
AMPOWER* Wave Crimp System Self-Aligning Header and Receptacle Assemblies

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for AMPOWER* Wave Crimp System self-aligning connector assemblies. This connector consists of 2 self-aligning halves, a header and a receptacle. The header is designed to mount on a circuit board with the mating axis parallel to the board. The receptacle is available in 2 mounting styles, latching and floating. 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 equipped with 4 pairs of power contacts. Each pair of power contacts terminates 1 insulated flat cable having 1 or 2 copper conductors in a 1 inch wide envelope. Both .010 and .020 inch thick conductors are available. When used with split or 2 conductor cable, the connector provides 8 independent power channels, however, when used with solid or single conductor cable, the connector provides only 4 power channels. In addition to the power channels, the connector is also equipped with 8 signal channels for sense and control functions. The connector is polarized to preserve circuit polarity.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents constitute a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the 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)
- ! 501-220: Qualification Test Report (AMPOWER* Wave Crimp System Self-Aligning Header and Receptacle Assemblies)
- ! 92-9983-355: Test circuit board
- ! 92-9983-360-4: Heat shield board

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the 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 2 for applicable current carrying capability
 - Signal contacts: 1.5 amperes maximum for single contact, 1 ampere maximum for fully energized connector
- ! 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 shall be 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 per channel (a channel consists of a split cable and 1 mating contact of the header). Signal contacts: 18 milliohms maximum per contact.	AMP Spec 109-6-1. Subject all mated contacts of cables 1 and 3 and individual signal contacts to 50 millivolts open circuit at 100 milliamperes maximum. See Figure 5.
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 the connector housing. 4) Between shorted signal pigtails and metal foil wrapped around the connector housing.

Figure 1 (continued)

Test Description	Requirement	Procedure
Insulation resistance.	1000 megohms minimum final.	AMP Spec 109-28-4. Test between closet adjacent contacts and between shell and contact closest to shell of mated connector assemblies.
Temperature rise vs current.	30°C maximum temperature rise at specified current.	AMP Spec 109-45-1. Measure temperature rise at rated current specified in Figure 2A. See Figures 2 and 7.
MECHANICAL		
Sinusoidal vibration.	No discontinuities greater than 1 microsecond in power or signal circuits. See Note.	AMP Spec 109-21-2. Subject mated connectors to 10 G's between 10 to 500 to 10 Hz traversed in 15 minutes. Three hours in each of 3 mutually perpendicular planes. See Figure 6.
Physical shock.	No discontinuities greater than 1 microsecond in power or signal circuits. See Note.	AMP Spec 109-26-1. Subject mated connectors 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. See Figure 6.
Mating force.	25 pounds maximum.	AMP Spec 109-42, Condition A. Measure force necessary to mate connector assemblies from point of initial contact to full engagement using free floating fixtures at a maximum rate of .5 inch per minute.
Unmating force.	6 pounds minimum.	AMP Spec 109-42, Condition A. Measure force necessary to unmate connector assemblies with locking latches removed at a maximum rate of .5 inch per minute.
Contact retention, receptacle, power contacts.	Cable strain relief integrity and function shall remain intact.	AMP Spec 109-30. Pulling on each full width cable individually, apply axial load of 40 pounds to power contacts in the unmating direction and release.
Contact retention, receptacle, signal contacts.	Wire crimp, signal contact receptacle function and signal module latch integrity shall remain intact.	AMP Spec 109-30. Pulling on each full wire individually, apply axial load of 3 pounds to signal contacts in the unmating direction and release.

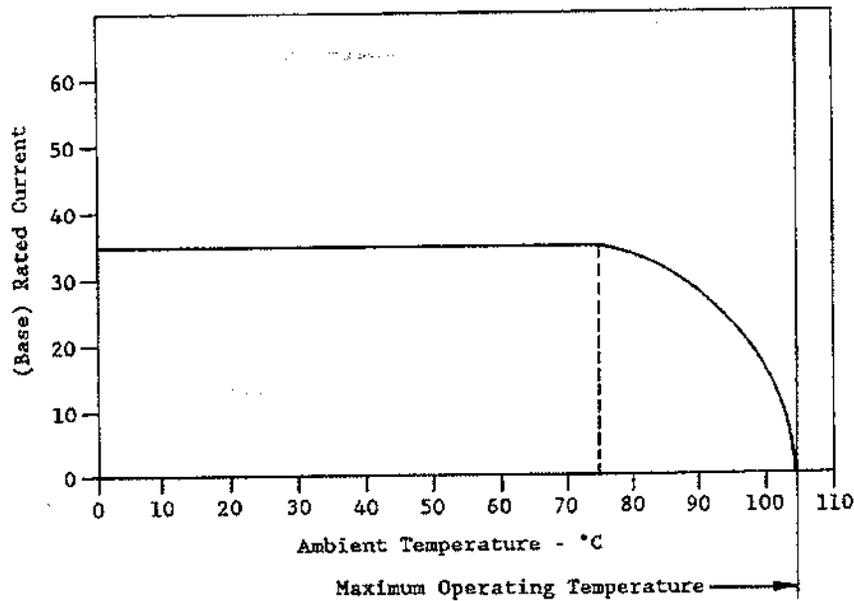
Figure 1 (continued)

