SL Series Jacks, Category 6

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP NETCONNECT® SL Series Category 6 Jacks to determine their conformance to the requirements of Product Specification 108-131000 Revision B.

1.2. Scope

This report covers the electrical, mechanical, environmental and transmission performance of AMP NETCONNECT SL Series Category 6 Jacks utilizing component engine 2111621. Testing was performed and test reports are on file at the Greensboro Electrical Components Test Laboratory, the Barcelona Electrical Components Test Laboratory, and the Den Bosch Netherlands Environmental Testing Laboratory. The test report numbers and file storage locations for this testing are listed in Section 2.1, Test Group / Report Summary.

1.3. Conclusion

The AMP NETCONNECT SL Series Category 6 Jacks listed in paragraph 1.5 conformed to the electrical, mechanical, environmental and transmission performance requirements of Product Specification 108-131000 Revision B.

1.4. Product Description

These assemblies are designed for installation into various outlet plates, surface mount boxes, panels, and other similar type fittings. Jacks incorporate IDC terminals for terminating both shielded and unshielded twisted pair communications cable. Jacks will accommodate 22 – 24 AWG solid and 24 – 26 AWG stranded conductors. The maximum conductor insulation diameter is 1.45 mm [0.057 in] and the maximum cable outer jacket diameter is 5.8 mm [0.23 in].

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens used as control specimens are not listed in the table below, but shown on the respective test requests in the final test reports. Specimens identified with the following part numbers were used for each test:

Part Number	Description	Test Group								Total
		1	2	3/6	4	5	7	8	9	
1375055	Cat 6 jack	10	10	10	10	2	3	10	15	70

Figure 1

1.6. Environmental Conditions

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

- Temperature: 15 to 35°C
- Relative Humidity: 25 to 75%

1.7 Qualification Test Sequence

Test or Examination	Test Group (a)								
	1(b)	2(b)	3(b)	4(b)	5(b)	6(b)	7(b)	8	9(c)
	Test Sequence (d)								
Initial examination of product	1	1	1	1	1	1	1	1	1
Visual examination of product	12,18	12	9	8	5	7	3		
ELECTRICAL									
Voltage proof	4,11	3,11	3,8	4,7		4			
Current carrying capacity							2		
Contact resistance, initial					2				
Contact resistance, R_{AD}	2,10,14	4,7,9	4,6	2,9,1		2		2,4,6	
Input to output resistance					4				
Input to output resistance unbalance					3				
Insulation resistance	3,9	2,10	2,7	3,6		3,6			
Surge test						5			
Gaging continuity				10					
MECHANICAL									
Plug insertion force	5,15								
Plug withdrawal force	6,16								
Plug retention in jack	7,17								
Durability, 8 position plug		5,8							
Durability, 6 position plug								3	
Vibration			5						
Dimensional gaging				9					
Thermal shock	8								
Humidity/temperature cycling	13								
Electrical load and temperature				5				5	
Flowing mixed gas corrosion		6							
TRANSMISSION: Permanent Link Configuration (e)									
Return loss									2
Insertion loss									2
NEXT									2
PSNEXT									2
ACR									2
PSACR									2
ELFEXT									2
PSELFEXT									2
Propagation delay									2
Delay skew									2
TRANSMISSION: Channel Configuration (f)									
Return loss									3
Insertion loss									3
NEXT loss									3
PS NEXT loss									3
ACR-N									3
PS ACR-N									3
ACR-F									3
PS ACR-F									3
Propagation Delay									3
Delay Skew									3

NOTES:

(a) See paragraph 1.5.

(b) Test groups 1 thru 7 are based on the "full test schedule" defined in IEC 60603-7 and IEC 60603-7-2.

(c) Test group 9 is based on ISO/IEC 11801. See Figure 6.

(d) Numbers indicate sequence in which tests are performed.

(e) Transmission parameters are checked as Class D permanent link configuration per ISO/IEC 11801, Annex A.

(f) Transmission parameters are checked as Class E channel configuration per ISO/IEC 11801, Section 6.4.

Figure 2

2. SUMMARY OF TESTING

2.1 Test Group / Report Summary

2.1.1 Test Group 1 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-A Test Group IDs 1 and 2.

2.1.2 Test Group 2 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-B Test Group IDs 1 and 2. This report also covers testing performed at the Den Bosch Netherlands Environmental Testing Laboratory.

