PA MIXING

A. A Typical Live Performance

Introduction

There are so many different types of 'live' scenarios that it would be almost impossible for us to describe each one in a book of these modest proportions. Instead, our 'typical live gig' is represented by a small band, whose set-up is shown in the "Mixing Live" diagram.

Microphones

Most of the microphones used in live applications are dynamic cardioids because they are tough, produce an intelligible sound and their directional response helps prevent spill or feedback. Dynamic microphones can handle anything from drums to vocals. However, condenser types, with their greater sensitivity to high frequencies are invariably used for jobs such as overhead pick-up on a drum kit or mic'ing acoustic instruments.

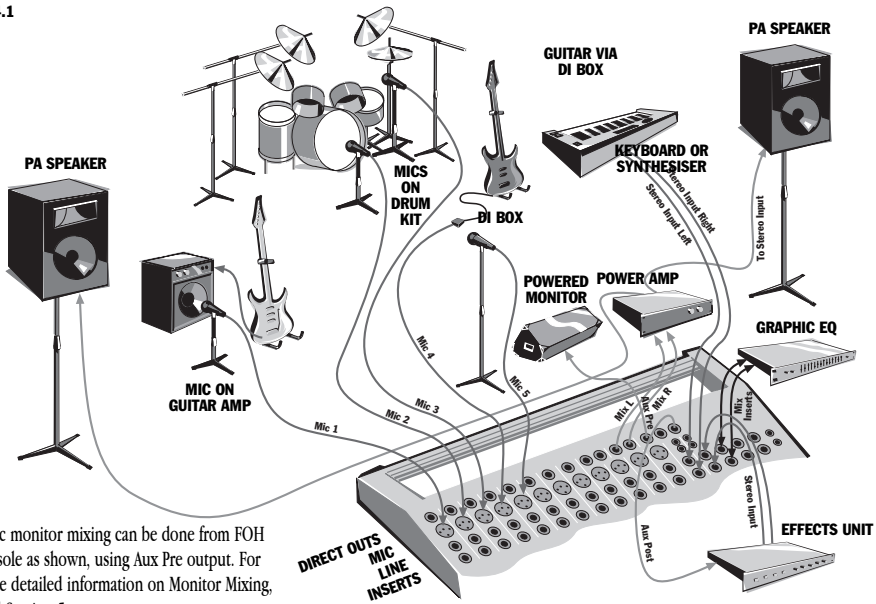
Cables and Connections

Interference and hum can be avoided! A few minutes spent checking cable runs and connectors pays dividends.

- A balanced audio connection provides low noise operation by cancelling out any interference in a signal. It does this by using a 2-conductor mic cable surrounded by a shield. Any interference picked up will be of the same polarity on the two conductors and is therefore rejected by the mic input's Differential Amplifier.
- Don't skimp on interconnecting cables - always buy the best that you can afford. Make sure that all connections are sound and keep cable runs as short as is practicable.
- A multicore cable and stage box will keep trailing cables to a minimum and presents a tidy and practical approach.
- If your mixer has a separate power supply unit, keep it well away from the console.
- Where signal and mains cables must cross, make sure they're at 90° to each other. This will help reduce the risk of hum and noise.
- If the venue has a three-phase supply, don't share the same phase as lighting controllers.
- It is dangerous to lift the mains earth when trying to eliminate

MIXING LIVE

FIG. 4.1



- Basic monitor mixing can be done from FOH console as shown, using Aux Pre output. For more detailed information on Monitor Mixing, read Section 5.

hum. You can isolate hum by lifting the appropriate audio signal shield.

- When using wireless mics, set the receiver on stage and run back to the console at balanced mic level. This will help avoid interference from digital sources and lighting controllers.
- Keep unbalanced 'insert' leads away from mains and keep them short - no longer than about 2 metres.

Connecting External Effects and Processors

We talked about Effects and Processors in Sections 2 and 3, so you're now aware of their functions and applications. Effects units are best connected via the console's Auxiliary Send and Return Loop (sometimes known as the Effects Send and Return Loop) or the Insert Point. When used in the Aux Send system, the dry signal level should be turned off on the effects unit, but when used via Insert Points (for guidance on how to wire a jack for use with Insert Points, see Section 6), the dry/effects balance must be set on the effects unit itself. Processors treat the whole of the incoming signal and therefore may only be used via console Insert Points or directly 'in-line' with a signal: they cannot be used in the Aux Send/Return loop system.

