



**Electro-Voice**

## MICROPHONE FACTS

FOR THE OPERATING ENGINEER

ELECTRO-VOICE, INC. • BUCHANAN, MICHIGAN • PHONE OXBOW 5-6831

October 1959

### NON-DIRECTIONAL MICROPHONES

When using a non-directional microphone at a distance of 6 inches, reverberation and random noise pickup will seldom be a problem. The signal is sufficiently high to overcome the noise. As the distance of source-to-microphone increases, a point will be reached where reverberation begins to color the signal. Under normal studio acoustic conditions, noticeable reverberation pickup will begin to be heard at about 12 inches with serious pickup at 18 to 24 inches.

Over the years, I have been asked many times, "Why does one type of microphone sound much better in a certain studio than another?" On investigation I have found a non-directional microphone being improperly compared with a directional microphone.

When comparing microphones having dissimilar directional characteristics begin the comparison in this way: Place them side by side and work at a distance of 6 inches. At this distance there will be no difference in response if their axial response is the same. From this point have the person speaking back away slowly and continue talking. When a point is reached at which a comparison check shows there has been a change in quality, the change will be due to reverberation. This is the point at which it is wise to discontinue the use of a non-directional unit unless this reverberation is desired. As stated above, this point will generally be reached at between 12 and 24 inches, depending on acoustic conditions.

There are instances in which the inclusion of reverberation is very desirable. Refer to my letter of November, 1958, describing the use of a single 655C for symphony pickup.

If you need more "reach" without reverberation, or if the reverberation component is too great, you have reached the limit of usefulness of the non-directional type. To gain more working distance, microphones with directional characteristics need be considered.

### BI-DIRECTIONAL MICROPHONES

These are pressure gradient or velocity microphones usually employing a ribbon as the moving membrane.

This type works on the gradient of sound pressure or the difference in pressure. Any microphone open to sound front and back, employing a ribbon or diaphragm, will be operating on the gradient of sound. With equal apertures front and back, this type of microphone will have a polar response such as that shown on the enclosed polar chart.

Sound originating at either  $0^\circ$  or  $180^\circ$  will be picked up equally but sound originating at  $90^\circ$  and  $270^\circ$  will cancel, since it arrives equally at both sides of the moving membrane. This gives the figure 8 pattern. The same procedure is used in plotting this polar response as that of the pressure microphone. Refer to the August issue of MICROPHONE FACTS.

The bi-directional polar pattern used in Chart # 1 was taken from a data sheet of another manufacturer. Since E-V has not made a ribbon for several years, we picked this particular microphone as representing the finest of its type. This unit, we understand, has also been discontinued recently.

Assuming that axial response is the same, the first thing you will notice in a comparison test of a pressure and a pressure gradient unit will be the increased "reach". Under average good studio conditions you should be able to work from 1-1/2 to 2 times greater distance from the pressure gradient microphone with the same quality pickup. This is due to the greatly reduced pickup from the sides reducing the random noise and reverberation pickup.

The ability to pick up from a greater distance has often been attributed to greater sensitivity of this type, when actually it is due to the directional effect. This directivity is helping to clean the path of pickup of competing noise, allowing you to advance the gain to a point required to accomplish this additional pickup distance.

This unit finds its greatest use where the microphone can be oriented to suit the condition and left in this position, such as in broadcasting. This type finds very little use when the microphone must be in almost constant motion because the equal pickup from the rear in most instances is undesirable.

I have found in the past few years that the trend is almost completely away from the bi-directional in favor of the non-directional or the unidirectional microphone. The non-directional has its place in applications in which a very wide angle pickup and/or the inclusion of reverberation is desired. The unidirectional is used in applications in which the opposite is required.

The next letter will take up unidirectional microphones and their application.

