ADD A "TICK-TOCK" TO YOUR DIGITAL CLOCK

Give your modern clock a familiar sound.

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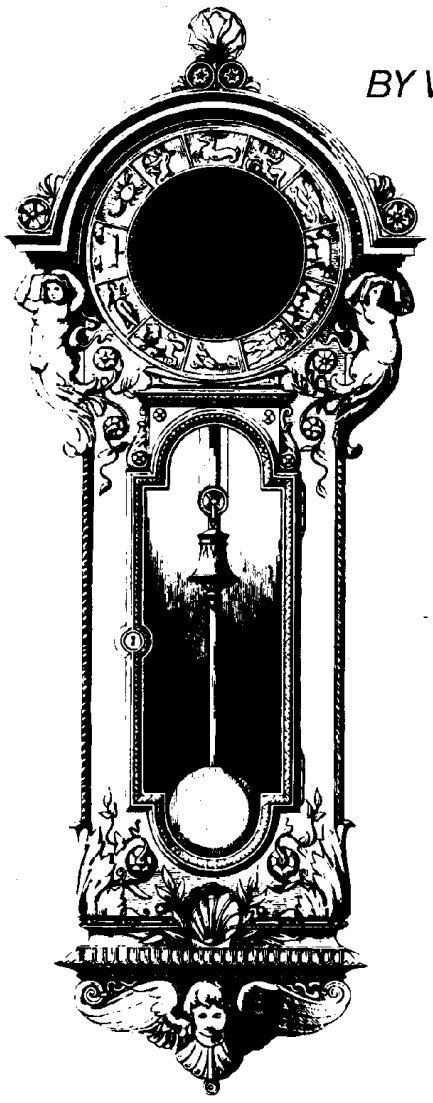

MODERN digital clocks keep very accurate time and make a fine addition to most living rooms. In fact, digital timepieces in the shapes of grandfather clocks are now available. Some of these even have a moving pendulum (made from LED's) to further enhance their appearance. About the only thing missing from these clocks is the familiar "tick-tock" sound.

If your digital clock has a LED pendulum, or a source of 1-Hz logic signals somewhere in its circuit, this project will add a nice touch to its operation.

The inputs to this project are buffered CMOS for negligible circuit loading, and the small amount of power required is easily supplied by the clock's power supply.

The basic circuit, shown in Fig. 1 is for CMOS and TTL approaches.

Circuit Operation. If your clock has a LED pendulum, one LED (usually the leftmost one) is designated the "tick" LED while the one on the right end is the "tock" LED. If the pendulum timing is conventional, these LED's will light alternately at 0.5-second intervals.

The individual tick and tock inputs are buffered by *IC1D* and *IC1E* then differentiated by *R3C2* and *R5C3* to produce two narrow pulses with the tock pulse a little wider than the tick pulse and lagging by 0.5 second. These alternate pulses are gated into two parallel-connected buffers. *IC1A* and *IC1F*, and used to drive transistor *Q1*. This transistor drives a small loudspeaker. Because of the narrow pulses, the average current through *Q1* and the speaker is small. The instantaneous current through *Q1* and the speaker is limited by the inductive reactance of the speaker voice coil to fast pulses.

The various alternate positions shown in the schematic, along with *IC1B*, are used to reverse the polarity of the differentiators and the diodes so that they can respond to either positive- or negative-going input pulses. When *IC1C* is used with a common 1-Hz input signal, the tick differentiator triggers the high level of the input signal while the tock differentiator triggers the low level.

The resulting output pulses from *Q1* sound surprisingly like the familiar tick-tock of an old-fashioned grandfather clock. The volume control (*R6*) can be used to reduce the level to that of a pocketwatch.

