



## The Crown DIFFEROID® MICROPHONE

### THE PROBLEM

When loud rock bands play on stage, lots of unwanted sound gets into the vocal microphones. The guitar amps and drums “leak” into the vocal mics. When the sound mixer turns up the vocal mics, the mix can be compromised because the vocal mics’ signals contain so much background noise. The sound isolation is poor.

Similarly, drummers who sing need isolation from the drum set in their vocal mic. Announcers at sporting events need isolation from crowd noise.

Another problem: house speakers and floor monitors can cause feedback in a vocal mic or DJ mic. So the speakers cannot be turned up as loud as desired. It’s often difficult to get enough gain-before-feedback.

### THE DIFFEROID SOLUTION

The Crown Differoid microphone effectively solves the problems of isolation and feedback. “Differoid” stands for **differential cardioid**.

A **differential** microphone is a noise-cancelling mic, which cancels sounds beyond a few inches away -- such as floor monitors, instruments on stage, and crowd noise. And a **cardioid** microphone rejects sounds behind the microphone -- such as floor monitor speakers.

Controlled field tests showed that the Differoid provides up to 12 dB more gain before feedback than conventional cardioid microphones.

Many users of the Differoid say that their house mix is better because the mic’s isolation is nearly complete. In other words, “Mic 1” is no longer vocals and some drums, guitar and bass. “Mic 1” is vocals only.

The microphone was also designed to reject sound behind the microphone, for example, from a floor monitor speaker. Not only does this prevent feedback, it also reduces the sonic coloration caused by monitor sound leaking into the vocal microphone.

Crown makes a handheld Differoid mic called the **CM-310A**, and a head-worn Differoid mic called the **CM-311A** (the mic of choice for Garth Brooks, Britney Spears, Janet Jackson, ‘N Sync, and many others).

### HOW IT WORKS

The Differoid microphone uses only one mic capsule which is open to sound at two points: the front and rear of the diaphragm. The diaphragm is moved by the *difference* in sound pressure between its front and rear sides — hence the name “Differential.”

How is the Differoid designed to increase gain-before-feedback?

- The mic’s polar pattern influences how well it rejects feedback. Cardioid seems to be the best choice because it rejects sound from the rear where the monitor speaker is likely to be. It also prevents a “closed-nose” coloration because it rejects sound from the side (from the nose) less than a supercardioid or hypercardioid pattern would.

- The mic-to-source distance affects the gain of the voice. The closer to a singer that a microphone is placed, the louder the sound is through the sound system (because of the inverse-square law). Distant miking sounds quiet; close miking sounds loud. So it makes sense to mount the microphone capsule close to the singer’s mouth in order to get plenty of gain. The Differoid microphone does this.

In the Differoid mic, the designers mounted the microphone capsule at the optimum distance from the mouth -- close enough for plenty of volume, but not so close as to degrade the sound quality.

- The microphone’s proximity effect also affects the gain of the voice. Proximity effect is the progressive rise in low-frequency response in most directional mics when they are placed closer to the sound source. In other words, when you talk close to a directional microphone, the low frequencies are boosted. This is free gain (extra volume) at low frequencies. The voice is made louder at low frequencies because it is close to the mic, but distant sounds don’t get this low boost. Unlike turning up a fader, proximity effect gives more gain but not more feedback.

The Differoid microphone has a huge amount of proximity effect because the microphone capsule is so close to the mouth. Normally this would make the voice too bassy or boomy. But in the Differoid, the low frequencies are rolled off electronically to control boominess. The microphone still has some bass rise for warmth, which singers prefer.

The voice is 16 dB louder with lips touching the grille than at 3 inches away. That’s 16 dB more gain before feedback. So the singer should use the differential cardioid with lips touching the grille.

### SUMMARY

- The Differoid cancels sound at a distance because it is so close to the mouth. Due to the inverse square law of sound attenuation with distance, the voice is picked up at a very high level relative to background sounds. The Differoid also cancels sound at a distance because it has no proximity effect (bass boost) for distant sounds, but has a lot of proximity effect for close sounds like the voice.
- The Differoid cancels sounds arriving from the rear because it has a cardioid polar pattern.
- The Differoid uses a single mic capsule which has two sound entries in front and in the rear.

All these features give the CM-310A and CM-311A Differoid mics outstanding gain-before-feedback and isolation.

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