TYPE KU-3A

Unidirectional Microphone

MI-10001B

DESCRIPTION

The Type KU-3A Unidirectional Microphones† were designed to meet the exacting requirements for sound-film recording at motion-picture studios. These microphones provide uniform and smooth reproduction over a wide audio range (suitable for dialogue and music), and have the unidirectional pattern considered so desirable for sound-motion-picture applications. They exhibit a high sensitivity for sound originating in front. Rejection (cancellation) at the back is such as to provide a new low in output of unwanted signal. The light weight, small size, rugged construction, and attractive appearance of the units make them outstanding in their field.

These microphones are of the type in which the moving element is a single thin extremely-light corrugated

TECHNICAL DATA

Output Impedance

30, 150, 250 ohms

Load Impedance

Open circuit (Unterminated transformer)

Effective Output Level* (at 1000 cycles)

—51 dbm at 150- and 250-ohm output impedance
—49 dbm at 30-ohm output impedance

Open-Circuit Voltage Output* (at 1000 cycles)

2800 microvolts at 250-ohm tap
2200 microvolts at 150-ohm tap
1370 microvolts at 30-ohm tap

Open-Circuit Output Level for Normal Speech at 2 ft. distance

—58 V.U. at 250-ohm tap

Output Hum Level for An Exciting Field of 0.001 Gauss

— 128 dbm

Frequency Response

See figure 5

Directional Characteristics

Unidirectional pattern (see figure 4)

External Connection

Type "P" 3-pin male Cannon Connector

Mounting

A suitable resilient suspension is essential.
(MI-10058B Microphone Hanger is recommended)

Physical Characteristics

Finish — Flat two-tone umber gray
Length — 8 inches
Width — 3 inches
Depth — 3½ inches
Weight — 2 pounds, 13 ounces

