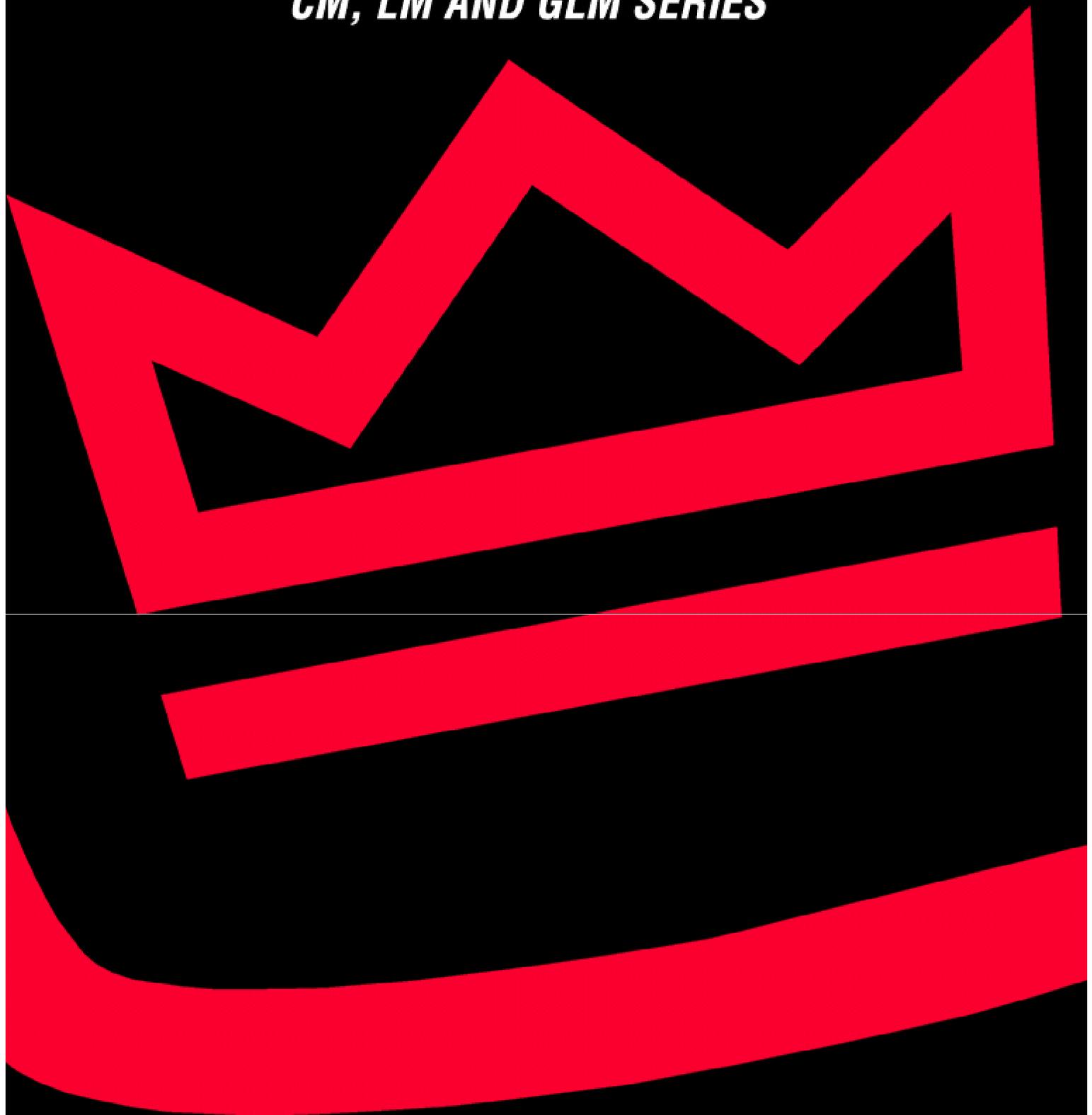


CROWN MICROPHONE APPLICATION GUIDE CM, LM AND GLM SERIES



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INTRODUCTION

In this guide you'll find suggestions on using Crown microphones effectively. The CM, GLM, and LM microphone lines are covered in this booklet. For application notes on the PZM®, PCC® and SASS®, please see the Crown Boundary Mic Application Guide. You will find that Crown microphones can solve many of your audio problems.

MICROPHONE TECHNIQUE BASICS

How to reduce feedback

Feedback is a squealing sound from sound-reinforcement speakers that occurs when volume is too high. To reduce feedback:

- Turn down the volume on the offending microphone until feedback stops.
- Use as few microphones as possible. Gain-before-feedback decreases 3 dB each time the number of open mics doubles.
- Place the mic close to the sound source. The closer the mic, the higher the gain-before-feedback. If close miking causes an unnatural tone quality, try using EQ to compensate.
- Equalize the sound system with a 1/3 octave graphic equalizer. Notch out frequencies that feedback.
- Place speakers as far from the mic as possible.
- Place the mics behind or to the outside of the house P.A. speakers. The house speakers should not aim at the microphones.
- Use directional mics. Hypercardioid and supercardioid patterns reject feedback better than cardioids, and cardioids reject feedback better than omnidirectional patterns.
- Use differential (noise-cancelling) mics, such as the Crown CM-310A or CM-311A. They have the highest gain before feedback of any mic you can buy.

The following table tells how many dB of feedback rejection you can expect from various polar patterns, in a reverberant sound field, compared to an omnidirectional pattern at the same distance:

Omnidirectional	0.0 dB
Cardioid	-4.8 dB
Bidirectional	-4.8 dB
Supercardioid	-5.7 dB
Hypercardioid	-6.0 dB

For example, a cardioid mic provides 4.8 dB more gain-before-feedback than an omni mic at the same distance from the sound source.

You can place a directional mic farther from its source than an omnidirectional mic in a reverberant sound field and have the same gain-before-feedback. The table below shows the distance multiplier for each pattern:

Omnidirectional	1.0
Cardioid	1.7
Bidirectional	1.7
Supercardioid	1.9
Hypercardioid	2.0

For example, if an omni mic is one foot from a sound source, a supercardioid mic can be placed 1.9 feet and have the same gain-before-feedback as the omni.

The figures above apply only when the mics are in a reverberant sound field - say, when the P.A. speakers are distant from the mics and the sound system is set up indoors.

