



**Drum Kit Microphone Placement  
Seminar Held Oct. 30, 2004  
At Hyde Street Studios In San  
Francisco During The 117th AES  
Show.**

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## Hello And Welcome!

A big thanks goes to [TransAudio Group](#) for organizing everything and to [Soundelux](#) and [Brauner Microphones](#) who also helped make these seminars a reality. Also thanks to Jeff Cleland here at [Hyde Street Studios](#) for the generous use of this facility--If you need a tracking or mixing space, please call them! Also thanks to [Al Schmitt](#) and William Whitman who did the other seminars and volunteered their time and [Mercury Recording Equipment](#) for providing transportation to/from the Moscone. Then there is Tape Op for helping us with getting the word out and engineer Gabriel Shepard for all three nights, Michael Isreal on drums here tonight, Paul Robinson for playing acoustic and electric guitars Thursday night and lastly for singing at last night's seminar, Chris Von Sneidern.

## Drum Tuning And Drummer

Drum tuning is very important--the overall sound of the kit can not be better than the way the kit sounds out in the studio. The timbre and tuning, squeaky hardware and other noises will all be recorded to a greater or lesser degree. An experienced drummer will know all about tuning. It also goes without saying that drum sound is very dependent on the drummer's skill and musicality. Good drummers play their kit in balance where every drum and cymbal is heard in proper mix right in the room.

I've been lucky, over the years, to have recorded a lot of very good drummers who played great sounding drums. When people ask me how I got a drum sound on a certain record I engineered, 9 out of 10 times it's just the sound of the drums and drummer's musicality and not anything special I did much beyond the basics we're going to cover here tonight.

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## Room Sound And Size



After drum tuning, the drum room and where the drums are placed in it makes a very big contribution to the overall drum sound. Drums make loud sound energies bringing out both the good attributes and possible problems of any room. There are no rules regarding how big a room must be to record a drum kit but we relate the

acoustical "size" of the drums to the size of the room their played in. How much of that room sound you capture and playback along with the kit tells our ears this information.

Size refers to both the actual drum sound itself and the allowed "space" the drums occupy within the recording's production. Size is equated to characteristics like: realistic (or unrealistic) ambience; a good aural "picture" of the drum stage; good internal drum balance between the individual drums; good low frequencies and high frequencies; punchiness or "weight" in the low mid-range frequencies; and dynamic range or how well you can hear the subtle to the loudest hits without distortion.

Here at Hyde Street, since I've never used the room before, for a starting point I have the kit placed in the center of the room farthest away from the walls. If I had more time, I'd try putting them a couple of different places (pending practical considerations like mic panels, entrance/exit doors etc, and other musicians I have to record at the same time). You can use wall surfaces to change the sound of the kit dramatically--placing the kit in corners will build bass, hard surfaces add a splashy brightness, rugs and padded walls absorb high frequencies and contribute to a deader or drier sound.

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## **Drum Overhead or Overall Mics**

Contrary to a lot of novice recordists, the overhead mics are not for just recording the cymbals. Each drum and cymbal should NOT be treated like separate elements coming out of a sampler or drum machine. You have to consider the drum kit as one huge acoustical instrument with many moving and different sounding parts and start by capturing or documenting the entire event--just like when recording a large orchestra for a classical music album. After you've achieved that, all further miking techniques are part of music production--be it straight ahead Pop, Rock, Hip-Hop, R&B, Smooth Jazz, Country or whatever sub genre you want.

The best and most important place to start is with the overhead or overall microphones. I compare these mics to the main orchestral mics place usually near and above the conductor's head. And just as for the orchestra, these overhead drum mics tell you just how the drums actually sound--good or bad! You'll hear how they are tuned and how good a drummer you have and how the room is adding to or subtracting from the sound. If the overheads are placed correctly, you'll hear the kit in the actual balance the drummer achieves. If the drummer is a basher who hits the cymbals as hard as he hits the toms, you'll hear that. If your drummer has a squeaky bass drum pedal, rattling hardware or a noisy hi-hat rig, you'll hear that too.

I always work on the mic's placement (balance), tonality (equalization), and ambience (distance) of the overheads. After that is sounding good, the rest of the close drum mics act like "spot" mics. Again just as in orchestra recording where certain sections or soloists are separately miked because they are not strong enough in the main microphones. If the sound of the kit is good just with the overheads, then it'll be great when you add the close mics.

