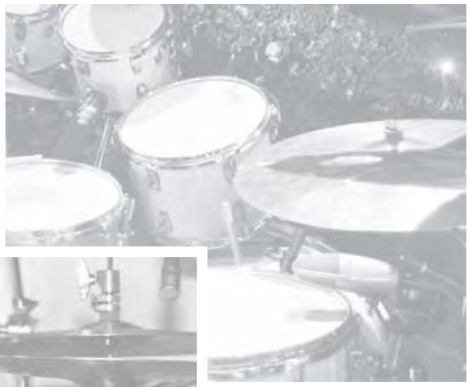
SHURE®

LEGENDARY
PERFORMANCE™

MICROPHONE TECHNIQUES

DRUMS

A Shure Educational Publication



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GENERAL RULES

Microphone technique is largely a matter of personal taste — whatever method sounds right for the particular instrument, musician, and song is right. There is no one ideal microphone to use on any particular instrument. There is also no one ideal way to place a microphone. Place the microphone to get the sound you want. However, the desired sound can often be achieved more quickly and consistently by understanding basic microphone characteristics, sound-radiation properties of musical instruments, and acoustic fundamentals.

Here are some suggestions to follow when miking musical instruments for sound reinforcement.

- Try to get the sound source (instrument, voice, or amplifier) to sound good acoustically ("live") before miking it.

- Use a microphone with a frequency response that is limited to the frequency range of the instrument, if possible, or filter out frequencies below the lowest fundamental frequency of the instrument.

- To determine a good starting microphone position, try closing one ear with your finger. Listen to the sound source with the other ear and move around until you find a spot that sounds good. Put the microphone there. However, this may not be practical (or healthy) for extremely close placement near loud sources.

- The closer a microphone is to a sound source, the louder the sound source is compared to reverberation and ambient noise. Also, the **Potential Acoustic Gain** is increased — that is, the system can produce more level before feedback occurs. Each time the distance between the microphone and sound source is halved, the sound pressure level at the microphone (and hence the system) will increase by 6 dB. **(Inverse Square Law)**

- Place the microphone only as close as necessary. Too close a placement can color the sound source's tone quality (timbre), by picking up only one part of the instrument. Be aware of **Proximity Effect** with unidirectional microphones and use bass rolloff if necessary.

- Use as few microphones as are necessary to get a good sound. To do that, you can often pick up two or more sound sources with one microphone. Remember: every time the number of microphones doubles, the **Potential Acoustic Gain** of the sound system decreases by 3 dB. This means that the volume level of the system must be turned down for every extra mic added in order to prevent feedback. In addition, the amount of noise picked up increases as does the likelihood of interference effects such as comb-filtering.

- When multiple microphones are used, the distance between microphones should be at least three times the distance from each microphone to its intended sound source. This will help eliminate phase cancellation. For example, if two microphones are each placed one foot from their sound sources, the distance between the microphones should be at least three feet. **(3 to 1 Rule)**

- To reduce feedback and pickup of unwanted sounds:

  1) place microphone as close as practical to desired sound source

  2) place microphone as far as practical from unwanted sound sources such as loudspeakers and other instruments

  3) aim unidirectional microphone toward desired sound source (on-axis)

  4) aim unidirectional microphone away from undesired sound source (180 degrees off-axis for cardioid, 126 degrees off-axis for supercardioid)

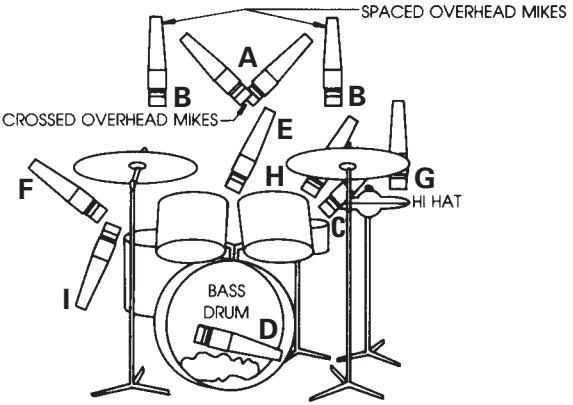
  5) use minimum number of microphones

- If the sound from your loudspeakers is distorted even though you did not exceed a normal mixer level, the microphone signal may be overloading your mixer's input. To correct this situation, use an in-line attenuator (such as the Shure A15AS), or use the input attenuator on your mixer to reduce the signal level from the microphone.

