

CROWN MICROPHONE APPLICATION GUIDE FOR STUDIO RECORDING



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INTRODUCTION

In this guide you'll find suggestions on using Crown microphones to record music effectively. Whether you run a large professional facility, or a project studio, you'll find useful tips here. We'll cover some basics of miking, Crown mic models for studio use, and specific applications.

At Crown we've designed several mics specifically for studio applications. All these mics were field-tested in studios. Some were approved as is; others were enhanced with suggested improvements. We know you'll like how they sound, and will appreciate their value.

MICROPHONE TECHNIQUE BASICS

How to reduce reverberation

Reverberation is sometimes loosely called "room acoustics" or "ambience." It is a pattern of sound reflections 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 direct boxes or cables.
- 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 the omnidirectional pattern at the same distance:

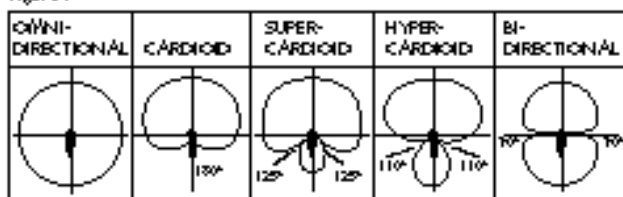
Omnidirectional	0.0 dB
Cardioid	-4.8 dB
Bidirectional	-4.8 dB
Supercardioid	-5.7 dB
Hypercardioid	-6.0 dB

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 are the null angles for various polar patterns (Figure 1):

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 one 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:

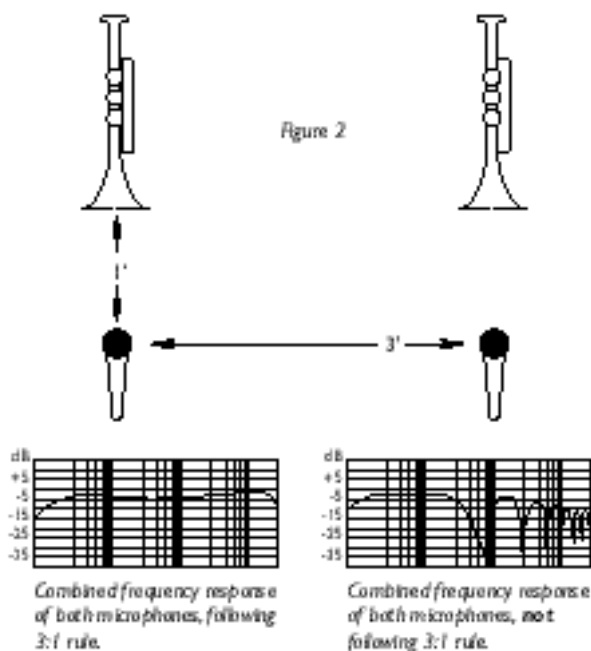
- Mike close with directional microphones.
- When recording, overdub instruments one at a time on each track of a multitrack recorder.
- Pick up electric instruments with direct boxes or cables.
- Use a room or studio with dead acoustics. The walls, ceiling, and floor should be covered with sound absorbing 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.

How to reduce 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: The distance between mics should be at least three times the mic-to-sound 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 (Figure 2).



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 recording 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 and stand noise

- Use an omnidirectional microphone such as a GLM-100, CM-150, or any PZM.
- Use a directional microphone which is relatively insensitive to handling noise, such as the CM-200A or CM-700.
- Use a directional microphone with an internal shock mount.
- Use a shock-mount stand adapter on a mic stand, such as the CMSM.
- 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 directional microphone. The closer the mic is to the sound source, the more bass you hear. To reduce proximity effect:

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

How to achieve a natural tone quality

- Use a microphone with a flat frequency response, such as: CM-700, CM-150, GLM-100, or a PZM-30D or PZM-6D set to "flat" response.
- Move the mic around until you find a spot where the monitored sound is natural.
- 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, treble, and articulate. To achieve a bright sound, use a microphone with a rising high-frequency response, such as a Crown

CM-200A, or a PZM-30D/PZM-6D set to “rising” response. Also, move the mic around until you find a spot where the monitored sound is bright.

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 emphasize the instruments in the center of the ensemble.
- If you're using two mics to record stereo, adjust the microphone angling or spacing for a good balance. 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 orchestra's mic stand to vary the balance between soloist and orchestra.