How to reduce reverberation

Reverberation is sometimes loosely called "room acoustics" or "ambience." It is a pattern of sound reflection off the walls, ceiling, and floor. For example, reverberation is the sound you hear just after you shout in an empty gymnasium. Too much reverberation in a recording can make the recorded instrument sound distant or muddy. To reduce reverberation:

- Place the mic closer to the sound source.
- Pick up electric instruments with a direct box or cable.
- Use a room or studio with dead acoustics. The walls, ceiling, and floor should be covered with a sound-absorbing material.
- Use directional microphones. Hypercardioid and supercardioid patterns reject reverb more than cardioid. Cardioid and bidirectional patterns reject reverb equally well. Cardioid rejects reverb more than an omnidirectional pattern at the same distance:

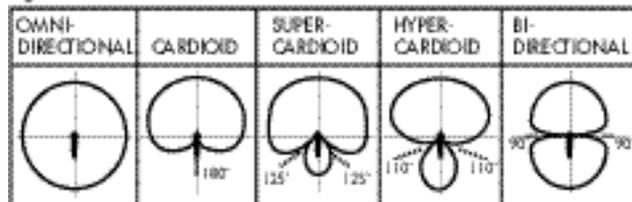
Omnidirectional	0.0 dB
Cardioid	-4.8 dB
Bidirectional	-4.8 dB
Supercardioid	-5.7 dB
Hypercardioid	-6.0 dB

How to reduce background noise

- Stop the noise at its source: turn off appliances and air conditioning; wait for airplanes to pass; close and seal doors and windows; use a quiet room.
- Mike close with directional mics.
- Pick up electric instruments with direct boxes or cables.
- Aim the null of the polar pattern at the offending noise source. The null is the angle off-axis where the mic is least sensitive. Different polar patterns have nulls at different angles. Shown below (Figure 1) are the null angles for various polar patterns:

Cardioid	180 degrees
Supercardioid	125 degrees
Hypercardioid	110 degrees
Bidirectional	90 degrees

Figure 1



How to reduce leakage

Leakage (also called bleed or spill) is the overlap of sound from an instrument into another instrument's microphone. For example, if you're miking drums and piano each with its own microphone, any drum sound picked up by the piano mic is leakage. To reduce leakage:

- Mike close with directional microphones.
- When recording, overdub instruments one at a time on each track of a multitrack recorder.
- Pick up electric instruments with direct boxes or cables.
- Use a room or studio with dead acoustics. The walls, ceiling, and floor should be covered with sound absorbing material.
- Aim the null of the polar pattern at the undesired sound source. For example, suppose you're miking two adjacent tom-toms with two hypercardioid mics. The null of the hypercardioid is 110 degrees off-axis. Angle each mic so that its null aims at the adjacent tom-tom.
- Use a Differoid mic on vocals such as the Crown CM-310A or CM-311A.

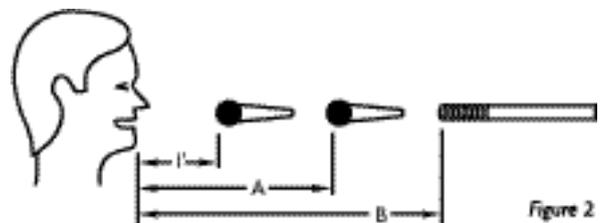
How to pick up sound at a distance

The farther you place a microphone from a sound source, the more reverberation, leakage, and background noise you pick up. Also, you hear more mixer noise compared to the signal because the mixer gain must be higher with distant miking.

To clearly pick up sound at a distance:

- Use a microphone with low self-noise (say, less than 22 dB SPL), such as the CM-200A, CM-700, CM-150, any PCC, or any PZM® (see the Crown Boundary Mic Application Guide).
- Boost the presence range on your mixer's EQ (around 5 kHz).
- If necessary, compensate for air losses at high frequencies by boosting EQ around 15 kHz.
- Use directional microphones. You can place a directional mic farther from its source than an omnidirectional mic and pick up the same amount of reverberation. The table below shows the distance multiplier for each pattern (Figure 2):

Omnidirectional	1.0 dB
Cardioid	1.7 dB
Bidirectional	1.7 dB
Supercardioid	1.9 dB
Hypercardioid	2.0 dB



Cardioid	A = 1.7
Supercardioid	A = 1.9
Hypercardioid	A = 2
Shotgun	B = 3 to 10 depending on length

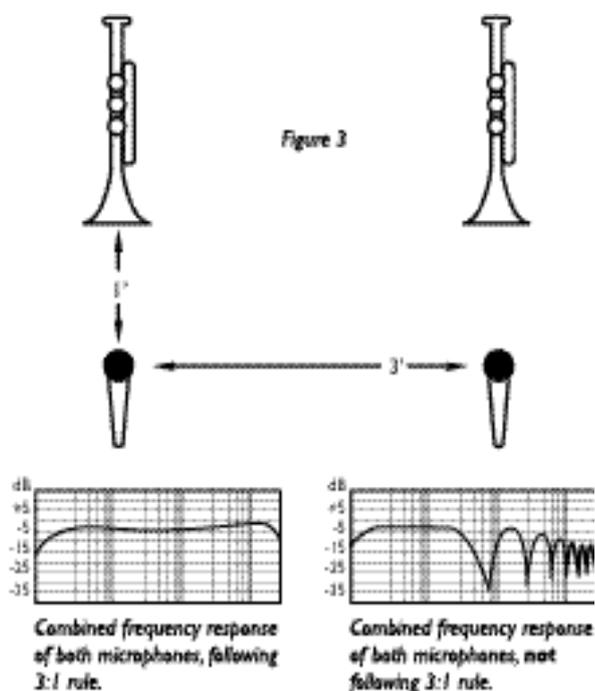
For example, if an omni mic is 1 foot from a sound source, you can place a supercardioid mic at 1.9 feet and pick up the same amount of reverb as the omni.

How to reduce the phase cancellations between two mics

If two microphones pick up the same sound source at different distances, and their signals are fed to the same channel, this might cause phase cancellations. These are peaks and dips in the frequency response caused by various frequencies combining out-of-phase. The result is a colored, filtered tone quality.

To reduce phase cancellations between two microphones:

- Mike close.
- Spread instruments farther apart.
- Follow the 3 to 1 rule (Figure 3): The distance between mics should be at least three times the mic-to-source distance. For example, if two microphones are each 1 foot from their sound sources, the mics should be at least 3 feet apart to prevent phase cancellations.



- Don't use two mics when one will do the job. For example, use just one mic on a lectern. If the talker wanders, use a lavalier mic instead.

How to reduce phase cancellations from surface reflections

Sometimes you must place a microphone near a hard reflective surface. Situations where this might occur are reinforcing drama, musicals, or opera with the microphones near the stage floor, recording a piano with the mic near the raised lid, or recording an instrument surrounded by reflective baffles.

