Stanford Research Systems

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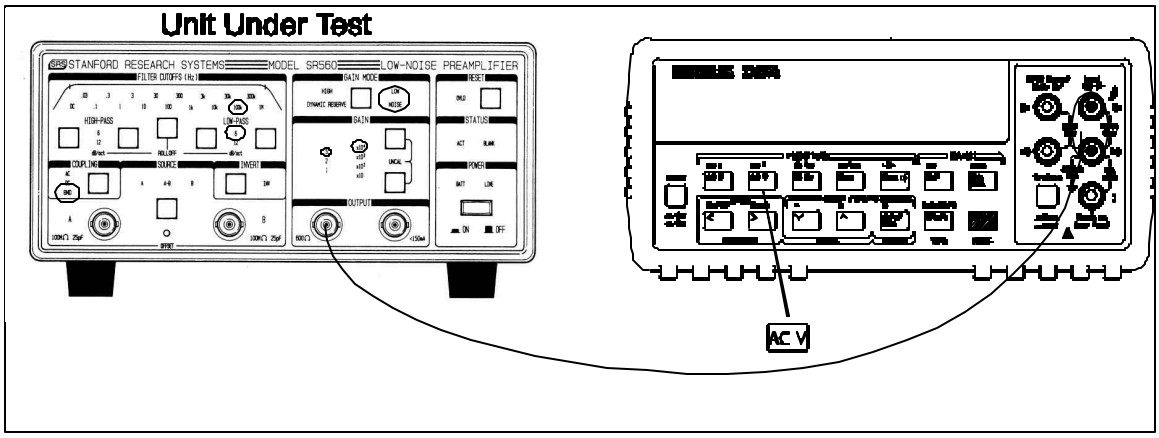
Estimating Input Noise on the SR560

The best method for characterizing the noise performance of the SR560 is to measure the output power spectral density using a spectrum analyzer such as the SR785. This note describes an alternate method using an RMS AC voltmeter. Verify that the voltmeter has at least 100 kHz bandwidth and measures true RMS VAC. Alternatively, an oscilloscope can be used to estimate VAC_{rms} by the approximation:

$$VAC_{rms} \approx V_{pp} \div 5.$$

The setup should be:



The Unit Under Test should be set to: Filter: –6dB Low Pass 100 kHz, Coupling: GND, Mode: LOW NOISE, Gain: 50,000.

Connect the output of the SR560 to the voltmeter input, and set the meter to AC Volts.

The noise equivalent bandwidth for the simple RC lowpass filter is given by the formula[1]

$$ENBW = \pi/2 \times f_{-3dB}.$$

For the filter settings above, this gives ENBW ≈ 160 kHz.

The approximate input noise for the Unit Under Test is then:

$$e_n = VAC_{rms} \div (TotalGain \times \sqrt{ENBW})$$

For the gain and filter settings above, this gives $\boxed{e_n = VAC_{rms} \div (2 \times 10^7).}$ An SR560 with 4 nV/ √Hz noise should read VAC_{rms} = 80 mV.

[1] See Horowitz & Hill (2nd ed), page 453