** With an input sound pressure of 10 dynes per sq. cm.*

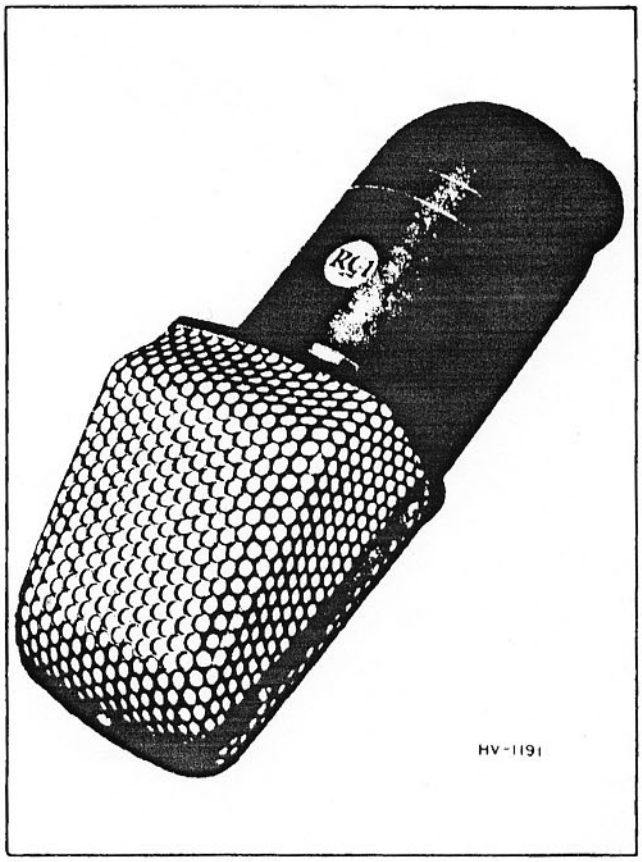

Figure 1 — MI-10001B Unidirectional Microphone

†Engineered and Manufactured in Hollywood

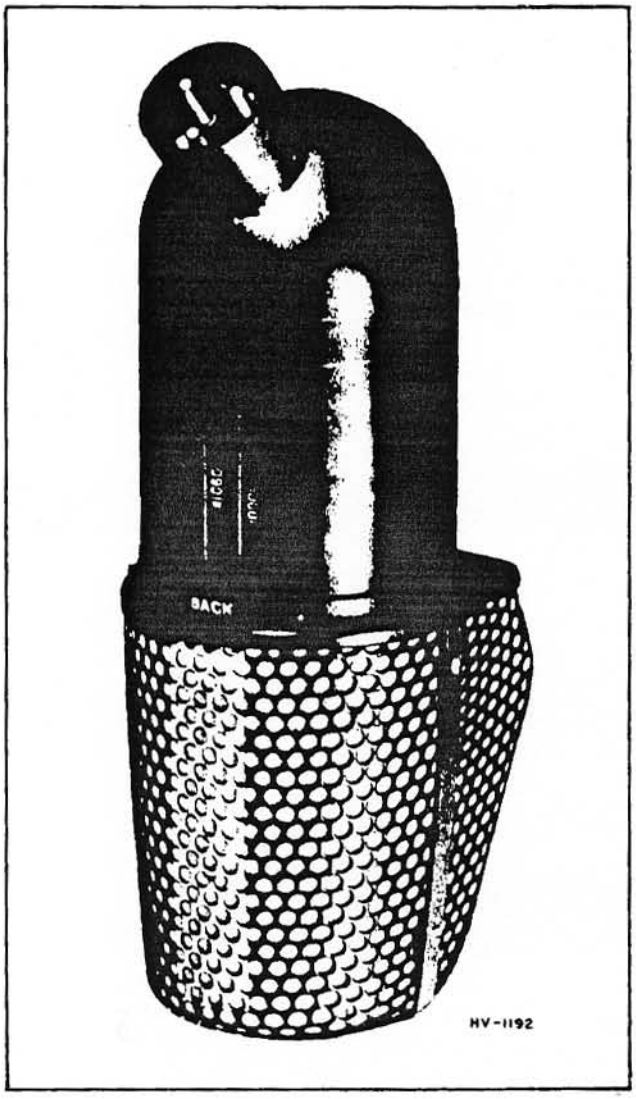

Figure 2 — MI-10001B Unidirectional Microphone (rear view)

metallic ribbon. The ribbon is suspended in an air gap between the poles of a permanent magnet, so as to vibrate freely with a motion corresponding closely to the motion of the air particles of the sound wave striking it. The voltage generated as the ribbon cuts the magnetic lines of force is the electrical equivalent of the velocity of the particles of the sound waves. An acoustical labyrinth formed in the cylindrical section of the microphone below the magnet and pole-piece assembly is coupled to the air gap by a tubular connector. This connector is sealed to the rear of the air gap, and contains a small silk-covered opening in the plate at the rear. The cloth-covered opening is of suitable dimensions to provide a unidirectional response characteristic for the microphone. The ribbon and magnet assembly are enclosed in a cloth-lined perforated-metal grille assembly which provides protection against mechanical injury, dust, and to a certain extent wind. The hemispherical shell below the acoustical labyrinth covers an impedance-matching transformer with output taps for 30, 150, and 250 ohms impedance. A three-pin output receptacle (male) is mounted on the shell, and 180-degree rotation of the shell is possible as a means of changing the output receptacle location.

The microphones are finished in a flat two-tone umber gray. A three-fourths inch white reference stripe on the back of the grille assembly is provided as a "panning" guide to the boom man, to indicate the "dead" side of the microphone.

Sensitivity

The Type KU-3A Unidirectional Microphone has a higher order of sensitivity than other previously-manufactured RCA film-recording microphones. The sensitivity is approximately 6 db higher than that of the double-ribbon type of unidirectional microphone, and approximately 4 db higher than that of current models of high-quality pressure and velocity microphones. For exact sensitivity information, refer to the *Technical Data.*

Directional Pattern

These microphones have a very uniform response for sound incident at the zero axis (at the front of the microphone), with the output decreasing slowly as the angle of the sound source with the zero axis increases. The pickup angle may vary approximately ± 50° from the zero axis with less than one db difference in output, and approximately ± 90° before the output is down 6 db over the frequency range normally reproduced in theaters. The broad solid angle of relatively equal response reduces and simplifies "panning," and makes possible the coverage of practically any action with a single microphone.

