

MILITARY SPECIFICATION

MICROPHONE, DYNAMIC M-92/U

This specification has been approved by the
Bureau of Naval Weapons, Department of the Navy.

1. SCOPE

1.1 Scope - This specification covers hand-held Dynamic Microphone M-92/U with self-contained transistor amplifiers for use in military equipment.

1.2 Classification - The microphone shall be of one type and shall consist of the following items:

<u>Item</u>	<u>Type Designation</u>	<u>Appl. Para.</u>
Microphone, Dynamic	M-92/U	3.4.1
<u>Mountings</u>		
Holder, Micro- phone	MT-2014/U	3.4.2

2. APPLICABLE DOCUMENTS

2.1 General - The following documents of the issue in effect on the date of invitation for bids, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-P-642	Plugs, Telephone
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-C-6166	Cord, Headset-Microphone, CX-1301/AR
MIL-I-6181	Interference Limits and Tests; Aircraft Electrical and Electronic Equipment
MIL-P-15035	Plastic Material, Laminated, Thermosetting; Sheets, Cotton-Fabric Base, Phenolic-Resin

MIL-P-17555 Preparation for Delivery of Electronic Equipment, Miscellaneous Electrical Equipment (Except Rotating Electrical Equipment) and Associated Repair Parts

MIL-N-18307 Nomenclature and Nameplates for Airborne Electronic and Associated Equipment

STANDARDS

Federal

Fed. Test Method-Std. No. -151 Metals; General Specification for Inspection of

2.2 Availability of Documents -

- (1) When requesting specifications, standards, drawings, and publications refer to both title and number. Copies of this specification and applicable specifications required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Naval Supply Depot, Code CDS, 5801 Tabor Avenue, Philadelphia 20, Pennsylvania.

3. REQUIREMENTS

3.1 Qualification - The microphones furnished under this specification shall be a product which has been tested, and has passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable qualified products list.

3.2 Parts and Materials - In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. In so doing the following shall govern:

- (1) Parts and materials requirements shall conform to Specification MIL-E-5400.
- (2) Nonrepairable subassemblies, as outlined in specification MIL-E-5400, shall be used when practicable. The general size of the subassembly, and the amount of circuitry to be included therein shall be approved by the Bureau of Naval Weapons. Nonrepairable subassemblies must be reliable. A mean-time-to failure of more than 5000 hours should be the goal of each.
- (3) When previously produced models of this equipment did not use nonrepairable subassemblies, the design shall not be changed to employ nonrepairable assemblies without the approval of the Bureau of Naval Weapons.

3.2.1 Nonstandard Parts and Material Approval - Approval for the use of nonstandard parts and materials shall be obtained as outlined in Specification MIL-E-5400.

3.3 General Design Requirements -

3.3.1 General - The equipment shall conform with all the applicable requirements of Specification MIL-E-5400 for design, construction and workmanship, unless otherwise specified herein.

3.3.2 Service Conditions - The microphone shall operate satisfactorily under any of the environmental and mechanical service conditions or reasonable combination of these conditions as specified in Specification MIL-E-5400 for Class I equipment except that the requirements for Sand and Dust shall not apply.

3.3.2.1 Altitude - Operation at altitudes in excess of 15,000 feet is not required.

3.3.3 Standard Conditions - The following conditions shall be used as a basis to establish normal performance requirements and for making laboratory bench tests on the microphone.

Temperature	Room ambient (30° ±10°C)
Altitude	Normal ground
Vibration	None
Humidity	Room ambient up to 90% relative humidity

3.3.4 Weight - The weight of the microphone and holder assembly, M-92/U and MT-2014/U shall not be greater than 12.0 ounces.

3.3.5 Marking - Each microphone unit shall be permanently and legibly marked as shown in Figure 1. The manufacturer's trademark may be added if desired.

3.3.6 Interchangeability - The equipment shall meet the interchangeability requirements as defined in Specification MIL-E-5400.

3.3.7 Operational Stability - The microphone shall operate with optimum performance for 500 hours, continuously or intermittently.

3.3.8 Operating Life -

3.3.8.1 Reliable Operating Life - The microphone shall have a reliable operating life of at least 1000 hours without removal for bench servicing. Parts requiring servicing or replacement at the end of this interval to renew this service life shall be specified by the manufacturer.

3.3.8.2 Total Operating Life - The microphone shall have a minimum total operating life of 5000 hours with reasonable servicing and replacement of parts. Parts requiring replacement within this interval and the life of such parts shall be specified by the manufacturer.

3.3.9 Nomenclature and Nameplates - Nomenclature assignment and nameplate approval for equipment identification shall be in accordance with the requirements of Specification MIL-N-18307.

3.3.10 Provisions for Maintenance and Field Testing - The microphone shall provide for ease of maintenance to the greatest extent practicable. Provisions for field testing shall be as specified in Specification MIL-E-5400.

3.3.11 Radio Interference Control - The generation of radio interference by the microphone and the vulnerability of the microphone to radio interference shall be controlled within the limits of Specification MIL-I-6181. Audio susceptibility requirements, as applicable to direct power input leads from either A. C. or D. C. aircraft power sources, shall not apply to the equipment specified herein.

3.3.12 Contacts - All metal parts of the microphone unit which makes electrical contact with the switch in the handgrip shall be made of coin silver or shall be heavily silver plated. Contact shall be effected by spring pressure. All electrical contacts of the switch mechanism shall be of coin silver.

3.3.13 Metal Switch Parts - Metal switch parts, except contacts, shall be beryllium copper or phosphor bronze in accordance with Federal Test Method-Std. No. 151.

3.3.14 Case - The case shall be molded in one piece of plastic material. The front plate shall be removable and shall be made of plastic material.

3.3.15 Insulating and Case Materials - Insulating and case materials shall comply with the following requirements, as applicable.

3.3.15.1 Laminated Plastic-Material - Laminated plastic-material shall be in accordance with Specification MIL-P-15035 type FBE.

3.3.15.2 Molded Plastic-Material - Molded plastic-material shall be in accordance with Specification MIL-M-14. Type CFG shall be used where electrical properties are predominant. Type CFI-10 shall be used where mechanical properties are predominant.

3.3.15.3 Insulating and Impregnating Compounds - All such compounds including varnishes, waxes and the like, shall be suitable in every respect for each particular application. Under all service conditions including test conditions outlined in Section 4 of this specification, the compound shall adequately preserve the dielectric strength of the insulation to which it is applied. A compound shall not, either in the state of its original application or as a result of aging under severe service conditions, show any injurious effect upon the insulation it is designed to protect, and shall not cause corrosion or deterioration of adjacent metal or plastic parts.

3.3.15.4 Cementing Compounds - Any cementing compound used in the construction of the microphone shall be of such a character and quality that it will withstand all service conditions including test conditions outlined in Section 4 of this specification without evidence of loosening or otherwise affecting the performance requirements of the microphone.

3.3.16 Cleaning and Finishing of Metal Parts -

3.3.16.1 Cleaning - Where cleaning operations on metal parts are not specified in detail, they shall be in accordance with the best suitable commercial practice.

3.3.16.2 Aluminum Alloys - Where aluminum alloy parts are employed they shall be cleaned by immersion in a hot caustic or other suitable solution until etched, rinsed thoroughly in clean cold water, immersed in nitric acid until the remaining caustic is neutralized, and thoroughly rinsed in cold, then hot water. Anodic treatment is not prohibited, but masking shall be employed where necessary to retain the quality of the original metal at areas where good electrical contact is necessary.

3.3.16.3 Other Non-Ferrous Metals and Alloys - Copper, Brass, Bronze, Beryllium-Copper and other similar materials shall be plated or otherwise suitably finished or enclosed to provide protection against corrosion and deterioration. The kind of plating or finish applied shall depend upon the characteristics of the individual part and its use in the microphone. The plating or finish used for each individual part shall be such as to provide good appearance, corrosion and deterioration resistance, and long life for that part. Various problems such as soldering, fitting, assembly, reaction with adjacent parts and the like, must be considered in the selection of the plating or finish.

3.3.16.4 Soldering Flux - Only resin, or resin and alcohol, may be used as a flux in the assembly of this equipment or any part thereof, except that an acid flux may be used on all-metal, non-electrical sub-assemblies provided that they are thoroughly and completely cleaned of all traces of the acid immediately after the soldering operation has been completed.

3.4 Detail Requirements - The design and assembly of the microphone shall be such that the microphone is inherently stable as to mechanical and electrical characteristics. The detailed mechanical and electrical design of the microphones shall be accomplished by the contractor, subject to the requirements of this specification. The requirements are detailed herein only to the extent considered necessary to obtain the desired mechanical and electrical characteristics and performance, and permanence of the same.

3.4.1 Microphone, Dynamic M-92/U - The microphone shall meet the following requirements:

3.4.1.1 Function - The microphone shall convert normal speech input to electrical signals suitable for connection into the speech amplifiers and/or modulators of radio or audio equipment. The microphone shall discriminate in favor of the speech signals and against ambient noise.

