

PRODUCT SPECIFICATION

1. SCOPE

1.1. Content

This specification covers the performance, test and quality requirements for the AMPLIMITE\* HDP-20 subminiature D connectors with removable F crimp contacts. The assembly consists of a two piece plastic housing which has integral plastic retention tines and two metal shells which secure the housing components.

1.2. Qualification

When tests are performed on the subject product line, the procedures specified in AMP 109 series specifications shall be used. All inspections shall be performed using the 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 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. AMP Documents

- A. 109-1: General Requirements for Test Specifications
- B. 109 Series: Test Specifications as indicated in Figure 1. (Comply with MIL-STD-202, MIL-STD-1344 and EIA RS-364)
- C. Corporate Bulletin 401-76: Cross-reference between AMP Test Specifications and Military or Commercial Documents
- D. 114-40030 : Application Specification
- E. 501-99 : Test Report
- F. 27280: Gage Pin, Engagement Test, Socket Contact

3. REQUIREMENTS

3.1. Design and Construction

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

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				DR F.Rinehardt 9/18/80	<b>AMP</b> AMP Incorporated Harrisburg, PA 17105-3608		
				CHK F.Mediate 9/16/80			
				APP D.Lehman 9/17/80	NO 108-40005	REV A	LOC B
A	Revise per ECN- BD3471	<i>FR</i>	12/6 89	PAGE 1 OF 13	TITLE CONNECTOR, AMPLIMITE HDP-20, SUBMINIATURE D CONNECTOR, WITH REMOVABLE F CRIMP CONTACTS		
LTR	REVISION RECORD	APP	DATE				

3.2. Material

- A. Contact:
  - (1) Pin: Brass
  - (2) Socket: Phosphor bronze
- B. Housing: Thermoplastic, glass filled, UL 94V-0 and UL 94V-1 as specified in the product drawing.

3.3. Ratings

- A. Voltage: 250 vac
- B. Current: Fully loaded and energized connectors, see Figures 2A and 2B.
  - (1) 18 AWG, 3.7 amperes
  - (2) 22 AWG, 2.4 amperes
  - (3) 28 AWG, 1.2 amperes
- C. Temperature: -55° to 105°C

3.4. Performance and Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. All tests are performed at ambient temperature unless otherwise specified.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure																					
Examination of Product	Meets requirements of product drawing and AMP Spec 114-40030.	Visual, dimensional and functional per applicable quality inspection plan.																					
ELECTRICAL																							
Termination Resistance, Specified Current	<table border="1"> <thead> <tr> <th>Wire Size AWG</th> <th>Test current ampere</th> <th>Resistance maximum milliohms</th> </tr> </thead> <tbody> <tr><td>18</td><td>3.1</td><td>15</td></tr> <tr><td>20</td><td>2.4</td><td>15</td></tr> <tr><td>22</td><td>2.0</td><td>15</td></tr> <tr><td>24</td><td>1.6</td><td>15</td></tr> <tr><td>26</td><td>1.3</td><td>15</td></tr> <tr><td>28</td><td>1.1</td><td>15</td></tr> </tbody> </table>	Wire Size AWG	Test current ampere	Resistance maximum milliohms	18	3.1	15	20	2.4	15	22	2.0	15	24	1.6	15	26	1.3	15	28	1.1	15	Measure potential drop of mated contacts assembled in housing, see Figure 6; AMP Spec 109-25, calculate resistance.
Wire Size AWG	Test current ampere	Resistance maximum milliohms																					
18	3.1	15																					
20	2.4	15																					
22	2.0	15																					
24	1.6	15																					
26	1.3	15																					
28	1.1	15																					
Termination Resistance, Dry Circuit	15 milliohms maximum	Subject mated contacts assembled in housing to 50 mv open circuit at 100 ma maximum, see Figure 6; AMP Spec 109-6-1.																					
Dielectric Withstanding Voltage	1.0 kvac dielectric withstanding voltage, one minute hold. 1.0 milliampere maximum leakage current.	Test between adjacent contacts of unmated connector assemblies; AMP Spec 109-29-1.																					