As described in the Crown Boundary Mic Application Guide, these situations can cause phase cancellations which give a strange tone quality. Solve the problem by using Crown PZM or PCC microphones mounted to the piano lid, wall, floor, or other large flat surface.

How to reduce handling noise and stand thumps

- Use an omnidirectional microphone such as a PZM.
- Use a directional microphone with low sensitivity to handling noise and thumps, such as the CM-200A, CM-310A, or any PCC.
- Use a directional microphone with an internal shock mount.
- Use a shock-mount stand adapter on a mic stand.
- Place the mic stand on foam or sponges.

How to reduce proximity effect

Proximity effect is the bass boost you hear when you mike close with a single-D directional microphone. "Single-D" means that the microphone has a single distance from its front sound entry to the rear sound entry. The closer the mic is to the sound source, the more bass you hear. To reduce proximity effect:

- Use an omni directional microphone.
- Turn down the excess bass with your mixer's EQ.

How to reduce pop

Pop is an explosive breath sound produced by the letters "p", "b", or "t". When a person says words containing these sounds, a turbulent puff of air is forced from the mouth. This air puff hits the microphone and makes a thump or little explosion called a "pop".

To reduce pop:

- Use an omnidirectional microphone.
- Use a microphone with a built-in pop filter or ball shaped grille, such as the Crown CM-200A or CM-310A.
- Place an external foam pop filter on the microphone.
- Place the microphone out of the path of pop travel - above, below, or to the side of the mouth.
- Roll off low frequencies below 100 Hz.

How to achieve a natural tone quality

- Use a microphone with a flat frequency response, such as: CM-700, CM-150, GLM-100, PCC-170, PCC-130, any LM mic, or a PZM-30D or PZM-6D set to “flat” response.
- Place the microphones as far from the sound source as the source is big. For example, the sound board of a guitar is about 18 inches long. Place the mic at least 18 inches away to pick up all the parts of the guitar about equally.
- If you must mike close to reduce feedback or leakage, use your mixer’s EQ to restore a natural tonal balance.

How to achieve a bright tone quality

A “bright” sound is crisp, clear, trebly, and articulate. To achieve a bright sound, use a microphone with a rising high-frequency response, such as a Crown GLM-200 or a PZM-30D / PZM-6D set to “rising” response.

How to achieve a good balance

A good balance is a good loudness relationship among instruments and voice in a mix. When the balance is good, no instrument is too loud or too soft. To achieve a good balance when recording a large ensemble with one or two microphones:

- Move instruments that are too quiet closer to the mics, and vice versa.
- Place the mic(s) far enough away so that you don’t over emphasize the instruments in the center of the ensemble.
- If you’re using two mics to record stereo, increase the microphone angling or spacing. If you hear a hole in the middle when using widely spaced mics, add a third mic in the center, panned to the center.
- If a soloist is performing in front of an orchestra, raise or lower the mic stand to vary the balance between the soloist and the orchestra.

NOTES ON CROWN MICROPHONE MODELS

CM-200A

The CM-200A is a handheld condenser microphone with a smooth, articulate sound quality. It will not overload no matter how loudly you scream into it. Because of its cardioid pickup pattern the CM-200A rejects sounds approaching the rear of the micro-

phone, so aim the rear of the mic at your floor monitor speakers. Use the foam pop filter to reduce breath pops.

CM-310A

The CM-310A is a handheld cardioid microphone that is noise-cancelling or differential. “Differential” means it cancels sound at a distance, and “cardioid” means it cancels sound from the rear. Because of these abilities, the CM-310A permits extremely high gain-before-feedback and isolation. To keep from cancelling your voice, you must use the microphone with lips touching the grille. Sing directly into the front of the microphone, not the side, or else your voice may get cancelled and sound thin.

CM-311A

The CM-311A is a headworn cardioid microphone that is noise-cancelling or differential. The mic’s capsule is directly in front of your lips. Like the CM-310A, the CM-311A has outstanding gain-before-feedback and isolation. Lightweight and comfortable, it adjusts to fit any head. The CM-311A comes with an Adapta-Pak belt pack that works with a 9V battery or phantom power. Model CM-311AE is the headworn mic alone, meant for connecting to a wireless mic transmitter of your choice.

CM-312A

The CM-312A is a headworn hypercardioid mic that is meant for less critical situations than the CM-311A. The mic capsule in the CM-312A is at the side of the mouth, and is very small and light. Model CM-312AE is the headworn mic alone, meant for connecting to a 9V-powered wireless mic transmitter of your choice.

CM-30/CM-31

The CM-30 is a miniature supercardioid condenser mic designed for overhead miking, such as over a choir. It is slightly bigger than the GLM microphones described below, but has lower noise. The CM-30 power module mounts in an electrical box in the ceiling; the CM-31 power module is a cylinder with an XLR-type connector. Both mics come in black or white. CM-30L and CM-31L have 60’ cables.

CM-700

The CM-700 is a superb, cardioid condenser mic for pro or semipro recording and high-quality sound reinforcement. Rugged enough for the road, the CM-700 works equally well for popular music (multi-miking) or classical music (stereo and spot-miking). It’s also a good choice for miking a lectern on a boom stand.

The CM-700 has a clear, natural sound. Self-noise is very low, and the mic can handle extremely loud sounds without distortion. A bass-tilt switch, pop filter and windscreen are included.

CM-150

The CM-150 is a stand-mounted omnidirectional condenser mic for measurements or studio recording. Its ultra-flat response from 20 Hz to 20 kHz lets it record any instrument – or an orchestra – with full fidelity.

CM-10 Now Discontinued

The CM-10 is a mini omni lavalier mic. You clip it to the users shirt or tie about 8 inches under the chin.

GLM-100, GLM-200

The Crown GLM offers all the quality and wide-range response of larger studio microphones, yet is nearly invisible in use. It can be attached to instruments or performers, or hung over musical ensembles. No mic stands are needed, which makes setup fast and easy.

Since the GLM is small, it can be mounted very close to instruments to improve isolation and reject off-mic sound.

Unlike larger microphones, GLMs pick up all surrounding instruments with the same tone quality or frequency response. That's because the microphones are very small and maintain their polar pattern up to high frequencies.

Two main models of GLMs are available: The GLM-100 and the GLM-200. The GLM-100 has an omnidirectional or all around pickup pattern. When placed in the center of a group of instruments (say, a drum set), it picks up all the instruments surrounding it. The GLM-200 has a hypercardioid pickup pattern. It picks up mainly what it's aimed at, and provides excellent isolation and gain-before-feedback.

