1 Page Review of Phase Sensitive Amplifiers

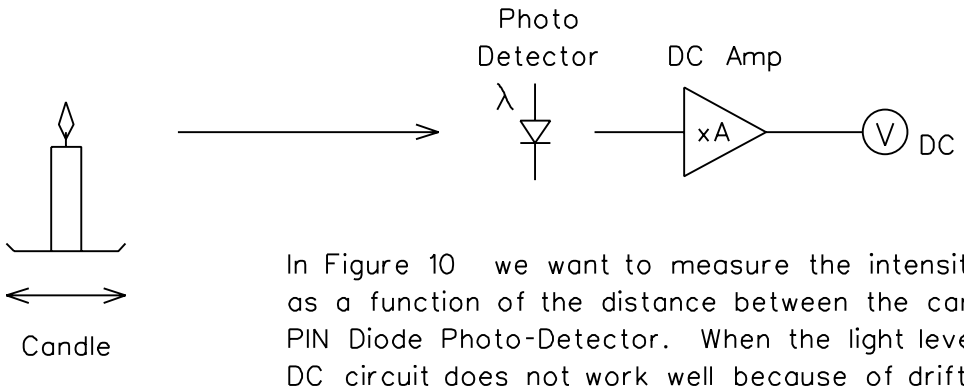

Figure 10

In Figure 10 we want to measure the intensity of the light as a function of the distance between the candle and the PIN Diode Photo-Detector. When the light level is low this DC circuit does not work well because of drift in the zero input response of the DC amplifier and because of increased noise (1/f noise) down at DC. The solution is to multiply the low frequency - DC light signal by a higher frequency "carrier signal", then AC Amplify in the frequency range around this carrier signal, next Phase-Lock-Detect the output of the AC Amplifier, and finally Low Pass Filter the output of the Phase-Lock-Detector.

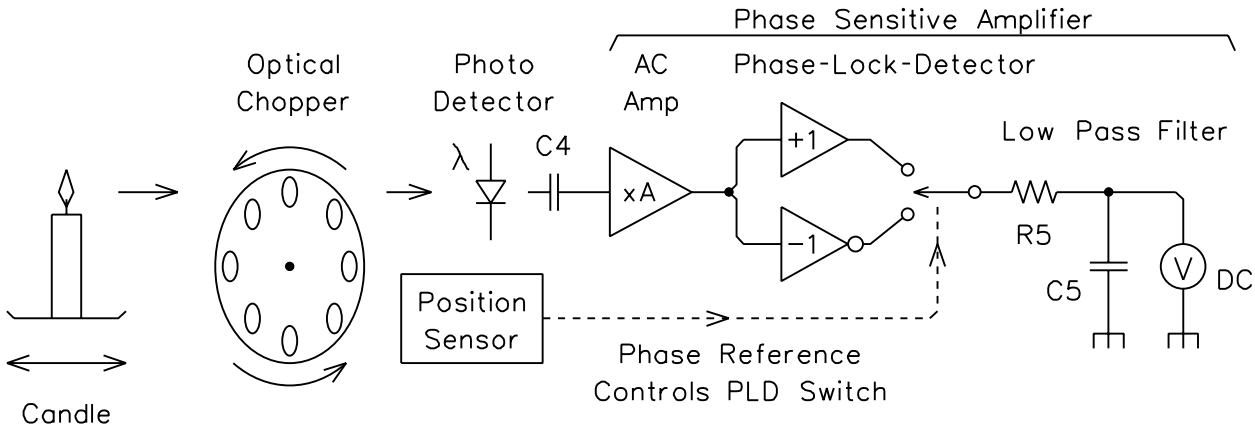

Figure 11

In Figure 11 the light signal is Chopped at perhaps 100 Hz by a rotating disk with holes in it. A position pickup senses the rotational position of the disk and generates a Reference Signal that controls the PLD Switch. This Switch is in the +1 position when light can pass through a hole in the disk and in the −1 position when the light is blocked by the disk. Capacitor C4 reminds us that we do not care about any DC signal from the Photo-Detector - we care only about the signal around 100 Hz.

R5-C5 form a simple Low Pass Filter. The time constant of this filter must be long compared to the 100 Hz carrier signal and it must be short compared to how frequently we want to make independent measurements. If we want to move the candle and make a measurement once every 30 seconds we could pick a 3 second RC time constant, i.e. 300 times longer than 100 Hz while allowing 10 time constants to settle between measurements. The bandwidth of this setup is about 1 / RC in this case 0.3 Hz.