## THE THUMPA-THUMPA BOX

THE ELECTRIC GUITAR sounds best when accompanied by a tempo-setting, rhythm drum. Unfortunately, few amateur guitarists are lucky enough to find drummers who are willing to accompany them day and night. There are, however, electronic drummers that fill the bill nicely. If the $200-up price tags on commercially made electronic drummers do not appeal to you, try building the "Thumpa-Thumpa Box" for about $17.

The Thumpa-Thumpa Box, or TTB, employs low-cost UJT pulse-generator, divider and simplified "drum" circuits to produce a wide variety of percussion sounds. In fact, the TTB can duplicate most of the tricks of the expensive commercial electronic drummers—and a few that commercial units can't produce.

Just set the TTB's divider and rate controls, and you have automatic bass and wood-block accompaniment. If you are the adventurous type, you can even adjust the circuits so it sounds as if you are being accompanied by anything from a pot lid to J. Arthur Rank's gong!

**Construction.** Layout of the TTB circuit (see Fig. 1) is not critical; but, while any method of assembly will give acceptable results, a printed circuit board will go a long way toward guaranteeing a successful project. The printed circuit board can be obtained commercially (see Parts List), or you can etch and drill your own board by following the actual size etching guide shown in Fig. 2. In either case, mount the components on the board as shown, paying particular attention to the polarities of the electrolytic capacitors and lead orientation of the diodes and transistors. Also, when soldering the transistor and diode leads to the foil pattern, use a heat sink and a soldering iron rated at 35 watts or less.

The project can be assembled inside any metal enclosure that will accommodate the circuit board, battery, and controls. It is a good idea to decide on the locations of the components and drill the mounting holes first. Deburr the holes; then spray paint the cover or cover it with self-sticking vinyl, and just spray paint the front and back of the box.

Now mount the dual-AA-cell holder, jack, and potentiometers in their respective locations (see Fig. 3). Then mount four rubber feet to the bottom of the case.

Solder an 8" length of wire to the circuit board at locations A through H and the hole marked with a + sign. The completed circuit board should be the last item mounted inside the case. Use 4-40 machine hardware and ⅜"-long insulated spacers and make sure the holes in the rear of the case line up with *R28* and *R29*.

Connect and solder the free ends of the circuit board wires to the controls and *S1* as shown in Fig. 4, removing and discarding any excess wire as you go. Then finish wiring together the circuit, referring back to Fig. 1 as needed. Finally, slip the battery into its holder, use a dry-transfer lettering kit to letter the functions of the controls on the front panel, and assemble the case.

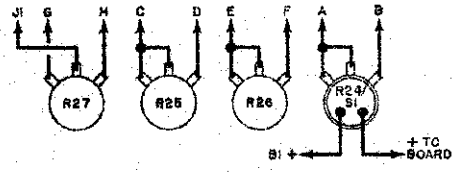



Fig. 4. Diagram shows the connections between pots and S1 lugs to lettered holes on circuit board.

**How to Use.** Connect a cable from the output jack of the TTB to the input of a hi-fi or instrument amplifier. Rotate the BALANCE control fully counter-clockwise, turn on the amplifier and TTB, and adjust the RATE control for a slow-tempo beat. Then rotate both DIVIDER controls fully clockwise.

Adjust the setting of *R23* for the most pleasing sound. Rotate the BALANCE control fully clockwise, and adjust the setting

