

Live Sound Reinforcement Guide

Instrument and Vocal Mix
Techniques

Module 03

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2 ABOUT THIS MODULE

The following list represents instruments and types of vocals you will commonly see in church audio settings. For each instrument, we will look at common techniques for setting up and mixing that instrument. The list is arranged in the order that is most often used on a console. When creating your input list, try to follow this order as closely as possible.

3 DRUMS

3.1 GENERAL TECHNIQUES

Drums are miked up for a reason. People may complain that they are too loud, and try to hide them behind thick walls, but this is usually a misuse of those types of baffles. The baffles are designed to isolate stage mics from the drums so that there is less bleed. Drums are loud and will always be loud, even behind a plexiglass cage. Your drums are the basis of your mix and determine the overall level of the service, so be careful with the volume, but don't be afraid of them either. They should be coming through the speakers; don't rely only on the acoustic sound of the drums.

If your drum channels run through a sub group, it is often nice to apply soft compression to the whole group. A 2:1 compressor with slow attack and moderate-fast release is usually a good starting point. Set the threshold so that it is almost constantly touched by the compressor, without crossing the threshold more than a few db. If the compressor has a mix level, try setting the mix level to 50% for an effect called *parallel compression*. This essentially places a small amount of compressed drum signal on top of the dry drum signal, which creates a subtle but effective glue for the drum bus that accentuates transients nicely.

3.2 KICK

3.2.1 MIKING

A kick drum specific microphone, such as an Audix D6 or AKG D112, is almost always required for this instrument to sound its best. They are well-suited to the low frequency "thump" of the drum due to their large diaphragm size, and also give the drum nice "slap" in the 2-4kHz range. If the kick drum is ported (has a hole on the resonant drum head), place the microphone a few inches inside, pointed straight ahead at the batter head. If it is not ported, place the microphone off-center an inch or so away from the resonant head.

3.2.2 EQUALIZATION

If you need more thump, boost the fundamental frequency of the kick drum, which is usually between 60Hz and 80Hz. Cutting at around 700Hz can help reduce thin or "boxy" sounding kick drums. If you need more attack or "slap" out of the kick, try boosting somewhere between 3kHz and 4kHz.

3.2.3 DYNAMICS

It is usually helpful to hard gate a kick drum. Set the gate with a quick attack and release, and set the threshold so that it only opens when the kick drum is played. This should be pretty easy because the microphone on a kick drum is well isolated from the other drum components.

Compression can also improve a kick drum signal. Use a slow attack and quick release, and adjust the ratio based on how wide the kick drum dynamics are coming through. Having a consistent kick drum level is important in a mix.

3.3 SNARE

3.3.1 MIKING

A Shure SM57 is usually the best choice for a snare drum in live settings. Some drum microphone kits include a clip-on mic or a microphone similar to the Shure like an Audix i5. Point the microphone at a 45-degree angle above the snare about an inch away. Don't point it too close to the center of the snare or it will sound boomy. Instead, point it closer to the rim of the snare head.

If the church also mikes the bottom of the snare, make sure to press the polarity flip button on the console for the bottom snare channel.

3.3.2 EQUALIZATION



High Pass Filter Engaged (~100 Hz)

I like to rely on subtractive EQ for snares. Reduce boominess by reducing somewhere around 200 Hz – 300 Hz. You may also experience a lot of 100 Hz proximity effect which it may help to decrease. You can increase the attack or “crack” of the snare by boosting somewhere around 3 kHz, but this is often unnecessary if you subtract the appropriate frequencies and use appropriate dynamic processing.

3.3.3 DYNAMICS

A gate on the snare channel is often helpful, but be sure that it doesn't cut off softer hits like ghost rolls and long builds. If a gate is too abrupt, generally because of a very quick release time, the snare will probably sound unnatural. Little or no compression is needed on snares. To give it nice transient attack, try a mild compressor with a slow attack time to let the transient through, and faster release to reduce ringing.

