CRYSTAL-CONTROLLED TIME-BASE GENERATOR

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A digital frequency counter needs a time-base generator to count the frequency with high resolution. Normally, a crystal-based oscillator with divider IC chain or a similar circuit in the form of an ASIC (application-specific IC) is used for time-base generation. Here we've presented a simple circuit for accurate time-base generation using the readily available 3.5795MHz crystal commonly used in telecommunication equipment.

The 3.5795MHz crystal is used in conjunction with a CD4060-based crystal oscillator-cum-divider (IC1). The crystal frequency is divided by 512 by IC1, which is further divided by 7 by CD4017 (IC2). IC2 is reset as soon as its Q7 output goes high.
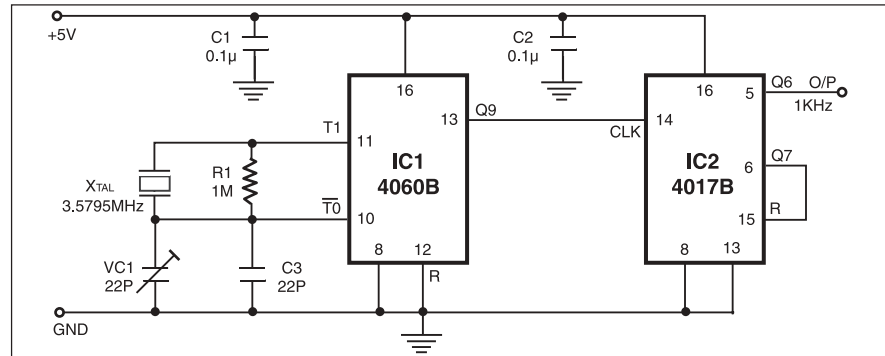
Thus the crystal frequency is divided by 3584, giving the final output frequency of around 998.8 Hz. This frequency can be trimmed to exactly 1 kHz with the help of trimmer capacitor VC1 as shown in the figure. The 1kHz signal can be further divided using decade counters to generate the required time period.

EFY lab note. To generate required gate for use in a frequency counter circuit, the final oscillator output needs to be followed by a toggle flip-flop. For example, a 1kHz clock, when applied to a toggle flip-flop, will generate gates with 1-sec 'on' period and 1-sec 'off' period.

This circuit is estimated to cost below Rs 50.