Figure 1 (cont)

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Test Description	Requirement	Procedure																								
Insulation Resistance	5000 megohms minimum initial. 500 megohms minimum final.	Test between adjacent contacts of unmated connector assembly; AMP Spec 109-28-4																								
Temperature Rise vs Current	Maximum temperature rise at specified current, 30°C.	Measure temperature rise vs current; AMP Spec 109-45-1. Reference Figure 2A and 2B.																								
<b>MECHANICAL</b>																										
Vibration Random	No discontinuities greater than 1 microsecond. See note (a).	Subject mated connectors to 20 G rms with 100 ma. current applied AMP Spec 109-21-5, test level F. See Figure 5, 20 minutes each axis																								
Physical Shock	No discontinuities greater than 1 microsecond. See note (a).	Subject mated connector to 50 G's halfsine shock pulses of 11 millisecond duration; 3 shocks in each direction applied along the 3 mutually perpendicular planes total 18 shocks; AMP Spec 109-26-1. See Figure 5.																								
Mating Force	See note (b). <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Size</th> <th>Number of Positions</th> <th>W/O Grd. Indents</th> <th>With Grd. Indents</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>9</td> <td>2.8</td> <td>30</td> </tr> <tr> <td>2</td> <td>15</td> <td>4.7</td> <td>33</td> </tr> <tr> <td>3</td> <td>25</td> <td>7.8</td> <td>37</td> </tr> <tr> <td>4</td> <td>37</td> <td>11.6</td> <td>40</td> </tr> <tr> <td>5</td> <td>50</td> <td>15.6</td> <td>44</td> </tr> </tbody> </table> pounds maximum.	Size	Number of Positions	W/O Grd. Indents	With Grd. Indents	1	9	2.8	30	2	15	4.7	33	3	25	7.8	37	4	37	11.6	40	5	50	15.6	44	Measure force necessary to mate connector assembly incorporated free floating fixtures at a rate of 1 inch/minute; AMP Spec 109-42, cond A.
Size	Number of Positions	W/O Grd. Indents	With Grd. Indents																							
1	9	2.8	30																							
2	15	4.7	33																							
3	25	7.8	37																							
4	37	11.6	40																							
5	50	15.6	44																							
Unmating Force	See note (b). <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Size</th> <th>Number of Positions</th> <th>W/O Grd. Indents</th> <th>With Grd. Indents</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>9</td> <td>2.8</td> <td>30</td> </tr> <tr> <td>2</td> <td>15</td> <td>4.7</td> <td>33</td> </tr> <tr> <td>3</td> <td>25</td> <td>7.8</td> <td>37</td> </tr> <tr> <td>4</td> <td>37</td> <td>11.6</td> <td>40</td> </tr> <tr> <td>5</td> <td>50</td> <td>15.6</td> <td>44</td> </tr> </tbody> </table> pounds maximum.	Size	Number of Positions	W/O Grd. Indents	With Grd. Indents	1	9	2.8	30	2	15	4.7	33	3	25	7.8	37	4	37	11.6	40	5	50	15.6	44	Measure force necessary to unmate connector assembly at a rate of 1 inch/minute; AMP Spec 109-42, cond A.
Size	Number of Positions	W/O Grd. Indents	With Grd. Indents																							
1	9	2.8	30																							
2	15	4.7	33																							
3	25	7.8	37																							
4	37	11.6	40																							
5	50	15.6	44																							
Contact Insertion Force	3 pounds maximum per contact.	Measure force to insert contact into housing; AMP Spec 109-41.																								

Figure 1 (cont)

