
Tin Plated Non-Bifurcated Crimp Twin Leaf Connector

1. SCOPE**1.1. Content**

This specification covers the performance, tests and quality requirements for the AMP* Tin Plated Non-Bifurcated crimp twin leaf connector assemblies, used to provide a connection method between discrete wiring and printed circuit boards. Contacts are crimp type, snap-in design. These multi-contact connectors have .100, .125 and .156 inch centerline spacing between adjacent contacts.

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 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 Specifications

- 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 76: Cross-reference between AMP Test Specifications and Military or Commercial Documents

2.2. Military Standard

MIL-STD-275: Printed Wiring for Electronic Equipment

3. REQUIREMENTS

3.1. Design and Construction

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

3.2. Materials

- A. Contact: Phosphor bronze, tin plated
- B. Housing Material: Polyester, black

3.3. Ratings

- A. Current: 5 amperes maximum per contact
- B. Operating Temperature: -40° to 85°C

3.4. Performance and Test Description

Connectors shall be designed to meet the electrical, mechanical, and environmental performance requirements specified in Figure 1.

3.5. Test Requirements and Procedures Summary

| Test Description | Requirement | Procedure | |
|-------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|
| Examination of Product | Meets requirements of product drawing. | Visual, dimensional, and functional per applicable inspection plan. | |
| ELECTRICAL | | | |
| Termination Resistance, Dry Circuit (Low Level) | 10 milliohms maximum. | Subject mated contacts assembled in housing to 50 mv open circuit at 100 ma maximum, see Figure 3; AMP Spec 109-6-1. | |
| Dielectric Withstanding Voltage | Altitude, Test Voltage, rms | Test between adjacent contacts of unmated connector assemblies, and contacts to mounting hardware; AMP Spec 109-29-1. | |
| | feet | | .100cl .125cl .156cl |
| | Sea Level | | 1000 1500 1800 |
| | 50,000 | | 400 525 675 |
| | 70,000 | 280 375 450 | |
| | 5 ma leakage maximum. | | |

Figure 1 (cont)

| Test Description | Requirement | Procedure | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|--|---------|-------|----|-----|-----|-----|----|-----|-----|-----|----|-----|-----|-----|----|-----|-----|-----|----|-----|-----|-----|----|------|-----|-----|----|------|-----|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insulation Resistance | 5,000 megohms minimum initial. | Test between adjacent contacts of unmated connector assembly; AMP Spec 109-28-4 (500 vdc). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current Cycling | Termination resistance, 5 milliohms maximum. | Subject mated contacts to 50 cycles at 125% rated current for 30 minutes "ON" - 15 minutes "OFF"; AMP Spec 109-51, cond B, test method 5. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crimp Resistance | <table border="1"> <thead> <tr> <th rowspan="2">Wire Size, AWG</th> <th rowspan="2">Test Current, amperes</th> <th colspan="2">Resistance, milliohms maximum</th> </tr> <tr> <th>Initial</th> <th>Final</th> </tr> </thead> <tbody> <tr> <td>28</td> <td>1.0</td> <td>3.0</td> <td>5.0</td> </tr> <tr> <td>26</td> <td>1.0</td> <td>2.5</td> <td>4.0</td> </tr> <tr> <td>24</td> <td>3.0</td> <td>2.0</td> <td>3.3</td> </tr> <tr> <td>22</td> <td>5.0</td> <td>1.2</td> <td>2.0</td> </tr> <tr> <td>20</td> <td>7.5</td> <td>0.7</td> <td>1.2</td> </tr> <tr> <td>18</td> <td>10.0</td> <td>0.5</td> <td>0.8</td> </tr> <tr> <td>16</td> <td>12.5</td> <td>0.4</td> <td>0.7</td> </tr> </tbody> </table> | Wire Size, AWG | Test Current, amperes | Resistance, milliohms maximum | | Initial | Final | 28 | 1.0 | 3.0 | 5.0 | 26 | 1.0 | 2.5 | 4.0 | 24 | 3.0 | 2.0 | 3.3 | 22 | 5.0 | 1.2 | 2.0 | 20 | 7.5 | 0.7 | 1.2 | 18 | 10.0 | 0.5 | 0.8 | 16 | 12.5 | 0.4 | 0.7 | Measure potential drop across crimped contact between wire as it enters the wire barrel and the end of the wire barrel nearest the contact transition, Figure 6. |
| Wire Size, AWG | Test Current, amperes | | | Resistance, milliohms maximum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Initial | Final | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | 1.0 | 3.0 | 5.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | 1.0 | 2.5 | 4.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | 3.0 | 2.0 | 3.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | 5.0 | 1.2 | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 7.5 | 0.7 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | 10.0 | 0.5 | 0.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | 12.5 | 0.4 | 0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MECHANICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vibration (a) | No discontinuities greater than 1 microsecond; no physical damage. | Subject connectors mated with P.C. Board to 10-55-10 Hz traversed in 1 minute at .06 inches total excursion; 2 hours in each of 3 mutually perpendicular planes; AMP Spec 109-21-1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Shock (a) | No discontinuities greater than 1 microsecond; no physical damage. | Subject mated connector with P.C. Board to 100 G's sawtooth in 6 milliseconds; 3 shocks in each direction applied along the 3 mutually perpendicular planes total 18 shocks; AMP Spec 109-26-9. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 1 (cont)