NOTES ON CROWN MICROPHONE MODELS

CM-200A

The CM-200A is a handheld condenser microphone with a smooth, articulate sound quality. It's great for drums, guitar amps, and singing guitarists. Because of its cardioid pickup pattern, the CM-200A rejects sounds approaching the rear of the microphone.

CM-700

The CM-700 is a superb, cardioid condenser mic for pro or semi-pro 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).

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 roll-off switch, pop filter and windscreen are included.

CM-150

The CM-150 is a ½-inch diameter, omnidirectional electret-condenser microphone. It has a very flat response from 20 Hz to 20 kHz, so it sounds accurate and natural. It preserves the delicate timbre of acoustic instruments yet can reproduce all the power of a pipe organ.

GLM-100

This miniature omni mic offers all the quality and wide-range response of larger studio microphones. Since the GLM is small, it can be attached to instruments to improve isolation and reject off-mic sound.

PZM-6D

The PZM-6D is a Pressure Zone Microphone. When suspended over an orchestra on a clear panel, the PZM practically disappears. Its miniature, permanently attached cable also reduces visual clutter.

The PZM-6D has a switchable, dual frequency response: rising or flat. The “rising” position adds brilliance. This makes it useful wherever crisp attack is desired, such as on percussion, drums or piano. The user can get a bright sound without boosting high frequencies on the recording console; the benefit is lower noise. The “flat” position provides a smooth, flat high frequency response for natural sound reproduction.

Like other Pressure Zone Microphones, the PZM-6D uses the Pressure Recording Process in which a miniature condenser mic capsule is mounted very close to a sound-reflecting plate or boundary. The capsule is in the “Pressure Zone” where sound coming directly from the sound source combines in phase with sound reflected off the boundary. The benefits are a wide, smooth frequency response free of phase interference, excellent clarity and “reach,” a hemispherical polar pattern and uncolored off-axis response.

PZM-30D

Same as the PZM-6D but larger. It accepts a rugged detachable cable.

SASS-P MKII

The SASS-P MKII is a stereo microphone using PZM technology. The unit makes excellent stereo recordings, has a natural tonal balance, is mono-compatible and easy to use, and costs less than the competition. It comes with a carrying case and a full line of accessories. Model SASS-P HC is the mic alone and costs less.

SPECIFIC APPLICATIONS

This section suggests some ways to place Crown microphones to record 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 pickup of room reverberation, 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 up close to isolate their sounds. This placement often results in a 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

- Place a CM-700, CM-150, or GLM-100 8 inches away at eye height to avoid breath pops. Use the foam pop filter.
- To record a singer/guitarist, mike the singer with a CM-200A up close. Use the foam pop filter. Put another mic on the guitar, aiming down away from the mouth. Or record the guitar first, then overdub the vocal with a CM-700.

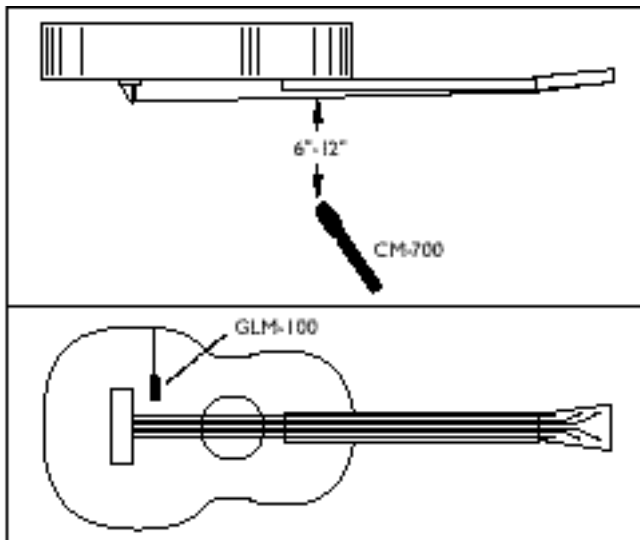


Figure 3

Acoustic guitar

- Attach a GLM-100 to the guitar soundboard, halfway between the bridge and the sound hole, near the low E string (Figure 3).

- Place a CM-700, CM-150, or GLM-100 6 to 12 inches from where the finger board joins the body (Figure 3). For stereo, add another mic the same distance from the bridge.