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## **Monitoring In Mono**

I always get drum sounds listening in mono--monitoring all tracks in mono. Once all the parts

of a drum kit are in balanced and well heard, I'll spread it out in stereo. Mono compatibility is not that much of an issue as in the old disc cutting vinyl days where the cutter head would lift out of the groove with excessive anti-phase component--spoiling the master disc. Today, mono compatibility is still important in digital audio because of all the paths and processing (.MP3 or .WMA conversions) those digital files will take to final delivery and playback--via the Internet, radio and satellite uplink and the way it is heard be it mono boom box, mono TV sound or over an in-store PA system.

## **Mic Choices**

What kind of mics should we use for overheads? Without getting into specific brands, condenser mics work best for overheads with large diaphragm models providing the best coverage of the entire drum set. Large diaphragms offer better low frequency response noticeable on the tom and snare drum's sound. Small diaphragms (due their smaller mass) respond faster and better to transients--this is usually perceived as a "brighter" sound with more articulation of the stick on the cymbals and toms, and a sharper "hit" sound.

Small diaphragm cardioid mics are more directional than large diaphragm cardioids--you might miss part of the kit if they are not exactly aimed. If you use small diaphragms, very large and wide kits may require three overhead mics whereas you'd still be OK with two large diaphragms. More than two overhead mics is usually phase problematic. Large diaphragm mics are more forgiving when it comes to aiming but their usually larger size requires bigger mic stands, more room and time to set up.

It is certainly wonderful to use expensive, even vintage classic microphones for overheads but I've gotten great sounds using very cheap mics. Just as an experiment, I once recorded an entire drum kit using only Shure SM-57 mics--for everything including overheads. The record was a top ten hit! Other producers asked us many times: "how did you get that cool sound?" So work with what you've got.

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## **X-Y, ORTF, M/S, Blumlein And Wide Spaced Mic Pairs**

There are two main types or approaches to drum overall miking: Overhead and front/rear of kit. Both styles can use coincident microphones techniques such as: X/Y, Blumlein, M/S pair, and non-coincident pairs such as an ORTF pair and the very popular wide space pair of cardioids or omnis.

Coincident pairs of mics produce a stereophonic effect by intensity; a sound source is closer to one mic than the other. ORTF and binaural heads, where the mics are fixed to approximate the distance between our ears, and wide spaced pairs, produce stereo using a combination of intensity and time. Since sounds, do to different intensities at each mic, may also arrive at a different times.



There are different reasons for using X/Y, ORTF, M/S pair, a Blumlein pair or wide spaced mics. M/S opens up more mixing options with the advantage of control over the side mic or stereo width (if you record the mid and side mic's signal on separate tracks) with a sum/difference matrix after the recording is finished.

X/Y is simpler to do and requires no dematrix setup. X/Y angled from 90 to 135 degrees offers a wider image than M/S while M/S has a more centered and stable middle image with excellent mono compatibility.

A Blumlein pair consists of a crossed pair of bidirectional (figure-eight) microphones mounted so that their pattern lobes are at right angles to each other.

ORTF (Office de Radiodiffusion Television Francais) is where two cardioids are spaced 17cm apart and angled outward 110 degrees to the left and right.

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## Ambience And The Room

The relative height of the overhead mics over the kit determine how much presence the kit has compared to the amount of the room's sound is picked up. Coincident pairs are simpler to set up and make foolproof stereo with good mono compatibility.

For an even wider stereo "look" at the drum kit than coincident pair miking, use a wide spaced cardioid pair. Try to space the two mics apart three times the distance to the sound

source. Called the 3:1 rule, this will ensure phase coherence but make you're getting all the parts of the kit evenly--keep moving them around until you do. Omnis work great and provide even more coverage, introduce more room sound for a more spacious sound although are less mono compatible and tend to sometimes sound slightly phasey.

Two mics at the rear of the kit are a whole other approach to "overheads"--they are set to pick up more of the snare, toms and kick than cymbals. Placing them in front of the kit produces more kick drum attack but "masks" the high frequencies coming from the snare drum since it may be blocked by the rack toms.