| Test Description | Requirement | Procedure | | | | | | | | | | | | | | | | |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----|-----|----|-----|----|-----|----|------|----|------|----|------|----|------|----------------------------------------------------------------------|
| Connector Mating Force | 20 ounces maximum per contact pair. | Measure force necessary to mate connector assembly from point in initial contact, with maximum thickness gage .070 (Figure 5) incorporating free floating fixtures at a rate of 0.5 inch/minute; AMP Spec 109-42, cond A calculate force per contact. | | | | | | | | | | | | | | | | |
| Contact Retention (Crimped Contacts) | Contacts shall not dislodge from its normal locking position. | Apply axial load of 8 pounds to contacts lead; AMP Spec 109-30. | | | | | | | | | | | | | | | | |
| Contact Engaging Force | 20 ounces maximum per contact pair. | Measure force to engage using gage 1, as indicated in Figure 5; AMP Spec 109-35. | | | | | | | | | | | | | | | | |
| Contact Separating Force | .7 ounces minimum per contact pair. | Size 3 times using gage 1, as indicated in Figure 5, insert gage 2 and measure force to separate; AMP Spec 109-35. | | | | | | | | | | | | | | | | |
| Crimp Tensile | <table border="1"> <thead> <tr> <th>Wire Size, AWG</th> <th>Tensile Strength, pounds minimum</th> </tr> </thead> <tbody> <tr> <td>28</td> <td>3.0</td> </tr> <tr> <td>26</td> <td>5.0</td> </tr> <tr> <td>24</td> <td>8.0</td> </tr> <tr> <td>22</td> <td>12.0</td> </tr> <tr> <td>20</td> <td>20.0</td> </tr> <tr> <td>18</td> <td>30.0</td> </tr> <tr> <td>16</td> <td>42.0</td> </tr> </tbody> </table> | Wire Size, AWG | Tensile Strength, pounds minimum | 28 | 3.0 | 26 | 5.0 | 24 | 8.0 | 22 | 12.0 | 20 | 20.0 | 18 | 30.0 | 16 | 42.0 | Determine crimp tensile at a rate of 1 inch/minute; AMP Spec 109-16. |
| Wire Size, AWG | Tensile Strength, pounds minimum | | | | | | | | | | | | | | | | | |
| 28 | 3.0 | | | | | | | | | | | | | | | | | |
| 26 | 5.0 | | | | | | | | | | | | | | | | | |
| 24 | 8.0 | | | | | | | | | | | | | | | | | |
| 22 | 12.0 | | | | | | | | | | | | | | | | | |
| 20 | 20.0 | | | | | | | | | | | | | | | | | |
| 18 | 30.0 | | | | | | | | | | | | | | | | | |
| 16 | 42.0 | | | | | | | | | | | | | | | | | |
| Durability | No physical damage. | Mate and unmate connector assemblies for 15 cycles with gage 1, Figure 5; AMP Spec 109-27. | | | | | | | | | | | | | | | | |

Figure 1 (cont)

| Test Description | Requirement | Procedure |
|----------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| ENVIRONMENTAL | | |
| Humidity-Temperature Cycling (a) | No physical damage. 1000 megohms final insulation resistance. | Subject mated connectors to 10 humidity-temperature cycles between 25° and 65°C at 95% RH; AMP Spec 109-23, method III, cond B, and cold shock at -10°C. |
| Thermal Shock (a) | No physical damage. | Subject mated connectors to 5 cycles -40°C to 85°C; AMP Spec 109-22. |

(a) Shall show no evidence of damage, cracking or chipping.

