

Connectors Using Box Type Contacts

1. **SCOPE:** This specification covers the performance requirements and test procedures for connectors using box type female receptacles and pins mounted in plastic housings.

1.1 TYPICAL APPLICATION -

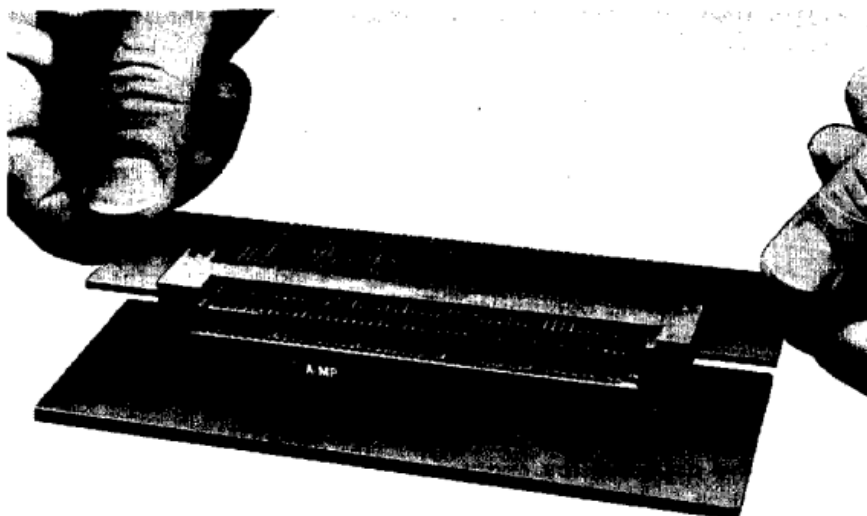


FIGURE 1

2. **REFERENCED DOCUMENTS:** The following documents form a part of this specification to the extent indicated herein.

2.1 MILITARY AND FEDERAL SPECIFICATIONS -	
MIL-G-45204	Gold Plating; Electrodeposited
QQ-C-533	Beryllium Copper
QQ-B-626B	Brass, Leaded and Non-Leaded
QQ-N-290	Nickel Plating; Electrodeposited
MIL-M-14F	Molding Plastic and Molded Plastic Parts
MIL-C-50	Copper Alloy Number 260 (Cartridge Brass, 70%); Sheet, Strip, Plate, Bar, & Discs
QQ-A-250/1	Aluminum Alloy, Plate and Sheet

- 2.2 AMP SPECIFICATIONS -
 - AMP 109-3 Millivolt Drop Method for Measuring Resistance of Electrical Connections
 - AMP 109-1 Definitions of Terms and Methods used in AMP Test Specifications
 - AMP 106-502 Manufacturing Process Specification for Hand Soldering of Electrical Connections for High Reliability Requirements
- 2.3 MILITARY STANDARDS -
 - MIL-STD-202 Test Methods for Electronic and Electrical Component Parts
- 3. DEFINITIONS: For purposes of this specification the following definitions shall apply. See Figure 1 for typical application.
 - 3.1 FEMALE CONNECTOR ASSEMBLY - A female connector assembly consists of a plastic housing containing the box receptacle contacts. The assembly is fastened to the printed card and will mate with the male connector assembly.
 - 3.2 MALE CONNECTOR ASSEMBLY - A male connector assembly consists of a plastic housing containing pin contacts. The connector assembly has contacts projecting from the rear of the housing which are designed to be soldered to the terminal areas on a printed wiring board.
 - 3.3 BOX RECEPTACLE CONTACT - The receptacle contact is a stamped and formed copper alloy contact having a square receptacle on one end, and a tab on the other end to provide for through-hole mounting to a printed wiring board or tabs with eyelets to facilitate wire terminations.
 - 3.4 PIN CONTACT - A pin contact is a round or square copper alloy contact having a pin on one end and a formed contact on the other end. When the contact is assembled into a housing the formed end extends from the rear of the housing and provides a means of connecting to the printed wiring board.
- 4. PHYSICAL REQUIREMENTS, ELECTRICAL AND MECHANICAL CHARACTERISTICS:
 - 4.1 MATERIAL AND FINISH - Material and finish shall be as specified herein. If a substitute material is used, the performance requirements of this specification must be met.
 - 4.1.1 MATERIAL AND FINISH -
 - 4.1.1.1 BOX RECEPTACLE CONTACT - The female box contact shall be fabricated from Beryllium Copper conforming to QQ-C-533.

