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## Commercial MATE-N-LOK\* Printed Circuit Board Headers

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### 1. SCOPE

#### 1.1. Content

This specification covers the performance, tests and quality requirements for the AMP\* commercial MATE-N-LOK\* printed circuit board headers. These headers provide a highly reliable and economical means of interfacing with printed circuit boards in today's home entertainment centers, appliances, vending machines, computers and other sophisticated commercial equipment.

#### 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 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. 114-1012: Contact, Pin and Socket, MATE-N-LOK, Commercial
- D. 501-63: Test Report

### 3. REQUIREMENTS

#### 3.1. Design and Construction

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

3.2. Materials

- A. Pin: Copper alloy 194, pre-tin
- B. Socket: Phosphor bronze, pre-tin
- C. Housing: Nylon 6/6, UL 94V-2

3.3. Ratings

- A. Current/Voltage: 250 vac at 12 amperes maximum
- B. Operating Temperature: -55° to 105°C

3.4. Performance and Test Description

Headers 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 and AMP Spec 114-1012.	Visual, dimensional and functional per applicable inspection plan.															
<b>ELECTRICAL</b>																	
Termination Resistance, Specified Current	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Wire Size, AWG</th> <th>Test Current, ampere</th> <th>Resistance, milliohms maximum initial</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>4.5</td> <td>3.25</td> </tr> <tr> <td>18</td> <td>6.0</td> <td>3.25</td> </tr> <tr> <td>16</td> <td>8.0</td> <td>3.25</td> </tr> <tr> <td>14</td> <td>10.0</td> <td>3.25</td> </tr> </tbody> </table>	Wire Size, AWG	Test Current, ampere	Resistance, milliohms maximum initial	20	4.5	3.25	18	6.0	3.25	16	8.0	3.25	14	10.0	3.25	Measure potential drop of mated contacts assembled in housing, see Figures 4 & 5; AMP Spec 109-25, calculate resistance.
Wire Size, AWG	Test Current, ampere	Resistance, milliohms maximum initial															
20	4.5	3.25															
18	6.0	3.25															
16	8.0	3.25															
14	10.0	3.25															
Termination Resistance Dry Circuit (Low Level)	3.25 milliohms maximum initial	Subject mated contacts assembled in housing to 50 mv open circuit at 100 ma maximum, see Figures 4 & 5; AMP Spec 109-6-1.															
Dielectric Withstanding Voltage	1 kvac dielectric withstanding voltage, one minute hold.	Test between adjacent contacts of mated connector assemblies; AMP Spec 109-29-1.															
Insulation Resistance	500 megohms minimum initial.	Test between adjacent contacts of mated connector assembly; AMP Spec 109-28-4.															

Figure 1 (cont)

Test Description	Requirement	Procedure
Temperature Rise vs Current (a)	Temperature rise, see Figure 2; termination resistance, specified current.	T=rise at rated current specified in Figure 2; AMP Spec 109-45-1.
Current Cycling	3.75 milliohms maximum termination resistance, specified current.	Subject mated contacts to 500 cycles at 125% rated current for 15 minutes "ON" - 15 minutes "OFF"; AMP Spec 109-51, cond B, test method 2.
<b>MECHANICAL</b>		
Vibration (b)	No discontinuities greater than 10 microseconds. 3.75 milliohms maximum termination resistance, dry circuit.	Subject mated connectors to 10-55-10 Hz traversed in 1 minute at .06 inch total excursion; 2 hours in each of 3 mutually perpendicular planes; AMP Spec 109-21-1.
Mating Force	5 pounds maximum initial.	Measure force necessary to mate connector assembly without latches, a distance of .100 from point of initial contact, incorporating free floating fixtures at a rate of 0.5 inch/minute; AMP Spec 109-42, cond A calculate force per contact.
Unmating Force	.7 pounds minimum final.	Measure force necessary to unmate connector assembly with locking latches removed, at a rate of 0.5 inch/minute; AMP Spec 109-42, cond A calculate force per contact.

