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A Shure Educational Publication

MICROPHONE TECHNIQUES

DRUMS



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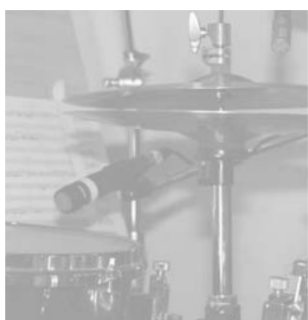


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GENERAL RULES

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**)

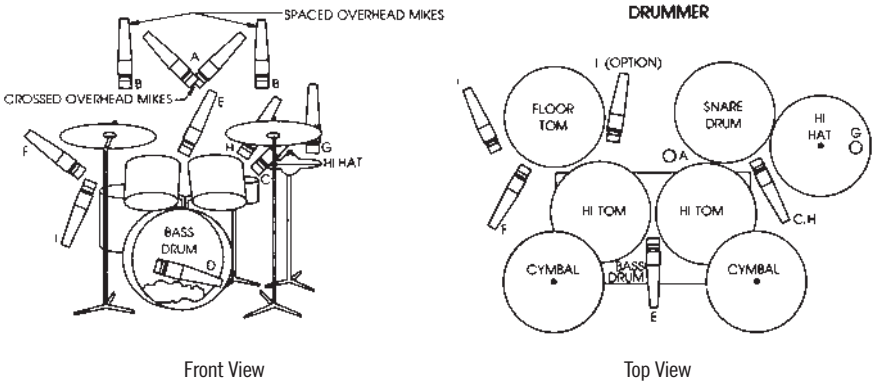
- Place the microphone only as close as necessary. Too close a placement can color the sound source's tone quality (timbre), by picking up only one part of the instrument. Be aware of **Proximity Effect** with unidirectional microphones and use bass rolloff if necessary.
- Use as few microphones as are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

Microphone Techniques for DRUMS

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.



Microphone Placement	Tonal Balance	Comments
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1 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.



Russ Miller

"I use what is called an 'XY Configuration' utilizing a pair of KSM44's. The two mics are placed close together and angled at about 75-90 degrees." **To read the full tip, go to page 14.**



Kenny Aronoff

"The VP88 Stereo overhead is an amazing mic because it gives you an incredible stereo image." **To read the full tip, go to page 11.**

2 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.



Dave Weckl – On the SM57:

"I like to put it right under the high-hat, so there is not a lot of high-hat bleed into that mic." **To read the full tip, go to page 20.**



Joel Stevenett

"I use an SM57 on my snare drum top and bottom... plus a 'Green Bullet' (520DX) lying under my snare, I get a low-fi loop texture that can be used perfectly in a final mix." **To read the full tip, go to page 19.**

Microphone Placement

Tonal Balance

Comments

3 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.



John Robinson

“I, of course, use a Beta 52 inside the kick drum about 1/3 in from the front head.” **To read the full tip, go to page 17.**



Paul Wertico

“One of the best bass drum sounds we’ve gotten has actually been with the SM7B microphone.” **To read the full tip, go to page 21.**

4 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.



Simon Phillips – On the KSM137:

“I do not place these mics close to the drums. They are at least 2” away from each drum. If the kit is well balanced there is no leakage problem.”
To read the full tip, go to page 15.



Jim Riley – On the KSM27 (now the SM27):

“I swear, not a night goes by that I do not get comments about the sound (and impact) of my floor toms.” **To read the full tip, go to page 16.**

Microphone Placement	Tonal Balance	Comments
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5 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.
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6 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.
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7 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.
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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 Techniques for DRUMS

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° 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.

TIPS
FROM THE
PROS



Kenny Aronoff

“I love the Beta 56’s on the toms when I am on tour because the bigger mic makes my toms have a fuller sound... engineers love the Beta 52 on the kick both live and in the studio... That’s what they ask for.”

The VP88 Stereo overhead is an amazing mic because it gives you an incredible stereo image. I have only used it in a live situation and the engineers love the sound quality and the amazing stereo effect you can get from placing one mic (one source) over the drum kit to get a stereo effect...”



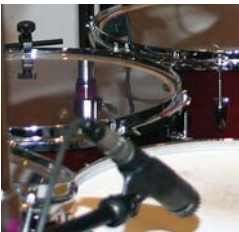
Microphone Techniques for DRUMS

TIPS
FROM THE
PROS



Ndugu Chancler

“When miking drums I try to place the mic where I can get a pure dynamic sound without reinforcement. A good example would be the Beta 57 on the snare. While I point the mic at the drumhead about two inches from the head, I also try to record flat without a lot of added EQ so I can get exactly what I want when I signal process. If I am unsure of the end results, I will record with more than one mic so I can mix the sounds while still having control of EQ and processing of each mic. Drums are the last of the acoustic dynamic instruments that are totally dependent on the selection of proper mics and mic placement. I use simple miking and basic mics. 57,91,81.”





