

# What is a Microphone Polar Pattern?



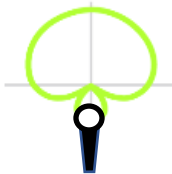

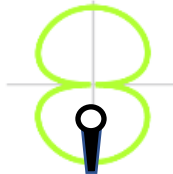
The main criteria for selecting a microphone is “Subjective and Artistic.” It is essential to “listen” to the different types of microphones to figure out what works best for your voice or instrument (whatever applications you are considering). You should examine the “Polar Pattern” of the microphones as well. This is an essential step in the selection process. This booklet will provide enough “initial” information concerning “Polar Patterns” to ensure that our readers have a good understanding of the basic concepts. Further studies on this subject are essential for audio technicians who want to continue to develop their knowledge and expertise.

## What are Microphone Polar Patterns?

The polar pattern of a microphone illustrates the directionality of a microphone – which are the points where the microphone is the most sensitive to sounds. This includes the sound from vocals or instruments and where the microphone will pick up the most noise from. Microphone polar patterns are also referred to as “Pickup Patterns.” The different types of microphones will have different polar patterns – It depends on the microphone model, type, and manufacturer.

There are five main microphone polar patterns: Omni-Directional, Cardioid, Super-Cardioid, Hyper-Cardioid, and Bi-Directional (also called a Figure 8).

Here is a chart that shows the most popular characteristics and their polar response patterns. Courtesy of Shure

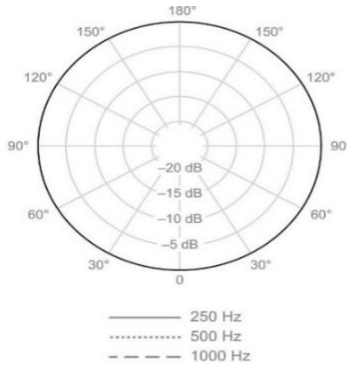
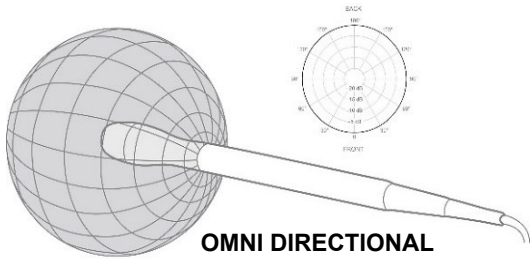
CHARACTERISTIC	ONMI-DIRECTIONAL	CARDIOID	SUPER-CARDIOID	HYPER-CARDIOID	BI-DIRECTIONAL
POLAR RESPONSE PATTERN					

1. **Omni-Directional** – This microphone polar pattern shows that sound will be picked up equally in a 360-degree area / space. This means that the microphone will be sensitive to sounds from the front, back and all sides consistently. Not ideal if you need to “point” directly at a source with the intention of only picking up that specific sound. Note: Quality can sometimes suffer due to the omni microphone picking up all sounds, from all directions – and this also means that it is very prone to feedback.
2. **Cardioid** – Pick up sounds in somewhat of a “heart shaped” pattern. As you can see from the polar pattern the majority of the sound is picked up from the front of the microphone, and no sound (least sensitive) around the back of the microphone. The sides of the microphone will pick up less sound, and be less sensitive in nature. In general, the Cardioid polar pattern offers very good rejection to feedback.
3. **Super-Cardioid** – Also picks up sounds in somewhat of a “heart shaped” pattern. The majority of the sound is picked up from the front of the microphone, but there is a small pickup area around the back of the microphone. The sides of the microphone will pick up less sound, and be less sensitive in nature.
4. **Hyper-Cardioid** – As with the other Cardioid microphones this microphone also picks up sounds in what can be described as a “heart shaped” pattern. The majority of the sound is picked up from the front of the microphone, but there is also a small pickup area in the back of the microphone that is larger than the one on a Super Cardioid microphone. The sides of the microphone will pick up less sound, and be less sensitive in nature.
5. **Bi-Directional** – Also known as the “Figure 8” polar pattern. Sounds will be picked up directly in front and directly in back of the microphone. This microphone will not pick up sound from the sides.

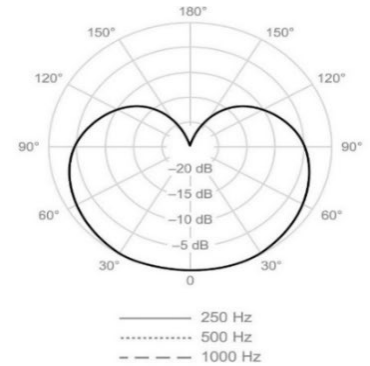
### Important Note:

As you can see, there’s a whole lot more to microphone selection than simply plugging in a microphone (any type) and just going for it. There are many other aspects related to choosing and setting up microphones that should be considered in order to get the best results. Each microphone polar pattern above has different attributes and works best when used for the applications they have been designed for.