Figure 1 (cont)

Test Description	Requirement	Procedure
Durability	4.0 milliohms maximum termination resistance, dry circuit; unmating force.	Mate and unmate connector assemblies for 50 cycles at a maximum rate of 500 cycles/hour; AMP Spec 109-27.
Housing Lock Strength	25 pounds minimum for 6-15 circuits and 1 pound minimum for 2,3 and 4 circuits.	Determine strength of housing locking mechanism; AMP Spec 109-50.
ENVIRONMENTAL		
Thermal Shock (b)	Dielectric withstanding voltage; insulation resistance; 5.0 milliohm maximum termination resistance, dry circuit.	Subject mated connectors to 25 cycles between -55° and 105°C; AMP Spec 109-22.
Humidity-Temperature Cycling	100 megohms final insulation resistance; 5.0 milliohms maximum termination resistance, dry circuit.	Subject mated connectors to 10 humidity-temperature cycles between 25° and 65°C at 95% RH; AMP Spec 109-23, method III, cond B, with low frequency vibration and cold shock at -10°C.
Industrial Mixed Flowing Gas	3.75 milliohms maximum termination resistance, dry circuit.	Subject mated connectors to environmental class III for 20 days; AMP Spec 109-85-3.

- (a) Maximum rated current that can be carried by this product is limited by maximum operating temperature of housings, which is 105°C, and temperature rise of contacts, which is 30°C. Variables which shall be considered for each application are: wire size, connector size, contact material, and ambient temperature.
- (b) Shall remain mated and show no evidence of damage, cracking or chipping.

Figure 1 (end)