3.4.1.2 Form Factor - The microphone shall not weigh in excess of 10.5 ounces and shall have the dimensions shown in Figure 1.

3.4.1.3 Contents of the Unit - The microphone shall be composed of the following:

- (1) Microphone Back Assembly, including the push-button, switch, cordage and plug as illustrated in Figure 4.
- (2) Transmitter Assembly, including the microphone element and the microphone amplifier. The element and the amplifier shall be designed to be compatible with each other.

3.4.2 Holder, Microphone MT-2014/U - The microphone holder shall meet the design and construction requirements as follows:

3.4.2.1 Holder - The microphone holder shall conform to the dimensions shown in Figure 2 and shall be suitable for permanent installation. It shall be designed so that the microphone can be quickly and easily stowed or removed by one hand. It shall hold the microphone securely regardless of position. Its weight shall not exceed 1.5 ounces.

3.4.3 Cordage - The cordage shall be retractile, shall have three conductors, shall have the dimensions shown in Figure 3, and shall be in accordance with Specification MIL-C-6166 except as follows:

3.4.3.1 Anchorage - The cordage shall be anchored at the microphone and at connector. The anchorages shall withstand a tension test of 20 pounds with the wires not connected.

3.4.3.2 Connector - One end of the cordage shall be equipped with a plug, type PJ-068, in accordance with Specification MIL-P-642.

3.5 Performance -

3.5.1 Sensitivity - The audio output of the microphone, when measured as specified in paragraph 3.5.2 at a sound pressure level of 115 db above 0.0002 dyne per sq. cm. and at a frequency of 1000 cps, shall be 50 ± 3 db above 1 millivolt. The sensitivity of the microphone shall not vary by more than 3 db after being subjected to any, or all, of the service conditions specified herein. At an altitude of 10,000 feet the sensitivity shall not fall below the sensitivity at sea level by more than 3 db.

3.5.2 Frequency Response - The frequency response of the microphone, when measured as specified in paragraph 3.5.3.2, compared to the response of 50 ± 3 db at 1000 cycles, shall be within the limits shown in Table I. However, the difference between any two successive readings, 100 cps apart up to 1000 cps or 250 cps apart above 1000 cps, shall not exceed 2.5 db, under all standard and service conditions.

TABLE I

<u>Frequency in CPS</u>	<u>Allowable Variation in Response from 1000 CPS Value in DB</u>	
300 cps	-10	-5
400 cps	-8	-4
500 cps	-7	-3
600 cps	-6	-2
700 cps	-4	0
800 cps	-2	0
900 cps	-1	0
1000 cps	0	0

TABLE I (Continued)

<u>Frequency in CPS</u>	<u>Allowable Variation in Response from 1000 CPS Value in DB</u>	
1250 cps	-1	0
1500 cps	-2	0
1750 cps	-2	-1/2
2000 cps	-3	-1
2250 cps	-5	-1 1/2
2500 cps	-7	-2
2750 cps	-7	-2
3000 cps	-7	-2
3250 cps	-7	-2
3500 cps	-7	-2
3750 cps	-7	-2
4000 cps	-7	-2

3.5.3 Noise-Immunity Characteristic - Under standard conditions the signal-to-noise ratio shall be at least 15 db in favor of the signal when measured in accordance with 4.5.2 and 4.5.3.3.

3.5.4 Distortion - At any frequency between 300 and 6000 cps when the sound pressure at the face of the microphone is 115 db above 0.0002 dyne per square centimeter, the harmonic distortion in the output of the microphone shall not exceed 4% under standard conditions or 5% under service conditions except at temperatures lower than -40°C and above +55°C the harmonic distortion shall not exceed 8%.

3.5.5 Linearity - The output voltage of the microphone shall be a linear function within ten per cent, of the input sound pressure in the range of 80 db to 125 db above 0.0002 dyne per square centimeter.

3.5.6 Impedance - The impedance of the microphone shall be within 100 ± 20 ohms between 300 to 4000 cps under standard or service conditions and shall be measured in accordance with 4.5.3.4.

3.5.7 Pressure Equalization - The response of the microphone at 1000 cps shall not vary by more than 4 db from the reference established at 15,000 feet while the microphone is subjected to a pressure increase corresponding to a descent from an altitude of 15,000 feet (16.7 inches of mercury) to sea level (30.0 inches of mercury) at a rate of 5000 feet per minute.

3.5.8 Stray Magnetic Field - The stray magnetic field of the microphone shall not cause more than a 3 degree deflection of a magnetic compass when tested as required by 4.5.12.

3.5.9 Microphone Current - The microphone current shall not be less than 7 ma, nor more than 10 ma, when the supply voltage is 27.5 ± 0.5 volts dc. The dc voltage shall not exceed 28.0 volts. (In environmental testing, the dc current shall not exceed 15 ma at +71°C and shall not be less than 5 ma at -54°C.)

3.5.10 Switch Action - The switch shall be contained in the hand grip and shall be of the plunger type having an axial movement of approximately 1/8 inch. It shall be designed for operation by a heavily gloved hand. The pressure required to depress the switch fully shall not exceed 4 pounds. A pressure of at least 1.5 pounds shall be required to hold the switch closed. The switch shall not have a detent action. The closing of the audio and the control contacts shall occur approximately simultaneously. The switch shall be capable of at least 100,000 operations without mechanical or electrical failure.

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of Tests - The sampling, inspection and test of Microphones, M-92/U, shall be classified as follows:

- (1) Qualification Tests - Qualification Tests are those tests accomplished on samples submitted for qualification as a satisfactory product.
- (2) Acceptance Tests - Acceptance Tests are those tests accomplished on microphone units manufactured and submitted for acceptance under contract.
 - (a) Individual Tests - Individual Tests are those tests conducted on each equipment submitted for acceptance under the contract.
 - (b) Sampling Tests - Sampling Tests are those tests accomplished on a quantity of equipments as approved by the Bureau of Naval Weapons and which have previously passed Individual Tests.
- (3) Life Tests - Life Tests shall be conducted by the contractor at his plant. These tests shall be started as soon as practicable on an early production equipment.

4.2 Qualification Tests - Qualification Tests are to be made on samples submitted for qualification as satisfactory production units. These tests shall be conducted at a laboratory and under conditions satisfactory to the procuring activity and shall consist of all the tests listed in 4.4, Table II. Ten units shall be submitted for qualification tests. Modifications required as a result of these tests shall be incorporated in the microphones prior to resubmission for qualification. Requests for authorization of qualification tests shall be addressed to the Bureau of Naval Weapons. (See 6.2.)

4.3 Acceptance Tests - The contractor shall furnish all samples and shall be responsible for accomplishing the required tests under the supervision of the cognizant Government Inspector. Contractors not having laboratory testing facilities satisfactory to the Government for sampling tests shall engage the services of a commercial testing laboratory acceptable to the Bureau of Naval Weapons. The contractor shall furnish test reports, in duplicate, via the cognizant Government Inspector, showing quantitative results for all tests required by this specification, and signed by an authorized representative of the contractor or laboratory as applicable. Acceptance or approval of material during course of manufacture shall in no case be construed as a guaranty of the acceptance of the finished product.

4.4 Tests Required - The microphone sample shall be subjected to the tests listed in Table II and any other tests deemed necessary by the Bureau of Naval Weapons or the cognizant Government Inspector to determine compliance of the microphones with the requirements of this specification.

TABLE II

<u>Inspection or Test</u>	<u>Test Procedure</u>	<u>Qualification Test</u>	<u>Ind. Tests</u>	<u>Sampl. Tests</u>
Visual & Mechanical	4.5.3.1	X	X	X
Response Measurements	4.5.3.2	X		X
Response Measurements (Individual Tests)	4.5.3.5		X	
Stray Magnetic Field Measurement	4.5.3.14	X		X
Impedance	4.5.3.4	X	X	X
Signal-to-Noise Ratio	4.5.3.3	X	X	X
Interference	4.5.3.13	X		X
Humidity	4.5.3.10	X		
Temperature Cycling	4.5.3.9	X		X

TABLE II (Continued)

<u>Inspection or Test</u>	<u>Test Procedure</u>	<u>Qualification Test</u>	<u>Ind. Tests</u>	<u>Sampl. Tests</u>
Temperature Extremes	4.5.3.7	X		
Salt Spray	4.5.3.8	X		
Distortion	4.5.3.11	X		X
Vibration	4.5.3.12	X		
Impact	4.5.3.15	X		X
Pressure Cycling	4.5.3.6.1	X		
Pressure Equalization	4.5.3.6.2	X		X
Life Test	4.8	X	(See 4.8.3)	

4.5 General Test Procedure -

4.5.1 Test Circuit Apparatus - The test circuit apparatus shall be assembled and connected as shown on Figures 5 and 6 and shall consist of the equipment described as follows:

4.5.1.1 Audio Oscillator - The audio oscillator shall have a waveform distortion not greater than .5 per cent. It shall be used with a high quality amplifier, capable of driving a Western Electric 555 speaker, or equivalent, up to a level of 120 db re 0.0002 dyne per square centimeter.