2.1.3 Test Group 3 – Refer to Greensboro Electrical Components Test Laboratory test request LT13-01-C, which correlates with Barcelona Electrical Components Test Laboratory Test Report E2013-024 Test Group IDs 1 and 2.

2.1.4 Test Group 4 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-D Test Group IDs 1 and 2.

2.1.5 Test Group 5 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-E Test Group ID 1.

2.1.6 Test Group 6 – Refer to Greensboro Electrical Components Test Laboratory test request LT13-01-F, which correlates with Barcelona Electrical Components Test Laboratory Test Report E2013-024 Test Group IDs 5 and 6.

2.1.7 Test Group 7 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-G Test Group ID 1.

2.1.8 Test Group 8 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-H Test Group IDs 1 and 2.

2.1.9 Test Group 9 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-01-I Test Group ID 2.

2.2 Initial Examination of Product – All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued and can be found in the respective original lab test files storage locations. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.3 Voltage Proof – Test Groups 1, 2, 3, 4 and 6

All specimens passed testing with no dielectric breakdown or flashover occurring.

2.4 Current Carrying Capacity – Test Group 7

The maximum allowed environmental temperature at rated current is 60°C.

2.5 Contact Resistance, Initial – Test Group 5

All initial termination resistance measurements taken were within specified limits.

2.6 Contact Resistance, Initial-Final Delta – Test Groups 1, 2, 3, 4, 6 and 8

All termination resistance measurements taken at 100 mA maximum and 20 mV maximum open circuit voltage were less than 20 milliohms ΔR after testing.

2.7 Input to Output DC Resistance - Test Group 5

Maximum total mated connector resistance measured values were less than 200 mΩ for all specimens.

2.8 Input to Output DC Resistance unbalance – Test Group 5

The differences between maximum and minimum total connector resistance measured values were less than 50 mΩ for all specimens.

2.9 Insulation Resistance – Test Groups 1, 2, 3, 4 and 6

All insulation resistance measurements were greater than 500 MΩ minimum.

2.10 Surge Test – Test Group 6

All specimens withstood testing without damage, were verified to operate correctly after testing, and testing did not result in a fire hazard in the equipment.

2.11 Gaging Continuity – Test Group 4

A specimens passed the requirement of no discontinuity greater than 10 microseconds.

2.12 Plug Insertion Force – Test Group 1

All insertion forces were less than 20 N.

2.13 Plug Withdrawal Force – Test Group 1

All withdrawal forces were less than 20 N.

2.14 Plug Retention in Jack – Test Group 1

All specimens withstood an applied axial load of 50 N with latch engaged for 60 seconds.

2.15 Durability, 8 position plug – Test Group 2

No physical damage occurred to the specimens as a result of mating and unmating the specimens for 375 cycles with latch inoperative.

2.16 Durability, 6 position plug – Test Group 8

No physical damage occurred to the specimens as a result of mating and unmating the plug gage into the specimens for 10 cycles.

2.17 Vibration – Test Group 3

All specimens passed vibration testing with no discontinuities greater than 10 µsec.

2.18 Dimensional Gaging – Test Group 4

All specimens passed the Go and No-Go gage requirements.

2.19 Thermal Shock – Test Group 1

No evidence of physical damage was visible as a result of exposure to rapid change in temperature.

2.20 Humidity/Temperature Cycling – Test Group 1

No evidence of physical damage was visible as a result of exposure to cycling damp heat.

2.21 Electrical Load and Temperature – Test Groups 4 and 8

No evidence of physical damage was visible as a result of exposure to stress relaxation.

2.22 Flowing mixed gas corrosion – Test Group 2

No evidence of physical damage was visible as a result of exposure to mixed flowing gas corrosion.

2.23 Transmission, Permanent Link Configuration – Test Group 9

All transmission parameters pass the specified requirements.

2.24 Transmission, Channel Configuration – Test Group 9

All transmission parameters pass the specified requirements.

3. TEST METHODS

Unless otherwise stated, testing was performed at the Greensboro Electrical Components Test Laboratory.

3.1 Examination of Product

A Certificate of Conformance was issued stating that all specimens in this test package have been produced, inspected and accepted as conforming to product drawing requirements, and made using the same core manufacturing processes and technologies as production parts.