- 4.1.1.2 **BOX PIN CONTACT** – The male pin contact shall be fabricated from brass conforming to QQ-B-626B or MIL-C-50.
- 4.1.1.3 **CONTACT HOUSING** – The molded housing shall be made from material conforming to MIL-M-14, Type SDG-F.
- 4.1.1.4 **CONTACT FINISH** – The contacts shall be plated with gold conforming to MIL-G-45204 with an underplate of nickel conforming to QQ-N-290. The plating thickness shall be as specified on applicable product drawings.
- 4.1.2 **ELECTRICAL AND MECHANICAL CHARACTERISTICS** –
 - 4.1.2.1 **CURRENT RATING** – The maximum continuous current ratings for the individual contacts of the connector of this specification shall be three amperes, except as limited in Paragraph 4.1.2.2.
 - 4.1.2.2 **TEMPERATURE RATINGS** – The connectors of this specification are rated for continuous operation at an upper temperature limit of +125°C. and a lower temperature limit of -65°C. Ambient temperature conditions and current loading of contacts shall be considered in determining whether these limits are exceeded. At an ambient temperature of 30°C. a current of 2.25 amperes through all contacts creates a connector body temperature of +125 °C.

5. PERFORMANCE REQUIREMENTS AND TEST METHODS:

- 5.1 **QUALIFICATION** – Qualification of the product covered by this specification shall be accomplished by using the samples specified in Paragraph 5.1.1. The samples shall be representative of production, and shall be tested to the sequence specified in Table III.
 - 5.1.1 **TEST SAMPLES** – Six male and female connectors shall be provided for test. The parts shall be wired or assembled in accordance with the applicable boards of Figures 2, 3, or 3A, after satisfactory completion of Paragraph 5.2.1. The soldering materials, methods, and techniques used in preparation of the test samples shall be in accordance with AMP Specification 106-502.
 - 5.1.1.1 **SPARE PARTS** – An additional two connectors of the size being qualified shall be obtained at the same time the test samples specified in 5.1.1 are selected. These samples should be held as spare parts for use in any comparative tests or test equipment set-up that may be required. After qualification, un-used spare parts may be re-entered into inventory.
 - 5.1.2 **TEST REPORTS** – All testing results shall be recorded in the form of actual measured values whenever possible. A formal report containing test data, analysis and product performance evaluation shall be issued at the completion of the qualified test program.

5.1.3 TEST REQUIREMENTS - Unless specifically stated, tests and examinations required by this specification shall be conducted under any combination of conditions within the ranges listed below.

Temperature: 20° to 30°C.

Relative Humidity: 30 to 80 percent

Barometric Pressure: 29 to 31 inches of mercury

Any single specified condition shall not affect the other two ambient ranges.

5.2 EXAMINATION OF PRODUCT - Components when checked in accordance with 5.2.1 shall meet the dimensional and plating requirements of applicable product drawings and/or engineering specifications.

5.2.1 EXAMINATION OF PRODUCT - The test samples specified in 5.1.1 shall be measured prior to testing, using standard inspection tools such as micrometers, comparators, etc., for conformance to appropriate product drawings and attached figures. The measured values shall meet the requirements of 5.2.

5.3. INSULATION RESISTANCE - When tested in accordance with 5.3.1, the insulation resistance shall not be less than 5,000 megohms.

5.3.1 INSULATION RESISTANCE - The mated assemblies shall be tested in accordance with Method 302, Test Condition B of MIL-STD-202. The insulation resistance between 5 random adjacent contacts in each test sample shall be measured and recorded. The measured values shall meet the requirements of 5.3.

5.4 DIELECTRIC STRENGTH - When tested in accordance with 5.4.1 the mated assemblies shall show no evidence of flashover or corons when the voltages specified in Table I are applied for one minute.

TABLE I

ALTITUDE	TEST VOLTAGE RMS
Sea Level	900
25,000 Feet	600
50,000 Feet	300

5.4.1 DIELECTRIC STRENGTH - The mated assemblies shall be tested in accordance with Method 301 of MIL-STD-202 at the simulated altitudes shown in Table I. The test voltage shall be applied between all adjacent contacts until the voltage specified in 5.4 is reached. The specified voltage shall be held for one minute. The test voltage shall be applied at the rate not exceeding 500 volts per second.