The GLM-100 has a deeper low-frequency response and a higher overload point than the GLM-200. For these reasons, the GLM-100 omni is the best choice for low pitched instruments (bass, kick drum) and for loud instruments. Also, the GLM-100 has less handling noise and wind noise than the GLM-200.

General tips: For outdoor or vocal use, place the included windscreen on the microphone to reduce wind noise and breath popping. Although the cable is rugged, excessive abuse such as tugging and twisting will shorten its life. It should last indefinitely if treated with care. The cable is short (8 feet) to allow easy wrapping and to reduce the amount of thin cable on stage.

LM-201, LM-300A, LM-300AL, LM-301A

These four models are meant to be used on lecterns, pulpits, or conference tables. The LM-201 has a noise-free swivel mount. Designed for installation by sound contractors, this model has a separate circuit module. The microphone is shock mounted, and is meant to be permanently screwed to the lectern top.

The LM-300A is a gooseneck microphone that plugs into an XLR-type connector mounted in your lectern. If shock mounting is necessary, order the LM-300SM Shock Mount.

The LM-300AL is 5 inches longer than the LM-300A, and has dual goosenecks for more-flexible positioning. The LM-301A has a collar which screws onto an Atlas flange or mic stand. Its cable can exit inside or outside the mounting device.

SPECIFIC APPLICATIONS

This section suggests some ways to place Crown microphones to record or reinforce various musical instruments. These are just starting points to reduce the time spent experimenting. They work well in many cases, but if you don't like the results, feel free to change the microphone or its placement.

If pick up of room reverbation, leakage, or feedback is excessive, place the mic closer than recommended below, and roll off the bass if necessary at your mixer to obtain a natural timbre.

For example, suppose you're miking a folk singer playing a guitar. If you want to control the balance between voice and guitar with mixer volume controls, you must mike the singer and guitar separately and up close to isolate their sounds. This placement often results in bassy tone quality, so you'll have to roll off some bass at your mixer until the sound is natural.

Many of the techniques suggested here apply when the instrument or voice is recorded alone, as for an overdub.

Vocal

Recording:

Place a CM-700 or CM-150 8 inches away at eye height to avoid breath pops. Use the foam pop filter.

Sound Reinforcement:

- For best sound quality, use a CM-200A not more than 3 inches from the mouth. Place the included foam pop filter on the mic. The closer the mic is to your mouth the greater the gain-before-feedback, and the greater the bass. Aim the mic at the nose to avoid a "closed nose" effect.

- For maximum gain-before-feedback and isolation, use a CM-310A with your lips touching the metal grille. The CM-310A Differoid® has more gain-before-feedback than any mic you can buy, so it really helps vocals stand out over a loud instrumental background.
- Vocalists who move around while playing often prefer a headworn mic. An excellent choice for this is the Crown CM-311A. It is worn with lips touching the microphone, and offers extremely high gain-before-feedback and isolation. For less critical situations, use a CM-312A. It is smaller and lighter than the CM-311A, and the mic is at the side of the mouth.

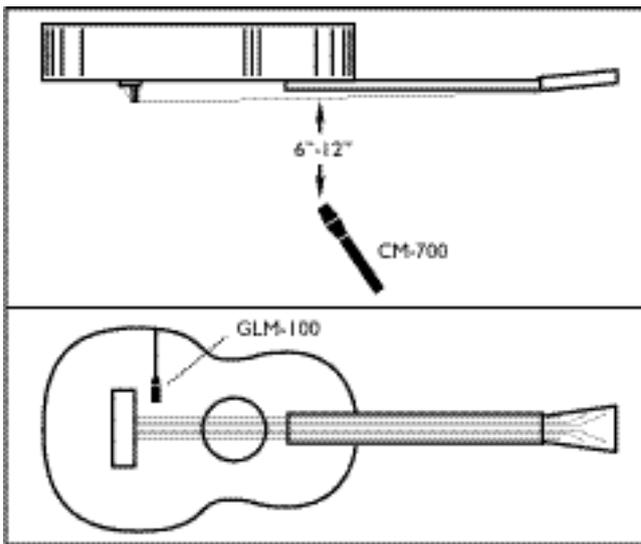


Figure 4

Acoustic guitar

Recordings (Figure 4):

- Attach a GLM-100 to the guitar sound board, halfway between the bridge and the sound hole, near the low E string.
- Place a CM-700 or CM-150 6 to 12 inches from where the finger board joins the body. For stereo, add another mic the same distance from the bridge.

Sound Reinforcement:

- Tape a GLM-100 inside the guitar onto the surface nearest the performer, so that the mic can see the sound hole. Equalize for the desired tone quality.
- Place a CM-700 a few inches from the sound hole and roll off the excess bass at your mixer.

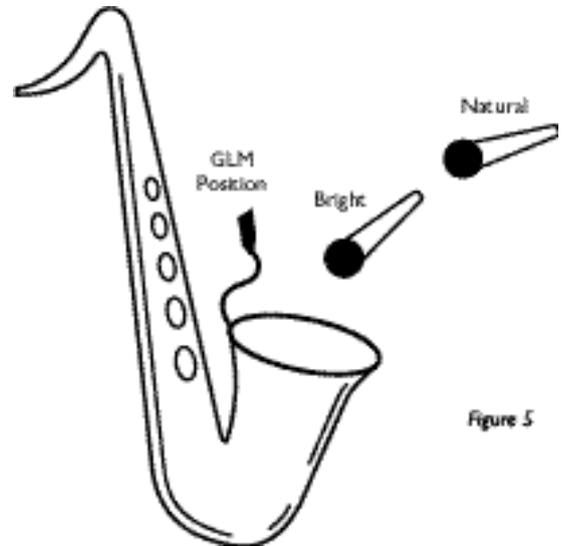


Figure 5

Sax (Figure 5):

Recording:

- Place a CM-700 or CM-150 18 inches away, a few inches above the bell, toward the player's right side.
- Clip a GLM-UM to the bell, and attach a GLM-100 to the clip about 4 inches from the bell so that it can see the tone holes.

Sound Reinforcement:

- Place a CM-200A or CM-700 just above the bell, aiming at the tone holes.
- Clip a GLM-UM to the bell, and attach a GLM-100 to the clip just above the bell, aiming at the tone holes.

Electric guitar or bass

Recorded Direct:

- For a clean sound, plug directly into an unbalanced line input or use a direct box. For a distorted sound, plug into a guitar signal processor (such as the Rockman™), then into a mixer input.

