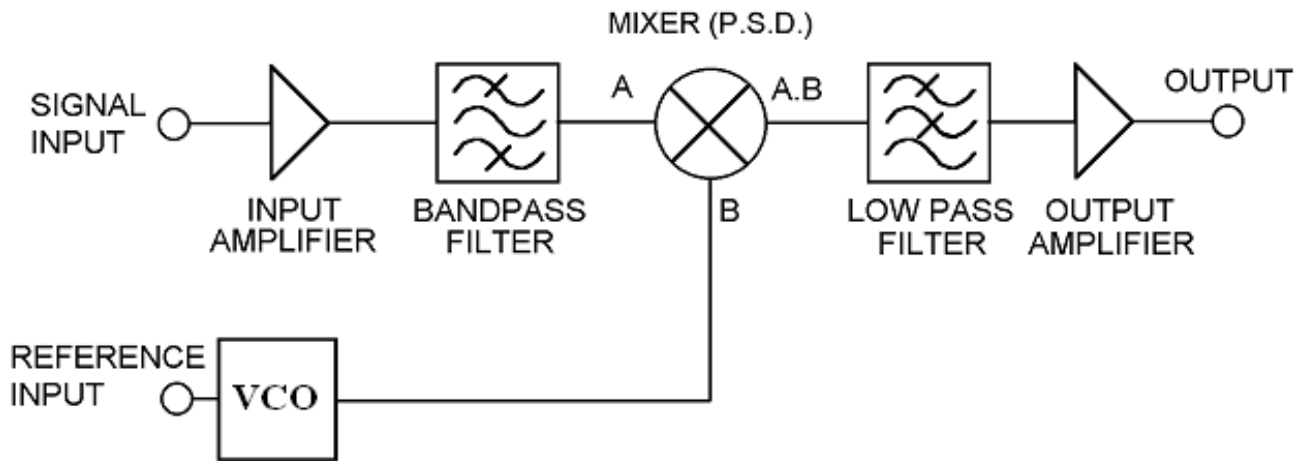


Lock-in-Amplifier

- Basic Functionality:
 - signal recovery from noise
 - high resolution measurement of signals

Basic Scheme (Analog Mode):

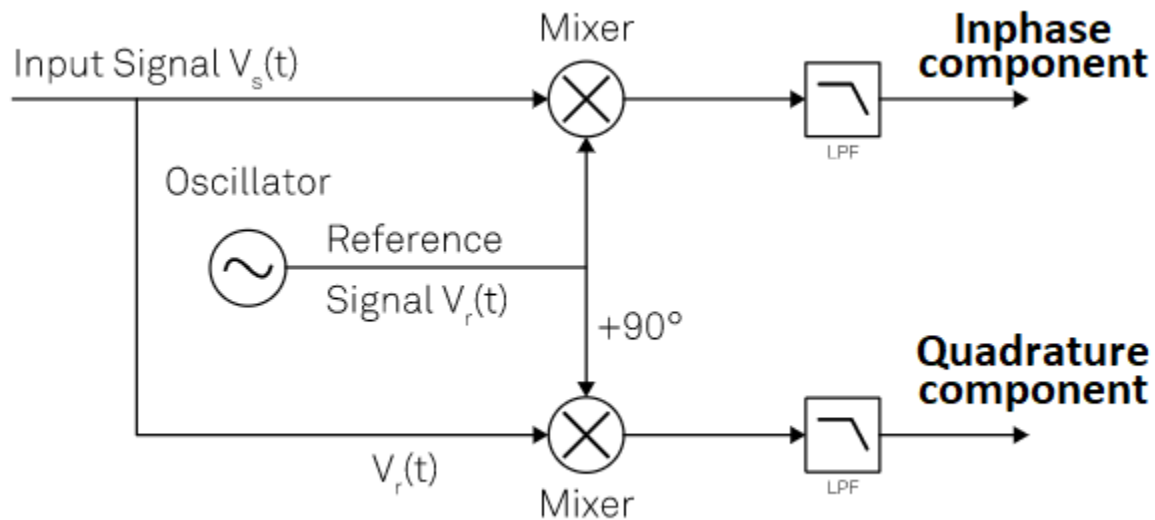


$$\begin{aligned} V_{\text{PSD}} &= A \cos(\omega t) \cdot B \cos(\omega t + \theta) \\ &= \frac{1}{2}AB \cos \theta + \frac{1}{2}AB \cos(2\omega t + \theta) \end{aligned}$$

If the magnitude of the reference signal is kept constant, then the output from the **phase-sensitive detector** is a DC which is-

- ◆ modulated at $2\omega t$, i.e. it contains components at twice the reference frequency.
- ◆ proportional to the magnitude of the input signal A
- ◆ proportional to the cosine of the angle, θ , between it and the reference signal

The low-pass filter removes the $2\omega t$ component, leaving the output of the lock-in amplifier as the required DC signal.



Modified Scheme

