# CROWN MICROPHONE APPLICATION GUIDE FOR SPEECH SOUND REINFORCEMENT

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When you do sound reinforcement for speech, you want the sound to be clear, natural, and loud enough for everyone to hear. High-quality microphones will help you reach this goal. In this guide, we'll offer miking tips for five applications in speech reinforcement: stage, lectern, conference, courtroom, and athletic events. We'll suggest which microphone is best for the job, and where to place it.

When you put together a sound system, one goal is to minimize feedback. This is the squealing sound you hear when the mics pick up the P.A. speakers. Most Crown microphones are designed to reject feedback, so you can turn them up loud enough for everyone to hear.

Also, Crown mics are designed for clear, clean sound so that speech will be easy to understand. Crown mics sound natural and true-to-life, rather than "canned" or muffled.

Besides good mics, it's important to use high-quality speakers. Place them as close to the audience as is practical, aiming at the audience. No mic sounds good through a poorly located speaker system.

Let's look at a variety of audio setups. In each case, we'll suggest how to choose the right mic and how to use it effectively.

## THEATER STAGE

Plays and musicals in an auditorium are a real challenge to pick up and amplify well. First, try to solve the problem at its source. The director should ask the performers to speak loudly and clearly. If the music drowns out the actors, you might tactfully ask the musical director to have the pit orchestra play more quietly.

Good microphones can help, too. Three types of microphones for stage miking are floor mics, hanging mics, and miniature wireless mics.

### Floor Mics

The Crown PCC-160 is a stage-floor microphone for miking drama (Figure 1). You place it on the stage floor, near the footlights. It's the industry-standard stage mic on Broadway, and has been extensively field-tested in schools.

The PCC-160 sounds clear and natural, and can be turned up loud enough for everyone to hear the performance and understand the words. It's rugged enough to withstand kicks by dancers and can be stepped on without damage.

You might wonder if the mic picks up footsteps, since it's on the floor. The PCC-160 is not sensitive to floor

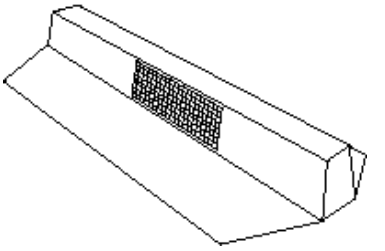

Figure 1 – PCC-160 supercardioid surface-mount microphone.

vibrations, but it does hear footsteps acoustically, like your ears. Normally this is not a problem because the audience sees and hears the actors walking across the stage.

The PCC-160 picks up sound from the front, but it rejects sound from the rear. That is, it picks up the actors, but not much of the pit orchestra or P.A. speakers. Also, the PCC-160 rejects feedback. It will feed back if the PA is too loud, like any mic, but you can turn it up louder without feedback than most other mics.

To further reject the pit orchestra, place the PCC-160 in a small L-shaped corner made of thin cardboard (Figure 2). Or lay a pad of acoustic foam on the floor behind the microphone (2" to 4" thick by 1 foot square).

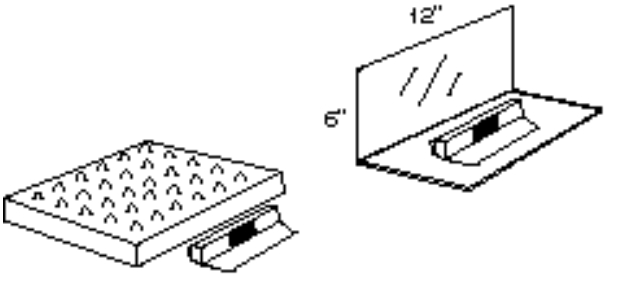


Figure 2 – Two methods to improve rear rejection of PCC-160.

In use, the PCC-160 is nearly invisible, so it does not distract from the set. It reduces stage fright. Young actors talk more naturally because they're not talking into a microphone.

How do you use them? Typically you evenly space three PCC's near the edge of the stage (Figure 3). Place them as close as possible toward the actors. One or two PCCs might be enough for a small stage.