Mike Mangini

“BASS DRUM "Tight (stuffing) Sound" – Beta 52A inside drum towards the top of the shell half way in, aiming at the beater(s.) Aiming down won't pick up so much of the bottom snare.

BASS DRUM "Open (no stuffing) Sound" – Beta 52A outside the drum on the beater head just like a Tom-Tom mic. It is near the hoop and aiming at the beater(s.)

TOM-TOMS – Beta 98S near the rim aiming half way between rim and the center of the drum

SNARE – Any of the following on the top: SM57, SM58, Beta 87A aiming halfway between the rim and the center of the drum.

Beta 56A on the bottom aiming halfway between the rim and the center of the drum

CYMBALS – KSM32 down low, halfway between top rack of cymbals and bottom rack. They are placed closer to the smaller cymbals, but aiming at the larger ones.

Sometimes, a KSM44 is placed behind me aiming at my back.”



Microphone Techniques for DRUMS



Russ Miller

“Shure makes the most high-quality well rounded series of mics available anywhere. I know, if I have Shure mics and my drums, I get a great drum sound!”

One of my favorite miking techniques is for the overhead mics. Most of the time, the majority of my drum sound comes from the overhead mics (or the room mics for an "Ambient Sound"). The idea here is to get a great full range of tones with a nice stereo image. I use what is called an "X/Y Configuration" utilizing a pair of KSM44's. The two mics are placed close together and angled at about 75-90 degrees. Each mic should be as close to one another as possible. I pan each mic hard left/right (left side is the hi-hat side for a drummer's perspective mix). The lower the mics are to the kit, the more 'stereo' the sound is. If you are mixing to a mono signal, raise the mics up to a higher position. Do not use roll-off switches on the KSM44's. All of the drums are tracked in my personal studio using API 312 Mic Pre-Amps, API 550a and 560a EQ's and the rooms are compressed (pending the music style) using Empirical Labs EI-8 Distressors.”





Simon Phillips

“Toms: I use KSM137s on all the toms for live applications and KSM27 (now the SM27) for recording.

The main requirement with live sound is a system that can be set up and taken down quickly. Certainly the system I had with my 98s was pretty slick. All the barrels (pre amps) set into A53M shock mounts which were attached to an aluminum bar which was mounted somewhere on the kit and then a loom of 98 cables all cut to specific lengths and then wrapped with tech flex made for an elegant and quick solution.

The KSM137 was the prime candidate as they would slide into the A53M shock mount, therefore isolating the mic from the drum and/or hardware, and then a loom made up of regular mic cable wrapped in tech flex and terminating somewhere at the rear of the kit and near to a stage box.

I do not place these mics close to the drums. They are at least 2" away from each drum. If the kit is well balanced there is no leakage problem.

Bass Drums: I use a Beta 52 which is mounted on a custom built clip assembly inside the drum. I think the best position for a kick mic is off center. I place mine around 4" from the shell facing directly towards the beater head.”

For more tips from Simon Phillips go to www.shure.com/artists



Microphone Techniques for DRUMS

TIPS
FROM THE
PROS



Jim Riley

“My choice of microphones is something that is very important to me. With Rascal Flatts, we use 2 mics on the bass drum: Beta 52 and a Beta 91. The Beta 91 picks up the snap and the 52 (placed just inside the hole in the resonant head) brings the big low end. On the snare top, we went with the SM7 because of it's exceptional ability to capture both low and high end frequencies with great clarity. The 57 on the bottom pick's up some additional "crack." On the high toms we went with Beta 98's. On our floor toms, Shure suggested the KSM27 (now the SM27). I swear, not a night goes by that I do not get comments about the sound (and impact) of my floor toms. We use another KSM27 on the gong and we top off the drum mix with a VP88 placed overhead, above the snare in the middle of the kit. We use the Beta 56 as my vocal mic because of it's ability to reject unwanted noise. The final, most crucial component to my Shure setup is my personal monitors. For me, the SCL5 are by far my favorite. Overall, Shure are the best microphones on the planet for one reason... they sound like you.”

For more tips from Jim Riley go to www.shure.com/artists



TIPS
FROM THE
PROS



John JR Robinson

“I, of course, use a Beta 52 inside the kick drum about 1/3 in from the front head. I balance my sound with a KSM27 (now the SM27) in front of the bass drum about 2 inches off the head. I record two separate tracks of bass drum. Depending on the song, the KSM27 add that extra “woof” sound needed on so many records today.

