# SQUID Elec. Use of Phase Sensitive Amplifier

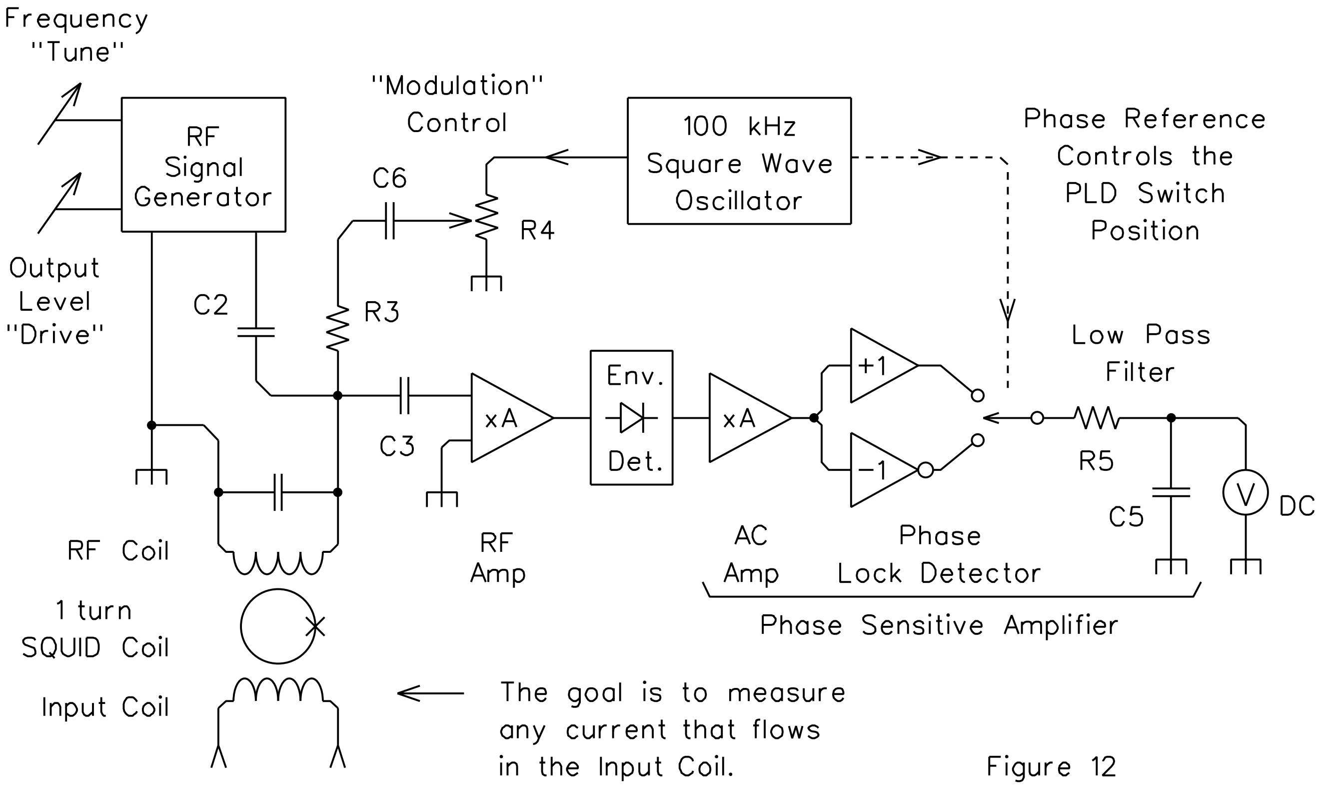


Figure 12

Figure 12 shows how Quantum Design applies Phase Sensitive Amplification in their SQUID Electronics to improve the S/N ratio of the weak 10 uVolt signal produced by the SQUID.

The flux passing through the 1 turn SQUID Coil is dithered by a 100 kHz square wave at an amplitude of approximately + − 1 /4 flux quanta. Generating this square wave magnetic flux requires a square wave current waveform of about + − 250 nAmp in the RF Coil. The same coax cable that carries the 200 MHz RF Signal to the RF Coil also carries the 100 kHz + − 250 nAmp square wave to the RF Coil. This is possible because R3 in Figure 12 is in the range of Meg Ohms so the 200 MHz signal traveling in the 50 Ohm coax environment completely ignores this resistor. On the other hand there are 3 orders of magnitude between 100 kHz and 200 MHz so C2 and C3 can be sized to have appropriate reactance at 200 MHz and a high isolating reactance at 100 kHz. Capacitor C6 just blocks any DC shift of the flux in the SQUID.

For a given initial amount of flux in the SQUID, the effect of the application of this 100 kHz square wave flux dither on the RF voltage across the RF Coil is shown in the figures on the next page. The 100 kHz variations in the RF envelope amplitude come out of the Envelope Detector. The Phase Sensitive Amplifier then produces an output voltage that is proportional to how far the initial amout of flux was displaced from a minimum and has a polarity that indicates left or right displacement.

Drw: 8
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