






Validation Test Report

FG Terminal

April 20, 2007.



Tested & Reported By	Reviewed By	Approved By	Test Date	From March 08, 2007 To April 20, 2007
			Classification	Unrestricted

● TE CONNECTIVITY RELIABILITY TEST REPORT

Test Name : Validation for FG Terminal.

1. Introduction

1-1 Purpose

Testing was performed on the FG Terminal to determine if it conformance to the requirements of Product Specification 108-61082, Rev.A

1-2 Scope

This report covers the electrical, mechanical, environmental performance requirements of the FG Terminal.

The testing was performed between March 08, 2007 and April 20, 2007.

1-3 Test Samples

The test samples were randomly selected from normal current production lots.

P/N	Description
1743728-1	FG Terminal
1743729-1	FG Terminal
177905-1	PDL PLUG 12P
179843-1	PDL HDR 12P

1-4 Conclusion

The FG Terminal meets the electrical, mechanical and environmental performance requirements of Product Specification 108-61082, Rev.A

1-5 Attachment

- 1) Test Sequence
- 2) Requirements and Test Procedure
- 3) Test Result

1) Test Sequence

Test Examination	Test Group																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Examination of Product	1, 3	1, 4	1, 4	1	1, 3	1, 4	1, 7	1, 7	1, 4	1, 4	1, 4	1, 4	1, 4	1, 4	1, 4	1, 3	1, 3	1, 3
Termination Resistance (Low Level)							2, 4, 6	3, 6	2, 5	2, 5	2, 5	2, 5	2, 5	2, 5	2, 5			
Dielectric withstanding Voltage						3			7									
Insulation Resistance						2			6									
Temperature Rising					2													
Vibration (Low Frequency)							5											
Physical Shock							3											
Connector Mating Force								2										
Connector Unmating Force								4										
Contact Mating Force		2																
Contact Unmating Force		3																
Crimp Tensile Strength	2																	
Durability (Repeated Mate/Unmating)								5										
Housing Locking Strength			3															
Post Retention Force																2		
Solderability																	2	
Humidity-									3									
Temperature Cycling																		
H2S													3					
Resistance to Soldering Heat																		2
Thermal Shock									3									
Salt Spray										3								
Resistance to Cold												3						
Contact Retention Force						5												
Temperature Life (Heat Aging)												3						

2) Requirements and Test Procedure

Para.	Test Items	Requirements		Procedures
3.5.1	Examination of Product	Meets requirements of product drawing and AMP Specification 114-61016 After test ,no corrosion influence performance.		Visual inspection No Physical damage
Electrical Requirements				
3.5.2	Termination Resistance (Low Level)	10 m Ω Max. (Initial) 20 m Ω Max. (Final)		Subject mated contacts assembled in housing to 20mV Max open circuit at 10mA. Take the resistance of the wire only away from measurement. Fig. 6 AMP Spec. 109-5311-1
3.5.3	Insulation Resistance	1000 M Ω Min. (Initial) 500 M Ω Min. (Final)		Impressed voltage 500 V DC. Test between adjacent circuits and between the surface of housing and contact of mated connectors. AMP Spec. 109-5302
3.5.4	Dielectric withstanding Voltage	No creeping discharge nor flashover shall occur. Current leakage : 5mA Max.		2.2 kVAC for 1 minute. Test between adjacent circuits and between the surface of housing and contact of mated connectors.
3.5.5	Temperature Rising	30 $^{\circ}$ C Max. under loaded specified current.		Measure temperature rising by energized current. Subject measurement must do at the place of no influence from convection of air. And contacts assembled in housing all of circuits The thermocouple attach to the contact of center circuits number Fig. 1,6 AMP Spec. 109-5310
Mechanical Requirements				
3.5.6	Vibration (Low Frequency)	No electrical discontinuity greater than 1 μ sec. shall occur. 20 m Ω Max.(Final)		Subject mated connectors to 10-55-10Hz traversed in 1 minute at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes. 100mA applied. Fig.7 AMP Spec. 109-5201
3.5.7	Physical Shock	No electrical discontinuity greater than 1 μ sec. Shall occur. Final 20 m Ω Max.		Mated Conn. (50G) Waveform : Half sine curve Duration : 11 m sec. Number of Drops : 3 drops each to normal and reversed directions of X,Y and Z axes, totally 18 drops. AMP Spec. 109-5208 See Fig. 7
3.5.8	Connector Mating /Unmating Force	Mating Force	(13.72 X Pos.)N Max. (1.4 X Pos)Kg Max	Operation Speed : 100mm/min Measure the force required to mate/unmate connectors. However, It is measure without HSG Lock.
		Unmating Force	(1.96 X Pos.)N MIN. (0.2 X Pos.)Kg MIN	
3.5.9	Contact Insertion Force	6.86 N (0.7 Kgf) Max. per contact.		Measure the force required to insert contact into housing AMP Spec. 109-5211
3.5.10	Contact Retention Force	41.16 N (4.2 Kgf) Min. per contact		Apply an axial pull-off load to crimped wire . Use the wire of AWG #16 or #18 . Operation Speed : 100 mm/min. AMP Spec. 109-5210.

