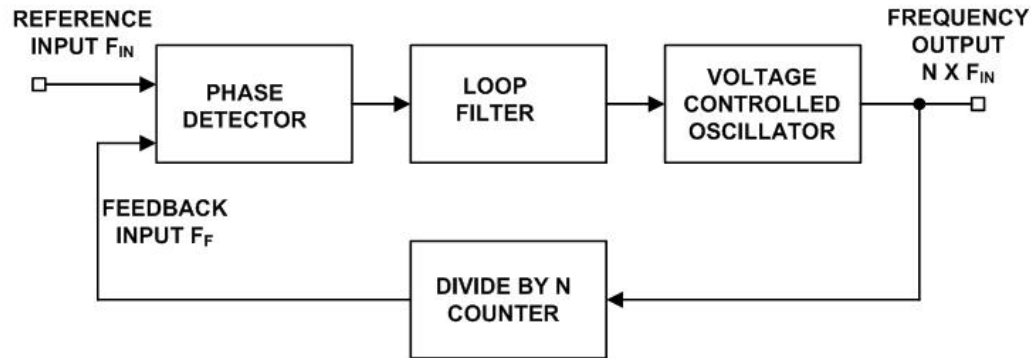


A **phase-locked loop** or **phase lock loop (PLL)** is a control system that generates an output signal whose **phase** is related to the **phase** of an input

A **phase-locked loop (PLL)** is an electronic circuit with a voltage or voltage-driven oscillator that constantly adjusts to match the frequency of an input signal. PLLs are **used to generate, stabilize, modulate, demodulate, filter or recover** a signal from a "noisy" communications channel where data has been interrupted



- Phase detector: As the name implies, this circuit block within the PLL compares the phase of two signals and generates a voltage according to the phase difference between the two signals.
- Voltage controlled oscillator, VCO: The voltage controlled oscillator is the circuit block that generates the radio frequency signal that is normally considered as the output of the loop. Its frequency can be controlled over the operational frequency band required for the loop.
- Loop filter: This filter is used to filter the output from the phase comparator in the phase locked loop, PLL. It is used to remove any components of the signals of which the phase is being compared from the VCO line, i.e. the reference and VCO input

How phase-locked loops work

PLLs work by constantly adjusting a voltage or current-driven oscillator to match the phase and frequency of an input signal, which typically consists of a voltage-controlled oscillator (VCO) tuned using a special semiconductor diode called a varactor. The VCO is initially tuned to a frequency close to the desired receiving or transmitting frequency. A circuit called a phase comparator causes the VCO to seek and lock onto the desired frequency, which is set via a crystal-controlled reference oscillator. When the VCO frequency differs from the reference frequency, the phase comparator produces an error voltage. The comparator output is usually run through a low-pass filter to further reduce noise. The filtered output is fed back to the varactor to continually push the VCO toward the reference frequency. The filtered output of the comparator also provides the output of the circuit -- the signal found in the transmission (the voice, video or data). Since the signal is encoded by modulating a carrier wave, it can be thought of as the difference between the carrier waveform and the actual transmitted waveform, and can therefore be found in the output of the comparator.

