AMPOWER* Wave Crimp System Header and Plug Drawer Connectors

1. SCOPE

1.1. Content

This specification covers 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 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 polarized to preserve circuit polarity. Drawer connectors are available in 4 standard widths 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.

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. TE Connectivity 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)
- 501-159: Qualification Test Report (AMPOWER* Wave Crimp System Header and Plug Drawer Connectors)

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: See Figure 2 for applicable current carrying capability
- Temperature: -40 to 105℃

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.	AMP Spec 109-6-1. Subject mated contacts assembled in housing to 50 millivolts open circuit at 100 milliamperes maximum. See Figure 6.
Termination resistance, dry circuit, signal contacts.	30 milliohms maximum.	AMP Spec 109-6-1. Subject mated contacts assembled in housing to 50 millivolts open circuit at 100 milliamperes maximum. See Figure 6.
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 leads and metal foil wrapped around the connector housing.

Figure 1 (continued)

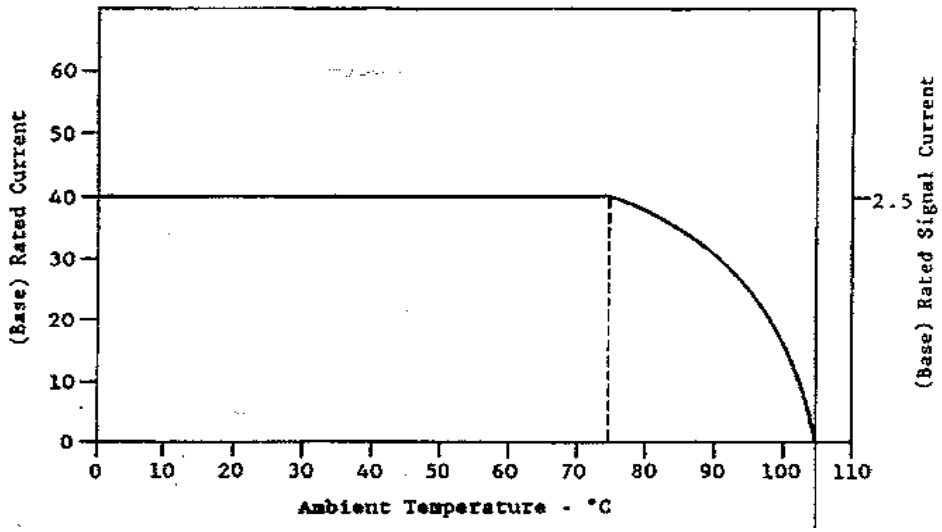
Insulation resistance.	5000 megohms minimum initial. 1000 megohms minimum final.	AMP Spec 109-28-4. Test between closest adjacent contacts of mated connector assemblies and between shell and contacts.
Temperature rise vs current.	30℃ maximum temperatu re rise at specified current.	AMP Spec 109-45-1. Measure temperature rise at rated power and signal currents (independent of each other) 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 5.
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 5.
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 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 1 inch per minute.
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 1 inch per minute. Attempt to push the contacts out of the housing.
Contact retention, header, signal contacts.	Contacts shall not dislodge.	AMP Spec 109-30. Apply axial load of 1 pound to solder tail tip of each signal pin at a maximum rate of .5 inch per minute. Attempt to push the contacts out of the housing.

Figure 1 (continued)

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 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.
Crimp tensile.	1/2 Width Cable — Tensile (pounds) .010 thick — 30 .020 thick — 40	AMP Spec 109-16. Determine crimp tensile at a maximum rate of 1 inch per minute.
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.	60 pounds minimum.	AMP Spec 109-50. Determine strength of the latch mechanism by pulling on all 4 cables simultaneously at a maximum rate of .5 inch per minute.
Solderability, power and signal contacts.	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℃ for 10 seconds.
ENVIRONMENTAL		
Thermal shock.	See Note.	AMP Spec 109-22. Subject mated connectors to 5 cycles between -40 and 105℃.
Humidity/temperature cycling.	See Note.	AMP Spec 109-23-3, Condition B. Subject mated connectors to 10 humidity/temperature cycles between 25 and 65℃ 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℃ 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) For determining power current base rating, only 1 row of power contacts were energized. Signal contacts were kept unenergized during power rating tests.

