Circuit combines power supply and audio amplifier

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THE CIRCUIT IN **Figure 1** can help if you must transfer dc power and audio over a pair of copper wires. One application for such a circuit is a low-cost door-opening system with speech input. The circuit uses only one IC, the well-known LM317, a low-cost power-supply regulator. Using this chip, you can modulate the adjustment-pin input with the audio signal from an electret condenser microphone, connected between the output and the adjustment terminals of the IC. The LM317 regulates the output in such a way that the voltage on the microphone is always 1.25V dc. This application uses a WM34 electret microphone, which comes in a standard 10-mm capsule from Panasonic and is common in low-cost equipment. You can use nearly any electret capsule, because the well-regulated voltage on the microphone never exceeds 1.25V. Every electret capsule contains an integrated JFET-based impedance converter that translates speech into a current flowing from the source to the drain terminal. This current through the microphone modulates the voltage on the variable resistor, R_P. Because the output of the LM317 must follow the voltage on R_P, you obtain a low-impedance audio signal riding on the output dc voltage.

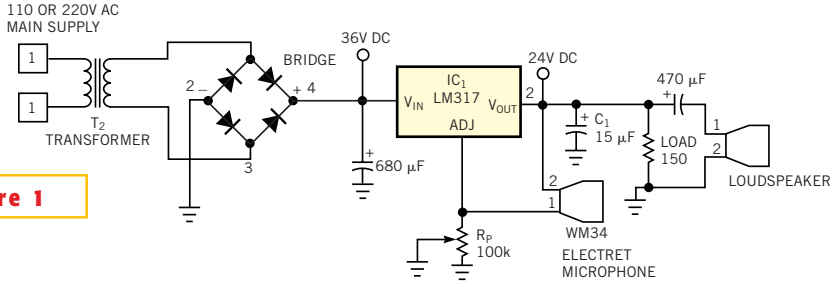

Figure 1

A novel circuit uses the adjustment pin of a regulator IC to provide audio amplification.

The microphone directly modulates the adjustment pin, so a smoothing capacitor, such as C_1, for noise and hum does not influence the level of the audio signal. C_1 shunts some of the audio signal to ground, but the LM317 compensates for the loss with internal gain. To avoid excessive losses in the LM317, use a capacitor with as low a value as possible. The circuit works well without a capacitor, but values as high as 47 µF do not present a problem. Using R_P, you can adjust the dc output voltage and the gain for the microphone signal. For proper operation, the LM317 needs to deliver a minimum current of 4 mA from its output terminal. If your design uses no loudspeaker, you can connect a load resistor to sink this 4 mA. Designs using low-impedance loudspeakers must also have load resistors. You must add the ac current in the audio signal to the minimum current requirement of 4 mA. For an 8Ω loudspeaker, you need a minimum resistive load of 470Ω to avoid distortion.

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