NOTES

An inexpensive white-noise and tone generator

M. MEINRATH and M. R. D'AMATO

Rutgers University, New Brunswick, New Jersey 08903

Texas Instruments recently developed an integrated circuit that can be used as a very economical white-noise and tone generator. The complex sound generator (SN76477) contains over a dozen internal functions for synthesizing complex sounds, ranging from futuristic ray guns to explosions, in a single 28-pin integrated-circuit package (Garner, 1978). For psychological researchers, however, the two most useful functions are a noise generator and a voltage-controlled oscillator.

The minimum circuitry for a general-purpose white-noise and tone generator is diagrammed in Figure 1. Switch 1 determines whether the circuit produces a tone (open) or white noise (closed). Switch 2 inhibits the output of the sound generator when closed and is used for pulsing either the tone or noise. By inhibiting the output at the source, sounds can be initiated and stopped without electrical transients. The sound generator can be remotely programmed to produce either continuous or pulsed white noise or tones by replacing the switches with SPST relays.

Using the component values specified in the parts list, the sound generator produces a reasonably good approximation of white noise and, depending upon the setting of R4, tones ranging from 500 to 5,000 Hz. However, the component values are not critical. The frequency spectrum of the noise generator can be raised or lowered by changing the value of R1. Similarly, the range of tones can be increased by substituting a larger potentiometer for R4 and R5. Alternately, the frequency of the tone can be modified by changing the time con-

Figure 1. Schematic diagram of a simple white-noise and tone generator circuit. All resistors are $\frac{1}{4}$ -W 10%.

Figure 2. Modifications of the circuit shown in Figure 1 to drive a single 8-ohm speaker.

stant of the RC network comprised of R3 and C1, which controls the frequency response of the voltage-controlled oscillator.

Because of its I^2L logic, the SN76477 chip requires a well-regulated +5 V dc at pin 15. However, if a 5-V power supply is not readily available, an internal voltage regulator supplies pin 15 with well-regulated 5 V from +7.5 to +10 V dc applied to pin 14. If the unit is not to be used for long periods, a 9-V battery is a convenient source of power.

The circuit in Figure 1 cannot drive a loudspeaker directly; an audio amplifier with an adjustable gain must be used (e.g., Radio Shack Micro-sonic amplifier-speaker, about \$11). In lieu of a separate amplifier, the modifications shown in Figure 2 will drive a single 8-ohm speaker. The output of this circuit is only loud enough for use in relatively small animal enclosures. Note that R7 from Figure 1 has been replaced by a potentiometer (R7A) in Figure 2. The potentiometer controls the speaker volume.

Construction of the noise and tone generator circuit is simple. The circuit is laid out on a perforated board with holes spaced .1 in. apart, which accommodates the pin placements on a 28-pin dual in-line socket. The components should be soldered to a socket rather than directly to the integrated circuit, as excessive heat will damage the chip. Otherwise, I^2L logic devices require no special handling and the placement of parts is not critical. The total cost of materials (less amplifier and speaker) is less than \$10.

REFERENCE

GARNER, L. Solid state: Chirp, jangle, woosh, bang. *Popular Electronics*, 1978, 14, 75-78.

(Accepted for publication June 10, 1979.)