

## **Gig Guidelines – Pro Audio – Sound Engineer Procedures**

First and foremost, get there early! It is important to arrive at the venue in plenty of time and not feeling rushed, and to identify any potential problems before you go too far with setting up. The physical layout of a venue will often make it impossible for you to set up the PA in the optimum position, but by understanding the nature of potential problems, and acting accordingly, you should usually be able to come up with a working compromise.

The first task is to position the main speakers in such a way as to allow the audience to hear the performance at its best, while at the same time allowing as little as possible of the front-of-house sound to get back into the stage microphones, either directly or via reflection from hard surfaces. There will always be some sound from the PA speakers that gets back into the vocal microphones, but by minimising it you will be able to achieve more level before feedback sets in. Part of the 'bedside manner' is going to be devoted to persuading the venue organiser to allow you to put the speakers and monitors where they make sense from an acoustic point of view, but without causing hazards or blocking fire exits. Also ensure that the floor is rigid and your stands secure, as a falling speaker can cause a lot of damage.

### **Speaker Placement Guidelines**

- It is advisable not to use more speaker cabinets than needed for the size of the venue.
- Arrange the speakers so that they are not pointing directly at the bar, you are less likely to receive complaints about the sound level.
- The speakers (obviously) should be set up in front of the performers. If they have to be angled inwards for any reason, they need to be further forwards than they would otherwise be.
- Angle the speakers to project as much sound as possible into the audience and as little as possible onto the walls, particularly the rear wall of the venue. Mounting the speakers on stands a foot or two above the head height of the front of the audience and at least three feet in front of the lead vocalist is a good starting point. If possible, direct the sound to an imaginary point around two-thirds of the way back in the room.
- For outdoor gigs or very wide rooms, if you have two or more speaker cabs per side angle the outside ones outwards slightly, to provide better coverage for the side.

### **Feedback, Microphones & Monitors**

In smaller venues, acoustic feedback is the main enemy. The likelihood of it happening is not simply related to how much gain is being used. For example, a loud singer working close to a microphone will be able to achieve higher levels before feedback than a singer with a weak voice or one who does not keep close to the microphone, as more gain will be needed to bring the latter up to the same level as the former.

Using cheap or inappropriate vocal microphones is asking for trouble, as peaks in their frequency response increase the risk of feedback occurring at those frequencies. Having said this, typical vocal models do include a slight presence peak between 3kHz and 5kHz, to help the vocal cut through a loud backing. However, although in theory any peak increases the risk of feedback (in this case in the 3-5kHz region of the audio spectrum where the presence peak lies), this risk is more than compensated for by the increase in intelligibility of the vocals that the presence peak affords.

Unless the directional characteristics of the microphone are tightly controlled, the microphone will pick up the significant amount of the sound from the sides and rear as well as from the front. The usual choice for live work is either dynamic microphone or a capacitor model designed specifically with stage use in mind, and with either a cardioid or hypercardioid directional characteristic (pickup pattern). It is important to know the difference. Hypercardioid

microphones have the most tightly controlled pickup pattern, but are more sensitive to sounds coming directly from behind than cardioid microphones are.

Because of this fact, the back end of a hypercardioid microphone shouldn't be aimed directly at a stage monitor, PA speaker or reflective wall. Given the choice, it is best to direct it towards something acoustically absorbent, such as the audience. The best place to position a stage monitor when you have a hypercardioid microphone is usually around 30 degrees off the rear axis, in both the horizontal and vertical planes, so you may need to adjust the angle of the microphone on the stand to achieve this. Hypercardioids are also rather more critical of the singer's position – if the singer tends to move around, the levels could vary significantly. Cardioid microphones have a slightly wider pickup pattern but exhibit much better rejection of sounds coming directly from the rear. With cardioid microphones, it is best to have monitors pointing exactly towards the rear of the microphone, as this is where they are least sensitive and again you will need to angle the microphone to make this work.

