AMP-TWIST® Modular Jack, UTP, Category 6A

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP-TWIST Category 6A UTP Jacks to determine their conformance to the requirements of Product Specification 108-2458 Revision B.

1.2. Scope

This report covers the electrical, mechanical, environmental and transmission performance of AMP-TWIST Category 6A UTP Jacks. Testing was performed and test reports are on file at the Greensboro Electrical Components Test Laboratory, the Barcelona Electrical Components Test Laboratory, the Tewkesbury Test Laboratory, and the Harrisburg Electrical Components Test 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-TWIST Category 6A UTP Jacks listed in paragraph 1.5 conformed to the electrical, mechanical, environmental and transmission performance requirements of Product Specification 108-2458 Revision A.

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 AWG stranded conductors. The maximum conductor insulation diameter is 1.60 mm [0.063 in] and the maximum cable outer jacket diameter is 9.0 mm [0.35 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	4	5	6	7	8	9	10	11	
1933476 *	Cat 6A UTP Jack	12	12	12	12	21	12	4	4	12	20	20	141

** Also represents 2111676, Cat 6A UTP Jack with dust cover.*

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(b)	9	10(c)	11(c)
	Test Sequence (d)										
Initial examination of product	1	1	1	1	1	1	1	1	1	1	1
Visual examination of product	12,18	13	8	8	6	7	3	3	9	9	5
ELECTRICAL											
Contact resistance, initial, interface								4			
Contact resistance, ΔR, assembly	2,10,14	4,6,8,10	2,6	2,9		2			2,4,7	2,4,6,8	2,4
Input to output resistance								2			
Input to output resistance unbalance								3			
Insulation resistance	3,9	2,11	3,7	3,6		3,6					
Voltage proof	4,11	3,12	4	4,7		4					
Current carrying capacity							2				
Surge test						5					
Gaging continuity				11							
MECHANICAL											
Plug insertion force	5,15										
Plug withdrawal force	6,16										
Plug retention in jack	7,17										
Jack retention in panel									5,8		
Cable bending										3	
Repeated Connection Durability											3
Durability, 8 position plug		5,9									
Durability, 6 position plug									3		
Vibration			5								
Dimensional gaging				10							
ENVIRONMENTAL											
Thermal shock, jack-plug interface	8										
Thermal shock, IDC-wire interface										5	
Cyclic damp heat, jack-plug interface	13										
Cyclic damp heat, IDC-wire interface										7	
Electrical load and temperature				5					6		
Flowing mixed gas corrosion		7									
TRANSMISSION: Channel Configuration (e)											
Return loss					2						
Insertion loss					2						
NEXT loss					2						
PS NEXT loss					2						
ACR-N					2						
PS ACR-N					2						
ACR-F					2						
PS ACR-F					2						
Propagation Delay					2						
Delay Skew					2						
PS ANEXT					4						
Avg. PS ANEXT					4						
PS AACR-F					4						
Avg. PS AACR-F					4						
TRANSMISSION: Permanent Link 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						
PS ANEXT					5						
Avg. PS ANEXT					5						
PS AACR-F					5						
Avg. PS AACR-F					5						

Figure 2 (continued)

NOTES:

- *(a) See paragraph 1.5.*
- *(b) Test groups 1 thru 8 are per the "full test schedule" defined in IEC 60603-7 and IEC 60603-7-41.*
- *(c) Test groups 10 and 11 are per the “basic test schedule” defined in IEC 60352-4.*
- *(d) Numbers indicate sequence in which tests are performed.*
- *(e) Transmission parameters are checked as Class E_A channel configuration per ISO/IEC 11801, Section 6.4.*
- *(f) Transmission parameters are checked as Class E_A permanent link configuration per ISO/IEC 11801, Annex A.*

Figure 2 (end)

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 LT12-28 (B109842-22A) Test Group IDs 1, 2, and 3. This report also covers testing performed at the Winston-Salem Electromechanical Components Laboratory, reference Test No. 20120166ACS.

