AMPOWER* Wave Crimp System ACTION PIN* Header and Receptacle Drawer Connectors

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for AMPOWER* Wave Crimp System drawer connectors. This connector consists of 2 self-aligning mating halves, a header and a receptacle. The header is designed for board mounting with the mating axis perpendicular to the circuit board. The header is equipped with ACTION PIN* contacts that feature compliant tails. This feature allows the header tails to make reliable contact with plated through holes in a circuit board of .093 inch or greater thickness, simply by pushing the tails into the holes instead of soldering them to the board. The receptacle is available in 2 mounting styles, latching mount and floating mount. The latching mount is equipped with 2 latches which engage the header body when the 2 connector halves are fully mated. The floating mount is designed for bulkhead applications where tolerance to misalignment is desirable in obscured engagements. Both header and receptacle are polarized to preserve circuit polarity. Drawer connectors are available in 4 standard widths with the following combinations: 2 power cables with 0 signal positions; 4 power cables with 0 signal positions; 4 power cables with 8 signal positions; and 4 power cables with 21 signal positions. All connectors use insulated flat cable having 1 or 2 copper conductors in a 1 inch wide envelope. Both .010 and .020 inch thick conductors are available. Sequenced engagement for power and ground contacts is available.

1.2. Qualification

When tests are performed on subject product line, procedures specified in AMP 109 series specifications shall be used. All inspections shall be performed using applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the event of conflict between requirements of this specification and product drawing, product drawing shall take precedence. In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

2.1. Tyco Electronics Documents

- 109-1: Test Specification (General Requirements for Test Specifications)
- 109 Series: Test Specifications as indicated in Figure 1
- 114-49005: Application Specification (AMPOWER* Wave Crimp System)
- 501-243: Qualification Test Report (AMPOWER* Wave Crimp System ACTION PIN* Header and Receptacle Drawer Connectors)

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of design, construction and physical dimensions specified on applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Voltage:
  - Power contacts: 250 volts AC (rms)
  - Signal contacts: 90 volts AC (rms)
- Current:
  - Power contacts: See Figure 5 for applicable current carrying capability
  - Signal contacts: See Figure 5 for applicable current carrying capability
- Temperature: -40 to 105°C

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1.Unless otherwise specified, all tests are performed at ambient environmental conditions per Test Specification 109-1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of product.	Meets requirements of product drawing and Application Specification 114-49005.	Visual, dimensional and functional per applicable quality inspection plan.
ELECTRICAL		
Termination resistance, dry circuit, power contacts.	2 milliohms maximum.	AMP Spec 109-6-1. Subject mated contacts assembled in housing to 50 millivolt open circuit voltage at 100 milliamperes maximum. See Figure 4.
Termination resistance, dry circuit, signal contacts.	30 milliohms maximum.	AMP Spec 109-6-1. Subject mated contacts assembled in housing to 50 millivolt open circuit voltage at 100 milliamperes maximum. See Figure 4.
Insulation resistance.	1000 megohms minimum final.	AMP Spec 109-28-4. Test between closest adjacent contacts of mated connector assemblies and between shell and contacts.

Figure 1 (continued)