Either way, this setup works great for drummers who hit cymbals as hard as they hit the toms and snare. It also works better when working in a very live and bright room. This is also more of a Rock approach where a specific stick technique on cymbals (like in traditional Jazz) is not usually part of the music. Also since the mics are closer to the floor, there is a bass build up that compliments the tom and snare sound. There is less of a left and right orientation with this setup so I'll aim the mics outward left and right to try an enhance the stereo width.

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### **Stereo Perspective--Drummer's Or Audience's**

Speaking of stereo, you should decide how you and your producer visualize the drum kit's sound image: from the drummer's perspective or from the audience's perspective.

A person mixing your recording might prefer the drummer's perspective and assume that the right overhead track (since you've only marked them "L" and "R") is over the floor tom side and panned that track and the rest of the kit's tracks predicated on that assumption.

You should name your drum tracks so there is no confusion. I.e. mark the overhead tracks so the left overhead is capturing sound from the left side of the kit where the floor tom is located and the right overhead is getting sounds from the hi hat side. (Audience perspective and right-handed drummer)

To avoid all this right/left-handed--perspective confusion, just mark one overhead as the floor tom side and the other as the hi hat side--unless the drummer uses a very unorthodox setup (that should be documented for the mixer), mixers will get this and correctly pan all the individual drum tracks like you did--or maybe all backwards for the opposite perspective but at least all the drum tracks will be correlated.

### **Compressing the Overhead Mics**

I often compress the overhead mic channels and record the compressor's output on two

additional tracks. You may not use them at all but it is nice to have these in reserve. By the way, it sounds completely different to compress "live" mics versus recorded tracks. (Which you can always do any time.)

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## Bass Drum

With the overheads sounding good, it is now time to add the first spot mic for the kick drum. Producers and engineers look for a "marriage" of the bass drum with the bass instrument because they both occupy and make up the important bottom end of the record. I prefer to hear the bass instrument play along with the drummer when getting bass drum sounds.

My usual starting place for the bass drum mic is half in and half out of the hole in the front head. This distance is variable and I try to keep the mic pointed exactly at the spot on the rear head where the beater hits to pickup the most attack. If there is too much attack, move the aim off a little.

If there is no front head, then you can experiment by moving the mic around the perimeter of the drum shell and from the rim inward to the center of the drum. An assistant where hearing protection should make these moves while you listen for differences. You will find a sweet spot!

If there is a front head, you can place the mic closely and try moving it around the perimeter again. In this case I might have to add a second mic on the beater side of the drum to get enough "snap."

An old '70s' trick is where the microphone goes right inside the bass drum. This produces a very present and dry sound that was great for disco music before the Linn drum machine. You should put a weight (sand bags are good) to hold the mic still and in place inside the drum.

Some engineers like to place a second mic further out in front the kick drum to get a more ambient bass drum sound. Mixing these two mics is touchy phase business and I recommend using a separate track for this mic. Unless you build a tunnel to isolate the kick, you will get a lot of spill from the rest of the kit that could wash out the total drum sound if this front mic is monitored loudly. In Pro Tools you can adjust the time (and therefore the phase) of this separate track after the recording.

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## Compression

One good trick is to use a compressor when recording the bass drum. I don't want a "compressed" sound here so gain reduction is almost zero...one to two dB max. I am looking for the added low end the compressor will bring up...it is different from just equalizing in low frequencies. You can also help a drummer who has an uneven bass drum level with a compressor, but you have to commit to a heavier setting to actually fix this problem. Starting out compressor settings would be a medium attack time and a 3:1 ratio.

## Snare Drum

For the next spot mic on the snare drum I might end up using three mics. I experiment often when recording snare drums. My ideal setup, if there is room in the tight area around the snare drum, is to use two mics on top and another on the bottom. I would use a condenser and a dynamic on top and a dynamic on the bottom. More for a quick A/B choice while the drummer plays, I rarely combine (mix) the two top mics together. Snare drum mics should be all end-fire types as side-firing mics are hard to sneak in and around drum kits.