(2) For determining signal current base rating, all signal contacts were series connected and energized. No power current was on during signal rating tests.

(3) Base rated power current is for 1, .020 inch thick conductor of a 2 conductor cable with both conductors energized. The header was soldered to a 5 ounce foil printed circuit board. See Figure 4 for printed circuit board part numbers.

(4) All cable were brought out of the receptacle in a layered configuration.

Figure 2
Current CarryingCapability

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 printed 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
	Test Sequence (b)					
Examination of product	1,11	1,9	1,10	1,3	1,3	1,4
Termination resistance, dry circuit (f)	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, header, power contacts						2
Contact retention, header, signal contacts						3
Contact retention, receptacle, power contacts	9					
Contact retention, receptacle, signal contacts	10					
Crimp tensile					2	
Durability	4					
Housing lock strength, latching mount			8			
Solderability, power and signal contacts				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℃ level for 100% loading as determin ed in Test Specification 109-151.
(d) Test group 3 applies only to product with an insulating system.
(e) Precondition samples with 10 durability cycles.
(f) To be measured for both power and signal contacts separately.

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 fully equipped but unmated drawer connectors with latching mount receptacles. Test group 4 shall consist of loose piece power and signal header contacts. Test group 5 shall consist of transition and cable subassemblies only. Test group 6 shall consist of fully populated headers only. Test groups 1, 2, 3 and 4 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℃ rated PTFE insulated wi re. 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 4 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	93-2481-023-1	90-9983-189-2	92-9983-333-4	92-9983-358-4
2	12	18	93-2481-023-1	90-9983-189-7	92-9983-333-2	92-9983-358-2
			93-2481-023-5	90-9983-189-4	92-9983-333-6	92-9983-358-6
3	8	9	93-2481-023-1	90-9983-360-1	92-9983-360-2	92-9983-360-3
4	25					
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 inch thick conductors and 5 ounce boards with .020 inch thick conductors.*

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.

4.5. Certification

This product has been recognized under the Component Recognition Program of Underwriters Laboratories Inc., Electrical File Number E248476 and Certified by Canadian Standards Association, Application Number 7189A-358.

