AMP

QUALIFICATION TEST REPORT

CONNECTOR, FLEXIBLE FLAT CONDUCTOR CABLE, .100 INCH CENTERLINE

501-131 Rev. O

Product Specification: 108-9024 Rev. K
CTL No.: CTL5176-044-024
CTL5176-022-022
CTL5107-002
CTL5107-009-005
Date: June 22, 1994
Classification: Unrestricted
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AMP

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CORPORATE TEST LABORATORY

Qualification Test Report

1. Introduction

1.1 Purpose

Testing was performed on AMP* Flexible Flat Conductor (FFC) Connector to determine its conformance to the requirements of AMP Product Specification 108-9024 Rev. K.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the FFC Connector manufactured by the Interconnection Components & Assemblies Division of the Capital Goods Business Unit. The testing was performed between June 18, 1991 and June 17,1994.

1.3 Conclusion

The FFC Connector meets the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-9024 Rev. K.

* Trademark

1.4 Product Description

The FFC pins and receptacles are designed to be crimped on flat conductor cable or AWG 22 to AWG 32 round wire. The contacts are on .100 inch centerline and mate to 0.025 square posts. The contacts are phosphor bronze, the housings are flame retardant, black, thermoplastic, UL94V-O.

1.5 Test Samples

The test samples were randomly selected from normal current production lots, and the following part numbers were used for test:

Test Group	Quantity	Part Nbr	Description
1,2,3	400	487406-1	15μ Gold Recpt
3	50	487117-4	15μ Gold Recpt (High Pressure)
3	50	487406-2	30μ Gold Recpt
3	50	487117-5	30μ Gold Recpt (High Pressure)
3	50	487406-3	50μ Gold Recpt
2,4,6,8	200	487406-4	100μ Tin Recpt
1,5,7	196	88997-2	100μ Tin Solder Tab
1,6,8	186	88117-5	100μ Tin Pin
8	10	1-103639-3	100μ Tin Recpt
1	10	2-88859-8	30 Pos Housing, Recpt.
2,3	70	487378-9	10 Pos Housing, Slimline
8	10	1-487526-3	14 Pos Housing, w/Latch
1	10	2-88586-9	30 Pos FFC Cable
2,3,5	80	88586-9	10 Pos FFC Cable

1.6 Qualification Test Sequence

	Test Groups							
Test or Examination	1	2	3	4	5	6	7	8
Examination of Product	1,9	1,5	1,5	1,5	1,8	1,3	1,3	1,3
Termination Resistance, Dry Circuit	3,7	2,4	2,4	2,4				
Dielectric Withstanding Voltage					3,7			
Insulation Resistance					2,6			
Vibration	5							
Physical Shock	6							
Mating Force	2							
Unmating Force	8							
Contact Retention								2
Crimp Tensile						2		
Durability	4							
Solderability							2	
Thermal Shock					4			
Humidity-Temperature Cycling				3	5			
Mixed Flowing Gas			3					
Temperature Life		3						

The numbers indicate sequence in which tests were performed.

2. Summary of Testing

2.1 Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Capital Goods Business Unit.

2.2 Termination Resistance, Dry Circuit - Groups 1,2,3,4

All termination resistance measurements, taken at 100 milliamperes DC and 50 millivolts open circuit voltage were less than 25 milliohms for gold plating and 45 milliohms for tin plating.

Test Group	Nbr of Samples	Condition	Min	Max	Mean
1	150	Initial	5.22	6.98	5.932
		After Mechanical	5.20	6.76	6.042
2	50	Initial	6.17	8.08	6.989
		After Temp Life	5.61	7.68	6.617
3	250	Initial	4.64	7.53	5.948
		After Mixed Gas	4.93	10.45	6.422

Gold Plated Contacts

Test Group	Nbr of Samples	Condition	Min	Max	Mean
1	172	Initial	5.52	9.64	7.660
		After Mechanical	6.50	24.80	10.650
2	50	Initial	4.94	5.91	5.502
		After Temp Life	5.36	14.02	6.834
4	50	Initial	5.42	8.21	6.663
		After Humidity	5.84	15.08	8.737

Tin Plated Contacts
All values in milliohms

2.3 Dielectric Withstanding Voltage - Group 5

No dielectric breakdown or flashover occurred when a test voltage was applied between adjacent contacts.

2.4 Insulation Resistance - Group 5

All insulation resistance measurements were greater than 5,000 megohms.

2.5 Vibration - Group 1

No discontinuities of the contacts were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.6 Physical Shock - Group 1

No discontinuities of the contacts were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.7 Mating Force - Group 1

All mating force measurements were less than 15 ounces maximum average per contact for standard pressure contacts and less than 36 ounces maximum average for high pressure contacts.

2.8 Unmating Force - Group 1

All unmating force measurements were greater than 1.5 ounces minimum average per contact for standard pressure contacts and less than 3.0 ounces minimum average for high pressure contacts.

2.9 Contact Retention - Group 8

No physical damage occurred to either the contacts or the housing, and no contacts dislodged from the housings as a result of supplying an axial load of 3 pounds to each contacts.

2.10 Crimp Tensile - Group 6

All tensile values were greater than 5 pounds per contact.

2.11 Durability - Group 1

No physical damage occurred to the samples as a result of mating and unmating the cable and connector assemblies 50 times.