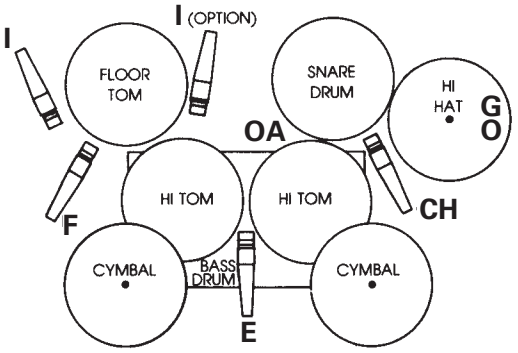
Seasoned sound engineers have developed favorite microphone techniques through years of experience. If you lack this experience, the suggestions listed on the following pages should help you find a good starting point. These suggestions are not the only possibilities; other microphones and positions may work as well or better for your intended application. Remember — Experiment and Listen!

MICROPHONE POSITIONS

In most sound reinforcement systems, the drum set is miked with each drum having its own mic. Using microphones with tight polar patterns on toms helps to isolate the sound from each drum. It is possible to share one mic with two toms, but then, a microphone with a wider polar pattern should be used. The snare requires a mic that can handle very high SPL, so a dynamic mic is usually chosen. To avoid picking up the hi-hat in the snare mic, aim the null of the snare mic towards the hi-hat. The brilliance and high frequencies of cymbals are picked up best by a flat response condenser mic.



Front View



Top View

Microphone Placement	Tonal Balance	Comments
❶ Overhead-Cymbals:		
One microphone over center of drum set, about 1 foot above drummer's head (Position **A**); or use two spaced or crossed microphones for stereo (Positions **A** or **B**).	Natural; sounds like drummer hears set	Picks up ambience and leakage. For cymbal pickup only, roll off low frequencies. Boost at 10,000 Hz for added sizzle. To reduce excessive cymbal ringing, apply masking tape in radial strips from bell to rim.
❷ Snare drum:		
Just above top head at edge of drum, aiming at top head. Coming in from front of set on boom (Position **C**); or miniature microphone mounted directly on drum.	Full, smooth	Tape gauze pad or handkerchief on top head to tighten sound. Boost at 5,000 Hz for attack, if necessary.
❸ Bass drum (kick drum):		
Placing a pad of paper towels where the beater hits the drum will lessen boominess. If you get rattling or buzzing problems with the drum, put masking tape across the drum head to damp out these nuisances. Placing the mic off center will pick up more overtones.		
Remove front head if necessary. Mount microphone on boom arm inside drum a few inches from beater head, about 1/3 of way in from edge of head (Position **D**); or place surface-mount microphone inside drum, on damping material, with microphone element facing beater head.	Full, good impact	Put pillow or blanket on bottom of drum against beater head to tighten beat. Use wooden beater, or loosen head, or boost around 2,500 Hz for more impact and punch.
❹ Tom-toms:		
One microphone between every two tom-toms, close to top heads (Position **E**); or one microphone just above each tom-tom rim, aiming at top head (Position **F**); or one microphone inside each tom-tom with bottom head removed; or miniature microphone mounted directly on drum.	Full, good impact	Inside drum gives best isolation. Boost at 5,000 Hz for attack, if necessary.

Microphone Placement	Tonal Balance	Comments
❺ Hi-hat:		
Aim microphone down towards the cymbals, a few inches over edge away from drummer (Position **G**). Or angle snare drum microphone slightly toward hi-hat to pick up both snare and hi-hat.	Natural, bright	Place microphone or adjust cymbal height so that puff of air from closing hi-hat cymbals misses mike. Roll off bass to reduce low-frequency leakage. To reduce hi-hat leakage into snare-drum microphone, use small cymbals vertically spaced 1/2" apart.
❻ Snare, hi-hat and hi-tom:		
Place single microphone a few inches from snare drum edge, next to hi-tom, just above top head of tom. Microphone comes in from front of the set on a boom (Position **H**).	Natural	In combination with Placements 3 and 7, provides good pickup with minimum number of microphones. Tight sound with little leakage.
❼ Cymbals, floor tom and hi-tom:		
Using single microphone, place its grille just above floor tom, aiming up toward cymbals and one of hi-toms (Position **I**).	Natural	In combination with Placements 3 and 6, provides good pickup with minimum number of microphones. Tight sound with little leakage.

Suggested Placement Techniques Based on Quantity of Available Microphones

One microphone: Use Placement 1. Placement 6 may work if the drummer limits playing to one side of the drum set.

Two microphones: Placements 1 and 3; or 3 and 6.

Three microphones: Placements 1, 2, and 3; or 3, 6, and 7.

Four microphones: Placements 1, 2, 3, and 4.

