

FIG. 1. The BK-5A is an excellent microphone for TV boom operation. New and improved shock mount affords simple, reliable, noise-free handling.

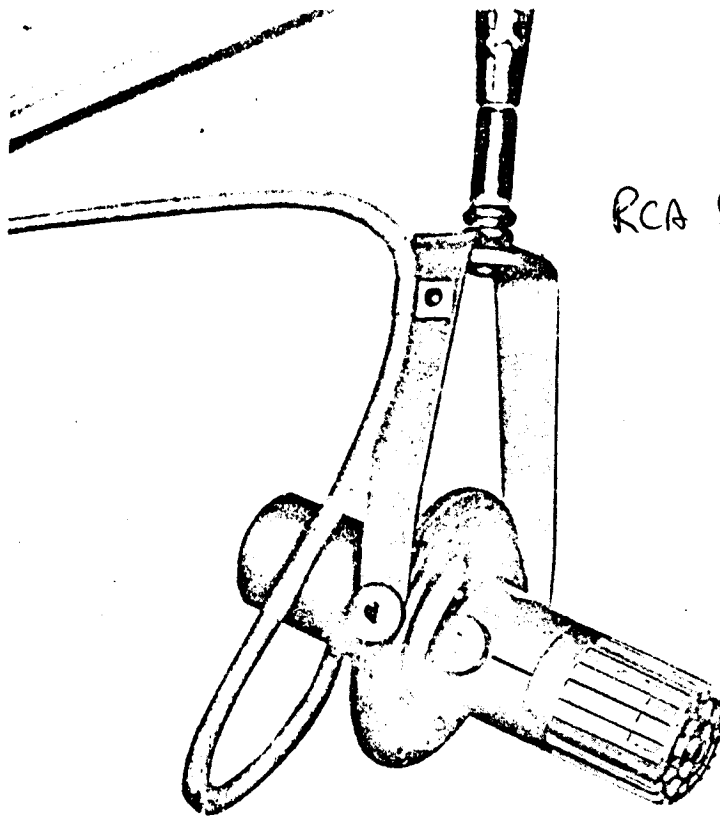
RCA Broadcast News, May, 1955

# The New BK-5A UNIAXIAL MICROPHONE

## Television's Most Versatile Sound Pickup Unit

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Engineering Products  
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For more than fifteen years the RCA Type 77D Polydirectional Microphone has been the pride of many small broadcasters and the standard of performance of the network stations. Throughout the rapid growth of television in the past ten years, the 77D has been the best all around microphone available; it has found near-universal acceptance for television broadcasting. The RCA Type BK-5A Uniaxial Microphone was primarily designed for television broadcasting as a successor to the 77D. Called Uniaxial because the direction of maximum sensitivity has been made to coincide with the major axis of the microphone, the Type BK-5A features new styling which blends function and appearance into one coherent whole.

The Type BK-5A is built for simple and sure handling when mounted on a boom. One of the features which contributes to this is the radically improved shock mount, shown in Fig. 1. This is an adaptation of a panel meter shock mount originally designed for military use. It effectively isolates the microphone from the boom support and does not itself generate any noise. It eliminates the rubber band mounting, which is noisy and requires frequent replacement of the rubber bands. The shock mount for the Type BK-5A will last the life of the microphone.

For stand mounting, the Type BK-5A is furnished with a cast fork cradle tapped with a  $\frac{1}{8}$ " straight pipe thread. This thread will receive the RCA Standard Cushion Mount Adapter (Stock No. 93973) which is required when using on Desk Stand, Type 91-C. The front of the grill of the Type BK-5A has a bullseye motif, presenting an obvious talking target.

Complementing the new styling, the Type BK-5A features improved acoustical performance. Compared to the Type 77D microphone there is increased resistance to gun blast, better directional properties, and the sensitivity to wind noise has been reduced. These are accomplished while maintaining the sensitivity slightly higher than that of the Type 77D microphone.

