BY FRANKLIN J. MILLER

Design and Use of Microphone Splitters

MY COMPANY (SESCOM) HAS BEEN BUILDING AND SELLING MICROPHONE SPLITTERS TO INDUSTRIAL USERS, RADIO AND TV BROADCASTERS, SOUND-SYSTEM USERS, AND THE GENERAL PUBLIC FOR MANY YEARS. THE FIRST DESIGN THAT WE offered was the single-input/dual-output equal-winding transformer shown in Fig. 1. You can see that it has only one electrostatic shield shared between the two outputs and one input. The transformer was built into a sturdy metal box and marketed as a Sescom model MS-1. It was also sold as a model 66J0036 audio transformer. The full schematic of the unit is shown in Fig. 2.

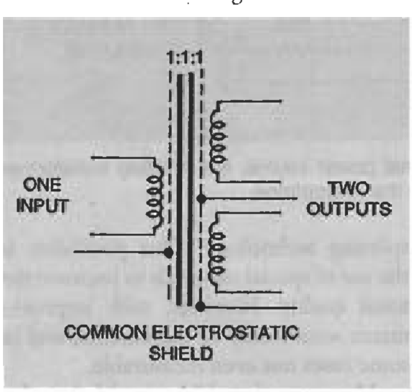

FIG. 1—THIS SINGLE-INPUT/DUAL-output transformer was one of the first microphone splitters the author designed.

A ground-lift switch was placed in the output circuit to help eliminate ground loop problems. Using that switch to open the ground connection does indeed help when ground-loop problems occur; unfortunately, it could also cause other problems. Those appear when any RFI (radio-frequency interference) or EMI (electromagnetic interference) signals are present. RFI problems are usually caused by radio transmitters, while EMI problems are generally traced back to electronic dimmers or motors. Either type of interference is not rare, and we've all run across them at one time or another.

Therefore, a new and improved version had to be developed to solve those problems once and for all. The solution we came up with was to install separate electrostatic shields for each winding, as shown in Fig. 3. With that setup, there are no ground connections between any of the windings, which solves the RFI and EMI problems. If any interference signals do appear in the input winding, they would have a path to ground via the AC coupling of the electrostatic shields. Those shields act as capacitors whose capacitive reactance is small and out of the audio band; they react only at the higher frequencies—just what we need to do the job.

That unit is wired as shown in Fig. 4. Note that there are no ground-lift switches in this circuit. With the new design we found that they were unnecessary more than 99% of the time. Rather than over-design our product with seldom-used features, the switches were intentionally left out. An external ground-lift switch or connector assembly could be easily added in those very few remaining instances where one was needed.

Other Problems, Other Solutions

Of course, when it comes to audio, few solutions are ever final. A new ground-loop problem did arise. It turned out to be related to the Switchcraft QG 3-pin audio connectors that were being widely used. A feature that made that connector unique was the ground solder lug that contacts the shell. Some people

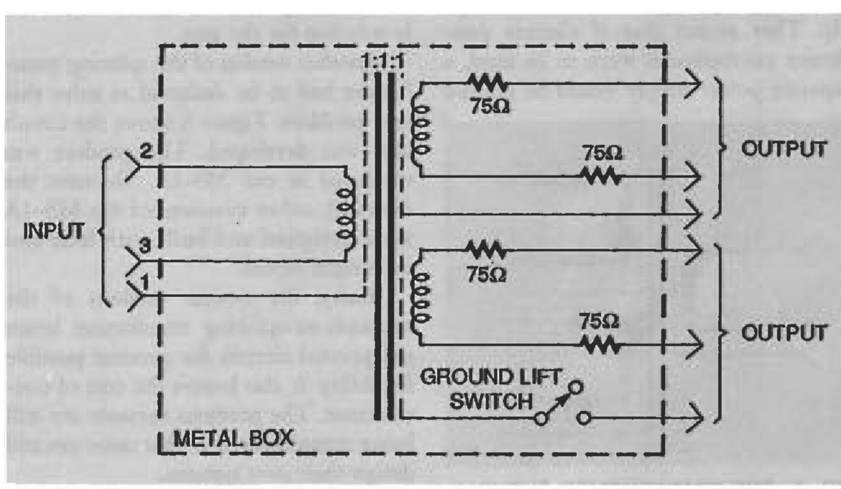

FIG. 2—THE TRANSFORMER SHOWN in Fig. 1 was installed in a metal box and a ground-lift switch was placed in the output circuit to eliminate ground-loop problems.

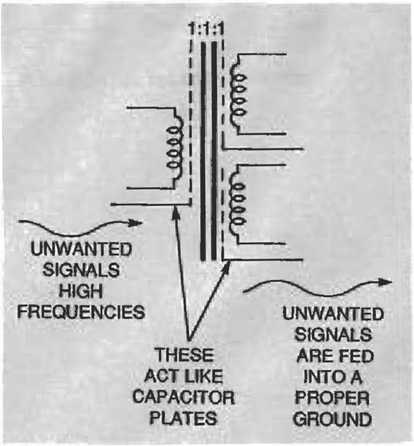

FIG. 3—USING SEPARATE electrostatic shields provides protection against most RFI and EMI signals.

made audio cables with the shield of the cable tied to pin 1 and the ground lug. Of course doing that makes the male-female cable connection RF proof, but it also makes it impossible to break the ground connection by lifting pin 1 in the box. Fortunately, a better solution appeared in the form of all-plastic male and female connectors that have no possible electrical connection from pin 1 to the shell unless you make it yourself.

