Multi-Beam XL* Cable Panel Mount and Squeeze-To-Release Receptacles

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Multi-Beam XL* Cable Panel Mount and Squeeze-To-Release Receptacles to determine its conformance to the requirements of Product Specification 108-2157 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Multi-Beam XL Cable Panel Mount and Squeeze-To-Release Receptacles. Testing was performed at the Engineering Assurance Product Test Laboratory between 21Jul04 and 02Dec04. The test file numbers for this testing are CTL B029133-007, B029133-013, B029133-014 and B029133-015. This documentation is on file at and available from the Engineering Assurance Product Test Laboratory.

1.3. Conclusion

The Multi-Beam XL Cable Panel Mount and Squeeze-To-Release Receptacles listed in paragraph 1.4., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2157 Revision A.

1.4. Test Specimens

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

Part Number	Revision Level	Description	Quantity per Test Group						
			1	2	3	4	5	6	7
1600636-6	Rev 6	Cable housing, panel	6	12	5	5	11		
1600688-3	Rev 4	Cable housing, STR		6	5	6			12
2-1450120-6	Rev 1	Right angle header assembly, Multi-Beam	6	6	5	5	11		
1600130-7	Rev 1	Right angle header assembly, 2 beam		6					
1450108-3	Rev 2	Vertical header		6	5	5			12
1600960-3	Rev 7	Power contact, MFBL, 8-10 AWG	12	72	80	20	10		
1600960-7	Rev 7	Power contact, STD, 8-10 AWG	12	72	80	20	10	48	
1600960-9	Rev O11	Power contact, MFBL, 10 AWG							104
1-1600960-0	Rev O11	Power contact, STD, 10 AWG							120
1600961-3	Rev 7	Power contact, MFBL,12-16 AWG	36	72		60	18		
1600961-7	Rev 7	Power contact, STD,12-16 AWG	36	72		60	18	36	
531216-6	Rev S	Signal contact	144	432		240			
531216-5	Rev S	Signal contact, 22 AWG							24
1600902-1	Rev 7	Secondary lock, signal contact	36	108	60	60			72
1600903-1	Rev 5	Secondary lock, power contact	96	288	160	160	176		224
1600915-1	Rev 2	Panel mount hardware kit	6	12	5	5	11		
1600905-1	Rev 5	Housing latch		12	10	10			
1-1600636-5	O16	Cable housing, panel							16

Figure 1

* Trademark
| Indicates change

1.5. Environmental Conditions

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

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

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)						
	1	2	3	4	5	6	7
	Test Sequence (b)1						
Initial examination of product	1	1	1	1	1	1	1
Low level contact resistance, signal and power contacts	2,5	3,7		2,4			
Low level contact resistance, power contacts only					2,6,8,10		
Contact resistance at rated current, power contacts					12		
Insulation resistance			3,7				
Withstanding voltage			4,8				
Temperature rise vs current					4,11		
Vibration, random		5			9©)		
Mechanical shock		6					
Durability	3(d)	4			3(f)		
Mating force		2(e)					
Unmating force		8(e)					
Contact insertion force, power contacts			2				
Contact retention, straight pull			10				
Contact retention, angled pull							2
Housing lock strength, straight pull			9				
Housing lock strength, angled pull							3
Crimp tensile						2	
Thermal shock			5				
Humidity-temperature cycling			6				
Temperature life				3	7		
Mixed flowing gas	4				5		
Final examination of product	6	9	11	5	13	3	4

NOTE

(a) See paragraph 1.4.
(b) Numbers indicate sequence in which tests are performed.
©) Energize at current for 18˚C temperature rise.
(d) Precondition specimens with 5 durability cycles.
(e) Power only in housing, signal with gage.
(f) Precondition specimens with 50 durability cycles

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

Certification 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 manufactured using the same core manufacturing processes and technologies as production parts.

2.2. Low Level Contact Resistance, Signal and Power Contacts - Test Groups 1, 2, 4 and 5

All low level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 10 milliohms initially and 20 milliohms after testing for power contacts, and 15 milliohms initially and 20 milliohms after testing for signal contacts.

2.3. Contact Resistance At Rated Current, Power Contacts - Test Group 5

All low level contact resistance measurements, taken at rated current were less than 0.7 milliohm after testing.

2.4. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 500 megohms for signal contacts and 1000 megohms for power contacts.

2.5. Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

2.6 Temperature Rise vs Current - Test Group 5

All specimens had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 35, 20 or 15 amperes and the correct derating factor value based on the specimens wiring configuration.

2.7. Vibration - Test Groups 2 and 5

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical Shock - Test Group 2

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability - Test Groups 1, 2 and 5

No physical damage occurred as a result of mating and unmating the specimens 250 times.

2.10. Mating Force - Test Group 2

All mating force measurements were less than 28 ounces average per contact for power contacts and 6 ounces average per contact for signal contacts.

2.11. Unmating Force - Test Group 2

All unmating force measurements were greater than 8 ounces per power contacts and .7 ounce per signal contact.

2.12. Contact Insertion Force, Power Contacts Test Group 3

All contact insertion force measurements were less than 6 pounds.

2.13. Contact Retention, Straight Pull - Test Group 3

All contact retention force measurements were greater than 30 pounds for power contacts and 3 pounds for signal contacts.

2.14. Contact Retention, Angled Pull - Test Group 7

All contact retention force measurements were greater than 30 pounds for power contacts and 3 pounds for signal contacts.

