VELOCITY MICROPHONE

MI-3027-E

TECHNICAL DATA

OUTPUT LEVEL*

At 1000 cycles when terminated into a matched load.
—55 db (0 db=.001 watts)
—63 db (0 db=.006 watts)

OPEN CIRCUIT VOLTAGES*

1740×10^{-6} volts (250 ohm tap)

775×10^{-6} volts (50 ohm tap)

DIRECTIONAL CHARACTERISTIC

Bi-directional—Figure 8 pattern
(See Figure 3)

FREQUENCY REPONSE

30-10,000 cycles
(See Curve Figure 4)

OUTPUT IMPEDANCE

250 and 50 ohms Connected for 250 ohms when shipped

PHYSICAL CHARACTERISTICS

Overall Dimensions

Length including hanger	10½ ins.
Width	4¾ ins.
Depth	3⅜ ins.
Weight including hanger (unpacked)	8¼ lbs.

DESCRIPTION

The MI-3027-E Velocity Microphone is a high quality ribbon microphone, which operates on the pressure gradient principle, and has been designed especially for the pickup of speech or music when making sound film recordings. Fidelity is entirely adequate to meet the requirements of modern sound motion picture recording.

The moving element in the microphone is a very thin, corrugated aluminum ribbon, suspended between the poles of a permanent magnet with its length perpendicular to, and its width in the plane of, the lines of magnetic force between the magnet poles. The ends of the ribbon are connected to the primary of a transformer which has both 50 and 250 ohm output connections. The ribbon is open to sound waves both in front and back. Movement of the ribbon is due to the small instantaneous differences in pressure on the two faces of the ribbon. These pressure differences are caused by the difference in the length of the acoustic paths which sound must traverse in reaching the front and back faces of the ribbon.

Because of the lightness of the ribbon, it moves exactly in accordance with these small differences between the pressures on the two faces of the ribbon. Since the moving element cuts the lines of magnetic force set up between the two magnetic poles, a voltage that varies exactly as the sound waves actuating the ribbon is induced in the ribbon and appears across the transformer primary to which the ribbon is connected.

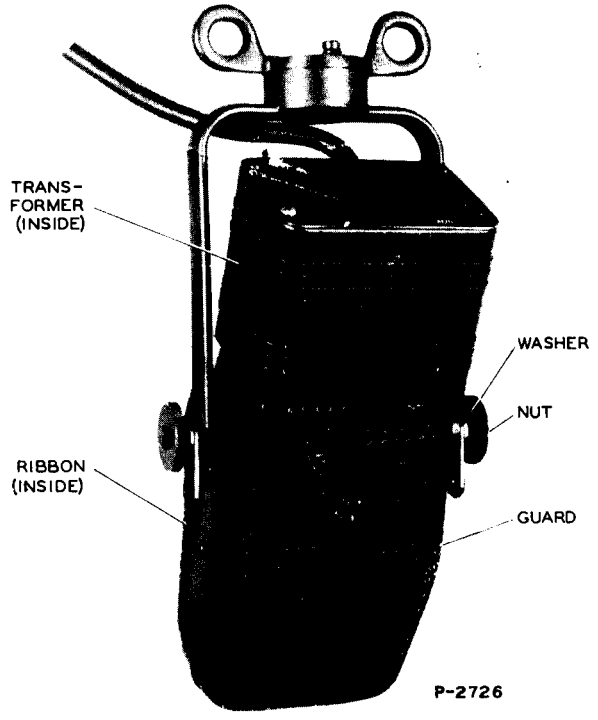

Figure 1—MI-3027-E Velocity Microphone

This type of microphone has an exceptionally uniform response throughout the audio frequency range employed in motion picture sound recording.

** With an input sound pressure of 10 dynes per square centimeter.*

The output level of the MI-3027-E microphone is of the same order as that of other high quality microphones used in sound recording for motion pictures. Its construction is such as to provide a relatively rugged microphone and one whose sensitivity and frequency response are practically unaffected by changes in temperature, humidity, and barometric pressure.