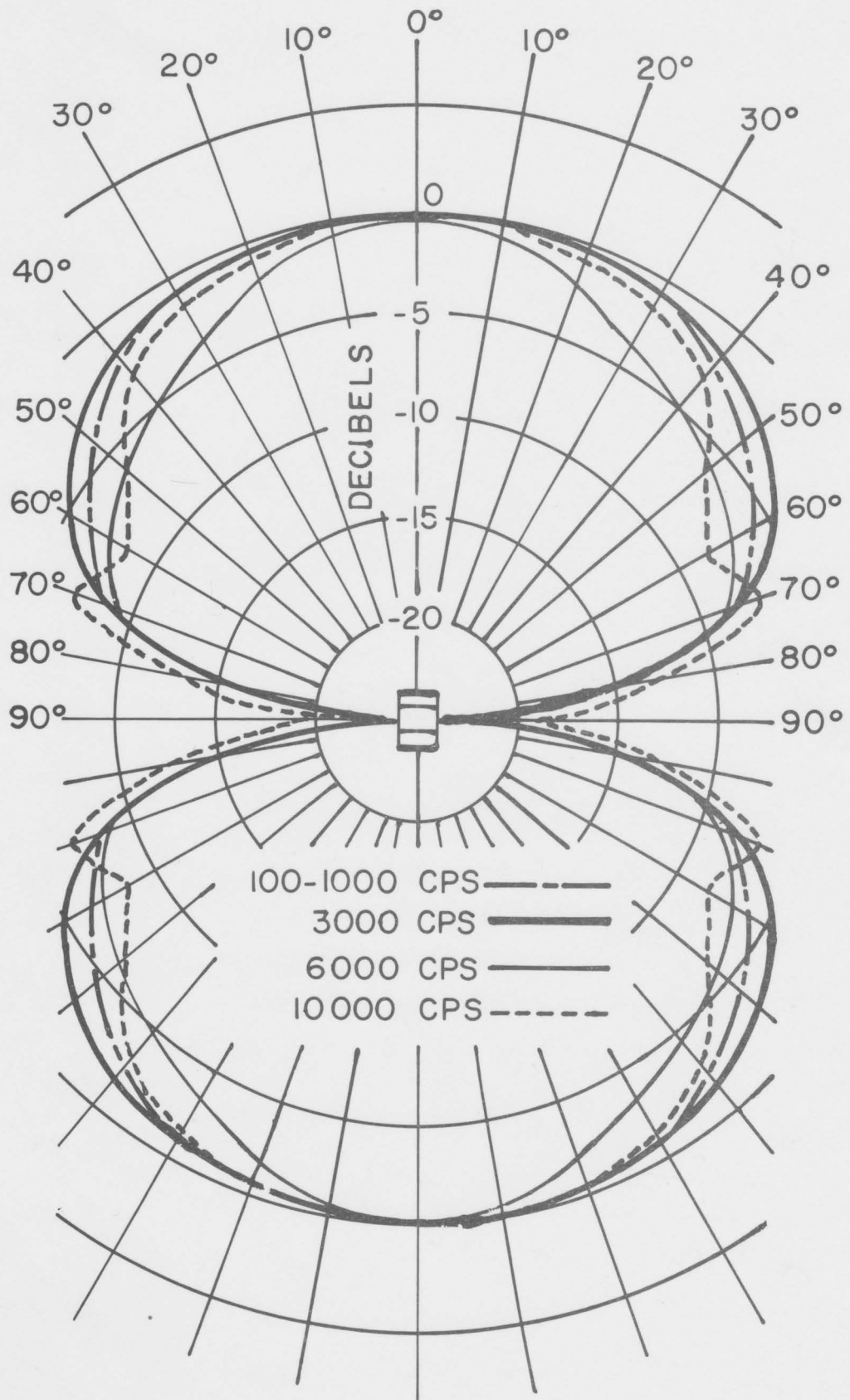
If something in the letter brings up a question, or if you feel a point needs to be expanded, please write. I'll be happy to be of help.

Cordially yours,

ELECTRO-VOICE, INC

*Lou Burroughs*

L.R. Burroughs  
Vice President  
Broadcast & Recording Equipment



**CHART NO. 1**