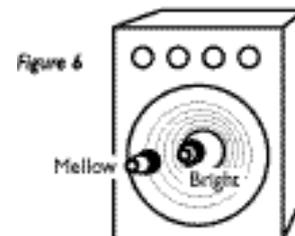


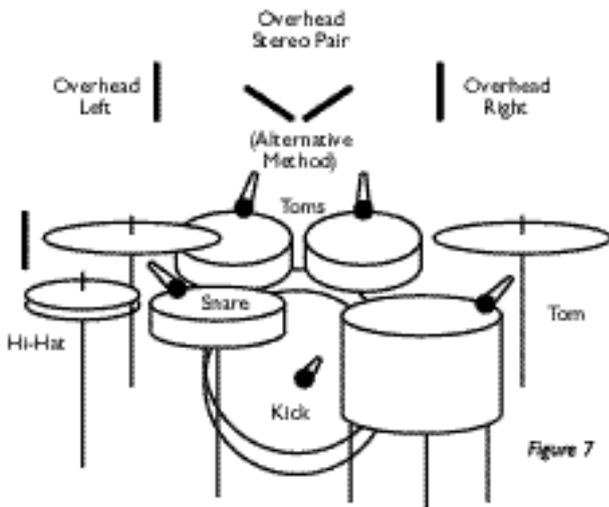
Figure 6

Electric guitar amp(Figure 6):

Recording/Reinforcement:

- Place a CM-200A 1 to 12 inches from the center of one of the speaker cones. For more bass, place the mic close. For the brightest tone, place the mic near the center of the speaker cone. For a mellower tone, place the mic near the edge of the speaker cone.

- Tape the cable of a GLM-100 to the grille cloth in front of a speaker cone. A mic placement at the center of the cone sounds bright; a placement near the edge of the cone sounds more mellow.



Drum set (Figure 7):

Toms and Snare, Recording/Reinforcement:

- Place a CM-700 about 1 inch above the head, 1 to 2 inches in from the rim, angled down about 45°. If the drum rings too much, tape some gauze or a folded handkerchief to the head.
- Clip a GLM-UM Universal Mount to each drum rim. Use GLM-200s.
- For more isolation, tape a GLM-100 inside each tom-tom on the shell, or place a CM-700 inside each tom-tom a few inches from the head, off center.

Cymbals, Recording/Reinforcement:

- Use one or two boom stands with CM-700, GLM-100, or GLM-200 mics 1 to 3 feet over the cymbal edges.

High-Hat, Recording/Reinforcement:

- Place a CM-700 with low-end roll off or GLM-200 8 inches above the edge aiming down.

Kick Drum, Recording/Reinforcement:

- Remove the front head and damp the kick-drum head with a pillow or blanket. Drop a GLM-100 through the vent hole so that it hangs inside the drum a few inches in front of the beater. Tape the GLM cable to the kick-drum shell. Use a wood beater or boost 2 kHz - 5 kHz for more attack or click. Cut a few dB around 400 Hz to remove the "papery" sound.

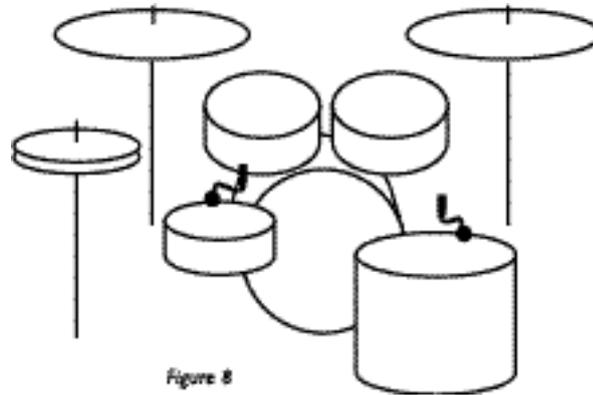


Figure 8

Three Microphones (Figure 8):

- Tape or clip one GLM-100 near the right side of the snare drum. This GLM picks up the hi-hat, snare, left rack tom, and cymbals. Tape or clip another GLM near the right rack tom and the floor toms. This GLM picks up the right rack tom, floor tom, and cymbals. Experiment with placement to achieve a good balance. You may want to boost the bass and treble slightly. Put another GLM in the kick drum.

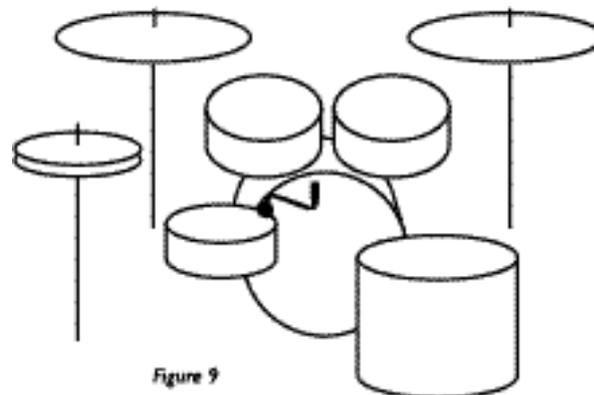


Figure 9

Two Microphones (Figure 9):

- Clip one GLM-100 to the snare drum rim, and position the mic in the center of the set, about 4" above the snare drum. With a little bass and treble boost, the sound is surprisingly good for such a simple setup. Put another GLM in the kick drum.

Percussion

Recording/Reinforcement:

- Place a CM-700 about 1 foot away.
- Tape a PZM on the musician's shirt (see the Crown Boundary Mic Application Guide).

Ambience

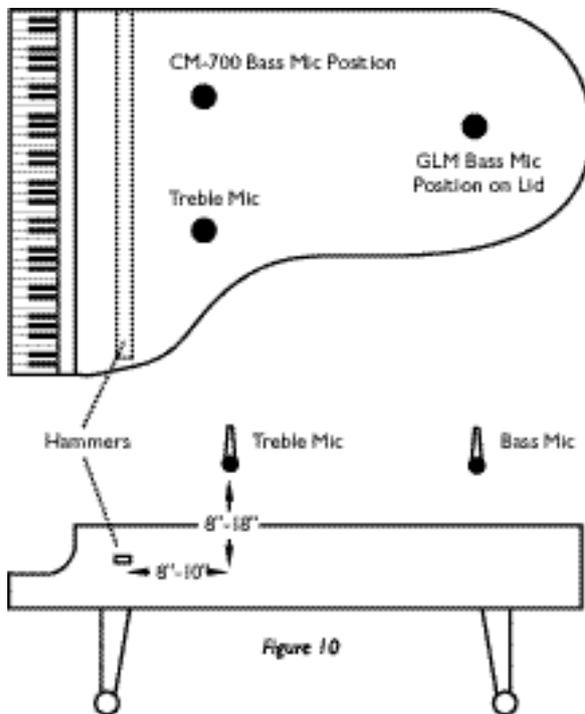
Recording:

- Place one or two PZMs on a distant wall, or on the control-room window.