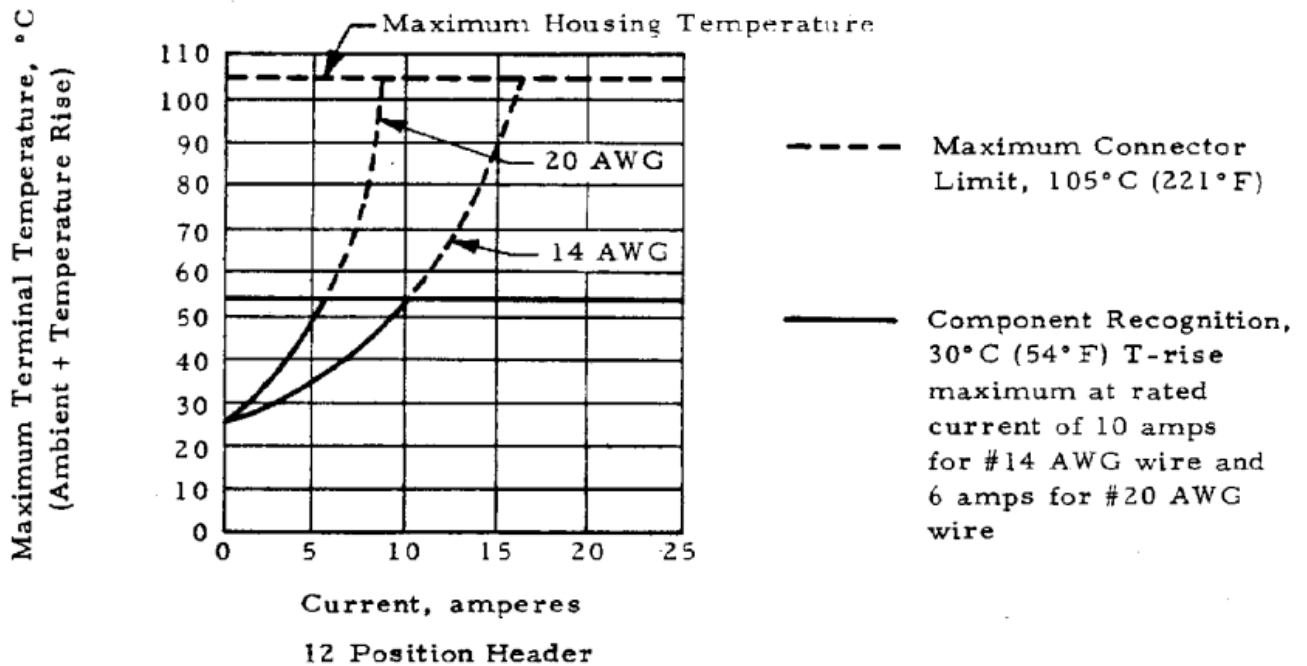
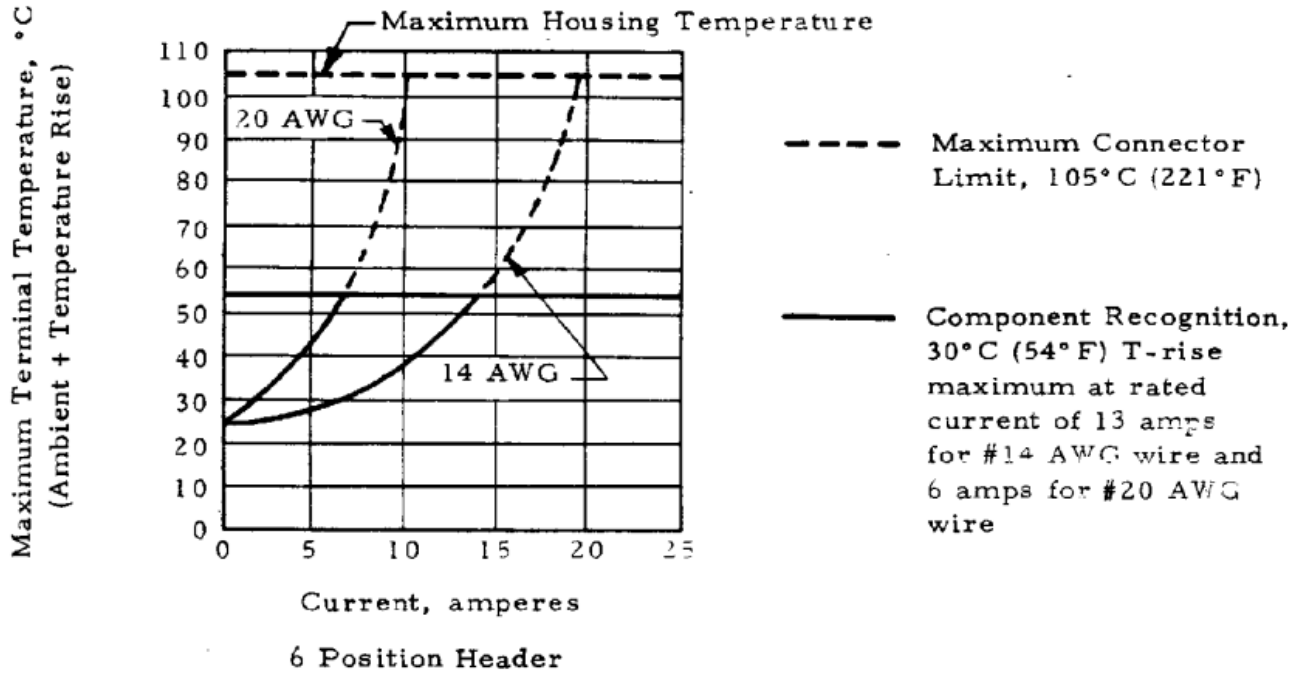