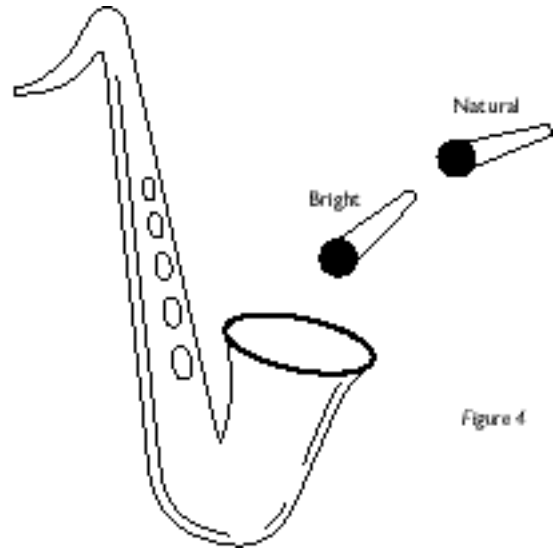


Figure 4

Sax

- Place a CM-700, CM-150, or GLM-100 18 inches away, a few inches above the bell, toward the player's right side (Figure 4).

Electric guitar or bass

Recorded Direct:

- For a clean sound, plug the guitar into a direct box and from there into a mixer mic input. For a distorted sound, plug into a guitar signal processor, then into a mixer line input.

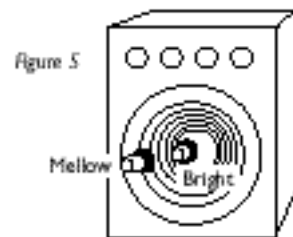
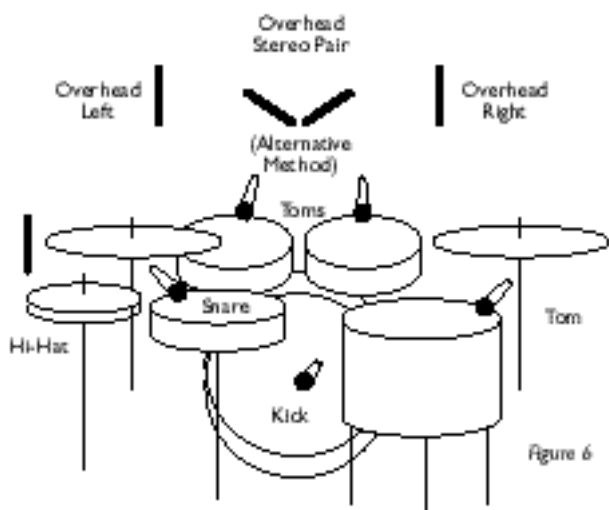


Figure 5

Electric guitar amp

- 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 (Figure 5).
- 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 6)

Toms and Snare

- Place a CM-200A or 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, or use damping rings.

Cymbals

- Use one or two boom stands with CM-700, GLM-100, CM-150, SASS-P MKII, or PZM-30D mics 2 to 3 feet over the cymbals.

High-Hat

- Place a CM-700 with low-end rolloff 8 inches above the outside edge aiming down.

Kick Drum

- 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. Use a wood beater or boost 2 to 5 kHz for more attack or click. Cut a few dB around 400 Hz to remove the “papery” sound.
- Hang a PZM-30D by its cable so that the plate is parallel with the drum head. Tape the cable to the shell inside on top. Place the mic a few inches from the beater head.
- Try a CM-700 inside near the beater head.

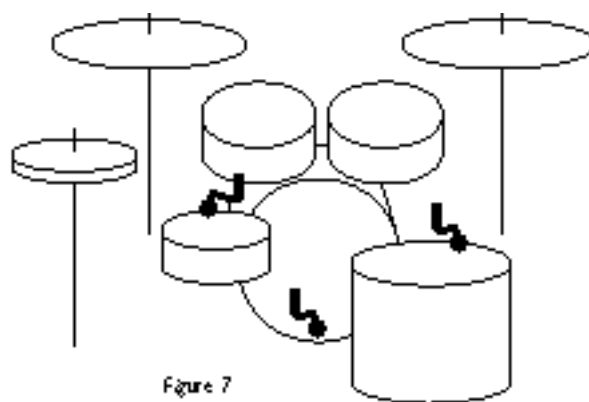


Figure 7

Three Microphones (Figure 7):

- Tape or clip one GLM-100 to the rim 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 or PZM in the kick drum.