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Test Description	Requirement	Procedure														
Contact Retention	Contacts shall not dislodge from the connector housing.	Apply axial load of 10 pounds to contacts, AMP Spec 109-30.														
Contact Engaging Force	8 ounces maximum per contact.	Measure force using gage A, as indicated in Figure 7; AMP Spec 109-35, engagement depth .220.														
Contact Separating Force	0.75 ounces minimum per contact.	Size 2 times using gage A, as indicated in Figure 7, insert gage B and measure force to separate; AMP Spec 109-35, separation depth .220.														
Crimp Tensile	<table border="1"> <thead> <tr> <th>Wire Size, AWG</th> <th>Crimp Tensile pounds minimum</th> </tr> </thead> <tbody> <tr> <td>18</td> <td>27</td> </tr> <tr> <td>20</td> <td>20</td> </tr> <tr> <td>22</td> <td>12</td> </tr> <tr> <td>24</td> <td>8</td> </tr> <tr> <td>26</td> <td>4.5</td> </tr> <tr> <td>28</td> <td>2.7</td> </tr> </tbody> </table>	Wire Size, AWG	Crimp Tensile pounds minimum	18	27	20	20	22	12	24	8	26	4.5	28	2.7	Determine crimp tensile at a rate of 1 inch/minute; AMP Spec 109-16.
Wire Size, AWG	Crimp Tensile pounds minimum															
18	27															
20	20															
22	12															
24	8															
26	4.5															
28	2.7															
Durability	15 milliohms maximum termination resistance, dry circuit.	Mate and unmate connector assemblies for number of cycles indicated at a maximum rate of 200 cycles/hour; AMP Spec 109-27. Plating <table border="1"> <thead> <tr> <th>microinches</th> <th>Cycles</th> </tr> </thead> <tbody> <tr> <td>Gold Flash</td> <td>100</td> </tr> <tr> <td>30 Gold</td> <td>500</td> </tr> </tbody> </table>	microinches	Cycles	Gold Flash	100	30 Gold	500								
microinches	Cycles															
Gold Flash	100															
30 Gold	500															

Figure 1 (cont)

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Test Description	Requirement	Procedure
<b>ENVIRONMENTAL</b>		
Thermal Shock	See note (a).	Subject unmated connectors to 5 cycles between -55° and 105°C; AMP Spec 109-22
Humidity-Temperature Cycling	See note (a).	Subject unmated connectors to 10 humidity-temperature cycles between 25° and 65°C at 95% RH; AMP Spec 109-23, method III, cond B, less 7b.
Industrial Mixed	See note (a).	Subject mated connectors to environmental class III for 20 days; AMP Spec 109-85-3.
Temperature Life	See note (a).	Subject mated connectors to temperature life; AMP Spec 109-43, test level 10, test duration C. 105°C for 500 hours.

- (a) Shall remain mated and show no evidence of damage, cracking or chipping and meet all requirements of subsequent testing  
(b) Grounding indents are on plugs.

Figure 1 (end)

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Rated Current vs Ambient Temperature Rating  
for  
Single Circuit, I<sub>RMS</sub> or I<sub>DC</sub>, Maximum Wire Gage, Continuous Operating