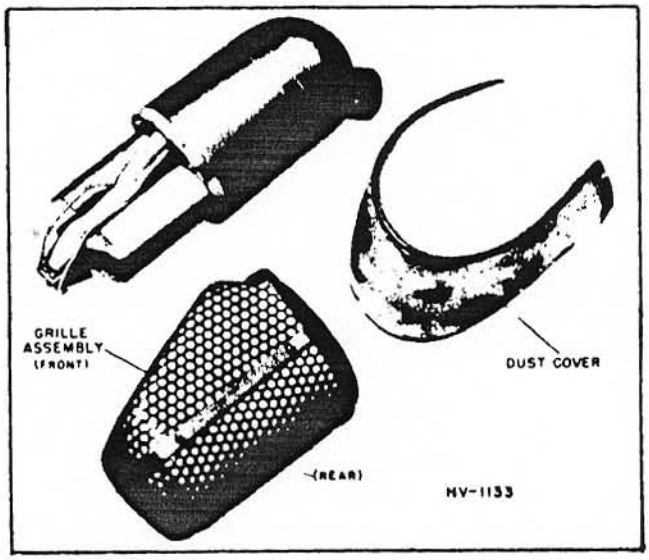

Figure 3 — MI-10001B Unidirectional Microphone (grille assembly off, and dust cover shown)