The more mics that are on, the muddier the sound, and the more feedback you will have. To aid clarity and reduce feedback, turn up as few mics as possible. For example, suppose an actor walks across the stage from left to right while talking. First turn up just the left mic, then turn it down while turning up the center mic. Then turn it down while turning up the right mic.

Follow cues in the script so you know when to turn up various microphones.

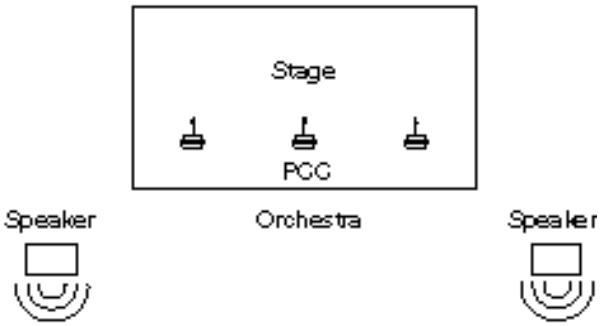


Figure 3 – Stage miking with PCC-160 microphones.

## Stage—Hanging Mics

Typically the PCC-160 can "reach" about 30 feet. But if you have trouble hearing actors farther upstage, hang one to three mics near them. The more mics, the more feedback potential there is, however.

Crown makes a miniature hanging microphone called the CM-31 (Figure 4). It sounds clear and natural. The mic picks up from the front and rejects sound from the rear, which helps reject feedback. You hang it from the ceiling.

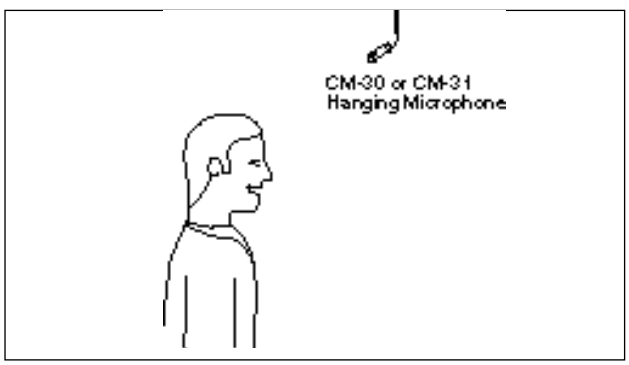


Figure 4 – Upstage miking with CM-30/CM-31.

The CM-31 comes in two parts - microphone and tubular electronics module, which you plug into a mic cable. In another Crown model, the CM-30, the electronics module mounts in a standard electrical outlet box.

## Stage—Mini Wireless Mics

Another way to pick up the main actors on stage is with a miniature lavalier wireless mic. It's about as big as a small paper clip. You can clip it on clothing (Figure 5), or hang it over the actors forehead with the cable running through the hair. To prevent sweat damage, you might want to cover the mic in a thin plastic sandwich bag or plastic wrap. Plug the mic into a belt-pack transmitter of your choice.

Since the mic is very close to the actor, the sound is louder and clearer than you get with a floor mic. If budget permits, use mini wireless mics for the main actors, and PCC-160 floor mics for group pickup.

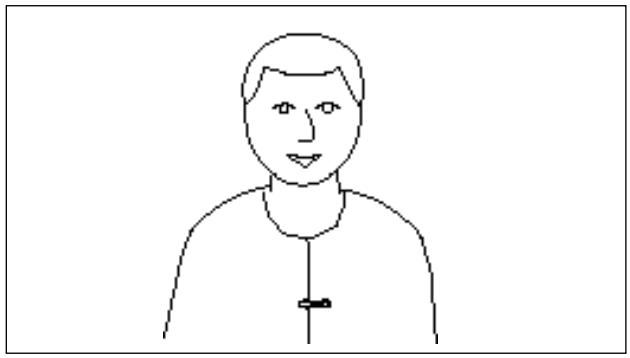

Figure 5 – clip-on microphone.

When you use a wireless mic, put the receiver on stage and run a cable back to your mixer. This keeps the path short between the transmitter and receiver, preventing dropouts and noise. If you want to monitor the receiver's performance, put it back at the mixer. But make sure the transmitter has a line of sight to the receiver.

Always use high-quality alkaline batteries in the transmitter and change them before each performance.

