AMP* Power Series 50 and 75 Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP* Power Series 50 and 75 connectors to verify crimp styles produced by new hand tool and connector combinations to determine that these new crimp styles are suitable for use in these applications.

1.2. Scope

This report covers crimps produced by crimp tool number 1526955-1 (AET T-406), the Tapetronics
I press 68250-1, and the ROSTRA 4200 single indent crimp tool (yellow ratchet style tool). Testing was performed at the Product Reliability Center Global Automotive Division Test Laboratory between October and December 2002. The test numbers for this testing are 20020167ACL, 20020171ACL and 20020211ACL. This documentation is on file at and available from the Product Reliability Center Global Automotive Division Test Laboratory.

1.3. Test Specimens

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

Test Group	Quantity	Part Number	Description
20020167ACL (AMP tool 1526955-1)			
1	12	647877-1	Cold headed contact on 6 AWG wire
	6	647845-3	Series 50 housing (red)
2	12	647877-1	Cold headed contact on 8 AWG wire
	6	647845-7	Series 50 housing (black)
	12	1445762-1	Reducing bushing
3	12	647879-1	Cold headed contact on 12 AWG wire
	6	647845-4	Series 50 housing (grey)
4	12 each	647877-1	Cold headed contact on 16 AWG wire
	6	647845-4	Series 50 housing (blue)
	12	1445763-1	Reducing bushing
20020171ACL (Tapetronics tool 68250-1 with die 68344-1 for 6 & 8 AWG wire; and die 68313-1 for 10 & 12 AWG wire)			
1	4	647877-1	Cold headed contact on 6 AWG wire
	2	647845-3	Series 50 housing (red)
2	4	647878-1	Cold headed contact on 8 AWG wire
	2	647845-7	Series 50 housing (black)
3	4	647879-1	Cold headed contact on 12 AWG wire
	2	647845-4	Series 50 housing (grey)
4	4 each	647879-1	Cold headed contact on 10 AWG wire
	2	647845-8	Series 50 housing (yellow)

Figure 1 (cont)

* Trademark
I Indicates change

Test Group	Quantity	Part Number	Description
20020211ACL (ROSTRA 4200)			
A	12	647877-1	Cold headed contact on 6 AWG wire
	6	647845-3	Series 50 housing (red)
B	12	647877-1	Cold headed contact on 8 AWG wire
	6	647845-7	Series 50 housing (black)
C	12	647879-1	Cold headed contact on 12 AWG wire
	6	647845-4	Series 50 housing (gray)
D	12 each	647877-1	Cold headed contact on 16 AWG wire
	6	647845-4	Series 50 housing (blue)
	12	1445763-1	Reducing bushing

Figure 1 (end)

1.4. Crimp Verification Tests and Test Sequence

Test Description and Sequence	Requirement	Result
20020167ACL (AMP tool 1526955-1)		
Crimp tensile.	Establish baseline values.	See Figure 3.
Cross section of crimped contact.	Establish baseline values.	Evaluated by lab project 0210-09.
Initial temperature rise.	40°C above ambient.	See Figure 4.
Initial voltage drop resistance.	Establish baseline values.	See Figure 5.
Heat age exposure	No damage.	Passed.
Temperature-humidity exposure.	No damage.	Passed.
Final temperature rise.	40°C above ambient.	See Figure 4.
Final voltage drop resistance.	Establish baseline values.	See Figure 5.
20020171ACL (Tapetronics tool 68250-1)		
Initial temperature rise.	40°C above ambient.	See Figure 4.
Initial voltage drop resistance.	Establish baseline values.	See Figure 5.
Heat age exposure	No damage.	Passed.
Temperature-humidity exposure.	No damage.	Passed.
Final temperature rise.	40°C above ambient.	See Figure 4.
Final voltage drop resistance.	Establish baseline values.	See Figure 5.
20020211ACL (ROSTRA 4200)		
Crimp tensile.	Establish baseline values.	See Figure 3.
Cross section of crimped contact.	Establish baseline values.	Evaluated by lab project 0210-09.
Initial temperature rise.	40°C above ambient.	See Figure 4.
Initial voltage drop resistance.	Establish baseline values.	See Figure 5.
Heat age exposure	No damage.	Passed.
Temperature-humidity exposure.	No damage.	Passed.
Final temperature rise.	40°C above ambient.	See Figure 4.
Final voltage drop resistance.	Establish baseline values.	See Figure 5.

Figure 2

Test Group	Wire Size	Number of Data Points	Crimp Tensile		
			Min	Max	Mean
20020167ACL (AMP tool 1526955-1)					
1a	6 AWG	10	748.30 [168.225]	1032 [232.004]	946.77 [212.843]
2a	8 AWG	10	812.70 [182.703]	1195 [268.648]	1048.09 [235.621]
3a	12AWG	10	676.0 [151.972]	725.20 [163.032]	702.76 157.988]
4a	16AWG	10	227 [51.032]	281.4 [63.262]	267.13 [60.054]
20020211ACL (ROSTRA 4200)					
A1	6 AWG	10	413.5 [92.959]	836.4 [188.031]	519.1 [116.699]
B1	8 AWG	10	490.4 [110.247]	827.7 [186.075]	633.78 142.48]
C1	12 AWG	10	293.6 [66.004]	372.1 [83.652]	327.56 [73.639]
D1	16 AWG	10	206.1 [46.333]	272.3 [61.216]	254.44 [51.201]

NOTE

(a) All values in Newtons [pounds force].