### Gun Blast Resistance

There have been many occasions where ribbon microphones have been damaged during television shows by guns being fired close to the microphone. Tests at RCA's David Sarnoff Research Center showed that the ribbon damage was not done by the steep-fronted blast wave, but rather by the concussion wave that followed as the air moved into the vacuum created by the explosion. The concussion wave contains mainly low frequency components. If it were possible to isolate the ribbon from

these components, a considerable measure of protection would be effected. To accomplish this, two layers of fine mesh cloth are supported in front of the ribbon by the horn-like structure shown in Fig. 8. These form an acoustical filter which reduces the concussion wave of gun blasts.

In laboratory tests, it was possible to fire .38 caliber blanks as close as three feet (3') to the microphone and .32 caliber blanks as close as one and one-half feet (1½') without any measurable effect on the performance. The tests were made with the gun fired at right angles to the microphone and directly in front of it.

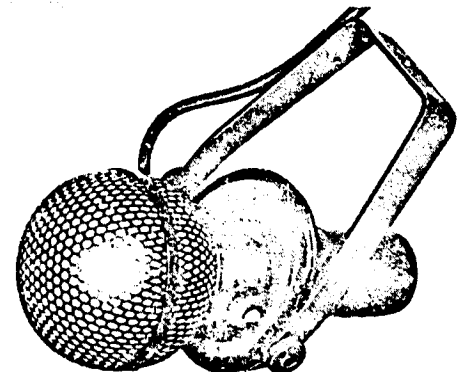


FIG. 2. BK-5A Microphone with Wind Screen, MI-11011, and Boom Mount, MI-11012.