Test Description	Requirement	Procedure
Dielectric withstanding voltage.	One minute hold with no breakdown or flashover.	AMP Spec 109-29-1. 1500 volts AC (rms) for power contacts. 1200 volts AC (rms) for signal contacts. Test mated connector assemblies as follows: 1) Between adjacent power contacts. 2) Between adjacent signal contacts. 3) Between shorted power conductors and metal foil wrapped around connector housing. 4) Between shorted signal leads and metal foil wrapped around connector housing.
Temperature rise vs current.	30°C maximum temperature rise at specified current.	AMP Spec 109-45-1. Measure temperature rise at rated power and signal currents. See Figure 5.
MECHANICAL		
Crimp tensile.	1/2 Width Cable — Tensile .010 thick — 30 lbs .020 thick — 40 lbs	AMP Spec 109-16. Determine crimp tensile at a maximum rate of 0.5 inch per minute.
Sinusoidal vibration.	No discontinuities greater than 1 microsecond in power or signal circuits. See Note.	AMP Spec 109-21-2. Subject mated connector to 10 G's, between 10 to 500 to 10 Hz traversed in 15 minutes. Three hours in each of 3 mutually perpendicular planes.
Physical shock.	No discontinuities greater than 1 microsecond in power or signal circuits. See Note.	AMP Spec 109-26-1. Subject mated connector to 50 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability.	See Note.	AMP Spec 109-27. Mate and unmate connector halves for 100 cycles at a maximum rate of 600 cycles per hour.
Contact retention, header, power contacts.	Contacts shall not dislodge.	AMP Spec 109-30. Apply axial load of 3 pounds to 6 contact pins of each power contact at a maximum rate of .5 inch per minute. Attempt to push the contacts out of the housing.

Figure 1 (continued)

Test Description	Requirement	Procedure
Contact retention, header, signal contacts.	Contacts shall not dislodge.	AMP Spec 109-30. Apply axial load of 1 pound to the tip of the ACTION PIN contact of each signal pin at a maximum rate of .5 inch per minute. Attempt to push the contacts out of the housing.
Contact retention, receptacle, power contacts.	Cable strain relief integrity and function shall remain intact.	AMP Spec 109-30. Apply axial load of 40 pounds to 2 layered cables by pulling on both cables simultaneously in the unmating direction and releasing.
Contact retention, receptacle, signal contacts.	Wire crimp, signal contact receptacle function and signal module latch integrity shall remain intact.	AMP Spec 109-30. Apply axial load of 3 pounds to contact leads by pulling on each lead individually and releasing.
Insertion force, header.	Header Type / Pounds Maximum 2 cable, 0 signal 4 cable, 0 signal 4 cable, 8 signal 4 cable, 21 signal — 40 pounds per contact	AMP Spec 109-41. Measure force necessary to insert the header into a printed circuit board at a maximum rate of .5 inch per minute.
Mating force.	Connector Model / Pounds Maximum 2 cable, 0 signal — 10 4 cable, 0 signal — 20 4 cable, 8 signal — 25 4 cable, 21 signal — 30	AMP Spec 109-42, Condition A. Measure force necessary to mate connector assemblies from the point of initial contact to full engagement using free floating fixtures at a maximum rate of .5 inch per minute.
Unmating force.	Connector Model / Pounds Minimum 2 cable, 0 signal — 1 4 cable, 0 signal — 4 4 cable, 8 signal — 5 4 cable, 21 signal — 6	AMP Spec 109-42, Condition A. Measure force necessary to unmate connector assemblies with latches inactive at a maximum rate of .5 inch per minute.
Housing lock strength, latching mount.	60 pounds minimum.	AMP Spec 109-50. Determine strength of latch mechanism by pulling on all 4 receptacle cables simultaneously at a maximum rate of .5 inch per minute.
ENVIRONMENTAL		
Thermal shock.	See Note.	AMP Spec 109-22. Subject mated connectors to 5 cycles between -40 and 105°C.

Figure 1 (continued)

Test Description	Requirement	Procedure
Humidity/temperature cycling.	See Note.	AMP Spec 109-23-3. Subject mated connectors to 10 humidity/temperature cycles between 25 and 65°C at 95% RH for 10 days.
Temperature life.	See Note.	AMP Spec 109-43. Subject mated connectors to temperature life at 140°C for 720 hours.
Mixed flowing gas.	See Note.	AMP Spec 109-85-3. Subject mated connectors to environmental class III for 20 days.