5.5 TERMINATION RESISTANCE -

TABLE II
RESISTANCE IN MILLIOHMS
Initial 15 After Test 20

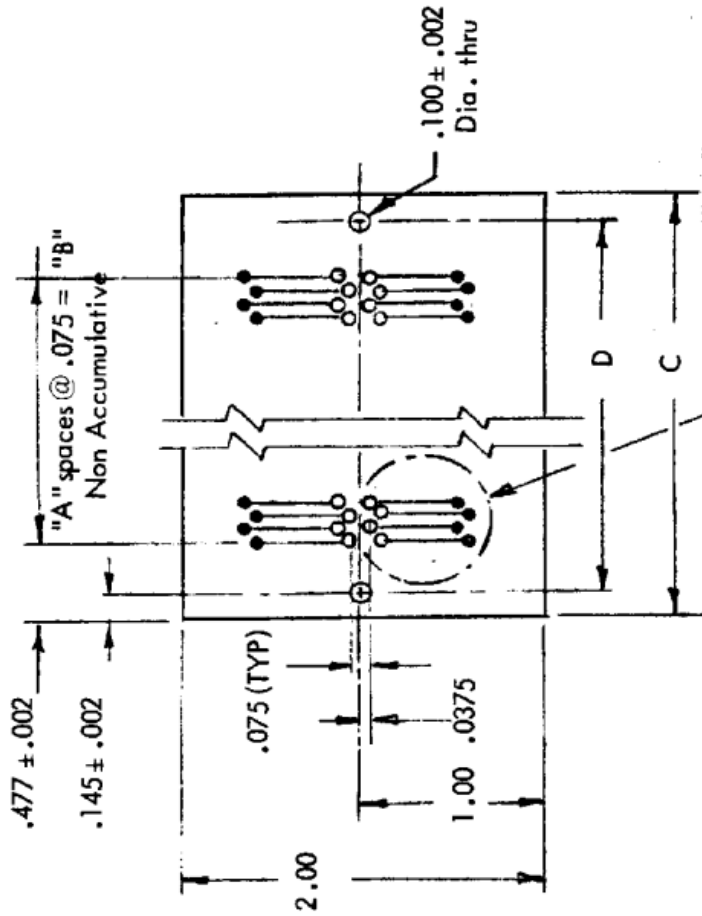
- 5.5.1 TERMINATION RESISTANCE - Low Current - When tested in accordance with 5.5.1.1 the resistance shall not exceed the applicable value specified in Table II.
- 5.5.1.1 TERMINATION RESISTANCE - Low Current - The resistance of contacts shall be measured in accordance with AMP 109-3. The test current shall be 10 milliamps. The open circuit voltage shall be limited to a maximum of 50 millivolts. Five random contacts shall be measured in each test sample at the points shown in applicable part of Figure 4. The measured values shall meet the requirements of 5.5.1.
- 5.5.2 TERMINATION RESISTANCE - Rated Current - When tested in accordance with 5.5.2.1 the resistance shall not exceed the applicable values specified in Table II.
- 5.5.2.1 TERMINATION RESISTANCE - Rated Current - The resistance shall be tested in accordance with Method 307 of MIL-STD-202, except that alternating current may be used. The test current shall be 2 amperes and the measurements shall be made at the points shown on the applicable part of Figure 4. Five random contacts shall be measured in each test sample. The measured values shall meet the requirements of Paragraph 5.5.2.
- 5.6 VIBRATION - The mated connector assemblies shall be tested in accordance with 5.6.1. There shall be no cracking, breaking, or loosening of parts nor loss of continuity of any contact circuits greater than one microsecond.
- 5.6.1 VIBRATION - The mated connectors shall be vibrated in accordance with Method 204, Condition D of MIL-STD-202. All contacts shall be series wired and shall be connected to a suitable testing circuit with 0.1 ampere flowing through the contacts. The assembly shall be rigidly mounted in a suitable fixture and held together by positive means. Contacts shall be monitored for continuity during and after test. The connectors shall meet the requirements of Paragraph 5.6.
- 5.7 CONTACT SEPARATION FORCE - When tested in accordance with 5.7.1, the force to separate the steel pin shall not be less than 0.1 ounces.