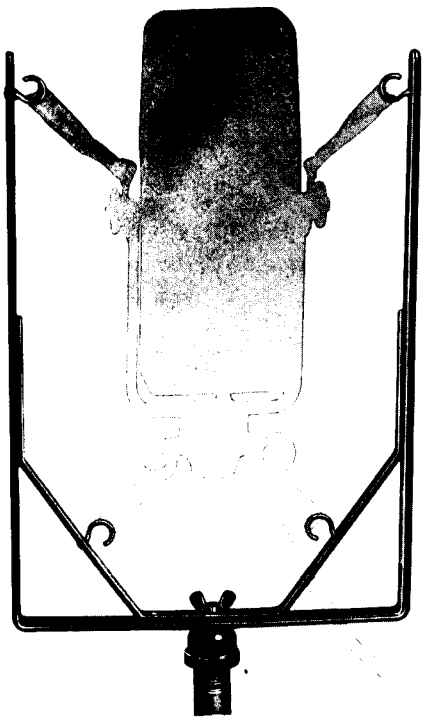

Figure 2—MI-3065 Suspension Mounting with Phantom Microphone

The ribbon and magnet assembly is contained in a perforated housing that provides protection against mechanical injury. The output transformer is contained in an attached housing and the transformer terminal board is accessible by removing the housing cover plate. The transformer is connected for an output impedance of 250 ohms when shipped. 50 ohms output impedance is also available by means of taps on the transformer winding.

The entire microphone is finished in dull gray.

This microphone is supplied with a suspension hanger, MI-4071-A assembled. This permits the unit to be suspended above an action scene where it is out of the view of the camera yet in the proper position for pickup of the sound associated with the scene. For sets where there is considerable vibration a special suspension mounting, MI-3065, is available. This mounting is especially designed to eliminate the transmission of unwanted sounds to the microphone through the medium of building vibration and transmission through supporting cables. (See Figure 2.)

An 18 inch strain relief cable and plug (MI-4630) is also supplied with this microphone. The microphone may also be mounted on a program or announce stand such as the MI-4090, or a tripod such as MI-10052-A by using an MI-3033-A or MI-3065 Adapter.

RESPONSE CHARACTERISTIC

The response of this microphone can be altered to provide the characteristic most suitable for either music or speech pickup. For this purpose a reactor is provided inside the housing with the output transformer. This reactor is connected across all or part of the transformer output winding when the microphone is to be used for the pickup of speech. (Across entire winding when connected for 50 ohms output impedance and across part of the winding when the 250 ohm connection is used.) This provides the low frequency equalization required by sound recording channels when used for speech recording

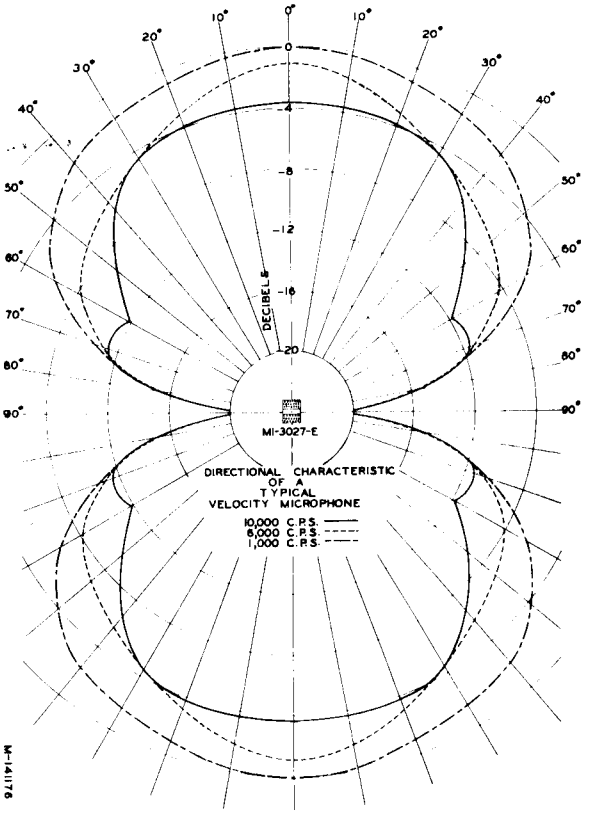

Figure 3—Directional Characteristic of MI-3027-E Microphone

For the pickup of music this reactor is not connected except in the special case cited below. Connections of the transformer and reactor to the out-

put terminal board are such that the microphone response can be adapted for the pickup of either speech or music by changing a jumper connection on the output terminal board.

