Modular Plugs, Thru-Hole and Surface Mount Jacks, Data and Telephone, PCB Mounted

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Modular PCB Mounted Telephone Plug and Jack | Connector to determine if it meets the requirements of Product Specification 108-1163 Revision F.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Modular PCB Mounted Telephone Plug and Jack Connector, manufactured by the Communications Products Division of the Signal Transmission Products Group. Testing was performed between 07Jun88 and 19May89.

1.3. Conclusion

The Modular PCB Mounted Telephone Plug and Jack Connector meets the electrical, mechanical, and | environmental performance requirements of Product Specification 108-1163 Revision F.

1.4. Product Description

The modular plug and printed circuit board modular jack are used for voice, data and signal transmission interconnections. These products conform to FCC Rules and Regulations Part 68, Subpart F.

1.5. Test Samples

Test samples were representative of normal production lots. Samples identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1 to 8	80	554739-1	PCB modular plug
	40	520259-4	Top entry modular jack
	40	520251-4	Side entry modular jack
9	10	555153-1	Shielded modular plug
	10	555178-1	Shielded modular jack

NOTE *All plugs were terminated with 28 AWG stranded wire.*

Figure 1

* Trademark
| Indicates change

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)								
	1	2	3	4	5	6	7	8	9
	Test Sequence (b)								
Examination of product	1	1	1	1	1	1	1	1	1
Termination resistance, dry circuit		2,4	2,4	4,6			2,6	2,4	
Termination resistance, rated current						2,5			
Insulation resistance	4		5				5		
Dielectric withstanding voltage	2						4		
Temperature rise vs current						3			
Current cycling						4			
Shielding effectiveness									2
Surge	3								
Vibration		3							
Durability				5					
Mating force				2					
Unmating force				3					
Plug retention in jack					2				
Pull								3	
Jack retention to PCB					3				
Thermal shock			3						
High humidity/temperature cycling							3		

NOTE *(a) See paragraph 1.5.*
(b) Numbers indicate sequence in which tests are performed.

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All samples submitted for testing were selected from normal production lots. They were inspected and accepted by the Product Assurance Department of the Signal Transmission Products Group.

2.2. Termination Resistance, Dry Circuit - Test Groups 2, 3, 4, 7 and 8

Termination resistance measurements were taken at 100 milliamperes DC and 50 millivolts open circuit voltage. All measurements were less than the specification requirement of 30 milliohms maximum increase after testing.

Test Group	Condition	Samples	Termination Resistance		
			Min	Max	Mean
2	After vibration				
	Top entry	40	-1.255	+10.419	+1.318
	Side entry	40	-4.775	+6.876	+0.566
3	After thermal shock				
	Top entry	40	-6.198	+29.570	+3.822
	Side entry	40	-4.456	+13.223	+3.198
4	After durability				
	Top entry	40	-9.619	+9.382	+0.736
	Side entry	40	-15.865	+7.656	+0.213
7	After high humidity/temperature cycling				
	Top entry	40	-6.237	+4.422	-0.207
	Side entry	40	-6.130	+6.670	+1.069
8	After pull				
	Top entry	40	-17.310	+13.209	+1.473
	Side entry	40	-17.909	+2.802	-1.136

NOTE *All values in milliohms.*

Figure 3

2.3. Termination Resistance, Rated Current - Test Group 6

Termination resistance measurements taken at the specified current of 1.5 amperes DC, were less than the specification requirement of 30 milliohms maximum increase after testing.

Test Group	Condition	Samples	Termination Resistance		
			Min	Max	Mean
6	After current cycling				
	Top entry	40	-4.690	+17.260	+0.722

NOTE *All values in milliohms.*

Figure 4

2.4. Insulation Resistance - Test Groups 1, 3 and 7

All insulation resistance measurements were greater than the specification requirement of 500 megohms minimum.

2.5. Dielectric Withstanding Voltage - Test Groups 1 and 7

There was no dielectric breakdown or flashover when a test voltage of 1000 volts AC was applied for 1 minute between adjacent contacts of mated plugs and jacks.

2.6 Temperature Rise vs Current - Test Group 6

All samples had a temperature rise of less than 30°C above ambient when a specified current of 1.5 amperes AC was applied.

2.7. Current Cycling - Test Group 6

After 500 cycles of cycling the current ON and OFF at 1.875 amperes, there was no evidence of physical damage to the test samples. The cycling current represented 125% of the specified current.

2.8. Shielding Effectiveness - Test Group 9

When tested through the frequency range of 30 to 400 MHz, radiation was reduced a minimum of 20 dB.

2.9. Surge - Test Group 1

There was no evidence of physical damage to either the contacts or the connector as a result of surge testing.

2.10. Vibration - Test Group 2

During vibration testing, there were no discontinuities of the contacts greater than 1 microsecond. Following vibration testing, there were no cracks, breaks, or loose parts on the connector assemblies.

2.11. Durability - Test Group 4

There was no physical damage to the samples as a result of mating and unmating the connector 750 times.

2.12. Mating Force - Test Group 4

All mating force measurements were less than the specification requirement of 5.0 pounds.

2.13. Unmating Force - Test Group $

All unmating force measurements were less than the specification requirement of 5.0 pounds.

2.14. Plug Retention In Jack - Test Group 5

With an axial load applied to the jack, the jack did not dislodge from the plug assembly.

2.15. Pull - Test Group 8

With an axial load applied to the test cable and rotated 45 degrees in each direction from the cable axis, the jack remained mated to its plug. There was no evidence of physical damage.

2.16. Jack Retention To PCB - Test Group 5

Before soldering (with a 1 pound perpendicular load applied) and after soldering (with a 10 pound perpendicular load applied), the jacks did not dislodge from their printed circuit board.