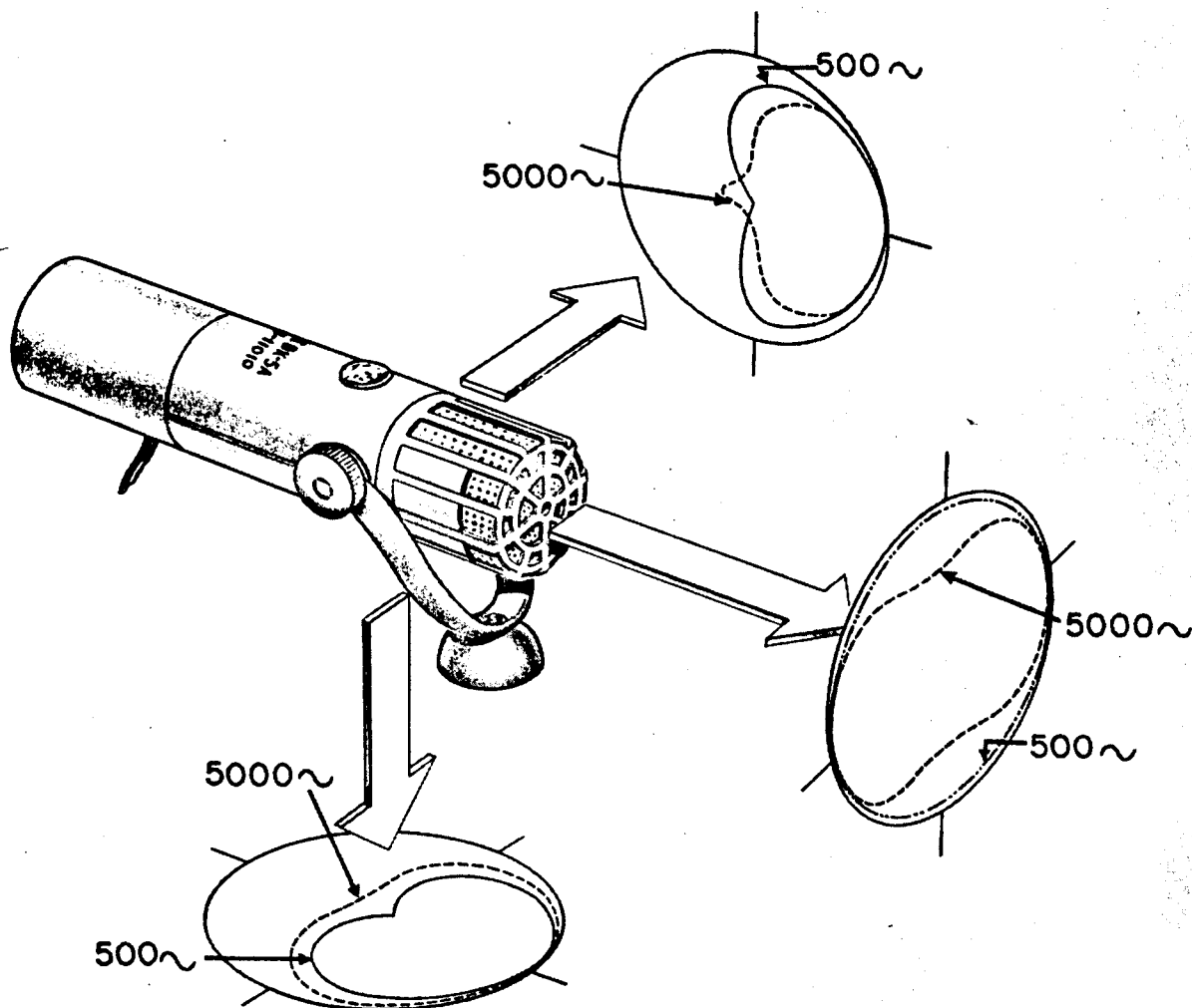


FIG. 3. Perspective view of the BK-5A showing the high frequency and low frequency directional characteristics about the major axes. At low frequencies, the pickup pattern is a true cardioid. At 5000 CPS and above, the pattern becomes fan shaped. This can be utilized to reduce pickup of scraping noises from the floor of a television set. The direction patterns shown in above sketch are illustrated in more detail in Fig. 7.

### Directional Characteristics

The directional properties of the BK-5A in the mid-frequency region is essentially a cardioid with an eighteen decibel front-to-back ratio. The high frequency directional properties have been improved over the Type 77D, both in pickup angle and in front-to-back ratio. This is done by changing the configuration of the acoustic circuit.

In the Type 77D, there is one port at the back of the ribbon, which in combination with the acoustic labyrinth gives it its directional properties. In the Type BK-5A there are two ports, one placed at each end of the ribbon. These act in cooperation with a short horn-like structure in front

of the ribbon (supporting the blast filter) to give a fan-like directional pattern above five thousand cycles per second. See Fig. 3. The ribbon in the Type BK-5A is mounted vertically, placing the high frequency "fan" in a horizontal plane. This can be used to minimize foot scuffing, or other high pitched sounds, which may come from the floor of the television set.

### Wind Noise Sensitivity

The wind noise sensitivity of the Type BK-5A is some five decibels less than that of the Type 77D. RCA has developed a technique for the quantitative measurement of the sensitivity of microphones to wind noise, which was described by one of the

authors before the Audio Engineering Society at the October 1954 meeting, and is described in detail beginning on page 52 of this issue.

Briefly, the method consists of fastening the microphone to the end of a long pendulum which moves through the still air of an anechoic chamber. Peak velocities up to twenty miles per hour are possible at the microphone. A tentative standard test velocity of ten miles per hour has been chosen. The noise generated by the microphone can be readily analyzed by a high speed recorder and an octave band filter.

A summary of the wind noise spectra of the Type 77D in comparison with the Type

BK-5A is shown in Fig. 4. In the presentation of the spectra, compensation has been made for the different sensitivity levels of the two microphones. The overall wind noise level can be further reduced by setting the voice-music switch in the  $V_1$  position.

In applications where even greater immunity to wind noise is required, a wind screen, shown in Fig. 2, is available as an accessory. Fig. 4 also compares the wind noise sensitivity of the Type BK-5A with and without the wind screen, demonstrating the effectiveness of the screen.