The characteristic for speech pickup is obtained by connecting the jumper marked "V" between the two terminals marked "M" on the output terminal board. (See Figure 5.) With this jumper in place the letter "V" is visible through a small hole in the transformer housing cover plate. Removing the jumper disconnects the reactor and provides a response suitable for the pickup of music. With the jumper removed the letter "M" is visible through the hole in the cover plate.

If the microphone is to be placed so that a source of music is within three feet or less, it may be desirable to connect the microphone for speech pickup in order to avoid the increase in low frequency response to sounds that originate within this distance when the microphone is connected for music. (See under "Operation.")

IMPORTANT: It is not intended that alterations in response will be made between scenes. The response adjustment feature is incorporated for the purpose of supplying a microphone with a characteristic most suitable for either speech or music recording. It is recommended that the response be adjusted for one type of service and the use of the microphone restricted accordingly.

A directional characteristic of this type results in considerable reduction in the pickup of reflected sound because such sounds reaching the microphone from side directions will have little effect. This reduction in the pickup of reflected sound results in recordings of higher quality and greater clarity. For a pickup with the same allowable reverberation content the operating distance of the velocity microphone is approximately 1.7 times that of a non-directional microphone of the same sensitivity. When used for public address or sound re-enforcing purposes this directional characteristic is of considerable value in reducing feedback effects between the microphone and loudspeaker.

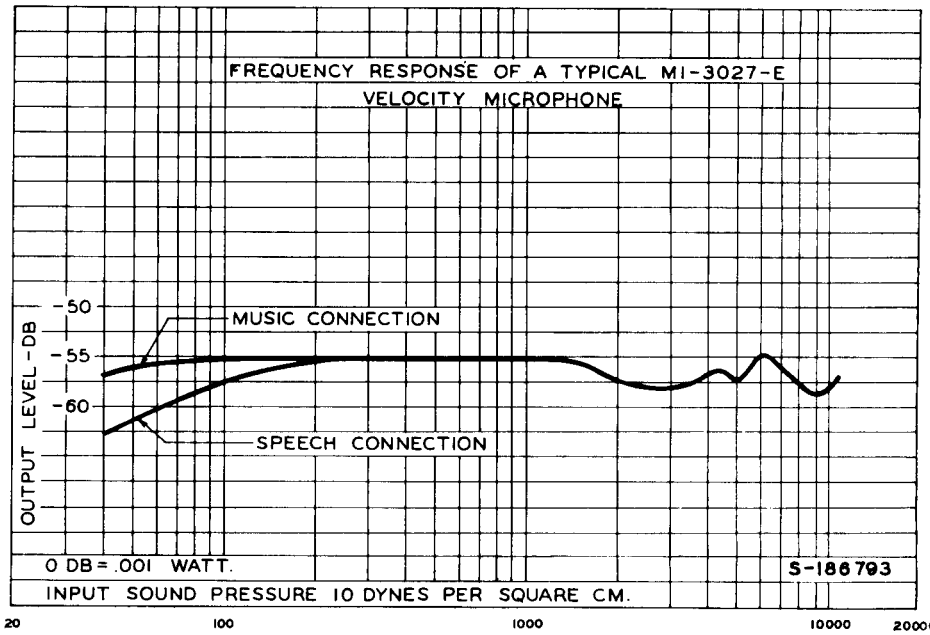

Figure 4—Frequency Response of MI-3027-E Microphone

DIRECTIONAL CHARACTERISTIC

One of the most important characteristics of the velocity microphone is its directional property. Sound waves approaching the microphone from a direction in the same plane as the ribbon have little effect upon it. Sound waves approaching from either the front or back direction along an axis perpendicular to the plane of the ribbon have the maximum effect. For equal distances from the microphone, the relative response to sound originating at various angles to the axis perpendicular to the ribbon is shown in Figure 3.