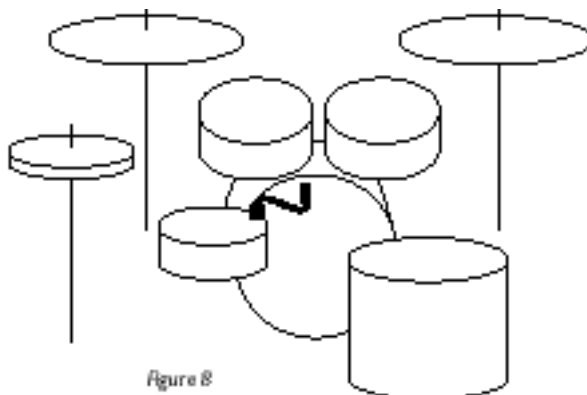


Figure 8

Two Microphones (Figure 8):

- Clip one GLM-100 to the snare drum rim, and position the mic in the center of the set, about 4 inches above the snare drum. With a little bass and treble boost, the sound is surprisingly good for such a simple setup. Put another GLM or PZM in the kick drum.
- Tape a PZM-30D or PZM-6D to the drummer's chest. It will pick up the set as the drummer hears it. Boost 6 dB at 80 Hz. Put another PZM or GLM-100 in the kick drum.

Percussion

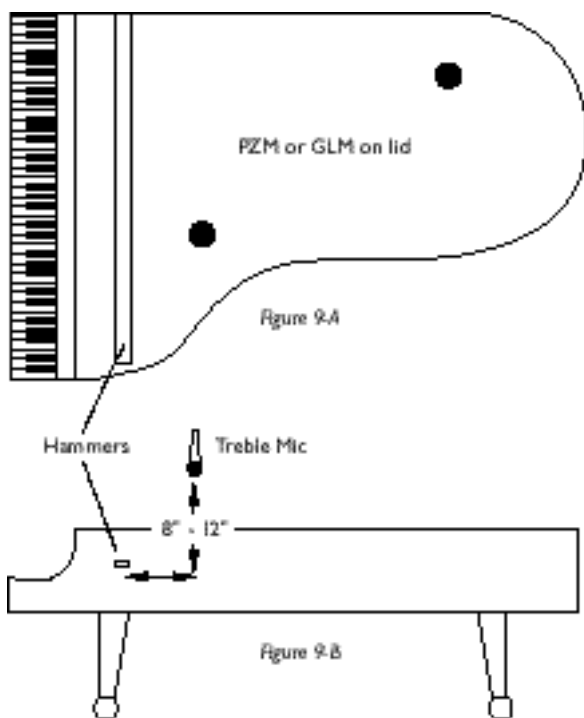
- Place a CM-700, CM-150, or GLM-100 about 1 foot away.
- Tape a PZM on the musician's shirt.

Ambience

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

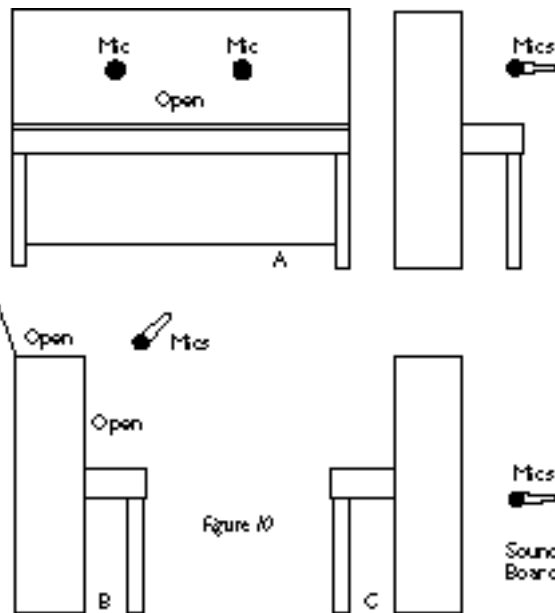
Grand piano

- Raise the lid. Tape a GLM-100, PZM-6D, or PZM-30D to the underside of the lid in the middle. For stereo, use two over the bass and treble strings



(Figure 9-A). If you need more isolation, close the lid. Boost a few dB at 10 kHz for clarity.