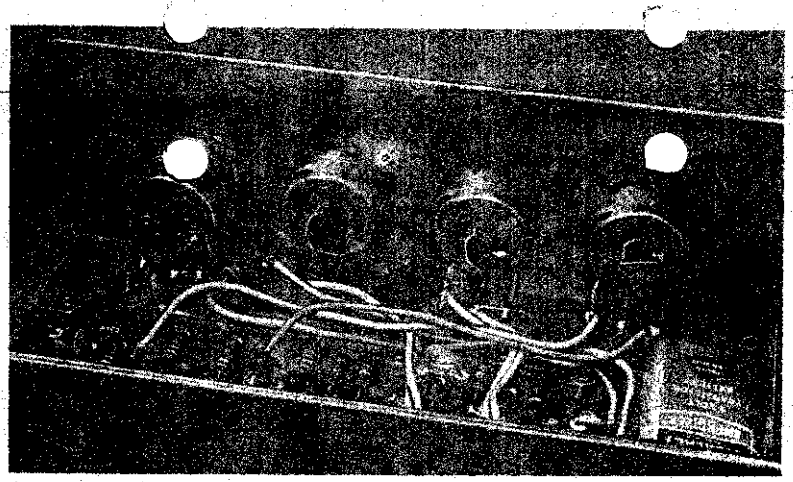
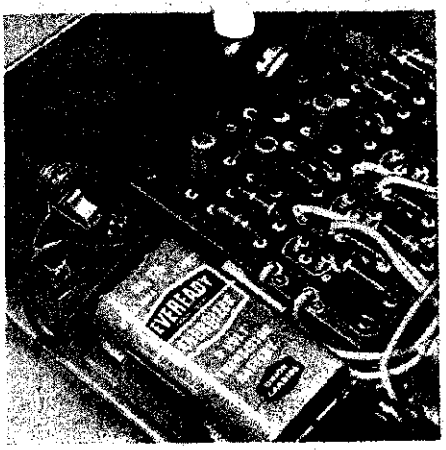
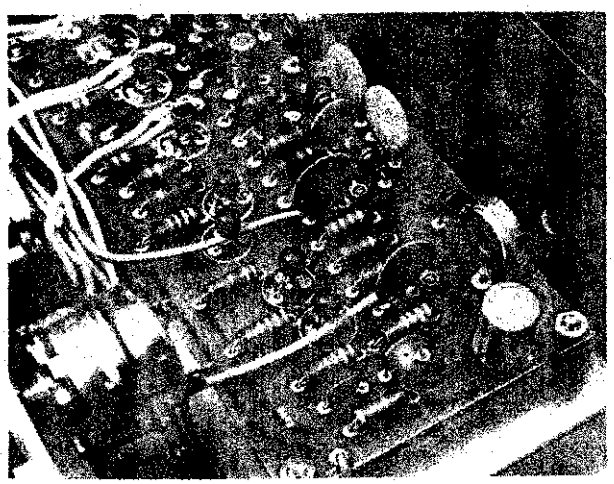


Fig. 3. All controls, except pots R28 and R29, are mounted on front panel. Battery holder and printed circuit board are mounted inside the chassis; use rubber feet on under side.




Battery can be conveniently mounted inside chassis with dual AA cell holder; use a conventional snap-on connector. Holes drilled directly in line with R28 and R29 (see top center of photo) provide access for tuning bass and woodblock oscillators. Mount output jack on rear.



Bolt assembled circuit board to chassis via short spacers and #6 hardware. Note proper method of neatly dressing hookup wires.

of *R29* for the most pleasing sound. Now rotate the BALANCE control back and forth to make sure the mixing, or balancing, action takes place.

In operation, the DIVIDER controls are used to produce the rhythm pattern desired. Tempo can be set by adjusting the RATE control. The BALANCE control is used to accentuate your choice of either bass or wood-block sounds. (Once *R28* and *R29* are set, they do not need to be touched again.)

A final note: the cover of the TTB case is held in place by the pressure of the sides against the front and rear of the box. However, if the TTB is to be subjected to rough handling, it is a good idea to bolt the halves of the case together with the aid of four L brackets. The mounting screws for the rubber feet can be used to anchor the brackets to the bottom of the case, and self-tapping sheet metal screws can be used to bolt the top to the brackets. -30-

## HOW IT WORKS

The Thumpa-Thumpa Box consists of five basic sections: a pulse generator, two frequency dividers, and two ringing oscillators. As shown in Fig. 1, unijunction transistor *Q1* and its associated components make up a simple relaxation oscillator that serves as the "clock" generator for the system.

With *S1* closed, *C1* charges up through *R1* and *R24*. When the potential across the capacitor exceeds the threshold of *Q1*, the UJT fires and allows *C1* to discharge rapidly and produce a voltage spike across *R3*. The rate of charge and discharge, or frequency, of the clock generator can be varied by changing the setting of *R24*.

Each clock pulse does several things simultaneously. First, it triggers the ringing oscillator formed by *Q4* and *Q5* to produce a tone similar to that of a bass drum. Second, it is coupled through potentiometers *R25* and *R26* to deposit charges on *C2* and *C3*, respectively. Diodes *D1* and *D2*, normally reverse biased, prevent the charges from leaking off.

