BY JAMES BARBARELLO

Add Fuzz TO YOUR ELECTRIC GUITAR OR BASS

Solid-state fuzz box for interesting sound effects.

ELECTRIC guitarists often use special circuits to alter the sounds their instruments produce. One of the oldest but still most popular of these signal modifiers is the "fuzz box." A solid-state circuit, the fuzz box generates a sound like that produced by early, low-cost vacuum-tube power amplifiers. When one of these amps was overdriven, a distorted, but pleasing sound resulted. The fuzz box, when controlled by a foot pedal, allowed the guitarist to introduce some "fuzz" without interrupting his performance to turn up the amp's gain.

Many different fuzz box designs have appeared over the years. The project presented here, is a somewhat different sine-to-square-wave converter. It produces a substantial output signal, even when used with inexpensive instruments. Its "fuzz" effect is as prominent in the bass as in the midrange and treble. In addition to the standard distortion effects, the circuit can produce a raspier, but at the same time mellower, voicing. The circuit's wide range of available output levels allows the user to preset different levels for the rhythm and lead modes. The project is especially useful with electric bass guitars because it can generate many of the effects called for in today's music without sacrificing the bass's characteristic deep tones.

The circuit is simple, uses a small number of readily available components, and can be built for about $10.

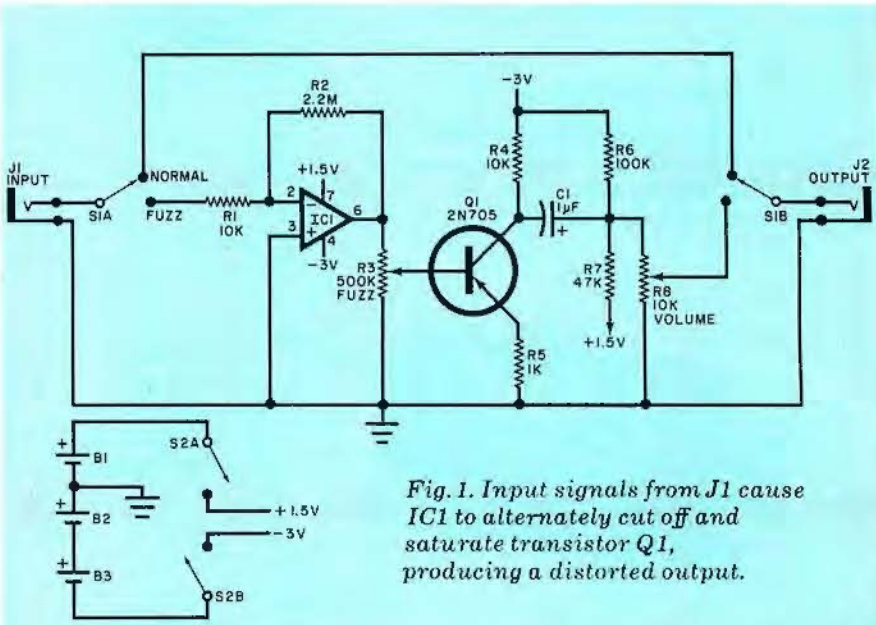

Fig. 1. Input signals from J1 cause IC1 to alternately cut off and saturate transistor Q1, producing a distorted output.

PARTS LIST

B1,B2,B3—1.5-volt AA, A, C or D cells
C1—1-µF, 16-V radial-lead electrolytic
IC1—741CV operational amplifier (Radio Shack 276-007 or equivalent)
J1,J2—¼-inch open-circuit phone jacks
Q1—General-purpose, high-beta pnp switching or audio transistor (2N705, Radio Shack RS-2005 or similar)
The following are ¼-watt, 10% tolerance fixed resistors:
R1,R4—10,000 ohms
R2—2.2 megohms
R5—1000 ohms
R6—100,000 ohms
R7—47,000 ohms
R3—500,000-ohm linear-taper potentiometer
R8—10,000-ohm linear-taper potentiometer
S1—Dpdt switch
S2—Dpst switch
Misc.—Printed circuit board, battery holders, hookup wire, suitable enclosure, knobs, pc board spacers, machine hardware, solder, etc.
Note—The following are available from BNB Kits, RD1, Box 241H, Tennent Rd., Englishtown, NJ 07726: etched and drilled pc board, #F-PC at $3.25; complete kit of parts including etched and drilled pc board, electronic components, jacks and switches, #F-E at $12.50. NJ residents add 5% sales tax.