Figure 1 (end)

3.6. Connector Qualification and Requalification Tests and Sequences

| Test or Examination | Test Group (a) | | |
|-------------------------------------|-------------------|------|-----|
| | 1 | 2 | 3 |
| | Test Sequence (b) | | |
| Examination of Product | 1 | 1 | 1 |
| Termination Resistance, Dry Circuit | 3,12 | 2,11 | |
| Dielectric Withstanding Voltage | 5,11 | 4 | |
| Insulation Resistance | 4,10 | 3 | |
| Crimp Resistance | | | 2,4 |
| Current Cycling | | | 3 |
| Vibration | | 9 | |
| Physical Shock | | 10 | |
| Mating Force | 2 | | |
| Contact Retention | 13 | 12 | |
| Contact Engaging Force | | 5 | |
| Contact Separating Force | 8 | 6,8 | |
| Crimp Tensile | | | 5 |
| Durability | 7 | 7 | |
| Humidity-Temperature Cycling | 9 | | |
| Thermal Shock | 6 | | |

(a) See Para 4.1.A.

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

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. They shall be selected at random from current production. Test group 1 and 2 shall consist of three samples of the greatest number of positions of each connector type offered. Two additional specimens shall be selected from the least number of positions offered and tested to Test Group 2. Test group 3 shall consist of 30 contacts of each style and desired wire size. When connectors are required to be mated, mating boards shall conform to Figure 4.

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 1.

C. Acceptance

- (1) Test results from development on pre-qualification samples will be used to determine upper and lower one-sided statistical tolerance limits for 99% reliability at 95% confidence, as follows. Let \bar{X} and s denote the sample average and standard deviation, respectively, of the test data. Let k denote the normal distribution one-sided tolerance factor for 95% confidence and 99% reliability. The value of k varies with sample size. Values of k are given in various tables, for example, NBS Handbook 91, Factors for One-Sided Tolerance Limits for Normal Distribution. Suitability of the normal distribution for representing the data shall be verified with normal probability plots, goodness of fit tests, etc.

Then the upper one-sided tolerance limit for 99% reliability at 95% confidence is given by $\bar{X} + ks$. The interpretation of this tolerance limit is as follows: based on the test data, and assuming a normal distribution for the test data, we can be 95% confident that 99% of the population of values represented by the sample data will not exceed $\bar{X} + ks$. For any test parameter for which there is specified an upper requirement which is not to be exceeded, satisfactory performance of the product is achieved when the value of $\bar{X} + ks$ does not exceed the requirement value.

The lower one-sided tolerance limit for 95% confidence and 99% reliability is given by $\bar{X} - ks$. This has a similar interpretation and corresponding application to lower requirement values.

- (2) 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.

4.2. Requalification Testing

Requalification shall be established by the cognizant divisional engineering function and may consist of all or any part of the overall qualification program provided that it is conducted within the required time period.

4.3. Quality Conformance Inspection

The applicable AMP 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.

