Stereo-Types

by Jeff Towne

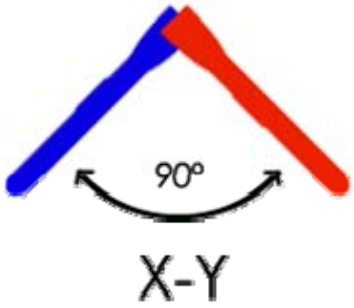
Collecting stereo sound in the field seems to be one of the most perplexing topics for recordists, There are a myriad of options encompassing equipment, technique and mixing. Mic placement, pick-up patterns, phase relationships and many more issues come into play.

The most common arrays, which can be achieved with two microphones, or with a single stereo mic which uses two internal mic elements, are: Mid-Side (M-S), X-Y, ORTF, and Spaced Pair. There are other esoteric techniques: binaural heads, spherical baffles, the Decca Tree, PZMs on walls, the Crown SASS, etc, but these are rarely practical for portable recording.

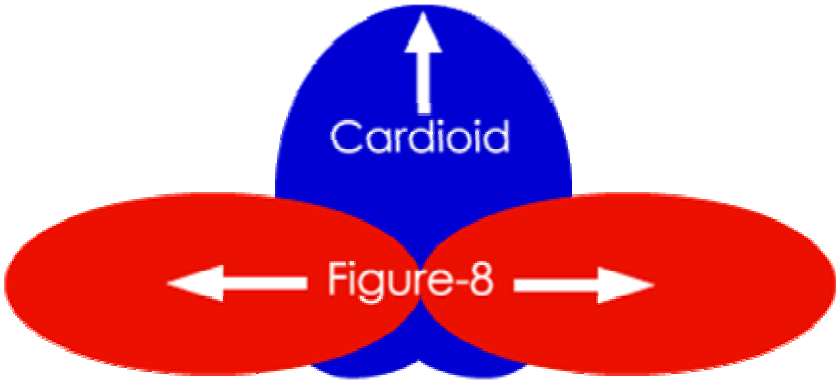
The easiest solution is to get a stereo mic. By using a single microphone with two recording elements that are precisely and permanently aligned, one can count on a stable stereo image, phase coherency, and ease of handling.

But it is not always practical to invest in a separate stereo mic if you primarily record interviews. One answer is to get a duplicate of your interview mic and use one of the many two-mic techniques. A stereo bar that will hold two mics in a fixed position can be had for less than $20. You'll also want a pistol grip unless you mount the bar on a stand. In a perfect world, you would want two precisely identical microphones, a "matched-pair" that have the same frequency response and sensitivity ratings. You can purchase matched pairs of high-quality microphones, often for a slightly higher cost than two unmatched mics. In practical use, you can get good results with unmatched pairs, but be sure to at least use two of the same mics.

Two things you should strive for are a realistic stereo image and mono compatibility. By following the tried-and-true formulas listed below, one can be fairly confident that both these goals are met. Of course, sometimes an unconventional technique will create a successful result, and sometimes realism is not the desired effect. The simplest and most basic is **X-Y** technique: crossing two mics at 90 degrees so the capsules are precisely above one another (coincident). This requires directional mics, usually cardioids, and will create a solid, mono-compatible image.