Test Description	Requirement	Procedure						
Crimp tensile.	<table border="1"> <tr> <td>Half Cable Conductor Thickness</td> <td>Crimp Tensile Lbs Minimum</td> </tr> <tr> <td>.010</td> <td>30</td> </tr> <tr> <td>.020</td> <td>40</td> </tr> </table>	Half Cable Conductor Thickness	Crimp Tensile Lbs Minimum	.010	30	.020	40	AMP Spec 109-16. Determine crimp tensile on half width cable specimen at a maximum rate of .5 inch per minute.
Half Cable Conductor Thickness	Crimp Tensile Lbs Minimum							
.010	30							
.020	40							
Durability.	See Note.	AMP Spec 109-27. Mate and unmate connector halves for 100 cycles at maximum rate of 600 cycles per hour.						
Housing lock strength, latching mount.	40 pounds minimum.	AMP Spec 109-50. Determine strength of the latch mechanism with contacts present at a maximum rate of .5 inch per minute.						
Insertion retention, torque mode.	Insert shall not spin in the housing.	AMP Spec 109-183. Subject inserts to 8 inch pound torque load.						
Insertion retention, axial mode.	Insert shall not dislodge from the housing.	AMP Spec 109-183. Subject inserts to 20 pound axial load.						
Solderability.	Solderable area shall have a minimum of 95% solder coverage.	AMP Spec 109-11-1. Subject contacts to solderability.						
Resistance to soldering heat.	See Note.	AMP Spec 109-63-3. Subject product mounted on printed circuit boards to solder bath at 260°C for 10 seconds.						
ENVIRONMENTAL								
Thermal shock.	See Note.	AMP Spec 109-22. Subject mated connectors to 5 cycles between -40 and 105°C.						
Humidity/temperature cycling.	See Note.	AMP Spec 109-23-3, Condition B. Subject mated connectors to 10 humidity/temperature cycles between 25 and 65°C at 95% RH.						
Mixed flowing gas.	See Note.	AMP Spec 109-85-3. Subject mated connectors to environmental class III for 20 days.						
Temperature life.	See Note.	AMP Spec 109-43. Subject mated connectors to temperature life at 140°C for 720 hours.						

NOTE

Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests specified in the Test Sequence in Figure 3.

Figure 1 (end)



NOTE

- (1) One row of power contacts (4 channels) energized at 1 time.
- (2) Signal contacts carrying 1 ampere in series simultaneously.
- (3) Base rated current is for 1, .020 inch thick conductor of a 2 conductor cable with both conductors energized.
- (4) Connector mounted on 5 ounce copper printed circuit board part number 92-9983-355-5.
- (5) All 4 cables were brought out of the receptacle on 1 side in a layered configuration (2 bundles of 2 cables each).

Figure 2A
Current Carrying Capability

Cable Positions Energized	PCB Foil Weight	Cable			
		.020		.010	
		Solid	Split	Solid	Split
1 and 3 (1 row)	5	2.0	1.0	1.70	.80
	2	1.84	.88	1.53	.70
	1	1.75	.86	1.10	.54
1 and 3 and 2 and 4 (both rows)	5	1.66	.72	1.20	.60
	2	1.40	.66	1.14	.55
	1	1.30	.60	1.0	.46

NOTE

To determine acceptable current carrying capability for circuit board and cable configuration indicated, use the Multiplication Factor (F) from the above chart and multiply it times the Base Rated Current shown in Figure 2A. In Figure 2B, solid and split refer to 1 and 2 conductor cables. Ratings are per conductor.