The amplitudes of the charges across *C2* and *C3* increase with each successive pulse from the clock generator. At some point during the voltage build-up, *Q2* and *Q3* fire, either simultaneously or independently, and rapidly discharge *C2* and *C3*, respectively. The resulting pulses that appear across *R5* and *R7* are then coupled to the base of transistor *Q6* in the "wood-block" oscillator. (Potentiometers *R25* and *R26* can be varied independently so that frequency dividers *Q2* and *Q3* fire at different rates to produce a wide variety of syncopated rhythms.)

The wood-block (*Q6* and *Q7*) and bass (*Q4* and *Q5*) oscillators are almost identical, each being composed of common-emitter gain and emitter-follower buffer stages. Feedback for the individual oscillators through the parallel-T filters (shown below each pair of transistors) is such that the amplifier is held just below the point of oscillation.

When a pulse is coupled to the input of either of these two oscillators, the circuit immediately breaks into a rapidly decaying oscillation. So, by properly selecting the gain of the amplifier and time constants of the parallel-T networks, the period and decay of the oscillating signals can be made to simulate the sound of practically any percussion instrument.

The output of the Thumpa-Thumpa Box is fed to an external amplifier. And potentiometer *R27* serves as a balance control to provide the desired mixture of bass and wood-block beats.

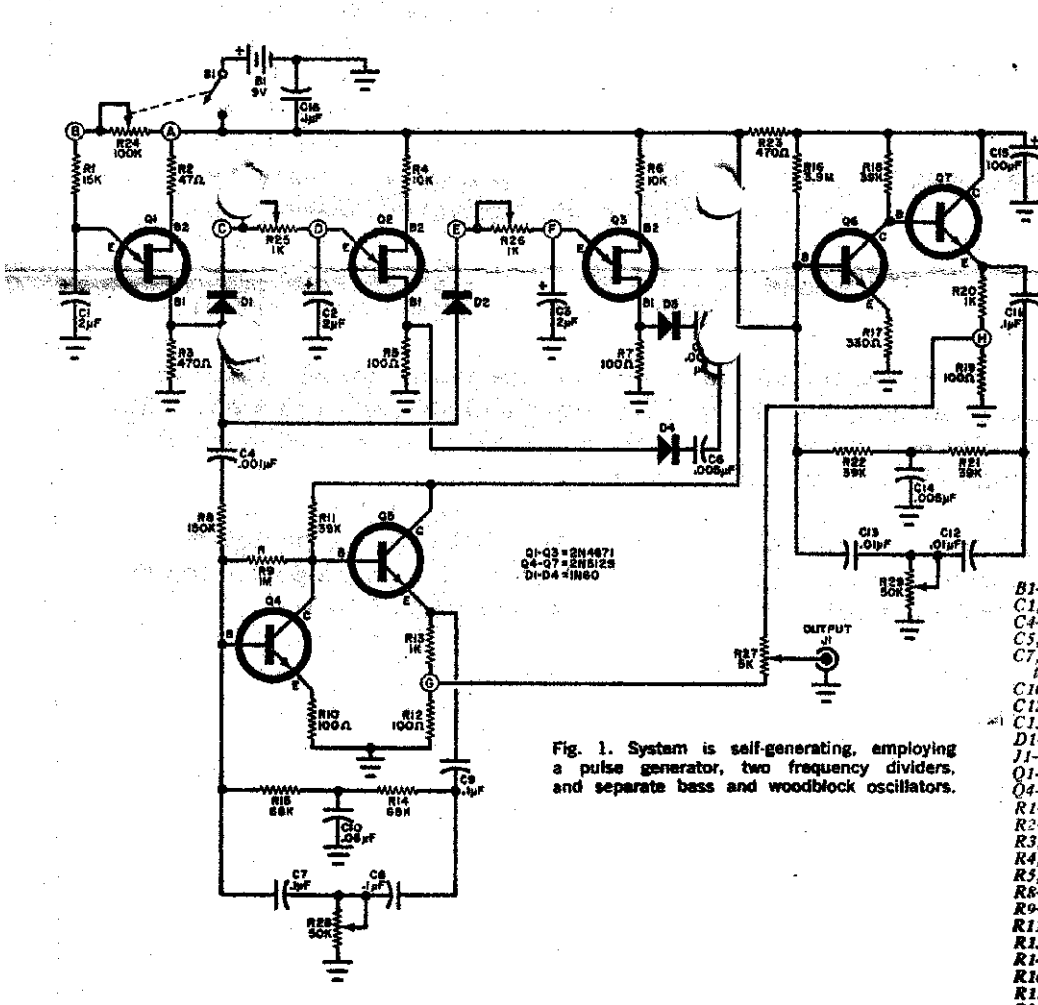
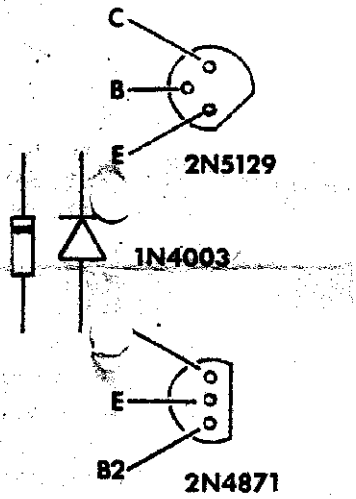