3.4 TOMS

3.4.1 MIKING

Toms will usually be miked with clip-on drum mic sets. The drummer can set this up quickly and easily. If the church uses non clip-on mics, set up the microphones similar to how you mike the snare drum.

3.4.2 EQUALIZATION

You can often roll off some of the low frequencies on high toms. Otherwise, these will rarely require any significant equalization. A well-tuned drum and an appropriate microphone should sound good without too much modification, especially if you're using a great tom microphone like the Sennheiser MD421.

3.4.3 DYNAMICS

Gate the toms. This is seriously important. Tom mics pick up a lot of additional noise from the kit, and are only played every so often. Hard gating the toms can save a lot of space in your drum mix. Make sure the gate has a nice long release to get the full depth of the tom.

3.5 HI-HAT

3.5.1 MIKING

A pencil condenser works best on hi-hats, especially the Shure SM81 if you have access to one. A dynamic microphone can be used if necessary. Place the microphone about an inch above the hi-hat (when the hat is completely loose) pointed at the edge of the cymbal. Pointing it too close to the center gives you a harsh and unpleasant sound characteristic of the mid-range heavy bell. It can help to angle the microphone a bit so that it points away from the snare drum.

3.5.2 EQUALIZATION



High Pass Filter Engaged (~2 kHz)

Not much need for EQ. Just make sure you filter out lots of the low and low-mid frequencies. We only want the hat here, not the whole kit.

3.5.3 DYNAMICS

Not much need for dynamics processing.

3.6 OVERHEADS

3.6.1 MIKING

Mike the overheads with pencil condensers, or dynamic mics like the SM57 if necessary. Ideally, you would use two of the same microphone, one on each side of the kit, to cover all of the cymbals. At the board, pan the two channels hard left and hard right from the audience's point-of-view. If you only have one microphone to spare, try to angle it across the cymbals in the center of the kit, or just try to get the best coverage that you can without bringing the mic too high above the kit. Usually 8"-12" above the cymbals is a good place to start.

3.6.2 EQUALIZATION



Similar to the hi-hat. Not much need for EQ. Just make sure you filter out lots of the low and low-mid frequencies. We might leave these frequencies in during a studio recording to get a clean, whole-kit sound, but live we are really just looking for the cymbals.

3.6.3 DYNAMICS

Dynamics are best used on the entire drum bus rather than the overheads alone. There's no need for compression or gating on just the overheads.

3.7 CAJÓN

Some smaller church settings will use a cajón instead of a full drum kit. The cajón is a small box that the performer sits on and hits with his or her hands. Hitting the center of the box mimics the sound of a kick drum, and hitting the corner mimics the sound of a snare drum.

3.7.1 MIKING

If your cajón is ported, you can mike it similar to the way you mike a kick drum. Although the fundamental frequency of a cajón is slightly higher than a traditional kick, you can typically go with the same microphone selection you would use on a kick. Alternatively, an SM57 works quite well for this instrument. If the cajón is not ported, take your best guess on where the sound is most present – it could either be the front or the back of the drum – and point a mike so that it's out of the way of the drummer's hands.

If you have two microphones and channels available, the best technique is to place a kick drum microphone in the port on the cajón, and point an SM57 at a corner where the snare sound is generated. Mixing these two mics gives you both the kick and the snap that a full drum kit would.

3.7.2 EQUALIZATION

The fundamental frequency is higher on a cajón than it is on a kick drum, and depends on the specific model. Try somewhere around 100 Hz to 150 Hz for extra thump. You may still get some bad "boxy" sound from the cajón at around 500 Hz to 700 Hz, which you may want to scoop out. Boost 2 kHz to 4 kHz for more snap from the snare portion of the instrument.

3.7.3 DYNAMICS

You can treat the instrument similar to a snare drum if you have the means to compress it. Try a longer attack time and quick release for the best transient response, and be careful when gating because there are often "ghost rolls" on the snare with this type of drum.