### Construction

A sectional view of the Type BK-5A, illustrating its rugged and compact construction, is shown in Fig. 8. The microphone is a fusion of four systems: the magnetic circuit, the acoustic circuit, the electrical circuit, and the mechanical integration of these three into the case.

The air gap flux density is in excess of 11,000 gauss, maintained by two Alnico V magnets and the magnetic grade iron yoke and pole pieces.

The acoustic circuit consists of the horn and screen assembly in front of the ribbon and the acoustic connector and labyrinth behind. The horn-screen assembly has already been described. The acoustic connector effects a transition from the long narrow air gap slot to the square cross section of the labyrinth pipe. The acoustic connector also has the two phase shifting ports. The ports are covered with an acoustically controlled cloth to form the proper impedance in the opening. This impedance and the acoustic resistance of the labyrinth in conjunction with the physical separation of the front and rear pickup points give the Type BK-5A its superior unidirectional characteristic. The acoustic labyrinth is a pipe approximately thirty-one inches long folded into the form of a cylinder. It is damped along its length to eliminate resonances so that it acts as a pure acoustic resistance over a substantial part of the frequency range.

The electrical circuit consists of the corrugated aluminum foil ribbon, a line matching transformer, the response compensation reactor, and the associated wiring. The cable has cadmium bronze conductors for extended life. The transformer and reactor are well shielded, and the wiring is balanced for external fields. The result is a hum sensitivity rating of  $-128$  dbm, the lowest attained by a magnetically energized microphone. The output impedances available are 30, 150, and 250

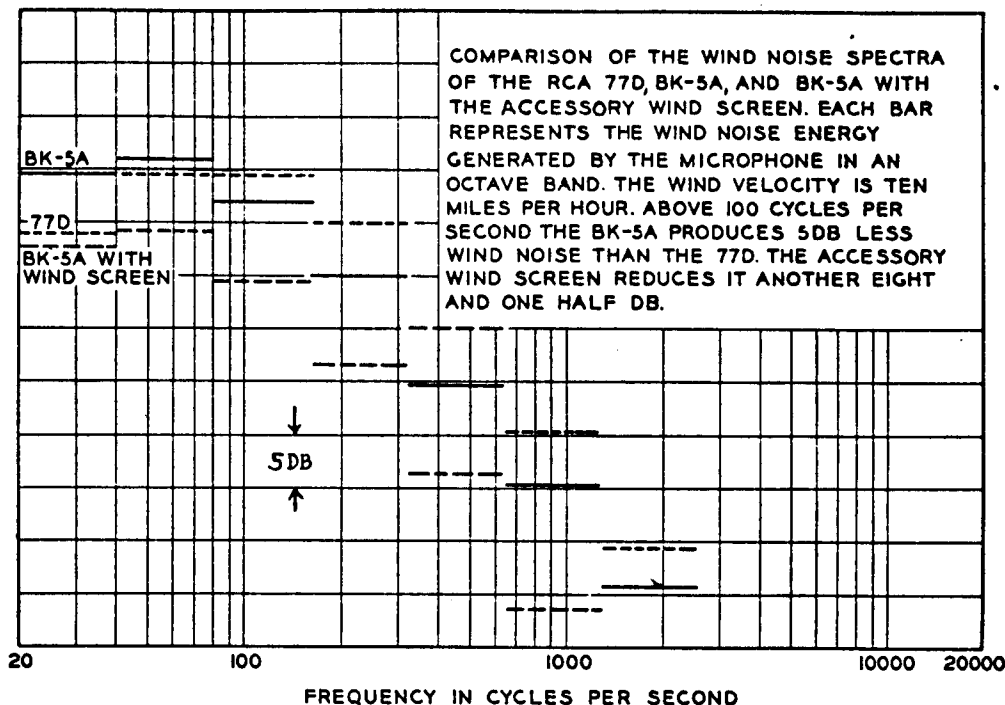


FIG. 4.

ohms. The impedance may be changed by relocating the cable connections at the terminal board in the rear cover cavity. Performance of the microphone will not be affected by removing the rear cover to change the output connections. A magnetic screen in front of the ribbon minimizes any accumulation of magnetic dirt in the critical parts of the microphone.

