

# Double rectification refines envelope extractor

by Thomas Henry

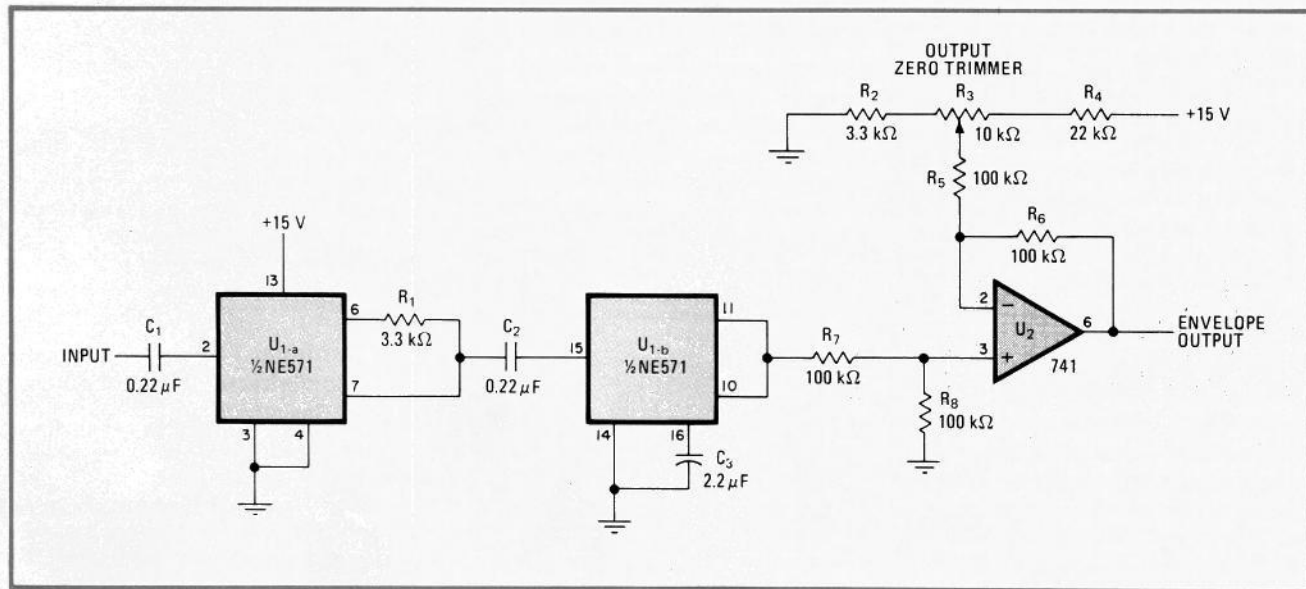
Transonic Laboratories, Mankato, Minn.

This design uses a double-rectification technique to get both a fast response time and low ripple from the circuits that extract the amplitude envelopes of complex input waveforms—circuits often used in electronic music, recording, and speech analysis. Since this design employs a

minimal number of components, it cuts design costs.

Through  $C_1$ , the input is capacitively coupled to the first rectifier,  $U_{1-a}$ . This output is fed to the second rectifier through  $U_{1-a}$ 's internal operational amplifier. To add a little gain to the signal,  $R_1$  is connected in this op-amp's feedback loop. After the second rectification, capacitor  $C_3$  filters the signal, superbly smoothing the rectified output. Since the rectified waveform is four times the input frequency, a low value,  $C_3$ , is sufficient.

Because the output contains a dc offset, trimmer  $R_3$  of operational amplifier  $U_2$  is adjusted to restore the output to its original level. For the components shown, the circuit provides a 1.5-v dc output from a 1.5-v peak-to-peak input. □



**Envelope follower.** This envelope extractor uses a double-rectification scheme to maintain a fast response time, while keeping output ripple to very low levels. Signetics NE571 provides the two rectifiers needed, capacitor  $C_3$  does the filtering, and potentiometer  $R_3$  nulls the output offset.