Experimenter's Corner

By Forrest M. Mims

THE 556 DUAL TIMER

IF THERE'S anything better than the popular 555 timer, it's the 556 dual timer. The 556 is two 555's on a single chip packaged in a 14-pin DIP. The pin outline of this versatile chip is shown in Fig. 1. Either or both halves of the 556 can be used for all the standard 555 applications. This month, we'll look at several that use two 555's and are therefore ideally suited for the 556.

Fig. 1. Pin outline of the 556 timer.

Tone-Burst Generator.
Figure 2 shows a circuit for a tone-burst generator using a single 556 dual timer. The first half of the 556 is connected as a monostable multivibrator (one-shot) whose timing period is controlled by R1 and C1. The second half of the 556 is connected as an astable (free-running) multivibrator which produces an audio tone with a frequency governed by R2, R3 and C4.

Normally the speaker is quiet; but when pushbutton switch S1 is pressed, the one-shot begins its timing cycle while simultaneously activating the tone generator. The tone continues until the one-shot's timing cycle is complete. The result is a tone burst which you can use for signaling, alarms, electronic music, and other effects.

You can experiment with the various timing and frequency-controlling components (R1, C1, R2, R3 and C4) to produce different sound effects. Remember that you're looking for a tone which continues after S1 is released, so adjust R1 until this occurs.

Dual-Action Timer Circuit.
The maximum time delay of a single 555 timer is limited to ten or fifteen minutes unless you use an expensive low-leakage timing capacitor. The 556 dual timer makes it easy to double the time delay of a single 555 by connecting the output of the first chip to the input of the second. After the first timer completes its timing cycle, it triggers the second timer.

A timer using this principle is shown in Fig. 3 where R2 and C1 determine the time delay of the first timer and R3 and C4 determine the delay of the second timer. The output of the first timer is coupled to the input of the second by C5.

Operation of the circuit is straightforward, and you should easily be able to generate time delays of more than twenty minutes. Though Fig. 3 shows potentiometers for R2 and R3, you can use fixed resistors if you prefer. The potentiometers, of course, are handy for altering the delay of each half of the timer.

You can also use a range of values for C1 and C4. Naturally, large-value capacitors will give long time delays; but if you only need a delay of a few minutes or so, you can use less costly units.

Finally, though the main purpose of this circuit, which I've borrowed from Signetics, is to extend the time delay of a single 555, you might want to take advantage of the first timer's output, too. Lots of interesting sequencer applications are possible since each timer can be adjusted for a different timing period.

Extra-Long Time-Delay Circuit.
A neat way to increase the time delay of a single 555 by a factor of ten is to connect a low-cost TTL decade counter like the 7490 to the basic timer circuit. This trick can provide time delays of up to a few hours—even more if you use a high-quality timing capacitor.
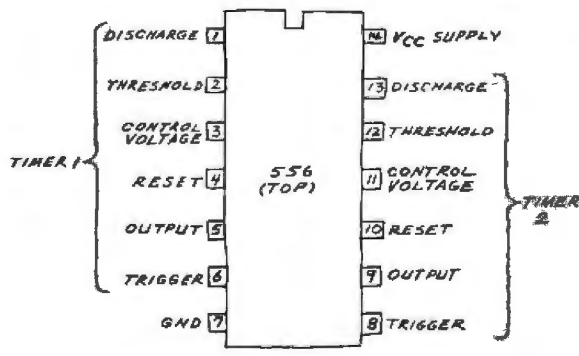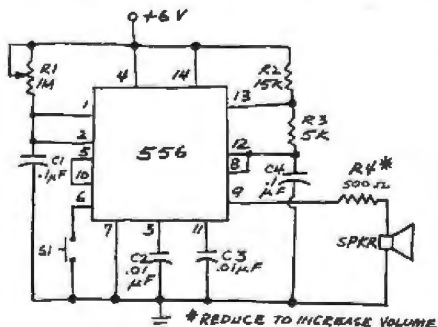

Fig. 3. Dual-action timer circuit using the 556 IC.

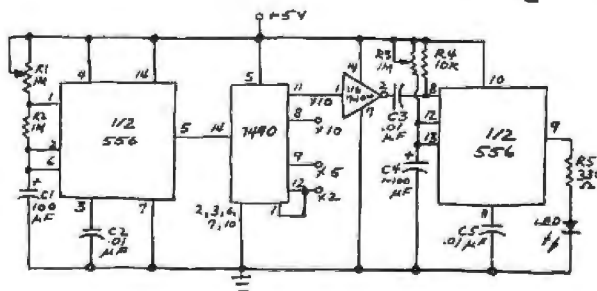
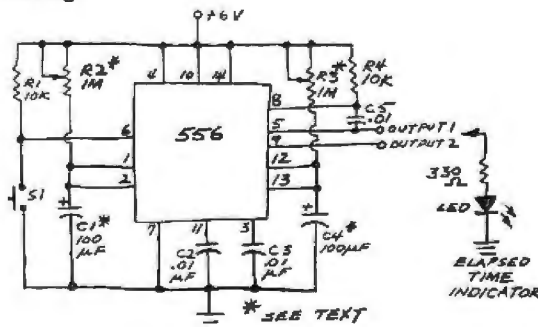Fig. 2. Tone-burst generator.

Fig. 4. Extra-long time delay circuit.

Operation of this circuit is made possible by the divide-by-ten operation of the 7490. The 7490 simply counts input pulses from the 555 until ten have been received. It then produces an output pulse of its own.

It's possible to connect the divide-by-ten output of the 7490 directly to an elapsed-time indicator such as an LED or audio oscillator. A better approach, however, is to connect a second 555 hooked up as a one-shot to the 7490. The one-shot is easy to adjust, and it will turn on the elapsed-time indicator for a fixed length of time. This is a handy feature if you want to use a bell or buzzer as an elapsed time indicator since the second 555 will trigger a quick burst of sound instead of a continuous noise.

Figure 4 shows how everything is connected together. A single 556 takes the place of the two 555 timers. One of the inverters in a 7404 hex inverter complements the output signal from the 7490 to provide the proper triggering potential. If you don't have a 7404 handy, use one of the gates in a 7400 quad NAND gate. Connect the two inputs of one gate together to form the inverter's input. (For example, connect pins 1 and 2 of the 7400 to pin 11 of the 7490. Connect pin 3 of the 7400 to pin 8 of the 556. Connect pins 14 and 7 of the 7400 to the positive and ground connections, respectively.)

The extra long timer circuit has several features you'll want to tinker with. First, note that potentiometer R1 sets the delay time while potentiometer R3 sets the on time of the elapsed time indicator. I used an LED for the elapsed-time indicator in the prototype circuit, but you can use a relay if you prefer (Radio Shack 275-004 or equivalent).

Second, note that the 7490 has *four* outputs. Both pins 11 and 8 will provide a time delay ten times that of the first 555 (one pulse out for every ten pulses in). Pin 9 will provide a time delay five times that from the 555. And pin 12 will provide twice the delay available from the 555.

Finally, if you want *really* long delays, you might consider connecting one or more additional 7490 decade counters in series with the first. Just connect pin 11 of the first 7490 to pin 14 of the second 7490. Pin 11 of the second 7490 goes to still another 7490 or to the inverter. Incidentally, note that this circuit is a repetitive, free-running timer. In other words, it begins a new timing cycle immediately upon completion of the first. Keep this in mind if you decide to tinker with super-long time delays.   ◇