Q & A

READERS' QUESTIONS, EDITORS' ANSWERS

Pinball Wizard Correction

Contrary to what we said in the May 1998 installment of "Q&A," the fine folks at Two Bit Score, Austin, Texas, do NOT repair, or supply parts for, Gottlieb pinball games. They do service most of the other leading makes. For more information see their web site at www.twobit.com. If anyone knows of a supplier of Gottlieb parts, do please let us know.

Dawn Simulator

Q *I would like to have a 120-volt AC circuit controlled by a clock radio so that when the clock switches the radio on, a 100-watt bulb will start very dim and brighten over a period of about 30 seconds. — F. P., Orland Park, IL*

A What you want is called a "dawn simulator" and is sometimes used to treat sleep disorders; it's a very gentle, natural way to wake a person up. Some dawn simulators take as long as 30 minutes (not 30 seconds) to bring the lights up to full brightness.

As you know, a light dimmer works by cutting off part of each AC cycle. This is done by triggering a Triac (AC switch) after part of each cycle has already passed by. The best way to build a dawn simulator would be to use a microcontroller to compute the exact time delay during each cycle, changing it slowly over a period of minutes. If there's sufficient interest, we might develop this as a construction project later; it would provide very smooth, reliable operation.

In the meantime, Fig. 1 shows an all-analog circuit that you can build. It's a modernized version of a circuit originally published by General Electric that used a unijunction transistor and a pulse transformer, both of which are hard to get nowadays.

Diodes D1-D4, resistor R1, and diode D5 produce a pulsating DC waveform clamped to 15 volts; almost a square wave. From that, the circuit derives two more waveforms, a sawtooth across C1 and a slowly rising voltage across C2. Those are combined, amplified by Q1 and Q2, and then used to control the Triac (TR1) through an optocoupler.

Switch S1 lets you start the timing cycle over again—a necessity while you are testing the circuit. The circuit is somewhat tricky, and you should breadboard it before building the final version. Adjust R4 so that the light bulb just goes off when S1 is pressed; you'll find that R4 affects the behavior of the circuit quite a bit. Change C2 to change the timing period; for a true dawn simulator, you may want to make C2 as large as 3200 mF. Use a smaller value while experimenting so you don't have to wait half an hour to see what's going to happen.

Most of the other parts aren't critical.

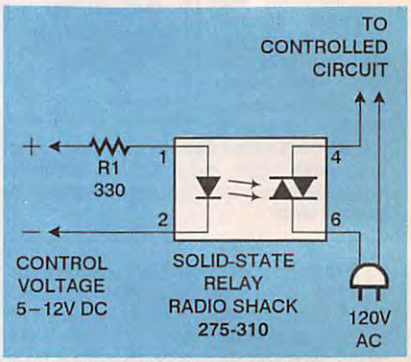

FIG. 2—USE THIS APPROACH TO INTERFACE the dawn simulator with a clock radio. The leads marked "Control Voltage" go across the capacitor in the radio circuit as described (see text), while the leads marked "To Controlled Circuit" go to the AC input of the simulator.

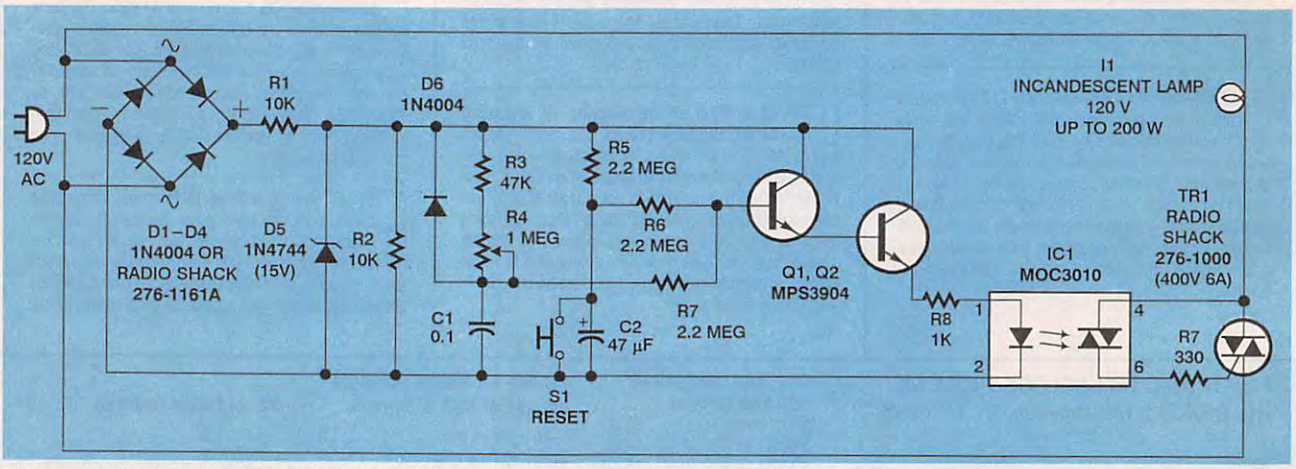

FIG.1—WHILE THE BEST APPROACH WOULD BE TO USE A MICROPROCESSOR, this all-analog circuit will fill the bill. It is a modernized version of a "dawn-simulator" circuit originally published by General Electric.