Adjust the audio trim pot in the transmitter as high as possible without any distortion or clipping. Here's how:

1. Turn up the audio trim pot all the way (full clockwise).

2. Have someone talk loudly while transmitting over the wireless mic.

3. Listen to the reproduced sound. If it sounds gritty or fuzzy, it is distorted. Turn down the trim pot a little at a time until the distortion stops. Note: Use a plastic screwdriver to avoid detuning the transmitter.

## Using an Equalizer to Prevent Feedback

An effective way to reduce feedback is to use a *third-octave graphic equalizer* (Figure 6). This is an electronic device with a row of knobs. Each knob controls a specific band of frequencies. The knobs toward the left control the low frequencies or bass, while the knobs toward the right control the high frequencies or treble.

Here's how to use the graphic equalizer. Connect it between your mixer output and power-amplifier input. Start with all the controls at their center or "flat" position.

Turn the mixer's master volume controls about ¾ up (to 0, or the shaded portion of fader travel). On the mixer, slowly turn up the volume control (fader) for one microphone until the sound system starts to ring or feed back. The ringing will occur at a certain frequency or note. On the graphic equalizer, push down each knob in turn, then return it to 0 or flat. You'll find one knob that stops the feedback. Push it down just to the point where the ringing stops.

Now turn up the mic a little more on the mixer until feedback starts again. It might be at a different frequency.

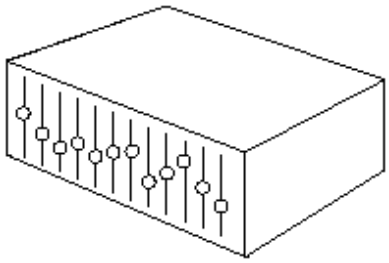

Figure 6 – Graphic equalizer.

Find the equalizer knob that reduces the feedback, and push it down until the ringing stops. Keep repeating this procedure until the sound system is loud enough.

There are devices available that control feedback automatically. Such a device detects feedback and then turns down the correct frequency all by itself. Ask your local Crown dealer for details on these devices.

## LECTERNS

Here are four ways to pick up speeches at a lectern:

- Gooseneck mic
- Clip-on mini mic
- Surface mounted mic
- Handheld mic on a boom stand

Let's look at each one:

### Gooseneck Mic

A gooseneck mic is a lectern-mounted microphone with an arm (gooseneck) that positions the mic near the person speaking. The LM-300A gooseneck mic has a slim, elegant design that does not detract from the person speaking. Its dual goosenecks adjust silently. The

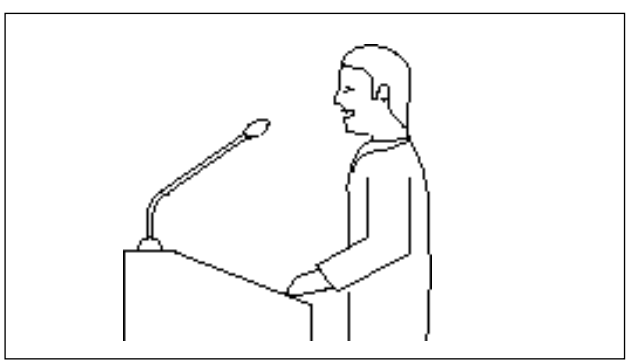

Figure 7 – LM microphone on a lectern.

microphone plugs into a female XLR-type chassis mount connector in your lectern, or it can be installed in an LM-SM shock mount to reduce lectern thumps. In this case, the mic plugs into a female XLR cable connector. Another model, the LM-300AL, is 3 inches longer.

The model LM-301A screws onto a mic stand or an Atlas AD-11 flange. Its cable can exit down or out the side.

Need extra ruggedness? Try the LM-201, which has a ball-and-socket swivel instead of a gooseneck (Figure 7). The swivel operates silently.

To use a gooseneck mic, talk about 8" away, over the mic to prevent breath pops (as in Figure 7).

### Lectern — Clip-on Mini Mic

If the person talking wanders around while speaking, you'll need to clip a miniature mic onto their clothing. Figure 5 shows a Crown CM-10 in this application.

