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Choir Miking in Worship: A Standard Approach

By Kent Margraves, Sennheiser

If you've ever had to mic up a choir in a worship sound reinforcement setting, you already know it's one of the tougher challenges in live sound, particularly when other loud sound sources are sharing the stage. But there are a number of good guidelines for the sound tech seeking successful choir reinforcement. Let's discuss them.

First:

- Use condensers.
- Use cardioids.



If the choir is on common risers or steps, try these placement tips:

Fig.1 - SIDE VIEW

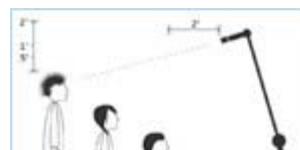
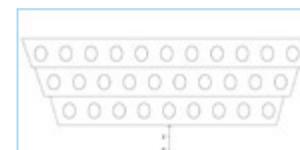


Fig.2 - TOP VIEW



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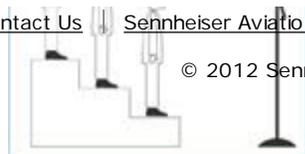
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Use one mic for approximately every 12-18 choir members. Start approximately one-half to 2 feet higher than the back row heads, and 2 to 2 ½ feet out from the front row, aiming the microphone axes at the mouths of the back row or slightly lower.

Stop here if you simply needed the microphone choice and placement suggestions above. Read on for more detail on this application.

The vast majority of pros use condensers for choir reinforcement, as opposed to dynamics or ribbons. As for directional characteristics, cardioids are the common choice. We can aim them at the choir and point their nulls (back side, least sensitivity) at the sounds we don't want to hear (loudspeakers, other stage sounds, etc.). So, cardioid condensers it is. There are many to choose from, at many qualities and price points. Use the very best you can get your hands on.

Whether hanging or placing the mics on floor stands, the ideal location and orientation are the same. And, the finest choir mics on the planet just won't work if they are not positioned well. There is also no perfect mic placement that works for every choir environment. But for choirs on typical steps or risers, here are some well proven techniques:

Height:

One half to 2 feet higher than the heads of the back row singers. Carefully raising the mics higher can put each member closer to equidistant from the mics, allowing a more natural blend.

Tilt:

Try pointing the mics' axes at the mouths of the top row singers or slightly lower.

Number of mics:

Careful here, less may be more! A 15+ voice choir or so in a reasonable sound reinforcement environment can do well with one cardioid condenser. Use two or three for choirs of roughly 30-50 voices. Over-miking choir is an easy error and bad sound quality is the result. If more than one mic is involved, they should never be near each other (see 3:1 rule below), and should be spaced across the choir.

Working distance:

Start two or two and one half feet from the front row. As the mics get closer, they hear fewer voices (the ones right in front of them) and bring a somewhat dryer, smaller group sound. When they are farther away, they hear more of a large group sound, but at some working distance they won't allow enough gain-before-feedback in the PA. If we are seeking a traditional choral sound, we may lean toward the slightly more distant/higher position (within the limits of available gain-before-feedback). If we are going for more of a pop, tight backing choir sort of sound, it's OK to work closer for extra "punch." And as we do we may even slightly increase the number of mics used (because the closer mics effectively hear fewer voices). These varied working distances create dramatically different sonic results, all of which may be appropriate (or not) for the application—experimentation is recommended.

personnel to interact with the end-user not only through outlets such as CSC, but the rapid personal response to crazy tech guys like me! It is why I can recommend using your products so readily."

Jay Ballard, Director of Technical Ministries, First Baptist Church of Plant City, Florida

The above tips are not hard and fast rules. Finding the ideal number and location for each environment requires practice and experience. Equally important is an understanding of the musical style and intended effect. Standing, moving about, and listening right in front of the choir during rehearsal or sound check can help discover useful placement. And routing the choir mics into a wireless personal monitor system (one at a time) to audition while moving the mic through various placements is extremely useful!