3.5.11	Contact Mate/Unmating Force	Mate Force	13.72 N(1400g)Max (1 st ~25 th)		Measured by gauge tab (Fig.8) Operation Speed : 100 mm/min. AMP Spec. 109-5206
		Unmating Force	0.58N(60g)Min.(1 st) 0.39N(40g)Min.(25 th)		
3.5.12	Crimp Tensile Strength	Wire Size		Crimp Tensile (min)	Apply an axial pull-off load to crimped wire of contact secured on the tester, Operation Speed : 100mm/min. Subject take insulation barrel away. AMP Spec.109-5205
		mm ²	(AWG)	N(Kgf)	
		0.14	26	19.6(2)	
		0.22	24	29.4(3)	
		0.31	22	49.0(5)	
		0.51	20	58.8(6)	
		0.87	18	68.6(7)	
1.27	16	78.4(8)			
3.5.13	Durability (Repeated Mate/Unmating)	Mating	(13.72xPos.)N Max. (1.4xPos.)N Max.		No. of Cycles : 25 cycles
		Unmating	(1.96xPos.)N Min. (0.2xPos.)Kg Min.		
3.5.14	Housing Locking Strength	34.3 N(3.5Kgf) Min. (2~4 Pos.) 44.1 N (4.5 Kgf) Min. (6,8,9,12 Pos.)			Measure connector locking strength. Operation Speed : 100 mm/min. AMP Spec. 109-5210
3.5.15	Post Retention Force	9.8N (1.0 Kgf)Min.			Measure post retention force Operation Speed : 100mm/min.
Environmental Requirements					
3.5.16	Thermal Shock	20 mΩ Max. (Final)			Mated connector -55℃/30 min. 85℃/30min. Making this a cycle, repeat 25 cycles. AMP Spec. 109-5103 Condition A The measurement is held after being left indoor for 3 hours.
3.5.17	Humidity-Temperature Cycling	Dielectric withstanding voltage 2.2KV AC 1 minute. Insulation resistance(final) 500 MΩ Min. Termination resistance 20 mΩ Max. (Final)			Mated connector, 25~65℃, 80 ~ 98% R.H. 10 cycles Cold shock -10℃ (not) performed AMP Spec. 109-5106 The measurement is held after being left indoor for 3 hours.
3.5.18	Salt Spray	20 mΩ Max. (Final) No corrosion influence performance			Subject mated connector to 5%±1% salt concentration for 48 hours. The measurement is held after remove the salt and dry up at indoor.
3.5.19	Heat Aging	20 mΩ Max. (Final)			Mated connector 150℃ ± 2℃ ,96 hours AMP Spec. 109-5108 condition A
3.5.20	Resistance to Cold	20 mΩ Max. (Final)			Mated connector -30℃±2℃,96 hours AMP Spec. 109-5108-3 Condition D But temperature shall be applicable to the above.

3.5.21	H ₂ S	20 mΩ Max.(Final) No corrosion influence performance	Mated connector 3 ± 1 ppm , 40 ± 2℃ 96 hours
3.5.22	Solderability	Wet Solder Coverage : 90 % Min.	Solder Temperature : 230±5℃ Immersion Duration : 3±0.5 seconds
3.5.23	Resistance to Soldering Heat	No physical damage shall occur.	Test connector on PCB. Solder Temperature :260±5℃ Immersion Duration : 10±0.5 sec. AMP Spec. : 109-5204

3) Test Result
- Test Group 1

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result									Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Crimp Tensile Strength	Initial	Rec	8.0 kgf Min.	kgf	#16	19.38	18.90	18.93	19.27	19.33	18.90	19.38	19.16	OK
				2.0 kgf Min.			#26	5.24	4.78	5.11	5.09	5.19	4.78	5.24	5.08

- Test Group 2

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result									Judgment
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Contact Mating Force	Initial	1.4 kgf Max.		kgf	-	0.78	0.73	0.77	0.81	0.79	0.73	0.81	0.78	OK
		25th					0.56	0.65	0.62	0.59	0.60	0.56	0.65	0.60	OK
3	Contact Un-Mating Force	Initial	0.06 kgf Min.		kgf	-	0.83	0.81	0.79	0.79	0.75	0.75	0.83	0.79	OK
		25th	0.04 kgf Min.				0.72	0.68	0.64	0.63	0.64	0.63	0.72	0.66	OK

