

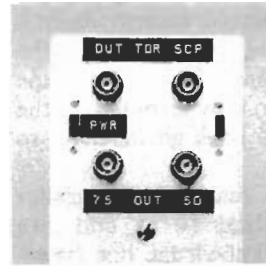
## Nanosecond-pulse generator is powered by two D cells

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A pocket-size source of nanosecond pulses is handy for field work in time-domain reflectometry and many other measurement applications. This pulse generator operates for about 180 hours from a pair of standard D cells, making it an ideal partner for the new battery-powered oscilloscopes. Parts cost for the combination pulse-generator/TDR fixture is less than \$10.

The simple circuitry is shown in Fig. 1. Three inverters of a 7405 integrated circuit form an oscillator. The inputs on the unused inverters are tied to ground to minimize power consumption. A 74S140 driver provides outputs at both of the popular cable impedances, 50 and 75 ohms, for use if the circuit is employed as a pulse source. The last section, an adaptation of the standard TDR fixture, provides the outputs for time-domain-reflectometry applications.

The FREQ switch selects pulse repetition rates of 2.8 megahertz or 150 kilohertz. With a duty cycle of about 60%, the pulse widths are 200 nanoseconds and 3.5 microseconds, respectively. The 3.5- $\mu$ s pulse width permits cable lengths of over 1,000 feet to be checked. The 2.8-MHz repetition rate produces a bright scope trace for tests on short cables or network impedances [*Electronics*, Oct. 9, 1972, p. 119]. The rise time at either

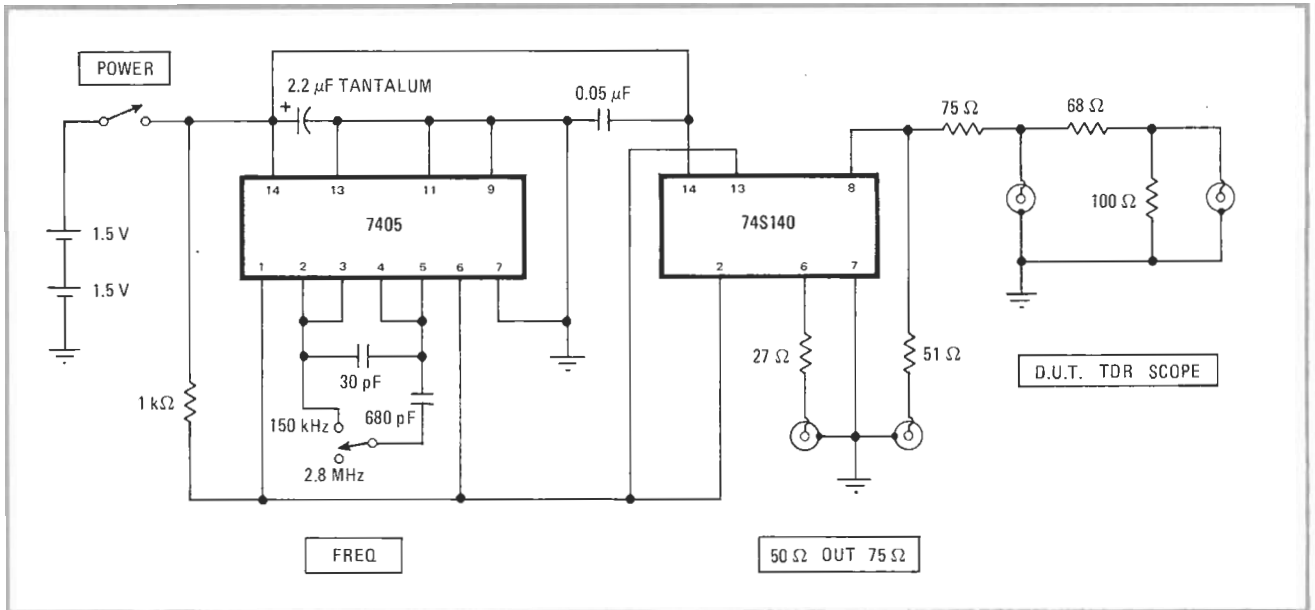


**2. A box of pulses.** Complete pulse generator, including batteries and fixture for time-domain reflectometry, is housed in a standard 3-by-2-by-5 1/4-inch aluminum box. Unit runs for 180 hours on two dry cells. Shown unlabeled at the right is the two-position frequency switch.

repetition rate is a little over 4 ns, a speed achieved by operating the TTL ICs below their rated voltage. The output amplitude into 50- or 75-ohm loads is about 0.8 volt. If three D cells instead of two are used to power the generator, the output amplitude is about 2 v, but the rise time is increased to about 5 ns.

Construction is on a small piece of Veroboard. Since TTL ICs are specified for propagation delay rather than rise time, the circuit should be breadboarded first with a socket to facilitate selection of a 74S140 with a fast rise time. The entire assembly can be housed in a 5/4-by-3-by-2-inch aluminum case (Fig. 2).

This device has other applications. The useful harmonics (3 millivolts minimum) of the 2.8-MHz pulses extend past 140 MHz, so the generator can be used in conjunction with a field-strength meter or spectrum analyzer for loss and isolation measurements in cable-television systems and components. To facilitate identifying individual harmonics, it is advantageous to replace the 30-picofarad capacitor with a 7-45-pF ceramic trimmer and adjust the frequency to 2.5 MHz. This adjustability also permits use of the unit as a low-precision comb marker generator. □



**1. Field man's friend.** Compact nanosecond-pulse generator powered by two dry cells delivers 0.8-volt pulses to either 50-ohm or 75-ohm output jacks; three batteries give 2 V, at some cost in rise time. Connections provide for use in time-domain reflectometry.