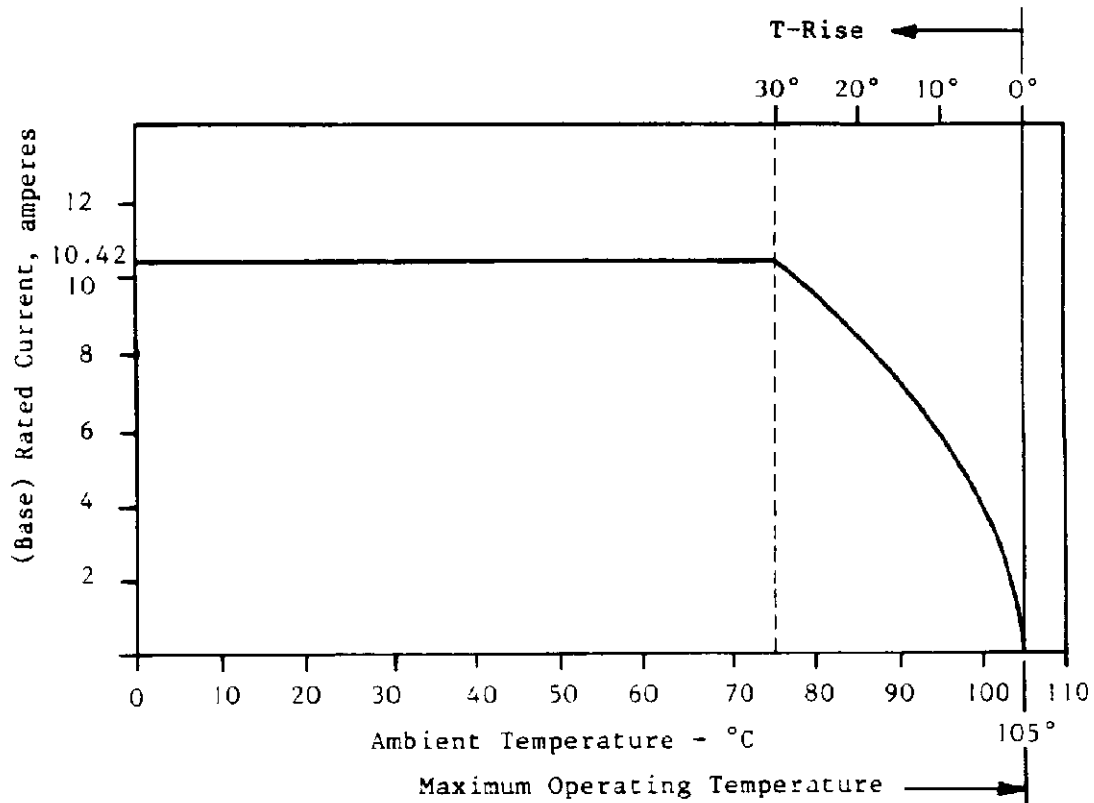


Figure 2A  
Current Carrying Capability

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$$I = F \times I_{base}$$

Wire Gage

% Connector Loading*	AWG	28	26	24	22	20	18
	%						
Single Contact		.384	.450	.536	.647	.795	1
26		.237	.278	.342	.400	.491	.618
50		.164	.193	.229	.277	.341	.428
76		.132	.155	.184	.222	.273	.344
100		.114	.134	.159	.192	.236	.297

Multiplication Factor -F

\*Connector loading is uniformly distributed.

NOTE: To determine the acceptable current carrying capacity for the percentage connector loading and wire gage indicated, use the Multiplication Factor (F) from the above chart and multiply it times the Base Rated Current for a single circuit at the maximum ambient operating temperature as shown on Figure 2A.

Figure 2B  
Current Rating

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### 3.6. Product Qualification and Requalification Tests

Test or Examination	Test Groups (a)				
	1	2(b)	3	4	5
	Test Sequence (c)				
Examination of Product	1,10	1,10	1,10	1,5	1,7
Termination Resistance, Specified Current	8				
Termination Resistance, Dry Circuit	3,7	2,9			
Dielectric Withstanding Voltage			4,8		
Insulation Resistance			3,7		
Temperature Rise vs Current		3,8			
Vibration	5	7			
Physical Shock	6				
Mating Force	2				2,5
Unmating Force	9				3,6
Contact Insertion Force			2		
Contact Retention			9		
Contact Engaging Force				2	
Contact Separating Force				3	
Crimp Tensile				4	
Durability	4	4			4
Thermal Shock (per Spec)			5		
Humidity-Temperature Cycle			6		
Industrial Mixed Flowing Gas		5			
Temperature Life		6			

(a) See Para 4.1.A

(b) Discontinuities shall not be measured for this test group. Energize per 109-151

(c) Numbers indicate sequence in which tests are performed.

Figure 3

### 3.7. Retention of Qualification Tests

Test or Examination	Test Group (a)	
	1	2
	Test Sequence (b)	
Examination of Product	1,8	1,8
Termination Resistance, Dry Circuit		3,7
Dielectric Withstanding Voltage	3,7	
Insulation Resistance	2,6	
Mating Force		2
Unmating Force		6
Durability		4
Thermal Shock	4	
Humidity-Temperature Cycling	5	5

(a) See Para 4.1.A.

(b) Numbers indicate sequence in which tests are performed.

