MS Stereo Mic

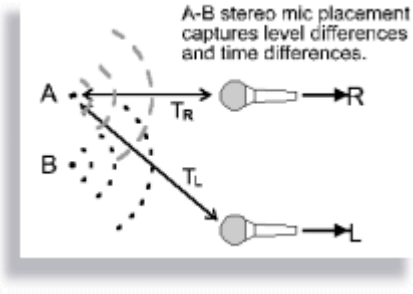
The PAiA MS Stereo Microphone produces a spacious, airy stereo image that's ideal for recording acoustic instruments. And if you initially record "too much" stereo you can reduce spread, or even take the mix to mono, with no danger of frequency dependant phase cancellations changing the timbre.

Mid-Side (MS) microphone placement for stereo recording is a favorite trick in high end studios. It's used less often in project studios because it requires expensive dual element condenser microphones and an elaborate mixing board. The PAiA MS Stereo Mic uses three high quality electret microphone elements and analog mixing and matrixing circuits to produce a compact and inexpensive Mid-Side (MS) Stereo Microphone.

Side and Mid level controls set stereo spread at the mic's Left and Right outputs. Outputs are adjustable from 4dB line level down to low level and are balanced on 1/4" TRS jacks. Mono plugs can be used for unbalanced connections and cables.

How MS Stereo Works

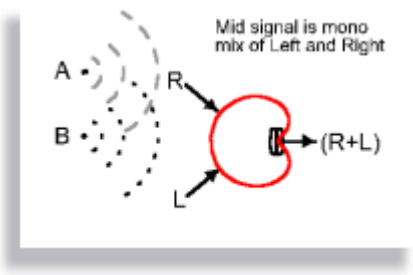
by John Simonton



Usually the most intuitive way to perform a task is the best ... but not always.

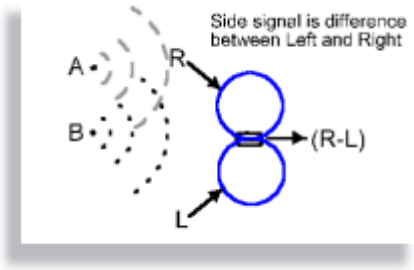
Since we have Left and Right ears, the most intuitive way to encode stereo sound information is as Left and Right channels. And stereo delivery media such as CD, tape, vinyl and older film do it just this way.
Similarly, when placing microphones to record a stereo signal the most intuitive way to go about it is what's known as A-B mic'ing. Two mics are placed some distance apart and pointed in the direction of the source to be recorded. The mic on the left is recorded as the L channel and the one on right as R. On the face of it this looks pretty fool-proof and when you listen to a ping pong game recorded this way, sure enough - it sounds like stereo.
But when the novelty of ping pong wears off and you progress to more sonically complex sound sources (like musical instruments) some subtle problems begin showing up that have to do with the fact that the mics are encoding the L and R information not only as level differences but also as time differences. In the figure, the distance from the "A" source to the "L" mic is greater than to the "R" mic so the "L" signal is slightly delayed relative to the "R" signal.
On playback, there can be listener positions where delays from the speakers interact with the recorded delay to produce comb-filter effects. In other words, the timbre may change depending on the listener's location. There may be several randomly located "sweet spot" locations in a room where everything sounds great and other places where bass is weak and others where it's overbearing and other places where high end and mid range are problems.

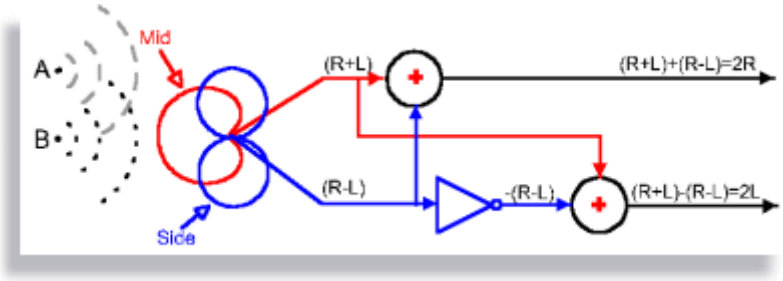
Also, when an A-B mic'd stereo signal is converted to mono - like when heard on most AM radios - some notes, even whole instruments, can go away because of phase cancellation of recording articfacts.
There are alternatives to A-B Mic'ing that prevent these problems, MS recording for instance. MS is an acronym for Mid-Side, named for the two signals that encode the location of sound sources and reverbrant ambiance of the stereo image. MS Stereo principles are used in the broadcast delivery of Mono/Stereo compatible sound and as part of Surround system but it is how these principles apply to microphone selection and placement during recording that is of concern here.



The Mid signal comes from a mic with a Cardioid polar sensitivity oriented so that the "front" faces the center of the stage. This signal is essentially a mono mix of the Right and Left sides of the stereo field and encodes very little information on placement of sound sources. For example, if the source "A" in the illustration is moved from the Right side of the stage to the equivalent position on the Left, the Mid signal will not change significantly. Mathematically the Mid signal can be expressed as R+L.

The Side signal comes from a mic with a Figure 8 polar sensitivity oriented so the lobes are facing Right and Left. Two characteristics of this map are important. First, the mic is deaf to sound sources located between the two lobes; for example, source "B" in the illustration will not be present in the Side signal at all. Also, there is a phase inversion between the Right and Left lobes - if source "A" is moved from the Right side of the stage to the equivalent postion on the Left, its relative phase will be inverted in the output. Math shorthand for this is R-L.