4.5.1.2 Vacuum Tube Voltmeter - The vacuum tube voltmeters (VTVM) used in the test circuit shall have a flat frequency response (plus or minus 1 db) from 100 to 10,000 cps and shall be capable of measuring voltages from 0.001 to 10 volts root mean square (v. r. m. s.).

4.5.1.3 Sound Source - The sound source shall be a Western Electric 555 speaker, or equivalent. The distortion in the output of the sound source shall be such that the second harmonic is at least 35 db, the third at least 40 db, and the fourth at least 45 db below the fundamental.

4.5.1.4 Baffle - A wooden ring shall be mounted on the front of the sound source, as shown on Figure 6, in a plane parallel with the face of the microphone.

4.5.1.5 Coupler - A brass coupler, of the dimensions shown on Figure 7 shall be mounted concentrically on the sound source as shown on Figure 6.

4.5.1.6 Microphone Baffle and Dummy Case - A standard baffle as shown on Figure 8 shall be used for holding the microphone under test. In addition, a dummy microphone case of shape similar to that of the microphone under test, shall be constructed as shown on Figure 9 for use in calibrating the sound source.

4.5.1.7 Base - The test equipment shall be mounted on a rigid base of suitable design.

4.5.1.8 Signal-to-Noise Ratio Test Apparatus - The Signal-to-Noise Ratio Test Apparatus shall be similar or equal to that detailed in Figure 10 and the test circuit similar or equal to that shown in Figure 11.

4.5.2 Test Calibration Procedure - The test calibration for measurement of sensitivity, frequency response and signal-to-noise shall be as follows:

4.5.2.1 Sensitivity and Frequency Response - The microphone baffle shown on Figure 8 shall be set up in front of the sound source. The condenser microphone shall be mounted in the baffle by means of a dummy case. A 1/4 inch air gap shall separate the coupler and the microphone grid. The microphone axis shall coincide with the center line of the mouth of the sound source. After having determined the electrical input to sound source required to yield a constant sound pressure level of 115 db re 0.0002 dyne per square centimeter the condenser microphone and the dummy case shall be removed and the microphone mounted in its test fixture as shown in Figure 6. The geometric center line of the grid shall coincide with the center line of the mouth of the sound source.

4.5.2.2 - Signal-to-Noise -

- (1) Noise Source - By means of suitable test apparatus and circuit, Figures 9 and 10, provision shall be made for the production of the noise spectrum, Table III, at a rms sound pressure of 115 db above a reference level of 0.0002 dyne per square centimeter as measured at the microphone diaphragm. The "noise" source shall be a loud speaker capable of producing a sound pressure of 115 db above a reference level of 0.0002 dyne per square centimeter at the rear as well as the front of the microphone and the loud speaker shall be located as far away from the microphone as practicable. The calibrating microphone shall be mounted in the test rig, in the box, 1/4 inch from the mouth of the signal speaker which shall be short circuited during adjustments of the noise spectrum.

TABLE III

<u>Frequency cps</u>	<u>Sound pressure in db relative to sound pressure at 130 cps</u>
40	0
70	0
130	0
300	-5
600	-9
1000	-13
2000	-17
3000	-19
4000	-21

- (2) Signal Source - By means of the apparatus as set up previously, provision shall also be made for the production of the following signal spectrum, Table IV, at a rms sound pressure of 115 db above a referenced level of 0.0002 dyne per square centimeter. The "signal" source shall be the driver unit. The calibrating microphone shall be positioned 1/4 inch directly in front of the driver unit.

TABLE IV

<u>Frequency cps</u>	<u>Sound pressure in db relative to sound pressure at 130 cps</u>
130	0
300	+7
600	+8
1000	+5
2000	-3
3000	-7
4000	-9

4.5.3 Test Methods - Tests required by this specification shall be conducted in accordance with the following procedures:

4.5.3.1 Visual and Dimensional Inspection - Each sample selected shall be examined externally to determine conformance with this specification with respect to material, workmanship, design, weight and dimensions.

4.5.3.2 Frequency Response - Response measurements shall be made utilizing the test circuit of Figure 5. Response measurements shall be made between 300 and 4000 cps at the intervals specified in 3.5.2 Table I. The output voltage of the unit as shown on VTVM #2 shall be plotted in decibels. Test results shall conform to the limits in 3.5.2 and Table I.

4.5.3.3 Measurement of the Signal-to-Noise Ratio - The microphone under test shall be mounted in the test rig with the front grid of the microphone 1/4 inch from the mouth of the signal speaker. The noise spectrum shall be applied and the microphone output measured. The noise spectrum shall be removed and the signal spectrum applied. The output of the microphone shall be measured. The signal-to-noise ratio shall be the quotient of these measured values.

4.5.3.4 Impedance - At the time the sensitivity is measured at 1000 cps (specified in 4.5.3.2) the impedance shall be measured as follows:

- (1) Remove the load resistor R2 from the test circuit in Figure 5 and insert an inductor having an impedance greater than 1000 ohms and a D. C. resistance equal to or less than 100 ohms. When an inductor is used which has a D. C. resistance less than 100 ohms, a series resistance shall be added to obtain a total D. C. resistance of 100 ohms. Couple the output to a resistance decade with a capacitor having a minimum capacitance of 60 microfarads.
- (2) Set resistance decade to infinity and measure output voltage of 0.4 volt RMS (Reference).
- (3) Set resistance decade to obtain one-half output voltage (0.2 volt RMS.)
- (4) The resistance value indicated by the decade at this point is the output impedance of the microphone and shall be as described in 3.5.6.

4.5.3.5 Response Measurements (Individual Tests) - Each microphone unit shall be subjected to response tests at no less than 6 approved frequencies, such as 300, 1000, 2000, 3000, 4000 and 6000 cps. The specified frequencies to be used will be determined by the procuring agency on the basis of tests made and information gained in the initial stages of production. Sweep or band frequency tests may be employed provided the contractor demonstrates the suitability of such tests to the procuring agency. The method of testing and the selection of frequencies shall be such that they will truly indicate the over-all response characteristics and output level of the microphone.

4.5.3.6 Altitude -

4.5.3.6.1 Pressure Cycling - The microphone unit shall be subjected to 5 varying pressure cycles. Each pressure cycle shall consist of 30 minutes at 3.4 inches of mercury (approximately 50,000 feet) and 30 minutes at 30 inches of mercury (approximately sea level). The pressure transition shall be approximately 5000 feet per minute. The response characteristic of the microphone unit shall then be measured and shall not show a decrease in output in excess of 4 db.

4.5.3.6.2 Response at Simulated Altitude of 15,000 Feet - The microphone unit shall be placed in an altitude chamber and the pressure inside the chamber reduced to that corresponding to an altitude of 15,000 feet (approximately 16.7 inches of mercury). The response of the microphone unit shall be measured at that altitude. The response of the microphone unit shall also be measured at a frequency of 1000 cps while the pressure is being varied at a rate of 5000 feet per minute (up or down).

4.5.3.7 Temperature Extremes -

4.5.3.7.1 Low Temperature - Expose the microphone unit to an ambient temperature of -62°C for 2 hours. Remove the microphone from the cold chamber and immediately measure the response under normal room temperature conditions.

4.5.3.7.2 High Temperature - Expose the microphone unit to an ambient temperature of +71°C for 2 hours. Remove the microphone unit from the hot chamber and immediately measure its response under normal room temperature conditions.

4.5.3.8 Salt Spray - The microphone unit shall be subjected to the salt spray test in accordance with Specification MIL-E-5272 for a period of 100 hours. The microphone unit shall be washed in tap water to remove excess salt deposits and then excess moisture removed. The response characteristics shall be measured immediately after removal from the salt spray chamber.

4.5.3.9 Temperature Cycling - The microphone shall be placed within the chamber and maintained for a period of at least 1 hour or until the microphone performance stabilizes at a temperature of $25^{\circ} \pm 15^{\circ}\text{C}$. The chamber temperature shall then be reduced to -55°C and maintained at this condition for at least 1 hour or until the microphone performance stabilizes. The internal temperature of the chamber shall then be increased to 71°C and maintained at this condition for at least 1 hour or until the microphone performance stabilizes. The internal temperature shall then be returned to $25^{\circ} \pm 15^{\circ}\text{C}$. The number of complete cycles shall be 5. The microphone shall be removed from the chamber and response measurements made after stabilization at room temperature.