INSTALLATION

The microphone is equipped with a suspension mounting when shipped. The suspension fitting is attached to the yoke of the microphone fork by means of three machine screws. Eyelets are provided at the extremities of the fork to which lines may be fastened to hold the microphone steady. The microphone may be suspended over a set by means of the standard suspension mounting or by the MI-3065 shock mounting or it may be positioned above the pickup area by means of MI-3060, MI-3066, or MI-3067 handbooms or by a mechanical boom. The MI-3060 is a wooden handboom while MI-3066 is a three section (12 ft.) duralumin boom and the MI-3067 is a two section (12 ft.) duralumin boom.

IMPORTANT: When suspension mounting is used the weight of the microphone should be carried by the hanger, with no strain on the cable.

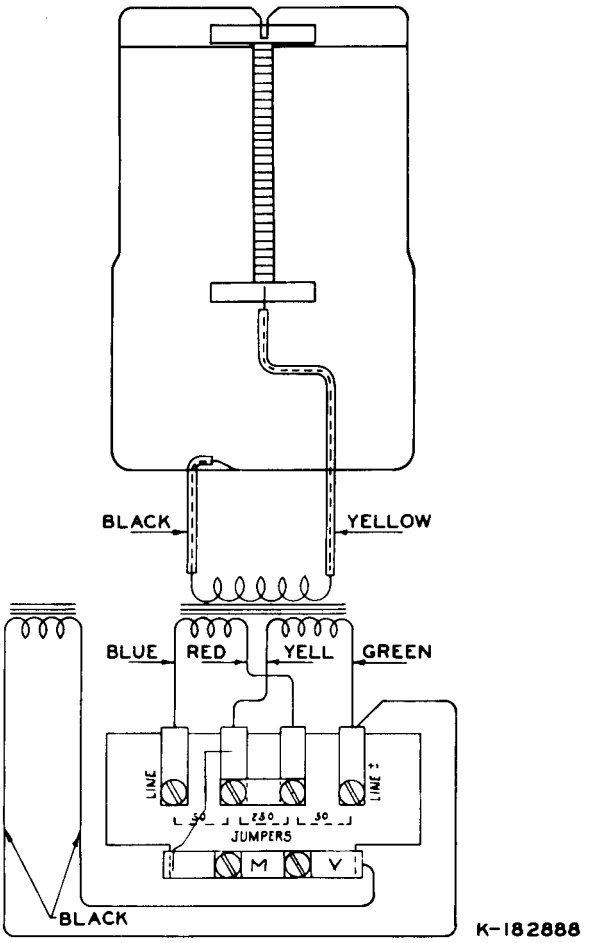

Figure 5—Connection Diagram

If mounting on a stand is desired, the MI-10052-A Tripod, MI-4090 Program Stand, and MI-4058-A Announce Stand are recommended. (When either of these stands is used an adapter MI-3033-A or MI-3065 is required. To mount the adapter on the microphone fork, remove the suspension fitting, pass the spindle of the adapter through the hole in the yoke and put on the flat washer, the spring-washer, the spacer and the clamping nut. Tighten the clamping nut in place. If either the tripod or program stands are to be used, screw the adapter assembly (the flange of which is drilled and threaded for this purpose) to the top of the stand. If the announce stand is to be used, remove the cable clamp from the adapter barrel, and the flange from the bottom of the adapter. Insert the adapter barrel into the hole in the stand and fasten in place by means of the three machine screws.

CONNECTIONS

With the cover plate on the transformer housing removed, the output terminal board will be exposed. Four terminals are located on one side of the block. The two outside ones are the output terminals. Between the two center terminals is engraved the number "250". (i.e. 250 ohms.)

Between each outside terminal and the adjacent center terminal is engraved the number "50" (i.e. 50 ohms). See Figure 5. If the microphone is to