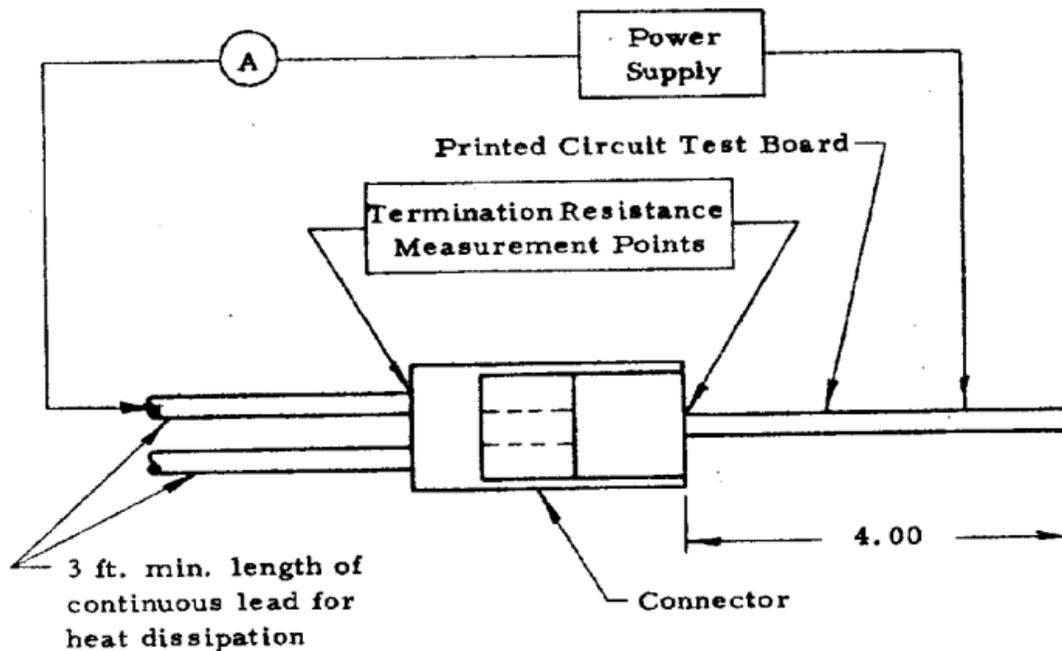
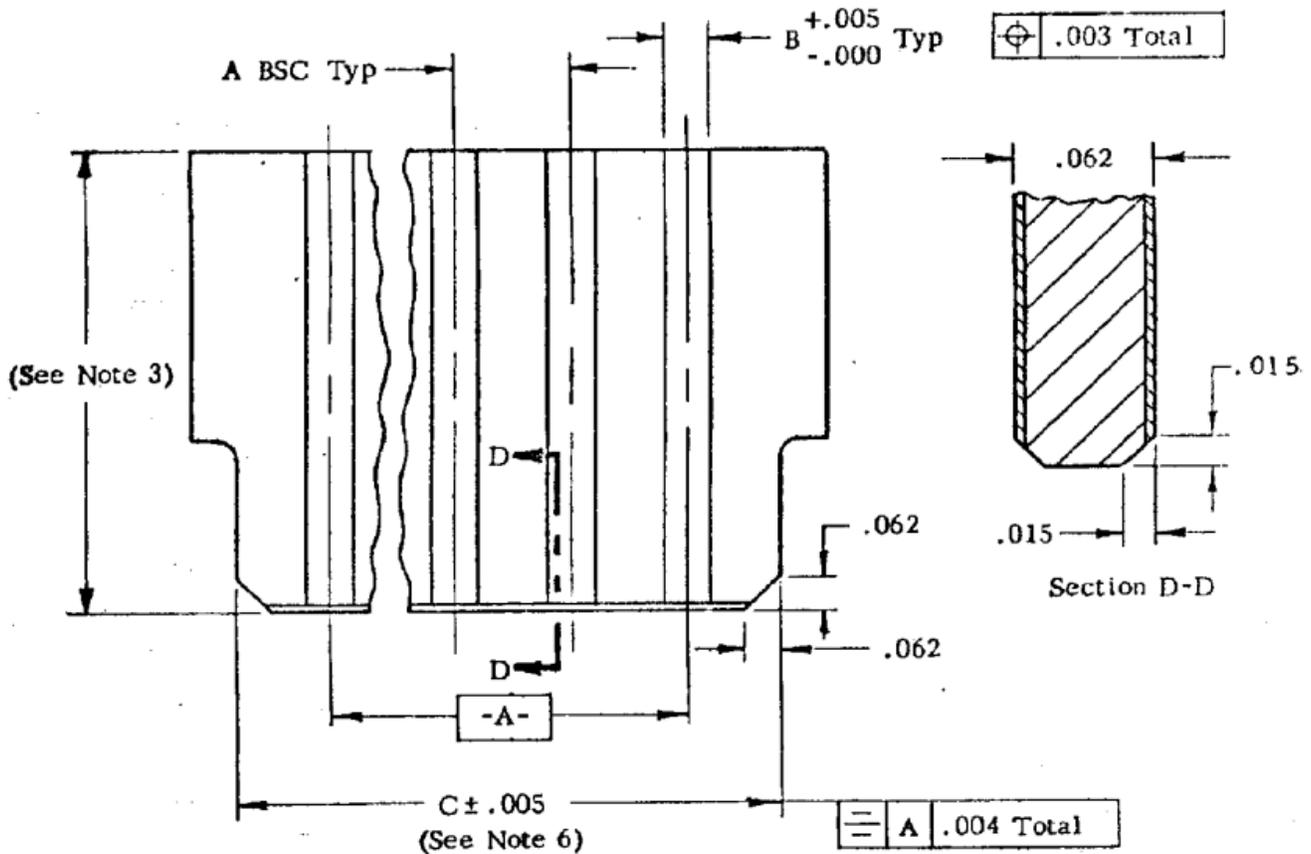


