

Microphone preamp gets power through signal cable

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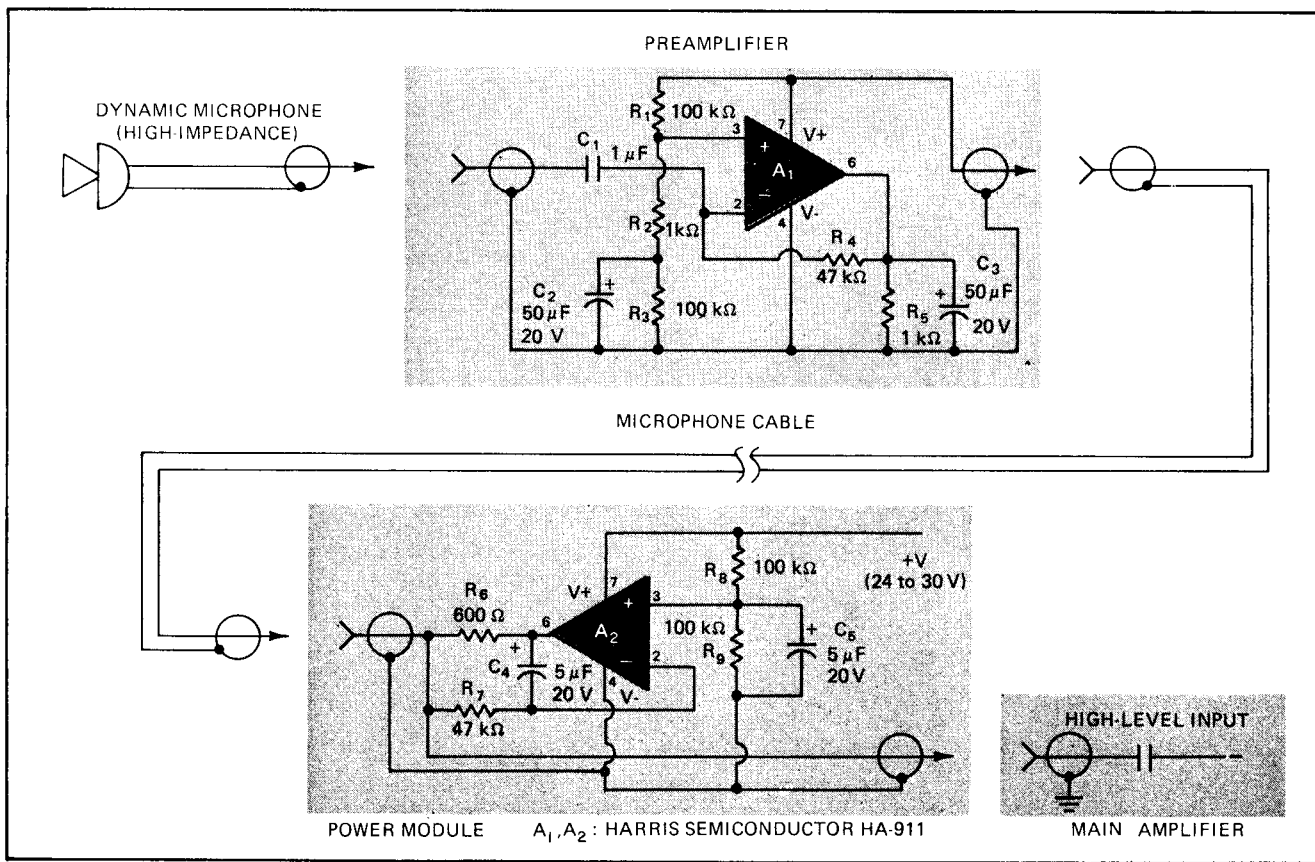
When a high-impedance microphone is at the end of more than 20 or 30 feet of cable, a preamplifier powered by batteries is often placed at the microphone to prevent high-frequency loss and to enhance the signal-to-noise ratio. But a preamp can be made much more compact if instead of using batteries it is powered remotely over the shielded or twisted-pair audio cable.

The hookup shown here is an unconventional application of an operational amplifier, but the performance will please any broadcaster or audio enthusiast. Performance is definitely high fidelity. Frequency response is better than ± 1 decibel from 20 hertz to 20 kilohertz, and equivalent input noise is about 3 microvolts rms over this band.

The diagram shows the circuit arrangement. In the

quiescent state, the output terminal (pin 6) of operational amplifier A_1 is biased by R_1 , R_2 , and R_3 to about half the power supply voltage, with negative feedback through R_4 . However, the audio-output signal is not taken from pin 6; instead, the audio output comes from pin 7, the V^+ terminal of the op amp. This output signal is inverted with respect to the normal amplifier output, so even though the audio-input signal from the microphone is fed into the inverting op-amp input terminal, the amplifier is actually noninverting. The gain (about 100) is determined by the ratio of R_1 and R_2 , which form the feedback network from the V^+ (audio-output) pin. The HA-911 op amp is used because its noise level ($8 \text{ nV/Hz}^{1/2}$, $0.35 \text{ pA/Hz}^{1/2}$) and gain-bandwidth product (8 MHz) are many times better than those of general-purpose op amps.

In the power module, op amp A_2 supplies about 12 V dc at 7 milliamperes through a 600-ohm termination to the cable; the dc power for the module can probably be obtained from the main amplifier. Instead of using the power module, the power for the preamp could be supplied to the cable through a passive choke in series with a dc supply, but 150 henrys would be required to obtain the same noise isolation from the dc line. \square



Two-way cable. Microphone cable carries power up to preamplifier and carries amplified signal down to main amplifier. Preamp, mounted at high-impedance microphone before long cable to preserve fidelity and suppress noise, is light and compact because its power is supplied through the cable, eliminating batteries. Although op amps are used in unconventional arrangements, performance is excellent.