4 GUITARS

4.1 BASS GUITAR

4.1.1 MIKING

Most often in church settings, your bass guitar will run from a DI box or an output directly off the performer's amplifier. In both cases, no miking is required and you'll have a nice, clean bass signal on the console. If that is not the case, you'll have to mic their amplifier. If available, try a microphone you would use on a kick drum, or a broadcast microphone like the EV RE20 or Shure SM7b. Otherwise, an SM57 still works great. Find one of the speaker cones on the amplifier cabinet and point the microphone so that it is about halfway between the center of the cone and the edge of the cone.

4.1.2 EQUALIZATION

If you want more bottom and "rumble" out of the bass, try boosting 30 Hz to 60 Hz. If you want more presence and fret/finger noise, try boosting somewhere around 700 Hz to 1 kHz.

4.1.3 DYNAMICS

I love to compress bass guitar. Since the strings are usually plucked with fingers, even really good bass players will often play the instrument with a very wide dynamic range, causing it to dip in and out in a mix. Remember, you should mix the bass so that it grooves well with the drums. With a little compression, this pocket can remain consistent with the dynamics of the drums.

I like to use a moderate attack on the compressor and a very long release (as long as 2-3 seconds in some cases). Set the threshold so that it only kicks in when the bass is really going at it, and give it a moderate ratio – perhaps starting with a 6:1 setting. The long release will give the bass a great sustain, and the higher ratio will pull down peaks without squashing the bass during softer dynamic sections. There's usually no reason to gate a bass unless the amp is really noisy and you need to gate out that noise when the bass is not playing. Make sure it's a soft and slow gate.

4.2 ACOUSTIC GUITAR

4.2.1 MIKING

This will almost always run through a DI box. If necessary, close mike it with a pencil condenser pointed at the 12th fret. If the acoustic guitar has an equalizer built in, it is almost always best to set the onboard EQ to be completely flat (no EQ boosts or cuts). Make sure their onboard volume is set to at least 75%.

4.2.2 EQUALIZATION



High Pass Filter Engaged (~150 to 200 Hz)

You can give the acoustic more fullness or body by boosting around 250 Hz. You can reduce that frequency or a bit lower if the guitar sounds too boomy. You can give it more clarity and presence by shelving the EQ above 2 kHz.

4.2.3 DYNAMICS

A subtle compressor can be nice, but often it's best to leave the dynamics alone on a DI acoustic guitar. If the guitar is noisy and you think it needs to be gated, the problem may actually be a noisy cable or bad DI box. Try to fix the problem manually before deciding to gate it.

4.3 ELECTRIC GUITAR

4.3.1 MIKING

If an electric guitar needs to be miked, find a speaker cone on the front of the amplifier cabinet. Place an SM57 directly on the amplifier grill pointed halfway between the center of the speaker cone and the edge of the speaker cone. If the guitar sounds too brittle or harsh, move the mic away from the center and closer towards the edge. If it sounds too dull or muddy, move the mic closer to the center of the speaker. A small amount of movement goes a long way in changing the tone you hear from the microphone.

4.3.2 EQUALIZATION



High Pass Filter Engaged (~100 Hz)

Make sure the electric guitars aren't too heavy on the low-end or they will crowd the mix and overpower the bass guitar. Reduce 100 Hz if the proximity effect is adding too much low frequency, or start the high pass roll off at a higher frequency. A boost at 250 Hz can improve the fullness of the guitar, but can overcrowd if increased too much. If you want more bite and energy out of the electrics, try a boost somewhere around 2 kHz to 3 kHz.

4.3.3 DYNAMICS

I usually apply compression to control major peaks, but otherwise let the guitars keep their dynamics. Gating is very important with electric guitars. Especially when they are distorted or overdriven, electric guitar amplifiers produce a lot of noise that is continuous even while the guitar is not being played. Set the gate to shut off completely when the guitarist is not playing so that amp noise is eliminated, and opens open whenever he or she plays.