Grand piano(Figure 10):

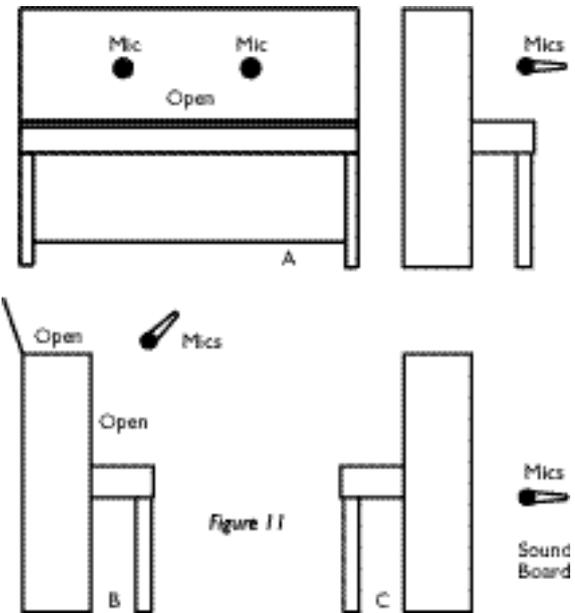
Recording:

- Raise the lid. Tape a GLM-100 to the underside of the lid in the middle. For stereo, use two over the bass and treble strings. If you need more isolation, close the lid. Boost a few dB at 10 kHz for clarity.
- Remove the lid. Place two CM-700s or CM-150s 8 inches over the bass and treble strings, 8 inches horizontally from the hammers. Boost a few dB at 10kHz for clarity.
- Remove the lid. Place two GLM-100s about 12 inches apart, angled 90° apart, 18 inches over the sound board and 10 inches horizontally from the hammers. Boost a few dB at 10 kHz for clarity.



Reinforcement:

- Use GLMs inside with the lid closed. Boost at 10 kHz for extra clarity.



Upright Piano(Figure 11):

Recording:

- Remove the panel in front of the player to expose the strings. Place two mics (CM-200A, CM-700, CM-150, GLM-100, or GLM-200) over the bass and treble strings.
- Mike the soundboard a few inches from the bass and treble strings.

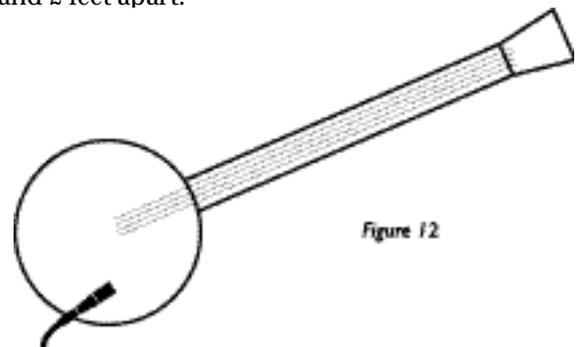
Reinforcement:

- For more isolation and gain-before-feedback, tape a GLM-100 or two onto the sound board. Experiment with position for best sound.

Xylophone and Marimba

Recording/Reinforcement:

- Place two CM-700s 18 inches above the instrument and 2 feet apart.



Banjo (Figure12):

Recording/Reinforcement:

- Clip a GLM-UM Universal Mount to a banjo tension rod, and position a GLM-100 1 inch from the head, 2 inches from the rim.

- For maximum isolation and gain-before-feedback, use a GLM-100 close to the drum head a few inches in from the rim.
- Place a CM-700 12 inches from the drum head for recording, closer for sound reinforcement.

Violin

Recording:

- Place a CM-700 or CM-150 1 to 2 feet away over the top.
- Attach a GLM-UM Universal Mount to the tailpiece and place a GLM-100 over an f-hole. Experiment with miking distance to get a good compromise between tone quality and isolation.

Reinforcement:

- For more gain-before-feedback, put the GLM inside the violin through the f-hole or clip it to the bridge.

Mandolin, Bouzouki, or Dobra

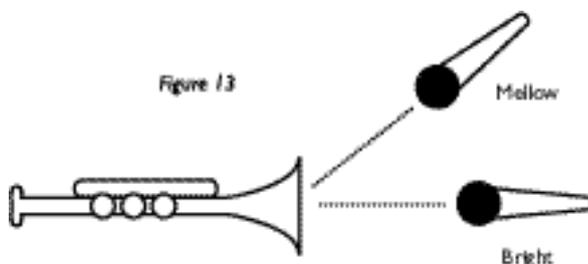
Recording/Reinforcement:

- Place a CM-700 12 inches away for recording, closer for sound reinforcement.
- Mount a GLM-100 on the sound board near an f-hole.

Acoustic Bass

Recording/Reinforcement:

- For a natural sound, place a GLM-100 or CM-700 on a boom a few inches out front, above the bridge.
- Tape a GLM-100 cable to the bridge.
- For a full, deep tone, tape a GLM-100 near an f-hole.
- For isolation, place a CM-200A near the f-hole and roll off excess bass.



Brass

Recording/Reinforcement:

- Place a CM-700 or CM-200A a few feet out front. Mic on-axis to the bell for a bright, edgy tone; mic off-axis to the bell for a mellower tone (Figure 13).
- Attach a GLM-UM Universal Mount to the bell, and position a GLM-100 about 4" from the bell, off-center.

Woodwinds

Recording/Reinforcement:

- Attach a GLM-UM Universal Mount to the bell, and position a GLM-100 or GLM-200 to pick up both the bell and the tone holes.
- Place a CM-700 about 12 inches from the tone holes.

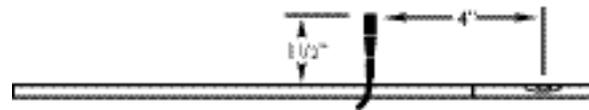


Figure 14

Flute

Recording/Reinforcement:

- Place a CM-700 halfway between the mouthpiece and the tone holes about 6 inches away.
- For recording or low-level sound reinforcement, use tape, a rubber band, or a padded broom holder to mount a GLM-100 on the flute. Attach the GLM cable 4 inches to the left of the lip plate (looking at the player), with the mic capsule 1 1/2 inches above the flute (see figure 14).
- For extra gain-before-feedback, tape the cable to the end of the flute nearest the lip plate, so that the mic can "see" the lips. Roll off the excess highs on your mixer.