NOTE *Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests as specified in Test Sequence in Figure 2.*

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)					
	1	2	3(b)	4	5	6
	Test Sequence (c)					
Examination of product	1,11	1,9	1,9	1,3	1,3	1,4
Termination resistance, dry circuit (d)	3,7	2,7				
Insulation resistance			2,6			
Dielectric withstanding voltage			3,7			
Temperature rise vs current		3,8				
Crimp tensile					2	
Vibration, sinusoidal, high frequency	5	6(e)				
Physical shock	6					
Durability	4					
Contact retention, header, power contacts						2
Contact retention, header, signal contacts						3
Contact retention, receptacle, power contacts	9					
Contact retention, receptacle, signal contacts	10					
Insertion force, header				2		
Mating force	2					
Unmating force	8					
Housing lock strength, latching mount			8			
Thermal shock			4			
Humidity-temperature cycling			5			
Temperature life		5				
Mixed flowing gas		4(f)				

NOTE

(a) See paragraph 4.1.A.
(b) Group 3 applies only to product with an insulting system.
(c) Numbers indicate sequence in which tests are performed.
(d) To be measured for both power and signal contacts separately.
(e) Discontinuities shall not be measured. If applicable, energize power contacts at 18°C level for 100% loading as determined in Test Specification 109-151. Energize signal contacts at .5 ampere.
(f) Precondition samples with 10 cycles durability.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector housings and contacts shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Test groups 1, 2 and 3 shall consist of fully equipped but unmated drawer connectors with latching mount receptacles. Test groups 4 and 5 shall consist of headers with ACTION PIN contacts only. Test group 6 shall consist of transition and cable subassemblies only. Test groups 1, 2, 3 and 5 shall be constructed using split cable equally representing both .010 and .020 inch thick cable conductors. Signal pigtails shall be 18 inches long and constructed using 22 AWG (7 X 30) 200°C rated PTFE insulated wire. Approximately 1/2 inch of insulation shall be removed from unterminated ends of all cables and signal pigtails. After removing insulation, cables shall be notched and .17 inch diameter hole punched in each cable half next to the notch. See Figure 3 for sample quantities and printed circuit board part numbers.

Test Group	Sample Size	Cable Length (Inch)	Printed Circuit Board Part Number			
			2 Cable 0 Signal	4 Cable 0 Signal	4 Cable 8 Signal	4 Cable 21 Signal
1	8	18				92-9983-358-2-B 92-9983-358-6-B
2	12	18				92-9983-358-2-B 92-9983-358-6-B
3	8	9				
4	10					
5	16	9				
6	2					

NOTE *For test group 2, printed circuit board part numbers are given for 1 and 5 ounce foil weights respectively. Use 1 ounce boards with .010 conductors and 5 ounce boards with .020 conductors.*

Figure 3

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit, or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

