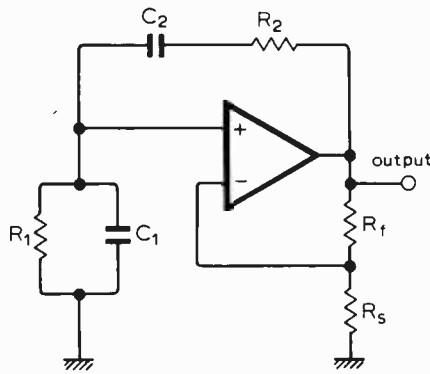


Op-amp Wien bridge oscillator

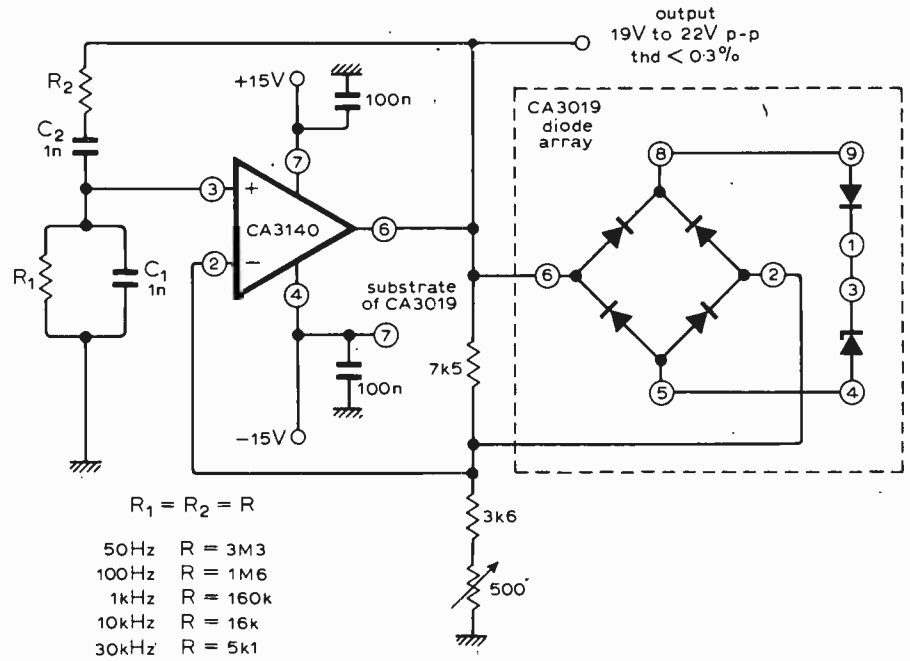
The CA3140 Bi-m.o.s. operational amplifier offers high input impedance, fast slew rate, and high output voltage capability which makes it suitable for use in a Wien bridge sine-wave oscillator. In the basic circuit, when $R_1 = R_2 = R$ and $C_1 = C_2 = C$, the frequency equation reduces to the familiar $f = 1/2\pi RC$, and the gain required for oscillation is equal to 3. If C_2 is increased by a factor of four and R_2 is reduced by a factor of four, the gain required for oscillation becomes 1.5, thus permitting a potentially higher operation frequency which is closer to the gain-bandwidth product of the CA3140. Oscillator stabilization has to be precise



$$f = \frac{1}{2\pi\sqrt{R_1 C_1 R_2 C_2}}$$

$$A_{OS} = 1 + \frac{C_1}{C_2} + \frac{R_2}{R_1}$$

$$A_{CL} = 1 + \frac{R_f}{R_s}$$



otherwise the amplitude will either diminish or limit. In the full circuit R_s is formed by a zener diode shunting the feedback resistor R_f . As output signal amplitude increases, the zener diode impedance decreases and reduces the gain, thus stabilizing the output amplitude.

Combination of a monolithic zener diode and bridge-rectifier circuit provides practically a zero temperature coefficient for this regulating system. Because the rectifier circuit does not have a time constant there is no lower

frequency limit. For example, with $1\mu F$ polycarbonate capacitors and $22M\Omega$ for the frequency-determining network, the operating frequency is 0.007Hz.

Output amplitude must be reduced as frequency is increased to prevent the output from becoming slew-rate limited. An output frequency of 180kHz will reach a slew rate of about $9V/\mu s$ when its amplitude is 16V peak-to-peak.

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Stopwatch facility for calculators

A calculator with a "constant" facility can also be used as a stopwatch. The method will vary between different types of calculator and on a Sinclair Cambridge Memory, if the "+.1" is keyed in and the "=" key is pressed at 10Hz, the calculator will act as a stopwatch.

This function is achieved by wiring a thyristor across the "=" contacts and triggering it from a 10Hz multivibrator. The thyristor will automatically turn off in the absence of a gate pulse because the i.c. sequentially strobes the keys. Accuracy of this multivibrator is adequate for most stopwatch applications over a few minutes.

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