Fig. 1. System is self-generating, employing a pulse generator, two frequency dividers, and separate bass and woodblock oscillators.




## PARTS LIST

*B1—9-volt transistor battery*
*C1,C3—2-μF, 6-volt electrolytic capacitor*
*C4—0.001-μF ceramic disc capacitor*
*C5,C6,C14—0.005-μF ceramic disc capacitor*
*C7,C8,C9,C11,C16—0.1-μF ceramic disc capacitor*
*C10—0.05-μF ceramic disc capacitor*
*C12, C13—0.01-μF ceramic disc capacitor*
*C15—100-μF, 10-volt electrolytic capacitor*
*D1-D4—1N60 diode*
*J1—Miniature phone or standard phono jack*
*Q1-Q3—2N4871 unijunction transistor*
*Q4-Q7—2N5129 bipolar transistor*
*R1—15,000-ohm*
*R2—47-ohm*
*R3,R23—470-ohm*
*R4,R6—10,000-ohm*
*R5,R7,R10,R12,R19—100-ohm*
*R8—150,000-ohm*
*R9—1-megohm*
*R11,R18,R21,R22—39,000-ohm*
*R13,R20—1000-ohm*
*R14,R15—68,000-ohm*
*R16—3.9-megohm*
*R17—330-ohm*
*All resistors ½-watt, 10%*
*R24—100,000-ohm, linear-taper potentiometer*
*R25, R26—1000-ohm, linear-taper potentiometer*
*R27—5000-ohm, linear-taper potentiometer*
*R28, R29—50,000-ohm, linear-taper "trim-pot"*
*S1—S.p.s.t. switch (part of R24)*
*Misc.—Metal chassis case; printed circuit board; battery holder; battery connector; control knobs (4); rubber feet; #6 machine hardware; hookup wire; solder; etc.*

TTB CONSTRUCTION NOTES

Please note that sturdier 1N4003 diodes have been substituted for the 1N60's called for in thePopular Electronics parts list.

Before soldering any components in place please thoroughly clean the conductor side of the circuit board with steel wool. Use a low wattage iron ( 35 watts max. ) when installing semi-conductors and heat sink all transistor and diode leads with needle nose pliers while soldering.

Resistor color coding is as follows:

| | | |
|---|---|---|
| R1 | 15K | brown-green-orange |
| R2 | 47 ohm | yellow-violet-black |
| R3, R23 | 470 ohm | yellow-violet-brown |
| R4, R6 | 10K | brown-black-orange |
| R5, R7, R10, R12 & R19 | 100 ohm | brown-black-brown |
| R8 | 150K | brown-green-yellow |
| R9 | 1 meg | brown-black-green |
| R11, R18, R21, R22 | 39K | orange-white-orange |
| R13, R20 | 1,000 ohm | brown-black-red |
| R14, R15 | 68K | blue-grey-orange |
| R16 | 3.9 meg | orange-white-green |
| R17 | 330 ohm | orange-orange-brown |

If you should experience trouble a repair service is available. Charges ordinarily run about $3.00 plus any parts used and shipping charges. Kits are returned COD with an explanation of the problem found. Please write ahead for repair address and shipping instructions.

A space is not provided on the circuit board for C16. In the prototype two of the soldering lugs on the battery clip were used as tie points for the leads coming from the battery connector and the leads of C16.