I always mic the underside of the snare drum even though I end up using it only about 30% of the time. Depending on the snare drum when a drummer hits hard, the attack or "stick" sound is so loud that you have to reduce the snare drum recording level so the peaks don't distort. You end up with very little of the snares' sound. You can use just about any mic under the snare and sometimes I'll tape the mic right to the post of the snare drum stand with gaffer's tape if I can't get a stand positioned in and around all the other stands--it doesn't matter even though the stand is vibrating. Very little of this microphone is used in my close snare drum mix...no more than 20%. I always flip phase on this mic since the top mic is facing it. Using the bottom mic can brighten the snare sound differently than an equalizer. Sometimes I roll the entire low end out of the bottom mic so it does not add any tone from the bottom head.

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## True Aim

In general, I always aim snare and tom mics directly at the center of the drumhead where the drummer should hit the drum. I will record as much of the transient part or attack of the drum hit as I can. If I find I have too much "hit" and not enough tonality, then I'll move the mic slightly off center. You'll get more tone and less attack there. Aiming towards the rim gives you more of the higher harmonics. The mic should aim from above the drum looking down from an angle of 20 to 50 degrees.

With close miking, you are using the proximity effect to realize more bass build up. Try to make sure not to aim the mic at a single lug by positioning it equidistantly between two lugs.



Pulling the mic back away from the snare drum greatly changes the sound. Doing this generally produces a more open and less choked off sound for a bigger sound with a little less attack and more ambience including leakage from the other drums and cymbals.

If you want to EQ the snare drum mic, use a very clean equalizer that can handle very high peak levels without distorting. Since a lot of the snare drum is heard in the overhead mics, I take the time to make sure the drummer is using the right snare drum for the song.

## **Tom-Toms**

The floor and rack toms are miked from the top only. I have miked the top and bottom of toms and I don't think it is worth it except for some strange and very tonal sounds. There is a point of diminishing returns with too many microphones around the kit and bottom tom mics is that point.

Both dynamics and condensers have advantages and disadvantages. Dynamics give you a "dry" and immediately present sound. You'll have better isolation from the rest of the kit making balancing easier because dynamics are (in general) more directional. Dynamics are also better for loud drummers who hit hard. Condensers give you a fuller sound and are able to capture more of a drummer's subtleties. Condensers are great for light to medium drum volumes.

Condenser disadvantages include: more leakage, more pickup of each tom's sympathetic vibrations when other drums are played, more expense and the risk of damage from being hit, they are (usually) larger, harder to fit in the kit and prone to distort more at loud levels.

## **Hi-Hat**

The all-important hi-hat should be miked even though it usually cuts through all the other microphones. Use a small diaphragm condenser for this bright sound that can handle good, hot levels. I try to get a mic close enough to be almost in the drummer's way and aim it right where he is striking the cymbals. AKG makes capsule swivels for the C-452 system that make getting the mic in tight much easier.

I record this mic on a separate track and I sometime roll out low frequencies so that the snare drum's (right next door) low end is not recorded on this track. A hypercardioid microphone, like Neumann's KM185, with its back to the snare and the rest of the kit would further isolate the hi-hat track.

## **Room Mics**

Room mics can often save an otherwise miserable sounding drum kit and lackluster

drummer! Using hot room mics is my last resort mixing option. The opportunity for sonic treatment of a room mic is almost endless and I always record them on separate tracks for post-processing. You can really experiment here. One time I put a mic in the adjacent bathroom because the drums sounded very cool while visiting this room through out the session. I put them at head height while in the sitting position. Try placing these mics as a stereo coincident pair or wide spaced cardioids looking at the kit or maybe one mic on either side of the kit. You can put the room mics right on the floor or close to the ceiling to get a bass buildup.

Heavy compression effects work best and sounds better while the drummer is playing because the compressor (and your settings) is working with the microphone pre-amplifier/EQ's full dynamic range (as opposed to the recording medium's and playback system's usually lesser dynamic range and noise floor--be it tape deck or DAW). The old vintage tube compressors like a Fairchild 670 or an RCA BA-6A are popular for this, but I have had good luck with a pair of Universal Audio's 1176LNs, LA Audio's Classic II Stereo compressor (these are both FET-based units), Chandler Limited's TG1 EMI unit, Manley's Variable-Mu tube-based unit, and also a pair of Empirical Labs' Distressors.

**Good Luck!**

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