- Raise or remove the lid. Place two CM-700s, CM-150s, or GLM-100s eight inches over the bass and treble strings, 8-inches horizontally from the hammers (Figure 9-B). Boost a few dB at 10 kHz for clarity.
- Remove the lid. Place two GLM-100s or CM-150's about 12 inches apart, angled 90° apart, 18 inches over the soundboard and 10 inches horizontally from the hammers. Boost a few dB at 10 kHz for clarity.

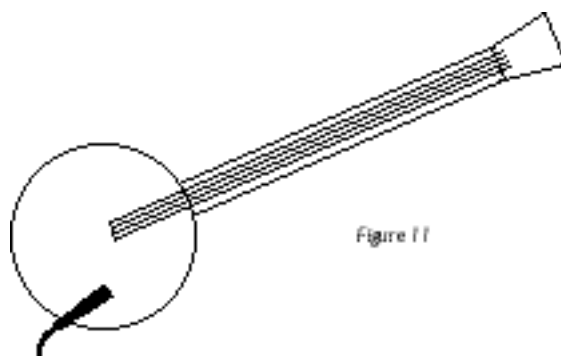


Upright Piano

- Remove the panel in front of the player to expose the strings. Place two mics (CM-200A, CM-700, GLM-100, or CM-150) over the bass and treble strings (Figure 10 A or B).
- Face the soundboard toward the room (not next to a wall). Mike the soundboard a few inches from the bass and treble strings (Figure 10-C).

Xylophone and Marimba

- Place two CM-700s, CM-150s, or GLM-100s 18 inches above the instrument and 2 feet apart.



Banjo

- 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 (Figure 11).
- Place a CM-700, CM-150, or GLM-100 12 inches from the drum head.

Violin

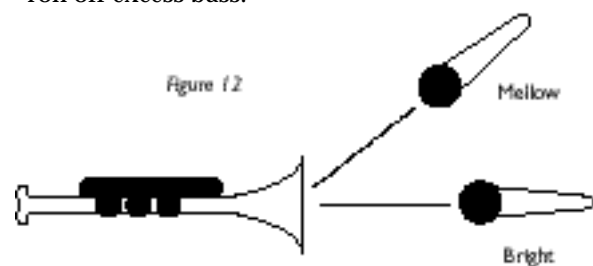
- Place a CM-700, CM-150, or GM-100 2 feet over the top.
- For a fiddle player who sings, try a CM-200A at mouth-height and horizontal.

Mandolin, Bouzouki, Dobro, or Lap Dulcimer

- Place a CM-700, GLM-100 or CM-150 12 inches away.

Acoustic Bass

- For a natural sound, place a CM-150, GLM-100, or CM-700 on a boom a few inches to a few feet out front, even with the bridge on the side toward the G (top) string.
- Tape a GLM-100 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

- Place a CM-700, CM-150 or GLM-100 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 12).
- Tape a PZM-6D or PZM-30D to the wall or to the control-room window.

Woodwinds

- Place a CM-700, CM-150 or GLM-100 about 12 inches from the tone holes.

Flute

- Place a CM-700, CM-150, or GLM-100 halfway between the mouthpiece and the tone holes about 6 to 12 inches away.

Hammered Dulcimer

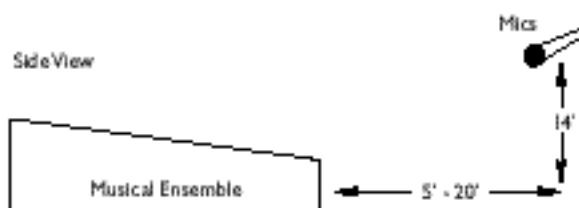
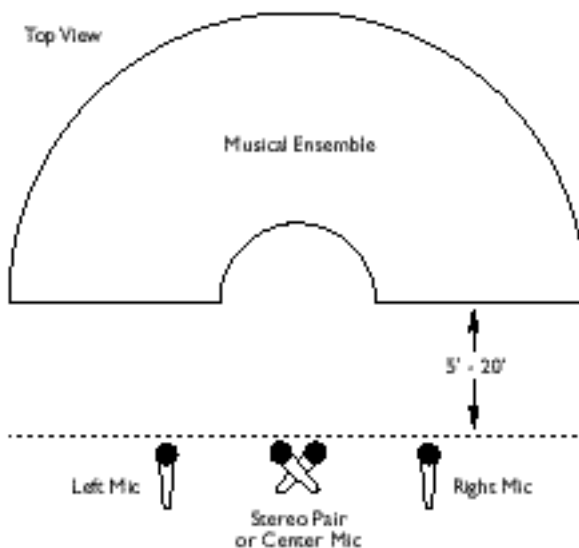
- Place a CM-700, GLM-100, or CM-150 about 12 inches above and in front of the center of the top edge.