2.15. Housing Lock Strength, Straight Pull - Test Group 3

All housing lock strength measurements were greater than 25 pounds.

2.16. Housing Lock Strength, Angled Pull - Test Group 7

All housing lock strength measurements were greater than 25 pounds.

2.17. Crimp Tensile - Test Group 6

All crimp tensile measurements were greater than specified in Figure 3.

Wire Size (AWG	Tensile (lb min)
Power Contacts	
8	80
10	80
14 (dual crimp)	80
12 (dual crimp)	80
12	70
16 (dual crimp)	50
14	50
Signal Contacts	
22	11
24	7
26	4

Figure 3

2.18. Thermal Shock - Test Group 3

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.19. Humidity-temperature Cycling - Test Group 3

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.20. Temperature Life - Test Groups 4 and 5

No evidence of physical damage was visible as a result of exposure to temperature life.

2.21. Mixed Flowing Gas - Test Groups 1 and 5

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

2.22. Final Examination of Product - All Test Groups

Specimens were visually examined for evidence of physical damage detrimental to product performance.

3. TEST METHODS

3.1. Initial Examination of Product

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

3.2. Low Level Contact Resistance, Signal and Power Contacts

Termination resistance measurements at low level current were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. All wire bulk was removed from the measurements.

3.3. Contact Resistance At Rated Current, Power Contacts

Termination resistance measurements at low level current were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. All wire bulk was removed from the measurements.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.5. Withstanding Voltage

A test potential of 1000 volts DC for signal contacts and 2500 volts DC for power contacts was applied between the adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Temperature rise was measured on unstressed and stressed connectors using infrared imaging. The specimens were prepared by drilling a small hole in the housing to expose the contact. The specimens consisted of the following configurations:

- Three specimens with 12 contacts crimped on 10 AWG wire.
- Three specimens with 12 contacts crimped on 14 AWG wire.
- Five specimens with 4 contacts crimped on 8 AWG wire.

Temperature rise curves were established for 14 AWG and 10 AWG specimens having a single circuit, 4 adjacent contacts, 8 adjacent contacts and all contacts energized at 5 different current levels. Temperature rise curves were established for 8 AWG specimens having a single circuit, 2 adjacent contacts, and all contacts energized at 5 different current levels. The specimens were allowed to stabilize before the temperature was measured. The connector was imaged using standard optics after applying an emissivity correction coating (Micatin foot powder). The emittance of the emissivity correction factor is 0.93. Raising this emittance value allows for accurate temperature measurements. ThermaGRAM thermal image processing was used for data analysis. The software has a temperature box measurement feature to determine maximum temperature of the contact. This software feature allows a measurement of the area inside the box when placed on an area of interest. The specimens were placed in a stable air environment of a temperature rise enclosure.

3.7. Vibration, Random

The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hz. The spectrum remains flat at 0.05 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 4.90 GRMS. The specimens were subjected to this test for 15 minutes in each of the 3 mutually perpendicular axes, for a total test time of 45 minutes per specimen. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.8. Mechanical Shock, Half-sine

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Durability

Specimens were mated and unmated 250 times at a maximum rate of 500 cycles per hour.

3.10. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of .5 inch per minute. Power contacts were measured with signal contacts removed. Signal contacts were measured using a .026 inch square gage.

3.11. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of .5 inch per minute. Power contacts were measured with signal contacts removed. Signal contacts were measured using a .024 inch square gage after sizing 3 times with the .026 inch square gage.

3.12. Contact Insertion Force, Power Contacts

Contact insertion force was measured by clamping the wire with air jaws and pushing the crimped contact into the housing at a rate of travel of .5 inch per minute.

3.13. Contact Retention, Straight Pull

Contact retention of the power contacts was measured using a tensile/compression device. The power contacts were pulled from the housing by clamping the connector to the x/y table and gripping the wire with air jaws and pulling in an axial direction. The signal contacts were measured by applying a three-pound weight to the wire and holding for six seconds.

3.14. Contact Retention, Angled Pull

Contact retention of the power contacts was measured using a tensile/compression device. The power contacts were pulled from the housing by clamping the connector to the x/y table and gripping the wire with air jaws and pulling at a 45 degree angle. The signal contacts were measured by applying a three-pound weight to the wire and holding for six seconds.

3.15. Housing Lock Strength, Straight Pull

The housing lock strength was measured using a tensile/compression device pulling in an axial direction with the rate of travel at .5 inch per minute and a free-floating fixture.

3.16. Housing Lock Strength, Angled Pull

The housing lock strength was measured using a tensile/compression device pulling at a 45 degree angle with the rate of travel at .5 inch per minute and a free-floating fixture.

3.17. Crimp Tensile

All specimens had a small metal fixture inserted in the socket to assist in clamping the contact during test. The specimens were clamped in a vise at the contact. Air jaws were used to grip the wire end and the load was applied in the vertical motion. The load was applied at the rate of .5 inch per minute till failure.

3.18. Thermal Shock

Mated specimens were subjected to 36 cycles of thermal shock with each cycle consisting of 30 minute dwells at -20 and 105˚C. The transition between temperatures was less than 1 minute.

3.19. Humidity-temperature Cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 40˚C twice while maintaining high humidity.

3.20. Temperature Life

The mated specimens were exposed to an elevated temperature of 105˚C in a circulating air oven for 504 hours.

3.21. Mixed Flowing Gas, Class IIA

Mated specimens were exposed for 20 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb and SO_2 at 100 ppb. Specimens were preconditioned with 5 cycles of durability.

3.22. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.