Generating tone bursts with only two IC timers

by L. W. Herring
LWH Associates, Dallas, Texas

With very few external components, two IC timers can be made to function as a tone-burst generator that is useful for radio and telephone applications. In the circuit shown here, one timer controls the tone burst, and the other generates its frequency.

Normally, a tone-burst generator is built with three timers, two being required for the control function. Although a single timer in its delay mode could provide the initial time period, the second timer is required to generate the burst length and reset the first timer. Alternatively, in the astable mode, a single timer's output duty cycle could be adjusted for the quiet and burst periods, except for one thing—the time to the first burst would be almost twice as long as the time to subsequent bursts because the initial charging period of the timing capacitor is longer than later periods.

Nevertheless, a single timer can in a sense be fooled into providing the control function on its own if an RC network (resistor R_2 and capacitor C_2 in the figure) is added to the timer's ($TIMER_1$) threshold and trigger inputs. Of course, the larger primary timing network (resistor R_1 and capacitor C_1 in the figure) remains connected to the timer's discharge circuit.

$TIMER_1$ is set up as an astable oscillator. But its threshold inputs are kept high by the additional RC network (R_2 and C_2) for longer than it takes the timer's discharge circuit to completely discharge the main RC network (R_1 and C_1). This assures that the output period of $TIMER_1$ remains almost constant, no matter if the burst is the first one or the last one.

The period that $TIMER_1$'s output remains high can be approximated by the standard equation for delay-mode operation:

$$T_{on} = 1.1R_1(C_1 + C_2)$$

The burst output time (when the output is low) can be adjusted to the desired value by the R_2C_2 network. This period is approximated by the equation for astable-mode operation:

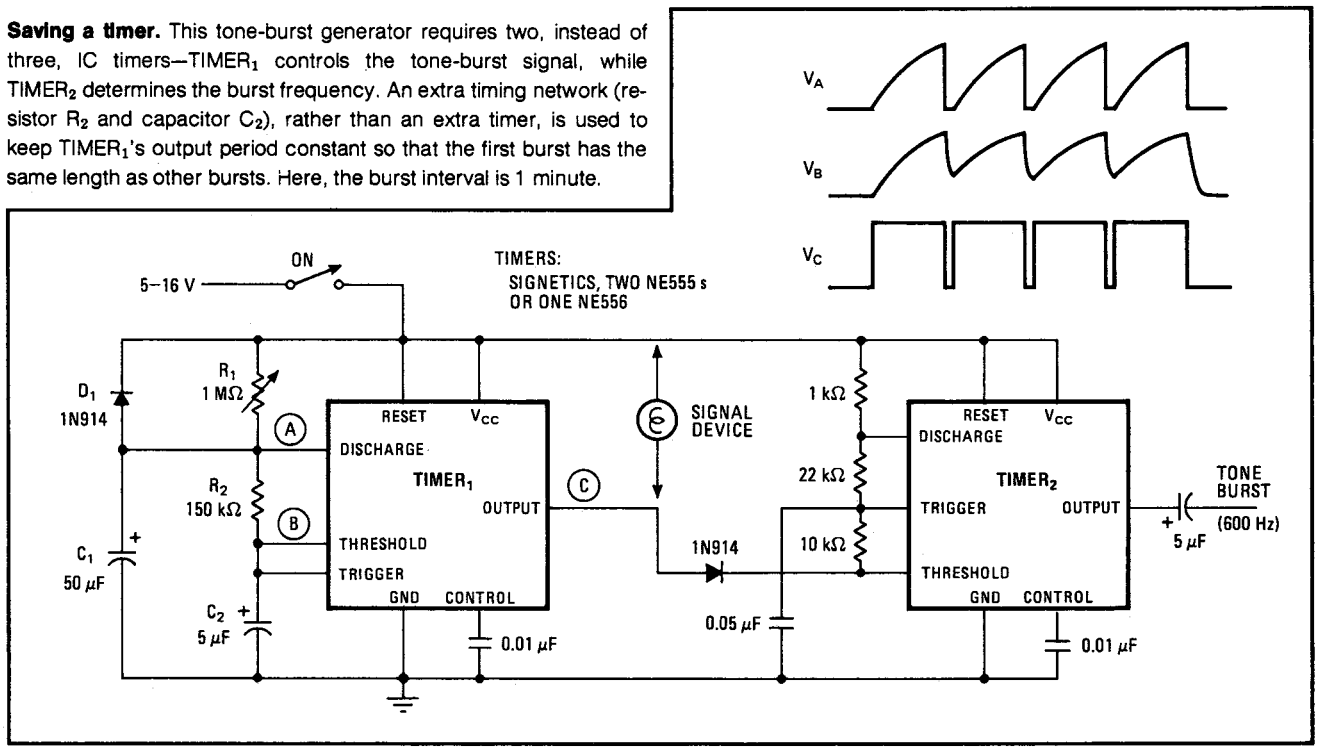
$$T_{off} = 0.693R_2C_2$$

When the added time period (burst length) approaches or exceeds the main time period, the two timing networks interact.

For this circuit, the output of $TIMER_1$ remains high for 1 minute and goes low for a half second. The best way to activate the circuit is to switch the V_{CC} supply lead for the entire circuit. Diode D_1 assures that capacitor C_1 will be discharged after any partial periods.

The control timer ($TIMER_1$) can provide the output for a lamp, bell, buzzer, or other signaling device. (This timer's output must be used to sink the signaling device, which must also be wired to the supply line.) $TIMER_2$ operates as the tone oscillator, determining the frequency of the tone burst. The manner in which $TIMER_2$ is keyed eliminates the need for an intermediate device to invert the output of $TIMER_1$ to operate the reset lead of $TIMER_2$.

This simple tone-burst generator can be used as an audible timing reminder for long-distance telephone calls or for radio repeaters that have 3-minute shutdown timers. The same arrangement can be used to generate sampling pulses for a sample-and-hold circuit or for a serial-to-parallel data converter for Ascii-character detectors. □



Saving a timer. This tone-burst generator requires two, instead of three, IC timers—$TIMER_1$ controls the tone-burst signal, while $TIMER_2$ determines the burst frequency. An extra timing network (resistor R_2 and capacitor C_2), rather than an extra timer, is used to keep $TIMER_1$'s output period constant so that the first burst has the same length as other bursts. Here, the burst interval is 1 minute.