### **Self-Mixing**

If you are managing your own mix from on stage, balance with the benefit of frequent listening checks 'out front' during sound checking, then make as few changes as possible during the performance. In particular, discourage the guitar player from turning up his/her amplifier. If you are a player in a band and also the engineer, consider using a radio guitar system or radio microphone so that you can move out front more easily during the sound check to establish a good balance. Set up the mixer within arm's reach so that you can address any feedback problems simply by pulling the master faders or the monitor sends down slightly. If you use an effects footswitch to turn reverb off between songs, try to get one with a status LED, as in some venues with limited visibility it is easy to lose track of whether the reverb is on or off.

### **Reflections & Spill**

Sadly, vocal microphones do not just pick up the singer using them, but also any other sound heading their way, especially anything coming from the main axis of the microphone – the end pointing towards the vocalist. Drum kits or guitar amplifiers, close behind the singer will get into the vocal microphone and make the sound difficult to balance. When you try to turn up the vocals, the drums or guitar leaking into the vocal microphone will also get louder. Solution? Position the backline and singer so that nothing loud is directly behind or overly close to the singer. Combo amplifiers on the floor or on low stands are less troublesome than stacks, as the sound tends to pass below the level of the vocal microphones rather than aiming directly into it.

There's also the spill from the main PA speakers to worry about. As discussed earlier, sensible positioning of the main PA speakers will minimise sound travelling directly from the speakers to the microphone, while avoiding beaming sound directly onto hard walls will help keep reflected sound to a minimum. A hard wall at the rear of the stage will also have the effect of reflecting sound from the room, the drum kit and the backs of any guitar amplifiers on stage right into the vocal microphone. In small venues, consider hanging a temporary curtain on the back wall behind the singer. A couple of lighting stands provide an easy means of hanging things.

### **Stage Monitor Considerations**

If sound from the main PA is a major factor in creating feedback problems, stage monitors can be a complete nightmare in smaller rooms.

Good-quality monitor speakers are essential, and while intuition may suggest that anything that sounds halfway decent will do the job, nothing could be further from the truth. That is because to eliminate rogue reflections, the monitors require a well-controlled and even

dispersion pattern at all audio frequencies. Any attempt to use a single large-cone driver on its own, for example, is doomed to disaster, as the high frequencies from such speakers are emitted in a progressively narrower beam, which invariably finds its way back into the microphones after bouncing off a few hard surfaces. The solution is to use a two-way monitor with a tweeter and properly designed crossover or a very small cone driver, these have much more even dispersion patterns and so tend not to be so problematic.

Because monitors are on stage, close to the microphones, they can be more troublesome as regards feedback than the main PA speakers and often some equalisation is desirable to 'notch out' problem frequencies that can be identified by turning up the system gain during the soundtrack until the system starts to 'ring'. Graphic equalisers are routinely employed to cut frequency bands where feedback is becoming an issue. Using a model of graphic EQ with metering LEDs on each band will help identify problem frequencies more quickly if your ears are not yet attuned to such things. After the frequency of the first 'ring' has been identified, you can turn up the system gain a little more until the next feedback 'hot spot' is discovered, then this too can be pulled down in gain. Soon there comes a point when you can not EQ any more out of the sound without messing it up, simply because even a large graphic equaliser attenuates sections of the spectrum a third of an Octave or more wide, while the feedback peaks are only fractions of a semitone wide. Even time you apply EQ cut, you remove some of the sound you want to keep, though this is less serious on monitors than on the front of house speakers.

The alternative to a graphic EQ is, of course, a dedicated feedback suppressor. These are worth having if feedback is a particular problem, as they automatically lock onto the feedback frequencies and deploy a number of very narrow but deep notch filters that stabilise the system without significantly affecting the sound.

## Level Setting

Having done the best you can with PA speaker, microphone and stage monitor placement, the next thing you will want to do is set up initial mix levels of the band members. Different engineers use different methods for setting these levels. After getting the DI (Direction injection) feeds working and checking that you are getting plenty of signal from close-microphone amplifiers and drums, set the vocal microphone levels, after which everything else has to be balanced to them, even if that means the overall level is not as high as you would have liked. The quick way to setting vocal microphone levels is as follows:

- Set the master level fader at around two-thirds maximum and the microphone faders at maximum. Turn the input gain trims right down.
- Gradually turn up the microphone gain trims one at a time until the microphone just starts to 'ring', then, back it off just a hint.
- When you have done this for all the vocal microphones, pull their faders back down to the unity gain position (full up is usually +10dB). This leaves you with around 10dB of headroom before feedback again becomes a problem.
- Now simply balance the instruments to this vocal level by doing a quick run-through of a song or two during the sound check.