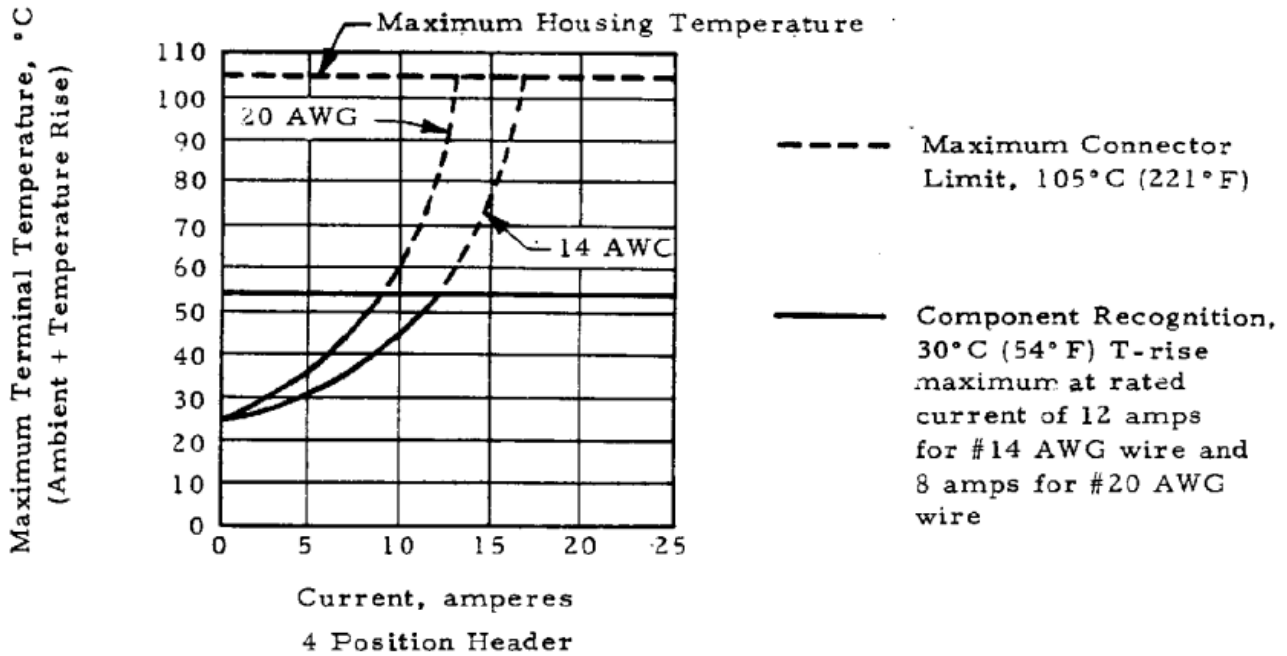