Harmonica

- Place a CM-700, GLM-100, or CM-150 1 foot away.

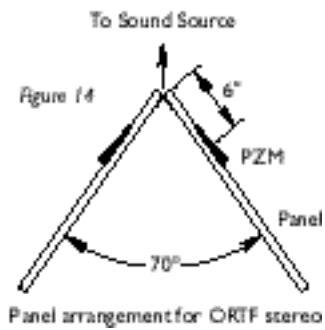
Harp

- Aim a CM-700 or CM-150 at the soundboard about 18 inches away.



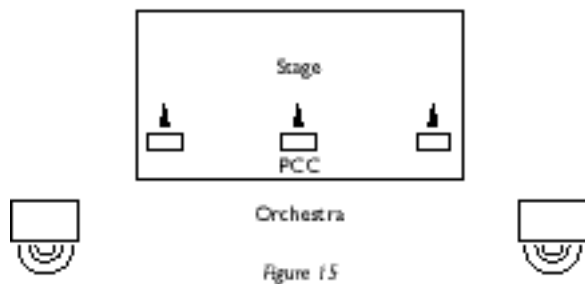
Orchestra, Band, Choir, Organ, or Classical-Music Soloist (Figure 13)

- Hang or place two CM-150 or CM-700 mics about 10 feet apart, 14 feet above the floor, and 5 to 20 feet in front of the front-row musicians. Adjust height and distance for desired sound.
- 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 20 feet in front of the front-row musicians. Also try the SASS-P MKII in this position.



PZM Wedge (Figure 14)

- Mount a PZM microphone 6 inches from the edge of a 2-foot square panel. Mount another PZM similarly on another panel. Tape together the panel edges nearest the microphones, forming a “V.” Aim the point of the “V” at the center of the sound source. Angle the panels about 70 degrees apart. This assembly is called a PZM wedge. Put the wedge where you would put a stereo mic.



Theatre, Drama, Opera, or Musicals (Figure 15)

Recording/Reinforcement:

- Use PCC-160s on the stage floor about 1 or 2 feet from the edge of the stage.

For more information, contact Technical Services Department at Crown International, 1718 West Mishawaka Road, Elkhart, IN 46517 or phone (219)294-8200 or 1-800-342-6939. Visit our website at www.crownaudio.com.

SUGGESTED CROWN MICS FOR VARIOUS APPLICATIONS

1 - First Choice 2 - Second Choice 3 - Third Choice 4 - Fourth Choice 5 - Fifth Choice

	CM-200A	CM-150	GUM-100	CM-700	PZM	PCC	SASS
Vocal	4	2	3	1			
Acoustic Guitar		2	3	1			4
Sax Recording		2	3	1			
Electric Guitar Amp	1		2	3			
Tom-Tom, Snare	1						
Cymbals		2	4	1	3		
H-Hat				1			
Kick Drum	3		1	4	2		
Drums [3 mics]			1				
Drums [2 mics]			1		2		
Percussion	3	2	4	1			
Ambience/Audience				1	2		3
Grand Piano		3	4	2	1		5
Upright Piano	3	2	4	1			
Xylophone, Marimba	3	2		1			
Banjo	3	2	4	1			
Fiddle, Violin	3	2	4	1			
Mandolin, Bouzouki, Dobro	3	2	4	1			
Acoustic Bass	2	1	2	1			
Brass		2	3	1	3		
Woodwinds		2	3	1			
Flute		2	3	1			
Harmonica	3	2		1			
Harp		2	4	1			3
Orchestra, Band, Choir, Organ		1	2	1	1		1
Theatre, Drama, Opera, Musicals					2	1	