Figure 2B
Current Rating

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)						
	1	2	3(d)	4	5	6	7
	Test Sequence (b)						
Examination of product	1,10	1,9	1,10	1,3	1,3	1,3	1,3
Termination resistance, dry circuit	3,7	2,7					
Dielectric withstanding voltage			3,7				
Insulation resistance			2,6				
Temperature rise vs current		3,8					
Sinusoidal vibration	5	6(c)					
Physical shock	6						
Mating force	2						
Unmating force	8						
Contact retention, receptacle, power contacts	9						
Contact retention, receptacle, signal contacts							
Crimp tensile					2		
Durability	4						
Housing lock strength, latching mount			8				
Insertion retention, torque mode						2	
Insertion retention, axial mode							2
Solderability				2			
Resistance to soldering heat			9				
Thermal shock			4				
Humidity/temperature cycling			5				
Mixed flowing gas		4(e)					
Temperature life		5					

NOTE

- (a) See paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) 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 100 milliamperes.
- (d) Test group 3 applies only to product with an insulating system.
- (e) Precondition samples with 10 durability cycles.

Figure 3

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 unmated connectors with latching mount receptacles equipped with signal line modules. Matching headers shall be fully populated with power and signal contacts. Receptacles shall be fully equipped with power contacts terminated to short cables of specified length and thickness. Cables for test groups 1 and 2 shall be brought out of the receptacle housing through strain relief slots marked 1 and 3 in 2 layers of 2 cables each. Cables for test group 3 shall be brought out separately, 1 cable through each strain relief slot marked 1 through 4. Signal modules shall be fully populated with signal contacts terminated to 12 inch leads of .010 PVC wall 22 AWG 7 strand tinned copper wire rated at 600 volts at 105°C. Test group 4 shall consist of header power and signal contacts only. Test group 5 shall consist of receptacle contacts terminated to short cables of specified length and thickness. Test groups 6 and 7 shall consist of empty header housing shells fitted with inserts. Sample quantities and cable details for each test group and printed circuit test board part numbers are shown in Figure 4. All samples shall be prepared from split cables. 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.

Test Group	Quantity	Conductor Thickness		Cable Length (inch)	PCB Part Number
		.010	.020		
1	8	4	4	18	92-9983-355-1
2	12	6	6	18	92-9983-355-1 92-9983-355-5
3	8		8	9	92-9983-360-4
4	25 each, loose piece header and signal contacts				
5	16	8	8	9	
6	4 header shells with inserts				
7	4 header shells with inserts				

NOTE For test group 2, use 1 ounce copper printed circuit test board with .010 cable samples and 5 ounce copper printed circuit test board with .020 cable samples.

Figure 4

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 3.

4.2. Requalification Testing

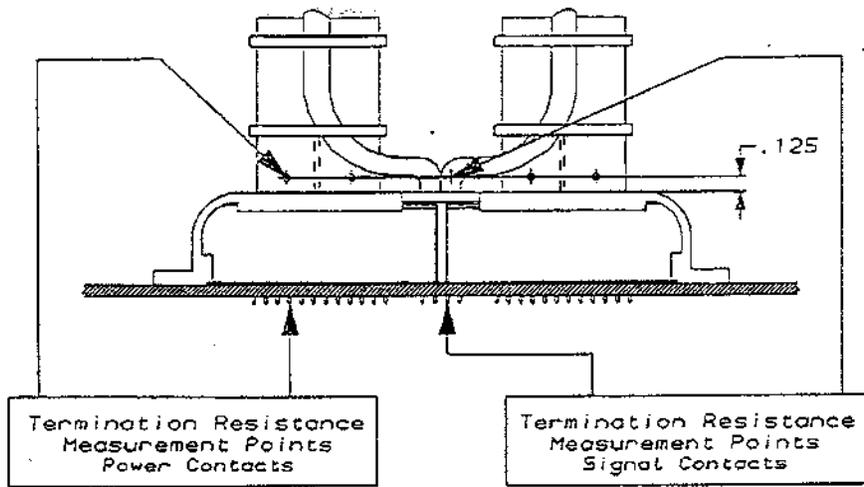
If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

