Filter levels output swing of Wien-bridge oscillators

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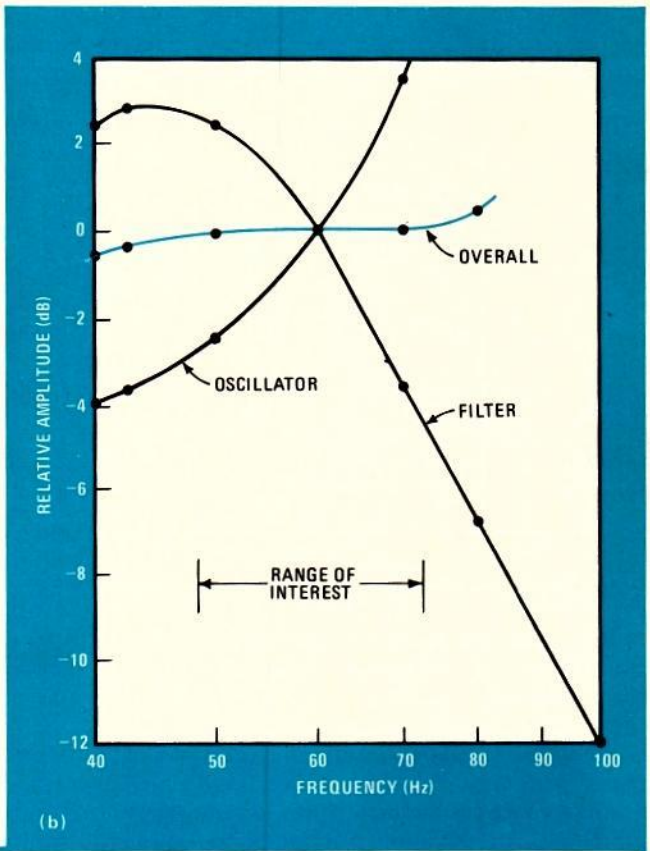
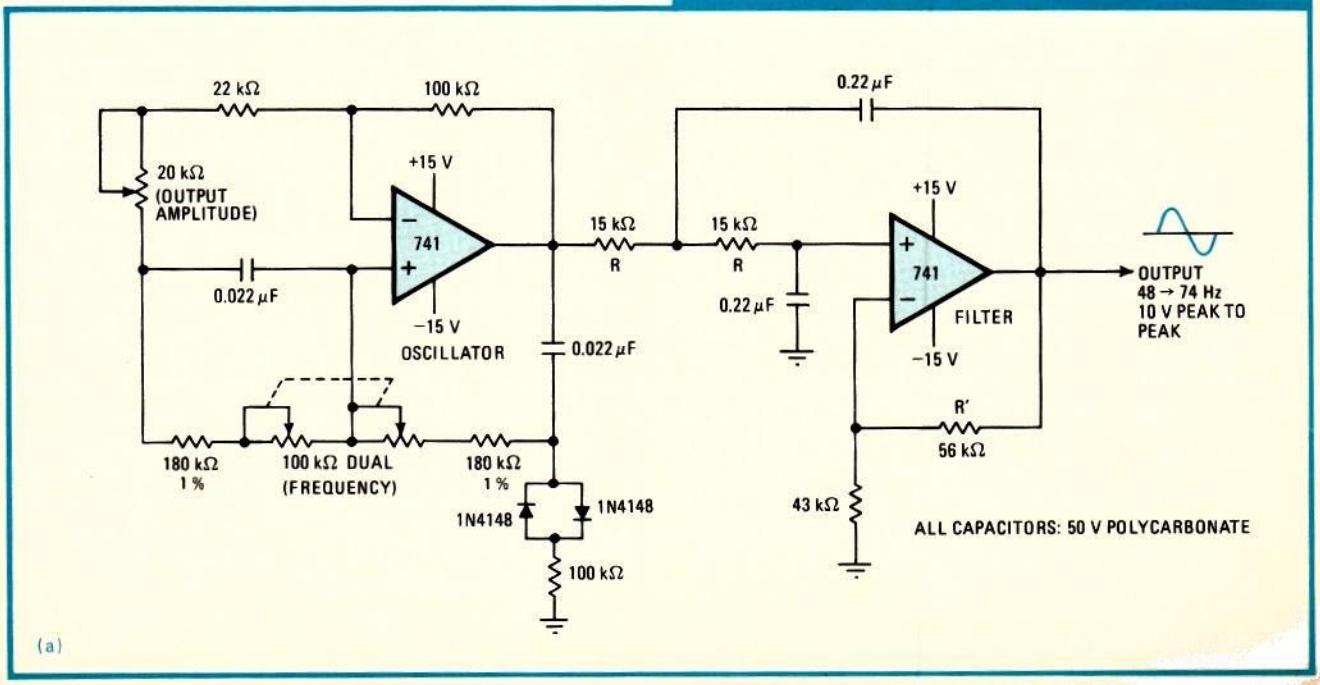
Although the output of a tunable Wien-bridge oscillator normally exhibits a large change in amplitude as a function of frequency, a standard active filter will hold it to within ±0.2 decibel over a ±20% frequency range. In this application, the filter's response is set to compensate for the amplitude variation of the oscillator. Most alternative amplitude-stabilization circuits tend to draw high power, create appreciable sine-wave distortion, or stabilize slowly.

The technique can be easily implemented at any frequency over the operating range of the oscillator, since the filter's component values are easy to calculate, being inversely proportional to frequency. The circuit shown was designed to control the speed of a 60-hertz



Stability. Active filter's roll-off characteristics compensate for oscillator's inherent amplitude change with tuning, keeping output level within ±0.2 dB in range of interest. Sine-wave distortion is also dramatically reduced—from 1% at oscillator output to 0.1%.



synchronous motor over a range of 48 to 74 Hz. It is used to adjust the tape speed of a recorder in the lab to that of an airplane's recorder so that the data can be recovered from airborne equipment that lacks a frequency-regulated power source.

Two diodes and a resistor at the oscillator's output provide soft limiting in order to confine the amplitude swing of the sine wave. The signal is then passed through the low-pass filter. To flatten the output amplitude, the filter's cutoff and its damping factor, adjusted by R and R′, respectively, are set to compensate for the oscillator's amplitude variations. In general, the slope of the filter's amplitude response is made equal in magnitude but opposite in sign to that of the oscillator's response.

The graph shows the overall output to be expected compared with the individual oscillator and filter responses. In addition to amplitude compensation, the filter provides good rejection of harmonics. Third-harmonic distortion is an order of magnitude below that achieved by the oscillator alone. □