- 5.7.1 **CONTACT SEPARATION FORCE** – The female connector assemblies shall be supported and the test pin aligned with the individual receptacle contact. The pin shall be inserted into the receptacle and the force to remove the pin measured and recorded. Five random contacts shall be measured in each sample, they shall be the same contacts measured for termination resistance. The test pin shall be made in accordance with Figure 6. The measured values shall meet the requirements of Paragraph 5.7.
- 5.8 **DURABILITY** – When tested in accordance with 5.8.1, the assembly shall show no evidence of mechanical or electrical damage. After cycling, the assemblies shall meet the After Test Termination Resistance requirements of Paragraph 5.5 and the Sea Level dielectric requirements of Paragraph 5.4. When visually examined there shall be no evidence of broken or damaged parts.
- 5.8.1 **DURABILITY** – The assemblies shall be mated and unmated 500 times. The mating and unmating shall be accomplished at a rate not exceeding 600 cycles per hour. Upon completion of the cycling the assemblies shall meet the requirements of 5.8.
- 5.9 **TEMPERATURE CYCLING** – When tested in accordance with 5.9.1, the connector assemblies shall show no evidence of physical damage. The connector assembly shall be capable of being mated and unmated at the temperature extremes specified in 5.9.1.
- 5.9.1 **TEMPERATURE CYCLING** – The unmated connector assemblies shall be subjected to temperature cycling in accordance with Method 102, Test Condition C of MIL-STD-202. Tests for mating and unmating shall be conducted during the fifth cycle of the test at the minimum and maximum temperatures and meet the requirements of 5.9.
- 5.10 **SALT SPRAY** – When tested in accordance with 5.10.1, the assemblies shall meet the requirements of Paragraph 5.5.1. Testing shall not cause sufficient corrosion to interfere with mating and unmating of the assemblies.
- 5.10.1 **SALT SPRAY** – The unmated assemblies shall be subjected to the salt spray test in accordance with Method 101, Test Condition B of MIL-STD-202. The salt solution concentration shall be five percent. At the completion of the exposure period, the samples shall be washed and air dried for a minimum of 12 hours at 38°C. Upon the first mating the assemblies shall meet the requirements of 5.10.
- 5.11 **SHOCK** – When tested in accordance with 5.11.1, the assemblies shall show no evidence of mechanical failure of metallic or dielectric materials, nor have any loss of continuity greater than one microsecond.

- 5.11.1 **SHOCK** - The mated assemblies shall be subjected to a shock test in accordance with Method 205, Condition C of MIL-STD-202. All contacts shall be series wired and shall be connected to a suitable testing circuit with 0.1 ampere flowing through the contacts. Contacts shall be monitored for continuity. During and after these tests the assemblies shall meet the requirements of Paragraph 5.11.
- 5.12 **MOISTURE RESISTANCE** - After being subjected to the conditioning specified in 5.12.1 the insulation resistance shall not be less than 5,000 megohms when measured in accordance with Paragraph 5.3.
- 5.12.1 **MOISTURE RESISTANCE** - The unmated assemblies shall be subjected to humidity testing in accordance with Method 106 of MIL-STD-202, except that Step 7b is not required. Assemblies shall be dried for 24 hours at ambient temperature following exposure to humidity. Upon completion of humidity conditioning and drying the samples shall meet the requirements of Paragraph 5.12.
- 5.13 **CONNECTOR MATING AND UNMATING FORCE** - When tested as specified in 5.13.1, the mating and unmating force shall not exceed 8 ounces per contact for connectors utilizing round pins with a nominal diameter of .030 inches and 4 ounces per contact for connectors utilizing square shaped pins having a .025 effective diameter.
- 5.13.1 **CONNECTOR MATING AND UNMATING FORCE** - The connector halves with printed wiring boards shall be mated and unmated and the forces measured. The values obtained shall be divided by the number of contacts and the values obtained shall comply with 5.13.
- 5.14 **RESISTANCE TO PROBE TEST DAMAGE** - After being tested in accordance with 5.14.1, the individual contacts shall meet the requirements for After Test Termination Resistance, Paragraph 5.5.2 and Contact Separation Force, Paragraph 5.7.
- 5.14.1 **RESISTANCE TO TEST PROBE DAMAGE** - The test shall be performed on five contacts in each connector, using the fixture shown in Figure 5, the contacts measured shall be the same contacts measured for termination resistance and separation forces. With the weight in position for a 4 inch ounce bending movement, insert the pin into a receptacle while the axis of the receptacle is in a horizontal position. With the fixture free and unsupported, rotate the connector 360 degrees about a horizontal axis, maintaining the receptacle in a horizontal position. After withdrawal of the fixture, the receptacle shall meet the requirements of Paragraph 5.14.