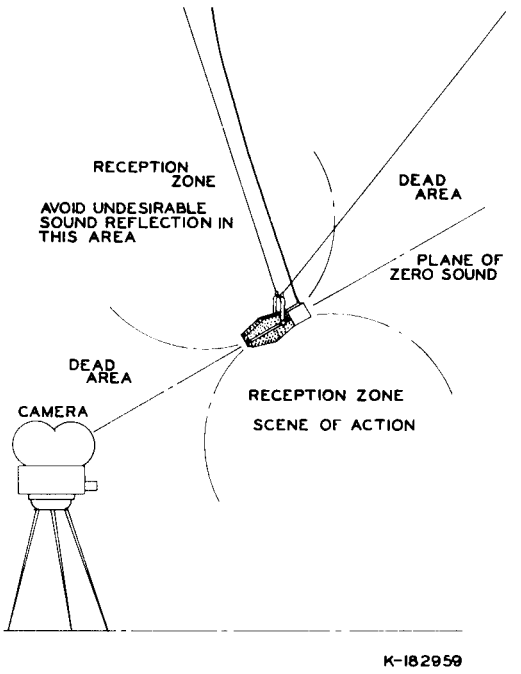

Figure 6—Typical Microphone Location

have an output impedance of 250 ohms, place the two small jumpers, one over the other, across the two center terminals (250 ohms). If the microphone is to have an output impedance of 50 ohms connect one of the jumpers across each pair of terminals marked "50". No change in microphone cable connections is required. The cable should pass through the slot in the transformer housing.

PHASING

When two or more microphones are connected into a mixing circuit, it is necessary that their outputs be in phase, otherwise, the output of one microphone will oppose the output of another, resulting in a reduction in overall output.

To check the phasing of velocity microphones, place two side by side, facing in the same direction, and connect them to a mixing circuit. Speak into both microphones and adjust the gain controls of both channels to the same position. Note the out-

put. Then rotate one microphone 180 degrees but keep it in the same location. Again speak into the microphone and note the output. If the output decreases from that noted in the first case, the microphones were in phase as they were placed originally. If the output increases the microphones were out of phase.

A velocity microphone may be reversed in phase by rotating it 180 degrees, however, in order to maintain uniform operating practices, it is recommended that all velocity microphones be connected so that they are in phase when the sound source is on the front side of the microphones (side opposite the cable). (Note: They will also be in phase then when the sound source is on the back side.)

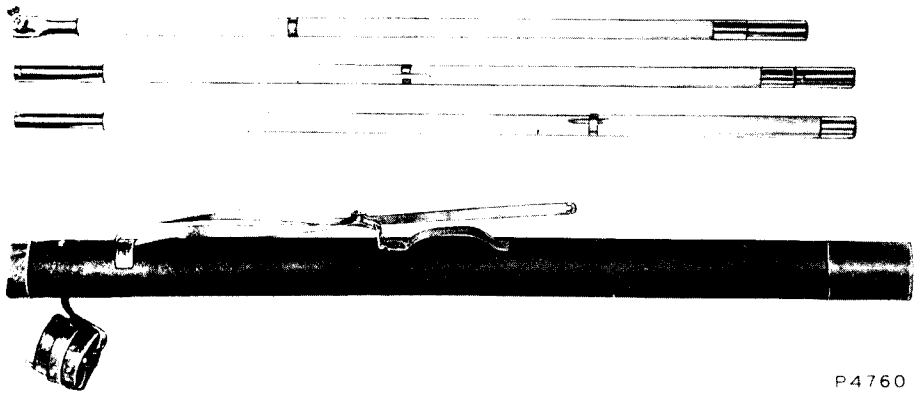

Figure 7—MI-3060 Handboom and Carrying Case

OPERATION

The directional characteristics and high relative sensitivity of this microphone are especially important in motion picture sound recording. Since motion picture sets must be constructed to have the proper appearance as well as to have the desired sound qualities, it is often expedient to sacrifice some of the sound qualities of the set in order to enhance the appearance. This, of course, causes more difficulty in controlling echoes and reverberation. The microphone usually cannot be in the field of view of the cameras, therefore, it is nearly always necessary to locate it at a greater distance from the actors than is the case in a broadcasting studio or other commercial application. Noises from people and machinery in motion on the set, that are not in the picture, must not be picked up. Consideration of these factors indicates the desirability of using a directional type of microphone, since the echo and reverberation pickup is greatly reduced with a microphone of this type. It is often possible to place a directional microphone so that unwanted sounds originate from a direction in which the response of the microphone is greatly attenuated.