Choir Miking and the 3:1 Rule

If you're familiar with the popular 3:1 rule for microphones, you may be concerned about the common choir miking technique discussed above. That rule-of-thumb for the minimum spacing of multiple mics is designed to minimize nasty sounding comb filtering by making it unlikely that any sound source (choir voices, in this case) is heard in multiple mics at usable levels. The rule says that whatever the distance is between a source and its mic, no other mic shall be within a minimum of three times that distance (from the first mic). If we follow that rule, and a sound still gets into a second (or third) mic than the intended one, at least its level in these additional mics will be greatly diminished (by theoretically 10 dB or more when observing the 3:1 rule). Otherwise, if two or more microphones are positioned in a way that allows them to hear the same source (especially at distances that differ by just a few inches or feet), audible comb filtering may occur once the mics are mixed together.

The choir members that stand nearer the mid-way point between any two mixed mics will be in a cancellation zone to some degree. So, this type of choir miking does violate the 3:1 rule for some of the singers. But it's a compromise that zillions of audio techs accept, or don't realize. The cancellation will be partial, and may sound hollow, but since only a minority of the voices in certain zones is affected, it is often acceptable and not noticeable. Sometimes, however, it is audible.

Knowing this, it might be useful to coordinate between the tech and music departments to make wise choices on the position of choir members, based on talent and experience. Those singers that are near the mid-way point between the microphones may not be heard quite as clearly. Want to hear or demonstrate this? Have someone talk and walk from side-to-side in the empty choir area with the mics on, mixed together. You may notice their signal weaken a bit (and the sound quality will suffer) in these (hopefully small) cancellation zones. The severity varies with each set-up.

Here are a few choir miking tips in no particular order:

Choir density

Tighten up. Choirs sometimes spread out to fill up an area that is larger than they really require for aesthetic or other reasons. This is a notable setback for the sound operator trying to achieve plenty of choir in his PA mix. Pushing the singers back closer together, using a smaller total space and potentially fewer microphones can improve choir reinforcement nicely. If modular risers are used, removing one or more end sections can help prevent spreading out and maintain choir density.

Record choir mics

Consider recording just the choir, with no accompaniment, for review purposes. Recording individual choir mics can reveal things not as obvious during the live event, such as excessive leakage, resonances, reflections, unfortunate "solos" (placement issues), various musical factors, etc. Recording or reviewing combinations of choir mics can reveal cancellation effects due to comb filtering.

Recording each mic on a separate track (multi-track record system) is most useful, but recording the choir mics summed for review is still beneficial. Reviewing any isolated choir recording may lead to decisions that may improve mic placement.

The clap test

Open the choir mics in the PA at normal level. Convince your choir director to work handclapping into a tune arrangement during sound check. It will quickly become obvious just how much reinforcement your choir mic layout is really providing. Certainly, group clapping is naturally loud on its own. If the clapping is not clearly hot in the PA, the choir miking needs work (type, placement, and/or processing). But if you find that the clapping is very loud in the PA and the vocals are relatively weak...trust your ears and bring this up with the music department leadership. You can only amplify what already exists! The cause may be more musical projection than technical. Choirs do fail to "project" sometimes. If all is working well (including the choir itself), the clapping and singing should be well reinforced.

No choir mics in the choir monitors

If you're asked to put the choir mics in the choir monitors, respectfully resist. Education is needed. This is an impractical request, in my opinion. Many choirs rehearse and perform weekly without reinforcement and/or without monitoring themselves—they learn to listen to each other acoustically.

You've got multiple, sensitive condenser microphones carefully cranked up for absolutely every bit of gain you can possibly achieve. Placing any amount of in those in nearby choir monitors will quickly decrease stability, resulting in a hollow sound and probably feedback before a usable monitoring level is achieved. It's a recipe for bad sound. Don't do it!

If the choir members really cannot hear each other as a group, find out why. Consider reducing exceptionally loud nearby sounds (turn down the monitor mix, reposition a drum kit further away, etc.). Or consider their acoustic environment: group singing benefits from very quick (really small fractions of a second) reflections from nearby surfaces, like hard flooring and walls. A lack of these elements is an inferior choral environment. If the choir can comfortably hear themselves a capella (without accompaniment) their environment is probably OK. If not, a qualified acoustician may be employed to investigate the choir's immediate surroundings for possible optimization. Removing carpet and revealing hard flooring has provided a quick improvement in more than one instance in my experience.

* See "Lose the Feedback" for a discussion on extending gain-before-feedback in choir reinforcement.

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