

Simple phase-locked loop

The conventional two-transistor multivibrator can be converted into a simple audio frequency phase-locked loop by the addition of a few components. Transistor Tr_1 and the diode are connected as a logic gate, and conduct during alternate half-cycles of the input and v.c.o. waveforms respectively. The output of this phase-detector, when filtered, is most negative when the waveforms are in phase, and most positive when they are in antiphase. Because the diode conducts only when Tr_2 is saturated, the action of the multivibrator remains unaffected. Once phase-lock has been established the v.c.o. settles to an equilibrium phase, lagging the phase of the input by an angle which depends on the difference between the frequency of the input and the free-running frequency of the v.c.o.

With the component values shown, phase-lock is maintained from 100Hz to around 3kHz. Within this range the output changes linearly at about 14mV/Hz. The response to a sinusoidal frequency-modulation is 3dB down at about 50Hz.

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