3.2 Voltage proof

A test potential of 1000 volts DC was applied to a terminated jack with mated plug, between each contact and all other contacts being connected together, and held for 1 minute.

3.3 Current Carrying Capacity

A series of DC loading currents were applied to the specimen, each application of current being allowed to reach thermal stability. The hottest contact temperature and ambient temperature were recorded at each current. The average temperature rise was calculated and used to generate the basic current current-carrying curve, which was in turn used to generate the de-rating curve. The de-rating curve was compared with the ambient temperature rating.

3.4 Contact Resistance, Initial

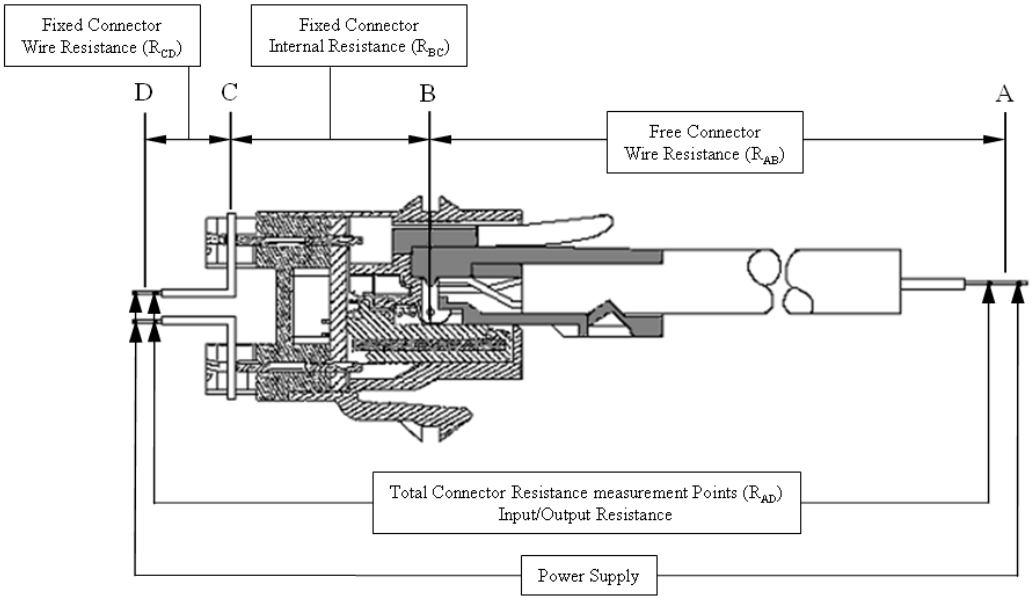
Termination resistance measurements were made by applying 20 mV maximum open circuit voltage at 100 mA maximum across a mated jack-plug interface. Jack-plug interface: Measured resistance at the interface is less than 20 milliohms. IDC-wire interface: Measured resistance at the interface is less than 5 milliohms.

3.5 Contact Resistance, Initial-Final Delta

Termination resistance measurements were made by subjecting a jack terminated with cable and mated plug to 20 mV maximum open circuit voltage at 100 mA maximum. Specimens were tested with two plugs, low plug and mid plug. Delta of initial test compared to final test requirement is less than 20 milliohms.

3.6 Input to output resistance

Input to output resistance measurements were made using the four-terminal technique as shown in Figure 3.



Jack-plug interface resistance: $R_I = R_B = R_{AD} - (R_{AB} + R_{BD})$ *[for reference only]*
IDC-wire interface resistance: $R_I = R_C = R_{AD} - (R_{AC} + R_{CD})$ *[for reference only]*
Connector Assembly Contact Resistance; $\Delta R = R_{AD\ (initial)} - R_{AD\ (final)}$

Figure 3
Contact Resistance Measurement Points

3.7 Input to output resistance unbalance

Input to output resistance unbalance was calculated as the maximum difference between maximum and minimum resistance measurements.

3.8 Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 100 volts DC, 500 M**Ω** minimum was applied for a 1 minute hold.

3.9 Surge test

Testing was performed at the Barcelona Electrical Components Test Laboratory. The specimens were subjected to power surges per ITU-T K.20 Table 2a/2b and ITU-T K.44.