The mechanical integration of the three systems is accomplished as shown in Fig. 8. Encasing the elements is done by covering the motor with a strong die cast zinc cover. The labyrinth is also a zinc die casting, the outside forming the center section of the microphone and the cavity inside the ring of tubes housing the transformer and reactor. The rear cover cavity

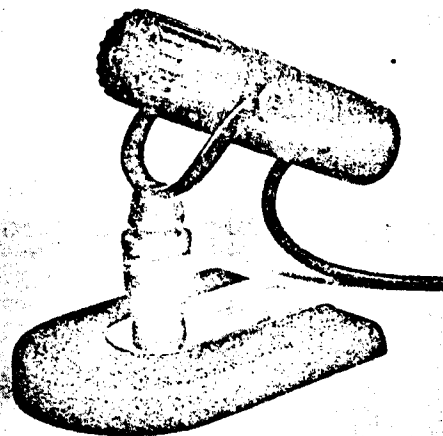


FIG. 6. BK-5A mounted on Type 91-C Desk Stand. RCA Standard Cushion Mount Adapter (Stock No. 93973) is required in this application.

FIG. 5.

### FREQUENCY RESPONSE OF THE BK-5A MICROPHONE SHOWING THE EFFECT OF THE VOICE MUSIC SWITCH

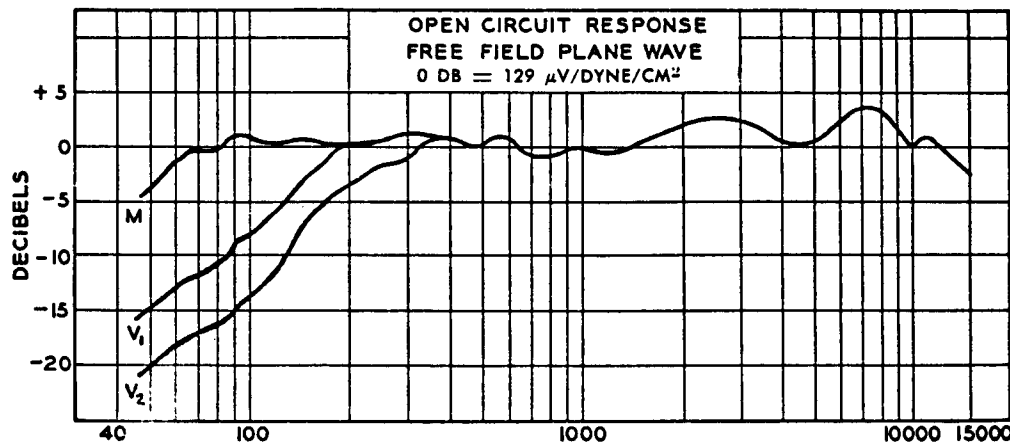
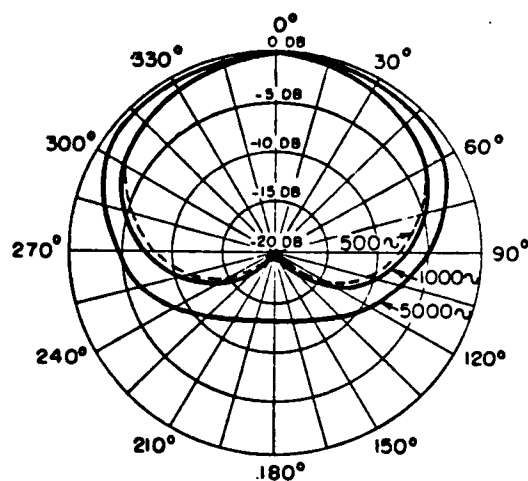
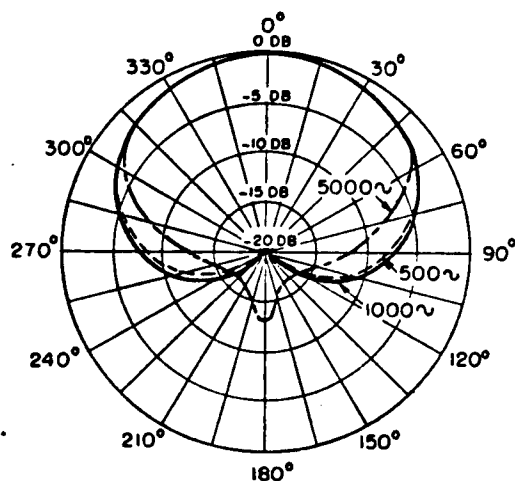
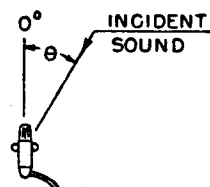