Figure 4

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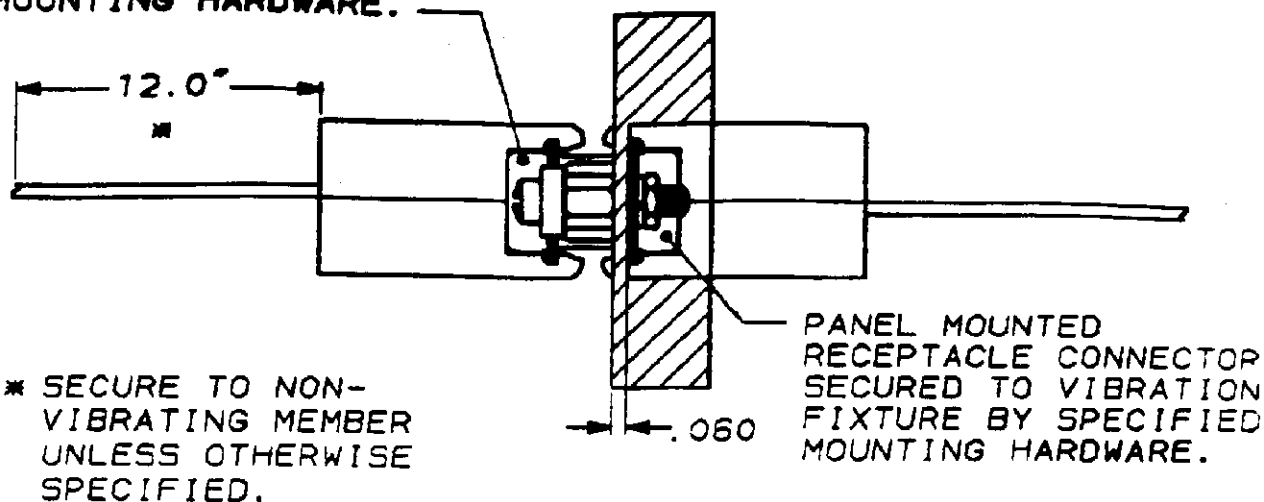
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PLUG CONNECTOR FULLY MATED AND FASTENED TO MATING CONNECTOR BY SPECIFIED MOUNTING HARDWARE.



NOTE: RECEPTACLE CONNECTOR TO BE MOUNTED ON VIBRATION FIXTURE UNLESS OTHERWISE SPECIFIED.



MOUNTING POINTS

SHELL SIZE	FIXTURE NUMBER
1	
2	
3	468165
4	
5	468166

VIBRATION LEVEL IS APPLIED TO THE SPECIFIED CONNECTOR MOUNTING AREA (  ) OF THE VIBRATION FIXTURE.

Figure 5  
Mounting and Clamping Locations  
for Vibration and Physical Shock

#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Sample Selection

Connector housings and contacts shall be prepared in accordance with applicable Instruction Sheets. They shall be selected at random from current production. Test groups shall consist of the following:

- (1) Test Groups 1 and 3  
Consist of 10, size 1 (9 position) crimp-snap connector mated pairs (plugs without grounding indents), fully loaded with crimp-snap contacts with insulation support and crimped to 24 AWG wire. Group 1 uses gold flash and 30 gold contacts. Group 3 uses only gold flash contacts. Cable clamps are to be used on all connectors. During vibration and physical shock tests screwlocks and male screws are to be used to secure the connectors.
- (2) Test Group 2  
Consists of 15 mated pairs, size 5 (50 position) crimp-snap connectors. Five mated pairs are loaded with 18 AWG wires, 5 with 24 AWG wire and 5 with 28 AWG wire. The plugs have no grounding indents, and the wires are crimped to contacts without insulation support. The contacts are gold flash plated. Cable clamps are to be used on all connectors.
- (3) Test Group 4  
Consists of 30 each of contacts with insulation support crimped to 24, 26, and 28 AWG wire. The 18, 20 and 22 AWG wires are crimped to contacts without insulation support. The contacts are gold flash plated.
- (4) Test Group 5  
Consists of 5 of each size of mated pairs fully loaded with contacts. The plugs have grounding indents. The contacts are gold flash plated.

###### B. Test Sequence

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

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#### 4.2 Retention of Qualification

If, in a five-year period, no changes to the product or process occur, the product shall be subjected to the two groups of the testing described in the test sequence, see Figure 4. Justification for exceeding this time limit must be documented and approved by the division manager.

#### 4.3. Requalification Testing

If changes significantly affecting form, fit, or function are made to the product or to the 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.

#### 4.4. 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.

#### 4.5. Quality Conformance Inspection

The applicable AMP 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.