TABLE III
CONNECTOR QUALIFICATION TESTING

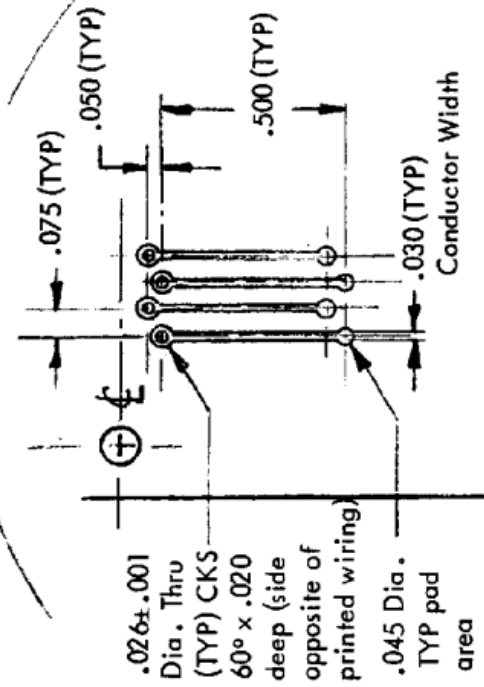
TEST SEQUENCE	REQUIREMENT PARAGRAPH	TEST GROUP
Examination of Product	5.2	X
Termination Resistance Low Current	5.5.1	X
Termination Resistance Rated Current	5.5.2	X
Insulation Resistance	5.3	X
Dielectric	5.4	X
Resistance to Probe Damage	5.14	X
Termination Resistance Rated Current	5.5.2	X
Contact Separation	5.7	X
Temperature Cycling	5.9	X
Connector Mating and Unmating	5.13	X
Vibration	5.6	X
Shock	5.11	X
Moisture Resistance	5.12	X
Insulation Resistance	5.3	X
Durability	5.8	X
After Test Termination Resistance Rated Current	5.5.2	X
Sea Level Dielectric	5.4	X
Salt Spray	5.10	X
Termination Resistance Low Current	5.5.1	X



"A"	"B"	"D"	"C"
4	.300	.965	1.255
9	.675	1.340	1.630
13	.975	1.640	1.930
14	1.050	1.715	2.005
19	1.425	2.090	2.380
24	1.800	2.465	2.755
29	2.175	2.840	3.130
34	2.550	3.215	3.505
39	2.925	3.590	3.880
44	3.300	3.965	4.255
49	3.675	4.340	4.630
54	4.050	4.715	5.005
59	4.425	5.090	5.380
89	6.675	7.340	7.630

NOTES:

1. Tolerances: $\pm .002$ on dimension .075 & less.
 $\pm .010$ on dimension .076 & over.
2. Material: G-10 Epoxy - Glass Laminated
2 ounce copper clad one side.
3. Board Thickness: $.062 \pm .0075$.
4. This board is for connectors covered by drawing #202844.