### Lectern — Surface-mounted Directional Mic

Some mics are made to be placed directly on the lectern surface. They also are directional, so they reject sound from the rear, such as feedback from the P.A. speakers. Crown makes three mics for this purpose: The PCC-160, PCC-170, and PCC-130. These mics sound almost the same but look different:

- PCC-160 is the most rugged
- PCC-130 is stylish and smal
- PCC-170 is stylish, though larger than the PCC-130

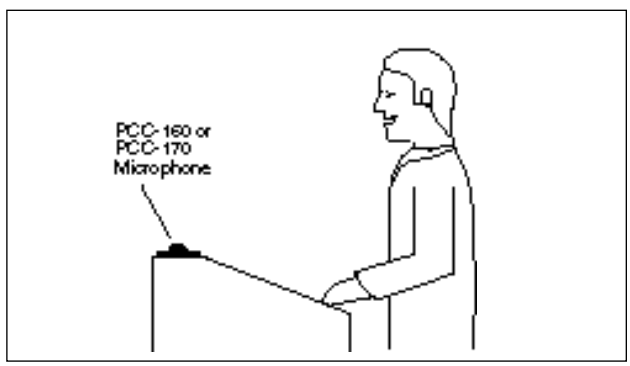


Figure 8 – PCC microphone on a lectern.

Lay the mic on top of the lectern as in Figure 8. Since the mic is relatively far from the talker, the talker can move around more without getting off-mic. The gain-before-feedback is not as good as with a gooseneck mic because the PCC is farther from the talker so try the PCC in your system first before settling on it.

### Lectern — Boom Mic

For a temporary setup, use a handheld mic on a boom (Figure 9). Crown mics for this purpose are the CM-700 or CM-200A.

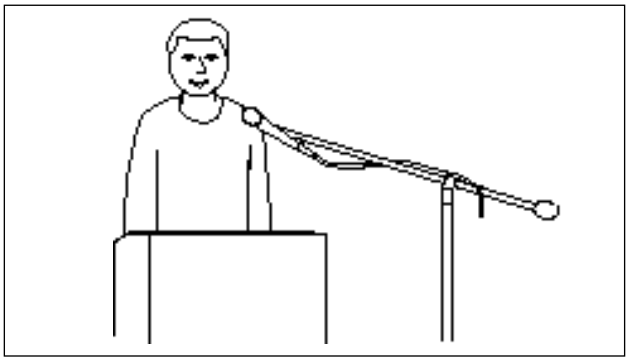

Figure 9 – CM-200ASW microphone at a lectern.

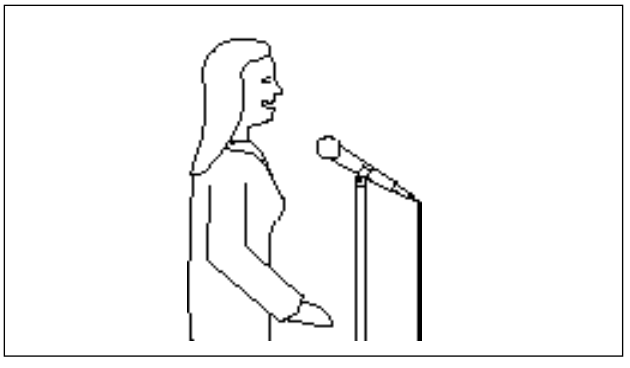

Figure 10 – CM-200A microphone on a mic stand.

On the CM-700, set the mic switch to BASS ROLLOFF. Place the mic about 8" away from the talker. Put the supplied foam windscreen on the mic to prevent breath pops. To pick up someone who is not using a lectern, place the mic on a regular mic stand (Figure 10).

Suppose you have a temporary P.A. setup, such as a school principal talking to a crowd of people sitting in bleachers. Obtain two P.A. loudspeakers, each containing one or two woofers and a horn. Put the P.A. speakers on either side of the mic, behind the mic and toward the audience. The speakers can go either on the floor angled up, or on top of speaker stands (Figure 11).

## CONFERENCES

Suppose you need to reinforce speech at a conference table. You'll use several microphones fed into a mixer. This mixer can be either standard or automatic. An automatic mixer (gated mixer) turns on a microphone when someone speaks into it and turns off all the other mics. This makes the sound clearer and reduces feedback.