Figure 2 (cont)



Terminal vs Current/Circuit, Phosphor Bronze Contacts  
Figure 2 (end)

### 3.6. Header Tests and Sequences

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Examination of Product	1	1	1	1	1
Termination Resistance, Specified Current	2,4,6				
Termination Resistance, Dry Circuit		2,4	4,7	2,4,6	
Dielectric Withstanding Voltage			8	7	
Insulation Resistance			9	8	
Temperature Rise vs Current	3				
Current Cycling	5				
Vibration				3	
Mating Force			2		
Unmating Force			5		
Durability			3		
Housing Lock Strength					2
Thermal Shock			6		
Humidity-Temperature Cycling				5	
Industrial Mixed Flowing Gas		3			

(a) See Para 4.1.A.

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

Figure 3



#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification and Retention of 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 shall consist of 2 connectors for each requirement of Figure 2. Test groups 2, 3 and 4 shall consist of 5 random connector assemblies. Test group 5 shall consist of 2 connectors of each locking style. Group 3 shall be used for retention of qualification. All contacts shall be crimped to appropriate PN 103501 and 103502 tin plated test conductors in accordance with AMP Specification 114-1012.

###### B. Test Sequence

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

###### 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.

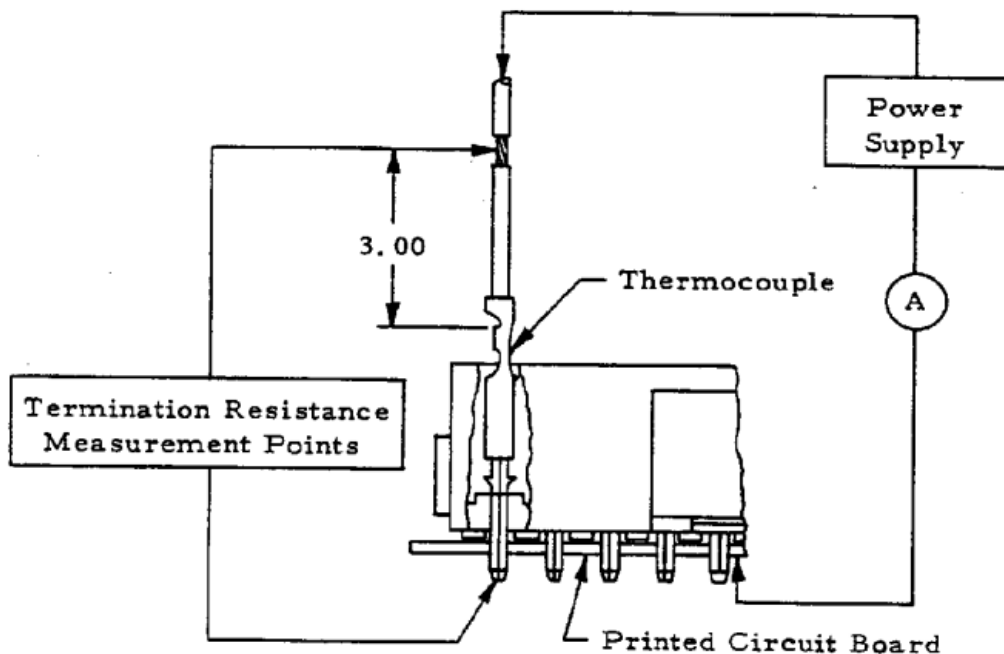
Then the upper one-sided tolerance limit for 99% reliability at 95% confidence is given by  $\bar{X} + ks$ . The interpretation of this tolerance limit is as follows: based on the test data, and assuming a normal distribution for the test data, we can be 95% confident that 99% of the population of values 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. 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.



- Notes:
1. A 1 foot minimum length of continuous lead for heat dissipation.
  2. Termination resistance equals millivolts divided by test current less resistance of 3 inches of wire.
  3. Printed circuit board is 2 ounce copper single side.