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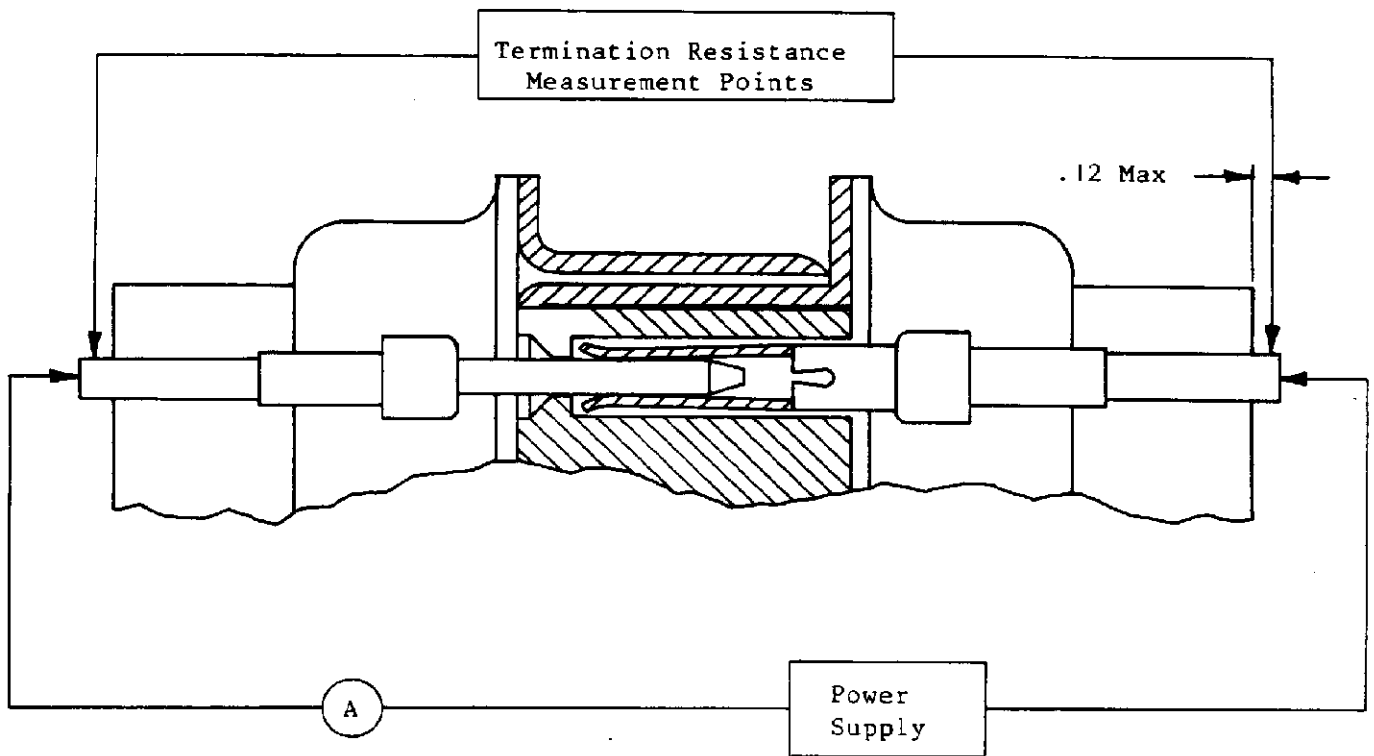


Figure 6  
Resistance Measurement Points

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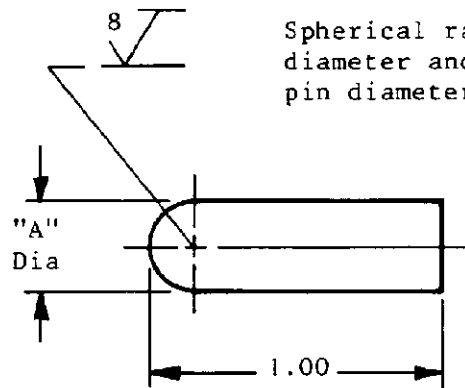
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**B**

Gage	AMP P/N	A Dia
A	92-944011-1	+ .0000 .0410 - .0001
B	92-944011-2	+ .0001 .0390 - .0000



Spherical radius shall be 1/2 the pin diameter and smoothly blended into pin diameter. See Note 2

1. Gage Material: High speed steel lapped finish to 1 microinch
2. Do not change size or finish of "A" Diameter where spherical radius blends.
3. Heat Treat to RC 62-64
4. This gage is for contact size 20

Figure 7

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A	B