# REGULARS

## CIRCUIT IDEAS

# Four channels on a single-channel oscilloscope

On a single-channel oscilloscope, this circuit, using only four ICs, multiplexes four signal channels for, effectively, simultaneous display.

The differential 4052 multiplexer works with two sets of four inputs: pins 11,12,14 and 15 carry the y signal, while pins 1, 2, 4 and 5 take DC potentials from the four potentiometers to determine the y position on the screen (a DC-coupled oscilloscope is assumed).

Clock pulses variable up to 2MHz are generated by the 4047 astable and drive the 2-bit Johnson counter, which produces A and B select waveforms for the multiplexer. High switching rates multiplex the y inputs at a higher rate than the oscilloscope sweep to give a virtually continuous display.

Output to the single input of the oscilloscope comes from an LM318 variable-gain op-amp.

*V Lakshminarayanan*
*Centre for Development of Telematics*
*Bangalore, India*



*Circuit for multiplexing four y channels into one single-channel oscilloscope input.*
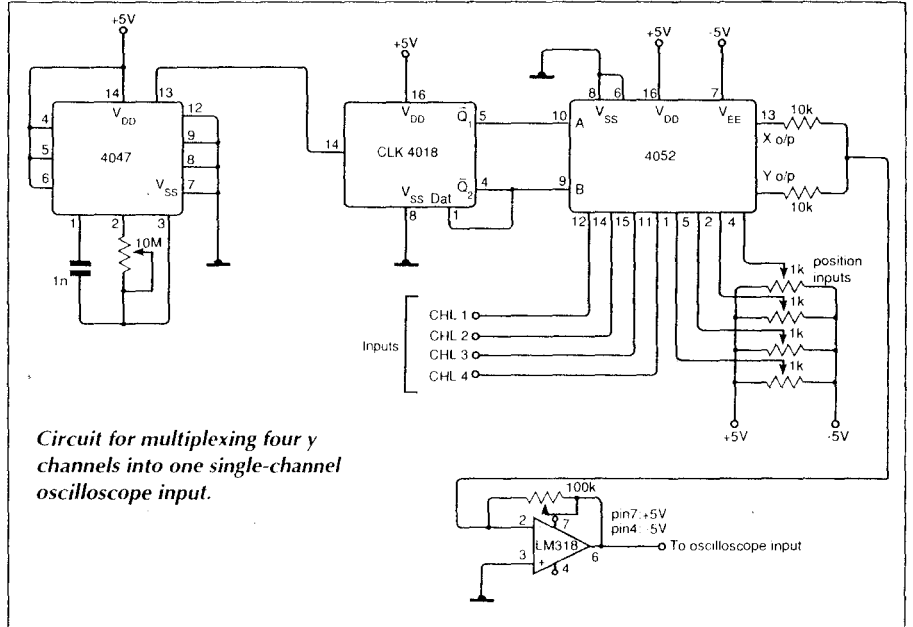
# Accurate astable multivibrator timing

In the free-running multivibrator of **Fig.1** the period is theoretically given by $T = 2CR_1 \ln(1+2R_2/R_3)$, positive and negative excursions being exactly equal.

Symmetry of the output waveform suffers in practice when the differential input voltage exceeds the specified value and, in some types of op-amp, causes an 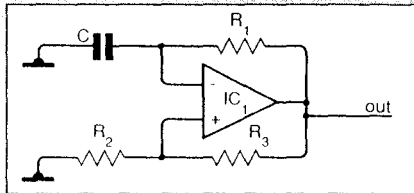avalanche input current. This usually happens as a result of exceeding input threshold protection or when long-tailed pair base/emitter zener action occurs.

**Figure 2** shows an improved circuit, in which the unity-gain buffer $IC_2$ isolates the timing circuit from the inverting input of $IC_1$, incidentally affording increased speed. Alternatively, the potential divider $R_{2,3}$ may be varied to give a lower differential input swing, but in this case the op-amp offset voltage cannot be neglected.

*Dmitri Danyuk and George Pilko*
*Kiev , USSR*



*Fig.1. Commonly used multivibrator circuit may give asymmetrical output if inverting input avalanches.*
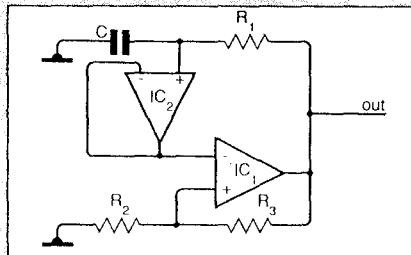


*Fig. 2. Modified circuit isolates timing components from inverting input to preserve symmetry.*