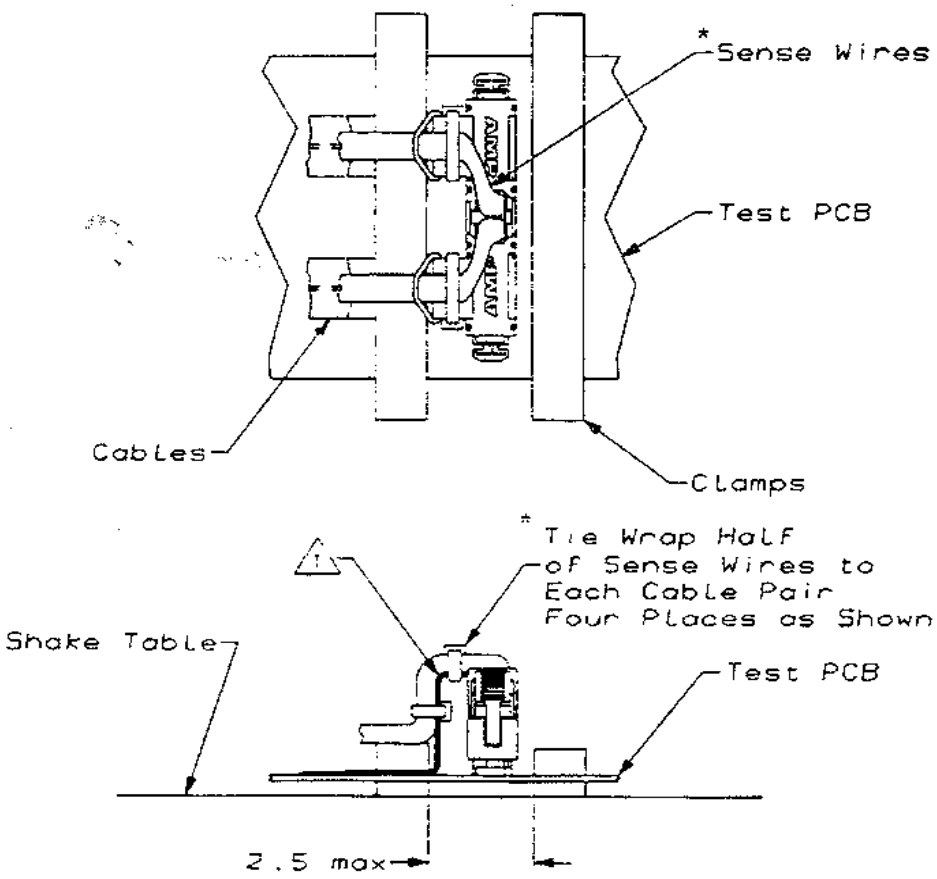


Figure 5

Vibration and Physical Shock Mounting Fixture

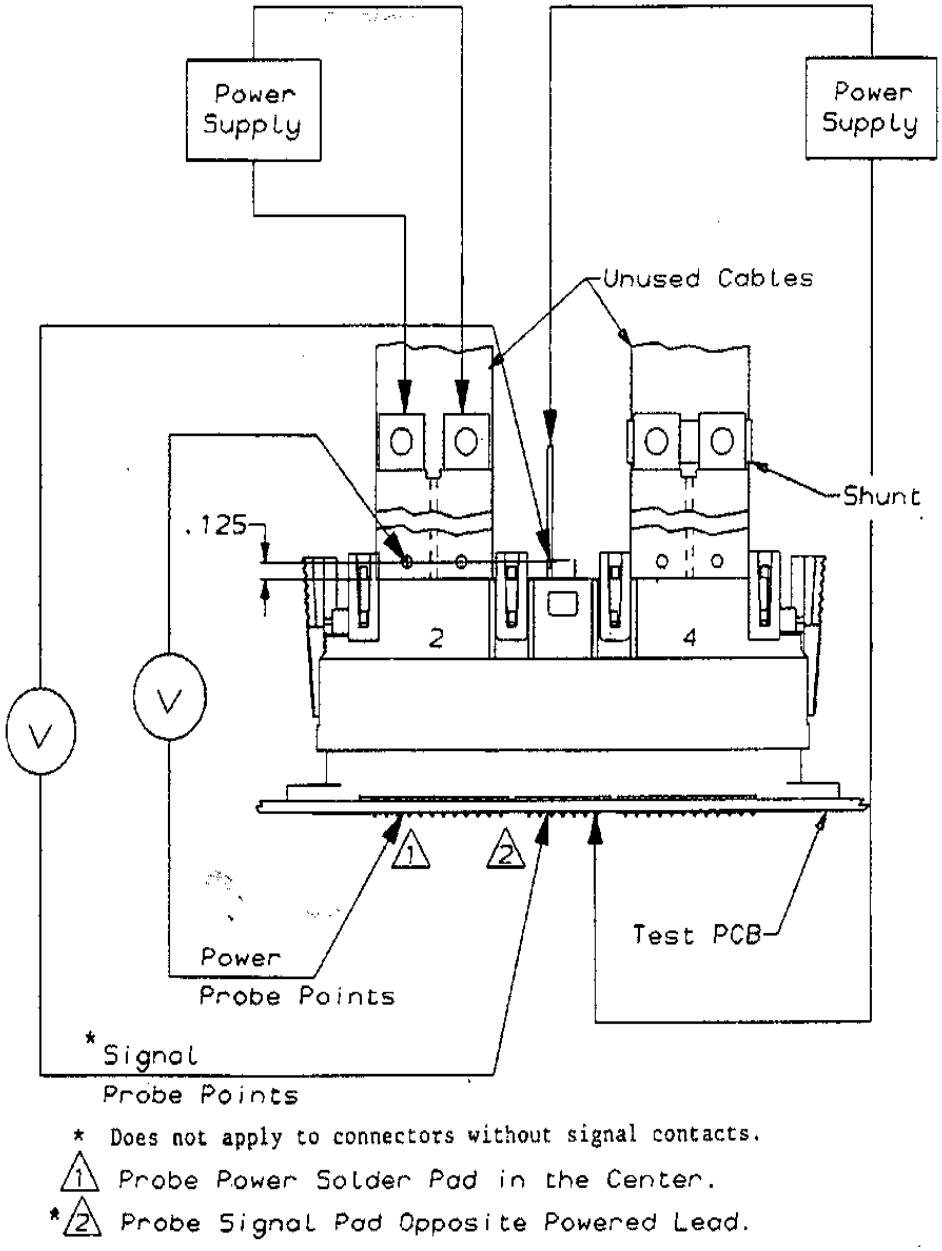


Figure 6

Termination Resistance Measurement Points