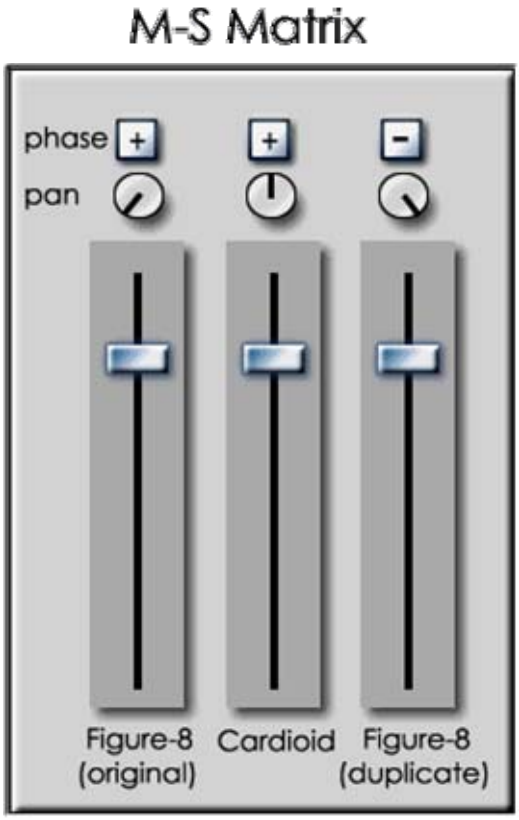
Another popular coincident mic technique is **"Mid-Side"** or **M-S**. Many stereo mics use this array, but you can make your own M-S matrix with one cardioid mic and a figure-8 pattern mic (available on many professional multipattern microphones, or as a specific capsule.) The cardioid mic faces forward and the figure-8 mic is set so that the capsule is as close as possible to the cardioid, usually directly on top. The lobes of the 8 should be positioned at 90 degrees to left and right.



M-S

These signals can be captured on a two-track recorder in this configuration, with one channel acting as "mid," the other as "side." The signals can be decoded later at mixdown, or in your digital editor. They cannot be monitored as is, at least not with the final stereo image.

In order to decode these two signals to make stereo, you must mult (or copy) the figure-8 mic's signal to two channels on a mixer and flip one channel out of phase. Using three faders, you can have lots of control over the sound, adjusting the ratio of middle to side info, or the size of the stereo field, etc. Generally one would pan the cardioid mic in the center, and the other channels hard left and right. But by varying the pan of the side channels, or simply the relative volumes between mid and side, one can have a tremendous amount of control over the focus, image and size of the audio "picture."

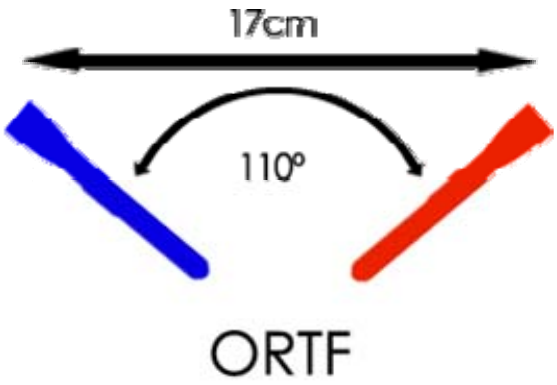


Most stereo mics that use M-S technique have an internal matrix, usually with a switch or dial to adjust the mid-side ratio. That way, the two output cables of the mic can be plugged directly into a stereo recorder or mixer, and create a coherent stereo image.

More than just a coincidence?

While these coincident mic techniques have extremely good mono compatibility, they create no time differences or filtering effects, both of which also provide powerful stereo cues to our brains. This is addressed in other two-mic techniques that use a "near coincident" technique, in which the mics are intentionally placed apart.

ORTF is generally done with cardioid mics, and requires a very specific arrangement of the mics to maintain phase coherence: 17 cm between the microphone diaphragms, and with a 110° angle between the capsules. This array was developed by French radio for recording classical orchestras, and is meant to approximate the spacing of the human ears. This technique relies on both the directionality of the mics and the tiny timing differences of sounds arriving at the different mics to create a stereo image.



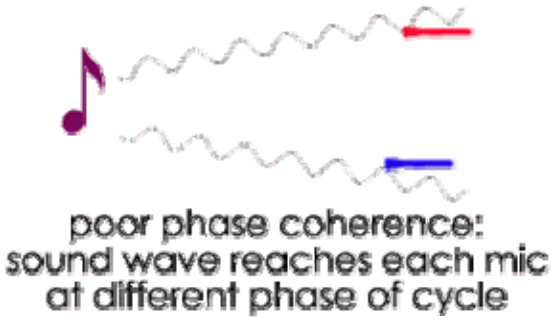
There are other variations on near-coincident mic placement, sometimes done with two omni mics and a sonically-absorbent sphere or baffle between them. Human ears are pretty omni in their pick-up patterns, except for our heads being in the way, and our earlobes providing filtering and some more directionality. Yet we can discern extremely accurate stereo info due in part to the acoustical "shadow" of our skulls, but also from tiny arrival-time discrepancies between the two ears.

