L-40991-161 Para 8.13	
Contact Resistance **45mV Max voltage drop @ 3A**	L-40991-161 Para 8.12	
Post test examination **6X optical inspection**	3.52 and 3.53	4.5.49

6.1 EMI Testing Detail

EMI Testing was completed to the following requirements:

Frequency	dB. Min. Attenuation
1 GHz	55
3 GHz	50
5 GHz	45
18 GHz	40

Table 1: Minimum Attenuation: High Frequency

Frequency	dB. Min. Attenuation
100 MHz	75
200 MHz	70
300 MHz	65
400 MHz	63
800 MHz	58
1000 MHz	55

Table 2: Minimum Attenuation: Low Frequency

6.2 Mating/Unmating Force Testing Detail

Mating/Unmating force testing resulted in the averages shown in the table below. After life forces are equivalent to the forces after 500 Cycles of Durability and Vibration testing.

Shell Size	Initial Mating Force (lbs)	Initial Unmating Force (lbs)	Mating Force After Life (lbs)	Unmating Force After Life (lbs)
6	9.6	11	3.1	12.4
9	8	12.5	2	21
12	13	20.8	11.1	30.6

Table 3: Mating/Unmating Force

7. SAMPLE PREPARATION/DEFINITION:

7.1 Group 1-Sample Breakdown

Two mated pairs of Amphenol Connectors, each connector size shall be prepared with two foot lengths of AS22759/11-24 wire.
Two mated pairs of Amphenol/Competitor Connectors, each connector size shall be prepared with two foot lengths of AS22759/11-24 wire. (Amphenol Plug - Competitor Receptacle, Amphenol Receptacle - Competitor Plug)

Part Number	Description	QTY	Size
F9-678901-07P	Plug	3	6
F9-678961-07S	Receptacle	3	6
804-001-06MT6-7PA	Plug	1	6
804-003-01MT6-7SA	Receptacle	1	6
F2-678904-19P	Plug	3	9
F2-678944-19S	Receptacle	3	9
804-001-06ZNU9-19P	Plug	1	9
804-003-00ZNU9-19S	Receptacle	1	9
F7-678906-37P	Plug	3	12
F7-678966-37S	Receptacle	3	12
804-001-06MT12-37P	Plug	1	12
804-003-01MT12-37S	Receptacle	1	12
10-597345-735	Socket	189	23
10-597346-735	Pin	189	23
AS22759/11-24	Wire	AN	24
*AFM8 or similar	Crimp Tool	N/A	N/A
*K1461	Crimp Positioner	N/A	23

AN= As Needed
*Crimp tool and crimp positioner are Daniels part numbers

7.2 Group 2-Sample Breakdown

Two mated pairs of Amphenol Connectors, each connector size shall be prepared with two foot lengths of AS22759/22-24 wire.
Two mated pairs of Amphenol/Competitor Connectors, each connector size shall be prepared with two foot lengths of AS22759/22-24 wire. (Amphenol Plug - Competitor Receptacle, Amphenol Receptacle - Competitor Plug)

Samples in this group must use high strength wire only.

Part Number	Description	QTY	Size
F9-678901-07P	Plug	3	6
F9-678961-07S	Receptacle	3	6
804-001-06NF6-7PA	Plug	1	6
804-003-01NF6-7SA	Receptacle	1	6
F2-678904-19P	Plug	3	9
F2-678944-19S	Receptacle	3	9
804-001-06ZNU9-19P	Plug	1	9
804-003-00ZNU9-19S	Receptacle	1	9
F7-678906-37S	Plug	3	12
F7-678966-37P	Receptacle	3	12
804-001-06MT12-37P	Plug	1	12
804-003-01MT12-37S	Receptacle	1	12
10-597345-735	Socket	189	23
10-597346-735	Pin	189	23
AS22759/22-24	Wire	AN	N/A
*AFM8 or similar	Crimp Tool	N/A	N/A
*K1461	Crimp Positioner	N/A	23

AN= As Needed
*Crimp tool and crimp positioner are Daniels part numbers

7.3 Group 3-Sample Breakdown

Two mated pairs of Amphenol Connectors, each connector size shall be prepared with two foot lengths of AS22759/11-24 wire.
Two mated pairs of Amphenol/Competitor Connectors, each connector size shall be prepared with two foot lengths of AS22759/11-24 wire. (Amphenol Plug - Competitor Receptacle, Amphenol Receptacle - Competitor Plug)