Five microphones: Placements 1, 2, 3, 4, and 5.

More microphones: Increase number of tom-tom microphones as needed. Use a small microphone mixer to submix multiple drum microphones into one channel.

Microphone Placement	Tonal Balance	Comments
Timbales, congas, bongos:		
One microphone aiming down between pair of drums, just above top heads.	Natural	Provides full sound with good attack.
Tambourine:		
One microphone placed 6 to 12 inches from instrument.	Natural	Experiment with distance and angles if sound is too bright.
Steel Drums:		
Tenor, Second Pan, Guitar One microphone placed 4 inches above each pan.	Bright, with plenty of attack	Allow clearance for movement of pan.
Microphone placed underneath pan.	Natural	Decent if used for tenor or second pans. Too boomy with lower voiced pans.
Cello, Bass One microphone placed 4 - 6 inches above each pan.	Natural	Can double up pans to a single microphone.
Xylophone, marimba, vibraphone:		
Two microphones aiming down toward instrument, about 1 1/2 feet above it, spaced 2 feet apart, or angled 135^0 apart with grilles touching.	Bright, with lots of attack	Pan two microphones to left and right for stereo.
Glockenspiel:		
One microphone placed 4 - 6 inches above bars.		For less attack, use rubber mallets instead of metal mallets. Plastic mallets will give a medium attack.

3-to-1 Rule – When using multiple microphones, the distance between microphones should be at least 3 times the distance from each microphone to its intended sound source.

Ambience – Room acoustics or natural reverberation.

Feedback – In a PA system consisting of a microphone, amplifier, and loudspeaker feedback is the ringing or howling sound caused by amplified sound from the loudspeaker entering the microphone and being re-amplified.

Frequency Response – A graph showing how a microphone responds to various sound frequencies. It is a plot of electrical output (in decibels) vs. frequency (in Hertz).

Interference – Destructive combining of sound waves or electrical signals due to phase differences.

Inverse Square Law – States that direct sound levels increase (or decrease) by an amount proportional to the square of the change in distance.

Isolation – Freedom from leakage; ability to reject unwanted sounds.

Leakage – Pickup of an instrument by a microphone intended to pick up another instrument. Creative leakage is artistically favorable leakage that adds a "loose" or "live" feel to a recording.

Noise – Unwanted electrical or acoustic interference.

PAG – Potential Acoustic Gain is the calculated gain that a sound system can achieve at or just below the point of feedback.

Polar Pattern (Directional Pattern, Polar Response) – A graph showing how the sensitivity of a microphone varies with the angle of the sound source, at a particular frequency. Examples of polar patterns are unidirectional and omnidirectional.

Proximity Effect – The increase in bass occurring with most unidirectional microphones when they are placed close to an instrument or vocalist (within 1 ft.). Does not occur with omnidirectional microphones.

Rolloff – A gradual decrease in response below or above some specified frequency.

Shure Microphone Selection Guide

Drums

Kick Drum
- Beta 52A
- Beta 91A
- Beta 57A
- SM57
- PG52

Snare Drum
- Beta 57A*
- Beta 56A*
- SM57*
- PG56
- PG57*

Rack/Floor Toms
- Beta 98 AMP
- Beta 98AD/C
- Beta 57A*
- Beta 56A*
- SM57*
- PG56
- PG57*

Congas
- Beta 98AD/C
- Beta 56A*
- Beta 57A*
- SM57*
- PG56
- PG57*

Cymbals
- Beta 181
- KSM141
- KSM137
- KSM44A
- KSM32
- SM137
- SM94
- SM81
- SM27
- PG42
- PG81

Mallets
- KSM141
- KSM137
- KSM44A
- KSM32
- SM137
- SM94
- SM81
- SM27
- PG81

Percussion
- KSM141
- KSM137
- KSM44A
- KSM32
- Beta 57A
- SM137
- SM81
- SM57
- SM27
- PG57

*Requires drum mount accessory to mount on rim.

This guide is an aid in selecting microphones for various applications. Microphone sound quality and appearance are subject to specific acoustic environments, application technique, and personal taste.

Additional Shure Publications Available:

Electronic versions of the following guides are also available.

- Microphone Techniques for Live Sound Reinforcement
- Microphone Techniques for Studio Recording

Our Dedication to Quality Products

Shure offers a complete line of microphones and wireless microphone systems for everyone from first-time users to professionals in the music industry–for nearly every possible application.

For over eight decades, the Shure name has been synonymous with quality audio. All Shure products are designed to provide consistent, high-quality performance under the most extreme real-life operating conditions.

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