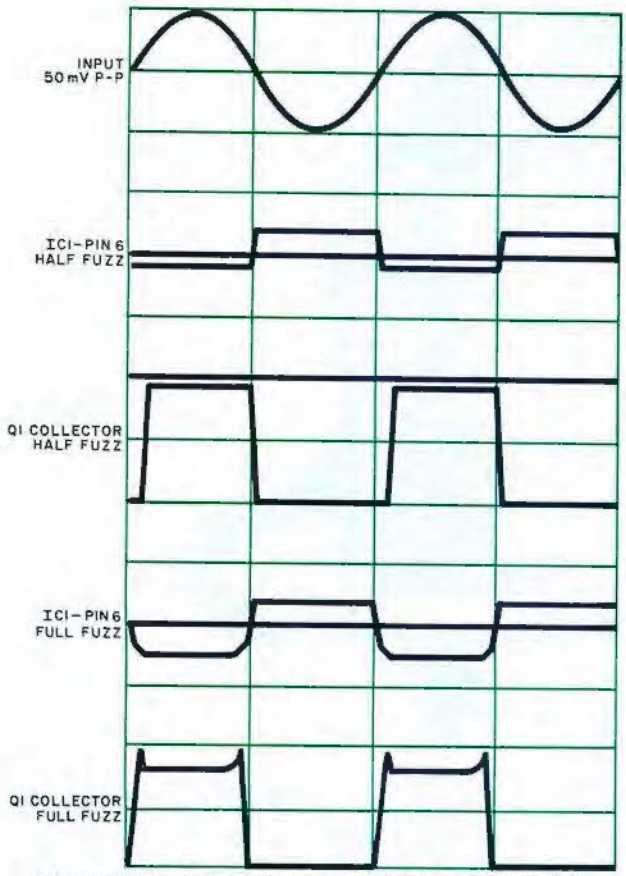

Fig. 2. Waveforms show effect of fuzz control R3. When it is set to pass maximum signal, the output waveform folds over and the sound is raspy.

About the Circuit. As shown in Fig. 1, input signals from the guitar pickup are routed by *S1* to the output jack or to inverting amplifier *IC1*, a standard 741 op amp. You might notice that the power supply voltages, furnished by series-connected AA penlight batteries, are lower than those normally used with this op amp. In this application, *IC1* is used solely to turn *Q1* on and off. The supply voltages employed allow the op amp to saturate at lower than normal input levels to produce the desired base drive for the transistor.

An input signal of about 30 mV produces ± 1 volt at the output of *IC1*, which is applied to the base of *Q1* through *R3*. A positive output from *IC1* causes *Q1* to cut off, and a negative output saturates the transistor. An ac signal will switch *Q1* between saturation and cutoff, thus producing a square-wave output from the circuit.

With *R3* adjusted so as to pass maximum signal to the base of *Q1*, *IC1* forward biases the base-collector junction of the transistor as the op amp's output goes negative. When this happens, *Q1* stops acting like an inverting switch (see Fig. 2) and passes the signal like a simple diode. The voltage at the collector then follows that at the base and, in effect, causes the signal waveform to "fold over" as shown in the bottom trace of Fig. 2. This signal is rich in harmonics and has a raspy, but mellow, sound.

Signals at the collector of *Q1* are ac coupled by *C1* to voltage divider *R6,R7*. Level shifting at this point presents a zero-volt signal to output level control *R8* in the absence of an input signal. This inhibits the generation of "popping" signal transients as the fuzz box is switched in and out of the signal path. The required supply voltages (+3 and −1.5 volts) are provided by three 1.5-volt batteries. Suitable for this application are AA, A, C or D cells.

Construction. Any assembly technique is acceptable, but a printed circuit board is perhaps the easiest and neatest way to reproduce the circuit. (See Parts List for availability of pc board and kit.) Suitable etching and drilling and parts placement guides are shown in Fig. 3. After the project has been wired and is operating, it can be housed in any suitable enclosure, including the electric guitar or bass. If you decide to put it in your musical instrument, keep the batteries accessible for replacement.

Checkout and Use. Connect your guitar or bass to the input jack and your amplifier to the fuzz box's output. Rotate the instrument's output level control for maximum signal and, with *S1* in its NORMAL position, adjust the amplifier's master volume control for a comfortable listening level. Set *R8* (VOLUME) for ⅓ rotation and *R3* (FUZZ) for ¾ rotation. Place *S1* in the FUZZ position and play the instrument, noting the sound produced. Rotate *R3* fully to hear a sound with increased "bite" or raspiness.

Next, adjust *R3* so that the wiper is at the midpoint of its travel and set the instrument's output level control for less signal until the following occurs. When a string is first plucked, a distorted output is heard. As the output level begins to decay, the distortion diminishes to the point where the instrument's sound is relatively unaltered. This is the characteristic distorted "tube" sound that inspired the original fuzz box.

Continue to experiment with different control settings. You'll doubtlessly discover many sounds that will add to your enjoyment of playing and the audience's listening pleasure. ◇

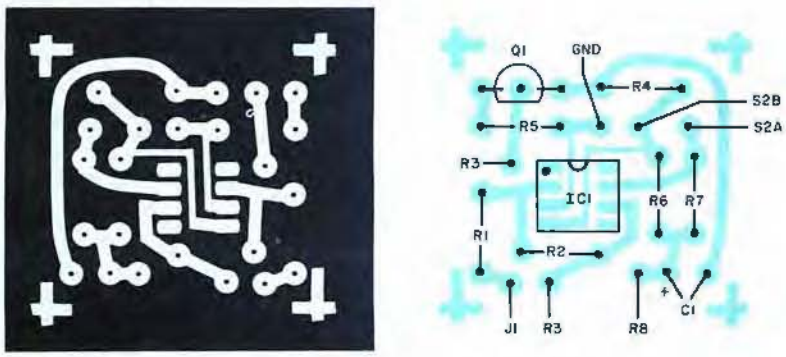

Fig. 3. Full-size etching and drilling guide for pc board is above left; component layout at right.