A brief guide for aligning coincident stereo microphone systems

By Hugh Robjohns

Coincident microphone stereo techniques employ small differences in signal amplitude between the two channels to convey positional information of the stereo image. Therefore, before any coincident stereo microphone technique can be used, it is essential to match the gains of the signal path through each channel. Figure 1 illustrates a simplistic signal path to demonstrate how many opportunities there are for gain mismatches to occur.

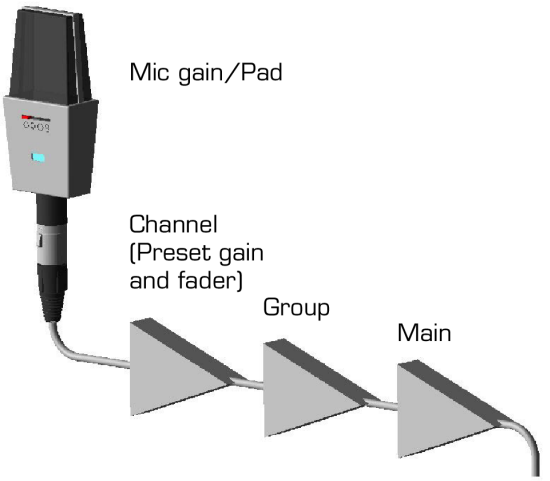

Figure 1

The process below provides a simple but highly accurate procedure which is considerably faster to do than describe!

Once the channel gains have been matched it is also sensible to perform a couple of quick checks to ensure that the microphones are functioning correctly and are suitable for use as a stereo pair. Do not assume that two microphones of the same type are inherently suited for use in a stereo array. Minor damage, component ageing and model revisions can all alter the performance of a microphone in subtle ways. Although these may not become apparent when used individually, they can have a profound affect when used in conjunction with another microphone.

Stereo alignment procedure

- Mount the microphones appropriately and cable back to a sound desk.

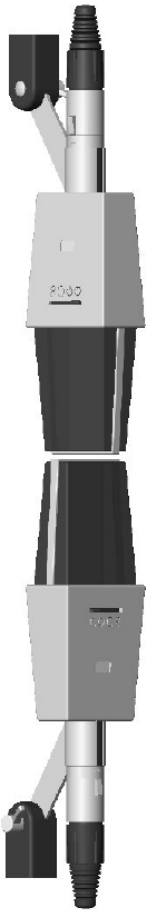

Figure 2

Ideally the microphones should be mounted such that the capsules are aligned vertically above one another (see figure 2). This ensures coincidence in the horizontal plane.

If this is not possible they should be mounted as close as possible to each other but arranged to avoid creating sound shadows in each other's pickup are. Mount as in figure 3, not as in figure 4.

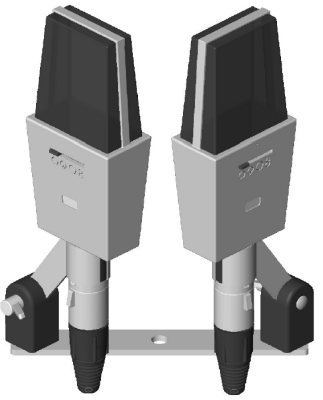

Figure 3

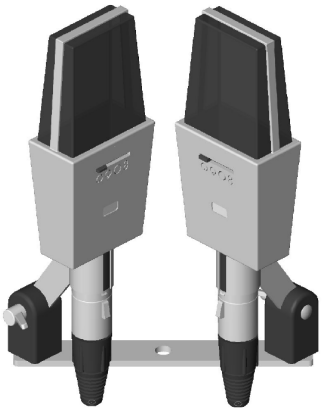

Figure 4

- Ensure that each microphone feeds only one channel – left or right, as necessary. If the desk channels incorporate pan-pots or stereo width controls check that they are adjusted correctly.

If a pair of mono channels are being used to control the stereo signal, use a fader clip to ensure both faders move together.

Identify which microphone is connected to which channel.

The microphone connected to the left channel should eventually be facing the left-hand side of the sound stage (from the viewpoint of an audience), and vice versa for the right channel.