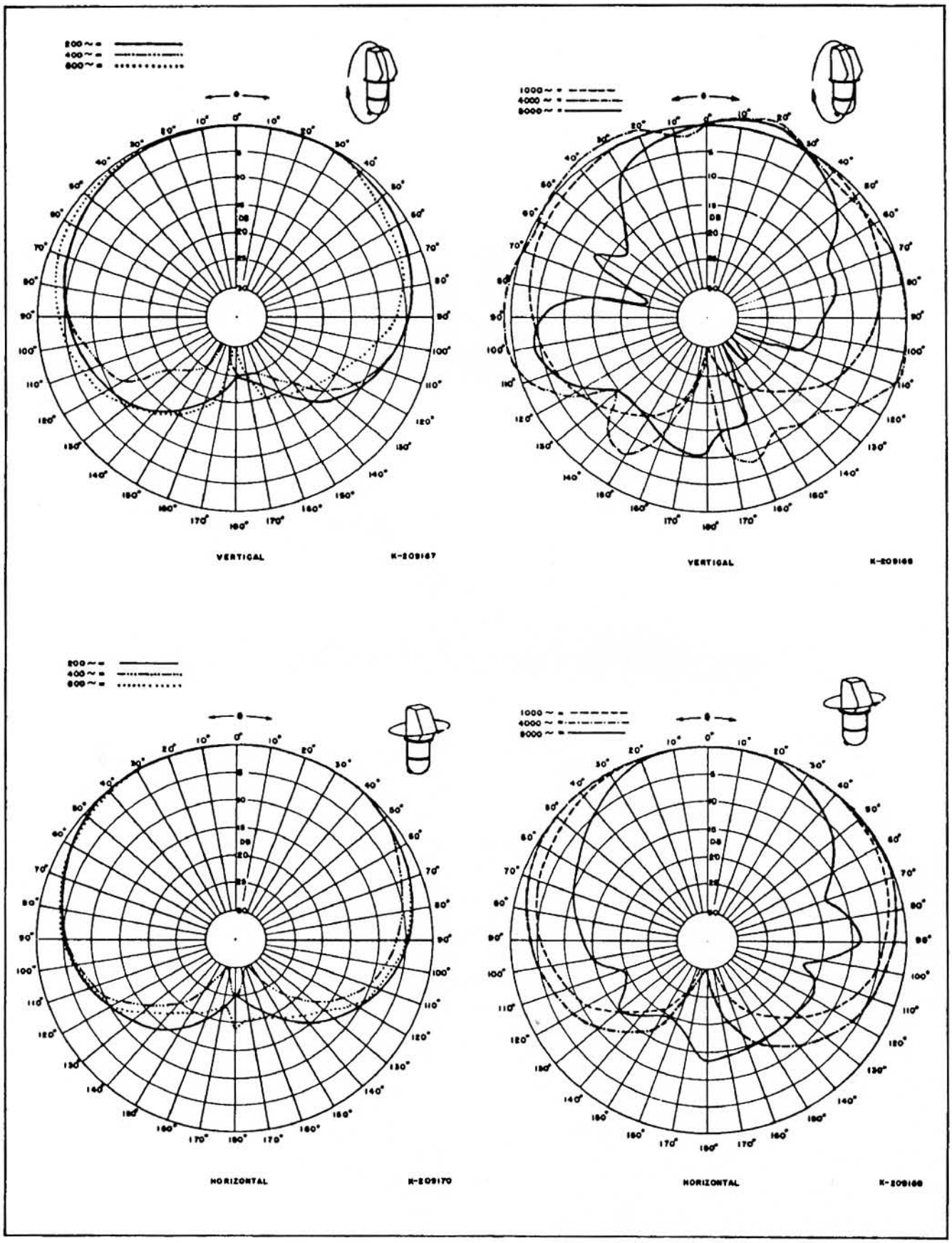

Figure 4 — Directional Patterns

The directional patterns at different frequencies as shown in figure 4 are based on a plane-wave sound incidence. Rejection (or "cancellation") for plane waves at the rear of the microphone is such that output is down 20 db or more at the 180° incident angle over a broad band of frequencies. However, as the distance between sound source and microphone is decreased (and the wave front becomes increasingly curved at the microphone), the cancellation for low frequencies is reduced.

The loss of directional characteristics at low frequencies and short distances is such that the output at a one-foot distance from microphone to sound source is very nearly the same at the back of the microphone as at the front. For example, the 80-cycle output is + 1½ db (approx.) at the 180° incident angle as referenced to zero db at 1000 cycles for a zero-degree incident wave front at one-foot distance (the 80-cycle zero-axis output is accentuated approximately + 3½ db, due to the low-frequency tip-up characteristic experienced by velocity-type microphones at close distances).

If a qualitative "performance" test of the unidirectional microphone is to be made, it should be observed from the above that voice tests at one or two feet are relatively meaningless unless carefully interpreted. Tests should normally be made with the sound source four feet or more from the microphone in order to obtain experimental results comparable to the plane-wave directional patterns shown in figure 4.

Frequency Response

The frequency response is relatively uniform over a wide audio range (see figure 5). As previously noted, the microphone exhibits to a certain extent the low-frequency accentuation characteristic of a velocity microphone when operated at close range, though to a lesser degree than standard bidirectional ribbon microphones. For normal response, the microphone should not be employed at distances closer than three feet from the sound source, and four feet or more is preferable.

INSTALLATION

In normal usage, the microphone must be suspended from a hanger providing adequate mechanical filtering. Double resilient mounting is recommended. The RCA MI-10058B Microphone Hanger is designed for this application (see figure 6).

In applying the microphone suspension to the MI-10001, -A and -B Microphones, *position the two suspension clamps so that their separation, measured between the jar edges, amounts to approximately 2 inches.* Since each clamp is ⅝" wide, the internal separation of the clamps, measured between the near edges, comes to ¾"

If replacement rubber bands should be slightly shorter or should stretch less easily than the bands with which the suspension came equipped, the clamps may be brought closer together when applying the suspension to the microphone. The clamp separation, then, depends on the rubber durometer, band length, etc. An effective measure of separation consists in noting the deflection of the clamp when the microphone is hanging vertically in the suspension, compared to the deflection when the suspension is "unloaded," that is, when it is without a microphone. Properly stretched

