



MICROPHONE FACTS

OR THE OPERATING ENGINEER

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THE PARABOLIC REFLECTOR MICROPHONE

In the early thirties, a parabolic-shaped reflector was developed for use with a nondirectional microphone. The resulting polar response is very directional above 1000 cps where it is teardrop in shape, as in Figure 1. From 1000 cps down, the polar pattern widens, becoming nondirectional at 200 cps. This is the polar response of a reflector three feet in diameter. Reflectors of larger diameters will be more directional at lower frequencies. One six feet in diameter, for example, will be directional above 100 cps.

This is how it works: if the reflector is parabolic in shape and a nondirectional microphone is located at the focal point of the reflector, sound will be focused on the microphone, as in Figure 2. The larger the reflector diameter, the greater the amount of energy accumulated, resulting in increasingly higher gain. With a three-foot diameter reflector, there will be an increase in gain of about 10 db; and for a six-foot diameter reflector, an increase of 16 db over the level of the microphone alone.

The directional effect obtained depends on the amount of sound reflected into the microphone. Sound originating off axis will be out of focus and, as a result, less will be picked up. As the off-axis angle increases, the mike output will be increasingly less.

For frequency response curve, see Figure 3. This is the curve of the reflector and the microphone that was designed to use with it. We were unable to improve the response using one of our microphones. The reflector controls the response to a large degree.

THE MACHINE GUN

The "machine gun" microphone consists of a number of small tubes with open ends as pickup points, varying in length from two inches to five feet in steps of approximately one inch. The tubes are bundled tightly together and terminated at the diaphragm of a nondirectional microphone.

With the tubes cut to the above lengths and bound together, a distributed sound entrance to the diaphragm is created and the nondirectional microphone becomes very directional at many frequencies.

This is how it works: sound originating in front (on axis) of the tubes, will first enter the longest tube. As the sound advances, it will enter each tube in normal progression following down until the diaphragm is reached. All sound reaching the diaphragm has traveled the same distance from its source, regardless of the tube it entered. This being the case, all sound arriving at the diaphragm on axis is in phase.

Sound originating at 90° off axis meets with an entirely different treatment. At this angle sound will enter all tubes at the same time. Sound entering the five-foot tube must travel five feet to reach the diaphragm while the same sound entering the two-inch tube only has to travel two inches. Since each tube in the bundle is of a different length, the same sound entering each tube must travel a different distance, causing an out-of-phase condition, cancelling a large portion of the sound originating at 90° . For sound originating at 180° off axis, an even greater phase difference occurs, and an even greater percentage is cancelled.

Figure 4 shows the frequency response curve of the multiple tube line microphone that was furnished to us for test. See Figure 5 for polar response.

This letter completes the series on microphone polar response, and we have discussed numerous types of past and present unidirectional types. Now let's see what the future has to offer: the most dramatic microphone in twenty years is now ready.

The advent of motion pictures introduced the use of microphones on booms...and brought with it the demand for a boom microphone that would solve the many problems that were created by this new use. For the past five years a solution to these problems has been a major project at Electro-Voice. During this time many ideas were tried and discarded until about two years ago when things began to fall in place; today this problem-solver is an accomplished fact. It is now ready to be put to work on your problems.

Introducing the E-V Cardiline Model 642...a combination of line and cardioid microphone principles employing a single dynamic unit. To make it practical for boom use the line section had to be reduced in length and diameter. This was accomplished by using a single tube one foot in length. A one-eighth inch open slit was milled in the tube over its entire length. The slit was then covered with a linear tapering acoustic resistance. A tube so constructed replaces the balance of the tubes required by the machine gun unit. This one tube with the slit supplies an infinite number of openings to sound making the frequency response smoother than is possible with multiple tubes. Figure 7 illustrates this fact.

The short length of the tube was found to have a distinct acoustical advantage. Being short, its internal acoustic resistance was greatly reduced over that of a long tube. With the resistance down, high frequency response was greatly extended.

Microphone Facts, April 1960

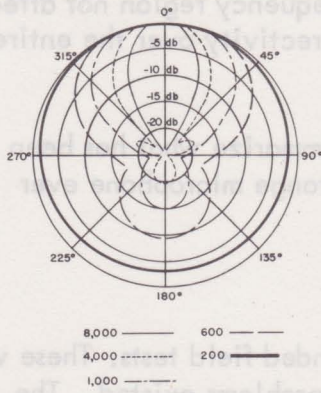


Fig. 1 Polar Pattern, Parabolic Microphone

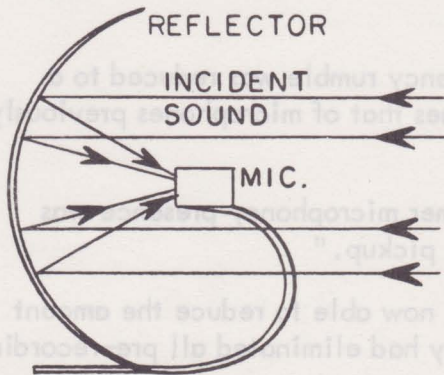


Fig. 2 Parabolic Reflector (Sectional View)