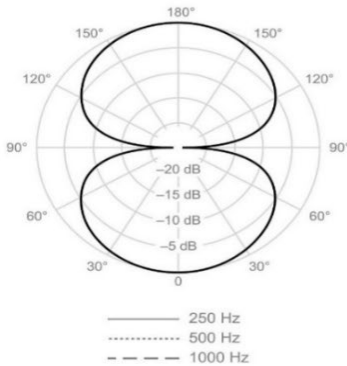
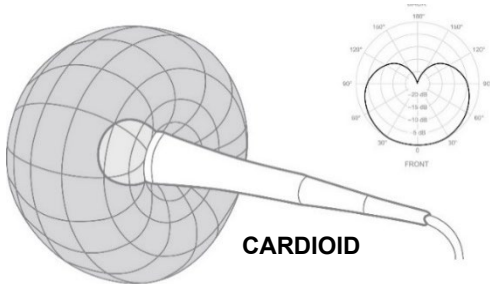
## Here are some additional diagrams of Microphone Polar Patterns



**OMNIDIRECTIONAL**

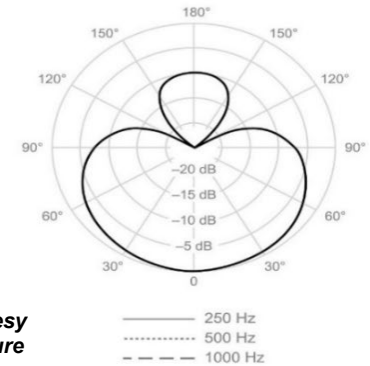


**CARDIOID (UNIDIRECTIONAL)**

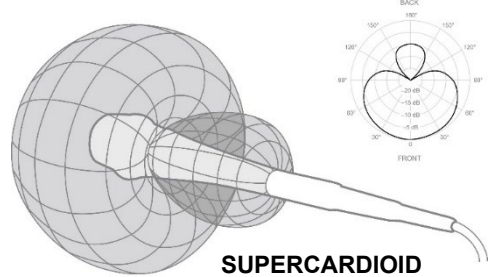


**BIDIRECTIONAL**

*Courtesy of Shure*



**SUPERCARDIOID**

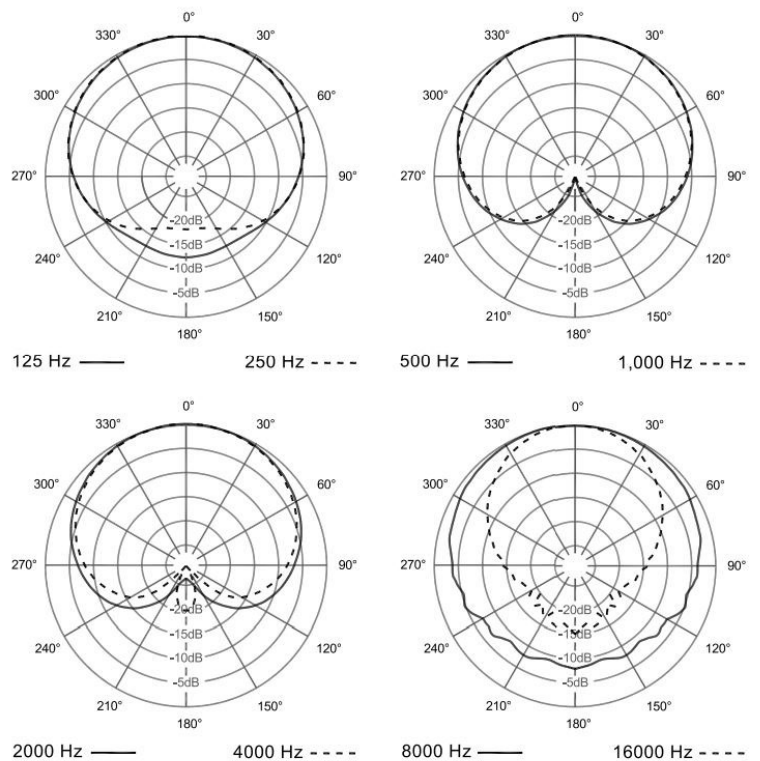


### Important Note:

Let's look at the Polar Response of the Electro-Voice ND66 Instrument microphone. The diagrams display the results of how this particular microphone responds at different frequencies. This leads us to conclude that microphone Polar Patterns depend on frequency – which is true for all microphones / polar patterns. It would be accurate to state that most microphones are more “directional” at higher frequencies and less “directional” at lower frequencies. The EV ND66 also has selectable high pass filters at 75Hz and 150Hz, removing problematic low frequencies from the signal path when needed.

If you feel that all this information regarding Polar Patterns and Polar Response is just too technical to deal with – It is suggested that you have a discussion with the “salesperson” you are purchasing the microphone from. They should be knowledgeable on this subject and assist you with choosing the correct microphone type for your application.

### Polar Response: Electro-Voice ND66 Instrument Mic



*Courtesy of ElectroVoice*