Generating nanosecond pulses with TTL monostables

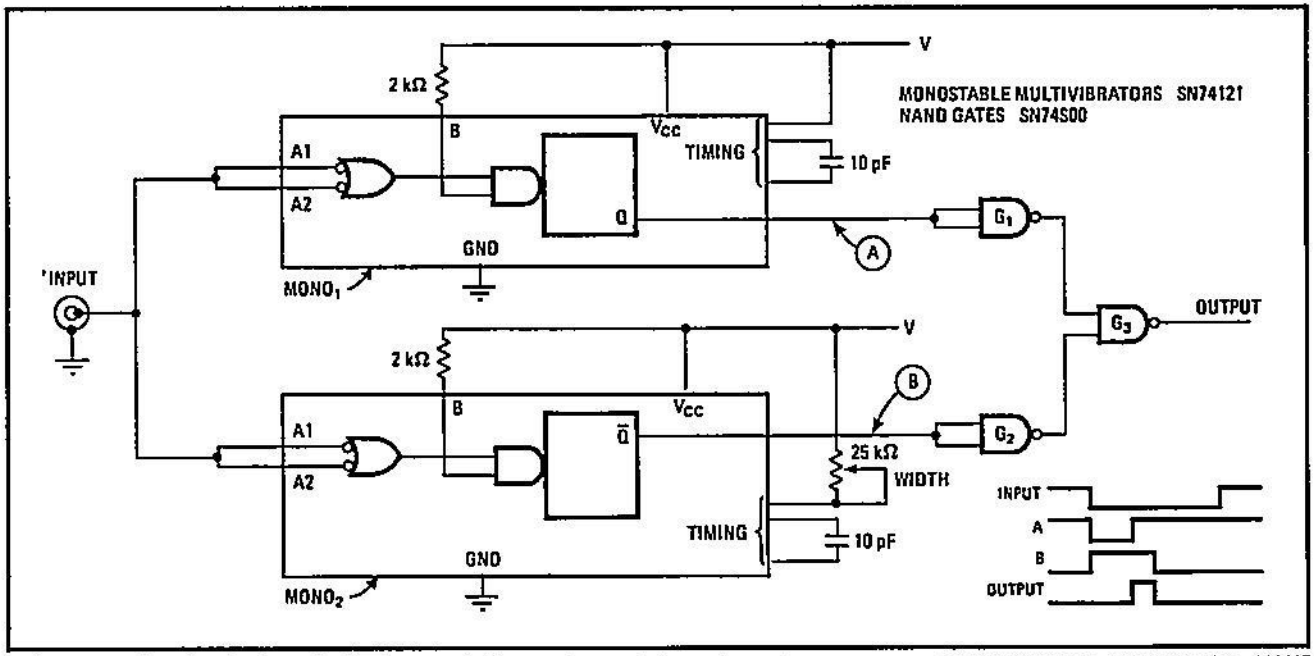
by Robert J. Broughton
Yale University, New Haven, Conn

Narrow fast pulses—with widths down to a few nanoseconds and rise and fall times of 2 ns—can be produced by a circuit based on transistor-transistor logic. The circuit's output pulse width is variable, and pulses as wide as 220 ns can be obtained.

The trick is to take the difference between two pulses generated by a pair of standard TTL monostable multivibrators. The input signal is applied to the edge-triggered inputs of $MONO_1$ and $MONO_2$. Those two monostable inputs are wired in parallel, while the Schmitt-trigger monostable inputs are kept high by the 2-kilohm resistors tied to the supply voltage.

$MONO_1$ is wired to produce a 30-ns pulse, which is conditioned by a Schottky-TTL NAND gate, G_1, to speed up its rise and fall times. Similarly, $MONO_2$ generates an output pulse that is complementary to the one generated by $MONO_1$ and that is conditioned by a second Schottky-TTL NAND gate, G_2. The width of this pulse is adjustable from 30 ns to more than 250 ns.

The third and last Schottky-TTL NAND gate, G_3, accepts the conditioned pulses from gates G_1 and G_2. The output of this gate is a fast narrow pulse whose width is the difference between the pulses produced by $MONO_1$ and $MONO_2$. An output pulse having a width of 8 ns and rise and fall times of 2ns can be easily obtained with the generator circuit. □



Pulse generator. A pair of standard TTL monostables can be made to produce sharp nanosecond pulses by using a Schottky-TTL NAND gate to accept their complementary outputs. The pulse width of $MONO_1$ is fixed at 30 ns, while the pulse width of $MONO_2$ is variable from around 30 ns to better than 250 ns. Gate G_3 takes the difference between these two pulse widths. Output rise and fall times are 2 ns.