Interfacing. The drive signals to the LED's on the electronic pendulum will be

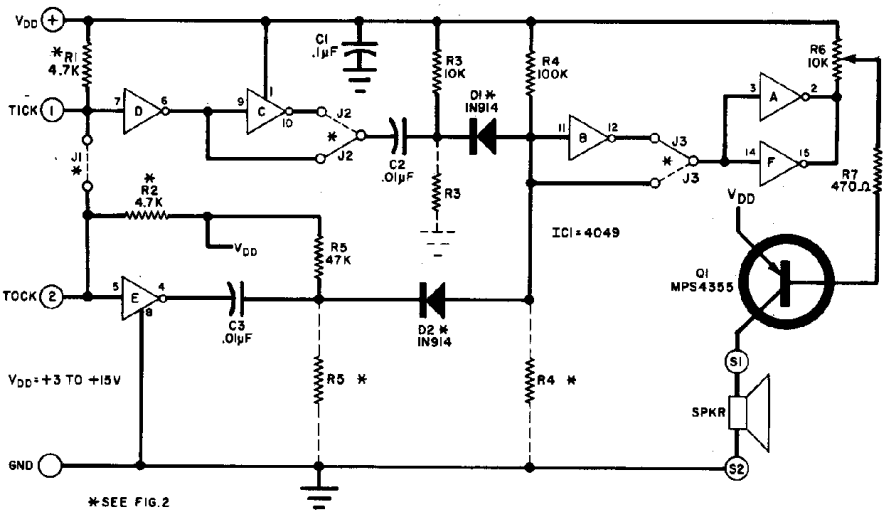

Fig. 1. Schematic of tick-tock circuit also shows alternate connections for different inputs.

PARTS LIST

C1—0.1-µF disc ceramic capacitor
C2, C3—0.01-µF, disc ceramic capacitor
D1, D2—1N914
IC1—4049B hex inverter (CMOS)
Q1—MPS4355 or similar
The following are ¼-watt, 10% resistors unless otherwise noted:
R1, R2—4700 ohms (see text)
R3—10,000 ohms
R4—100,000 ohms
R5—47,000 ohms
R6—10,000-ohm trimmer potentiometer (Radio Shack No. 271-218 or similar)
R7—470 ohms
SPKR—1½" to 2½" 8-to-10-ohm speaker
Misc.—Socket (optional), hookup wire, mounting hardware, etc.

Note: The following is available from CM Circuits, 22 Maple Ave., Lakawana, NY 14218: etched and drilled pc board at $3.00 plus $0.50 postage and handling. NY state residents, please add sales tax.

	INPUT WAVEFORMS	FOR TTL CLOCK ONLY	POSITION OF * PARTS
1	TICK / TOCK	R1, R2	FIG. 3A
2	TICK / TOCK	R1, R2	FIG. 3B
3	TICK / TOCK, .5S .5S	J1, R2	FIG. 3B +J1

Fig. 2. Three approaches to parts usage and wiring for different inputs and clock types.

either a 1 or a 0. The tick-tock project will accept either one. If the drive signals are logic 1, use the approach shown in row 1 in Fig. 2. If the signals are logic-0, use approach in row 2 of Fig. 2.

If your clock does not have a pendulum, and you can locate a 1-Hz logic signal in your circuit, use row 3 of Fig. 2.

The input logic signals can vary from +3 to +15 volts as long as the project is powered from the clock supply.

Construction. The actual-size pc board shown in Fig. 3 will accommodate either of the three variations of construction. Note that jumper *J1* is used only for the approach in row 3, while jumpers *J2* and *J3* are used in accordance with the parts placement guides.

If you have a TTL clock, pull-up resistors *R1* and *R2* are required at the inputs. When *J1* is used with row 3, only *R2* is used. Note the alternate placement of some resistors and diodes and follow Fig. 2 for particular input signals.

If desired, a socket may be used for *IC1*, and any method of construction can be used. ◇

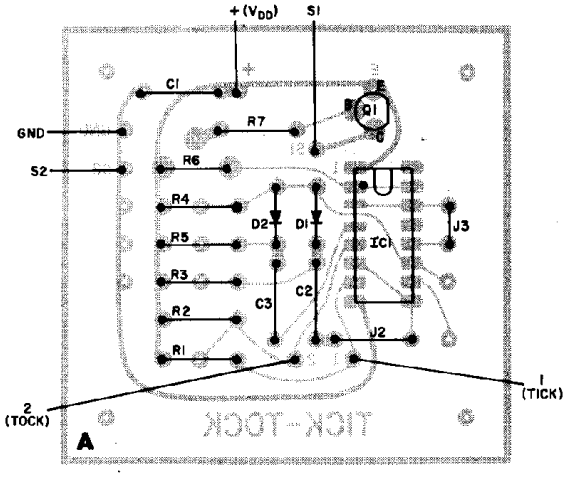

Fig. 3. Etching and drilling guide for pc board is shown below. At (A) is component arrangement for row 1 in Fig. 2. Use (B) for rows 2 and 3 in Fig. 2. Note J1 is used only for row 3 of Fig. 2.