In the early 1970s, we began to manufacture splitter boxes with phase-reversal switches on each input, and separate ground-lift switches; called the Sescom 9 x 3 Mike-Splitter, it is shown in Fig. 5. Those units were built in a three-rack version (5¼ inches) with nine sets of inputs and three outputs. The unit was popular with sound-rental companies that needed many splits on a temporary basis.

One consideration with that splitter is that it would not pass phantom voltage to the microphone from the main supply. That meant that if electret condenser microphones were to be used, a separate power supply would be needed before the splitter. That could be a costly solution for the user.

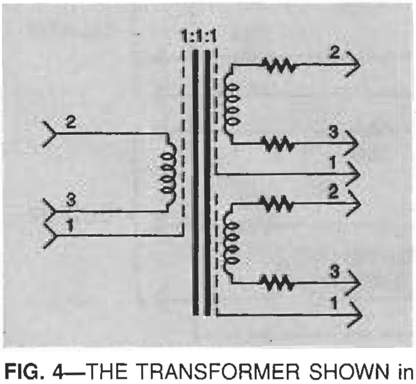

FIG. 4—THE TRANSFORMER SHOWN in Fig. 3 is wired as shown here. Note the lack of ground-lift switches; with this design they are not needed 99% of the time.

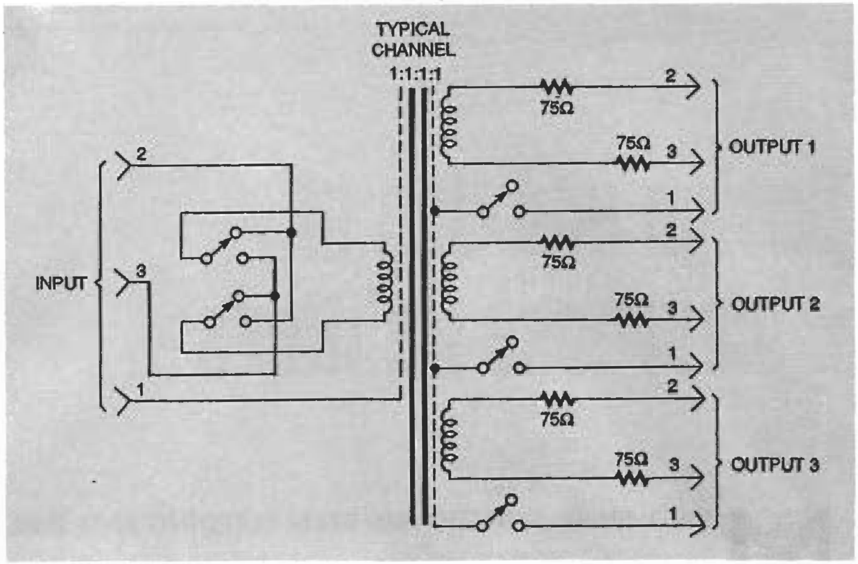

FIG. 5—PHASE-REVERSAL SWITCHES and separate ground-lift switches were used in microphone splitters of the 1970s.

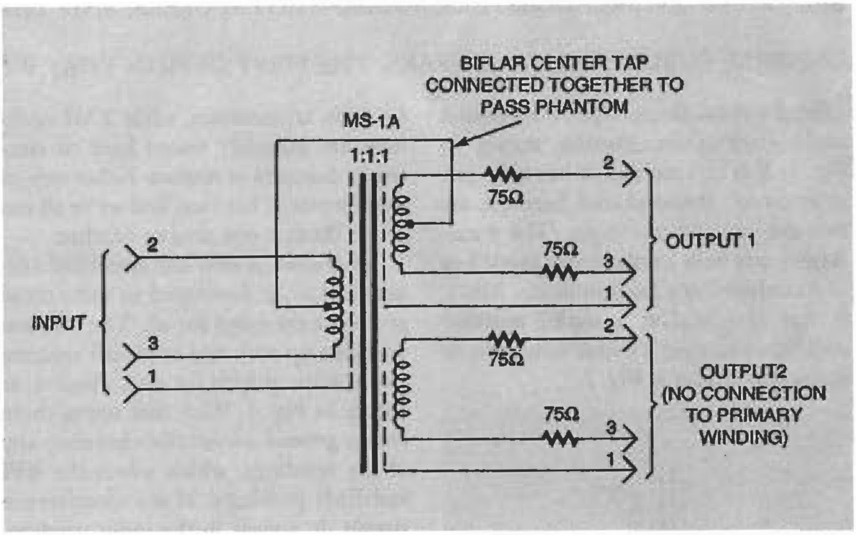

FIG. 6—TO AVOID THE NEED for an additional power source, this splitting transformer was developed to pass the phantom voltage to the microphone.

Another version of the splitting transformer had to be designed to solve that new problem. Figure 6 shows the circuit that was developed. The product was marketed as our MS-1A. To meet the demand, other versions of the MS-1A were designed and built with four and even eight inputs.

Today, the newest versions of the microphone-splitting transformer boxes use printed circuits for greatest possible reliability. It also lowers the cost of construction. The previous versions are still being manufactured so that users can still design their own systems.

The Future

What comes next in microphone-splitting technology? One possibility is the use of special materials to improve the tonal quality. However, such improvements would only be incremental and in some cases not even measurable.

More noticeable would be the improvement that could be achieved using digital technology. Using A/D converters, the analog audio could be converted to a digital signal; they could then be distributed without any loss to various devices, where they would be converted back into their original analog form.

Only time will tell what the future will bring. The only thing certain is that right now, there is a bright young engineer out there with an idea that no one else has thought of yet! Maybe it is you! EN