Figure 3

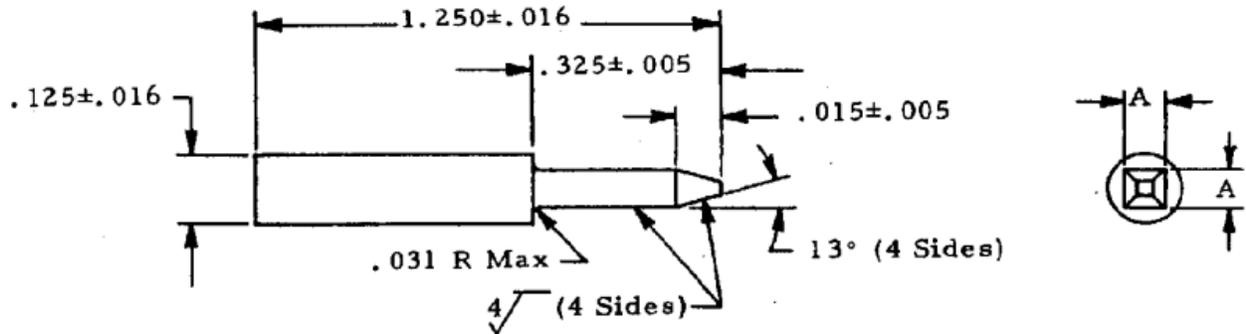
Termination Resistance



- Notes:
1. Dimensions are in inches.
 2. Unless otherwise specified, tolerance is $\pm .005$.
 3. The test card shall extend $4.00 \pm .02$ from the receptacle after insertion.
 4. Number of contacts shall be the same as on the corresponding printed wiring connector.
 5. Printed circuit test board shall be 2 oz copper and tin/lead over nickel plated per MIL-STD-275.
 6. This dimension shall be the minimum connector card slot length minus .005.
 7. Conductor configuration optional beyond card slot depth.
 8. Printed wiring shall be identical on both sides.

| Connector Contact Spacing | A BSC | B |
|---------------------------|-------|------|
| .100 | .100 | .052 |
| .125 | .125 | .078 |
| .156 | .156 | .094 |

Figure 4
Mating Card

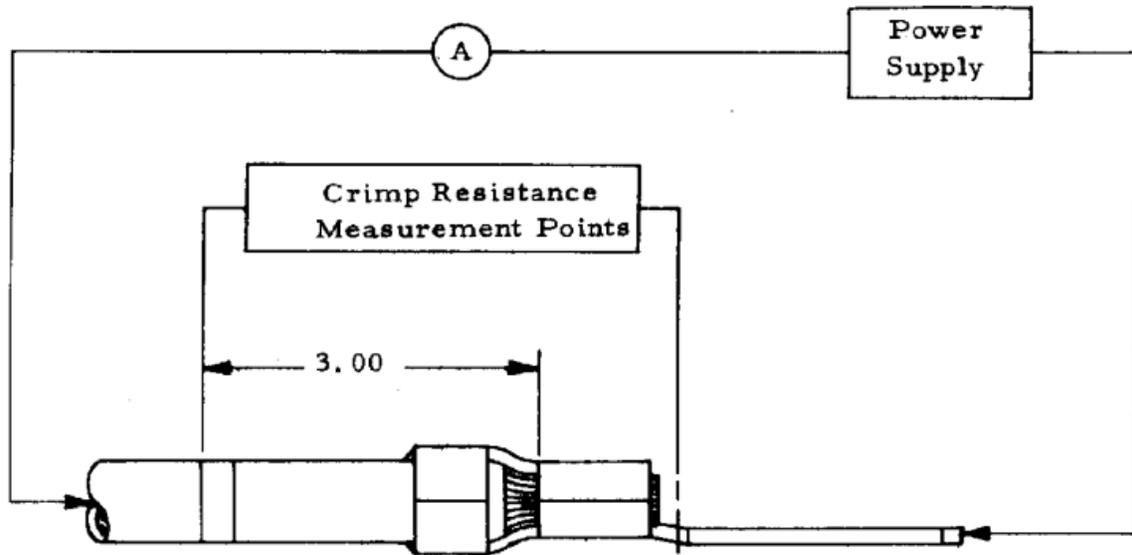


- Notes:
1. Tolerance: $\pm .005$ or $\pm 2^\circ$ as applicable, unless otherwise specified.
 2. Material: Tool steel, AISI type 02 per AMP Specification 100-15.
 3. Heat treat: Rockwell C50-55.
 4. Gage Surface shall be clean of contaminants or lubricants.

| Gage | A |
|------|-------------|
| 1 | .070 inches |
| 2 | .054 inches |

Figure 5

Force and Durability Gages



Note: The resistance of 3 inches of wire shall be measured and that amount deducted from the total value so as to show only the crimp resistance.

Figure 6

Crimp Resistance Test Circuit