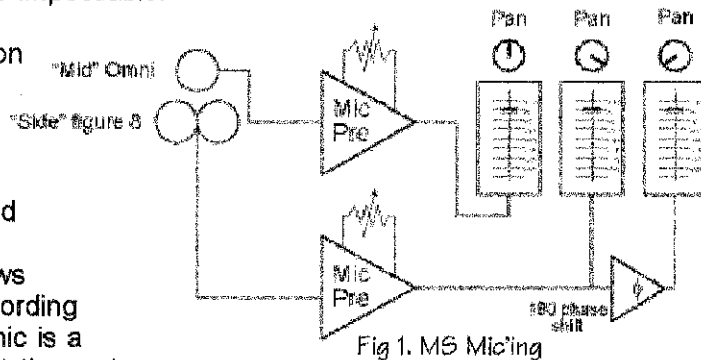


One of the classic stereo microphone recording methods is the MS or Mid-Side microphone technique. To do this requires the use of two microphones, one of which can be set for a figure eight pattern. The classic of course, is a pair of Neumann U87 or equivalent. Additionally some minor signal processing is required. Most large studio consoles can perform this. Some of the smaller home studio consoles don't have all the bells and whistles need to achieve this, or at least not without some serious patch cord usage. So what are the options? Well you can break out a bunch of patch cords, perform the processing in your multi-track software program or... Build the Project r MS decoder. This article will show you how to do all three. Why would you want to build a stand-alone MS decoder when there are other methods available to achieve the same results? Well, for one, the Project MS Decoder will free up a channel on your mixing board and allow you to record MS recordings straight to a two channel recorder such as a DAT machine or directly into your computer via a Stereo A/D converter. And it lets you hear exactly what you are recording as it is recorded (as opposed to decoding after recording during mix down). It is yet another one of those simple but indispensable projects that is worth an evening of your time soldering. It is also the perfect addition to that high-end mic preamp you finally got around to buying. Because there is no signal gain associated with the circuit and high performance op-amps are used, the audio specs of the Project r MS Decoder are impeccable.

Figure one is the "classic" configuration to achieve MS recording. The Mid microphone is an omni pattern mic facing the sound source (guitar, drum set, choral group, etc.). This mic picks up the straight sound source and then after the pre-amp, is sent to the stereo buss panned center. This allows it to remain exactly the same if the recording gets played back in mono. The Side mic is a figure 8 microphone positioned so that the main sound source is actually in the microphones dead spot, or least receptive position. This microphone captures the room sound or ambience as opposed to the main sound source. Obviously the better sounding the room, the better the MS stereo effect will sound. Even in an acoustically dead space there will be sound that emanates to the sides differently than the direct source. An acoustic guitar is a perfect example. The side microphone will pick up sound emanating from the strings and finger noise better than sound from the sound hole. Now here is where the audio trickery comes in. The signal from the side mic is amplified then sent to a console channel that is panned hard right. At the same time a phased reversed (180 out) side signal is sent to another console channel and panned hard left. This creates a wonderful stereo spread that sounds great over headphones or through speakers. Now here is the cool part, if the signal is collapsed into mono, the ambience information cancels itself out and we are left with our original signal. Now I know that today the odds of that happening are slim, but in the old days of AM radio this was an important consideration. The phase reversal is achieved with the phase switch on the console channel being used. What your mixing board doesn't have one? Time to fire up that soldering iron!



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THE CIRCUIT BOARD

The MS Decoder is built on a single-sided circuit board. Before beginning assembly, clean oxidation from the copper side of the board using scouring cleanser and water. The copper should be bright and shiny before beginning assembly.

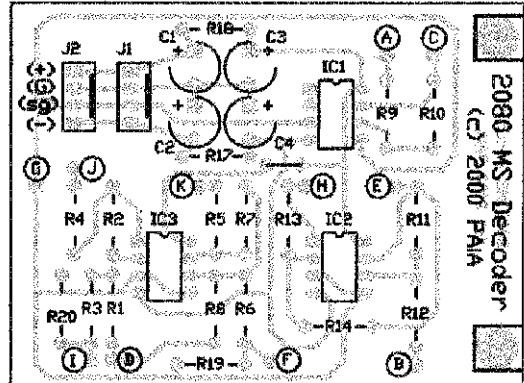
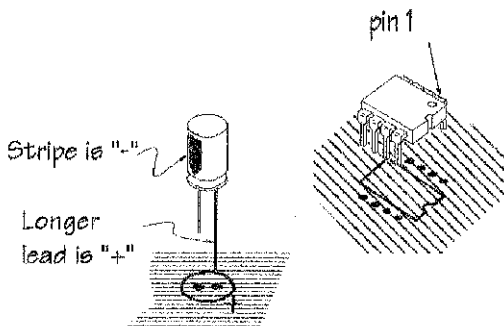
SOLDERING