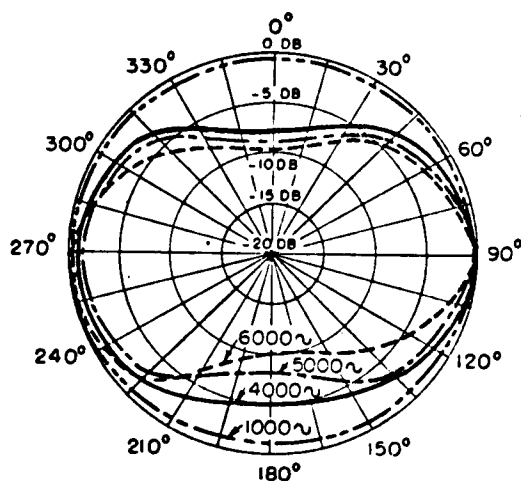
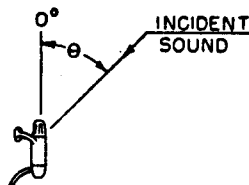
FIG. 7. Directional characteristics of the BK-5A Microphone.



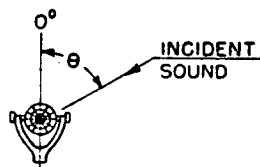
ABOUT THE VERTICAL AXIS



ABOUT THE HORIZONTAL AXIS



ABOUT THE LONGITUDINAL AXIS



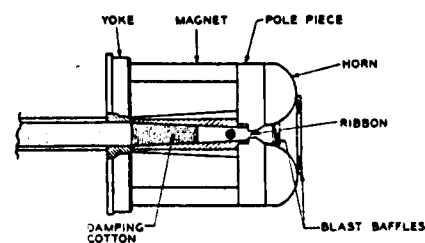
is reserved for output terminal board, reactor switch, and cable clamp.

The frequency response characteristic of the BK-5A is shown in Fig. 5. The high frequency response above 10 kilocycles is more uniform than has been heretofore possible. The output level is -56 dbm.

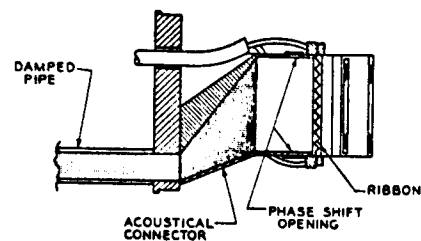
The Type BK-5A is equipped with a voice-music switch giving two degrees of low frequency roll-off, as shown in Fig. 5. This feature may be used to attenuate low frequency noise in a studio. It may also be used to compensate for the increase in low frequency response obtained when the speaker is near the microphone.

The Type BK-5A is the latest of a distinguished line of acoustic tools for the broadcast and television industry. Its premium performance, classic styling and ease of handling will meet with wide acceptance for many years to come.

FIG. 8. Cutaway view of BK-5A.



TOP VIEW



SIDE VIEW