4.5.3.10 Humidity - The microphone shall be subjected to the humidity test Procedure I of Specification MIL-E-5272.

4.5.3.11 Distortion - The distortion measurements shall be made for conformance with 3.5.4 employing a distortion analyzer of the wave analyzer or total distortion type. The frequency range of the analyzer shall be at least 100 to 10,000 cps with high selectivity and an input voltage range from 0.001 to 10 volts. The measurement of distortion under service conditions may be made immediately after subjecting the microphone to the temperature extremes.

4.5.3.12 Vibration - The microphone unit shall be placed in a vertical position on a vibration machine giving motion in 3 planes; vertical, horizontal and 45 degrees to the horizontal, of 0.03 inch amplitude (0.06 inch total excursion) and the frequency of vibration varying from 10 to 50 to 10 cps approximately every 3 minutes. The microphone shall be connected in a test circuit providing for an amplifier current of 10 milliamperes. The test shall be conducted for a period of one hour. The current shall be turned on for 2 minutes and off for 2 minutes alternately for the duration of the test period.

4.5.3.13 Interference Tests - Interference tests shall be conducted in accordance with Specification MIL-I-6181.

4.5.3.14 Stray Magnetic Field Measurements - Stray magnetic field measurements shall be made in a shielded room or in an area proved to the satisfaction of the cognizant Government Inspector to be free from appreciable magnetic disturbances. The microphone under test shall be rotated on its axis at various points on the surface of an 8 inch radius sphere surrounding a Keuffel and Esser Type No. 5600 compass or approved equivalent.

4.5.3.15 Impact Test - The microphone unit shall be subjected to 20 random drops, from 6 foot height to a covered concrete floor. The covering shall consist of 1/8 - or 3/16 - inch thick asphalt tile thoroughly cemented to the concrete floor using a minimum thickness of cement.

4.5.3.16 Retractile Cordage Test Methods - The cord shall be tested in accordance with Specification MIL-C-6166 to determine conformance with 3.4.3.

4.6 Individual Test - Each equipment submitted for acceptance shall be subjected to the Individual Test to determine compliance with the requirements of material, workmanship, and operational adequacy. As a minimum each equipment accepted must successfully pass the tests specified in the following paragraph.

4.6.1 Scope of Test - As a minimum, each equipment shall be subjected to the following:

- (1) Examination of Product
- (2) Operational Test

4.6.1.1 Examination of Product - Each equipment shall be carefully examined to determine that the requirements for material and workmanship as specified in Specification MIL-E-5400 have been met. Also, it shall be determined that approval has been granted for the use of all non-standard parts.

4.6.1.2 Operational Test - Each equipment shall be operated. The period of operation shall be long enough to check sufficient characteristics and record adequate data to assure satisfactory equipment operation (include Impedance Measurement 4.5.3.4, Response Measurement 4.5.3. and Signal-to-Noise Ratio Test 4.5.3.3).

4.7 Sampling Test - Sampling Tests shall be conducted on a quantity of equipments as specified in the following paragraph. Equipment for sampling tests shall be selected by the cognizant Government Inspector after the equipment has passed the Individual Tests and has been packaged and packed ready for shipment. Sampling Tests shall be conducted on complete equipments.

4.7.1 Sampling Test Schedule - Sampling Tests shall be performed on the following quantity of equipment:

<u>Quantity of Equipment Offered for Acceptance</u>	<u>Quantity to be Tested</u>
From the first 10	1
From 11 to 100	2
From 101 to 200	1
From 201 and above	1 for each additional 500 or fraction thereof

4.7.2 Scope of Tests - As a minimum, each equipment selected for sampling tests shall be subjected to the tests indicated in 4.4, Table II.

4.7.3 Equipment Failure - Should a failure occur during the Sampling Test, the following action shall be taken.

- (1) Determine the cause of failure.
- (2) Determine if the failure is an isolated case or design defect.
- (3) Suggest corrective action for the Bureau of Naval Weapons' approval, designed to reduce the possibility of the same failure occurring in future tests.
- (4) Where practical, include a test in the Individual Test to check all equipments for this requirement until reasonable assurance is obtained that the defect has been satisfactorily corrected.

4.8 Life Tests - The equipment shall be subjected to a Life Test at the contractor's plant under the following simulated service conditions.

Temperature	Normal room temperature
Altitude	Normal room
Humidity	Room ambient

4.8.1 Test Data - The contractor shall keep a daily record as to the performance of the equipment, making particular note of any deficiencies or failures. In the event of part failures during this test, the defective part shall be replaced and the operation resumed for the balance of the test period. A record shall be kept of all failures throughout the test, including all tube failures. This record shall indicate the following:

- (1) Part Type Number.
- (2) The circuit reference symbol-number.
- (3) The part function.
- (4) Name of the manufacturer.
- (5) Nature of the failure.
- (6) The number of hours which the part operated prior to failure.

4.8.1.1 Failure Report - In the event of a part failure the Naval Inspector shall be notified immediately. A report shall be submitted to the Bureau of Naval Weapons upon completion of the test. In this report the contractor shall propose suitable and adequate design or material corrections for all failures which occurred. The Bureau of Naval Weapons will review such proposals and determine whether they are acceptable.

4.8.2 Test Duration - The duration of the Life Test shall be 300 hours.

4.8.2.1 Test Periods - The test may be run continuously or intermittently. Periodically the equipment shall be turned on and off several times and put through all phases of its performance.

4.8.2.2 Performance Check - At approximately eight hour intervals during the test, a limited performance check shall be made. The performance check proposed by the contractor shall be subject to approval by the Bureau of Naval Weapons.

4.8.3 Life Test Schedule - The equipment to be tested shall be representative of the current production in all significant aspects of design and manufacture. It shall be selected by the Government Inspector from equipments which have passed the Individual Tests. The Life Test shall be performed on the following quantities of equipment unless otherwise stated in the contract or approved by the Bureau of Naval Weapons.

<u>Quantity of Equipment Offered for Acceptance</u>	<u>Quantity to be Tested</u>
First 25	1
Next 26 to 200	1
Next 201 to 500	1
Over 500	1 for each additional 500 or fraction thereof

4.8.4 Reconditioning of Test Samples - Equipment which has been subjected to the Life Test shall be reconditioned as follows:

- (1) On completion of the Life Test, the equipment shall be reworked by the contractor by replacing all tubes and "wear" items. The "wear" item shall be determined by agreement between the contractor and the Bureau of Naval Weapons.
- (2) After reworking, the contractor may submit the equipment for acceptance under the contract.

4.9 Pre-Submission Testing - No item, part or complete equipment shall be submitted by the contractor until it has been previously tested and inspected by the contractor and found to comply, to the best of his knowledge and belief, with all applicable requirements.

4.10 Rejection and Retest - Equipment which has been rejected may be reworked, or have parts replaced to correct the defects, and resubmitted for acceptance. Before submitting reworked equipment for retest, the contractor shall furnish to the Inspector full particulars concerning the previous rejection and the action taken to correct the defects found in the original. Units rejected after retest shall not be resubmitted without the specific approval of the Bureau of Naval Weapons.

5. PREPARATION FOR DELIVERY

5.1 General - All major units and parts of the equipment shall be packaged, packed and marked for shipment in accordance with the requirements of Specification MIL-P-17555.