Setting Up

- Position the mixing console so that you can hear the on-stage performance as the audience will hear it. Ensure that you have a clear view of the performers.
- After setting up, switch the power amps on last to prevent any thumps occurring when effects or instruments are powered up. Ensure the console's master gain is down before you switch on the amplifiers.
- Don't set up the vocal mic directly in front of the drum kit or a guitar stack.
- Make sure the speakers aren't obstructed by the audience and that the majority of the sound is being directed towards the audience, not towards the rear or side walls.
- Set up the vocal levels first - it's no use getting a great drum sound if the vocals feed back before they can even be heard.
- Keep the vocals panned towards the centre of the mix. Not only will this sound more natural, but it will allow the greatest vocal level before feedback or distortion occurs.
- Be sparing on the use of artificial reverb. Most venues are too reverberant anyway, and excessive reverb will ruin the intelligibility of the vocal performance.
- Do not use reverb on low frequency sound sources such as bass, kick drums and tom toms.
- Keep backline amp levels down: let the mic and mixer do the work!
- Always leave a little gain in hand so you can wind up the level slightly as the show progresses.
- Putting high levels of bass guitar or kick drum through a small PA can overload the system and distort vocal quality. Try rolling off some of the low bass, you'll get a higher subjective sound level without overload.

Ringing Out: Nulling Room Acoustics

Caution: Ringing out can cause bowl around which can damage speakers, so use care when adjusting levels.

As experienced engineers will tell you, there's no such thing as a perfect venue. To help tailor the sound to the room acoustics, insert a Graphic Equalizer into the console's mix insert jacks which are effectively between the mixer and the power amp.

'Ringing Out' the system prior to the sound check will help reduce troublesome feedback. To Ring Out, follow this procedure:

1. Set all graphic EQ controls to centre (0).
2. Turn up amp volume until feedback is just beginning to 'ring'.
3. Turn back the amp volume slightly to prevent accidental feedback.
4. Starting from the left, adjust the first graphic EQ frequency gain control to 'max': if the system doesn't feedback, then this is not a problem frequency. Return this gain control to centre position. If the system feeds back, reduce the EQ gain by the same amount you boosted to get feedback.
5. Repeat this procedure for all graphic EQ frequencies.

Setting the Mix

- Turn down the amplifier gain before the system is first switched on. This will avoid unwelcome howls of feedback and can prevent loudspeaker damage due to switch-on transients.
- Set all the channel EQs to their flat or neutral position and optimize the input gain control setting for each channel in turn using PFLs.
- If low frequency background noise is a problem, switch in the High Pass Filter on each of the microphone channels being used, except on low frequency sound sources such as basses and kick drums.
- Ring out the system as described above, with the vocal mics open, and notch out any obvious trouble spots.
- Establish the maximum working level for the lead vocal mic so as not to incur feedback and then work a little below this level to allow a margin of safety. Again, see the notes on ringing out the system.
- Set up the backing vocal mics and check that there is no feedback problem when both the backing vocal and lead vocal mics are on. If there is, reduce the master gain setting until the feedback disappears.
- Now the instrument and direct line inputs can be balanced relative to the vocals. Start with drums and work through to the bass and rythm instruments.
- Test out any effects units connected to the system and establish the correct balance of dry and effected sound.

Avoiding Feedback

- Turn down or mute any mics not in use. This reduces the risk of feedback and avoids the back line being picked up.
- If feedback is a real problem, consider moving the main PA speakers away from the mics a little. Also check the back of the stage, because if the wall is acoustically reflective, some sound from the room will be reflected back into the mics increasing the risk of feedback.
- Avoid excessive use of boosted EQ as this can encourage feedback and may also spoil the basic character of the sound. Consider it an aid to fine tuning rather than as a means of making radical changes.
- The use of stage monitors will also worsen the feedback situation so run these at the lowest volume that the performers can comfortably work with. Position the cabinets so as to allow as little direct sound as possible to enter the vocal microphones. If possible, use a graphic EQ on each monitor.

NB: Remember, people soak up sound! The perfect mix achieved in an empty venue will have to be tweaked when the crowds arrive. Sound waves are also affected by heat and humidity.

B. Larger Performances

Although the example shown in the 'Mixing Live' diagram shown at the beginning of this section is of a small band, the principles are the same no matter the size of the live performance or venue. However, for larger PAs additional speakers, monitors, effects and processors may be required as well as slightly different positioning for each of these pieces of equipment. These additional requirements are outlined below:

Medium Sized Venues

The console used will require more input channels. For example it is likely you will want to mic up all of the drums, and there are also likely to be more instruments, backing singers and sound sources in general.

More monitor sends will also be required - a single monitor will not be enough for larger bands. The bass and drums will require a monitor between them. The vocalists will want a monitor each so they can hear themselves above the band.

More speaker outputs may be needed in larger venues so that all the audience can be reached, without there being "holes" in the amplified audio signal. It may be necessary to record the event. This will require additional level controlled stereo outputs or direct outs if a multitrack is being used.

NB: For simplicity, these diagrams do NOT show any outboard equipment.