Select a soldering iron with a small tip and a power rating not more than 35 watts. Soldering guns are completely unacceptable for assembling solid state equipment because the large magnetic field they generate can damage components.

Use only rosin core solder (acid core solder is for plumbing, not electronics work). A proper solder joint has just enough solder to cover the soldering pad and about 1/16 inch of lead passing through it. There are two improper connections to beware of: Using too little solder will sometimes result in a connection which appears to be soldered when actually there is a layer of flux insulating the component lead from the solder bead. This situation can be cured by reheating the joint and applying more solder. If too much solder is used on a joint there is the danger that a conducting bridge of excess solder will flow between adjacent circuit board conductors forming a short circuit. Accidental bridges can be cleaned off by holding the board upside down and flowing the excess solder off onto a clean, hot soldering iron.

Mount the circuit board components by passing their leads through the holes provided for them on the silk-screen legended side of the board and solder on the copper side. Clip off any excess component lead flush with the solder joint. Use care when mounting all components. Never force a component into place.

Resistors are not polarized and may be mounted with either lead in either of the holes in the circuit board. The electrolytic capacitors and IC are polarized and must be oriented as shown in the illustrations.



Components are mounted on the board in the locations shown. Note solid jumper below C4. Phantom traces show connections between parts.

MS Decoder Kit Parts List

Qty	Description	Designation
4	100uF / 25V Electrolytic Capacitor	C1-C4
3	5532 Dual Audio OpAmp	IC1-IC3
All resistors 5% 1/4W film, values in ohms		
14	10k (brown-black-orange)	R1-R3, R6-R14, R19, R20
2	47 (yellow-violet-black)	R4, R5
2	330 (orange-orange-brown)	R17, R18
Potentiometers		
1	100k linear taper	R15
1	100k dual linear taper	R16 a&b
Miscellaneous		
1	2080PC circuit board	
2	set screw knobs	
1	wire	
4	1/4" Open Circuit Phone Jacks	J3-J6

More on power supplies on the Web
 at: <http://paia.com/9700faq.htm#power>

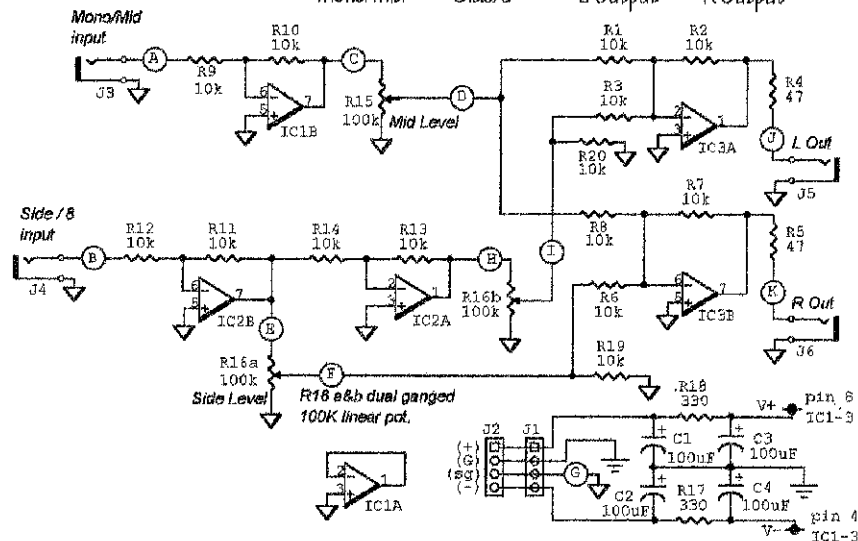
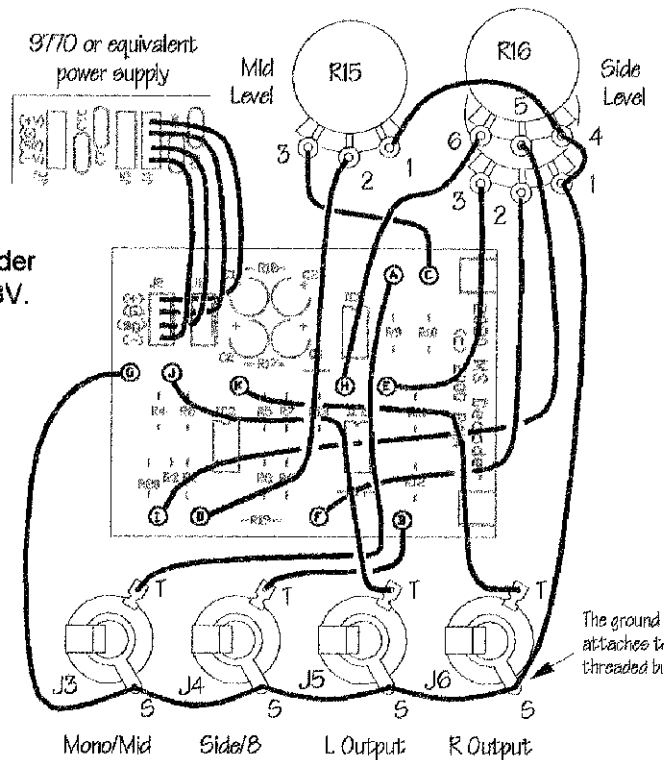
Use appropriate lengths of the #22 insulated stranded wire supplied to connect the circuit board to the phone jacks and controls as shown.