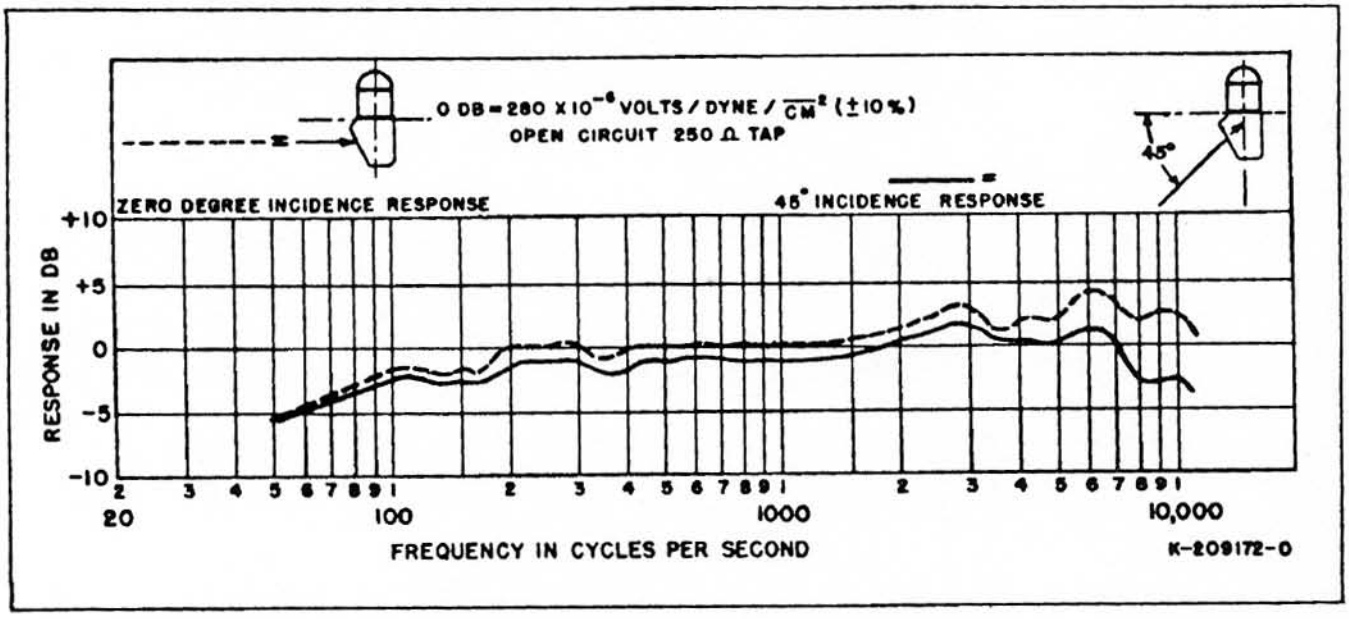

Figure 5 — Frequency Response

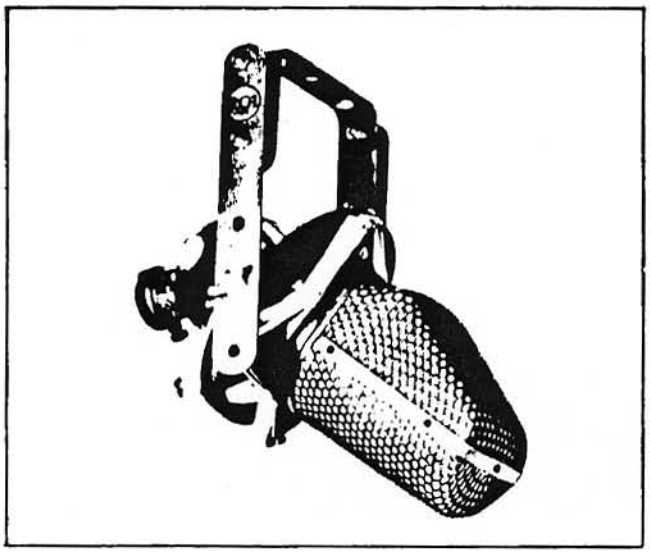

Figure 6 — Microphone mounted in MI-10058B Hanger

rubber bands will allow the microphone to sag approximately ⅛" in the suspension when the microphone is hanging vertically.

IMPORTANT: Any noise producing play between insert and shell of the mating Cannon plug on the microphone cable used with the Type KU-3A Microphone should be eliminated. This can be done by replacing the two insert-retaining No. 2-56 fillister-head screws of the mating plug with flat-head or round-head screws.

See figure 7 for the connection diagram.

OPERATION

IMPORTANT: Protect the microphone from loud explosive-type sounds, such as gun shots. These are likely to damage the ribbon and make necessary its replacement.

The microphone should ordinarily be suspended at an angle of approximately 45° to the floor of the sound stage, with the microphone just outside the camera angle. The zero-degree axis (perpendicular to ribbon at front of microphone) should be directed toward the desired sound source, with the back of the microphone directed as much as possible toward interfering sound sources. Interference may be caused by camera noise, arc light whistle, set rumble, street and traffic noise, reflection from very "live" surfaces in a set or on location, or even by background noise which is essential for the desired effect, but which must in some cases be recorded separately and mixed in rerecording to avoid masking the dialogue.

The frequency response characteristic of the microphone will change as indicated in figure 5, as the angle of incident sound varies from zero to forty-five degrees. Also, as the distance from sound source to microphone is decreased approaching the recommended minimum, the lower frequencies will be accentuated somewhat in the manner characteristic of velocity microphones. However, the degree of accentuation at 80 cycles on the zero axis is only approximately + ½ db at 3 feet, + 1½ db at 2 feet, or + 3½ db at one foot, as referred to zero db at 1000 cycles.