6. NOTES

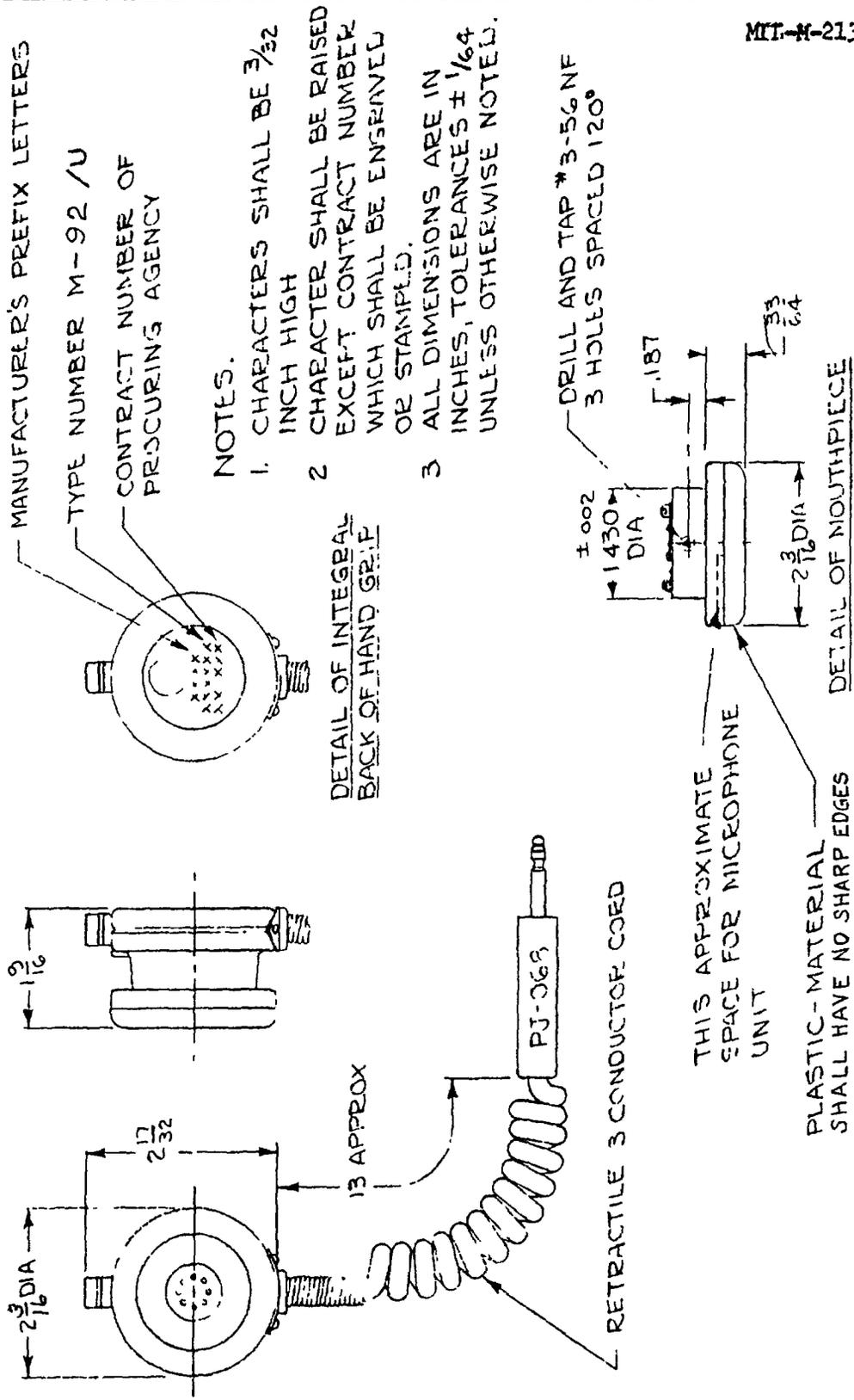
6.1 Use - It is intended that this microphone convert normal speech input to electrical signals suitable for connection to speech amplifiers and or modulators of radio or audio equipment.

6.2 Qualification - With respect to products requiring qualification, awards will be made only for such products as have, prior to the bid opening date, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is Bureau of Naval Weapons, Washington 25, D. C., and information pertaining to qualification of products may be obtained from that activity.

6.3 Precedence of Documents - When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence shall apply:

- (1) Contract - The contract shall have precedence over any specification.
- (2) This Specification - This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications where applicable, shall be specifically approved in writing by the Bureau of Naval Weapons.
- (3) Referenced Specifications - Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

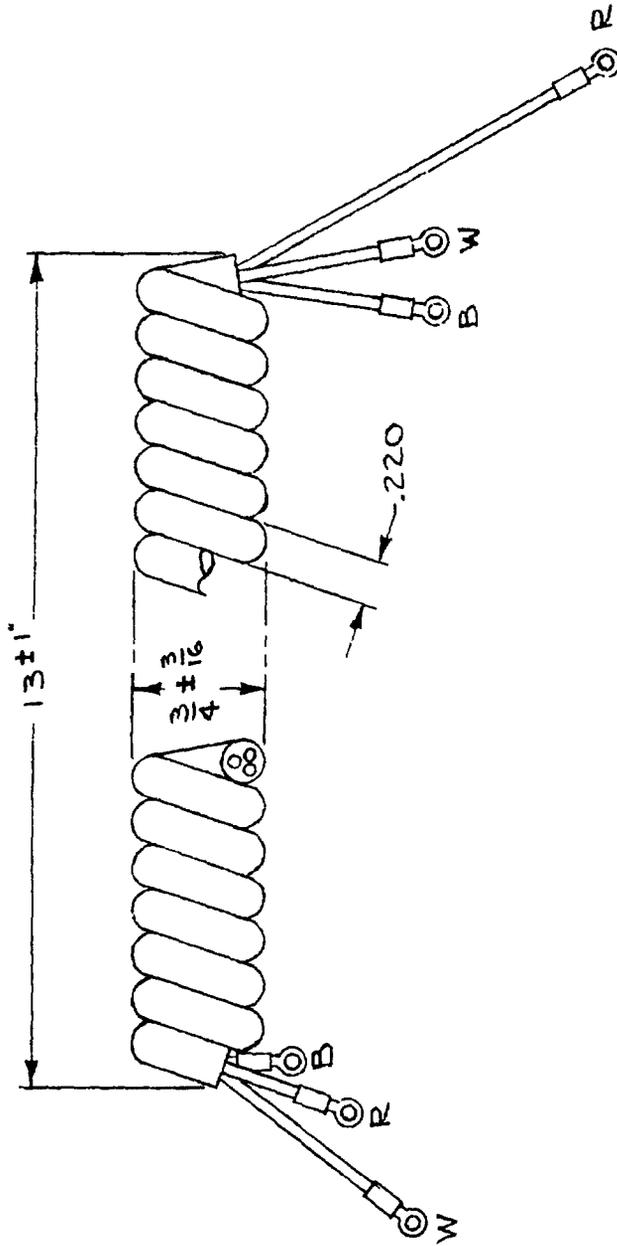
NOTICE - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.



NOTES.

1. CHARACTERS SHALL BE 3/32 INCH HIGH
2. CHARACTER SHALL BE RAISED EXCEPT CONTRACT NUMBER WHICH SHALL BE ENGRAVED OR STAMPED.
3. ALL DIMENSIONS ARE IN INCHES, TOLERANCES ± 1/64 UNLESS OTHERWISE NOTED.

FIGURE 1. HAND-HELD MICROPHONE, M-92 /U.



CONDUCTOR LENGTHS: PLUG END
 W(WHITE): TIP TERMINAL; $1\frac{3}{8}$ INCHES
 R (RED): RING TERMINAL; $\frac{3}{4}$ INCH
 B (BLACK): SLEEVE TERMINAL; $\frac{3}{8}$ INCH
 TOLERANCE $\begin{matrix} +1/16 \\ -0 \end{matrix}$

TERMINALS: #2 HOLE, $\frac{3}{8}$ LONG
 ALL DIMENSIONS ARE IN INCHES.

NOTE 1 CONDUCTOR LENGTHS ARE MEASURED FROM JACKET EDGE TO TERMINAL EYE CENTER.

CONDUCTOR LENGTHS: MICROPHONE END
 R (RED): RING TERMINAL; $2\frac{3}{8}$ INCHES
 W(WHITE) TIP TERMINAL; $1\frac{1}{8}$ INCHES
 B (BLACK): SLEEVE TERMINAL; $1\frac{1}{8}$ INCHES
 TOLERANCE $\begin{matrix} +1/16 \\ -0 \end{matrix}$