An automatic (gated) mixer also allows extra features such as chairperson override, number-of-open-microphones compensation, and so on.

If you want to use a standard (non-gated) mixer, each user needs to manually switch his or her mic on or off.

Choose one of these switchable microphone models:

PCC-130SW : Small mic with a half-cardioid patern.

PCC-170SW : Larger mic with a half-supercardioid pattern for extra clarity.

PCC-170SWO : Like the PCC-170SW, but provides remote sensing of switch closure. This mic can be used with a video camera switcher. When a person turns on their mic, the camera aiming at that person is switched on. Then the TV-monitor view tracks whoever is speaking.

Mini Boundary Mics: Very small mics with a half-supercardioid pattern. Three switchable models are available:
MB-1: Plugs into an aluminum or brass insert in the table.
MB-2: Plugs into a jack in the table.
MB-4E: Lowest cost. Cable fits through a small hole in the table.

Theses models require an MB-100 or MB-200 interface. The MB-100 interface has connections for an on/off switch near each user. The MB-200 interface also allows remote sensing of switch closure, so it can be used with a video switcher.

If you want to use an automatic (gated) mixer, choose one of these mics:

PCC-130: Small mic with a half-cardioid pattern.

PCC-170: Larger mic with a half-supercardioid pattern for extra clarity.

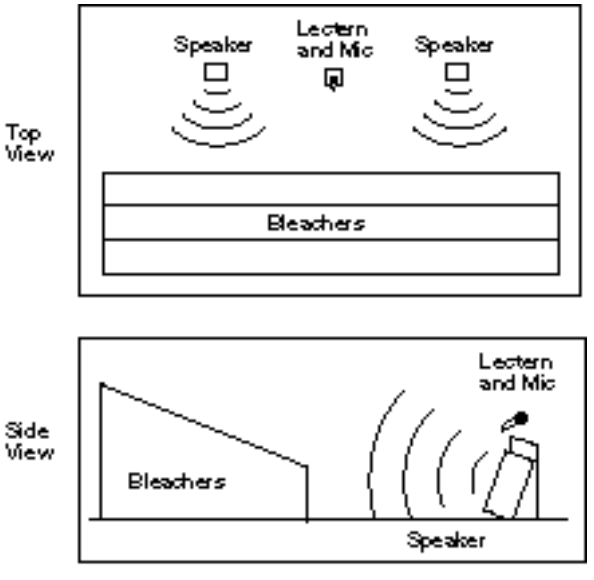


Figure 11 – Temporary P.A. setup.

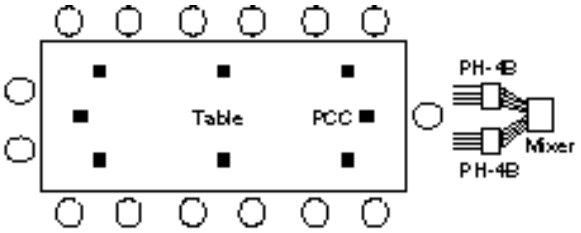


Figure 12 – Miking a conference with PCC microphones.

Mini Boundary mics: Very small mics with a half-supercardioid pattern. Five models available:

- MB-1: Plugs into a brass or aluminum insert in the table.
- MB-2: Plugs into a jack in the table.
- MB-3: Tubular; mounts in ceiling, wall or table.
- MB-4: For temporary use. Has a thin, cable with an XLR connector.
- MB-4E: Lowest cost. Cable fits through a small hole in the table.

Models MB-1, MB-2, and MB 4E require an MB-100 or MB-200 interface. The MB-200 interface also allows remote sensing of switch closure, so it can be used with a video switcher. Each interface can take up to four mics.

For teleconferencing applications, see the Crown Microphone Application Guide For Teleconferencing and Distance Learning .

## COURTROOM

Here are suggestions for miking the people in a courtroom. Please refer to Figure 13.