"Panning" should be limited to the essential minimum, due consideration being given the wide solid angle of equal response of the unidirectional microphone. Unnecessary movement or "facing" of the microphone should be avoided, and the amount required is considerably less than with a "non-directional" pressure microphone whose high-frequency response falls off rapidly beyond a ± 30° from zero incidence.

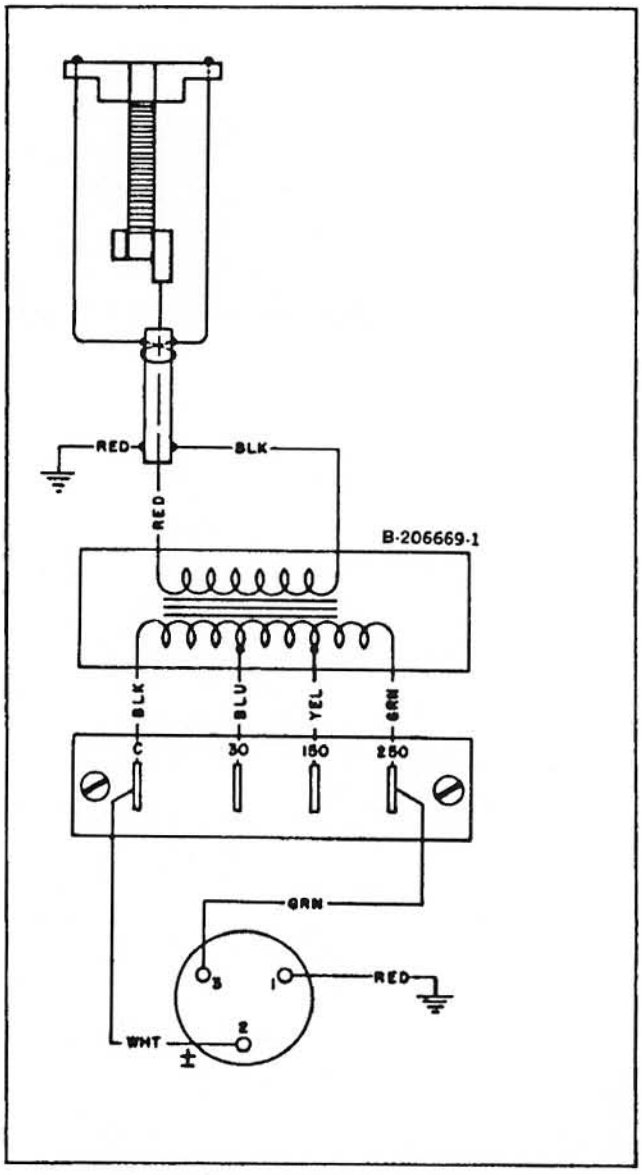

Figure 7 — Connection Diagram

The random energy response of the unidirectional microphone is one-third that of a non-directional microphone, and hence for the same allowable recorded reverberation may be used at 1.7 times the distance of a non-directional microphone.

A windscreen should be used with these microphones for all outdoor work where either a wind or dust problem might exist. This would probably be on any ordinary location work, inasmuch as wind velocities as low as 5 miles per hour (approximately 7 feet per second) may be sufficient to cause dust particles to penetrate the grille and become a source of trouble. Dust or other particles reaching the air gap may cause changes in sensitivity, frequency response, and noise level.

NOTE: The plastic cover supplied with the microphone should be put on as a general protection when storing, or whenever the unit is not in use, or when exposed to gun shots.

LIST OF PARTS

Description	*Stock No.*
Clamp, ribbon (bottom)	901003
Clamp, ribbon (top)	901017
Cover assembly (transformer), less plug insert, for MI-10001-B	901507
Dust cover (plastic)	901508
Grille assembly (front), for MI-10001B	901941
Grille assembly (rear), for MI-10001B	901506
Ribbon	900998
Transformer	903344
Clip	901879
Suspension Ring	902428
Rubber bands	903469
Microphone Clamps	903470
Fork Shock Absorbers	903471
Fiber Washer	901784
Wing Nut	901873

MI-10058B HANGER

Clip	901879
Suspension Ring	902428
Rubber Bands	903469
Microphone Clamps	903470
Fork Shock Absorbers	903471
Fiber Washer	901874
Wing Nut	901873