If the guitar amplifiers are always too loud, and it is your band that you are engineering (rather than a client), consider using smaller combos or power soaks at smaller gigs, so that they can be played at a lower level without sacrificing tone. If you can run the backline at a level where the PA can be used to boost is slightly, you will have far more control when it comes to turning up for solos and so forth. If you are lucky, the presence of an audience will soak up some of the unwanted reflections and make your job easier during the show.

Usually you would set up monitors in a similar way to the main PA, by turning off the main PA then seeing how much monitor gain you can set on each microphone before you hear ringing. Again, back off from this maximum level by a few dBs to give some operating

headroom. If the monitors are positioned properly and EQ used to tame the worst peaks, that is about the best you can do without using an automatic feedback eliminator.

### **Monitoring Tip**

Where it is possible to use two stage monitors for one singer, you can wire one out of phase with the other to reduce feedback problems. To make this work, the monitors must be placed symmetrically around the microphone stand at exactly the same distance from the microphone, so that the sound from the two monitors largely cancels out the vicinity of the microphones. The singer will still be able to hear the monitors quite clearly due to the miracle of the stereo hearing. Passive monitors can be phase-inverted by using a special speaker lead made up with that two conductors reversed at one end of the cable – but make sure this cable is clearly marked, as you wouldn't want it to get loose in your cable box. Active monitors (but only those with balanced inputs) can be inverted by making up a special Neutrik XLR microphone-style cable (for balanced Neutrik jack lead, if this is what's required) with the conductors feeding pins two and three reversed. Again, make sure this is clearly marked.

### **Live Engineers Checklist**

- Turn up on time and ensure you have adequate spare cables and batteries, plenty of gaffer tape and basic tools.
- Determine the best placement for the PA speakers and monitors, taking into account the microphones types and placement as well as potential sources of reflected sound, such as deep roofing supports, stage arches or hard walls. Use impromptu sound absorption at the back of the stage if possible.
- In venues where the main speakers can not be positioned symmetrically, consider panning everything into mono. Alternatively, if a microphone close to one of the speakers is causing particularly bad feedback problems, try panning it slightly towards the other speaker.
- If any cables are run in public areas, ensure that they are covered up with appropriate mats and that on-stage cables are taped down or routed out of the way of the performers.
- Balance all your instruments and backline against the maximum safe working microphone level you have set during the sound check and leave yourself of few dBs of safety margin for making adjustments during the show. Backline levels do tend to creep up.
- If more than one band will be playing, use coloured clips or labels to identify the various microphones, as the performers may switch them around. Also identify your DI boxes using large numbers or coloured stickers.
- Mark up the mixer channels with marking tape or gaffer tape, and use an indelible pen. If you are using coloured microphone tags, sheets of self-adhesive coloured stickers can be used to mark the corresponding mixer channels.
- Maintain 100 percent concentration on the band and their needs at all times. Do not hold conversations or wander to the bar, and do not expect to be able to do a good mix if you have had too much to drink.
- Turn down unused microphones to clarify the sound and reduce the risk of feedback.
- Use your own judgement to determine how much reverb to add, depending on the type of song – unless you have precise instructions from the band. Turn off reverb or other vocal effects between songs.
- If you do not know the band or the songs, rely on body language to tell you when a solo is about to start and ride the gain manually for the best balance.
- Establish clear sign language, so that the band can tell you if their level in the monitors needs to go up or down.

- Mark the maximum monitor level before feedback available for each vocal microphone or acoustic instrument microphone. Close-microphone loud instruments or amplifiers are not likely to present a problem in this respect.
- Be ready to deal with unexpected encores, and make sure the band has really finished before you pull down all the faders or unplug any cables.
- Double check to make sure you have not left anything behind after the gig. If you can use coloured sleeving to identify your own cables, that always helps.