(b) Crimp tensile using Tapetronics tool 68250-1 was tested on a previous date, see Figure 6 in the Appendix.

Figure 3
Crimp Tensile Results

Test Group	Wire Size	Number of Data Points	Initial	Final
20020167ACL (AMP tool 1526955-1)				
1c	6 AWG	6	81.98	74.42
2c	8 AWG	6	64.66	64.55
3c	12 AWG	6	40.40	40.78
4c	16 AWG	6	27.98	28.12
20020171ACL (Tapetronics tool 68250-1)				
1	6 AWG	2	93.91	91.23
2	8 AWG	2	64.34	61.50
3	12 AWG	2	42.67	40.34
4	10 AWG	2	56.58	56.33
20020211ACL (ROSTRA 4200)				
A3	6 AWG	6	81.79	59.46
B3	8 AWG	6	64.34	61.50
C3	12 AWG	6	38.51	21.83
D3	16 AWG	6	27.25	26.28

NOTE *All values in amperes.*

Figure 4
Initial and Final Temperature Rise Results

Test Group	Wire Size	Number of Data Points	Initial			Final		
			Min	Max	Mean	Min	Max	Mean
20020167ACL (AMP tool 1526955-1)								
1c	6 AWG	6	0.93	0.96	0.945	0.98	1.12	1.065
2c	8 AWG	6	1.41	1.45	1.425	1.44	1.49	1.470
3c	12 AWG	6	3.46	3.52	3.49	3.57	3.64	3.602
4c	16 AWG	6	8.50	8.53	8.518	8.59	8.67	8.632
20020171ACL (Tapetronics tool 68250-1)								
1	6 AWG	2	0.87	0.88	0.875	0.90	0.91	0.905
2	8 AWG	2	1.28	1.29	1.285	1.31	1.34	1.325
3	12 AWG	2	3.41	3.41	3.41	3.51	3.56	3.535
4	10 AWG	2	2.09	2.11	2.1	2.10	2.13	2.115
20020211ACL (ROSTRA 4200)								
A3	6 AWG	6	0.93	0.95	0.943	1.14	1.44	1.277
B3	8 AWG	6	1.43	1.46	1.44	1.46	1.58	1.515
C3	12 AWG	6	3.46	3.53	3.495	4.81	6.82	5.710
D3	16 AWG	6	8.60	8.65	8.622	8.64	9.07	8.935

NOTE *All values in millivolts.*

Figure 5
Initial and Final Voltage Drop Resistance Results

2. TEST PROCEDURES

2.1. Crimp Tensile - Reference EIA-364-8B. An "L" vise was attached to the cross-head of an Instron machine to hold the contact. A second clamp was attached to the base of the machine to hold the end of the wire. Test speed was 25.4 mm [1 in] per minute in the tensile mode.

2.2. Cross Section - Cross sectioning of crimped contacts was performed by the Materials and Process Laboratory under Project Number 0210-09, Process Engineering Report.

2.3. Temperature Rise vs Current vs Voltage Drop - Reference EIA-364-70A. Both positions of each connector were loaded during testing. Measurements were made by energizing 100% of the circuits. Test specimens were arranged in a draft free enclosure in a horizontal attitude a minimum of 50.8 mm [2 in] above the bottom, a minimum of 152.4 mm [6 in] below the top, and a minimum of 203.2 mm [8 in] from the sides of the enclosure. The ambient probe was placed 152.4 mm [6 in] from the test specimens at the same horizontal altitude. Temperature rise and voltage drop measurements were made using the Automated T-Rise System (T1). Specimens were energized at a current level and allowed to maintain thermal stability. Thermal stabilization is obtained when the temperature rise of 3 consecutive readings taken a 5 minute intervals differ by no more than 1°C [1.8°F]. Once the specimen is considered stable at a current level, the measurements were taken and the program of the T1 system automatically increases the current to the next level entered. This was repeated until a 40°C [104 °F] was reached. The overall resistance measurements included wire, crimp, bulk material and interface. A 4 wire probe method was used to take voltage drop readings.

2.4. Heat Age - Test specimens were positioned in the chamber in such a manner that there was no restriction of airflow and subjected to a temperature of 105°C [221 °F] for 500 hours.

2.5. Temperature-Humidity Cycling - Reference EIA-364-31A. Specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C [77 and 149°F] twice while maintaining high humidity.

APPENDIX

Part Number	Wire Size (AWG)	Number of Data Points	Die Set	Tapetronics	Tensile (N [lbf] max)	Failure Mode
647879-1	12	3	68313-1	68250-1	845.158 [190]	Wire break
647879-1	10	3	68313-1	68250-1	1334.46 [300]	Wire break
647878-1	8	3	68344-1	68250-1	1556.87 [350]	Wire tear in crimp
647877-1	6	3	68344-1	68250-1	1868.244 [420]	Wire pulled from crimp; wire barrel tear

NOTE *These tests were performed on samples produced and used in tests shown in this report (502-1136 and 20020171ACL). The tests were performed by Tom Michielutti (Product Engineer) during March of 2002.*

Figure 6
Crimp Tensile