- Select the required directional polar response on the two microphones – figure-of-8, hypercardioid or cardioid.
- Adjust the mutual angle between the microphones such that both capsules are initially arranged to face directly forwards.

This ensures that they pick up a sound source from any incident angle at the same level. It is no longer essential to position the sound source on the precise central axis of the two microphones.

- Using an appropriate sound source, adjust the gains of both microphone channels to provide approximately the correct signal level (with the faders at their normal position).

If the sound source used for this calibration is significantly quieter than that expected for the recording (eg using a voice for alignment before a full orchestral recording) the line-up is likely to be performed at a low level. However, it is important that the channel gains are set for the higher anticipated level. Therefore, it may be helpful to set the faders beyond their normal position, or to increase the monitoring level so that the voice can be heard clearly during the alignment. Don't forget to turn the monitoring or faders down afterwards!

Having set the approximate channel gains, the next stage is to match them precisely to one another. The best method is to listen to the difference between them and adjust for the best null.

- For example, on the loudspeaker monitoring controls select 'Mono' and 'Phase Reverse' to audition the difference signal (S).

If there is no facility for applying a phase reverse to the monitoring, introduce the phase reverse on one of the desk channels to achieve the same result. Ensure you deselect the channel phase reverse after completing the alignment!

- Adjust the (fine) gain control of one channel to produce the minimum difference (S) signal level heard over the loudspeakers.

Minor discrepancies in frequency and phase response of the two microphones or the desk channels and monitoring system usually prevent the signal from being nulled completely, but a

This completes the alignment. Do not alter the gain controls again after this adjustment has been performed.

- Cancel the Phase Reverse but with the loudspeakers still switched to mono confirm that there is a sharp and stable central image.
- Return the monitoring to normal Stereo and check that the image doesn't move. If it does there is an alignment error in the loudspeaker monitoring circuits.

Having aligned the channel gains for the front axis of the two microphones, it is important to check that their polar patterns are matched for all angles of incidence.

- The easiest technique is to ask an assistant to walk slowly around the microphone pair while talking.

The quality and level of speech will vary but the image should remain firmly in the centre of the sound stage. If it doesn't, the microphones have un-matched polar patterns and are not acceptable for use as a stereo pair.

- Finally, rotate the microphones to the required mutual angle – typically around 90°.

If you find that the stereo image is the wrong way around do not swap the cables to the microphones or desk channels as this would destroy the gain alignment completely. Remount (or rotate) the microphones to face the correct directions. If this is not feasible, alter the desk routing (eg. reverse the pan-pots) – and take more care over the initial channel identification the next time!

Alternative alignment

There will be occasions when the microphones cannot be physically manipulated to set them facing in the same direction, as required for this line-up procedure. The most common example is when the microphones are suspended high above the floor and have to be set to the desired mutual angle when they are rigged. The solution is to use microphones (or, more typically, a stereo microphone) with remotely controlled polar patterns.

The alignment procedure is basically the same as above except that, instead of rotating the microphones to face the same way, the remote control facility is used to select omnidirectional polar patterns for both capsules. In this condition both microphones should pick up sounds equally from all directions and therefore the preset mutual angle becomes irrelevant to the line-up. The rest of the procedure is identical, but it will not be necessary to check that the polar patterns are matched for all angles of incidence or rotate the microphones.

It should be noted that this alternative alignment procedure is not as accurate. This is because the mechanism for controlling the polar patterns of a capacitor microphone also has the potential to alter its sensitivity. Precise calibration of the channel gains with omnidirectional patterns does not necessarily guarantee the accuracy of calibration in the required directional polar pattern. However, with good quality stereo microphones any discrepancies are usually negligible.

Hugh Robjohns was a lecturer at the BBC's Wood Norton training establishments for many years. Now a technical author and consultant, he contributes to many technical publications, is ***Technical Editor of Sound on Sound*** *and Editor of* ***LineUp,*** *the journal of the Institute of Broadcast Sound.*

First published Microphone Data Book 2001