For overheads:

I use KSM44's on my be-bop kit in an old Ruddy Van Gelder Technique from the early 60's. If I'm behind the kit, the left overhead is above the crash angled down and the right mic is just above the floor tom also slightly angled down. I don't need any tom mics using this technique.”



Microphone Techniques for DRUMS



Derek Roddy

“My favorite miking technique is... whatever sounds best... given the situation I'm playing in.

I mic different sized drum kits... different ways.

For instance... I wouldn't mic a 4 piece the same way I would mic my monster 10 piece. Also, depends on the sound I'm going for... Room sound, close sound, isolated sound, etc.

For the 4 piece and playing blues or Jazz type of "sounds"... I would use 4 mics. A pair of KSM 32's for overheads, a Beta 52 on the kick and a SM57 on the snare. More roomy type of sound.

For the big kit... and playing Rock, Metal, etc... I normally use 3 SM81's for overheads (L, center, R) Beta 52's for the kicks, SM57 on top and bottom of snare, SM98's on the Toms. A "closed mic" isolated type of sound.

One trick I always use is... cutting a small piece of cardboard in a 6 inch square, with a hole (just big enough to push a 57 through) in the middle. I use the cardboard as a "buffer" for air pressure coming from the Hi Hat... to prevent that annoying bleed.”





Joel Stevenett

“As a drummer, I’m very particular about how my drums sound live and in the studio. Shure microphones have always provided me with a wide open sound, which gives the engineer and producer the flexibility to mix exactly what the track demands.

For my perfect bass drum sound, I use a combination of the Beta 52A and a Beta 91. For instance, this combination has worked perfectly on such recordings as the NBA theme and Disney’s “Ultimate Band” (for Nintendo Wii).

I love the versatility of SHURE microphones! I use an SM57 on my snare drum top and bottom. With the combination of that plus a “Green Bullet” (520DX) lying under my snare, I get a low-fi loop texture that can be used perfectly in a final mix.”



Microphone Techniques for DRUMS

TIPS
FROM THE
PROS



Dave Weckl

“I like to put it right under the high-hat, so there is not a lot of high-hat bleed into that mic. A lot of people comment on the 57 having a lot of off-axis problems with capturing other parts of the kit, but I happen to like that. I have a cowbell right across from the snare drum that gets picked up really nicely from that 57. Generally, I have it pretty much right at the rim angled toward the center of the drum. If I want a fatter snare sound I'll put it over the head a little bit more, if I want it to be a little more distant I'll back it off the rim an inch or two.

I sometimes also use a second 57 under the snare when I want more snap to the sound from the snares underneath.”





Paul Wertico

“At my home studio (Rat Howl Recording), my engineer, Brian Peters, and I love to constantly experiment to find not only great traditional sounds, but also new non-traditional sounds, and we’ve found that whatever sound we’re going for, the line of Shure microphones gives us unlimited options in our eternal quest for “That Sound”.

One of the best bass drum sounds we’ve gotten has actually been with the SM7B microphone on the beater side in conjunction with another bass drum mic we normally use, like the Beta 91 or the Beta 52A.

A cool trick I learned while recording with legendary engineer/producer Reinhold Mack (ELO, Queen, Rolling Stones) is to mic the snare drum from the side of the snare shell. We’ve tried this method with multiple different microphones (including the trusty SM57, which we’ve used on the last few recordings) and it really brings out the sound of the drum itself, with just enough of the snap from the snares and almost none of the ringing overtones coming off of the top head. It also gets a very nice rim click sound. We usually position the mic an inch or less away from, and perpendicular to, the surface of the shell (making sure to avoid the drum’s air vent hole).”

For more tips from Paul Wertico go to www.shure.com/artists



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 91
Beta 57A
SM57
PG52

Snare Drum

Beta 57A*
Beta 56A*
SM57*
PG56
PG57*

Rack/Floor Toms

Beta 98 D/S
Beta 57A*
Beta 56A*
SM57*
PG56
PG57*

Congas

Beta 98D/S
Beta 56A*
Beta 57A*
SM57*
PG56
PG57*

Cymbals

KSM141
KSM137
KSM44
KSM32
SM137
SM94
SM81
SM27
PG81

Mallets

KSM141
KSM137
KSM44
KSM32
SM137
SM94
SM81
SM27
PG81

Percussion

KSM141
KSM137
KSM44
KSM32
Beta 57A
SM137
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.

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