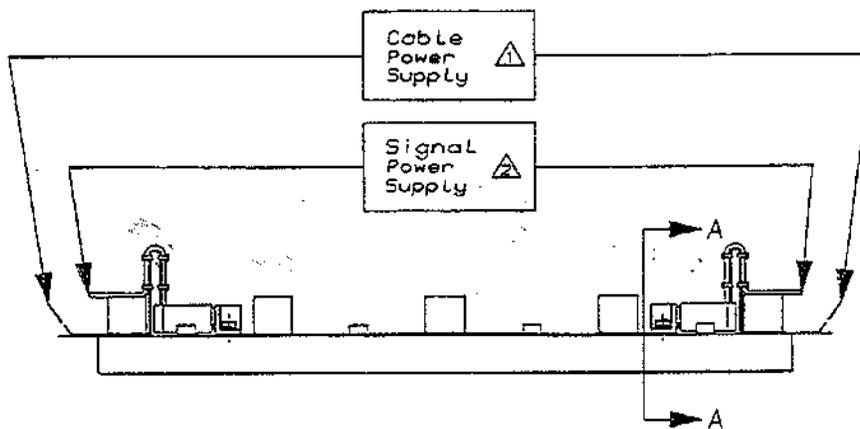
Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing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

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall 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.



Section A-A



- ⚠ Typical power supply connection for termination resistance of power contacts.
- ⚠ Typical power supply connection for termination resistance of signal contacts.