Dulcimer

Recording/Reinforcement:

- Tape a GLM-100 on the center of the top edge, 1/2-inch above it.
- Place a CM-700 about 8 inches above and in front of the center of the top edge.

Harmonica

Recording/Reinforcement:

- Place a CM-200A a few inches to 1 foot away. Hand hold the mic for sound reinforcement. For a bluesy, dirty sound, pick up the harmonica with a mic plugged into a guitar amp, and mike the amp.

Harp

Recording:

- Aim a CM-700, CM-150, or GLM at the sound board about 18 inches away.
- Tape a GLM-100 to the sound board.

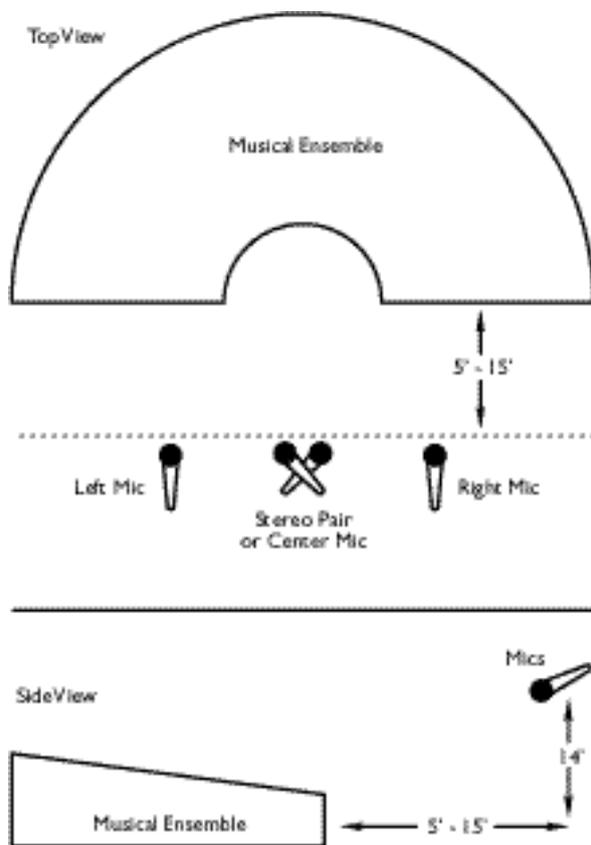


Figure 15

Orchestra, Band, Choir, or Organ Recording (Figure 15):

- Hang or place two GLM-100, CM-700 or CM-150 mics about 10 feet apart, about 14 feet above the floor, and 5 to 15 feet in front of the front-row musicians.
- Using a stereo mic adapter, hang or place two CM-700 mics in a coincident or near coincident arrangement. Place the pair about 14 feet above the floor, and 5 to 15 feet in front of the front-row musicians.
- See the Crown Boundary Mic Application Guide for more suggestions. The SASS is especially useful for this application.

Reinforcement:

- For sound reinforcement of an orchestra or band, mike each section separately a few feet away with a GLM-100, CM-30, or CM-31. Keep in mind the 3:1 rule to prevent phase interference: The distance between microphones should be at least three times the distance from each microphone to its sound source.

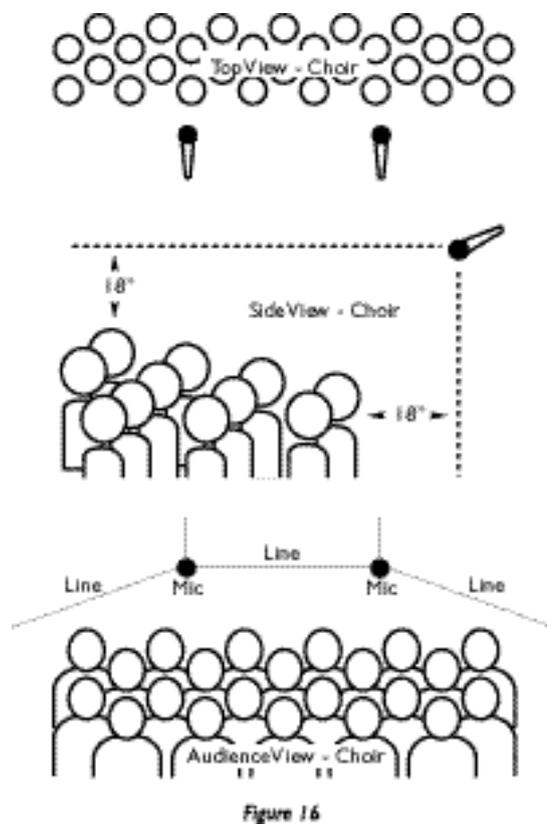


Figure 16

Choir (Figure 16):

Reinforcement:

- To reinforce a choir, use two CM-30 or CM-31 microphones, spaced to divide the choir in thirds. Hang them 18 inches in the front row, 18 inches over the head height of the back row. Angle them down to aim at the back row.
- To keep each microphone from rotating, you might want to thread some fishing line through the tiny pipe or crossbar on the hanger. Attach the line to the side walls, about a foot below the height of the microphone in order to provide a downward pull.
- Use two CM-700s on stands.

News and sports reporting

Studio:

- Clip a miniature omni microphone to the shirt about 8 inches under the chin. Since the camera sees it on-edge, it looks like a tie bar, not a microphone.

Field:

- To reduce ambient noise, use a CM-200A cardioid handheld mic with a foam windscreen. Roll off any excess bass at your mixer.
- If the ambient noise level is very high and you want to reject it, use a CM-310A handheld mic or CM-311A headworn mic with lips touching the grille. Roll off excess bass at your mixer.
- Clip a CM-10 miniature omni microphone to the shirt about 8 inches under the chin. Place the foam windscreen on the mic.
- Use a CM-312A hypercardioid headworn mic. Model CM-312A HS mounts on a Sony MDR-7506 head-
phone.

Speeches

Speaker that Wanders, Recording/Reinforcement:

- Clip a lavalier mic about 8 inches under the chin.