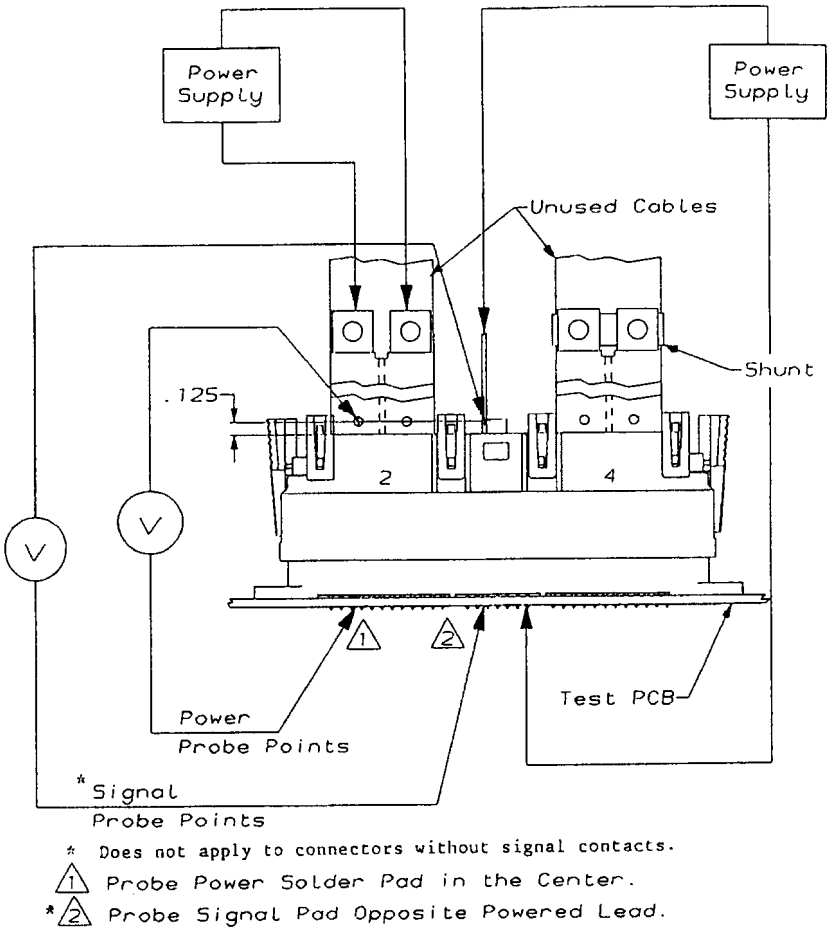
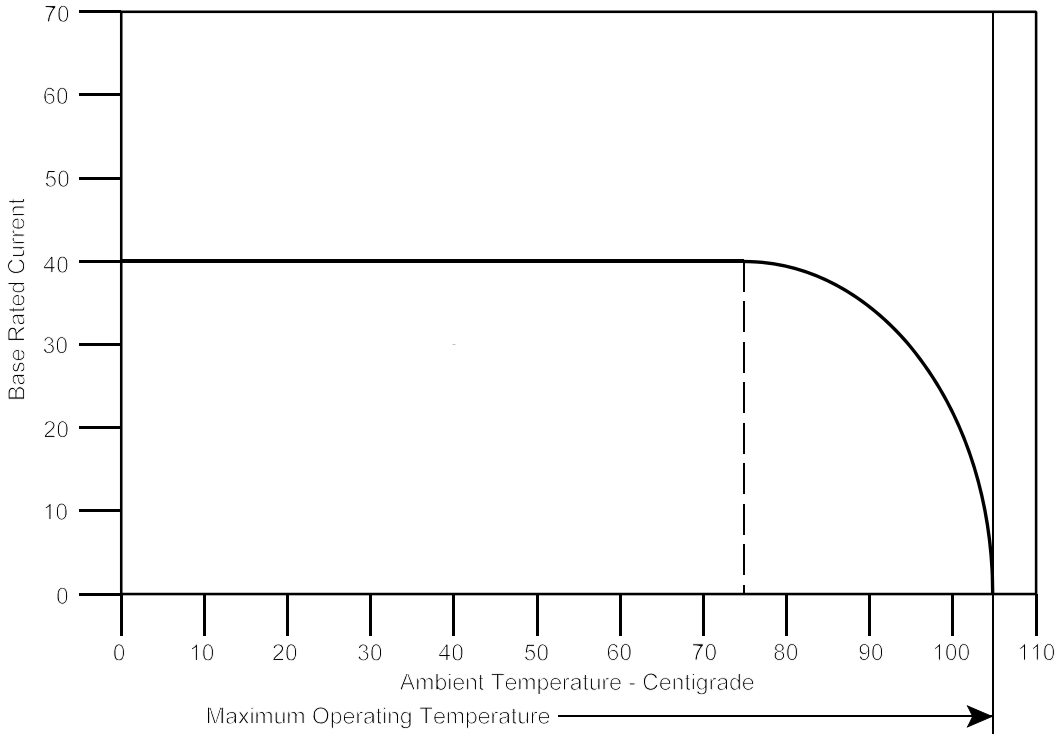


Figure 4
Termination Resistance Measurement Points



NOTE

Power rating is determined as follows:

(1) 1 row of power contacts energized.
(2) Signal contacts not energized.
(3) Base current is for 1, .020 thick conductor of a 2 conductor cable with both conductors energized.
(4) Mounted on 5 ounce copper printed circuit board (see Figure 3 for circuit board part numbers).
(5) All cables brought out of receptacle in a layered configuration.