2.17. Thermal Shock - Test Group 3

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

2.18. High Humidity/temperature Cycling - Test Group 7

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

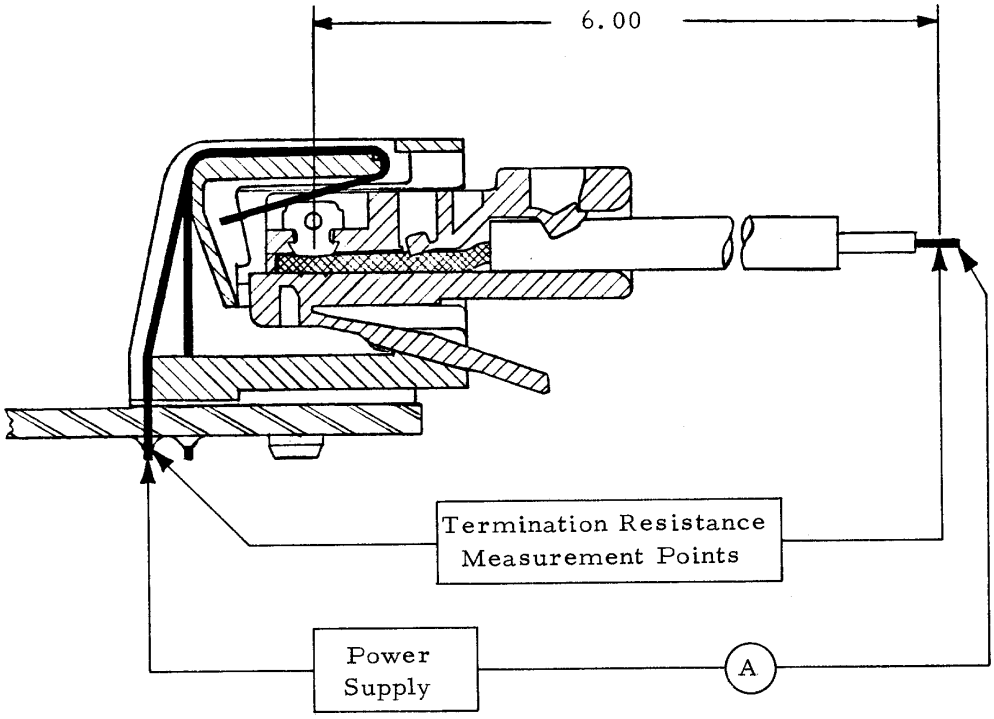
3. TEST METHODS

3.1. Examination of Product

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

3.2. Termination Resistance, Dry Circuit

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 5). The test current was maintained at 100 milliamperes DC with an open circuit voltage of 50 millivolts DC.



NOTE *Millivolt drop (resistance) due to the 6 inch wire length shall be subtracted from all readings.*

Figure 5
Termination Resistance Measurement Points

3.3. Termination Resistance, Rated Current

Termination resistance measurements at rated current were made using a 4 terminal measuring technique (Figure 5). The test current was 1.5 amperes DC.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts using a test voltage of 100 volts DC. This voltage was applied for 1 minute before the resistance was measured.

3.5. Dielectric Withstanding Voltage

A test potential of 1000 volts AC was applied between the adjacent contacts. This potential was applied for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Mated plug and jack temperature was measured while energized at the specified current of 1.5 amperes AC. Thermocouples were attached to the connectors to measure their temperatures. This temperature was then subtracted from the ambient temperature to find the temperature rise. When 3 readings at 5 minute intervals were the same, the readings were recorded.

3.7. Current Cycling

Connectors were cycled ON and OFF for 500 cycles at 125% of the specified current. Each cycle had current ON for 15 minutes and current OFF for 15 minutes.

3.8. Shielding Effectiveness

The radiated response from an unshielded mated jack and plug, terminated with unshielded cable while conductors were excited between 30 and 400 MHz was measured. The procedure was repeated, using shielded jacks mated with shielded plugs terminated with aluminum/MYLAR shielded cable. The difference in response is the shielding effectiveness in dB.

3.9. Surge

Mated plug and jack assemblies were subjected to 10 voltage surges (5 surges of each polarity). The surge had a peak of 1000 volts, with a risetime of 10 microseconds, and a half point decay of 1000 microseconds.

3.10. Vibration

Mated connectors were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 0.06 inch, double amplitude. The vibration frequency was varied logarithmically between the limits of 10 and 50 Hz and returned to 10 Hz in 1 minute. This cycle was performed 15 times in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Connectors were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.11. Durability

Connectors were mated and unmated 750 times at a rate not exceeding 500 cycles per hour.

3.12. Mating Force

The force required to mate individual contacts was measured using a tensile/compression device with a free floating fixture and a rate of travel of 0.5 inch per minute. Measurements were taken after 3 mate/unmate cycles.

3.13. Unmating Force

The force required to unmate individual contacts was measured using a tensile/compression device with a free floating fixture and a rate of travel of 0.5 inch per minute.

3.14. Plug Retention In Jack

An axial load of 20 pounds was applied to the plug housing. The plug was mated to a jack assembly with the latches engaged.

3.15. Pull

Cables with plugs attached were loaded with 17 pounds and mated to jack assemblies. The jack assemblies were then rotated 45 degrees in each direction.

3.16. Jack Retention To PCB

A perpendicular load was applied at a rate of 2.0 inches per minute to a jack mounted on a 0.062 inch thick printed circuit board.

3.17. Thermal Shock

Mated connectors were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 60°C. The transition between temperatures was less than 1 minute.

3.18. High Humidity/temperature Cycling

Mated connectors were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 4 and 60°C twice while maintaining 95% RH.