2.1.2 Test Group 2 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT12-29 (B109842-22B) Test Group IDs 1, 2, and 3. This report also covers testing performed at the Harrisburg Electrical Components Test Laboratory, reference Test No. EA20120185T.

2.1.3 Test Group 3 – Refer to Greensboro Electrical Components Test Laboratory test request LT12-30 (B109842-22C) Test Group IDs 1, 2, and 3, which correlates with Tewkesbury Test Laboratory Test Report No. UK 11/2012 Test Group IDs R, C, and L.

2.1.4 Test Group 4 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT12-31 (B109842-22D) Test Group IDs 1, 2, and 3.

2.1.5 Test Group 5 – Refer to Greensboro Electrical Components Test Laboratory test request LT13-14 Test Group IDs 1, 2, and 3, which correlates with Tewkesbury Test Laboratory Test Report No. UK 09/2013.

2.1.6 Test Group 6 – Refer to Barcelona Electrical Components Test Laboratory Test Report E2013-086 Test Group IDs 1, 2, and 3.

2.1.7 Test Group 7 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-15-A Test Group IDs 1, 2, 3, and 4.

2.1.8 Test Group 8 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT13-15-B Test Group IDs 1, 2, 3, and 4.

2.1.9 Test Group 9 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT12-96 Test Group IDs 1, 2, and 3.

2.1.10 Test Group 10 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT12-35 (B109842-22I) Test Group IDs 1, 2, 3, and 4. This report also covers testing performed at the Winston-Salem Electromechanical Components Laboratory, reference Test Report ECL2012-0140.

2.1.11 Test Group 11 – Refer to Greensboro Electrical Components Test Laboratory Test Report LT12-35-JA (B109842-22JA) Test Group IDs 1, 2, 3, and 4.

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 Contact Resistance, Initial – Test Group 8

All initial termination resistance measurements taken were within specified limits.

2.4 Contact Resistance, Initial-Final Delta – Test Groups 1, 2, 3, 4, 6, 9, 10, and 11.

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

2.5 Input to Output DC Resistance - Test Group 8

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

2.6 Input to Output DC Resistance Unbalance – Test Group 8

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

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

All insulation resistance measurements were greater than 500 MΩ minimum.

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

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

2.9 Current Carrying Capacity – Test Group 7

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

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

All 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 Plug Retention in Panel – Test Group 9

All specimens withstood an applied axial load of 50 N to the jack housing for 60 seconds.

2.16 Cable Bending, IDC-Wire Interface – Test Group 10

All specimens withstood an applied axial load of 50 N to the free end of the jack over 10 cycles of bending at 30 degrees in both directions from vertical.

2.17 Repeated Connection Durability, IDC-Wire Interface – Test Group 11

No evidence of physical damage was visible as a result of repeated termination and removal of wire.

2.18 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.

2.19 Durability, 6 position plug – Test Group 9

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

2.20 Vibration – Test Group 3

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

2.21 Dimensional Gaging – Test Group 4

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

2.22 Thermal Shock, Jack-Plug Interface – Test Group 1

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

2.23 Thermal Shock, IDC-Wire Interface – Test Group 10

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

2.24 Humidity/Temperature Cycling, Jack-Plug Interface – Test Group 1

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

2.25 Humidity/Temperature Cycling, IDC-Wire Interface – Test Group 10

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

2.26 Electrical Load and Temperature – Test Groups 4 and 9

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

2.27 Flowing mixed gas corrosion – Test Group 2

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

2.28 Transmission, Channel Configuration – Test Group 5

All transmission parameters pass the specified requirements.