TERMINALS: #2 HOLE, $\frac{7}{16}$ LONG

FIGURE 3. DIMENSIONS OF RETRACTILE CORD

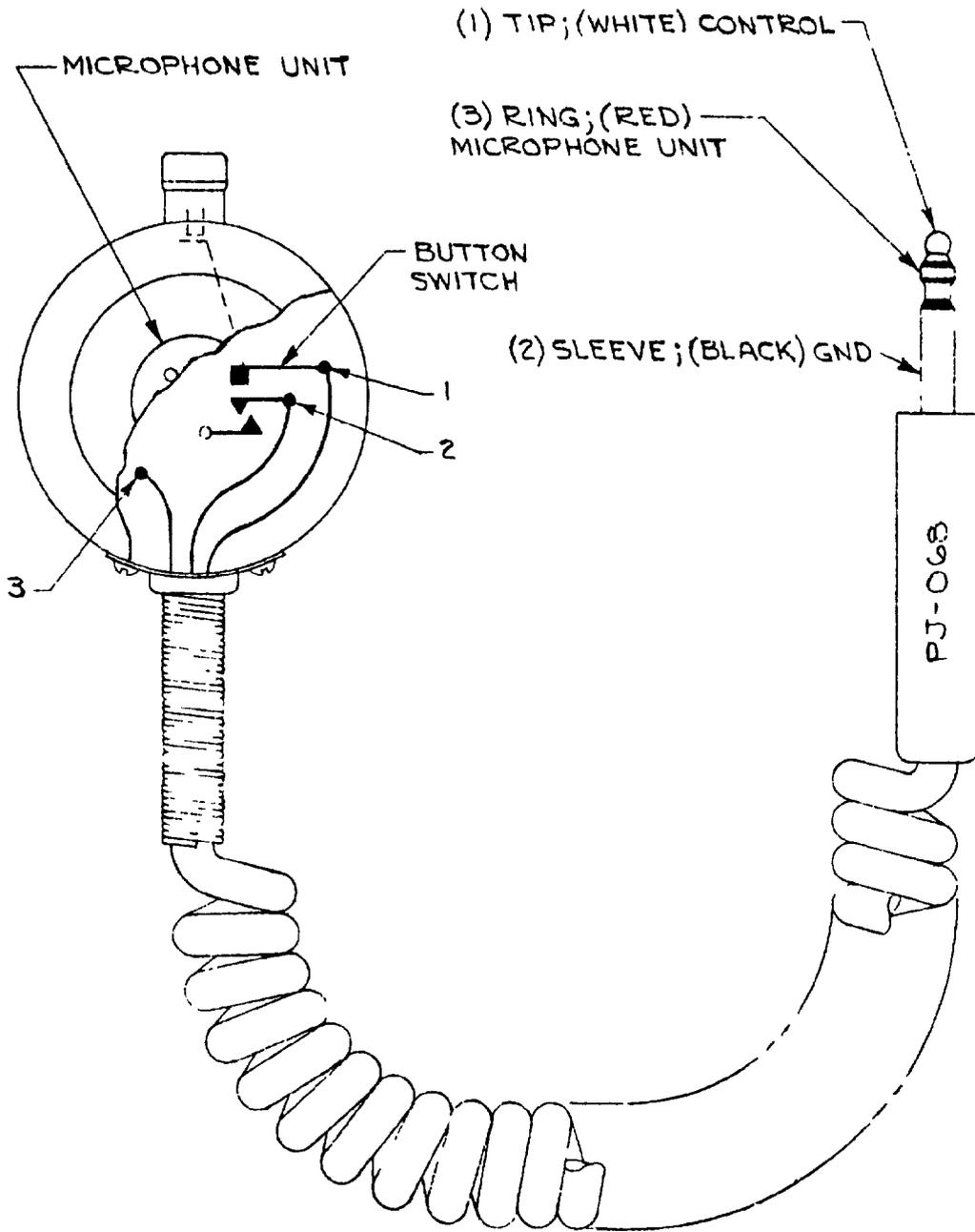


FIGURE 4. MICROPHONE WIRING CIRCUIT

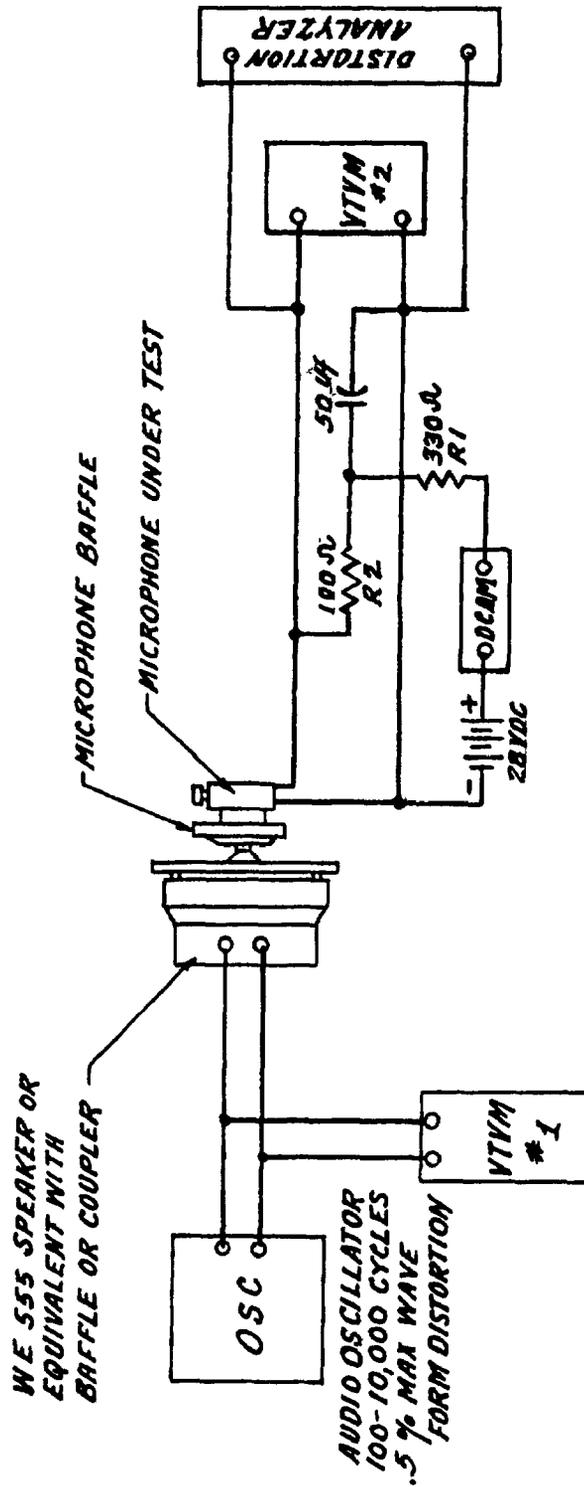
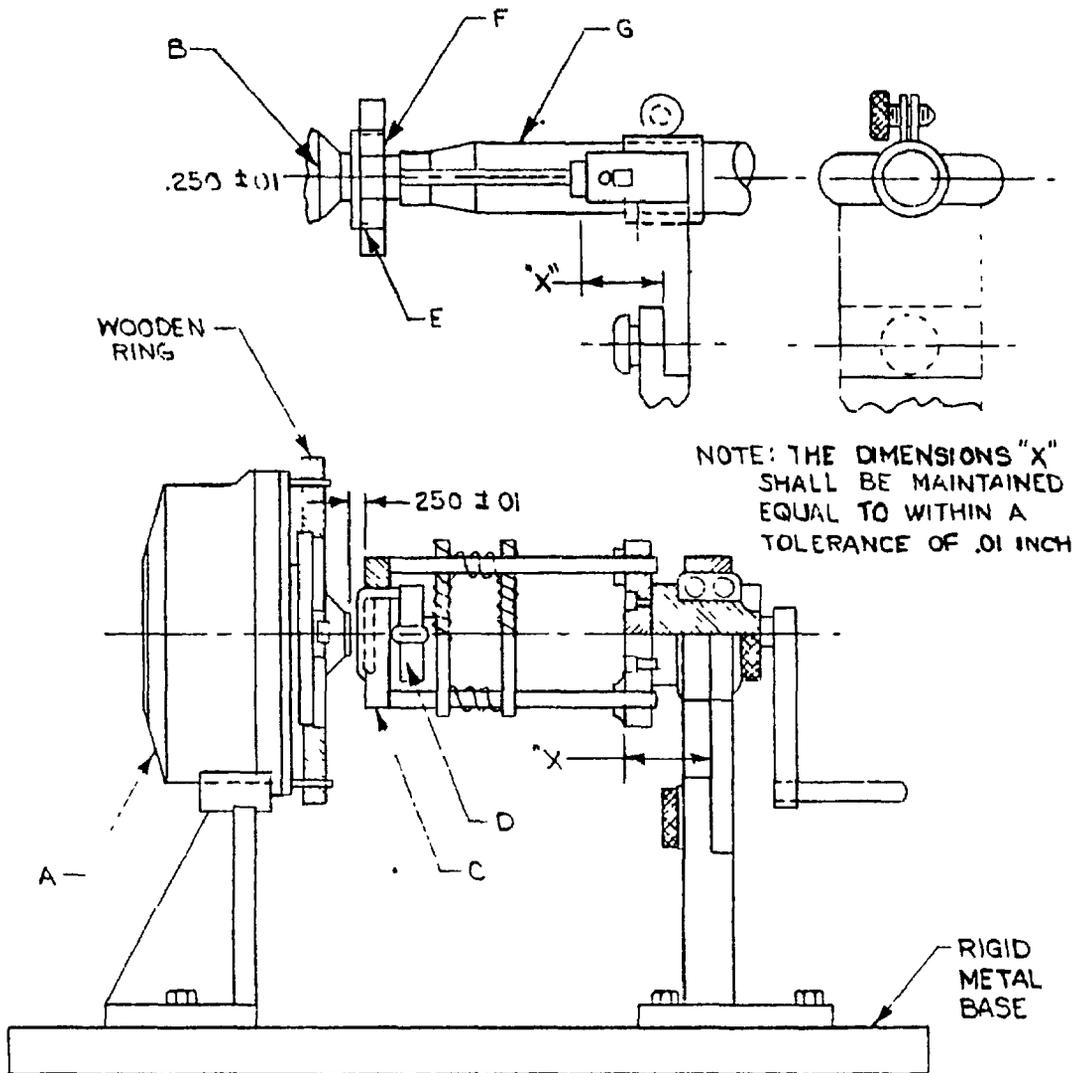


FIGURE 5. STANDARD TEST CIRCUIT, DISTORTION AND FREQUENCY RESPONSE MEASUREMENT



- A W. E. 555 SPEAKER DRIVER, OR EQUIVALENT.
- B MICROPHONE CALIBRATING COUPLER (FIG 7)
- C MICROPHONE BAFFLE (FIG 8).
- D MICROPHONE UNDER TEST.
- E, DUMMY MICROPHONE CASE FOR CALIBRATION (FIG 9).
- F. WE 640-A CONDENSER MICROPHONE WITH GRID, OR EQUIVALENT.
- G PRE-AMPLIFIER