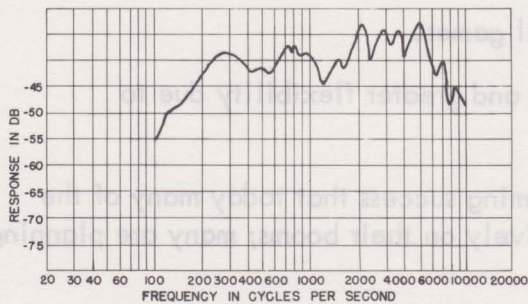


Fig. 3 Frequency Response Curve, Parabolic Microphone

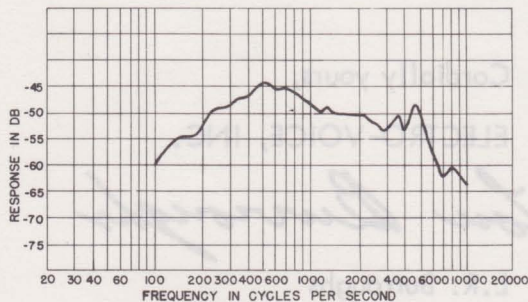


Fig. 4 Frequency Response Curve, "Machine Gun" Microphone

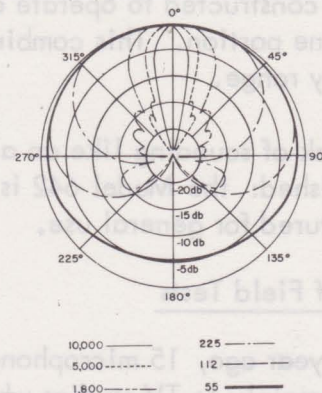


Fig. 5 Polar Pattern, "Machine Gun" Microphone

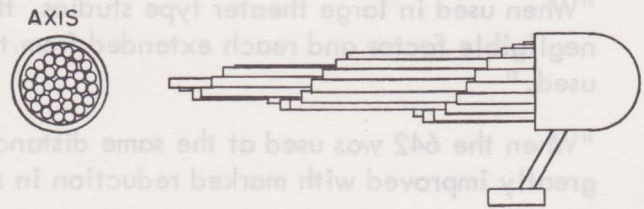


Fig. 6 Multiple Tube Line Microphone (The "Machine Gun")

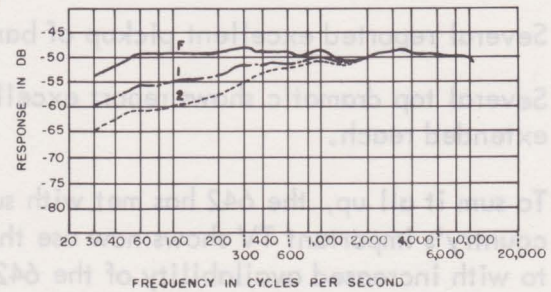
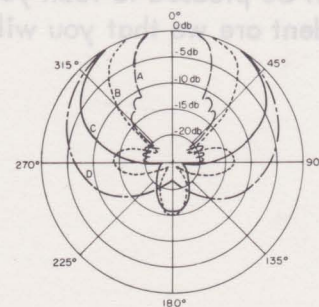


Fig. 7 Frequency Response Curve Model 642 Microphone



A — 10,000 cps C — 1,000 cps
B — 2,500 cps D — 100 cps

Fig. 8 Polar Pattern, Model 642 Microphone

To compensate for the loss in directivity associated with the short tube, the dynamic unit was constructed to operate as a cardioid over the low frequency region not affected by the line portion. This combination results in excellent directivity over the entire frequency range.

At the risk of sounding like an advertising copywriter, we summarize what has been accomplished: the Model 642 is the most directional, wide range microphone ever manufactured for general use.

Results of Field Tests

About a year ago, 15 microphones were constructed for extended field tests. These were supplied mainly to TV studios where major boom microphone problems existed. The following information is a summary of reports from some of the country's top audio engineers, all having used the Model 642 for at least six months.

"When used in large theater type studios, the low frequency rumble was reduced to a negligible factor and reach extended from two to six times that of microphones previously used."

"When the 642 was used at the same distance as our former microphone, presence was greatly improved with marked reduction in random noise pickup."

Due to increased reach, several reported that they were now able to reduce the amount of pre-recording previously necessary. Two reported they had eliminated all pre-recording except in occasional extremes.

All reported that, due to the -48 db level, their signal-to-noise ratio had been improved.

Several reported excellent pickup of bands at football games.

Several top dramatic shows report excellent presence and greater flexibility due to extended reach.

To sum it all up, the 642 has met with such overwhelming success that today many of the country's important TV shows now use the 642 exclusively on their booms; many are planning to with increased availability of the 642.

When you complete your test of the 642, please let me hear from you. Your reports help us design and improve the microphones you need. Please remember, any franchised E-V distributor will be pleased to loan you any of our microphones for evaluation prior to purchasing, so confident are we that you will keep what you try.

Cordially yours,

ELECTRO-VOICE, INC.

Lou Burroughs

L.R. Burroughs
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Broadcast & Recording Equipment