ABOUT POWER SUPPLIES: The MS Decoder will function on supplies from +/-9V to +/-18V. The recommended PAIA supply is the 9770R-12 but if you are back fitting into a console you probably can tap power from the existing supply. If the supply that you are using does not have separate power and signal grounds these connections on the phono-pre board can both connect to the single power supply ground but separate wires should be used for each.

As shown in the MS Decoder schematic, both the Mid and Side signals are initially buffered by unity gain inverting amps formed around IC1b and IC2 b which ensure enough drive current for the following sections.

The Mid signal goes to level control potentiometer R15 and is then fed equally to the left and right summing amplifiers, which are formed around the two sections of IC3. Controls R15 and R16 allow adjustment of the relative levels of the mid/side levels independent of the mic-pre gain setting, which is useful for directly feeding a recording device.

The Side signal has a little different path. After initial buffering, it is fed to the right summing amplifier via one section of dual potentiometer R16. It is also fed to a unity gain inverter formed by IC2a and its associated resistors. This inverted signal goes to the other half of the dual ganged potentiometer section and is summed into the left channel via IC3a.



Use:

Just patch the Project r MS decoder between your microphone pre-amps and your mixing board. You can also run the signal straight into a DAT or you're A/D converters if recording into your computer. The key to good results is the ability to monitor the stereo signal while recording. Then you can hear exactly how the final MS recording will sound. This allows adjustments of the relative levels of mid/side and microphone positions. Normally the Mid level will be fully up and the Side level almost all the way up. Depending on the amount of ambient information, you may want to back off a bit. In a relatively dead space, you may want to do the opposite and back off on the Mid signal a bit.

Now here is something that is really different: Faux MS miking. So you don't have Neumann U87. In fact you don't have a figure 8 microphone at all. Well, fake it. Close mike your source with one microphone and send that to the Mid input. Then take a second microphone and place that back from your sound source to capture room ambience and send that to the Side input. Viola! Fake MS miking. It isn't the real thing but it sounds good. It is completely different than just panning the second microphone to a different position than the first. To hear what this sounds like just switch the Figure 8 microphone to cardioid or omni. Another interesting thing to do is to separate the two microphones used. Normally the two microphones are as close together as possible. I have recorded in a blues studio in Florida that uses a figure 8 mic as the room mike and mixes that in the same way as MS miking with the exception that there isn't even a Mid mic. This works great as a drum overhead too. Experimentation is the key. With that Leslie I mentioned earlier, we had the mid microphone in the bottom of the cabinet where the large speaker and rotating baffle are. The Side mic was placed about a foot from the upper rotating horns and about three feet from the Mid mic. Sounded great.