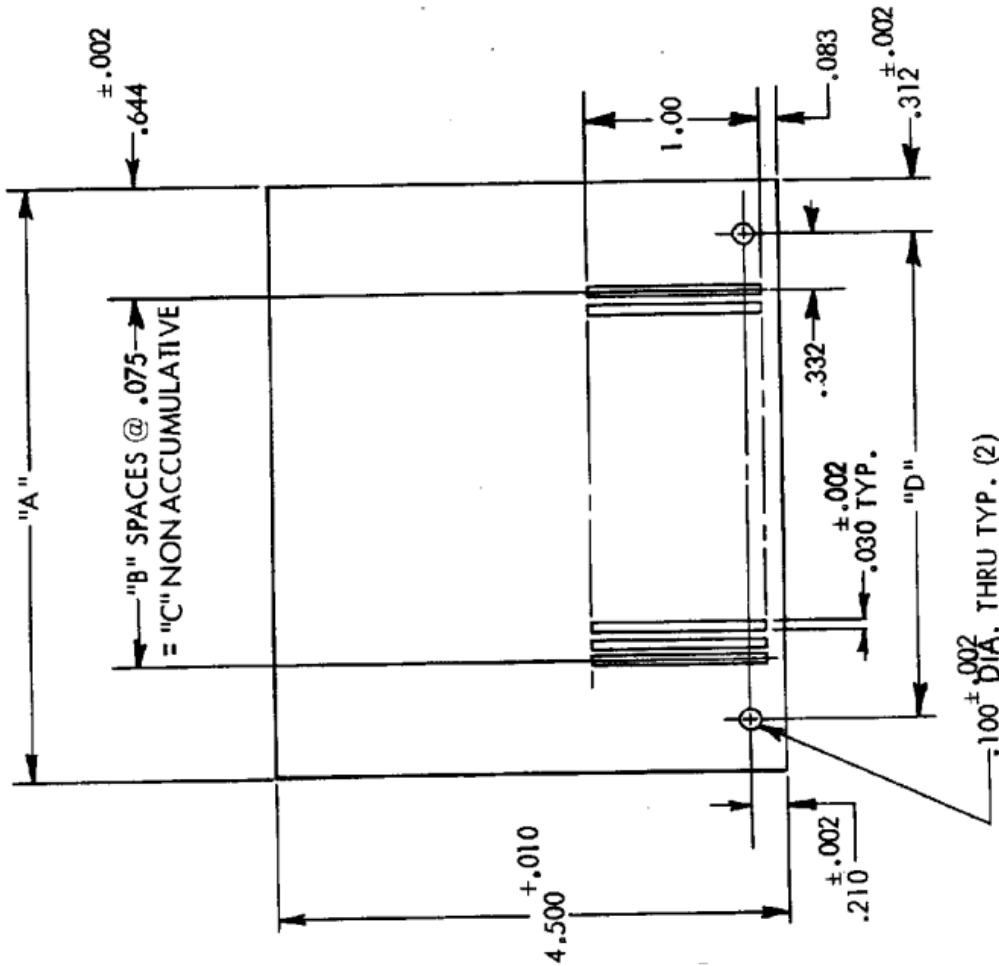


TEST BOARD for MOUNTING RECEPTACLE CONNECTOR ASSEMBLY
FIGURE 2

POS.	"A"	"B"	"C"	"D"
10	1.589	4	.300	.965
20	1.964	9	.675	1.340
28	2.264	13	.975	1.640
30	2.339	14	1.050	1.715
40	2.714	19	1.425	2.090
50	3.089	24	1.800	2.465
60	3.464	29	2.175	2.840
70	3.839	34	2.550	3.215
80	4.214	39	2.925	3.590
90	4.589	44	3.300	3.965
100	4.964	49	3.675	4.340
110	5.339	54	4.050	4.715
120	5.714	59	4.425	5.090
150	6.839	74	5.550	6.215
180	7.964	89	6.675	7.340

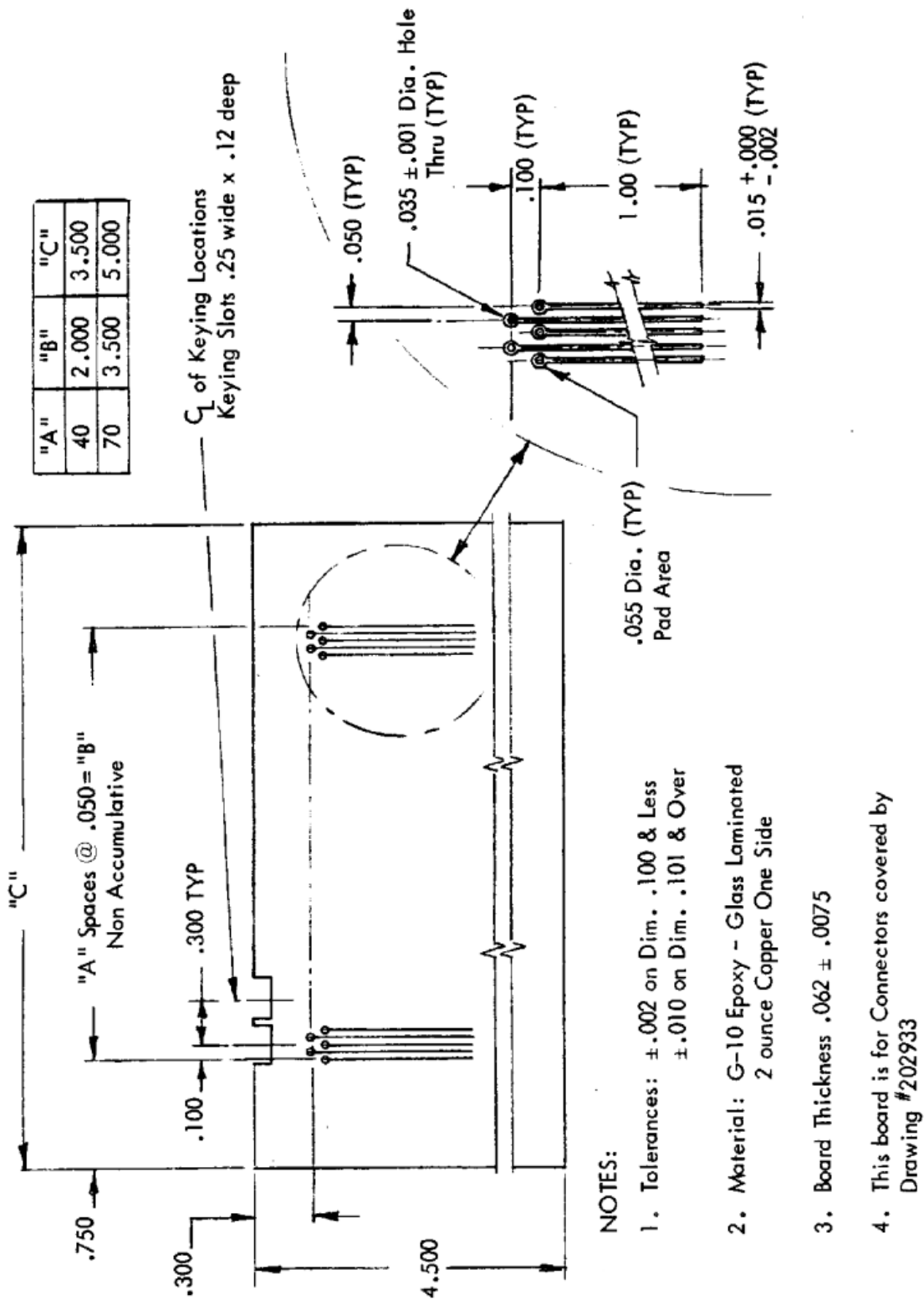
NOTES:

1. TOLERANCES: $\pm .002$ on Dim.
 $.075$ & less. $\pm .010$ on Dim.
 $.076$ & over.
2. MATERIAL: G-10 Epoxy-Glass
Laminated 2 Ounce Copper Clad.
2 Sides.
3. BOARD THICKNESS $.062 \pm .0075$.



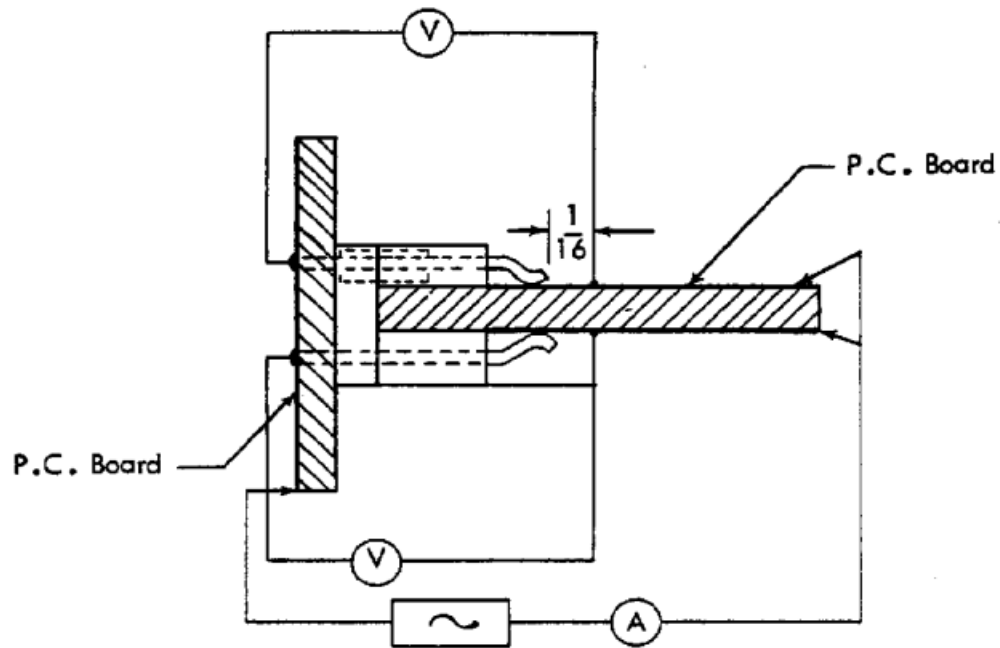
TEST BOARD for MOUNTING PIN HEADER ASSEMBLY