3.10 Gaging Continuity

Specimens were tested per IEC 60603-7 Annex A and IEC 60512-2-5.

3.11 Plug Insertion Force

The force required to mate individual specimens was measured with latch depressed at a maximum rate of 50 mm per minute per IEC 60512-13-2.

3.12 Plug Withdrawal Force

The force required to unmate individual specimens was measured with latch depressed at a maximum rate of 50 mm per minute per IEC 60512-13-2.

3.13 Plug Retention in Jack

An axial load of 50N was applied to mated connector assemblies in a direction that would cause the connector lacking latches to disengage.

3.14 Durability, 8 position plug

Specimens were mated and unmated for 375 cycles with jack latch inoperative; maximum rate was 10mm/sec, 1 second rest mated and 1 second unmated.

3.15 Durability, 6 position plug
Gage was mated and unmated with specimens for 10 cycles; maximum rate was 10mm/sec, 1 second rest mated and 1 second unmated.

3.16 Vibration

Testing was performed at the Barcelona Electrical Components Test Laboratory. Test specimens were subjected to sinusoidal vibration from 10 to 500 Hz; displacement amplitude: 0.35mm; acceleration: 5g; 10 sweeps per axis of 3 mutually perpendicular axes.

3.17 Dimensional Gaging

Go gage was fully inserted into specimen and removed at constant speed with 8.9 N maximum insertion and removal force applied. No-go gage maximum insertion depth was less than 1.78 mm with 8.9 N maximum insertion force applied.

3.18 Thermal Shock

Mated specimens (terminated jack/plug) were subjected to 25 cycles between -40 and 70°C, 30 minutes at each condition.

3.19 Humidity/Temperature Cycling

Mated specimens (terminated jack/plug) were subjected to 21 cycles between 25 and 65°C with 93% RH with 5 subcycles at -10C.

3.20 Electrical Load and Temperature

Mated specimens (terminated jack/plug) were subjected to 70°C for 500 hours, 2 hour recovery. Half of the specimens were then energized with 0.8 ampere DC, the remaining half not energized.

3.21 Flowing Mixed Gas Corrosion

Testing was performed at the Den Bosch Netherlands Environmental Testing Laboratory.
Specimens (half mated terminated jack/plug, half unmated) were exposed for 4 days to a mixed flowing gas per IEC 60512-11-7 Method 1. Exposure is defined as a temperature of 25°C and a relative humidity of 75% with the pollutants of H_2S: 100±20 (10^{-9} vol/vol), SO_2: 500±100 (10^{-9} vol/vol).

3.22 Transmission, Permanent Link Configuration

Transmission testing was performed using a calibrated Fluke Networks DTX-1800 cable analyzer together with two Class E_A Permanent Link Adapters (Fluke Networks DTX-PLA002). Class E_A adapters are backward compatible to Class E for Permanent Link testing.

3.23 Transmission, Channel Configuration

Transmission testing was performed using a calibrated Fluke Networks DTX-1800 cable analyzer together with two Class E Channel Adapters (Fluke Networks DTX-CHA001).

4. REVISION SUMMARY

- Revision A – Initial draft.
- Revision A1 – Section 3 paragraph numbering corrected. Paragraphs 2.9 and 3.8, changed from 500 m**Ω** to 500 M**Ω**.
- Revision B – Paragraph 1.1, changed referenced Product Specification 108-131000 from Revision A to B. Paragraph 1.2, changed component engine from 2111323 to new 2111621 and updated list of referenced test labs per product design change and subsequent qualification testing. Paragraph 1.3, corrected and changed referenced Product Specification from 108-13100 Revision A to 108-131000 Revision B. Paragraph 1.5, updated specimen quantities per product design change and qualification using new component engine 2111621. Figure 2, Note (c), removed test group 10 and added Transmission: Channel Configuration requirements to table. Paragraph 2.1, updated Test Group Report references per product design change and qualification using new component engine 2111621. Added Paragraph 2.24, Channel Configuration. Paragraphs 3.16 and 3.21, updated test lab locations per Test Reports LT13-01-B and LT-13-01-C. Paragraph 3.22, updated Permanent Link adapters reference per Test Report LT13-01-I. Added Paragraph 3.23, Channel Configuration.
- Revision C – Rebranded to CommScope