Figure 5
Termination Resistance Measurement Points

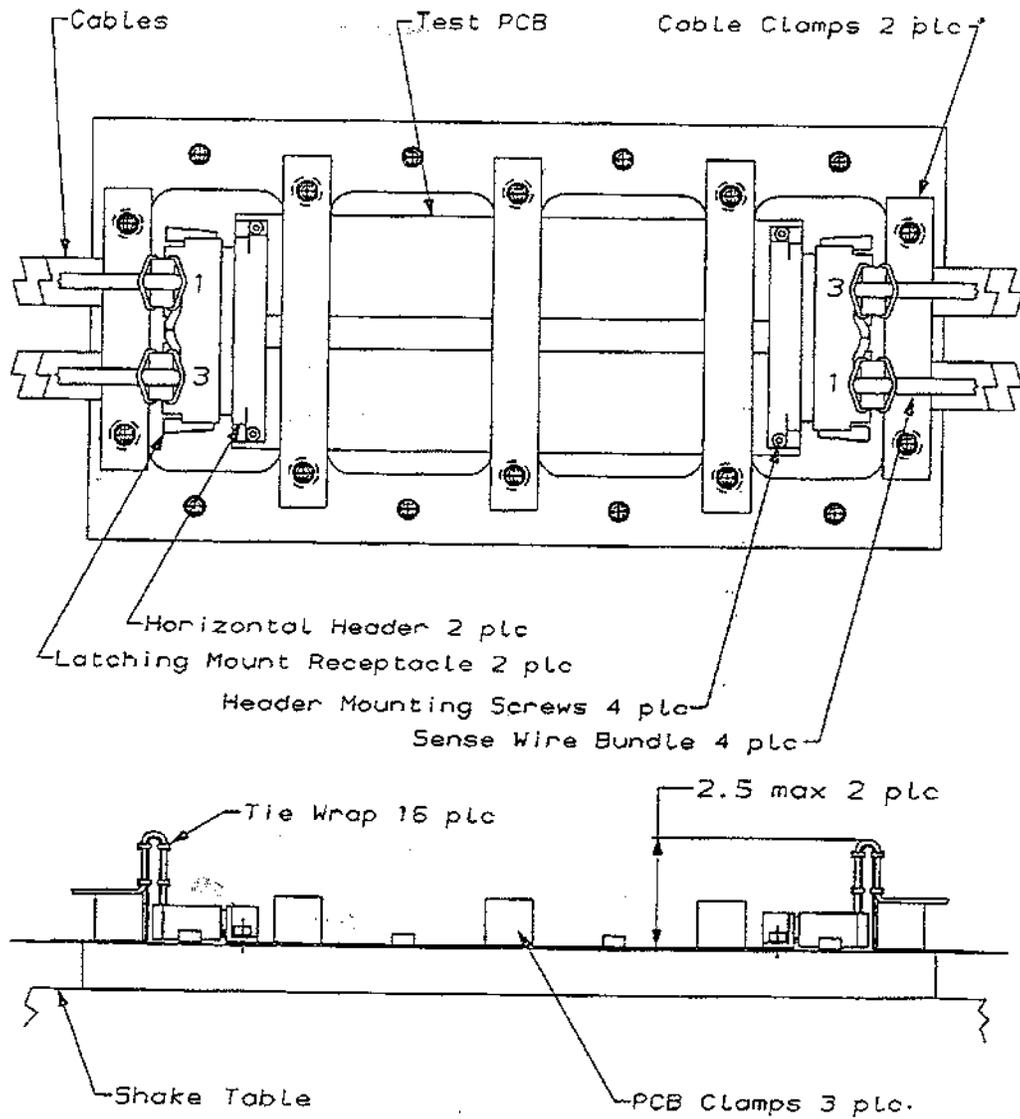
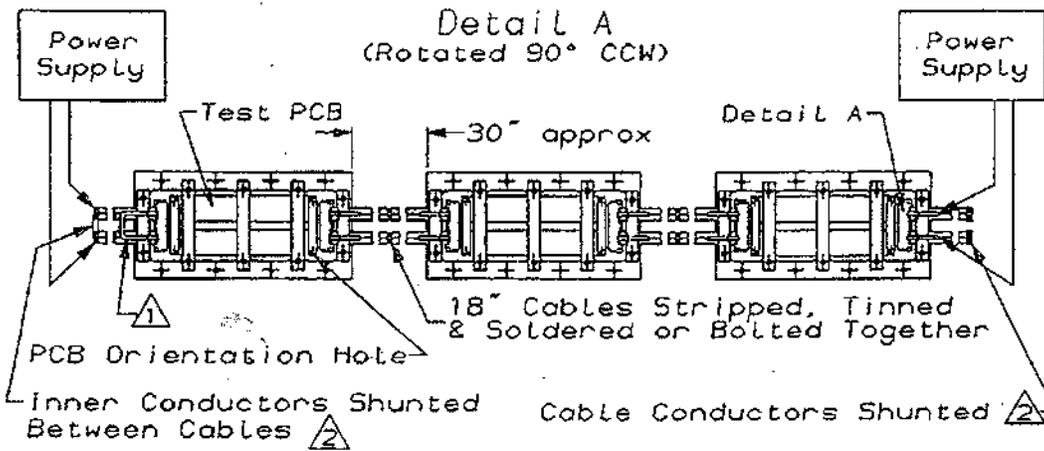
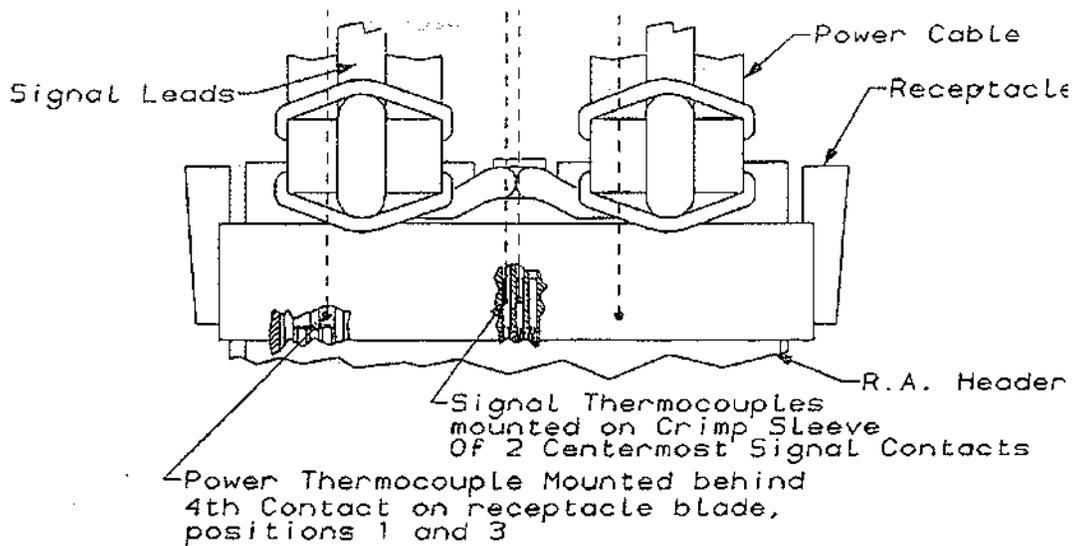


Figure 6
Vibration and Physical Shock Mounting Fixture



- ⚠ Note: Signal leads and pins connected such that all signal contacts are in series
- ⚠ Note: Power cables connected as shown above such that position 1 and 3 power contacts are in series; position 2 and 4 power contacts are not energized

Figure 7
Temperature Rise