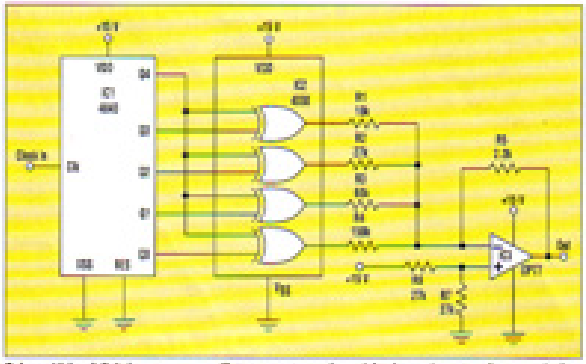
Simple Sine-Wave Generator
Has No Low-Or High-Pass Filters

Generating sine waves with controlled frequencies over a wide range is difficult when using RC or LC sinusoidal oscillators. However, this performance can be simply created using a wideband digital square-wave oscillator, a counter, and a weighted summing network

Using the circuit shown, a sinusoidal output signal with a 100,000,000+:1 frequency range from about 1 MHz to under 0.01 Hz can be obtained without need for any low-pass or high-pass filters. The circuit consists of two parts. The first part is a counter IC with a controlled inverter (IC2) that sequences the switching of input resistor of the second part-a summing amplifier (IC3). The EXOR gates are used to invert signals from four of IC1 counter's out-puts (q0-q3), depending on logical value at the fifth counter output (Q4). This operation creates the positive and negative halves of the sine waveform. Each of this halves consists of $2^4 = 16$ parts.



Only a wideband digital square-wave oscillator, a counter, and a weighted summing network are required to create this wide-range sine-wave generator. Other waveforms are possible using different resistor values

The logical values at IC1's Q0 – Q4 outputs produce weighted symmetrical currents at the summing junction of IC3. The amplifier adds all four weighted currents and generates an output signal with the desired sinusoidal waveform.

Every period of the output signal needs 16 * 2 = 32 periods of input signal, i.e. the frequency of input clock signal must be 32 times higher than the desired frequency of output analog signal :

$$f_{OUT\text{-}ANALOG} = f_{IN\text{-}DIGITAL}/32$$

By changing the values of resistors R1-R4, other waveform can be produced.