Speaker that Stays Behind the Lectern, Recording/Reinforcement:

- For permanent inconspicuous miking, use an LM-type microphone on the lectern. The LM-201 has a silent, rugged swivel mount; the LM-300A has a quiet, economical gooseneck. The LM-300AL is 5 inches longer than the LM-300A. The LM-301A mounts onto an Atlas flange or a mic stand.
- For temporary miking, place a CM-700 on the end of a mic-stand boom. Position it about 8 inches from the person speaking. Place the included foam pop filter on the mic to prevent breath pops. Set the bass tilt switch to roll off.
- Place a PCC-160, PCC-130, or PCC-170 surface mic on top of the lectern, out of cavities. See the Crown Boundary Mic Application Guide for details.

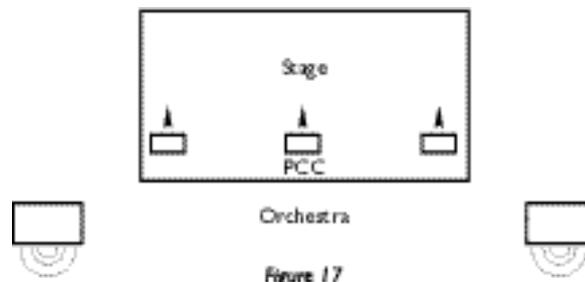
Narration recording:

- Place a CM-700 on a boom about 8 inches from the mouth at eye height. Ask the announcer to maintain a constant distance to the microphone.

Group discussion

Recording/Reinforcement:

- Hang a CM-30 or CM-31 straight down over the center of the group. Group members should be no more than 45° off-axis.
- Use PCC-170s, PCC-130s, or PZMs on the table. See the Crown Boundary Mic Application Guide for more suggestions.



Theatre, Drama, Opera, or Musicals (Figure 17):

Recording/Reinforcement:

- Use PCC-160s on the stage floor or suspend CM-30s or CM-31s overhead. See the Crown Boundary Mic Application Guide for suggestions.

Film or video:

- Hide a GLM-100 or CM-10 mini mic under clothing.
- Attach a GLM-100 to the back of props close to the action.
- In an automobile, clip a GLM-100 to the sun visor near the center-line of the automobile.
- To reduce clothing noise when the GLM is used on an actor, spray clothing with Static Guard® or water (spray leather with silicone spray or WD-40®). Tape the cable to clothing, using band-aids on skin. Make a loop in the cable to act as a strain relief. Place the connector near the actor's foot for unplugging between takes.
- For video documentaries, see the tips on news and sports reporting and narration recording.
- For audience miking, use two PZMs 3 feet apart on the stage front, or place two CM-700s over the audience front row, aiming at the back row.
- For more tips, see the Crown Microphone Application Guide for Video.
- To convert the GLM for wireless use, please order Technical Bulletin #3.

We hope this application guide has provided some insight into the operation and use of Crown microphones. For application notes on PZMs, PCCs, SASS, and boundaries, order the Crown Boundary Mic Application Guide - free from Crown. For more information, contact the Technical Support Group at Crown International, 1718 West Mishawaka Road, P.O. Box 1000, Elkhart, IN 46515 or phone (219) 294-8200 or visit us on the world wide web at www.crownaudio.com.

CHOOSING THE RIGHT CROWN MICROPHONE

There's a wide variety of Crown microphones to choose from. This guide will help you select the microphones best-suited for your applications.

Transducer Type

Condenser or Dynamic

In a dynamic microphone, a coil of wire attached to a diaphragm is suspended in a magnetic field and generates an electrical signal similar to the incoming sound wave.

In a condenser microphone, a diaphragm and an adjacent metallic disk (backplate) are charged to form two plates of a capacitor. Sound waves striking the diaphragm vary the spacing between the plates; this varies the capacitance and generates an electrical signal similar to the incoming sound wave.

The diaphragm and backplate can be charged either by an externally applied voltage, or by a permanently charged electret material in the diaphragm or on the backplate.

Because of its lower diaphragm mass and higher damping, a condenser microphone responds faster than a dynamic microphone to rapidly changing sound waves (transients).

Dynamic microphones offer good sound quality, are especially rugged, and require no power supply. Condenser microphones require a power supply to operate internal electronics, but generally provide a clear, detailed sound quality with a wider, smoother response than dynamics.

Boundary or Free Field

Boundary microphones are meant to be used on large surfaces such as stage floors, piano lids, hard-surfaced panels, or walls. Boundary mics are specially designed to prevent phase interference between direct and reflected soundwaves, and have little or no off-axis coloration. Free-field microphones are meant to be used away from surfaces, say for up-close miking.

Crown Pressure Zone Microphones (PZMs) and Phase Coherent Cardioids (PCCs) are boundary microphones; Crown GLMs, CMs and LMs are free-field microphones.

Polar Patterns

Omnidirectional or Unidirectional

Omnidirectional microphones (also called pressure microphones) are equally sensitive to sounds coming from all directions. Unidirectional microphones (also called pressure gradient microphones) are most sensitive to sounds coming from one direction - in front of the microphone.

Three types of unidirectional patterns are the cardioid, supercardioid, and hypercardioid pattern. The cardioid pattern has a broad pickup area in front of the microphone. Sounds approaching the side of the mic are rejected by 6 dB; sounds from the rear (180° off-axis) are rejected 20 to 30 dB. The supercardioid rejects the side sounds by 8.7 dB, and rejects sound best at two "nulls" behind the microphone, 125° off-axis.

The hypercardioid pattern is the tightest pattern of the three (12 dB down at the sides), and rejects sound best at two nulls 110° off-axis. This pattern has the best rejection of room acoustics, and provides the most gain-before-feedback from the main sound reinforcement speakers.

Choose omnidirectional mics when you need:

- All-around pickup.
- Pickup of room acoustics.
- Extended low-frequency response.
- Low handling noise.
- Low wind noise.
- No up-close bass boost.

Choose unidirectional mics when you need:

- Selective pickup.
- Rejection of sounds behind the microphone.
- Rejection of room acoustics and leakage.
- More gain-before-feedback.
- Up-close bass boost (proximity effect).

An omnidirectional boundary microphone (such as PZM) has a half-omni or hemispherical polar pattern. A unidirectional boundary microphone (such as a PCC-160) has a half-supercardioid polar pattern. The boundary mounting increases the directionality of the microphone, thus reducing pickup of room acoustics.

Frequency Response

Bright or Flat

A bright frequency response tends to have an emphasized or rising high-frequency response, which adds clarity, brilliance, and articulation. A flat frequency response tends to sound natural. Microphone placement also has a major effect on the recorded tonal balance. With loud guitars, amps and drums, a mic with rising highs or presence peak tends to sound natural; a flat-response mic tends to sound dull.