Judge: Place a PCC on the judicial bench. This is a surface-mounted mic which rejects feedback. Three models are available:

- PCC-130 is a small, inconspicous cardioid mic.
- PCC-170 is larger but is supercardioid.
- PCC-170SW or PCC-130SW has an on/off membrane switch.

If you want this microphone to pick up both the judge and people standing at the bench, use a Crown PZM-30D, which picks up all around.

Lawyer: If the lawyer wanders around while speaking, clip a CM-10 mini mic to their clothing about 8" under the chin. If you prefer to go wireless, use a CM-10E mic into a wireless transmitter. If the lawyer speaks mostly from a table, install a PCC of your choice on the table.

Witness: Install a Crown lectern mic such as the LM-201, LM-300A, LM-300AL, or LM-301A. Use the supplied foam windscreen. Another option is a PCC surface-mounted mic of your choice.

Jury: Hang a Crown CM-30 or CM-31 microphone over and in front of the jury. Place the mic 18" in front of the front row, and 18" over the head-height of the back row. If you prefer to use a mic stand instead, use a CM-700 or CM-200A cardioid mic. You could also use a PCC type microphone on a nearby surface.

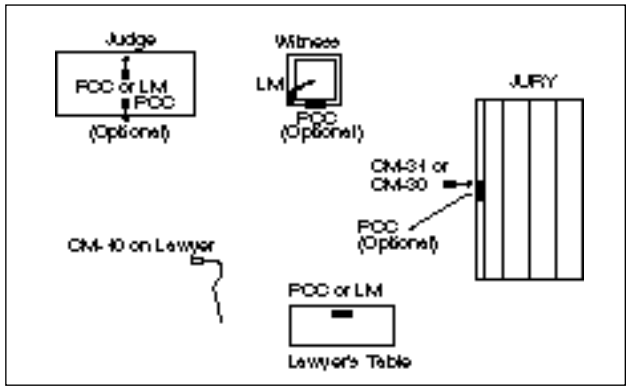


Figure 13 – Courtroom miking.

## ATHLETIC ANNOUNCEMENTS

For athletic events, you need a mic that picks up the announcer without picking up the crowd noise. That is, you need a noise cancelling mic. Crown's noice cancelling mic is the CM-310A Differoid . It has the most gain-before-feedback and isolation of any microphone available. You can turn it up very loud without feedback. Since it cancels sounds a few inches away, the mic must be used with the lips just touching the grille (Figure 14). You might prefer the CM-310ASW , which has an on/off switch.

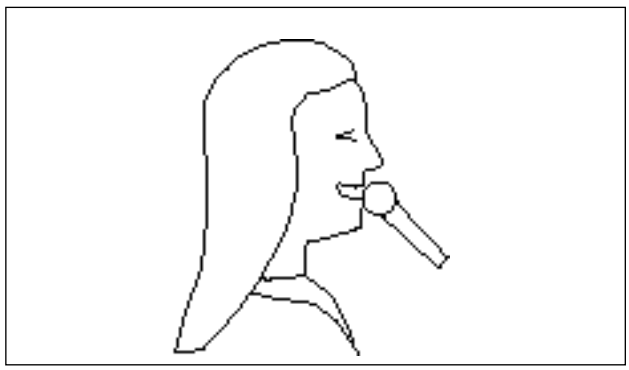

Figure 14 – Proper use of a CM-310A Differoid microphone.

The Differoid is used at the Indianapolis 500 Speedway. An announcer sits in the stands with the audience. Even with the track speakers blaring at him, there is no feedback.

If announcers move their head to follow the sports action, you might want to use a headworn mic such as the Crown CM-312A. It's light and comfortable, and provides good volume without feedback. The mic is mounted to the side of the mouth.

If feedback is a big problem, try the CM-311 Differoid headworn mic (Figure 15). It's placed in front of the mouth. Models CM-311AHS and CM-312AHS mount on a Sony MDR-7506 headphone.

