

Circuit Ideas

Constant amplitude sawtooth generator

This sawtooth generator is designed to give a constant-amplitude output over a range of frequencies when driven by an external periodic waveform. The ampli-

tude of the output is sensed and a corrective voltage is applied to the base of a transistor used as a constant-current source. The exponential current-voltage relationship of such a source renders it particularly useful for this purpose.

An MC3401P is the op-amp package used. This contains four single-supply internally-compensated amplifiers sharing common biasing circuitry, and operating over +5 to +18V. Each amplifier has a common-emitter type inverting input, and a current-mirror non-inverting input, often used to set quiescent output voltage.

Transistors Tr_1 and Tr_2 form the basic sawtooth generator, Tr_1 being driven on at the input frequency by a 300ns pulse. The resulting waveform is amplified by IC_1 and fed to IC_2 which acts as a comparator — the amplitude sensing element. The threshold is set by the 25k Ω potentiometer which should be adjusted for maximum output-ampli-

tude versus frequency linearity. Rectangular waves at IC_2 output are filtered to give a control voltage; this is shifted in level by IC_3 and D_1 to meet the input voltage requirements of Tr_2 . Capacitor C_1 acts as a reservoir to smooth out any voltage fluctuations at Tr_2 base during each cycle.

Values shown are for a range from 2kHz to 100kHz. If a faster response is desired it may be obtained by altering filter values at the expense of frequency range. An output appears at the source of Tr_3 , and may be amplified to the desired value. For optimum stability, the power supply should be stabilized. The unit may be employed as a frequency multiplier by adding comparators set to fire at various ramp levels.

The pin diagram for the 14-pin d.i.l. version of the 3401 is shown. This device may be obtained from Jermyn, Sevenoaks, Kent.

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Oxford.