In order to obtain the best results it is necessary that performers and instruments be grouped properly, and that they be placed relative to the microphone so that each will register with the proper relative intensity. The correct placement and grouping will be determined best as a result of experience since the requirements for individual sets will vary widely. For a detailed discussion of the principles involved in microphone and sound source placement the reader is referred to the booklet entitled "Microphone Technique in Sound Film Recording" IB-24316. The following general rules for velocity microphones may be helpful when acquiring the basic experience upon which a good microphone technique may be built.

1. Never place performers nearer than two feet to the microphone. Usually, the best results are obtained when performers are at least three to four feet from the microphone. The low frequency response of this microphone is increased if the sound source is within about three feet or less of the microphone, and it is desirable to maintain this minimum distance unless special effects are desired. Voices tend to become "boomy" and unnaturally deep-throated if performers are too close to the microphone. Beyond three feet the response is as shown by the curve (Figure 4).

It may be desirable to place the microphone nearer to performers than the minimum distance recommended if special effects are desired. This may be done to increase the "presence" of the sound, for "close-up" pickup of a soloist with an orchestra, etc. In such cases the microphone may be connected for the pickup of speech in order to provide low frequency attenuation that will approximately offset the low frequency boost caused by the proximity of the microphone to the sound source.

2. Place the microphone so that the source of sounds to be recorded will be either to the front or back of the microphone. Whenever possible the microphone should be placed so that sources

of unwanted sound are to the sides where the pickup is greatly attenuated. A baffle of sound absorbing material such as heavy felt may be placed about three feet to the rear of the microphone when unwanted sounds originate from directions opposite to that of the desired sounds. This will attenuate the pickup of sounds originating to the rear of the microphone. Figure 6 shows a camera placed in the plane of zero sound of the microphone which is suspended above the performers in such a way that it is unlikely that sound sources will be at the rear of the microphone.

3. High frequency instruments should be placed along the axis perpendicular to the plane of the microphone ribbon or displaced from this axis only by small angles. Low frequency instruments may be displaced from the axis by larger angles. Refer to Figure 3 for the change in directional characteristic with the change in frequency. Experimental placement of performers and instruments is usually necessary in order to obtain the desired effect for a specific set.

4. Protect the microphone from strong winds or loud explosive type sounds. Such sounds may stretch the microphone ribbon abnormally and necessitate its replacement.

5. Always place the microphone so that direct sound from the subject is picked up instead of reflected sound from tables, walls, floors, etc.

REPAIRS

It is recommended that microphones be returned to the factory for all major repairs. Guards, transformers, cables, and mounting parts are stocked for replacement in the field.

After it is determined definitely that trouble exists in the microphone and not elsewhere in the circuit, obtain a "Returned Goods" tag and "Report Blank" from Radio Corporation of America, RCA Victor Division, Camden, N. J., before returning the apparatus for repairs.

REPLACEMENT PARTS LIST

The following parts list is included to provide proper identification when ordering replacement parts. When ordering specify the item by its stock number and description.

STOCK NO.	DESCRIPTION
48763	Cable—Microphone cable assembly complete with plug
16825	Guard—Microphone guard (2 sections)
16829	Hanger—(Set of two) Extension hangers
16830	Hanger—For suspending microphone in space
16826	Nut—Thumb nut
25597	Plug—3 contact male for microphone cable
44711	Stud—Microphone mounting stud
45629	Transformer—Microphone transformer RT-435A
16827	Washer—Stop washer under thumb nut

LIST OF ACCESSORIES

STOCK NO.	DESCRIPTION
MI-3065	Suspension Mounting
MI-3060	Handboom (Wood)
MI-3066, -3067	Duralumin Handbooms
MI-3061	Handboom bag for MI-3060 or MI-3066
MI-4090	Program Stand
MI-4058A	Announce Stand
MI-3033A	Adapter Cushion Type
MI-62	Cable—2 conductor shielded, rubber covered extension cable
	Replacement Parts for MI-3033-A Adapter
16987	Cushion—Mounting assembly, less flange
16967	Flange—Cushion mounting flange
16988	Nut—Thumb nut on cushion mounting assembly

OTHER RCA RECORDING MICROPHONES

RCA TYPE NO.	DESCRIPTION	USE
MI-3043-B, -C	Uni-Directional Microphones	Speech or music indoors or out
MI-3044-B, -D, -E	Pressure Microphone	Speech and outdoor recordings