FIGURE 6. TEST BASE ASSEMBLY

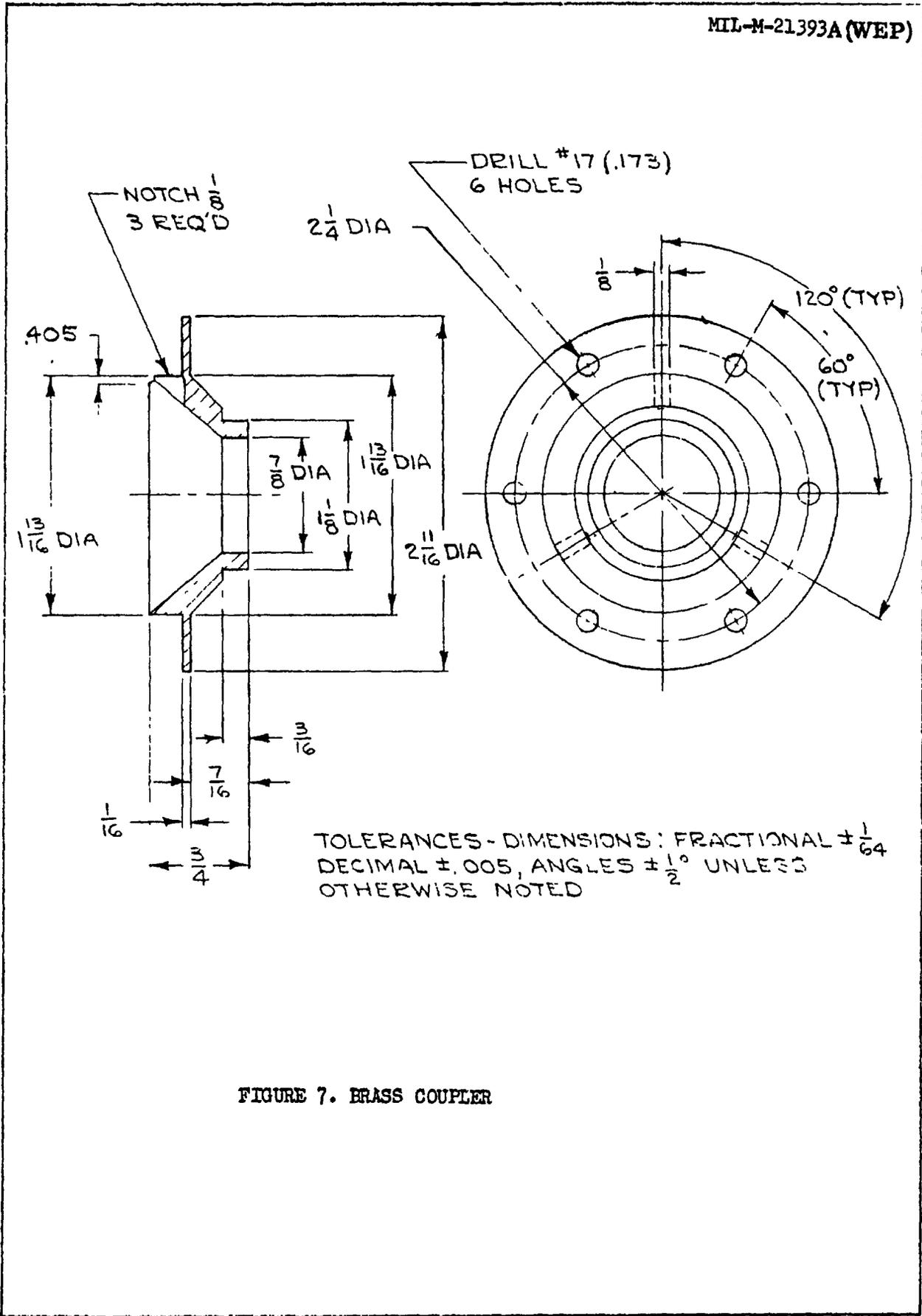
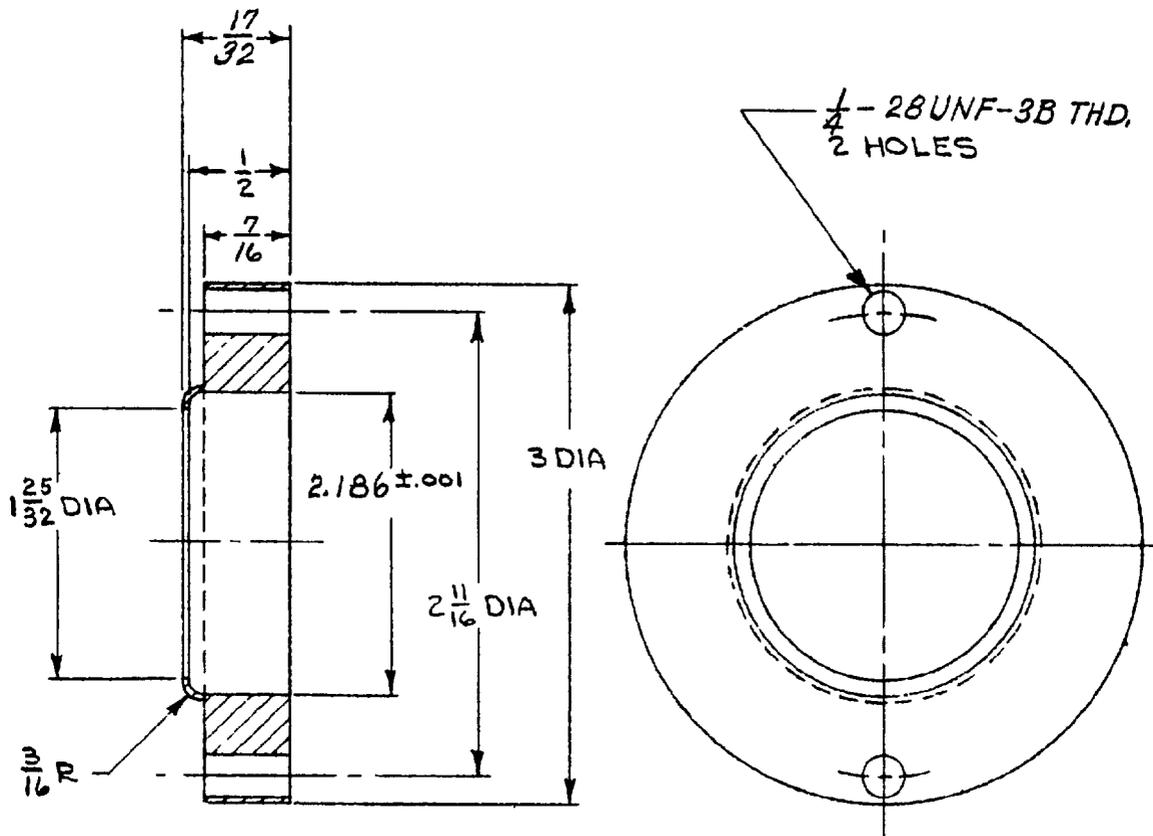
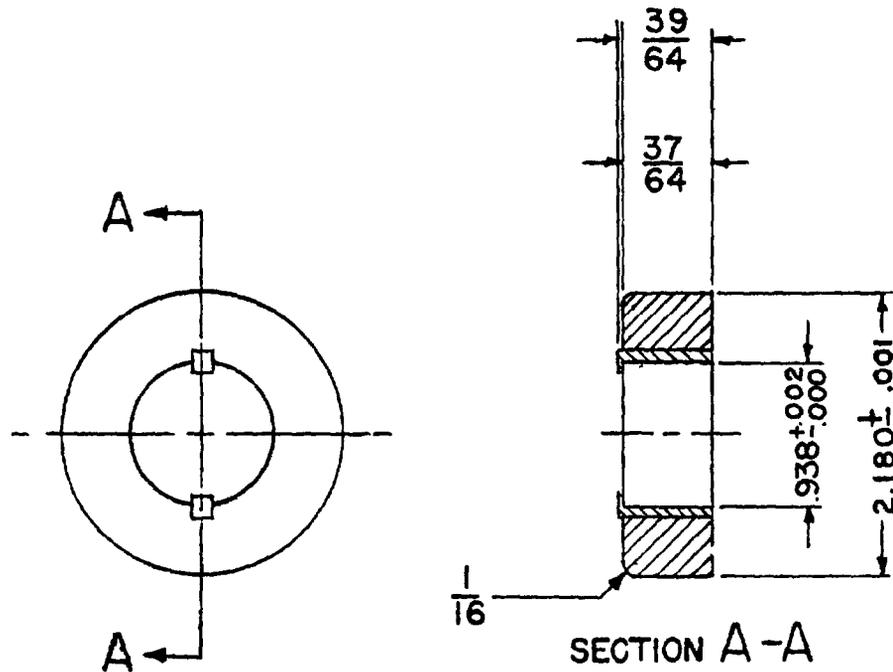