2.12 Solderability - Group 7

The contact leads had a minimum of 95% solder coverage.

2.13 Thermal Shock - Group 5

No evidence of physical damage to either the contacts or the connector was visible as a result of thermal shock.

2.14 Humidity-Temperature Cycling - Groups 4,5

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to humidity-temperature cycling.

2.15 Mixed Flowing Gas - Group 3

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to the pollutants of mixed flowing gas.

2.16 Temperature Life - Group 2

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to an elevated temperature.

3. Test Methods

3.1 Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2 Termination Resistance, Low Level

Termination resistance measurements at low level current were made using a four terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes DC with an open circuit voltage of 50 millivolts DC.

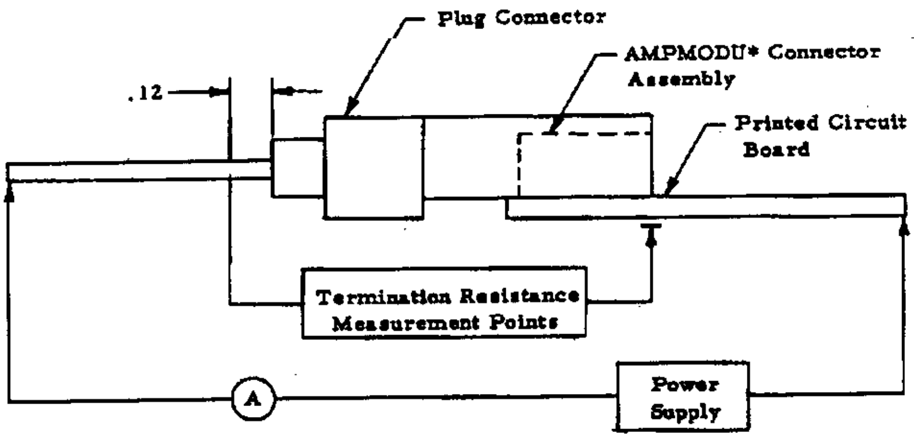

Figure 1
Typical Termination Resistance Measurement Points

3.3 Dielectric Withstanding Voltage

A test potential of 720 vac at sea level, 480 vac at 25,000 feet, and 330 vac at 50,000 was applied between the adjacent contacts. This potential was applied for one minute and then returned to zero.

3.4 Insulation Resistance

Insulation resistance was measured between adjacent contacts, using a test voltage of 500 vdc. This voltage was applied for two minutes before the resistance was measured.

3.5 Vibration, Random

Mated assemblies were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 hertz. The power spectral density at 50 hz is 0.075 G^2/Hz. The spectrum slopes up at 6 dB per octave to a PSD of 0.300 G^2/Hz at 100 Hz. The spectrum is flat at 0.300 G^2/Hz from 100 to 1000 Hz. The spectrum slopes down at 6 dB per octave to the upper bound frequency of 2000 Hz, at which the PSD is 0.075 G^2/Hz. The root-mean square amplitude of the excitation was 20.71 GRMS. The test was run for a duration of 15 minutes in each of the 3 mutually perpendicular axes. Assemblies were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.6 Physical Shock

Mated assemblies were subjected to a physical shock test, having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes, for a total of 18 shocks. The assemblies were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.7 Mating Force

The force required to mate individual assemblies was measured, using a free floating fixture with the rate of travel at 0.5 inch/minute. The force per contact was calculated.

3.8 Unmating Force

The force required to unmate individual assemblies was measured using a free floating fixture with the rate of travel at 0.5 inch/minute. The force per contact was calculated.

3.9 Contact Retention

An axial load of 3 pounds was applied to each contact and held for 60 seconds. The force was applied in a direction to cause removal of the contacts from the housing.

3.10 Crimp Tensile

An axial load of 5 lbs force was applied to each sample crimped to Flat Flexible Cable at a crosshead rate of 1.0 inch per minute.

3.11 Durability

Connectors and headers were mated and unmated 50 times at a rate not exceeding 150 per hour.

3.12 Solderability

Connector assembly contact solder tails were subjected to a solderability test by immersing them in a nonactivated Rosin flux for 5 to 10 seconds, allowed to drain for 10 to 60 seconds, then held over molten solder without contact for 2 seconds. The solder tails were then immersed in the molden solder at a rate of approximately one inch per second, held for 3 to 5 seconds, then withdrawn. After cleaning in isopropyl alcohol, the samples were visually examined for solder coverage. The solder used for testing was 60/40 tin lead composition and was maintained at a temperature of 245°C.

3.13 Thermal Shock

Mated assemblies were subjected to 5 cycles of temperature extremes with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -65°C and 105°C. The transition between temperatures was less than one minute.

3.14 Humidity-Temperature Cycling

Mated assemblies were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice while the relative humidity was held at 95%. During five of the first nine cycles, the assemblies were exposed to a cold shock at -10°C for 3 hours.

3.15 Mixed Flowing Gas, Class III

Mated assemblies were exposed for 20 days to a mixed flowing gas Class III exposure. Class III exposure is defined as a temperature of 30°C and a relative humidity of 75% with the pollutants of $C1_2$ at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb.

3.16 Temperature Life

Mated assemblies were exposed to a temperature of 105°C for 500 hours.

4. Validation

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