

## BACK-AND-FORTH SEQUENTIAL FLASHER

THIS IS the first in a planned series of monthly additions to the "Experimenter's Corner"—the "Project of the Month." Many different projects of an experimental nature, using a variety of circuits and construction methods, will be described in future issues.

This first project was suggested by reader Al Rieke of Santa Isabel, Puerto Rico. Al writes that he's familiar with circuits that sequentially flash each LED in a row in one direction only. But he's not been able to find a back-and-forth sequential flasher in his ten-year collection of back issues of POPULAR ELECTRONICS.

The circuit that should solve Al's problem is shown in Fig. A. A 555 timer connected as an astable multivibrator supplies clock pulses to a 74193 4-bit (0000-1111) up/down counter through a pair of gates in a 7400. The output from the counter is fed into a 74154 decoder that lights one of 16 LED's.

The inputs of an RS flip-flop (or latch) made from the remaining two gates in the 7400 are connected to the 0 (0000) and 15 (1111) outputs of the decoder. This provides electronic limits that switch the counter between its *up* and *down* modes as it

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reaches its upper (1111) and lower (0000) limits. The actual switching is accomplished by steering the clock signal to either the up or down input through the first two gates according to the status of the latch's outputs.

Front and back views of a Wire-Wrapped prototype version of the circuit are shown in the photos. The prototype was assembled on a 4-x-8.5-cm rectangle of perforated board with copper solder pads and bus strips (Radio Shack 276-152 or similar cut to size).

Note how *R1*, *R2* and *C1* (a miniature tantalum capacitor) are inserted in the unused portion of the 555's socket. Not having a 24-pin, Wire-Wrap socket handy, I

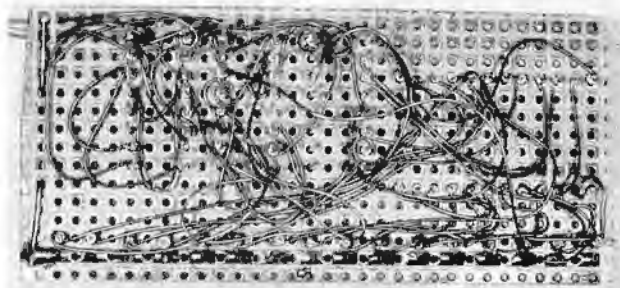
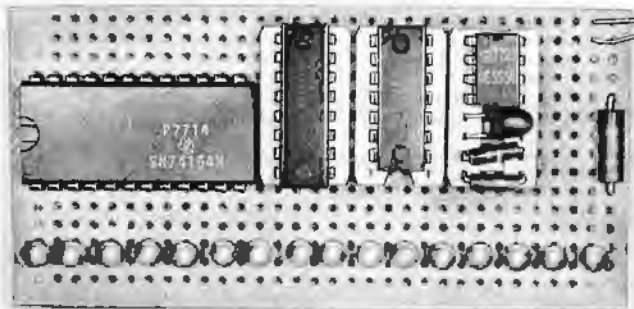
wrapped wires directly to the pins of the 74154 without any problems. The anodes of the LED's were soldered to a common bus strip. All other connections were made with wrapped wire.

You can change the speed of the moving dot display by substituting a 1-megohm potentiometer for *R1*. Mount the LED's in various configurations for special effects. When arranged vertically, the column of LED's becomes a "bouncing ball" display. When arranged horizontally, it can be called a "Ping-Pong" or "pendulum" display. For a more realistic pendulum effect, mount the LED's in an arc.

An interesting way to simulate the swing of a *real* pendulum is to replace *R1* with a high dark resistance cadmium sulfide photocell and place the cell near the center of the display. The room lights should be dimmed.

The resistance of the cell is *decreased* by the presence of light, and this *increases* the clock speed. Therefore the moving dot will speed up as it passes by the cell and slow down at either end of its "swing."

The photocell can also be used to simulate a bouncing ball. (Can you figure out how to do it?) Both applications provide interesting experiments in mechanical simulation and optoelectronic feedback, so try them after you assemble the circuit. ◊



Photos of the front and back of the prototype project show how Wire-Wrapped connections were used. It was assembled on perforated board with copper solder pads and bus strips.

Note: The Project of the Month is planned as a regular feature of the Experimenter's Corner. This "Back-and-Forth Sequential Flasher" circuit is the first.

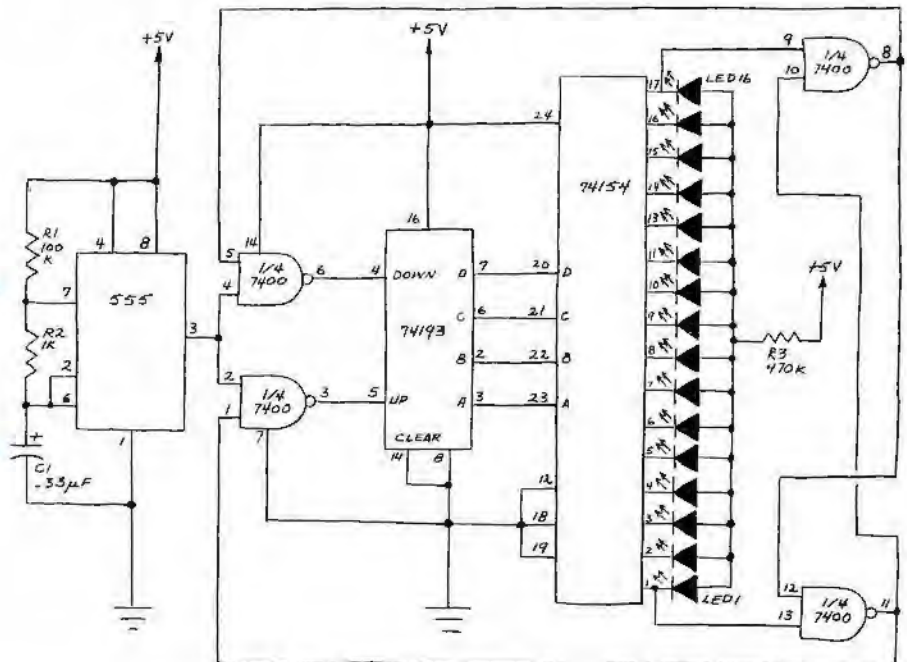


Fig. A. Schematic of the flasher circuit. A 555 used as a multivibrator supplies clock pulses to a counter.