Part Number	Description	QTY	Size
F9-678901-07P	Plug	3	6
F9-678961-07S	Receptacle	3	6
804-001-06NF6-7PA	Plug	1	6
804-003-01NF6-7SA	Receptacle	1	6
F2-678904-19P	Plug	3	9
F2-678944-19S	Receptacle	3	9
804-001-06ZNU9-19P	Plug	1	9
804-003-00ZNU9-19S	Receptacle	1	9
F7-678906-37S	Plug	3	12
F7-678966-37P	Receptacle	3	12
804-001-06MT12-37P	Plug	1	12
804-003-01MT12-37S	Receptacle	1	12
10-597345-735	Socket	189	23
10-597346-735	Pin	189	23
AS22759/22-24	Wire	AN	N/A
*AFM8 or similar	Crimp Tool	N/A	N/A
*K1461	Crimp Positioner	N/A	23

AN= As Needed
*Crimp tool and crimp positioner are Daniels part numbers

7.4 Group 4-Sample Breakdown

Two mated pairs of each connector size, connectors consist of special Electroless Nickel plated modified shells for EMI (no inserts or contacts).

Part Number	Description	QTY	Size
FH-696130-006	Plug Shell	2	6
+FH-696152-006	Recept Shell Kit	2	6
FH-696130-009	Plug Shell	2	9
+FH-696152-009	Recept Shell Kit	2	9
FH-696130-012	Plug Shell	2	12
+FH-696152-012	Recept Shell Kit	2	12

+Populated with Canted Coil Spring and O-ring

7.5 Group 5-Sample Breakdown

Two mated pairs of Amphenol Connectors, size 6 shall be prepared with two foot lengths of AS22759/11-24 wire.

Part Number	Description	QTY	Size
F9-678901-07P	Plug	4	6
F9-678961-07S	Receptacle	2	6
10-597345-735	Socket	28	23
10-597346-735	Pin	28	23
AS22759/11-24	Wire	AN	N/A
*AFM8 or similar	Crimp Tool	N/A	N/A
*K1461	Crimp Positioner	N/A	23

AN= As Needed

*Crimp tool and crimp positioner are Daniels part numbers

8.0 Testing Matrix

Amphenol or Competitor Test Plan Part Number	**Competitor Test Plan 91906189**				**Amphenol QTP L-40991-161 Rev C**				
Product	**Competitor 804 Series**				**Amphenol 2M804 Series**				
	Test Group				**Test Group**				
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**
Test Group Summary	**Electrical Engagement, Insert Retention, Salt Spray**	**Vibe, Shock**	**Sand and Dust, Immersion**	**EMI**	**Electrical Engagement, Insert Retention, Salt Spray**	**Vibe, Shock**	**Sand and Dust, Immersion**	**EMI**	**Durability (2000 Cycles)**
	+Test Sequence				**+Test Sequence**				
Visual and Mechanical Examination	1	1	1	1	1	1	1	1	1
***Insert Retention**					2				
Shell to Shell Conductivity	2,7,10	2,8,12			3,10,13	2,12,16			3
Mating/Unmating Force	3,8,11	3,9,13			4,11,14	3,13,17			4
Insulation resistance at ambient temperature	4	5			5	4,9			
Dielectric withstanding voltage at sea level	5	6			6	5,10			
***Low Level Contact Resistance**					7,15	6,18,21			5
***Contact Resistance**					8,16	7,19,22			6
Durability (500 cycles)	6	7			9	11			
***Durability (2000 cycles)**									2
Salt spray	9				12				
Electrical Engagement	12				17				
Temperature Cycling		4				8			
Vibration		10				14			
Shock		11				15			
Humidity		14				20			
Sand and Dust			2				2		
Immersion			3				3		7
EMI Shielding Effectiveness				2				2	
Post Test Examination	13	15	4	3	18	23	4	3	8
Results or Scheduled Completion Date	**N/A**	**N/A**	**N/A**	**N/A**	**Passed**	**Passed**	**Passed**	**Passed**	**Passed**

***Testing not completed in Competitor's Test Plan**

+Numbers shown in Test Sequence detail the order in which tests were completed in each group.