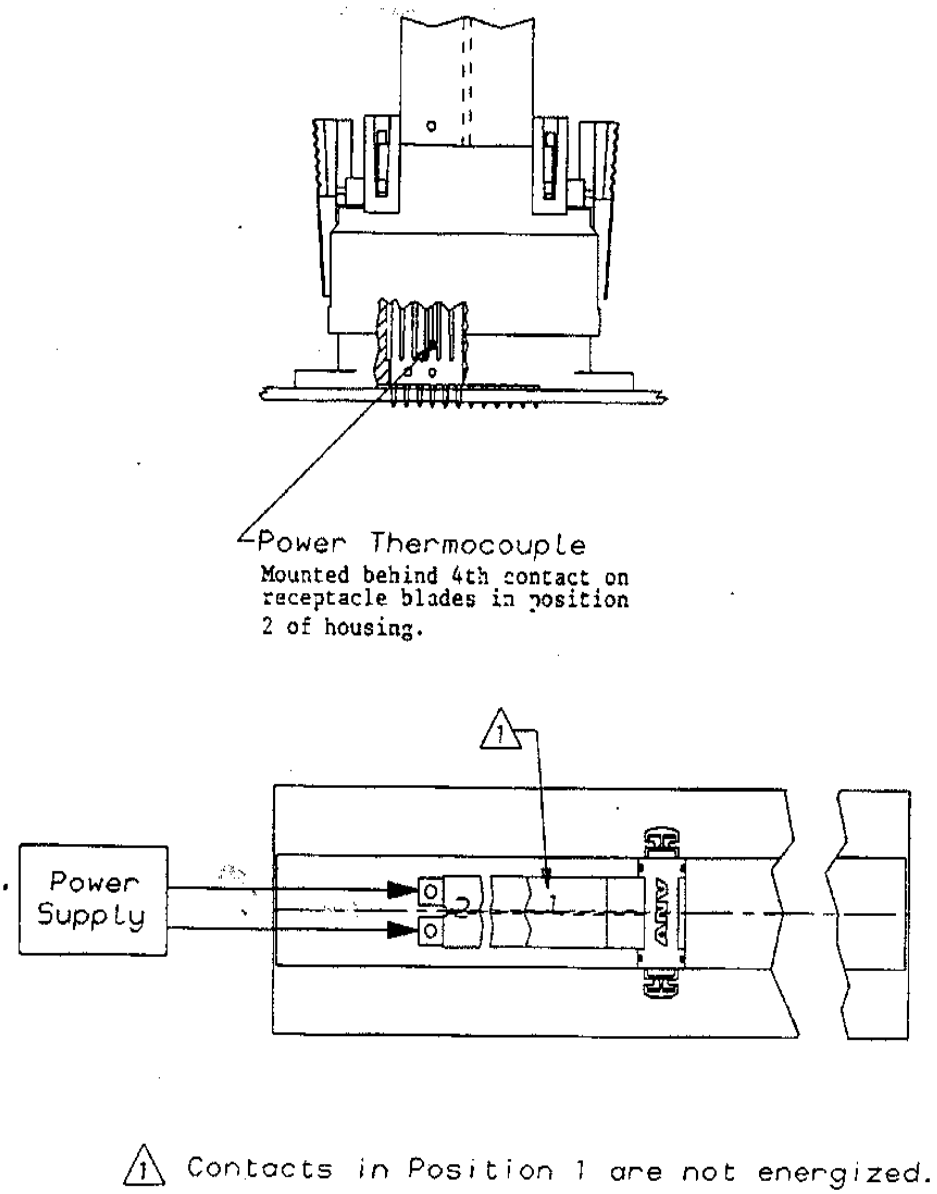
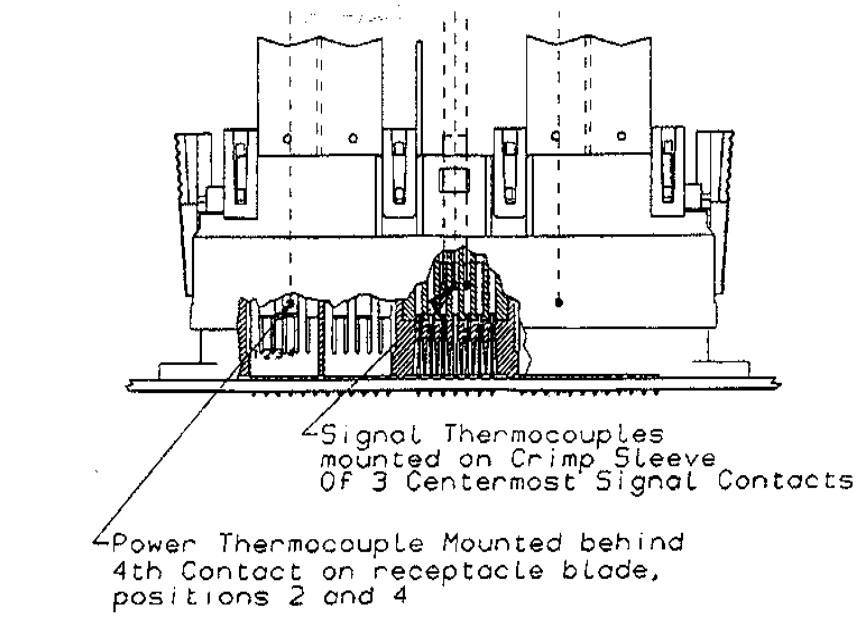
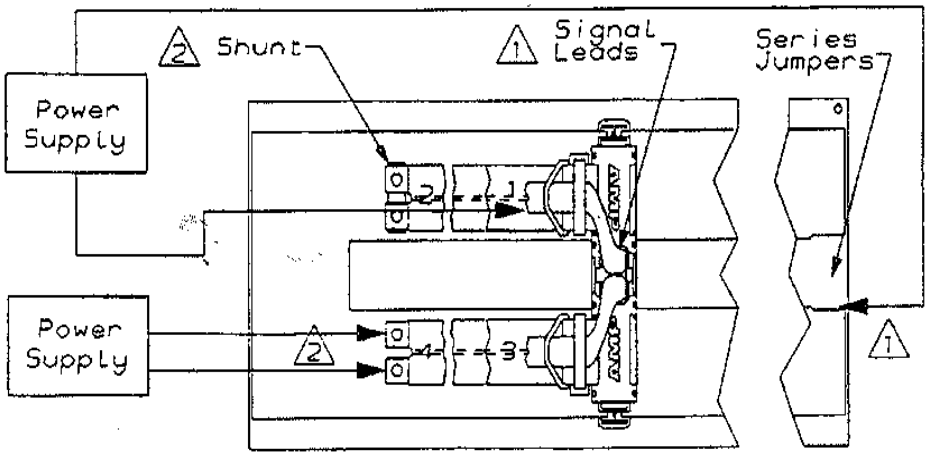


Figure 7A

Temperature Rise, 2 Cable





1 Note: Signal Leads and Signal Pins connected Such That All Signal Contacts Are In Series

2 Note: Power cable in Position 2 is Shunted Such That Position 2 and 4 Power Contacts Are In Series; Position 1 and 3 Power Contacts Are Not Energized

Figure 7B
Temperature Rise, 4 Cable