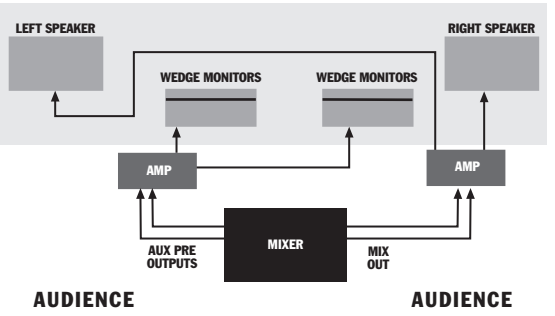
Large Sized Venues

Large venues will require a separate "Front of House" (FOH) console for the audience mix and a Monitor console for the band, as with a larger stage area each band member will require at least one monitor wedge. The auxiliary send system of the FOH console will not be able to cope with these demands alone as it will have to deal with several effects units.

The FOH console will have a large number of mic/line inputs, plus a large number of matrix outputs so that a complex range of speaker clusters can be placed around the auditorium.

SMALL VENUES

FIG. 4.2



MEDIUM SIZED VENUES

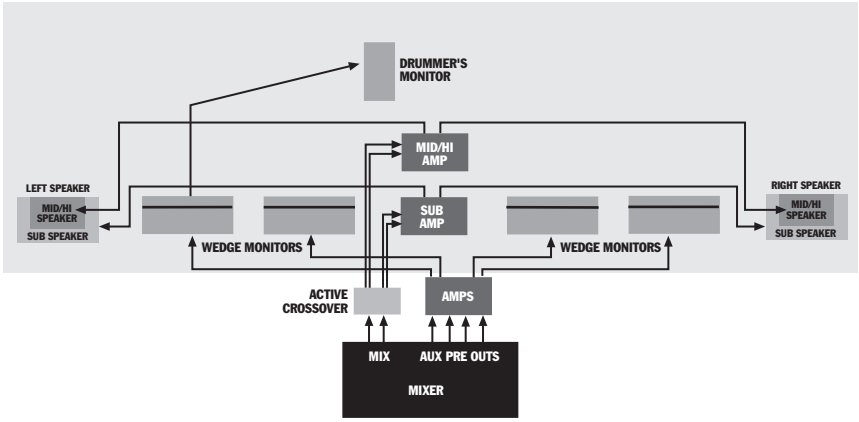


FIG. 4.3

LARGER VENUES

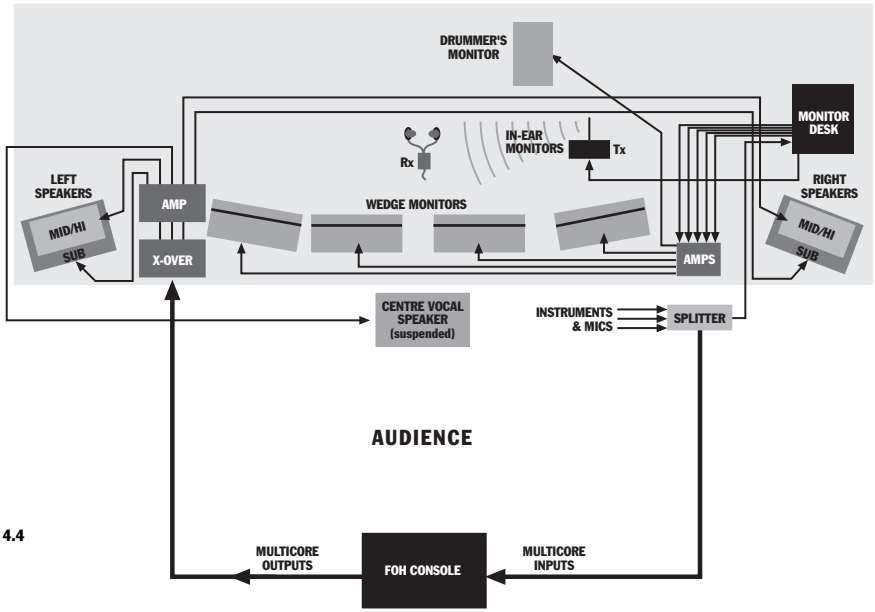


FIG. 4.4

C. Recording Live

In some situations, you may want to record a performance. Depending on the situation, the feed for recording may come from the FOH mixer, microphone splitter boxes, or your own microphones which have been set up alongside those of the band.

The diagram below shows a typical example of the sound sources being split between FOH and Recording. The recording console operates independently from the FOH mixer.

NB: When using Folio SX it will be necessary to re-patch for multitrack playback.

NB: Subgroups can be used for submixing many inputs (e.g. drums) to a multitrack input. This is useful when tape track availability is limited.

Hints & Tips

- Try to locate the mixer in a different room to the performance to avoid distraction from the live sound.
  If this is not possible, use a good pair of noise-excluding headphones for monitoring.
- Wherever possible, take feeds from mic splitters - this will provide clean, low-noise signals suitable for recording.
- Often, Tape Sends are unbalanced, so keep signal paths as short as possible between output and recorder to avoid interference.
- If there aren't enough microphones, use a stereo pair to pick up the overall sound and the rest to emphasize individual performers.
- Use a compressor/limiter to avoid overloading the digital input of the recorder, or select Limit function if using a Spirit ProTracker.

RECORDING LIVE

FIG. 4.5