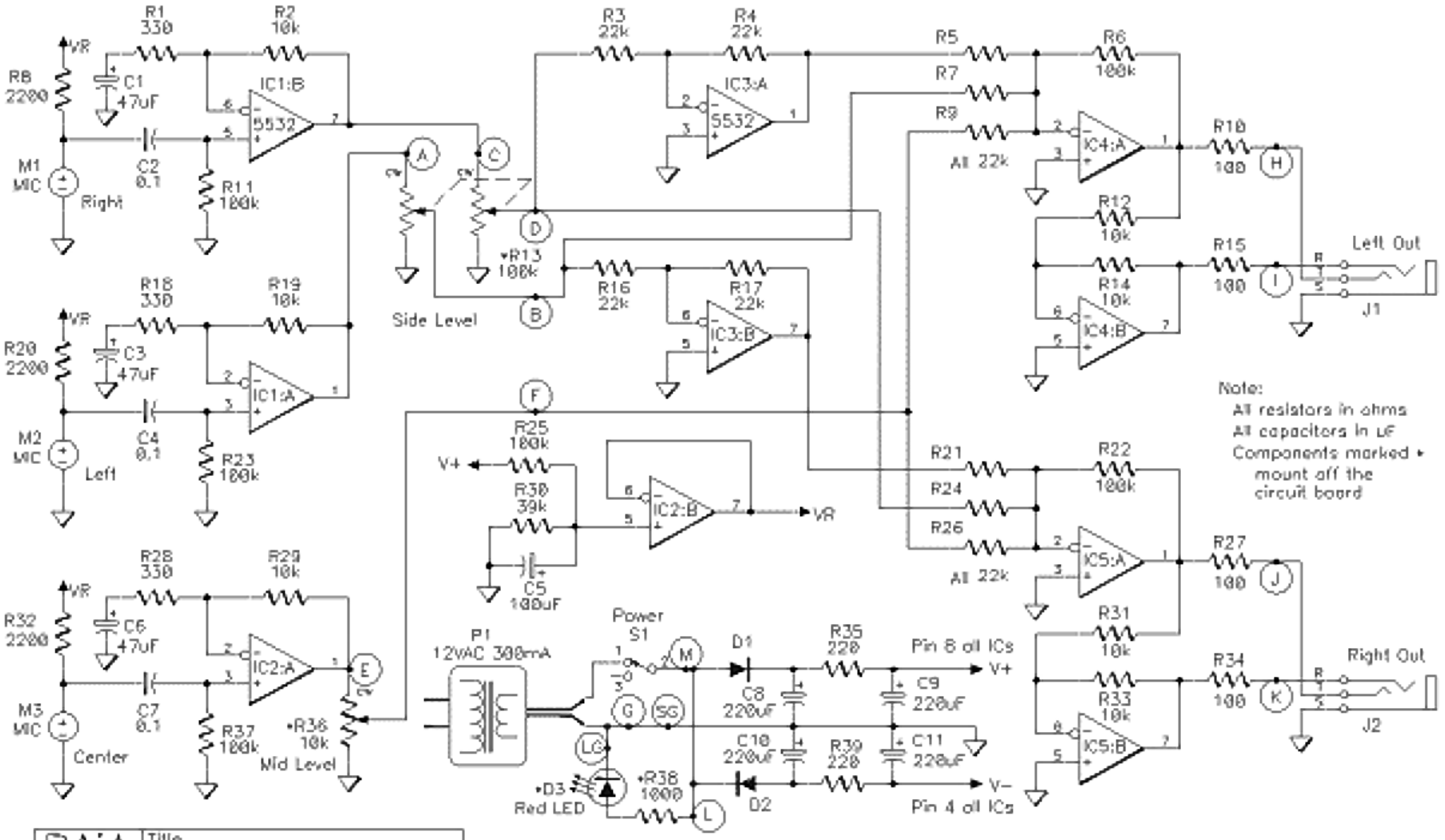




The MS Decoder performs sum and difference operations to extract Right and Left level and phase information from the Mid and Side signals. In the illustration the circles with "+" signs represent summing functions.

The triangle represents a 180º phase inversion, the equivalent of changing the sign of the output relative to the input or multiplying the input by -1.

In an actual circuit OpAmps compute sums and phase inversion.
FM Stereo, Stereo TV and even some quad and surround sound systems use MS encoded signals because it is an easy path to sending a signal that is mono/stereo compatible. In these systems, the Mid signal modulates the main sound carrier while the Side signal modulates a stereo subcarrier. In simple monophonic receiving equipment only the main carrier is demodulated and the Mid signal is used for a mono output. When stereo outputs are desired, the stereo subcarrier is also demodulated and the Side signal combined with the Mid signal in a decoder to extract Left and Right Stereo channels.



PAiA Electronics, Inc.	Title: MS Microphone	
Size: A	Author: Ryckebusch	Sheet of
	Number: 9506	Rev 1
		Rev 2
Date: 10/14/95	Drawn by: js	Rev 3
Filename: msmic		Rev 4
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(405) 340-6300 paia@paia.com