- Test Group 3

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result								Judgment	
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.		Avg.
1	Examination of Product	Initial	No physical damage.		-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final					OK	OK	OK	OK	OK	-	-	-	OK
2	Housing Locking Strength	Initial	4.5 kgf Min.		kgf	-	14.34	13.70	14.29	13.89	14.20	13.70	14.34	14.08	OK

- Test Group 4

NO	Test Items	Test Condition	Acceptance criteria		Unit	Test Result								Judgment	
						Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.		Avg.
1	Examination of Product	Initial	No physical damage.		-	-	OK	OK	OK	OK	OK	-	-	-	OK
2	Contact Insertion Force	Initial	Rec	0.7 kgf Max.	kgf	-	0.41	0.37	0.39	0.35	0.40	0.35	0.41	0.38	OK

- Test Group 5

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Temperature Rising	Initial	Δ 30 °C Max. AWG16 : 7A AWG26 : 2A	°C	#16	14.10	13.80	14.40	14.20	14.00	13.80	14.40	14.10	OK
					#26	15.10	16.40	16.10	16.50	16.40	15.10	16.50	16.10	OK

- Test Group 6

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Insulation Resistance	Initial	1000MΩ Min.	MΩ	-	1000MΩ Over					-	-	-	OK
3	Dielectric withstanding Voltage		No creeping discharge nor flashover shall occur Current Leakage : 5mA Max.	mA	-	0	0	0	0	0	0	0	0	OK
4	Contact Retention Force		Rec	4.2 kgf Min.	kgf	-	14.84	14.29	13.86	14.75	14.18	13.86	14.84	14.38

- Test Group 7

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.91	0.88	0.90	0.87	0.89	0.87	0.91	0.89	OK
		After Physical Shock	20 mΩ Max.			1.12	1.17	1.09	1.11	1.14	1.09	1.17	1.13	OK
		After Vibration				1.21	1.29	1.18	1.20	1.23	1.18	1.29	1.22	OK
3	physical shock	Initial	No electrical discontinuity greater than 1μ sec. Shall occur.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
4	Vibration (Low Frequency)	Initial	No electrical discontinuity greater than 1μ sec. Shall occur.	-	-	OK	OK	OK	OK	OK	-	-	-	OK

- Test Group 8

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.85	0.83	0.91	0.86	0.93	0.83	0.93	0.88	OK
		After Durability	20 mΩ Max.			1.21	1.19	1.28	1.20	1.34	1.19	1.34	1.24	OK
3	Connector Mating Force	Initial	16.8 kgf Max.	kgf	-	11.95	11.69	11.86	11.79	11.78	11.69	11.95	11.81	OK
4	Connector Un-Mating Force	Initial	2.4 kgf Min.			10.13	10.92	10.19	9.89	10.29	9.89	10.92	10.28	OK

- Test Group 9

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.83	0.82	0.79	0.86	0.85	0.79	0.86	0.83	OK
		After Thermal Shock	20 mΩ Max.			1.17	1.19	1.24	1.14	1.09	1.09	1.24	1.17	OK

- Test Group 10

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Confirmation of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.91	0.86	0.85	0.81	0.86	0.81	0.91	0.86	OK
		After Humidity	20 mΩ Max.			1.18	1.14	1.09	1.13	1.11	1.09	1.18	1.13	OK
3	Insulation Resistance	After Humidity	500MΩ Min.	MΩ	-	1000MΩ Over					-	-	-	OK
4	Dielectric withstanding Voltage		No creeping discharge nor flashover shall occur Current Leakage : 5mA Max.	mA	-	0	0	0	0	0	0	0	0	0

- Test Group 11

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.86	0.87	0.81	0.83	0.85	0.81	0.87	0.84	OK
		After Salt Spray	20 mΩ Max.			0.92	0.96	0.94	0.97	0.92	0.92	0.97	0.94	OK

- Test Group 12

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.86	0.87	0.85	0.93	0.91	0.85	0.93	0.88	OK
		After Temperature Life	20 mΩ Max.			1.19	1.28	1.18	1.17	1.15	1.15	1.28	1.19	OK

- Test Group 13

NO	Test Items	Test Condition	Acceptance criteria	Unit	Test Result									Judgment
					Wire (AWG)	S1	S2	S3	S4	S5	Min.	Max.	Avg.	
1	Examination of Product	Initial	No physical damage.	-	-	OK	OK	OK	OK	OK	-	-	-	OK
		Final				OK	OK	OK	OK	OK	-	-	-	OK
2	Termination Resistance (Low Level)	Initial	10 mΩ Max.	mΩ	-	0.81	0.79	0.92	0.83	0.87	0.79	0.92	0.84	OK
		Resistance to Cold	20 mΩ Max.			1.08	1.09	1.10	1.11	1.17	1.08	1.17	1.11	OK