Therefore, one can get fairly realistic stereo even with omni mics, by replicating those arrival time differences by spacing the mics a bit. There are many spaced-omni techniques that rely on this phenomenon. A foot and a half to two feet is the conventional spacing, but you can get decent stereo with spaced omnis as close as 6 inches or so, because that is approximately the distance between the human ears, and even such tiny time delays alone will give our brains some stereo information.

It's just a phase

If using two mics not for stereo, but to capture two different sounds, like recording a description of something by putting one mic on the voice and another on the object being described, the "3:1 rule" dictates that the mics should be at least 3 times as far from one another as they are from the source. Otherwise phase discrepancies can spring up, resulting in weak sound or odd frequency effects in mono.

Sound travels in waves, with sound pressure peaks and valleys. If sound radiating out from a source hits your two mics so that at the same instant one mic gets a peak, and the other gets a through, you end up with phase inconsistencies. In the worst case, the two signals cancel each other out completely when summed to mono. This extreme example hardly ever occurs from mic placement (but can result from incorrect wiring.) Different frequencies have different wavelengths, and so any non-coincident stereo micing array will experience some phase differences. But so do our ears. The trick is to make those phase differences sound natural.



Phase is a bigger problem when employing several microphones, but one can get in plenty of trouble with just two. It's important to listen carefully, but also to be aware that phase problems are often difficult to detect on headphones. Try to stick to the established patterns, and listen for problems like a "weak middle" or a very exaggerated stereo sound, which can indicate that your recording will not translate well to mono.

Why do you care about mono? If your production is airing on the radio, there are many listeners that are receiving your program in mono. They may be listening on a clock radio in the bedroom, or a small portable on the porch, or they may be at the edges of the station's broadcast area and get better reception in mono. Perhaps you want to make a streaming audio file available on the web, and often bandwidth savings make mono the best choice. If your stereo ambiences do not translate to mono well, your final product will sound terrible in these circumstances, and there's not much you can do about it at that stage.

The Image Thing

In the end, there are lots of unconventional techniques that will still give an effective or powerful effect, even if they do not fit the textbook diagrams. Producers have reported success with two mics at great distances from one another, and this indeed can give an interesting, if unrealistic, effect. There are little "T" mics that have two elements mounted 180 degrees from one another built into a plug that jacks directly into a stereo mini input. Just holding two cardioids in a rough X pattern can get down-and-dirty stereo in a pinch. I've even gotten good sound with a $20 set of two tiny omni mics from Radio Shack (part#33-3028) held about 6 inches apart. And there are several inexpensive Sony microphones that don't have the greatest specs in the world, but can still record ambience fairly well.

A two-mic technique can make a lot of sense for radio recording, because it allows flexibility. The second mic can be a back-up for your first interview mic. A stereo bar that will hold your mics in a stable position is small and inexpensive. And two good-quality mics are usually cheaper than a dedicated stereo mic. But a stereo mic is quicker and easier to set-up, and guarantees mono compatibility.

Whether using a stereo mic or a two-mic array, one also needs to keep some mic technique guidelines in mind. Don't swing a stereo mic around rapidly, this can be very nauseating to listen to as the stereo image whirls around. For this reason, you rarely want to conduct interviews in stereo, because the subject tends to "wander" in the stereo field, which can be distracting. It can have great impact to conduct the interview in stereo if something is being demonstrated, or if you are moving with the subject through a space. But try very hard to keep your mic very still, or at least to make your mic movements slow and gradual, and to keep your subject fairly centered in the stereo field.

All this trouble is worth it, the vividness of stereo can put the listener in the middle of the action, dramatically increasing the impact of your recording.

For more information

DPA microphones' **Microphone University** has lots of information about mics, including stereo mic techniques.

Products:

The Crown SASS stereo mic
Shure VP88 Stereo Mic
Audio Technica AT825 Stereo Mic
AKG 426
Miniature mic sets from Core Sound.
More miniature mics, including the "T" mic

*For more microphone info, check out the **"What Microphone Do I Get"** Column here at Transom Tools.*