FIGURE 7. BRASS COUPLER



TOLERANCES - DIMENSIONS: FRACTIONAL $\pm \frac{1}{64}$
 DECIMAL $\pm .005$
 UNLESS OTHERWISE NOTED

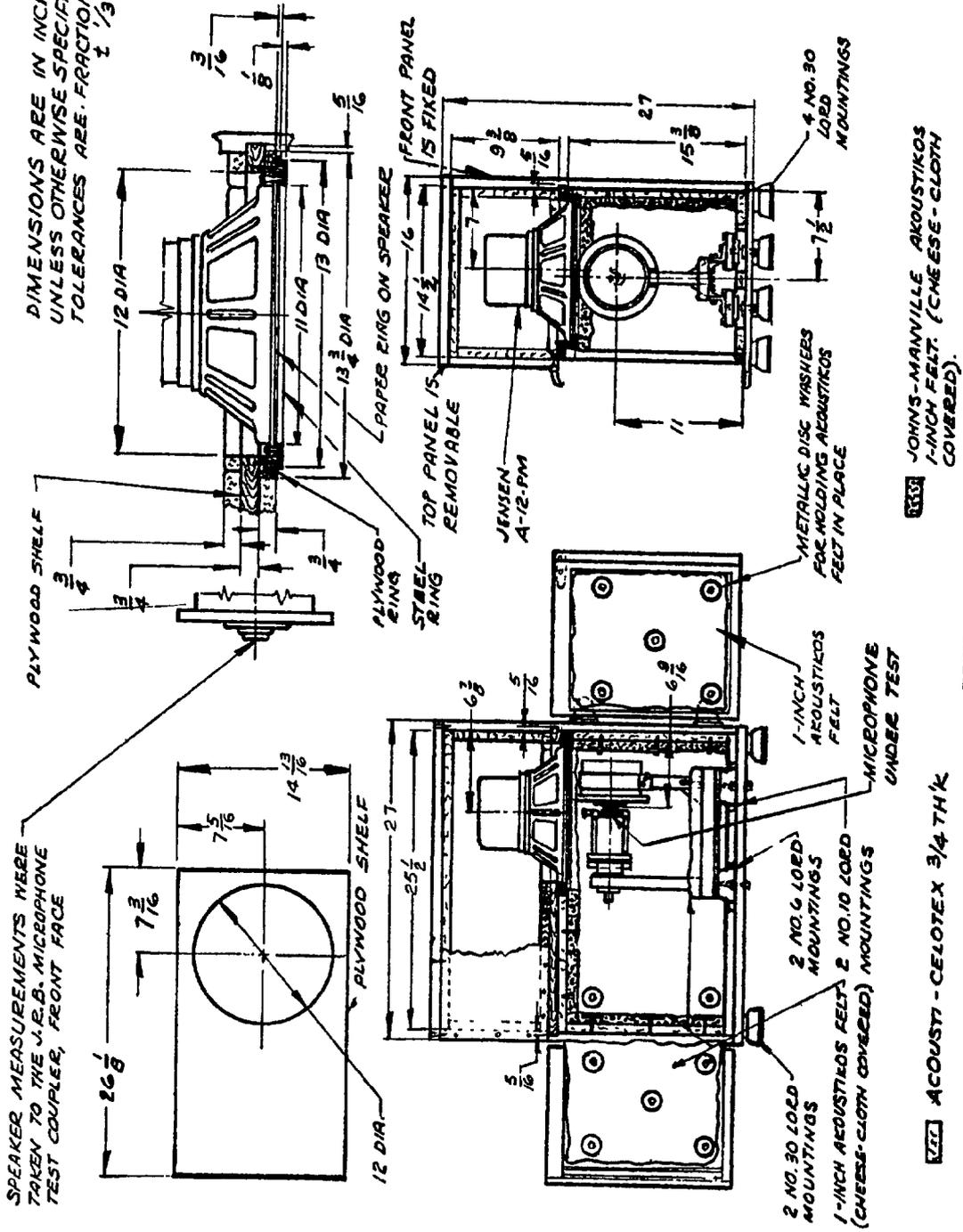
FIGURE 8. MICROPHONE BAFFLE



TOLERANCES: DIMENSIONS: FRACTIONAL $\pm \frac{1}{64}$
 DECIMAL $\pm .005$
 UNLESS OTHERWISE NOTED
 MATERIAL: BAKELITE

FIGURE 9. DUMMY MICROPHONE CASE

DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED,
TOLERANCES ARE FRACTIONS
 $\pm 1/32$



SPEAKER MEASUREMENTS WERE
TAKEN TO THE J.E.B. MICROPHONE
TEST COUPLER, FRONT FACE

JOHNS-MANVILLE ACOUSTIKOS
1-INCH FELT (CHEESE-CLOTH
COVERED).

FIGURE 10

ACOUSTI - CELOTEX 3/4 TH'K

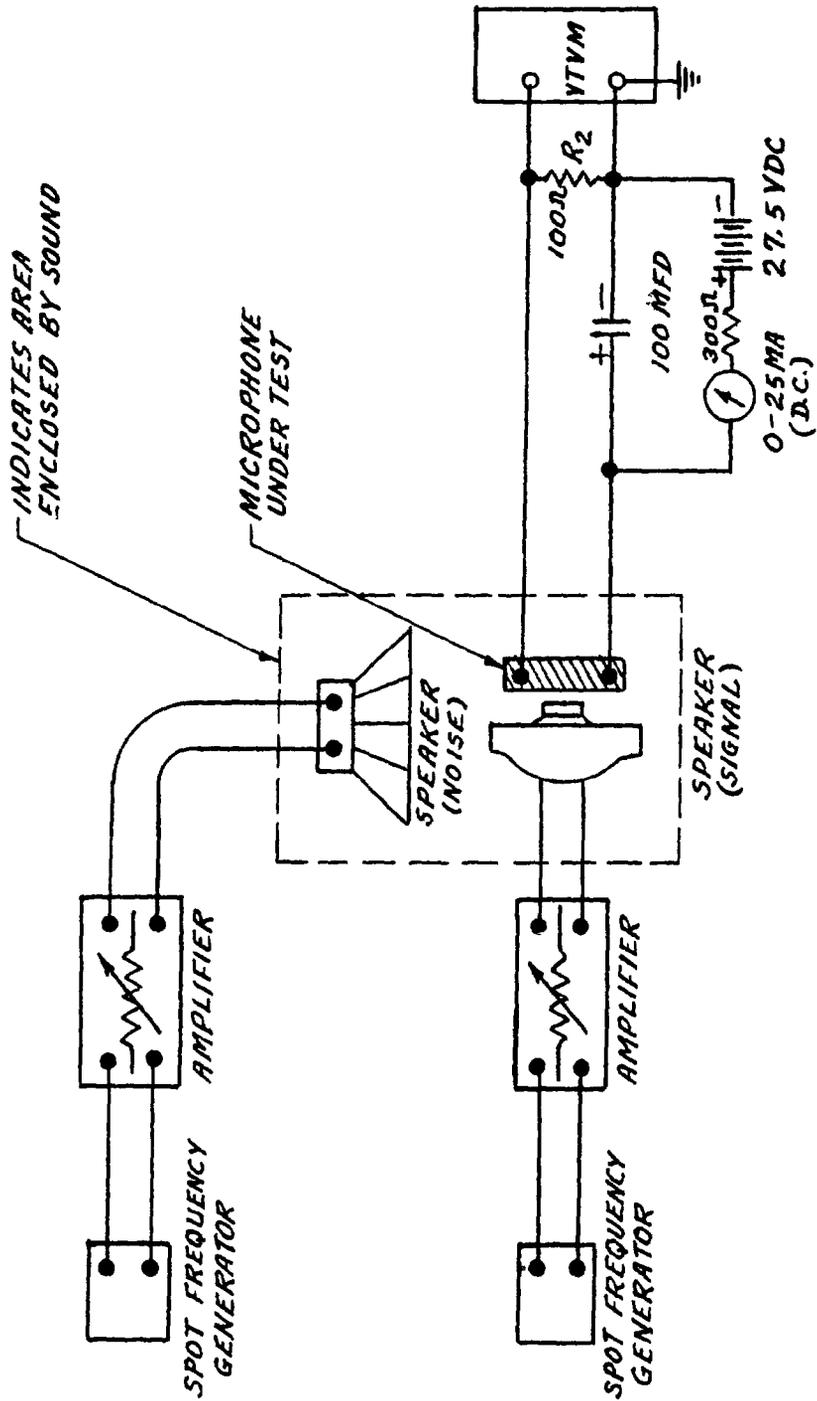


FIGURE 11