2.29 Transmission, Permanent Link Configuration – Test Group 5

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 Contact Resistance, Initial

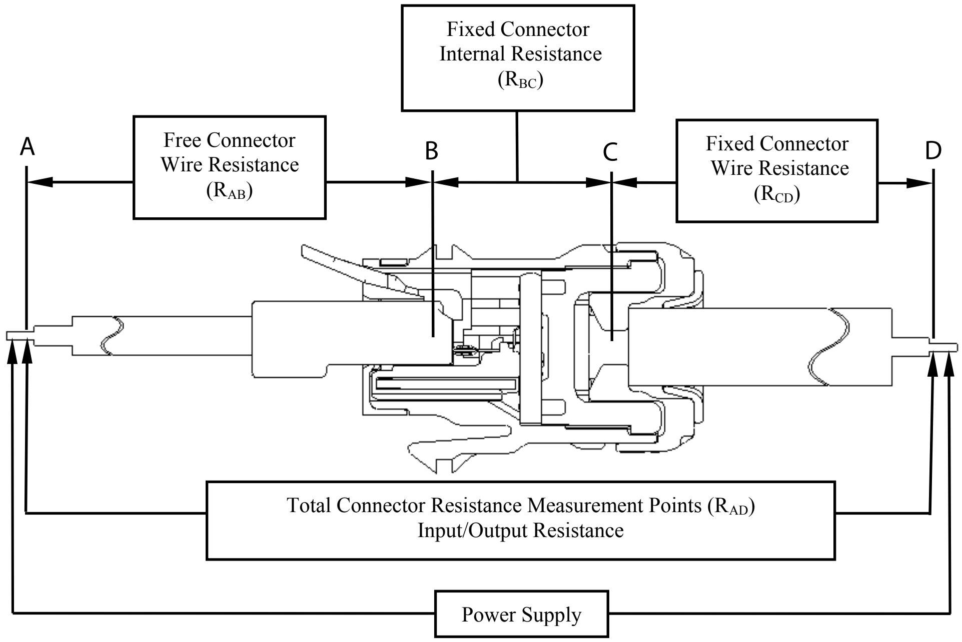
Termination resistance measurements were made by applying 20 mV maximum open circuit voltage at 100 mA maximum across a mated jack-plug interface. Jack-plug interface: measured resistance at the interface is less than 20 milliohms. IDC-wire interface: measured resistance at the interface is less than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

3.3 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.

3.4 Input to Output DC Resistance

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



Jack-Plug Interface Contact Resistance: $R_I = R_B = R_{AD} - (R_{AB} + R_{BD})$ *[for reference only]*
IDC-Wire Interface Contact 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

3.5 Input to Output DC Resistance Unbalance

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

3.6 Insulation Resistance

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

3.7 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.

3.8 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.

3.9 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 Jack Retention in Panel

An axial load of 50 N was applied to the jack housing in a direction that would cause the inadequate jack housing latching mechanism to disengage.

3.15 Cable Bending, IDC-Wire Interface

An axial load of 50 N was applied to the free end of the jack in a direction that would cause inadequate wire termination to disengage. The cable was subjected bending at 30 degrees in both directions from vertical over 10 cycles at a maximum rate of 100 mm/sec.

3.16 Repeated Connection Durability, IDC-Wire Interface

Specimens were terminated to and removed from specified wire for 20 cycles.

3.17 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.

3.18 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.

3.19 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.

3.20 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.

3.21 Thermal Shock, Jack-Plug Interface

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

3.22 Thermal Shock, IDC-Wire Interface

Specimens (terminated jack) were subjected to 5 cycles between -55 and 100°C, 30 minutes at each condition.

3.23 Humidity/Temperature Cycling, Jack-Plug Interface

Mated specimens (terminated jack/plug) were subjected to 21 cycles between 25 and 65°C with 93% RH with 5 sub-cycles at -10C in the first 9 cycles.

3.24 Humidity/Temperature Cycling, IDC-Wire Interface

Specimens (terminated jack) were subjected to 6 cycles between 25 and 55°C with 95% RH.

3.25 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.

3.26 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).

3.27 Transmission, Channel Configuration

Transmission testing was performed using a network analyzer with in-house software.

3.28 Transmission, Permanent Link Configuration

Transmission testing was performed using a network analyzer with in-house software. Other items used for testing included termination plugs from the Fluke Networks DTX-1800 Alien test kit.

4. REVISION SUMMARY

- Revision A – Initial release.
- Revision B – Rebranded to CommScope