5 STRINGS

5.1 ELECTRIC KEYBOARD OR SYNTHESIZER

5.1.1 MIKING

This signal will always come from a direct output on the keyboard and into a single DI box, a stereo DI box, or two mono DI boxes. If you have a stereo signal, pan each channel hard left and right at the console.

5.1.2 EQUALIZATION

These keyboards are usually well balanced and come pre-equalized. The only thing you might need to adjust is if the keyboard gives you too much low-end and overcrowds the bass guitar. In this case, you can reduce at around 80 Hz to 120 Hz with a shelf EQ or a high-pass filter.

5.1.3 DYNAMICS

A bit of compression can be nice here. Use a moderate attack and release time with somewhere around a 4:1 ratio, and set the threshold to only kick in when the piano is hitting hard.

6 VOCALS

6.1 GENERAL TECHNIQUES

In a full mix, I like to keep all vocals at the same level. Set their gain structures appropriately, then find a level for where the lead vocalist should sit in the mix, and bring all other vocalists up to the same level. This is especially effective in church settings. Backup vocals, while singing harmony or unison, will naturally control their voice to sit behind the lead vocalist. Turning them too low in the mix will just cause them to be lost entirely. Then, if one of the backup singers takes the lead on a song, they will already be turned up and ready to go, and their voice will naturally push ahead to take the lead. Singers are trained to control themselves in this way, and it also happens naturally as they take on different singing roles.

6.2 MALE VOCALS

6.2.1 MIKING

This is pretty straightforward. Vocalists will often have a favored microphone that they like to use. If not, it can't hurt to hand them a Shure SM58. They'll be familiar with it, and for the most part, it does the job well. There are some other Shure microphones in the Beta series that are common. You might see a Beta 57A, Beta 58A, Beta 87A, or Beta 87C. The Beta 87 microphones are especially interesting because they are handheld condenser mics.

While these often provide a much better studio-quality sound, cut through mixes nicely, and sound great to the vocalists, they are slightly more fragile than the other dynamic type microphones, and you have to watch out for sibilance on them. Also watch out for the polar patterns on these microphones. Some feature supercardioid or hypercardioid patterns that isolate the vocal very nicely, but if you are using floor wedges, getting too close to the monitors can cause feedback because these patterns also pick up from the rear.

If you experience feedback

6.2.2 EQUALIZATION



High Pass Filter Engaged (-150 Hz)

The human voice is generally in the range of 2 kHz to 5 kHz. You can improve a vocal's presence with a boost at around 5 kHz. Be careful with this, however. Most vocal microphones have a presence boost built-in that causes this range of frequencies to be enhanced without EQ. If you experience boominess, try reducing somewhere around 150 Hz to 250 Hz. You should definitely have the vocals rolled out under 100 Hz. Sibilance occurs in the range of 7 kHz to 10 kHz.

6.2.3 DYNAMICS

Compression on vocals is quite important. Most singers you deal with will have great control, and generally keep the levels consistent, either backing up when belting it, or getting up close for more intimate sections of the song. However, a moderate compression using a 4:1 ratio is a good place to start to help focus the vocal mix. Use a moderate attack and release, and set the threshold to not only catch peaks, but to generally control the level by almost constantly being applied. A soft knee is also a good choice if your compressor has the option.

6.3 FEMALE VOCALS

6.3.1 MIKING

Same as male vocal. Choose a mic that accentuates the presence of a female singer without adding too much sibilance.

6.3.2 EQUALIZATION



High Pass Filter Engaged (-150 Hz)

Not much different than a male vocal, except that the fundamental is generally a bit higher, so the frequencies to affect will be on the upper end of the ranges listed above.

6.3.3 DYNAMICS

Be careful with sibilance on female vocals, especially if using condenser mics. Otherwise, dynamic processing should be generally the same.