FIGURE 3



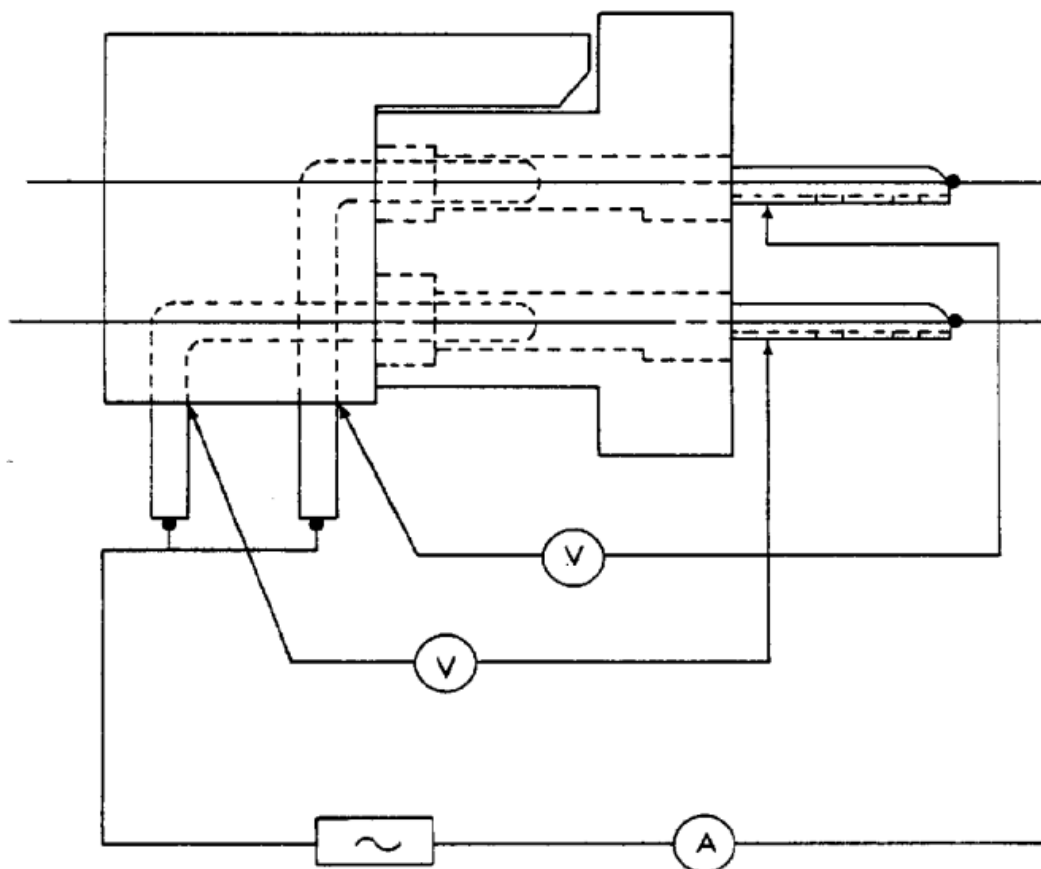
TEST BOARD for MOUNTING RIGHT ANGLE PIN HEADER

FIGURE 3A



MEASURING TERMINATION RESISTANCE for
Part Numbers 202845, Pin Header and 202844, Receptacle Assembly

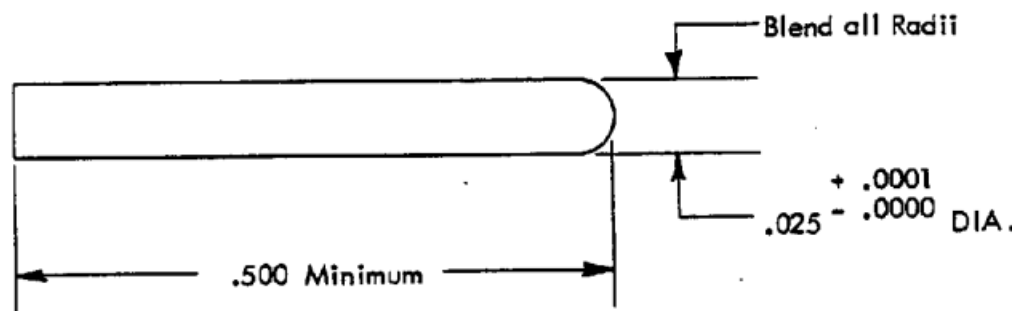
FIGURE 4



MEASURING TERMINATION RESISTANCE for
Part Numbers 202933, Pin Header and 202932, Receptacle Assembly

FIGURE 4A





MATERIAL: Van Keuren Alloy Steel

FINISH: 2 to 10 Micro Inch RMS

GAGE PIN

FIGURE 6

SUBMITTED BY:

R E Wine
Specifications Engineer

11-8-66
Date

APPROVED BY:

R. H. Tuel
Product Engineer

11-8-66
Date

John S. Lighter
Product Engineering Supv.

11-14-66
Date

W. A. Rust
Reliability Engineer

11/10/66
Date

Albert L. Brunkhardt Jr.
Test Laboratory

11-9-66
Date