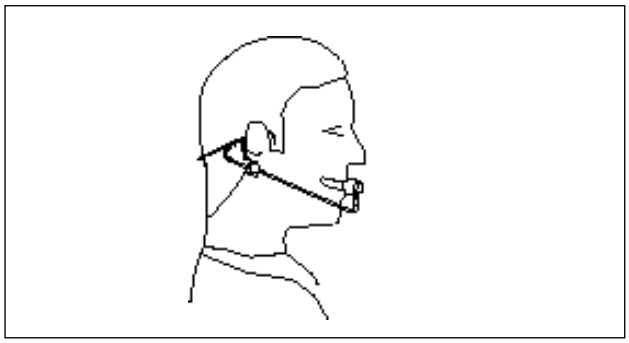

Figure 15 – CM-311A headworn microphone.

## UNDERSTANDING SPECS

We've covered how to choose and use Crown microphones in various applications. Now let's explain the specs found in microphone data sheets.

Transducer Type or Element: This spec describes how the mic converts sound into electricity. The three main types are condenser, dynamic, and ribbon. All current Crown mics are the condenser type, which generally provide the highest sound quality.

Powering: Condenser mics need a power supply to operate. All Crown mics can be powered by a phantom power supply, which provides power to the mic along the mic cable. Phantom power is 12 to 48 volts DC on pins 2 and 3 with respect to pin 1 of the mic-cable connector. Most modern mixers have phantom power built in.

If your mixer lacks phantom power, you can use an external phantom supply made by Crown. Use either the model PH-4B (4 channels, AC powered) or model PH-1A (one channel, battery or AC adapter powered). Model PH-4B is shown in Figure 16.

Frequency response. This is the range of frequencies that the mic reproduces at an equal level, usually within a tolerance (such as +/- 3 dB). A frequency response of 80 Hz to 12 kHz is good, 60 Hz to 15 kHz is better, and 40 Hz to 20 kHz is excellent. Note, however, that 80 Hz to 12 kHz is more than adequate for speech.

Polar pattern. This spec describes the directional pickup pattern of a microphone — how it picks up sounds from various directions. Figure 17 shows various polar patterns.

Figure 16 – PH-4B phantom power supply.

An *omnidirectional* mic picks up sound equally well from all directions. This pattern can cause feedback in a P.A. system unless the mic is clipped onto the person speaking.

A *unidirectional* mic picks up sound best from one direction—in front of the microphone. It reduces sound pickup from the rear. The three main types of unidirectional patterns are *cardioid*, *supercardioid*, and *hypercardioid*. They have progressively more rejection of sounds from the side.

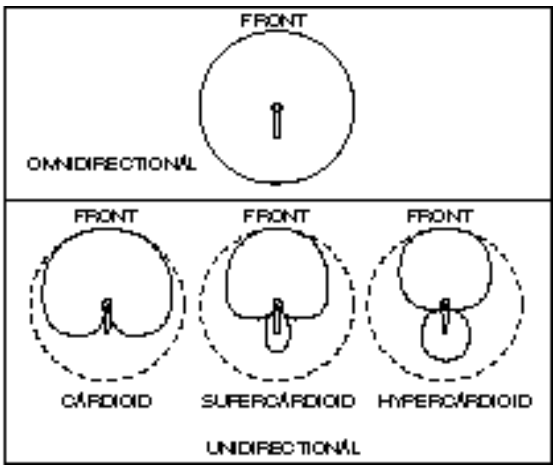


Figure 17 – Polar patterns.

Impedance: This is an electrical characteristic of a microphone. All Crown microphones are low impedance (less than 600 ohms). This lets you run long mic cables without picking up hum or losing clarity.

Crown has other microphone application guides, free from your Crown dealer or directly from Crown:

• *Microphone Application Guide*. This covers music recording and sound reinforcement for CM, LM, and GLM series microphones.

• *Boundary Microphone Application Guide*. This covers boundary theory and applications, teleconferencing, music and speech recording and reinforcement for PZM, PCC and SASS microphones.

• *Microphone Application Guide for Video*

• *Microphone Application Guide for Houses of Worship*

• *Microphone Application Guide for Schools*

• *Microphone Application Guide for Teleconferencing and Distance Learning*

• *Microphone Application Guide for Security and Surveillance*

• *Microphone Application Guide for Studio Recording*

• Microphone Application Guide for Live Sound

We hope this guide will help you reinforce speech with a clear, natural sound. Whatever your audio application, Crown makes a microphone designed for it.