Figure 4

Resistance and Temperature Measurement Points



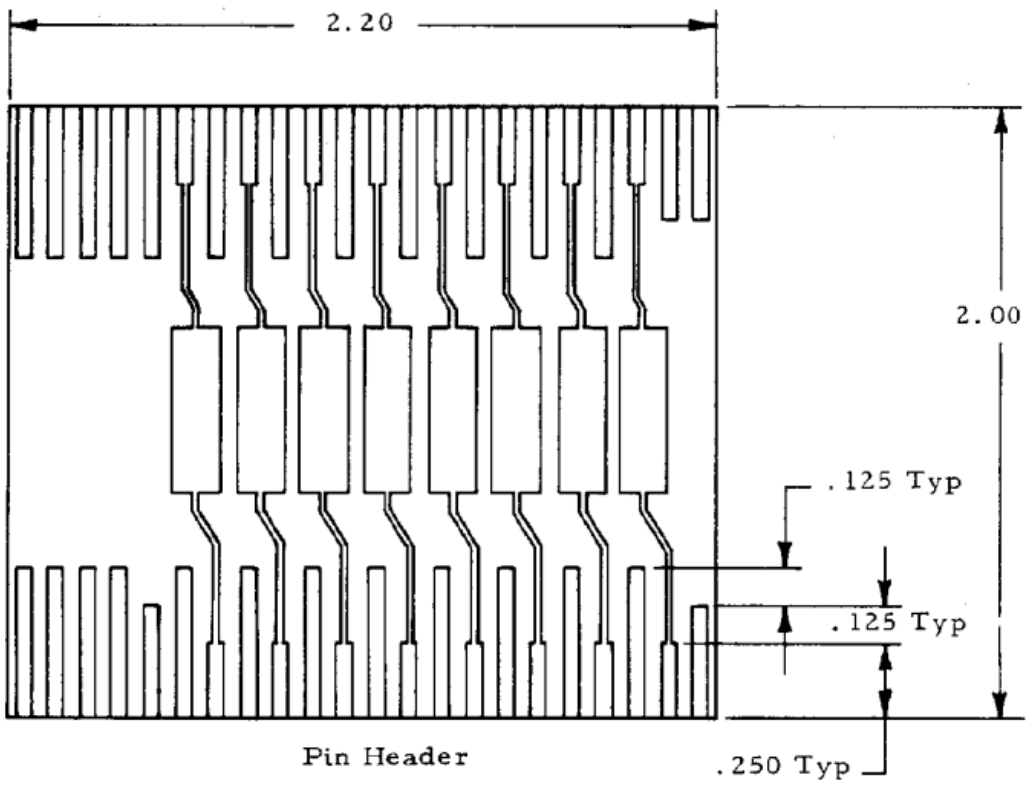
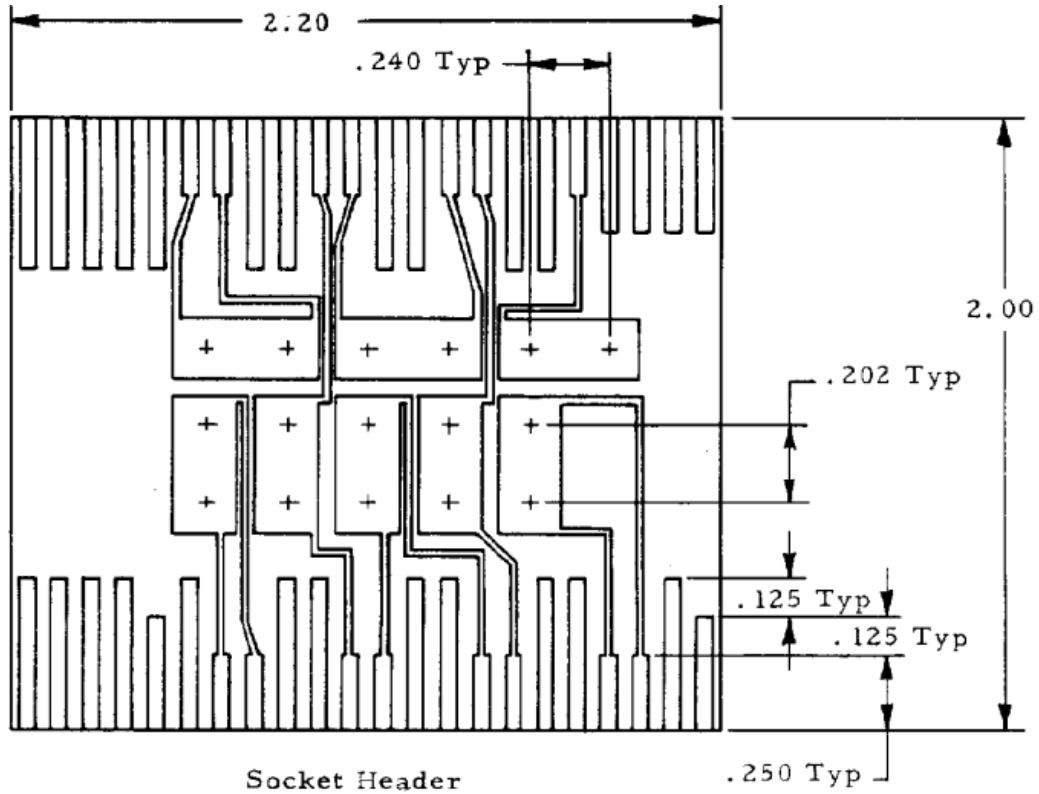


Figure 5