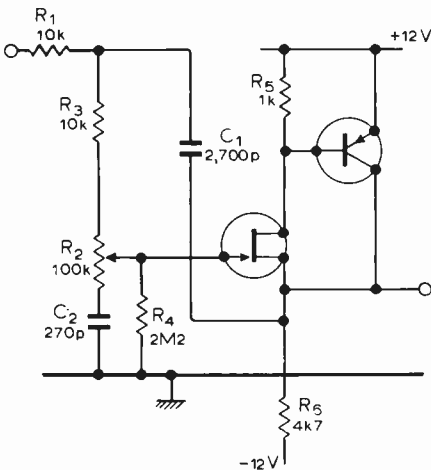


Circuit Ideas

Variable slope low-pass filter

An important feature of audio pre-amplifiers is a low-pass filter to limit the bandwidth at high frequencies. It is desirable to incorporate a variable slope device as this allows the amount of filtering to be selected for a particular programme source. A Sallen-Key design is suitable for second order filtering and the circuit may be realized with any suitable form of unity gain amplifier. This circuit uses an enhanced source follower which offers a high input impedance, low input bias current, and low distortion. The low bias current enables the gate of the f.e.t. to be directly coupled to the slider of the potentiometer. Resistor R_4 prevents any



noise occurring from the slider and R_3 restricts the fractional setting of R_2 to about 0.1. This ensures that there is an ultimate roll off above audible frequencies, and also prevents any stray capacitance at the amplifier input from forming a high Q filter.

With the values shown the turnover frequency is about 6kHz and the attenuation with minimum slope is about 2dB at high frequencies. Combined with a simple CR network, the slope can be adjusted between 6 and 18dB/octave but the author's preference is to use a second switched Sallen-Key filter with fixed slope to give a total variation from 0 to 24dB/octave.

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Long duration c.m.o.s. monostable

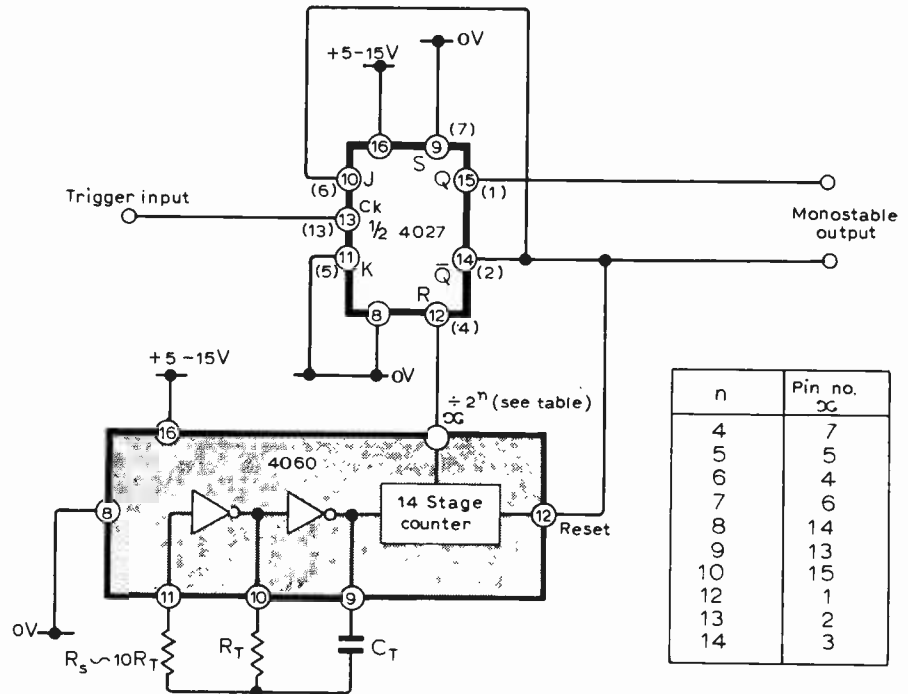
The duration of a pulse from standard c.m.o.s. monostable i.cs is affected by temperature changes and other short term variations. When accurate pulse duration is required, a more stable circuit can be made using a 4060 14-stage counter and oscillator, and half of a 4027 dual JK flip-flop.

Initially, the dividers are held at 0V by a high on their reset line. A monostable pulse is triggered by a positive edge which sets Q to a high, clears the reset line, and allows the counters to operate. After 2^{n-1} counts, the $+2^n$ output goes

high to reset the bistable and zero the counters. Pulse duration is approximately $2^{n-1} \times 2.2 \times R_t \times C_t$ seconds and the variation, in normal room temperatures, is about 0.5%. Variation in supply voltage will increase this figure.

Apart from stability, this circuit has the advantage of long variable pulse times with good linearity. Application notes ICAN 6086 and 6539 from RCA give details of a crystal control which can be used to produce even more stable, fixed durations.

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Inductance bridge

This circuit was developed to replace a high cost differential amplifier used with a.c. bridge circuits. A pulse transformer with 3 windings is connected in series with the lower limbs of the bridge. Decade resistance box R_v , and variable inductor L_v , are used for fine balancing while the ratio R_1/R_2 provides a coarse adjustment. As the bridge is brought towards balance, the inductance of the transformer drops rapidly to its leakage value which causes an increase in sen-

sitivity of the system. The third winding is followed by an amplifier with a gain of about 500. If this is fed into a transistor threshold detector it is possible to detect inductance changes of less than 0.1µH in 30µH.

If the unknown limb is used in a noisy environment the interference can be filtered and fed into the known limb through capacitor C to produce a cancellation.

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