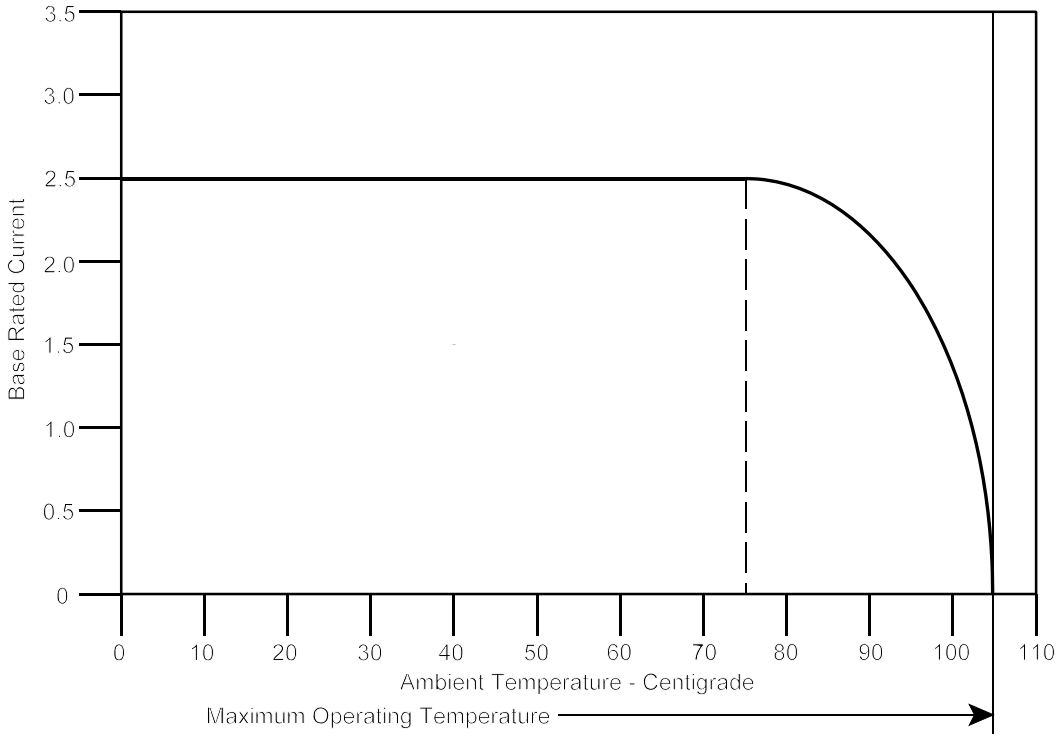
Figure 5A
Power Current Rating

Cable Positions Energized	PCB Foil Weight	Cable			
		.020		.010	
		Solid	Split	Solid	Split
1 row	5	2.0	1.0	1.70	.80
	2	1.84	.88	1.53	.70
	1	1.70	.81	1.28	.65
Both rows	5	1.66	.72	1.20	.60
	2	1.40	.66	1.14	.55
	1	1.30	.60	1.0	.51

NOTE

To determine power current rating of device for circuit board and cable configuration indicated, use Multiplication Factor from above chart and multiply it times Base Rated Current as shown in Figure 5A. In Figure 5B, solid and split refer to 1 and 2 conductor cables. Ratings are per conductor.

Figure 5B
Multiplication Factors



NOTE

Signal rating is determined as follows:
(1) All signal contacts energized simultaneously.
(2) Power contacts not energized.
(3) Header mounted on 5 ounce printed circuit board.

NOTE

Multiply rated signal current by .80 if header is mounted on 1 ounce PC board.

Figure 5C
Signal Current Rating